ZION STATION

DEFUELED
SAFETY ANALYSIS REPORT
(DSAR)

October 2016

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF CONTENTS

1. INTRODUCTION AND GENERAL DESCRIPTION OF PLANT

1.1 INTRODUCTION

The Nuclear Regulatory Commission approved the transfer of the facility licenses from Exelon Generation Company, LLC (EGC) to Zion*Solutions*, LLC (ZS) on May 4, 2009 (Reference 1). Some historical references in the Defueled Safety Analysis Report (DSAR) have been retained, as appropriate, instead of being changed to ZS to properly preserve the historical context.

In February 1998, Commonwealth Edison (ComEd) certified the permanent cessation of operation of Zion Station Units 1 and 2 to the NRC (Reference 2). In March 1998, ComEd certified to the NRC that all fuel assemblies have been permanently removed from both Zion Station reactor vessels and placed in the spent fuel pool (Reference 3). ZS transitioned Zion Station from the SAFSTOR condition (a period of safe storage of the stabilized and defueled facility) to active dismantlement. Spent fuel was transferred by ZS from the Spent Fuel Pool to an on-site Independent Spent Fuel Storage Installation (ISFSI) to allow the completion of decommissioning of the Zion Station.

This DSAR is derived from the July, 1996 update of the Zion Station Updated Final Safety Analysis Report (UFSAR). The DSAR has been developed as a licensing basis document that reflects the permanently defueled condition of Zion Station and supersedes the UFSAR. As such, the DSAR is intended to serve the same function during decommissioning that the UFSAR served during operation of the facility. An evaluation of the systems, structures and components (SSCs) described in the UFSAR was performed to determine the function, if any, these systems would perform in a defueled condition. Each major SSC was evaluated to determine if it was required to support the safe storage of irradiated fuel in the spent fuel pool, or needed to support decommissioning activities. With the relocation of the spent fuel to the ISFSI, the license bases for the majority of the SSCs has changed and only minimal SSCs are needed to support the ongoing active decommissioning. These SSCs and design function will continue to transition as active decommissioning progresses. The remaining SSCs needed to support active decommissioning have controls established in the Quality Assurance Project Plan (QAPP) and the Offsite Dose Calculation Manual (ODCM). These key SSCs support radiation protection and ALARA and are discussed in Section 4 of the DSAR.

A brief history of major plant operations and licensing related actions for Zion Station is as follows:

1. Construction Permit issued, December 1968,
2. Final Safety Analysis Report submitted, December 1970,
3. Operating license issued, April 1973 for Unit 1 and November 1973 for Unit 2,
4. Commercial Operations achieved, December 1973 for Unit 1 and September 1974 for Unit 2,
5. Certification of permanent cessation of plant operation submitted, February 1998,
6. Certification of permanent removal of all fuel from the reactor vessels, March 1998.
7. Spent fuel was moved from the spent fuel pool to the on-site ISFSI, January 2015.

Upon docketing of the certification for permanent cessation of operation and permanent removal of fuel from the reactor vessels, the 10 CFR Part 50 license no longer authorizes operation of the reactors or emplacement or retention of fuel in the reactor vessels. In addition, the operating licenses scheduled to expire in April 2013 for Unit 1 and November 2013 for Unit 2 continue to remain in effect until the Nuclear Regulatory Commission notifies ZS that the licenses have been terminated.

Certain sections of the DSAR may contain figures that are copies of controlled Zion Station drawings and diagrams. These figures are included to supplement the text and aid in the understanding of the information provided. The drawings in Table 1-1 are included as historical information and will no longer be updated as decommissioning progresses. As a result of updating the Zion Station DSAR on a biennial basis in accordance with 10 CFR 50.71(e), later revisions of the controlled drawings or diagrams may exist.

1.2 GENERAL PLANT DESCRIPTION

Westinghouse Electric Corporation, Sargent and Lundy Engineers, and the Commonwealth Edison Company jointly participated in the design and construction of each unit. The plant was operated by the Commonwealth Edison Company. Each unit employed a pressurized water reactor nuclear steam supply system furnished by Westinghouse Electric Corporation designed for a power output of 3250 MWt. The equivalent warranted gross and approximate net electrical outputs of the plant were 1085 MWe and 1050 MWe, respectively.

With the relocation of the spent fuel to the ISFSI and active decommissioning in progress, structures, systems and components (SSCs) are no longer required to meet the original design and license bases. The site SSCs continue to be utilized to support ongoing decommissioning activities and to ensure radiological effluents and occupational radiological exposures are maintained As Low As Reasonably Achievable (ALARA).

1.2.1 General Design Criteria

The general design criteria followed in the design of Zion Station were developed as performance criteria which define or describe safety objectives and procedures. Along with these performance criteria, Zion Station was designed to comply with ComEd’s understanding of the intent of the Atomic Energy Commission's (AEC) proposed General Design Criteria, as published for comment by the AEC in July 1967 (see Reference 4). The Zion construction permit, which fixed many of the safety-related design criteria, was issued in December 1968. The Zion FSAR, which presented the detailed design of the plant, was submitted in December 1970. Subsequent to this submittal, the AEC's final General Design Criteria (see Reference 5) were published as Appendix A to 10 CFR 50 in July 1971.

The limited performance criteria that are applicable to the defueled condition are addressed in the DSAR where pertinent. As applicable, the performance criteria are quoted and followed by a brief summary of the design or procedures. The design or procedures are then more fully described in other sections of the chapter.

Compliance with Commonwealth Edison’s understanding of the intent of the AEC's proposed General Design Criteria, as published in July 1967, is presented in Chapter 3.

Overall Requirements

1. There are no remaining Quality and Performance Standards applicable to the former Zion power plant with the spent fuel relocated to the ISFSI.

2. Fire Protection

   Fire protection facilities are provided in accordance with the recognized guidelines of the National Fire Protection Association, Nuclear Electric Insurance Limited, and Underwriters Laboratory. The Fire Protection Report outlines the basic design and operational features of the plant Fire Protection System. The requirements for fire protection of the facility are governed by 10 CFR 50.48(f).

3. Record Requirements

   ZS and EGC or their authorized representatives and Westinghouse Electric Corporation have retained complete documentation of the design, fabrication, and construction of all essential plant components. These records are available to verify the high quality and performance standards applicable to all essential plant components.

1.2.1.1 Radiation Controls

Monitoring radiologically controlled areas and radioactive effluents is accomplished through a combination of effluent and monitoring instrumentation and through the use of radiation protection procedures during active decommissioning. The effluent radiation monitors are defined in the ODCM and provides surveillance requirements to maintain releases within radioactive gases and liquid concentration and dose limits defined in the QAPP.

1.2.1.2 Waste Storage Systems

Waste handling activities during active decommissioning are controlled such that accidental releases of radioactivity directly to the atmosphere will not exceed the limits of 10 CFR 100.

Postulated accidents involving the release of radioactivity from waste storage and handling facilities are shown in Chapter 5 to result in exposures well within the limits of 10 CFR 100.

1.2.1.3 Dry Cask Storage

The NAC MAGNASTOR dry cask storage system and the Independent Spent Fuel Storage Installation (ISFSI) provide long-term on-site storage of Zion spent nuclear fuel and Greater-than-Class C (GTCC) waste as shown in Figure 1-4. Use of the dry cask storage system is granted upon issuance of a Certificate of Compliance (Reference 7) from the NRC for Zion spent fuel. Use of the ISFSI for storage and handling of spent fuel is granted upon compliance with the conditions of the General License issued under 10 CFR 72, Subpart K and the Zion Nuclear Power Station 10 CFR 72.212 Evaluation Report (Reference 8).

1.2.1.4 Effluents

Gaseous, liquid, and solid waste disposal facilities are designed so that discharge of effluents and offsite shipments shall be in accordance with applicable governmental regulations. Process and discharge streams are appropriately monitored and safety features are incorporated to preclude releases more than the limits of 10 CFR 20. The plant restricted area, as it is applied to the definitions in 10 CFR 20, is defined in Appendix F of the ODCM. This area includes

sections of shoreline. The area is owned by EGC and is leased from them and in the possession and control of ZS; the control being required in 10 CFR 20. Neither EGC nor ZS has any riparian ownership extending out into the lake. Verification of annual exposures to persons in those portions of the lake which constitute the restricted area will be accomplished by station release records and the environmental monitoring program. The restricted area does include shoreline frontage. The property boundary is shown on Figure 1-1. All solid wastes are placed in suitable containers and stored onsite until shipment offsite for disposal. Chapter 4 contains additional discussion regarding gaseous, liquid and solid waste management.

1.2.2 Structures

The major structures that were part of the design of the plant included a separate and independent Containment for each reactor, a common Auxiliary Building with holdup tank vault, a common Fuel Handling Building, a common Turbine Building, a common Cribhouse, and a common Administration and Service Building. The ISFSI stores spent fuel and GTCC waste and is located south of the switchyard as shown on Figure 1-4.

1.2.3 Waste Disposal System

Liquid and gaseous waste discharge to the environment is controlled to keep the offsite dose well within the limits of 10 CFR 20.

1.2.4 Site and Environment

The characteristics of the site and its environs have been investigated to establish bases for determining criteria for storm, flood, and earthquake protection and to evaluate the validity of calculational techniques for the control of routine and accidental releases of radioactive liquids and gases to the environment. Field programs to investigate geology and seismology are completed. A Preoperational Meteorological Program to provide onsite observations of wind speed and direction was begun January 1970. A radiological study of the site environs was initiated March 1970 with the objective of establishing background radiation levels.

The site is in Northeast Illinois on the west shore of Lake Michigan about 40 miles north of Chicago, Illinois, and about 42 miles south of Milwaukee, Wisconsin, as shown in Figure 1-17.

The site is covered mainly by sandy soil with patches of peat and muck in the marshy western portions of the site. Test borings, to investigate subsurface conditions reveal that the site is blanketed by granular lake deposits underlain by glacial drift consisting of till, outwash and lake deposits. The site is well ventilated and not subject to severe persistent inversion. While tornadoes occur in the region, none have been reported to affect the lake shore site directly. High winds (on the order of 70-mph) can be expected once in 50 years from storms.

A horizontal ground acceleration, at the site, of 0.17 times gravity (0.17g) combined with a vertical acceleration of 0.11 times gravity (0.11g) has been used for the earthquake design criteria based on site investigations.

1.2.5 Facility Safety Conclusions

The safety of the public and plant operating personnel and reliability of plant equipment and systems have been the primary considerations in the plant design. The approach taken in fulfilling the safety consideration were three-fold. First, careful attention has been given to the design so as to prevent the release of radioactivity to the environment under conditions which

could be hazardous to the health and safety of the public. Second, the plant has been designed so as to provide adequate protection for plant personnel wherever a potential radiation hazard exists. Third, Engineered Safety Features were designed with redundancy and diversity, and to stringent quality standards. The first two approaches above remain applicable during active decommissioning of the facility, while the third is no longer applicable. During active decommissioning, originally installed equipment and systems will be removed from service and sent for disposal.

Based on the overall design of equipment and systems, the analyses of the possible incidents and the controls established in the QAPP and ODCM, it is concluded that Zion Station does not represent an undue hazard to the health and safety of the public.

1.3 IDENTIFICATION OF AGENTS AND CONTRACTORS

As owner, Commonwealth Edison Company engaged, or approved the engagement of, the contractors identified below in the construction of Units 1 & 2 which were put in commercial service in December of 1973 and September of 1974, respectively. However, irrespective of the explanation of contractual arrangements offered below, Commonwealth Edison Company was the sole applicant for the construction permit and operating license. Commonwealth Edison Company, as owner and applicant, was responsible for the design, construction and operation of the plant.

The plant was designed by Westinghouse Electric Corporation and Sargent and Lundy for Commonwealth Edison Company. Westinghouse Electric provided the nuclear steam supply equipment and system including the fuel assemblies. Commonwealth Edison Company engaged the architect-engineering services of Sargent and Lundy, Chicago, Illinois, to provide the design of the balance of the plant and to prepare specifications for the purchase and construction thereof. Commonwealth Edison reviewed the designs, construction and purchase specifications prepared by Sargent and Lundy and Westinghouse Electric Corporation to assure that the general plant arrangements, equipment and operating provisions were satisfactory.

Analysis of all environmental data was performed by NUS Corporation. Specific investigations regarding seismic, geologic and hydrologic features were prepared by Dames and Moore.

1.4 DRAWINGS AND OTHER DETAILED INFORMATION

Table 1-1 lists DSAR figures that are historical drawings and will no longer be updated.

1.5 REFERENCES

1. NRC letter, “Order Approving Transfer of Licenses and Conforming Amendments Relating to Zion Nuclear Power Station, Units 1 and 2”, dated May 4, 2009.

2. Letter from O. D. Kingsley, ComEd to U.S. NRC, dated February 13, 1998, Certification of Permanent Cessation of Plant Operation.

3. Letter from O. D. Kingsley, ComEd to U.S. NRC, dated March 9, 1998, Certification of Permanent Removal of all Fuel from the Reactor Vessels.

4. Atomic Energy Commission, Proposed General Design Criteria, Federal Register, July 11, 1967.

5. Atomic Energy Commission, General Design Criteria, Federal Register, July 1971.

6. NRC letter “Braidwood, Byron, Dresden, LaSalle, Quad Cities and Zion - Orders Approving Transfer of Licenses from Commonwealth Edison Company to Exelon Generation Company, LLC, and Approving Conforming Amendments,” dated August 3, 2000.

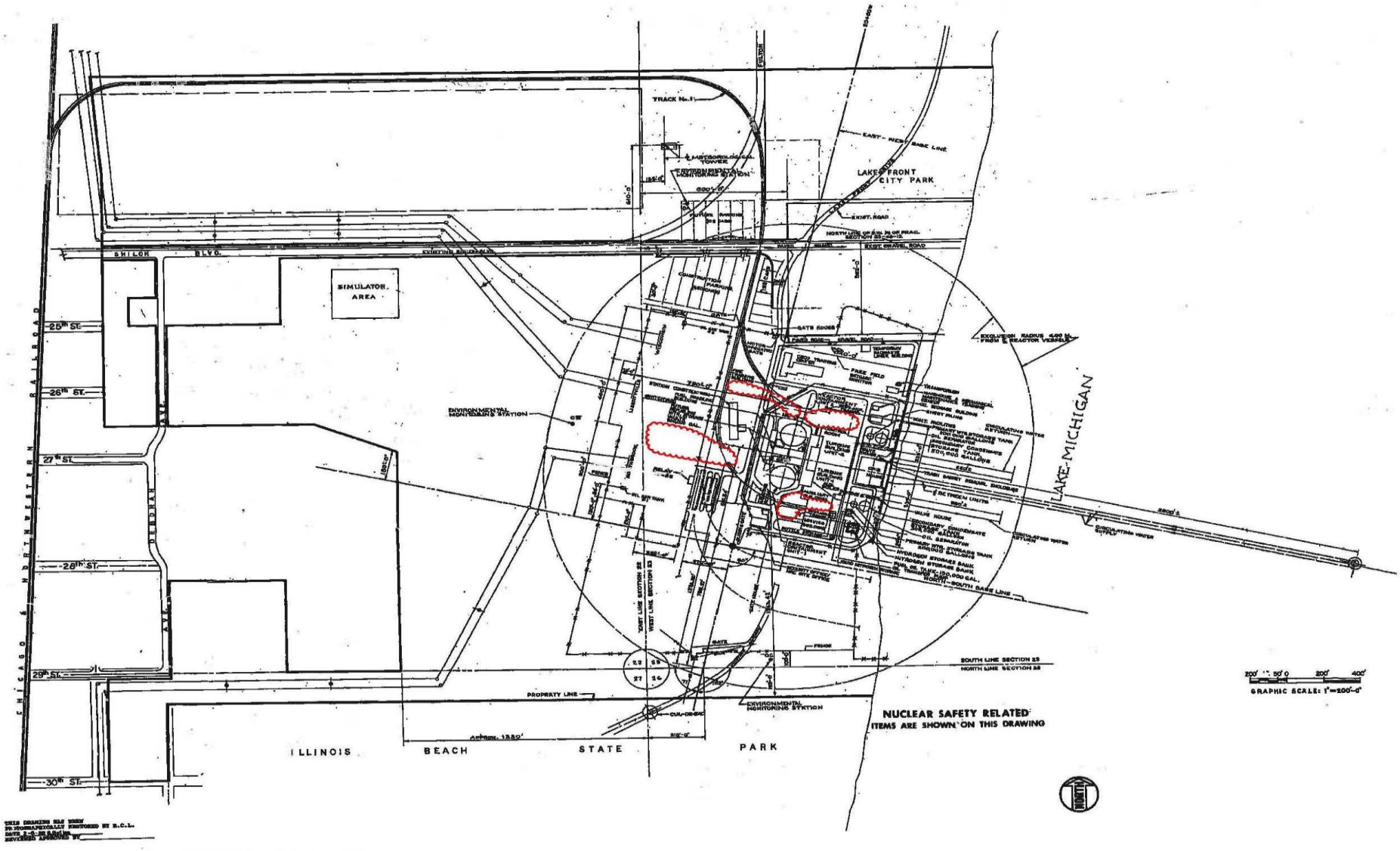
7. NRC Certificate of Compliance No. 1031, Amendment 3 for the NAC International Inc. (NAC) MAGNASTOR System, July 25, 2013.

8. Zion Nuclear Power Station Independent Spent Fuel Storage Installation (ZNPS ISFSI) 10 CFR 72.212 Evaluation Report.

TABLE 1-1

CROSS-REFERENCE FOR CONTROLLED DRAWINGS

DSAR FIGURE NUMBER	DRAWING NUMBER
1-1	M-1
1-2	M-2

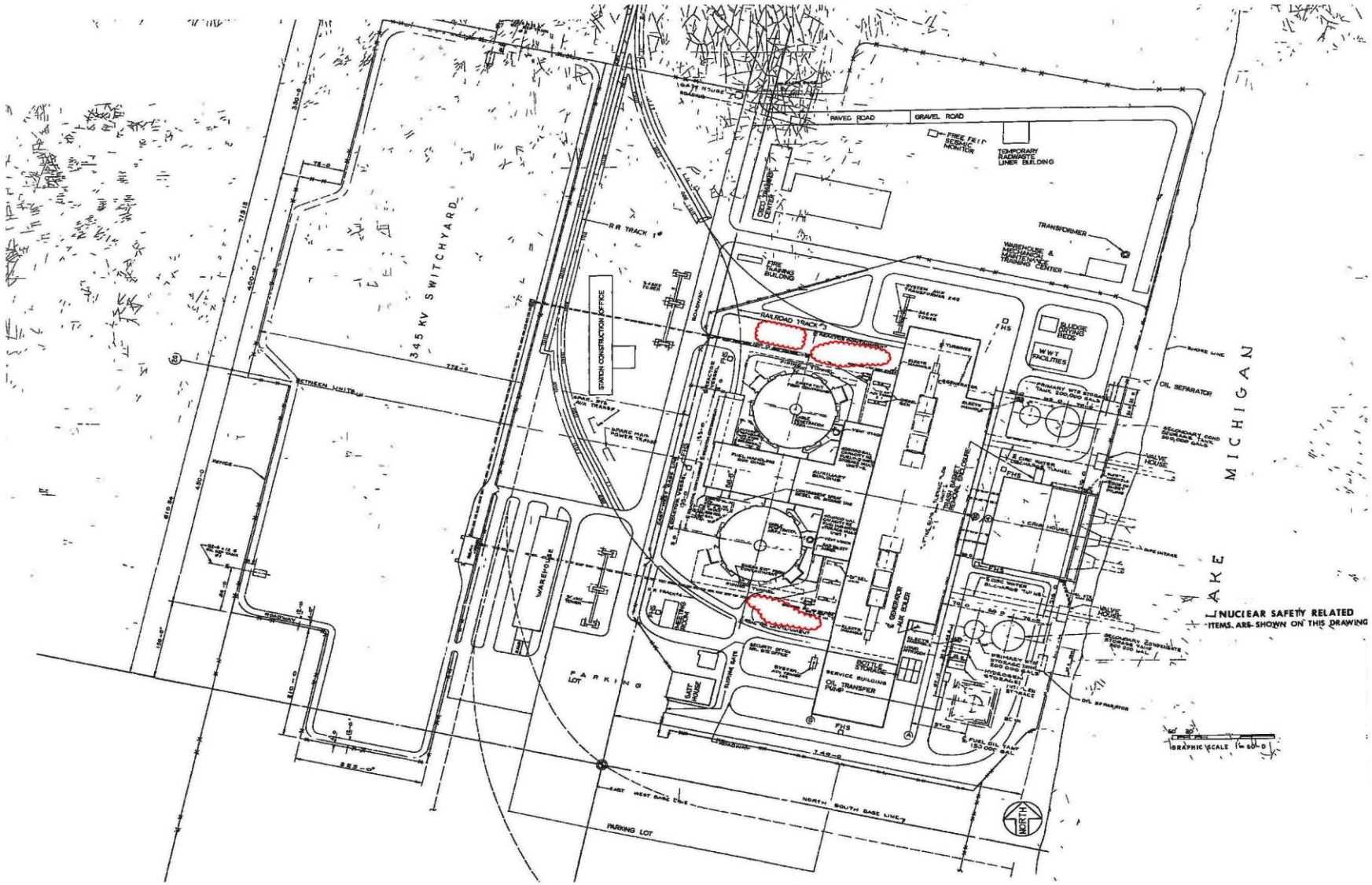


ZION STATION DSAR

Figure 1-1

Property Plat

October 2016



ZION STATION DSAR

Figure 1-2

Property Development Plat

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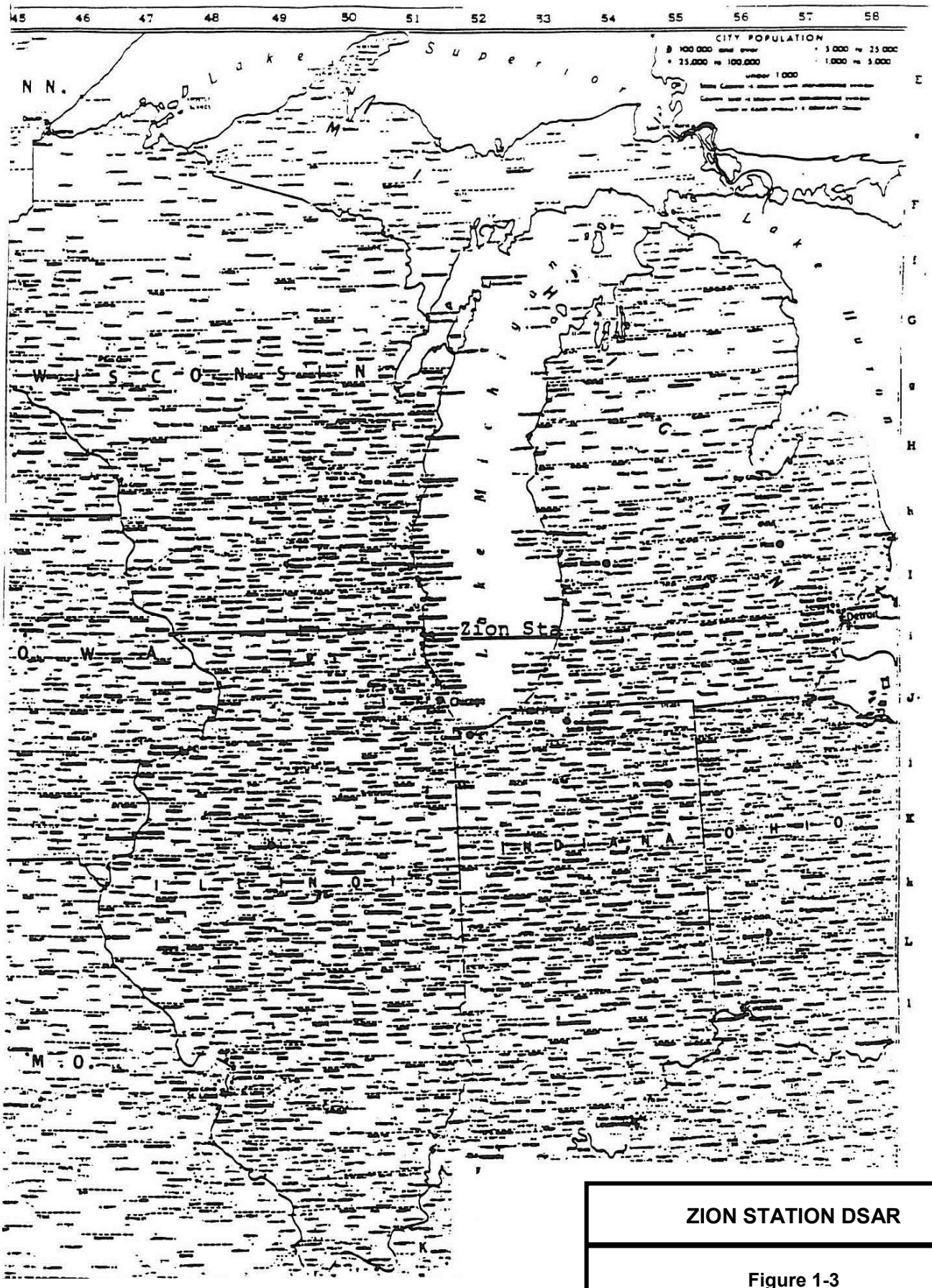
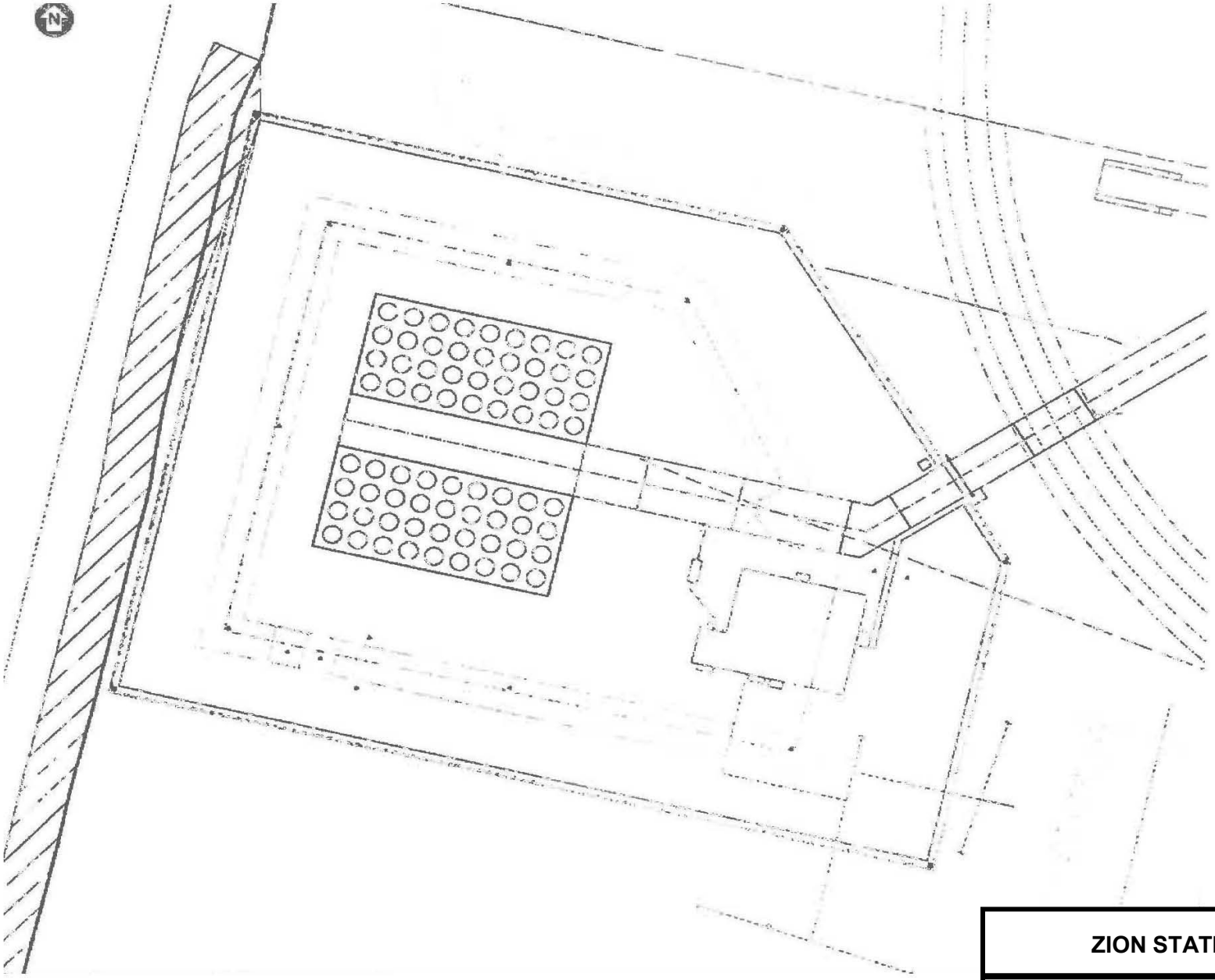


ZION STATION DSAR

Figure 1-3

Location of Zion Station

October 2016



ZION STATION DSAR

Figure 1-4

Independent Spent Fuel Storage Installation

October 2016

2. SITE CHARACTERISTICS

2.0 INTRODUCTION

This chapter summarizes information on the geological, seismological, hydrological, and meteorological characteristics of the site and vicinity, in conjunction with population distribution, land use, and site activities and controls. The purpose is to indicate how these site characteristics influenced the original plant design, operating criteria, and overall adequacy of the site for nuclear power operations. Much of this information is historical in nature. This information demonstrates, in complement with more detailed discussions provided in other chapters, the overall adequacy of the site for safely storing, monitoring, and handling of fuel, to safely handle radioactive waste, and to monitor all radiological effluent release paths.

2.1 GEOGRAPHY AND DEMOGRAPHY

2.1.1 Site Location and Description

The site is in Northeast Illinois on the west shore of Lake Michigan about 40 miles N of Chicago, Illinois, and about 42 miles S of Milwaukee, Wisconsin, as shown in Figure 2-1. The site is in the extreme eastern portion of the city of Zion, (Lake County) Illinois, on the west shore of Lake Michigan approximately 6 miles NNE of the center of the city of Waukegan, Illinois, and 8 miles south of the center of the city of Kenosha, Wisconsin. It is located at longitude 87 degrees 48.1 minutes W and latitude 42 degrees 26.8 minutes N.

The site comprises approximately 331 acres which is owned by EGC. The site is traversed from west to east by Shiloh Boulevard near the northern property boundary. Site maps covering details out to a 10 mile radius and in the Low Population Zone (LPZ) and Exclusion areas, are respectively shown in Figures 2-1 and 2-2. Figure 2-3 is an aerial photograph depicting the site.

ZS requested to remove and release approximately 214 acres of the site classified as radiologically non-impacted from its Part 50 license in accordance with 10 CFR 50.83(b) in a letter dated August 27, 2015 (Reference 53). The NRC approved the request in a letter dated March 31, 2016 (Reference 54). The radiologically non-impacted areas are identified in the Zion Station License Termination Plan.

In addition to those roads which connect directly with the site, there is a network of primary and secondary highways and section line roads in the adjacent area which provide a variety of high capacity routes to and from the site and the immediate vicinity, as indicated on Figure 2-2. For example, in addition to Shiloh Boulevard, which extends approximately 2 miles west of the plant site, there are within 1-mile of the site three other highways or roads (Ill. Rt. 173, 29th Street, and Wadsworth Road) extending westerly and intersecting each of the principal north-south secondary highways located within four miles of the site, i.e., Sheridan Road, Lewis Avenue, Kenosha and Green Bay Roads (Ill. Rt. 131), and also U.S. Rt. 41, a four lane, highspeed, divided highway. In addition, Interstate 94, a limited access, four lane tollway, is situated approximately 6 miles west of Zion.

2.1.2 Exclusion Area Authority and Control

The site, owned solely by EGC and controlled by ZS under lease, provides the requisite exclusion area. Reference Section 1.2.1.4 for discussion of the radiological restricted area.

There are no residences on the site or within 2000 feet of the station structures.

2.1.3 Population Distribution

The 0-10 mile population estimates were made using the 1980 Census Bureau population data for the incorporated areas and 1980 aerial photographs for unincorporated areas. The incorporated area totals were added to the unincorporated area totals to obtain population estimates by zone which appear in Table 2-1.

A list of incorporated villages and cities within 10 miles of Zion was prepared by finding their distance and direction using the following maps: USGS 1:250,000 topographical map, Illinois Highway map, Wisconsin Highway map 1981-1982, New Expanded Chicago Tribune Chicagoland map, Kenosha County Highway map and official township maps for Kenosha and Lake counties. Population totals for these municipalities were obtained from the 1980 US Census Bureau lists of Incorporated Municipalities for Illinois and Wisconsin. Those areas with 25,000 inhabitants or more are listed by distance and population in Table 2-2.

As discussed in Chapter 5, the total radiation doses under postulated hypothetical accidents to an individual at the boundary of the exclusion area or at the boundary of the “low population zone” are within the limits prescribed by 10 CFR 100 and within USEPA Protective Action Guidelines.

The population density and use characteristics of the environs are compatible with the operation of the Zion Station.

2.2 NEARBY INDUSTRIAL, TRANSPORTATION, AND MILITARY FACILITIES

2.2.1 Locations and Routes (References 1 and 2)

The Waukegan-North Chicago area is predominantly an industrial region with 144 manufacturing establishments. The product of the largest of these manufacturing firms is pharmaceuticals and chemicals with the most predominant product of the remainder being in the metallurgical and fabricated metal products field. None of the industries listed by the Waukegan-North Chicago Chamber of Commerce will represent a limitation to the operation of the Zion Station.

2.2.2 Descriptions (References 3, 4, and 5)

2.2.2.1 Nonmilitary Facilities

The Zion-Winthrop Harbor area is a small industrial region. A portion of this industry is located between the western boundary of the site and the Chicago and Northwestern Railroad tracks approximately 0.8 miles due west of the plant location and is light in nature. There is also a warehouse located in this industrial area.

There are no schools or hospitals within one mile of the station.

The site is bordered on the north and the south by the Illinois Beach State Park.
The centers of the communities of Zion and Winthrop Harbor are located 1.6 and 2.5 miles, respectively, from the plant location. According to the Lake County Regional Planning Commission, commercial fishing is almost nonexistent in this portion of Lake Michigan due to the migration northward of the Lake Trout. Sport fishing has increased in popularity since the introduction of salmon and trout in the lake.

2.2.2.2 Military Facilities

The major military installation in the vicinity of the Zion site is the Great Lakes Naval Training Station.

The Great Lakes Naval Training Station has a small arms practice range utilizing a small area of Lake Michigan 10 miles south of the Zion site.

There is no active vessel of the Navy on Lake Michigan. The U.S. Coast Guard operates surface vessels and aircraft on the lake.

It is concluded that military installations and operations in the vicinity of the Zion site do not pose any threat to safe facility operation.

2.2.2.3 Waterways

Commercial barges and ships do not ordinarily operate within five miles of the Zion site, and the majority of commercial traffic on Lake Michigan does not approach within twenty miles of the site. All barge traffic north of the Chicago area is limited to the summer months due to waves or ice on the lake. Explosives and toxic gases are carried only aboard oceangoing vessels which do not closely approach the site.

2.2.2.4 Airports

Waukegan Regional Airport is the closest airport to the station and is the only one within 10 miles of the plant. It is located 3.14 miles southwest of the site. The station is located 0.76 miles from the extended centerline of the longest runway (5/23). Figure 2-4 shows the general airport layout.

2.2.3 Evaluation of Potential Accidents

A probabilistic risk evaluation was performed circa 1989 which estimates the potential for an aircraft accident resulting in a post-crash fire within sufficient proximity to Zion Station to present a hazard (References 6 and 7). The evaluation concluded that the probability of occurrence of the event was below 1.0×10^{-7} per year, and would remain below this value even to the year 2008. The NRC reviewed and accepted this evaluation via Reference 8. The NRC's conclusion is stated below:

"The overall probabilities of an aircraft crash leading to a fire near the ventilation intakes of the Zion plant meet the acceptance criteria of Section 3.5.1.6 of the Standard Review Plan. Accordingly, the technical specification for aircraft fire detection is not required."

A new aircraft crash hazard analysis (Reference 52) was performed in April 2013 to determine if the 1989 analysis for the Diesel Generator and Switchgear Room Ventilation System air intakes, Auxiliary Building Ventilation air intake, and the Crib House Service Water Pump Area Ventilation intakes remained bounding for the Fuel Handling Building. The new analysis determined that the probability of occurrence of an aircraft crash was below 1.0×10^{-7} per year for the Fuel Handling Building which meets the NUREG-0800 criteria of 1.0×10^{-7} per year as to when an aircraft crash is not considered a design basis external event. In summary, the potential adverse effects of an airplane crash need not be considered and the 1989 analysis remains the bounding analysis. Aircraft crash analysis as it relates to the ISFSI is discussed in the 10 CFR 72.212 Evaluation Report.

The Zion Station can withstand any fire or explosion which could result from an accident in the normal shipping lanes on Lake Michigan. The release of toxic gases on the lake could affect the environs of the station, but would not cause the historical Control Room to become uninhabitable.

2.3 METEOROLOGY

2.3.1 Regional Climatology

2.3.1.1 General Climate

The climate of the region around the site is primarily continental, with characteristic cold winters and warm summers. There is no dry season; precipitation occurs with some uniformity throughout the year. Average annual precipitation is about 33 inches, average annual snowfall is about 40 inches, and the mean annual temperature in the area is near 50°F.

Winds over 70 miles per hour are not expected to occur more than once every 50 years. Tornadoes occur with relative high frequency in Illinois, but are mostly found in the southern half of the state.

Northern Illinois is well-ventilated, with infrequent periods of calms. Most frequent wind direction occurrences are southwest and northeast during the warm months of the year, and southwest and northwest during the cool months. The lake breeze effect is an important factor in wind direction during the summer months. The longest duration of uninterrupted winds blowing from one direction was 39 hours from the northwest.

Some extremes of meteorological variables are listed in Table 2-3.

Data and analyses in Section 2.3 are based on: five years of hourly observations from Milwaukee, Wisconsin and Chicago (O'Hare); wind summaries from Waukegan, Illinois (Reference 9); summaries of climatological data from Wisconsin and Illinois; and other reference data of a more specific nature. Data presented from the Milwaukee, Waukegan, and O'Hare airports was that five-year period which was available on magnetic tape from the National Weather Records Center.

2.3.2 Local Meteorology

2.3.2.1 Normal and Extreme Values of Meteorological Parameters

2.3.2.1.1 Climate

The climate of the Zion region is illustrated on Figure 2-5 which shows average and extreme temperatures and precipitation for 30 or more years of record at Chicago and Milwaukee.

The climate of the site region is influenced by the general storms which move eastward along the northern tier of the United States and by those which move northeastward from the southwestern part of the country to the Great Lakes. This continental type of climate is modified by Lake Michigan. Wind shifts from westerly to easterly directions produce marked cooling of the day time temperatures in spring and summer. In autumn the relatively warm water of the Lake prevents night time temperatures from falling as low as they do a few miles inland from the shoreline. Summer time temperatures seldom rise above 90°F along the Lake shore, and sub-zero temperatures occur only about twelve days during the winter months. Rainfall

averages around 33 inches per year, with the largest proportions falling during the growing season. Extreme winds for design purposes are described below.

Results are from a special study done by the Weather Bureau for winds at 30 feet elevation. Extreme-mile winds are: 50 mph with probability of 0.50 and a recurrence interval of once in 2 years; and a 50-year recurrence interval is associated with a 70 mph wind with a probability of 0.02. (The extreme-mile wind speed is defined as the 1-mile passage of wind with the highest speed for a day.)

An annual stability wind rose table for 1980 was generated using the former Zion meteorological tower data (Table 2-4). The 35-ft wind speed and wind direction data and the 250-35 ft differential temperature data were used in the comparison. The modal wind speed for this period was the 4-7 mph class (41.80%). The prevailing wind direction was northwest (9.75%) followed by west (9.24%). Stability classes were weighted towards the neutral-slightly-stable classes (44.42%).

2.3.2.1.2 Wind Direction

Average annual wind roses are shown on Figure 2-6 for Milwaukee, Waukegan, and Chicago (O'Hare). The wind regimes at all three locations are quite similar, except that the results from Chicago (O'Hare) show considerable observer bias in favoring the octant points of the compass. At all three locations, the warm weather lake breeze effect is reflected in a definite spike of higher wind frequencies from the northeasterly direction. Calm conditions at these three sites are reported to range from about 1% to 6% on an annual bases. There are no major dissimilarities between the three wind roses. Data from Milwaukee were selected as being reasonably free from observer bias and representative of the west coastal areas along Lake Michigan, and have been used in the preliminary determination and analysis of Zion site meteorological factors. Figure 2-7 shows the average wind rose for the Zion site based on limited onsite data. No major differences are noted between the two figures. These wind roses were used in evaluating the meteorological factors for initial licensing.

Table 2-5 presents the stability wind rose data obtained from the former Zion Meteorological Tower for the period of January 1, 1972, through December 31, 1980. These roses are based on the 35 ft wind speed direction and the 250-35 ft differential temperature. The prevailing wind direction for this period is west (9.73%) followed by southwest (9.52%). The modal wind speed class for this period was 4-7 mph (44.98%) followed by the 8-12 mph class (29.73%). Wind speeds less than 4 mph occurred 7.23% of the time. For the period, the stability distribution was weighted toward the neutral-slightly stable classes (59.70%).

The information provided for the former Zion Meteorological Tower was used in evaluating the Zion site meteorological factors.

2.3.2.1.3 Wind Direction Persistence

Wind direction persistence at Milwaukee and Chicago (O'Hare) for the five year period of record are presented in Figure 2-8 and Figure 2-9, respectively. For each direction, the duration in hours, the number of occurrences, the data of the beginning hour and a summary of the stability class spectrum is given on the plots. Maximum persistence winds follow the wind rose patterns shown previously in Figure 2-6. Most persistent winds at Milwaukee were from the SSW for 32 hours under neutral (Pasquill Class “D”) and slightly stable (Pasquill Class “E”) conditions; from NW for 30 hours all under neutral stability; and from NNE for 29 hours under neutral and slightly stable conditions.

The most persistent winds at Chicago were from the NW for 39 hours (twice) under slightly stable conditions, from the NNE for 38 hours under neutral conditions, from the SW for 36 hours under stable and neutral conditions, and from the S for 32 hours under neutral conditions. In general, flow from Lake Michigan over land occurs under neutral conditions.

Based on the five years of data from O'Hare and Milwaukee, a wind direction persistence frequency distribution has been constructed (see Figure 2-10). For one-sector persistences, O'Hare would exceed an 80-hour duration with a probability of 10^{-4}, while Milwaukee would exceed a 38-hour duration at the same probability level.

Table 2-6 identifies the Pasquill stability classifications versus the temperature lapse rate. Tables 2-7 through 2-9 present the hourly joint frequency distributions of wind speed and direction by stability classifications.

2.3.2.1.4 Atmospheric Stability

Assessments of atmospheric stability at General Mitchell Field, Milwaukee, and O'Hare Field, Chicago, were made based on five years of data. These data were analyzed by techniques described by Turner (Reference 10) based on work done by Pasquill (Reference 11) and formulated into a computer code (WINDIF)* by NUS Corporation.

Hourly surface observations were analyzed for seasonal stability, dispersion (χ/Q) calculations and persistence including:

1. Hourly stability index distribution in percent of total observations and in percent of each hourly observations;
2. Day-night stability index distribution in percent of total observations;
3. Average wind speed for each stability index in knots;
4. Wind rose for each stability index in percent of each index total;
5. Average wind speed for each stability index and each of 16 wind directions;
6. χ/Q as a function of release height, wind direction, and downwind distance weighted by stability class and wind rose frequencies; and
7. Seasonal wind persistence calculations which include frequency of wind persistence by wind direction in percent of total number of observations for one sector, centerline plus and minus one sector, and centerline plus and minus two sectors. Stability variation for each hour of pre-selected magnitude of wind direction persistence.

Results of the stability class distribution along the wind rose for both Chicago (O'Hare) and Milwaukee are shown in Figures 2-11 and 2-12, respectively, for average annual and seasonal wind roses. On each direction ray the distance between the symbols for each stability class measured from the calm circle is the frequency of occurrence of each stability class in percent of total observations for five years of data.

* Tabulation of data is shown in Appendix 2A. Zion tabulation based on limited data is shown in Appendix 2B.

Routine releases of radioactive gases will be made intermittently from the vent discharge pipe near the top of the Containment structure. Atmospheric dispersion of these gases may be described by various analytical expressions such as the Gaussian formulation described by Gifford, (Reference 12) as modified for the building wake effect. The basic expression for diffusion is as follows:

$$\chi / Q = \frac{\bar{\mu}}{(\pi \sigma_y \sigma_z + cA)}$$

where:

χ	=	concentration (units/m ^{3})
Q	=	release rate (units/sec)
μ	=	mean wind speed (m/sec)
σ_y and σ_z	=	respectively the lateral and vertical dispersion (Reference 13) coefficients(m)
c	=	building wake factor (dimensionless)
A	=	area of Containment (m)^2

For distances out to the exclusion boundary, the predominant dispersion mechanism is that due to aerodynamic turbulence in the wake of the Containment structure as contrasted with releases from a tall stack with no local interferences.

An overlay plot of the annual average χ/Q results for ground level release of waste gases corrected for initial dilution by the building wake model (Reference 13) is shown superimposed on the aerial photograph of the site in Figure 2-13. Based on Milwaukee data, the annual average diffusion factor (χ/Q) is about 2 x 10 $^{-6}$sec/m ^{3} at approximately 2000 feet to the North of Unit 2. Figure 2-14 presents the χ/Q isopleths results for a ground level release based on available Zion site data.

2.3.2.1.5 Severe Weather

Northern Illinois experiences about 36 thunderstorms per year, with the largest number occurring from May through August. Most of these thunderstorms are of light or moderate intensity; but occasionally, severe thunderstorms, accompanied by high winds, hail, and heavy rainfall, can cause extensive damage to crops.

Based on work by Thom (Reference 14), highest expected winds were determined for the Zion site and are listed in Table 2-10.

The value of the highest gust of wind with a mean recurrence interval of 100 years is approximately 104 miles per hour, and for a 50-year interval, approximately 91 mph. The above estimates of highest gusts are based on work performed by Huss (Reference 15).

Since 1871, only three tropical storms have moved far enough inland to have passed near the Zion site. The tropical storms, which passed within about fifty miles of the site, occurred on October 6, 1949; June 28, 1960; and June 26, 1968. All were in a state of well-advanced dissipation and did not cause any significant damage to northeastern Illinois.

In the period from 1959 to 1969, thirty-four tornadoes have been recorded in Weather Bureau records as having occurred inside a square 80 miles on a side with the Zion site in the center. These are listed in Table 2-11, with the occurrence recorded as to state, date, direction of movement, path length, and width. Most of the tornado activity in Illinois takes place in the southern half of the state, and relatively few cross the shoreline from land to water.

According to methods outlined in a paper by Thom, (Reference 16) estimates of the probability of tornado occurrence at a point within a one-degree square are possible. Using the median values of path width and length of Iowa tornado tracks, and the approximate area of the site, the probability of a tornado occurrence at the site has been calculated to be 1.29×10^{-4}. On the basis of the ten years of observations used in Thom's paper, the 95% confidence limits have been determined to be $\pm 4.07 \times 10^{-5}$ ($\pm 2.2\sigma$). A probability of 1.69×10^{-4} is thus determined at the 95% confidence level. This indicates a recurrence interval of approximately one tornado every 5900 years within the site boundaries.

An alternate method, using the value for a path area of 2.8209 square miles suggested by Thom, yields a probability of 9.0×10^{-4} for the 95% confidence limits. These result in a range of recurrence interval from 800 to 1600 years.

2.3.3 Onsite Meteorological Measurements Program

An on-site meteorological measurement program is no longer required based on the current status of decommissioning. Metrological data can be obtained from various sources as needed to support site activities.

2.3.4 Short-Term Diffusion Estimates

Short-term diffusion estimate data is contained in Appendix 2C.

2.3.5 Long-Term Diffusion Estimates

Long-term diffusion estimate data is contained in Appendix 2C.

2.4 HYDROLOGIC ENGINEERING

2.4.1 Hydrologic Description

2.4.1.1 Site and Facilities

The plant's cooling water was drawn from Lake Michigan. Radioactive liquid waste generated at the plant is collected, treated, and either recycled or discharged. Those liquid wastes that are discharged are monitored to assure compliance with 10 CFR 20. Radioactivity levels will not exceed permissible concentrations. The Lake County Public Water District operates a water intake about one mile north of the site and about 3,000 feet out in the Lake. This water intake is the closest source of potable water. Continuous release from the site will result in radionuclide concentrations below those permitted under 10 CFR 20.

Site activities will not result in releases greater than 10 CFR 20 limits at the point of discharge and consequently should not result in significant radioactivity concentrations in drinking water. Interactions with contributions from other nuclear power stations are not considered significant since there are none located or currently announced within 66 miles of the Zion station.

The next nearest potable water intake which utilizes surface water from Lake Michigan is 6 miles south of the site at Waukegan. The Waukegan waterworks uses two intake aqueducts.

The crib of one is in 27 feet of water approximately 1250 feet southeast of the Waukegan Harbor entrance light. The crib of the second is in 35 feet of water approximately 3250 feet southeast of the first crib. The water is filtered and treated prior to distribution.

Potable water supplies from Lake Michigan are also located at Kenosha, Wisconsin, and North Chicago, Illinois, ten miles north and south, respectively, of the site. Others are located farther up and down the Lake shore. The municipal water system characteristics are summarized in Table 2-14 and are based on References 1, 4, and 17.

The topography of the site (see Figure 2-2) and its immediate environs is relatively flat with elevations varying from the Lake shoreline to approximately 20 feet above the level of the lake. Approximately two miles west of Lake Michigan is a topographical divide causing surface water drainage west of the divide to flow away from the lake while the east drainage flows toward the lake.

The site itself has very little slope and is relatively marshy in its western and central portions. However, the eastern portion of the site (next to the lake) on which the plant is located is not marshy and has good surface drainage toward the lake. Just behind the beach there is a low line of bluffs approximately 5 to 10 feet high.

2.4.1.2 Hydrosphere

Lake Michigan is one of the largest of the Great Lakes. It is 307 miles long from north to south and has an average width of 70 miles. It has a maximum depth of 923 feet, an average depth of 325 feet and covers an area of 22,400 square miles. The total volume of water in Lake Michigan is approximately 1,400 cubic miles. However, since an exchange of water occurs between Lake Michigan and Lake Huron through the Mackinac Straits, the water ultimately available for dilution is approximately 2,500 cubic miles.

The normal water level in Lake Michigan is approximately 582 feet above mean sea level (MSL). The maximum recorded water level is 584 feet above MSL, which occurred in June 1886, and the minimum recorded to date occurred in 1964 at 577.4 feet above MSL according to the United States Geologic Survey (USGS).

In the general vicinity of the site, the 30-foot depth contour of the lake is 1.2 miles, and the 60-foot depth contour is 2.0 miles from the shore.

The subsurface water table of the area is sloped to the east towards the lake. The shallow aquifers are the sand and gravel overburden and the underlying dolomite formations. The deep aquifers are in sandstone and dolomite formations with a strata of shale above them. The “free water” in the shallow aquifers over the six county northeast Illinois region is 4.72×10^{12} gallons and in the deep aquifers is 3.53×10^{14} gallons. However, the artesian pressure of the deep aquifers has dropped some 700 feet since 1864.

Since 1957, the cities of Zion and Winthrop Harbor, and the Illinois Beach State Park plus a number of retail establishments in unincorporated communities have obtained their water from the Lake County Public Water District. The supply is treated by coagulation, sedimentation and sand filtration, and is chlorinated prior to distribution.

2.4.2 Floods

The surface streams near the site are:

Kellogg Ravine -	1.25 miles north of the site; flows west-east.
Dear River -	3 miles south of the site; flows west-east.
Bull Creek -	0.2 mile south of the site; flows west-east

The first two are very short drainage streams extending 2 and 1 miles from Lake Michigan, respectively. Both contain negligible flows except during periods of high runoffs. Flooding by any of these streams would not involve the site.

The runoff, due to a probable maximum storm over the water shed of Bull Creek west of the plant site, was analyzed to examine the potential for flooding the power plant former Class I structures. The significant and maximum (1%) wave effects of a coincident 45 miles per hour (mph) wind from the critical direction were superimposed on the maximum water level corresponding to the probable maximum flood conditions. This was done to determine the upper limit of the Bull Creek flood potential. Shown in Figure 2-15 are the locations of Zion Nuclear Power Station, Bull Creek drainage area, and the significant drainage structures, railway, and roadways.

Analyses and computations show the maximum water surface elevation in the vicinity of the power station, under probable maximum precipitation conditions over Bull Creek, is 590.1 feet above MSL. Superimposing the wave effects of a sustained 45 mph wind on the maximum water level, the calculated wave runup elevations corresponding to a significant wave and a maximum (1%) wave are 591.2 feet and 591.7 feet, respectively. The grade floor level of the power plant former Class I structures is elevation 592.0 feet above MSL.

Results of the aforesaid analyses and computations and observations made in a field inspection of the Bull Creek water shed and plant site lead to the conclusion the occurrence of a maximum probable flood in Bull Creek and a coincident 45 mph wind from the critical direction would not result in flooding of the power plant former Class I structures.

The marshy area of the site is classified by the Lake County Regional Planning Commission as a flood plain. However, this does not include the area of the plant location. The flooding is due to poor drainage and the presence of peat and muck which inhibits percolation of surface water into the sandy soil. Measures such as grading have been taken to drain the site adequately.

The high water level of Lake Michigan is 584 feet above MSL which is 8 feet below grade floor level of the plant (592 feet above MSL). Therefore, the occurrence of maximum wave conditions at the site is 6.7 feet, which, even at high water, would not result in flooding of the plant area. Section 2.4.5 discusses lake flooding in more detail.

2.4.2.1 Rainfall

Lakes Michigan and Huron are considered as a unity from the standpoint of drainage and water level since these two lakes are connected. The drainage basin for these two lakes comprises 115,700 square miles and has an average annual rainfall of about 31 inches. Table 2-15 lists the average and maximum precipitations recorded at various locations on the Illinois shore of southern Lake Michigan.

2.4.2.2 Flood Design Considerations

No special design features are required to accommodate the hydrological characteristics of the site. The station grade level is approximately 2.1 feet above the theoretical maximum water level at the shoreline due to a 6.7 foot wave occurring simultaneously with the maximum high water level. For a maximum seiche height of 8.8 feet concurrent with 2 foot waves occurring at the maximum high water level, the station floor grade level is approximately 2 feet below surge water level for up to 20 minutes. With the plant in a permanently defueled condition and spent fuel relocated to an on-site ISFSI, no SSCs are classified as safety related. Potential flood damage to SSCs is discussed in Section 2.4.5.

2.4.3 Probable Maximum Flood (PMF) on Streams and Rivers

Text for this section is not applicable to the Zion Station.

2.4.4 Potential Dam Failures, Seismically Induced

Text for this section is not applicable to the Zion Station.

2.4.5 Probable Maximum Surge and Seiche Flooding

2.4.5.1 Surge and Seiche Water Levels

A seiche may be caused by intense squall lines that move across the Southern Basin of Lake Michigan in a direction generally toward the southeastern quadrant. The accompanying pressure gradient and wind stress acting on the lake surface can produce an organized mid-lake disturbance which resembles a solitary wave. Upon arrival at the lake shore, this wave can create large changes of water level through the operation of shoaling effects. The highest surge (seiche) on the Chicago shore occurs at Montrose Harbor as the result of squall lines which have moved toward the southeast at about 55 knots. The surge travels with the squall line as it crosses the lake and thus, for the usual west to east motion, occurs on the eastern shore with the squall line, but must be reflected to reach the western shore. This means the west-shore seiche usually will occur at a time of meteorological quiet and thereby can catch people unaware unless they are alerted to the danger. Amplification of this discussion can be found in References 18 through 20. On June 26, 1954, the maximum recorded seiche occurred with a rise of eight feet at Montrose Harbor. The rise in level calculated to exist at Montrose Harbor and Zion under the conditions of June 26, 1954, is 6 feet and 2 feet, respectively. With the number of variables in such a calculation, the predicted value of 6 feet versus the observed value of 8 feet is considered a good correlation. The pertinent fact is the seiche at Zion will be less than any of Montrose Harbor by a factor of approximately one-half. This observation is supported by the “contours of amplitude” curves shown in Reference 19, published in the Monthly Weather Review, Vol. 93, Number 5, May 1965. These curves show the maximum seiche levels at Montrose Harbor and Zion are in a ratio of 8 to 5 under the worst conditions.

Therefore, the maximum seiche level that will occur at Zion, based on correlation to the June 26, 1954 Montrose Harbor seiche level, is considered to be five feet.

Using the Platzman Theory (Reference 18), the storm surge that could occur at the site was found to be 8.8 feet due to the passage of a squall line with a pressure jump of 0.21 inches Hg and a wind speed of 65 knots. This surge height is greater than the 5 foot seiche projected to occur based on the Montrose Harbor correlation. Adding this surge to the maximum monthly lake elevation of 583.24 feet above MSL results in a maximum water level of 592.05 feet above MSL. The surge height of 8.8 feet was based on an estimated deep water surge height of 2.92 feet with a shoaling factor of 3.0. The surge, in combination with waves in the height range of 1 to 2 feet, would result in overtopping of the sheet pile wall which extends to elevation 592.0 feet above MSL and would create water levels of 1 to 2 feet above plant grade (592.0 feet above MSL) for up to 20 minutes.

