From: Perdomo, Federico R [Federico.Perdomo@unistarnuclear.com]
Sent: Monday, September 28, 2009 9:57 AM
To: Schaaf, Robert
Cc: Quinn, Laura; Lutchenkov, Dimitri
Subject: FW: UniStar letter UN#09-396 - RAI No. 1014, Ozone Air Emissions during Construction and Operation (E-Mail 1 of 2)
Attachments: FINAL UN#09-396 -- SIGNED (Pages 1 -29).pdf

Mr. Schaff,

E-Mail forwarded to you as requested by Dimitri Lutchenkov.

Thank You

Federico Perdomo

From: Perdomo, Federico R
Sent: Friday, September 25, 2009 10:53 PM
To: 'Quinn, Laura'
Cc: Stevenson, Michael; Frailer, Melanie D; Yox, Michael J; Konerth, Thomas L; Weissinger, Thomas R; Lutchenkov, Dimitri
Subject: UniStar letter UN#09-396 - RAI No. 1014, Ozone Air Emissions during Construction and Operation (E-Mail 1 of 2)

Laura,

Attached please find UniStar letter UN#09-396, "RAI No. 1014, Ozone Air Emissions during Construction and Operation." The hard copies of this letter will be distributed as normal. This E-mail copy will help in any telephone discussions that we may have near-term.

Due to file size limitations, I will send the letter in two parts.

Thank You

Federico Perdomo

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Created By: Federico.Perdomo@unistarnuclear.com

Recipients:
"Quinn, Laura" <Laura.Quinn@nrc.gov>
Tracking Status: None
"Lutchenkov, Dimitri" <dimitri.lutchenkov@unistarnuclear.com>
Tracking Status: None
"Schaaf, Robert" <Robert.Schaaf@nrc.gov>
Tracking Status: None

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Greg Gibson
Vice President, Regulatory Affairs

750 East Pratt Street, Suite 1600
Baltimore, Maryland 21202

UniStar NUCLEAR ENERGY

10 CFR 50.4
10 CFR 52.79

September 25, 2009

UN#09-396

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Calvert Cliffs Nuclear Power Plant, Unit 3
RAI No. 1014, Ozone Air Emissions during Construction and Operation

Reference: 1) Laura Quinn (NRC) to Greg Gibson (UniStar Nuclear Energy), Request for Additional Information Related to the Environmental Report for the Calvert Cliffs Combined License Application – Ozone Air Emissions during Construction and Operation, dated August 27, 2009.

The purpose of this letter is to respond to the request for additional information (RAI) identified in NRC letter to UniStar Nuclear Energy, dated August 27, 2009 (Reference 1). RAI No. 1014 requests information related to the ozone air emissions during construction and operation of Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3.

Enclosure 1 provides the response to RAI No. 1014. Enclosure 2 contains a report of Construction Activities and Air Impacts used in support of the RAI response. This response does not impact the Combined License Application content. One new regulatory commitment is made in this response and is summarized in Enclosure 3.

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Dimitri Lutchenkov at (410) 470-5524.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on September 25, 2009

for Greg Gibson

Enclosures:

1) Response to NRC Request for Additional Information, RAI No. 1014, Ozone Air Emissions during Construction and Operation, CCNPP3

2) Report of the Construction Activities and Air Impacts from the Proposed Unit 3 at Calvert Cliffs Nuclear Power Plant, dated August 2008

3) Regulatory Commitment CC-09-0002

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

GTG/FRP/jmm

Commitment: CC-09-0002

Enclosure 1

Response to NRC Request for Additional Information
RAI No. 1014, Ozone Air Emissions during Construction and Operation
Calvert Cliffs Nuclear Power Plant Unit 3

RAI No 1014

The NRC is required to make a conformity determination under 40 CFR 93.150 et seq. with regard to the proposed construction and operation of Calvert Cliffs Unit 3 (CCNP Unit 3) unless one or more of the exceptions listed in 40 CFR 93.153 applies. A possible exception for CCNPUnit 3 is if the totals of direct and indirect emissions are below threshold values listed in 40 CFR93.153(b).

UniStar has provided the Maryland Public Service Commission with a tentative schedule for completion and operation of CCNP Unit 3 (CPCN Application Table 1.4-1), with an extensive listing of emissions during plant construction (CPCN Application Tables 5.5-2 and 5.5-3), and with a listing of maximum expected emissions during normal operation (CPCN Application Table 6.5-2). The NO_x emissions during the construction period listed in Table 5.5-2 exceed the 40 CFR 93.153(b) threshold value for the first four years. However, the construction activities that would be authorized by the NRC (as defined in 10 CFR 50.10) are only a subset of the activities covered by Table 5.5-2. Provide, for each class of emissions and year of construction, the annual quantity released (tons/yr), the percentages that would be related to "construction" activities regulated by NRC, and the basis for determining the percentage.

Response

RAI No. 1014 is based on outdated information contained in the Certificate of Public Convenience and Necessity (CPCN) Technical Report filed with the Maryland Public Service Commission (PSC) in November 2007. A second amendment to the CPCN Technical Report was submitted to the Maryland PSC in August 2008. Section 5.5 of the August 2008 CPCN Technical Report references a separate report documenting revised construction emissions and associated air impacts (Appendix, Revision 3, Volume 9, Tab 28). This report entitled, "Report of the Construction Activities and Air Impacts from the Proposed Unit 3 at Calvert Cliffs Nuclear Power Plant" dated August 2008 and provided as Enclosure 2 to this response, shows that construction related NOx emissions in the first four years of construction are between 57 and 82 tons per year (see Table 2-2). These values are below the 40 CFR 93.153(b) threshold value that would trigger a conformity determination for CCNPP Unit 3. Calvert County is part of the Washington DC-MD-VA ozone nonattainment area which has a severity classification of moderate per 40 CFR 81.321. The applicable threshold value for NOx emissions (as an ozone precursor) is 100 ton per year threshold.

The above mentioned report on construction emissions was not done for purposes of a conformity applicability analysis. Rather it was prepared in support of the CPCN technical studies to evaluate the impact of site construction emissions. It did not address indirect emissions from activities outside the construction site that would be included in a formal conformity determination, such as offsite commercial deliveries and commuter vehicles. Also, UNE has more recent information on construction activities. Therefore, UNE will prepare an updated construction emissions analysis for CCNPP Unit 3 in order to determine if emissions are still within threshold values. UNE will provide the NRC with the schedule for completion of this emissions analysis by October 2, 2009.

