MARYLAND DEPARTMENT OF NATURAL RESOURCES

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PPRP

Environmental Review of Proposed Air Pollution Control Project at Brandon Shores

DRAFT

5 February 2007

MARYLAND POWER PLANT RESEARCH PROGRAM

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1.0 INTRODUCTION

1.1 BACKGROUND

Constellation Power Source Generation, Inc. (CPSG) has submitted an application to the Maryland Public Service Commission (PSC) for a modification of the Brandon Shores Generating Station in Anne Arundel County, Maryland (see general location in Figure 1-1). The proposed modification consists of air pollution control systems designed to reduce emissions in compliance with Maryland's recently enacted Healthy Air Act (2006).

The air pollution control systems proposed for Brandon Shores include a wet flue gas desulfurization (FGD) system, mercury and acid mist controls, and associated enhancements. These modifications promise significant environmental benefit in the form of reduced air emissions.

The Department of Natural Resources (DNR) Power Plant Research Program (PPRP), coordinating with other State agencies, performed this environmental review of the Brandon Shores project as part of the PSC licensing process. Before modifications of the facility can be undertaken, the PSC must grant a Certificate of Public Convenience and Necessity (CPCN). PPRP's review is being conducted to evaluate the potential impacts to environmental and cultural resources for the proposed modification, pursuant to Section 3-304 of the Natural Resources Article of the Annotated Code of Maryland.

PPRP used the analysis of potential impacts as the basis for establishing initial recommended license conditions for operating the modified facility, pursuant to Section 3-306 of the Natural Resources Article. PPRP's recommendations are made in concert with other programs within DNR as well as the Departments of Agriculture, Business and Economic Development, Environment, Planning, and Transportation, and the Maryland Energy Administration. The initial recommended licensing conditions are included as Appendix A to this report.

Figure 1-1 Project Location Map

Please see the separate file "Case_9075_Figure_1-1".

1.2 HEALTHY AIR ACT

1.2.1 Background on HAA and Federal Multi-pollutant Reduction Programs

The Maryland Healthy Air Act (HAA) was signed into law in the spring of 2006. The HAA is a sweeping "multi-pollutant" air pollution control program requiring substantial reductions in emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), and mercury from fifteen coal-fired generating units at seven power plants in Maryland, including Brandon Shores Units 1 and 2. The HAA also requires Maryland to participate in a multi-state program known as the Regional Greenhouse Gas Initiative (RGGI) to reduce emissions of pollutants, including carbon dioxide, that contribute to climate change.

The HAA regulates NO_x and SO_2 emissions based on a pollutant "cap-and-trade" program in which the State establishes annual, state-wide total tonnage emissions caps separately for NO_x and SO_2 and then allocates a portion of the annual state-wide caps to each of the 15 individual coal-fired power plant generating units subject to the HAA. Power plant owners can comply by reducing emissions at each unit to meet the unit's cap, or can comply with the caps on a system-wide basis, by over-controlling emissions at some plants and trading the excess allowances to other HAA plants that the company owns and operates in Maryland. Table 1-1 identifies the HAA caps and reduction requirements in MDE-ARMA's regulations implementing the HAA (COMAR 26.11.27).

The U.S. Environmental Protection Agency (EPA) recently passed its own multi-pollutant regulations affecting power plants: the Clean Air Interstate Rule (CAIR), which regulates NO_x and SO_2 emissions, and the Clean Air Mercury Rule (CAMR), which regulates mercury emissions. Like the HAA, the Federal rules for NO_x and SO_2 are based on a cap-and-trade program, although the caps established for Maryland power plants by CAIR and CAMR are less stringent than those set by the HAA. In fact, the HAA is more stringent than the Federal regulations in several key ways:

- HAA requires greater pollutant reductions than CAIR.
- HAA reductions schedules are more aggressive than the Federal schedule.

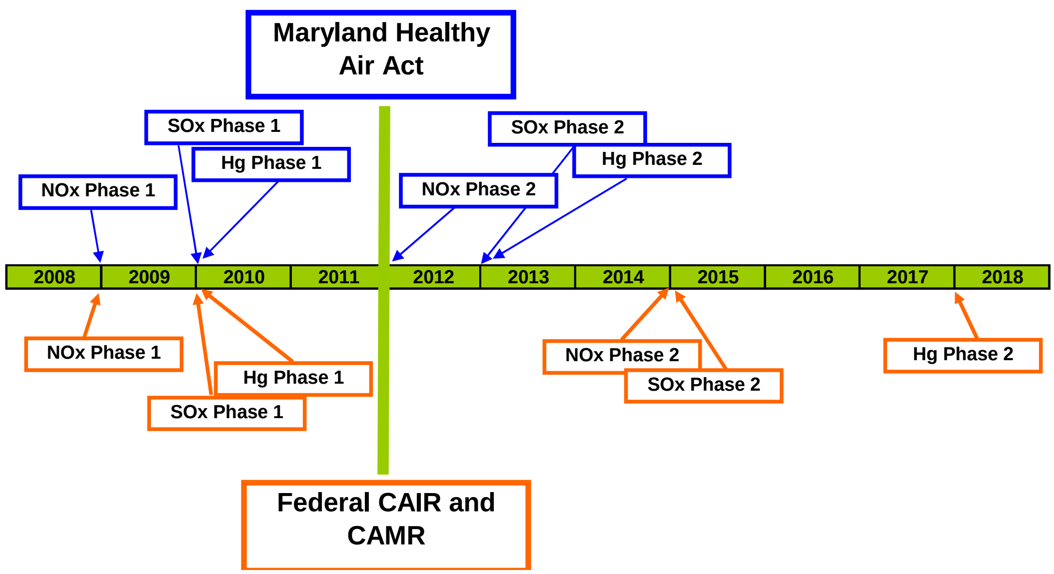
Table 1-1 Emissions Caps and Reduction Requirements in MDE's HAA Enabling Regulations (COMAR 26.11.27) in Tons

Generating Unit	NO_x (2009) Annual (tpy)	NO_x (2012) Annual (tpy)	NO_x (2009) Ozone Season (t/O_3)	NO_x (2012) Ozone Season (t/O_3)	SO_2 (2010) Annual (tpy)	SO_2 (2012) Annual (tpy)
CONSTELLATION						
Brandon Shores Unit 1	2,927	2,414	1,363	1,124	7,041	5,392
Brandon Shores Unit 2	3,055	2,519	1,449	1,195	7,347	5,627
C.P. Crane Unit 1	832	686	345	284	2,000	1,532
C.P. Crane Unit 2	894	737	385	317	2,149	1,646
Wagner Unit 2	673	555	278	229	1,618	1,239
Wagner Unit 3	1,352	1,115	583	481	3,252	2,490
CONSTELLATION TOTAL	**9,733**	**8,026**	**4,403**	**3,630**	**23,407**	**17,926**
MIRANT						
Chalk Point Unit 1	1,415	1,166	611	503	3,403	2,606
Chalk Point Unit 2	1,484	1,223	655	542	3,568	2,733
Dickerson Unit 1	672	554	311	257	1,616	1,238
Dickerson Unit 2	736	607	333	274	1,770	1,355
Dickerson Unit 3	698	575	314	259	1,678	1,285
Morgantown Unit 1	2,540	2,094	1,053	868	6,108	4,678
Morgantown Unit 2	2,522	2,079	1,048	864	6,066	4,646
MIRANT TOTAL	**10,067**	**8,298**	**4,327**	**3,567**	**24,209**	**18,541**
ALLEGHENY						
R. P. Smith Unit 3	67	55	27	22	161	124
R.P. Smith Unit 4	349	288	143	118	841	644

- HAA prohibits the affected power plant from acquiring allowances from outside the State of Maryland.
- To date, there are no Federal programs regulating greenhouse gas emissions from power plants or other sources, while the HAA requires Maryland to participate in RGGI.

The coal-fired generating units in Maryland are subject to the HAA and the Federal CAIR/CAMR programs. Figure 1-2 illustrates the schedules for the State and Federal pollution control regulations.

Figure 1-2 Maryland HAA and Federal CAIR/CAMR Program Deadlines



Note: Hg = mercury

1.2.2 Project Schedules

FGD system installations involve substantial construction projects. CPSG indicates in its CPCN application for the Brandon Shores project that it will need to initiate construction on the project in the summer of 2007 to complete the design, purchase, and installation of the air pollution control systems and be able to meet the HAA Phase 1 deadlines. Because of the aggressive HAA deadlines, and the size and complexity of the wet FGD project, CPSG has requested an expedited review of its application.

1.3 REPORT ORGANIZATION

This report synthesizes the evaluations that PPRP has conducted related to CPSG's application for a CPCN for the proposed modifications. The information is organized into the following sections:

- Section 2 provides a description of the site, the existing facility and proposed project.
- Section 3 describes the existing site conditions, including climatology, biological resources, the regional socioeconomic setting, and noise.
- Section 4 discusses the project's impacts on air quality and associated regulatory requirements.
- Section 5 presents other environmental impacts that the project will have on the surrounding area, in particular to ecological, socioeconomic, and cultural resources, and the acoustic environment.
- Section 6 discusses the project's water supply needs, proposed source, and associated impacts.
- Section 7 describes wet FGD by-product management, off-site disposition, and an evaluation of impacts.
- Sections 8 and 9 provide, respectively, a summary of issues and a list of references.

2.0 *PROJECT DESCRIPTION*

2.1 *SITE DESCRIPTION*

The site of the proposed modification is the existing Brandon Shores Generating Station located on the Patapsco River in Anne Arundel County, Maryland. Brandon Shores is co-located on a 483-acre site with the H.A. Wagner Generating Station, which has a nominal generating capacity of 1,020 megawatts (MW). The site also includes an office, maintenance shops, and warehouse complex.

2.2 *EXISTING FACILITY*

Brandon Shores is a coal-fired power plant that consists of two Babcock and Wilcox pulverized coal boilers and two steam turbines (Units 1 and 2) with a combined nominal generating capacity of 1,370 MW. Unit 1 went into operation in May 1984 and Unit 2 went into operation in May 1991.

Coal is delivered to Brandon Shores via a common coal barge unloading system shared with Wagner, and is stored in areas adjacent to Units 1 and 2. Brandon Shores can accommodate more than 5 million tons of coal annually as fuel for power generation. Low-sulfur "compliance coal" is currently used, which has a sulfur content of about 0.7 percent by weight to comply with the current SO_2 emissions limit allowed under federal regulations.

Exhaust gases leave each unit through a 700-ft stack. Current air quality control systems at Brandon Shores, as mandated by prior legislation, consist of a hot-side electrostatic precipitator (ESP) and a selective catalytic reduction (SCR) system on each unit. The ESP reduces particulate matter (PM) emissions to less than 0.062 pounds per million Btu (lb/MMBtu) on average; the SCR system reduces NO_x emissions to less than 0.1 lb/MMBtu on average when operating. At present, SCR systems at Brandon Shores are used only in May to September to limit NO_x emissions during the ozone season.

2.3 *PROPOSED PROJECT*

Proposed modifications at Brandon Shores are designed to modify the existing flow of flue gas from the facility's stack in order to control emissions of SO_2, sulfuric acid mist (SAM), mercury, and PM. Existing flue gas handling systems will be linked to the new system by means of new ductwork. Existing induced-draft fans will be upgraded from their current design, new booster fans will be installed, and a new stack will be built. The existing stack will be utilized as a drawdown to accommodate the existing furnace and ductwork. Figure 2-1 provides a detailed layout of the equipment and buildings on the site.

The proposed project involves the following four components:

- Installation of an air pollution control system for each unit consisting of a wet FGD system and associated process system, a fabric filter baghouse, sorbent and powdered activated carbon (PAC) injection equipment for removal of mercury and sulfuric acid mist, and a single dual-flue 400-foot stack to serve the wet FGD systems of both units;

- Installation of material handling and storage equipment for process input (limestone and other air pollution control system reagents) and output (gypsum) materials, and reconfiguration of the coal yard to accommodate coal alternatives created by the installation of the wet FGD system;

- Installation of by-product management system components and water and wastewater treatment facilities; and

- Enhancements to auxiliary electrical energy generation features to accommodate the energy requirements necessary for operating the proposed air pollution control systems.

Figure 2-1 Site Plan

Please see the separate file "Case_9075_figures.pdf" for all report figures formatted to print on 11 x 17 sized paper.

2.3.1 *Air Control System Components for Each Steam Unit*

Flue gases will flow through the existing system, by-pass the existing stack, and then undergo a series of chemical treatments involving the injection of sorbents to reduce emissions of SAM and mercury. A by-product of these injections is PM, consisting primarily of fly ash particles.

PM in the treated flue gas will be captured by means of a fabric filter baghouse and temporarily stored on-site before off-site disposal or beneficial use. This will minimize the amount of PM that enters the wet FGD system. The fabric filter will utilize multiple fabric bags to filter the solid particles from the flue gas, and will be periodically cleaned (e.g., pulse-jet or reverse air cleaning). Collected material (or filter cake) will be captured in enclosed hoppers and pneumatically transported to storage silos built for this purpose.

Wet FGD systems (also referred to as "scrubbers") will remove SO_2 from the flue gas from each steam turbine. The project design includes a single 100 percent capacity SO_2 absorber for each unit. Flue gas is then emitted to the environment through a dual-flue 400-foot stack that will be constructed as part of the proposed project. It will consist of a concrete or steel frame chimney shell that surrounds and supports the flues from each of the steam turbines. Each flue will be fabricated of fiberglass-reinforced plastic and have an approximate diameter of 31.5 feet. The stack will contain the majority of continuous emissions monitoring systems (CEMS).

Operation of the wet FGD system requires input of a mixture of ground limestone and water (limestone slurry). Gypsum (also known as calcium sulfate) is formed as a by-product when the limestone slurry reacts with SO_2 in the flue gas. The by-product gypsum is suitable for use in making wallboard, cement manufacturing and other alternative uses. The limestone slurry necessary for operation of the wet FGD system is prepared in ball mills by mixing limestone with water and grinding it to small particles to form limestone slurry. This is stored in a slurry storage tank prior to input into the wet FGD system.

Once used in the wet FGD absorber, the reactant is pumped to hydroclone classifiers that will separate the slurry into low-density fines and high-density coarse crystals, corresponding respectively to unreacted limestone and gypsum by-product. Any unreacted limestone will be recycled and the gypsum by-product will be removed from the slurry through a mechanical dewatering process consisting of belt filters. The separated liquid will be recycled back through the wet FGD system. The gypsum will be temporarily stored on-site before being sent off-site for reuse or disposal. To control the accumulation of chloride salts within the water phase of the wet FGD system, a chloride purge stream will be extracted and sent to the wastewater treatment system.

Inputs to the wet FGD system include water and limestone for the limestone slurry and energy for operating the system. Additional outputs besides gypsum from the wet FGD system and PM from the fabric filter baghouse include wastewater. The necessary subsystems for material preparation, handling and storage will be constructed as part of the proposed project.

2.3.2 *Material Handling and Storage Equipment for Process Input and Output Materials*

Coal Storage and Handling

Modifications will be made to the existing coal storage and handling system to allow for the blending of coals. Coal will be unloaded by barge using the existing system, through Transfer Tower 1 to Brandon Shores' coal yard. Transfer Tower 2, located at the eastern end of the Brandon Shores coal yard, will be modified to allow coal being transferred from the barge unloader to be diverted onto a new conveying system. The new overland conveying system will be located around the southern portion of the existing long-term storage pile. It will include three transfer points and is rated at approximately 4,400 tons/hour.

A radial stacking conveyor, capable of stockpiling approximately 44,000 tons of fuel, will be located at the end of this system, and will feed coal directly onto the existing underground reclaim belt or to a new underground reclaim tunnel and conveyor. The new underground conveyor, rated at approximately 1,250 tons per hour, will send coal to a new transfer tower, which will allow the blended fuel to be directed to new conveyors that will be connected to either of the two existing conveyors (C-6 and C-7). The existing conveyors currently transfer reclaimed coal to the existing crusher building. A new single hopper reclaim tunnel and conveyor will be added near Transfer Tower 2 in order to convey coal from the existing fixed stacker pile area onto an existing conveyor (C-6) via the new transfer tower.

Limestone Receiving, Handling and Storage

Up to 740,000 tons of limestone will be delivered to the site annually, primarily in barges similar in size (5,000-ton) to those currently used. The existing Wagner Barge Unloader, located at the east edge of the site along the Patapsco River, will be reconditioned and modified for unloading of limestone. Figure 2-2 provides a detailed flow diagram of the movement of both limestone and gypsum. It is expected that up to seven barge deliveries will be made per week, each taking approximately 2.5 hours to unload, and that barge operations will occur primarily during daylight hours. However, lighting for night operations will also be provided. Some maintenance and repair of the existing sheet pile river cells upon which the unloader and associated barge positioners sit will be required, but there will be no new construction below the water level.

The existing "MA" Conveyor will be modified into two new conveyors, MA-1 and MA-2. Conveyor MA-1 will allow transport of the limestone from the unloader to a new elevated transfer point (LTT-1) located onshore. This new transfer point with a diverter gate or other suitable device will allow limestone to be delivered to a new conveyor (rated at 1,200 tons per hour) leading to the limestone storage pile. The conveyor system deposits limestone onto the active storage pile (approximately 28,000 tons), representing a capacity of about 15 days of plant operation at full load. A front-end loader will be used to move limestone within the storage area to a low-profile reclaimer, transferring limestone via a new conveyor to two limestone day-silos located in the wet FGD system area. Each silo will have a limestone supply capacity equal to at least 12 hours of plant operation.

Figure 2-2 Flow diagram Limestone and Gypsum by Barge

Please see the separate file "Case_9075_figures.pdf" for all report figures formatted to print on 11 x 17 sized paper.

Gypsum Handling, Storage, and Barge Loading

A single conveyor will move the commercial grade gypsum by-product from the wet FGD system to the gypsum storage area. The gypsum storage pile (approximately 15,000 tons) is equivalent to the output of about 5 days of plant operation. It will be stored on the ground in an enclosure to protect it from rainfall.

A new gypsum conveyor (GC9) will be constructed over water between gypsum transfer tower GTT7, located on land north of the existing breakwater, and a new offload tower (GTT8), located to the east of the existing Wagner barge unloader. Installation of the new offload tower will require some excavation of river bottom, corresponding to 400-500 cubic yards of spoil that will be transported to the Cox Creek spoil disposal area.

No dredging is required for barge access and the existing channel will be maintained at 17 feet mean low water level. It is expected that up to 11 barges per week (each with a capacity of 5,000 tons) will be loaded with the gypsum for transport off the site, totaling approximately 1,200,000 tons annually.

Receipt and Storage of Other Reagents

Lime for use in the wastewater treatment system, activated carbon for mercury control, and sodium bisulfide ($NaHSO_3$) sorbent will all be delivered to the site by bulk-carrier truck. Each will be pneumatically transported to its own storage silo, which will be equipped with dust collection devices to capture reagent dust expelled with the transport air.

2.3.3 Water and Waste Management

Water Supply

Operation of the wet FGD system will require up to approximately 5.5 million gallons per day (mgd) of water on an average basis. The project will use effluent from the neighboring municipal sewage treatment plant, Anne Arundel County's Cox Creek Water Reclamation Plant, located on the southern boundary of the facility's property. The treatment plant has a right-of-way across the property to pipe its discharge into the Patapsco River.

A lift station will be installed at the treatment plant to pump the effluent water to new water treatment facilities on the Project site, which will further treat the water to a quality suitable for use in the wet FGD equipment. Prior to use, effluent water will be treated by clarification, filtration, and chlorination.

Wastewater Treatment

The proposed project will include treatment facilities for the wastewater generated by the wet FGD system, and a system for thickening and dewatering sludges generated from the water treatment system clarifier and from wastewater treatment process units. This will be located to the north of and alongside the existing wastewater treatment system.

The wet FGD chloride purge stream will be treated in a two-stage process to produce an effluent that meets water quality standards. Heavy metals will be removed by chemical precipitation and nitrogen will be removed by biological processes. The treated effluent will flow via gravity to the existing retention pond, from which it will be discharged to the Patapsco River along with other plant wastewaters.

Handling and Storage of Water and Wastewater Treatment Sludge Cake

The sludges from the wastewater treatment system clarifiers and the water treatment system clarifier will be transferred to a sludge thickener for concentration. Thickened sludge will be pumped to filter presses for dewatering, resulting in an approximately 50 percent solids sludge cake. It is expected that up to 85 tons per day of sludge cake will be produced.

Operations will take place in the wastewater treatment building and the resulting sludge cake will be collected in lined roll-off containers (probably 20 cubic yards in size). Each roll-off container can accept approximately 20 tons of wet sludge. Full containers will be sealed with a watertight cover and moved to a temporary storage area in the yard before off-site disposal by a waste management contractor.

Handling and Storage of Fabric Filter Waste

Fabric filter waste containing residual fly ash and spent sorbents will be conveyed pneumatically through a vacuum transport system from the collection hoppers to a dedicated silo. Transport air will be exhausted through a dust collector mounted on the silo. Waste will be removed from the silo by gravity through pug mills, where water will be mixed with the material to reduce dusting, and then loaded into trucks for off-site disposal, beneficial reuse, or as a marketable commodity. It is expected that up to approximately 380 tons/day of fabric filter waste, of which about 80 percent are solids, will be produced.

2.3.4 *Enhancements to Auxiliary Electrical Energy Generation*

Project operation will require a significant amount of auxiliary electrical energy to operate equipment such as pumps, fans, conveyor belts, miscellaneous motors, controls, etc. At full load operations, the power demand is expected to approach approximately 35 MW (for both units). To reduce and offset the resulting loss in generation output from the plant's output, enhancements to existing equipment will be made. These include an upgrade of the high pressure turbine steam path components. Collectively, these enhancements are estimated to allow Brandon Shores to generate an additional 60 MW, which will recover the additional power demand (35 MW) while also providing a potential additional gain of 25 MW of power from both units. The additional output created may in turn require enhancements to the transmission interconnection facilities between the plant and the switchyard.

3.0 EXISTING SITE CONDITIONS

3.1 CLIMATOLOGY AND AMBIENT AIR QUALITY

3.1.1 Climatology

The discussion of climatology in the vicinity of the Brandon Shores plant is based primarily on data from Baltimore Washington International airport (BWI), which is the closest National Weather Service (NWS) station to the Brandon Shores site. The climate data cited in this section is from the Maryland State Climatologist Office Website, which is operated by the University of Maryland Department of Atmospheric and Oceanic Science. BWI is located approximately 12 miles west of the Brandon Shores facility, and is considered representative of the area.

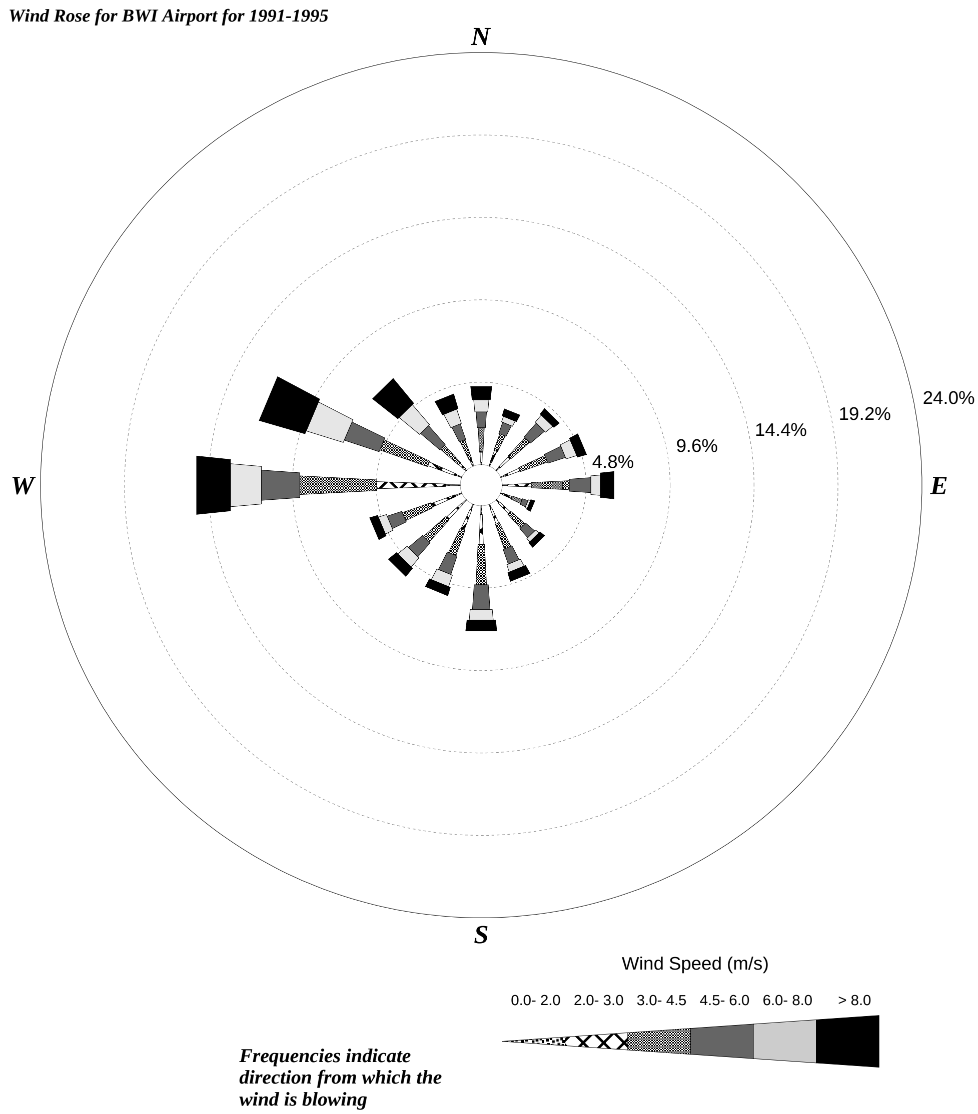
The climate in the vicinity of the Brandon Shores site is temperate with four defined seasons. The annual mean temperature is approximately 55°F. The record minimum and maximum extreme temperatures range from a low of -7°F to a high of 105°F. Normal minimum and maximum temperatures are 24°F and 87°F, respectively. Lowest yearly temperatures tend to occur in January, while highest temperatures occur in July.

Precipitation is evenly distributed throughout the year. The mean annual precipitation is approximately 42 inches. This total has varied from as little as 28 inches to over 63 inches during the past 30 years.

Thunderstorms are relatively common, occurring about 30 days during an average year, with about 75 to 80 percent of them occurring from May through August. Tornadoes are much rarer. Of the ones that do occur, most are small and result in nominal losses. About 20 percent of the tornadoes experienced in Maryland occur on the eastern shore.

The average annual wind speed at BWI is 4.0 miles per hour. Based on wind data at BWI from 1991-1995, prevailing winds are from the west. A wind rose of BWI wind measurements based on data from 1991 through 1995 is presented in Figure 3-1.

Figure 3-1 BWI Wind Rose for 1991-1995



3.1.2 *Existing Ambient Air Quality Standards and Designations*

Air Quality: Monitoring and Determining Attainment of Ambient Air Quality Standards

The U.S. Environmental Protection Agency (EPA) monitors concentrations of the "criteria" pollutants, nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter (PM), ozone, carbon monoxide (CO), and lead at various locations across the United States near ground level. If monitoring indicates that the concentration of a pollutant exceeds the National Ambient Air Quality Standard (NAAQS) in any area of the country, that area is labeled a "nonattainment area" for that pollutant, meaning that the area is not meeting the ambient standard. Conversely, any area in which the concentration of a criteria pollutant is below the NAAQS is labeled an "attainment area" indicating that the NAAQS is being met.

The attainment/nonattainment designation is made by states and EPA on a pollutant-by-pollutant basis. Therefore, the air quality in an area may be designated attainment for some pollutants and nonattainment for other pollutants at the same time. For example, many cities are designated nonattainment for ozone, but are in attainment for the other criteria pollutants.

Since the late 1980s, the NAAQS for PM covered "PM10," which represents PM less than 10 microns in diameter. In 1997, EPA revised the NAAQS for PM and added a standard for a new form of PM known as PM2.5, PM less than 2.5 microns in diameter. PM2.5, or "fine particulates," are of concern because the particles small size allows them to be inhaled deeply into the lungs. In December 2004, EPA published its final designation of PM2.5 nonattainment areas.

EPA and states makes attainment designations based on air quality surveillance programs that measure pollutants in a network of nationwide monitoring stations known as the State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Monitoring Stations (PAMS) (EPA 1998). NAMS are a subset of the SLAMS focused on urban and multi-source areas. PAMS are also a subset of the SLAMS, and focus on areas of the county with ozone nonattainment issues. Appendix D of Part 58 of the Code of Federal Regulations establishes air quality monitoring network design specifications.

