K. Air Quality

1. Introduction

An air quality analysis was prepared to provide potential air quality impact information in connection with the proposed ~~p~~Project. This Section provides a summary of the Mobile Source Air Pollution Modeling report included the Appendix to this DEIS.

2. Existing Conditions

a. Ambient Air Quality

Existing air quality in the Town of Dover is considered very good as it is for the Hudson Valley, from Dutchess County northward. The average air quality index (AQI) is 39 versus a national average of 44.59. An AQI between 0 and 50 is satisfactory and air pollution poses little or no risk.

Existing air quality standards for New York State are found in the State Ambient Air Quality Standards (SAAQS) which largely mimic the National Ambient Air Quality Standards (NAAQS). Possible relevant pollutants for mobile sources are particulate matter, ozone and carbon monoxide. Carbon monoxide is the dominant pollutant and so, it is modeled as provided in NYSDOT's Environmental Procedures Manual (EPM). Sulfur dioxide can be relevant to building heating sources.

Particulate matter (PM 2.5) as measured in Newburgh, New York has been below the 15 ug/m3 annual mean standard since 2000 and has ranged between 9.6 and 12.1 ug/m3 for 2005 to 2007. Lead levels contained in these particulates have been measured in Wallkill at a maximum quarterly value of 0.02 ug/m3 versus a standard of 1.5 ug/m3.

Ozone is measured in Millbrook, New York. Ozone is the only pollutant that occasionally exceeds the standard both in NYSDEC Region 3 and State-wide. It is formed from the long-term transport of hydrocarbon emissions in the mid-western United States and as such, is not a "local" enforcement issue on emissions. The average 3 year annual mean for this pollutant was 0.074 parts per million (ppm) for the years 2005 to 2007. The fourth highest maximum daily eight hour average was 0.082 ppm in 2005 when it slightly exceeded the 0.080 ppm standard.

Carbon monoxide (CO) levels are not measured in NYSDEC Region 3. The closest monitoring station is in Loudonville, New York. Since 2000, the annual arithmetic mean has ranged from 0.4 to 0.5 ppm. The highest one hour value in 2007 was 1.5 ppm versus a standard of 35 ppm. The highest eight hour value was 1 ppm versus a standard of 9.0 ppm.

The closest sulfur dioxide (SO2) monitoring station is at Mt. Ninham in northeastern Putnam County. In 2007, 3 hour averages have peaked at 16 to 19 parts per billion (ppb) versus a standard of 500 ppb and 24 hour averages have peaked at 9 ppb versus a standard of 140 ppb.

3. The Future Without the Proposed Project

Analysis results for the modeled receptors are presented in Appendix A of the full Mobile Source Air Pollution Modeling Report included in the Appendix to this DEIS. The peak CO result was 3.9 ppm in the one hour scenario and 2.73 ppm in the eight hour scenario in 2020 PM Future Without the Proposed Project at the intersection of Route 22 and Pleasant Ridge Road.

4. Potential Impacts of the Proposed Project

a. Intersection Analysis

The first level of "air quality screening" was performed in accordance with methodology described in NYSDOT's Environmental Procedures Manual (EPM). Additional detail on the methodology can be found in the Mobile Source Air Pollution Modeling report included the Appendix to this DEIS. The intersection of Route 22/55 and Wheeler Road was selected for three reasons: (1) This intersection could run at LOS D under the Build (PM) condition; (2) This intersection is representative of "typical" conditions along Route 22 and (3) This intersection ~~will~~would be the Project's "main" entrance and at the "Town Center."

In addition to that intersection, the intersections of Hoags Corners Road and Wheeler Road and Pleasant Ridge Road and Route 22/55 were also modeled. These intersections ~~will~~would operate at LOS C or better and, strictly speaking, do not require modeling pursuant to NYSDOT's EPM. However, they were deemed to be closely intertwined with the intersections being modeled (i.e., they affect link counts and queing in those intersections) and they add a degree of accuracy in modeling of over-all air quality along Route 22/55. Further, they "bracket" the ~~p~~Project ~~s~~Site and provide a result for the traffic entering and exiting both its eastern and western sides.