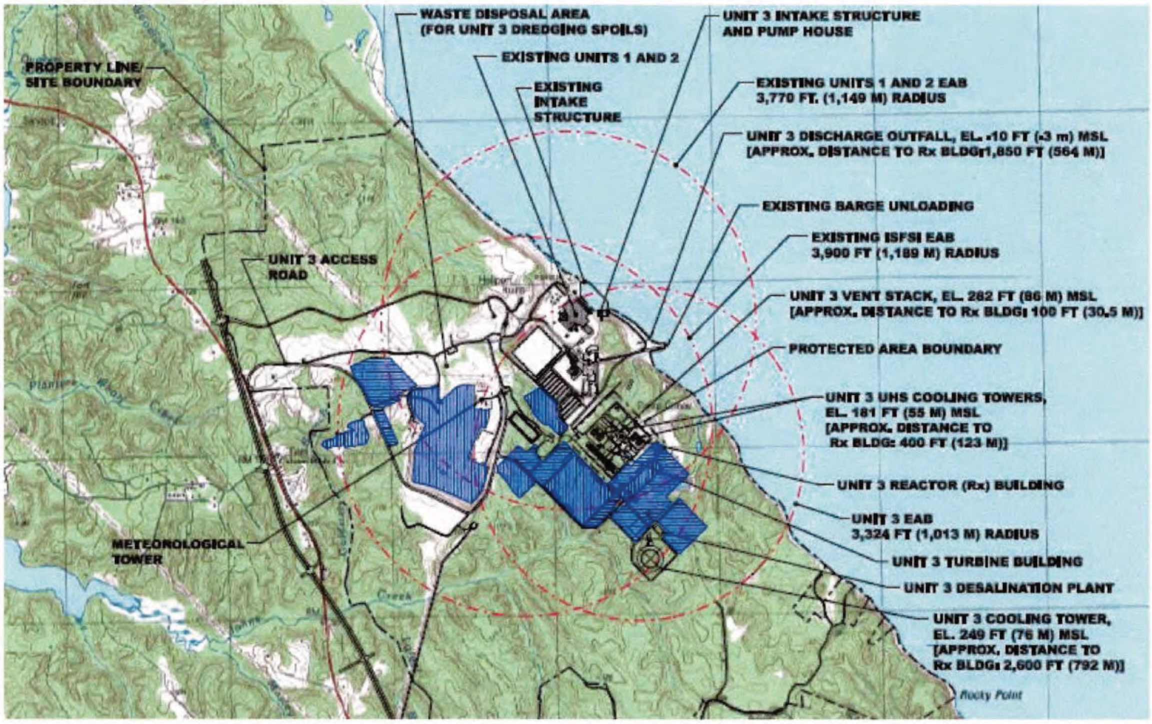
COLA Impact

No changes to the CCNPP Unit 3 COLA are required as a result of this RAI response.

Enclosure 2

Report of the Construction Activities and Air Impacts from the Proposed Unit 3 at Calvert Cliffs Nuclear Power Plant, dated August 2008

Prepared for:
UniStar Nuclear Energy, LLC and
UniStar Nuclear Operating Services, LLC



Report of the Construction Activities and Air Impacts from the Proposed Unit 3 at Calvert Cliffs Nuclear Power Plant

ENSR Corporation
August 2008
Document No.: 04189-025-0016

ENSR | AECOM

Prepared for:
UniStar Nuclear Energy, LLC and
UniStar Nuclear Operating Services, LLC

Report of the Construction Activities and Air Impacts from the Proposed Unit 3 at Calvert Cliffs Nuclear Power Plant

Olga Kostrova
Prepared By: Olga Kostrova

Ian Miller
Ian Miller

Robert J. Paine
Reviewed By: Robert J. Paine

ENSR Corporation
August 2008
Document No.: 04189-025-0016

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1.0 Introduction

UniStar Nuclear Energy, LLC (UNE) and UniStar Nuclear Operating Services, LLC (UNO) (Co-Applicants) are proposing to construct and operate a new nuclear power unit on the existing Calvert Cliffs Nuclear Power Plant (CCNPP) site. The new unit will be designated as CCNPP Unit 3, and will have a gross electric generation capacity of about 1,710 megawatts.

The CCNPP campus, currently owned by Calvert Cliffs Nuclear Power Plant, Inc., consists of 2,070 acres near Lusby, Calvert County, Maryland, on the west bank of the Chesapeake Bay, approximately halfway between the mouth of the bay and its headwaters at the Susquehanna River. Figure 1-1 shows the CCNPP location. The site is approximately 40 miles southeast of Washington, D.C. and 7.5 miles north of Solomons Island, Maryland.

The CCNPP property contains two existing pressurized water reactors designated as CCNPP Units 1 and 2. The proposed CCNPP Unit 3 will be located approximately 600 meters south of the existing nuclear power plant within the present CCNPP site.

Activities associated with construction of the proposed CCNPP Unit 3 will result in release of pollutants to the atmosphere. This document addresses emissions and air quality impacts from particulate matter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), and oxides of nitrogen (NOx). Fugitive dust and fine particulate emissions will be generated as a result of vehicular traffic on paved and unpaved roads, earth moving, and material handing activities. The construction activities will require temporary installation of material processing and handing equipment as well as construction and operation of a concrete batch plant.

1.1 Purpose of the Report

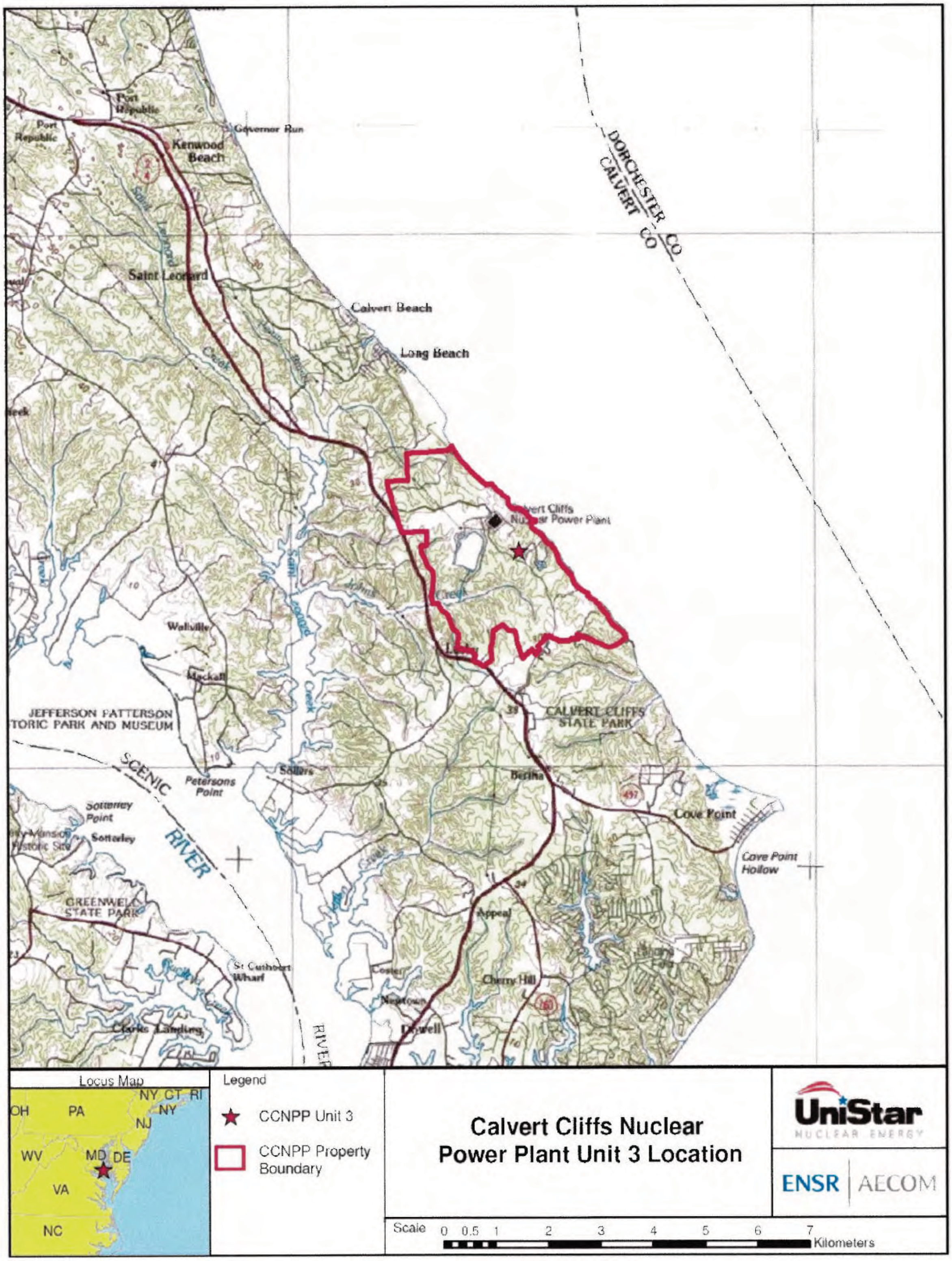
This report provides the technical analyses and supporting data of the emissions associated with construction of the proposed CCNPP Unit 3 to ensure compliance with the National Ambient Air Quality Standards (NAAQS) during this temporary activity. The document addresses the following items:

