CDM

New York City Department of Environmental Protection

Greenhouse Gas Management Feasibility Study

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Final Report

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Introduction

1.1 Feasibility Study Purpose and Objectives

The New York Power Authority (NYPA) and Camp Dresser & McKee Inc. (CDM) conducted a **Greenhouse Gas Mitigation Feasibility Study** for the New York City Department of Environmental Protection (NYCDEP). This **Feasibility Study Report** is the first phase of a larger project, of which Phase 2 will consist of developing a GHG emissions inventory for the agency and detailed greenhouse gas (GHG) emission management plans.

The Feasibility Study ("Phase 1") tasks have focused on assessing the sources, quality, and availability of GHG emissions data, as well as identifying objectives, processes, and structures for creating facility specific GHG management plans. Objectives of this study included the following:

- Review existing emissions data sources for quality and data gaps;
- Catalog sources of GHG emissions and potential emissions sinks;
- Evaluate tracking systems for GHG inventories and reporting;
- Identify energy-efficient and low-GHG-emitting design standards that can be incorporated into capital plans for new facilities and facility retrofits; and
- Outline the structure and objectives of facility-specific GHG management plans.

Phase 2 of the GHG mitigation initiative will include preparation of an agency-wide GHG emissions inventory, development of facility-specific GHG management plans, and development of systems and proper protocols for GHG emission reductions tracking and potential reporting schemes.

1.2 NYCDEP Climate Change Initiatives

The NYCDEP is committed to managing, and reducing where practicable, GHG emissions from NYCDEP-owned facilities and operations. The NYCDEP Climate Change Task Force ("Task Force") identified potential impacts of climate change on NYCDEP facilities and recommended strategies for adapting NYCDEP's infrastructure and operations to address the impacts of climate change; these recommendations were based on recent studies by the Columbia Earth Institute and NASA Goddard Institute for Space Studies (Rosenzweig 2001).

The Task Force also recommended the development of a strategy for greenhouse gas reduction. In response, NYCDEP is supporting this initial feasibility study for an agency-wide greenhouse gas inventory and management plan.

NYCDEP's long-term goal is to develop an agency-wide GHG Inventory and Management Plan, and to realize GHG reductions through large facility GHG

planning, focusing on the Water Pollution Control Plants (WPCP) and other large facilities, coupled with the agency's Ten-Year Capital Plan for each WPCP facility. GHG reductions would be implemented over the long term, integrated with facility upgrades and new facility designs.

1.3 New York City GHG Commitments

New York City government has a history of demonstrating local leadership on climate change. NYCDEP's pioneering efforts in adaptation planning, together with the City of New York's increasingly ambitious commitments to address GHG emissions and climate change (see **Table 1.3-1**), have resulted in New York City's position as a leading local government on the issue of global warming:

- In 2001, New York City joined the international Cities for Climate Protection ™ campaign (Res. 1923-2001) and is an active member of ICLEI-Local Governments for Sustainability (ICLEI), a non-profit association of local governments working to reduce greenhouse gas emissions and to promote sustainable development;

- In 2005, Mayor Bloomberg committed to a 7% reduction of GHG emissions from 1990 inventory levels by 2012 under the U.S. Conference of Mayors Climate Protection Agreement, lead by Seattle Mayor Greg Nickels. This initiative has recruited over 400 U.S. Mayors in 50 states, representing over 66 million Americans, to commit to GHG emissions reductions;

- Mayor Bloomberg's Office of Environmental Coordination set a more aggressive goal than the U.S. Conference of Mayors Climate Protection Agreement of a 20% reduction from 1995 GHG emissions by 2010; and

- In December 2006, the City of New York proposed a 30% reduction in GHG emissions from 2007 by 2030, one of ten citywide goals announced under the newly launched PLANYC, a plan to make New York the most sustainable city.