EPA's six stated objectives for the monitoring network design for the SLAMS are (EPA 1998; pg 2-1):

(1) to determine highest concentrations expected to occur in the area covered by the network;

(2) to determine representative concentrations in the areas of high population density;

(3) to determine the impact on ambient pollution levels of significant sources or source categories;

(4) to determine general background concentration levels;

(5) to determine the extent of Regional pollutant transport among populated areas, and in support of secondary standards; and

(6) to determine the welfare-related impacts in more rural and remote areas (such as visibility impairment and effects on vegetation).

EPA further explains that SLAMS monitors are intended to be located so that the samples they collect are representative of air quality over the entire area they are intended to cover. The Agency has established "spatial scales of representativeness" to ensure that monitoring of specific pollutants is appropriate and representative. The scales of representativeness include microscale, middle scale, neighborhood scale, urban scale, and regional scale (EPA 1998). The scale takes into consideration such factors as local terrain, pollutant-specific criteria, and population density. EPA reviews the program annually to "…improve the network to ensure that it provides adequate, representative, and useful air quality data" (EPA 1998).

In summary, EPA and state air agencies have established a monitoring network designed to allow collection of monitoring data sufficient for EPA to determine ambient air quality of criteria pollutants. The monitoring data is used to determine background ambient concentrations of criteria pollutants, and to classify all areas of the county as attainment or nonattainment of the NAAQS.

3.1.3 Local Air Quality

All of the State of Maryland, including Anne Arundel County, is in attainment of the NAAQS for all criteria pollutants with the exception of ozone and PM2.5. Some counties in Maryland are designated ozone attainment areas and some are nonattainment areas; however, because ozone is a regional issue, EPA treats the Northeastern United States, from northern Virginia to Maine, as an ozone nonattainment area known as the Northeast Ozone Transport Region.

Anne Arundel County is a designated "moderate" ozone nonattainment area (on a scale that ranges from worst to best air quality of extreme – severe – serious – moderate – marginal), and nonattainment for PM2.5.

Figure 3-2 illustrates ambient air quality monitoring stations in and around Anne Arundel County, operated under the SLAMS network. The monitoring data are collected and maintained by EPA's AIRS database and is available from the EPA's website (www.epa.gov/air/data/). Table

3-1 presents the existing ambient air concentration for ozone and PM2.5 in Anne Arundel County.

Figure 3-2 Location of Pollutant Monitoring Stations in and around Anne Arundel County

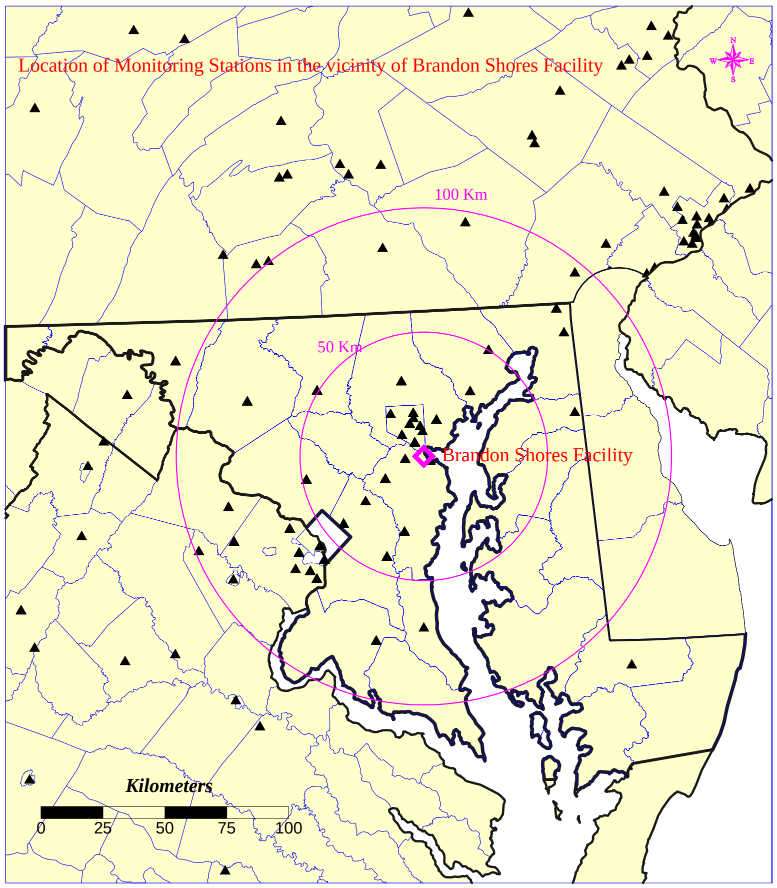


Table 3-1 Summary of Monitoring Data for Ozone and PM2.5 in Anne Arundel County

Pollutant	Averaging Period	Maximum Concentration (µg/m³)
Ozone	1-hour	0.15
	8-hour	0.12
PM2.5	24-hour	64.0
	Annual	17.2

3.2 BIOLOGICAL RESOURCES

3.2.1 Vegetation and Land Cover

The portion of the Brandon Shores property where the new wet FGD system will be constructed is located within an open, maintained grassland parcel to the immediate northwest of the existing generating units, no trees or shrubs are present. The proposed wet FGD site was disturbed during the construction of the existing Brandon Shores facility, and also during construction activity related to the SCR. It is routinely mowed and maintained. Habitats in the vicinity of the wet FGD site include a mixed hardwood/pine forest to the north, a transmission line corridor to the northeast, a small drainage ditch to the west, and the Patapsco River, located to the east. Paved access roads are located along the perimeter of the site and adjacent to the boundary fence; railroad tracks are located to the northeast of the site. Land use within the area surrounding the Brandon Shores facility is predominantly industrial and anthropogenically altered. Areas of retail businesses and single-family and townhome residences are located to the south. Descriptions of the wet FGD site and vicinity vegetative communities are provided below.

3.2.1.1 Maintained Grassland

The proposed site consists of previously cleared and periodically mowed open grassland composed of planted lawn grasses and ruderal weedy vegetation. The maintained grassland area is dominated by common grasses such as meadow fescue (*Festuca pratensis*) and switchgrass (*Panicum virgatum*) interspersed with weedy herbaceous species such as common chickweed (*Stellaria media*), white clover (*Trifolium repens*), common plantain (*Plantago major*), and pepper cress (*Lepidium virginicum*). A few small scattered individual sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), and red cedar (*Juniperus virginianus*) trees exist along the railroad tracks at the northeastern edge of the wet FGD site.

3.2.1.2 Vegetative Communities Adjacent to Site

Other vegetative communities exist adjacent to the proposed site; these include small parcels of mixed hardwood/pine forest to the north and a small drainage ditch located to the west. Forested areas adjacent to the wet FGD site include a mixture of sweetgum, American holly (*Ilex opaca*), red oak (*Quercus rubra*), sycamore, white oak (*Quercus alba*), red maple

(*Acer rubrum*), scrub pine (*Pinus virginiana*), white pine (*Pinus strobus*), willow oak (*Quercus phellos*), and blackberries (*Rubus* spp.). An intermittent drainage ditch to the west of the site conveys water to the south toward a stormwater pond. Dominant vegetation within and adjacent to the ditch includes sweetgum, red maple, Virginia pine, willow (*Salix* sp.), black locust (*Robinia pseudoacacia*), poison ivy (*Toxicodendron radicans*), and common reed (*Phragmites australis*). The majority of the project site is outside of the Chesapeake Bay Critical Area (CBCA); the nearby CBCA areas are primarily adjacent to the Patapsco River and Cox Creek.

3.2.2 *Wildlife*

According to CPSG, wildlife resources at the site and the immediate vicinity were characterized by Golder during field reconnaissance conducted in April 2006. Other observations were made by DNR during several visits to the site during 2006. The property and adjacent areas were traversed by Golder using pedestrian transects and recorded on aerial photographs. Wildlife observations included direct observations, calls, tracks, scat, burrows, and skeletal remains.

CPSG's application also states that avian species observed at the wet FGD site and surrounding vicinity during the April 2006 field reconnaissance included Canada goose (*Branta canadensis*), European starling (*Sturnus vulgaris*), American crow (*Corvus brachyrhynchos*), rock dove (*Columba livia*), killdeer (*Charadrius vociferus*), osprey (*Pandion haliaetus*), mallard (*Anas platyrhincus*), herring gull (*Larus argentatus*), and mute swan (*Cygnus olor*). White-tailed deer (*Odocoileus virginianus*) were observed within the mixed hardwood/pine forest to the north of the project site. Constellation also indicated that additional species observed within the vicinity of Brandon Shores during previous investigations included lesser scaup (*Aythya affinis*), ruddy duck (*Oxyura jamaicensis*), ring-billed gull (*Larus delawarensis*), mockingbird (*Mimus polyglottis*), house sparrow (*Passer domesticus*), Canada goose (*Branta canadensis*), American coot (*Fulica americana*), red-tailed hawk (*Buteo jamaicensis*), and American robin (*Turdus migratorius*).

3.2.3 *Threatened and Endangered Species*

According to CPSG, field surveys were conducted by Golder in April 2006 to determine if rare, threatened, and endangered (RTE) species or their habitats exist on or near the wet FGD site. The habitat assessments concluded that no RTE flora or fauna or their habitats exist at the wet FGD site or immediate vicinity. CPSG requested a Maryland DNR Division of

Natural Heritage database search for the vicinity of the Brandon Shores Power Plant, no records were found by Heritage for RTE species. CPSG also requested information on RTE species and their habitats from the U.S. Fish and Wildlife Service (USFWS) Chesapeake Bay Field Office; no records were found by USFWS for RTE species.

3.2.4 Wetlands and Aquatic Resources

CPSG has indicated it is currently assuming barge delivery service will handle the bulk of its wet FGD operation-related materials. They also stated that the selected barge-handling equipment has been designed to minimize impacts on wetlands, channels, and floodplains within the vicinity of the proposed project. Material handling equipment at the existing Wagner loading dock, however, will require upgrades to the existing pilings. These upgrades would occur in tidal waters, to accommodate the new limestone and gypsum deliveries. Constellation stated that the required upgrades would disturb a total of approximately 1 acre of aquatic habitat adjacent to the existing Wagner unloading facility. A joint MDE/US Army Corps of Engineers (USACE) tidal wetlands permit application has been submitted for the necessary improvements.

Because of the approximately 17-foot water depth of the Patapsco River, it is unlikely that submerged aquatic vegetation (SAV) exists in the immediate vicinity of the proposed upgrades to the existing Wagner loading dock. SAV is generally not found in waters deeper than about two meters in the tidal rivers of the region, particularly in large turbid rivers like the Patapsco (where it may not survive in waters deeper than about a meter).

3.3 REGIONAL SOCIOECONOMIC SETTING

The Brandon Shores facility is located in Anne Arundel County. The surrounding counties are Baltimore County to the north, Kent, Queen Anne's and Talbot Counties across the Chesapeake to the east, Calvert County to the south, and Prince George's and Howard Counties to the west. The county is within the Baltimore Metropolitan Statistical Area (MSA). Anne Arundel's land area is approximately 413 square miles.

The facility is in the Pasadena/Marley Neck planning area, which is bounded on the north by the Patapsco River and Baltimore Harbor, and which consists of the Marley Neck and Tick Neck peninsulas. In addition to the Brandon Shores power plant, the area includes the H.A. Wagner Generating Station, Kennecott Refinery, the US Coast Guard Yard Curtis

Bay and several other large industrial and commercial establishments that are situated alongside the residential communities of Solley, Orchard Beach, Riviera Beach, Green Haven, and Marley-Harundale (Anne Arundel County Office of Planning and Zoning 2004).

3.3.1 Population

Anne Arundel County's population was 489,656 in 2000, up 14.6 percent from 1990. This is just below the average population increase of 14.9 percent for all counties in Maryland. Its expected population growth rate between 2000 and 2010 is 8.7 percent, with a population of 532,500 by 2010. Projections indicate a gradual decrease in population growth over the next fifteen years, with 4.2 percent growth projected between 2010 and 2020, and 3.0 percent growth between 2020 and 2030 (Maryland Department of Planning 2006a).

The population of the Pasadena/Marley Neck planning area is 33,239; about 6.8 percent of the county's residents. From 1990 to 2000 the area experienced a 22.2 percent growth rate. By 2010, its population is projected to be about 40,260.

In 2000 there were 12,423 housing units in the planning area, a 27 percent increase since 1990. Development trends from 1990-2000 indicate a greater increase in renter-occupied units (41.65 percent), than in owner-occupied units (23.60 percent). The current home ownership rate of the area is 85 percent, significantly greater than the national average and Anne Arundel's rate of 75.5 percent. The majority of these households, 75.6 percent, are family occupied.

3.3.2 Employment and Income

The labor force of the county was 272,962 in 2005 with an unemployment rate of 4.4 percent. Approximately 90 percent of residents age 25 and older hold a high school diploma, and 34.3 percent hold a bachelor's degree or higher. The average income for all households is $87,788, and the per capita income is $34, 376 (US Census Bureau 2005). The Marley Neck planning area's total labor force in 2000 was 9,022, with a 3.3 percent unemployment rate. Residents holding a high school diploma were 77.9 percent of the labor force, and those holding college degrees were 14.1 percent in 2000.

There are 18 major employers in the county, including Anne Arundel County Public Schools (10,500 employees countywide), State of Maryland (8,000), Northrop Grumman (7,500), Anne Arundel County government

(4,308), and the Naval Academy (1,347). Major employers of the Marley Neck area include Constellation Energy Group, Eby-Brown & Eby-Brown Mid Atlantic, F. A. Davis & Sons, Sunbelt, and Smurfit-Stone and Bello Machre (Baltimore Metropolitan Council 2006).

Planners project that Anne Arundel County businesses will create an additional 70,000 new jobs over the next 25 years primarily in the service, retail, finance, and insurance industries (Maryland Department of Planning 2006b). Job growth is expected to favor western Anne Arundel County, close to the National Security Agency, Fort Meade, and the Baltimore Washington International airport. The area is projected to have about 10,200 jobs in 2010, with a 9.7 percent growth rate between 2000 and 2010 (Anne Arundel County Office of Planning and Zoning).

Approximately 85 percent of the county labor force commutes to with an average travel time of 27 minutes (Maryland Department of Planning 2003). In 2000, 144,033 residents of Anne Arundel were working within the county. Those working outside of the county commuted to Baltimore City, Baltimore County, the District of Columbia, Howard County, and Prince George's County (with more than 10,000 commuters each), and to Arlington and Fairfax Counties in Virginia, and to Calvert County and Montgomery County (with between 1,000 and 6,500 commuters each). In addition approximately 19,500 workers from Baltimore County, and over 13,600 workers from Baltimore City and Howard County commuted to Anne Arundel County in 2000.

3.3.3 Transportation

Brandon Shores is located south of the Baltimore Beltway (I-695) on the Patapsco River, and is accessed via Brandon Shores Drive from an intersection with Fort Smallwood Road (MD 173). A second entrance to the site, at the intersection of Fort Smallwood Road and Solley Road, is currently unused. In the vicinity of its intersection with Brandon Shores Drive, MD 173 is classified as a four-lane urban Other Principal Arterial (OPA), with a curbed median and 12-foot lanes. In 2005, the Average Annual Daily Traffic (AADT) on MD 173 at Brandon Shores Drive was 18,475 vehicles, and was 24,625 in the vicinity of Solley Road (State Highway Administration 2005). The intersections at Brandon Shores Drive and Solley Road are both signalized with dedicated left turn lanes from eastbound MD 173.

Westbound from Brandon Shores (toward the Baltimore Beltway), Fort Smallwood Road becomes Hawkins Point Road approximately 1.7 miles from Brandon Shores Drive, just beyond the Baltimore City line. Slightly beyond the Baltimore City line, Hawkins Point Road intersects with Quarantine Road, which interchanges with I-695 at Exit 1. There are several large traffic generators on Marley Neck that utilize the I-695/Quarantine Road interchange, including the United States Coast Guard, Quarantine Road Sanitary Landfill, Hawkins Point Marine Terminal, and Eby-Brown distribution center, the latter in the Marley Neck Industrial Park. The Maryland Transportation Administration plans to construct interchange improvements, which will include a new commercial vehicle inspection facility, with construction to begin in 2007 (Maryland Transportation Authority 2006).

Coal is currently delivered to the facility by barge. Vessels access the facility from a barge channel below the Brewerton Angle off the Brewerton Channel in the Patapsco River. The barge channel services the Wagner Station oil dock in addition to the Brandon Shores coal unloading facility. (The Wagner Station coal unloading facility is currently not used.) The Brewerton Channel is at the head of the Patapsco River and is entered from the Chesapeake Bay via the Craighill Channel Upper Range from the south or the Tolchester Channel and Brewerton Channel Eastern Section from the north. The Brewerton Channel transitions into the Fort McHenry Channel at the Francis Scott Key Memorial Bridge (I-695), which subsequently branches off to various tributaries and port facilities in Baltimore Harbor. The Brewerton Channel is 700 feet wide with a federal project depth of 50 feet (Maryland Port Authority 2006).

Baltimore has more than 200 piers and wharves at Locust Point, Fairfield, Curtis Bay, Hawkins Point, Sparrows Point, Dundalk, Canton, Lazaretto Point, and in the Inner Harbor. In 2005, there were more than 4,200 deep draft vessel transits through Baltimore Harbor (Maryland Port Authority 2006).

Sparrows Point, a highly developed industrial area, lies across the Patapsco River from Brandon Shores. AES Sparrows Point LNG, LLC has proposed to construct and operate a liquefied natural gas (LNG) facility on an abandoned section of the Sparrows Point Shipyard on a site previously owned by the Bethlehem Steel Corporation. The marine channel serving Sparrow's Point branches off the Brewerton Channel above the Brewerton Angle, beyond the barge channel to Brandon Shores.

A rail spur from the CSX mainline through Baltimore enters the Brandon Shores property at its boundary with the Marley Neck Industrial Park. The spur is not used by CPSG and would require rehabilitation to return it to useable service.

3.3.4 Land Use

Anne Arundel County adopted a county-wide General Development Plan (GDP) in 1997, which designates 16 small planning areas to be monitored through zoning regulations (Anne Arundel County Office of Planning and Zoning 1997). The Brandon Shores plant is located in the Pasadena/Marley Neck area, which is regulated by the Pasadena/Marley Neck Small Area Plan. The plan seeks to maintain the area as a home town that meets the needs of its residents. Major goals for industrial and commercial development in the Marley Neck area are:

(a) to define commercial areas

(b) to limit heavy industrial polluters and

(c) to reduce current emissions and pollutants affecting air and waterways

(d) limit commercial development and uses to defined areas

To ensure that the needs of Marley Neck residents are met, the development plan provides for the identification of parks and greenways that should be set aside as open space, recreation, and wildlife areas. The availability of affordable housing to maintain balance with employment growth, is also a priority.

The Pasadena/Marley Neck area is approximately 11,278 acres. Most of the older established residential communities are located near Cox Creek, Nabs Creek, Stoney Creek and Rock Creek. Newer residential communities are developing in the Marley Neck area and in mixed residential-industrial areas south of Mountain Road. Commercial activity is located along Mountain Road and Fort Smallwood Road, and industrial activity is primarily located along Kembo, Carbide, Fort Smallwood, and Solley Roads on the Marley Neck peninsula (Anne Arundel County Office of Planning and Zoning 2004).

Residential land use totals 34.8 percent of the Marley Neck area, the majority of which is single family housing. Residential communities include Lake Riviera, Bar Harbor, Sunset Beach, Elizabeth's Landing, Stoney Beach, Orchard Beach, Stoney Creek, Lombardee Beach, Altoona Beach, Chesterfield, Brookfield, and Jacobsville. Industrial lands made up 2.7 percent of the planning area in 1995. These are primarily located in the northeastern regions of Marley Neck. Developments are located on Kembo and Carbide Roads near the planning region boundaries, and south of the intersection of Fort Smallwood and Solley Roads.

Commercial land uses include retail and service establishments. Commercial areas along Mountain Road include the Lake Shore area between Solley Road and State Route 100, and the intersection of Mountain and Jumpers Hole roads. The areas along Fort Smallwood Road include those in Riviera Beach and Orchard Beach. Commercial centers include the Festival Shopping Center, Harbor Hospital Health Park, Mountain Marketplace, Mountain Road Plaza, Chesterfield Plaza, Rock Creek Village Shopping Center, Riviera Plaza, Stavlas Business Center and 84 Lumber (Anne Arundel County Office of Planning and Zoning 2004). Transportation/utility land use accounts for 11 percent of the area and includes roadways and utility corridors, as well as the Brandon Woods Energy Park. Remaining lands in the planning area are government or institutional (2.8 percent), agricultural (3 percent) and vacant (30 percent). The majority of vacant lands are in the northeastern and central part of the Marley Neck peninsula southwest of Fort Smallwood Road.

The Pasadena/Marley Neck planning area is zoned for low, low-medium and medium density residential uses, commercial uses, light and heavy industrial uses, maritime uses, residential-agricultural uses, deferred development and open space.

Residentially zoned areas make up 64.4 percent of the area. Low density residential areas include communities on the Marley Neck Peninsula east of Solley Road and south of Nabbs Creek (not including Lombardee Beach and View Point), the area east of Altoona Beach between Nabbs Creek and Chestnut Hills roads, the Powhatan beach community, the Deerfield community, the area east of Artic Drive, and the area south of Mountain Road (not including the Route 100 area). Low-to-medium and medium density areas include the Riviera Beach Peninsula, and the Stoney Beach, Orchard Beach, Clearwater Beach, Carvel Beach, Chestnut Hill Cove, Lombardee Beach, and View Point communities located on the Marley Neck peninsula. The Deerfield community south of Mountain Road and east of Edwin Raynor Boulevard, and the area west of Marley Neck Boulevard and south of Carbide Road (aka Tanyard Springs), are also medium density areas.

Industrially zoned areas make up 26.4 percent of the area; 8.2 percent is zoned W1 – Industrial Park, two percent is zoned W2 – Light Industrial, and 16.2 percent is zoned W3 – Heavy Industrial. Commercially zoned areas make up 4.2 percent of the area; 2.3 percent is zoned C3 – General Commercial, 1.1 percent is zoned C4 – Highway Commercial, and the remaining areas are zoned C1 – Local Commercial and C2 – Commercial Office. Maritime-zoned areas make up less than one percent, and open spaces make up 4.9 percent of Anne Arundel County.

The Brandon Shores plant is located in a Heavy Industrial District (W3), and is adjacent to other Heavy Industrial and Light Industrial districts. The plant is surrounded by vacant or open land to the northwest and to the south. Areas to the west include natural open space, park and recreation areas, and residential areas. Areas located across the Cox Creek are residential and commercial.

Planning for future growth in the area raises concerns about residential development, commercial revitalization and adapting to congestion in the planning area along major routes. Commercial revitalization (Bills 97-01 and 69-02) efforts have begun to extend some of the commercial uses of C3 and C4 zoned areas, as well as to allow for residential development in C3 and C4 zones. The Orchard Beach, Riviera Beach and the Mountain Road and Fort Smallwood commercial corridors are targeted for further commercial development.

Residential development is expected to occur outside residentially-zoned areas, expanding into the open space and light industrial zoned areas in the Solley Road and Marley Neck Boulevard corridor between State Routes 648 and 177 (Anne Arundel County Office of Planning and Zoning 2004). There are also efforts through the development process to purchase and retain open space for passive and active recreation and public water-accesses.

3.3.5 Historical and Archaeological Resources

There are over 800 properties in Anne Arundel County that have been inventoried by the Maryland Historical Trust. These include historical homes, agricultural buildings, cemeteries, churches, commercial buildings, industrial and engineering structures, bridges, maritime resources, military structures, small historic towns and scenic/historic roads.

Most historic properties are privately owned and fewer than 12 are open to the public. Thirty-five historic properties are protected by historic preservation easements, held by the Maryland Historic Trust or the National Trust for Historic Preservation. All historic and archeological resources in the county are protected by the National Historic Preservation Act and the Anne Arundel County Code.

Historic resources in the Marley Neck planning area include sites of 17th century European settlement, farmhouses and other agriculture-related buildings dating from the 18th and 19th centuries, plus churches, schools, and early industrial developments. There are 18 registered historical sites in the Pasadena/Marley Neck area. These include the US Coast Guard Yard and its supporting buildings at Curtis Bay, four sites in Riviera Beach, and the Marley Neck School, Solley Methodist Church Cemetery, Thomas Solley Farm, and Chestnut Hill Farm site on Solley and Marley Neck roads.

There are two archeological sites of prehistoric Native American civilization dating to 11,000 B.C. and 10,000 B.C. that are on the national register. The Garmen Site is the earliest known site of Native American occupation in Anne Arundel County, dating to 11,000 B.C. It is located just west of the Pasadena/Marley Neck planning area near the Marley Station Mall. The other, Magothy Quartzite Quarry, dates to 10,000 B.C. and is located on the southern edge of the planning area. There are no documented archeological sites within the Brandon Shores site.

3.3.6 Public Services and Public Safety

3.3.6.1 Recreation and Parks

The majority of the area's parks are located in the Riviera Beach and Jacobsville areas. Lake Waterford Park, Tick Neck Park, Havenwood Park, Rock Creek Park, Sunset Park, Stoney Creek Park, Solley's Cove Park, Beachwood Park, Brandon Woods Park, and Solley Park are County owned parks. The Lake Shore Athletic Complex and Downs Park are located in the neighboring Lake Shore planning area, but serve both the Marley Neck and Lake Shore communities.

3.3.6.2 Public Education

Students in the Pasadena/Marley Neck planning area are served by schools from three networks that feed into the Northeast, Chesapeake and Glen Burnie secondary school systems. The planning area has five elementary schools (K-5), one middle school (6-8), and one high school, which are all part of the Northeast feeder system. Solley Elementary School, located on Solley Road on Marley Neck Peninsula, is the only school within two miles of the plant. Marley Neck students may also attend Chesapeake Senior, Chesapeake Bay Middle, Jacobsville Elementary, and Pasadena Elementary schools from the Chesapeake system, and Glen Burnie Senior, Marley Middle and Freetown Elementary schools from the Glen Burnie systems. Chesapeake Senior and Chesapeake Bay Middle Schools are located in the Glen Burnie small planning area, and Glen Burnie High, Marley Middle and Freetown Elementary are all located in the Lake Shore planning area.

3.3.6.3 Fire and Rescue Services

The Anne Arundel County Fire Department has four companies serving residents of the Pasadena/Marley Neck area. Riviera Beach Volunteer Company 13, Jacobsville Fire Station 10, and Armiger Volunteer Company 30 serve the communities of Pasadena on Tick Neck peninsula and farther inland. Orchard Beach Volunteer Company 11 and Marley Volunteer Company 18 are the nearest and first responders to the plant.

In addition to fire and rescue response, the Anne Arundel County Fire Department has personnel trained in Hazardous Materials, Incident Mitigation, Dive/Water Rescue, High-Angle Rescue, Confined Space Rescue, Collapse Rescue and other technical rescue situations. A Paramedic Unit is housed at all stations except Armiger and Orchard Beach, both have a Basic Life Support unit.

3.3.6.4 Police Services

The Eastern Police Patrol District serves the majority of the planning area, with central headquarters located on Mountain Road, west of Hog Neck Road. It is composed of 13 beats that are staffed 24 hours a day. Beats 3A1, 3A2, 3C1 and 2D3 respond to residents of the Pasadena/Marley Neck area.

3.3.6.5 Medical Services

The Baltimore Washington Medical Center (BWMC) is the closest hospital center providing 24-hour emergency care. BWMC is a 286-bed community hospital with over 600 physicians and 2,400 employees. It is located on Hospital Drive in Glen Burnie and offers services in intensive care, cardiac care, vascular medicine, neurology, radiology and diagnostic imaging, and wound healing.

3.4 NOISE

3.4.1 Definition of Noise

Noise generally consists of many frequency constituents of varying loudness. Three decibels (dB) is approximately the smallest change in sound intensity that can be detected by the human ear. A tenfold increase in the intensity of sound is expressed by an additional 10 units on the dB scale, a 100-fold increase by an additional 20 dB. Because the sensitivity of the human ear varies according to the frequency of sound, a weighted noise scale is used to determine impacts of noise on humans. The most commonly used frequency filter is the A-weighted decibel (dBA) scale, which weighs the various components of noise based on the response of the human ear. For example, the ear perceives middle frequencies better than low or very high frequencies; therefore, noise composed predominantly of the middle frequencies is assigned a higher loudness value on the dBA scale. Subjectively, a tenfold increase in sound intensity (10 dB increase) is perceived as an approximate doubling of sound. Typical A-weighted sound levels for various noise sources are shown in Table 3-2.