- Calculations of PM_{10} emissions that will result from vehicle travel, disturbed earth and aggregate movement, wind erosion, material and equipment handling activities. The document also discusses PM_{10} emissions control measures, as well as SO_2, CO, and NOx emissions that will result from primarily vehicle travel and concrete batch plant operations.
- An air dispersion modeling analysis demonstrating that the impact of PM_{10}, SO_2, CO, and NOx emissions will be in compliance with the NAAQS. This analysis was completed in accordance with the U.S. EPA Guideline on Air Quality Models as codified at 40 CFR Part 51, Appendix W.

1.2 Contents of the Report

This report document consists of five sections, including this section, and one appendix. Section 2 presents a description of the construction activities and the calculated PM_{10}, SO_2, CO, and NOx emission and their control measures. The dispersion modeling approach is discussed in Section 3 and results of the impact assessment for construction emissions are presented in Section 4. References are provided in Section 5. Appendix A provides the emissions calculations. A computer modeling archive is being provided separately.

Figure 1-1: CCNPP and Unit 3 Location



2.0 Environmental Effects of Site Preparation and Construction

2.1 Estimated Air Emissions During Construction

Temporary construction related activities will result in the release of criteria pollutant emissions to the atmosphere. Oxides of nitrogen (NOx), carbon monoxide (CO), and small amounts of sulfur dioxide (SO_2), volatile organic compounds (VOC), and particulate matter (PM_{10}) will be released as a result of fuel combustion. Fuel combustion is primarily from off-road diesel engines used for generators, compressors, and construction equipment such as backhoes and bulldozers. Fugitive dust and fine particulate emissions (PM_{10}) will be generated as a result of vehicular traffic on paved and unpaved roads, earth moving, and material handling activities. Construction of Unit 3 and the cooling towers will require the temporary installation of a concrete batch plant.

The USEPA, along with several state and local air pollution control agencies, have developed methodologies and emission factors that are commonly used to develop emissions estimates from construction activities. These emission estimates are then input into an EPA developed air dispersion model along with localized metrological data to assess the net air quality impact of construction activities. The impact of construction activities must be less than the National Ambient Air Quality Standard (NAAQS), which were established to protect public health and welfare.

Portions of the CCNPP site will be cleared for roadways, facility construction, construction laydown areas, parking, and other construction-related uses. The current site elevation varies from 40 to 130 feet, with an average elevation around 100 feet. The final grading site plan leaves the majority of the impacted areas at an average elevation between 90 and 100 feet. The power block area will be slightly lower, at 80 to 85 feet. Suitable materials from grading higher elevations will be used as fill for lower elevations where possible.

Major earth moving activities that will generate air emissions include:

- Creation of construction access road from the main highway (MD 2 and 4) to CCNPP Unit 3 construction areas,
- Upgrading and extending the heavy haul road from the barge landing to CCNPP Unit 3 construction areas,
- Establishing general plant area grade,
- Excavation for building foundations, and
- Backfilling around foundations.

A variety of diesel powered equipment will be required to support construction activities. These include:

- Bulldozers, scrapers, and graders for land clearing, road construction and grading,
- Backhoes and loaders for excavating foundations and material transfer,
- Cranes for moving heavy equipment and transferring materials (such as sand and aggregate) from barges,
- Dump trucks for moving excavating earth to storage and returning as backfill material and for transferring sand and aggregates from barges, and

- Support vehicles, trucks, and compressors.

The project's temporary concrete batch plant will have a peak production of 200 cubic yards (152.9 cubic meters) per hour. The total cement production is estimated to be 555,000 cubic yards (424,328 cubic meters) over a four-year portion of the facility's construction period. This activity averages to approximately 138,750 cubic yards (106,082 cubic meters) per year. The batch plant will primarily use fabric filter baghouses to control air emissions.

Fugitive emissions will be generated by vehicular traffic on paved and unpaved (graveled) roadways on-site. An existing section of paved road leads from MD 2/4 to a branch-off onto the future unpaved construction road. The unpaved portion of the construction road will traverse the site, connecting to the heavy haul road to the barge area. Construction employee commuting and some delivery vehicles will ride on both stretches of road, while heavy construction vehicles will only use the unpaved portion. During CCNPP Unit 3 construction, a maximum of approximately 4,000 full time equivalent (FTE) workers will be employed. A concrete batch plant will be used to produce the estimated 555,000 cubic yards of concrete required. Trucks will bring sand and aggregate materials from the barge to storage piles at the concrete plant and mixed concrete from the batch plant to the construction locations.

Estimating construction-related emissions involves the use of activity data and emission factors, along with appropriate corrections as necessary. The design firm for the project, Bechtel Power, provided estimated activity data for the project. Construction activity data is summarized in Table 2-1. A detailed activity data sheet for the combustion equipment listing expected annual hours of use is located in Appendix B. Information is provided in the table for each of the various construction related activities by year. Emission factor data comes from EPA's AP-42 compilation of emission factors, EPA's NONROAD model background information, EPA's Mobile 6.2 model, and Mojave Desert AQMD Emission Inventory Guidance. Other ancillary sources of information were consulted as necessary.