Table 1.3-1 New York City GHG Emission Reduction Targets

Program	Reduction Target	Schedule
Mayor's Office of Environmental Coordination	20% reduction from 1995 baseline inventory levels	By year 2010
U.S. Mayors Climate Protection Agreement	7% reduction or greater from 1990 levels	By year 2012
PLANYC	30% reduction from 2007 levels	By year 2030

Although these initiatives neither mandate NYCDEP action nor dictate any agency-specific emissions reduction targets, NYCDEP views GHG emissions as an important issue to consider for long-term planning. NYCDEP's fourteen WPCPs have been identified in a prior GHG study as potential significant sources of GHG emissions, and as such, provide significant opportunities for GHG reductions (NYCDEP 2007). NYCDEP is also evaluating existing infrastructure, future population growth, water conservation efforts, as well as identifying opportunities to encourage more energy efficiency throughout the City's facilities. The purpose of this Feasibility Study is to identify available data and tools for NYCDEP's GHG emission planning and proactive management. This GHG emission mitigation work will continue NYCDEP's environmental leadership, similar to their pioneering efforts in climate change adaptation planning.

1.4 Feasibility Study Report Outline

This Feasibility Study Report is organized into two main sections – Emissions Accounting and Emissions Management – followed by a concluding section containing recommendations and considerations for conducting an agency-wide GHG inventory for 2005 and developing facility-specific management plans.

Section 2: Emissions Accounting

The second section of the report describes the quality, completeness, and availability of GHG data from prior studies, and gives an overview of major sources and sinks, as well as options for emissions tracking going forward. The assessment of emissions data and challenges includes an overview of emissions accounting principles; a review of the 1995 baseline inventory data; an assessment of the availability and quality of data available for 2005 emissions accounting; a summary of carbon sink data and appropriate estimation methods; a catalog (list) of 2005 emissions sources and sinks organized by facility type; and an evaluation of emissions tracking methods and software alternatives.

Section 3: Emissions Management

The third section of the report provides an overview of GHG management planning and a suggested plan and process structure for NYCDEP facility-specific planning. This section includes an introduction to the best practices and benefits of GHG management planning; an outline of the structure for facility-specific GHG management plans; and an assessment of opportunities for incorporating energy efficiency and renewable energy into facility retrofits and new construction.

Section 4: Conclusions

The final section of the report concludes with a summary of the major findings of the Feasibility Study and a recommended strategy and approach for Phase 2 of the project, updating the GHG inventory and developing facility-specific management plans.

1.5 References

NYCDEP Climate Change Task Force. Report Pending Regarding Adaptation and Mitigation Strategies for NYCDEP. 2007.

Rosenzweig, Cynthia and William D. Solecki, Editors. *Climate Change and a Global City: The Potential Consequences of Climate Variability and Change.* A Report of the Columbia Earth Institute for the U.S. Global Change Research Program. July 2001.

Section 2
Emissions Accounting

2.1 Introduction

Greenhouse gas (GHG) emissions accounting is an area of growing interest and concern for public managers because of the expanding opportunities in emissions reporting and GHG emission registries, the potential for carbon offsets production, and the growing pressure for GHG accountability in the public sector. Although it is quickly becoming more streamlined and standardized, the practice of GHG emissions accounting and reporting in the U.S. is still plagued with inconsistencies due to the variety of emerging policies and programs in different jurisdictions, and the disparity in reporting requirements for different public and private programs.

This section on GHG emissions accounting provides the most current information on best practices in accounting and reporting; a review of the most up-to-date standards and protocols for emissions inventories; an assessment of the NYCDEP 1995 Baseline GHG Emissions Inventory; a review of 2005 emissions sources and sinks data; a review of accounting practices for carbon sinks and sequestration; and recommendations for best practices and next steps for GHG emissions tracking and management over time.

2.2 Standards, Protocols, and Principles

The current practice of GHG emissions accounting is guided by two main sources of standards and protocols:

- The Greenhouse Gas Protocol ("GHG Protocol") of the World Resources Institute (WRI) and the World Business Council on Sustainable Development (WBCSD); and
- The technical reports and methodology guidelines of the Intergovernmental Panel on Climate Change (IPCC).

Although several programs for reporting, registering, and trading emissions exist throughout the U.S. and abroad, they are mainly based on the standards and protocols of the GHG Protocol and IPCC guidelines, which are widely accepted as best practice in GHG emissions accounting. A third standard that is specific to cities and municipal agencies was developed by ICLEI.