If these three intersections comply with the ambient air quality standards, it is more than assured by the NYSDOT EPM that any other intersection studied as outlined in the scope would also comply with the standards.

(1) CAL3QHC Results

The CAL3QHC model was run at peak PM conditions for 2008 Existing Condition, the 2020 No Build and the 2020 Build Condition. The 2020 Build Condition was also modeled with and without the recommended intersection improvements. Peak PM traffic scenarios were analyzed at the subject intersections using worst case meteorology for each condition. Traffic volumes associated with the build scenarios anticipated the full build of the ~~p~~Project. Large proposed or planned developments in the area (as of 2020) and a regional growth rate were included in the build scenarios as provided in the traffic analysis. That is, the cumulative impact of the proposed ~~p~~Project plus the added major projects and increases in general traffic were included in traffic analysis. The air quality analysis does likewise.

Analysis results for the modeled receptors are presented in Appendix A to the Mobile Source Air Pollution Modeling Report included in the Appendix to this DEIS. In summary, all results were below their respective one hour standard of 35 ppm and eight hour standard of 9 ppm in the 2020 build condition, and therefore it was determined that the ~~p~~Project ~~will~~would not significantly impact air quality. Moreover, it was determined that the recommended intersection improvements ~~will~~would result in better CO concentrations.

The NYSDEC currently recommends the use of Level II threshold modeling of up to three intersections in conformity with the NYSDOT EPM. In this case, five intersections were modeled five intersections for the reasons described below. NYSDOT and the USEPA have accepted MOBILE 6.2 and CAL3QHC as its official models and the MOBILE 6.2 has been modified by NYSDOT to provide emission factor data specific to each NYSDOT region. These programs were used to determine potential air quality impacts on CO levels due to the proposed ~~p~~Project at or near the subject intersections.

b. Regional Analysis

If the ~~p~~Project would significantly affect traffic conditions over a large area, it is also appropriate to consider regional air quality effects of the ~~p~~Project by way of a mesoscale analysis. Such analyses are generally required for projects which include significant construction on or improvements to limited access highways (i.e., I-84 or the Taconic Parkway). No such construction ~~will~~would occur in this area for this ~~p~~Project therefore no mesoscale analysis was required.

c. Short Term Construction Impacts

The short-term use of heavy equipment operations at the site ~~will~~would result in a temporary minor increase in pollutant emissions from the various equipment used in the construction process for a several year phased duration. However, the major concern during the construction operation ~~will~~would be the control of fugitive dust during site clearing, excavation, demolition and grading operations. Fugitive dust is essentially airborne soil particles caused by heavy equipment operations entraining the soil into the air. To a lesser extent, some fugitive dust emissions ~~will~~would arise from wind erosion of the exposed soil after the groundcover is removed. All construction related air quality impacts ~~will~~would be of relatively short duration and generally not in proximity to public receptors. The phasing of the ~~p~~Project ~~will~~would reduce the intensity of any impacts. In addition, best construction management practices ~~will~~would be employed to reduce soil erosion and possible sources of fugitive dust. This generally includes the daily use of water/spray trucks in dry periods and anti-tracking pads at construction entrances.

Prior to initiating the design of any structure rehabilitation/demolition or roadway construction, a determination ~~will~~would be made regarding whether any asbestos-containing materials, that currently exist as building, structure, roadway and/or utility components of the affected ~~p~~Project ~~s~~Site, ~~will~~would be disturbed as a result of the proposed work. If asbestos-containing materials are identified and determined to require abatement, the ~~p~~Project design ~~will~~would incorporate provisions for asbestos abatement and waste disposal in accordance with all OSHA standards and guidelines.

d. ~~Carbon Footprint~~Greenhouse Gas and Climate Change

Introduction
The carbon footprint is a measure of the total amount of carbon dioxide (CO_2) emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product. This includes activities of individuals, populations, companies, institutions, organizations and industry. The CO_2 "emission" ~~calculation~~modeling was based upon U.S. Environmental Protection Agency's (USEPA) most recent "Individual Household Calculation Tool" and "Office Carbon Footprint Tool."[1]