Table 2-1 Construction Activity Data

Item No.	Construction Activity	Operation Type	Units	2010	2011	2012	2013	2014	2105	TOTAL
SITEWORK										
	Clear & Grub									
1	Vegetations Removal	Bulldozing (inc. w/Item 8)	Hours							
2	Scrapers removing topsoil		Tons	310,000	0	0	0	0	0	310,000
3	Scrapers in travel	Unpaved Roads	VMT	5,060	0	0	0	0	0	5,060
4	Scrapers unloading topsoil	Batch Drop	Tons	310,000	0	0	0	0	0	310,000
	General Site Grading & Fill									
5	Scrapers removing overburden		Tons	2,158,000	2,158,000	644,000	0	0	0	4,960,000
6	Scrapers in travel	Unpaved Roads	VMT	35,160	35,160	10,500	0	0	0	80,820
7	Scrapers unloading overburden as fill	Batch Drop	Tons	2,158,000	2,158,000	644,000	0	0	0	4,960,000
8	Bulldozing	Includes Items 1, 13, 17	Hours	7,800	7,800	4,100	2,000	500	0	
9	Compaction	Includes Items 18, 24	Hours	5,200	5,200	2,600	1,000	500	0	
BUILDING EXCAVATION										
10	Load Excavated Mat'l into Trucks	Batch Drop	Tons	3,410,000	0	0	0	0	0	3,410,000
11	Haul to Stockpile Area	Unpaved Roads	VMT	546,000	0	0	0	0	0	546,000
12	Truck-Dump	Batch Drop	Tons	3,410,000	0	0	0	0	0	3,410,000
13	Spread material	Bulldozing (w/Item 8)	Hours							
STRUCTURAL BACKFILL										
14	Load Stockpile into Off-Road Truck	Batch Drop	Tons	0	2,790,000	0	0	0	0	2,790,000
15	Haul to Powerblock	Unpaved Roads	VMT		447,000					447,000
16	Truck-Dump	Batch Drop	Tons	0	2,790,000	0	0	0	0	2,790,000
17	Spread material	Bulldozing (w/Item 8)	Hours							
18	Compaction	Included with Item 9	Hours							
UNPAVED ROAD CONSTRUCTION										
23	Motor Grading		VMT	2,500	3,800	2,500	1,300	0	0	10,100
24	Compaction	Included with Item 9	Hours							
CONCRETE OPERATIONS										
25	Material transfer from Barge	Batch Drop	Tons	198,800	397,600	198,800	0	0	0	795,200
26	Material Transport - Barge to Plant	Unpaved Roads	VMT	35,200	70,380	35,200	0	0	0	140,780
27	Material Transport to Pile	Batch Drop	Tons	198,800	397,600	198,800	0	0	0	795,200
28	Material Transfers - Pile to Silo/Plant	Batch Drop	Tons	60,435	187,670	246,510	240,950	59,635	0	795,200
29	Ready Mix Transport	Unpaved Roads	VMT	13,300	41,200	54,000	52,800	13,200	0	174,500
OPEN AREAS										
19	Power-Block & Cooling Tower Areas	Wind & Erosion	Acres	45	45	45	0	0	0	n/a
20	Switchyard Area	Wind & Erosion	Acres	43	43	43	0	0	0	n/a
21	Soils Stockpile	Wind & Erosion	Acres	60	60	60	60	0	0	n/a
22	Temporary Gravel Parking Areas	Wind & Erosion	Acres	70	70	70	70	70	70	n/a
VEHICLE TRAFFIC										
30	Commuters	Paved Road	VMT	44,000	179,000	356,000	540,000	184,000	15,000	1,318,000
31	Commuters	Unpaved Road	VMT	205,000	838,000	1,670,000	2,536,000	863,000	69,000	6,181,000
32	Commercial Deliveries	Paved Road	VMT	5,500	6,100	4,100	760	100	0	16,560
33	Commercial Deliveries	Unpaved Road	VMT	19,400	21,700	14,500	2,730	350	0	58,680

2.1.1 Vehicle Travel

As noted in Section 2.1, vehicle travel will occur on paved and unpaved roads as well as on disturbed earth at the site during construction. The emission factors for site preparation activities in Section 2.1.3 include disturbed earth travel for bulldozing, grading, scraping, and compacting.

Unpaved road travel will consist of construction vehicles (trucks in transport) that will operate on roads from the barge area to the concrete plant, from the concrete plant to the application sites, from soil excavation points to storage locations, and from storage to backfill locations. Commuting vehicles will travel to and from parking lots and delivery vehicles will travel to various locations. . Emissions were estimated for unpaved roads using Equation 1. Equation 1 is from AP-42 Section 13.2.2 (11/06) for Unpaved Roads.

$$E = k * \left(\frac{s}{12}\right)^{a} \left(\frac{W}{3}\right)^{b} \qquad (1)$$

where:

E size-specific emission factor (lb/VMT)
k particle size multiplier (lb/VMT)
a, b empirical constants (dimensionless)
s surface material silt content (%)
W mean vehicle weight (tons)

Paved road travel will consist of commuting construction workers and some delivery trucks. Emissions were estimated from paved roads using Equation 2. Equation 2 is from AP-42 Section 13.2.1 (11/06) for Paved Roads.

$$E = \left[k * \left(\frac{sL}{2}\right)^{0.65} \left(\frac{W}{3}\right)^{1.5} - C\right] * \left(1 - \frac{P}{4N}\right) \qquad (2)$$

where:

E particulate emission factor (lb/VMT)
k particle size multiplier (lb/VMT)
a, b empirical constants (dimensionless)
sL road surface silt loading (g/m^2)
W average vehicle weight of vehicles traveling the road (tons)
C emission factor for exhaust, break wear, and tire wear
P number of “wet” days with at least 0.01 inch of precipitation during the averaging period
N number of days in the averaging period

It is important to note that per AP-42 instructions, the W in each of the equations represents the average that represents the “fleet” average weight of all vehicles travelling the road. Inputs for the Equations 1 and 2 and calculations of emissions are presented in Appendix B. Also, the precipitation correction factor in Equation 2 is only used for estimating annual emissions.

2.1.2 Material Transfer

Materials such as excavated earth, backfill, aggregates, and sand will be hauled and transferred by trucks to and from different locations on the site. Particulate emissions are potentially generated each time a load of material is loaded into or unloaded from a truck. Estimating emissions from material transfers was performed using Equation 3. Equation 3, colloquially known as the “batch drop equation”, comes from AP-42 Section 13.2.4 (11/06) Aggregate Handling and Storage Piles.

$$E = k * 0.0032 \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \quad (3)$$

where:
E emission factor (lb/ton material)
k particle size multiplier (dimensionless
U mean wind speed (miles/hour)
M material moisture content (%)

The mean wind speed is based on the on-site CCNPP wind monitor. Material moisture content is based on AP-42 Table 13.2.4-1 for earth and footnote b to Table 11.2-2 for aggregates and sand. Inputs for the Equation 3 and calculations of emissions are presented in Appendix B.

2.1.3 Site Preparation

Site preparation will be performed by bulldozers, scrapers, compactors, and graders which will shape and clear the land before and while construction occurs. Bulldozing and compaction hours are noted in Table 2-1. Scraping and grading operating hours are estimated from the combustion equipment activity data presented in Appendix A.

Estimation of emissions from material transfers was performed using Equation 4. Equation 4 comes from Mojave Desert Air Quality Management District Emissions Inventory Guidance (4/2000) Method D – Bulldozing, Scraping, and Grading of Materials. The corresponding AP-42 emission factor as presented in Section 11.9 Western Surface Coal Mining for bulldozing was judged to be not representative of activities at CCNPP. In fact, the Mojave guidance references the AP-42 section as a basis, but presents a more refined version of the calculation, presented below. No control is assumed for this emissions category.

$$E = 2.76 * k * \frac{s^{1.5}}{M^{1.4}} \quad (4)$$

where:
E emission factor (lb/hour of operation)
k particle aerodynamic factor (dimensionless)
s average silt content (%)
M average material moisture content (%)

Silt content and moisture content come from AP-42 Table 13.2.4-1. Inputs for the Equation 4 and calculations of emissions are presented in Appendix B.

2.1.4 Wind Erosion

Wind erosion causes fugitive dust to be blown from open areas and storage piles.

The emission factor for estimating wind erosion from open areas comes from Clark County, NV Department of Air Quality and Environmental Management (DAQEM). DAQEM uses a PM_{10} emission factor of 1.66 lb/acre/day to estimate wind erosion fugitive dust. Given the difference in climate between Clark County, Nevada and the CCNPP site, this is thought to be a conservative estimate.

Wind erosion will also occur at the material storage piles. The concrete batch plant will have separate storage piles for aggregates and sand. Estimating emissions from storage piles was performed using Equation 5. Equation 5 comes from Mojave Desert Air Quality Management District Emissions Inventory Guidance (4/2000) Method G – Wind Erosion from Stockpiles.

$$E = E_f * A \tag{5}$$

$$E_f = J * 1.7 * \frac{sL}{1.5} * \frac{365 - P}{235} * \frac{I}{15} * \frac{365}{2000} \tag{6}$$

where:

E Emission rate (ton/yr)
E_f Emission factor (tons/acre)
A Exposed surface area of stockpile (acres)
J Particulate aerodynamic factor
sL average silt content (%)
P Average number of days during the year with at least 0.01 inch of precipitation
I Percentage of time with unobstructed wind speed > miles/hour (%)

Inputs for the Equations 5 and 6 and calculations of emissions are presented in Appendix B. Area watering may be necessary for the open areas to minimize windblown fugitive dust

2.1.5 Concrete Batch Plant

A concrete batch plant will be used to produce all of the concrete required for construction operations. The individual operations involved in the plant are aggregate and sand delivery, aggregate and sand transfer, sand transfer to elevated storage, cement and supplement loaded into storage silo, weight hopper loading of sand, gravel and cement, and loading concrete into mix trucks.