Table 3-2 Typical Sound Levels for Common Sources (dBA)

Noise Source	**Typical Sound Pressure Level**
Lowest sound audible to human ear	10
Soft whisper in a quiet library	30-40
Light traffic, refrigerator motor, gentle breeze	50
Air conditioner at 6 meters, conversation	60
Busy traffic, noisy restaurant, freight train moving 30 mph at 30 meters	70
Subway, heavy city traffic, factory noise	80
Truck traffic, boiler room, lawnmower	90
Chain saw, pneumatic drill	100
Rock concert in front of speakers, sand blasting, thunder clap	120
Gunshot, jet plane	140

Noise monitoring is typically conducted continuously over a period of time to obtain a representative picture of the acoustic environment. The length of time required for noise monitoring, and the frequency of individual measurements, will vary depending upon a number of factors, including surrounding land use, time of day, the purpose of noise monitoring, the number of locations at which sound levels are being measured, and the capabilities of the monitoring equipment being used.

Ambient sound pressure levels can also be expressed in various ways. Quite often, noise levels are measured or reported as equivalent sound levels, L_{eq}, over a given time period. A one-hour L_{eq}, for instance, is the constant sound level that has the same energy content as the actual sound variations over a one-hour monitoring period. Monitoring of the ambient noise levels in a community is often reported as L_{eq} as well as L_{90}, the sound pressure level that is exceeded 90 percent of the time. The L_{90} is also called the "noise floor," the minimum background noise level that is characteristic of that monitoring location. The difference between the L_{90} and the L_{eq} is an indication of the variability of noise at a given location.

Because sound levels are expressed as relative intensities, multiple sound sources are not directly added. Rather, the total noise is primarily a result of the source of highest intensity. For example, two sources, each having a noise rating of 50 dBA, will together be heard as 53 dBA; a source of 65 dBA combined with a source of 85 dBA will result in a noise level of 85.1 dBA. As the intensity difference between the two sources increases, the effect of the lower sound source becomes negligible.

3.4.2 Existing Noise Levels at the Site

CPSG conducted ambient noise surveys in April and June of 2006 to characterize the existing acoustic environment in the area. Daytime and nighttime measurements were collected at four locations along the site boundary. Table 3-3 shows the results of these surveys; monitoring locations are illustrated in Figure 3-3. In addition, CPSG collected short-term noise measurements during daytime at five off-site locations (Sites 6 through 10 in Figure 3-3), and monitored noise levels for 24 hours continuously at the approximate location of the proposed wet FGD system (Site 5).

As shown in Table 3-3, the L_{eq} sound levels at the property boundary monitoring locations (Sites 1-4) ranged from 46.2 dBA at Site 1 and 61.6 dBA at Site 2. The nighttime L_{eq} sound levels at these monitoring locations ranged from 51.2 dBA at Site 1 to 59.0 at Site 2. The L_{eq} values measured at five offsite locations ranged from 50.7 dBA at Site 8 (the Villages at Stoney Beach) to 62.9 dBA at Site 9 (Brockington PUD). Motor Vehicle noise on Fort Smallwood Road/State Road 173 clearly dominates the noise levels measured at Sites 2, 3, 6, 7, 9, and #10.

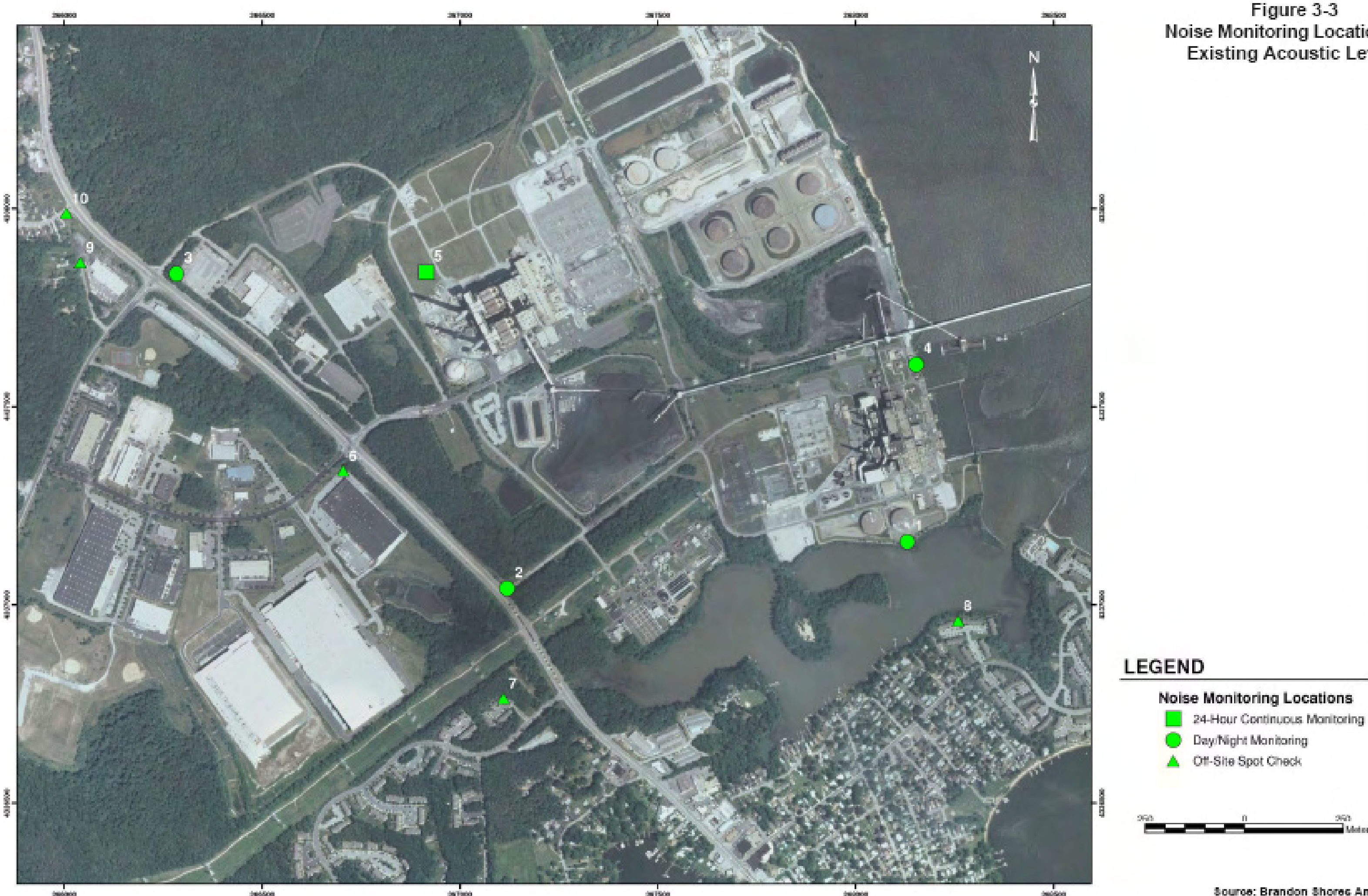
One-minute L_{eq} values were recorded over a 24-hour continuous monitoring period at Site 5. This period demonstrated the constant low noise source of Brandon Shores. Elevated noise levels were primarily due to jet aircraft.

Table 3-3 Results of Ambient Noise Surveys

Site Number	Location	Date	Time	Sound Levels (dBA)				Comments/Notes
				L_{min}	L_{max}	L_{90}	L_{eq}	
1	Southern property boundary adjacent to Wagner Power Plant	20-Apr-06	Day	43.5	55.6	43.0	46.2	Barking dogs, birds chirping, traffic on SR 173
		20-Apr-06	Night	46.9	64.9	48.2	51.2	Insects, crickets, traffic SR 173
2	Southwestern property boundary adjacent to SR 173	20-Apr-06	Day	47.5	73.7	54.9	61.6	Heavy traffic on SR 173
		21-Apr-06	Night	43.9	74.0	45.7	59.0	Light to moderate traffic on SR 173
3	Northwest property boundary adjacent to SR 173	20-Apr-06	Day	49.5	74.5	53.3	59.9	Heavy traffic on SR 173
		20-Apr-06	Night	42.8	68.1	44.9	52.6	Light to moderate traffic on SR 173, jet aircraft
4	Eastern property boundary by coal unloading pier	20-Apr-06	Day	54.1	68.7	54.1	57.3	Seagulls, jet aircraft
		20-Apr-06	Night	55.1	63.4	56.1	56.8	Pumps, ducks, PA system alarm
5	24-hour continuous data at Project site adjacent to Plant	20-Apr-06	NA	57.7	81.3	61.6	63.3	Wind, jet aircraft, geese in the morning
6	Commercial Property	21-Apr-06	Day	56.6	68.0	57.4	61.6	7621 Gambrills Rd., heavy traffic on SR 173
7	Chestnut Woods	21-Apr-06	Day	57.4	62.7	57.8	59.6	Chestnut Cove Dr., traffic on SR 173, jet aircraft
8	Villages of Stoney Beach	21-Apr-06	Day	48.2	63.1	49.1	50.7	1320 Cox Cove Rd., birds chirping
9	Brockington PUD	26-Jun-06	Day	53.8	67.5	55.9	62.9	927 Lauren Way, heavy traffic on SR 173, light rain
10	Steens Hill Road	26-Jun-06	Day	50.4	67.5	50.5	55.4	Adjacent to Cable Sign

Source: Golder Associates Inc., 2006.

Figure 3-3
Noise Monitoring Locations for Existing Acoustic Levels



Source: Brandon Shores Amended CPCN Application, Oct. 2006.

4.0 AIR QUALITY IMPACTS

4.1 IMPACT ASSESSMENT BACKGROUND AND METHODOLOGY

4.1.1 Overview

As part of the CPCN application process, PPRP, in conjunction with MDE's Air and Radiation Management Administration (ARMA), evaluates potential impacts to air quality resulting from emissions of projects to be licensed in Maryland. This evaluation consists of emissions investigations and other studies, including air dispersion modeling assessments, to ensure that impacts to air quality from the proposed projects are acceptable. PPRP and MDE-ARMA also conduct a complete air quality regulatory review for two purposes: 1) to assist in the impact assessment, because air quality regulatory standards and emissions limitations define levels to protect against adverse health, welfare, and environmental effects; and 2) to ensure that the proposed project will meet all applicable regulatory requirements.

4.1.2 Regulatory Considerations

The EPA has defined concentration-based NAAQS for several pollutants, which are set at levels considered to be protective of the public health and welfare. Specifically, the NAAQS have been defined for six "criteria" pollutants—particulate matter (PM10 and PM2.5), SO_2, NO_2, CO, ozone, and lead. Air emissions limitations and pollution control requirements are generally more stringent for sources located in areas of the country that do not currently attain a NAAQS for a particular pollutant (known as "nonattainment" areas).

Brandon Shores is located in Anne Arundel County, Maryland. The air quality in Anne Arundel County, which is designated as Area III (COMAR 26.11.01.03) by MDE-ARMA, is currently in attainment for all criteria pollutants with the exception of ozone and PM2.5. Because of the high levels of ozone historically found in Anne Arundel County during the ozone season (May-October), the County was formerly designated as "severe" for the 1-hour ozone NAAQS and is now designated "moderate" for the 8-hour ozone standard. Emissions of the two pollutants that are the primary precursors to ozone—volatile organic compounds (VOCs) and NO_x—are regulated more stringently in ozone nonattainment areas to ensure that air quality is not further degraded (i.e., the ambient air concentrations of ozone do not continue to increase as new sources of emissions are constructed).

PM2.5 is a newly regulated pollutant. Anne Arundel County (and several other counties in Maryland and other states) became a designated PM2.5 nonattainment area as of April 5, 2005. Although EPA has promulgated an ambient standard for PM2.5 and has designed PM2.5 nonattainment areas, there are no Federal or State implementing regulations for PM2.5, as there are for ozone. EPA published interim guidance for implementing PM2.5 nonattainment programs in a memorandum of September 2005. PPRP and MDE have used the interim guidance on PM2.5 for this case.

Potential emissions from new and modified sources in attainment areas are evaluated through the Prevention of Significant Deterioration (PSD) program (COMAR 26.11.06.14). The goal of the PSD program is to ensure that emissions from major sources do not degrade air quality. Triggering PSD requires pollution control measures known as Best Available Control Technology (BACT) and additional impact assessments.

Potential emissions from new and modified sources in nonattainment areas are evaluated through the nonattainment New Source Review (NA-NSR) regulatory program (COMAR 26.11.17). The goal of the NA-NSR program is to allow construction of new emission sources and modifications to existing sources, while ensuring that progress is made towards attainment of the NAAQS. Triggering NA-NSR indicates that a project could adversely impact air quality, which means that impacts must be managed. NA-NSR requires that major sources limit emissions of affected pollutants through the implementation of the most stringent levels of pollution control, known as Lowest Achievable Emission Rate (LAER). In addition, NA-NSR requires pollutant "offsets" to be obtained for every ton of regulated pollutant emitted.

Because Brandon Shores is located in a nonattainment area for ozone and PM2.5 and an attainment area for the other pollutants, PPRP and MDE-ARMA assessed applicability with both NA-NSR and PSD to ensure that no adverse impacts would be caused by the proposed project. The results of these evaluations for the proposed project are discussed in Sections 4.3 (PSD program) and 4.4 (NA-NSR program).

Other federal and State air quality regulations may apply to the proposed project. These regulations apply either as a result of the type of emission source that is to be constructed, reconstructed, modified, or as a result of a change of the pollutants to be emitted from the system. These regulations, discussed in Section 4.7, specify limits on pollutant emissions and impose recordkeeping and reporting requirements.

4.2 PROPOSED PROJECT SOURCE CHARACTERIZATION

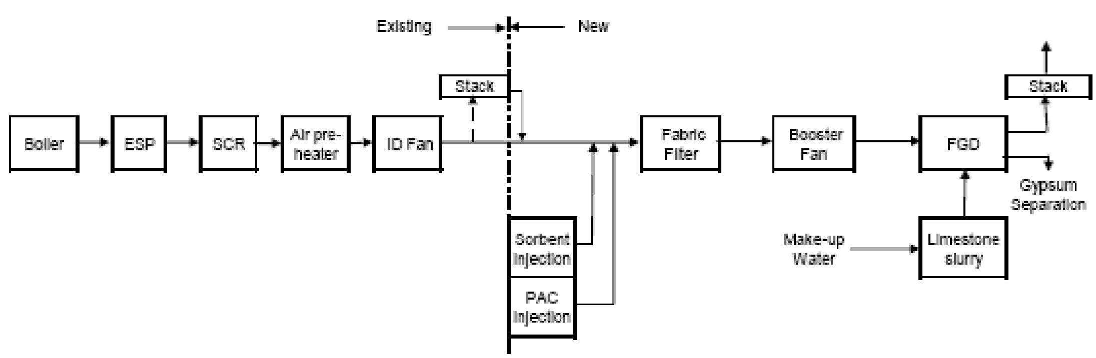
4.2.1 Pollution Control Equipment

CPSG is proposing to retrofit existing Unit 1 and Unit 2 at Brandon Shores with air pollution control (APC) equipment consisting of a wet FGD, mercury, and SAM controls, and new fabric filters. The APC train will be identical for Units 1 and 2; the two units will share a single new stack. Key components of the Brandon Shores project, referred to by CPSG as the AQCS Project are described below.

4.2.1.1 Proposed Pollution Control Train

Figure 4-1 is a schematic showing the flue gas train from the existing Brandon Shores boilers to the stack. The equipment to the left of the vertical line depicts the existing system (boiler to existing stack). The two sides together (to the left and to the right of the vertical line) depict the proposed system (existing train as well as the new APC equipment). With the exception of the existing stack—which will be used essentially as a relief valve for emergency situations—the equipment to the right of the vertical line is the equipment that is the subject of this CPCN, and is referred to as the AQCS Project.

Figure 4-1 Schematic of the Existing Flue Gas Train at Brandon Shores Units 1 and 2



4.2.1.2 Sorbent Injection - Acid Mist Control

Sulfur trioxide (SO_3) is formed as part of the combustion process within the boiler. SO_3 will react with the water in the wet FGD system, forming H_2SO_4, also known as sulfuric acid mist (SAM). To prevent the formation of SAM, CPSG proposes to operate a sorbent injection system to remove SO_3 prior to the wet FGD. The sorbent will be adsorbed and removed with particles that will be controlled by a new fabric filter, also located upstream of the wet FGD. The sorbent selected for the Brandon Shores project will be sodium bisulfide ($NaHSO_3$), which is projected to achieve a SAM reduction rate of up to 80% on these boilers in a retrofit application.

4.2.1.3 PAC Injection – Mercury Control

Mercury present in coal is volatilized during the combustion process. Some of the mercury is oxidized as it passes through the SCR. To improve overall mercury removal, CPSG proposes to utilize a PAC injection system to adsorb the mercury. PAC is injected into the ductwork and the particles are then removed downstream by the fabric filter. Additional mercury is removed as a co-benefit of the wet FGD system.

CPSG is designing a PAC injection system for Brandon Shores; however, PAC will only be injected if the co-benefits of the wet FGD and the fabric filter are not sufficient to reduce mercury to appropriate HAA levels (generally 80% reduction from the baseline year beginning in 2010, and 90% from the baseline year beginning in 2013; see Section 1.2.1).

4.2.1.4 Fabric Filters

A fabric filter baghouse will be added to each unit to minimize the amount of PM prior to the wet FGD system. As mentioned previously, the fabric filter will not only filter out PM, but it also assist in the removal of mercury and SAM as well.

4.2.1.5 Booster Fans

New booster fans will be installed for each unit to overcome the flow resistance associated with the fabric filter, wet FGD system ductwork, absorbers, and stack.

4.2.1.6 Wet FGD

A wet FGD system will be employed to reduce the emissions of SO_2. In wet FGD systems, as the flue gas enters a large vessel (spray tower or absorber), it is sprayed with water slurry (limestone). The calcium in the slurry reacts with the SO_2 to form calcium sulfite or calcium sulfate (i.e., removing the SO_2). The calcium sulfite in the spray tower absorber is nearly a hundred percent oxidized to form gypsum (calcium sulfate) by bubbling compressed air through the sulfite slurry in the tower recirculation tank or in a separate vessel. It is CPSG's intention to sell the gypsum off-site to a wallboard manufacturer for beneficial reuse (see Section 7.1).

4.2.1.7 *Stack*

One new stack will be installed to exhaust the flue gases for both units. The new stack will be 400 feet high with a concrete or steel frame chimney shell surrounding and supporting two flues, one for each unit. Each flue will have an approximate diameter of 31.5 feet. The existing stack will be utilized as a drawdown to accommodate the existing furnace and ductwork. The flues will be constructed of fiberglass-reinforced plastic.

4.2.2 *Power Block Modifications*

The wet FGD project will require additional energy to operate equipment such as pumps, fans, conveyor belts, miscellaneous motors, controls, etc. To recover this loss of power, CPSG will include enhancements to existing equipment that will increase electrical output.

Power block enhancements, as described in the *Application for CPCN Authorizing Modification of the Brandon Shores Generating Station Environmental Analysis* will include an upgrade to the high pressure turbine steam path components. The results of this upgrade will improve heat rate and increase generator output at current steam flow rates. The increased high pressure turbine efficiency will result in a reduced high pressure turbine steam exhaust temperature. To compensate for the lower temperature, additional enhancements to the boilers will be needed, including upgrades to the economizers, superheaters, and related process equipment. The lower temperatures will also require an increase in fuel derived heat input to the boilers. Collectively, the power block enhancements are estimated to allow Brandon Shores to generate an additional 60 MW, which will recover about 35 MW of parasitic load and provide a potential net gain of about 25 MW of additional power (total both boilers). Enhancements are planned to take effect during or after the initial startup of the air pollution control equipment.

4.2.3 *Stack Emissions Characterization*

The AQCS Project will substantially reduce SO_2 emissions with the installation of the wet FGD. NO_x emissions will also be reduced because the existing SCR systems, one on each unit, will be operated for the full year, instead of just during the ozone season (May-October), as is currently the practice at Brandon Shores. Overall, the AQCS Project is projected to result in slight decreases in PM10 emissions from the generating units, given the installation of new high efficiency fabric filters. However, emissions of CO, VOC, SAM will increase.

Throughout this ERD, the following nomenclature will be used when referring to particulate matter:

- PM – total filterable or suspended particulate;
- PM10 – filterable plus condensable particulate < 10 microns in diameter; and
- PM2.5 - filterable plus condensable particulate < 2.5 microns in diameter.

CPSG presented estimates of total suspended particulates (TSP, or PM), PM10, PM2.5, SO_2, NO_x, CO, VOC and SAM emissions from the AQCS Project, along with the assumptions used to estimate emissions in its CPCN application and Responses to DNR Data Requests Nos. 1 and 2. PPRP used this information to verify emissions for each source and for the AQCS Project.

Table 4-1 summarizes the projected short-term emissions rates for the proposed AQCS Project sources. Projected maximum annual emissions from the AQCS Project are summarized in Table 4-2. Emissions are based on the following assumptions:

- Use of worst-case coal (4% sulfur) with a heat input equal to 7,128 million British thermal unit (MMBtu);
- Wet FGD operation of 8,760 hours per year at an SO_2 emission rate of 0.25 pounds per million British thermal unit (lb/MMBtu) and an SO_2 removal efficiency of 96%;
- SCR operation of 8,760 hours per year at a NO_x emission rate of 0.1 lb/MMBtu and a NO_x removal efficiency of 80%;
- Fabric filters and existing ESP operation of 8,760 hours per year at a PM emission rate of 0.015 lb/MMBtu
- PM10 and PM2.5 emission rates of 0.034 lb/MMBtu;
- SAM emission rate of 0.027 lb/MMBtu with an 80% reduction of SAM using $NaHSO_3$;
- CO emission rate of 0.2 lb/MMBtu
- VOC emission rate of 0.0024 lb/MMBtu
- Mercury emission rate of 0.08 micrograms per gram (µg/g), assuming a reduction efficiency of 90%.

Table 4-1 Brandon Shores AQCS Project Projected Short-term Emissions

Emissions Unit	PM	PM10/PM2.5[2]	SO_2	NO_x	CO	VOC	Hg	SAM
Boiler Unit 1	107 lb/hr	242.4 lb/hr	1543 lb/hr	713 lb/hr	1426 lb/hr	16.7 lb/hr	0.0413 lb/hr	192 lb/hr
	0.015 lb/MMBtu	0.034 lb/MMBtu	0.25 lb/MMBtu	0.1 lb/MMBtu	0.2 lb/MMBtu	0.0024 lb/MMBtu		0.027 lb/MMBtu
Boiler Unit 2	107 lb/hr	242.4 lb/hr	1543 lb/hr	713 lb/hr	1426 lb/hr	16.7 lb/hr	0.0413 lb/hr	192 lb/hr
	0.015 lb/MMBtu	0.034 lb/MMBtu	0.25 lb/MMBtu	0.1 lb/MMBtu	0.2 lb/MMBtu	0.0024 lb/MMBtu		0.027 lb/MMBtu
Quench Pump (500 hp)[1]	0.4 g/bhp-hr		0.15 g/bhp-hr	7.8 g/bhp-hr	2.6 g/bhp-hr	7.8 g/bhp-hr	Negl.	Negl.
	0.44 lb/hr		0.17 lb/hr	8.6 lb/hr	2.87 lb/hr	8.6 lb/hr		

[1] Specifications for this engine were not provided as CPSG has not selected a vendor at the time of PPRP's review. Short-term emissions for total PM, SO_2, VOC, mercury, and SAM were not reported. NO_x and VOC emissions are worst-case, as NO_x + VOC = 7.8 g/hp-hr.
[2] Includes filterable + condensable fractions.

Table 4-2 Brandon Shores Projected Annual Emissions for Unit 1 and Unit 2 in Tons per Year (tpy)

Emissions Unit	PM	PM10	PM2.5	SO2	NOx	CO	VOC	SAM	Hg
Unit 1	422	956	956	7027	2811	5621	66	759	327
Unit 2	422	956	956	7027	2811	5621	66	759	327
Total	844	1,912	1,912	14,054	5,622	11,242	132	1,518	654

In addition to criteria pollutants, boilers also emit Hazardous Air Pollutants (HAPs) such as heavy metals (e.g., arsenic, cadmium, chromium), hydrogen chloride, hydrogen fluoride, volatile organics and polycyclic aromatic hydrocarbons (PAHs). These emissions are estimated in Table 4-3 for the Brandon Shores Unit 1 and Unit 2, using emission factors from EPA's AP-42.

Maryland has Toxic Air Pollutants (TAPs) regulations that are applicable to all pollutants listed in COMAR 26.11.16.06 and 26.11.16.07. However, fuel burning equipment, which includes the units at Brandon Shores, is exempt from the TAPs regulations. Therefore, the emissions associated with non-HAP TAPs are not estimated for the boilers.

Table 4-3 Estimated HAP Emissions from Brandon Shores Units 1 and 2

HAP	Boilers (lb/Ton)	Boilers (tpy)	Diesel Quench Pump (lb/MMBtu)	Diesel Quench Pump (tpy)	Totals by HAP
Acetaldehyde	5.70E-04	1.24E+00	7.67E-04	0.0110	1.25
Acetophenone	1.50E-05	3.27E-02	-	-	
Acrolein	2.90E-04	6.33E-01	9.25E-05	0.0013	6.34E-01
Benzene	1.30E-03	2.84E+00	9.33E-04	0.0134	2.85
Benzyl chloride	7.00E-04	1.53E+00	-	-	
Biphenyl	1.70E-06	3.71E-03	-	-	
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	1.59E-01	-	-	
Bromoform	3.90E-05	8.51E-02	-	-	
1,3 Butadiene	-	-	3.91E-05	0.0006	5.62E-04
Carbon disulfide	1.30E-04	2.84E-01	-	-	
2-Chloroacetophenone	7.00E-06	1.53E-02	-	-	
Chlorobenzene	2.20E-05	4.80E-02	-	-	
Chloroform	5.90E-05	1.29E-01	-	-	
Cumene	5.30E-06	1.16E-02	-	-	
Cyanide	2.50E-03	5.45E+00	-	-	
2,4-Dinitrotoluene	2.80E-07	6.11E-04	-	-	
Dimethyl sulfate	4.80E-05	1.05E-01	-	-	
Ethyl benzene	9.40E-05	2.05E-01	-	-	
Ethyl chloride	4.20E-05	9.16E-02	-	-	
Ethylene dichloride	4.00E-05	8.72E-02	-	-	
Ethylene dibromide	1.20E-06	2.62E-03	-	-	

Formaldehyde	2.40E-04	5.23E-01	1.18E-03	0.0170	5.40E-01
Hexane	6.70E-05	1.46E-01	-	-	
Isophorone	5.80E-04	1.27E+00	-	-	
Methyl bromide	1.60E-04	3.49E-01	-	-	
Methyl chloride	5.30E-04	1.16E+00	-	-	
Methyl ethyl ketone	3.90E-04	8.51E-01	-	-	
Methyl hydrazine	1.70E-04	3.71E-01	-	-	
Methyl methacrylate	2.00E-05	4.36E-02	-	-	
Methyl tert butyl ether	3.50E-05	7.63E-02	-	-	
Methylene chloride	2.90E-04	6.33E-01	-	-	
Naphthalene	1.30E-05	2.84E-02	8.48E-05	0.0012	2.96E-02
Phenol	1.60E-05	3.49E-02	-	-	
Propylene	-	-	2.58E-03	0.0371	3.71E-02
Propionaldehyde	3.80E-04	8.29E-01	-	-	
Styrene	2.50E-05	5.45E-02	-	-	
Tetrachloroethylene	4.30E-05	9.38E-02	-	-	
1,1,1-Trichloroethane	2.00E-05	4.36E-02	-	-	
Toluene	2.40E-04	5.23E-01	4.09E-04	0.0059	5.29E-01
Vinyl acetate	7.60E-06	1.66E-02	-	-	
Xylenes	3.70E-05	8.07E-02	2.85E-04	0.0041	8.48E-02
Antimony	1.8E-05	3.93E-02	-	-	
Arsenic	4.1E-04	8.94E-01	-	-	
Beryllium	2.1E-05	4.58E-02	-	-	
Cadmium	5.1E-05	1.11E-01	-	-	
Chromium	2.6E-04	5.67E-01	-	-	

Chromium (VI)	7.9E-05	1.72E-01	-	-
Cobalt	1.0E-04	2.18E-01	-	-
Lead	4.2E-04	9.16E-01	-	-
Magnesium	1.1E-02	2.40E+01	-	-
Manganese	4.9E-04	1.07E+00	-	-
Mercury	8.3E-05	1.81E-01	-	-
Nickel	2.8E-04	6.11E-01	-	-
Selenium	1.3E-03	2.84	-	-
PAH (total)	2.08E-05	4.53E-02	-	-
HCl	1.2	262	-	-
HF	0.15	32.7	-	-
Total HAPs		346.24		0.09

4.2.4 *Material Handling Operations*

Material handling operations generate fugitive particulate matter from wind erosion of open material piles, material transfer, and release of road dusts from truck traffic (for delivery and pickup of materials and wastes).