An analysis of wave runup on the sheet pile wall showed waves breaking 100 feet offshore will runup to elevation 594.2 feet above MSL, overtopping the wall at elevation 592 feet above MSL by some 2 feet. The analysis was based on the assumption of an equivalent slope from the point of breaking to the top of the wall, as suggested in “Shore Protection Planning and Design,” Third Edition, 1966, p. 190. The depth at this point is 11 feet and the breaking wave height 8.6 feet. The runup above design highwater is 11.8 feet. Wave setup is estimated at 0.17 feet. The amount of water overtopping the wall will be less than 1 cubic foot per second per foot of width.

2.4.5.2 Currents, Tides, Waves and Littoral Drift (References 21 and 22)

2.4.5.2.1 Wind Effects on Surface Currents

Surface currents in Lake Michigan are generated primarily by wind stress on the water surface. The lake's wind-driven currents have speeds averaging 1% to 2% of the wind speeds. Thus, an average wind speed of 15 mph over the lake would generate an average surface current of about 0.15 to 0.3 mph. Such currents may persist for several days after the wind has subsided. On large water surfaces, the wind-driven current is theoretically 45 degrees to the wind vector, due to the rotation of the earth. On the west side of Lake Michigan, the current is largely parallel to the shore and nearly 22 degrees to the right of the prevailing wind. Current velocities were measured three miles off the coast of Waukegan during July 1963 through June 1964 by the Great Lakes Illinois River Basin Study of the Federal Water Pollution Control Administration (see Reference 23). Measurements taken at a depth of 10 meters showed the flow to be from the south 60% of the time with greater than 40% of the current directions within 70 degrees centered on south.

Data on current speeds for the period July through November 1963 are representative of the entire period and are shown in Table 2-17.

Median current speed for the observed period is 9.2 cm/sec (0.3 ft/sec).

2.4.5.2.2 Wave Action Due to High Winds

The second phenomena is wave action due to local squalls and persistent high winds. Deep water wave heights in the general vicinity of the site due to storms, based on Corps of Engineers observations at Chicago and Milwaukee, can be expected to occur with a frequency as shown in Table 2-18.

Based on the deep-water wave heights in Table 2-18, the maximum elevation of wave runup and wind tide is estimated to be 6.7 feet above the normal water level (at an occurrence frequency of once in 500 years.) It is to be noted this 6.7-foot height is the maximum elevation at the shoreline.

Of the two phenomena, the seiche presents the greater hazard to the site. The deep-water wave will be quickly dissipated as it overruns the shore and is therefore of little consequence to structures located at some distance from the shoreline. However, the seiche-generated wave will comprise a much greater quantity of water, and the rise in level will endure for longer periods of time.

Waves are responsible for most of the littoral drift on Lake Michigan. The predominant drift appears to be to the north.

During much of the winter season, portions of the lake are covered with ice, and fetch areas are limited considerably. In addition, for a somewhat greater portion of the winter season, the coast area of the lake is covered with ice. Even though waves are generated in offshore areas, they never reach the shore, being interrupted by the ice around the rim of the lake. No account of this effect of the ice was taken in the compilation of the above data.

2.4.5.3 Protective Structures

There are no longer any protective structures. This information is used in support of the evaluation of the ISFSI and potential impacts from flooding.

The sheet pile wall near the shoreline has a height up to El 592' above MSL at maximum high water El 583.24' above MSL. The maximum water depth at the wall will be 7 feet. The offshore bottom slope at the wall is approximately 1:45.

Assuming a wave period of 8 seconds, the maximum height of waves breaking on the wall is estimated at 6.7 feet. The corresponding deep-water wave height is 6.0 feet. This estimate is based on the assumption that waves breaking at a distance equal to seven breaker-heights offshore will strike the wall.

The runup at the wall is estimated at 2.8 times the deep-water wave height, or 17 feet. The wall will be overtopped.

The quantity of water overtopping the wall is estimated at less than one cubic foot per second.

Using Minikin's method, the peak pressure on the wall (static plus dynamic) is found to be 3310 psf and the thrust is 7.3 kips per foot applied at El 583.8' above MSL.

The minimum water level of the lake is 575 feet. The depth of the trough (also height) of the surge wave is 2.92 feet in deep water. Considering the shoaling effect, the depth of the trough at the shoreline is 8.8 feet. The offshore location of the intakes will result in a trough depth somewhere between these values.

Assuming a linear increase (a conservative assumption) in trough depth from deep water at one mile from the shoreline to the shoreline, it is expected a surge wave depth of 5.8 feet would occur at the intake located one-half mile from the shoreline. This results in a minimum lake level at the intakes of approximately 569 feet.

The lake intake bell is located at El 560.7'.

An earthquake-generated seiche in Lake Michigan has been considered by assuming the occurrence of the Design Basis Earthquake, a shallow focus Intensity VII event, near Lake Michigan. The magnitude of seiche effects at the site was estimated by methods proposed by Iida (Reference 25) and Wilson (Reference 26), and by research of historical data. The calculational methods indicate the seiche caused by the earthquake would be on the order of one foot or less. The research of historical data (Reference 27) indicates an Intensity VII earthquake would produce a barely perceptible surge at the site. On this basis, it is considered there would be no adverse effects on structures from this phenomenon, and wind-generated surge would be controlling at the site.

2.4.6 Ice Effects

The water intakes and discharges for Zion Station were designed so as not to be obstructed by wind-driven ice. The top of the intake structure is approximately 13 to 6 feet under water (dependent upon monthly high and low water levels). Also, the intake is located 2600 feet from shore. The top of the intake has 12 sides and is surrounded by a circular thawing box. The discharge pipes extend 760 feet from shore at a depth of from 4 to 12 feet, dependent upon lake water level. The discharge openings are staggered, (most of which are oriented perpendicular to the shoreline).

2.4.7 Dispersion, Dilution, and Travel Times of Accidental Releases of Liquid Effluents in Surface Waters

2.4.7.1 General

Water from Lake Michigan is extensively used for municipal and domestic water supplies. All liquid waste discharged will be less than permitted under 10 CFR 20. Thus, any radioactive releases from the site into the lake will be diluted below levels permitted under 10 CFR 20 for unrestricted areas before it reaches the nearest water supply intake. As previously stated, the nearest potable water intake is located about one mile north of the site and 3000 feet out in the Lake.

The two discharge structures (1 per unit) are located 308 feet apart, and 760 feet from shore. The design of the structures is shown on Figure 2-16. Outlets are located at 45^{o} from the shoreline and in a direction that diverted the water away from the inlet. The inlet is located between the two discharge structures. These discharge openings are located slightly above the bottom of the lake Radioactive contamination of the plant discharge water can occur in two modes. The first is by an intermittent controlled release of small amounts of activated corrosion products and fission products into the discharge water stream. The second type of radioactivity release is assumed to be an instantaneous discharge which could only result from a series of operating errors and equipment failures, the combination of which is not considered credible.

As described in Chapter 4, and supported by operating reactor plant data, radioactive liquid waste treatment systems are capable of maintaining radionuclide concentrations in the effluent below those permitted under 10 CFR 20 for instantaneous and intermittent controlled releases.

2.4.7.2 Temperature Alterations

The effect of temperature alterations to Lake Michigan as a result of the circulating water discharge was determined to be non-impacting to the lake ecology. Reference 28 discusses the exact effect upon the lake.

2.4.8 Groundwater

The groundwater table in the area is close to the ground surface, and has a flat gradient to the east and south. This is historical information and is not being updated.

Ordinarily there will be no municipal uses of potable groundwater in the Benton or Waukegan townships. Two older wells in Zion, with depths of 1025 feet and 220 feet, and one well in Winthrop Harbor, with a depth of 130 feet, are maintained on a standby basis to meet emergencies (Reference 17).

Zion's two deep wells are 1100 and 1025 feet deep, respectively; they derive water under artesian conditions from Trempealeau Dolomites. The radius of the core of their influence is estimated to be approximately 4,000 feet. These wells are located approximately 1 1/2 miles west of the plant site. Winthrop Harbor's two shallow wells are 130 and 138 feet deep; they derive water from Niagaran Dolomites. The core radius of their influence is estimated to be approximately 500 feet. The wells are located approximately 12,000 feet away. The radius of the core of influence of other domestic wells drawing water from the upper 30 feet thick sand stratum is well within 500 feet. Table 2-19 and Figure 2-17 furnish the details of recorded wells within one mile of the site.

Considering the locations of the wells and the topographical divide which causes surface water to drain to the east, contamination of ground water supplies is unlikely. No pathways for radioactive materials such as wells, old unsealed bore holes, etc., were detected in a survey of the power plant area. Commonwealth Edison Company will monitor any plans for municipal water development in the area of influence.

Intermittent liquid effluents from the site will not affect ground water supplies in the adjacent area in excess of 10 CFR 20 due to local drainage patterns, release rates, and specific features of the sources of water supplies.

2.5 GEOLOGY, SEISMOLOGY AND GEOTECHNICAL ENGINEERING

2.5.1 Basic Geologic and Seismic Information

The site is located on the shore of Lake Michigan in the extreme eastern portion of the city of Zion, Illinois, and occupies portions of Sections 22, 23, 26 and 27 in Township 46 North, Range 23 East.

Marshy depressions and sand ridges comprise the principal surface features. The uppermost soils at the site consist predominantly of granular lake depositions. These sediments are underlain by glacial drift which consists of till, outwash, and lake deposits. Beneath the glacial soils, Paleozoic sedimentary rocks extend for several thousand feet to the depth of the crystalline Precambrian basement rock.

There are no cut and fill slopes at the Zion site.

There is no evidence of faulting closer than the Des Plaines disturbance, located approximately 25 miles southwest of the site. Other inactive faults exist at a distance of about 45 miles to the northwest and 75 miles to the southwest.

The geology of the area indicates that the strata underlying the site are capable of supporting loads at least as high as that required for the station structures. Consequently, no problems or restrictions beyond normal design practice were anticipated.

The region within 100 miles of the site is considered an area of minor seismic activity and has experienced a few earthquake events of moderate magnitude during the last 150 to 200 years. Structures built on adequate foundation materials at the site are designed for horizontal ground accelerations as defined in Section 2.5.2.2. Detailed studies performed to evaluate the probable ground accelerations and to prepare dynamic response criteria appropriate for the site are reported in Appendix B to the PSAR.

The principal sources of data are given in References 29 through 50.

2.5.1.1 Geological Program

A detailed geological investigation of the site has been performed. The scope of the geological program consists of:

1. A review of pertinent published literature and unpublished data, and discussions with local geologist, in order to describe the geology of the region and the site.
2. A test boring and laboratory testing program to identify predominant soil and rock types and to evaluate pertinent physical and chemical properties of the soils and rock.
3. Field observations to determine the depth and gradient of the groundwater table at the site.
4. An analysis to evaluate the ability of the geologic substrata to support the anticipated building loads.

The results of item 1 and 3, the test borings, and a portion of the laboratory testing listed under item 2 are presented in this report and Appendix B to the Zion PSAR.

The possibility of liquefaction of soil layers supporting former Class I structures was evaluated in accordance with methods proposed by Seed and Idriss (Reference 51) which utilize standard penetration resistance as an index of soil relative density. Considering standard penetration resistance in excess of 30 blows per foot, water table at a depth of 5 feet, maximum ground surface acceleration during the Design Basis Earthquake (DBE) equal to 0.17g, and depth of susceptible soils equal to approximately 30 feet, it can be concluded that there is a significant margin of safety against liquefaction of soils below or adjacent to former Class I structures.

The possibility of settlement due to the densification of soil strata supporting former Class I structures during a DBE was also considered. Because of the high relative densities of the sand, as indicated by standard penetration resistance in excess of 30 blows per foot, as reported in the PSAR, essentially no settlement due to densification is anticipated.

2.5.1.2 Seismology Program

A seismological investigation of the site has been performed. The seismological program consists of:

1. An evaluation of the seismic history of the site.
2. A study of geologic faulting as related to earthquake activity.
3. The field and laboratory measurement of the dynamic response characteristics of soil and rock strata underlying the site.
4. The postulation of an Operating Basis Earthquake (OBE) and a DBE.

Data which pertains to the seismic history of the region are presented in this section. The results of the remainder of the seismological program are reported in Appendix B to the Zion PSAR.

2.5.1.3 Regional Geology

General

Bedrock in the region consists of Paleozoic sedimentary rocks which rest on the Precambrian basement rock. The thickness of the Paleozoic sedimentary rocks in northeastern Illinois is approximately 4,000 feet. The bedrock dips gently toward the east at a rate of about 10 feet per mile.

The bedrock surface in the northeastern Illinois region is covered by a thick mantle of glacial drift, formed when most of Wisconsin, Illinois, and the adjacent areas were subjected to repeated glaciation during the Pleistocene epoch. The advancing glaciers scoured major stream valleys and formed the large depressions now occupied by the Great Lakes. The glacial drift deposited by the glaciers consisted of till, outwash, and lacustrine deposits. Recent deposits in the region consist of unconsolidated sand, silt and peat.

2.5.1.4 Site Geology

Site Conditions

The site is located on a narrow strip of lake deposits which borders the Lake Michigan shoreline. Crossing the site is a series of low parallel, beach ridges separated by marshy depressions. The beach ridges are composed primarily of sand. In the depressions, organic materials have accumulated.

The subsurface conditions at the site were investigated by drilling seven exploration test borings at the locations shown on Figure 2-18. The test borings revealed that the site is blanketed by granular lake deposits which range in thickness from 24 to 33 feet. The granular lake deposits consist of fine, and fine to medium sand which contains variable amounts of coarse sand and gravel, and occasional pockets of peat and organic material. The granular lake deposits are underlain by Pleistocene glacial till, glacial outwash, and glacial lacustrine deposits. The glacial deposits consist essentially of silty clays, clayey silts, and silt, contain variable amounts of sand and gravel, contain pockets of granular outwash, and extend to depth ranging from approximately 102 to 116 feet below the existing ground surface. The glacial tills and glacial

lacustrine deposits are firm to hard and are relatively impermeable. A detailed description of the subsurface conditions at the site is presented in Figure 2-19 through 2-25.

The Pleistocene soils rest unconformably on Niagara Dolomite of Silurian age. The Niagara Dolomite, penetrated by our test borings, is pitted, contains small solution cavities (vugs) and pyrite crystals, and is generally moderately fractured. The degree of fracturing varies and is indicated on the log of borings. Coraline fossils are abundant, and attest to the reef origin of a large part of the Niagara Formation in this area. Although no large solution cavities were encountered in the drilling program, they have been found elsewhere in the upper zones of this formation. These large solution cavities have usually been filled with clays and sand. The Niagara Dolomite was the only bedrock formation encountered within the depths of our drilling program at the site.

The Niagara Dolomite, at the site, is approximately 250 feet thick and dips gently to the east towards the Michigan Basin. The lower bedrock formations consist predominantly of sandstone and dolomite with subordinate layers of shale and siltstone, are several thousand feet in thickness, and are underlain by crystalline Precambrian basement rock. The thickness and age relationship of the various bedrock units and surficial deposits of the region are presented in Table 2-20.

Table 2-21 provides the elevations of all former Class I structures relative to the elevations of different foundation soil levels at the site.

Groundwater

Groundwater is near the surface over much of the site area. Ground water levels at the boring locations are shown on the log of borings. The beach ridges project slightly above the water table, and most of the intervening depressions are marshy and are at or slightly below the water table. A very slight groundwater gradient trends to the east and south. A stagnant condition now generally prevails between the beach ridges.

Shoreline Modifications

An environmental characteristic of the site is minor shoreline modification. The rate of change in the position of the shoreline is due to lake level fluctuations, currents, wave actions, storm conditions and the nature of the shoreline sediments.

The shoreline of Lake Michigan along the east side of the Zion site has moved approximately 100 feet during the 83 years from 1872 to 1955. The movement of the shoreline is a result of a combination of approximately 50 feet of aggradation along the north half of the site and less than 100 feet of degradation in the form of shoreline erosion, in the south half of the site. The tendency during this period has been to “smooth-out” the irregularities of the shoreline to an equilibrium position. This equilibrium condition exists at the present time as evidenced by the minimal shoreline movement during the last 20 years.

The general movement of wind-driven current sand is from north to south. When Commonwealth Edison Company built a breakwater at its Waukegan Generating Station during the period 1928 to 1938, sand accretion built up the shoreline out into the lake as much as 1000 feet from its original position. The Zion shore, however, is not affected by artificial barriers and therefore will move little. Sand erosion has been easily stopped by the construction of groins or jetties, and by the use of rip-rap.

2.5.2 Vibratory Ground Motion

2.5.2.1 Seismicity

Northeastern Illinois is considered an area of minor seismic activity. King's distribution of epicenters contours the area as having approximately three epicenters per 10,000 square kilometers, a figure near the lower levels of his classification. The Seismic Zone Map of the United States prepared by the U.S. Department of Defense, dated 1966, also indicates that the area is a zone of minor seismic probability. The site itself is free of known seismic disturbance.

Since the beginning of the 19th century, two earthquakes with epicentral intensities of VII, Modified Mercalli Intensity Scale of 1931, are known within a distance of 60 miles of the site. The first of these earthquakes, near Fort Dearborn, Illinois, occurred in 1808 at an epicentral distance of approximately 35 miles from the site. The second occurred in 1909 north of the Illinois-Wisconsin border near Beloit, Wisconsin, at an epicentral distance approximately 60 miles from the site. Including the earthquakes described above, three earthquakes are known within a distance of 50 miles with epicentral intensities ranging from III to VII, and nine earthquakes have been recorded within 100 miles with epicentral intensities ranging from II to VII. In addition to these, a few very great, but distant earthquakes may have been felt at the site, but with very low intensity.

A tabulation of earthquakes having epicenters in Illinois and Wisconsin, together with certain out-of-state earthquakes felt in Illinois, is presented in Table 2-22. The regional earthquake events are shown on Figure 2-26. Earthquake intensities are described in terms of the Modified Mercalli Intensity Scale of 1931, which is explained in Table 2-23.

2.5.2.2 Design Basis Earthquake

Earthquake design for former SSCs was based on ordinary allowable stresses as set forth in applicable codes. See Chapter 3 for further information.

2.5.3 Surface Faulting

The site is located near the center of the Central Lowland Physiographic Province. The dominant structural feature of the area is the Kankakee Arch which separates the Michigan Basin to the northeast from the Illinois Basin to the south. The La Salle Anticline to the southwest of the site forms the northern side of the Illinois Basin and is believed to be Pre-Pennsylvanian in age.

A series of minor folds whose axes pitch eastward have been traced through all of the bedrock formations present. This system of folds which begins near the site and extends to the Sandwich fault area appears to be Silurian or younger in age.

Several faults are known in the region. The Sandwich Fault zone extends eastward into Will County from the town of Sandwich in De Kalb County. Faulting in the area is quite complex, but movement has been generally down on the north side of these structures. Twenty miles north of the Sandwich Fault and parallel to it, another fault has been inferred on the basis of dislocations of the lower Paleozoic sediments and the Precambrian basement. Near Des Plaines, approximately 25 miles southwest of the site, a highly complex faulted zone exists which appears to bear no relationship to the regional structure. The zone is roughly circular and covers an area of 25 square miles. Within the faulted zone, the bedrock generally has been upthrown. Some faulting also exists in southern Wisconsin and the closest known fault in

southern Wisconsin is approximately 45 miles from the site and has a northeast orientation. There is no evidence of recent activity along any of the faults that are known in the area.

2.6 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The Radiological Environmental Monitoring Program (REMP) is being conducted in the vicinity of the station. The REMP provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of members of the public resulting from the facility activities. This monitoring program implements Section IV.b.2 of Appendix I to 10 CFR 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of effluent measurements and the modeling of the environmental exposure pathways. The site Offsite Dose Calculation Manual (ODCM) defines the current REMP.

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Mr. A.V. Carozzi, University of Illinois

Dr. Arthur L. Howland, Northwestern University

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TABLE 2-1

POPULATION
WITHIN 10 MILES OF THE SITE

Radial Distances – Miles (From Center of Containment)	Local Censuses 1980
0 to 1	289
0 to 2	15,506
0 to 3	28,182
0 to 4	32,644
0 to 5	39,243
0 to 10	234,180
0 to 1	289
1 to 2	15,217
2 to 3	12,676
3 to 4	4462
4 to 5	6599
5 to 10	194,937

TABLE 2-2

POPULATION CENTERS OF 25,000 INHABITANTS
WITHIN 10 MILES OF THE SITE

Community	Distance to the Center and Direction From the Site	Population (1980 Census)
Waukegan, IL	7 miles S	67,653
Kenosha, WI	9 miles N	77,685
North Chicago, IL	7 miles S	38,774

TABLE 2-3

METEOROLOGICAL EXTREMES

VARIABLE	CHICAGO	MILWAUKEE
Highest Temperature	105°F (July 1934)	105°F (July 1934)
Lowest Temperature	-26°F (January 1982)	-25°F (January 1875)
Greatest Monthly Precipitation	14.17 in. (September 1961)	10.03 in. (June 1917)
Greatest 24-Hour Precipitation	6.24 in. (July 1957)	5.76 in. (June 1917)
Greatest Monthly Snowfall	42.5 in. (January 1918)	52.6 in. (January 1918)
Greatest 24-Hour Snowfall	23.0 in. (January 1967)	20.3 in. (February 1924)
Highest Wind Speed	NE 87 mph (February 1894)	SW 73 mph (March 1954)

TABLE 2-4 (1 of 2)
35 ft. Wind Speed and Direction (January 1, 1980 – December 31, 1980)

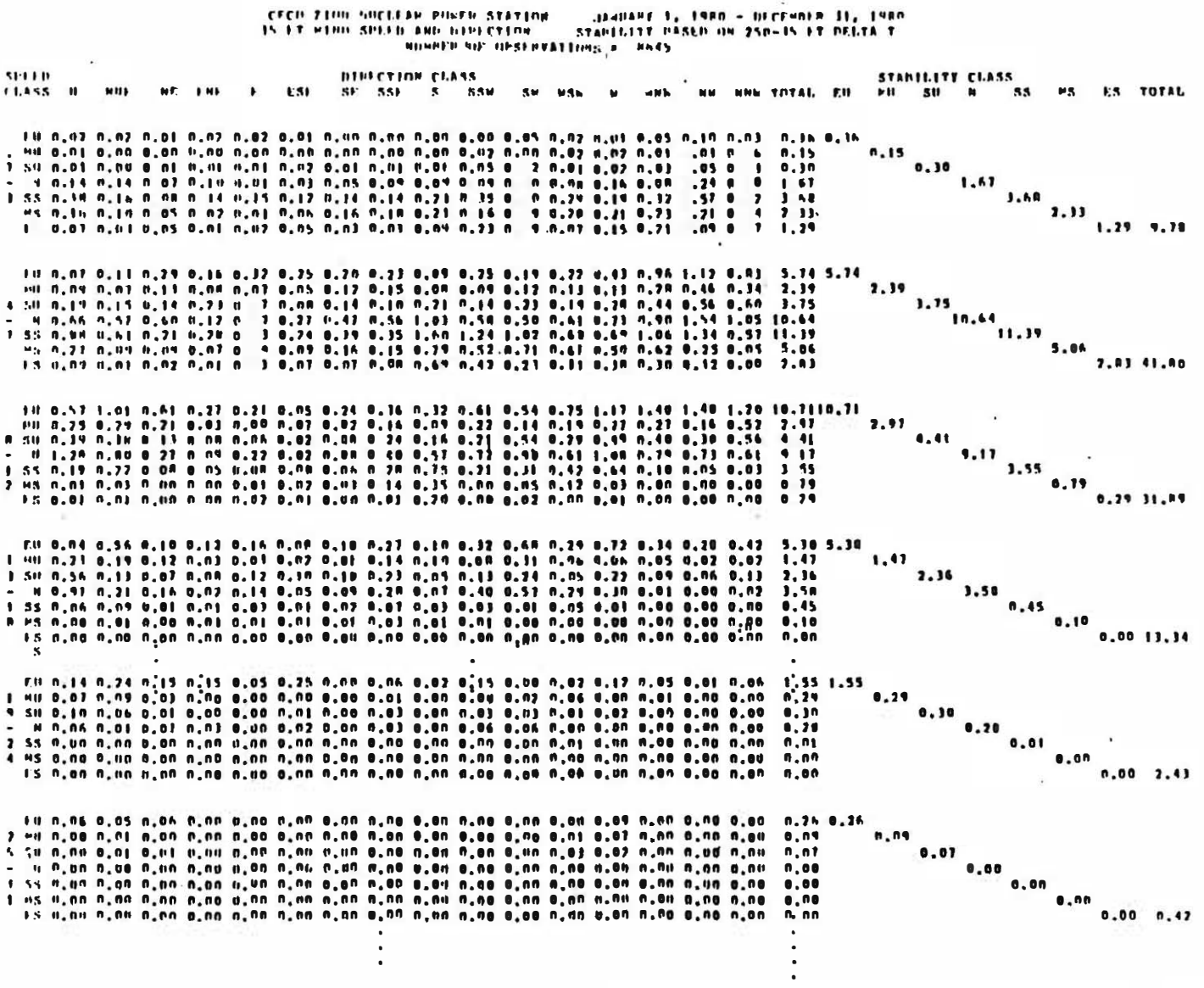


TABLE 2-4 (2 of 2)
35 ft. Wind Speed and Direction (January 1, 1980 – December 31, 1980)

CECO ZION NUCLEAR POWER STATION — JANUARY 1, 1980 - DECEMBER 31, 1980
35 FT WIND SPEED AND DIRECTION — STABILITY BASED ON 250-35 FT DELTA T

SPEED CLASS	DIRECTION CLASS N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	STABILITY CLASS FU	MU	SU	N	SS	MS	ES	TOTAL
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
2 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
- N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
3 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0 00	0.00	0.00	0.00	0.00	0.00							0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
2 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
- N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
3 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 0	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 0	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 0	0.00							0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
6 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
7 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
- N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
8 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 0	0.00					0.00			
9 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 0	0.00						0.00		
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 0	0.00							0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
G MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
T SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
4 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
5 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00					0.00			
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00							0.00	0.00
TOT	8.83	6.48	3.78	2.42	2.44	2.16	2.78	4.73	7.96	7.32	8.33	6.78	9.24	9.00	9.75	7.66	99.66	24.00	7.16	11.19	25.34	19.08	8.28	4.41	99.66
S FU	1.70	2.01	1.22	0.72	0.76	0.64	0.54	0.92	0.53	1.33	1.54	1.10	2.56	2.80	2.91	2.54	24.00								
U MU	0.65	0.65	0.49	0.14	0.18	0.14	0.15	0.46	0.27	0.41	0.59	0.47	0.55	0.67	0.65	0.94	7.36								
B SU	1.25	0.73	0.17	0.40	0.26	0.23	0.31	0.61	0.41	0.56	1.06	0.58	1.05	0.96	1.05	1.32	11.19								
- N	3.11	1.73	1.11	0.56	0.54	0.19	0.60	1.16	1.76	1.85	2.21	1.59	2.27	1.78	2.51	1.88	25.34								
T SS	1.51	1.04	0.38	0.48	0.49	0.45	0.61	0.84	2.61	1.83	1.64	1.45	1.55	1.48	1.96	0.72	19.08								
O MS	0.44	0.23	0.14	0.10	0.14	0.18	0.36	0.42	1.18	0.69	0.95	1.01	0.74	0.85	0.46	0.19	8.28								
1 ES	0.17	0.05	0.01	0.02	0.07	0.11	0.10	0.12	0.98	0.65	0.34	0.18	0.54	0.51	0.21	0.07	4.41								

TABLE 2-5 (1 of 2)
35 ft. Wind Speed and Direction (January 1, 1972 – December 31, 1980)

ZION NUCLEAR POWER STATION — JANUARY 1, 1972 - DECEMBER 31, 1980
35 FT WIND SPEED AND DIRECTION — STABILITY BASED ON 250-35 FT DELTA T

SPEED CLASS		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	[illegible]	[illegible]	[illegible]
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
2	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
-	N	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01				0.01				
3	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
8	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	0.01
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
3	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
9	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
-	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
4	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
6	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	0.00
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
G	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
T	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
4	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
6	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	0.00
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
C	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
L	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
M	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	0.00
TOT		0.02	7.24	4.21	3.00	2.85	2.70	3.57	4.39	7.97	7.57	9.52	8.79	9.73	7.95	8.43	6.11	100.05	14.99	3.98	6.83	31.49	28.21	9.07	5.48	100.05
5	EU	0.82	1.72	0.86	0.58	0.46	0.48	0.58	0.61	0.62	0.64	1.18	1.26	1.52	1.25	1.47	0.94	14.99								
0	MU	0.25	0.41	0.21	0.11	0.14	0.17	0.14	0.15	0.14	0.21	0.39	0.35	0.37	0.27	0.35	0.27	3.98								
8	SU	0.41	0.65	0.35	0.20	0.23	0.23	0.27	0.30	0.31	0.29	0.62	0.61	0.68	0.54	0.58	0.54	6.83								
-	N	2.11	2.59	1.67	1.20	0.98	0.82	1.00	1.37	1.66	2.06	3.04	2.83	3.06	2.26	2.57	2.05	31.49								
T	SS	1.74	1.54	0.88	0.65	0.78	0.69	0.99	1.34	2.80	2.67	2.79	2.29	2.58	2.27	2.49	1.76	28.21								
0	MS	0.11	0.25	0.15	0.15	0.17	0.21	0.18	0.42	1.34	1.03	1.00	0.93	0.86	0.76	0.66	0.43	9.07								
T	ES	0.17	0.08	0.09	0.11	0.09	0.15	0.21	0.26	1.10	0.67	0.50	0.52	0.66	0.60	0.11	0.07	5.48								

TABLE 2-5 (2 of 2)
35 ft. Wind Speed and Direction (January 1, 1972 – December 31 1980)

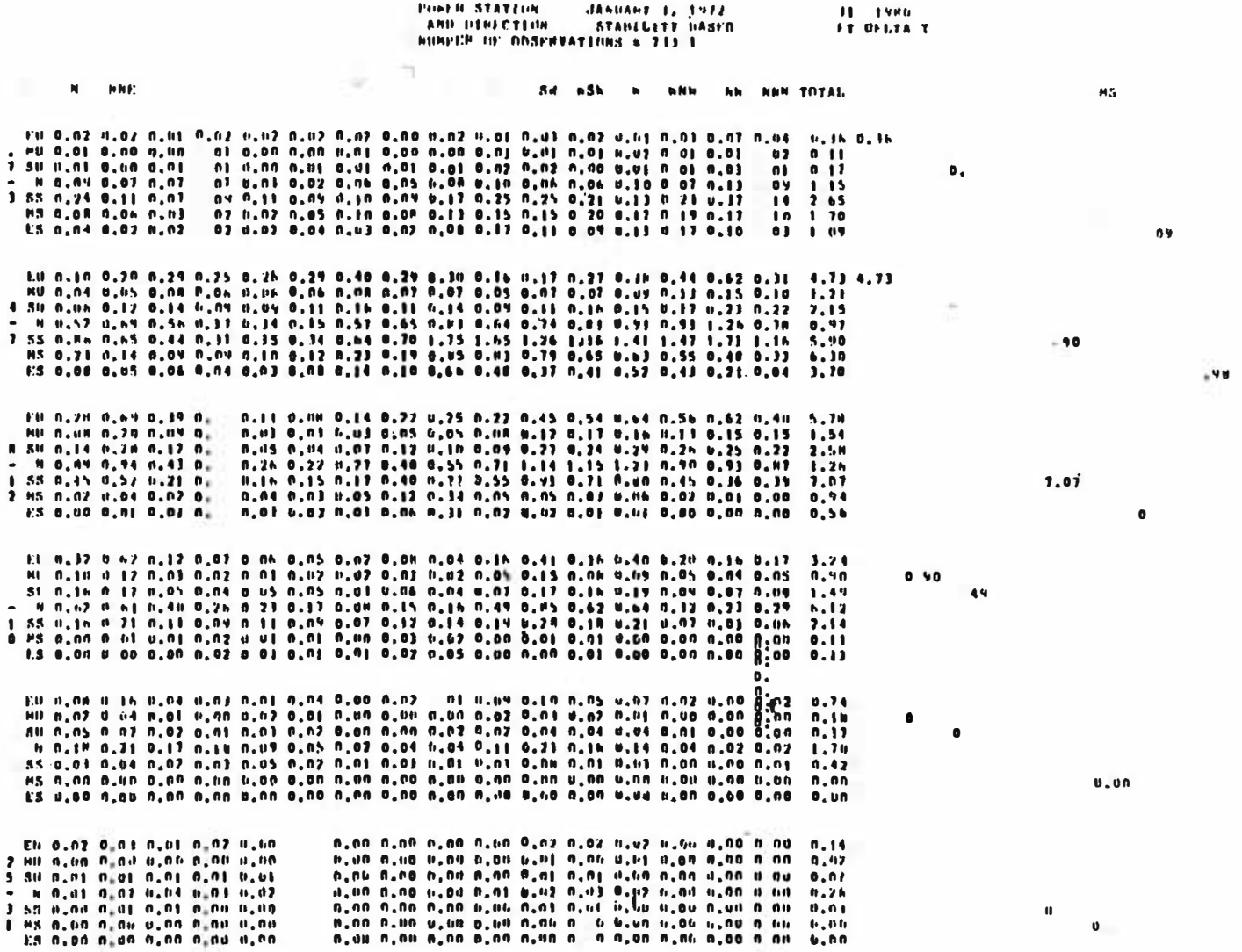


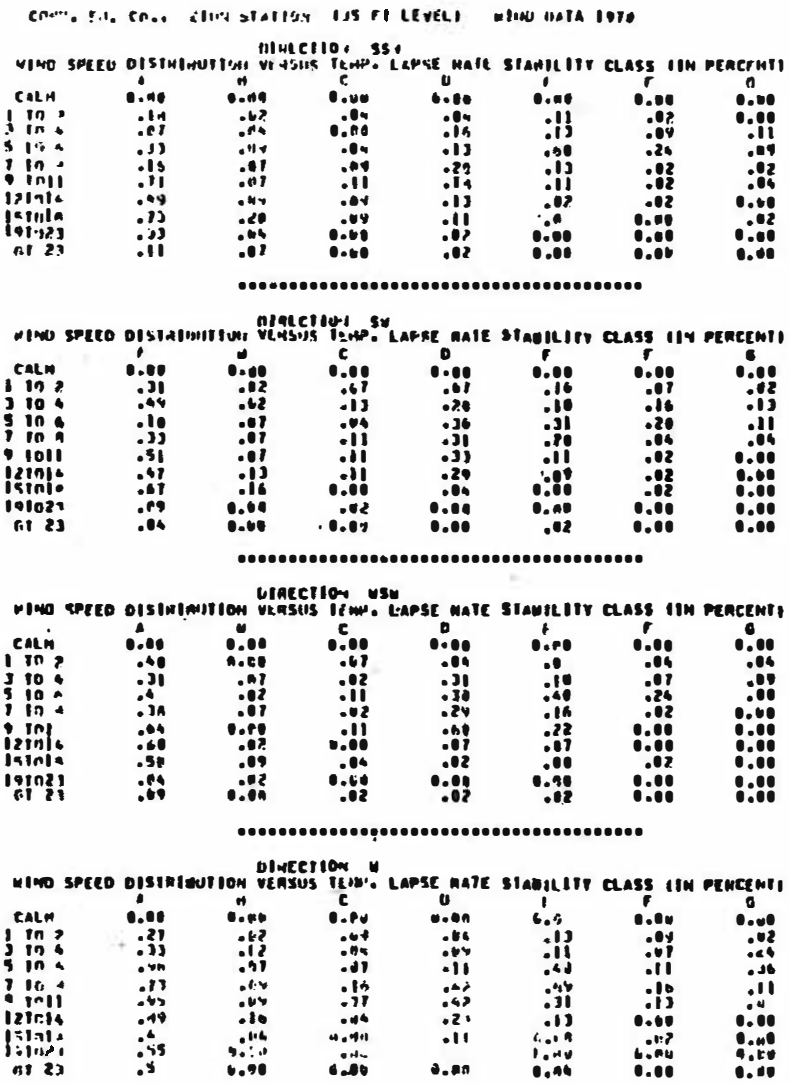
TABLE 2-6

PASQUILL STABILITY CLASSIFICATIONS
VS
TEMPERATURE LAPSE RATE

INDEX	RANGE (°c/100M)	DESCRIPTION
1(A)	$\Delta T < -10.3$	Extremely Unstable
2(B)	$-10.3 \leq \Delta T < -9.3$	Unstable
3(C)	$-9.3 \leq \Delta T < -8.3$	Slightly Unstable
4(D)	$-8.3 \leq \Delta T < -2.6$	Neutral
5(E)	$-2.6 \leq \Delta T < 8.9$	Slightly Stable
6(F)	$8.9 \leq \Delta T < 20.4$	Stable
7(G)	$20.4 \leq \Delta T$	Extremely Stable

TABLE 2-7 (1 of 3)

Wind Speed Distribution vs. Temperature Lapse Rate-Stability Class (1970)



[illegible] Co... Zion Station (35 Ft Level) Wind Data 1970

DIRECTION SSW

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.14	.02	.04	.04	.11	.02	0.00
3 TO 4	.07	.04	0.00	.16	.13	.09	.11
5 TO 6	.13	.04	.04	.13	.00	.26	.09
7 TO 8	.15	.07	.09	.20	.13	.02	.02
9 TO11	.11	.07	.11	.14	.11	.02	.04
12TO16	.09	.04	.04	.13	.02	.02	0.00
17TO18	.13	.20	.09	.11	.0	0.00	.02
19TO23	.13	.04	0.00	.02	0.00	0.00	0.00
GT 23	.11	.07	0.00	.02	0.00	0.00	0.00

DIRECTION SW

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.31	.02	.07	.07	.16	.07	.02
3 TO 4	.44	.02	.13	.20	.18	.16	.13
5 TO 6	.18	.07	.04	.36	.31	.20	.11
7 TO 8	.33	.07	.11	.31	.20	.04	.04
9 TO11	.51	.07	.11	.33	.11	.02	0.00
12TO16	.47	.13	.11	.29	.09	.02	0.00
17TO18	.47	.16	0.00	.04	0.00	.02	0.00
19TO23	.09	0.00	.02	0.00	0.00	0.00	0.00
GT 23	.04	0.00	.02	0.00	.02	0.00	0.00

DIRECTION WSW

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.40	0.00	.07	.04	.0	.04	.04
3 TO 4	.31	.07	.02	.31	.18	.07	.09
5 TO 6	.4	.02	.11	.38	.40	.24	.00
7 TO 8	.38	.07	.02	.29	.16	.02	0.00
9 TO1	.04	0.00	.11	.60	.22	0.00	0.00
12TO16	.60	.02	0.00	.07	.07	0.00	0.00
17TO18	.58	.09	.04	.02	.00	.02	0.00
19TO23	.04	.02	0.00	0.00	0.00	0.00	0.00
GT 23	.09	0.00	.02	.02	.02	0.00	0.00

DIRECTION W

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.0	0.00	0.00
1 TO 2	.27	.02	.04	.04	.13	.09	.02
3 TO 4	.33	.12	.04	.09	.11	.07	.04
5 TO 6	.00	.07	.07	.11	.40	.11	.36
7 TO 8	.27	.04	.16	.42	.40	.16	.11
9 TO11	.62	.09	.27	.42	.31	.13	.0
12TO16	.49	.16	.04	.2	.13	0.00	0.00
17TO18	.4	.04	0.00	.11	0.0	.02	0.00
19TO23	.55	0.00	.04		0.00	0.00	0.00
GT 23	.5	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 2-7 (2 of 3)

Wind Speed Distribution vs. Temperature Lapse Rate-Stability Class (1970)

COMM. ED. CO.. ZION STATION 135 FT LEVEL WIND DATA 1970

DIRECTION NW

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 3	.06	0.00	.04	.02	.07	.04	.07
3 TO 4	.48	.42	.02	0.00	.04	.01	.22
5 TO 8	.73	.32	.04	.13	.22	.18	.22
7 TO 9	.07	.04	0.00	.11	.36	.09	0.00
9 TO11	.55	.07	.02	.02	.07	.04	.04
12TO14	.58	.04	.04	.02	0.00	0.00	0.00
13TO16	.04	0.00	.02	0.00	0.00	0.00	0.00
19TO23	.31	0.00	0.00	.02	.02	0.00	0.00
AT 24	.04	0.00	0.00	0.00	0.00	0.00	0.00

DIRECTION NW

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 3	.16	0.00	0.00	.07	.02	.02	.09
3 TO 4	.48	.11	.07	.09	.36	.13	.27
5 TO 8	.75	.62	.07	.29	.27	.18	.24
7 TO 9	.41	.02	.04	.04	.04	.04	.02
9 TO11	.42	.13	0.00	.07	.02	.02	.02
12TO14	.75	.04	0.00	0.00	0.00	0.00	0.00
15TO18	.29	0.00	0.00	0.00	0.00	0.00	0.00
19TO23	.07	0.00	0.00	0.00	0.00	0.00	0.00
AT 24	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DIRECTION NNW

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 3	.20	.02	0.00	.04	.02	.02	.09
3 TO 4	.47	.02	0.00	.07	.13	.04	.07
5 TO 8	.90	.04	.11	.22	.02	.09	.11
7 TO 9	.53	.04	.04	.11	.18	0.00	0.00
9 TO11	.33	.02	.62	.04	.02	.02	.02
12TO14	.33	0.00	0.00	0.00	.02	0.00	.07
15TO18	.09	0.00	0.00	.07	0.00	0.00	0.00
19TO23	.04	0.00	0.00	0.00	0.00	0.00	0.00
AT 24	.02	0.00	0.00	0.00	0.00	0.00	0.00

DIRECTION N

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.06	0.00	0.00	0.00	0.00
1 TO 3	.09	0.00	.04	.07	.07	.02	.04
3 TO 4	.19	.07	0.00	.13	.18	.04	.09
5 TO 8	.78	.44	.07	.18	.33	.02	0.00
7 TO 9	.44	.04	.11	.18	.13	.04	.02
9 TO11	.73	.04	.04	.16	.09	.02	.04
12TO14	.04	0.00	.07	.22	.04	0.00	0.00
15TO18	.71	.07	.02	.04	.04	0.00	.04
19TO23	.11	.02	0.00	.04	0.00	.02	.04
AT 24	.24	.02	.07	.07	0.00	0.00	0.00

TABLE 2-7 (3 of 3)

Wind Speed Distribution vs. Temperature Lapse Rate-Stability Class (1970)

WIND SPEED DISTRIBUTION, PERCENT

CALM	1 TO 3	4 TO 7	8 TO 12	13 TO 18	19 TO 24	GT 24
3.96	6.47	11.55	17.04	17.49	17.26	10.85	8.42	3.07	1.98

****

SUMMED OVER ALL DIRECTIONS
WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 3	2.62	.15	.51	.64	1.11	.48	.73
4 TO 7	4.48	.51	.82	1.66	2.18	.82	1.78
8 TO 12	6.72	.64	1.47	3.06	3.71	1.71	1.55
13 TO 18	9.48	.69	1.13	3.09	3.11	.67	.36
19 TO 24	10.14	.93	1.83	2.91	1.96	.51	.33
GT 24	7.52	.75	.56	1.29	.73	.07	.09
CALM	6.53	.64	.94	.35	.33	.07	.11
VRBL	2.75	.11	.49	.11	.02	.02	.04
GT 24	1.31	.13	.25	.13	.07	0.00	0.00

****

SUMMED OVER ALL TEMP. LAPSE RATE STABILITIES
WIND SPEED VERSUS DIRECTION (IN PERCENT)

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 3	.34	.22	.20	.33	.22	.14	.42	.47	.42	.71	.62	.67	.27	.36	.48	.33
4 TO 7	.91	.64	.98	.53	.47	.40	.49	.78	.68	1.31	1.04	.91	.91	1.42	.88	.69
8 TO 12	.67	1.04	.33	.49	.78	.95	1.24	1.93	1.53	1.27	1.64	2.09	1.55	1.82	1.40	1.42
13 TO 18	.98	.93	.91	.53	.98	.49	1.31	2.02	.69	1.11	.93	2.35	1.47	1.13	.89	.98
19 TO 24	.87	1.22	.91	.53	.71	.62	.89	2.04	1.24	1.15	1.58	2.09	1.22	1.09	.49	1.13
GT 24	.34	.64	.47	.49	.98	.27	.73	.85	.84	1.11	.75	1.42	.69	.98	.42	.98
CALM	.53	.53	.24	.11	.11	.11	.09	.04	1.26	.49	.84	.58	.40	.29	.16	.93
VRBL	.22	.33	.13	.24	.07	.04	.11	.24	.44	.11	.07	.60	.36	.02	.04	.22
GT 24	.18	.29	.04	0.00	0.00	0.00	0.00	.07	.20	.07	.16	.58	.04	0.00	.02	.40

TABLE 2-8 (1 of 2)

Wind Speed vs. Direction-Stability Class (1970)

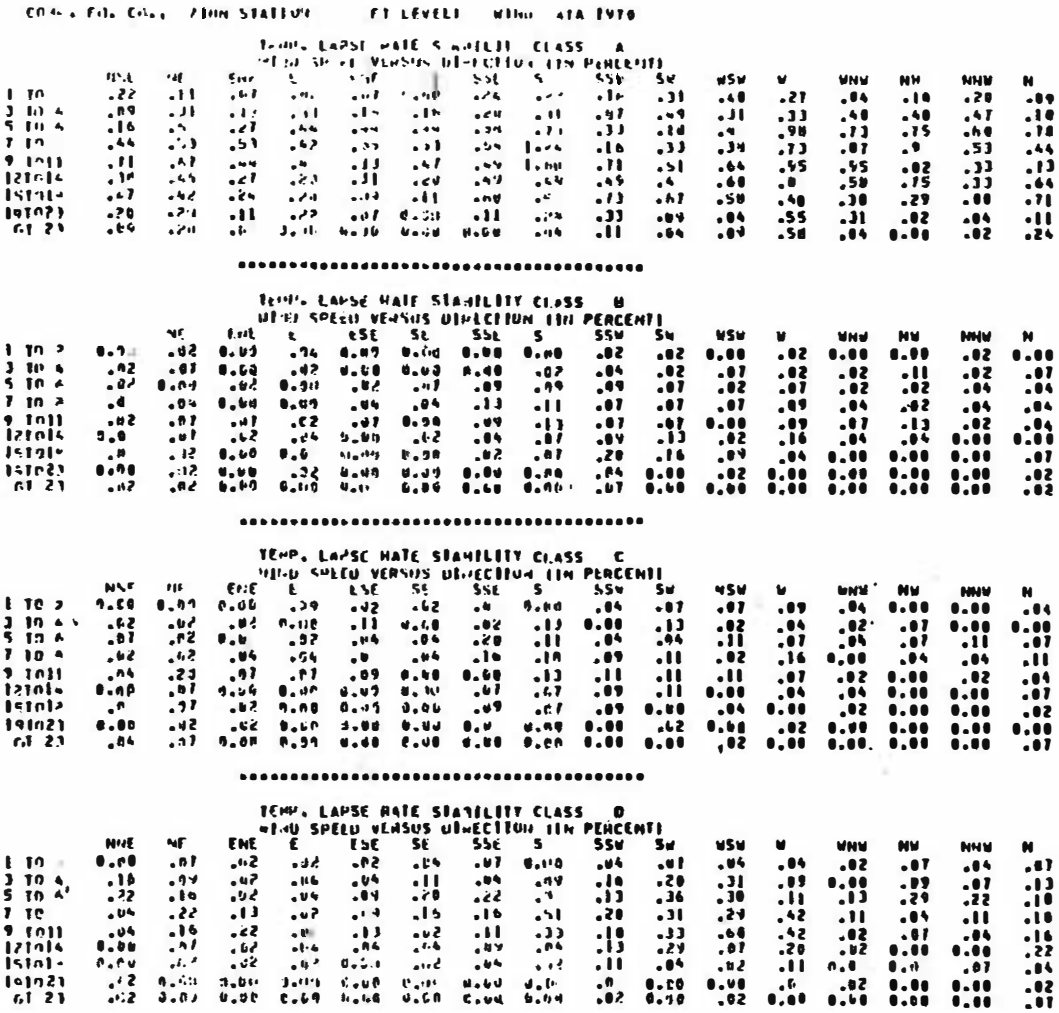


TABLE 2-8 (2 of 2)

Wind Speed vs. Direction-Stability Class (1970)

COMM. ED. CO.. ZION STATION 155 FT LEVEL WIND DATA 1970

TEMP. LAPSE RATE STABILITY CLASS E
WIND SPEED VERSUS DIRECTION (IN PERCENT)

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N
1 TO 2	.04	.02	.04	.02	.01	.01	.04	.14	.11	.16	.02	.13	.07	.02	.02	.07
3 TO 4	.11	.04	.11	[illegible]	.04	.11	.22	.13	.10	.10	.11	.14	.36	.13	.10	
5 TO 6	.04	.11	.02	.11	[illegible]	.14	.13	.47	.40	.31	.40	.40	.22	.27	.02	.33
7 TO 8	.20	.13	.20	.1	.04	.04	.16	.1	.13	.20	.16	.6	.36	.04	.16	.13
9 TO11	0.00	.13	.11	.04	.09	.11	.13	.24	.11	.11	.22	.31	.07	.02	.02	.09
12TO14	0.0	0.00	.16	.11	.02	.02	.04	0.00	.02	.09	.07	.13	0.00	0.00	.02	.04
15TO18	.02	.02	0.00	.07	0.00	0.00	.0	0.00	.04	0.00	.04	0.00	0.00	0.00	0.00	.04
19TO23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.02	0.00	0.00	0.00
AT 23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.02	0.00	.02	.02	0.00	0.00	0.00	0.00	0.00

TEMP. LAPSE RATE STABILITY CLASS F
WIND SPEED VERSUS DIRECTION (IN PERCENT)

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N
1 TO 2	0.00	0.00	0.00	.02	.02	0.0	.02	.02	.02	.07	.04	.09	.02	.02	.02	.02
3 TO 4	.04	0.00	.02	.02	0.00	.04	.02	0.00	.09	.14	.07	.07	.07	.13	.04	.0
5 TO 6	.07	.04	.0	.09	.04	.0	.02	.11	.24	.20	.24	.11	.18	.18	.09	.02
7 TO 8	.02	0.00	0.00	.02	.0	.02	.0	.11	.02	.04	.02	.16	.09	.04	0.00	.04
9 TO11	.02	0.00	0.00	.02	0.00	.02	.07	.09	.02	.02	0.00	.13	.04	.02	.02	.07
12TO14	0.00	0.00	0.00	0.00	.02	0.00	0.00	0.00	.02	.02	0.00	0.00	0.00	0.00	0.00	0.00
15TO18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.02	.02	.02	0.00	0.00	0.00	0.00
19TO23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.02
AT 23	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TEMP. LAPSE RATE STABILITY CLASS G
WIND SPEED VERSUS DIRECTION (IN PERCENT)

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N
1 TO 2	.09	0.00	.02	.09	.02	.04	.02	.07	0.00	.02	.04	.02	.07	.09	.09	.04
3 TO 4	.07	.07	.04	.16	.09	.04	.09	0.00	.11	.13	.09	.24	.22	.27	.07	.09
5 TO 6	.9	.02	.02	.04	.0	0.00	0.00	.11	.09	.11	.09	.36	.22	.24	.11	0.00
7 TO 8	0.00	0.00	0.00	0.00	0.00	0.00	.02	.11	.02	.04	0.00	.11	0.00	.02	0.00	.02
9 TO11	.02	0.00	0.00	0.00	0.00	0.00	0.00	.11	.04	0.00	0.00	.0	.04	.02	.02	.04
12TO14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.02	0.00	0.00	0.00	0.00	0.00	0.00	.07	0.00
15TO18	0.00	0.00	0.00	.02	.02	0.00	0.00	0.00	.02	0.00	0.00	0.00	0.00	0.00	0.00	.04
19TO23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT 23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 2-9 (1 of 2)

Wind Speed vs. Temperature Lapse Rate-Stability Class (1970)

[illegible] 10 M LEVEL WIND DATA 1970

DIRECTION NNE

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	[illegible]	0.00	0.00	[illegible]	0.00	0.00
1 TO 2	.22	[illegible]	0.00	[illegible]	.04	0.00	.04
3 TO 4	.09	.02	.02	.14	.11	.04	.07
5 TO 6	.16	.02	.07	.22	.09	.07	.04
7 TO 9	.44	.07	.02	.04	.20	.02	0.00
9 TO11	.11	.02	.04	.04	0.00	.02	.02
12TO14	.04	0.00	0.00	0.00	0.00	0.00	0.00
15TO17	.07	.02	.02	0.00	.02	0.00	0.00
18TO21	.20	0.00	0.00	.02	0.00	0.00	0.00
GT 21	.09	.02	.04	.07	0.00	0.00	0.00

DIRECTION NE

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.11	.02	0.00	.07	.02	0.00	0.00
3 TO 4	.31	.07	.02	.04	.09	0.00	.07
5 TO 6	.67	0.50	.02	.16	.13	.04	.02
7 TO 9	.53	.04	.02	.22	.13	0.00	0.00
9 TO11	.67	.07	.20	.16	.13	0.00	0.00
12TO14	.44	.07	.07	.07	0.00	0.00	0.00
15TO17	.42	.02	.07	.02	.02	0.00	0.00
18TO21	.2	.07	.02	0.00	0.00	0.00	0.00
GT 21	.20	.02	.07	0.00	0.00	0.00	0.00

DIRECTION ENE

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.07	0.00	0.00	.02	.09	0.00	.02
3 TO 4	.13	[illegible]	.02	.02	.11	.02	.04
5 TO 6	.27	.02	0.00	.02	.02	.02	.02
7 TO 9	.53	0.00	.04	.13	.20	0.00	0.00
9 TO11	.44	.07	.07	.22	.11	0.00	0.00
12TO14	.27	.02	0.00	.02	.16	0.00	0.00
15TO17	.24	0.00	.02	.02	0.00	0.00	0.00
18TO21	.11	0.00	.02	0.00	[illegible]	0.00	0.00
GT 21	.04	0.00	0.00	0.00	0.00	0.00	0.00

DIRECTION E

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.04	.04	[illegible]	.02	.02	.02	.04
3 TO 4	.33	[illegible]	0.00	.04	[illegible]	.02	.14
5 TO 6	.44	[illegible]	.02	.04	.11	.04	.09
7 TO 9	.4	[illegible]	.04	.02	.07	.02	0.00
9 TO11	.42	.02	.07	.07	.09	.02	0.00
12TO14	.20	.04	0.00	.04	.11	0.00	0.00
15TO17	.20	[illegible]	0.00	.02	.07	0.00	.0
18TO21	.22	.02	[illegible]	0.00	[illegible]	0.00	0.00
GT 21	0.00	[illegible]	[illegible]	[illegible]	[illegible]	0.00	0.00

TABLE 2-9 (2 of 2)

Wind Speed vs. Temperature Lapse Rate-Stability Class (1970)

COMM. ED. CO., ZION STATION (195 FT LEVEL) DATA 1970

DIRECTION ESE

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.07	0.00	.02	.02	.07	.02	.02
3 TO 4	.13	0.00	.11	.04	.04	0.00	.09
5 TO 6	.04	.02	.04	.04	.09	.04	.04
7 TO 8	.09	.04	.04	.07	.04	.02	0.00
9 TO11	.13	.07	.09	.13	.09	0.00	0.00
12TO14	.31	0.00	0.00	.04	.02	.02	0.00
15TO18	.04	0.00	0.00	0.00	0.00	0.00	.02
19TO23	.07	0.00	0.00	0.00	0.00	0.00	0.00
GT 23	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****

DIRECTION SE

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	0.00	0.00	.02	.04	.07	0.00	.04
3 TO 4	.16	0.00	0.00	.11	.04	.04	.04
5 TO 6	.44	.07	.04	.20	.16	.04	0.00
7 TO 8	.63	.04	.04	.16	.09	.02	0.00
9 TO11	.47	0.00	0.00	.02	.11	.02	0.00
12TO14	.29	.02	0.00	.04	.02	0.00	0.00
15TO18	.11	0.00	0.00	.02	0.00	0.00	0.00
19TO23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GT 23	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****

DIRECTION SSE

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.24	0.00	.02	.07	.04	.02	.02
3 TO 4	.20	0.00	.02	.04	.11	.02	.09
5 TO 6	.56	.09	.20	.27	.13	.02	0.00
7 TO 8	.04	.13	.16	.16	.16	.04	.02
9 TO11	.49	.04	0.00	.11	.13	.07	0.00
12TO14	.49	.04	.07	.09	.04	0.00	0.00
15TO18	.60	.02	.04	.04	.04	0.00	0.00
19TO23	.11	0.00	0.00	0.00	0.00	0.00	0.00
GT 23	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****

DIRECTION S

WIND SPEED DISTRIBUTION VERSUS TEMP. LAPSE RATE STABILITY CLASS (IN PERCENT)

	A	B	C	D	E	F	G
CALM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 TO 2	.22	0.00	0.00	0.00	.16	.02	.07
3 TO 4	.31	.02	.13	.04	.22	0.00	0.00
5 TO 6	.78	.04	.11	.31	.42	.11	.11
7 TO 8	1.24	.11	.13	.51	.36	.11	.11
9 TO11	1.20	.13	.13	.13	.24	.04	.11
12TO14	.49	.07	.07	.44	0.00	0.00	.02
15TO18	.53	.17	.37	.02	0.00	0.00	0.00
19TO23	.24	0.00	0.00	0.00	0.00	0.00	0.00
GT 23	.04	0.00	0.00	0.00	.02	0.00	0.00

TABLE 2-10

HIGHEST EXPECTED WINDS FOR THE ZION SITE

Maximum Speed (mph)		Recurrence Interval (years)
48	0.50	2
60	0.10	10
69	0.04	25
70	0.02	50
80	0.01	100

TABLE 2-11
TORNADO OCCURRENCES**

ILLINOIS

DATE	DIRECTION OF MOVEMENT	PATH LENGTH (miles)	WIDTH (Yards)
9/21/59	NE	2	40
9/26/59	NNE	10	*
9/26/59	NE	10	*
10/8/59	NE	2	90
4/19/63	N	*	*
4/11/65	NNE	10.5	400
4/11/65	E	5.75	200
4/11/65	E	0.3	100
4/11/65	NE	0.1	250
5/26/65	ENE	15.5	70
6/23/65	*	0.1	10
4/19/66	NE	0.5	30-50
4/19/66	E	0.5	100
6/9/66	E	*	*
4/21/67	E	28	600-1200
4/21/67	E	*	*
4/21/67	NE	9	50-150
4/21/67	E	*	*
4/21/67	N	8	20
4/21/67	NE	16	100-200
4/21/67	N	0.25	10
7/26/69	E	5	35

WISCONSIN

6/12/59	*	2	1000
9/26/59	NE	4	*
9/26/59	E	15	50
10/8/59	NE	0	*
7/22/59	*	25	*
10/4/62	NE	*	*
7/9/63	SW	8	30
8/22/64	NE	2	400
4/11/65	NE	1	50
3/21/66	ENE	15	200
5/23/66	NE	5	50
5/26/68	N	1	100
6/29/69	ENE	10	100

* Not Available
** These occurrences are within a square 80 miles on a side with the Zion site at the center.