2.2.1 The GHG Protocol

The GHG Protocol is the pre-eminent standard for conducting a GHG emissions inventory. Launched in 1998, the GHG Protocol is a multi-stakeholder partnership of businesses, non-governmental organizations, governments, academics, and others convened under WRI and WBCSD. Its mission is to develop and promote broad adoption of internationally accepted GHG accounting and reporting standards and protocols.

The GHG Protocol Initiative provides two reference documents as well as a set of tools for all corporations and other organizations to identify, calculate, and report

GHG emissions based on the same set of standards. The GHG Protocol has been successful in establishing the "gold standard" in emissions inventories, and has guided the development of regulatory and voluntary GHG reporting and trading programs around the world. Most programs base their accounting and reporting requirements on the GHG Protocol including, but not limited to, the California Climate Action Registry, the Eastern Climate Registry (formerly known as the Regional Greenhouse Gas Registry), the EU Emissions Trading Scheme, the Chicago Climate Exchange, and the U.S. EPA Climate Leaders Program.

The GHG Protocol consists of two modules, or guidebooks, for developing GHG emissions inventories:

- The Corporate GHG Accounting and Reporting Module, first published in October 2001 (a revised edition published in 2004); and
- The Project GHG Accounting and Reporting Module, published in November 2005.

In addition to the two guidebooks, the GHG Protocol provides more than sixteen calculation tools that represent best practice with regard to calculating GHG emissions for specific industries and sectors. The calculation tools are consistent with the IPCC guidelines for preparing national emissions inventories.

Figure 2.2-1 summarizes the three different categories, or "scopes," of emissions under the GHG Protocol (adapted from the WRI GHG Protocol). As a general rule,

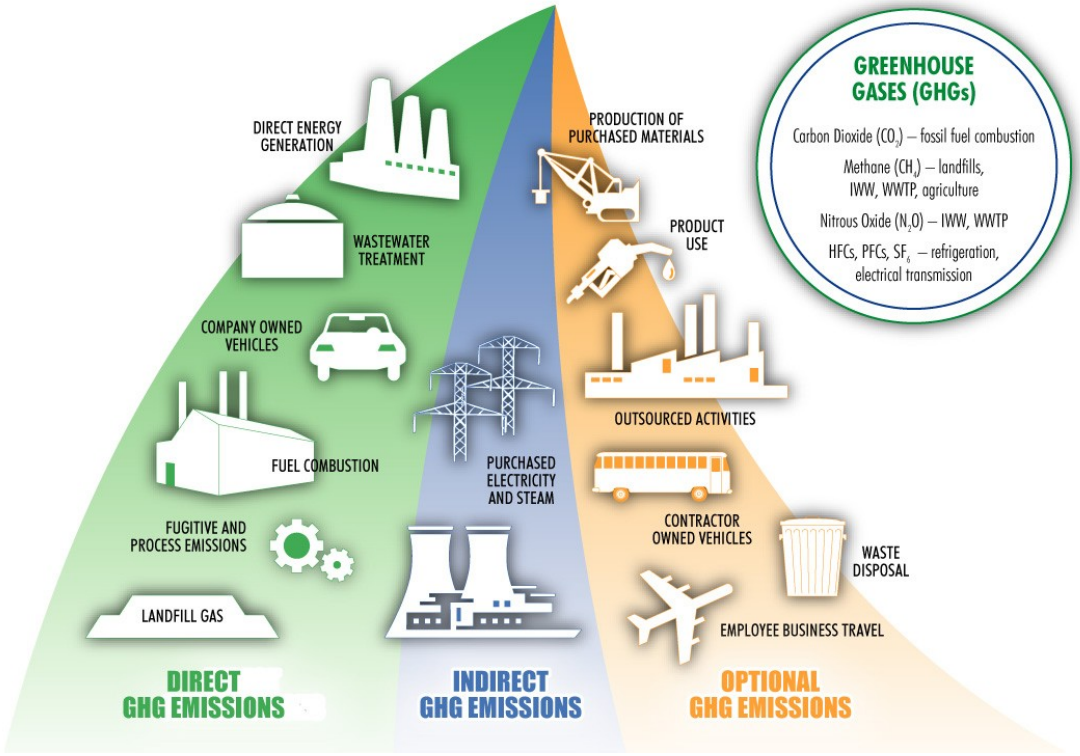


Figure 2.2-1 GHG Protocol Emissions Scopes

data for direct emissions, including direct energy generation, wastewater treatment, travel in vehicles owned by the company/organization, fugitive GHG emissions, and landfill gas, should be reported. Indirect emissions from purchased electricity and steam are also included. GHG emissions from non-company-owned vehicles or other employee travel, waste disposal, outsourced activities, product use, and purchased materials are optional to report under most programs (see **Section 2.7** for more details).