Material handling operations for the AQCS Project will include limestone delivery, unloading, transfer, storage and handling; gypsum transfer, storage, handling, and loading; coal unloading, transfer, storage and handling; PAC, mercury sorbent, and other reagent delivery and handling; and fabric filter flyash and wastewater sludge removal. Note that although the ash generation rate from the existing ESPs will also increase, ash handling from the ESPs will be the sole responsibility of another company, not CPSG.

CPSG presented estimates of PM, PM10 and PM2.5 emissions (all representing only filterable material) from the AQCS Project, along with the assumptions used to estimate emissions, in its CPCN application and Responses to DNR Data Request No. 1 and 2. Although CPSG indicated that it would utilize different modes of transportation (barge, rail, and trucking) in its application; PPRP determined that shipping and receiving material via trucking represents the worst-case emissions scenario, and would generate the most fugitive dust emissions. CPSG has indicated that barging will be its primary mode of materials transport; however, the company is not willing to commit to only barging materials. Therefore, to estimate emissions conservatively, PPRP has assumed that all transportation for the AQCS Project will be handled by truck.

Potential annual fugitive PM emissions from AQCS Project material handling operations were independently calculated by PPRP using EPA AP-42 emission factors, EPA's Fugitive Dust Background Document (Section 2.3.1.3.3), information and assumptions provided by CPSG, and the following maximum, reported facility throughputs:

- limestone - 740,000 tpy;
- gypsum - 1,080,000 tpy; and
- coal - 4,389,466 tpy.

A summary of the material handling emissions is presented in Table 4-4.

Table 4-4 Brandon Shores Projected Annual Emissions for Material Handling (tpy)

	PM	PM10	PM2.5
Material Handling Emissions	28	12	2

The AQCS Project also has the potential to emit small quantities of heavy metal HAPs/TAPs in the dust associated with the coal and limestone material handling operations. The gypsum precipitated from the scrubber was assumed to have negligible HAP/TAP concentrations. The emissions presented in Table 4-5 are estimated using the PM10 emission rates from the material handling operations and the concentrations of the HAPs/TAPs found in the associated material. HAP/TAP concentration data for limestone was found in the *Trace Metals from Limestone During Flue Gas Desulfurization by Electric Utilities Chemistry Report*, dated March 26, 1997. HAP/TAP concentration data for coal was found in the report, *USGS COALQUAL Database Trace Elements for the Central Appalachian Region*.

Total emissions of HAPs from the material handling portion of the AQCS Project will be insignificant, relative to those from the boilers. The TAP emissions from material handling equipment are subject to Maryland's TAP screening analysis, which is provided in Section 4.6.3.

Table 4-5 AQCS Project Projected HAPs/TAPs from Material Handling Operations in Tons per Year

HAP/TAP	Emissions (tpy)
Arsenic (HAP)	1.25E-04
Beryllium (HAP)	1.31E-05
Cadmium (HAP)	9.23E-06
Nickel (HAP)	1.88E-04
Antimony (HAP)	6.43E-06
Barium	6.74E-03
Chromium (HAP)	5.68E-03
Cobalt (HAP)	4.89E-05
Manganese (HAP)	3.70E-03
Mercury (HAP)	4.18E-06
Selenium (HAP)	1.63E-05
Silver	3.71E-06
Tellurium	2.34E-04
Thallium	3.61E-06
Vanadium	1.02E-04
Zinc	1.02E-03
TOTAL	**2.23E-02**

4.2.5 *Wastewater Treatment System*

The wet FGD system will require CPSG to install and operate a new wastewater treatment plant to treat the blowdown from the scrubbers. The wastewater will consist of dissolved salts/ions that accumulate in the scrubber (e.g., sulfates, metals, nitrates, etc.). These pollutants will be removed through chemical precipitation/filtration, detrification, biological oxidation, and clarification. The wastewater is not expected to have significant levels of VOCs because at the high temperatures in the scrubber, they do not typically transfer from the gas phase to a liquid phase dissolved in water. Additionally, although methanol, a VOC and HAP, can be used as a carbon source in the denitrification processes, CPSG has indicated that the use of a carbon source in this process will not result in measurable VOC or HAP emissions.

Another potential pollutant of concern is hydrogen sulfide. Because there is sulfur in the wastewater (in the form of sulfate), there is a potential for hydrogen sulfide to form, if there are sulfur-reducing bacteria in the absence of oxygen (like in the denitrification step). However, CPSG reports that 1) in this step of the wastewater treatment plant, the prevalent bacteria will be the denitrifying bacteria, not the sulfur-reducing bacteria, and 2) nitrates will actually inhibit the activity of sulfur-reducing bacteria. CPSG indicated that they will monitor the oxidation-reduction potential (ORP) of the wastewater to ensure hydrogen sulfide is not formed.

4.2.6 Quench Pumps

Two small diesel-fired quench pumps, up to 500 horsepower (hp), may be installed to provide water in the event of a plant shutdown following an emergency or unusual event, and if power is unavailable from the reserve auxiliary transformer. Criteria pollutant emissions from these quench pumps are presented in Table 4-6.

Table 4-6 Projected Annual Emissions from the Quench Pumps (tons per year)

Emissions	PM	PM10	SO_2	NO_x	CO	VOC
Quench Pumps	0.005	0.005	0.025	0.1	0.03	0.02

Note that emissions for the quench pumps were calculated based on operating one hour per month (12 hours per year).

4.2.7 Facility-wide Emission Summary

Table 4-7 presents the projected future actual emissions after implementation of the AQCS project.

Table 4-7 AQCS Project Emission Summary (tons per year)

Emissions Unit	PM	PM10	PM2.5	SO2	NOx	CO	VOC	SAM	Hg
Unit 1	422	956	956	7027	2811	5621	66	759	327
Unit 2	422	956	956	7027	2811	5621	66	759	327
Quench Pumps	0.005	0.005	0.005	0.025	0.1	0.03	0.02	Negl.	Negl.
Material Handling	28	12	2	--	--	--	--	--	--
Wagner Project	6	6	6	--	--	--	--	--	--
Total Project	878	1,930	1,920	14,054	5,622	11,242	132	1,518	654

4.2.8 Construction Emissions

The AQCS Project will involve extensive and lengthy construction; CPSG estimates construction could take up to three years. Air emissions will be generated from the operation of construction equipment at times over the period. Construction activities that could generate emissions will include ground excavation, grading, cut-and-fill operations, and the installation of the APC equipment. Minimal emission of VOC, CO, SO_2 and NO_x will be emitted from the construction equipment's exhaust. Fugitive dust emissions will be produced from trucks traveling over the paved roads. Additional fugitive emissions may be generated from wind erosion of open excavation areas during construction. Emissions estimates were verified by PPRP and are summarized in Table 4-8.

Construction emissions are not regulated in the same manner as those from stationary sources. However, if a project must obtain a license or permit from a federal agency, then emissions from construction activities would be quantified and included in the applicability determination under EPA's general conformity rule (40 CFR 93). However, because this project does not require a federal permit or license, construction emissions are not regulated beyond the requirements for "reasonable precautions" identified in COMAR 26.11.06.03D. As such, CPSG indicates that they will use control measures such as wet suppression to minimize fugitive dust from the land-based construction activities.

Table 4-8 Projected Emissions Associated with Construction Activities

Pollutant	Total Emissions
PM (PM, PM10 & PM2.5)	2.0
NO_x	3.4
CO	3.3
VOC	0.4
SO_2	0.2

4.2.9 Greenhouse Gas Emissions

Emissions of greenhouse gases (GHGs) are not yet regulated in Maryland; however, Maryland is scheduled under Regional Greenhouse Gas Initiative (RGGI) to establish a GHG cap-and-trade program. Therefore, PPRP and MDE-ARMA independently calculated the total carbon dioxide (CO_2) emissions including the installation of the AQCS Project using emission factors published by the Intergovernmental Panel on Climate Change (IPCC). The projected CO_2, based on design fuel would be 13.5 million tons per year.

4.3 PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

The Brandon Shores facility is an existing major source as defined in PSD regulations (40 CFR 52.21). Therefore, any modifications at the facility must be evaluated to determine whether the resulting emissions changes would constitute a "major modification" under PSD (40 CFR 52.21(b)(2)). The PSD applicability analysis is conducted only for pollutants for which the air quality in the vicinity of the plant is designated attainment, which in Anne Arundel County, includes SO_2, NO_x, PM/PM10, CO, and SAM.

The AQCS project was evaluated to determine whether: 1) the project constitutes a modification for any pollutants, and 2) whether any modifications are "significant" (above PSD applicability thresholds) and thus trigger PSD. In the PSD analysis, future projected emissions due to the project are compared with past actual baseline emissions to determine the net emissions increase from the project. Table 4-9 summarizes the baseline emissions for Unit 1 and Unit 2 (established based on the highest two-year average of past actual emissions in the past five years); future projected emissions, estimated as a result of the proposed project (see Table 4-7); and the net emissions change compared to PSD thresholds. For PSD applicability purposes, the entire Brandon Shores-Wagner complex is considered a single "source." CPSG has proposed a Healthy Air Act project at Wagner (PSC Case No. 9083) nearly simultaneously with the Brandon Shores case; therefore, emissions from the two HAA projects, one each at Brandon Shores and Wagner, must be considered together to determine whether emissions increases will be subject to PSD review.

Table 4-9 PSD and NA-NSR Applicability Determinations

	PM	PM10	PM2.5	SO2	NOx	CO	VOC	SAM
Total Project Emissions (1)	878	1,930	1,920	14,054	5,622	11,242	132	1,518
Baseline (2)	864	1957	1957	41,495	15,788	886	106	480
Net Increase (Decrease)	14	(27)	(37)	(27,440)	(10,166)	**10,357**	**26**	**1,038**
PSD/NSR Threshold	25	15	15	40	40/25	100	40/25	7

(1) See Table 4-7.
(2) Average of emissions from 2004-2005.

As indicated in Table 4-9, potential emissions of CO and SAM exceed the significance thresholds and are subject to PSD review; VOCs, a nonattainment pollutant, are addressed in Section 4.4.

Potential emissions of other PSD regulated pollutants, including lead, total fluorides, total reduced sulfur, reduced sulfur compounds, and hydrogen sulfide were not discussed in the application; however, with the exception of total fluorides, these emissions are assumed to be negligible. Total fluorides would include hydrogen fluoride, an acid gas HAP formed from the fluoride in the coal. Projected emissions of this pollutant, as provided in Table 4-3, are estimated to be 33 tpy. However, due to the installation of the wet scrubber, which typically achieve at least a 90% removal of acid gases, this will represent a decrease in emissions from previous levels.

Because there are pollutants that exceed the PSD significant thresholds, the applicant must:

- Demonstrate application of Best Available Control Technology (BACT) for regulated pollutants emitted above PSD thresholds for all emissions units (see discussion in Section 4.3.1 of this report);

- Assess the ambient impact of emissions through the use of dispersion modeling (Section 4.3.3); and
- Conduct additional impact assessments that analyze impairment to visibility, soils, and vegetation as a result of the modification, as well as impacts on Class I areas (Section 4.3.3).

4.3.1 BACT Analysis

Based on projected potential emissions, BACT is required for the boiler and quench pumps to control CO and SAM emissions. This section summarizes the BACT determination for these pollutants.

BACT for any source is defined in COMAR 26.11.17.01(B)(3) as:

> (a) "…. an emissions limitation, including a visible emission standard, based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Department, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for that source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combination techniques for control of the pollutant.
>
> (b) Application of best available control technology may not result in emissions of any pollutant which would exceed the emissions allowed by an applicable standard under 40 CFR 60 and 61.
>
> (c) If the Department determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination of these, may be prescribed instead to satisfy the requirement for the application of best available control technology. This standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of the design, equipment, work practice, or

> operation, and shall provide for compliance by means which achieve equivalent results."

BACT analyses are conducted using EPA's "top-down" BACT approach, as described in EPA's *Draft New Source Review Workshop Manual* (EPA 1990). The five basic steps of a top-down BACT analysis are listed below:

Step 1: Identify potential control technologies

Step 2: Eliminate technically infeasible options

Step 3: Rank remaining control technologies by control effectiveness

Step 4: Evaluate the most effective controls and document results

Step 5: Select BACT

The first step is to identify potentially "available" control options for each emission unit triggering PSD, for each pollutant under review. Available options consist of a comprehensive list of those technologies with a potentially practical application to the emission unit in question. The list includes technologies used to satisfy LAER requirements, innovative technologies, and controls applied to similar source categories.

For this analysis, the following sources were investigated to identify potentially available control technologies:

- U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) database,
- EPA's New Source Review website,
- In-house experts,
- State air regulatory agency contacts,
- Technical books and articles, and
- Guidance documents and personal communications with state agencies.

After identifying potential technologies, the second step is to eliminate technically infeasible options from further consideration. To be considered feasible for BACT, a technology must be both available and applicable.

The third step is to rank the technologies not eliminated in Step 2 in order of descending control effectiveness for each pollutant of concern. If the highest ranked technology is proposed as BACT, it is not necessary to perform any further technical or economic evaluation. Potential adverse impacts, however, must still be identified and evaluated.

The fourth step entails an evaluation of energy, environmental, and economic impacts for determining a final level of control. The evaluation begins with the most stringent control option and continues until a technology under consideration cannot be eliminated based on adverse energy, environmental, or economic impacts. The economic or "cost-effectiveness" analysis is conducted in a manner consistent with EPA's *OAQPS Control Cost Manual* Fifth Edition (EPA 1996) and subsequent revisions.

The fifth and final step is to select as BACT the most effective of the remaining technologies under consideration for each pollutant of concern.

4.3.2 BACT Determinations

4.3.2.1 CO

The only feasible control method for reducing CO emissions from utility coal-fire boilers is by avoiding its formation through the implementation of good combustion practices. CO can be removed from exhaust gases from gas- or oil-fired engines through the use of oxidation catalysts. However, the addition of oxidation catalysts to a coal-fired boiler system is not feasible for a variety of reasons, including:

- Temperature requirements for the conversion are not easily and consistently met at one location;
- Placement of the catalyst at the boiler outlet to meet the temperature requirements means the catalyst is quickly fouled;
- It causes additional oxidation of SO_2 to SO_3; and
- It is unproven in a coal-fired boiler.

CPSG is proposing to use good combustion practices to achieve a CO emission rate of 0.2 lb/MMBtu from Brandon Shores Units 1 and 2 for BACT.

PPRP and MDE-ARMA independently conducted a BACT evaluation. Review of EPA's RACT/BACT/LAER Clearinghouse (RBLC) indicated that BACT for all utility boilers subject to PSD has been the implementation of good combustion practices. Reported emission levels from the use of good combustion practices to control CO ranged from 0.11 to 1.26 lb/MMBtu. However, the rates at the lower end of the range were consistently for new boiler installations, not retrofits. A CO emission rate of 0.2 lb/MMBtu appears to be generally consistent with RBLC reported CO emission rates for older units of approximately the same vintage as the Brandon Shores units. Therefore, PPRP and ARMA concur that BACT for Unit 1 and Unit 2 is 0.2 lb/MMBtu on a 24-hour average basis, to be achieved through the use of good combustion practices.

The small (500 hp or less) quench pumps, assuming a manufacture date of 2008 or earlier, will be state-of-the-art engines that will conform to EPA Tier III emission standards, which will represent BACT.

4.3.2.2 SAM

SAM, or sulfuric acid mist, is an acidic liquid aerosol droplet that can be created and entrained in the exhaust from coal fired boilers. The sulfur in the coal is oxidized in the boiler to form mostly SO_2, but there is some SO_3 that is also formed. SO_3 can then react with water vapor to form liquid droplets of H_2SO_4, sulfuric acid. When an SCR is used, some additional SO_2 is oxidized on the catalyst to form even more SAM. Although it is acidic, the wet scrubber will not remove much SAM because it is a liquid particle, or aerosol.

One means of controlling SAM is through the use of a wet electrostatic precipitator (WESP). Here, the liquid aerosol is attracted to the charged fields, similar to those in a dry ESP, but, instead of rappers knocking the particles off, water, which dissolves the sulfuric acid, is used to remove them.

Another means of controlling SAM is through the use of a dry sorbent injection that can chemically react with the SAM and be removed by dry particulate control equipment. The sorbent could be injected into the boiler where the SAM is first formed and removed by the ESP; however, Brandon Shores has an SCR downstream that then creates more SAM. Therefore, the most feasible location for sorbent injection would be downstream of the SCR and upstream of the new fabric filter for particle removal.

Both WESPs and sorbent injection are feasible technologies and both have been used in coal-fired power plants. However, CPSG is proposing to install and operate a $NaHSO_3$ injection system to achieve a SAM emission rate of 0.027 lb/MMBtu as BACT. Because the project plans include the installation of a fabric filter for additional mercury control, the installation of the sorbent injection system appears to have very low costs ($525/ton removed). CPSG provided an economic evaluation of the installation of

WESPs in addition to the sorbent injection system and found that the additional removal achieved is not cost effective with a cost of $13,964/ton. PPRP and MDE-ARMA have reviewed this evaluation and concurs with the results.

PPRP and MDE-ARMA also independently conducted a review of the RBLC. The range of SAM emissions reported as BACT in the RBLC was 0.0014 lb/MMBtu (to avoid PSD) to 0.031 lb/MMBtu. This included sorbent injection and WESPs. Similar to CO, the lower end of the range of BACT SAM emissions was consistently for new boiler installations rather than retrofits. For older units, approximately the same vintage as the boilers at Brandon Shores, the installation of the $NaHSO_3$ injection system to achieve a SAM emission rate of 0.027 lb/MMBtu should be considered BACT for Unit 1 and Unit 2.

Any SAM from the quench pumps will be negligible.

4.3.3 NAAQS and PSD Increment Compliance Demonstration

The NAAQS are concentrations in the ambient air that are established by EPA at levels intended to protect human health and welfare, with an adequate margin of safety. The air quality analysis required for sources subject to PSD includes an evaluation of the impact of the new source's emissions on NAAQS attainment, and also includes an evaluation of the impact of the new source's emissions on applicable PSD increments. PSD increments are established by EPA as allowable incremental increases in ambient air concentrations due to new sources or major modifications in attainment areas, set at levels that are substantially less than the NAAQS. PSD increments cannot be exceeded even if the NAAQS evaluation would allow for impacts from new sources that are greater than the PSD increments.

The proposed project exceeds the PSD major modification emissions threshold for carbon monoxide (CO) and sulfuric acid mist (SAM) only; the change in emissions for the remaining criteria pollutants is less than the PSD emission thresholds. The applicant conducted an air quality modeling analysis to evaluate impacts of emission increases from the project on ambient air quality for CO. Only the emissions from the stack were included in the modeling analysis; the emissions associated with material handling were not considered in the PSD modeling analysis. There are no ambient air quality standards for SAM; therefore, SAM was not included in the modeling analysis. Furthermore, ambient impact analyses for VOC emissions are not required if the emissions increase is less than 100 tons per year (TPY).

The emissions from the boiler are currently emitted from a 700-foot stack. The good engineering practice (GEP) height for this stack is 587 feet. In this project, emissions from the boilers will be controlled using a wet FGD system, which will allow for a shorter stack and still be in compliance with the ambient air quality standards. A 400-foot stack is proposed to be installed as a part of this project. The impact of the change in stack height on ambient air quality was evaluated for NO_x, SO_2, and PM in this modeling analysis in addition to the analysis for PSD pollutants.

PPRP and ARMA conducted independent modeling, as described in this section, to verify the applicant's results. The NAAQS for the six criteria pollutants NO_2, SO_2, CO, lead, PM10, and ozone, defined by federal regulations (40 CFR 50), are shown in Table 4-10. NAAQS for PM2.5 and 8-hour ozone are also listed in Table 4-10 for completeness; however, these standards are in the process of being implemented and are not evaluated further in this report.

Table 4-10 Ambient Air Quality Thresholds

Pollutant	Averaging Time	Primary NAAQS	Secondary NAAQS	PSD Increment	Monitoring *de minimis*	Significant Impact Level
NO_2	Annual	100 (0.053 ppm)	100 (0.053 ppm)	25	14	1.0
SO_2	Annual	80 (0.03 ppm)	—	20	—	1.0
	24-hr	365 (0.14 ppm)	—	19	13	5.0
	3-hr		1300 (0.5 ppm)	512	—	25.0
CO	8-hr	10,000 (9 ppm)	—	—	575	500
	1-hr	40,000 (35 ppm)	—	—	—	2000
PM10	Annual	50	50	17	--	1.0
	24-hr	150	150	30	10	5.0
PM2.5	Annual	15	15	—	—	—
	24-hr	65	65	—	—	—
Lead	Calendar quarter	1.5	1.5	—	0.1	—
Ozone	1-hr	235 (0.12 ppm)	235 (0.12 ppm)	—	100 tpy VOC	—
	8-hr	156 (0.08 ppm)	156 (0.08 ppm)	—	—	—

ppm = parts per million

Source: 40 CFR 50; all values are shown in μg/m^3 except as noted.

Ozone, another criteria pollutant for which NAAQS have been defined, is not emitted directly from the proposed Brandon Shores facility sources. Ozone is formed by reactions of VOCs and NO_x emissions (called "ozone precursors") from point sources in the presence of sunlight and in the presence of precursors emitted by other sources. Ozone is considered to be a regional pollutant, in that the effects of individual sources are not ordinarily distinguishable from the effects of literally thousands of ozone precursor sources. For this reason, modeling the impact of an individual source on ozone concentrations is not required and was not carried out for this project. For VOCs, offsets are required (see Section 4.4) that ensure progress towards attainment of the ozone standard.

The significant impact levels (SILs) for these pollutants are also provided in the table. SILs have been established by EPA to serve as an initial test of air quality impacts. Predicted impacts less than the SILs are considered low enough that no threat to the NAAQS or PSD increments is present due to the sources being evaluated by the dispersion modeling analyses. Additional analyses relative to attainment of the NAAQS and PSD increments are not required or necessary for projects with predicted impacts less than the SILs. Impacts greater than the SILs need to be evaluated further to determine whether additional modeling or analysis is necessary to demonstrate NAAQS and increment attainment. It should be noted that only the impacts from pollutants triggering the requirements of PSD need to be compared against the SILs (only CO in this case). The impacts for the remaining pollutants were compared against the PSD increments and NAAQS only.

PSD regulations require a source impact analysis (NAAQS and PSD increments) and an ambient air quality evaluation. The ambient air quality evaluation requires the analysis of monitored concentrations in the vicinity of the PSD source if the source impacts are greater than the monitoring *de minimis* values displayed in Table 4-10, and allows the regulatory agency to exempt a source from the analysis if impacts are less than the *de minimis* values.

4.3.3.1 NAAQS and PSD Increment Modeling: AQCS Project Sources Only

To initiate the compliance demonstration for the NAAQS and PSD increments, CO emissions from sources associated with the Brandon Shores AQCS project were modeled using the American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD), version 04300. The purpose of this initial modeling analysis was to determine maximum project impacts relative to the SILs and monitoring *de minimis* concentrations for CO and impacts relative to PSD increments and NAAQS for SO_2, NO_x, and PM10. AERMOD was promulgated as a regulatory dispersion model and included in the Guidelines for Air Quality Models (40 CFR Part 51, Appendix W) on 9 November 2005. There is a one-year transition period during which either the previous guideline model (ISCST3) or AERMOD can be used for regulatory modeling analysis. As of December 2006, AERMOD replaced ISCST3 (the current regulatory model) for use in regulatory dispersion modeling analyses.

Meteorological Data Representativeness

An air quality modeling analysis should be accompanied by an evaluation of the representativeness of the meteorological data used in the model. For this project, Brandon Shores used surface and upper air data from BWI and Sterling, VA (Dulles Airport), respectively, for the time period 1991-1995.

Wind roses showing wind direction and speed patterns based on the BWI airport data were developed and displayed (CPCN application Figure 2.6-1). PPRP and ARMA conducted analyses to understand and analyze the representativeness of the BWI surface meteorological data for the Brandon Shores facility site. The locations of the Brandon Shores site and BWI Airport are presented in Figure 4-2. A wind rose for the period 1991-1995 for BWI surface data is presented in Figure 4-3. The Brandon Shores site is located 8 miles (12 km) east of the BWI airport. This distance is considered close enough for the meteorological data from the airport to be representative for the Brandon Shores site.

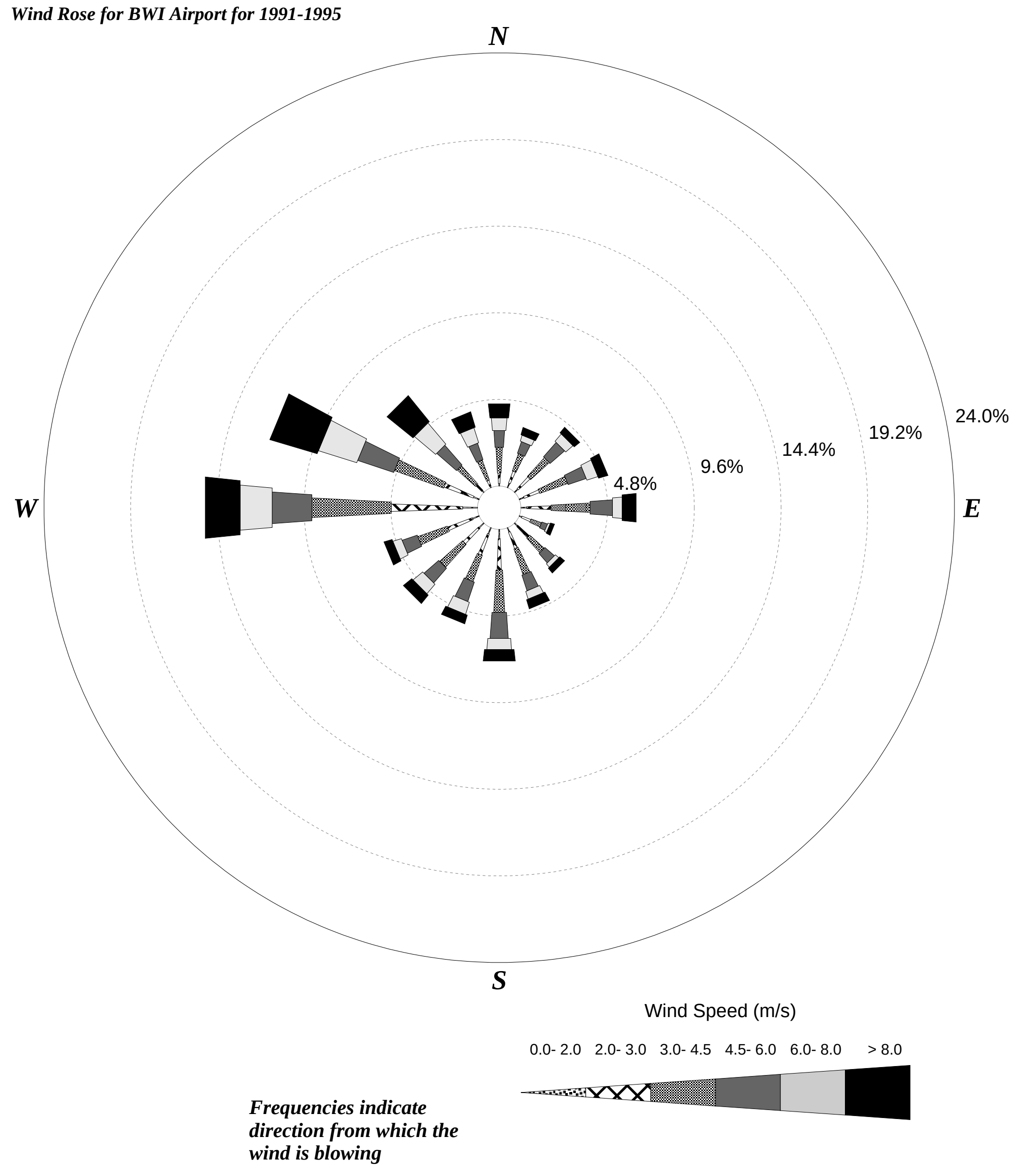
A review of the information presented by the applicant and the additional information developed by PPRP and ARMA reveals the following:

- Based on visual inspection of the terrain and land use surrounding the two sites, it is noted that differences exist, but these are judged to be not significant enough to invalidate the use of the BWI meteorological data for the AERMOD modeling. No major terrain features are located in between the Brandon Shores site and BWI.
- No channeling effects are observed from the wind rose, which indicate no sudden changes in terrain elevations in the immediate vicinity of the meteorological station.

PPRP and MDE-ARMA concluded that the five-year data set from the BWI airport is representative and suitable for use with the Brandon Shores facility modeling.