Emissions from batch plant operation are estimated using emission factors from AP-42 Section 11.12 (6/06) Concrete Batching, Tables 11.12-2 and 11.12-5. Calculations for concrete operations are presented in Appendix B.

2.1.6 Combustion Equipment

Construction equipment will require fuels primarily in the form of diesel fuel for power. Various types of equipment will require diesel fuel including bulldozers, scrapers, graders, cranes, and many others. Gasoline automobiles and light trucks will also be needed on-site. Appendix B contains a detailed listed of the expected equipment, the approximate engine size, expected annual use, and zero-hour steady state criteria pollutant emission factors.

Criteria pollutant emissions from diesel combustion engines are estimated using two background documents to EPA's NONROAD model documentation: "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling –Compression Ignition" (EPA420-P-04-009, 4/2004) and "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" (EPA420-P-04-005, 4/2004). These two documents provide the basis for calculating emissions from diesel equipment.

For purposes of emissions estimation, all diesel engines are assumed to be Tier 2 certified. However, when construction begins actual emissions are expected to be lower due to an increasing use of newer Tier 3 and Tier 4 certified engines.

Criteria pollutant emissions from on-site gasoline pickup trucks and automobiles are estimated using EPA's Mobile 6.2 model. Emission factors in g/VMT were taken for light duty gasoline vehicles (LDGV) and two classes of light duty gasoline trucks (LDGT12 and LDGT 34). The two truck categories are for gross vehicle weight ratings of above and below 6,000 pounds. The emission factors were turned into a composite emission factor for all three vehicle types by taking a weighted average of all three model output emission factors and using adjusted vehicle distributions by only looking at these three vehicle types. The emission factors were translated into g/hp-hr by assuming an average speed of 20 miles/hr and an engine size of 231 hp.

2.1.7 Source Location

Figure 2-1 shows the modeled areas of the plant. Unpaved roads are scattered among the seven labeled areas. Emissions are divided among the areas based on traffic flows, trip purpose, and destination areas.

The Unit 3 area is the future location of the power block and reactor. Area 2 is for parking and laydown. Area 3 is the future location of the cooling towers and also includes a storage area. Area 4 will contain parking ans laydown areas and will have the future switchyard. Area 5 is an existing laydown area which will be used for Unit 3 construction. Area 6 contains the concrete batch plant. Area 7 is the haul road to the barge. It is broken into four pieces for modeling purposes.

Figure 2-1 Location of Sources Associated with the Construction of CCNPP Unit 3

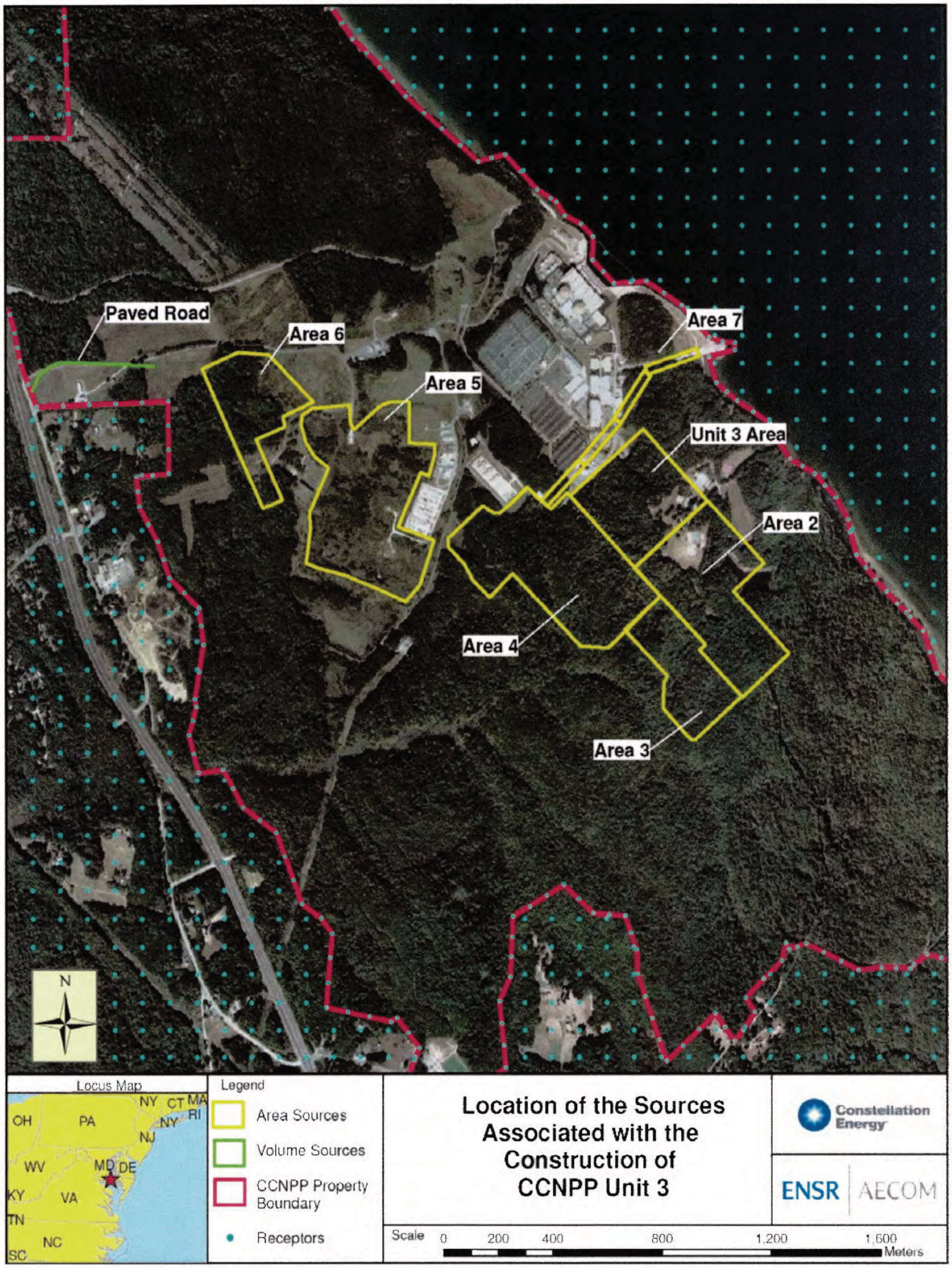


Table 2-2 Criteria Pollutant Emissions Summary

		2010	2011	2012	2013	2014	2015
Paved Roads	PM_{10}	0.07	0.27	0.53	0.8	0.27	0.02
Unpaved Roads	PM_{10}	17.48	25.10	17.56	23.58	7.75	0.56
Material Transport	PM_{10}	3.49	3.16	0.44	0.00	0.00	0.00
Site Preparation	PM_{10}	50.40	52.79	24.28	9.38	2.58	0.37
Concrete Batch Plant	PM_{10}	0.12	0.38	0.50	0.49	0.12	0.00
Wind Erosion	PM_{10}	6.91	7.09	6.91	3.94	2.12	2.12
Combustion Equipment	PM_{10}	1.54	2.27				
Total	**PM_{10}**	**80.0**	**91.1**	**52.4**	**40.0**	**18.4**	**8.0**
Combustion Equipment	NO_X *	60.92	82.48	72.61	57.04	39.03	13.92
Combustion Equipment	CO *	23.31	36.33	44.67	39.72	34.56	15.77
Combustion Equipment	VOC *	4.36	6.37	7.18	5.55	4.40	1.78
Combustion Equipment	SO_2 *	2.45	3.32	2.91	2.27	1.54	0.54

* Combustion equipment emissions are the only sources of these pollutants

2.2 Air Pollution Control Measures

During construction of CCNPP Unit 3, several measures will be undertaken to minimize potential generation of emissions. The emissions data were calculated assuming the contractor will employ the watering practices and engine types listed below.