TABLE 2-12

ZION STATION
METEOROLOGICAL INSTRUMENT LOCATIONS AND ANALOG DATA RECORDING SYSTEMS

Measurement	Type	Digital System Accuracy	Threshold	Range	Elevation (Above Grade)	Recorder Type
Wind Speed/ Wind Direction	Teledyne Geotech 1564/1565	±1% / ±5°	0.28 mps/ 0.31 mps	0 to 44.7 mps/ 0 to 540°	35 ft	Esterline Angus L1102S
Wind Speed/ Wind Direction	Teledyne Geotech 1564/1565	±1% / ±5°	0.28 mps/ 0.31 mps	0 to 44.7 mps/ 0 to 540°	250 ft	Esterline Angus L1102S
Ambient Air Temperature	RDF 23789-4	±0.3°C	N/A	-40° to 48.9°C	35 ft	Esterline Angus MRL-244-0-RD-RC-64-MP
Differential Temperature	RDF-23789-4	±0.14°C*	N/A	-5.6° to 16.7°C	250-35 ft	Esterline Angus MRL-244-0-RD-RC-64-MP
Precipitation	MRI Model 302 Tipping Bucket	±0.25mm	N/A	0.0 to 25.4 mm	Shelter Roof	Esterline Angus MRL-244-0-RD-RC-64-MP

* ±0.14°C over the height differential on the tower is within the ANS 2.5 specified accuracy standard of ±0.15°C/50m

TABLE 2-13

ZION STATION (2, 5, & 15 Mile Supplemental Tower*)
METEOROLOGICAL INSTRUMENT LOCATIONS AND ANALOG DATA RECORDING SYSTEMS

Measurement	Type	Digital System Accuracy	Threshold	Range	Elevation (Above Grade)	Recorder Type
Wind Speed/ Wind Direction	Teledyne Geotech Series 50.1/ 50.2c	±1% / ±5°	0.33 mps/ 0.42 mps	0 to 44.7 mps/ 0 to 540°	33 ft	Esterline Angus L1102S
Wind Speed/ Wind Direction	EG & G Model 110S-M	±0.3°C	N/A	-31.7 to 37.8°C	33 ft	Esterline Angus MS401BB

* Equipment is identical at each of the three locations.

TABLE 2-14

NEARBY LAKE MICHIGAN WATER SUPPLY SYSTEMS

Community	Intake Distance From Site, Miles	Average Withdrawal, Million Gallons Per Day (MGD)	Storage Capacity, Million Gallons (MG)
Lake County, Illinois, Public Water District	1.1	2.5	4
Waukegan, Illinois	6	7.4	8.6
North Chicago, Illinois	10	6.5	5.0
Kenosha, Wisconsin	10	11	10.2
Great Lakes NTS, Illinois	13	5.8	4.5
Lake Forest, Illinois	16.5	1.6	2.9

TABLE 2-15

ANNUAL PRECIPITATION AT VARIOUS ILLINOIS LOCATIONS

Location	Mean Annual Precipitation Inches	Maximum Annual Precipitation Inches	Maximum 24-Hr. Rainfall Inches
Antioch	32.83	42.71	5.10
Waukegan	31.89	41.97	3.58
Chicago-WBAP	32.99	45.92	6.24
Chicago-WB, City	33.17	46.41	6.19
Marengo	32.89	40.77	9.08
Wheaton College	35.01	45.58	5.60
Aurora College	34.52	47.03	4.87
Park Forest	35.60	43.43	---
Chicago University	32.29	45.71	---

TABLE 2-16

DOOR LOCATIONS AND PRINCIPLE USE EXTERIOR
ACCESSES BELOW ELEVATION 600' MSL

LOCATION	ELEVATION	TYPE OF USE (PRINCIPLE)
Aux. Bldg. (10-L)	592'0"	Equipment access
Aux. Bldg. (30-L)	592'0"	Material access to vermiculite and cement mixing room
Aux. Bldg. (30-K)	595'10-1/2"	Removal of solid waste from drumming station and dry active waste storage
Fuel Hand Bldg. (17-W)	592'0"	New and spent fuel access
Diesel Generator Bldg. (34-J, 33-J, 31-J, 9-J, 7-J, 6-J)	592'3" *	Ventilation and combustion air to diesels
Turb. Bldg. (38-G)	592'0"	Equipment access
Turb. Bldg. (37-G)	592'0"	Personnel access
Turb. Bldg. (38-C)	592'0"	Personnel access
Turb. Bldg. (22-A)	592'0"	Equipment and personnel access
Turb. Bldg. (2-C)	592'0"	Personnel access
Turb. Bldg. (3-G)	592'0"	Personnel access
Turb. Bldg. (2-G)	592'0"	Equipment access
Crib House (113-AA)	594'0"	Personnel access
Crib House (101-AA)	594'0"	Personnel access

* Elevation corresponds to bottom of air intake leuvers.
Plenum access door elevation at approximately 593'-9".

TABLE 2-17

DATA ON SURFACE CURRENT SPEEDS FOR LAKE MICHIGAN
(July through November 1963)

Current Speed		Frequency
(cm/sec)	(ft/sec)	(% of Time)
< 6	< 0.2	21.9
6 - 15	0.2 - 0.5	46.5
15 - 30	0.5 - 1.0	24.9
30 - 45	1.0 - 1.5	5.8
> 45	> 1.5	0.9

TABLE 2-18

FREQUENCY OF DEEP WATER WAVE HEIGHTS DUE TO STORMS

Frequency	Wave Height in Feet* (Reference 24)	
	Full Year	Ice Free Period
Once each month	6.5	5
Once each 6 months	9.9	7.5
Once each year	11.4	8.5
Once each 2 years	12.6	9.4
Once each 5 years	14.3	10.8
Once each 10 years	15.7	11.8
Once each 25 years	17.4	13.6
Once each 500 years	22.0	20.3

* Crest to trough height.

TABLE 2-19
WELL DATA - ZION STATION (WITHIN ONE MILE OF STATION)

Well No.	Location (T46N) Rise	Surf Elev (MSL)	Depth	Mineral Analysis	Pump Rate (GPM)	Static Level (Below Grade)	Construction Report
W-1	320'S, 880'W Cent. Sec. 22		1500'	Partial			
W-4	200'S, 200'E Cent. Sec. 22		108'	Partial			
W-5	175'E, 1630'S Cent. Sec. 22		225'	Partial			
W-6	400'E, 1660'S Cent. Sec. 22		50'	Partial			
W-7	300'E, 1550'S Cent. Sec. 22		220'	Partial			
W-8	300'E, 1380'S Cent. Sec. 22		225'	Partial			
W-9	750'E, 500'N SW Cor. Sec. 22			Yes			
W-13	1150'E, 1800'S NW Cor. Sec. 22	615'	160'	----			
W-18	1500'N, 1500'E SW Cor. Sec. 14		123'	----	20	17 24*	Yes
W-19	1700'N, 1000'E SW Cor. Sec. 14		125'	----	30	19 25*	Yes
W-20	1800'N, 1200'E SW Cor. Sec. 14		180'	----	3	13 180*	Yes
W-21	50'S, 800'E NW Cor. Sec. 23		120'	----	20	14 50*	Yes
W-22	50'S, 1150'E NW Cor. Sec. 23		144'	----	2	9 142*	Yes
W-24	570'N, 510'N		1370'	Partial			

TABLE 2-20 (1 of 2)

GEOLOGIC FORMATIONS

Geologic Age	Geologic Name	Approx. Thickness In Feet	Description	Remarks
Quaternary	Recent Deposits	0 to 35	Unconsolidated sand, silt and peat	Largely Lake Michigan shore deposits. Present at site
	Pleistocene	80 to 150	Unconsolidated material ranging from clay to boulders deposited as till, outwash, loess and lake sediments	Largely from Wisconsin Glaciation. All but loess present at site
Silurian	Niagara Formation	0 to 465	Dolomite, vuggy, locally contains solution cavities, fossiliferous	Bedrock at site
Ordovician	Maquoketa Formation	0 to 250	Shale, grades locally to dolomite or limestone	Generally not water bearing
	Galena-Platteville Formation	220 to 350	Dolomite or limestone, shaly	Aquifer
	Glenwood-St. Peter Formation	100 to 650	Sandstone, fine to coarse grained	Aquifer
	Prairie du Chien Formation	0 to 340	Dolomite and sandstone	May not be present under the site

TABLE 2-20 (2 of 2)

GEOLOGIC FORMATIONS

Geologic Age	Geologic Name	Approx. Thickness In Feet	Description	Remarks
Cambrian	Trempealeau Formation	0 to 225	Dolomite and sandstone	
	Franconia Formation	45 to 175	Dolomite and sandstone	
	Ironton-Galesville Formation	105 to 270	Sandstone	Most important bedrock aquifer
	Eau Clair Formation	235 to 450	Shale and Siltstone	
	Mt. Simon Formation	2000	Sandstone with siltstone and shale	Aquifer
Precambrian	Undifferentiated	Unknown	Granites and associated intrusives	Principal basement rock

TABLE 2-21

ELEVATION OF CLASS I STRUCTURES WITH RESPECT TO VARIOUS FOUNDATION SOIL LEVELS

Class I Structure	Foundation Elevation	Granular Lake Deposits (Sand)	Glacial Till (Clay)	Glacial Lacustrine & Glacial Outwash (Sand, Silt & Clay)	Niagara Dolomite
Fuel Handling Building	571' & 587'	585'	555'	515'	486'
Auxiliary Building	537'	585'	554'	526'	481'
Diesel Generator (N)	562.5'	585'	556'	523'	483'
Diesel Generator (S)	562.5'	585'	554'	525'	476'
Reactor (Unit II)	521.5' & 548'	585'	554'	522'	483'
Reactor (Unit I)	521.5' & 548'	585'	555'	529'	480'
Crib House	530'	585'	554'	515'	486'

TABLE 2-22 (1 of 2)

REGIONAL EARTHQUAKE OCCURRENCES

Date	Intensity*	Locality	Epicenter Location N. Lat.	W. Long	Area Sq. Miles
1804 Aug. 20	VII	Ft. Dearborn	4.20	87.8	30,000
1811 Dec. 16	XII Felt throughout Illinois	New Madrid, Missouri	36.6	89.6	2,000,000
1812 Jan. 23	XII Felt throughout Illinois	New Madrid, Missouri	36.6	89.6	2,000,000
1812 Feb. 7	VII Felt throughout Illinois	New Madrid, Missouri	36.6	89.6	2,000,000
1883 Feb. 4	VI	North of Michigan – Indiana Border	42.3	85.6	8000
1886 Aug. 31	X Felt in Chicago	Charleston, S.C.	32.9	80.0	2,000,000
1895 Oct. 31	VIII Felt throughout Illinois and Wisconsin	Charleston, Missouri	37.0	89.4	1,000,000
1905 March 13	V	Menominee, Michigan	45.0	87.7	
1909 May 26	VII IV at Kenosha	N.E. Illinois	42.5	89.0	500,000
1912 Jan. 2	VI	N.E. Illinois	41.5	88.5	40,000
1917	VI	E. Missouri	38.1	90.6	200,000

* As defined in Table 2-23

TABLE 2-22 (2 of 2)

REGIONAL EARTHQUAKE OCCURRENCES

Date	Intensity*	Locality	Epicenter Location N. Lat.	W. Long	Area Sq. Miles
1923 Nov. 9	V	Cass County, Illinois			
1931 Oct. 18	VI	Madison, Wisconsin			
1933 Dec. 6	IV	Stoughton to Putland, Wisconsin			
1934 Nov. 12	VI	Rock Island, Illinois	41.5	91.5	
1935 Nov. 1	VI Felt in Wisconsin	Timiskaming, Canada	46.8	79.1	1,000,000
1939 Nov. 23	V III at Janesville, Wisconsin	Southern Illinois			
1943 Feb. 9	II	Thunder Mt., Marinette Co., Wisconsin			
1947 May 6	V	S.E. Wisconsin			
1947 Aug. 9	VI	So. Central Michigan	42.0	85.0	50,000
1956 July 18	IV	Oostburg, Wisconsin			
1956 Oct. 13	IV	Milwaukee-Racine, Wisconsin			
1968 Nov. 9	VII (III at site)	Southern Illinois	38	88.5	

* As defined in Table 2-23

TABLE 2-23 (1 of 2)

MODIFIED MERCALLI INTENSITY SCALE 1931
(Abridged)

I. Not felt except by a very few under especially favorable circumstances.

II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.

III. Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.

IV. During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed, walls make creaking sound. Sensation like heavy truck striking buildings. Standing motor cars rocked noticeably.

V. Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.

VI. Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.

VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures, considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.

TABLE 2-23 (2 of 2)

MODIFIED MERCALLI INTENSITY SCALE 1931
(Abridged)

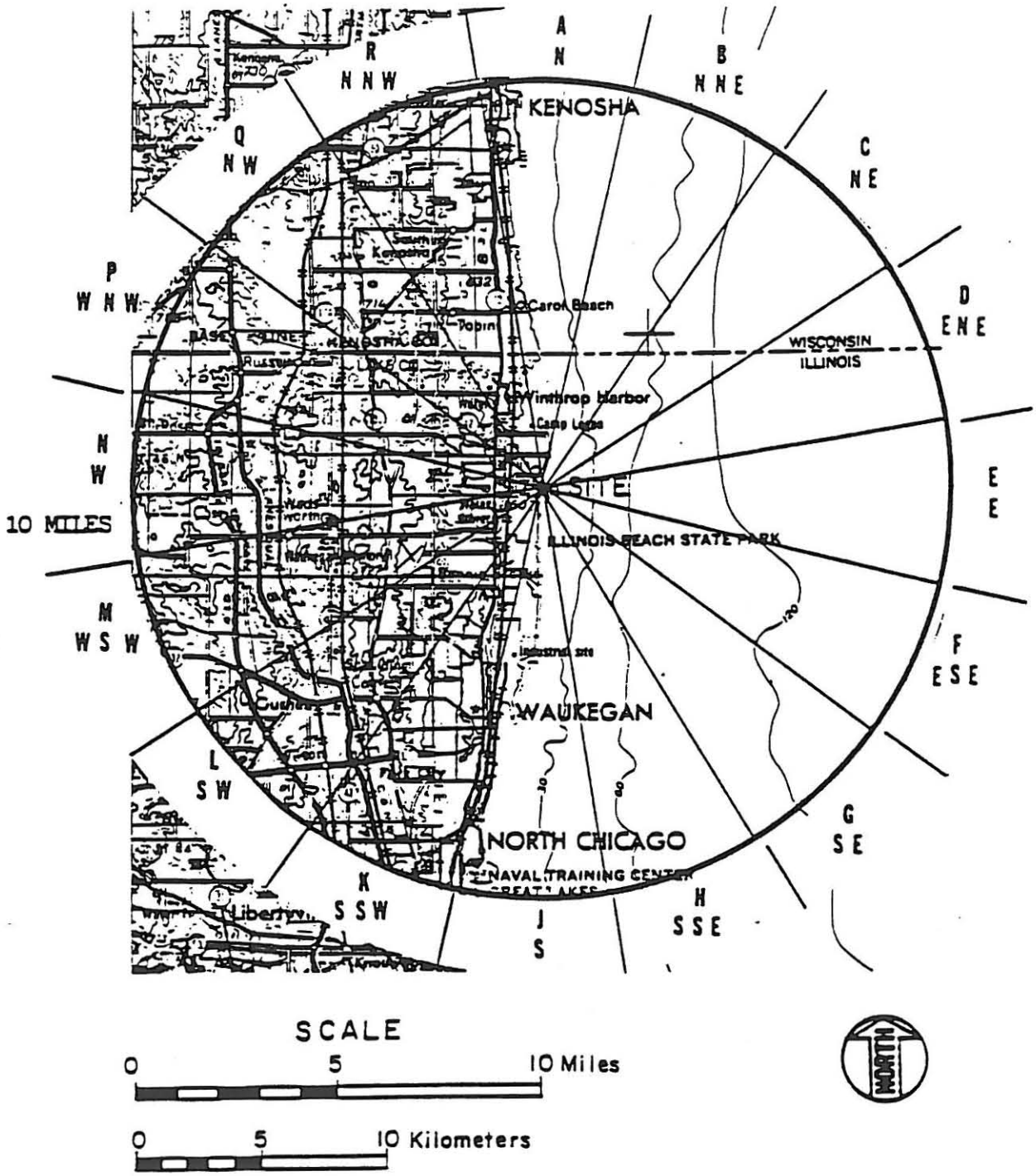
VIII. Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Disturbs persons driving motor cars.

IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.

X. Some well-built wooden structures, destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.

XI. Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII. Damage total. Waves seen on ground surfaces. Lines of slight and level distorted. Objects thrown upward into the air.



SCALE

0 5 10 Miles

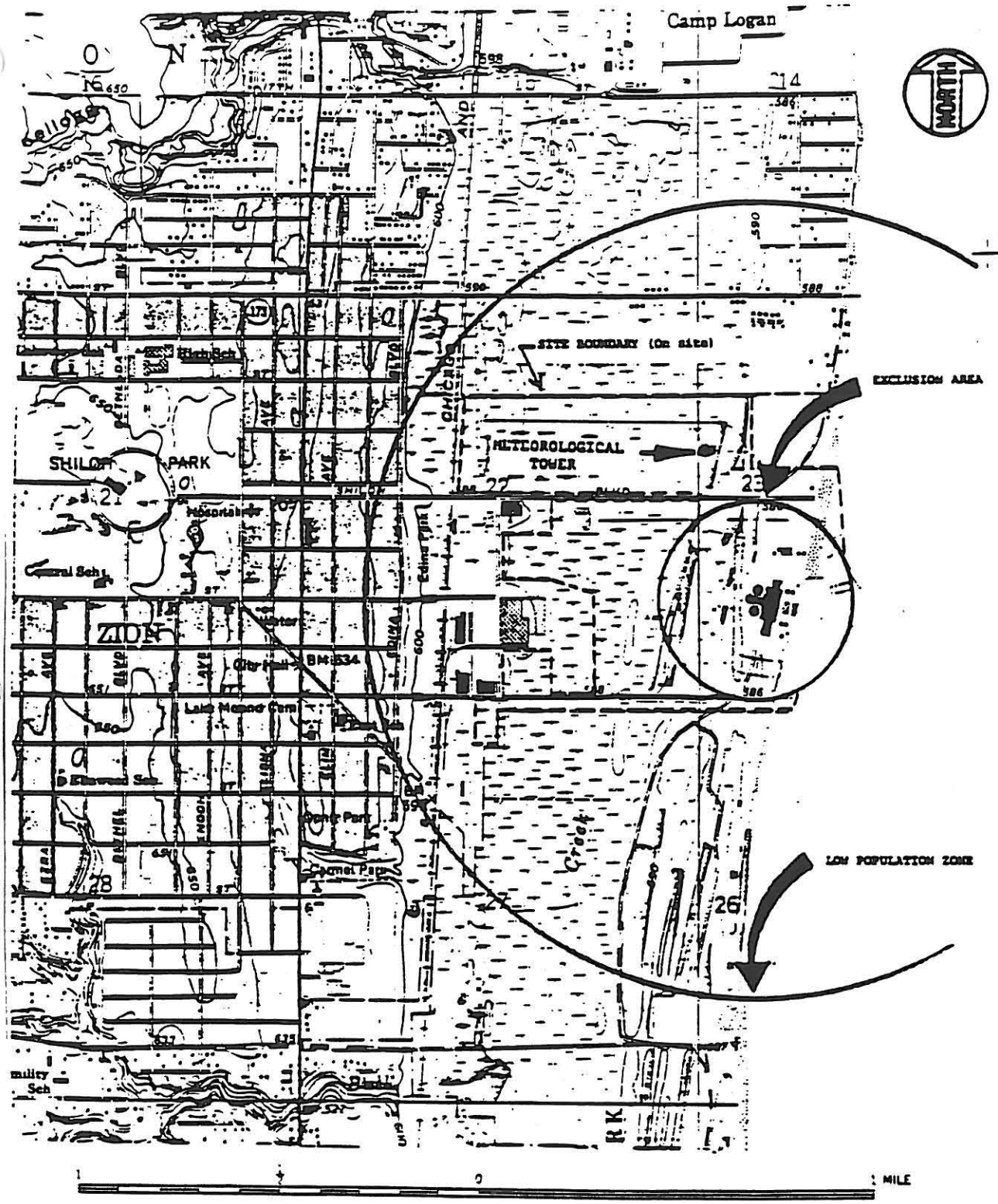
0 5 10 Kilometers

NORTH

ZION STATION DSAR

Figure 2-1
TOPOGRAPHICAL FEATURES WITHIN A 10-MILE RADIUS OF THE ZION STATION

October 2016

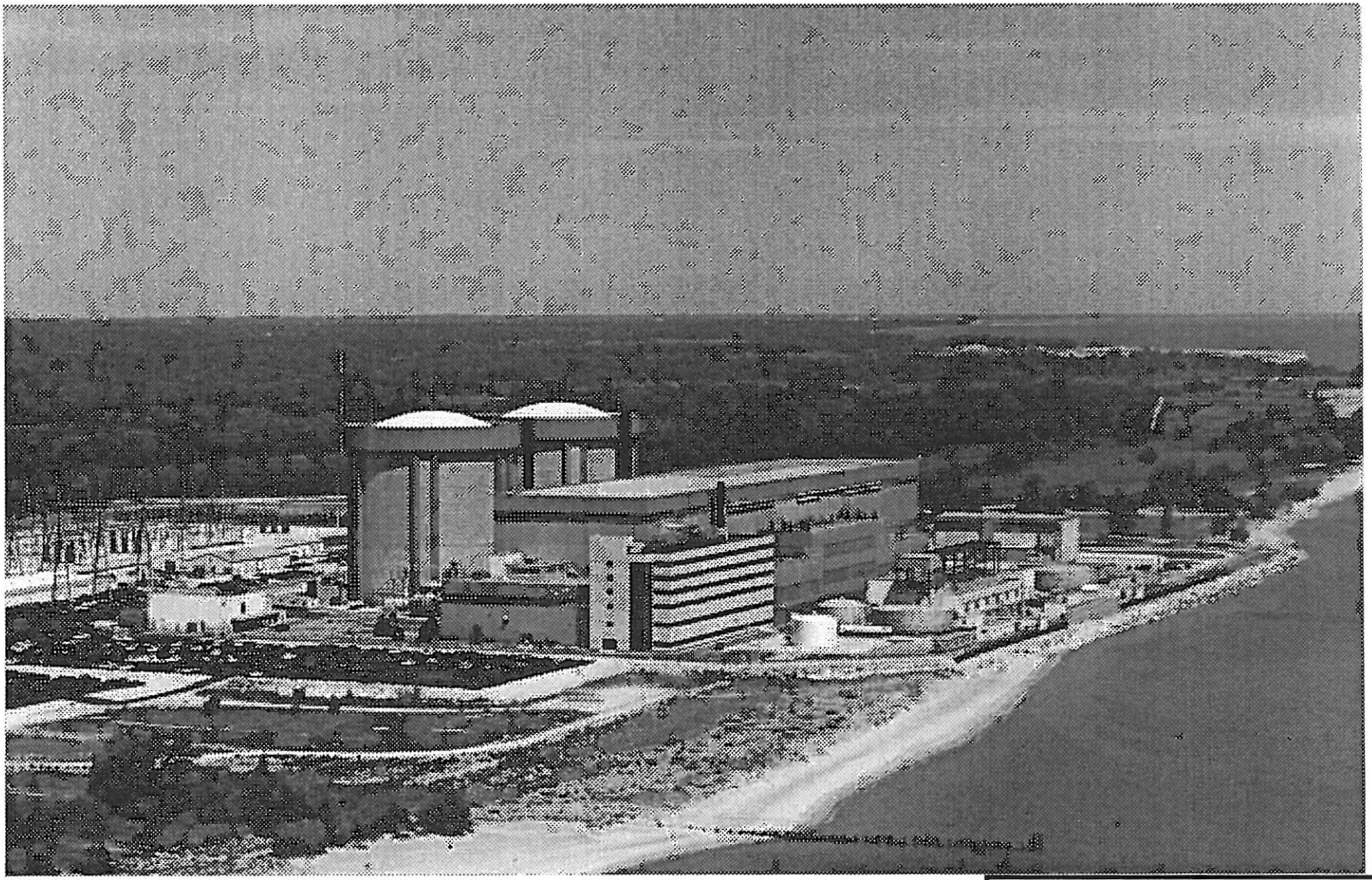


ZION STATION DSAR

Figure 2-2

MAP OF ZION STATION (LPZ AND EXCLUSION AREA)

October 2016

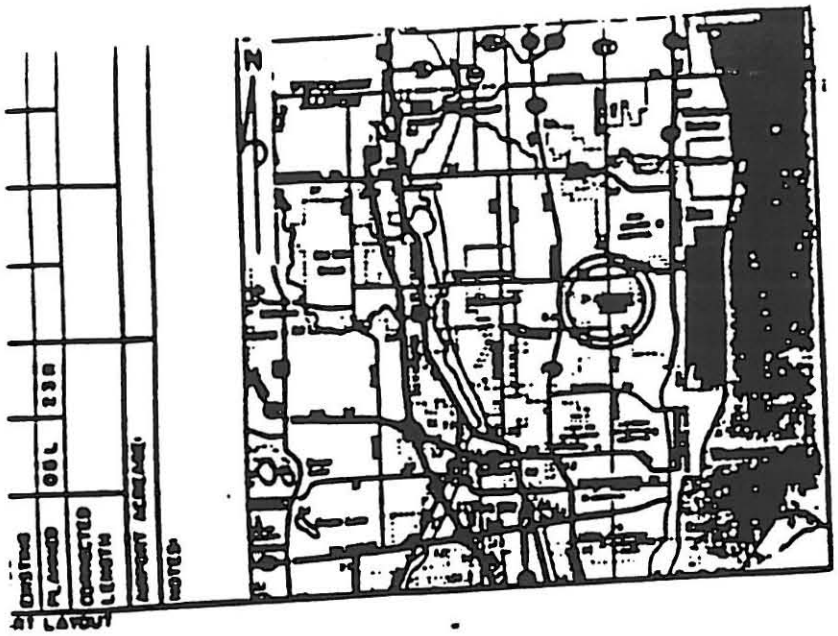


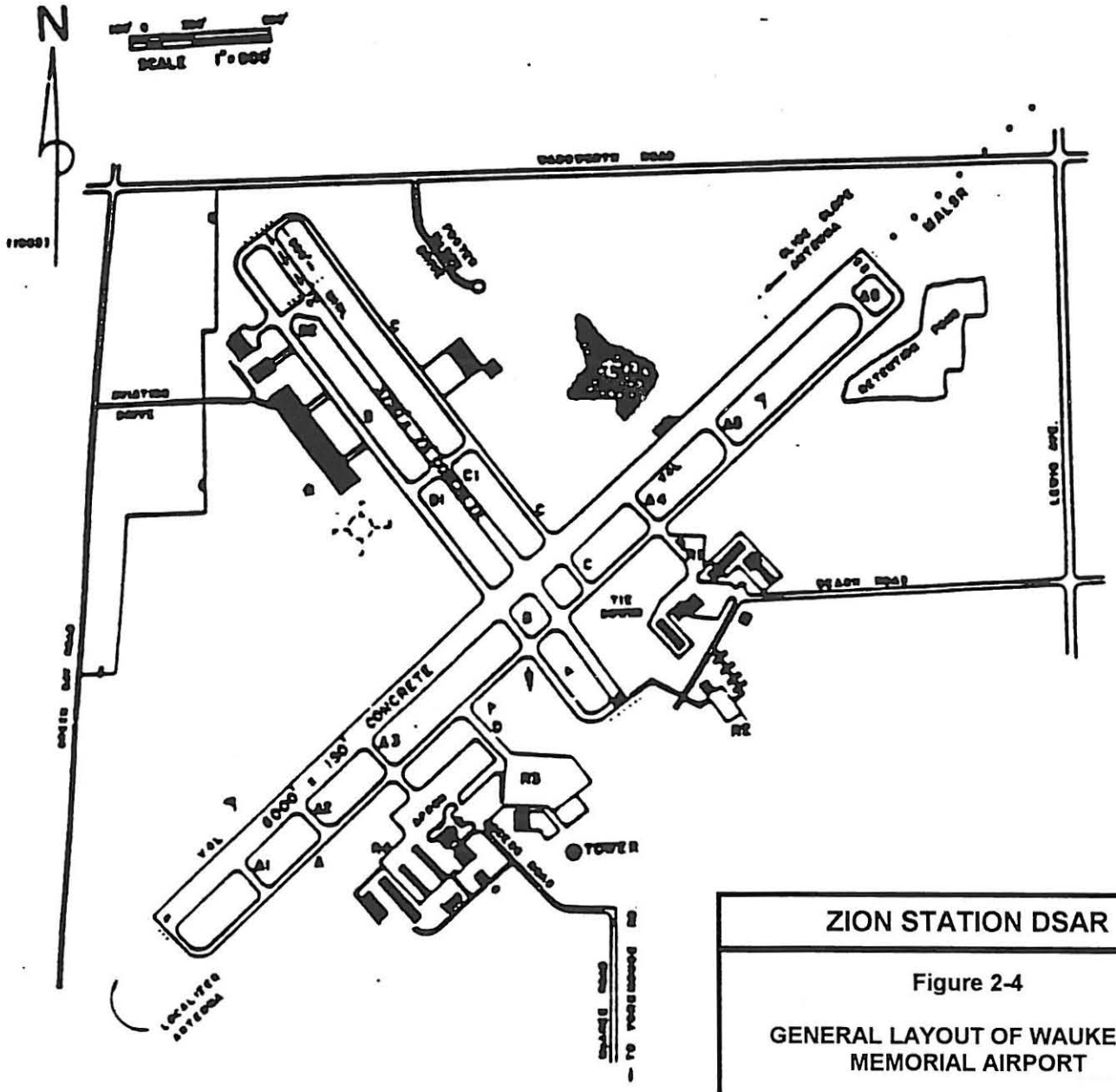
ZION STATION DSAR

Figure 2-3

SITE AERIAL PHOTOGRAPH

October 2016



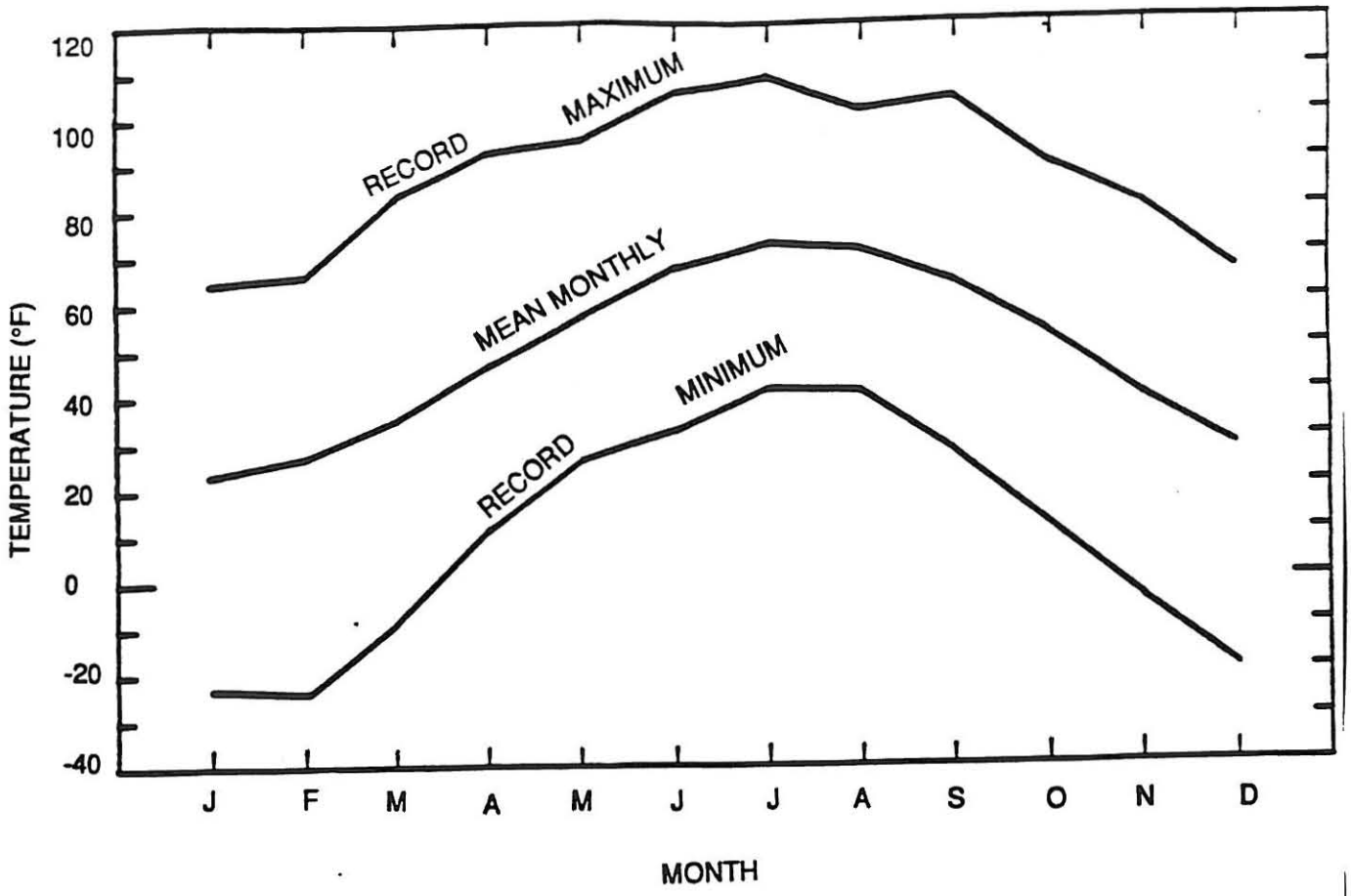


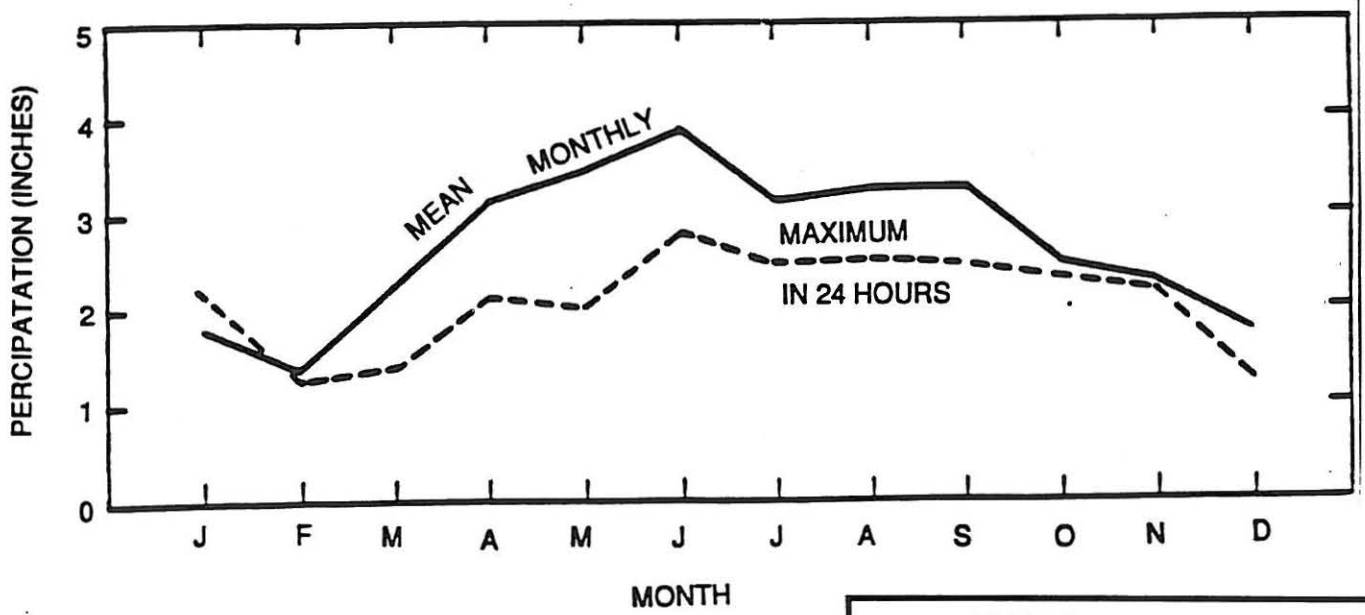
ZION STATION DSAR

Figure 2-4

GENERAL LAYOUT OF WAUKEGAN MEMORIAL AIRPORT

October 2016





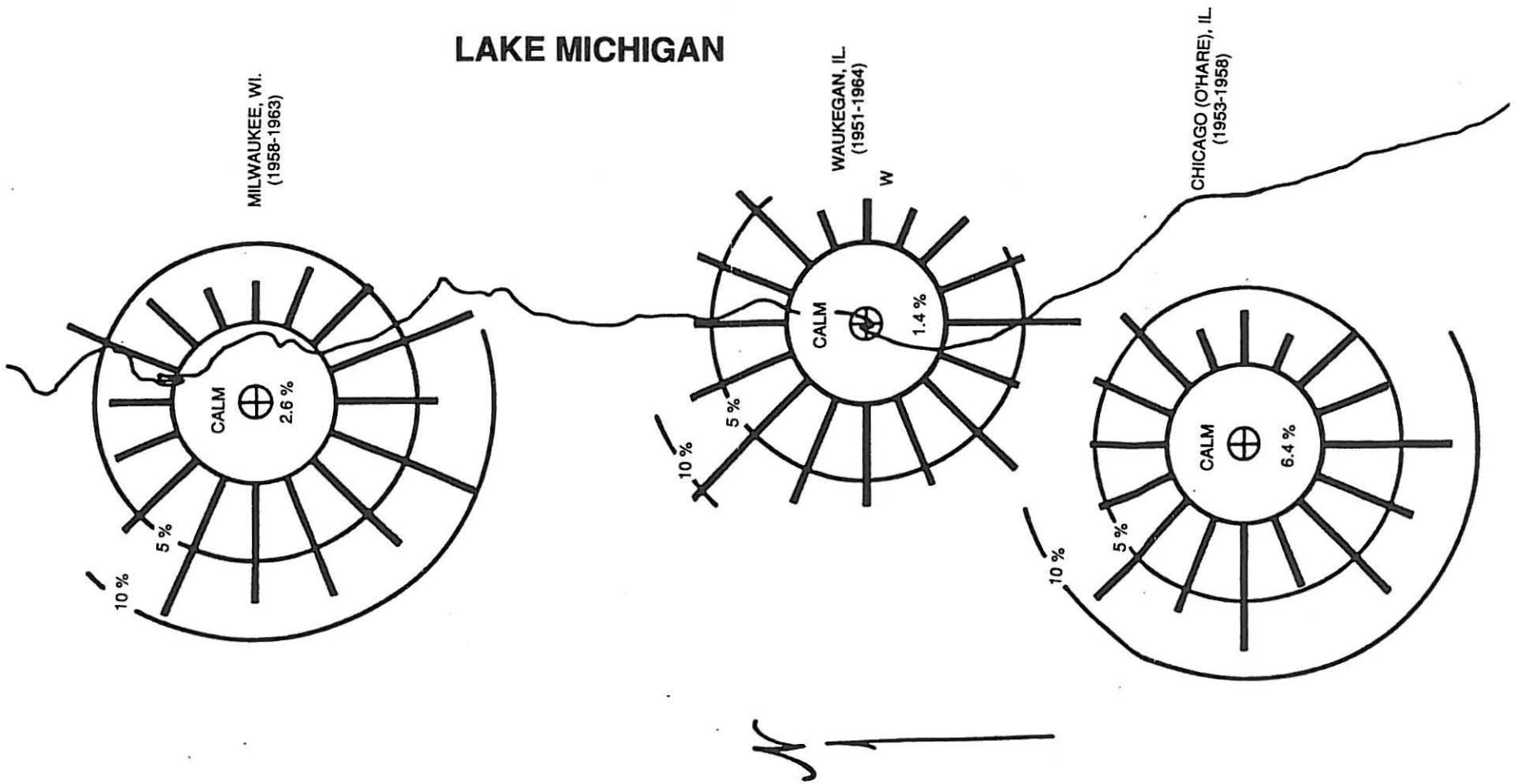
NOTE:
BASED ON WAUKEGAN DATA

ZION STATION DSAR

Figure 2-5

CLIMATE OF ZION REGION

October 2016

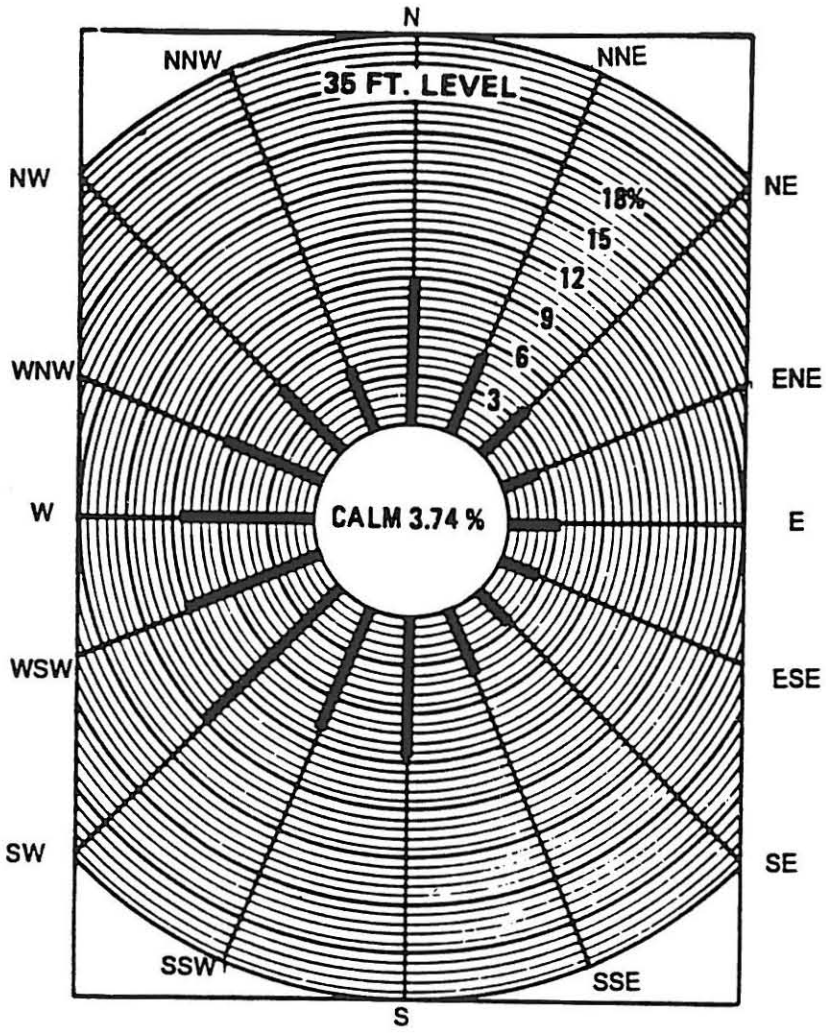


ZION STATION DSAR

Figure 2-6

AVERAGE ANNUAL WIND ROSES MILWAUKEE, WAUKEGAN, CHICAGO (O'HARE)

October 2016

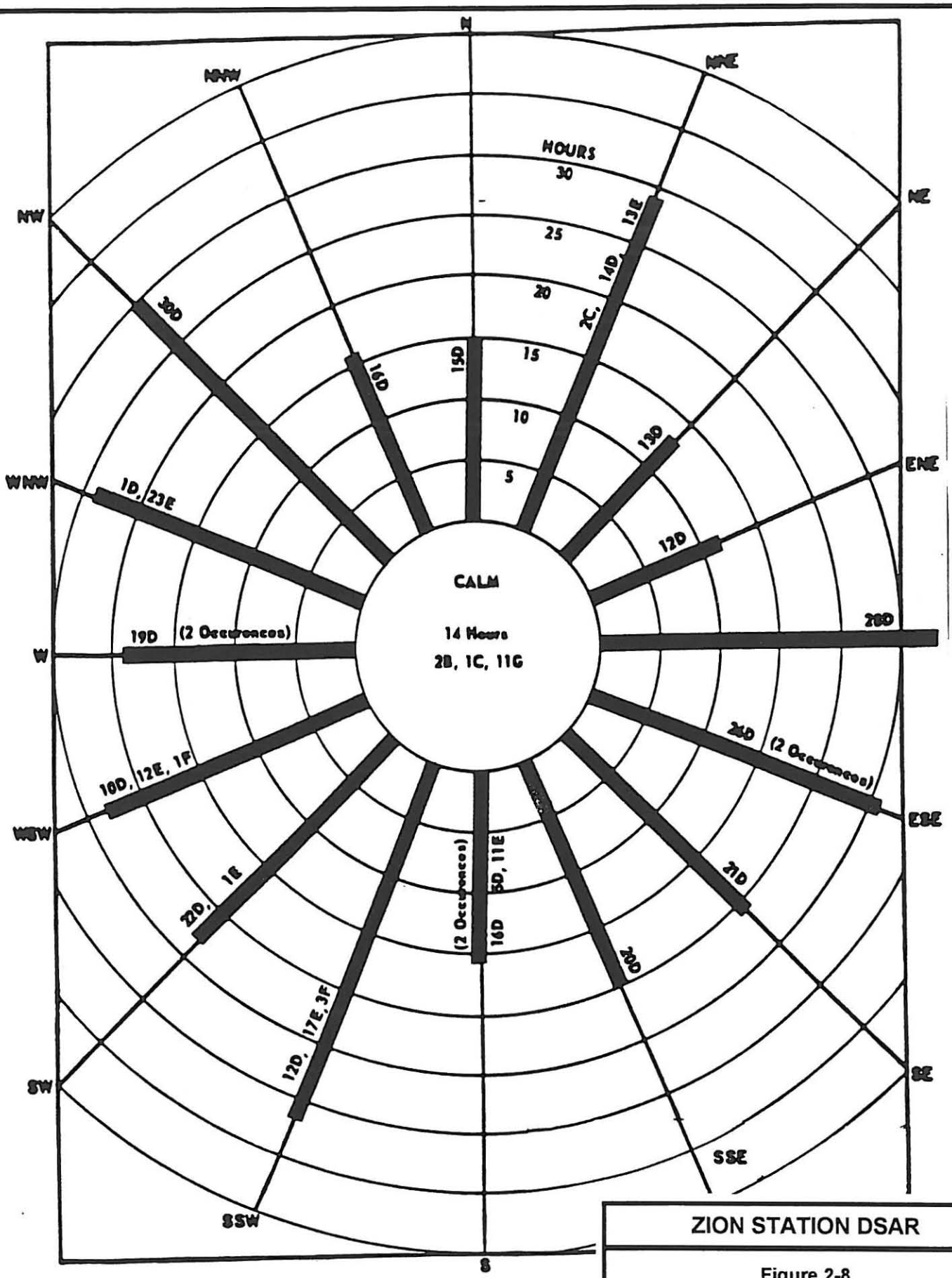


ZION STATION DSAR

Figure 2-7

AVERAGE WIND ROSE FOR THE ZION SITE

October 2016



Number Is Total Hours Of Each Stability

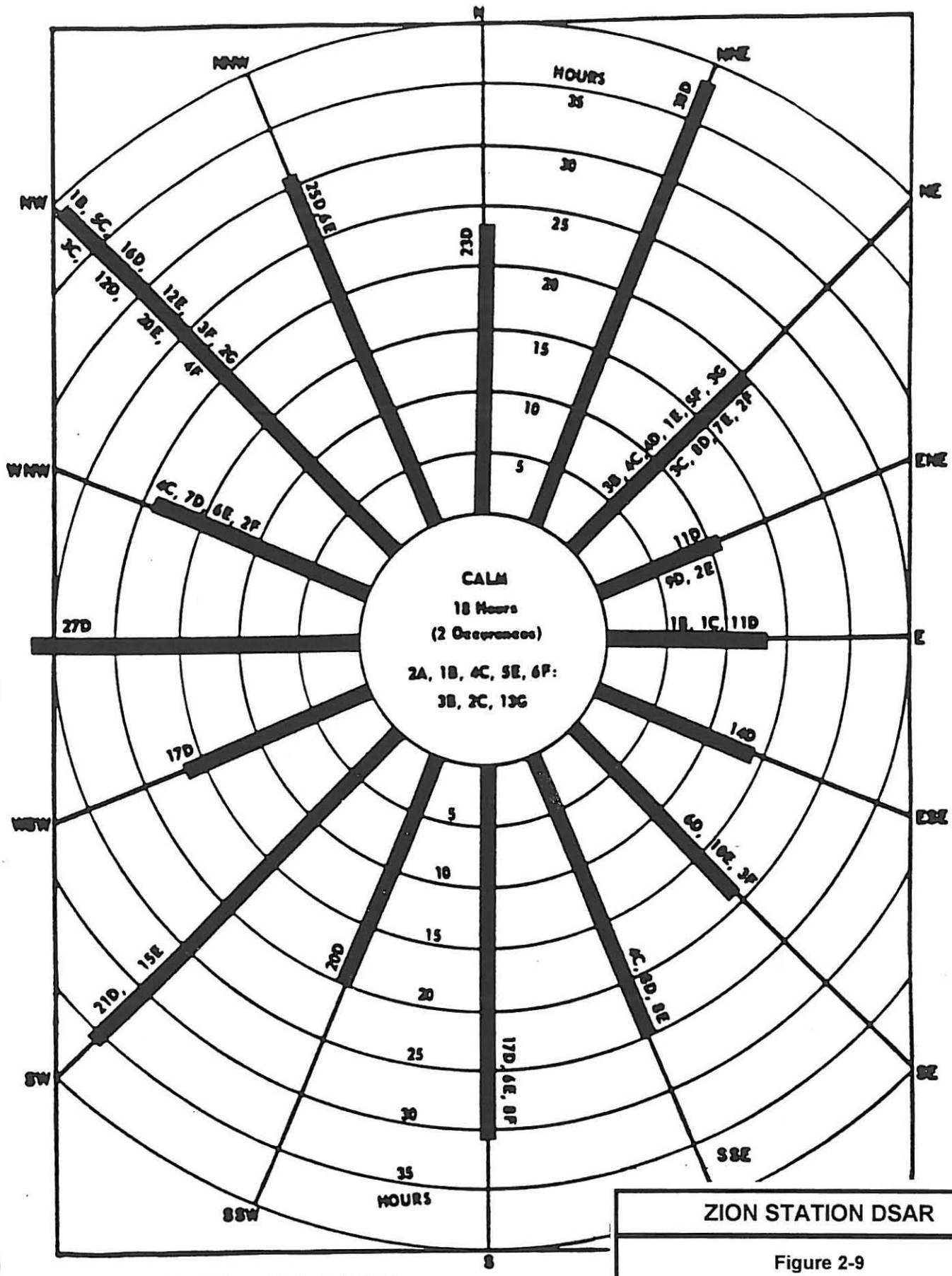
A. . . . . G – Pasquill Stability Class

ZION STATION DSAR

Figure 2-8

WIND DIRECTION PERSISTENCE
AT MILWAUKEE

October 2016

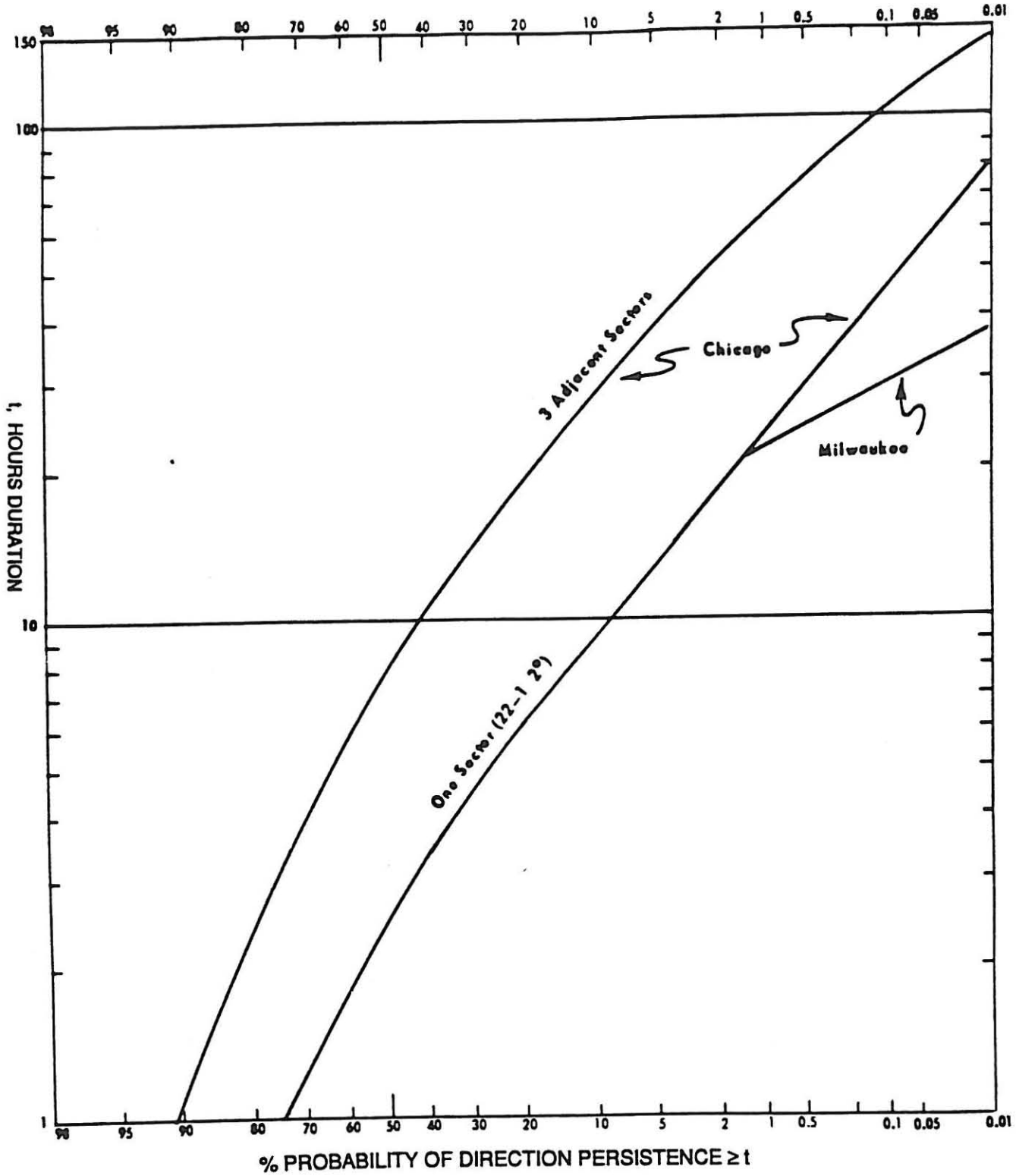


ZION STATION DSAR

Figure 2-9

WIND DIRECTION PERSISTENCE AT CHICAGO (O'HARE)

(5-YEAR DATA RECORDS)