2.2.2 IPCC Guidelines and Methodology Reports

The IPCC was established by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) in 1988. The role of the IPCC is to provide independent assessments of the scientific, technical, and socio-economic information relevant to understanding climate change, its potential impacts, and options for adaptation and mitigation. These assessments are based on peer reviewed, published scientific and technical literature, compiled and reviewed by international scientific, political, and economic experts of the IPCC.

A main activity of the IPCC is to provide in regular intervals assessments of the state of knowledge on climate change. The First IPCC Assessment Report was completed in 1990. The Second Assessment Report, Climate Change 1995, provided key input to the negotiations that led to the adoption of the Kyoto Protocol in 1997. The Third Assessment Report was issued in 2001, and the Fourth Assessment Report is expected in 2007. The IPCC also prepares Special Reports and Technical Papers on topics where independent scientific information and advice is deemed necessary, and it supports the UN Framework Convention on Climate Change (UNFCCC) through its work on methodologies for National Greenhouse Gas Inventories.

IPCC Methodology Reports describe methodologies and practices for national greenhouse gas inventories and are used by Parties to the UNFCCC for preparing their national communications. The first IPCC Guidelines for National Greenhouse Gas Inventories were prepared in 1994 and revised in 1996. They are currently undergoing another major revision and new IPCC Guidelines for National Greenhouse Gas Inventories will be available in 07. In addition, the following Methodology Reports have been published:

- Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (2000);
- Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003); and
- Definitions and Methodological Options related to Inventory Emissions from Direct Human-Induced "Degradation" of Forests and "Devegetation" of other Vegetation Types (2003).

These documents provide additional guidance for national and corporate emissions accounting, and are considered the standard worldwide for best practice in emissions inventories.

2.2.3 ICLEI Cities for Climate Protection ™ Campaign

ICLEI is an international membership association for local governments. This non-profit organization runs the Cities for Climate Protection ™ (CCP) campaign, a program for local governments promoting GHG emission reductions. Participants in CCP are encouraged to conduct an emissions inventory with software created specifically for local government use. See **Section 2.3** and **Section 2.7** for more information about the ICLEI Clean Air and Climate Protection (CACP) software program.

Although primarily based on the same accounting principles as the GHG Protocol and IPCC standards, there are some important distinctions to note about the CCP Program:

- ICLEI emissions inventories often include the residential, commercial, and transportation sectors within the agencies jurisdiction, and do not limit inventory boundaries to operational or equity control;
- The CCP emissions inventory program also includes the solid waste sector, one that is typically not included, or optional, in other accounting programs;
- Emissions factors in the ICLEI software program may differ from IPCC and GHG Protocol (see **Section 2.3**); and
- The CCP program is policy-based and intended to aid local decision-makers. It is not intended for GHG reporting or regulatory purposes.

2.2.4 Accounting and Reporting Principles

According to the Corporate GHG Accounting and Reporting Module (WRI/WBCSD March 2004), the following principles should be applied to the process of accounting for and reporting GHG emissions:

- **Relevance** - Ensure the GHG inventory appropriately reflects the GHG emissions of the organization and serves the decision-making needs of users – both internal and external to the organization;
- **Completeness -** Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions;
- **Consistency -** Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series;
- **Transparency -** Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used; and

- **Accuracy -** Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

2.3 1995 Baseline GHG Emissions Inventory

NYCDEP completed a baseline emissions inventory for 1995 in coordination with the city-wide baseline inventory conducted under the Mayor's Office of Environmental Coordination (NYC.GOV 2007). This emissions inventory was conducted using the ICLEI CACP software, created by Torrie Smith and Associates. Although ICLEI is continuously working with organizations such as WRI and the California Climate Registry to maintain best practices in GHG accounting, it should be noted that the CACP software uses some different emissions factors than those recommended by IPCC and the GHG Protocol (Lundgren 2006).