Stabilizing unpaved areas with gravel – Construction roads, parking lots, and laydown areas will be covered with gravel to stabilize surfaces and reduce the amount of materials that could become airborne as a result of wind movement and mechanical energy from movement of vehicles and equipment.

Application of water – Application of water to paved and unpaved roads and exposed areas will be effective in reducing the potential generation of fugitive dust. Water will be applied on a daily basis to the paved and unpaved roads and open areas cleared during construction. Daily application to paved and unpaved roads has the potential to reduce fugitive dust by limiting the . Application of water to open areas as needed has the potential to reduce fugitive dust generation. Natural fugitive dust mitigation will occur through rain or snowfall. According to AP-42 Figures 13.2.1-2 and 13.2.2-1, the CCNPP area receives 140 days of 0.01 inches or more of precipitation. This negates the need to apply water manually on precipitation days.

Concrete batch plant – The concrete batch plant will utilize fabric filters or other equivalent techniques to control emissions from the material transfer operations. The contractors that will be responsible for operating these plants will be required to obtain any necessary permits as temporary sources before bringing equipment on-site, ensuring that the until will be in full compliance with MDE's requirements and standards.

Storm water pollution prevention plan (SWPPP) – A dust control program will be incorporated into the SWPPP.

Diesel Engines – As noted in Section 2.1.6, the worst-case emissions associated with using all Tier 2 certified equipment has been assumed. Tier 3 standards have begun to come into effect for larger size engines in 2006 and Tier 4 standards are slated to come into effect in 2011. The use of tiered emissions levels is EPA's way of promoting the use of lower emitting engines, while allowing older models to operate throughout their useful lives. Heavy equipment used by contractors at the time of construction should gradually shift to using newer engines as construction progresses.

3.0 Dispersion Modeling Analysis

3.1 Overview

This section presents the modeling analysis of the Unit 3 construction activities that was conducted to assess ambient air quality impacts which will demonstrate compliance with applicable state and federal ambient air quality regulations. The analyses were conducted in accordance with USEPA Guideline on Air Quality Models (GAQM; as incorporated in Appendix W of 40 CFR Part 51). Note that the USEPA recently promulgated a revision to the GAQM on November 9, 2005. The revised version of GAQM adopts AERMOD as the preferred dispersion model.

Dispersion modeling was conducted with the US EPA's AERMOD model (Version 07026) and five years of on-site meteorological data. This 5-year data set was processed with AERMET, the meteorological processor for AERMOD, in accordance with guidance provided by US EPA in the recently revised *AERMOD Implementation Guide* (AIG; US EPA, January 9, 2008).

3.2 Model Selection Criteria

The suitability of an air quality dispersion model for a particular application is dependent upon several factors. For this study, the following selection criteria have been evaluated:

- stack height relative to nearby structures, where applicable,
- dispersion environment,
- local terrain, and
- availability of on-site or representative meteorological data.

3.2.1 Dispersion Environment

The application of the model requires characterization of the local (within 3 kilometers (km)) dispersion environment as either urban or rural, based on a US EPA-recommended procedure that characterizes an area by prevalent land use. This land use approach classifies an area according to 12 land use types. In this scheme, areas of industrial, commercial, and compact residential land use are designated urban. According to US EPA modeling guidelines, if more than 50 percent of an area within a three-kilometer radius of the proposed facility is classified as rural, then rural dispersion coefficients are to be used in the dispersion modeling analysis. Conversely, if more than 50% of the area is urban, urban dispersion coefficients are used.

For this analysis, an aerial photo and a topographical map of the facility area has been reviewed. Visual inspection of the map shows that the 3-kilometer area surrounding the proposed facility (see Figure 1-1) is predominantly rural. Therefore, a rural application approach to characterize the source dispersion environment was chosen for this dispersion modeling analysis.

3.2.2 Terrain Considerations

The US EPA modeling guidelines require that the differences in terrain elevations between the stack top, plume centerline and model receptor locations be considered in the modeling analyses. There are three types of terrain:

- simple terrain – locations where the terrain elevation is at or below the exhaust height of the stacks to be modeled;

- intermediate terrain – locations where the terrain is between the top of the stack and the modeled exhaust "plume" centerline (this varies as a function of plume rise, which in turn, varies as a function of meteorological condition);
- complex terrain – locations where the terrain is above the plume centerline.

Based on a review of USGS topographical maps, the terrain within the study area is all simple terrain with respect to the Unit 3 construction sources.

3.3 Representative Meteorological Data

For this analysis, five calendar years of on-site (2001-2005) meteorological data were used. The meteorological tower for the CCNPP site is located in an open field southwest of the CCNPP Unit 1 and 2. The base elevation of the tower is approximately 120.6 ft (37 m) above mean sea level (msl). The tower instrumentation consists of wind speed, wind direction, and duplicate sets of aspirated temperature sensors located at 197 ft (60 m) and 33 ft (10 m) above ground level. A tipping bucket rain gauge is located approximately 30 ft (9.1 m) from the meteorological tower in an open field and a barometric pressure device is located in the Met Building. No moisture measurements (dew point or wet bulb temperature, relative humidity) are currently taken. The onsite meteorological monitoring program was designed, and has been operated, according to U.S. NRC Regulatory Guide 1.23, Revision 0. This guidance includes the following specifications for meteorological measurements at the 10-m and 60-m levels:

- wind direction accuracy of +/- 5 degrees;
- wind speed accuracy of +/- 0.5 mph, with a starting threshold of under 1 mile per hour;
- temperature accuracy of +/- 0.5 deg C, and delta-T accuracy of +/- 0.1 deg C.

These system accuracies are consistent with United States Environmental Protection Agency (USEPA) guidance for on-site meteorological programs.

The data recovery goal of 90% was met for each of five years of data (2001 through 2005). Figures 3-1 and 3-2 show multi-year wind roses from the 33-ft and 197-ft tower levels.

Upper air data for the concurrent period is available from the Washington Dulles Airport, Virginia (KIAD), twice-daily soundings. For parameters not observed by the on-site meteorological instrumentation, such as cloud cover, hourly observations are available from the closest representative airport, Washington Reagan Airport, Virginia (KDCA).