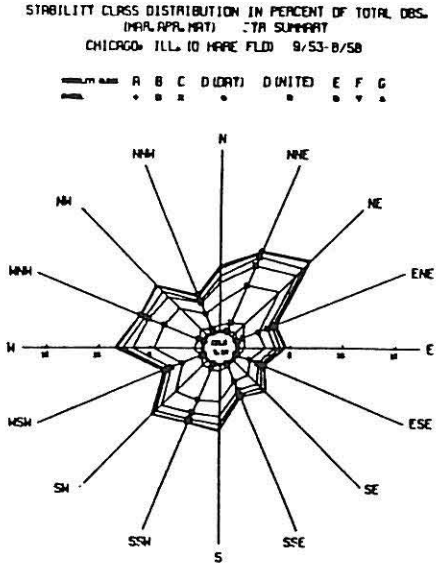


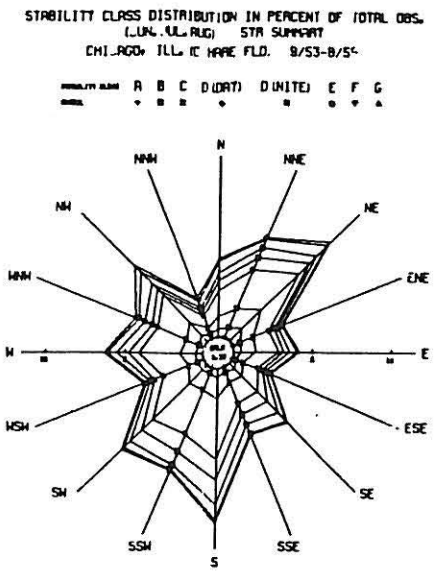
ZION STATION DSAR

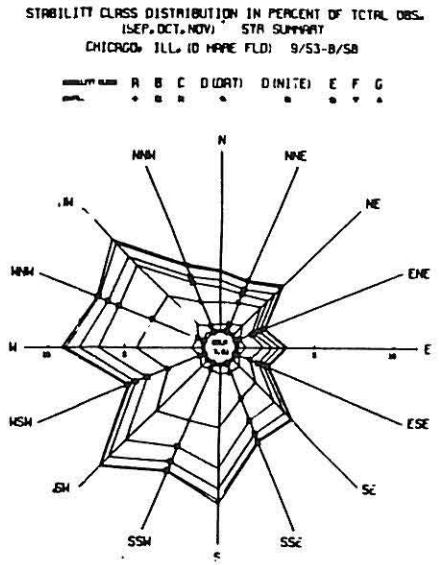
Figure 2-10

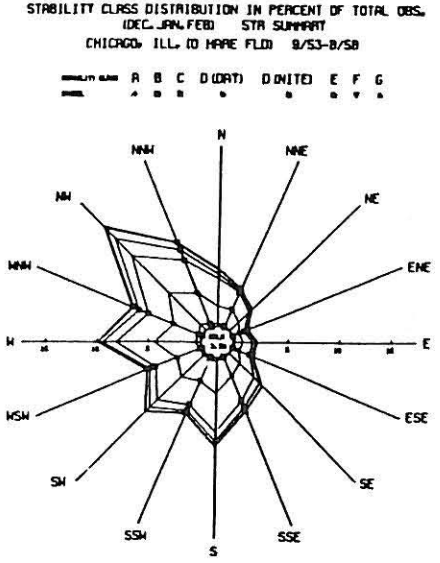
WIND DIRECTION PERSISTENCE FREQUENCY DISTRIBUTION

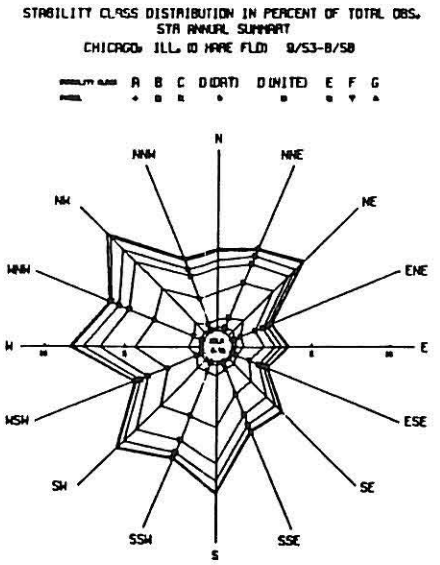
October 2016







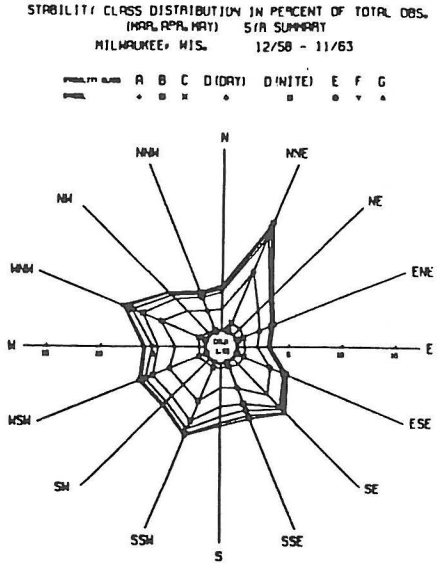


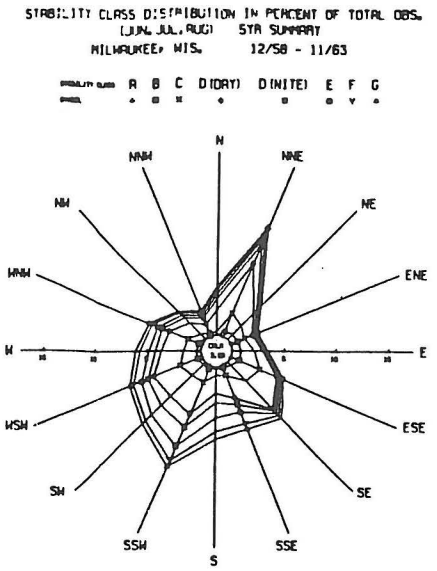


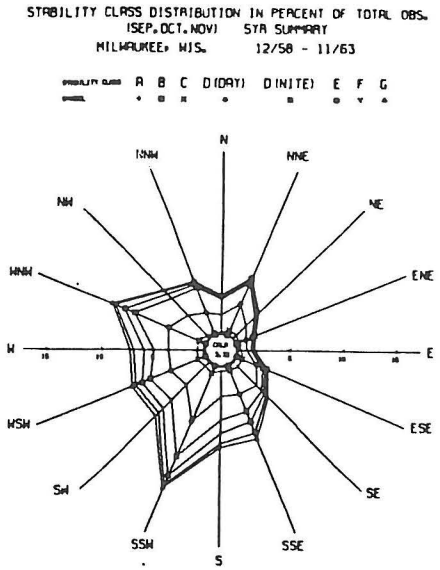
ZION STATION DSAR

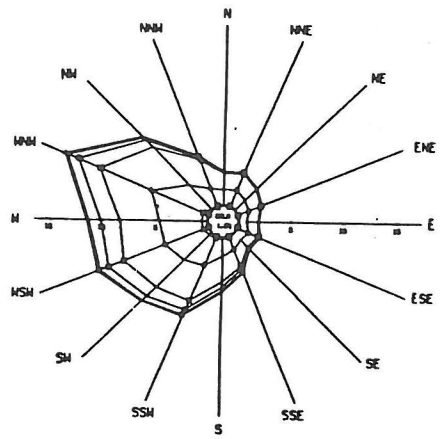
Figure 2-11

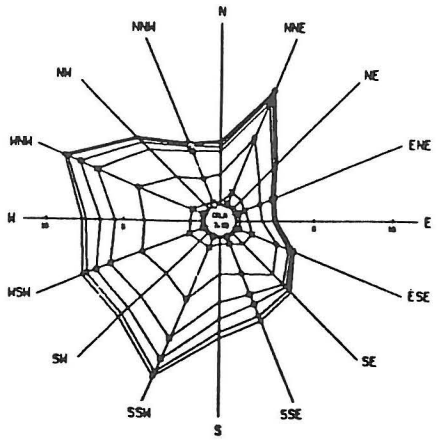
STABILITY CLASS DISTRIBUTION, 5 YEAR SUMMARY – CHICAGO







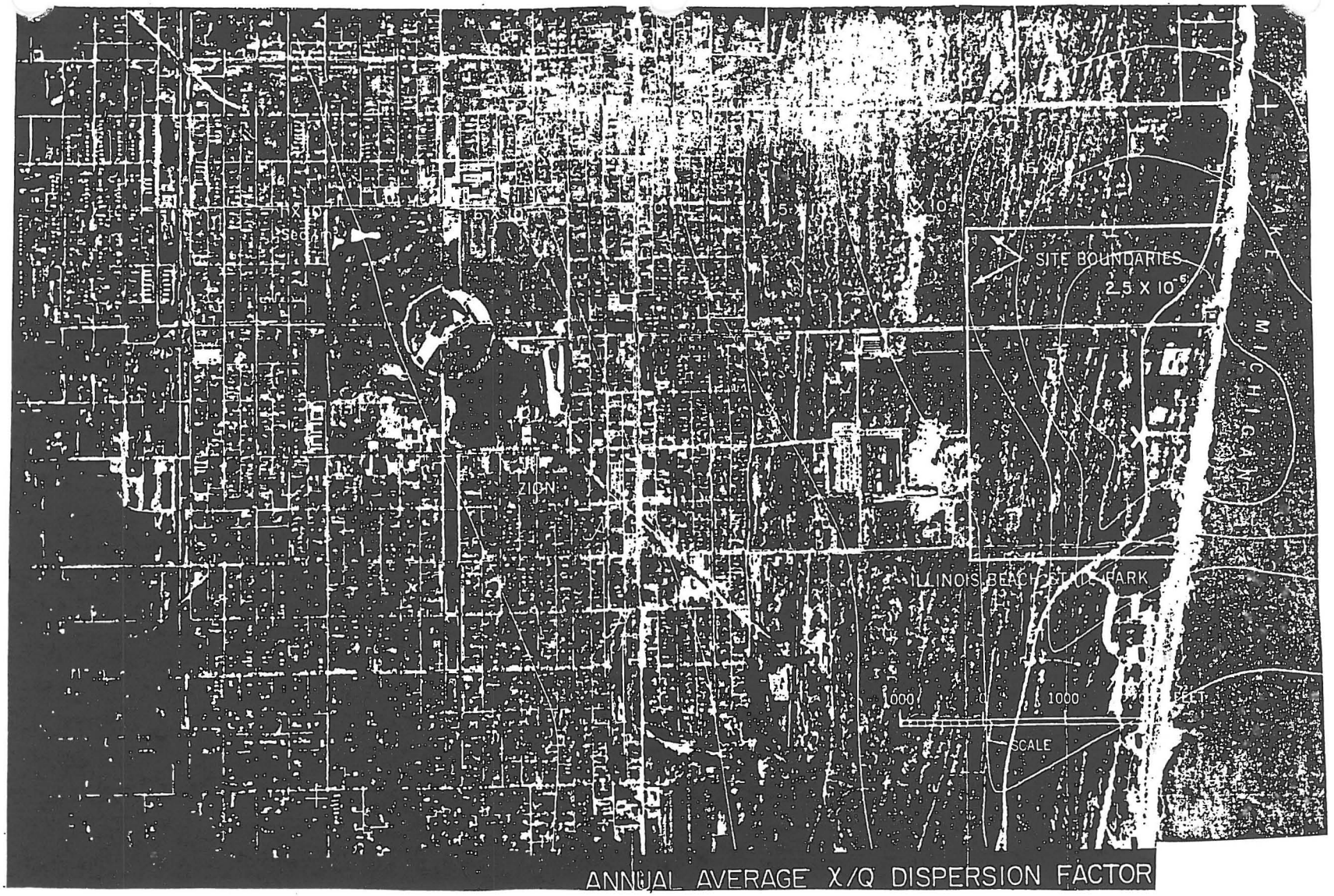




ZION STATION DSAR

Figure 2-12

STABILITY CLASS DISTRIBUTION, 5 YEAR SUMMARY – MILWAUKEE

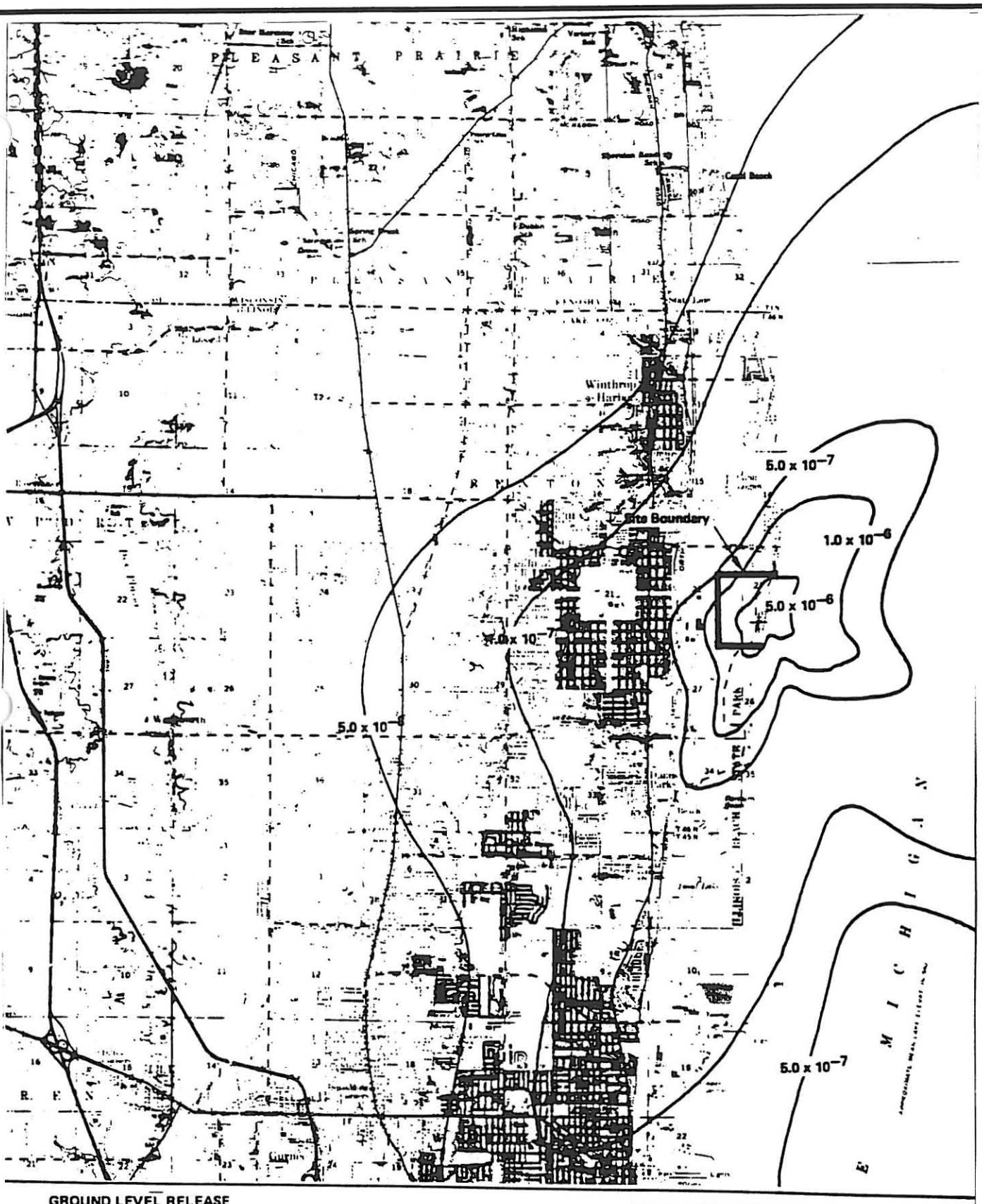


ZION STATION DSAR

Figure 2-13

ANNUAL AVERAGE χ / Q

October 2016



GROUND LEVEL RELEASE
WIND & STABILITY SPECTRUM

χ /Q ISOPLETHS (35 FT. LEVEL)

UNITS: sec/m^3

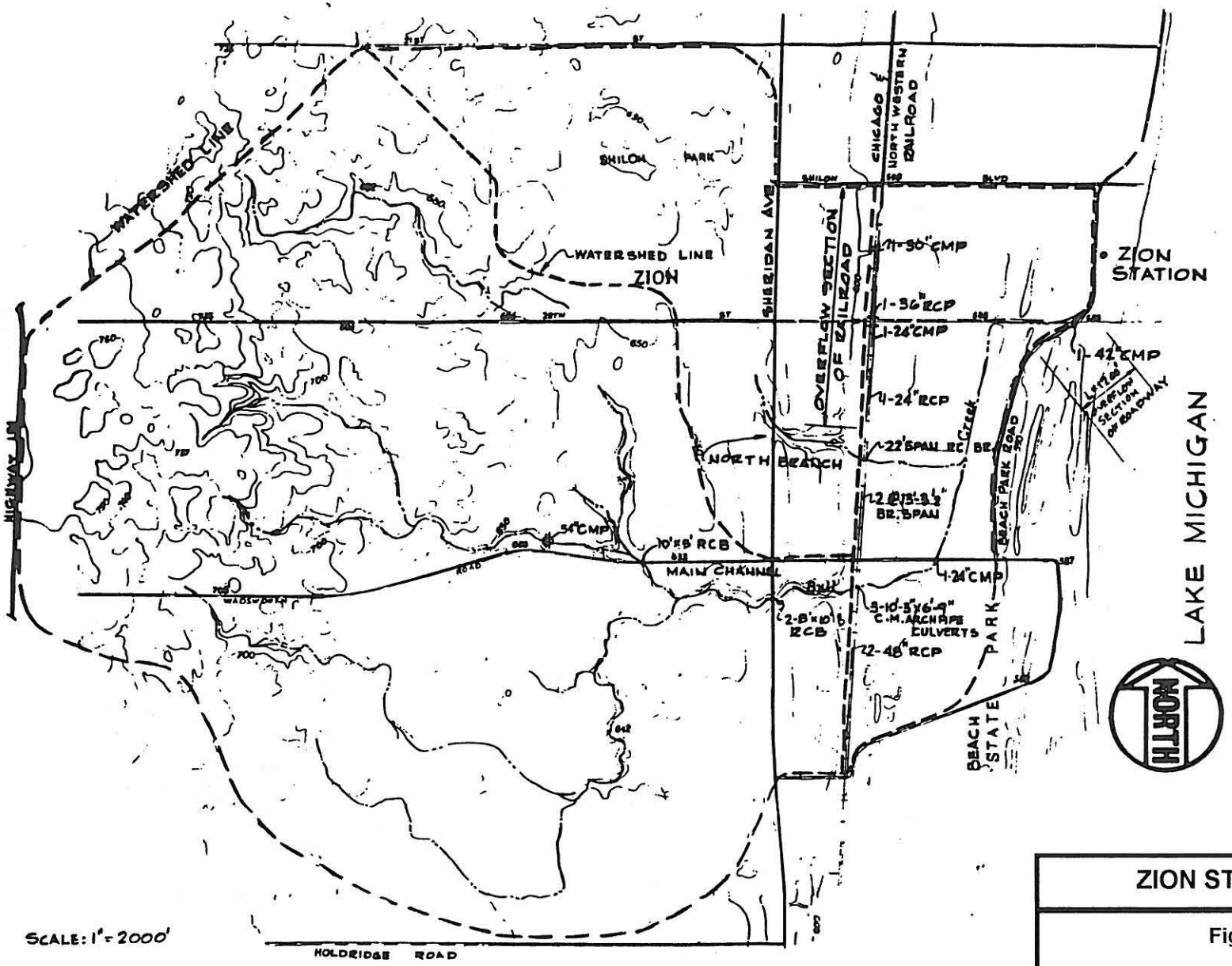
SEMI–ANNUAL AVERAGE

ZION STATION DSAR

Figure 2-14

χ / Q ISOPLETHS

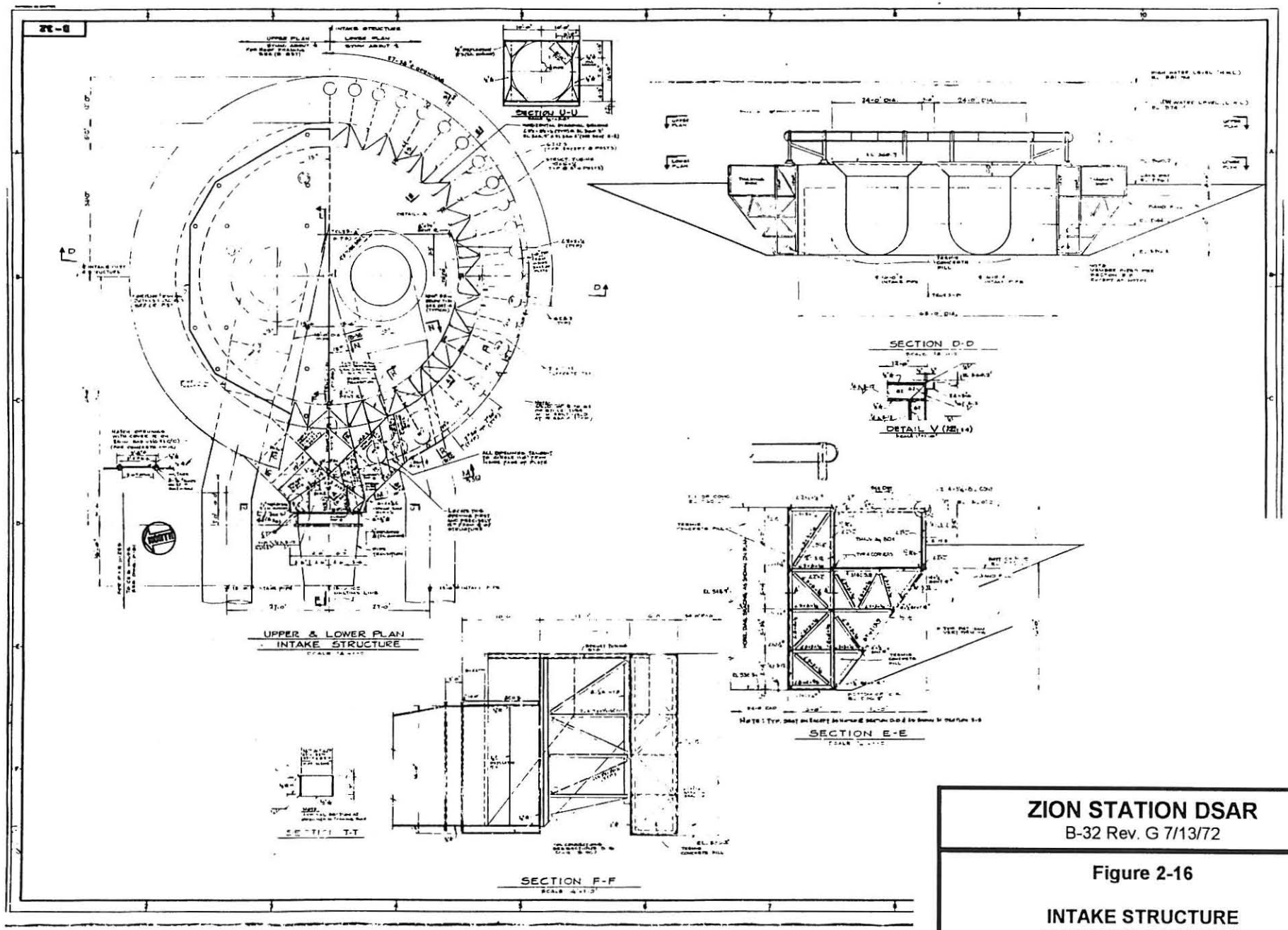
October 2016



ZION STATION DSAR

Figure 2-15

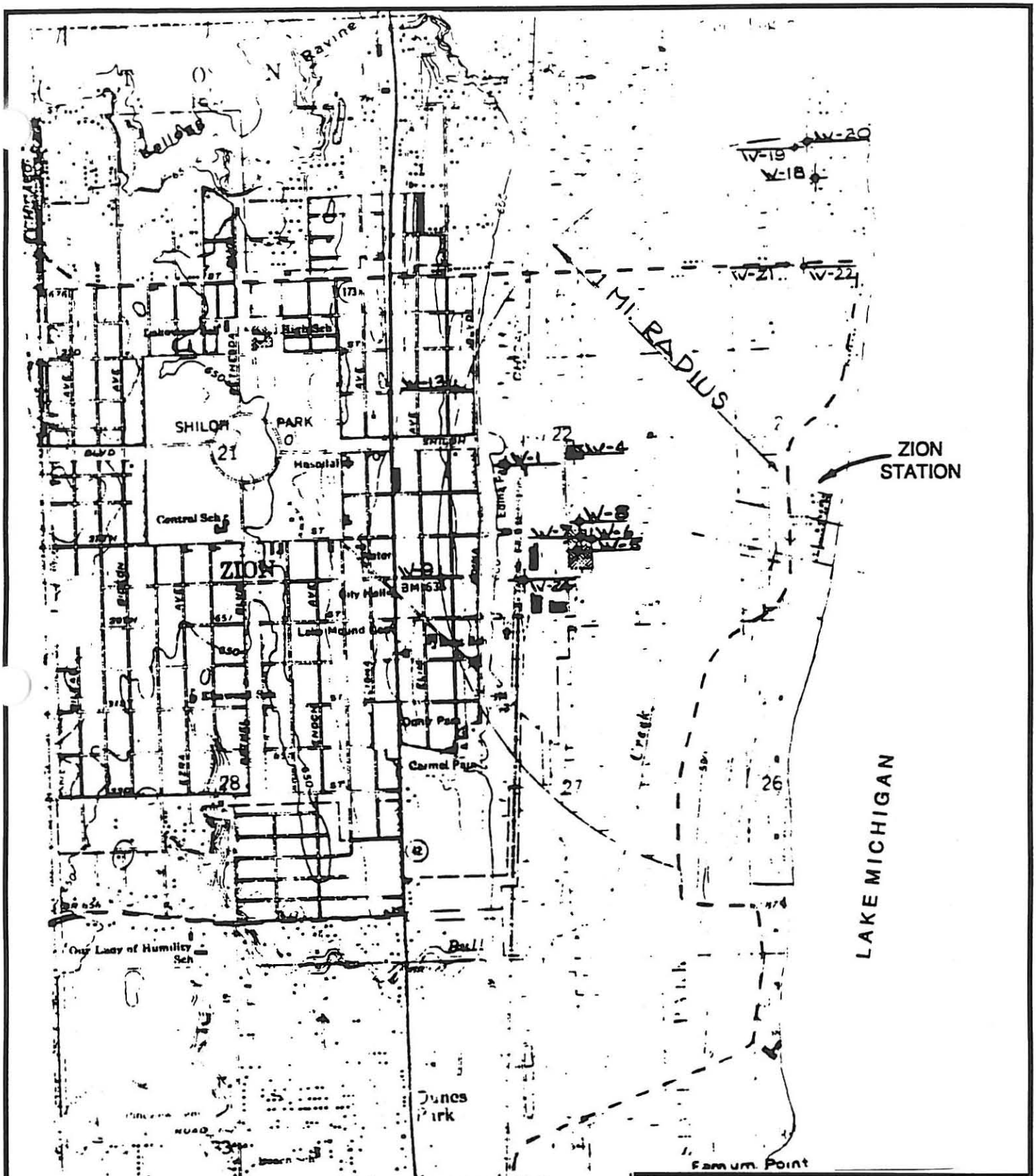
LOCATION MAP – ZION NUCLEAR POWER STATION AND BULL CREEK DRAINAGE AREA AND STRUCTURES



ZION STATION DSAR
B-32 Rev. G 7/13/72

Figure 2-16

INTAKE STRUCTURE
SECTIONS & DETAILS

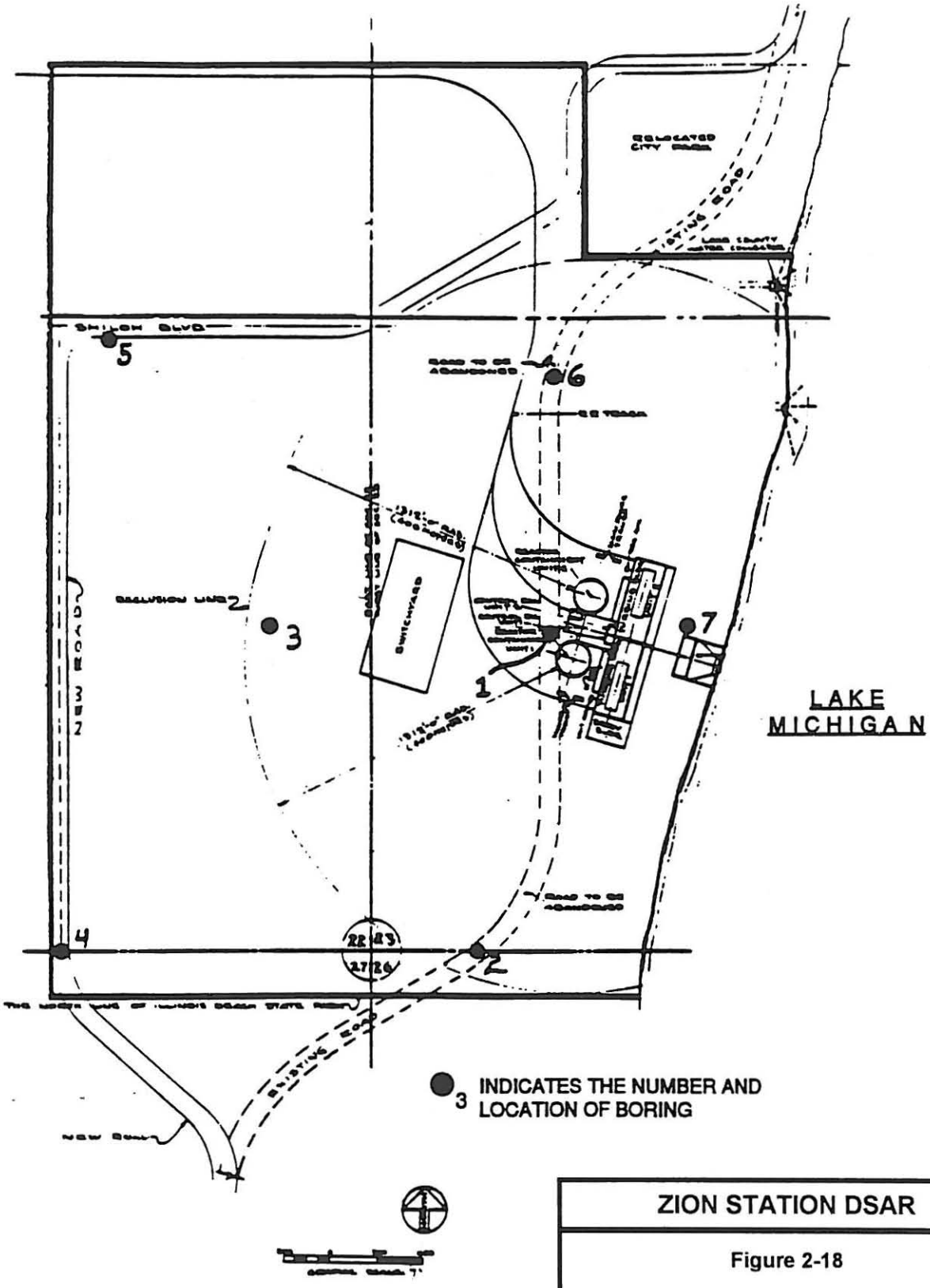


ZION STATION DSAR

Figure 2-17

WATER WELLS IN ZION NUCLEAR POWER PLANT AREA

October 2016

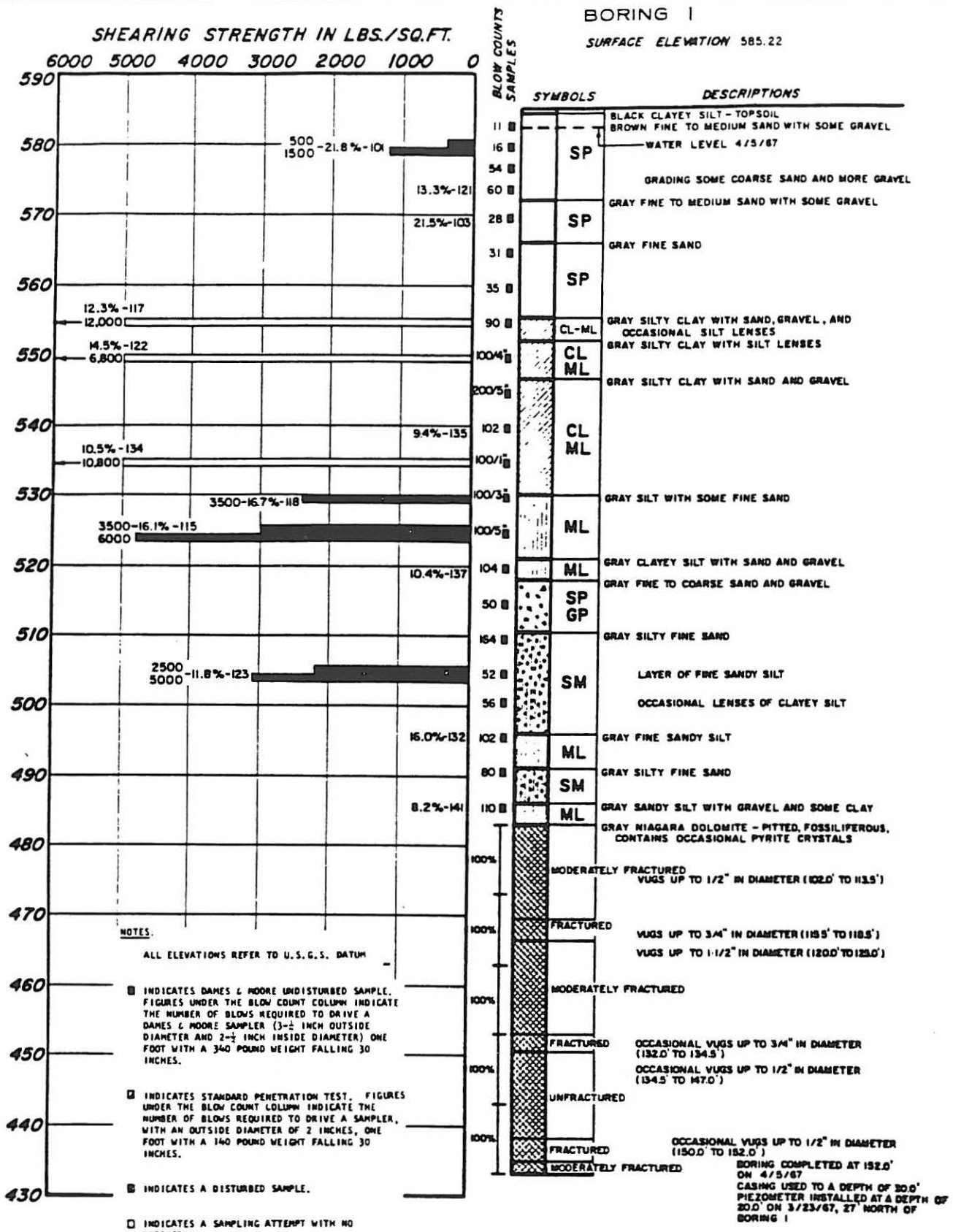


ZION STATION DSAR

Figure 2-18

BORING LOCATION MAP

October 2016



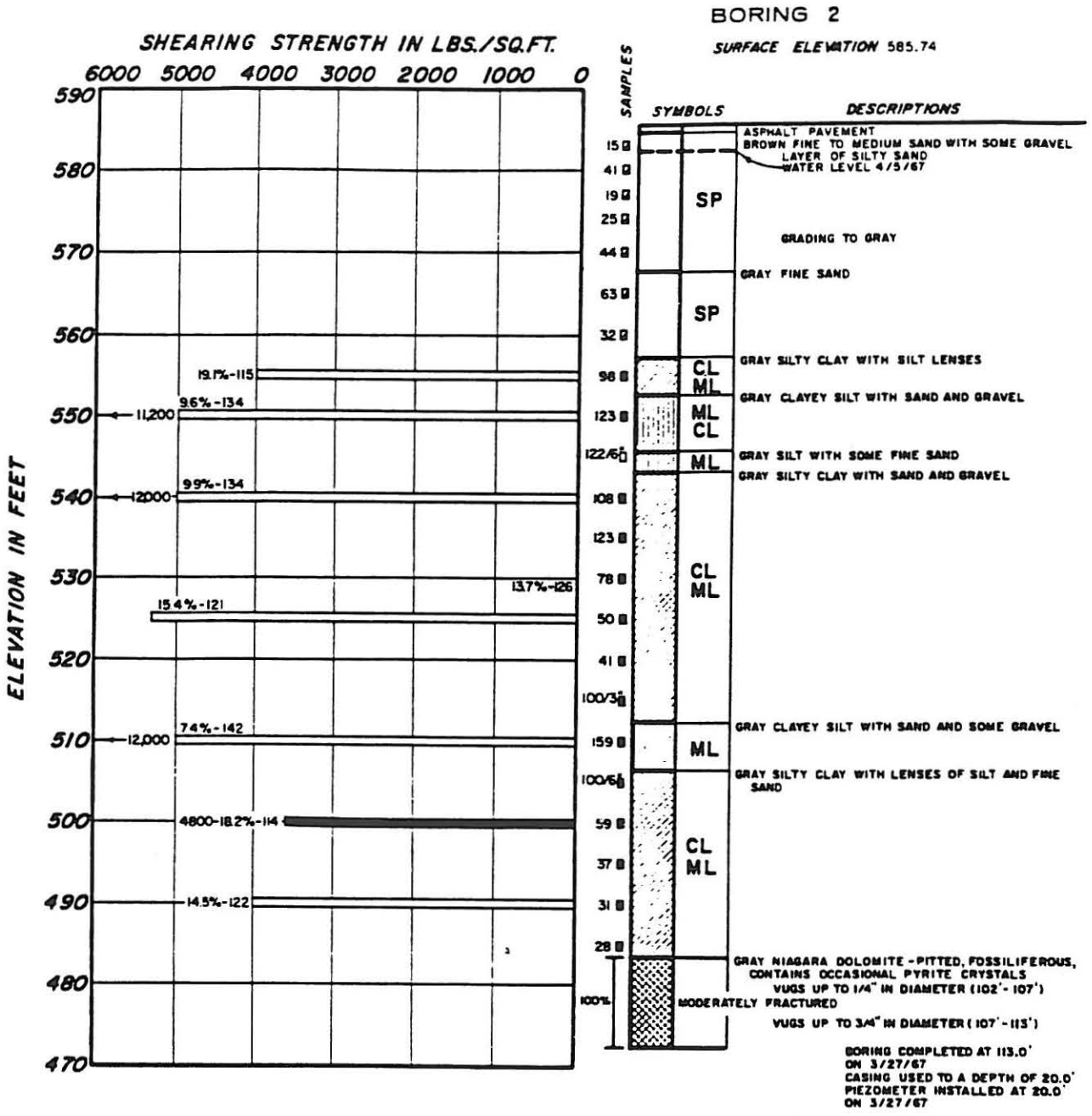
DAMES & MOORE

ZION STATION DSAR

Figure 2-19

LOG OF BORINGS, (BORING 1)

October 2016



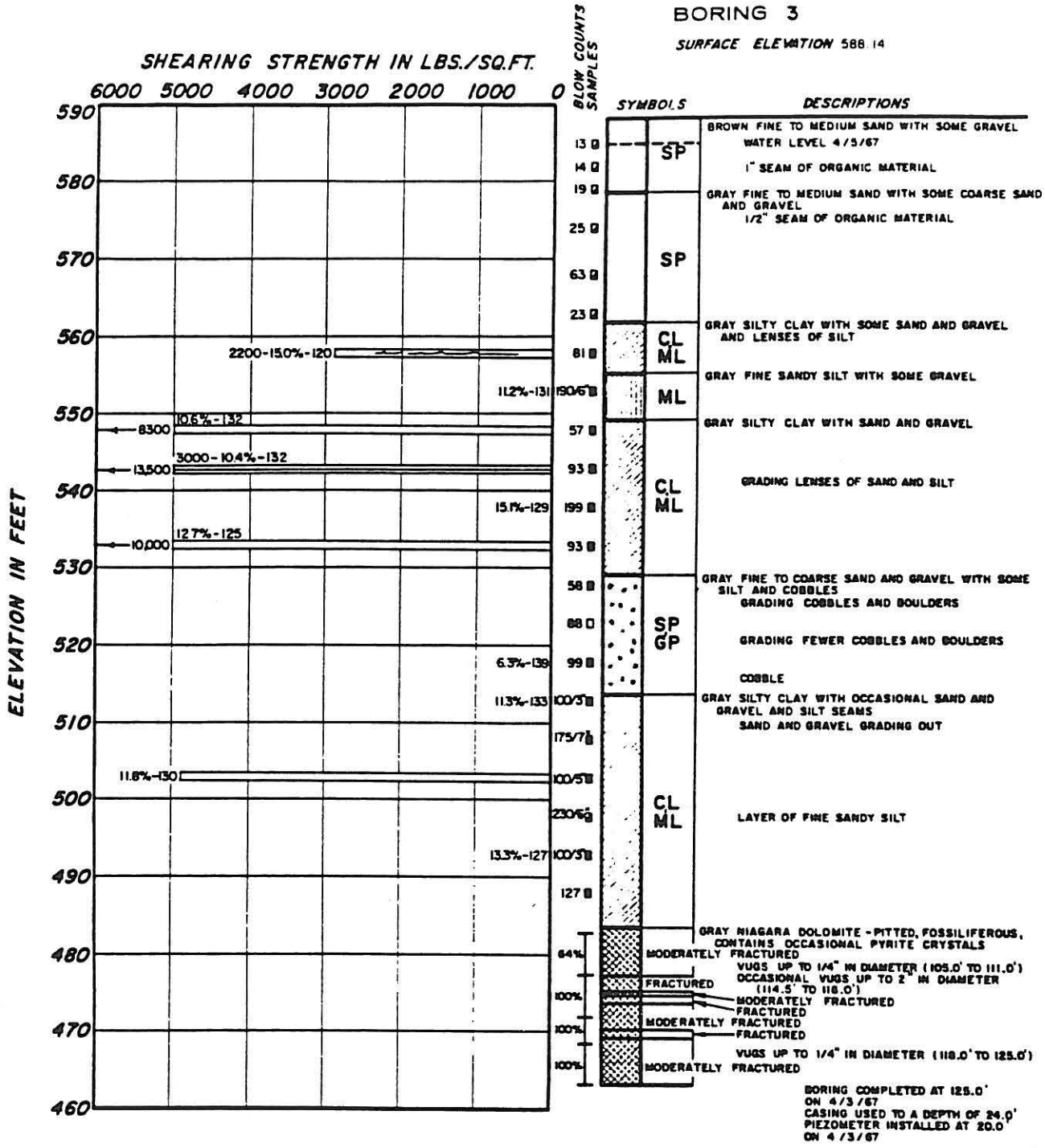
ZION STATION DSAR

Figure 2-20

LOG OF BORINGS, (BORING 2)

October 2016

DAMES & MOORE



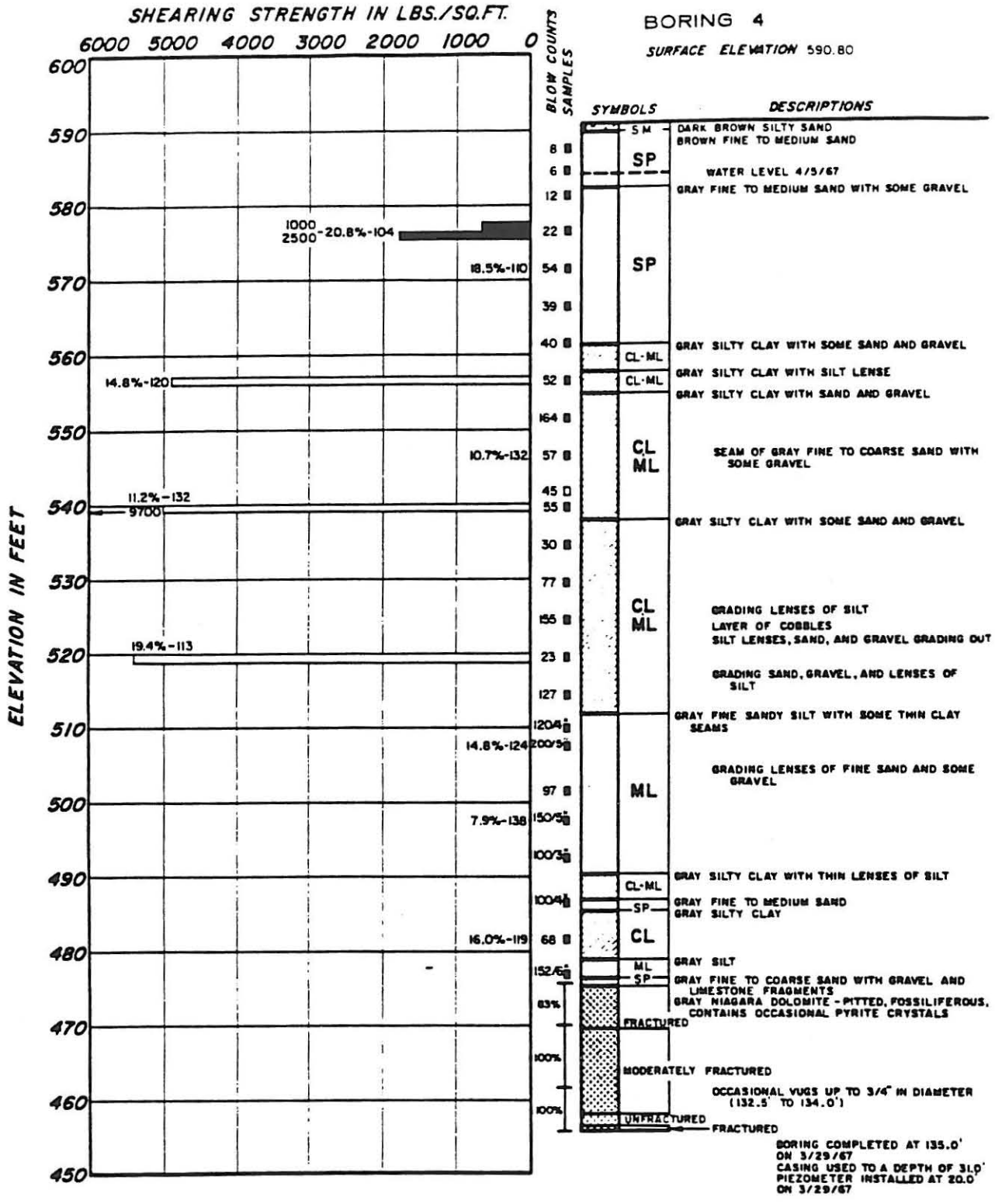
ZION STATION DSAR

Figure 2-21

LOG OF BORINGS, (BORING 3)

October 2016

DAMES & MOORE



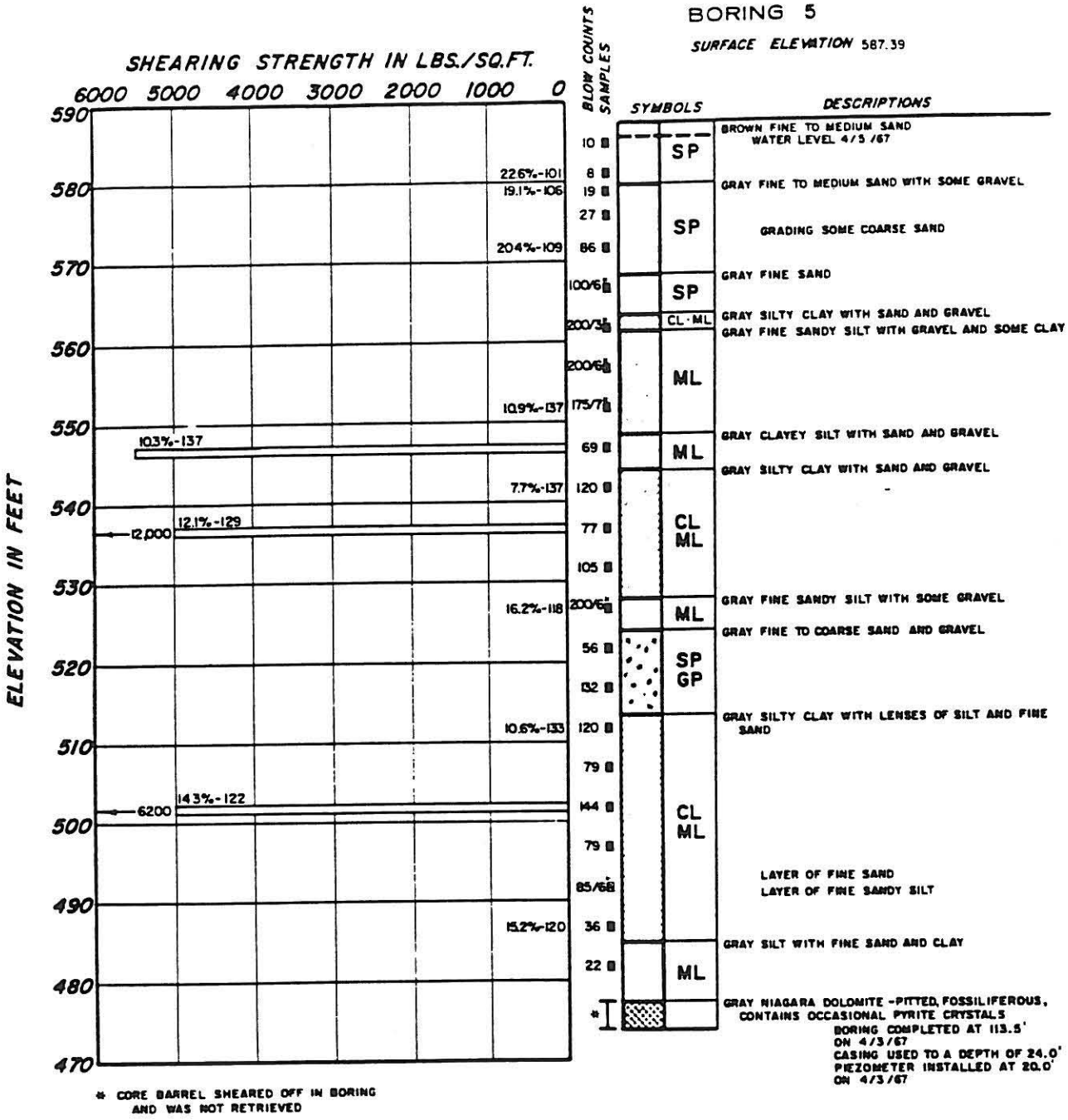
ZION STATION DSAR

Figure 2-22

LOG OF BORINGS, (BORING 4)

DAMES & MOORE

October 2016



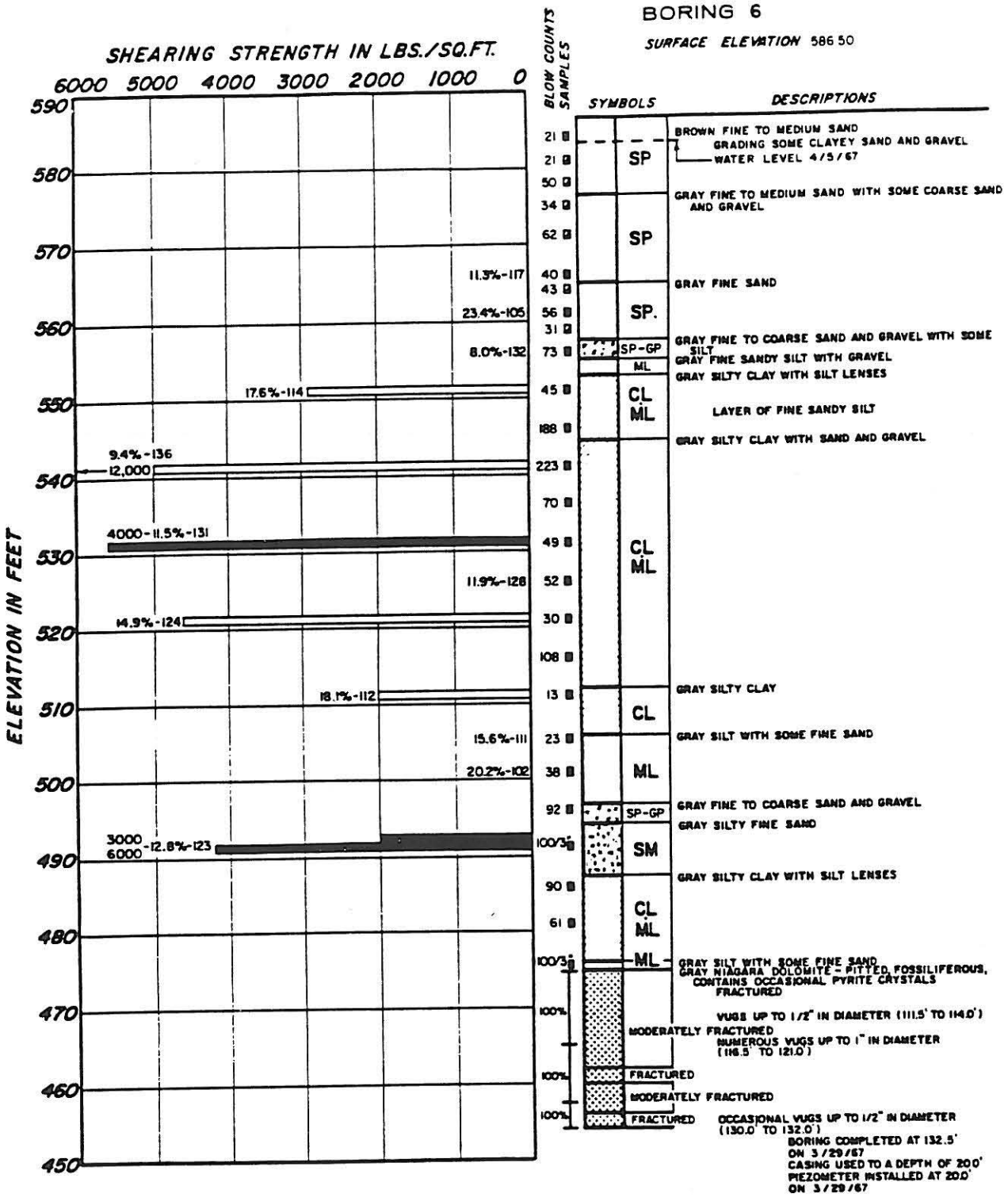
ZION STATION DSAR

Figure 2-23

LOG OF BORINGS, (BORING 5)

October 2016

DAMES & MOORE



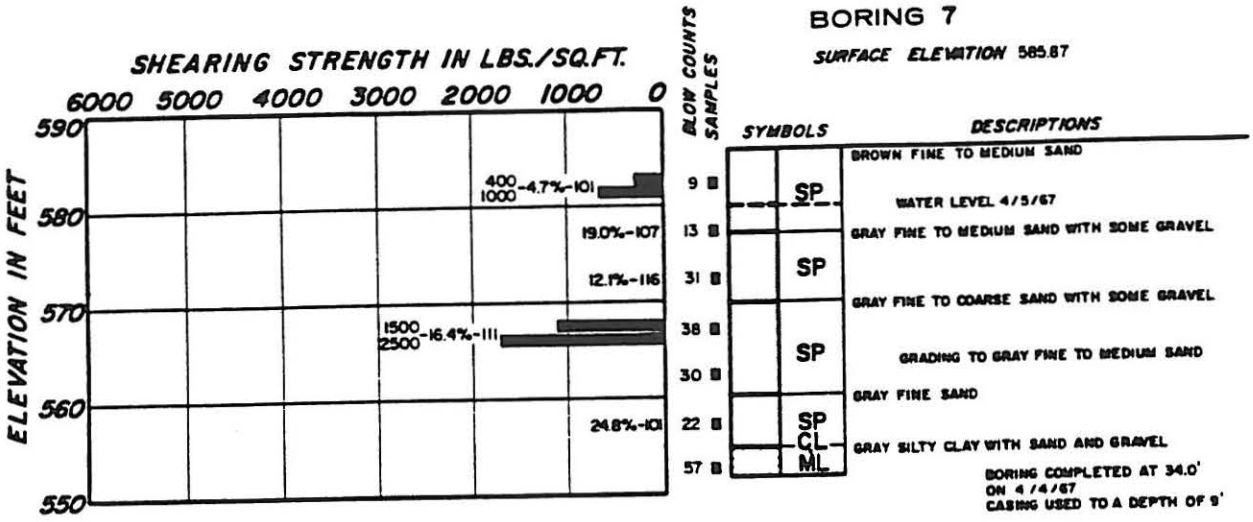
ZION STATION DSAR

Figure 2-24

LOG OF BORINGS, (BORING 6)

DAMES & MOORE

October 2016



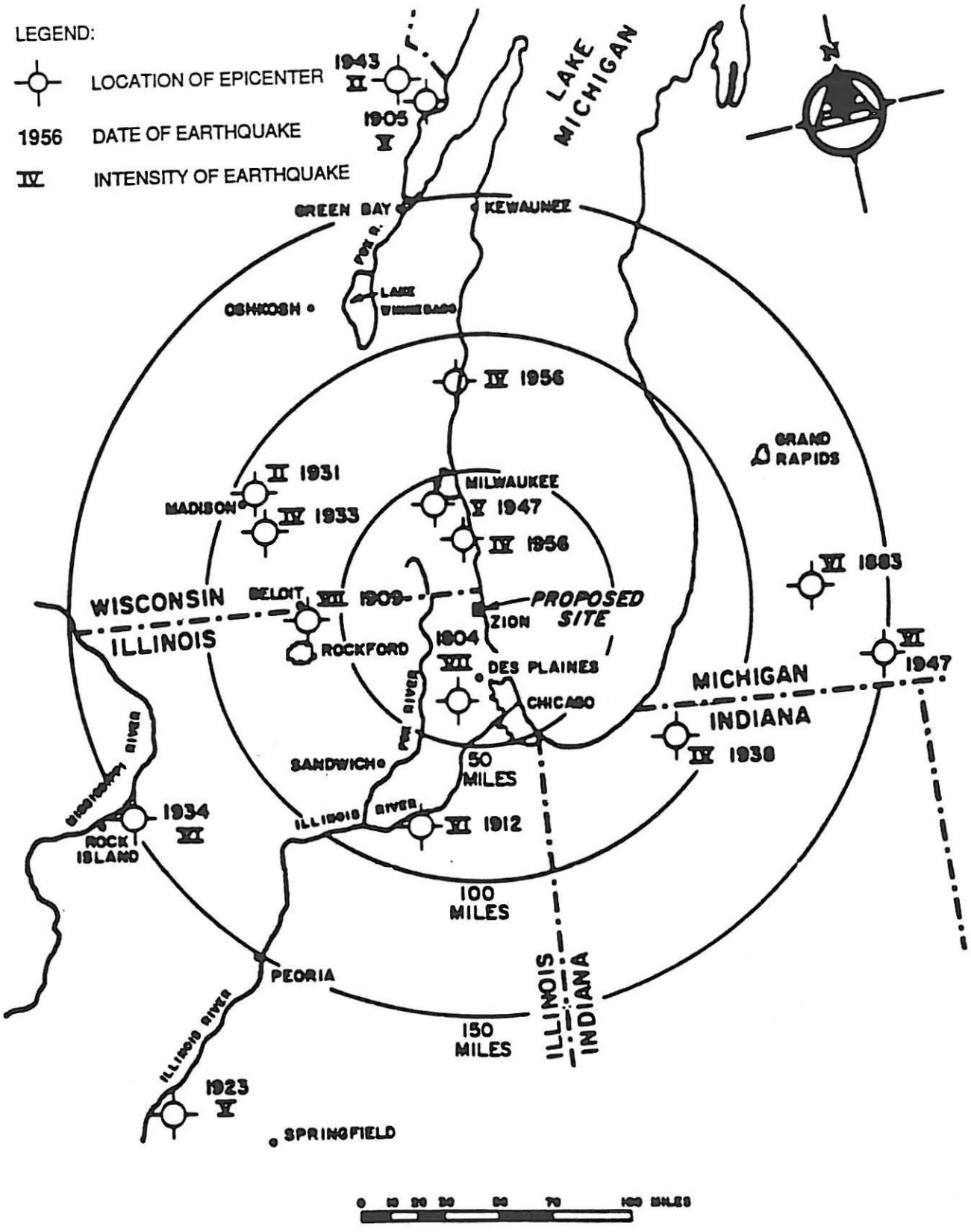
ZION STATION DSAR

Figure 2-25

LOG OF BORINGS, (BORING 7)

DAMES & MOORE

October 2016



REFERENCE:
VARIOUS RECORDS OF THE U.S.
COAST & GEODETIC SURVEY.