NYCDEP's baseline inventory was initially completed by the NASA Goddard Institute for Space Studies, where the software and data were housed. Currently, the 1995 data exists in a collection of over forty Excel spreadsheets in a variety of formats on NYCDEP computers. Unfortunately, at this time the initial ICLEI software files could not be located or recovered by NYCDEP. As a result, our review of the 1995 baseline data is based on the available spreadsheet data output. Additional data from 1995 may be recovered or located for the emissions inventory development in Phase 2 of the project.

2.3.1 Data Gaps

A baseline of GHG emissions is critical to GHG management programs because it provides the starting point for measurement of progress and reductions of GHG into future years. NYCDEP 1995 emissions data provides an initial summary of GHG emissions for NYCDEP facilities; however, because many sources of data were not included, it will need to be updated to reflect a complete and accurate accounting of 1995 emissions.

The baseline inventory includes energy and emissions data from electrical power and natural gas consumption only. A review of the 1995 spreadsheet data also reveals missing electrical power and natural gas data for several large facilities including WPCPs. The following list provides an overview of the primary data gaps identified in the 1995 baseline inventory:

- Fuel oil consumption is not included. No data available for No. 2 or No. 4 fuel oils, digester gas, or any other fuel for stationary combustion aside from natural gas;
- Vehicle fleet data are not included. No data available for number of vehicles, vehicle miles traveled, or mobile fuels consumption;
- Newtown Creek WPCP and Rockaway WPCP data are not included. No data available for any energy or emissions sources at these plants;

- Natural gas consumption figures are not included for several large facilities, including North River, Owl's Head, Wards Island, and Port Richmond WPCPs; and
- No information is provided for other emission sources or emissions sinks:
  - Digester gas flares;
  - Potential refrigerant emissions;
  - Fugitive emissions such as digester gas leakage; or
  - Carbon sinks including permanently protected forests.

Table 2.3-1 provides a summary of the GHG emissions data available from the 1995 baseline emissions inventory, organized by facility and source type.

2.3.2 Recommendations

There are two important aspects to setting a baseline year for GHG inventories: timing and the representation of emissions over time (Loreti 2000). Timing refers to the baseline year in which an organization begins to track its emissions and the year against which future progress is measured. The second aspect refers to how an organization chooses to measure, track progress, and communicate their emissions and reduction goals – either through absolute emissions reductions or normalized measures. Normalization is typically achieved by measuring emissions per dollar of revenue or emissions per unit of product, and is the preferred method for organizations experiencing significant growth in operations or production.

Despite the 1995 energy and emissions data gaps, the city-wide effort to reduce emissions through the Mayor's Office of Long-term Planning and Sustainability is based on the 1995 baseline year. Although NYCDEP may want to keep this data as a reference for future city-wide initiatives, it may be more accurate and efficient to use a separate baseline year for NYCDEP's GHG management plans.

In order to compare 2005 emissions to the baseline inventory, NYCDEP will need to amend the 1995 inventory by either locating appropriate historical data sources or estimating the missing emissions. The data gaps can be addressed by estimating energy use and emissions based on verified emissions data from 2005 and known growth factors and facilities upgrades over the past ten years. **Table 2.3-1** provides initial recommendations for preparing these estimates to complete the 1995 inventory; however, these suggested methods of estimation will depend on 2005 data as well as known facility and equipment changes since 1995. **Section 2.4** provides detailed information about the 2005 energy and emissions data available to aid in this analysis.