The US EPA models are based upon detailed information which has been accumulated by the various Departments of the Federal government. These data include intensive information regarding energy consumption for a wide variety of human endeavors; they have been accumulated and complied since the mid-1970's (as spurred on by the first energy crisis of 1973-1974). Data include home or commercial heating (oil, natural gas, etc.) in various regions of the country, the consumption of various goods, the transportation of both goods and people, etc. pus the energy required to accomplish these ends. Industry-wide energy equivalent conversions from gallons, kilowatts or cubic feet (therms) of energy consumed were/are applied in the calculations. For example, one kilowatt hour (kwh) of electricity translates to 3,412 British Thermal Units (btu's), one horsepower (transportation) to 2,545 btu and one therm (natural gas) to 100,000 btu. Combustion was assumed to be 100 percent of the fuel at issue and carbon content was based on the type fuel "utilized". For example, one gallon of gasoline contains 18.9 kilograms (kg) of carbon per giga-joule (GJ equivalent to a little less than one million btu's) and propane has 17.2 kg of carbon per GJ. Carbon dioxide equivalents were/are determined from the carbon data by using the appropriate molecular weights of carbon.

To estimate a carbon footprint, it is necessary to measure and combine the following:

(A) Transportation: Pounds of carbon dioxide equivalent are calculated and based on USEPA's estimate of the greenhouse gas emissions (especially as CO_2) from a typical passenger vehicle in New York State (based on vehicle miles traveled per capita plus vehicle registrations). Estimates of the typical values for fuel economy and miles driven per week are from the same source.[2] These data were based on vehicle miles traveled per DMV data from Sullivan County and average national fuel consumption for the vehicle types assumed to be used. The vehicle miles are then connected to CO_2 equivalents per WRI/WBCSD's CO_2 mobile-calculation tool.

(B) Electricity**:** Electricity emissions factors are categorized by geographic sub-region. Electrical uses have been complied by use, square footage, and occupancy based on USEPA and U.S. Department of Energy (USDOE) statistics. For example, for commercial office buildings, USEPA's eGrid version 2.1 was used to calculate an electrical consumption of 13.9 kwhr per square foot specific to New York State. This use

[1] Results of the commercial modeling are calculated in metric tons per year of CO2 equivalent emissions. One metric ton equals 2,205 pounds.
[2] For projects with substantial future completion dates, CAFE standards are considered.

then translates to 0.907 lbs of CO2 equivalent per year based on carbon dioxide output of 907.16 pounds per MWhr of electricity for New England power plants. The energy consumption data were then varied by proposed and "existing" uses and consumption for such uses (i.e. commercial retail, grocery versus community space versus health care space) based on the USDOE Energy Information Administration's most recent release (in this case December 2006).

(C) Natural Gas[3]: Typical CO_2 emissions were calculated per household and are based on use, sequence footage, and occupancy based on USEPA statistics. The consumption levels were further refined based upon Department of Energy's Energy Information Administration data, New York State Electric and Gas (NYSEG) pricing/consumption data, etc. These data were adjusted to two or four person households depending on the residential unit size modeled. Some natural gas consumption was also included for heating of the various commercial spaces.

(D) Production: The production and delivery of goods to the ~~p~~Project (on an operating basis) was calculated based on consumption rates for these uses, delivery vehicles used and employee services provided. For the production portion of this calculation, data were derived from USEPA's 2006, *Solid Waste Management and Greenhouse Gasses A Lifecycle Assessment of Emissions*. As example, 0.87 metric tons of carbon equivalent (MTCE) is used to produce one English ton of steel cans and 0.28 MTCE is used to produce one ton of office copier paper. These production/consumption equivalent emissions are partially offset by recycling and land filling as a result of waste disposal discussed below.

(E) Waste Disposal: Calculations assume that households generate waste based upon an average per person per day. Waste generation was also calculated based on the proposed office and retail uses. Greenhouse gas emission benefits from recycling newspaper, glass, plastic, metal and magazines were developed using the USEPA data and all life-cycle greenhouse gas emissions factors for waste management. Carbon dioxide equivalent emissions associated with household waste management were calculated using total emissions for landfills. The emissions for each material type were presented by USEPA on greenhouse gas emissions from waste management and is part of the Waste Reduction Model (WARM). These emission factors take into account the full material life cycle: i.e., not only the emissions into the landfill, but also the emissions and sequestration associated with production, manufacturing, remanufacturing, forest carbon storage due to reduced harvests.