ZION STATION DSAR

Figure 2-26

REGIONAL EARTHQUAKE EVENTS

October 2016

APPENDIX 2A: FIVE-YEAR STABILITY DATA (WINDIF) FOR CHICAGO AND MILWAUKEE

NOTE: This document was retyped for clarity in the 1992 UFSAR Update.

**** ANNUAL AVERAGE **** * 5 YR DATA * CHICAGO, ILL. (O HARE FLD) 9/53-8/58

** HOURLY STABILITY INDEX DISTRIBUTION ** TOTAL NO OF OBS = 43821

HOUR INDEX	* IN PERCENT OF TOTAL OBS *							* IN PERCENT OF HOURLY OBS *						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
0	0.00	0.00	0.00	1.91	0.96	0.80	0.50	0.00	0.00	0.00	45.89	22.95	19.11	12.05
1	0.00	0.00	0.00	1.98	0.91	0.77	0.51	0.00	0.00	0.00	47.43	21.91	18.46	12.21
2	0.00	0.00	0.00	1.92	0.90	0.87	0.47	0.00	0.00	0.00	46.17	21.69	20.92	11.23
3	0.00	0.00	0.00	1.97	0.88	0.86	0.45	0.00	0.00	0.00	47.21	21.19	20.70	10.90
4	0.00	0.00	0.00	1.99	0.94	0.82	0.42	0.00	0.00	0.00	47.65	22.62	19.72	10.02
5	0.00	0.00	0.30	2.49	0.60	0.54	0.23	0.00	0.00	7.12	59.86	14.40	13.03	5.59
6	0.00	0.09	0.53	2.83	0.36	0.27	0.08	0.00	2.19	12.81	67.91	8.71	6.57	1.81
7	0.00	0.19	0.78	2.90	0.16	0.10	0.02	0.00	4.60	18.74	69.75	3.89	2.47	0.55
8	0.03	0.35	0.83	2.95	0.00	0.00	0.00	0.77	8.49	19.95	70.79	0.00	0.00	0.00
9	0.04	0.47	0.81	2.84	0.00	0.00	0.00	0.99	11.34	19.55	68.13	0.00	0.00	0.00
10	0.07	0.52	0.78	2.80	0.00	0.00	0.00	1.70	12.38	18.67	67.25	0.00	0.00	0.00
11	0.12	0.54	0.90	2.60	0.00	0.00	0.00	2.96	13.03	21.58	62.43	0.00	0.00	0.00
12	0.12	0.47	0.95	2.62	0.00	0.00	0.00	2.90	11.39	22.89	62.81	0.00	0.00	0.00
13	0.08	0.47	0.86	2.75	0.00	0.00	0.00	1.97	11.23	20.70	66.10	0.00	0.00	0.00
14	0.03	0.31	0.78	3.06	0.00	0.00	0.00	0.60	7.34	18.62	73.44	0.00	0.00	0.00
15	0.01	0.29	0.66	3.21	0.00	0.00	0.00	0.16	6.85	15.94	77.05	0.00	0.00	0.00
16	0.00	0.12	0.70	3.34	0.00	0.00	0.00	0.11	2.85	16.87	80.18	0.00	0.00	0.00
17	0.00	0.04	0.55	3.21	0.21	0.11	0.04	0.00	0.99	13.32	76.99	5.15	2.68	0.88
18	0.00	0.00	0.13	3.14	0.51	0.29	0.10	0.00	0.00	3.01	75.41	12.21	6.90	2.46
19	0.00	0.00	0.08	2.56	0.75	0.56	0.21	0.00	0.00	2.03	61.56	18.07	13.36	4.98
20	0.00	0.00	0.00	1.99	0.97	0.86	0.35	0.00	0.00	0.00	47.65	23.27	20.70	8.38
21	0.00	0.00	0.00	2.03	0.90	0.81	0.43	0.00	0.00	0.00	48.74	21.63	19.39	10.24
22	0.00	0.00	0.00	1.97	0.94	0.81	0.44	0.00	0.00	0.00	47.37	22.67	19.44	10.51
23	0.00	0.00	0.00	1.99	0.92	0.73	0.52	0.00	0.00	0.00	47.86	22.07	17.63	12.43

** DAY-NIGHT STABILITY INDEX DISTRIBUTION (IN PERCENT OF TOTAL OBS.) **

INDEX	1	2	3	4	5	6	7
DAY	0.51	3.86	9.66	36.22	0.00	0.00	0.00
NIGHT	0.00	0.00	0.00	24.84	10.94	9.21	4.76

** AVERAGE WIND SPEED FOR EACH STABILITY INDEX (IN KNOTS) **

INDEX	1	2	3	4(D)	4(N)	5	6	7
SPEED	2.1	4.7	7.1	11.5	10.8	7.3	4.2	1.2

** WIND ROSE FOR EACH STABILITY INDEX (IN PERCENT OF EACH INDEX TOTAL) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	5.41	5.41	3.15	3.60	1.35	1.35	1.80	2.70	1.35	4.95	2.70	3.15	1.80	4.95	2.25	3.60	50.45
2	6.86	11.52	5.02	6.21	2.54	5.67	3.96	5.85	3.84	5.50	3.84	5.67	4.26	7.57	4.08	5.56	12.06
3	7.04	9.95	4.61	5.29	2.86	3.73	4.30	7.21	5.65	6.64	3.64	7.56	5.46	8.65	3.92	4.96	8.53
4(D)	6.73	7.18	2.73	3.52	2.39	4.15	4.60	8.98	8.36	9.33	5.64	9.37	7.72	8.42	4.88	4.79	1.21
4(N)	5.22	5.20	2.01	2.74	2.66	5.70	5.65	9.07	6.84	8.66	5.38	8.88	6.85	9.84	6.17	6.14	2.98
5	4.97	5.49	2.82	3.65	2.42	7.20	6.26	10.50	7.35	9.89	4.78	9.70	6.18	9.79	4.42	4.59	0.00

6	4.58	6.74	2.75	3.86	2.87	5.85	4.73	7.43	3.86	6.09	3.44	7.13	5.65	11.67	6.27	6.32	10.75
7	1.97	3.93	1.49	2.49	1.25	1.63	1.49	3.21	1.82	2.68	1.53	3.31	2.78	6.76	3.55	3.74	56.38

** TOTAL NO OF OBS = 43821 **

** GROSS WIND ROSE (IN PERCENT OF TOTAL OBS) **

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
	5.77	6.73	2.77	3.60	2.50	4.91	4.84	8.43	6.67	8.18	4.81	8.44	6.53	9.11	5.08	5.23	6.40

** STABILITY INDEX DISTRIBUTION FOR EACH WIND DIRECTION (IN PERCENT OF DIRECTION TOTAL) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	0.47	0.41	0.58	0.51	0.27	0.14	0.19	0.16	0.10	0.31	0.28	0.19	0.14	0.28	0.22	0.35	4.00
2	4.59	6.61	6.99	6.66	3.93	4.46	3.16	2.68	2.22	2.59	3.08	2.60	2.42	3.21	3.10	4.10	7.28
3	11.79	14.27	16.04	14.20	11.06	7.34	8.58	8.26	8.17	7.84	7.31	8.65	8.07	9.17	7.46	9.15	12.88
4(D)	42.30	38.63	35.61	35.45	34.64	30.62	34.43	38.60	45.37	41.31	42.52	40.20	42.85	33.46	34.79	33.13	6.85
4(N)	22.48	19.18	18.01	18.90	26.51	28.86	29.01	26.73	25.47	26.30	27.81	26.14	26.07	26.82	30.20	29.16	11.56
5	9.42	8.91	11.10	11.10	10.60	16.03	14.15	13.62	12.03	13.22	10.87	12.57	10.35	11.75	9.53	9.59	0.00
6	7.32	9.22	9.13	9.89	10.60	10.97	9.01	8.13	5.33	6.86	6.60	7.79	7.97	11.80	11.37	11.12	15.48
7	1.62	2.78	2.55	3.30	2.38	1.58	1.46	1.81	1.30	1.56	1.52	1.87	2.03	3.53	3.33	3.40	41.96

** STABILITY INDEX DISTRIBUTION IN PERCENT OF TOTAL OBS. **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.02	0.01	0.03	0.01	0.02	0.26
2	0.26	0.44	0.19	0.24	0.10	0.22	0.15	0.23	0.15	0.21	0.15	0.22	0.16	0.29	0.16	0.21	0.47
3	0.68	0.96	0.44	0.51	0.28	0.36	0.42	0.70	0.55	0.64	0.35	0.73	0.53	0.84	0.38	0.48	0.82
4(D)	2.44	2.60	0.99	1.28	0.86	1.50	1.67	3.25	3.03	3.38	2.04	3.39	2.80	3.05	1.77	1.73	0.44
4(N)	1.30	1.29	0.50	0.68	0.66	1.42	1.40	2.25	1.70	2.15	1.34	2.21	1.70	2.44	1.53	1.53	0.74
5	0.54	0.60	0.31	0.40	0.26	0.79	0.68	1.15	0.80	1.08	0.52	1.06	0.68	1.07	0.48	0.50	0.00
6	0.42	0.62	0.25	0.36	0.26	0.54	0.44	0.68	0.36	0.56	0.32	0.66	0.52	1.07	0.58	0.58	0.99
7	0.09	0.19	0.07	0.12	0.06	0.08	0.07	0.15	0.09	0.13	0.07	0.16	0.13	0.32	0.17	0.18	2.68

** AVERAGE WIND SPEED FOR EACH STABILITY INDEX AND DIRECTION (IN KNOTS) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N
1	4.2	4.3	4.4	4.3	5.0	3.7	4.0	3.3	5.0	4.0	4.3	4.0	4.5	4.2	4.4	3.6
2	6.1	5.8	5.9	5.7	5.4	5.0	5.5	5.3	5.3	5.3	5.3	5.1	5.3	4.7	5.2	5.1
3	8.0	7.6	7.5	7.1	7.8	6.8	7.6	7.9	8.8	8.9	8.6	8.1	8.5	7.4	6.9	6.6
4(D)	10.3	9.1	8.6	8.5	8.8	10.0	11.4	11.7	13.8	13.2	13.7	13.8	13.6	11.1	10.2	9.3
4(N)	9.4	9.1	8.2	7.8	9.4	10.2	11.3	12.0	13.1	12.8	13.2	12.7	12.3	10.5	10.4	9.2
5	6.6	6.3	6.1	6.1	6.8	7.0	7.3	7.4	7.8	7.8	8.0	7.7	7.8	7.5	7.3	6.5
6	4.5	4.5	4.7	4.6	4.8	4.8	4.9	4.9	4.9	4.8	4.9	4.9	4.8	4.8	4.7	4.6
7	2.9	2.8	2.7	2.7	2.8	2.9	2.9	2.9	2.7	2.8	2.8	2.9	2.8	2.8	2.8	2.9

**** ANNUAL AVERAGE **** * 5 YR DATA * MILWAUKEE, WIS. 12/58-11/63 5/16 66 YSK

** HOURLY STABILITY INDEX DISTRIBUTION ** TOTAL NO OF OBS = 43813

HOUR INDEX	* IN PERCENT OF TOTAL OBS *							* IN PERCENT OF HOURLY OBS *						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
0	0.00	0.00	0.00	2.20	0.00	0.73	0.44	0.00	0.00	0.00	52.82	19.18	17.42	10.58
1	0.00	0.00	0.00	2.20	0.83	0.67	0.46	0.00	0.00	0.00	52.91	19.90	16.06	11.13
2	0.00	0.00	0.00	2.25	0.83	0.60	0.46	0.00	0.00	0.00	54.85	19.99	14.51	11.45
3	0.00	0.00	0.00	2.20	0.87	0.63	0.46	0.00	0.00	0.00	52.79	20.97	15.12	11.12
4	0.00	0.00	0.00	2.22	0.82	0.68	0.45	0.00	0.00	0.00	53.23	19.61	16.32	10.04
5	0.00	0.00	0.26	2.73	0.52	0.41	0.25	0.00	0.00	6.35	65.39	12.43	9.86	5.97
6	0.00	0.00	0.52	2.92	0.31	0.22	0.11	0.00	2.03	12.49	70.15	7.56	5.28	2.57
7	0.00	0.12	0.73	3.84	0.16	0.89	0.03	0.22	2.85	17.59	72.88	3.73	2.14	0.82
8	0.01	0.22	0.83	3.11	0.00	0.00	0.00	0.00	5.26	19.84	74.68	0.00	0.00	0.00
9	0.00	0.35	0.81	3.01	0.00	0.00	0.00	0.00	8.49	19.34	72.16	0.00	0.00	0.00
10	0.00	0.32	0.87	2.97	0.00	0.00	0.00	0.71	7.73	20.88	71.48	0.00	0.00	0.00
11	0.03	0.42	1.86	2.65	0.00	0.00	0.00	0.00	10.88	25.52	63.69	0.00	0.00	0.00
12	0.04	0.40	1.86	2.67	0.00	0.00	0.00	0.16	9.53	25.52	64.87	0.00	0.00	0.00
13	0.01	0.36	0.97	2.83	0.00	0.00	0.00	0.00	8.68	23.29	67.95	0.00	0.00	0.00
14	0.00	0.13	0.81	3.23	0.00	0.00	0.00	0.00	3.18	19.44	77.38	0.00	0.00	0.00
15	0.00	0.10	0.66	3.48	0.00	0.00	0.00	0.00	2.52	15.88	81.68	0.00	0.00	0.00
16	0.00	0.06	0.54	3.56	0.00	0.00	0.00	0.00	1.48	12.99	85.53	0.00	0.00	0.00
17	0.00	0.01	0.47	3.33	0.21	0.11	0.03	0.00	0.33	11.17	79.90	5.09	2.68	0.02
18	0.00	0.00	0.07	3.36	0.40	0.26	00.00	0.00	0.00	1.78	80.50	9.53	6.35	1.92
19	0.00	0.00	0.10	2.74	0.69	0.47	0.16	0.00	0.00	2.38	65.77	16.65	11.39	3.89
20	0.00	0.00	0.00	2.18	0.89	0.79	0.30	0.00	0.00	0.00	52.27	21.48	19.81	7.23
21	0.00	0.00	0.00	2.16	0.89	0.76	0.36	0.00	0.00	0.00	51.92	21.25	18.18	8.65
22	0.00	0.00	0.00	2.17	0.88	0.67	0.45	0.00	0.00	0.00	52.88	21.14	15.99	10.79
23	0.00	0.00	0.00	2.20	0.81	0.67	0.48	0.00	0.00	0.00	52.68	19.55	16.16	11.61

** DAY-NIGHT STABILITY INDEX DISTRIBUTION (IN PERCENT OF TOTAL OBS.) **

INDEX	1	2	3	4	5	6	7
DAY	0.08	2.59	9.76	37.84	0.00	0.00	0.00
NIGHT	0.00	0.00	0.00	27.49	9.92	7.77	4.56

** AVERAGE WIND SPEED FOR EACH STABILITY INDEX (IN KNOTS) **

INDEX	1	2	3	4(D)	4(N)	5	6	7
SPEED	3.7	5.7	8.0	11.7	11.2	7.2	4.3	1.6

** WIND ROSE FOR EACH STABILITY INDEX (IN PERCENT OF EACH INDEX TOTAL) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	2.78	11.11	5.56	16.67	22.22	0.00	0.00	0.00	2.78	0.00	5.56	11.11	2.78	0.00	2.78	2.78	13.89
2	6.18	9.62	9.62	10.33	10.59	7.41	3.00	3.44	5.83	4.85	6.53	7.24	6.35	3.18	0.97	1.24	2.82
3	8.39	5.94	4.14	5.75	9.17	8.86	4.79	4.26	7.18	6.94	9.52	7.44	7.81	3.55	2.17	1.45	2.64
4(D)	9.73	4.36	2.77	2.15	4.02	7.31	5.41	5.81	9.58	7.87	8.38	7.38	9.52	6.68	4.37	4.73	0.21
4(N)	8.59	4.37	2.97	2.47	2.95	3.29	5.15	6.63	9.63	7.68	7.81	6.56	10.34	0.61	6.79	5.88	1.05
5	5.48	2.02	0.92	0.74	1.60	2.55	6.95	10.56	14.52	11.30	9.71	9.78	12.15	0.01	2.95	2.69	0.00

6	3.50	1.73	1.02	1.38	1.05	3.23	10.55	10.64	11.31	7.14	8.55	11.81	11.02	4.64	2.32	3.14	5.05
7	2.05	1.55	1.29	1.58	1.75	5.11	8.16	8.76	7.41	6.16	7.21	6.51	4.56	2.45	2.10	2.45	31.00

** TOTAL NO OF OBS = 43813 **

** GROSS WIND ROSE (IN PERCENT OF TOTAL OBS) **

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
	7.93	4.09	2.77	2.58	4.14	5.46	5.91	6.50	9.78	7.85	8.34	7.70	9.65	6.39	4.33	3.99	2.58

** STABILITY INDEX DISTRIBUTION FOR EACH WIND DIRECTION (IN PERCENT OF DIRECTION TOTAL) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	0.03	0.22	0.16	0.53	0.44	0.00	0.00	0.00	0.02	0.00	0.05	0.12	0.02	0.00	0.05	0.86	0.44
2	2.01	6.08	8.97	10.34	6.62	3.51	1.66	1.37	1.54	1.68	2.02	2.43	1.70	1.29	0.58	0.80	2.83
3	10.33	14.17	14.57	21.73	21.63	15.84	7.92	6.39	7.16	8.64	11.13	9.43	7.90	5.43	4.90	3.55	10.01
4(D)	46.40	40.27	37.78	31.45	42.27	50.61	34.65	29.16	37.07	37.95	37.64	36.25	37.35	39.56	38.22	44.90	3.10
4(N)	29.78	29.34	29.47	26.33	19.59	16.55	23.95	28.07	27.06	26.90	25.71	23.41	29.52	37.02	43.12	35.05	11.16
5	6.85	4.91	3.29	2.83	4.83	4.64	11.66	16.13	14.72	14.28	11.54	12.60	12.49	9.32	6.75	6.70	0.00
6	3.42	3.29	3.70	4.15	3.48	4.68	13.87	12.72	8.98	7.07	7.96	11.91	8.87	5.64	4.16	6.13	17.63
7	1.18	1.73	2.06	2.65	1.93	4.26	6.30	6.15	3.45	3.56	3.94	3.85	2.15	1.75	2.21	2.01	54.83

** STABILITY INDEX DISTRIBUTION IN PERCENT OF TOTAL OBS. **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
2	0.16	0.25	0.25	0.27	0.27	0.19	0.18	0.09	0.15	0.13	0.17	0.19	0.16	0.08	0.03	0.03	0.07
3	0.82	0.58	0.40	0.56	0.89	0.87	0.47	0.42	0.70	0.68	0.93	0.73	0.76	0.35	0.21	0.14	0.26
4(D)	3.68	1.65	1.05	0.81	1.75	2.76	2.05	1.89	3.63	2.98	3.14	2.79	3.60	2.53	1.65	1.79	0.08
4(N)	2.36	1.20	0.82	0.68	0.81	0.90	1.42	1.82	2.65	2.11	2.15	1.80	2.85	2.37	1.87	1.48	0.29
5	0.54	0.20	0.09	0.87	0.17	0.25	0.69	1.85	1.44	1.12	0.96	0.97	1.21	0.68	0.29	0.27	0.00
6	0.27	0.13	0.10	0.11	0.14	0.25	0.82	0.83	0.88	0.55	0.66	0.92	0.86	0.36	0.18	0.24	0.45
7	0.09	0.07	0.06	0.07	0.08	0.23	0.37	0.48	0.34	0.28	0.33	0.30	0.21	0.11	0.10	0.11	1.41

** AVERAGE WIND SPEED FOR EACH STABILITY INDEX AND DIRECTION (IN KNOTS) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N
1	5.0	5.0	3.5	4.0	4.4	0.0	0.0	0.0	3.0	0.0	5.0	4.3	3.0	0.0	5.0	4.0
2	6.2	6.2	6.8	6.6	6.7	6.0	4.9	4.7	5.5	5.6	6.0	5.6	5.6	4.3	4.3	4.0
3	9.6	8.4	7.7	7.4	8.5	8.7	6.4	6.8	8.7	8.6	8.5	7.8	8.2	7.0	7.1	7.5
4(D)	12.5	10.6	10.9	10.1	10.0	10.4	10.1	10.7	12.3	12.6	12.3	11.5	12.3	12.3	13.0	13.0
4(N)	12.4	12.2	11.2	10.3	10.6	10.2	9.1	9.9	10.7	11.2	12.0	10.0	11.0	12.1	12.2	12.4
5	7.3	6.3	6.4	5.6	6.0	5.5	6.3	6.8	7.3	7.7	7.5	7.3	7.5	7.8	7.3	7.2
6	4.3	4.4	4.8	3.2	3.6	3.5	4.3	4.5	4.8	4.7	4.6	4.7	4.9	4.6	4.6	4.3
7	2.3	2.4	2.4	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.4	2.2

**** ANNUAL AVERAGE **** * 5 YEAR DATA * MILWAUKEE, WIS. 12/58 - 11/63 5/16/66 YSK

** ONE SECTOR CALCULATION **

** FREQUENCY OF PERSISTENCE (IN PERCENT) ** TOTAL OBS = 43801

HOURS	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	1.33	1.37	0.98	1.05	1.35	1.53	1.82	2.06	2.08	2.32	2.39	2.43	2.04	1.62	1.34	1.26	0.78
2	1.07	0.86	0.65	0.63	0.81	1.07	1.25	1.41	1.71	1.59	1.64	1.58	1.56	1.24	0.76	0.86	0.50
3	0.84	0.58	0.06	0.32	0.58	0.75	0.84	0.87	1.05	1.26	1.09	1.05	1.13	0.93	0.52	0.51	0.27
4	0.64	0.37	0.18	0.19	0.34	0.46	0.58	0.63	0.93	0.74	0.77	0.69	0.92	0.68	0.39	0.39	0.22
5	0.72	0.31	0.15	0.14	0.21	0.48	0.35	0.46	0.74	0.33	0.63	0.46	0.67	0.51	0.31	0.19	0.13
6	0.44	0.19	0.16	0.04	0.29	0.38	0.30	0.29	0.58	0.52	0.41	0.33	0.58	0.34	0.23	0.18	0.25
7	0.40	0.14	0.05	0.08	0.08	0.21	0.11	0.22	0.29	0.40	0.24	0.27	0.59	0.30	0.24	0.13	0.10
8	0.37	0.09	0.07	0.05	0.11	0.13	0.10	0.16	0.46	0.11	0.33	0.22	0.31	0.20	0.15	0.05	0.07
9	0.29	0.08	0.04	0.02	0.02	0.12	0.10	0.10	0.29	0.23	0.25	0.08	0.39	0.08	0.12	0.12	0.08
10	0.23	0.02	0.05	0.00	0.00	0.07	0.07	0.07	0.30	0.11	0.09	0.09	0.16	0.02	0.00	0.09	0.11
11	0.20	0.03	0.05	0.03	0.05	0.10	0.08	0.05	0.20	0.05	0.05	0.05	0.23	0.18	0.05	0.10	0.05
12	0.19	0.03	0.03	0.00	0.03	0.05	0.03	0.00	0.14	0.00	0.08	0.08	0.25	0.14	0.11	0.03	0.00
13	0.09	0.03	0.00	0.00	0.00	0.03	0.06	0.03	0.21	0.06	0.06	0.06	0.15	0.00	0.00	0.03	0.00
14	0.10	0.00	0.00	0.00	0.03	0.00	0.06	0.03	0.06	0.00	0.06	0.06	0.13	0.00	0.03	0.00	0.03
15	0.10	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.14	0.00	0.00	0.03	0.10	0.00	0.03	0.03	0.00
16	0.07	0.00	0.00	0.00	0.00	0.04	0.00	0.07	0.11	0.04	0.00	0.11	0.07	0.04	0.04	0.00	0.00
17	0.16	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.04	0.04	0.08	0.00	0.04	0.04	0.00	0.00	0.00
18	0.04	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.00	0.08	0.00	0.00	0.00	0.00
19	0.09	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.09	0.00	0.04	0.09	0.09	0.00	0.00	0.00	0.00
20	0.09	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00	0.00
21	0.10	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.05	0.00	0.00	0.00	0.00
24	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00
25	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	7.93	4.09	2.77	2.58	4.14	5.46	5.91	6.49	9.78	7.85	8.34	7.70	9.64	6.39	4.33	3.99	2.59

** OBS PRECEDED OR FOLLOWED BY CALM (IN PERCENT) **

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	TOTAL
PRECE	4.26	4.09	3.02	2.49	3.73	5.86	11.90	12.97	9.59	8.17	10.12	7.82	5.33	4.44	2.66	3.55	563
FOLLO	6.05	3.56	3.91	4.27	5.43	7.47	9.96	8.90	12.28	7.30	9.79	6.94	5.52	3.02	2.31	3.38	562

**** ANNUAL AVERAGE **** * 5 YEAR DATA * CHICAGO, ILL. (O HARE FLD) 9/53 - 8/58

** ONE SECTOR CALCULATION **

** FREQUENCY OF PERSISTENCE (IN PERCENT) ** TOTAL OBS = 43801

HOURS	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	1.39	1.60	1.13	1.17	0.92	1.17	1.28	1.76	1.70	1.80	1.46	1.74	1.53	1.70	1.34	1.45	1.62
2	1.05	1.13	0.56	0.87	0.61	1.00	0.86	1.45	1.18	1.37	1.05	1.21	1.03	1.38	0.86	1.03	1.10
3	0.70	0.87	0.46	0.46	0.28	0.64	0.74	1.12	0.99	0.97	0.63	0.91	0.89	0.09	0.68	0.67	0.87
4	0.58	0.65	0.21	0.38	0.20	0.44	0.48	0.73	0.78	0.90	0.46	0.76	0.68	0.85	0.40	0.50	0.47
5	0.30	0.65	0.14	0.30	0.16	0.37	0.21	0.78	0.56	0.65	0.31	0.72	0.48	0.67	0.31	0.26	0.45
6	0.37	0.33	0.10	0.12	0.10	0.26	0.30	0.47	0.40	0.59	0.26	0.63	0.32	0.66	0.34	0.34	0.36
7	0.24	0.29	0.03	0.11	0.13	0.27	0.27	0.35	0.32	0.32	0.14	0.46	0.35	0.43	0.24	0.19	0.29
8	0.26	0.29	0.02	0.05	0.02	0.29	0.15	0.33	0.24	0.37	0.18	0.46	0.29	0.40	0.16	0.18	0.29
9	0.10	0.18	0.04	0.06	0.02	0.12	0.10	0.31	0.14	0.23	0.08	0.23	0.14	0.25	0.16	0.06	0.14
10	0.05	0.18	0.05	0.05	0.00	0.07	0.11	0.25	0.09	0.18	0.07	0.34	0.21	0.37	0.11	0.02	0.11
11	0.15	0.15	0.05	0.00	0.00	0.10	0.15	0.23	0.03	0.10	0.05	0.10	0.20	0.33	0.05	0.10	0.25
12	0.08	0.08	0.00	0.00	0.00	0.03	0.03	0.16	0.03	0.11	0.08	0.08	0.08	0.14	0.05	0.08	0.11
13	0.09	0.06	0.00	0.03	0.03	0.00	0.03	0.12	0.09	0.09	0.00	0.33	0.03	0.27	0.03	0.06	0.03
14	0.06	0.00	0.00	0.00	0.03	0.00	0.03	0.06	0.10	0.06	0.00	0.06	0.10	0.16	0.00	0.00	0.06
15	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.00	0.03	0.03	0.14	0.03	0.07	0.03
16	0.07	0.04	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.11	0.00	0.15	0.07	0.11	0.07	0.00	0.11
17	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.08	0.12	0.00
18	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.16	0.04	0.08	0.00	0.00	0.08
19	0.04	0.00	0.00	0.00	0.00	0.04	0.00	0.09	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.04	0.00
20	0.05	0.09	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00
TOTAL	5.77	6.73	2.78	3.60	2.50	4.91	4.84	8.42	6.68	8.18	4.81	8.44	6.53	9.10	5.08	5.24	6.39

** OBS PRECEDED OR FOLLOWED BY CALM (IN PERCENT) **

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	TOTAL
PRECE	5.46	6.57	3.09	6.01	4.75	7.44	4.91	10.60	5.14	7.04	3.48	7.28	4.67	10.13	6.09	7.36	1264
FOLLO	6.01	10.12	3.95	6.80	3.40	6.01	4.11	7.75	3.79	5.93	2.69	8.85	4.98	10.83	6.17	8.62	1265

APPENDIX 2B: SIX MONTH STABILITY DATA FOR ZION POWER STATION

NOTE: This document was retyped for clarity in the 1992 UFSAR Update.

**** ANNUAL AVERAGE **** * 7 MO DATA * ZION COMM. ED. CO. 35 FT. LEVEL (01/26/70-06/18/70)

** HOURLY STABILITY INDEX DISTRIBUTION **TOTAL NO OF OBS = 2032

HOUR INDEX	* IN PERCENT OF TOTAL OBS *							* IN PERCENT OF HOURLY OBS *						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
1	0.00	.05	.49	1.72	1.38	.39	.20	0.00	1.16	11.63	40.70	32.56	9.30	4.65
2	0.00	0.00	.39	2.02	1.28	.34	.15	0.00	0.00	9.41	48.24	30.59	8.24	3.53
3	0.00	0.00	.54	1.72	1.23	.59	.15	0.00	0.00	12.79	40.70	29.07	13.95	3.49
4	0.00	0.00	.59	1.77	1.38	.39	0.00	0.00	0.00	14.29	42.86	33.33	9.52	0.00
5	.05	0.00	.54	1.72	1.43	.25	.10	1.20	0.00	13.25	42.17	34.94	6.02	2.41
6	0.00	0.00	.69	1.92	1.03	.39	0.00	0.00	0.00	17.07	47.56	25.61	9.76	0.00
7	0.00	.10	.69	1.97	1.03	.20	.10	0.00	2.41	16.87	48.19	25.30	4.82	2.41
8	0.00	.05	.84	1.92	1.03	.20	.05	0.00	1.20	20.48	46.99	25.30	4.82	1.20
9	0.00	.10	1.18	1.67	.89	.30	0.00	0.00	2.30	20.57	40.48	21.43	7.14	0.00
10	0.00	.15	1.28	1.67	.64	.30	.05	0.00	3.61	31.33	40.96	15.66	7.23	1.20
11	.10	.10	1.13	1.57	.89	.15	0.00	2.50	2.50	28.75	40.00	22.50	3.75	0.00
12	.05	.30	1.03	1.82	.64	.10	0.00	1.25	7.50	26.25	46.25	16.25	2.50	0.00
13	.10	.30	1.43	1.67	.54	0.00	0.00	2.44	7.32	35.37	41.46	13.41	0.00	0.00
14	0.00	.15	1.53	2.02	.39	.15	0.00	0.00	3.49	36.05	47.67	9.30	3.49	0.00
15	.05	.25	1.38	1.87	.39	.10	.05	1.20	6.02	33.73	45.78	9.64	2.41	1.20
16	0.00	.30	1.43	1.87	.59	.05	.05	0.00	6.90	33.32	43.68	13.79	1.15	1.15
17	0.00	.34	.94	2.02	.84	.10	.05	0.00	8.05	21.84	47.13	19.54	2.30	1.15
18	.10	.10	1.38	1.48	.94	.15	.10	2.33	2.33	32.56	34.88	22.09	3.49	2.33
19	0.00	0.00	.74	2.51	.84	.20	0.00	0.00	0.00	17.24	50.82	19.54	4.60	0.00
20	0.00	0.00	.49	1.92	1.48	.39	.05	0.00	0.00	11.36	44.32	34.09	9.09	1.14
21	0.00	0.00	.44	2.02	1.08	.49	.25	0.00	0.00	10.34	47.13	25.29	11.49	5.75
22	0.00	.05	.39	2.07	1.13	.34	.25	0.00	1.16	9.30	48.84	26.74	8.14	5.81
23	.05	.05	.44	1.72	1.38	.54	.10	1.15	1.15	10.34	48.23	32.18	12.64	2.30
24	0.00	0.00	.39	2.21	1.03	.34	.30	0.00	0.00	9.20	51.72	24.14	8.05	6.90

** STABILITY INDEX DISTRIBUTION (IN PERCENT OF TOTAL OBS.) **

INDEX	1	2	3	4	5	6	7
	.49	2.36	20.37	44.88	23.47	6.45	1.97

** AVERAGE WIND SPEED FOR EACH STABILITY INDEX (IN MPH) **

INDEX	1	2	3	4	5	6	7
SPEED	6.9	7.1	8.9	8.3	6.9	4.6	3.1

** WIND ROSE FOR EACH STABILITY INDEX (IN PERCENT OF EACH INDEX TOTAL) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	0.00	0.00	0.00	0.00	0.00	20.00	10.00	30.00	20.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00
2	2.08	0.00	0.00	2.08	2.08	16.67	25.00	20.83	6.25	2.08	2.08	2.08	2.08	0.00	0.00	2.08	14.58
3	0.00	0.00	.24	.48	1.69	3.14	12.56	18.84	5.31	10.14	11.11	18.12	10.87	7.00	.48	0.00	0.00
4	3.40	6.47	2.52	2.96	3.18	2.63	2.52	7.46	8.77	14.36	12.28	8.66	8.00	6.47	6.14	4.17	0.00
5	12.79	4.61	5.03	6.29	2.31	1.26	.42	2.73	6.92	8.39	3.56	2.10	1.47	2.52	4.61	20.55	14.47
6	5.34	1.53	2.29	2.29	0.00	.76	0.00	4.58	13.74	16.03	4.58	5.34	4.58	6.87	6.11	25.95	0.00
7	7.50	0.00	0.00	2.50	0.00	0.00	0.00	2.50	12.50	20.00	7.50	5.00	5.00	10.00	0.00	27.50	0.00

** TOTAL NO OF OBS = 2032 **

** GROSS WIND ROSE (IN PERCENT OF TOTAL OBS) **

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
	5.07	4.08	2.51	3.15	2.36	2.66	4.43	8.81	8.02	11.96	9.10	8.56	6.59	5.66	4.33	8.96	3.74
SPEED	10.5	9.9	6.9	7.1	8.5	7.2	5.8	6.8	7.9	8.2	7.5	8.4	7.1	6.0	6.5	11.9	0.0

** STABILITY INDEX DISTRIBUTION FOR EACH WIND DIRECTION (IN PERCENT OF DIRECTION TOTAL) **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	0.00	0.00	0.00	0.00	0.00	3.70	1.11	1.68	1.23	0.00	0.00	0.00	0.00	1.74	0.00	0.00	0.00
2	.97	0.00	0.00	1.56	2.08	14.81	13.33	5.59	1.84	.41	.54	.57	.75	0.00	0.00	.55	9.21
3	0.00	0.00	1.96	3.13	14.58	24.07	57.78	43.58	13.50	17.28	24.86	43.10	33.58	25.22	2.27	0.00	0.00
4	30.10	71.08	45.10	42.19	60.42	44.44	25.56	37.99	49.08	53.91	60.54	45.40	54.48	51.30	63.64	20.88	0.00
5	59.22	26.51	47.06	46.88	22.92	11.11	2.22	7.26	20.25	16.46	9.19	5.75	5.22	10.43	25.00	53.85	90.79
6	6.80	2.41	5.88	4.69	0.00	1.85	0.00	3.35	11.04	8.64	3.24	4.02	4.48	7.83	9.09	18.68	0.00
7	2.91	0.00	0.00	1.56	0.00	0.00	0.00	.56	3.07	3.29	1.62	1.15	1.49	3.48	0.00	6.04	0.00

** STABILITY INDEX DISTRIBUTION IN PERCENT OF TOTAL OBS. **

INDEX	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	CALM
1	0.00	0.00	0.00	0.00	0.00	.10	.05	.15	.10	0.00	0.00	0.00	0.00	.10	0.00	0.00	0.00
2	.05	0.00	0.00	.05	.05	.39	.59	.49	.15	.05	.05	.05	.05	0.00	0.00	.05	.34
3	0.00	0.00	.05	.10	.34	.64	2.56	3.84	1.08	2.07	2.26	3.69	2.21	1.43	.10	0.00	0.00
4	1.53	2.90	1.13	1.33	1.43	1.18	1.13	3.35	3.94	6.45	5.51	3.89	3.59	2.90	2.76	1.87	0.00
5	3.00	1.08	1.18	1.48	.54	.30	.10	.64	1.62	1.97	.84	.49	.34	.59	1.08	4.82	3.40
6	.34	.10	.15	.15	0.00	.05	0.00	.30	.89	1.03	.30	.34	.30	.44	.39	1.67	0.00
7	.15	0.00	0.00	.05	0.00	0.00	0.00	.05	.25	.39	.15	.10	.10	.20	0.00	.54	0.00
(AVERAGE INVERSE SPEED)																	
1	0.00	0.00	0.00	0.00	0.00	.22	.17	.12	.22	0.00	0.00	0.00	0.00	.23	0.00	0.00	
2	.08	0.00	0.00	.50	.25	.13	.15	.12	.26	.03	.08	.25	.20	0.00	0.00	.17	
3	0.00	0.00	.20	.25	.16	.15	.28	.23	.14	.13	.15	.15	.19	.18	.12	0.00	
4	.09	.14	.19	.19	.19	.18	.36	.19	.21	.22	.21	.20	.24	.40	.31	.07	
5	.13	.16	.18	.29	.30	.23	.27	.30	.26	.23	.26	.26	.33	.37	.55	.11	
6	.33	.38	.32	.44	0.00	.33	0.00	.30	.25	.29	.52	.27	.39	.50	.52	.23	
7	1.00	0.00	0.00	.50	0.00	0.00	0.00	.20	.32	.48	.67	.75	.75	.37	0.00	.26	

APPENDIX 2C: SITE AIRBORNE EFFLUENT DIFFUSION
AND RECORD OF METEOROLOGICAL MONITORING
FOR THE PERIOD OF MAY 1, 1971 - APRIL 30, 1972

NOTE: Portions of this document were retyped for clarity in the 1992 UFSAR Update.

ZION STATION RECORD OF DATA RECOVERY

May, 1971 - April, 1972

Parameter	Hours of Valid Record (% of Possible Hours)
Wind speed (35 ft level)	7861 (89)
Wind direction (35 ft level)	7229 (82)
Wind speed & direction (35 ft level)	7229 (82)
Differential temperature	8135 (93)
Precipitation	8157 (93)
Total	38,611 (88)

Computer programs developed and used to generate the data tables contained herein consist of the following:

1. Gross wind rose
2. Stability wind rose
3. Wind direction persistence
4. Wind speed persistence
5. Stability persistence
6. Stability by hour of day
7. Sigma sub theta frequencies
8. Daily weather data summaries
9. Relative concentration factors