It is also recommended that NYCDEP consider developing a normalization factor for tracking and reporting their emissions over time, in order to account for new facility construction and the respective growth in emissions expected from facility expansion. Such normalization factors would enable NYCDEP to communicate progress outside of absolute annual emissions. Some examples of normalization factors that may be suitable for NYCDEP include gallons of water supplied or treated, or amount

Table 2.3-1 1995 GHG Emissions Data Availability Organized by Type of Emissions Sources or Sinks

Facility Type	1995 Data Status and Content Description	Time Period: Calendar Year (CY) or Fiscal Year (FY)	Criteria air pollutant emissions provided?	Fuel data included = NG, N2, N4, GA, DI, EL, DG	Fugitive emissions data included?	Refrigerant emissions data included?	Recommendations for 1995 Emissions Inventory Completion
Major Facilities	All electric and natural gas accounts are organized by address in ICLEI Inventory Excel spreadsheets	CY	No	NG, EL	No	No	Locate historical fuel oil usage records, or estimate annual fuel oil consumption based on ratio of 1995 to 2005 natural gas consumption and any known fuel switching or new equipment since 1995.
Unmanned Pump Stations	All electric and natural gas accounts are organized by address in ICLEI Inventory Excel spreadsheets	CY	No	NG, EL	No	No	Locate historical fuel oil usage records, or estimate annual fuel oil consumption based on ratio of 1995 to 2005 natural gas consumption and any known fuel switching or new equipment since 1995.
Office Buildings	All electric and natural gas accounts are organized by address in ICLEI Inventory Excel spreadsheets	CY	No	NG, EL	No	No	Locate historical fuel oil usage records, or estimate annual fuel oil consumption based on ration of 1995 to 2005 natural gas consumption and any known fuel switching or new equipment since 1995. Use facility database to identify office buildings that use heating oil or other sources of fuel oil.
Other minor facilities	All electric and natural gas accounts are organized by address in ICLEI Inventory Excel spreadsheets	CY	No	NG, EL	No	No	Locate historical fuel oil usage records, or estimate annual fuel oil consumption based on ratio of 1995 to 2005 natural gas consumption and any known fuel switching or new equipment since 1995. Use 2005 complete facilities list for comparison.
Mobile Sources	Data not available						Inquire with Mayor's Office if this information was included as a percentage of overall city fleet in the city-wide 1995 inventory. Estimate size of fleet in 1995 as compared to current fleet, and use current mobile source emissions and size ratio to estimate 1995 historic emissions.
Emissions Sinks	Data not available						Estimate baseline of forested land ownership and conservation easements in DEP control before annual reporting on filtration avoidance began in 1997 (see **Section 2.6**).
Emissions Intensity Data	Data not available						Inquire about 1995 data on gallons of water treated or other normalization factors as appropriate (to be determined). May need to be estimated, but could provide a useful comparison to 2005.

Notes:
Fuel Data Abbreviations: N2 = No. 2 Fuel Oil , N4= No. 4 Fuel Oil, NG = Natural Gas, GA= Gasoline, DI = Transportation Diesel, EL = Electricity, DG= Digester Gas

(tonnage) of water pollutants removed.

2.4 2005 GHG Emissions Data Review

Emission sources and sinks data were collected for 2005 in order to assess the current state of NYCDEP data available to conduct a current emissions inventory. Although this Feasibility Study does not include the calculation of GHG emissions or conducting the GHG inventory, the assessment of available data is intended to facilitate the execution of that task in Phase 2 of the project.

2005 data sources were collected and reviewed for availability, quality, consistency, and completeness. **Table 2.4-1** provides a list of the data sources reviewed, the format and content of data received, and an assessment of the required steps for preparing a 2005 GHG emissions inventory.

2.4.1 Data Gaps

The following list of primary data gaps identifies specific data needs for the preparation of a complete GHG inventory for 2005 and is also outlined in **Table 2.4-1**:

- Emissions statements including fuel consumption for all WPCP;
- WPCP fuel oil and natural gas usage and costs for calendar year 2005, as opposed to fiscal year;
- Equipment specific annual fuel use data for stationary combustion sources at each WPCP and other major facilities;
- Fuel oil use for all additional NYCDEP facilities (offices, pump stations, garages, grit chambers);
- Natural gas account data for all facilities by address; and
- Estimates for digester gas leakage from all WPCPs.