[3] Fuel source was assumed to be natural gas equivalents (not heating oil) per the site utility report by Divney Tung Schwalbe, LLP.

Footprint calculations follow from the CO_2 emission calculations and are based on several "assumptions:"

- It is possible to keep track of most of the resources people consume and many of the wastes offices generate.
- It is possible to determine the energy need to produce and or/use these products.
- The amount of carbon oxidized from fuels to generate the necessary energy for the production and use of these products can be determined.
- Biological activity, especially in the form of plant life, can remove carbon from the atmosphere and "store" it in relatively stable, solid forms.
- Most ~~of these~~ resource and waste "emissions" can be converted into the biologically productive area that is required to "maintain" these "emissions."
- These different areas can be expressed in the same unit (acres) once they are scaled proportionally to their biomass productivity. In other words, each particular acre can be based upon the equivalent CO_2 sequestration.
- Since these areas have exclusive uses, and each standardized acre represents the same amount of biomass productivity, they can be added up to a total.
- This area for demand can be compared with nature's supply of ecological "services" (including carbon absorption).

In addition to the specific sources identified above, ~~In making the calculations about projected energy and resource use in this report, consumption has been projected based on the transportation, residential unit types, commercial information of the proposed project plus estimates of community space to be provided. D~~data were also derived from information developed in the DEIS process. This includes the traffic analysis ~~of December 2008~~ prepared by John Collins Engineering, Inc. and the site utility report prepared by by Divney Tung Schwalbe, LLP. Additional data as needed were derived from MetroNorth, New York State Electric and Gas Company (NYSEG), the New York State Department of Motor Vehicles, USEPA, the U.S. Department of Agriculture and USDOE plus demographic data provided in the DEIS (e.g., square footages, site plans, number of employees, etc.).[4]

In making the calculations about projected energy and resource use in this report, consumption has been projected based on the transportation, residential unit types, commercial information of the proposed Project plus estimates of community space to be provided. The data allow for calculations of primary and secondary CO_2 "emissions" data versus credible carbon measurement standards.

Calculation Results

[4] The analysis was prepared to be specific to the project, its location and various alternatives. Most carbon footprint tools and models have been developed for regional purposes and have their use and results focused on metropolitan regions, in entire states or multi-state areas. This analysis presents data which can be inserted into a regional planning calculation methodology or model such as the west coast PLACES model. However, this is the function of regional/governmental planning agencies, not specific project sponsors.

Carbon emissions and footprint modeling results were calculated for several scenarios. All results are in pounds, kilograms or tons of CO_2 equivalent emissions per year.[5] The results are reported as the Proposed Action – residential without mass transit, Proposed Action – residential with mass transit, a standard single family subdivision, Proposed Action – commercial with mass transit and the existing condition in the form of a functioning health institute. The proposed commercial was split into both office and commercial retail. The commercial retail was assumed to be dominated by food retail, including a supermarket and some food preparation. Community square footage was also included.

The Proposed Action has both a residential component and commercial component. These elements have been designed to function as a traditional Town. That is, the commercial uses are at the Town Center and approximately 1,100 of the residential units are "clustered" around the commercial Town Center. Both uses are also focused around the existing rail road station. This configuration emphasizes or encourages use of the mass transit and/or moving around the site without using a motor vehicle (or at least a full size motor vehicle).

It is important to note that the projected ~~p~~Project population ~~will~~would occur regardless of the ~~p~~Project's implementation. What this means is that the people which make up this population ~~will~~would occur somewhere within the New York City metropolitan region and they ~~will~~would create some type of carbon footprint as a result of their mere existence; the only reasonable questions are – where ~~will~~would they occur and ~~will~~would that location foster a greater or smaller carbon load/footprint?