FIGURE 1

X/Q Isopleths (sec/m^3) Zion Station - Detailed Location
May 1971 - April 1972

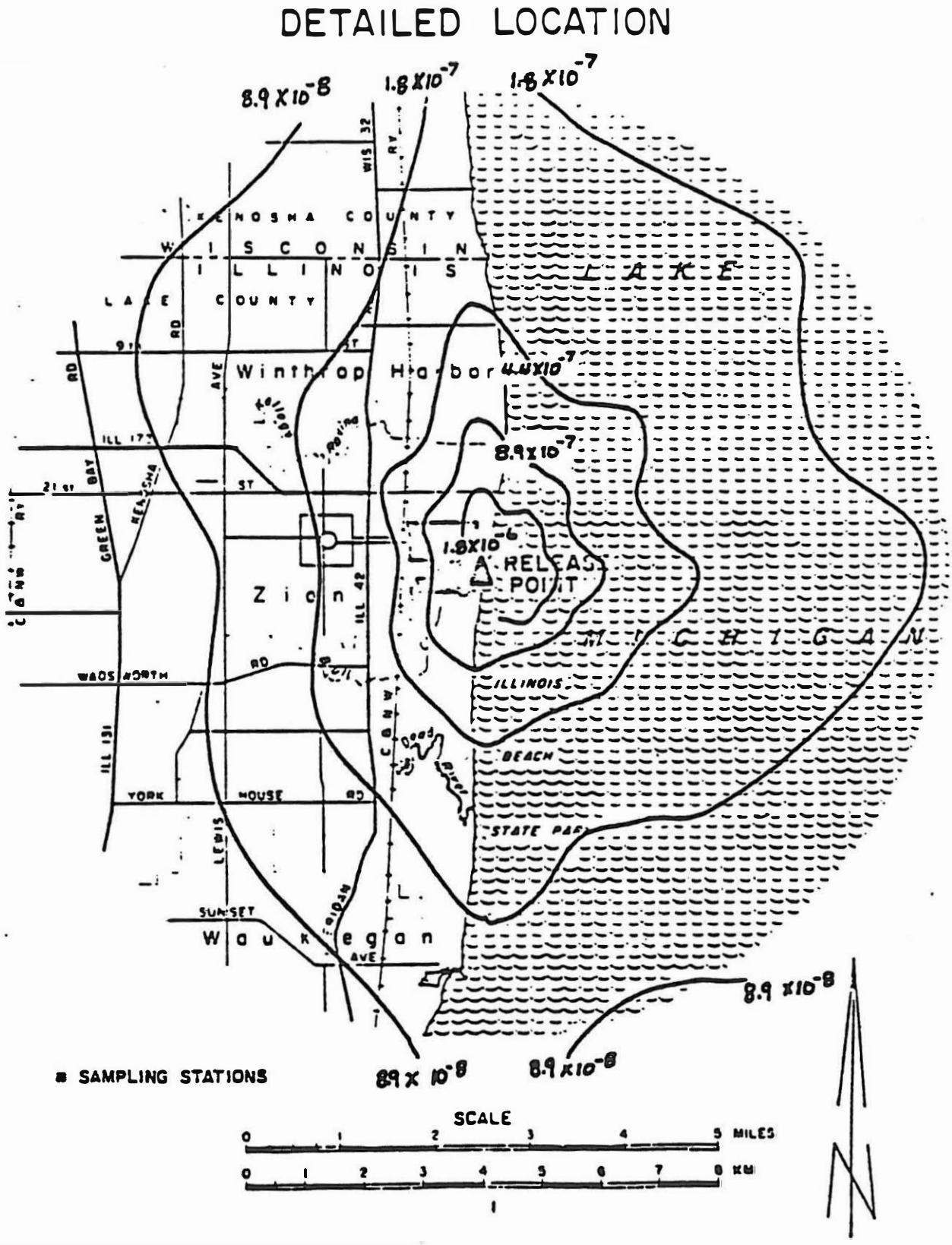


FIGURE 2

X/Q Isopleths (sec/m^3) Zion Station - General Location
May 1971 - April 1972

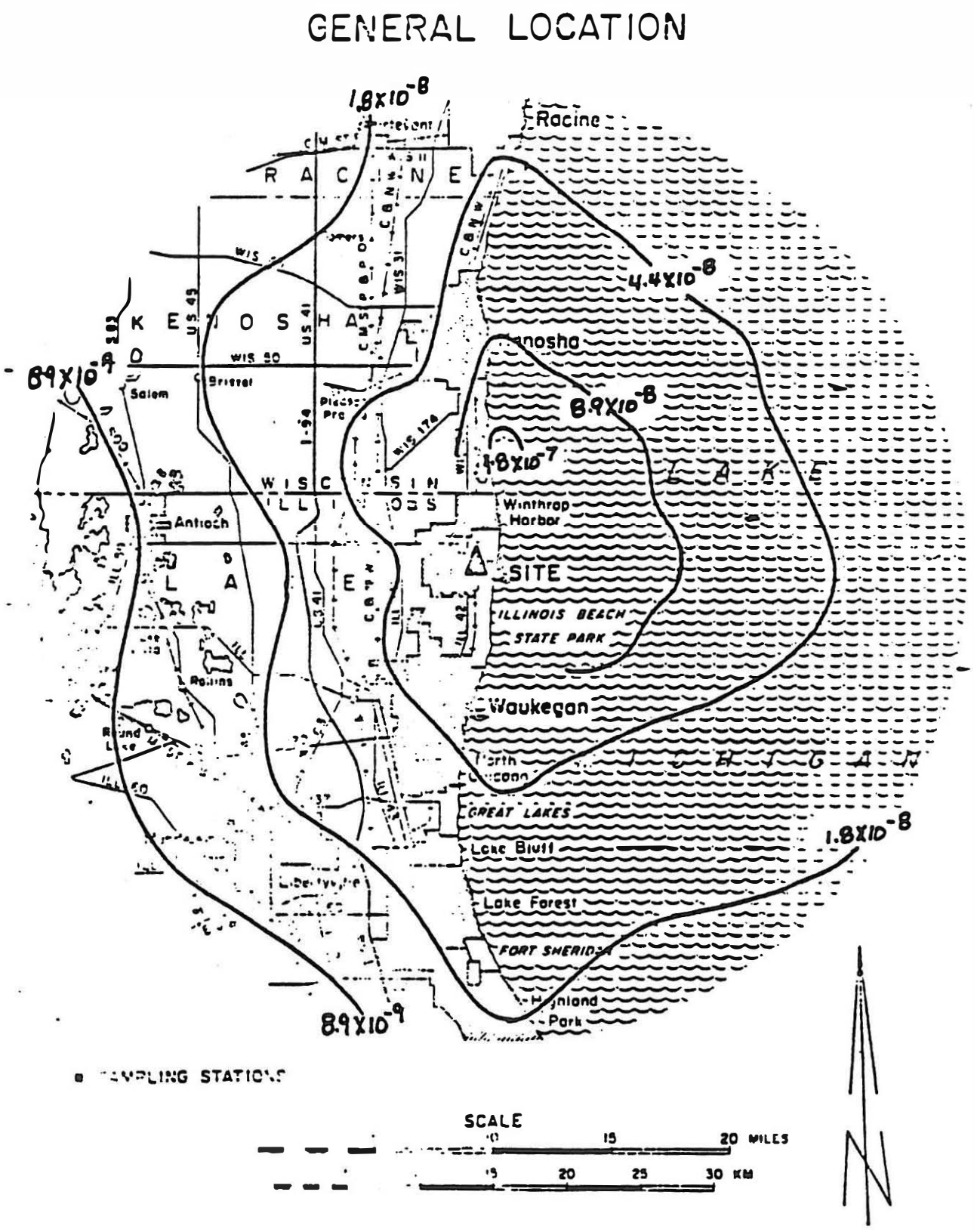


FIGURE 3

X/Q Isopleths (sec/m^3) Zion Station - Detailed Location
October - December 1971

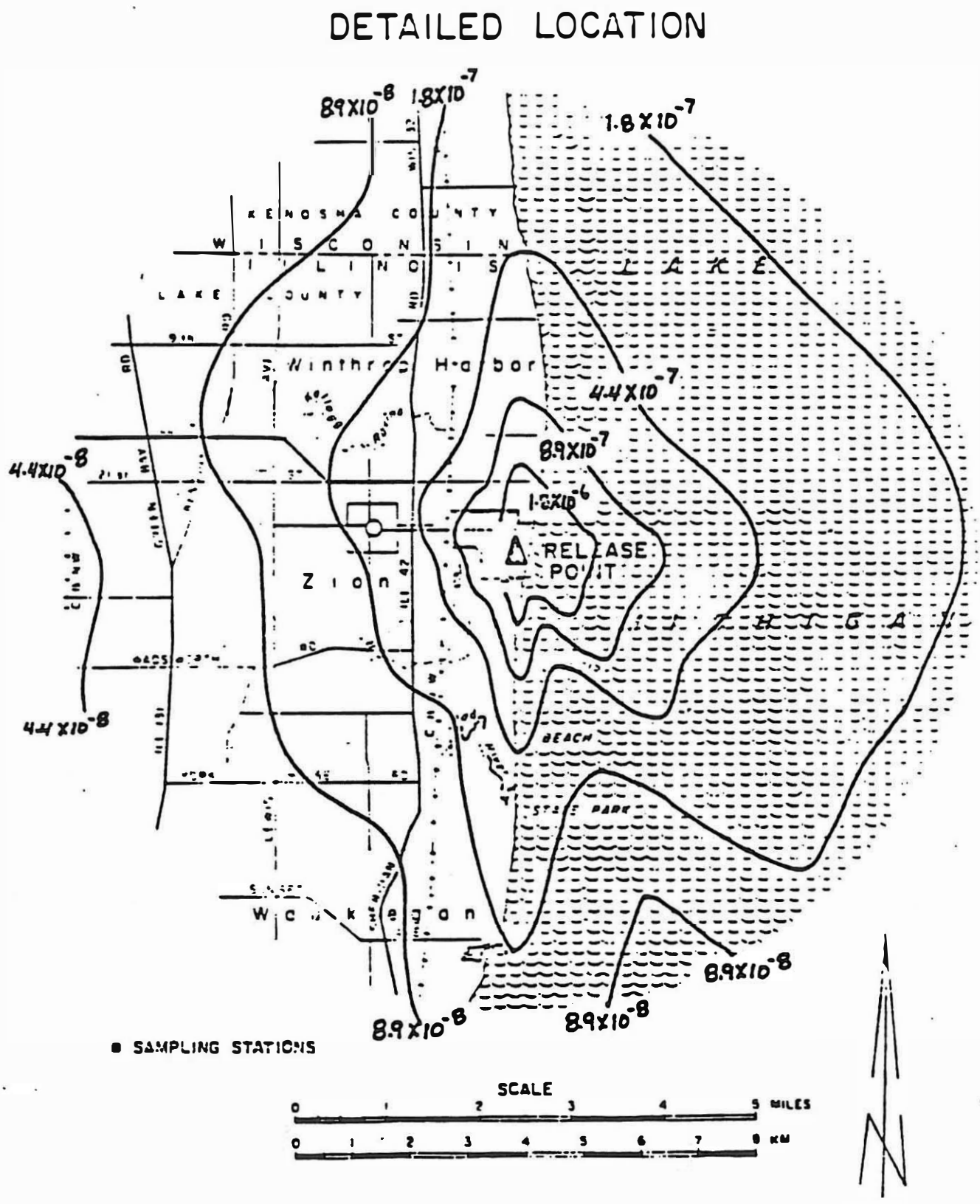


FIGURE 4

X/Q Isopleths (sec/m^3) Zion Station - General Location
October - December 1971

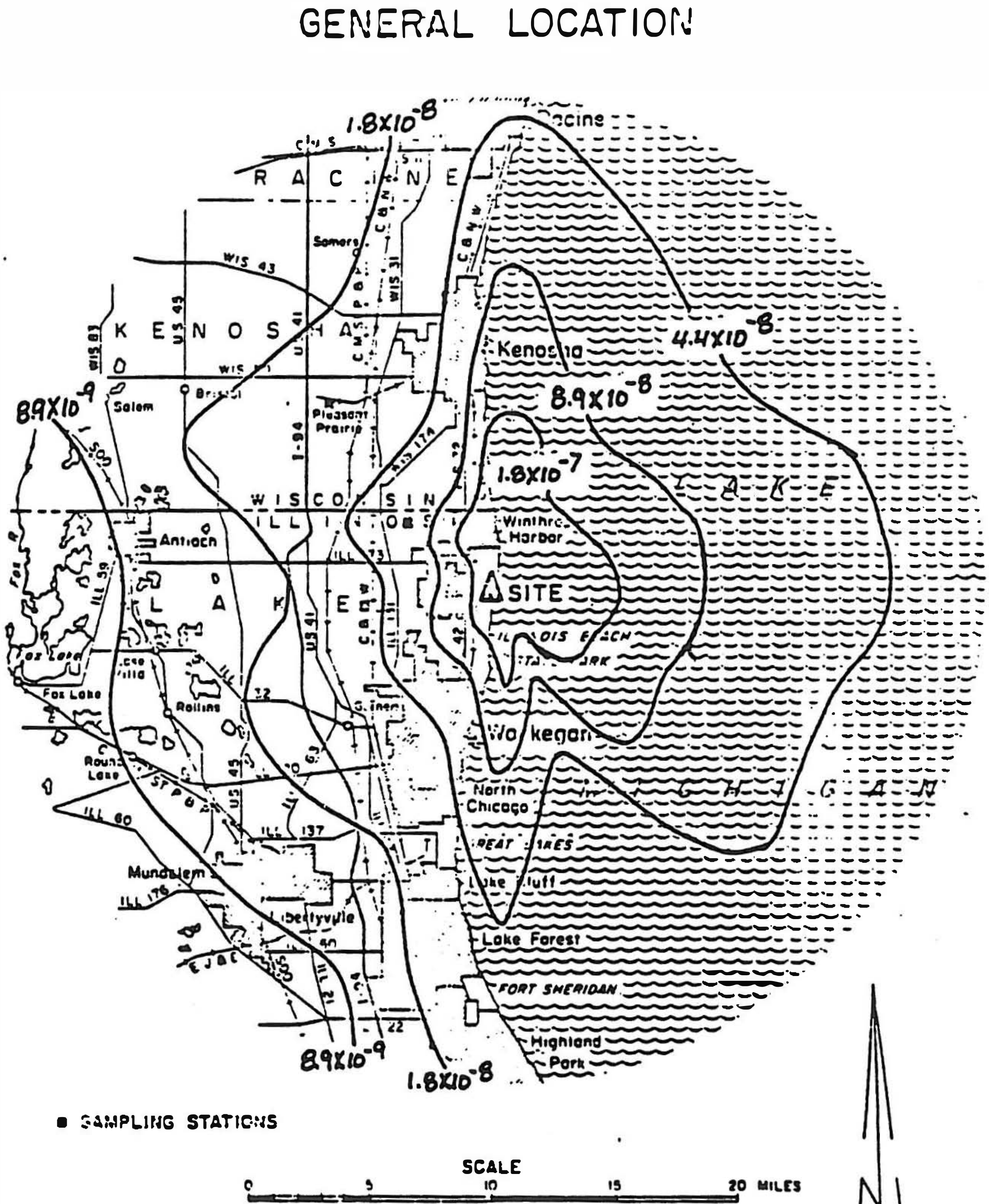


FIGURE 5

X/Q Isopleths (sec/m^3) Zion Station - Detailed Location
July - September 1971

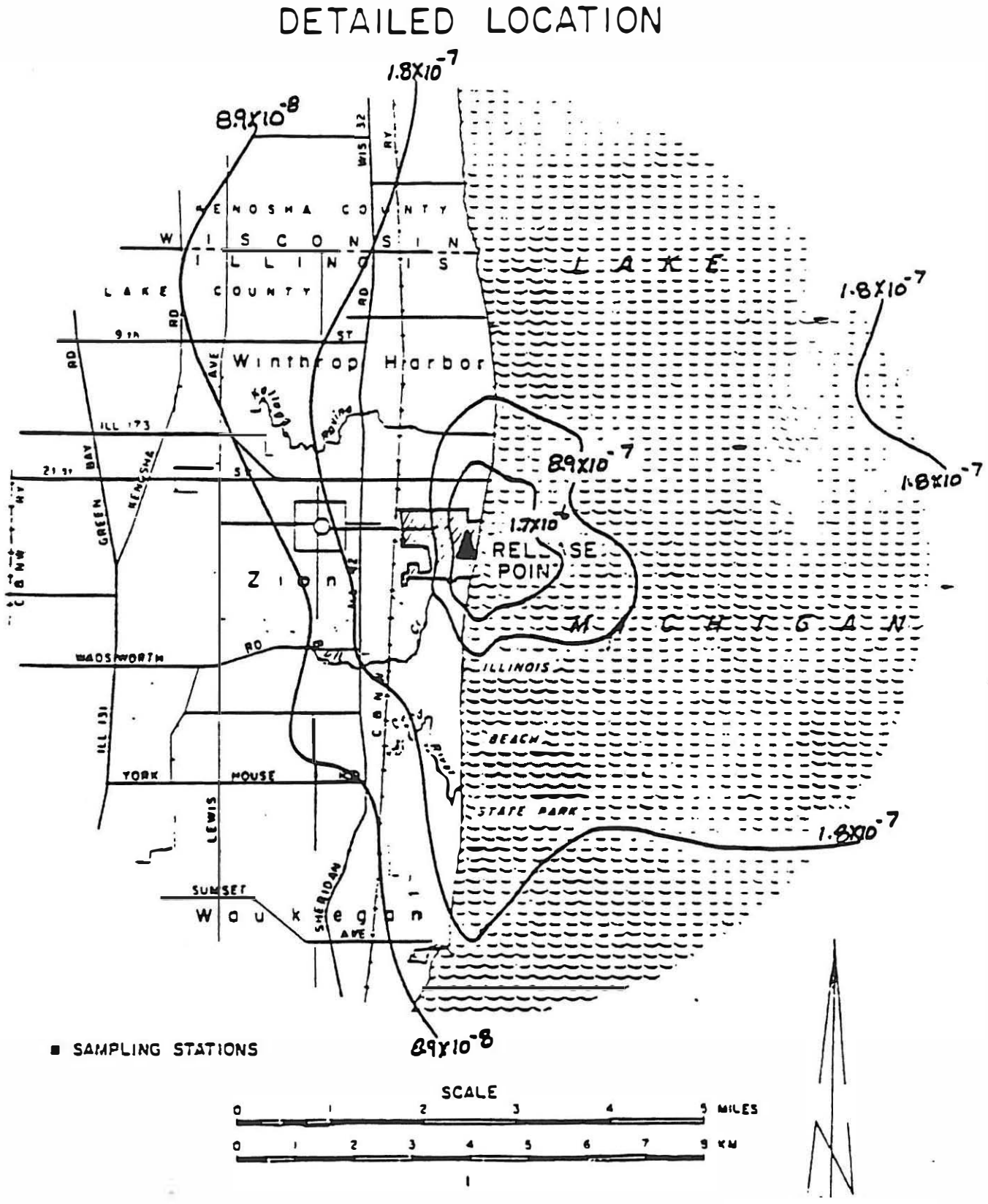


FIGURE 6

X/Q Isopleths (sec/m^3) Zion Station - General Location
July - September 1971

GENERAL LOCATION

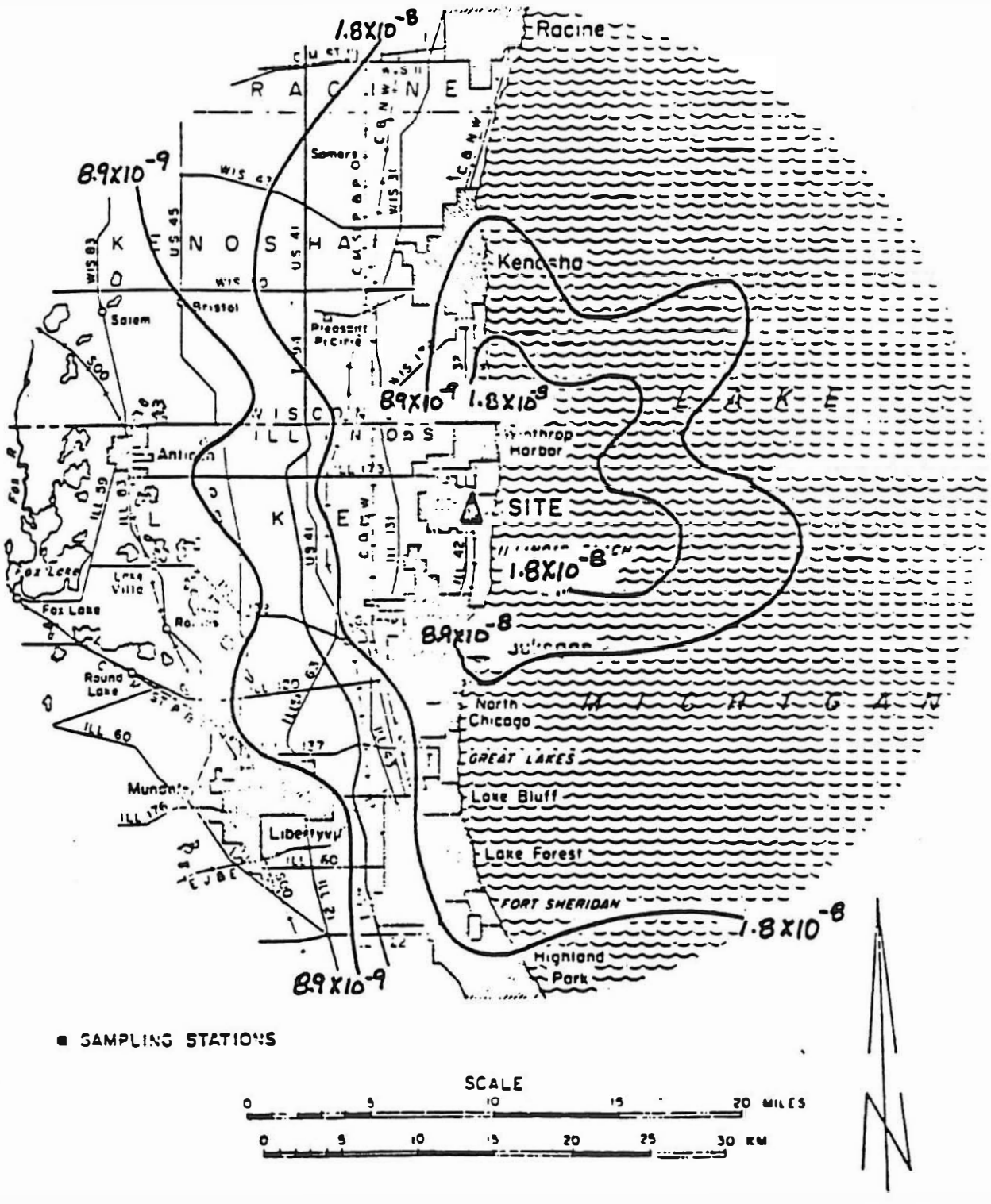


FIGURE 7

X/Q Isopleths (sec/m^3) Zion Station - Detailed Location
May - June 1971

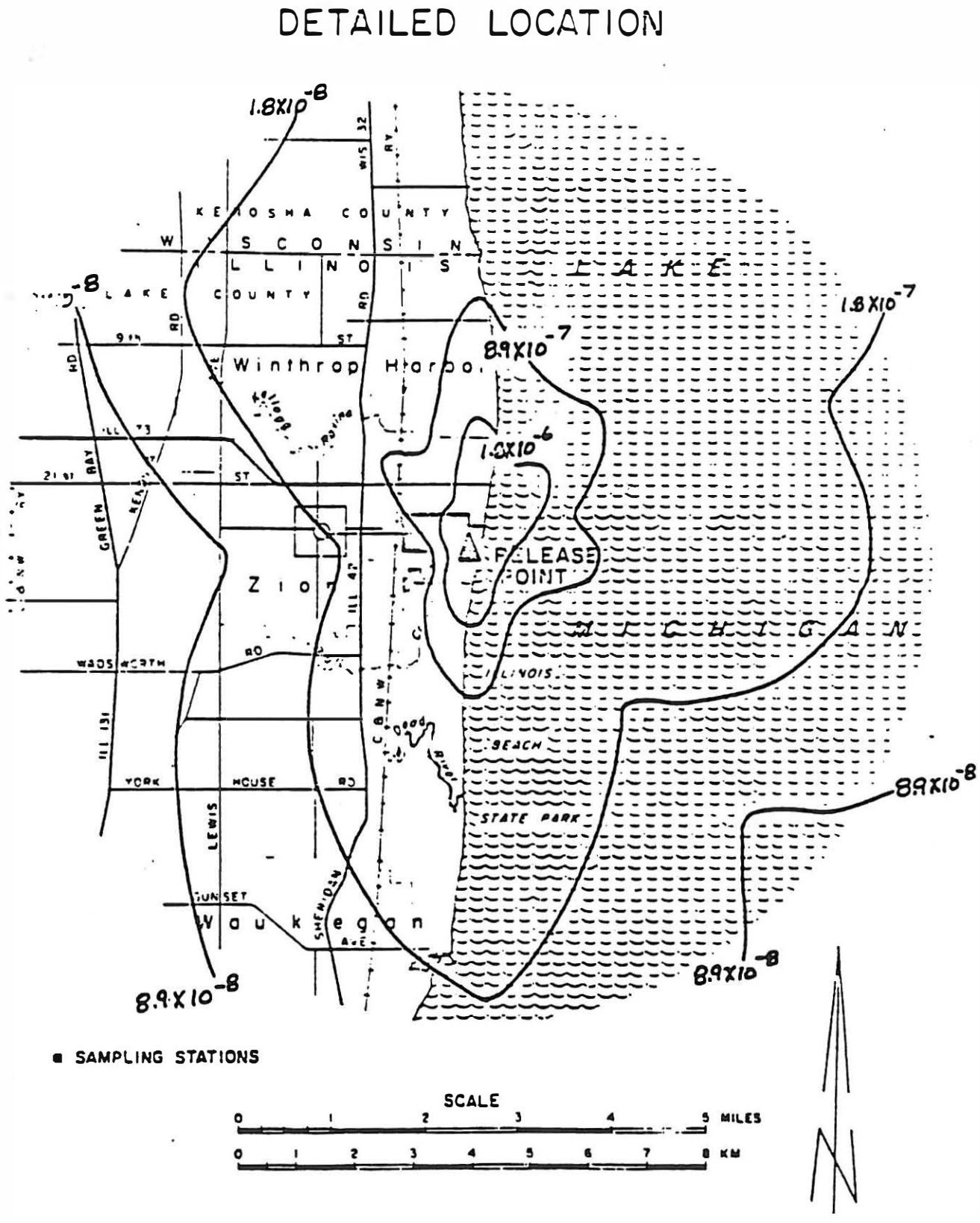


FIGURE 8

X/Q Isopleths (sec/m^3) Zion Station - General Location
May - June 1971

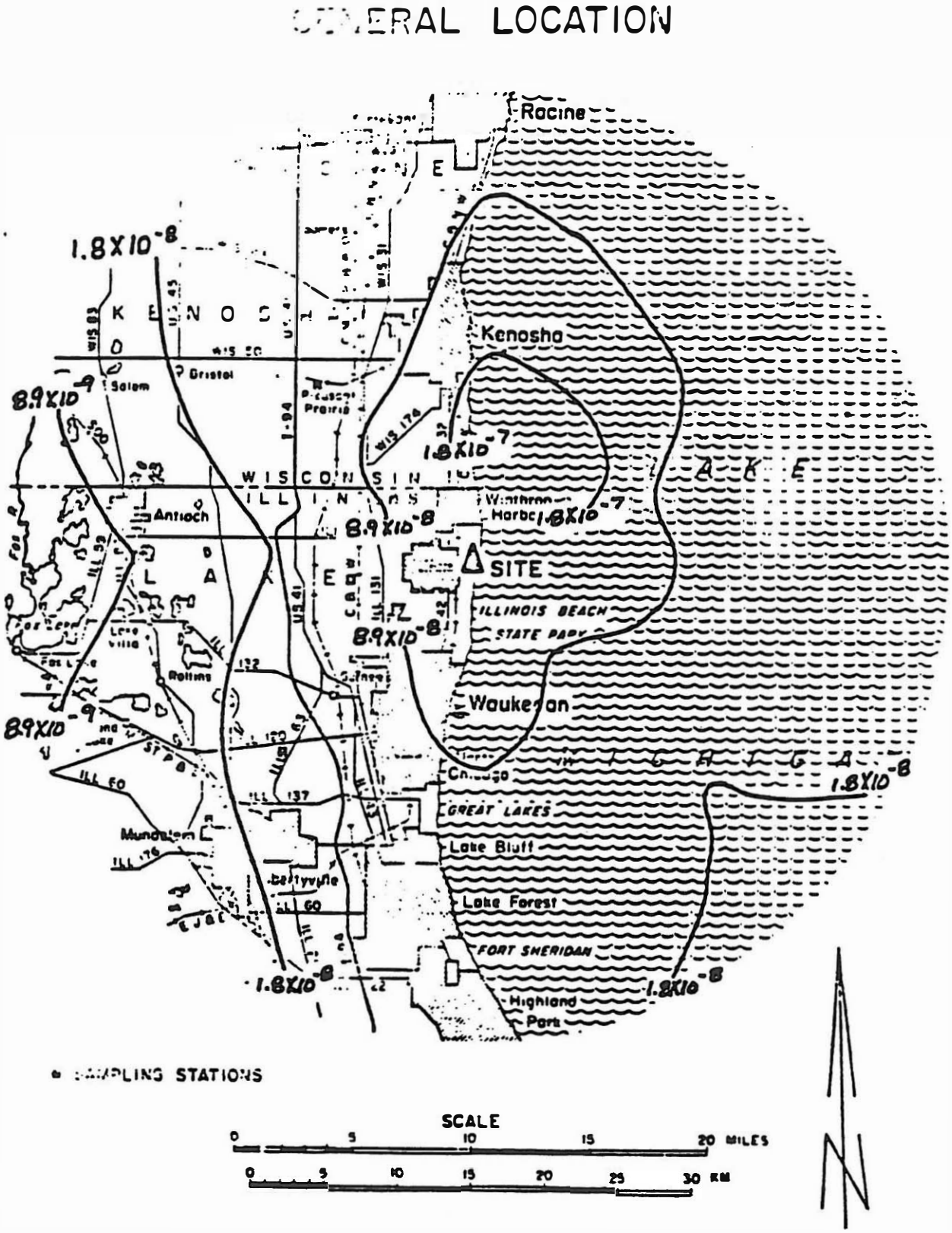


FIGURE 9

X/Q Isopleths (sec/m^3) Zion Station - Detailed Location
January - March 1972

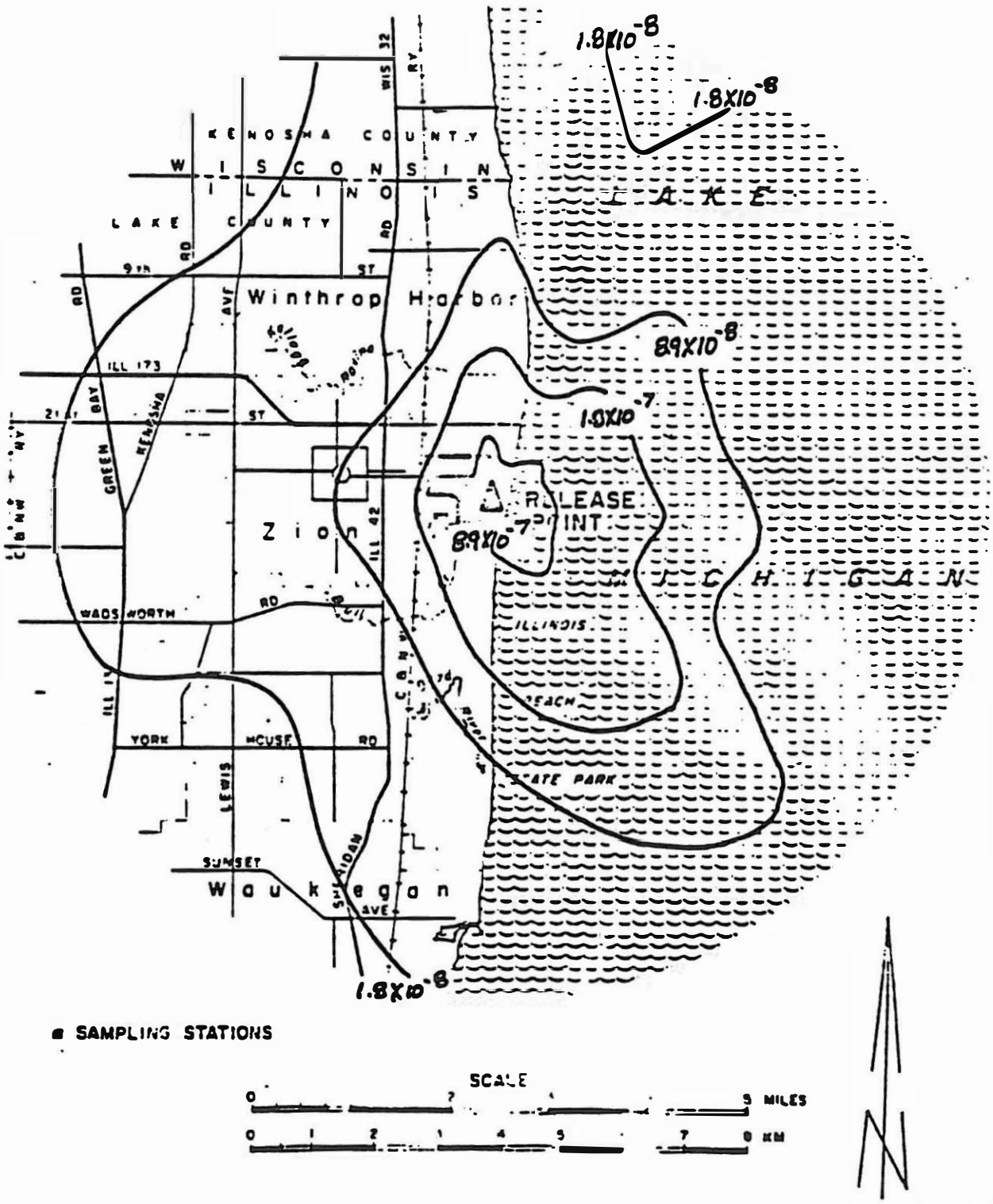


FIGURE 10

X/Q Isopleths (sec/m^3) Zion Station - General Location
January - March 1972

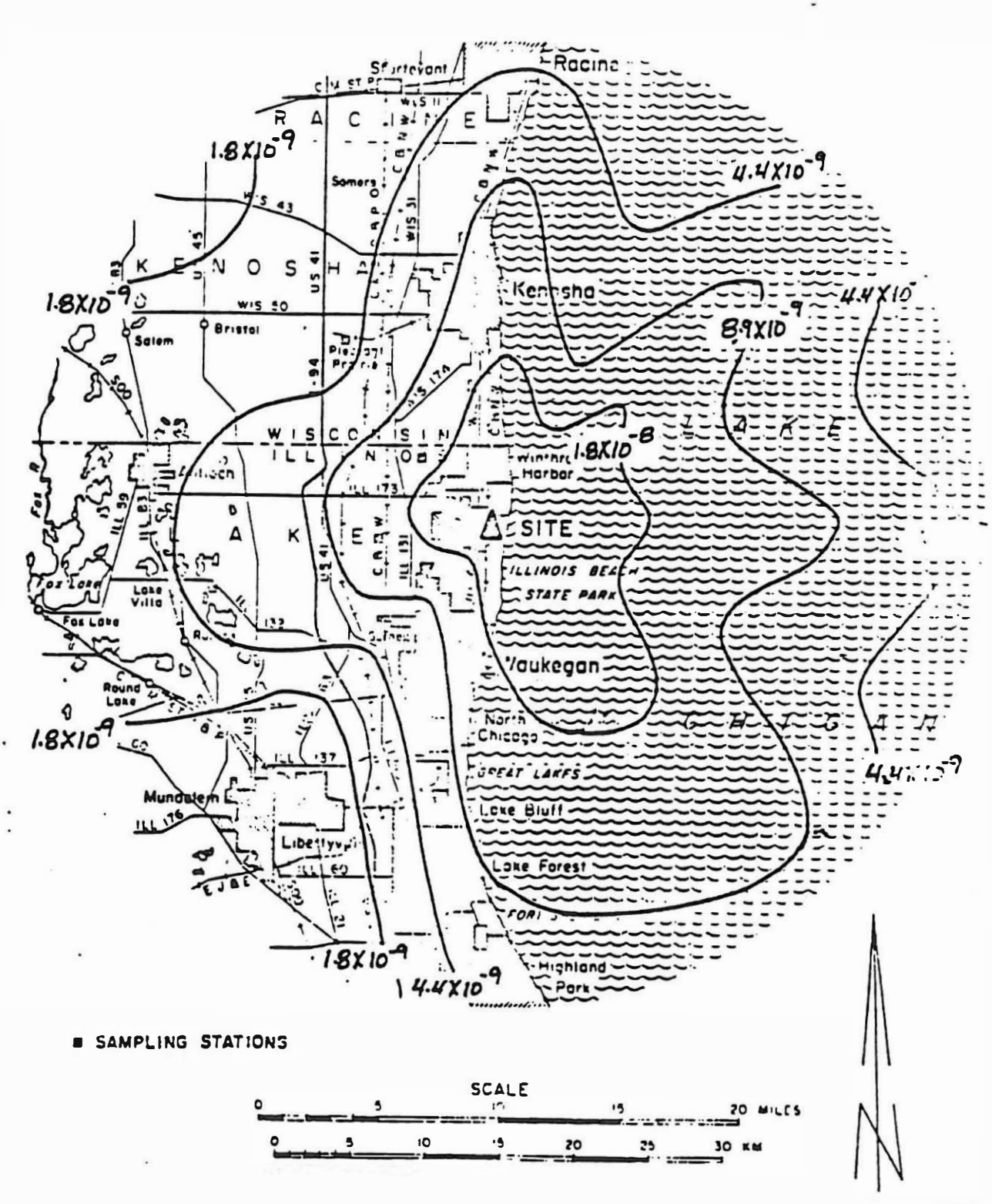
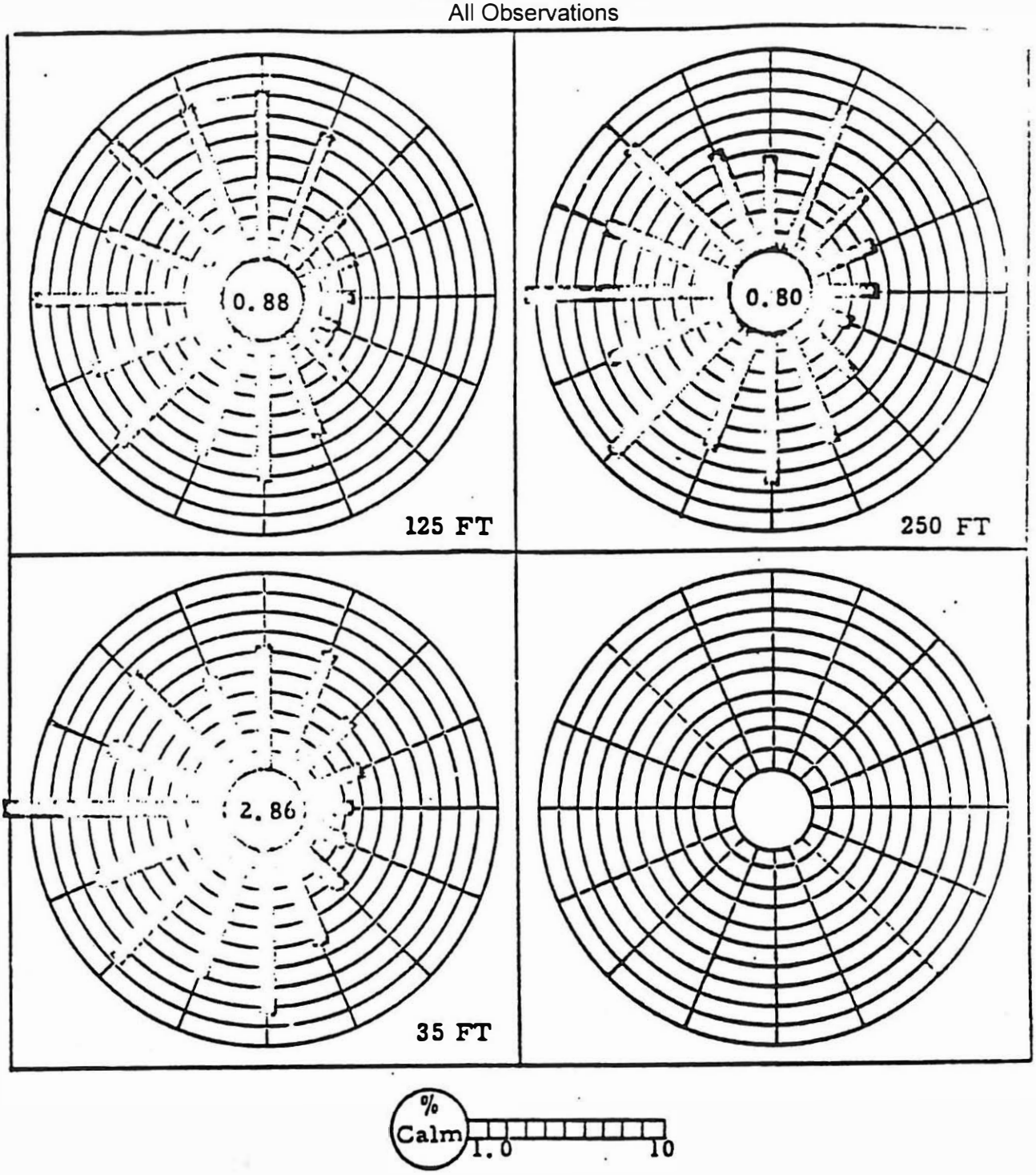


FIGURE
Zion Nuclear Power Station Wind Rose
May 1971 - April 1972
All Observations



ZION NUCLEAR POWER STATION
WIND ROSE MAY 1971-APRIL 1972
ALL OBSERVATIONS

TOTAL HOURS	35 FT	7442
	125 FT	7751
	250 FT	7497

FIGURE
Zion Nuclear Power Station Wind Rose
October - November - December 1971
All Observations Composite

22

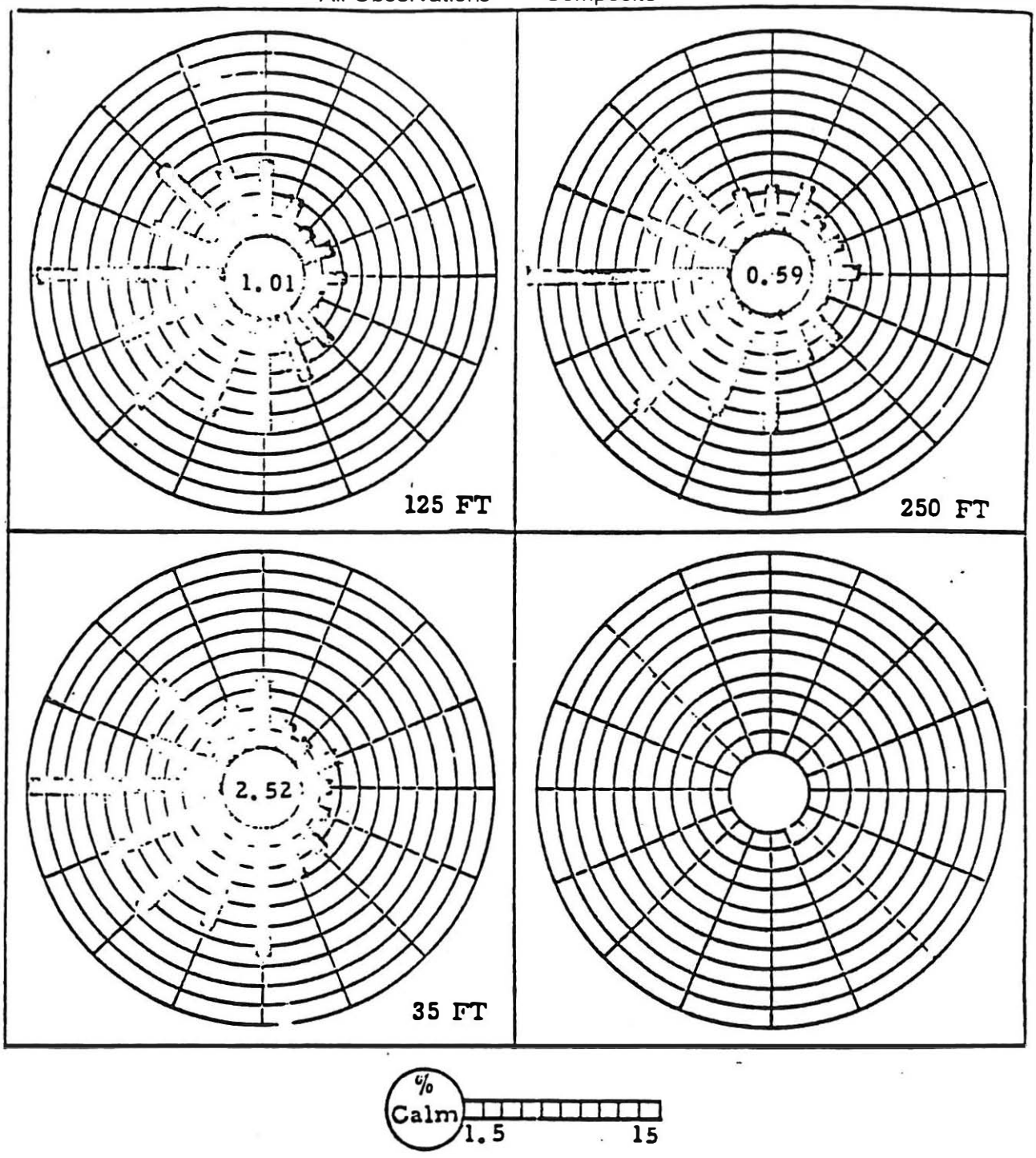


FIGURE 4 ZION NUCLEAR POWER STATION
WIND ROSE OCTOBER-NOVEMBER-DECEMBER 1971
ALL OBSERVATIONS COMPOSITE

TOTAL HOURS		
	35 FT	2064
	125 FT	2088
	250 FT	1857

FIGURE
Zion Nuclear Power Station Wind Rose
Jul - Aug - Sept 1971
All Observations

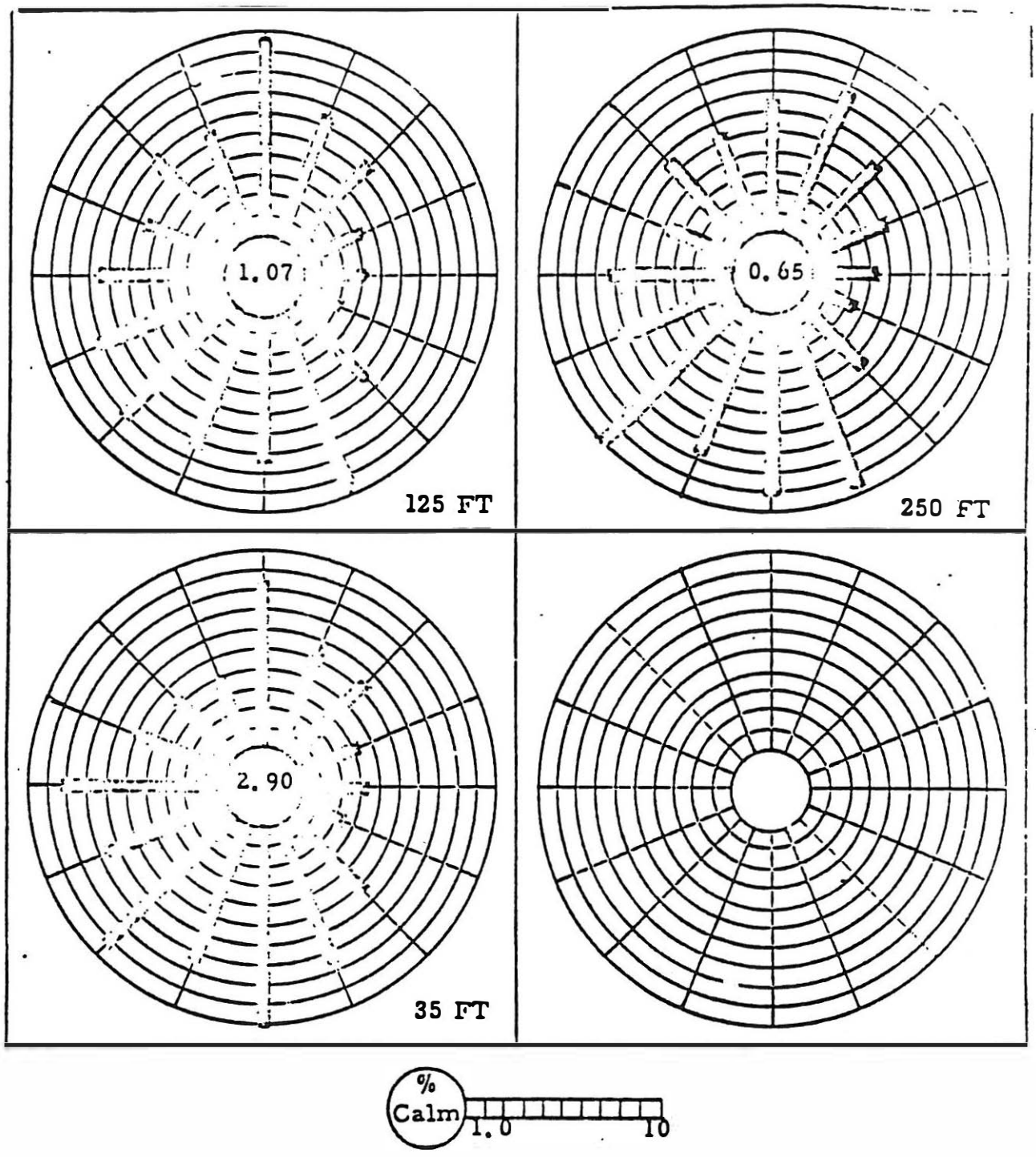


FIGURE 4 ZION NUCLEAR POWER STATION
WIND ROSE JUL-AUG-SEPT 1971
ALL OBSERVATIONS

TOTAL HOURS		
	35 FT	1584
	125 FT	1588
	250 FT	1686

FIGURE
Zion Generating Station Wind Rose
April - May - June 1971
All Observations

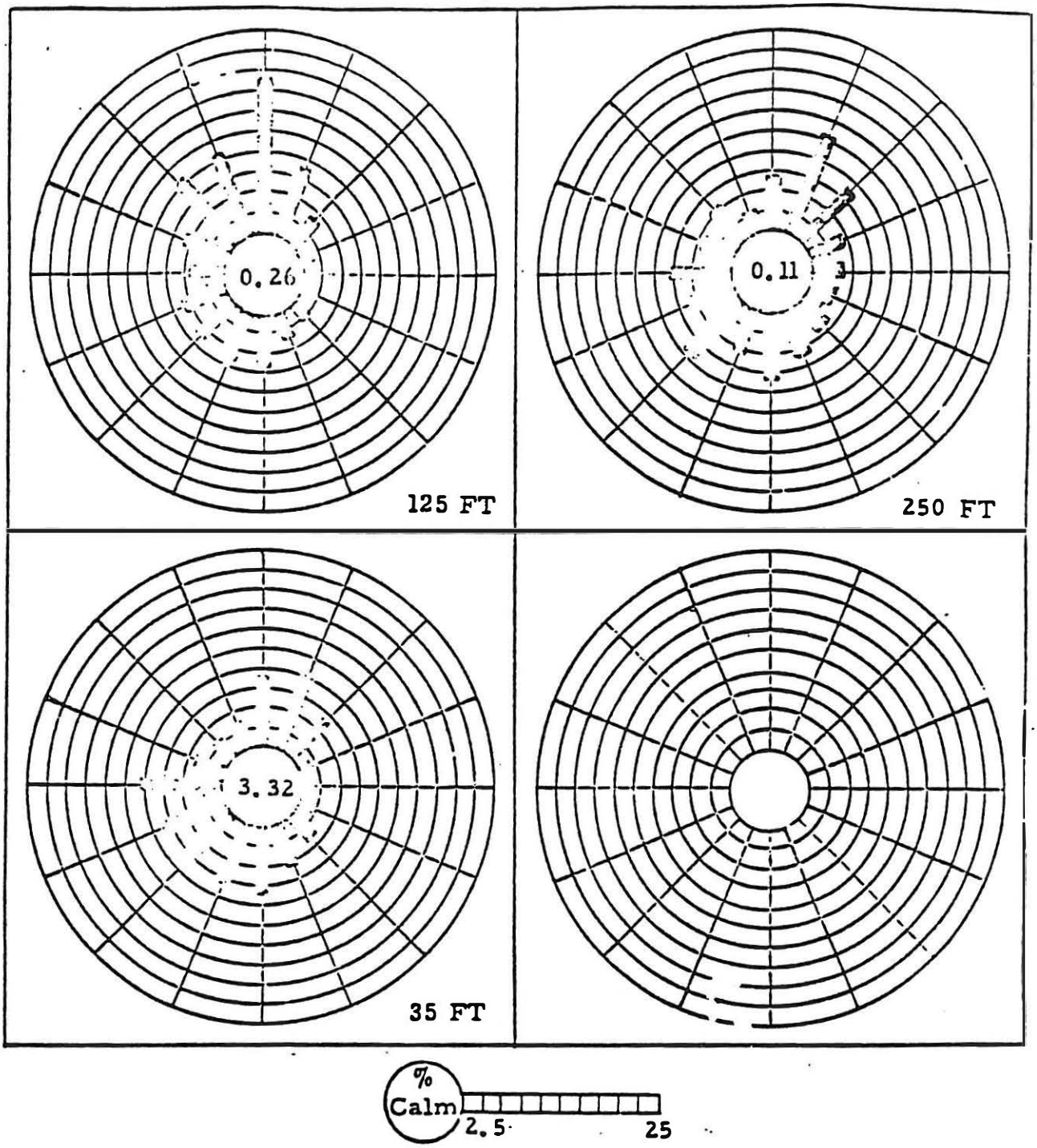


FIGURE 4

ZION GENERATING STATION
WIND ROSE
APRIL-MAY-JUNE 1971
ALL OBSERVATIONS
TOTAL HOURS 35 FT 1173
125 FT 1926
250 FT 1810

FIGURE
Zion Nuclear Power Station Wind Rose
January - February - March 1972
All Observations

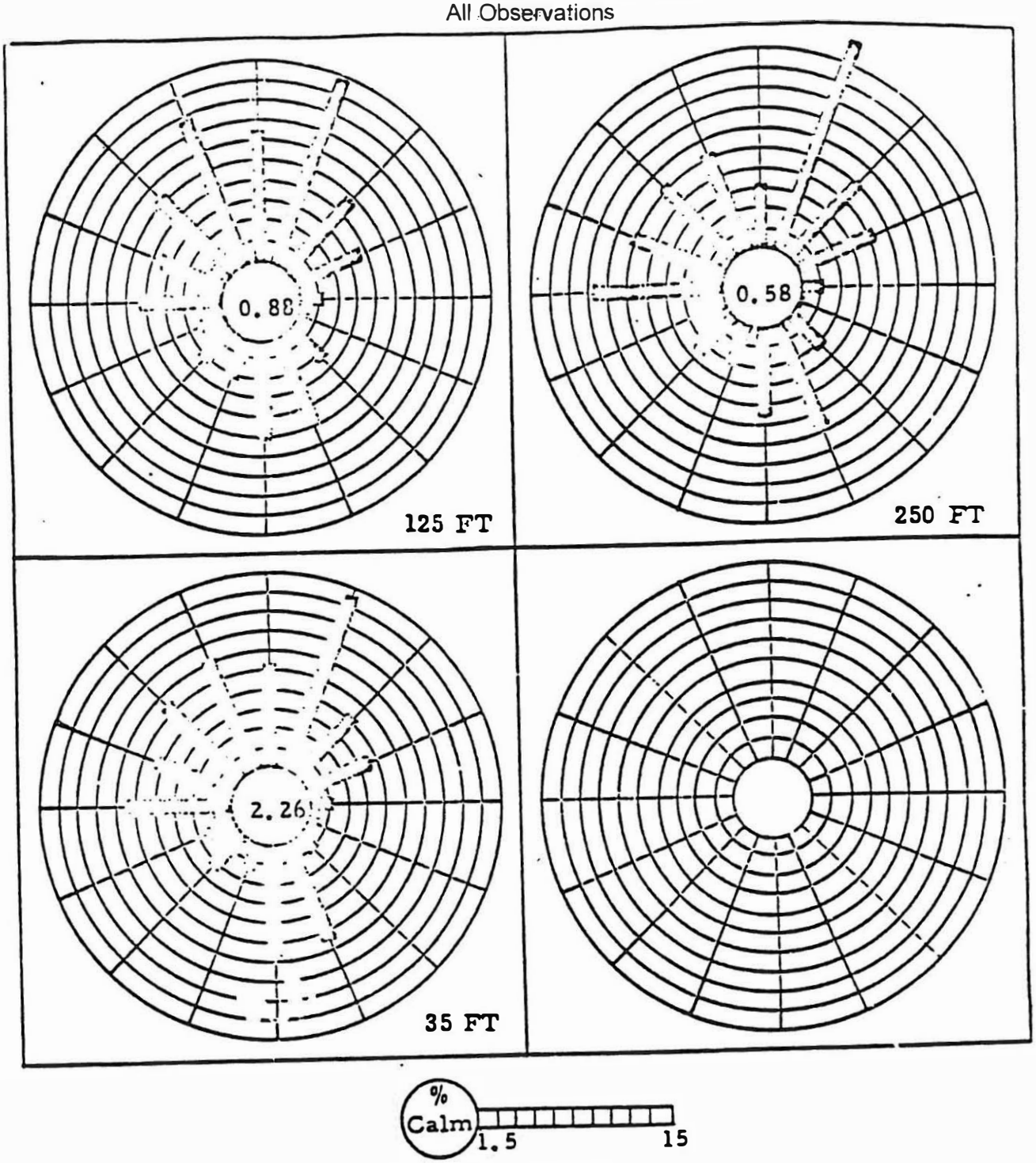


FIGURE ZION NUCLEAR POWER STATION
WIND ROSE
JANUARY-FEBRUARY-MARCH 1972
ALL OBSERVATIONS

TOTAL HOURS · 35 FT 2033
125 FT 2083
250 FT 2090

TABLE I

CECO ZION NUCLEAR POWER STATION

WIND ROSE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7442 OF 7442 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.34	1.75	2.51	1.36	0.28	0.05	0.00	C.OO	0.00	6.29
NNE	0.30	1.40	2.85	1.63	0.40	0.04	0.00	0.00	0.00	6.61
NE	0.21	1.59	1.75	0.51	0.23	0.00	0.00	0.00	0.00	4.29
ENE	0.11	1.20	1.09	0.59	0.12	0.20	0.00	C.CO	0.00	3.31
E	0.16	0.91	0.70	0.57	0.15	0.04	0.00	0.00	0.00	2.55
ESE	0.24	1.12	0.59	0.38	0.07	0.00	0.00	C.CO	0.00	2.39
SE	0 35	2.04	1.18	0.15	0.00	0.00	0.00	C.00	0.00	3.72
SSE	0.20	2.14	2.08	0.90	0.13	0.00	0.00	0.00	0.00	5.46
S	0 43	4.56	2.94	0.44	0.07	0.00	0.00	0.00	0.00	8.44
SSW	0.36	2.92	1.71	1.49	0.59	0.04	0.00	0.00	0.00	7.01
SW	0 44	2.78	3.00	1.84	0.69	0.08	0.00	C.CO	0.00	8.83
WSW	0.46	2.28	2.39	1.79	0.31	0.04	0.00	C.CO	0.00	7.27
W	0.67	3.16	4.23	2.71	0.52	0.09	0.01	C.CO	0.00	11.41
WNW	0.73	2.74	2.11	0.99	0.05	0.00	0.00	C.00	0.00	6.62
NW	0.69	3.45	2.42	1.09	0.00	0.00	0.00	C.CO	0.00	7.65
NNW	0.42	2.08	1.84	0.91	0.04	0.00	0.00	C.CO	0.00	5.29
TOTL	6.10	36.01	33.39	17.37	3.65	0.59	0.01	C.CO	0.00	100.00

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A SPEED CLASS REGARDLESS OF DIRECTION
PERCENT CALM 2.86

TABLE I

CECO ZION NUCLEAR POWER STATION

WIND ROSE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7751 OF 7751 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.08	0.85	2.32	2.98	1.52	0.28	0.05	0.00	0.00	8.09
NNE	0.15	0.65	2.13	2.21	1.16	0.34	0.15	0.01	0.00	6.80
NE	0.06	0.72	1.56	0.80	0.44	0.23	0.06	0.00	0.00	3.88
ENE	0.12	0.55	0.88	0.71	0.49	0.09	0.22	0.00	0.00	3.06
E	0.09	0.61	0.81	0.70	0.40	0.15	0.00	0.00	0.00	2.76
ESE	0.12	0.53	0.58	0.44	0.26	0.08	0.01	0.00	0.00	2.01
SE	0.05	0.79	1.39	1.06	0.44	0.06	0.00	0.00	0.00	3.79
SSE	0.04	0.84	2.39	1.54	0.34	0.12	0.00	0.00	0.00	5.56
S	0.06	0.67	2.44	2.95	0.74	0.30	0.06	0.00	0.00	7.22
SSW	0.03	0.54	2.14	2.40	0.77	0.49	0.15	0.00	0.00	6.53
SW	0.04	0.53	2.36	3.06	1.32	0.77	0.23	0.00	0.00	8.31
WSW	0.12	0.57	2.06	3.01	1.24	0.37	0.09	0.00	0.00	7.46
W	0.08	0.65	2.64	3.75	1.84	0.63	0.12	0.10	0.00	9.82
WNW	0.09	1.01	2.75	1.94	0.75	0.23	0.00	0.00	0.00	6.76
NW	0.13	1.23	3.79	2.83	0.89	0.12	0.00	0.00	0.00	8.98
NNW	0.09	0.99	3.26	2.23	1.23	0.26	0.03	0.00	0.00	8.09
TOTL	1.34	11.71	33.52	32.99	13.82	4.53	1.19	0.12	0.00	100.00

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.88

TABLE I

CECO ZION NUCLEAR POWER STATION

WIND ROSE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7497 OF 7497 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.09	0.36	1.07	1.76	1.37	0.24	0.05	0.00	0.00	4.95
NNE	0.05	0.60	1.83	3.43	1.51	0.33	0.23	0.03	0.00	8.00
NE	0.12	0.87	1.97	1.11	0.39	0.36	0.01	0.00	0.00	4.83
ENE	0.13	0.70	1.24	0.68	0.35	0.23	0.17	0.00	0.00	3.80
E	0.09	0.80	1.07	0.88	0.45	0.15	0.01	0.00	0.00	3.45
ESE	0.08	0.63	0.64	0.61	0.24	0.13	0.00	0.00	0.00	2.33
SE	0.11	0.69	1.43	1.08	0.60	0.07	0.00	0.00	0.00	3.97
SSE	0.07	0.73	2.39	1.89	0.83	0.23	0.00	0.00	0.00	6.14
S	0.11	0.73	1.93	2.81	1.48	0.53	0.09	0.00	0.00	7.70
SSW	0.12	0.36	1.23	2.47	1.21	0.73	0.17	0.00	0.00	6.30
SW	0.08	0.91	1.79	3.52	2.04	0.72	0.27	0.00	0.00	9.32
WSW	0.20	0.43	1.85	2.57	1.39	0.37	0.04	0.01	0.00	6.87
W	0.15	0.60	2.13	4.43	2.44	0.88	0.05	0.08	0.00	10.76
WNW	0.15	0.88	2.43	2.43	0.92	0.19	0.01	0.00	0.00	7.00
NW	0.19	1.05	3.48	2.73	0.65	0.04	0.00	0.00	0.00	8.15
NNW	0.07	0.52	2.09	2.16	0.65	0.12	0.00	0.00	0.00	5.62
TOTL	1.80	10.6	28.57	34.77	16.53	5.32	1.12	0.12	0.00	100.00

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.80

TABLE 11

CECO ZION NUCLEAR POWER STATION

WIND ROSE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NON-PRECIPITATION

SAMPLE TOTAL IS 6725 OF 6983 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.29	1.70	2.49	1.30	0.20	0.04	0.00	0.00	0.00	6.03
NNE	0.27	1.39	2.99	1.53	0.32	0.03	0.00	0.00	0.00	6.57
NE	0.21	1.62	1.73	0.39	0.16	0.00	0.00	0.00	0.00	4.11
ENE	0.11	1.17	1.02	0.46	0.04	0.19	0.00	0.00	0.00	2.99
E	0.17	0.84	0.56	0.43	0.10	0.00	0.00	0.00	0.00	2.11
ESE	0.24	0.97	0.40	0.30	0.00	0.00	0.00	0.00	0.00	1.92
SE	0.33	1.63	1.07	0.13	0.00	0.00	0.00	0.00	0.00	3.37
SSE	0.20	2.06	1.95	0.66	0.14	0.00	0.00	0.00	0.00	5.01
S	0.42	4.65	2.98	0.40	0.07	0.00	0.00	0.00	0.00	8.42
SSW	0.37	2.75	1.70	1.37	0.59	0.03	0.00	0.00	0.00	6.82
SW	0.40	2.63	2.99	1.80	0.69	0.07	0.00	0.00	0.00	8.59
WSW	0.44	2.16	2.36	1.82	0.33	0.04	0.00	0.00	0.00	7.16
W	0.57	3.06	4.24	2.79	0.52	0.10	0.01	0.00	0.00	11.30
WNW	0.64	2.79	2.18	1.06	0.06	0.00	0.00	0.00	0.00	6.73
NW	0.64	3.22	2.45	1.10	0.00	0.00	0.00	0.00	0.00	7.42
NNW	0.40	1.90	1.75	0.87	0.04	0.00	0.00	0.00	0.00	4.97
TOTL	5.73	34.78	32.77	16.47	3.25	0.50	0.01	0.00	0.00	96.31

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 2.79

TABLE II

CECO ZION NUCLEAR POWER STATION

WIND ROSE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NON-PRECIPITATION

SAMPLE TOTAL IS 6957 OF 7211 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.06	0.78	2.20	2.94	1.47	0.25	0.03	C.00	0.00	7.72
NNE	0.17	0.67	2.22	2.33	1.12	0.31	0.12	C.01	0.00	6.95
NE	0.06	0.73	1.59	0.82	0.24	0.19	0.03	C.CO	0.00	3.66
ENE	0.12	0.58	0.87	0.67	0.39	0.06	0.21	C.00	0.00	2.90
E	C.08	0.60	0.73	0.62	0.26	0.10	0.00	C.00	0.00	2.40
ESE	0.12	0.50	0.57	0.31	0.17	0.01	0.00	C.00	0.00	1.68
SE	0.06	C.79	1.19	C.86	0.40	0.00	0.00	C.CO	0.00	3.30
SSE	0.04	0.83	2.39	1.68	0.26	0.07	0.00	0.00	0.00	5.27
S	0.07	C.64	2.51	2.93	0.71	0.28	0.07	C.CO	0.00	7.20
SSW	0.03	0.54	2.05	2.43	0.72	0.50	0.12	C.00	0.00	6.39
SW	0.04	C.49	2.32	2.86	1.22	0.76	0.25	C.CO	0.00	7.93
WSW	0 11	0.54	1.94	2.93	1.19	0.35	0.10	0.00	0.00	7.16
W	C.08	C.57	2.65	3.80	1.90	0.65	0.11	C.11	0.00	9.87
WNW	0.10	0.94	2.77	2.00	0.76	0.25	0.00	0.00	0.00	6.82
NW	0.11	1.07	3.70	2.86	1.90	0.12	0.00	C.CO	0.00	8.76
NNW	0.10	0.73	3.00	2.20	1.32	0.28	0.03	0.00	0.00	7.65
TOTL	1.35	11.00	32.71	32.21	13.04	4.17	1.07	C.12	0.00	96.48

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.80

TABLE II

CECO ZION NUCLEAR POWER STATION

WIND ROSE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NON-PRECIPITATION

SAMPLE TOTAL IS 6739 OF 7003 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.06	0.29	1.06	1.64	1.36	0.24	0.03	C.00	0.00	4.67
NNE	0.06	0.60	1.83	3.57	1.49	0.31	0.20	0.00	0.00	8.05
NE	0.13	0.57	2.01	1.07	0.37	0.24	0.00	C.CO	0.00	4.70
ENE	0 11	D.83	1.27	0.80	0.23	0.13	0.16	C.CO	0.00	3.53
E	0.10	0. 1	1.01	0.80	0.30	0.C7	0.00	C.CO	0.00	3.1D
ESE	0.06	0.59	0.64	0.40	0.14	0.07	0.00	C.CO	0.00	1.90
SE	0.11	0.64	1.31	0.96	0.53	0.C4	0.00	C.CO	0.00	3.60
SSE	0.06	0.73	2.33	1.70	D.77	0.17	0.00	C.CO	0.00	5.75
S	0.11	0.71	1.96	2.86	1.43	0.51	0.10	C.CO	0.00	7.58
SSW	0.11	0.37	1.16	2.44	1.10	0.74	0.14	C.CO	0.00	6.07
SW	0.07	0.77	1.71	3.34	1.96	0.70	0.29	C.CO	0.00	8.84
WSW	0.21	0.34	1.77	2.41	1.39	0.39	0.04	C.01	0.00	6.57
W	0.14	0.54	2.11	4.40	2.54	0.90	0.06	C.09	0.00	10.78
WNW	0.13	0.89	2.41	2.53	0.94	0.20	0.01	C.00	0.00	7.11
NW	0.17	1.00	3.37	2.67	0.66	0.04	0.00	C.00	0.00	7.91
NNW	0.07	0.41	1.90	2.13	0.70	0.13	0.00	C.CO	0.00	5.34
TOTL	1.71	10.40	27.76	33.71	15.89	4.90	1.03	C.10	0.00	96.23

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.73

TABLE III

CECO ZION NUCLEAR POWER STATION

WIND ROSE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: PRECIPITATION

SAMPLE TOTAL IS 253 OF 6983 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.00	0.06	0.11	0.04	0.04	0.01	0.00	0.00	0.00	0.27
NNE	0.01	0.07	0.01	0.04	0.11	0.01	0.00	0.00	0.00	0.27
NE	0.01	0.00	0.10	0.03	0.09	0.00	0.00	0.00	0.00	0.23
ENE	0.00	0.07	0.09	0.04	0.09	0.03	0.00	0.00	0.00	0.32
E	0.00	0.00	0.10	0.04	0.04	0.04	0.00	0.00	0.00	0.23
ESE	0.00	0.06	0.16	0.04	0.01	0.00	0.00	0.00	0.00	0.27
SE	0.03	0.03	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.13
SSE	0.01	0.09	0.07	0.10	0.00	0.00	0.00	0.00	0.00	0.27
S	0.01	0.07	0.19	0.07	0.00	0.00	0.00	0.00	0.00	0.34
SSW	0.00	0.04	0.06	0.10	0.04	0.01	0.00	0.00	0.00	0.26
SW	0.01	0.10	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.20
WSW	0.00	0 04	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.17
W	0.00	0. 6	0.16	0.06	0.04	0.00	0.00	0.00	0.00	0.32
WNW	0 03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.10
NW	0.01	0.10	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.20
NNW	0 01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.07
TOTL	0.16	0.83	1.35	0.72	0.49	0.11	0.00	0.00	0.00	3.69

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.04

TABLE III

CECO ZION NUCLEAR POWER STATION

WIND ROSE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: PRECIPITATION

SAMPLE TOTAL IS 254 OF 7211 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.00	0.01	0.07	0.08	0.08	0.03	0.03	0.00	0.00	0.31
NNE	0.00	0.03	0.03	0.03	0.03	0.06	0.04	0.00	0.00	0.21
NE	0.01	0.01	0.03	0.01	0.08	0.06	0.04	0.00	0.00	0.25
ENE	0.00	0.01	0.01	0.10	0.03	0.04	0.03	0.00	0.00	0.22
E	0.00	0.01	0.06	0.03	0.04	0.06	0.00	0.00	0.00	0.19
ESE	0.00	0.01	0.00	0.08	0.07	0.01	0.01	0.00	0.00	0.19
SE	0.00	0.01	0.07	0.07	0.03	0.01	0.00	0.00	0.00	0.19
SSE	0.00	0.03	0.06	0.06	0.01	0.03	0.00	0.00	0.00	0.18
S	0.00	0.06	0.06	0.14	0.07	0.01	0.00	0.00	0.00	0.33
SSW	0.00	0.01	0.06	0.10	0.04	0.03	0.04	0.00	0.00	0.28
SW	0.00	0.04	0.07	0.06	0.06	0.00	0.00	0.00	0.00	0.22
WSW	0.01	0.03	0.04	0.01	0.07	0.04	0.00	0.00	0.00	0.21
W	0.00	0.03	0.06	0.07	0.07	0.03	0.01	0.00	0.00	0.26
WNW	0.00	0.04	0.07	0.03	0.03	0.00	0.00	0.00	0.00	0.17
NW	0.01	0.03	0.06	0.03	0.03	0.00	0.00	0.00	0.00	0.15
NNW	0.00	0.03	0.03	0.10	0.00	0.00	0.00	0.00	0.00	0.15
TOTL	0.04	0.40	0.75	0.9	0.73	0.40	0.21	0.00	0.00	3.52

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.00

TABLE III

CECO ZION NUCLEAR POWER STATION

WIND ROSE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: PRECIPITATION

SAMPLE TOTAL IS 264 OF 7003 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.00	0.00	0.01	0.10	0.09	0.00	0.03	0.00	0.00	0.23
NNE	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.03	0.00	0.26
NE	0.00	0.00	0.01	0.03	0.01	0.14	0.01	0.00	0.00	0.21
ENE	0.00	0.00	0.01	0.09	0.01	0.11	0.03	0.00	0.00	0.26
E	0.00	0.01	0.07	0.06	0.07	0.07	0.01	0.00	0.00	0.30
ESE	0.00	0.03	0.00	0.10	0.04	0.03	0.00	0.00	0.00	0
SE	0.00	0.03	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.14
SSE	0.01	0.04	0.04	0.13	0.03	0.03	0.00	0.00	0.00	0.29
S	0.00	0.03	0.09	0.06	0.14	0.03	0.00	0.00	0.00	0.34
SSW	0.01	0.01	0.03	0.07	0.11	0.04	0.04	0.00	0.00	0.33
SW	0.00	0.09	0.03	0.09	0.04	0.01	0.00	0.00	0.00	0.26
WSW	0.00	0.04	0.01	0.06	0.07	0.01	0.00	0.00	0.00	0.20
W	0.00	0.00	0.04	0.14	0.04	0.04	0.00	0.00	0.00	0.27
WNW	0.00	0.01	0.11	0.00	0.03	0.00	0.00	0.00	0.00	0.16
NW	0 00	0 03	0.06	0.04	0.03	0.00	0.00	0.00	0.00	0.16
NNW	0.00	0.01	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.13
TOT	0.03	0.37	0.63	1.10	0.83	0.57	0.17	0.03	0.00	3.77