2.4.2 Fugitive Emissions and Other Greenhouse Gases

In order to prepare a complete 2005 GHG emissions inventory for current and proposed GHG registry and reporting programs (see **Section 2.7**), NYCDEP will also need to incorporate data on fugitive emissions and other GHG emissions aside from carbon dioxide and methane. Although neither type of emissions were included in the 1995 baseline inventory, it is possible to prepare estimates of these emissions for historical purposes once they have been inventoried for 2005; however, the accuracy of these estimates may always be questioned.

In addition to carbon dioxide and methane, four other greenhouse gases – those regulated by the international Kyoto Protocol – are typically included in GHG emission inventories for internal and external reporting purposes (see **Section 2.7**). **Table 2.4-2** provides a list of the six reported GHG emissions and their common sources. Although generally emitted in much lower quantities than carbon dioxide and methane, they can be critical to include in GHG inventories because of their

Table 2.4-1 2005 GHG Emissions Data Availability Organized by Type of Emissions Sources or Sinks

Facility Type	Data Source	Description of Data Needs	Data format	2005 Data Status and Content Description	Time Period = Calendar Year (CY) /Fiscal Year (FY)	Criteria air pollutant emissions provided?	Fuel data included = NG, N2, N4, GA, DI, EL, DG	Fugitive emissions data included?	Refrigerant emissions data included?	Next Steps for GHG Inventory Preparation
Major Facilities	Annual Emission Statements for NYCDEP "Major" Facilities (April 2006 for 2005 annual emissions).	Annual reports filed for major facilities include a description of air pollution sources by facility plus annual fuel consumption totals per facility.	Hard copy	Received 6 2005 Emission Statements (NC, NR, OH, TI, WI, CI)	CY	Yes	NG, N2, N4, GA, DI, DG	No	No	Do not contain equipment-specific fuel consumption - it is totaled by facility in usage/monitoring reports. Obtain usage reports from each WPCP facility.
Major Facilities	Title V air permit applications and permits	Description of air pollution sources for major facilities.	PDF files	Received from Ming Shen	CY	Yes	No	No	No	Used these data to compile major sources catalog for stationary combustion at WPCPs (See **Section 2.5**).
Major Facilities	State air permit applications and permits	Description of air pollution sources for major facilities.	PDF files	Received from Ming Shen	CY	Yes	No	No	No	Used these data to compile major sources catalog for stationary combustion at WPCPs (See **Section 2.5**).
Major Facilities	Current energy budget and fuel use information for major facilities.	Determine how/where energy consumption data kept and tracked. Determine current fuel costs.	Excel spreadsheet - major facilities only	Plants Fuel use for FY 2005 provided, need electricity figures	FY	No	NG, N2, N4, GA, DI	No	No	Obtain same data for CY 2005. Need to identify fuel oil usage at other non-WPCP facilities (see below).
Major Facilities	Electricity Account Data from NYPA	Electricity consumption for 2005 and rates for current costs.	PDF files	All NYPA accounts, annual 2005 electricity consumption	CY	No	EL	No	No	Identify DEP facilities not served by NYPA (Rockaway). Transform from PDF to excel listing of all accounts by address.
Major Facilities	Capital improvement projects since 1995	Including retrofits, new designs, fuel switching in order to tabulate actions taken since baseline.	Unknown	Not obtained	FY	No	No	No	No	Locate 10-year capital plans, facility-specific for each major plant.
Major Facilities	Digester Gas Leak Study of 4 WPCPs	Identify potential fugitive emissions for current year inventory.	12/6/2005 Report	Provides estimates of leaks from 4 WPCPs, based on potential gas production	CY	No	DG	Yes	No	Refine estimates for fugitive emissions, estimate for remaining 8 WPCPs.
Major Facilities	WPCP emissions calculations for boilers, flares and generators	Provided by Wayne Kuang for this study.	Excel workbook	Provides emissions factors and calculations for WPCP from fuel consumption	CY	Yes	NG, N2, N4, DG	No	No	Need verifiable source data. These figures not included in air permits or annual emissions reports. Identify utility account data and usage records. Emissions factors and heating values will be useful for conducting unit level emissions calculations.
Unmanned Pump Stations	List of pump stations and major equipment	Physical addresses, capacity and number of facilities needed for collecting electricity, natural gas and fuel oil consumption data.	Excel list of 94 pump stations	List includes pump station name, address, type, number of pumps and required number of pumps.	Current	No	No	No	No	Locate fuel use data from utilities by electric and natural gas accounts, identify fuel oil usage.