Figure 4-2 Location of Brandon Shores and BWI

Figure 4-3 Wind Rose for BWI Airport (1991-1995)



Meteorological Data Processing

The surface and upper air data collected at Dulles were processed by the applicant utilizing the AERMET program. AERMET is the recommended processor for developing inputs to AERMOD. AERMET requires, at a minimum, hourly NWS data and once-daily upper air sounding profiles. The processing program produces two files for input to AERMOD: a surface file containing calculated micrometeorological variables (heat flux, stability, and turbulence parameters) that represent the dispersive potential of the atmosphere, and a profile file that provides vertical profiles of wind speed, wind direction, and temperature. In the case of meteorological data files developed from NWS data, the profiles contain only one level (the surface level) and a meteorological interface within AERMOD generates profiles of wind, temperature, and turbulence from the input data files. The Brandon Shores AERMET analysis used parameters for surrounding land characteristics (albedo, or reflectivity of the ground surface; bowen ratio, an indicator of surface moisture; and roughness length, an indicator of surface roughness) based on tables 4-1 through 4-3 provided in the AERMET users guide. Land use characteristics provide important inputs to the AERMET preprocessor and to the AERMOD model. The capability of the atmosphere to simulate plume dispersion is simulated by AERMET and AERMOD through the use of scaling parameters such as the convective velocity scale, the friction velocity, and the Monin-Obukhov length scale. These parameters are in turn highly dependent on land characteristics. PPRP and ARMA conducted an independent analysis of land characteristics in the vicinity of Brandon Shores and BWI, which revealed similar characteristics to those used by the applicant.

PPRP and ARMA have reviewed the meteorological data processing, and conclude that the AERMET processing conducted by the applicant is suitable for use with the Brandon Shores facility modeling.

Downwash

Aerodynamic downwash caused by buildings and structures in the vicinity of exhaust stacks can lead to an increase in ground level concentrations. Downwash effects are modeled within AERMOD by using algorithms derived from the ISCPRIME model. The algorithms contained in ISCST3 are known to have several deficiencies, most of which tend to make the predictions conservative (i.e., predict higher impacts than a more accurate model would predict). The ISCPRIME model was developed by the Electric Power Research Institute (EPRI) in response to a need to improve existing downwash models. The impacts of the project sources were modeled using AERMOD by the applicant.

AERMOD requires information about buildings and structures to be input in a prescribed format. Brandon Shores used EPA's Building Profile Input Program (BPIP) for this purpose. The BPIP program generates information on the location and size of buildings and structures relative to each stack, and AERMOD uses this information to calculate downwash effects.

BPIP also calculates the good engineering practice (GEP) stack height for a given stack location. GEP is the height at which downwash effects are considered to be insignificant. The GEP height as determined by BPIP was 587.5 feet or 179.1 meters, which is greater than the existing stack height of 700 feet. The new stack height (post-project) will be 400 feet (121.92 meters). Since the proposed stack height is less than GEP and therefore affected by downwash, the direction-specific building dimensions generated by BPIP were used in the AERMOD model runs. The existing stack was modeled at the GEP height of 587.5 feet, while the new stack was modeled at a height of 400 feet.

Source Characterization

The impact of emission increase on SILs for CO and change in stack heights for all pollutants were evaluated. The GAQM require that the emissions from a source be modeled at the GEP height, if the stack height is greater than the GEP height. Two emission scenarios were modeled in this analysis: the current (existing) and projected (future) scenario. The existing emissions, also called baseline actual emissions, were calculated as the maximum of the 2-year averages over five years preceding the project. The five years used in this analysis was for the period between 2001 and 2005. Different load conditions for the units (100 percent, 75 percent and 50 percent) were examined for the future emission scenario, because lower loads can result in lower plume heights, which in turn can result in higher predicted impacts even at the lower emission rates associated with the lower loads. The complete set of emission rates and stack parameters for these scenarios is shown in Table 4-11 and 4-12, respectively, and is also listed in the CPCN application, Table 6.3-1. The location of stacks, superimposed on an aerial photograph of the Brandon Shores facility and vicinity, is shown in Figure 4-4.

Table 4-11 Actual Emissions Before and Projected Emissions After the AQCS Project

(i) Projected Emissions

(a) English Units

Load Condition	CO		NOx		SO2		PM		H2SO4	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
100	1426	6246	713	3123	1783	7807	242	1062	192.5	843
70	998	4372	499	2186	1248	5465	170	743	134.8	590
40	570	2498	285	1249	713	3123	97	425	77	337

(b) Modeling Units

Load Condition	CO (g/s)		Nox (g/s)		SO2 (g/s)		PM (g/s)		H2SO4 (g/s)	
	1-unit	2-units	1-unit	2-units	1-unit	2-units	1-unit	2-units	1-unit	2-units
100	179.68	359.35	89.84	179.68	224.66	449.32	30.49	60.98	24.26	48.51
70	125.75	251.50	62.87	125.75	157.25	314.50	21.42	42.84	16.98	33.97
40	71.82	143.64	35.91	71.82	89.84	179.68	12.22	24.44	9.70	19.40

(ii) Baseline Actual Emissions

Year		Average-2004/2005	Total-Unit 1+ Unit 2		
			(tpy)	(lb/hr)	(g/s)
Unit 1	SO2	20,010	41,495	9,474	1,193.69
	NOx	5,281	11,809	2,696	339.71
	CO	436	886	202	25.47
	PM	1,025	1,956	447	56.27
	VOC	52	106	24	3.05
Unit 2	SO2	21,484			
	NOx	6,528			
	CO	450			
	PM	932			
	VOC	54			

Table 4-12 Stack Parameters and Emission Rates Used in Modeling Analysis

(i) Current (Existing) Scenario

(a) English Units

	Stack Height (ft)	Diameter (ft)	Exit Velocity (ft/sec)	Temperature (deg F)	Flow (acfm)
	587.5	22	116.19	325	2,597,100

(b) Metric Units

	Stack Height (m)	Diameter (m)	Exit Velocity (m/sec)	Temperature (K)	
	179.07	6.71	35.41	435.93	

(ii) Future Scenario

(a) English Units

Load Condition	Stack Height (ft)	Diameter (ft)	Exit Velocity (ft/sec)	Temperature (deg F)	Flow (acfm)
100	400	31.5	55.7	126	2,597,100
70	400	31.5	38.99	126	1,817,970
40	400	31.5	22.28	126	1,038,840

(b) Metric Units

Load Condition	Stack Height (m)	Diameter (m)	Exit Velocity (m/s)	Temperature (K)	
100	121.92	9.60	16.98	325.37	-
70	121.92	9.60	11.88	325.37	-
40	121.92	9.60	6.79	325.37	-

Figure 4-4 Location of Stacks Used in Modeling Analysis

Receptor Grid Development

PPRP and ARMA developed a receptor grid extending outwards in each direction from the Brandon Shores site up to a distance of 5 Kilometers. Receptor spacing was set to 25 meters along the site boundary; 50 to 100 meters spacing from the site boundary to about 1.5 kilometers; 150 meters from 1.5 kilometers to 2.5 kilometers; and 250 meters from 2.5 kilometers to 5 kilometers.

A total of 3,873 receptors were analyzed in the model. Terrain elevations were assigned to each receptor, and a hill scale was calculated with the use of the program AERMAP. AERMAP is a companion program to AERMOD that utilizes digitized USGS digital elevation model (DEM) data files to assign elevations and hill scales to receptors. The hill scale assigned to each receptor is used by AERMOD to determine the appropriate terrain algorithm to use for the receptor. AERMOD calculates a critical dividing streamline height, based on the hill scale that divides the approach flow towards the hill into two parts: one that rises over the terrain obstacle, and one that passes around the side of the obstacle. Based on the plume height relative to the terrain and relative to the receptor, AERMOD calculates concentration contributions from different parts of the plume following the different flow regimes. The receptor elevations were assigned using the 7.5 minute digital elevation maps (dems) files developed by United States Geological Survey (USGS).

Stack Height Evaluation and Source Only Modeling Analysis

Modeling conducted by the applicant used five years of meteorological data from 1991 through 1995 from BWI Airport for pre and post-project emissions. For the post project case, emissions for different operating scenarios were used in the modeling analysis. For the existing stack height case, the baseline actual emissions were used in the modeling analysis. As noted earlier, emissions for CO only exceed the major modification threshold for PSD and hence are required to be compared against the significant impact levels (SIL). For the other criteria pollutants (SO_2, NO_x, and PM10), only the impact of the change in stack height on ambient air quality (NAAQS and PSD increment) is evaluated.

PPRP and ARMA have evaluated the modeling methodology including the model used, the development and application of the meteorological database, the use and application of BPIP to determine downwash effects, the design of the receptor grid, and the actual model application. PPRP and ARMA's conclusion based on this evaluation is that the methodology is adequate to determine the impact of emissions from the Brandon Shores facility project.

Model results for all scenarios were presented in the Brandon Shores CPCN application. PPRP and ARMA conducted independent modeling of selected scenarios to verify the results reported by the applicant. Table 4-13 presents a summary of the modeling analysis conducted by PPRP and MDE-ARMA- these results reflect the stack location as revised in the amended CPCN application submitted in November 2006. The modeling results for CO indicate that the emissions increase does not exceed the SIL for CO; therefore, no further modeling analysis is required for this pollutant. The impacts of SO_2, NO_2, and PM10 are less than the PSD increments and NAAQS for the respective pollutants.

The AQCS Project results in decrease in emissions for SO_2, and PM10. Emissions of NO_x have decreased below historical levels due to the previous installation of an SCR system, and may decrease further in response to HAA requirements through year-round operation of the SCR. Emissions from the project result in increases in local maximum ambient impacts for PM10 and CO, while the impacts of all other pollutants decrease. The future stack height for the AQCS Project (400 feet) is less than the GEP height for the emission sources (587.5 feet). The reduced stack height and a lower flue gas temperature due to cooling of the exhaust caused by the wet FGD system, results in maximum impacts greater than those predicted using the existing stack height. The benefits derived by reducing emissions of PM10 are offset locally by the increase in impacts due to the lower stack height and exhaust temperature. Overall, however, the impacts from the AQCS Project do not exceed the ambient air quality standards and hence the impacts from the AQCS Project can be considered insignificant. The increase in maximum impacts is localized and occurs close to the facility. Section 4.3.4 discusses the broader air quality benefits of the emissions reductions that will be achieved by this project.

4.3.3.2 *Preconstruction Monitoring*

The air quality modeling analyses described in Section 4.3.3.1, which address attainment of the NAAQS and PSD increments, are intended to fulfill the requirements contained in the PSD regulations at 40 CFR Part 52.21(k), "source impact analysis." Additional requirements at 40 CFR Part 52.21(m) require an analysis of air quality in the vicinity of the PSD source, including preconstruction monitoring. If the ambient impacts of a new source or modification are less than the monitoring *de minimis* levels specified in Part 52.21(i)(8), an exemption may be granted from the air quality analysis. Since the impacts of the Brandon Shores AQCS Project do not exceed the monitoring *de minimis* levels for CO, an exemption can be granted for this pollutant. PPRP and MDE-ARMA conclude, therefore, that the air quality analysis requirements of 52.21(m) have been satisfied for the Brandon Shores facility.

Table 4-13 Summary of Modeling Results Using AERMOD

Pollutant	**Averaging Period**	**Project Impacts**			**Air Quality Threshold**			
		Current	Future	Net Impacts	SIL	PSD Increment	NAAQS	Monitoring Deminimis
SO2	Annual	2.90	8.53	5.63	1	20	80	-
	24-Hour	3.31	71.14	67.84	5	91	365	13
	3-Hour	3.62	147.01	143.39	25	512	-	-
NO2	Annual	3.62	3.41	-0.21	1	25	100	14
PM10	Annual	3.48	1.16	-2.32	1	17	50	-
	24-Hour	3.21	9.66	6.45	5	30	150	10
CO	8-Hour	5.53	95.97	90.44	500	-	10,000	575
	1-Hour	5.57	129.24	123.67	2,000	-	40,000	-

Notes:
1. A negative net impacts indicates that there is a decrease in the future impacts from the project sources as compared to the past impacts.

4.3.3.3 *Summary and Conclusions*

Based on the information provided in the Brandon Shores CPCN application, supplemented with independent analyses conducted by the State, PPRP and MDE-ARMA conclude that criteria pollutant impacts for the Brandon Shores AQCS Project will not adversely affect the NAAQS or PSD increments for NO_2, SO_2, PM10, and CO.

4.3.3.4 *Additional Impact Analyses*

The PSD regulations require additional analyses beyond the NAAQS and PSD increment assessment described in the previous section. Specifically, the regulations require an assessment of any impairment to visibility, soils, and vegetation that would occur as a result of the new source and of general commercial, residential, industrial, and other growth associated with the new source. Furthermore, impacts on Class I areas must be analyzed to determine compliance with Class I increments and to assess the impacts of new emissions on air quality related values (AQRVs). Since there are no PSD increments for CO, and CO does not affect AQRVs, a Class I analysis was not conducted. A review of applicant's analyses, and a discussion of further analyses conducted by PPRP and MDE-ARMA, follow.

Impacts on Soils and Vegetation; Impacts of Growth

Constellation has conducted an analysis of the effect of the growth associated with the Brandon Shores facility sources, and of the impact of the AQCS Project emissions on soils and vegetation (CPCN application Section 6.7). These analyses consist of research into what ambient pollutant levels would be harmful, and a comparison of harmful levels to projected levels due to the AQCD Project. PPRP and MDE-ARMA have reviewed this analysis and agree with the conclusion that impacts from the Brandon Shores AQCS Project will not cause harmful effects on local soils and vegetation. PPRP and MDE-ARMA also agree with the conclusion that growth associated with the AQCS Project will not have a significant effect on air quality.

4.3.4 Air Quality Benefits from the AQCS Project

The proposed AQCS Project, and other pollution control projects recently undertaken by Constellation, will result in significant decreases in emissions of SO_2 and NO_x (approximately 27,000 tons and 10,000 tons respectively, Table 6-4.3 of the CPCN application). These reductions will result in anticipated improvements in air quality within Maryland, including benefits related to ground-level ozone concentrations, acid deposition, nutrient loading to the Chesapeake Bay, and reduced concentrations of sulfate aerosols that contribute to the current nonattainment status for PM2.5. PPRP and MDE-ARMA have conducted additional air quality modeling to quantify the benefits of the projected emissions reductions to PM2.5 concentrations within the PM2.5 nonattainment area, acid deposition within Maryland, nutrient loading to the Chesapeake Bay.

The model used for the benefits analysis was CALPUFF, a Lagrangian puff model that has been previously used in Maryland for addressing nutrient loading and secondary aerosol impacts. CALPUFF is an EPA guideline model that is capable of simulating the transport, dispersion, and atmospheric transformation of SO_2 and NO_x emissions, and the subsequent impacts on secondary aerosols as well as wet and dry deposition of sulfur and nitrogen containing species.

CALPUFF was run with a full calendar year (2002) of meteorological data based on the Penn State/NCAR mesoscale model (MM5) runs produced by the University of Maryland. A receptor grid was developed for the Brandon Shores facility that extended from the power plant to the edges of the Chesapeake Bay watershed (an area approximately 500 by 700 kilometers). The "before" and "after" stack and emissions configuration were modeled and the results processed to identify the maximum changes in impacts. The USGS Spatially Referenced Regressions on Watershed Attributes (SPARROW) model was used to calculate the mass nitrogen loading to the Chesapeake Bay due to deposition within the watershed and subsequent transport to the bay, and due to deposition directly on the bay waters.

AQCS Project effects on secondary aerosol concentration, acidic deposition, and nutrient loading are summarized in tabular and graphic forms. Table 4-14 summarizes the overall predicted project benefits.

Table 4-14 Summary of AQCS Project Benefits

Sulfate Aerosol (PM2.5) Concentrations
Units are in ug/m3

	Current Impact	Future Impact	Benefit
Maximum concentrations			
Annual Average	0.092	0.040	-0.052
Maximum 24-hr Average	6.39	1.96	-4.42
Average concentrations within PM2.5 nonattainment area			
Annual Average	0.057	0.020	-0.037
Maximum 24-hr Average	1.10	0.39	-0.71
Acidic Deposition (sulfur) within Maryland			
Total Sulfur Loading (kg)	2,792,955	1,221,774	-1,571,180
Nitrogen Loading to the Chesapeake Bay			
Total Nitrogen Loading (kg)	63,006	29,375	-33,631

Figures 4-5 through 4-8 depict the spatial patterns of predicted benefits for sulfate aerosol - annual and 24-hr averages, sulfur and nitrogen deposition, respectively.

Figure 4-5 AQCS Project Benefits: Annual Average Sulfate Aerosol

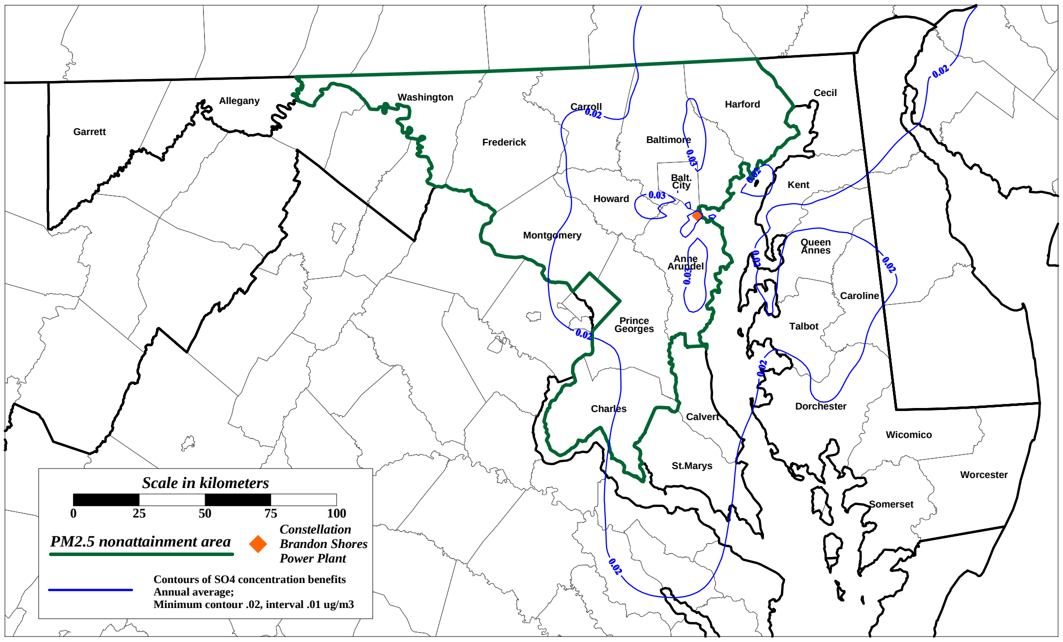


Figure 4-6 AQCS Project Benefits: 24-hour Average Sulfate Aerosol

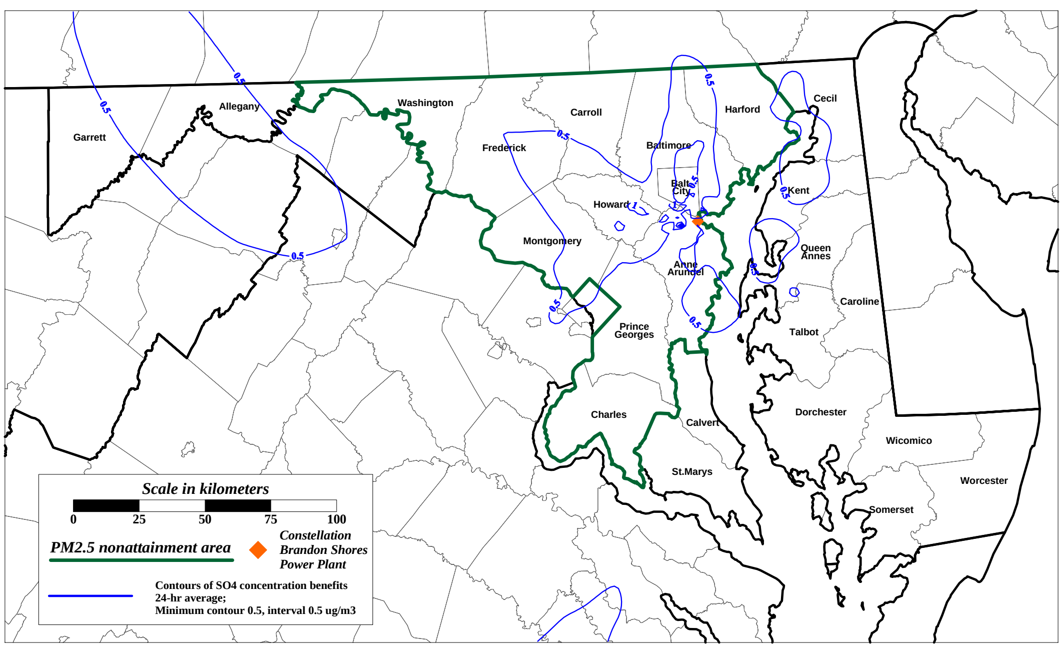


Figure 4-7 AQCS Project Benefits: Sulfur Deposition

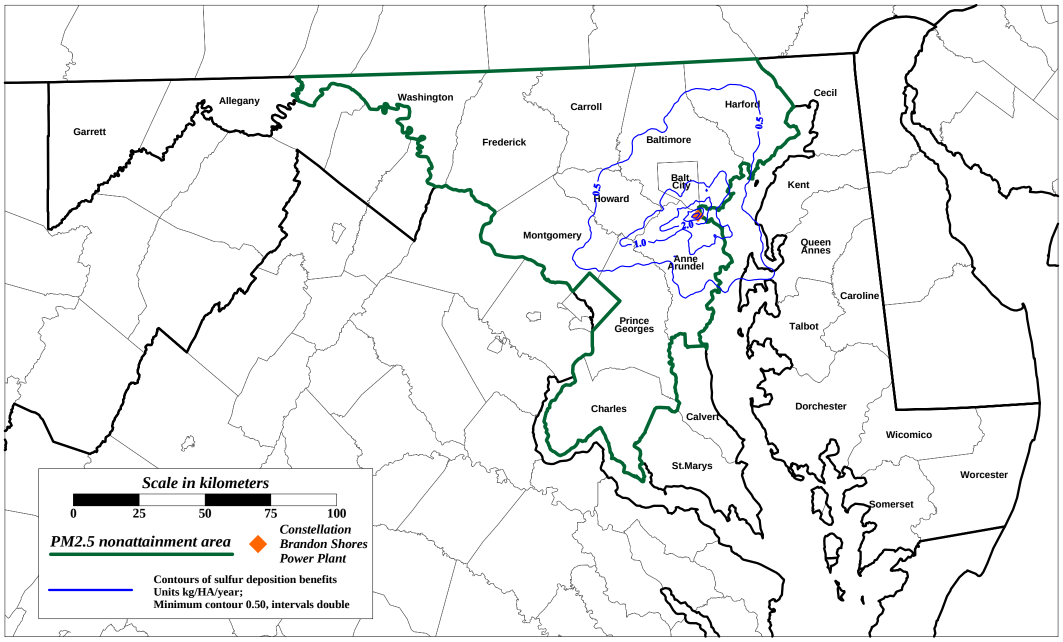
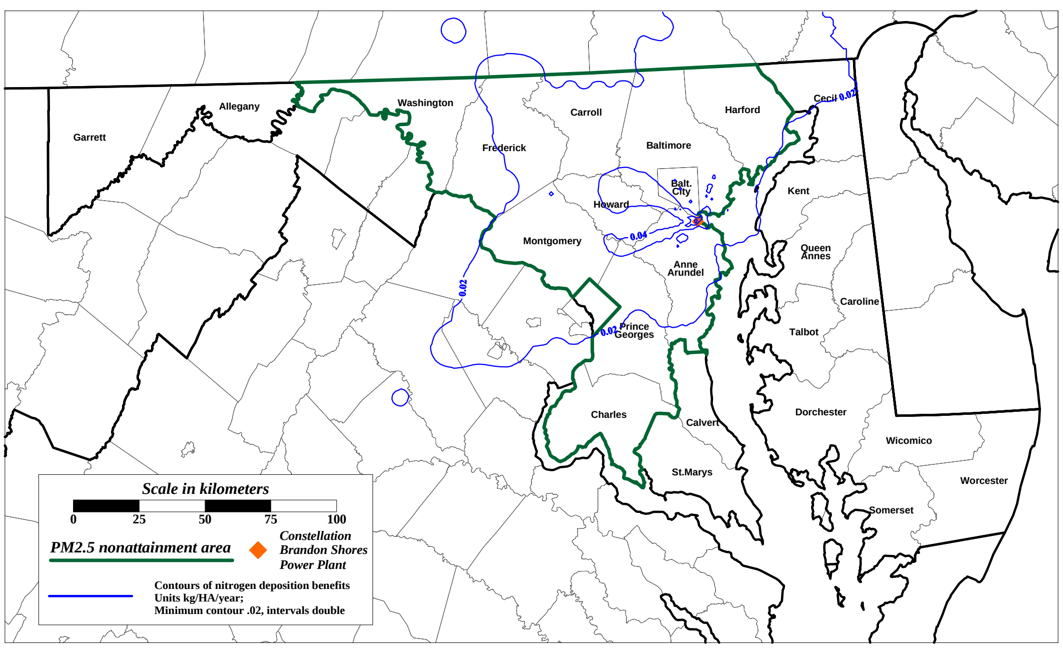


Figure 4-8 AQCS Project Benefits: Nitrogen Deposition



The benefits of the proposed emissions reductions have been quantified and appear to produce air quality improvements and reduced deposition and nutrient loading across a wide area. The beneficial effects of this project occur primarily within Maryland and the Chesapeake Bay.

4.4 NONATTAINMENT NEW SOURCE REVIEW (NA-NSR)

As presented in Table 4-9, the net emissions increase in VOC emissions from the AQCS Project are slightly above the NA-NSR major threshold; emissions of NO_x and PM2.5 are below NA-NSR thresholds.

Because the proposed AQCS Project is subject to NA-NSR, Brandon Shores must:

- Implement Lowest Achievable Emission Rate (LAER) level of pollution control for VOCs from all emissions units;
- Obtain emissions reductions (offsets) for VOCs from other sources that impact the same nonattainment area;
- Certify that all other sources owned by CPSG in Maryland are complying with all applicable requirements of the Clean Air Act (CAA); and
- Demonstrate through an analysis of alternative sites, sizes, production processes, and environmental control techniques, that the benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification.

The following sections review the proposed Brandon Shores AQCS Project in relation to these NA-NSR requirements.

4.4.1 LAER Analysis

LAER is defined in COMAR 26.11.17.01(B)(11) as:

> ″(a) … for any source, the more stringent rate of emissions based on the following:
>
> (i) The most stringent emissions limitation which is contained in the implementation plan of any state for a class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that these limitations are not achievable; or
>
> (ii) The most stringent emissions limitation which is achieved in practice by a class or category of stationary sources, with this limitation, when applied to a modification, meaning the lowest achievable emissions rate for the new or modified emissions units within the stationary source.

> (b) The application of this definition does not permit a proposed new or modified stationary source to emit any pollutant in excess of the amount allowable under 40 CFR 60."

In general, the steps to identify and determine LAER are similar to, but more rigorous than the steps to determine BACT (see Section 4.3.2). For example, in addition to reviewing available control technologies, all applicable emissions limits in effect in any State Implementation Plan (SIP) must be considered as part of the process to determine LAER.

Similar to CO, the only feasible control method for reducing VOC emissions from utility coal-fired boiler is by avoiding its formation through the implementation of good combustion practices. VOCs can be removed from exhaust gases from gas or oil fired engines through the use of oxidation catalysts; however, the addition of oxidation catalysts to a coal-fired boiler system is not feasible for all the same reasons as stated in Section 4.3.2 for CO.

CPSG is proposing to use combustion controls to limit VOC emissions from Brandon Shores Units 1 and 2 to a rate of 0.0024 lb/MMBtu as LAER. PPRP conducted a review of EPA's RBLC, which indicated that LAER for every utility boiler was good combustion controls and that the associated VOC emissions ranged from 0.0024 lbs/MMBtu to 0.015 lb/MMBtu.

LAER, for the quench pumps, assuming a manufacturing date of 2008 or earlier, will be to conform to the Tier III emission standards.

4.4.2 *Offsets*

In addition to achieving LAER, NA-NSR requires CPSG to obtain emission offsets for each potential ton of VOC to be emitted by the AQCS Project. In accordance with COMAR 26.11.17, CPSG must meet the "reasonable further progress requirements" of the CAA by attaining VOC emission offsets at a ratio of 1.3 to 1 from existing sources. The offsets may be from sources within the ozone nonattainment area in which the proposed facility will be located. Specifically, under COMAR 26.11.17.04C:

> "(1)…offsets are acceptable if obtained from within the same nonattainment area as the new source. The Department may allow the owner or operator of a source to obtain VOC or NO_x emission reductions in another ozone nonattainment area if the other area has

an equal or higher nonattainment classification than the area in which the source is located, and emissions of the particular pollutant from the other area have been demonstrated to contribute to a violation of the national ambient air quality standard in the nonattainment area in which the source is located.