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.04

TABLE IV

CECO ZION NUCLEAR POWER STATION

WIND ROSE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 851 OF 6950 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED MPH									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.12	0.37	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.58
NNE	0.09	0.07	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.26
NE	0.09	0.07	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.22
ENE	0.04	0.10	0.12	0.03	0.00	0.00	0.00	0.00	0.00	0.29
E	0.06	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.16
ESE	0.09	0.19	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.32
SE	0.06	0.26	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.42
SSE	0.04	0.29	0.23	0.07	0.01	0.00	0.00	0.00	0.00	0.65
S	0.17	1.40	0.55	0.06	0.00	0.00	0.00	0.00	0.00	2.17
SSW	0.14	1.02	0.16	0.01	0.00	0.00	0.00	0.00	0.00	1.34
SW	0.19	1.02	0.07	0.01	0.00	0.00	0.00	0.00	0.00	1.29
WSW	0.20	0.55	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.85
W	0.24	0.66	0.13	0.00	0.00	0.00	0.00	0.00	0.00	1.04
WNW	0.26	0.47	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.78
NW	0.14	0.35	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.52
NNW	0.09	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36
TOTL	2.01	7.17	1.71	0.30	0.03	0.00	0.00	0.00	0.00	12.24

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 1.02

TABLE IV

CECO ZION NUCLEAR POWER STATION

WIND ROSE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 914 OF 7174 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.01	0.22	0.32	0.22	0.03	0.00	0.00	0.00	0.00	0.81
NNE	0.04	0.11	0.31	0.07	0.01	0.00	0.00	0.00	0.00	0.54
NE	0.03	0.13	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.24
ENE	0.06	0.13	0.06	0.04	0.06	0.00	0.00	0.00	0.00	0.33
E	0.03	0.08	0.04	0.04	0.06	0.01	0.00	0.00	0.00	0.26
ESE	0.04	0.13	0.06	0.06	0.03	0.00	0.00	0.00	0.00	0.31
SE	0.01	0.19	0.21	0.11	0.00	0.00	0.00	0.00	0.00	0.52
SSE	0.03	0.14	0.35	0.24	0.07	0.03	0.00	0.00	0.00	0.85
S	0.03	0.10	0.68	0.63	0.04	0.01	0.00	0.00	0.00	1.49
SSW	0.00	0.22	0.75	0.81	0.06	0.03	0.00	0.00	0.00	1.87
SW	0.00	0.18	0.68	0.56	0.03	0.04	0.00	0.00	0.00	1.49
WSW	0.03	0.15	0.46	0.29	0.04	0.00	0.00	0.00	0.00	0.98
W	0.00	0.13	0.67	0.17	0.00	0.00	0.00	0.00	0.00	0.96
WNW	0.01	0.11	0.43	0.11	0.04	0.00	0.00	0.00	0.00	0.71
NW	0.00	0.17	0.47	0.03	0.00	0.00	0.00	0.00	0.00	0.67
NNW	0.03	0.07	0.32	0.17	0.01	0.00	0.00	0.00	0.00	0.60
TOTAL	0.35	2.24	5.87	3.57	0.47	0.13	0.00	0.00	0.00	12.74

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.11

TABLE IV

CECO ZION NUCLEAR POWER STATION

WIND ROSE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 846 OF 6971 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.01	0.06	0.23	0.23	0.03	0.00	0.00	C.00	0.00	0.56
NNE	0.00	C.06	0.19	0.26	C.03	0.CO	0.00	C.CO	0.00	0.53
NE	0.03	0.26	0.22	0.07	0.00	0.00	0.00	0.00	0.00	0.57
ENE	0.03	C.06	0.11	C.07	0.00	0.00	0.00	C.CO	0.00	0.27
E	0.00	0.26	0.13	0.10	0.09	0.03	0.00	C.00	0.00	0.60
ESE	0.01	C.07	0.09	C.07	0.04	0.01	0.00	C.00	0.00	0.30
SE	0.00	0.17	0.23	0.10	0.10	0.01	0.00	C.00	0.00	0.62
SSE	0.01	0.09	0.29	0.23	0.16	0.04	0.00	C.00	0.00	0.82
S	0.00	0.13	0.55	0.73	0.36	0.06	0.00	C.00	0.00	1.82
SSW	0.06	0.09	0.39	0.65	0.20	0.07	0.CO	C.00	0.00	1.45
SW	0.01	0.26	0.44	0.72	0.16	0.CO	0.00	C.CO	0.00	1.59
WSW	0.03	0.09	0.19	0.22	0.13	0.CO	0.00	C.CO	0.00	0.65
W	0.07	0 07	0.33	0.40	0.17	0.CO	0.00	C.CO	0.00	1.05
WNW	0.01	0.09	0.22	0.13	C.04	0.CO	0.CO	C.CO	0.00	0.49
NW	0.01	0.11	0.23	0.10	0.00	0.CO	0.00	C.00	0.00	0.46
NNW	0.00	0.06	0.10	0.09	0.00	0.CO	0.00	C.CO	0.00	0.24
TOTL	0.30	1.91	3.92	4.16	1.51	0.23	0.00	C.CO	0.00	12.14

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.11

TABLE V

CECO ZION NUCLEAR POWER STATION

WIND ROSE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1237 OF 6950 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.13	0.79	0.68	0.23	0.00	0.00	0.00	0.00	0.00	1.83
NNE	0.03	0.42	0.33	0.04	0.00	0.00	0.00	0.00	0.00	0.82
NE	0.07	0.35	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.60
ENE	0.03	0.23	0.20	0.01	0.00	0.00	0.00	0.00	0.00	0.47
E	0.03	0.07	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.19
ESE	0.06	0.22	0.12	0.01	0.01	0.00	0.00	0.00	0.00	0.42
SE	0.14	0.52	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.94
SSE	0.03	0.45	0.53	0.09	0.00	0.00	0.00	0.00	0.00	1.09
S	0.13	1.27	0.63	0.04	0.00	0.00	0.00	0.00	0.00	2.07
SSW	0.04	0.75	0.55	0.16	0.04	0.01	0.00	0.00	0.00	1.55
SW	0.12	0.66	0.78	0.13	0.00	0.00	0.00	0.00	0.00	1.68
WSW	0.14	0.53	0.37	0.06	0.00	0.00	0.00	0.00	0.00	1.11
W	0.07	0.72	0.65	0.16	0.00	0.00	0.00	0.00	0.00	1.70
WNW	0.09	0.55	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.76
NW	0.32	0.69	0.09	0.00	0.00	0.00	0.00	0.00	0.00	1.09
NNW	0.14	0.62	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.81
TOTAL	1.57	8.92	5.64	0.94	0.06	0.01	0.00	0.00	0.00	17.80

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.66

TABLE V

CECO ZION NUCLEAR POWER STATION

WIND ROSE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1260 OF 7174 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.01	0.22	0.70	1.03	0.20	0.01	0.00	C.CO	0.00	2.17
NNE	0.01	C.17	0.39	C.32	0.04	0.01	0.00	C.00	0.00	0.95
NE	0.01	0.17	0.24	0.09	0.03	0.00	0.00	0.00	0.00	0.53
ENE	0.01	0.08	0.10	0.14	0.08	0.00	0.00	C.00	0.00	0.42
E	0.01	0.14	0.21	0.17	0.00	0.01	0.00	0.00	0.00	0.54
ESE	0.01	C.C8	0.07	0.01	0.03	0.01	0.01	C.CO	0.00	0.24
SE	0.03	0.14	0.21	0.24	0.06	0.00	0.00	0.00	0.00	0.67
SSE	0.01	0.26	0.68	0.59	0.04	0.01	0.00	0.00	0.00	1.60
S	0.01	0.17	0.54	0.75	0.13	0.03	0.00	0.00	0.00	1.63
SSW	0.00	C.11	0.47	0.60	C.11	0.01	0.03	C.00	0.00	1.34
SW	0.00	0.11	0.43	0.68	0.15	0.03	0.00	C.CO	0.00	1.41
WSW	0.03	0.11	0.40	0.49	C.17	0.CO	0.CO	C.CO	0.00	1.20
W	0.01	0.14	0.50	0.66	0.24	0.03	0.00	C.CO	0.00	1.58
WNW	0.03	0.11	0.47	0.24	C.01	0.CO	0.00	C.CO	0.00	0.86
NW	0.03	0.08	0.67	0.36	0.01	0.00	0.00	C.00	0.00	1.16
NNW	0.06	0.19	0.63	0.28	C.00	0.C1	0.00	C.CO	0.00	1.16
TOTL	0.29	2.29	6.72	6.64	1.30	0.18	0.04	C.CO	0.00	17.56

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.11

TABLE V

CECO ZION NUCLEAR POWER STATION

WIND ROSE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1219 OF 6971 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.01	0 13	0.32	0.47	0.32	0.00	0.00	C.00	0.00	1.25
NNE	0.01	0.17	0.42	0.66	0.22	0.C1	0.00	C.CO	0.00	1.49
NE	0.04	0.13	0.26	0.29	0.01	0.CO	0.00	C.00	0.00	0.73
ENE	0.01	0.14	0.24	0.23	0.03	0.C1	0.00	C.CO	0.00	0.67
E	0.04	0.09	0.17	0.27	C.01	0.C1	0.00	C.CO	0.00	0.60
ESE	0.03	0.13	0.13	0.10	C.04	0.04	0.00	C.CO	0.00	0.47
SE	0.00	0.13	0.16	0.22	0.19	0.03	0.00	0.00	0.00	0.72
SSE	0.01	0.19	0.55	0.66	0.17	0.07	0.00	C.00	0.00	1.65
S	0.04	0.20	0.40	0.75	0.33	0.06	0.01	0.CO	0.00	1.79
SSW	0.03	0.09	0.33	0.69	0.22	0.07	0.04	C.00	0.00	1.46
SW	0.03	0.14	0.24	0.65	0.34	0.03	0.00	C.00	0.00	1.43
WSW	0.00	0.11	0.27	0.27	0.14	0.07	0.00	C.00	0.00	0.88
W	0.00	0.07	0.24	0.65	0.33	0.04	0.00	C.00	0.00	1.33
WNW	0.01	0.13	0.26	0.52	0.04	0.00	0.00	C.00	0.00	0.96
NW	0.00	0.04	0.39	0.60	0.00	0.00	0.00	C.00	0.00	1.03
NNW	0.03	0.03	0.34	0.30	0.07	0.01	0.00	C.00	0.00	0.79
TOTL	0.32	1.92	4.72	7.32	2.47	0.47	0.06	C.00	0.00	17.49

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.22

TABLE VI

CECO ZION NUCLEAR POWER STATION

WIND ROSE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1397 OF 6950 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.04	0.33	0.58	0.16	0.03	0.00	0.00	0.00	0.00	1.14
NNE	0.04	0.27	0.43	0.19	0.09	0.00	0.00	0.00	0.00	1.02
NE	0.01	0.36	0.17	0.07	0.00	0.00	0.00	0.00	0.00	0.62
ENE	0.00	0.23	0.14	0.07	0.00	0.00	0.00	0.00	0.00	0.45
E	0.04	0.13	0.14	0.22	0.13	0.01	0.00	0.00	0.00	0.68
ESE	0.04	0.19	0.17	0.20	0.01	0.00	0.00	0.00	0.00	0.62
SE	0.04	0.36	0.39	0.07	0.00	0.00	0.00	0.00	0.00	0.86
SSE	0.06	0.46	0.47	0.12	0.00	0.00	0.00	0.00	0.00	1.11
S	0.07	0.73	0.73	0.10	0.00	0.00	0.00	0.00	0.00	1.64
SSW	0.09	0.68	0.53	0.55	0.12	0.03	0.00	0.00	0.00	1.99
SW	0.07	0.46	0.95	0.62	0.07	0.01	0.00	0.00	0.00	2.19
WSW	0.00	0.43	0.42	0.35	0.07	0.00	0.00	0.00	0.00	1.27
W	0.14	0.52	1.08	0.82	0.12	0.00	0.00	0.00	0.00	2.68
WNW	0.19	0.53	0.30	0.16	0.00	0.00	0.00	0.00	0.00	1.18
NW	0.09	0.69	0.35	0.27	0.00	0.00	0.00	0.00	0.00	1.40
NNW	0.10	0.30	0.30	0.10	0.00	0.00	0.00	0.00	0.00	0.81
TOTL	1.04	6.68	7.17	4.06	0.63	0.06	0.00	0.00	0.00	20.10

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.47

TABLE VI

CECO ZION NUCLEAR POWER STATION

WIND ROSE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1467 OF 7174 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.00	0.20	0.43	0.45	0.25	0.03	0.00	0.00	0.00	1.35
NNE	0.06	0.11	0.31	0.35	0.20	0.01	0.03	0.00	0.00	1.06
NE	0.00	0.14	0.21	0.20	0.06	0.00	0.00	0.00	0.00	0.60
ENE	0.01	0.13	0.17	0.13	0.04	0.00	0.00	0.00	0.00	0.47
E	0.01	0.08	0.15	0.11	0.18	0.13	0.00	0.00	0.00	0.67
ESE	0.03	0.08	0.21	0.07	0.11	0.00	0.00	0.00	0.00	0.50
SE	0.00	0.22	0.17	0.25	0.22	0.01	0.00	0.00	0.00	0.88
SSE	0.00	0.17	0.47	0.39	0.03	0.01	0.00	0.00	0.00	1.07
S	0.01	0.15	0.39	0.75	0.17	0.10	0.01	0.00	0.00	1.59
SSW	0.00	0.11	0.57	0.60	0.26	0.14	0.03	0.00	0.00	1.71
SW	0.01	0.14	0.59	0.84	0.56	0.10	0.00	0.00	0.00	2.23
WSW	0.01	0.08	0.35	0.42	0.25	0.13	0.04	0.00	0.00	1.28
W	0.00	0.15	0.54	1.06	0.64	0.15	0.04	0.00	0.00	2.59
WNW	0.03	0.21	0.56	0.28	0.17	0.06	0.00	0.00	0.00	1.30
NW	0.06	0.25	0.77	0.32	0.15	0.03	0.00	0.00	0.00	1.58
NNW	0.00	0.08	0.53	0.43	0.31	0.01	0.00	0.00	0.00	1.37
TOTL	0.24	2.31	6.41	6.64	3.60	0.91	0.15	0.00	0.00	20.45

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED
A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.20

TABLE VI

CECO ZION NUCLEAR POWER STATION

WIND ROSE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1434 OF 6971 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.00	0.07	0.16	0.23	0.19	0.04	0.00	C.CO	0.00	0.69
NNE	0.03	0.07	0.32	0.65	0.26	0.01	0.09	0.00	0.00	1.42
NE	C.00	0.20	0.23	0.20	0.06	0.00	0.00	C.00	0.00	0.69
ENE	0.03	0.24	0.22	0.14	0.03	0.00	0.00	C.00	0.00	0.66
E	C.01	C.17	0.26	C.17	C.14	0.07	0.00	0.00	0.00	0.83
ESE	0.00	0.13	0.19	0.13	0.04	0.03	0.00	0.00	0.00	0.52
SE	0.03	0.14	0.34	0.36	C.09	0.CO	0.00	C.CO	0.00	0.96
SSE	0 01	0.10	0.49	0.33	0.16	0.04	0.00	C.00	0.00	1.13
S	0.03	0.20	0.43	0.75	C.36	0.10	0.01	C.CO	0.00	1.88
SSW	0.01	0.17	0.33	0.53	0.37	0.11	0.09	0.00	0.00	1.62
SW	0.00	0.24	0.44	1.00	C.76	0.10	0.04	C.00	0.00	2.60
WSW	0 04	0 03	0.40	0.53	0.27	0.C9	0.01	0.00	0.00	1.38
W	0.03	0.11	0.42	1.15	0.63	0.23	0.00	C.CO	0.00	2.57
WNW	0 03	0.22	0.46	0.39	0.23	0.C4	0.00	C.CO	0.00	1.36
NW	0.01	C.24	0.69	0.53	C.10	0.CO	0.00	C.CO	0.00	1.58
NNW	0.01	0.04	0.22	0.29	0.04	0.C1	0.00	C.CO	0.00	0.62
TOTL	0.29	2.40	5.58	7.37	3.73	0.89	0.24	C.CO	0.00	20.57

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM C.07

TABLE VII

CECO ZION NUCLEAR POWER STATION

WIND ROSE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3465 OF 6950 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.06	0.36	1.34	0.95	0.20	0.03	0.00	C.CO	0.00	2.94
NNE	0.14	0.59	2.04	1.41	0.32	0.04	0.00	C.CO	0.00	4.55
NE	0.06	0.31	1.32	0.46	0.24	0.00	0.00	C.00	0.00	2.89
ENE	0.04	0.65	0.63	0.50	0.13	0.22	0.00	0.00	0.00	2.17
E	0.04	0.66	0.35	0.39	0.03	0.03	0.00	0.00	0.00	1.50
ESE	0.06	0.42	0.20	0.17	0.04	0.00	0.00	C.00	0.00	0.89
SE	0.10	0.68	0.36	0.06	0.00	0.00	0.00	C.00	0.00	1.19
SSE	0.07	0.85	0.69	0.52	0.13	0.00	0.00	C.00	0.00	2.26
S	0.07	C.85	0.96	0.27	0.07	0.00	0.00	C.00	0.00	2.23
SSW	0.07	0.30	0.50	0.82	0.45	0.00	0.00	C.00	0.00	2.14
SW	0.06	0.55	1.15	1.18	0.66	0.07	0.00	C.CO	0.00	3.67
WSW	0.09	0.60	1.44	1.30	0.26	0.04	0.00	C.00	0.00	3.81
W	0.13	1.14	2.43	1.86	0.45	0.10	0.01	0.CO	0.00	6.12
WNW	0.20	1.31	1.76	0.86	0.06	0.00	0.00	0.00	0.00	4.19
NW	0.14	1.93	2.10	0.88	0.00	0.00	0.00	C.00	0.00	5.05
NNW	0.09	1.01	1.61	0.86	0.04	0.00	0.00	C.00	0.00	3.61
TOTAL	1.42	12.69	18.89	12.53	3.02	0.53	0.01	C.CO	0.00	49.86

TAB E ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.65

TABLE VII

CECO ZION NUCLEAR POWER STATION

WIND ROSE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3533 OF 7174 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.06	0.22	0.98	1.42	1.03	0.20	0.04	0.00	0.00	3.94
NNE	0.06	0.24	1.09	1.55	0.96	0.32	0.11	0.01	0.00	4.34
NE	0.01	0.29	1.07	0.50	0.36	0.25	0.07	0.00	0.00	2.56
ENE	0.03	0.25	0.54	0.39	0.35	0.08	0.24	0.00	0.00	1.88
E	0.03	0.29	0.40	0.36	0.18	0.01	0.00	0.00	0.00	1.28
ESE	0.03	0.21	0.24	0.21	0.10	0.07	0.00	0.00	0.00	0.85
SE	0.01	0.29	0.66	0.32	0.15	0.00	0.00	0.00	0.00	1.44
SSE	0 00	0.29	0.78	0.47	0.15	0.04	0.00	0.00	0.00	1.74
S	0.01	0.26	0.71	0.78	0.42	0.14	0.06	0.00	0.00	2.38
SSW	0.03	0 13	0.31	0.38	0.38	0.31	0.10	0.00	0.00	1.62
SW	0.03	0.10	0.56	0.96	0.66	0.66	0.25	0.00	0.00	3.21
WSW	0 06	0 22	0.79	1.63	0.84	0.28	0.06	0.00	0.00	3.88
W	0.07	0.26	0.98	1.71	1.03	0.46	0.08	0.11	0.00	4.71
WNW	0 03	0.63	1.38	1.35	0.54	0.20	0.00	0.00	0.00	4.13
NW	0.06	0.77	1.95	2.09	0.77	0.10	0.00	0.00	0.00	5.63
NNW	0.01	0.71	1.90	1.44	0.96	0.24	0.03	0.00	0.00	5.28
TOTL	0.52	5.17	14.23	15.57	8.88	3.35	1.03	0.13	0.00	49.25

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.38

TABLE VII

CECO ZION NUCLEAR POWER STATION

WIND ROSE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3472 OF 6971 VALID OBSERVATIONS

WIND DIRECTION	WIND SPEED (MPH)									
	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	GT 46	TOTAL
N	0.04	0.10	0.37	0.79	0.76	0.13	0.04	C.CO	0.00	2.24
NNE	0 01	0.33	0.92	2.04	1.08	0.32	0.14	C.00	0.00	4.83
NE	0.06	0.30	1.22	0.55	0.33	0.37	0.01	C.CO	0.00	2.84
ENE	0 06	0.36	0.65	0.44	0.29	0.20	0.19	C.00	0.00	2.18
E	0.04	0.24	0.46	0.33	C.19	0.C4	0.01	C.CO	0.00	1.32
ESE	0.03	0.27	0.26	0.24	0.11	0.04	0.00	C.00	0.00	0.96
SE	0.09	0.26	0.59	0.33	0.22	0.00	0.00	C.CO	0.00	1.48
SSE	0.03	0.39	0.95	0.56	0.32	0.04	0.00	C.00	0.00	2.28
S	0.04	0.20	0.55	0.55	0.52	0.22	0.06	C.CO	0.00	2.12
SSW	0.03	0.03	0.22	0.47	0.43	0.47	0.06	C.CO	0.00	1.71
SW	0.03	0.23	0.72	1.25	0.89	0.65	0.24	0.00	0.00	4.00
WSW	0.14	0.19	0.99	1.48	0.76	0.24	0.03	C.01	0.00	3.84
W	0.04	0.39	1.22	2.24	1.26	0.63	0.06	C.09	0.00	5.92
WNW	0.09	0.49	1.56	1.51	0.65	0.16	0.01	C.00	0.00	4.46
NW	0.17	0.72	2.15	1.55	0.60	0.04	0.00	C.00	0.00	5.24
NNW	0.03	0.40	1.33	1.58	C.59	0.10	0.00	C.00	0.00	4.03
TOTL	0.93	4.89	14.14	15.89	8.98	3.66	0.36	C.10	0.00	49.81

TABLE ENTRY IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED AND DIRECTION CLASS SIMULTANEOUSLY
A ROW TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED A COMPASS DIRECTION CLASS REGARDLESS OF WIND SPEED
A COLUMN TOTAL IS FREQUENCY OF VALID OBSERVATIONS WIND OCCUPIED SPEED CLASS REGARDLESS OF DIRECTION

PERCENT CALM 0.34

TABLE VIII

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 35 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7229 OF 7229 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	89	87	63	59	56	73	95	96	129	143	116	143	121	111	100	94	66
2	36	40	37	28	20	22	31	45	63	48	50	41	61	48	43	37	30
3	16	29	20	14	8	11	15	18	35	25	25	25	31	24	32	11	13
4	15	5	7	5	2	0	9	9	8	15	19	8	24	16	14	12	6
5	5	6	2	3	2	4	5	8	13	6	17	9	14	6	9	8	1
6	6	3	4	3	2	0	0	6	5	3	6	9	7	4	7	2	2
7	2	6	3	0	1	0	2	2	7	2	6	3	6	3	5	5	1
8	5	2	0	0	0	1	0	2	2	3	3	4	3	5	3	0	0
9	1	2	1	1	0	0	0	0	1	0	4	2	5	1	1	2	0
10	1	0	1	1	1	0	0	1	3	4	1	0	2	1	1	1	0
11	1	2	0	0	1	0	0	0	0	2	0	1	2	0	2	0	0
12	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	0	0
13	0	2	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0
14	0	0	0	0	0	0	0	1	0	0	2	2	1	0	0	0	0
15	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	2	0
16	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0
17	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
21 - 25	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	22	22	10	17	12	8	7	14	13	11	16	14	20	16	16	15	7
50.0 %	2	2	1	1	1	1	1	1	2	1	2	1	2	1	2	1	1
80.0 %	4	3	3	3	2	2	2	3	3	3	4	3	4	3	4	3	2
90.0 %	6	6	4	4	4	3	4	5	5	4	5	5	6	4	5	5	3
99.0 %	17	13	9	10	12	5	7	10	12	10	14	11	16	9	13	15	6
99.9 %	22	22	10	17	12	8	7	14	13	11	16	14	20	16	16	15	7

BLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION
.0 WIND DIRECTION

TABLE VIII

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 125 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7805 OF 7805 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION																
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	96	90	76	64	77	76	101	99	100	121	111	132	114	128	118	96	34
2	49	37	40	24	14	22	28	38	43	34	44	48	66	57	55	48	8
3	25	32	18	13	9	9	12	30	27	32	21	26	35	19	29	21	3
4	16	10	7	7	7	0	6	15	14	16	14	18	15	12	15	13	1
5	12	11	1	3	1	0	7	5	11	4	8	6	12	7	11	18	1
6	6	4	3	1	3	0	4	4	7	8	8	7	6	8	10	6	0
7	4	6	3	1	1	2	1	4	2	3	7	3	3	4	8	5	0
8	2	2	2	0	1	0	2	1	3	1	7	7	6	4	4	0	0
9	3	1	1	0	0	0	0	3	3	2	4	0	3	1	4	1	0
10	0	1	0	0	1	0	0	0	1	2	3	3	4	0	3	1	0
11	2	1	0	0	1	0	0	0	4	1	2	1	1	0	2	1	0
12	2	3	0	0	0	0	0	0	0	2	2	0	2	1	0	0	0
13	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0
14	2	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0
15	0	0	0	0	0	0	0	0	3	0	1	0	2	1	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
17	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0
18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
21 - 25	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
26 - 30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE HOURS	24	26	9	17	11	7	8	9	15	12	15	13	22	15	17	23	5
50.0 %	2	2	1	1	1	1	1	2	2	1	2	1	2	1	2	2	1
80.0 %	4	4	3	3	3	2	2	3	4	3	4	3	4	3	4	4	2
90.0 %	6	5	4	4	4	3	4	4	6	5	7	5	6	5	6	5	3
95.0 %	17	12	8	14	10	7	8	9	15	11	12	10	16	9	11	20	5
99.9 %	24	26	9	17	11	7	8	9	15	12	15	13	22	15	17	23	5

ABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE VIII

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 250 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7537 OF 7537 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SW	WSW	W	WNW	NW	NNW	CALM
1	66	76	55	70	66	71	78	80	100	96	135	104	102	101	76	23
2	42	34	33	32	20	19	32	40	47	48	49	51	53	27	36	9
3	11	22	31	14	15	9	15	31	27	22	20	23	21	27	19	3
4	12	15	4	7	6	4	9	13	17	13	19	15	21	8	17	11	1
5	9	9	3	6	3	3	6	9	3	7	7	15	9	7	11	15	0
6	4	6	2	2	2	0	1	6	5	6	8	3	9	7	8	4	1
7	2	6	5	2	1	0	3	1	5	0	6	1	8	5	6	2	0
8	2	4	4	1	2	1	0	4	6	3	6	1	7	4	3	1	0
9	0	4	1	0	0	0	0	2	1	0	3	3	3	6	1	1	0
10	0	1	0	0	1	0	1	1	2	1	2	1	3	0	4	0	0
11	1	3	0	0	1	0	1	0	1	4	0	1	5	1	2	1	0
12	0	3	0	0	0	0	0	1	1	2	1	1	5	0	3	0	0
13	0	1	0	0	1	0	0	0	2	0	3	0	1	0	1	0	0
14	0	1	0	0	0	0	0	0	1	0	1	0	0	0	2	0	0
15	1	1	0	0	0	0	0	0	1	1	1	0	0	1	0	1	0
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
17	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
19	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	15	19	9	17	13	8	11	12	15	15	20	12	19	15	14	21	6
50.0 %	1	2	1	1	1	1	1	2	2	1	2	1	2	2	2	2	1
80.0 %	3	5	3	3	3	2	3	3	4	3	4	3	5	3	4	4	2
90.0 %	5	7	4	4	4	3	4	5	6	5	7	5	8	6	7	5	3
95.0 %	11	15	8	8	11	5	10	10	13	12	17	10	18	9	13	21	6
99.9 %	15	19	9	17	13	8	11	12	15	15	20	12	19	15	14	21	6

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 35 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 780 OF 6755 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION																
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	21	12	11	11	11	15	21	19	46	47	30	28	27	20	15	16	26
2	5	3	2	3	0	2	4	10	21	14	9	2	10	9	4	3	12
3	3	0	0	1	0	1	0	2	7	2	3	0	4	4	2	1	2
4	0	0	0	0	0	0	0	0	3	3	3	1	0	1	0	0	2
5	0	0	0	0	0	0	0	0	2	0	3	1	1	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	3	2	2	3	1	3	2	3	13	4	6	6	8	4	7	3	7
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80.0 %	2	1	1	2	1	1	1	2	2	2	3	1	2	2	2	1	2
90.0 %	3	2	2	2	1	2	2	2	3	2	4	5	3	3	3	2	3
95.0 %	3	2	2	3	1	3	2	3	13	4	6	6	8	4	7	3	7
99.9 %	3	2	2	3	1	3	2	3	13	4	6	6	8	4	7	3	7

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE X

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 125 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 721 OF 7231 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	25	19	9	13	13	20	26	28	43	45	43	36	23	20	21	22	8
2	5	9	4	4	3	1	4	12	17	20	9	6	8	6	6	4	0
3	5	0	0	1	1	0	1	2	4	7	7	4	4	3	3	2	0
4	2	1	0	0	0	0	0	0	1	4	4	1	2	1	0	0	0
5	0	0	0	0	0	0	0	1	3	1	2	0	2	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0
7	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	4	4	2	3	3	2	3	5	7	7	5	6	5	6	6	7	1
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80.0 %	2	2	2	2	2	1	1	2	2	2	2	2	3	2	2	2	1
90.0 %	3	2	2	2	2	1	2	2	3	3	3	3	4	3	3	3	1
99.0 %	4	4	2	3	3	2	3	5	7	7	5	6	5	6	6	7	1
99.5 %	4	4	2	3	3	2	3	5	7	7	5	6	5	6	6	7	1

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE X

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 250 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 639 OF 7019 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	13	19	19	14	13	13	21	25	33	36	30	27	24	14	18	10	3
2	2	6	5	1	8	4	8	11	21	16	14	5	10	8	3	2	1
3	2	2	2	1	3	0	2	2	2	7	4	1	6	0	1	1	1
4	0	0	0	0	1	0	0	1	5	1	5	0	1	1	0	0	0
5	1	0	1	0	0	0	0	0	0	0	2	1	0	0	1	0	0
6	1	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
8	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	6	3	5	3	4	2	3	4	13	8	6	5	7	4	5	3	3
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80.0 %	2	2	2	1	2	2	2	2	2	2	3	2	2	2	2	2	2
90.0 %	3	2	3	2	3	2	2	2	4	3	4	2	3	2	2	2	3
99.0 %	6	3	5	3	4	2	3	4	13	8	6	5	7	4	5	3	3
99.9 %	6	3	5	3	4	2	3	4	13	8	6	5	7	4	5	3	3

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE XII

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 35 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1099 OF 6755 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	30	21	28	7	6	13	38	36	64	50	35	29	31	23	31	21	23
2	13	9	3	3	1	4	7	8	15	5	11	9	11	6	3	6	8
3	5	1	1	2	1	1	2	4	6	6	2	2	4	2	6	4	1
4	2	2	1	1	0	0	0	0	1	0	2	3	4	2	1	0	1
5	1	1	0	0	0	0	0	0	1	2	3	0	2	0	2	0	0
6	0	0	0	0	0	0	0	1	0	1	3	1	0	0	1	1	0
7	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
8	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	11	5	4	10	3	3	3	6	7	8	6	6	12	4	6	6	4
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80.0 %	3	2	1	3	2	2	1	2	2	2	2	2	3	2	3	2	2
90.0 %	5	3	2	4	3	2	2	3	3	3	5	3	4	3	3	3	2
99.0 %	11	5	4	10	3	3	3	6	7	8	6	6	12	4	6	6	4
99.9 %	11	5	4	10	3	3	3	6	7	8	6	6	12	4	6	6	4

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION O WIND DIRECTION

TABLE XII

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 125 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1197 OF 7231 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	44	33	23	15	18	13	26	42	62	50	36	34	38	28	30	28	5
2	10	9	6	2	1	3	2	11	10	4	8	11	16	7	7	5	0
3	10	4	1	0	1	0	4	7	9	4	2	2	5	2	3	3	1
4	1	1	0	0	1	0	1	2	1	1	4	2	1	0	2	3	0
5	2	0	0	1	0	0	0	0	0	2	2	0	2	1	2	2	0
6	2	0	0	1	0	0	0	2	0	1	1	1	0	1	0	0	0
7	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	11	4	3	6	11	2	4	6	4	7	6	6	11	6	9	7	3
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
90.0 %	3	2	2	2	1	1	2	2	2	2	2	2	2	2	2	3	1
95.0 %	5	3	2	5	3	2	3	3	3	3	4	2	3	3	4	4	3
99.0 %	11	4	3	6	11	2	4	6	4	7	6	6	11	6	9	7	3
99.9 %	11	4	3	6	11	2	4	6	4	7	6	6	11	6	9	7	3

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION
D WIND DIRECTION

TABLE XII

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 250 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1123 OF 7019 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	27	38	21	22	14	19	26	43	68	54	40	31	30	22	21	31	6
2	10	12	7	1	4	2	4	12	13	4	11	4	12	6	4	4	2
3	3	5	2	3	0	1	2	5	3	4	5	1	2	5	3	3	0
4	3	3	2	1	0	1	2	1	1	2	0	1	3	1	1	0	0
5	1	1	0	0	1	0	0	1	0	2	1	0	1	1	3	1	1
6	0	0	0	0	0	0	0	0	1	1	1	2	0	0	1	0	0
7	0	1	0	1	0	0	0	1	0	0	0	0	1	0	1	0	0
8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	10	7	4	7	13	4	4	8	6	6	6	6	7	5	7	5	5
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80.0 %	2	2	2	2	2	1	2	2	2	1	2	2	2	2	3	2	2
90.0 %	4	3	3	3	2	2	3	3	2	3	3	3	4	3	5	3	5
99.0 %	10	7	4	7	13	4	4	8	6	6	6	6	7	5	7	5	5
99.9 %	10	7	4	7	13	4	4	8	6	6	6	6	7	5	7	5	5

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE XIV

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 35 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1288 OF 6755 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	37	41	18	13	17	19	33	41	55	56	44	38	57	31	28	23	18
2	4	5	9	3	5	3	6	9	12	11	14	14	13	13	8	11	4
3	2	1	1	2	4	3	2	1	7	4	7	1	6	2	3	1	2
4	3	0	0	0	1	1	0	1	1	4	3	1	3	1	1	0	0
5	1	0	0	0	0	1	1	1	0	3	4	1	0	1	1	0	0
6	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0
7	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
9	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	5	9	3	3	4	5	7	5	9	7	12	5	15	5	16	8	3
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80.0 %	2	1	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2
90.0 %	3	2	2	3	3	3	2	2	3	4	4	2	3	2	4	2	2
95.0 %	5	9	3	3	4	5	7	5	9	7	12	5	15	5	16	8	3
99.9 %	5	9	3	3	4	5	7	5	9	7	12	5	15	5	16	8	3

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION IN WIND DIRECTION

TABLE XIV

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 125 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1395 OF 7231 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION																
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	42	40	23	14	16	23	27	45	49	50	40	44	50	43	30	32	4
2	15	5	6	4	3	3	6	8	9	9	11	12	15	8	12	17	3
3	3	3	2	2	4	1	2	2	2	4	8	5	7	6	7	3	1
4	3	1	0	0	3	1	0	2	2	6	7	1	3	0	3	1	0
5	0	0	0	0	0	0	0	0	1	1	0	0	3	0	1	1	0
6	0	0	0	0	0	0	2	0	0	0	1	0	2	0	0	0	0
7	0	0	0	0	0	0	0	0	1	2	4	0	0	0	0	0	0
8	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0
9	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0
10	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	4	9	3	3	4	4	8	4	10	7	9	4	14	8	9	8	3
50.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80.0 %	2	1	2	2	3	1	2	2	2	2	3	2	3	2	3	2	2
90.0 %	2	2	2	2	4	2	3	2	3	4	4	2	4	3	4	3	3
99.0 %	4	9	3	3	4	4	8	4	10	7	9	4	14	8	9	8	3
99.9 %	4	9	3	3	4	4	8	4	10	7	9	4	14	8	9	8	3

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE XIV

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 250 FT LEVEL (22.5 DEG SECTORS)

MAY.1971-APR.1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1367 OF 7019 VALID OBSERVATIONS

RSISTENCE HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	29	40	25	19	26	20	23	44	55	45	37	46	50	32	26	21	2
2	2	9	7	6	6	6	7	13	14	11	14	13	11	11	10	8	1
3	1	3	2	2	2	0	3	0	3	4	8	3	5	6	3	3	0
4	2	2	0	0	2	1	1	0	3	5	6	2	4	1	6	0	0
5	0	1	0	1	0	0	0	1	0	0	5	0	4	0	1	0	0
6	0	0	0	0	0	0	2	0	0	0	1	0	1	1	1	0	0
7	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0
9	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AXIMUM RSISTENCE HOURS)	4	9	3	5	4	4	6	5	10	7	12	4	12	8	13	8	2
.0 %	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0 %	1	2	2	2	2	2	2	2	2	2	4	2	3	2	4	2	2
.0 %	2	3	2	3	3	2	3	2	3	3	5	2	5	3	4	3	2
.0 %	4	9	3	5	4	4	6	5	10	7	12	4	12	8	13	8	2
.0 %	4	9	3	5	4	4	6	5	10	7	12	4	12	8	13	8	2

BLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION
O WIND DIRECTION

TABLE XVI

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 35 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3588 OF 6755 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	57	56	37	38	33	24	38	53	54	41	61	87	79	65	63	58	14
2	23	24	26	13	13	11	8	16	18	16	24	25	41	27	32	25	6
3	10	15	14	6	4	3	7	8	5	10	13	13	20	10	19	7	2
4	8	6	6	4	2	0	3	4	3	3	10	5	11	9	7	9	2
5	4	6	1	3	2	1	0	2	3	2	6	6	10	6	6	6	0
6	3	3	1	3	1	0	0	1	0	0	2	1	4	4	4	1	1
7	1	6	3	0	1	1	0	1	2	0	2	1	1	1	2	3	0
8	1	1	0	0	1	0	0	1	0	1	1	3	2	3	1	0	0
9	0	2	1	1	0	0	0	0	0	0	2	2	3	1	1	1	0
10	0	0	1	0	0	0	0	0	2	1	0	0	0	1	1	1	0
11	0	1	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
13	0	2	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
17	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	8	13	10	17	8	7	4	13	10	11	9	9	20	16	15	15	6
50.0 %	1	2	2	1	1	1	1	1	1	1	1	1	2	1	2	1	1
80.0 %	3	4	3	3	2	2	2	3	2	3	3	3	3	4	3	3	2
90.0 %	4	6	4	5	4	3	3	4	4	4	5	4	5	5	5	5	4
99.0 %	7	13	10	17	8	7	4	13	10	11	9	9	14	10	13	10	6
99.9 %	8	13	10	17	8	7	4	13	10	11	9	9	20	16	15	15	6

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE XVI

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 125 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3718 OF 7231 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	63	53	40	31	38	27	40	40	41	37	50	63	71	65	69	56	11
2	34	23	18	12	6	9	10	13	10	11	24	27	39	48	35	27	5
3	13	19	15	8	3	4	5	7	6	8	7	15	17	11	18	15	1
4	8	8	4	5	2	0	3	5	4	4	6	10	12	1	9	10	1
5	8	6	2	1	2	0	3	2	4	0	3	7	3	6	7	11	0
6	2	3	1	0	1	0	1	1	1	1	3	4	3	5	8	5	0
7	2	2	2	1	2	1	0	0	2	0	2	1	2	2	2	1	0
8	0	0	2	0	0	0	0	0	1	0	4	1	2	2	3	0	0
9	1	2	1	0	0	0	0	2	2	0	2	0	1	1	2	0	0
10	1	1	0	0	0	0	0	0	0	0	1	2	1	0	3	1	0
11	0	3	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
12	1	2	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0
13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
14	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	12	12	9	17	7	7	6	9	13	12	10	10	15	12	13	23	4
50.0 %	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	1
80.0 %	3	4	3	3	2	2	2	3	4	3	4	3	3	3	4	4	2
90.0 %	5	6	4	4	4	3	4	4	6	4	6	5	4	5	6	5	3
97.0 %	10	12	9	17	7	7	6	9	13	12	9	10	12	9	10	21	4
99.9 %	12	12	9	17	7	7	6	9	13	12	10	10	15	12	13	23	4

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE XVI

CECO ZION NUCLEAR POWER STATION

WIND DIRECTION PERSISTENCE 250 FT LEVEL (22.5 DEG SECTORS)

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3690 OF 7019 VALID OBSERVATIONS

PERSISTENCE (HOURS)	DIRECTION																
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
1	59	49	39	30	40	33	35	45	31	29	57	71	57	68	71	53	10
2	24	21	17	19	6	10	9	10	12	13	20	28	38	34	20	26	4
3	5	19	20	7	4	2	5	14	8	3	13	11	14	7	17	13	1
4	6	6	2	6	4	1	7	6	4	4	6	8	14	5	13	9	1
5	3	8	1	2	1	0	2	2	0	2	6	9	4	7	6	7	0
6	3	4	2	2	0	0	0	0	0	1	2	2	6	4	7	3	0
7	0	2	2	1	1	1	1	0	2	0	4	0	2	2	3	0	0
8	0	3	4	0	1	0	0	1	2	0	3	2	2	4	2	1	0
9	0	0	0	0	0	0	0	2	0	0	3	1	2	5	0	0	0
10	0	1	0	0	0	0	0	1	1	0	1	1	1	0	3	0	0
11	0	1	0	0	0	0	0	0	0	2	0	0	2	0	1	0	0
12	0	2	0	0	0	0	0	0	0	1	0	0	3	0	1	0	0
13	0	1	0	0	0	0	0	0	2	0	1	0	1	0	0	0	0
14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
26 - 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	6	14	8	17	8	7	7	10	13	12	13	10	19	9	12	21	4
50.0 %	1	2	2	2	1	1	1	1	1	1	2	1	2	1	2	2	1
60.0 %	2	4	3	3	2	2	3	3	3	3	4	3	4	3	4	4	2
90.0 %	4	6	5	4	4	2	4	4	7	5	7	5	6	6	6	5	3
99.0 %	6	13	8	17	8	7	7	10	13	12	10	9	13	9	11	21	4
99.9 %	6	14	8	17	8	7	7	10	13	12	13	10	19	9	12	21	4

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND WIND DIRECTION

TABLE XVIII

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7648 OF 7648 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH) CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	66	242	336	303	132	42	13	1	0	0
2	30	75	173	163	77	18	1	0	0	0
3	13	39	93	103	47	17	1	0	0	0
4	6	20	71	67	37	8	3	0	0	0
5	1	10	48	37	18	2	1	0	0	0
6	2	8	42	30	16	1	0	0	0	0
7	1	0	21	28	13	3	0	0	0	0
8	0	1	15	18	6	0	0	0	0	0
9	0	2	9	14	4	2	1	0	0	0
10	0	0	13	10	1	0	0	0	0	0
11	0	1	12	7	2	0	0	0	0	0
12	0	1	5	3	6	1	0	0	0	0
13	0	0	4	7	1	1	0	0	0	0
14	0	0	4	4	4	1	0	0	0	0
15	0	0	3	3	2	0	0	0	0	0
16	0	0	4	0	1	0	0	0	0	0
17	0	0	1	2	2	1	0	0	0	0
18	0	0	1	0	0	0	0	0	0	0
19	0	0	0	1	1	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	3	0	2	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	1	0	1	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	7	12	38	19	39	17	9	1	0	0
50.0 %	1	1	2	2	2	2	1	1	0	0
80.0 %	2	2	5	5	5	4	4	1	0	0
90.0 %	3	4	7	7	7	6	4	1	0	0
99.0 %	6	8	16	14	19	17	9	1	0	0
99.9 %	7	12	38	19	39	17	9	1	0	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XVIII

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7921 OF 7921 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH) CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	34	100	228	373	335	189	69	21	1	0
2	8	37	119	172	166	94	33	6	0	0
3	3	9	56	100	113	56	23	2	0	0
4	1	4	29	65	65	25	9	2	0	0
5	1	1	16	48	44	17	11	2	0	0
6	0	2	7	28	42	17	3	2	0	0
7	0	0	6	24	27	3	1	1	0	0
8	0	0	3	17	13	5	3	0	1	0
9	0	1	1	11	16	3	0	0	0	0
10	0	0	1	9	14	0	0	1	0	0
11	0	0	0	9	4	5	0	0	0	0
12	0	0	0	1	5	1	1	0	0	0
13	0	0	0	7	2	0	0	0	0	0
14	0	0	0	4	1	2	0	0	0	0
15	0	0	0	2	3	0	0	0	0	0
16	0	0	0	5	1	2	0	1	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	1	2	0	0	0	0	0
19	0	0	1	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	2	0	0	0	0	0	0
26 - 30	0	0	0	0	0	1	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	5	9	19	21	18	26	12	16	8	0
50.0 %	1	1	2	2	2	2	2	1	1	0
80.0 %	2	2	3	4	5	3	3	4	8	0
90.0 %	3	3	4	7	7	5	5	6	8	0
99.0 %	5	6	8	15	13	14	8	16	8	0
99.9 %	5	9	19	21	18	26	12	16	8	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XVIII

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 7596 OF 7596 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH) CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	23	71	189	283	301	195	71	21	0	1
2	9	34	90	181	156	110	37	4	1	0
3	3	10	52	106	105	60	22	1	0	0
4	1	6	19	43	70	37	12	2	0	0
5	0	4	13	42	55	21	11	1	0	0
6	1	1	12	25	35	9	5	0	0	0
7	0	0	3	14	24	16	2	2	1	0
8	0	0	2	14	17	2	0	2	0	0
9	0	0	2	10	21	6	2	1	0	0
10	0	0	2	11	6	3	1	0	0	0
11	0	0	2	5	6	4	0	0	0	0
12	0	0	0	2	4	2	0	0	0	0
13	0	0	0	2	6	2	0	0	0	0
14	0	0	0	2	3	1	1	0	0	0
15	0	0	0	3	5	0	0	0	0	0
16	0	0	0	1	0	0	0	0	0	0
17	0	0	0	2	1	0	0	0	0	0
18	0	0	0	0	2	0	0	0	0	0
19	0	0	0	0	1	0	0	0	0	0
20	0	0	0	0	1	0	0	0	0	0
21 - 25	0	0	0	0	0	1	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	6	6	11	17	20	21	14	9	7	1
50.0 %	1	1	2	2	2	2	2	1	2	1
80.0 %	2	2	3	4	5	4	4	4	7	1
90.0 %	3	3	4	6	7	5	5	7	7	1
99.0 %	6	5	10	14	15	12	10	9	7	1
99.9 %	6	6	11	17	20	21	14	9	7	1

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION
ND SPEED CLASS

TABLE XIX

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 976 OF 7342 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	26	96	123	60	9	2	0	0	0	0
2	12	27	48	19	3	0	0	0	0	0
3	2	12	31	5	2	0	0	0	0	0
4	2	6	10	1	0	0	0	0	0	0
5	0	3	9	0	0	0	0	0	0	0
6	0	2	3	1	0	0	0	0	0	0
7	1	0	5	0	0	0	0	0	0	0
8	0	0	1	0	0	0	0	0	0	0
9	0	0	2	0	0	0	0	0	0	0
10	0	0	1	0	0	0	0	0	0	0
11	0	0	1	0	0	0	0	0	0	0
12	0	0	1	0	0	0	0	0	0	0
13	0	0	1	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	7	6	13	6	3	1	0	0	0	0
50.0 %	1	1	1	1	1	1	0	0	0	0
80.0 %	2	2	3	2	2	1	0	0	0	0
90.0 %	3	3	5	2	3	1	0	0	0	0
95.0 %	7	6	11	6	3	1	0	0	0	0
99.9 %	7	6	13	6	3	1	0	0	0	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XIX

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 975 OF 7395 VALID OBSERVATIONS

ISTENCE	WIND SPEED (MPH)									
OURS)	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	8	25	77	119	88	16	2	0	0	0
2	0	14	21	37	30	9	2	0	0	0
3	0	2	8	24	14	0	1	0	0	0
4	0	0	5	9	10	0	0	0	0	0
5	0	1	2	10	4	0	0	0	0	0
6	0	0	0	4	1	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	1	0	0	0	0	0	0
9	0	0	1	3	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	1	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
- 25	0	0	0	0	0	0	0	0	0	0
- 30	0	0	0	0	0	0	0	0	0	0
- 35	0	0	0	0	0	0	0	0	0	0
- 40	0	0	0	0	0	0	0	0	0	0
- 48	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0
IMUM SISTENCE OURS)	1	5	9	12	6	2	3	0	0	0
.0 %	1	1	1	1	1	1	2	0	0	0
.0 %	1	2	2	3	2	2	2	0	0	0
.0 %	1	2	3	4	4	2	3	0	0	0
0 %	1	5	5	9	5	2	3	0	0	0
9 %	1	5	9	12	6	2	3	0	0	0

E ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION
SPEED CLASS

TABLE XIX

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 894 OF 7124 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH) CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	3	19	47	89	79	33	6	0	0	0
2	1	7	12	31	41	11	2	0	0	0
3	1	3	10	16	24	7	2	0	0	0
4	0	0	5	5	8	3	0	0	0	0
5	0	0	1	6	2	1	0	0	0	0
6	0	0	2	1	1	1	0	0	0	0
7	0	0	0	0	1	1	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	1	1	0	0	0	0	0
10	0	0	0	1	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	3	3	6	10	13	7	3	0	0	0
50.0 %	1	1	1	1	1	1	1	0	0	0
80.0 %	2	2	3	2	3	3	2	0	0	0
90.0 %	3	3	4	3	3	4	3	0	0	0
99.0 %	3	3	6	9	9	7	3	0	0	0
99.9 %	3	3	6	10	13	7	3	0	0	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XX

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1231 OF 7342 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	23	89	225	118	32	1	1	0	0	0
2	8	16	55	41	5	1	0	0	0	0
3	1	8	32	12	0	0	0	0	0	0
4	1	1	15	6	0	0	0	0	0	0
5	0	1	5	4	1	0	0	0	0	0
6	0	1	4	6	0	0	0	0	0	0
7	0	0	1	3	0	0	0	0	0	0
8	0	0	0	2	0	0	0	0	0	0
9	0	0	2	0	1	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	1	0	1	0	0	0	0	0	0
12	0	0	1	0	0	0	0	0	0	0
13	0	0	1	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	4	11	13	11	9	2	1	0	0	0
50.0 %	1	1	1	1	1	1	1	0	0	0
80.0 %	2	2	2	2	1	2	1	0	0	0
90.0 %	2	3	3	4	2	2	1	0	0	0
99.0 %	4	6	9	8	9	2	1	0	0	0
99.9 %	4	11	13	11	9	2	1	0	0	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XX

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1215 OF 7395 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	5	30	89	184	150	34	7	2	0	0
2	0	6	30	59	38	8	2	0	0	0
3	1	3	6	17	27	3	0	0	0	0
4	0	1	0	5	9	0	0	0	0	0
5	0	0	0	5	7	1	0	0	0	0
6	0	0	0	2	3	2	0	0	0	0
7	0	0	0	1	4	0	0	0	0	0
8	0	0	0	1	2	0	0	0	0	0
9	0	0	0	0	1	1	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	1	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	3	4	3	13	9	9	2	1	0	0
50.0 %	1	1	1	1	1	1	1	1	0	0
80.0 %	1	2	2	2	3	2	2	1	0	0
90.0 %	3	2	2	3	4	3	2	1	0	0
99.0 %	3	4	3	7	8	9	2	1	0	0
99.9 %	3	4	3	13	9	9	2	1	0	0

ABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XX

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1152 OF 7124 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	6	19	67	154	143	49	17	4	0	0
2	2	4	21	39	50	25	6	0	0	0
3	0	0	4	6	26	9	0	0	0	0
4	0	0	0	5	6	3	0	0	0	0
5	1	1	0	4	11	2	0	0	0	0
6	0	0	1	1	4	0	0	0	0	0
7	0	0	0	0	1	0	0	0	0	0
8	0	0	0	1	2	0	0	0	0	0
9	0	0	0	0	1	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	1	0	0	0	0
12	0	0	0	0	1	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	1	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	5	5	6	9	14	11	2	1	0	0
50.0 %	1	1	1	1	1	1	1	1	0	0
80.0 %	2	2	2	2	3	2	2	1	0	0
90.0 %	5	2	2	2	4	3	2	1	0	0
99.0 %	5	5	6	5	9	11	2	1	0	0
99.9 %	5	5	6	9	14	11	2	1	0	0

ABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XXI

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1404 OF 7342 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH) CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	18	78	211	179	73	16	3	0	0	0
2	4	16	62	36	19	4	0	0	0	0
3	2	2	23	22	14	2	0	0	0	0
4	0	0	9	10	2	0	0	0	0	0
5	0	2	5	3	3	0	0	0	0	0
6	0	1	1	6	2	0	0	0	0	0
7	0	0	1	1	2	0	0	0	0	0
8	0	0	0	2	1	0	0	0	0	0
9	0	0	0	0	1	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	1	0	0	0	0	0	0
12	0	0	0	2	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0
14	0	0	1	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	1	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	3	6	14	12	17	3	1	0	0	0
50.0 %	1	1	1	1	1	1	1	0	0	0
80.0 %	2	2	2	2	3	2	1	0	0	0
90.0 %	2	2	3	3	4	2	1	0	0	0
99.0 %	3	6	5	11	13	3	1	0	0	0
99.9 %	3	6	14	12	17	3	1	0	0	0

ABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XXI

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1434 OF 7395 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	4	24	96	215	167	85	23	8	0	0
2	3	6	24	44	51	21	5	1	0	0
3	1	1	5	19	17	6	3	0	0	0
4	0	0	1	13	15	6	0	0	0	0
5	0	0	2	4	5	5	1	0	0	0
6	0	0	1	2	5	3	1	0	0	0
7	0	0	0	1	0	2	0	0	0	0
8	0	0	0	0	0	1	0	0	0	0
9	0	0	0	0	1	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	1	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
- 25	0	0	0	0	0	0	0	0	0	0
- 30	0	0	0	0	0	0	0	0	0	0
- 35	0	0	0	0	0	0	0	0	0	0
- 40	0	0	0	0	0	0	0	0	0	0
- 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	3	3	6	11	9	8	6	2	0	0
90.0 %	1	1	1	1	1	1	1	1	0	0
80.0 %	2	2	2	2	2	2	2	1	0	0
70.0 %	3	2	2	3	3	4	3	2	0	0
50.0 %	3	3	5	6	6	7	6	2	0	0
10.0 %	3	3	6	11	9	8	6	2	0	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION IN SPEED CLASS

TABLE XXI

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1382 OF 7124 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	2	17	67	153	183	93	25	3	0	0
2	1	5	17	51	59	19	6	2	0	0
3	0	3	7	15	20	12	2	0	0	0
4	0	1	3	6	12	5	0	1	0	0
5	0	0	3	5	9	3	1	0	0	0
6	0	0	1	2	2	1	1	0	0	0
7	0	0	0	0	0	2	0	0	0	0
8	0	0	0	1	1	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	1	0	2	0	0	0	0	0
11	0	0	0	0	0	1	0	0	0	0
12	0	0	0	0	1	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	2	4	10	8	12	11	6	4	0	0
50.0 %	1	1	1	1	1	1	1	1	0	0
80.0 %	2	2	2	2	2	2	2	2	0	0
90.0 %	2	3	3	3	3	3	3	4	0	0
99.0 %	2	4	10	6	10	7	6	4	0	0
99.9 %	2	4	10	8	12	11	6	4	0	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XXII

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3731 OF 7342 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	14	76	191	184	117	29	8	1	0	0
2	6	22	99	112	44	14	1	0	0	0
3	2	12	33	63	37	16	2	0	0	0
4	2	2	24	37	26	7	2	0	0	0
5	0	1	16	20	16	2	1	0	0	0
6	1	1	8	16	17	2	0	0	0	0
7	0	0	7	19	9	2	0	0	0	0
8	0	0	3	8	7	0	0	0	0	0
9	0	0	5	5	3	2	1	0	0	0
10	0	0	2	6	0	0	0	0	0	0
11	0	0	1	4	1	0	0	0	0	0
12	0	0	1	3	2	1	0	0	0	0
13	0	0	2	1	0	1	0	0	0	0
14	0	0	1	2	3	0	0	0	0	0
15	0	0	0	1	1	0	0	0	0	0
16	0	0	2	0	0	0	0	0	0	0
17	0	0	0	0	2	1	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	1	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	1	0	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	6	6	16	15	25	17	9	1	0	0
50.0 %	1	1	2	2	2	2	1	1	0	0
80.0 %	2	2	3	4	5	4	4	1	0	0
90.0 %	4	3	5	7	7	6	5	1	0	0
99.0 %	6	5	13	12	17	17	9	1	0	0
99.9 %	6	6	16	15	25	17	9	1	0	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XXII

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3771 OF 7395 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	11	37	100	198	219	134	49	14	1	0
2	5	7	42	93	99	55	26	6	0	0
3	1	4	23	42	58	36	17	3	0	0
4	1	1	10	29	23	18	6	3	0	0
5	0	0	8	20	20	11	7	2	0	0
6	0	0	2	11	11	11	2	1	0	0
7	0	0	2	12	13	1	0	1	0	0
8	0	0	2	7	5	2	3	0	1	0
9	0	0	1	5	10	3	0	0	0	0
10	0	0	0	0	5	0	0	0	0	0
11	0	0	0	2	3	1	0	0	0	0
12	0	0	0	1	0	1	1	0	0	0
13	0	0	0	1	1	1	0	0	0	0
14	0	0	0	1	0	1	0	0	0	0
15	0	0	1	0	0	0	0	0	0	0
16	0	0	0	2	1	0	0	1	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0
26 - 30	0	0	0	0	0	1	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	4	4	15	16	16	26	12	16	8	0
50.0 %	1	1	1	2	2	2	2	2	1	0
80.0 %	2	2	3	4	3	3	3	4	8	0
90.0 %	3	3	4	5	6	5	5	5	8	0
99.0 %	4	4	9	12	11	13	8	16	8	0
99.9 %	4	4	15	16	16	26	12	16	8	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION AND SPEED CLASS