The carbon loading and footprint results and detailed calculations are included in the Appendix. In summary, the Proposed Action's residential component, with mass transit, has a projected carbon loading of 2~~8~~7,~~7~~671 tons per year. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses. As a subset of these results, Proposed Action residential component with mass transit has a projected carbon consumption intensity of ~~104.54~~70.0 tons per year per 10,000 square feet. This result compares to the various scenarios/alternatives as follows:

The Proposed Action's residential component, without mass transit would have a projected carbon loading of 29,981~~456~~ tons per year. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses. As a subset of these results, Proposed Action's residential component without mass transit would have a projected carbon consumption intensity of 75.9~~108.85~~ tons per year per 10,000 square feet. Thus, the introduction of mass transit reduces the carbon footprint by approximately ~~4~~8 percent.

The alternative, single family residential subdivision, with mass transit would have a projected carbon loading of 50,441 tons per year. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses.

[5] Tons of carbon are a factor of about 4 times less than CO_2 equivalents based upon the appropriate molecular weights.

As a subset of these results, a single family subdivision with mass transit would have a projected carbon consumption intensity of 110.31 tons per year per 10,000 square feet. This is higher than the Proposed Action as it would spread development out. The difference also represents ~~5.5 percent~~no gain in carbon in efficiency created by the "Town Center."

~~As provided in Table 2, t~~The commercial ~~p~~Project components follow a similar pattern with regard to mass transit and Town Center, carbon efficiency benefits. However, on a per square foot basis, the commercial uses are more "intense" than residential uses. The office carbon emissions are projected at 6~~22~~16 tons per year and the food service/retail carbon consumption intensity are projected at 1,25~~8.8~~2 tons per year (both per 10,000 square feet). Thus, the full service carbon consumption is twice that of the office space. These results are ~~6~~9 to 1~~2~~7 times the residential results on a per square foot basis.

The existing condition is an abandoned psychiatric "health care" institution. To provide a comparison to the Proposed Action, its emission level as a functional facility (at 2.15 million square feet) with mass transit was also calculated and projected to have a carbon loading of ~~216,562.2~~215,322.5 tons per year. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses. As a subset of these results, Harlem Valley Psychiatric Center with mass transit had a carbon consumption intensity of 1,002~~7~~ tons per year per 10,000 square feet. By any measure, this past use of the site had the largest carbon load of the project scenarios considered.[6]

Carbon Footprint

Transitioning from a carbon "emissions" calculation to a carbon footprint raises the concept of carbon sequestration. Carbon sequestration is largely the result of the photosynthetic activity of plant life on this planet, which converts gaseous CO_2 to carbon-based tissues. This sequestration begins at the level of single cell algae and continues up to the largest tree. To the extent the algae and, especially the larger plant species, concentrate this biomass (and so, carbon) within themselves and then more "slowly" release it back to the environment upon their death, carbon accumulates within natural ecosystems.[7]

In this case, since the ~~p~~Project is in the Mid-Atlantic/New England biome, the carbon sequestration comparison method chosen was "treed" acreage. The Proposed Action's and alternatives' CO_2 emissions were reduced to tons and then calculated in equivalent acres. The equivalent acres were then compared to the site acreage to show (a) the footprint in relation to the site and (b) the footprint in relation to all analyzed alternatives.

The site ~~conditions sum~~contains approximately 937 acres. A carbon minimum and maximum sequestration per acre (occurred to be biologically active) was calculated and the minimum was used to provide a ratio to the existing ~~p~~Project ~~s~~Site.

[6] However, it had~~A~~ lesser carbon consumption intensity then food service retail.

[7] Other sequestration mechanisms occur which are man-made but only the dominant, natural mechanism is relied upon in this analysis.

The Proposed Action with mass transit has a projected carbon footprint of 13,~~882~~570 acres. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses. As a subset of these results, Proposed Action with mass transit has a projected carbon footprint ratio of 14.~~8~~5. This result is the lowest of all the "alternative" scenarios compared to the various scenarios/alternatives as follows.

The Proposed Action without mass transit would have a projected carbon footprint of 14,651~~449~~ acres. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses. As a subset of these results, Proposed Action without mass transit would have a projected carbon footprint ratio of 15.~~4~~6.