(2) The Department shall give preference to offsets from sources located as close to the proposed new source site as possible."

Total AQCS Project VOC emissions will be 26 tpy, which means that CPSG must obtain is 34 tons of VOC offsets. Note that in its CPCN application CPSG indicates VOC totaling 47 tons will be required for the project; however, we believe that the applicant based its offset calculation on a typographical error in the VOC emission rate.

4.4.3 Alternatives Analysis

As a major source of VOCs under NA-NSR, CPSG is required to conduct "…an analysis of alternative sites, sizes, production processes, and environmental control techniques for a proposed source [that] demonstrates that benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification" (COMAR 26.11.17.03B(6)).

The applicant did not provide an alternatives analysis specifically addressing COMAR 26.11.17.03B(6); however, given the nature of this project (addition of an air pollution control system), no alternatives analysis is required.

4.4.4 CAA Compliance Certification

The AQCS Project is subject to NA-NSR, therefore, the applicant must certify that "all existing major stationary sources owned or operated by the applicant, or any entity controlling, controlled by, or under common control with the applicant, in the State are in compliance with all applicable emission limitations or are in compliance with an approved federally enforceable plan for compliance" under COMAR 26.11.17.03(B)(1).

4.5 PLUME ANALYSIS (MODELING, ICING/FOGGING IMPACTS)

The addition of wet FGD systems to control SO_2 emissions from Brandon Shores Units 1 and 2 will result in an increased quantity of water vapor to be discharged through the new, 400-ft stack. The water vapor will result in a visible plume when atmospheric conditions favor condensation into water droplets. CPSG conducted additional modeling to determine whether the increased water vapor loading would contribute to fog and/or icing events at specific locations (Key Bridge and BWI airport) or to any local area surrounding the power plant.

Additional modeling was conducted with CALPUFF which has the capability of predicting fogging and icing events. A preprocessor called FGEMISS was used to create a specialized input file for CALPUFF containing hourly information on plume water vapor content. The model was run to produce a data file containing information on plume length and receptor impacts. Postprocessors were then applied to analyze the file produced by CALPUFF and to estimate visible plume height and length statistics, as well as to estimate the frequency of possible fogging and icing events at local and specific receptor (Key Bridge and BWI airport) locations.

The CALPUFF analysis predicted that no fogging or icing events would occur either locally, at Key Bridge, or BWI airport. The new stack height, combined with buoyant plume rise, appears to be sufficient to avoid these events. PPRP and MDE-ARMA have reviewed the methodology and execution of this analysis, including re-running processor programs and CALPUFF, and have verified the conclusions based on this analysis.

4.6 APPLICABLE REQUIREMENTS REVIEW

Based on the source types and projected emissions, this section outlines the Federal, State, and local air quality requirements to which the Brandon Shores AQCS Project will potentially be subject. These requirements are in addition to the PSD and NA-NSR requirements outlined in Sections 4.3 and 4.4.

4.6.1 Federal Requirements

4.6.1.1 NSPS Subpart Y – Coal Preparation Plants

The proposed AQCS Project will be considered a modification to an existing Coal Preparation Plant under NSPS Subpart Y (40 CFR 60.250 et seq.) because Brandon Shores plans to modify the facility's coal storage and handling systems to enable fuel blending and these physical changes will result in an increase in PM emissions. The proposed modifications will include the installation of a new conveying system (adding several coal transfer points) to the existing coal handling facility and reconfiguring several areas of this facility.

The existing coal handling facilities at Brandon Shores are considered a "coal preparation plant" under New Source Performance Standards Subpart Y because Brandon Shores installed coal sizing equipment (i.e., crushers) as part of their coal handling operations in 1981, which is after the October 1974 Subpart Y effective date. CPSG controls fugitive dust from the existing coal handling equipment in a number of ways. According to the existing 1981 CPCN (Case #6516) for Brandon Shores, approval for the construction of the coal handling facilities was authorized based on a specific set of control devices with specific levels of PM control. Additionally, in Brandon Shore's Title V permit, CPSG must implement a Best Management Practices (BMP) Plan on the coal handling equipment in order to meet the COMAR 26.11.09.03D requirements for "reasonable precautions" in material handling operations.

Modifying the existing coal preparation plant subjects the new and modified coal transfer and unloading equipment to the NSPS Subpart Y opacity limits (<20 percent opacity) under 40 CFR §60.252(c). Neither Brandon Shores' existing or new coal facilities include thermal drying or pneumatic cleaning; therefore, other parts of NSPS Subpart Y (40 CFR §60.252(a) and (b)) do not apply.

The opacity limit in 40 CFR §60.252(c) applies during all times, except during periods of startup, shutdown and malfunction. During times of startup, shutdown and malfunction, the NSPS General Provisions of 40 CFR §60.8 require Brandon Shores to operate affected equipment and controls consistent with "good air pollution control practice" for minimizing emissions. Being subject to an NSPS also requires Brandon Shores to prepare and submit a number of notifications to MDE-ARMA and U.S. EPA, and to conduct testing to demonstrate compliance with the opacity standard.

EPA Method 9 will be used in initial performance tests to determine compliance with Subpart Y opacity requirements. Because the emissions will be fugitive from a variety of sources, Brandon Shores will also have to provide to MDE-ARMA a test plan describing how they propose to demonstrate initial compliance. Brandon Shores will also have to follow requirements in 40 CFR §60.7, §60.8, and §60.11 to comply with testing and notification requirements.

Information from Brandon Shores on how they plan to control emissions from the coal handling equipment suggests that the affected facilities will meet the NSPS opacity requirements.

4.6.1.2 NSPS Subpart OOO – Non-metallic Mineral Processing Plants

The proposed AQCS Project will be considered a Non-Metallic Mineral Processing Plant under NSPS Subpart OOO (Standards of Performance for Non-Metallic Mineral Processing Plants) due to the proposed installation of limestone sizing and screening equipment (i.e., ball mill and classifier), storage silos, and conveying equipment that will support the preparation of limestone slurry. By definition in 40 CFR 60.671, limestone is considered a non-metallic mineral, and the operation of the proposed grinding mill, storage silos and conveying equipment are all considered affected facilities under the rule. In addition, NSPS defines a non-metallic mineral processing plant as any combination of equipment used to crush or grind non-metallic minerals at power plants or other facilities (e.g., lime plants, steel mills, asphalt concrete plants, portland cement plants) that may require the processing of non-metallic minerals.

Triggering NSPS Subpart OOO subjects the affected equipment to various PM emission limits, and monitoring, testing, and recordkeeping and reporting requirements. The affected storage silo vents and conveyor transfer points are subject to a PM limit of 0.05 g/dscm (0.022 gr/dscf) and a visible emissions limit of 10% opacity. The ball mill will be subject to a 15% opacity limit (40 CFR §60.672).

In addition, the affected equipment will need to comply with testing requirements under 40 CFR §60.675, recordkeeping and reporting requirements under 40 CFR §60.676, and continuous monitoring requirements under 40 CFR §60.674.

4.6.1.3 NSPS Subpart IIII – Stationary Compression Ignition Internal Combustion Engines

The proposed 500-hp quench pumps will be subject to the newly promulgated NSPS Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. These engines meet the NSPS definition of fire pump engines because the pumps provide thermal protection.

Applicability of NSPS Subpart IIII requires each quench pump to meet specific emission limits (dependant on model year and engine displacement volume) and associated fuel, monitoring, compliance, testing, notification, reporting, and recordkeeping requirements (40 CFR §60.4200 *et seq*.), and related applicable provisions of 40 CFR §60.7 and §60.8.

4.6.1.4 NSPS Subpart Da – Electric Utility Steam Generating Units

The Brandon Shores boilers are currently subject to a previous version of NSPS Subpart Da, which includes emissions limits for NO_x, PM and SO_2. PPRP and MDE-ARMA evaluated the proposed AQCS Project to determine whether it constitutes an NSPS modification, thus possibly triggering additional (more recent) Subpart Da requirements. Under 40 CFR 60.2 of the NSPS program, modification is defined as:

> any physical change in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted.

The project will be a physical change to the existing source in that the boiler heat recovery systems and turbines will be changed to allow an increase in the rated heat input capacity of the boilers and there will be additional emission controls for SO_2, PM, mercury and SAM. The next test is whether there will be an increase in emissions of a regulated pollutant. 40 CFR 60.14(b) of the NSPS General Provisions provides that an increase in emissions is determined based on an hourly emission rate (i.e., lbs/hr). 40 CFR 60.14(h) goes further and indicates that:

> no physical change, or change in the method of operation, at an existing electric utility steam generating unit shall be treated as a modification for the purposes of this section provided that such change does not increase the maximum hourly emissions of any pollutant regulated under this section above the maximum hourly emissions achievable at that unit during the five years prior to the change.

For PM, SO_2 and mercury, the addition of the control systems (e.g., baghouse for PM and mercury and scrubber for SO_2) will reduce the hourly emissions of these pollutants. Additional evaluation is necessary for NO_x, as there is no NO_x control system being installed as part of this project.

During the five years prior to the change (i.e., current operations), the Brandon Shores boilers (Units #1 and #2) have a maximum achievable

NO_x emission rate of 3,087 lbs/hr per unit, based on the NO_x RACT limit of 0.5 lbs/MMBtu and the boiler capacity of 6,173 MMBtu/hr. Although the units have had SCR installed since 2001, they are only required to operate during the ozone season, thus, the "maximum achievable" hourly emissions are the uncontrolled values.

Future hourly NO_x emissions from the boilers must account for an increase in heat input (from 6,173 to 7,130 MMBtu/hr). However, at the time of the project CPSG is committing to operating the SCRs full time, with a NO_x emission rate of 0.1 lbs/MMBtu. This equates to a future hourly emission rate of 713 lbs/hr. Because there will be a decrease in NO_x, PM, SO_2 and mercury emissions, the project will not be subject to NSPS Da requirements.

4.6.1.5 40 CFR Part 63, Subpart ZZZZ - Stationary Reciprocating Internal Combustion Engines

The proposed 500-hp quench pumps will also be subject to requirements of the Reciprocating Internal Combustion Engine (RICE) MACT (40 CFR 63, Subpart ZZZZ). Applicability with Subpart ZZZZ is triggered due to the fact that CPSG will be installing a RICE at a facility that is a major source of HAPs.

The RICE MACT requires each quench pump to meet specific CO or formaldehyde reduction requirements (i.e., reduce CO emissions by 70% or limit formaldehyde emissions to 580 ppbvd or less at 15 percent O_2) and other operating, compliance, notification and recordkeeping requirements. Compliance with this subpart must occur upon startup of the affected source.

Provided the quench pumps have state-of-the-art engines, they should be able to meet this requirement.

4.6.2 State Requirements

In addition to facility-wide requirements to which the facility is already subject (and which are addressed in the facility's Title V Operating Permit), PSD and NA-NSR requirements, and the project-specific Federal requirements described in Section 4.6.1, the proposed AQCS Project will be subject to the following State requirements:

- COMAR 26.11.01.10—Requires CPSG to install Continuous Opacity Monitoring (COM) systems to monitor opacity and Continuous Emissions Monitoring (CEM) systems to monitor SO_2,

NO_x and either O_2 or CO_2 from each boiler; and to meet applicable CEM installation, certification, operating, monitoring, testing, and malfunction requirements in 40 CFR Part 60, 40 CFR Part 75, or 40 CFR Part 51, Appendix P, §3.3-3.8 or §3.9 as incorporated by reference;

- COMAR 26.11.03.19—Requires CPSG to update the existing Part 70 Operating Permit (No. 24-003-00468) to include applicable AQCS Project requirements;

- COMAR 26.11.06.02C(2)—Prohibits CPSG from causing or permitting the discharge of emissions from any installation or building except fuel burning equipment, other than water in an uncombined form, which is visible to human observers;

- COMAR 26.11.06.03B(2)(a)—Prohibits CPSG from causing or permitting to be discharged into the outdoor atmosphere from any non-fuel burning confined source (i.e., the limestone, gypsum, and other material storage silos, enclosed material transfer points, etc.) particulate matter in excess of 0.03 gr/SCFD (68.7 mg/dscm);

- COMAR 26.11.06.03C(1)—Prohibits CPSG from causing or permitting emissions from an unconfined (fugitive) source without taking reasonable precautions to prevent particulate matter from becoming airborne;

- COMAR 26.11.06.03D(1)-(6)—Requires reasonable precautions to prevent particulate matter from becoming airborne from material handling activities;

- COMAR 26.11.06.08—Prohibits CPSG from operating or maintaining any source in such a manner that a nuisance is created;

- COMAR 26.11.06.09—Prohibits CPSG from causing or permitting the discharge into the atmosphere of gases, vapors, or odors beyond the property line in such a manner that a nuisance or air pollution is created;

- COMAR 26.11.06.12—Prohibits CPSG from constructing, modifying, or operating, or causing to be constructed, modified, or operated, a New Source Performance Standard source as defined in COMAR 26.11.01.01C, which results or will result in violation of the provisions of 40 CFR 60;

- COMAR 26.11.06.14—Prohibits CPSG from constructing, modifying, or operating, or causing to be constructed, modified, or operated, a Prevention of Significant Deterioration (PSD) source, as defined in COMAR 26.11.01.01B(37), which will result in violation of any provision of 40 CFR §52.21, except that the reviewing authority is the Department instead of the Administrator unless otherwise specified in 40 CFR §52.1116, and the applicable procedures are those set forth in COMAR 26.11.02;

- COMAR 26.11.09.03—When determining compliance with applicable particulate matter emission standards from the boiler stacks (concentration requirement expressed as grains per standard cubic foot or milligrams per cubic meter of dry exhaust gas), CPSG shall correct to 50 percent excess air. In addition, when determining compliance with a mass-based particulate matter emission limit expressed as pounds per million Btu (lb/MMBtu), CPSG shall use the procedures for determining particulate matter emission rates in 40 CFR Part 60 Appendix A, Method 19;

- COMAR 26.11.09.05A(2)—Prohibits CPSG from discharging emissions from the boilers other than water in an uncombined form, which is visible to human observers. This limitation does not apply to emissions during load changing, soot blowing, startup, or adjustments or occasional cleaning of control equipment if: (i) the visible emissions are not greater than 40 percent opacity; and (ii) the visible emissions do not occur for more than 6 consecutive minutes in any 60-minute period;

- COMAR 26.11.09.05B(2) and B(3)—Prohibits the discharge of emissions from the quench pump engines, when operating at idle, greater than 10 percent opacity, and when in operating mode, greater than 40 percent opacity. Exceptions: (i) limitations when operating at idle do not apply for a period of 2 consecutive minutes after a period of idling of 15 consecutive minutes for the purpose of clearing the exhaust system; (ii) limitations when operating at idle do not apply to emissions resulting directly from cold engine start-up and warm-up for the following maximum periods: engines that are idled continuously when not in service: 30 minutes and all other engines: 15 minutes; (iii) limitations when in idle and operating modes do not apply while maintenance, repair, or testing is being performed by qualified mechanics;

- COMAR 26.11.09.06B(3)—Prohibits CPSG from causing or permitting particulate matter emissions from Brandon Shores

Units 1 and 2 in excess of 0.03 grains per dry standard cubic feet (gr/dscf), corrected to 50 percent excess air;

- COMAR 26.11.09.07A(2)(a)--Prohibits CPSG from burning coal with a sulfur content greater than 1.0 percent by weight unless an SO_2 control device is employed such that the discharge of SO_2 to the atmosphere does not exceed that which would occur if the coal being burned met the 1 percent sulfur requirements;

- COMAR 26.11.09.07A(2)(b)–Prohibits CPSG from burning distillate fuel oil in the quench pumps with a sulfur content greater than 0.3 percent;

- COMAR 26.11.27—Requires CPSG to comply with the applicable emissions limitations for NO_x, SO_2 and mercury, and the monitoring and recordkeeping requirements contained in COMAR 26.11.27.

4.6.3 Toxic Air Pollutant Screening Analysis

Table 4-5 presents estimated emissions of TAPs from new or modified material handling operations at the site, which must undergo a screening analysis in accordance with COMAR 26.11.15 to ensure that there are no adverse toxic impacts off the project's property. Emissions from the existing boilers and the proposed quench pump engines are not included in this analysis because they are exempt from the TAP screening analysis requirement per 26.11.15.03(a)(1) and COMAR 26.11.02.09 as fuel burning equipment.

For the TAP analysis, risk screening levels for each TAP are determined based on threshold limit values (TLVs) for occupational exposure (in $\mu g/m^3$) and are provided by ARMA on their web site (ARMA, 2006). In accordance with COMAR 26.11.16.02 and ARMA's *Fact Sheet* for the TAP ambient impact requirements provides equations to calculate allowable emission rates for TAPs, based on each TAP's screening level. Table 4-15 presents estimated emissions of each TAP, their screening levels, and their allowable emission rates. The analysis indicates that the emissions of all but two TAPs from the project pass the TAP screening requirement using the allowable emission rate technique.

Table 4-15 TAP Compliance Demonstration Using Allowable Emissions Method

TAP	TAP Class	Screening Level[1] 1-hour (ug/m3)	8-hour (ug/m3)	Annual (ug/m3)	Allowable Emissions[2] lbs/hr	lbs/yr	Actual Emissions lbs/hr	lbs/yr	Compliance Demon.? with lbs/hr Std.	with lbs/yr Std.
Arsenic	I		0.1	0.0012	3.58E-04	0.44	2.63E-04	2.49E-01	YES	YES
Beryllium	I	0.1	0.02	0.0024	7.17E-05	0.88	2.62E-05	2.61E-02	YES	YES
Cadmium	I		0.02	0.0036	7.17E-05	1.31	2.92E-05	1.85E-02	YES	YES
Nickel	I		1	0.0417	3.58E-03	15.22	4.83E-04	3.75E-01	YES	YES
Antimony	II		5		1.79E-02		1.29E-05		YES	
Barium[3]	II		5		1.79E-02		2.42E-02		NO	
Chromium	II		5		1.79E-02		6.03E-03		YES	
Cobalt	II		0.2		7.17E-04		1.25E-04		YES	
Manganese[3]	II		2		7.17E-03		1.33E-02		NO	
Mercury	II		0.25		8.96E-04		1.37E-05		YES	
Selenium	II		2		7.17E-03		3.30E-05		YES	
Silver	II		0.1		3.58E-04		1.28E-05		YES	
Tellurium	II		1		3.58E-03		4.68E-04		YES	
Thallium	II		1		3.58E-03		7.23E-06		YES	
Vanadium	II		0.5		1.79E-03		2.04E-04		YES	
Zinc	II		500		1.79E+00		3.11E-03		YES	

Notes

[1] – Screening Level taken from MDE List of Screening Levels, 2006

[2] – Allowable Emissions calculated from equations in ARMA's TAP Analysis Fact Sheet in accordance with COMAR 26.11.16.02

[3] – Compound does not pass using allowable emission test; however, its estimated ambient concentrations from TM86-02 are below the screening levels.

As presented in Table 4-15, barium and manganese have potential hourly emissions that exceed the allowable emission rate by a small amount. When TAPs do not pass the screening using this method, mathematical modeling of the off-site concentrations can be conducted using MDE's guidance in TM86-02. PPRP used equations 6.2 in Section III.B. – Area Source Procedures of TM86-02 to estimate the 8-hour average off-site concentrations of barium and manganese for comparison to their screening levels. These compounds are associated with the fugitive dust emissions from the coal and limestone handling operations; therefore, the area source procedure is appropriate.

The area source equations require information on total emissions from all fugitive sources and the length of the side of the square area source. Although the fugitive emissions from the coal and limestone handling operations extend to various locations within the plant, the coal pile area was selected as the primary fugitive emission location. The side of an approximate square encompassing all of this area was estimated to be 1,200 ft. Based on this information, the 8-hour concentrations of barium and manganese at the boundary of the area source, which is located on the CPSG property, are 3.3 ug/m^3 and 1.8 ug/m^3, respectively. Based on the TM86-02 analysis the worst-case, fugitive emissions of barium and manganese from the coal and limestone handling operations at Brandon Shores produce ambient concentrations below their 8-hour screening levels of 5 ug/ m^3 and 2 ug/ m^3, respectively; therefore, they pass the required TAP screening.

4.7 AIR IMPACT SUMMARY

The Brandon Shores AQCS Project is considered a major modification for CO and SAM for PSD purposes and VOCs for NA-NSR permitting purposes. MDE-ARMA and PPRP have reviewed CPSG's pollution control technology proposals and concur that the project will meet appropriate BACT and LAER requirements.

Based on the information provided in the CPCN application, supplemented with independent analyses conducted by the State, PPRP and MDE-ARMA conclude that criteria pollutant impacts for the Brandon Shores AQCS Project will not adversely affect the NAAQS or PSD increments. PPRP and MDE-ARMA also believe that it can be reasonably concluded that the Brandon Shores facility impacts on primary pollutant concentrations, visibility, deposition, and ozone in the Shenandoah National Park Class I area are likely to be insignificant.

If designed and operated under the recommended licensing conditions (Appendix A), the Brandon Shores AQCS Project will meet all applicable State and Federal air quality requirements.

5.0 OTHER ENVIRONMENTAL IMPACTS

5.1 IMPACTS TO BIOLOGICAL RESOURCES

5.1.1 Vegetation and Land Cover

The location of the proposed wet FGD system is within an open, regularly maintained grassland parcel adjacent to the existing Brandon Shores Units 1 and 2. Considering that the entire area proposed for construction of the new equipment has been previously disturbed or developed, clearing and construction would not likely cause significant ecological impacts to the existing vegetation and land cover.

5.1.2 Wildlife

The existing developed nature of the site, including the proximity to the existing Brandon Shores Units 1 and 2, and existing roadways, human presence, and lack of forested habitat, greatly reduce the quality of the area for wildlife habitat. No significant adverse impacts to wildlife resources would likely occur as a result of construction of the proposed wet FGD project.

5.1.3 Threatened and Endangered Species

No threatened or endangered species have been documented utilizing the site; therefore, no significant impacts to federal or state-listed terrestrial plants or animals are anticipated.

5.1.4 Wetland and Aquatic Resources

Because of the previously developed nature of the proposed wet FGD site and the surrounding area, nontidal wetlands are not present. Therefore, there would be no impacts to nontidal wetlands from either the construction or operation of the project. A tidal wetlands permit, jointly issued by MDE and the U.S. Army Corps of Engineers (USACE), will be required for construction of the gypsum barge loading facilities and the gypsum conveyor. Construction in tidal wetlands would not commence prior to securing all necessary tidal wetland permits from MDE and USACE. Impacts would be restricted to about one acre of open water that is approximately 17 feet deep. Because of the existing water depth, submerged aquatic vegetation would not be directly impacted, as it does not exist beyond depths of about 2 meters in regional tidal rivers. In addition, impacts to the benthic community in the vicinity of the proposed new gypsum conveyor and barge loading facility are likely minimal. It is probable that most mobile species would avoid the area during construction; sessile organisms may naturally re-populate substrate following completion of piling installation and other construction. Therefore, impacts to tidal waters relating to the proposed wet FGD project would likely be minimal.

The proposed wet FGD project footprint is greater than 3,000 feet from both the Patapsco River (to the east) and Cox Creek (to the south) and is located outside of the Chesapeake Bay Critical Area. Adherence to appropriate best management practices will minimize impacts to these waterways, and therefore, associated impacts to aquatic biological communities would not likely be significant.

5.1.5 Storm Water and Wastewater Discharges

Storm water and wastewater represent two potential discharges that may result in impacts to the Patapsco River during operation of the Brandon Shores wet FGD project. CPSG will develop a revised storm water pollution prevention plan (SWPPP), designed to ensure storm water quantities and quality are maintained within approved limits. Based on the SWPPP implementation and ongoing compliance with the facility's storm water permit, no significant impacts to any surrounding surface waters are expected as a result of facility operations.

The wet FGD system will generate approximately 0.5 million gallons per day of wastewater (see water balance diagram in Figure 6-1, under the discussion of water supply). The proposed project includes a new system to treat this wastewater to a level that complies with Maryland water quality standards at the existing point of discharge for the facility, Outfall 001, as stated in CPSG's application for a CPCN.. A revised NPDES permit for Brandon Shores for this additional effluent will be required.

CPSG's preferred source of water as makeup for the wet FGD system is effluent from the Cox Creek Water Reclamation Plant. Because of evaporative losses in the FGD system, water quality constituent concentrations will generally increase 5- to 10-fold between entering the absorber units as makeup water and exiting the units as (untreated) FGD wastewater. However, there will be no net increase in constituent loadings to the Patapsco River due to use of this source and there should not be significant or measurable environmental effects on the estuarine ecosystem. In fact, when Brandon Shores is receiving effluent from the

Cox Creek facility, there will be a net decrease in nutrient loadings to the Patapsco River estuary and Chesapeake Bay as a result of the additional treatment that CPSG will provide for that portion of the Cox Creek effluent, compared to loadings that occur when Cox Creek discharges its entire effluent stream directly to the Patapsco.

5.2 SOCIOECONOMIC AND CULTURAL IMPACTS

5.2.1 Employment and Income

Construction of the wet FGD facility would create as many as 600 craft and 50 non-manual jobs during the peak construction period. Over the 34 month project schedule, an average of 250 construction workers is expected to be on-site. CPSG estimates that construction payrolls will total $70 million over the nearly three-year construction period. (All dollar estimates are in 2006 dollars.) Using multipliers from the Department of Business and Economic Development (DBED), construction employment and payrolls could generate an additional 800 person-years of indirect employment and $65 million in indirect earnings over the same period.

Operating the wet FGD facility would add another 22 employees to the Brandon Shores workforce and add at least $1.3 million in annual earnings. Indirect multiplier effects associated with operations employment and payrolls are estimated to be eight person-years of additional employment and more than $500,000 in additional earnings annually.

Additional economic benefits are expected to result from the purchases of goods and services during both construction and operation phases of the project. CPSG estimates that, of its $503 million investment, approximately $280 million represents material and equipment cost that could generate an additional $200 million of sales in multiplier effects. Since some wet FGD components are specialized and not manufactured in Maryland, not all expenditures would be captured by Maryland industries. However, a significant portion of construction expenditures are expected to be distributed to manufacturers and service providers in Maryland and surrounding states. Operation of the wet FGD facility would require purchases of limestone, water treatment chemicals, and waste disposal services. CPSG estimates that much of O&M expenditures will be spent in the Baltimore metropolitan area, resulting in additional employment and tax revenues.

While the direct and indirect economic benefits of the project are sizable, the employment and income effects of project construction and operation are expected to be largely inconsequential within the greater Baltimore economy. However, employment and income impacts from both construction and operation are unequivocally positive and would contribute to the continued growth and stability of the regional economy.

5.2.2 *Population and Housing*

Brandon Shores is within a major labor market. In 2005, the labor force averaged nearly 1.37 million persons in the Baltimore-Towson Metropolitan Statistical Area (MSA), and more than 550,000 in Anne Arundel County and Baltimore City (Maryland Department of Labor, Licensing and Regulation 2005). According to the U.S. Bureau of Labor Statistics, more than 67,000 were employed in construction and extraction occupations in the Baltimore-Towson MSA during 2005 (U.S. Department of Labor 2006).

Although labor market conditions and low unemployment could affect labor availability and hiring, most construction jobs are expected to be filled by construction workers living within commuting distance of the project, and thus few effects on population and housing are anticipated from construction activities. Some construction workers with specialized construction skills may be recruited from outside the region. However, these workers are expected to commute to the area on a weekly basis and domicile in transient accommodation. There are more than 7,300 hotel rooms in Baltimore (BACVA 2004), and the number of hotel rooms in Anne Arundel County is expected to approach 9,000 rooms by 2007 (Leiva 2005). As a result, construction effects on transient accommodation are expected to be insignificant.

CPSG estimates that operation of the wet FGD facility will increase on-site employment by 22 jobs. With permanent jobs, employees are expected to reside within commuting distance of Brandon Shores. Even if recruited from outside the region, an influx of O&M workers and their families would be subsumed within existing migration trends into the area.

5.2.3 *Land Use*

The wet FGD facility is a modification to CPSG's Brandon Shores Generating Station and would be contiguous to existing generation assets. The power plant is located in the Pasadena/Marley Neck planning area of Anne Arundel County on land zoned W3 – Heavy Industrial District. Land adjacent to the plant site is predominantly zoned W3 – Heavy

Industrial or W2 – Light Industrial, although the area south of the Brandon Shores property across Cox Creek is zoned R5 – Residential. Brandon Shores lies across the Patapsco River from the Sparrows Point shipyard and industrial complex in Baltimore County.

As the project area is already zoned Heavy Industrial, no direct land use impacts are anticipated from construction activities or operation of the wet FGD system. Furthermore, the project is in an area of Anne Arundel County where land use is designated Transportation/Utility and hosts a number of industrial activities. As a result, no indirect impacts on surrounding land uses are expected from the proposed modifications to the Brandon Shores facility.