TABLE XXII

CECO ZION NUCLEAR POWER STATION

WIND SPEED PERSISTENCE 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3696 OF 7124 VALID OBSERVATIONS

PERSISTENCE (HOURS)	WIND SPEED (MPH)									
	CALM	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46
1	10	39	103	169	183	119	46	13	0	0
2	4	10	50	98	84	64	26	5	0	0
3	1	4	18	49	49	38	11	2	0	0
4	1	3	4	25	34	15	5	2	0	0
5	0	2	5	23	27	11	10	1	0	0
6	0	0	2	7	12	8	3	0	0	0
7	0	0	3	6	12	7	1	1	1	0
8	0	0	2	5	3	2	0	1	0	0
9	0	0	0	5	11	3	2	1	0	0
10	0	0	0	5	4	2	1	0	0	0
11	0	0	1	0	2	0	0	0	0	0
12	0	0	0	0	1	1	0	0	0	0
13	0	0	0	1	1	0	0	0	0	0
14	0	0	0	1	1	0	1	0	0	0
15	0	0	0	1	1	0	0	0	0	0
16	0	0	0	1	0	0	0	0	0	0
17	0	0	0	1	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	1	0	0	0	0
26 - 30	0	0	0	0	0	0	0	0	0	0
31 - 35	0	0	0	0	0	0	0	0	0	0
36 - 40	0	0	0	0	0	0	0	0	0	0
41 - 48	0	0	0	0	0	0	0	0	0	0
> 48	0	0	0	0	0	0	0	0	0	0
MAXIMUM PERSISTENCE (HOURS)	4	5	11	17	15	21	14	9	7	0
50.0 %	1	1	1	2	2	2	2	1	7	0
80.0 %	2	2	2	4	4	3	4	4	7	0
90.0 %	3	3	3	5	6	5	5	7	7	0
99.0 %	4	5	8	13	11	10	10	9	7	0
99.9 %	4	5	11	17	15	21	14	9	7	0

TABLE ENTRIES ARE THE OCCURRENCES THE WIND PERSISTED FOR A SPECIFIC DURATION
ND SPEED CLASS

TABLE XXIII

CECO ZION NUCLEAR POWER STATION

STABILITY PERSISTENCE

MAY,1971-APR,1972

SAMPLE TOTAL IS 8134

PERSISTENCE (HOURS)	STABILITY CLASS			
	VERY STABLE	MODERATELY STABLE	NEUTRAL	UNSTABLE
1	88	282	324	110
2	45	100	146	57
3	34	60	53	39
4	19	30	37	23
5	23	22	19	18
6	16	9	11	22
7	5	11	5	23
8	8	5	8	21
9	10	6	4	16
10	11	2	3	16
11	4	5	8	17
12	5	3	3	13
13	3	3	1	9
14	1	2	2	4
15	3	C	3	1
16	0	0	1	3
17	0	0	3	3
18	0	0	2	4
19	1	0	0	2
20	0	C	C	3
21 - 25	0	1	0	10
26 - 30	0	0	0	8
31 - 35	0	0	1	0
36 - 40	0	C	0	3
41 - 48	0	1	0	1
> 48	0	C	C	17
MAXIMUM PERSISTENCE (HOURS)	19	41	34	149
50.0 %	3	1	1	4
80.0 %	6	3	3	11
90.0 %	10	5	5	18
99.0 %	15	13	16	104
99.9 %	19	41	34	149

TABLE ENTRIES ARE THE OCCURRENCES THE STABILITY CLASS PERSISTED FOR A SPECIFIC DURATION

TABLE XXIV

CECO ZION NUCLEAR POWER STATION

HOURLY STABILITY CLASS

MAY,1971-APR,1972

SAMPLE TOTAL IS 8134

HOUR (CST)	STABILITY CLASS			
	VERY STABLE	MODERATELY STABLE	NEUTRAL	UNSTABLE
0	23.2	22.1	24.7	30.0
1	22.0	22.9	24.3	30.8
2	22.0	22.9	24.3	30.8
3	23.2	20.9	24.1	31.8
4	22.7	21.8	22.4	33.0
5	21.2	23.0	21.8	33.9
6	15.5	22.6	22.3	39.6
7	10.9	15.8	20.5	52.8
8	4 4	8.8	19.7	67.1
9	4.1	7.7	13.0	75.1
10	2.1	8.1	11.9	77.9
11	3.6	5.1	11.6	79.8
12	3.6	9.3	11.9	75.2
13	6.0	6.9	9.6	77.5
14	7.6	8.2	12.1	72.2
15	6.3	10.1	13.4	70.1
16	8 4	10.1	21.8	59.7
17	10.5	15.5	18.4	55.6
18	11.7	18.5	20.5	49.3
19	13.8	18.2	27.6	40.5
20	15.0	24.6	25.5	34.9
21	19.0	24.5	24.5	32.1
22	20.6	27.6	21.8	29.9
23	22.2	24.9	21.9	31.0
LUMN TOTALS	1087	1360	1596	4091

BLE ENTRY IS FREQUENCY (PERCENT OF ROW TOTAL) WITH WHICH A PARTICULAR
ABILITY CLASS OCCURRED ON A PARTICULAR HOUR OF THE DAY

LUMN TOTAL IS DAILY DISTRIBUTION OF STABILITY CLASSES REGARDLESS OF TIME
DAY

TABLE XXV

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 6559 OF 6559 VALID OBSERVATIONS

SIGMA SUB	WIND SPEED									ROW
THETA	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	TOTAL
0-1	0.91	0.87	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.80
2-3	1.40	4.25	0.06	0.05	0.00	0.00	0.00	0.00	0.00	5.76
4-7	1.11	7.93	4.09	1.13	0.23	0.14	0.00	0.00	0.00	14.62
8-12	0.91	15.15	18.95	8.80	1.65	0.27	0.00	0.00	0.00	45.74
13-17	0.21	5.99	11.14	8.69	2.20	0.24	0.02	0.00	0.00	28.50
18-22	0.08	0.78	1.74	0.72	0.02	0.00	0.00	0.00	0.00	3.32
> 22	0.00	0.12	0.11	0.03	0.00	0.00	0.00	0.00	0.00	0.26
										100.00

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

.ABLE XXV

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 6953 OF 6953 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.32	1.14	1.28	0.40	0.04	0.00	0.00	0.00	0.00	3.18
2-3	0.22	2.66	7.91	4.13	0.78	0.27	0.06	0.00	0.00	16.02
4-7	0.17	2.99	13.97	15.81	6.08	1.31	0.56	0.01	0.00	40.90
8-12	0.13	2.24	8.77	13.23	7.75	3.02	0.66	0.12	0.00	35.93
13-17	0.07	0.37	1.16	1.50	0.30	0.22	0.00	0.00	0.00	3.62
18-22	0.00	0.04	0.16	0.03	0.00	0.00	0.00	0.00	0.00	0.23
> 22	0.00	0.03	0.03	0.06	0.00	0.00	0.00	0.00	0.00	0.12
										100.00

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXV

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: ALL OBSERVATIONS

SAMPLE TOTAL IS 6839 OF 6839 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.15	0.56	1.70	1.89	0.44	0.19	0.03	0.00	0.00	4.94
2-3	0.26	1.86	6.24	8.26	3.00	0.77	0.22	0.01	0.00	20.63
4-7	0.32	3.49	11.45	16.64	8.63	2.32	0.63	0.00	0.00	43.49
8-12	0.38	2.68	8.20	9.05	5.35	2.24	0.32	0.10	0.00	28.32
13-17	0.06	0.57	0.79	0.60	0.16	0.04	0.00	0.00	0.00	2.22
18-22	0.04	0.06	0.07	0.06	0.01	0.00	0.00	0.00	0.00	0.25
> 22	0.00	0.06	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.15
										100.00

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXVI

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 662 OF 6140 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.49	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11
2-3	0.49	1.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.39
4-7	0.41	1.76	0.28	0.05	0.00	0.00	0.00	0.00	0.00	2.49
8-12	0.18	1.76	0.80	0.20	0.03	0.00	0.00	0.00	0.00	2.96
13-17	0.05	0.86	0.55	0.07	0.00	0.00	0.00	0.00	0.00	1.53
18-22	0.02	0.08	0.11	0.03	0.00	0.00	0.00	0.00	0.00	0.24
> 22	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.05
										10.78

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXVI

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 746 OF 6448 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.08	0.34	0.60	0.19	0.02	0.00	0.00	0.00	0.00	1.23
2-3	0.09	0.47	2.84	1.05	0.08	0.02	0.00	0.00	0.00	4.54
4-7	0.05	0.40	1.23	1.35	0.17	0.02	0.00	0.00	0.00	3.21
8-12	0.02	0.19	0.65	0.92	0.19	0.05	0.00	0.00	0.00	2.00
13-17	0.02	0.08	0.16	0.14	0.03	0.05	0.00	0.00	0.00	0.47
18-22	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.08
> 22	0.00	0.02	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.05
										11.57

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXVI

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: VERY STABLE

SAMPLE TOTAL IS 717 OF 6367 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.02	0.14	0.69	0.94	0.20	0.06	0.00	0.00	0.00	2.06
2-3	0.05	0.60	1.73	2.07	0.77	0.05	0.00	0.00	0.00	5.26
4-7	0.03	0.36	0.80	0.83	0.36	0.08	0.00	0.00	0.00	2.47
8-12	0.02	0.24	0.30	0.31	0.19	0.05	0.00	0.00	0.00	1.10
13-17	0.00	0.11	0.11	0.03	0.02	0.00	0.00	0.00	0.00	0.27
18-22	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.05
> 22	0.00	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.06
										11.26

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXVII

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 983 OF 6140 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.20	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
2-3	0.28	1.29	0.05	0.00	0.00	0.00	0.00	0.00	0.00	1.61
4-7	0.29	2.33	0.89	0.02	0.00	0.00	0.00	0.00	0.00	3.52
8-12	0.28	3.08	3.03	0.47	0.00	0.00	0.00	0.00	0.00	6.86
13-17	0.03	1.27	1.42	0.36	0.05	0.02	0.00	0.00	0.00	3.14
18-22	0.02	0.11	0.29	0.02	0.00	0.00	0.00	0.00	0.00	0.44
> 22	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03
										16.01

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXVII

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 1030 OF 6448 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
1	0.09	0.26	0.36	0.12	0.00	0.00	0.00	0.00	0.00	0.84
3	0.03	0.54	2.00	1.52	0.11	0.00	0.00	0.00	0.00	4.20
7	0.03	0.45	2.25	3.21	0.76	0.05	0.00	0.00	0.00	6.75
12	0.03	0.39	1.29	1.55	0.40	0.08	0.03	0.00	0.00	3.77
17	0.00	0.09	0.09	0.17	0.00	0.00	0.00	0.00	0.00	0.36
22	0.00	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.05
22	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02
										15.97

B E ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS
D SIGMA SUB THETA CLASS

TABLE XXVII

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: MODERATELY STABLE

SAMPLE TOTAL IS 992 OF 6367 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.03	0.22	0.41	0.49	0.08	0.03	0.00	0.00	0.00	1.26
2-3	0.09	0.47	1.52	2.84	0.83	0.13	0.00	0.00	0.00	5.89
4-7	0.06	0.44	1.63	2.98	1.26	0.22	0.05	0.00	0.00	6.64
8-12	0.02	0.20	0.42	0.71	0.14	0.02	0.02	0.00	0.00	1.52
13-17	0.00	0.05	0.03	0.06	0.02	0.02	0.00	0.00	0.00	0.17
18-22	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.03
> 22	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.06
										15.58

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXVIII

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1175 OF 6140 VALID OBSERVATIONS

WIND SPEED

4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL	. 46	ROW TOTAL
0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	).00	0.48
0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	).00	3.49
1.64	1.11	0.31	0.07	0.00	0.00	0.00	0.00	3.31	).00	8.41
3.06	3.71	1.61	0.13	0.02	0.00	0.00	0.00	8.68	).00	6.58
0.99	2.20	1.95	0.29	0.03	0.00	0.00	0.00	5.49	).00	0.57
0.11	0.28	0.15	0.00	0.00	0.00	0.00	0.00	0.54	).00	0.00
0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03	).00	0.00
								19.14		19.53

IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS ASS
3 THETA CLASS

TABLE XXVIII

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: NEUTRAL

SAMPLE TOTAL IS 1241 OF 6367 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.05	0.06	0.17	0.13	0.03	0.02	0.00	0.00	0.00	0.46
2-3	0.05	0.53	1.48	1.44	0.49	0.09	0.02	0.00	0.00	4.10
4-7	0.06	0.93	2.29	4.44	2.04	0.38	0.11	0.00	0.00	10.26
8-12	0.02	0.28	1.10	1.46	0.99	0.28	0.05	0.00	0.00	4.18
13-17	0.02	0.03	0.19	0.11	0.03	0.00	0.00	0.00	0.00	0.42
18-22	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.08
> 22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										19.49

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXIX

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 35 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3320 OF 6140 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
2-3	0.28	0.29	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.64
4-7	0.24	2.38	1.81	0.80	0.16	0.15	0.00	0.00	0.00	5.54
8-12	0.33	7.21	11.78	6.79	1.53	0.24	0.00	0.00	0.00	27.88
13-17	0.13	2.49	6.79	6.61	1.97	0.21	0.02	0.00	0.00	18.22
18-22	0.03	0.36	0.80	0.42	0.02	0.00	0.00	0.00	0.00	1.63
> 22	0.00	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.13
										54.07

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXIX

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 125 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3413 OF 6448 VALID OBSERVATIONS

SIGMA SUB THETA	WIND SPEED 1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	ROW TOTAL
0-1	0.11	0.36	0.08	0.03	0.03	0.00	0.00	0.00	0.00	0.60
2-3	0.08	1.12	1.32	0.78	0.26	0.19	0.06	0.00	0.00	3.80
4-7	0.08	1.57	7.71	7.66	3.99	1.15	0.53	0.02	0.00	22.69
8-12	0.08	1.33	5.27	8.30	5.57	2.39	0.59	0.12	0.00	23.65
13-17	0.00	0.22	0.65	0.78	0.23	0.12	0.00	0.00	0.00	2.00
18-22	0.00	0.02	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.12
> 22	0.00	0.02	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.06
										52.93

TABLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS AND SIGMA SUB THETA CLASS

TABLE XXIX

CECO ZION NUCLEAR POWER STATION

SIGMA SUB THETA 250 FT LEVEL

MAY,1971-APR,1972

CONDITIONS: UNSTABLE

SAMPLE TOTAL IS 3417 OF 6367 VALID OBSERVATIONS

GMA / UB	WIND SPEED									ROW
ETA	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	> 46	TOTAL
1	0.00	0.05	0.20	0.14	0.11	0.08	0.02	0.00	0.00	0.60
3	0.08	0.24	1.43	1.74	0.85	0.50	0.20	0.00	0.00	5.04
7	0.17	1.93	6.74	8.47	5.04	1.51	0.50	0.00	0.00	24.36
12	0.36	2.04	6.53	6.69	4.19	1.96	0.28	0.11	0.00	22.18
17	0.05	0.33	0.49	0.41	0.08	0.00	0.00	0.00	0.00	1.35
22	0.03	0.05	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.11
22	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03
										53.67

\BLE ENTRY IS FREQUENCY THAT WIND OCCUPIED A PARTICULAR SPEED CLASS
ID SIGMA SUB THETA CLASS

The data presented in Appendix 2C is based on the following criteria:

1. The Δt interval used was between the 250 foot and 35 foot elevations.

2. The stability classifications are defined as:

Very stable	$\Delta t < 1.8°F$
Moderately stable	$-0.6°F < \Delta t < 1.8°F$
Neutral	$-1.8°F < \Delta t < -0.6°F$
Unstable	$\Delta t < -1.8°F$

The highest average X/Q at 400 meters for the one year site data occurred in the north direction. The value was 3.1×10^{-6} sec/m^3.

For the **Fuel Handling** accident analysis, a X/Q of **3.7×10^{-3}** sec/m^3 was used. This value is listed in **Table 5-3**.

Reference List - Chapter 2

Z1 - Ltr to E.G. Case from C. Reed 12/18/77 "The Environmental Impact Assessment of Occasional Temperature Excursions above 20°F Intake - Discharge Temperature Differential and a 55°F Discharge Temperature During Ice Melt at Zion Station."

Z1 - M22-1(2)-80-06

3. DESIGN BASIS

3.1 CONFORMANCE WITH NRC GENERAL DESIGN CRITERIA

The general design criteria followed in the design of the Zion Station were developed as performance criteria which define or describe safety objectives and procedures. Along with these performance criteria, the Zion Station was designed to comply with the applicant's understanding of the intent of the Atomic Energy Commission's (AEC) proposed General Design Criteria, as published for comment by the AEC in July 1967. The Zion construction permit, which fixed many of the safety-related design criteria, was issued in December 1968. The Zion FSAR, which presented the detailed design of the plant, was filed in December 1970. Subsequent to this filing, the AEC's final General Design Criteria were published as Appendix A to 10 CFR 50 in July 1971. The AEC requested Commonwealth Edison Company to demonstrate that the Zion Station design complies with each of the final General Design Criteria published as Appendix A to 10 CFR 50 (July 1971). The response to this request was supplied as an informative comparison but is not included here.

The performance criteria used in the design of Zion Station that remain applicable in the defueled condition with spent fuel relocated to an onsite ISFSI are specifically addressed in the DSAR where they are pertinent. There, the performance criteria are quoted and are followed by a brief summary of the design or procedures. The design or procedures are then more fully described in later sections of the chapter.

Compliance with Commonwealth Edison's understanding of the intent of the AEC's proposed General Design Criteria, as published in July 1967, that remain applicable in the defueled condition with spent fuel relocated to an onsite ISFSI are summarized below and described in the following paragraphs. The references cited throughout this section have been updated to correspond to current DSAR chapters and sections.

	CRITERIA	1967 NUMBER
I.	OVERALL PLANT REQUIREMENTS	
	Record Requirements	5
III.	NUCLEAR AND RADIATION CONTROL	
	Monitoring Radioactive Releases	17
	Monitoring Fuel and Waste Storage	18
VIII.	FUEL AND WASTE STORAGE SYSTEM	
	Prevention of Fuel Storage Criticality	66
	Fuel and Waste Storage Decay Heat	67
	Fuel and Waste Storage Radiation Shielding	68
	Protection Against Radioactivity Release From Spent Fuel and Waste Storage	69
IX.	EFFLUENTS	
	Control of Releases of Radioactivity to the Environment	70

I. OVERALL PLANT REQUIREMENTS

Criterion 5 - Records Requirements

Records of the design, fabrication, and construction of essential components of the plant shall be maintained by the reactor operator or under its control throughout the life of the reactor.

Answer

The applicant intends to maintain, either in its possession or under its control, a complete set of records of the design, fabrication, construction and testing of major Seismic Class I plant components throughout the life of plant. ZS has received partial exemption to the record keeping requirements of 10 CFR 50.71(c); 10 CFR Part 50, Appendix A; 10 CFR Part 50, Appendix B; and 10 CFR 50.59(d)(3). This exemption generally allows for the destruction of historical records during the decommissioning process as the SSCs are removed from the licensing basis and the need for their records is, on a practical basis, eliminated. A quality assurance program has been employed and appropriate records have been and are being maintained in conformance with applicable quality requirements by EGC under agreement with ZS or are under ZS control.

III. NUCLEAR AND RADIATION CONTROLS

Criterion 17 - Monitoring Radioactivity Releases

Means shall be provided for monitoring the containment atmosphere, the facility effluent discharge paths, and the facility environs for radioactivity that could be released from normal operations, from anticipated transients, and from accident conditions.

Answer

The facility contains means for monitoring the containment atmosphere, effluent discharge paths, and the facility environs for radioactivity which could be released under any conditions. The details of the effluent discharge monitoring are contained in Chapter 4 while the environmental radiation monitoring system function is described in Chapter 2.
The environmental radiation monitoring system will include the ISFSI.

Criterion 18 - Monitoring Fuel and Waste Storage

Monitoring and alarm instrumentation shall be provided for fuel and waste storage and handling areas for conditions that might contribute to loss of continuity in decay heat removal and to radiation exposures.

Answer

Sufficient monitoring and alarm instrumentation is provided in waste storage and handling areas to detect conditions which might contribute to abnormal radiation releases. Details of the radiation monitoring using the Radiation Protection Program are included in Chapter 4. All spent fuel is stored at the ISFSI as well as GTCC radwaste and monitoring for the passive decay heat removal system at the ISFSI is performed as described in the 10 CFR Part 72.212 Evaluation Report.

VIII. FUEL AND WASTE STORAGE SYSTEMS

Criterion 66 - Prevention of Fuel Storage Criticality

Criticality in new and spent fuel storage shall be prevented by physical systems or processes. Such means as geometrically safe configurations shall be emphasized over procedural controls.

Answer

Criticality in spent fuel storage at the ISFSI is prevented by the design of the MAGNASTOR Dry Cask Storage System as discussed in the 10 CFR Part 72.212 Evaluation Report.

Criterion 67 - Fuel and Waste Storage Decay Heat

Reliable decay heat removal systems shall be designed to prevent damage to the fuel in storage facilities that could result in radioactivity release to plant operating areas or the public environs.

Answer

All spent fuel is stored at the ISFSI using the MAGNASTOR Dry Cask Storage System which uses passive decay heat removal. The MAGNASTOR System used sealed containers that prevent any radioactive release to the site or environment as discussed in the 10 CFR Part 72.212 Evaluation Report.

Criterion 68 - Fuel and Waste Storage Radiation Shielding

Shielding for radiation protection shall be provided in the design of spent fuel and waste storage facilities as required to meet the requirements of 10 CFR 20.

Answer

Shielding is provided for waste storage areas to lower radiation doses to levels below limits specified in 10 CFR 20. Shielding for these areas and other shielding requirements and criteria are included in Chapter 4. Shielding for spent fuel is provided by the MAGNASTOR Dry Cask Storage System at the ISFSI as discussed in the 10 CFR Part 72.212 Evaluation Report.

Criterion 69 - Protection Against Radioactivity Release From Spent Fuel and Waste Storage

Containment of fuel and waste storage shall be provided if accidents could lead to release of undue amounts of radioactivity to the public environs.

Answer

Waste storage facilities are designed to prevent the release of undue radioactivity to the public. Waste storage facilities are described in Chapter 4 and analysis of potential accidents in these systems is included in Chapter 5. All spent fuel is stored at the ISFSI using the MAGNASTOR Dry Cask Storage System which uses passive decay heat removal. The MAGNASTOR System used sealed containers that prevent any radioactive release to the site or environment as discussed in the 10 CFR Part 72.212 Evaluation Report.

IX. EFFLUENTS

Criterion 70 - Control of Releases of Radioactivity to the Environment

The facility design shall include those means necessary to maintain control over the plant radioactive effluents, whether gaseous, liquid, or solid. Appropriate holdup capacity shall be provided for retention of gaseous, liquid, or solid effluents, particularly where unfavorable environmental conditions can be expected to require operational limitations upon the release of radioactive effluents to the environment. In all cases, the design for radioactivity control shall be justified: (a) on the basis of 10 CFR 20 requirements for normal operations and for any transient situation that might reasonably be anticipated to occur; and (b) on the basis of 10 CFR 100 dosage level guidelines for potential reactor accidents of exceeding low probability of occurrence except that reduction of the recommended dosage levels may be required where high population densities or very large cities can be affected by the radioactive effluents.

Answer

Provision is included in the facility design for storage and processing of radioactive waste and the release of such waste under controls adequate to prevent exceeding the limits of 10 CFR 20. The facility also includes provision to prevent radioactivity releases during accidents from exceeding the limits of 10 CFR 100. A description of the function of the Radioactive Waste Disposal System is included in Chapter 4. The effects of potential accidents are analyzed in Chapter 5.

3.2 CLASSIFICATION OF STRUCTURES, COMPONENTS, AND SYSTEMS

3.2.1 Seismic Classifications

The plant structures and process systems were classified according to their function and their degree of integrity required to protect the public from uncontrolled releases of radioactivity. The single design basis accident still applicable at this stage of decommissioning is the Radioactive Waste Handling Accident. This accident does not rely on any SSCs to protect the public from exceeding the site boundary dose limit. Structures no longer have any design features that are credited in the accident analysis.

Historical information related to seismic accelerations that were originally developed for the power block structures that were used for development of ISFSI structural analyses are retained in Figures 3-1 and 3-2.

3.3 MISSILE PROTECTION

3.3.1 Missiles Generated by Natural Phenomena

3.3.1.1 Criteria and Design

The historical Containment was designed to withstand the force caused by a tornado with a peripheral tangential wind velocity of 300 mph and forward progression of 60 mph. In addition, differential pressure between the inside and the outside of the Containment structure was calculated to be 3 psi. ISFSI Components have been protected against loss of function due to damage by the missiles shown in Table 3-1 which shows design basis missiles for historic seismic Class I structures. The evaluation is described in the 10 CFR Part 72.212 Evaluation Report.

3.4 HEAVY LOADS PROGRAM

The overhead handling of heavy loads at the Zion Nuclear Power Station near and around the spent fuel pool was conducted historically in a safe manner through the use of safe load paths, qualified operators and adequately designed and maintained load handling equipment. These controls as implemented complied with NUREG 0612 “Control of Heavy Loads at Nuclear Power Plants.”

Handling of spent fuel stored at the ISFSI will be addressed on a plant specific basis in accordance with the Certificate Holders requirements if the need for movement of the stored spent fuel TSCs is required for transportation. Movement of the VCC at the ISFSI is described in the 10 CFR Part 72.212 Evaluation Report.

3.5 PLANT SUPPORT SYSTEMS

3.5.1 Service Water System

The Service Water System previously supplied the equipment cooling water for the plant, but now only a portion of the system is used as an option for providing dilution flow to support radioactive liquid waste discharges. Water for the remaining portion of the fire protection system is now supplied by water from the City of Zion versus service water.

3.5.2 Auxiliary Building Ventilation

3.5.2.1 Design Bases

The Auxiliary Building Ventilation system provides a bulk exhaust flow for ease of effluent sampling.

The ODCM and Radiation Protection Procedures provide the requirements for radioactivity sampling, which will be followed to ensure appropriate quantification of effluent releases.

3.5.3 Fire Protection System

A detailed description of the plant's Fire Protection System is contained in the Fire Protection Report.

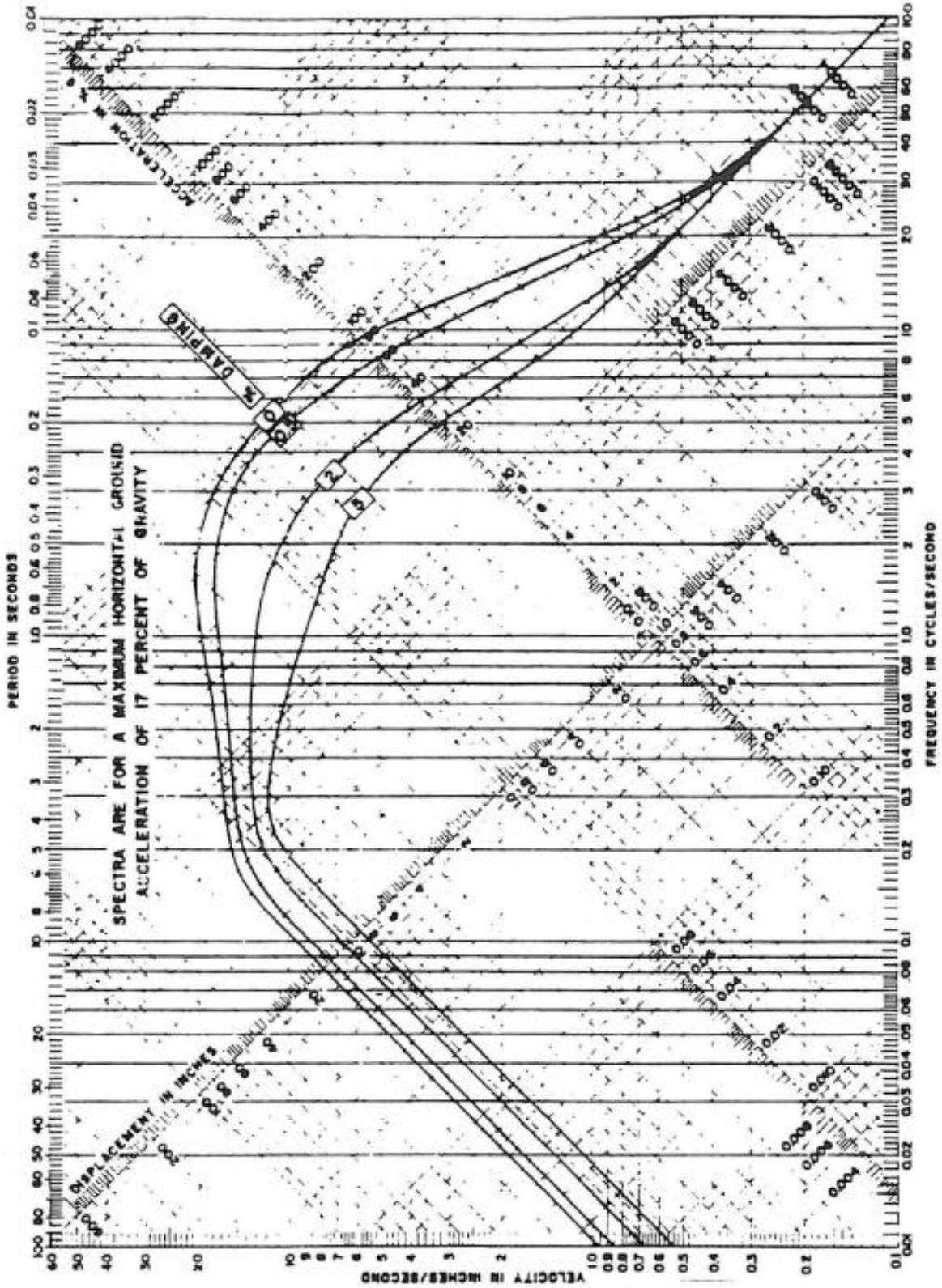
3.5.4 Communications System

Normal and emergency communication systems are described in the DSEP. These systems include those required to contact external emergency management agencies, officials and other government entities, and the general public. The DSEP also described the method to notify personnel onsite of an emergency.

TABLE 3-1

LIST OF MISSILES FOR WHICH SEISMIC CLASS I STRUCTURES HAVE BEEN DESIGNED

Missile	Item	Length (feet)	Weight (lbs)	Speed (mph)	Impact Area (inches)^2
1	8" Diameter wood pole	12	190	225	50.5
2	2 1/2" Diameter sch 40 pipe	8	46	195	6.5
3	6" Diameter sch 40 pipe	6.7	127	225	34.2
4	8" Diameter sch 40 pipe	7.8	224	225	58
5	10" Diameter sch 40 pipe	8.1	385	225	92
6	12" Diameter sch 40 pipe	8.1	500	225	126
7	4 x 12 FIR	12	115	255	8
8	Automobile		4000	255	20 (ft)^2
9	7 x 9 cross tie	8.5	185	255	63
10	Piece of concrete housing plug and drive shaft out of reactor	6"x12"x12"	75	255	72
11	Plug		11	520 (ft/sec)	5.7
	Shaft	300 (inches)	120	250 (ft/sec)	2.4

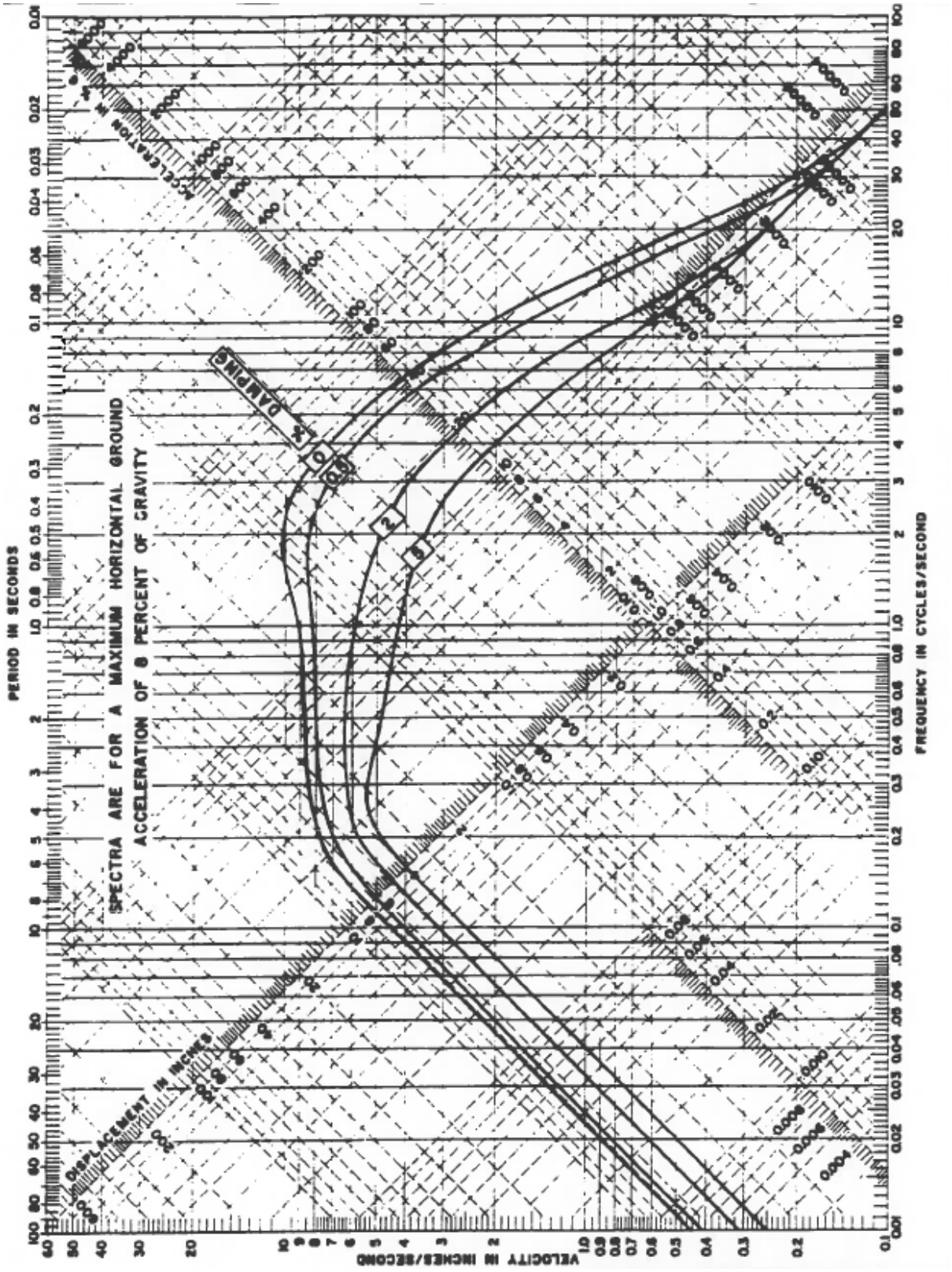


ZION STATION DSAR

Figure 3-1

DESIGN BASIS EARTHQUAKE (DBE) RESPONSE SPECTRA

October 2016



ZION STATION DSAR

Figure 3-2

Operating BASIS EARTHQUAKE (OBE) RESPONSE SPECTRA

October 2016

4. RADIATION PROTECTION

4.1 ENSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE AS LOW AS REASONABLY ACHIEVABLE (ALARA)

Consistent with station modification, maintenance, operational requirements, and economic and social considerations, the policy of ZS is to:

1. Maintain the occupational dose equivalent to the individual As Low as is Reasonably Achievable (ALARA);
2. Maintain the sum of occupational dose equivalents received by all exposed workers ALARA; and
3. Limit the number of workers authorized to receive exposure to radiation.

Regulatory Guide 8.8, Revision 3, Sections C.1, C.3, and C.4 is used as a basis for developing the ALARA and radiation protection programs.

Station management's commitment to this policy is reflected in radiological procedures and programs. The Radiation Protection staff provides the radiological conditions and protective requirements necessary to complete work safely. Each individual's responsibility to adhere to these requirements and the procedures governing their work is key to the success of the program.

4.2 RADIATION SOURCES

The source terms used in the original design and evaluation of Zion Station consists of the types and quantities of radionuclides that are produced in the fuel, primary coolant, and structural materials of the reactor coolant system, and the rate of transfer of these nuclides into other systems for an operating plant. Based on the current state of decommissioning, the number and magnitude of potential radiation sources have been and continue to be reduced substantially from the original design bases source terms. The source terms used in the original plant design are historical information and are not discussed here since they are not applicable. The radiation protection program will continue to monitor appropriate areas and activities to ensure impacts from decommissioning are assessed and license basis requirements are maintained.

4.3 RADIATION PROTECTION DESIGN FEATURES

4.3.1 Shielding

The nuclear radiation shielding was designed to prevent persons from being exposed to radiation in excess of that allowed by 10 CFR 20 and 10 CFR 100. The source terms used in the design of plant shielding are based on full power operations, reactor shutdown, and design basis accidents. During decommissioning, the primary function of permanent and temporary shielding is for filters, resins or other radioactive material needed for personnel protection. Administrative controls will be used to supplement the protection of personnel afforded by shielding.

4.3.1.1 Shielding Description

4.3.1.1.1 Auxiliary Building

Shielding protecting general access areas in the Auxiliary Building is designed to reduce radiation levels to an acceptably low level. General access areas are entered through access control stations and access is controlled through the Radiation Protection Program.

4.3.1.1.2 Fuel Handling Building

Concrete shielding is provided in the Fuel Handling Building.

4.3.1.1.3 Containment Buildings

The Containment Buildings provide shielding for personnel working outside the buildings and for the public from radiation sources inside the buildings.

4.4 RADIATION PROTECTION PROGRAM

4.4.1 Equipment, Instrumentation, and Facilities

4.4.1.1 Personnel Monitoring

Administrative controls provide the requirements and controls for personnel entering radiologically posted areas onsite and the need to wear personnel monitoring devices based on the radiological hazards. These administrative controls also provide for the use of portal personnel radiation monitors.

A portal personnel radiation monitor is provided at the plant exit for monitoring of surface and internal activity of people leaving the plant. The portal monitor provides for complete head-to-foot coverage. The portal console monitor located on the portal frame includes status lights including a contamination alarm. The contamination signal from the console alerts personnel to the contamination condition so that the proper action can be taken.

4.4.1.2 Protective Clothing

The nature of the work to be performed during decommissioning and the radiological conditions are the governing factors in the selection of protective clothing to be worn. Examples of the protective apparel available are shoe covers, rubber overshoes, head covers, beanies, gloves (cotton liners and rubber gloves), and coveralls or lab coats. Additional items of specialized apparel such as plastic or rubber suits, face shields, and respirators are available for activities involving high level contamination and airborne radioactivity areas. In all cases, administrative controls provide the requirements and controls for radiation protection to evaluate the radiological conditions and specify the required items of protective clothing.

Controlled areas are posted as radiation areas, high radiation areas, radioactive materials areas, airborne radioactivity areas, or combinations thereof. Access to controlled areas for all work is authorized in accordance with the radiation protection procedures.

4.4.1.3 Physical Barriers for Access to High Radiation Areas

High radiation areas are controlled as required by the Defueled Technical Specifications Section 5.

4.4.1.4 Records

Radiation protection related records are maintained in accordance with administrative procedures and a retention and retrieval system.

4.4.2 Procedures

The Radiation Protection Program and Procedures are designed to provide protection of personnel against exposure to radiation and radioactive materials in a manner consistent with applicable regulations. The policy of ZS is to maintain personnel radiation exposure As Low as is Reasonably Achievable (ALARA). Therefore, each individual is trained to minimize his exposure consistent with discharging his duties. Each individual is responsible for observing rules adopted for his safety and that of others. Radiation protection procedures are in-place which factor in ALARA controls.

Radiation protection personnel evaluate radiological conditions during decommissioning in accordance with established radiation protection procedures, which are required to be followed by all personnel. They ensure that all applicable regulations are complied with and that the required radiation protection records are adequately maintained.

Training of site personnel in radiation protection principles and procedures is given at the beginning of their work assignments and periodically retraining thereafter as defined in radiation protection procedures.

Procedures are in place which require performance of ALARA reviews, as necessary, as decommissioning progresses.

4.5 RADIOACTIVE WASTE MANAGEMENT

4.5.1 General

Radioactive waste management is managed during decommissioning through the use of permanently installed and temporary Liquid and Solid Waste Treatment Systems. These systems collect, process, monitor and regulate the discharge of all potentially radioactive wastes from the site.

4.5.2 Liquid Waste Management System

4.5.2.1 Design Basis

The original Liquid Waste Systems was designed to collect, store, process, monitor, and dispose of liquid radioactive waste from the station. The principle design criteria for the Liquid Waste Systems were as follows:

1. Ensure that the quantities of radioactive waste discharged from the plant during normal operation are as low as practicable and, in any event, well within the allowable concentration limits; and
2. Limit the inadvertent release of radioactive material from the plant so that the resulting radiation exposure to the public is as low as practicable and, in any event, well within the allowable concentration limits.

A combination of permanent and temporary systems are used to store, process and discharge

liquid radioactive waste water during decommissioning. These systems will continue to be modified during decommissioning and will transition to exclusively use temporary tanks, hoses and filter systems. These systems, along with approved procedures will provide the management controls to ensure that the radioactive releases are completed within the allowable concentrations and dose limitations defined in the QAPP and Offsite Dose Calculation Manual (ODCM).

4.5.2.2 System Description

Liquid waste is processed as needed prior to being released from the site ensure that the releases are within allowable concentrations and dose limitations defined in the QAPP and ODCM. The applicable surveillance requirements for radioactive liquid releases are stipulated in the ODCM. Based upon required analyses, a discharge rate is determined prior to initiating the release considering factors, such as dilution. At no time during waste discharge is the water leaving the plant and entering the lake above the allowable concentration limits. Procedures are developed and implemented as required by the QAPP. The guidance of Regulatory Guide 1.143 is implemented, as applicable to the changing conditions during decommissioning, to prevent liquid waste from being discharged to the environment in locations not authorized by the State of Illinois discharge permit.

4.5.2.3 Wastewater Treatment Facility

The Wastewater Treatment Facility (WWTF) was designed to treat nonradioactive and low level radioactive liquid from many facility sources including building roof runoff and the turbine building fire sump, which receives input from the turbine building equipment and floor drains.

Effluent from the WWTF was discharged to the Intake forebay where it was diluted prior to release to the discharge canals.

With the progression of decommissioning, the WWT system has been isolated and the associated equipment has been abandoned. The inputs to the WWT system and the discharge flowpath to the Intake forebay are no longer in operation and are isolated or removed.

The structure of the WWTF will be maintained, as needed, to support liquid effluent releases via the liquid waste system.

4.5.2.4 Oil Separator System

The Oil Separator System was designed to treat turbine building equipment and floor drains for release. The oil separator consists of an oil separator tank, which provides for oil coalescing, oil skimming, and oil baffling. Discharge from the oil separator tank is pumped by feed pumps to the fire sump and eventually to the WWTF. As decommissioning progresses, this system will no longer perform these functions.

4.5.3 Solid Waste Management System

4.5.3.1 Design Basis

The principal design criteria for the Solid Waste System are as follows:

1. Package radioactive solid wastes for offsite shipment and burial in accordance with applicable regulations; and
2. Minimize the release of radioactive materials to the environs so as to keep the overall exposure to the public as low as practicable and, in any event, within the limits of 10 CFR 20.

4.5.3.2 System Description

Miscellaneous permanent and temporary systems may be used during decommissioning activities. Administrative controls, such as approved procedures or Work Orders will be utilized to ensure processing activities are controlled.

4.6 RADIATION MONITORING SYSTEMS

4.6.1 Design Bases

The Radiation Monitoring System was originally designed to detect, compute, indicate, annunciate and record the radiation levels at selected locations in the plant. The system was divided into the following subsystems of process radiation monitoring and area radiation monitoring. The process radiation monitoring system, which includes the effluent monitors, was designed to provide early warning of increasing radiation activity due to a malfunction of plant equipment and to monitor radioactive discharges to the environment to ensure concentrations do not exceed specified limits. This system remains in use to support DSEP requirements. The area radiation monitoring system was designed to alert personnel of increasing radiation levels in the plant, and is used, as applicable, to support decommissioning activities. Radiation protection personnel also utilize portable equipment to fulfill the design functions to detect, compute, indicate, annunciate and record the radiation levels at selected locations in the plant. During decommissioning, the process radiation monitoring system may be used in conjunction with portable radiation protection equipment and instruments to ensure site personnel protection and effluents are maintained within the limits defined within the QAPP and ODCM. The effluent monitors are designed to provide early warning of increasing radiation activity due to a malfunction of plant equipment, and to monitor radioactive discharges to the environment to ensure concentrations do not exceed specified limits.

4.6.2 Process and Effluent Radiological Monitoring and Sampling Systems

4.6.2.1 System Description

The Process Radiation Monitoring System and Sampling System was designed primarily to give early warning of an equipment or system malfunction and also warn personnel of increasing radiation levels which might result in a radiation health hazard. The Process and Effluent Radiological Monitoring and Sampling System is maintained as defined in the ODCM. All radiation monitoring channels employ instrument failure alarms Instrument failure alarms are initiated upon failure of the radiation monitor, loss of detector signal, loss of power, or, for offline detectors, loss of sample flow. Radiation monitor trip points are established in accordance with the Offsite Dose Calculation Manual (ODCM) to ensure “an as low as practicable” site boundary

dose is obtained which is consistent with the design characteristics of the monitoring equipment, and acceptable operating considerations.

4.6.2.2 Calibration and Testing

The Process and Effluent Radiological Monitoring and Sampling System is calibrated and tested as defined in the ODCM.

4.6.2.3 Process and Effluent Monitoring and Sampling

The Process and Effluent Radiological Monitoring and Sampling System is performed as defined in the ODCM.

4.7 SEALED SOURCES

Radiation Protection procedures detail methods of leak testing sealed sources and receipt, handling and storage of radioactive sources. Approved procedures outline specific techniques for the safe handling of calibration sources.

Radioactive sealed sources shall be leak tested for contamination. Any licensed sealed source is exempt from such leak tests if the source contains 100 microcuries or less of beta and/or gamma emitting material or 5 microcuries or less alpha emitting material.

Test for leakage and/or contamination shall be performed by the licensee or by other persons specifically authorized by the NRC or an Agreement State as follows:

1. Each sealed source (excluding startup sources and fission detectors previously subjected to core flux) containing radioactive materials with a half life greater than 30 days (excluding Hydrogen 3), and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed 6 months.

2. The periodic leak test does not apply to sealed sources and fission detectors that are stored and not being used. The sources and fission detectors exempted by this test shall be tested for leakage prior to any use or transfer to another licensee unless they have been leak tested within the previous six months. Sealed sources and Fission detectors transferred without a certificate indicating the last test date shall be tested prior to being placed in use. Sealed sources contained in shielded devices such as rad monitors are considered to be stored unless they are removed from the shielded mechanism.

3. The leakage test shall be capable of detecting the presence of .005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination. It shall be immediately withdrawn from use, decontaminated, and repaired or disposed of in accordance with Commission regulations.

A report shall be prepared and submitted to the Commission on an annual bases if sealed source or fission detector leakage tests reveal the presence of greater than or equal to 0.005 microcurie of removable contamination, if the contamination could have resulted from source leakage.

5. SAFETY ANALYSES

5.1 GENERAL

This chapter of the DSAR addresses the accidental airborne release of radioactive material due to a radioactive waste handling event. This chapter, therefore, presents an evaluation of the safety aspects of the facility and demonstrates that the site can be safely decommissioned even if highly unlikely events are postulated. It also shows that radiation exposures resulting from occurrences of these highly unlikely accidents do not exceed the guidelines of 10 CFR 100, or the Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs).

The Radioactive Waste Handling Accident is the only remaining accident.

5.2 RADIOACTIVE WASTE HANDLING ACCIDENT

5.2.1 Accident Description

This accident postulates the failure of a High Integrity Container (HIC) containing dewatered radioactive demineralizer resin generated during decontamination activities to the extent that entire solid, non-combustible contents escape. Such a failure would consist of radioactive waste handling that is beyond the design, testing, and handling criteria in 10 CFR 71. All solid radioactive waste handling is conducted in accordance with the Process Control Program.

5.2.2 Method of Analysis

Calculations have been performed (Reference 2) to determine the dose at the Exclusion Area Boundary that would result from dropping a HIC in the location designated by the former Interim Radwaste Storage Facility (IRSF), such that its entire contents of radioactive, dewatered resin escape. A fraction of the escaped resin is non-mechanistically assumed to be released as airborne radioactivity and pass from the IRSF directly to the environment, resulting in off-site dose consequences. The solid-to-aerosol release fraction is assumed to be the worst case non-mechanistic, mechanically initiated release fraction. The whole body and inhalation dose at the closest point on the Exclusion Area Boundary from the IRSF are then calculated.

Inputs and assumptions used in this evaluation are provided in Table 5-1. The radioactivity assumed to be present in the HIC for this evaluation is 1000 curies. The amount of radioactivity that can be placed in a HIC is limited by handling and shipping requirements. The Process Control Program at Zion ensures that the radioactivity level placed in a HIC will be less than the assumed amount. The worst case mix of fission products that contribute to dose consequences is represented by 100% Co-60. The methodology used in this accident analysis does not credit the actuation or mitigation of any system, structure, or component (e.g., ventilation system filtration). Conservative values for atmospheric diffusion (X/Q) are assumed since the release is postulated to occur from undefined leakage pathways in the IRSF without the aid of any ventilation system.

5.2.3 Results

The radiological dose consequences for an accident involving the failure of a High Integrity Container are presented in Table 5-2. The results show that the projected doses are insignificant in comparison to the 10 CFR 100 guidelines (Reference 2), and are less than the EPA PAGs (Reference 2). The projected dose at the Low Population Zone would be less than at

the Exclusion Area Boundary and, since this accident involves an instantaneous release, is also within the 10 CFR 100 guidelines.

It is anticipated that station decontamination and dismantling activities (e.g., vacuum filter bag ruptures, or removal of major primary system components etc.) will not result in potential releases of radioactive material beyond the levels discussed here.

5.3 REFERENCES

1. NRC Regulatory Guide 1.109 Rev. 1, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50 Appendix I”, October, 1977.

2. Zion Station Calculation No. 22N-0-119M-0001, Rev. 1, “Dose Effects of Radwaste Handling Accident Involving a HIC.”

3. Federal Guidance Report No. 11, “Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion.” Washington, DC; U.S. Environmental Protection Agency, 1988.

TABLE 5-1

ASSUMPTIONS USED IN CALCULATING THE DOSE CONSEQUENCES FOR A RADIOACTIVE WASTE HANDLING ACCIDENT INVOLVING A HIGH INTEGRITY CONTAINER (HIC)

Parameter	Value
Radioactivity Level in HIC	1000 curies
Breathing Rate	$3.47 \times 10^{-4} (m^3/sec)$
Distance to Exclusion Area Boundary	210 meters
Atmospheric diffusion Factor (X/Q)	1.2×10^{-2} sec/m^3
Fission Product Mix	100% Co-60
Wind Speed	1 meter/sec.
Inhalation Dose Conversion Factors	From Reference 3, Table 2.1

TABLE 5-2

PROJECTED DOSE FOLLOWING A RADIOACTIVE WASTE HANDLING ACCIDENT

	Whole Body Dose (Rem)	Inhalation Dose (Rem)
Site EAB	7.9×10^{-3}	9.1×10^{-1}
10 CFR 100 Guidelines(1)	0.5	6
EPA PAGs	Note 2	Note 2

NOTE 1:

For conservatism, the probability of the accident occurring is the same as a radioactive gas tank rupture. The acceptance criteria is established as 1/50 of the 10 CFR 100 guidelines.

NOTE 2:

The acceptance criteria is that the sum of the whole body dose and the inhalation dose is less than 1.0 rem.

6. CONDUCT OF OPERATIONS

6.1 RESPONSIBILITY AND ORGANIZATION

Onsite and offsite organizations are established for unit and corporate management, respectively. The onsite and offsite organizations include the positions for activities affecting the safety of the facility.

1. Lines of authority, responsibility, and communication are established and defined for the highest management levels through intermediate levels including all operating organization positions. These relationships are documented and updated, as appropriate, in the form of organization charts, functional descriptions of departmental responsibilities and relationships, and job descriptions for key personnel positions, or in equivalent form of documentation. These requirements are documented in the Quality Assurance Project Plan incorporated by reference into the DSAR.
2. A Vice President has corporate responsibility for decommissioning activities and the safe storage of spent nuclear fuel at the facility.
3. Zion Station is managed by a Senior Manager. This Senior Manager has day-to-day responsibility for the facility and has control of the onsite activities necessary for the safe operation and maintenance of structures and systems required for the safe storage of spent nuclear fuel.
4. The individuals who carry out radiation protection and quality functions may report to an appropriate onsite manager; however, they have sufficient organizational freedom to ensure their independence from operating pressures.
5. Either the Manager of the Health Physics Department or the Lead Health Physicist shall meet or exceed the qualifications of “Radiation Protection Manager” of Regulatory Guide 1.8, September 1975.

6.1.1 On-Site Organization

6.1.1.1 Duties and Responsibilities of Staff Personnel

Duties and responsibilities of staff personnel are contained in the ZS Quality Assurance Project Plan (QAPP) and site administrative procedures and organizational charts published in Zion Administrative Procedures.

6.2 TECHNICAL SPECIFICATIONS

Zion Station is governed by the Technical Specifications provided as Appendix A to Operating License Nos. DPR-39 and DPR-48, Docket Nos. 50-295 and 50-304.

6.3 TRAINING

Programs are conducted to train site personnel. Key personnel receive on-site classroom or guided self-study and on-the-job training. The training program ensures the monitoring, handling and storage of nuclear fuel is performed in a manner consistent with ensuring the health and safety of the public. Appropriate plant personnel receive instruction in emergency plan and radiation protection procedures. Specialized training in specific areas conducted by

the equipment manufacturers or other vendors is utilized as necessary. Training on a continuing basis is used to maintain a high level of proficiency in the staff.

6.4 PROCEDURES

Written procedures/instructions are required for site activities as defined in the QAPP.

6.5 PROGRAMS

6.5.1 Emergency Plan

The Defueled Station Emergency Plan (DSEP) is a written emergency plan that establishes the concepts, evaluation and assessment criteria, and onsite protective actions necessary to limit and mitigate the consequences of potential or actual emergencies. The DSEP provides the necessary pre-arrangements, directions, and organization to ensure radiological emergencies can be effectively and efficiently resolved in order to safeguard station personnel and property.

The DSEP identifies on-site and off-site facilities and equipment available for emergency assessment, communications, first aid and medical care, and damage control. The DSEP also includes notification requirements for classified events, including prompt and accurate notifications to appropriate government agencies. Zion has developed Emergency Plan Implementing Procedures (EPIPs) or Emergency Operating (EO) procedures as applicable which implement the DSEP appropriately. Training is conducted for all emergency response personnel to ensure their proficiency. The DSEP is distributed on a controlled basis to all emergency facilities requiring them, including appropriate government agencies. The DSEP is reviewed annually, and any changes or revisions that decrease the effectiveness of the Emergency Plan are submitted to the NRC for approval.

6.5.2 Security Plan

The Zion ISFSI physical security plan conforms to the requirements of 10 CFR 73.55, with associated exemptions. A separate security plan is also maintained for 10 CFR 37 until this radioactive material of concern is either stored at the ISFSI or shipped offsite for disposal.

6.5.3 Fire Protection Program

The Zion Station Fire Protection Program describes how Zion Station complies with and meets the objectives of 10 CFR 50.48(f). The Fire Protection Program is outlined in the Fire Protection Report.

6.5.4 Offsite Dose Calculation Manual

The Zion Station Offsite Dose Calculation Manual (ODCM) is defined by the QAPP to contain the methodology and parameters used in the calculation of off-site doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain the Radioactive Effluent Control and Radiological Environmental Monitoring Programs and descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports.

6.5.5 Process Control Program

The Process Control Program (PCP) contains the current formulas, sampling analyses, tests, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71; state regulations; burial ground requirements; and other requirements governing the disposal of solid radioactive waste. Dry active waste (DAW) such as compacted trash and contaminated components are not included in the scope of the PCP. Written procedures are established, implemented, and maintained covering the key activities of the Process Control Program. Changes to the PCP shall be documented and records of reviews performed shall be retained as required by QAPP.

6.5.6 Quality Assurance Program

The Quality Assurance Program is implemented in accordance with QAPP. The QAPP defines the Zion*Solutions* LLC Quality Assurance Program to be implemented during the Zion Station Restoration at the Zion Nuclear Power Station (ZNPS) site. The QAPP is designed to meet the requirements of Title 10 of the Code of Federal Regulations, Part 50 Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” Part 71, Subpart H, “Quality Assurance Requirements for Packaging and Transportation of Radioactive Waste” and Part 72, Subpart G, “Quality Assurance Requirements for the Independent Storage of Spent Nuclear Fuel, High Level Radioactive Waste, and Reactor-Related Greater than Class C Waste.”

6.6 REVIEW AND INVESTIGATIVE FUNCTION

The review and investigative functions are conducted in accordance with the QAPP.