Figure 3-1 On-site Meteorological Tower Wind Rose, 33-ft Level

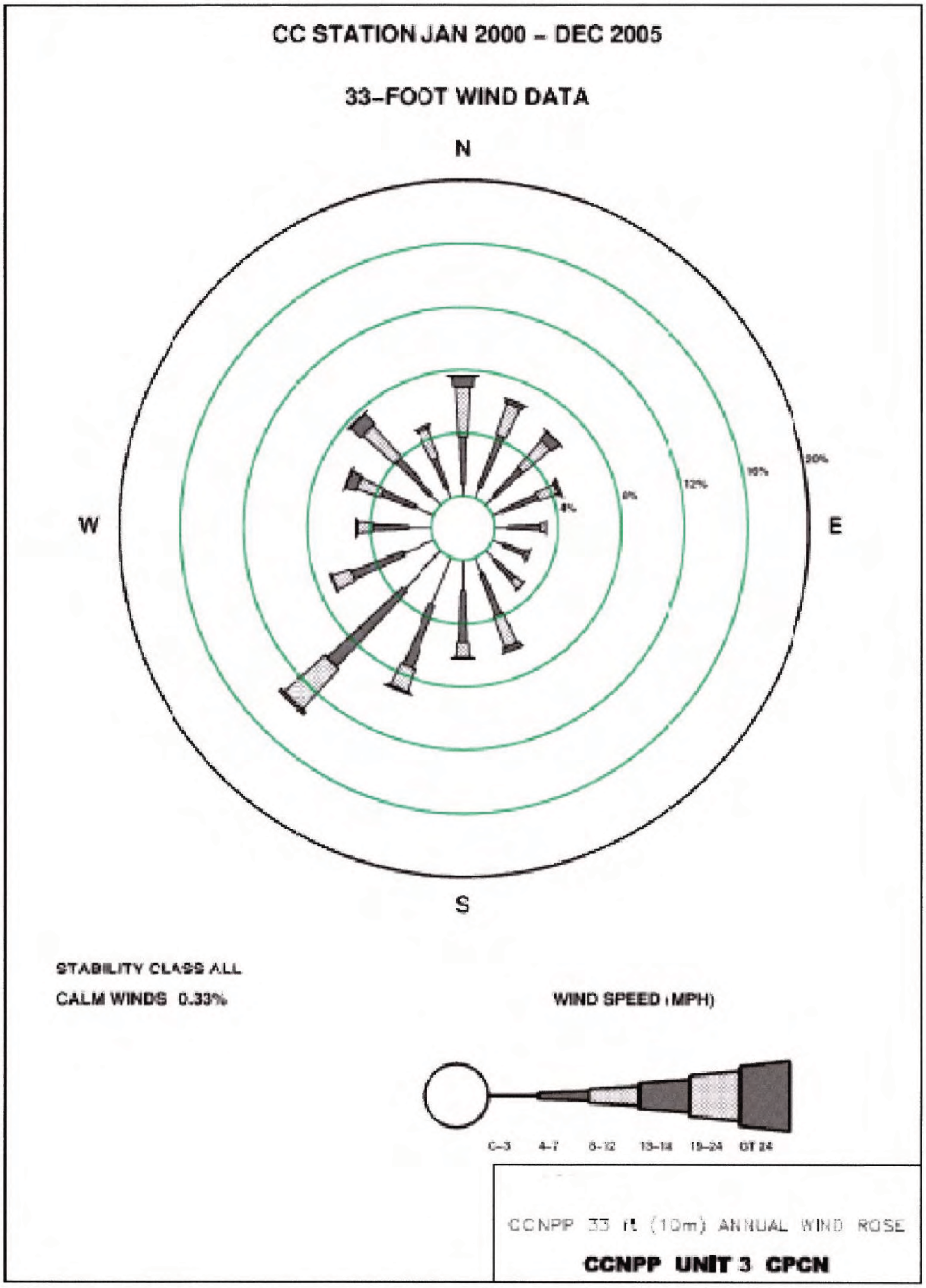
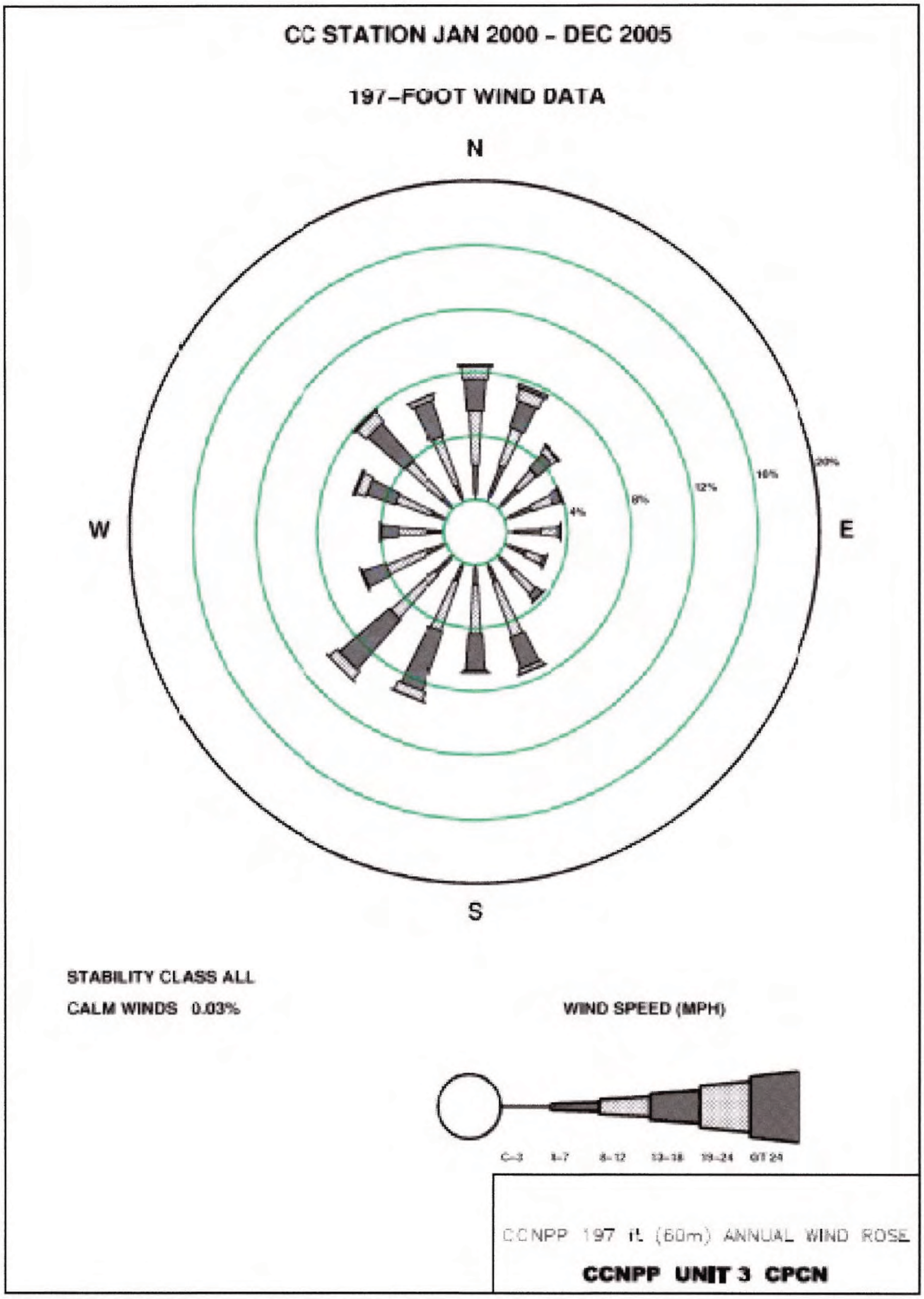


Figure 3-2 On-site Meteorological Tower Wind Rose, 197-ft Level



3.4 Dispersion Model Selection and Application

Based on a review of the factors discussed above, US EPA's preferred dispersion model, AERMOD, was used to assess air quality impacts. AERMOD is a state-of-the-art dispersion model that incorporates modeling improvements especially for applications involving building downwash. The latest version of AERMOD (07026), the AERMET (06341) meteorological preprocessor, and the AERMAP (06341) terrain preprocessor was used in this application. In the application of AERMOD, the regulatory default options were used.