5.2.4 Transportation

The wet FGD facility would be a major trip generator during peak construction activities, when more than 550 workers would be commuting to the project site for the day shift. In recognition of possible increases in congestion on local roadways during the morning and afternoon peak hours, CPSG intends to mitigate these effects through shift scheduling.

Construction traffic would enter and exit the site at the intersection of MD 173 (Fort Smallwood Road) and Solley Road at a previously used entrance gate to the Brandon Shores property, which is currently closed. This is a signalized intersection with a dedicated (left) turning lane from eastbound MD 173 into the Brandon Shores entrance, and a full-width acceleration lane from the Brandon Shores entrance onto westbound MD 173. The predominant movement from Solley Road is left turning traffic onto westbound MD 173 toward the Baltimore Beltway.

The signals for the MD 173/Solley Road intersection are split phased but, as the proposed entrance to the site is currently closed, the presence or operation of signal detection loops or cameras at this intersection for managing left turns from MD 173 is unknown. CPSG should confirm the presence and operation of signal detection loops or cameras and appropriate signal heads at this intersection, and should coordinate with the Maryland State Highway Administration if improvements are needed. CPSG commissioned a Traffic Impact Study (Traffic Concepts Inc. 2006), which evaluated the current and projected levels of service at this intersection during the peak construction period. The analysis showed that the intersection currently operates at level of service (LOS) A and, if the day shift is split between 6:00 am and 7:00 am arrival times, the intersection would continue to operate at LOS A during the peak construction period. Similarly, the intersection is predicted to operate at an acceptable level of service during the afternoon periods when construction worker traffic exits from the site.

For the journey to work, commuter traffic associated by construction activities at Brandon Shores is assumed to be distributed among a number of major thoroughfares leading to the site, although the majority (55%) is expected to enter the site via a left turn from eastbound traffic on MD 173. In the morning peak period, most of the eastbound construction worker traffic on MD 173 would originate from Interstate Highway 695 (I-695, the Baltimore Beltway) via an interchange with Quarantine Road at Exit 1, a left turn from Quarantine Road onto Hawkins Point Road at a signalized intersection and a continuation onto Fort Smallwood Road near the Anne Arundel County line. Because there are a number of large employers on Marley Neck, including a U.S. Coast Guard yard, the Hawkins Point Marine Terminal and others, this interchange experiences congestion and operating inefficiencies during peak commuter periods. To address this, the Maryland Transportation Administration plans to construct improvements to this interchange, with construction scheduled to coincide roughly with CPSG's wet FGD construction schedule. Congestion is likely to increase at this interchange while it is under construction and may be exacerbated by the additional traffic associated with construction at Brandon Shores, evidenced by longer left turn queues (in the morning) at the intersection of Quarantine Road and Hawkins Point Road. However, CPSG construction traffic is not anticipated to make congestion at this interchange significantly worse than it already is.

Additional truck traffic would also be generated by construction at Brandon Shores. While currently evaluating the feasibility of transporting large components by barge, CPSG projects that up to 80 truck deliveries may occur in a day. However, deliveries would be distributed throughout the day, and truck deliveries of oversize equipment would be scheduled for off-peak hours. Truck traffic should therefore not have a measurable effect on traffic on nearby roads during project construction.

Once operational, commuter traffic to Brandon Shores would decline significantly since only 22 full-time employees are projected to be added to the CPSG workforce. O&M workers would enter the site at the main gate on Brandon Shores Drive. CPSG proposes that most deliveries of limestone, in addition to coal, would be via barge. Barge would also be used to transport the major wet FGD byproduct – gypsum – off site. Under this scenario, up to 330 round-trip truck trips would be generated per day to transport off-specification gypsum (potentially), other reagents, fabric filter waste, sludge and other materials or services from or to the site. Although CPSG estimates that approximately 20 percent of truck trips could occur in the morning and afternoon peak periods, the additional traffic is not projected to affect levels of service on nearby road segments or intersections.

With about 4.8 million tons of coal consumed annually (at Brandon Shores and the adjacent H.A. Wagner plant), CPSG operations currently generate 618 barge trips per year, or almost three per day on a five-day week schedule. Barges also deliver approximately 250,000 tons of oil to the Wagner Oil Dock, amounting to another 45 barges per year. Operation of the wet FGD system would require up to 740,000 tons of limestone to be delivered to the facility annually, and the export of up to 1.2 million tons of gypsum. If 5,000 ton barges are used to transport limestone and gypsum, this would add another 146 and 240 barges, or a total of 772 transits annually in the Brewerton Channel to or from the channel leading to the Wagner and Brandon Shores docks. Representing about 18 percent of existing traffic in the Port of Baltimore, the Brewerton Channel is approximately 700 feet wide in this area, and the additional traffic is an increment of less than four barges (eight transits) per day. The U.S. Army Corps of Engineers notes that while there could be some short-term, localized congestion depending on the origination and destination of the tugs and barges, the time of day, and the characteristics of other vessel traffic in the channel, the proposed number of additional tug and barge transits should not pose an unacceptable level of congestion based on the existing traffic (McKee 2006).

CPSG commissioned a barge traffic study (Shaw Coastal Inc. 2006), which did suggest that while the channel to the Wagner and Brandon Shores docks and limestone unloading facility could, under normal circumstances, handle projected traffic flows, the coal unloading and gypsum loading facilities would need to increase their cargo handling rates to avoid serious delays. These findings, however, are predicated upon preliminary estimates and assumptions, and may no longer be valid. Since the study was completed, CPSG has increased throughput estimates for limestone and gypsum by approximately 10 percent, and has specified a larger barge size for transporting these materials (5,000 versus 2,000 tons). CPSG should re-estimate barge service rates using new materials throughout estimates and cargo handling rates to insure that operational requirements can be met.

Since the barge channel to Brandon Shores extends approximately 9,000 feet from the Brewerton Channel, operational issues associated with coal, limestone or gypsum transfers, to the extent that they occur, are not expected to affect vessel transits in the Brewerton Channel. Conversely, other vessel transits in the Brewerton Channel should not affect barge operations at Brandon Shores, although the scheduling of barge transits could be affected if the AES Sparrows Point LNG facility is developed as proposed. Security restrictions are likely to limit vessel activity in the Brewerton Channel between the LNG project site and Fort Carroll when LNG ships are being moved from the channel to the berth (AES 2006). Since scheduling of LNG arrivals and designation of security zones around LNG vessels fall under the jurisdiction of the U.S. Coast Guard, the potential impact of a proposed LNG facility on barge operations at Brandon Shores cannot be determined with any certainty.

While barge is the preferred mode for transporting limestone and gypsum, CPSG has reserved the option of transporting these materials by truck or rail. Modal choice is likely to be dependent on the source of limestone, location of markets for synthetic gypsum, operational constraints associated with barge operations, and economic considerations. CPSG has reported that all the potential gypsum purchasers it is negotiating with have indicated that barge would be the preferred mode of transport to their wallboard manufacturing facilities. Therefore, the likelihood of truck and rail shipments of limestone and gypsum is low.

That CPSG's rail spur is currently unused and would require improvements to restore it to an operational standard suggests that the rail alternative is unlikely. A Phase I evaluation indicated that the cost of upgrading rail facilities to allow the loading and unloading of gypsum and limestone could potentially exceed $20 million. DNR concurs that no further analysis of this alternative is required at this time. Thus, the only feasible alternative to barge transport of limestone or gypsum is trucking.

The use of trucks to transport limestone and gypsum to or from Brandon Shores would increase truck traffic on MD 173 and I-695. A Traffic Impact Study (Traffic Concepts Inc. 2006) evaluated the effects of additional truck traffic on local road segments and intersections and concluded that even with the addition of nearly 1,080 round-trip truck trips per day destined for or originating from the Brandon Shores facility, the intersections of MD 173 with Solley Road, Energy Parkway/Brandon Shores Drive, and Riviera Drive/Bar Harbor Road would continue to operate at acceptable levels of service during the morning and afternoon peak hours. DNR concurs with this finding; however, we also recognize that the additional truck traffic would add to high truck volumes at the intersection of Quarantine Road and I-695 (Exit 1) because the interchange already services the Quarantine Road Sanitary Landfill and Hawkins Point Marine Terminal. To prevent trucks from using alternate routes in attempts to avoid congestion at Exit 1, CPSG should designate a truck route connecting

I-695 to the site access driveway via Quarantine Road, Hawkins Point Road (MD 173) and Fort Smallwood Road (MD 173) and include the designated truck route in all contracts with suppliers and contractors.

5.2.5 Visual Quality

The Brandon Shores power plant is located in an area of Anne Arundel County that is distinctly industrial in its visual setting. In addition to Brandon Shores, the site is adjacent to the Wagner power plant and Marley Neck Industrial Park. Except for tidal wetlands around Swan Creek, all land east of Fort Smallwood Road and north of Cox Creek, is designated Heavy Industrial. Land to the west of Fort Smallwood Road opposite Brandon Shores is designated Light Industrial. As noted earlier, the Sparrows Point Shipyard and Industrial Complex lies across the Patapsco River from Brandon Shores.

From a visual perspective, construction activities could create temporary visual disturbances from wind-blown dust during earth moving activities, but these events would be minimized by good construction practices. As a result, the most visible element during construction other than the erection of structures is likely to be truck traffic entering or exiting the site, which would be similar to normal plant operations, albeit at a higher volume.

Modification of Brandon Shores for wet FGD would increase the industrial character of the site by adding a scrubber building containing the air quality control system, a 400-foot stack, enhancements to the existing coal conveying system and yard, reconditioning of the existing Wagner barge unloading system for receiving limestone, modification of an existing conveyer to transport limestone to an active storage pile, a new gypsum handling storage and offloading system, solid waste handling systems, and new water and wastewater treatment systems.

While the most prominent of these modifications is the stack, the structure itself would be significantly shorter than the two existing stacks, which are both 700 feet high. New material handling facilities would be visible primarily from the Patapsco River or from Sparrows Point, but the visual effect would be marginal since the shoreline has already been intensely developed for existing barge unloading facilities. The scrubber building, waste handling and water treatment systems would have relatively low profiles and, although partly visible from some perspectives, would not be in conflict with existing views. In summary, structural project elements would have no adverse effect upon the visual quality of the Brandon Shores site.

Two operational elements – outdoor lighting and the steam plume from the new stack – would add to the visual setting of the Brandon Shores facility. Outdoor lighting is required on all new and modified project components to satisfy operational requirements, OSHA requirements for worker safety, FAA requirements for obstruction marking and lighting the new stack, and USCG navigation lighting requirements for facilities on water. The new stack would require strobe lighting, which already exists on the two taller stacks. Operating hours of the new loading and unloading facilities for limestone and gypsum are expected to be at least 12 hours per day, necessitating operational lighting, but the new lighting would coexist with existing operational lighting at the existing coal unloading platform.

Given an existing buffer of land between most facility components and potential receptors off-site, light trespass onto adjoining properties is not expected to be significant. Lighting on new barge unloading facilities could create an additional nighttime visual intrusion upon some residents of the Stoney Beach neighborhood across Cox Creek, but views from this area are already compromised by existing structures and lighting associated with the Wagner plant. As noted in its application, within operational and safety constraints, CPSG would minimize light trespass from the project when the outdoor lighting systems are designed.

Because of the wet nature of exhaust gases from wet FGD absorbers, a water vapor plume from the new stack would be visible at nearly all times. CALPUFF simulations conducted by CPSG suggest that plume would generally be less than 400 meters high and 300 meters long in weather conditions where the plume would be most visible. Given that the new stack is setback from the Brandon Shores property lines, at most times the vapor plume would be confined horizontally within the site. However, the height of the plume would make it visible from a distance.

To some extent, expected changes to views would be mitigated by structures and infrastructure that characterize an urban environment and as a phenomenon that is associated with an industrial setting. Furthermore, most receptors of views of the vapor plume would be transient motorists on the Francis Scott Key Memorial Bridge, who may not be concerned with aesthetic elements of the landscape at this point of their journey. The vapor plume is not expected to induce icing events on the bridge (see further discussion in Section 4.X).

5.2.6 *Fiscal Impacts*

Fiscal impacts from the project would be in the form of tax revenues and government expenditures on public services. During construction, revenues from taxes on construction worker wages, income taxes on indirect employment incomes, and sales taxes on consumption expenditures would accrue to Maryland and county coffers. Using CPSG construction employment and income estimates, and indirect employment and income estimated from state multipliers, state income tax revenues attributable to the project over the construction period could approach $5 million. Sales tax revenues are more difficult to estimate because, of the $280 million in purchases of goods and services, the percentage that would be awarded to Maryland firms is unknown. However, sales tax revenues from the personal consumption expenditures of construction and indirect employment are estimated to be approximately $2 million over the construction period. Although not "new" revenue, *per se*, these are revenues that can be attributed to CPSG's investment in Brandon Shores.

During the construction period, county tax revenues would accrue from personal income taxes on direct (construction) and indirect income, and would be distributed among all counties where employed workers, both direct and indirect, reside. As most of the construction labor force is expected to be drawn from Anne Arundel and surrounding counties, including Baltimore City, the project would generate most county income tax revenues in these jurisdictions.

Income and sales tax revenues would continue to be generated by the project when it is operational, but at a lower level. With an additional O&M workforce of 22, direct and indirect state income tax revenues are expected to be less than $100,000 annually. Sales tax revenues from CPSG purchases of goods and services from Maryland firms and from personal consumption expenditures by direct (O&M) and indirect employment could approach $200,000 annually.

Property tax revenues paid by CPSG to Anne Arundel County would increase slightly after improvements to real property are made but, as the planned modification to Brandon Shores is a certified coal pollution control facility, a partial exemption of 95 percent applies to the assessed value of the personal property associated with the wet FGD system (Annotated Code of Maryland 2006). As a result, the modification would have only a minor impact on county property tax revenues. CPSG has estimated that out of a total estimated project cost of $503 million, $280 million represents material and equipment cost. If the Maryland

Department of Assessments and Taxation classifies all material and equipment cost as a pollution facility, annual property tax revenues to Anne Arundel County attributable to the wet FGD system would range from $122,000 in the first year of operation to about $46,000 after 20 years.

Still, incremental state and county tax revenues from the project are expected to more than offset public expenditure costs, particularly since no population effects are anticipated either from construction or operation of the facility. CPSG would not require an extraordinary level of public services to undertake the modification to Brandon Shores nor to operate the scrubber. State or local agency involvement may be required, for example, to upgrade signal detection loops or install appropriate signal heads at the proposed construction access road intersection. To the extent that this involvement has costs, they would be borne by CPSG.

5.2.7 Cultural Impacts

As a modification to an existing facility, the project would be constructed on an industrial site that has been previously disturbed. Furthermore, there are no confirmed archeological sites or cultural deposits within the project boundaries. Therefore, construction of the wet FGD system would have no adverse direct effect on cultural resources.

There are numerous properties in the vicinity of Brandon Shores that are listed in the Historical Sites Survey of the Maryland Historical Trust. These include several structures within the U.S. Coast Guard Yard Curtis Bay (AA-783, AA-784x), three properties in Riviera Beach (AA-728, AA-729, AA-730), and properties southwest of Brandon Shores near Solley. These properties are situated in an area that has been extensively suburbanized over the past 50 years and where the visual setting is no longer intact. All are outside the area of potential effect from construction. As a result, construction activities would have no adverse effect on properties listed in the Historical Sites Survey for Anne Arundel County.

While the visual element of the proposed wet FGD system encompasses a larger area of potential effect, the distance from the project to historic properties and relatively minor alteration of the visual landscape would produce no adverse effect upon these properties.

Construction and operation of the facility would have no adverse effect on nearby recreational or public facilities.

5.3 NOISE IMPACTS

PPRP has utilized information provided by the applicant to conduct an independent evaluation of potential noise impacts that operation of the proposed facility could have on nearby receptors. The objective of our analysis was to determine whether the facility, as proposed, will operate in compliance with applicable State regulations.

5.3.1 Evaluation Methodology

The applicant provided PPRP with source noise data from the major components of the proposed facility. Using the source noise estimates, PPRP prepared screening-level estimates of the sound pressure levels that would result at various receptors surrounding the Brandon Shores site when the proposed plant is operating at full load. Sound pressure levels at varying distances were calculated using the following formula (Kurze and Beranek 1988):

$$L_p = L_w + DI - 20 \log(r) - A_e - 11$$

where:

L_w is the source sound power level in dB

DI is a source directivity factor (we assumed hemispherical spreading, DI = 3)

r is the distance from the source to the receptor location in meters

A_e is the excess attenuation due to absorption in air, conservatively assumed to be zero

Noise impacts were estimated for six receptor locations, chosen to represent the maximum potential impact with respect to noise from the proposed modification. Three of the receptors are at or adjacent to residential areas; three are industrially zoned. Five of the six receptors we considered correspond to locations where CPSG monitored ambient noise levels, as discussed in Section 3.4. We also considered one additional receptor location within the residential area to the south of the Brandon Shores/Wagner complex. Figure 5-1 shows the location of the six receptor locations.

- Receptor 1 lies on the southwestern property boundary; adjacent to Fort Smallwood Road (corresponds to CPSG monitoring location 2). Land across from Fort Smallwood Road in that direction is generally used for light industrial purposes.

- Receptor 2 lies on the northwest property boundary (CPSG monitoring location 3). This location is immediately adjacent to vacant land owned by CSX and zoned industrial.

- Receptor 3 lies near light industrial property on the western property boundary (CPSG monitoring location 6).

- Receptor 4 is located in the residential area south of the site, Villages of Stoney Beach (CPSG monitoring location 8).

- Receptor 5 is also within the Villages of Stoney Beach. This site is the closest to barge activities and is located to the east of Receptor 4.

- Receptor 6 is located to the northwest and represents the nearest residentially zoned land (CPSG monitoring location 9).

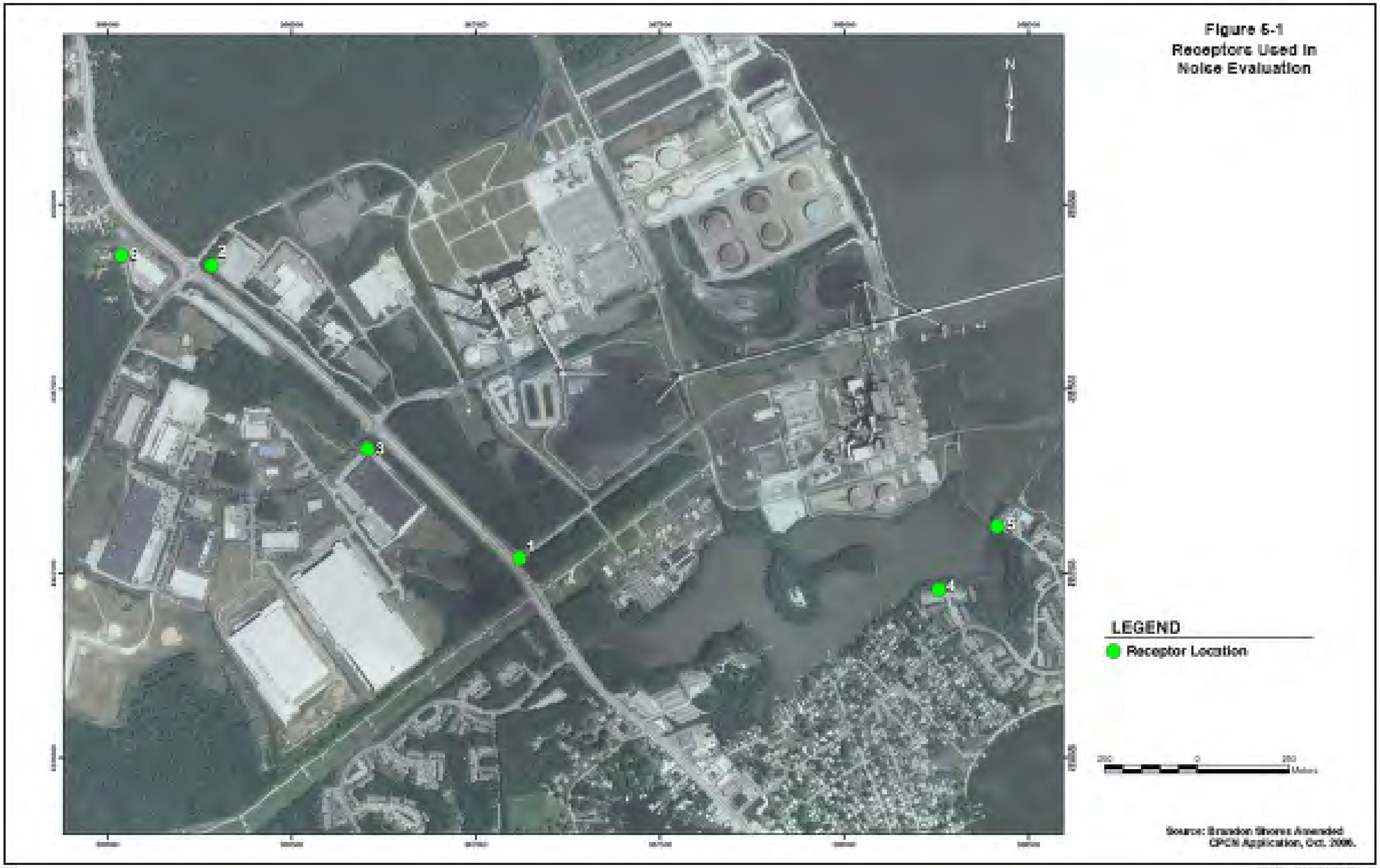


Figure 5-1
Receptors Used in
Noise Evaluation

5.3.2 *Summary of Regulatory Requirements*

Maryland State noise regulations specify maximum allowable noise levels, shown in Table 5-2 (COMAR 26.02.03). The maximum allowable noise levels specified in the regulations vary with zoning designation and time of day. The noise limit for residential areas is 55 dBA (A-weighted decibel scale) during nighttime hours and 65 dBA during daytime hours.

Table 5-1 Maximum Allowable Noise Levels (dBA) for Receiving Land Use Categories

	Zoning Designation		
	Industrial	**Commercial**	**Residential**
Day	75	67	65
Night	75	62	55

Source: COMAR 26.02.03
Note: Day refers to the hours between 7 AM and 10 PM; night refers to the hours between 10 PM and 7 AM.

The State regulations provide certain exemptions for specified noise sources and noise generating activities. For example, motor vehicles on public roads are exempt from Maryland noise regulations; however, while on industrial property, trucks are considered part of the industrial source and are regulated as such. The regulations also allow for construction activity to generate noise levels up to 90 dBA during daytime hours, but the nighttime standard may not be exceeded during construction.

5.3.3 *Estimates of Noise Emissions*

The table below presents summary results of PPRP's calculations. These preliminary estimates only consider distance spreading and average values for molecular absorption in the atmosphere. The calculations take into account shielding that would result from the largest structures on site, primarily the Brandon Shores boiler house and associated structures. However, the estimates do not include noise reductions that would be caused by smaller structures or by any natural barriers (such as vegetation) between the noise sources and the receptors.

Table 5-2 Calculated A-Weighted Sound Pressure Levels Resulting from Proposed Air Quality Control System Operation, Projected to Receptor Locations

Source	Component's Sound Power Level (dB)	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Booster Fans (4)	123.6	64.1	62.4	67.8	32.7	32.6	59.6
Ball Mills (2)	97.9	34.5	37.2	38.2	4.8	4.8	34.3
Conveyors (14)	81.2	24.2	16.0	15.5	24.2	25.7	20.2
Bulldozers (4)	105.3	43.2	27.9	29.7	42.3	43.1	38.9
Limestone Unloader	104.7	34.3	7.9	34.4	39.1	40.5	29.5
TOTALS		**64.2**	**62.4**	**67.8**	**44.3**	**45.3**	**59.6**

5.3.4 Comparison to Regulatory Standards and Impact Evaluation

The available information indicates that the units as presently proposed will comply with Maryland noise standards. Receptors 1, 2, and 3 are on the property boundary and adjacent to light industrial land uses, and our evaluation indicates that noise from the facility modifications would not exceed the 75 dBA noise limit at those receptors. For Receptors 4 and 5, the residential limit of 65 dBA daytime, 55 dBA at night would apply, and again, the calculations show that these limits will be met.

At Receptor 6, the residentially zoned area to the northwest, the calculations predict a noise level of 59.6 dBA, somewhat higher than the nighttime residential noise limit of 55 dBA. However, it should be noted that shielding will occur as a result of office building structures and vegetation between the wet FGD system location and the receptor site. These shielding effects are not accounted for in the calculations. Furthermore, the analytical method is conservative in that it does not consider molecular absorption of noise in air, which can be significant over a distance. For these reasons, the projected noise levels are conservatively high, and the actual noise generated is expected to be less.

The fans required to propel the flue gases through the pollution control systems are the loudest component of the proposed facility modifications. In the case of Sites 1, 2, 3, and 6, the booster fans account for essentially all of the noise from the proposed facility. Sites 4 and 5 are zoned residential and are more than 1,500 meters away from the fans; noise at these locations results mostly from material handling, which is significantly less noisy compared to the booster fans.

Our findings indicate that the modifications proposed for Brandon Shores will operate in compliance with applicable State limits with respect to noise.

6.0 WATER SUPPLY

6.1 WATER REQUIREMENTS

The proposed combined cycle facility will need water primarily for makeup in the wet FGD. Water lost from the hot flue gases through evaporation or discharge will be replenished using makeup water to maintain the appropriate water quality in the limestone slurry. The preferred source of the makeup water will be reclaimed water from the Anne Arundel Cox Creek Water Reclamation Plant (Cox Creek wastewater treatment plant, WWTP). In the event of supply interruption, the backup source of water would be cooling water effluent from the existing Brandon Shores cooling towers, prior to Outfall 001 to the Patapsco River.

CPSG estimates that the total average daily water use for the air pollution control system will be 5.6 million gallons per day (mgd). Of this amount, 1 mgd will be used for service water purposes throughout the Brandon Shores facility, replacing the municipal water that CPSG is currently purchasing to supply the site. Of the 4.6 mgd remaining after service water is distributed to the facility, an average of 3.9 mgd of water is evaporated in the scrubbers, and a small amount goes out in gypsum by-product and other waste streams. On average, the air pollution control system will contribute about 0.64 mgd of wastewater in addition to the existing facility's wastewater. A water balance is shown in Figure 6-1.

The State has established, in previous licensing cases, that reuse of treated, reclaimed water is beneficial because this option avoids impacts to aquatic biota associated with the withdrawal of water from surface water. In the case of Brandon Shores, the discharge pipeline for the Cox Creek WWTP passes directly through CPSG's property, making it a convenient water source. There is no need to obtain lengthy rights-of-way for pipeline access, and ecological impacts are avoided.

Figure 6-1 Water Balance

Please see the separate file "Case_9075_figures.pdf" for all report figures formatted to print on 11 x 17 sized paper.

6.2 *RECLAIMED WATER SOURCE*

CPSG has identified the purchase of reclaimed water from Anne Arundel County as the preferred source of water for the power plant.[1] The Cox Creek WWTP is projected to have a sufficient amount of treated effluent to supply all the reclaimed water needed for CPSG. The WWTP has a design capacity of 15 mgd; based on monthly Discharge Monitoring Reports (DMRs) for the period July 2005 to July 2006, it was discharging an average of between 10 and 12 mgd. Although this flow fluctuates seasonally, it always exceeds the wet FGD scrubber water requirements by a wide margin; the lowest reported flow during this period was 8.97 mgd.

This section of the report describes and evaluates this water supply option and describes the recommended operational requirements necessary to ensure that the reclaimed water is used in a safe manner.

6.2.1 *Source Description*

CPSG has indicated that the use of reclaimed water obtained from Anne Arundel County is a technically feasible option for the facility. CPSG has not reached an agreement with Anne Arundel County regarding acquisition of reclaimed water. Prior to beginning construction, the applicant will have to negotiate a signed agreement with the County and provide a copy to DNR.

A lift station will be installed at the Cox Creek treatment plant to pump the effluent water to new water treatment facilities on the Brandon Shores site, which will further treat the water to a quality suitable for use in the wet FGD equipment. Prior to use, effluent water will be treated by clarification, filtration and chlorination. CPSG will install tank storage for treated, FGD-ready water to provide capacity in case of an interruption in water supply.

[1] On 19 January 2007, CPSG and Anne Arundel County executed a formal Letter of Intent memorializing their mutual intention to negotiate a contract for the supply of treated effluent from the Cox Creek plant to the Brandon Shores FGD project.

6.2.2 *Design and Operational Requirements*

PPRP has identified a number of conditions that should be met if CPSG elects to use reclaimed water as a source of water for the proposed facility. The purpose of these conditions is to ensure that reclaimed water is managed safely and does not pose any risk to human health and the environment as a result of pathogen concentration in the water vapor exiting the scrubber stack.