The single family, standard residential subdivision with mass transit would have a projected carbon footprint of 19,2~~50~~62 acres. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses. As a subset of these results, single family, standard residential subdivision with mass transit would have a projected carbon footprint ratio of 20.6.

Finally, the use of the site for a health institute with mass transit had a projected carbon footprint of 53,831~~4,151~~ acres. This includes both the per capita/per square foot operational elements and transportation projected to result from these uses. As a subset of these results, the use of the site for a health institute with mass transit had a projected carbon footprint ratio of 57.4~~8~~. This result compares to the various scenarios/alternatives as that use with the highest carbon consumption by a factor of three to four times.

Carbon Emissions – Construction

CO2 equivalent emissions were estimated in a preliminary fashion for a number of construction components of the proposed action and two scenarios for comparative purposes. The different construction alternatives were not "adjusted" for the use of mass transit as this is expected to be unused in the production or transport of construction materials at this Project. Further, the Project is in the early stages of site planning. Thus, while building locations uses, type and sizes are established, building materials, volumes and sources of each are not well established.

To allow for an equivalent comparison of each buildings type to the other, only one construction material, concrete, was considered at present. Concrete was chosen because it has the largest net CO2 equivalent emissions (i.e., CO2 equivalents for production minus CO2 equivalents for sequestration) of all materials that could be used. For example, its CO2 equivalent emissions are 105 times higher than a ton of steel[8] (before even counting the lower "tonnage" of steel generally required for construction of the same structure). This effect creates an environmentally conservative result because construction with other materials would yield lower CO2 equivalent emissions. Finally, the existing psychiatric buildings are dominantly of concrete/brick construction; many

[8] Per USEPA's 2009 Draft U.S. Greenhouse Gas Inventory.

would be re-used by the Project. As such, the mitigating factor represented by this re-use is more readily calculated and so, demonstrable.

The construction CO_2 equivalent emissions were separated from the Project's operational emissions. This was done for several additional reasons. First, it would be a "one time" factor; second, these CO_2 equivalent emissions ultimately are much less precise (see above planning discussions) than the operational CO_2 equivalent emission estimates. Therefore, these estimates are for comparative purposes only. The results are presented in Table 4 in the Carbon Emission and Footprint Analysis in the Appendix[9].

The construction of the residential space ranked lowest in the CO_2 equivalent emissions per 10,000 square feet at 206.5 tons. However, as the square footage for the residential components of the Project is approximately 2,752,000 square feet, the Project CO_2 equivalent emissions are estimated at 56,843 tons. Comparisons to the alternative single family results shows it to be higher, at 94,45 tons as the square footage constructed with that alternative would also increase. The highest emissions, in terms of intensity of CO_2 equivalent emissions were for the office and community space at 516.4 tons per 10,000 square feet. However, their total CO_2 equivalent emissions for construction were much less than the residential components, at 3,615 tons and 3,976 tons-respectively, because these uses would build only 70,000 square feet and 77,000 square feet-respectively (i.e., only 2.5 and 2.7 percent of the total residential space planned for the Project, respectively).

For comparative purposes, the construction of the existing psychiatric facility buildings had the highest intensity of CO_2 equivalent emissions at 723 tons per 10,000 square feet and, therefore, the highest total CO_2 equivalent emissions at 155,429 tons for 2,150,000 square feet.

The Proposed Action would "preserve" and reconstruct some 413,439 square feet of the existing psychiatric facility buildings. This plan would result in a significant CO_2 equivalent emission savings (i.e., mitigation) for the Project. This plan would "recycle" 98,552 square feet or 3.5 percent of the proposed residential square footage. This would "save"10 some 4,000 tons of CO_2 equivalent emissions versus building on a previously undeveloped site. This is especially true for the proposed action's commercial and community space where the majority of these uses would be placed in the "recycled" psychiatric buildings. Given that re-use, the Proposed Action would save approximately an additional 12,000 tons of CO_2 equivalent emissions versus building on a previously undeveloped site.

[9] Data regarding the use of concrete for various structures was derived from the Portland Concrete Association Case Studies.