3.4.1 Terrain and Receptor Data Processing with AERMAP

A comprehensive Cartesian receptor grid extending to approximately 7 km from the Unit 3 site was used in the AERMOD modeling to assess maximum ground-level pollutant concentrations. This receptor grid was sufficient to resolve the maximum impacts and any potential significant impact area(s).

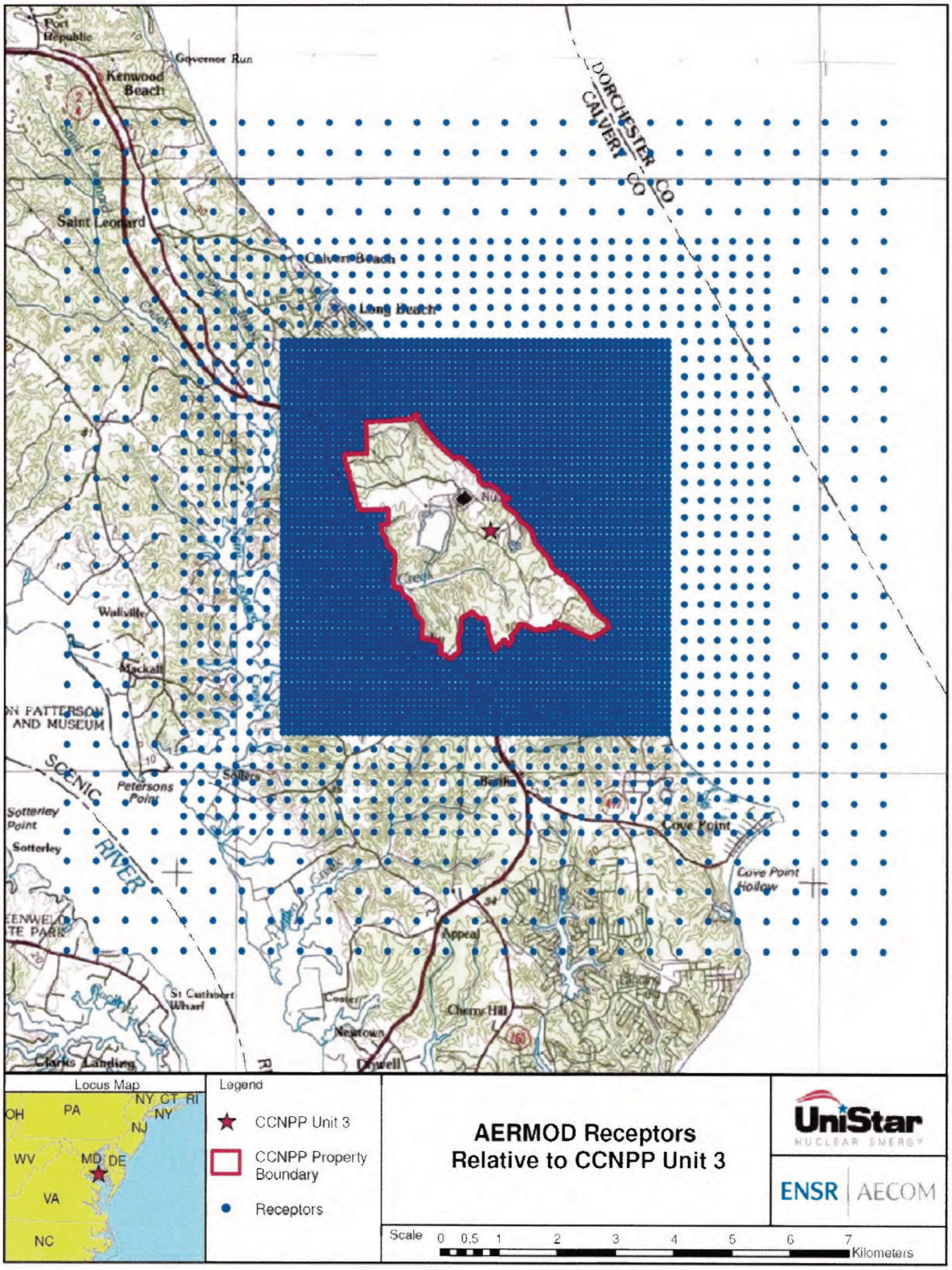
The Cartesian receptor grid consisted of the following receptor spacing:

- property boundary to approximately 1 kilometer at 100-meter increments,
- beyond 1 kilometer to 3 kilometers at 300-meter increments, and
- beyond 3 kilometers at 500-meter increments

Discrete receptors were placed at 100-meter intervals along the plant property boundary.

The AERMAP receptor locations are shown in Figure 3-3. Terrain elevations from Digital Elevation Model (DEM) data acquired from USGS were processed with AERMAP (Version 03107) to develop the receptor terrain elevations and corresponding hill height scale required by AERMOD.

Figure 3-3 AERMOD Receptors



3.4.2 Meteorological Data Processing with AERMET

The meteorological data required for input to AERMOD was created with AERMET (Version 06341), the meteorological preprocessor, which utilizes hourly on-site weather data, nearby cloud cover data from Washington National Airport, and concurrent upper air sounding data from Washington Dulles Airport, VA. (Note that the poor data capture for the Patuxent River Naval Air Station precluded use of that meteorological station for input to AERMET.) AERMET creates two output files for input to AERMOD:

- SURFACE: a file with boundary layer parameters such as sensible heat flux, surface friction velocity, convective velocity scale, vertical potential temperature gradient in the 500-meter layer above the planetary boundary layer, and convective and mechanical mixing heights. Also provided are values of Monin-Obukhov length, surface roughness, albedo, Bowen ratio, wind speed, wind direction, temperature, and heights at which measurements were taken.
- PROFILE: a file containing multi-level meteorological data with wind speed, wind direction, temperature, sigma-theta (σ_θ) and sigma-w (σ_w) when such data are available. For this application involving on-site, the profile file contains a two levels (10-m and 60-m) of wind data and temperature data.

AERMET requires specification of site characteristics including surface roughness (z_o), albedo (r), and Bowen ratio (B_o). These parameters were developed according to the guidance provided by US EPA in the recently revised AERMOD Implementation Guide (AIG).

The revised AIG provides the following recommendations for determining the site characteristics:

1. The determination of the surface roughness length should be based on an inverse distance-weighted geometric mean for a default upwind distance of 1 kilometer relative to the measurement site. Surface roughness length may be varied by sector to account for variations in land cover near the measurement site; however, the sector widths should be no smaller than 30 degrees. As discussed below, 3 sectors were used in this application.
2. The determination of the Bowen ratio should be based on a simple un-weighted geometric mean (i.e., no direction or distance dependency) for a representative domain, with a default domain defined by a 10-km by 10-km region centered on the measurement site.
3. The determination of the albedo should be based on a simple un-weighted arithmetic mean (i.e., no direction or distance dependency) for the same representative domain as defined for Bowen ratio, with a default domain defined by a 10-km by 10-km region centered on the measurement site.

The AIG recommends that the surface characteristics be determined based on digitized land cover data. US EPA has developed a tool called AERSURFACE that can be used to determine the site characteristics based on digitized land cover data in accordance with the recommendations from the AIG discussed above. AERSURFACE incorporates look-up tables of representative surface characteristic values by land cover category and seasonal category. AERSURFACE will be applied with the instructions provided in the *AERSURFACE User's Guide* (EPA, 2008).

The current version of AERSURFACE (Version 08009) supports the use of land cover data from the USGS National Land Cover Data 1992 archives[1] (NLCD92). The NLCD92 archive provides data at a spatial resolution of 30 meters based upon a 21-category classification scheme applied over the continental U.S. The

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[1] http://edcftp.cr.usgs.gov/pub/data/landcover/states/