6.2.2.1 *Previous Studies Regarding Use of Reclaimed Water for Cooling Water Supply*

The use of reclaimed water for nonpotable water supply is becoming more common across the country. In portions of our country such as the Southwest and Florida, where high quality surface water and ground water supplies are either not abundant or inaccessible, beneficial reuse of treated wastewater has a long history. Power plants and other industries in the greater Los Angeles metropolitan area have been using WWTP effluent for cooling since the late 1960s. In addition, reclaimed water has been used for many years for irrigation in Maryland and other states, particularly for golf courses and agricultural and horticultural applications.

DNR's experience with treated effluent reuse encompasses the following projects:

- The Panda-Brandywine generating station in southern Prince George's County has been utilizing reclaimed water from the Mattawoman WWTP since 1996. This facility was licensed by the PSC in the summer of 1994 and has been operational since 1996.

- Use of the Mattawoman WWTP effluent was approved by the PSC for the Kelson Ridge power plant in 2002 (applicant canceled plans for that facility).

- Use of treated effluent in Frederick County was approved by the PSC for the Catoctin Power facility in 2005 (that facility also has not been built).

- Earlier in the 1990s, PPRP evaluated and recommended the use of reclaimed water for the steam cycle expansion of the Perryman power plant in Harford County (to date, that expansion has not taken place).

During the licensing proceedings for the Panda-Brandywine facility, PPRP performed an extensive evaluation of the suitability of using reclaimed wastewater for cooling tower makeup water. PPRP's analyses included the suitability of reclaimed wastewater in terms of both quantity and quality for use in process cooling, potential risks associated with cooling tower drift including deposition on crops, and process controls that would ensure there would be no adverse impacts to human health or the environment while using reclaimed wastewater. The findings from PPRP's analyses are summarized below and are documented in detail in the February 1997 PPRP report entitled *Environmental Review of the Panda-Brandywine Cogeneration Project*.

- Tertiary treated WWTP effluent is of sufficiently high quality that it can be used in a power plant's cooling system.
- WWTP effluent has been used in similar applications in other parts of the country for approximately 30 years without operational or health-related incidents.
- A quantitative assessment of human health risks associated with emissions from the cooling tower based on inhalation and potential residential exposures to soils affected by deposition concluded that the use of the Mattawoman WWTP effluent (i.e., the source of reclaimed water for the Panda-Brandywine power plant) for cooling tower makeup water poses no unacceptable human health risks. However, maintaining a measurable free chlorine residual for disinfection purposes, along with routine monitoring of other water quality parameters, was recommended to ensure the water being used in Panda's cooling tower is consistently acceptable, even during upset conditions at the Mattawoman WWTP.

6.2.2.2 *Quality of Cox Creek Effluent*

The Cox Creek Water Reclamation Plant is a tertiary WWTP, which means that in addition to biological treatment it incorporates physical and chemical treatment processes, resulting in high-quality effluent. Based on the water quality data for Cox Creek, presented in Table 5.1-1 in the CPCN application, coupled with PPRP's review of the monthly water quality data presented in the DMRs for the period July 2005 to July 2006, this facility's effluent is typical of tertiary treatment facilities and routinely of very high quality.

Table 6-1 presents the maximum values of water quality parameters for the Cox Creek treated effluent, based on the data provided by CPSG in its CPCN application and the Cox Creek facility DMRs. For comparison, the effluent data is compared to federal Drinking Water Standards, where available.

Table 6-1 Maximum Concentrations of Constituents in the Cox Creek WWTP Effluent Compared to Federal Drinking Water Standards

Constituent (parts per million, ppm, unless specified)	Cox Creek Effluent Conc.[a]	Cox Creek Effluent Conc. [b]	Drinking Water Standards [c]
General Water Quality			
pH (pH units)	6.52	6.6 – 8.3	6.5 – 8.5 S
Specific conductivity (µmhos)	490	NR	NA
Temperature (°F)	80	NR	NA
Total suspended solids	13	9.3	2.05
Total dissolved solids	309	NR	500 S
Fecal coliform (MPN/100mL)	NR	22	NA
BOD (5-day)	NR	11.0	NA
Nitrate + nitrite (as N)	NR	8.92	10.0
Ammonia as N	NR	4.04	NA
Total Kjeldahl nitrogen	NR	5.9	NA
Total phosphorus	NR	2.12	NA
Inorganics (mg/L)			
Calcium	27.2	NR	NA
Chloride (as Cl)	103	NR	250 S
Magnesium	5.2	NR	NA
Potassium	11.1	NR	NA
Silica (as SiO2)	13.6	NR	NA
Selenium	< 0.002	NR	0.05
Sodium (as Na)	75	NR	--
Sulfate (as SO4)	42	NR	250 S

a. Data from Table 5.1-1 of the CPSG CPCN application.
b. Data from Cox Creek WWTP monthly Discharge Monitoring Reports for the period July 2005 to July 2006.
c. From Drinking Water Standards and Health Advisories, EPA 822-B-00-001, Summer 2000.
S indicates secondary standard for non-enforceable federal guidelines for cosmetic or aesthetic effects.
NA Standard Not Available
NR Concentration Not Reported

The comparison of the data to drinking water standards indicates that the quality of the effluent is good. Further, review of the DMRs for the period July 2005 to July 2006 indicates that the plant has a good compliance history, and that very few upsets have occurred. Upsets were limited to two short-term excursions during this period. The water quality is similar to that from the Mattawoman WWTP, approved for use in the Panda-Brandywine case.

6.2.2.3 *Operational Requirements*

PPRP's previous evaluations of reclaimed water as a water supply option have concluded that tertiary treated reclaimed water is of acceptable quality for use in power plant cooling systems. While the CPSG proposal is for water use in a wet FGD system, not a cooling tower, the same exposure route and types of preventive measures are called for in the proposed Brandon Shores modification.

PPRP has developed recommended license conditions that establish water quality limits and require routine monitoring of the effluent. From a human health standpoint, it is critical to maintain a measurable amount of free chlorine (or comparable chemical disinfectant) in the effluent for a sufficient amount of time to ensure that any pathogens that may remain in the effluent are destroyed prior to use in the cooling system, and/or to prohibit the re-growth of microorganisms in the conveyance and water storage systems prior to the water being used in the plant's cooling system. Establishing a measurable level of free chlorine is necessary to prevent any risk of airborne dispersal of disease-carrying organisms.

PPRP recommends that CPSG have the capability of adding chlorine to the reclaimed water as needed to sufficiently establish and maintain free chlorine in the reclaimed water prior to the time that the makeup water is used in the wet FGD system. The reclaimed water to be used for wet FGD purposes should have a low concentration of suspended solids because high levels of suspended solids can interfere with and decrease the effectiveness of chlorination as a disinfection procedure. The particles in suspension may reduce disinfection efficiency by impeding the contact of the chlorine with the target microorganisms. High levels of suspended solids could also indicate upset conditions at the WWTP due to inadequately treated effluent. Therefore, the effluent will be required to have low turbidity — a method of estimating suspended solids concentration that can be performed at the plant on a real-time basis. To ensure effective disinfection, turbidities should be less than 5 nephelometric turbidity units (NTU) (CDHS 1994).

With proper design and operation of the wet FGD water system, and in compliance with the recommended license conditions in Appendix A, human health risks from the use of reclaimed water will be non-existent.

Under the recommended licensing conditions, CPSG will be required to submit a sampling and analysis plan to specify parameters for monitoring, monitoring locations, and methods. The applicant will also need to submit, for approval, Standard Operating Procedures to demonstrate compliance with the licensing conditions and with the disinfection requirements, to ensure that effluent of unacceptable quality does not enter the wet FGD system.

7.0 WET FGD BY-PRODUCT MANAGEMENT

7.1 GENERATION, MANAGEMENT AND DISPOSITION

7.1.1 Synthetic Gypsum

Generation

The wet FGD systems create calcium sulfate ($CaSO_4 \cdot 2H_2O$), also known as synthetic gypsum, as a by-product of the reaction between flue gas SO_2, limestone ($CaCO_3$), and forced oxidation air (O_2). The estimated composition of the wet FGD sludge is provided in Table 7-1.

Table 7-1 Approximate Composition of Wet FGD Sludge Expected from Proposed System

Constituent	Percent
Calcium sulfate ($CaSO_4 \cdot 2H_2O$)	78.0
Limestone inerts	4.7
Calcium carbonate	1.9
Fly ash	0.9
Biosolids	1.6
Metal hydroxides [1]	12.9

[1] Aluminum estimated at 3.9%, iron at 4.7%, copper at 0.13%, zinc at 0.08% and other metals less than 0.05%.

CPSG estimates that the synthetic gypsum will be generated at a rate ranging from 306,000 tons/year to 1,200,000 tons/year. The annual generation rate for synthetic gypsum depends on the plant load, capacity factor, sulfur content, and quality of the coal. The maximum generation rate is based on the assumptions of using 4 percent sulfur coal and 100 percent capacity factor, while the minimum generation rate is based on firing 1 percent sulfur coal and an 85 percent capacity factor. The maximum daily generation rate is expected to be 4,000 tons/day (CPSG 18 September 2006 response to DNR Question 8). A generation rate based on average annual operating conditions is presented in Table A-2 in the CPCN application as 1,080,000 tons per year or about 3,000 tons/day.

CPSG plans to provide the synthetic gypsum to a wallboard manufacturer as a replacement for natural gypsum. A certain percentage of the gypsum by-product will be considered to be off-specification if it does not meet the specifications of the wallboard user. CPSG estimates that five percent of the total volume of synthetic gypsum will be considered off-specification. This represents an estimated generation rate of 15,300 to 60,000 tons per year of off-specification gypsum.

<u>Management</u>

The gypsum handling system will convey the synthetic gypsum product from the wet FGD system to the gypsum storage area, and then to a new barge loader on the Patapsco River. CPSG's proposed gypsum handling system is presented below.

- Gypsum will be moved from the wet FGD unit to the gypsum storage pile via a single conveyor. In case of conveyor outage, the gypsum will be moved by front-end loaders and trucks.
- Gypsum will be stored on a pad in an enclosed dome to protect it from precipitation. The area within the dome will be underlain with a six inch thick concrete pad. The nominal capacity of the gypsum storage dome will be about four days or 15,000 tons (30,000 cubic yards), based on an estimated daily generation rate of 4,000 tons under maximum operating conditions.
- The inactive gypsum storage pile will be used to provide additional capacity in case transportation delays cause gypsum accumulation to exceed the domed storage capacity. The space allocated for inactive gypsum storage will hold up to 30,000 tons or 60,000 cubic yards, corresponding to eight inactive days. The inactive gypsum portion of the storage area will be built on compacted fill, and eventually compacted gypsum will act as a base for the inactive pile (CPSG Response to DNR Data Request 1-12). The inactive pile area is open to precipitation. Stormwater from the inactive pile will be collected and sent to the wastewater treatment plant (CPSG 18 September 2006 response to DNR Question 6).

Gypsum will be reclaimed from the pile and conveyed to the barge loader for loading onto 5,000-ton barges. CPSG indicated that all of the potential purchasers of the synthetic gypsum currently under consideration would use barges as the main form of transport to their wallboard plants (5 September 2006 response to DNR Question 4).

Disposition

CPSG stated in Section 5.3.2 of the CPCN application that there will be no onsite disposal of solid wastes associated with the project. Additionally, CPSG stated during cross examination on 4 December 2006 (Transcript p. 59, Witness D. Costa) that CPSG has no plans at this point to dispose of unused synthetic gypsum in a landfill as a backup or contingency plan. PPRP recommends a license condition requiring CPSG to obtain a solid waste permit from MDE if it determines the need to design, construct and operate an industrial waste landfill to dispose of synthetic gypsum, off-specification synthetic gypsum, or other non-hazardous solid waste (discussed in Section 7.2 below), and ensure compliance with all applicable requirements set forth in COMAR 26.04.07.19 and .20, and any applicable local requirements.

The wet FGD system produces a gypsum by-product suitable for use in making wallboard, use in cement manufacturing, and other alternative uses. CPSG proposes to provide 100 percent of the synthetic gypsum to a leading producer of wallboard for use in the manufacture of wallboard. CPSG is in discussions with three potential wallboard manufacturers to accept 100 percent of the synthetic gypsum. CPSG further expects that the wallboard manufacturer will accept the off-specification synthetic gypsum, and as such be responsible for using the material in wallboard manufacture by blending the material with higher purity gypsum, recycling it into other uses (cement or agricultural), or placing it in a landfill (CPSG 18 September 2006 response to DNR Question 1). The typical length of a purchase contract is 10 to 20 years (CPSG 18 September 2006 response to DNR Question 4).

CPSG has proposed that the synthetic gypsum will be tested onsite after dewatering to determine whether the material meets the wallboard manufacturer's specifications. The specific test methods will be negotiated with the final user and incorporated into the sales contract. The criteria for determining whether the gypsum is suitable for wallboard manufacturing is expected to be purity, free water, crystal size, chlorides, pH, calcium sulfite percent, water soluble sodium, soluble magnesium, ammonia, mercury, and percent fly ash (CPSG 5 September 2006 response to DNR Question 31e).

CPSG has indicated that its current schedule is to have a gypsum contract in place by the end of the first quarter 2007 (CPSG Response to DNR Data Request 1-10). PPRP requested in DNR Data Request 1-10 more detailed information regarding the location of the wallboard manufacturer, the annual amount of gypsum to be used, an explanation of how off-specification gypsum will be handled, and the duration of the contract. This information is necessary to ensure that CPSG has identified an adequate means for the disposal of plant-generated wastes. CPSG responded that this information is not yet available because contracts are not yet in place, but would provide the requested information subject to execution of a confidentiality agreement. PPRP recommends a license condition requiring CPSG to make the information available at the power plant for inspection when the contract with a wallboard manufacturer is in place.

The potential exists that the future user of the synthetic gypsum and off-specification synthetic gypsum determines that not all of the material can be accepted. PPRP recommend that CPCN be conditioned to require any unused synthetic gypsum or off-specification gypsum be disposed of as solid waste. Additionally, PPRP's recommended license conditions would require CPSG to notify the PSC of any change in the proposed plan to beneficially use 100 percent of the synthetic gypsum and off- specification synthetic gypsum, and to provide the PSC with alternate plans for disposition of these materials for review at least 120 days in advance of implementing an alternate beneficial use plan. The alternate plan for disposition proposed in the future by CPSG must comply with all applicable requirements set forth in COMAR 26.04.07.19 and .20 and any applicable county requirements for in-state disposition, any applicable local requirements, and any other state requirements for out-of-state disposition.

7.1.2 *Fly Ash and Other Solid Wastes*

Generation

CPSG is planning to increase heat input to the Brandon Shores facility by approximately 15 percent to offset parasitic power losses associated with the operation of the AQCS. This will result in an approximate 15 percent increase in annual fly ash production to approximately 70,000 tons. The incremental amount of fly ash will be managed in the same manner as the existing fly ash, namely beneficially used for the production of concrete and cement flowable fill, and to reclaim a sand and gravel mine (CPSG 5 September 2006 response to DNR Question 34).

CPSG reported that the existing mine reclamation site being backfilled with fly ash has a total of five years of additional capacity remaining, and thus a new mine reclamation site will need to be permitted by MDE to provide this option as a long-term outlet for fly ash disposition (CPSG 18 September 2006 response to DNR Question 12). However, recent discussions with CPSG relative to the nature and extent of ground water quality impacts at the mine reclamation site indicated that the mine site has two years of additional capacity. Additionally, MDE Water Management Administration is evaluating the cause and extent of the ground water quality impacts, and thus the status of filling the mine reclamation site with fly ash is being reexamined by MDE and could change in the future based on the findings of the evaluation.

Solid wastes include fabric filter solid waste and sludge cake from the water and wastewater treatment system. The estimated volumes and characteristics of each of the solid waste steams are described below. The actual quantities of solid waste will depend on plant load, fuel quality, and the operating parameters of the air quality control systems.

- **Fabric Filter Waste**. This waste stream will consist of residual fly ash remaining after the ESP, reaction products of the SO_3 sorbent injection, and spent activated carbon particles from the flue gas. A fabric filter located upstream of the wet FGD system will collect these solid particles from the flue gas. The filter bags are periodically cleaned, causing the filter cake to break up into large pieces and fall by gravity into enclosed hoppers. CPSG estimates that up to 380 tons/day, or 138,700 tons/year, will be produced.
- **Sludge Cake**. Sludge is produced from three processes: 1) the clarification of the Cox Creek influent suspended solids; 2) the physical/chemical clarification of the influent suspended solids in the wet FGD wastewater treatment system; and 3) the clarification of biological solids in the wet FGD wastewater treatment system. The sludge cake is expected to contain primarily calcium sulfate, metal hydroxides and oxides, and bacterial solids. Filter presses will be used to dewater the sludge generated during the treatment of water and wastewater to greater than 50 percent solids dry weight. Assuming 50 percent solids content, CPSG estimates that up to 84.5 tons/day, or 30,840 tons/year of sludge cake will be produced from the three combined sources. Of the total sludge cake, 81.1 tons/day (50 percent solids) will be generated during the physical/chemical clarification of the influent suspended solids in the wet FGD wastewater treatment system.

<u>Management</u>

CPSG's proposed management of the two solid waste streams is described below.

- **Fabric Filter Solids**. A vacuum transport system will convey the waste from the collection hoppers to the dedicated silo. The silo will have a capacity of approximately 88 hours of production, serving as a buffer for intermittent off-loading into trucks and a suspension of trucking on weekends (CPSG 18 September 2006 response to DNR Question 11). From the silo, the waste will be conveyed by gravity through pug mills, mixed with water to reduce dusting, and loaded into trucks for off-site disposition.
- **Sludge Cake**. The dewatered sludge will exit the filter press directly into lined roll-off containers (probably 20 cubic yards in size). The full containers will be sampled and moved to a temporary storage area. The storage area will be able to contain one week of storage. Following confirmation that the sludge is non-hazardous, the container will be transported to a licensed disposal facility.

<u>Disposition</u>

CPSG stated in Section 5.3.2 of its CPCN application that there will be no onsite disposal of solid wastes associated with the Project. Further, the CPCN application states that fabric filter solid waste and sludge cake from the water and wastewater treatment system will either be disposed of in a commercial off-site landfill, or reused in commercial applications. In addition, any unused synthetic gypsum or off-specification synthetic gypsum would be classified as a non-hazardous solid waste. The commercial landfills are expected to accept non-hazardous industrial solid waste, and comply with federal and state laws and regulations.

CPSG has not yet entered into a contract with a landfill operator, but has committed to pursuing combined landfill capacities and contract terms to ensure an uninterruptible service and acceptance of wastes (CPSG 18 September 2006 response to DNR Question 10). CPSG has had preliminary discussions with Waste Management Inc. regarding the use of their landfills for solid waste disposal. Waste Management operates three facilities in eastern Virginia and another in Frostburg, Maryland. These landfills are located within a three to four hour drive of the Brandon Shores plant. CPSG provided two examples of landfills that have adequate capacity for the estimated 465 tons/day solid waste that will be generated by the proposed air quality control project:

- Waste Management indicated to CPSG that the Atlantic Waste Disposal landfill in Waverly, Virginia (approximately 25 miles southeast of Richmond) is permitted to accept an unlimited quantity of waste on a daily basis; and
- The Charles City landfill in Charles City, Virginia (approximately 15 miles east of Richmond), has a current permitted capacity to accept up to 6,900 tons/day of waste and is currently accepting an average of 2,000 tons per day.

CPSG indicated that the current schedule for entering into an agreement with a commercial landfill for disposal of 100 percent of the solid waste generated by the project is by the end of the fourth quarter 2007 (CPSG Response to DNR Data Request 1-11). PPRP also requested in DNR Data Request 1-11 more detailed information regarding the location of the landfill(s), the capacity of the landfills proposed for receiving the waste and the duration of the contract. This information is necessary to ensure that CPSG has identified an adequate means for the disposal of plant-generated wastes. CPSG responded that this information is not yet available because contracts are not yet in place, but would provide the requested information subject to execution of a confidentiality agreement. PPRP recommends a license condition requiring CPSG to make the information available for inspection at the power plant when the contract with a commercial landfill is in place. PPRP also recommends a license condition requiring notification to the PSC if the plan to dispose of the solid waste at a commercial landfill changes.

7.2 IMPACT EVALUATION

CPSG committed in the application and subsequent submittals to store the synthetic gypsum and solid wastes in a manner that will not impact surface or ground water quality. Onsite surface and ground water quality will be protected using the following approaches:

- **Synthetic Gypsum**. The active pile will be enclosed in a dome and constructed on concrete, and thus will be sheltered from the elements. Although the inactive pile, which will be used intermittently to buffer transportation delays, will be outside and exposed to the elements, stormwater from the inactive pile will be collected and sent to the wastewater treatment plant.
- **Fabric Filter Solids**. Storage of the fabric filter solids in a silo will prevent exposure of the waste to the elements, and thus prevent ground water quality degradation.

- **Sludge Cake**. The placement of the sludge cake in the lined roll-off containers and the weekly shipment of the boxes to an offsite landfill will prevent exposure of the waste to the elements, and thus prevent ground water quality degradation.

The potential for ground water quality impacts associated with the disposition of the synthetic gypsum and solid waste is mitigated by beneficially using the material or placing it in a commercial landfill. Table 7-2 summarizes the generation and disposition of the by-product streams.

Table 7-2 Disposition of By-product Streams

By-product	Annual Generation (tpy) Minimum	Annual Generation (tpy) Maximum	Daily Generation (tpd)	Primary Mode of Transportation	Disposition
Synthetic Gypsum	306,000	1,200,000	4,000	5,000-ton Barge	Wallboard Manufacturing
Off-Specification Gypsum	15,300	60,000	Not provided	5,000-ton Barge	Wallboard Manufacturing
Fly Ash	Not provided	70,000	Not provided	20-ton truck	Cement Mine Reclamation
Fabric Filter Waste at 80 percent solids	Not provided	138,700	380	20-ton truck	Landfill
WTP and WWTP Sludge Cake at 50 percent solids	Not provided	30,840	84.5	20 cy roll-off	Landfill

Synthetic gypsum from the proposed wet FGD system that is beneficially used in the manufacture of wallboard, or for other commercial uses, will not impact ground water quality because it will not be placed on the ground.

Solid waste from the proposed project that is sent to commercial landfills is expected to not impact ground water quality because the commercial landfills are constructed and operated in accordance with federal and state solid waste laws and regulations. State regulations for non-hazardous solid waste landfills require the construction and operation of leachate collection and treatment systems, which if operated as designed, prevent ground water quality impacts.

8.0 SUMMARY

8.1 AIR QUALITY

The Brandon Shores air pollution control project is considered a major modification for CO and SAM for PSD purposes, and a major modification for VOCs for NA-NSR permitting purposes. MDE-ARMA and PPRP have reviewed CPSG's pollution control technology proposals and concur that the project will meet appropriate BACT and LAER requirements.

Based on the information provided in the CPCN application, supplemented with independent analyses conducted by the State, PPRP and MDE-ARMA conclude that criteria pollutant impacts for the Brandon Shores project will not adversely affect the NAAQS or PSD increments. PPRP and MDE-ARMA also believe that it can be reasonably concluded that the Brandon Shores facility impacts on primary pollutant concentrations, visibility, deposition, and ozone in the Shenandoah National Park Class I area are likely to be minimal.

If designed and operated in accordance with the recommended licensing conditions (Appendix A), the air quality control project will meet applicable State and Federal air quality requirements.

8.2 BIOLOGICAL RESOURCES

The proposed site for modifications at the Brandon Shores power plant is within an area that has been disturbed for many years by human activities. Significant natural communities are not present on site where the wet FGD system is proposed for construction; this area is currently a mowed upland field directly adjacent to the already developed Brandon Shores facilities. The developed nature of the site has lessened its habitat potential for wildlife. In addition, no rare, threatened, or endangered species are known to exist on or adjacent to the site. Approximately 1 acre of 17-foot-deep water habitat would have to be disturbed in the near shore Patapsco River for construction of the gypsum barge loading facilities and the gypsum conveyor. This site was previously disturbed through the dredging and construction for the existing Wagner conveyor facility. Given the deep water, the turbid water quality, and the dredging that has taken place in this location, it is highly unlikely that submerged aquatic vegetation is present. Construction and operation of the wet FGD project would likely not pose any negative impacts to biological resources.

8.3 SOCIOECONOMIC IMPACTS

Construction of the wet FGD facility would create as many as 600 craft and 50 non-manual jobs during the peak construction period. Over the 34 month project schedule, an average of 250 construction workers is expected to be on-site. CPSG estimates that construction payrolls will total $70 million over the nearly three-year construction period. Operating the wet FGD facility would add another 22 employees to the Brandon Shores workforce and add at least $1.3 million in annual earnings. Additional economic benefits are expected to result from the purchases of goods and services during both construction and operation phases of the project.

The wet FGD facility is a modification to CPSG's Brandon Shores Generating Station and will be contiguous to existing generation assets. No direct or indirect land use impacts are anticipated from construction activities or operation of the proposed modifications to the Brandon Shores facility. Construction and operation of the facility would have no adverse effect on nearby recreational or public facilities.

During peak construction activities of the wet FGD facility, more than 550 workers are expected to commute to the project site for the day shift. However, CPSG intends to mitigate potential effects through shift scheduling. Additional truck traffic would also be generated by construction and operation of the proposed facility at Brandon Shores, but it is not projected to affect levels of service on nearby road segments or intersections. CPSG proposes that most deliveries of limestone, in addition to coal, would be via barge. Barge would also be used to transport the major wet FGD byproduct – gypsum – off site. The recommended licensing conditions in Appendix A include provisions to minimize impacts of truck traffic as well as construction worker commuting.

8.4 NOISE

An independent evaluation of potential noise impacts from operation of the modifications proposed for Brandon Shores on surrounding receptors concluded that noise generated by the project would fall within applicable Maryland noise limits. The fans required to propel the flue gases through the pollution control systems are the loudest component of the proposed facility modifications. For nearby receptors located to the north and west of the Brandon Shores property, the fans would constitute the loudest single noise source. These locations are already significantly affected by traffic (including trucks) on Fort Smallwood Road.

Noise levels from the project predicted for the residential areas to the south of the site are well below the residential limit of 65 dBA daytime and of 55 dBA at night. Noise at these locations would result mostly from material handling, which is significantly less noisy compared to the booster fans.

8.5 WATER SUPPLY

The proposed combined cycle facility will need water primarily for makeup in the wet FGD. The preferred source of the makeup water will be reclaimed water from the Anne Arundel Cox Creek Water Reclamation Plant. The plant's discharge pipeline passes directly through CPSG's property, making it a convenient water source. In the event of supply interruption, the backup source of water would be cooling water effluent from the existing Brandon Shores cooling towers, prior to Outfall 001 to the Patapsco River.

A lift station will be installed at the Cox Creek treatment plant to pump the effluent water to new water treatment facilities at the Brandon Shores project site, which will further treat the water to a quality suitable for use in the wet FGD equipment. Prior to use, effluent water will be treated by clarification, filtration and chlorination. CPSG will have the capability of adding chlorine to the reclaimed water as needed to sufficiently establish and maintain free chlorine in the reclaimed water. To ensure that the water quality requirements are met consistently, PPRP recommends that CPSG monitor effluent quality routinely and reject effluent that is determined to be unsuitable for use in the wet FGD system. CPSG will be required to submit a monitoring plan and design documentation to ensure adequate disinfection and operation of the facility in a way that protects human health and the environment.

8.6 BY-PRODUCT MANAGEMENT

Operation of the Brandon Shores air quality control systems will generate synthetic gypsum, fly ash, fabric filter waste, and sludge cake as by-products. These will be stored such that they are protected from exposure to the elements, and thus prevent ground water quality degradation.

The wet FGD system produces a gypsum by-product suitable for use in making wallboard, use in cement manufacturing, and other alternative uses. CPSG proposes to transport the synthetic gypsum via barge on the Patapsco River to a leading producer of wallboard. CPSG is in discussions with three potential wallboard manufacturers to accept 100 percent of the synthetic gypsum. PPRP recommends that CPSG make available for inspection at the power plant the information regarding the selected party that will use the synthetic gypsum. Additionally, PPRP recommends that any synthetic gypsum that cannot be used beneficially be disposed of as a solid waste compliant with COMAR 26.04.07.19 and .20, or the applicable requirements of the receiving state and/or county.

CPSG is planning for an approximate 15 percent increase in heat input to the units to offset parasitic power losses. This will result in an increase in annual fly ash production, which will be managed in the same manner as the existing fly ash.

Other solid wastes will include fabric filter solid waste and sludge cake from the water and wastewater treatment system. Actual quantities of solid waste generated will depend on plant load, fuel quality, and operating parameters of the air quality control systems. These wastes will be stored temporarily on-site prior to loading into trucks for off-site disposition at a commercial landfill, or for reuse in commercial applications.

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Appendix A
Initial Recommended Licensing Conditions

Initial recommended conditions are attached to the Letter of Recommendations, DNR Exhibit__(JS-2)