Table 2.4-1 2005 GHG Emissions Data Availability Organized by Type of Emissions Sources or Sinks

Facility Type	Data Source	Description of Data Needs	Data format	2005 Data Status and Content Description	Time Period = Calendar Year (CY) /Fiscal Year (FY)	Criteria air pollutant emissions provided?	Fuel data included = NG, N2, N4, GA, DI, EL, DG	Fugitive emissions data included?	Refrigerant emissions data included?	Next Steps for GHG Inventory Preparation
Office Buildings	Size of DEP staff and office facilities	Addresses, number of employees and square footage of each.	Facilities database query	Partial list available from DEP from facility database. Not all records include area or heating type.	Current	No	No	No	No	Need a single record list of all DEP non-plant office facilities by address and approximate square footage and employees at each.
Other minor facilities	List of DEP maintenance facilities and activities	For those facilities that remove or recharge refrigerants to vehicle or building air conditioners, estimates can be made of fugitive releases of HFCs and PFCs.	Facilities database query	Received DEP facilities list of 305 records. After removing WPCP and pump stations, 145 records available.	Current	No	No	No	No	Need a single record list of all DEP other minor facilities by address. Compare with other 1995 list of other facilities.
Mobile Sources	Current vehicle inventory and annual vehicle miles traveled or fuel consumed	Need number of vehicles by type (sedan, truck, hybrid) and either total miles driven or gallons of fuel consumed for 2005.	Excel list	Received BWT vehicle inventory and 2005 mileage, and overall makeup of current fleet and current mileage reading.	CY or current	No	GA, DI	No	No	Determine/estimate miles traveled in 2005 for entire fleet. Divide current mileage by vehicle's age. Identify marine fleet fuel usage.
Emissions Sinks	Current acreage and type of conservation land, by location	Square acres of DEP owned or permanently protected, forested watershed protection land for estimating carbon sequestration potentials.	PDF reports on website	Filtration avoidance reports available from DEP website for years 1998-2006.	CY	NA	NA	NA	NA	Confirm data with DEP (See **Section 2.6**). Determine appropriate sequestration rate based on forest age and species types.
Emissions Intensity Data	Number of customers served, gallons of water treated	For data normalization purposes and, if possible, for comparing 1995 and 2005 emissions.	Excel spreadsheet	Have current customers served, and spreadsheet of 2005 flow for WPCPs by month	CY	NA	NA	NA	NA	For normalization purposes, in order to compare different years of data and compare WPCPs. Potentially normalize to suspended solids removed or gallons water treated.

Notes:
Fuel Data: N2 = No. 2 Fuel Oil , N4= No. 4 Fuel Oil, NG = Natural Gas, GA= Gasoline, DI = Transportation Diesel, EL = Electricity, DG = Digester Gas.
Major Facilities are WPCPs, manned pump stations, grit chambers, and CSO facilities with Title V permits.

global warming potential (GWP), which is the relative heat-trapping strength of the gas as compared to carbon dioxide (CO_2). GWP is a measure of the relative radioactive effect of a given substance compared to CO_2, integrated over a specific time horizon (IPCC 2001). **Table 2.4-2** also shows the GWP of the six gases over a 100 year time horizon, the most commonly used time period.

Table 2.4-2 Six Greenhouse Gases and their Global Warming Potential

Greenhouse Gas	Common Sources	Global Warming Potential
CO_2 Carbon Dioxide	Fossil fuel combustion, forest clearing, cement production	**1**
CH_4 Methane	Landfills, production and distribution of natural gas & petroleum, anaerobic digestion, rice cultivation, fossil fuel combustion	**23**
N_2O Nitrous Oxide	Fossil fuel combustion, fertilizers, nylon production, manure	**296**
HFCs Hydrofluorocarbons	Refrigeration gases, aluminum smelting, semiconductor manufacturing	**120-12,000**
PFCs Perfluorocarbons	Aluminum production, semiconductor industry	**5700-11,900**
SF_6 Sulfur Hexafluoride	Electrical transmissions and distribution systems, circuit breakers, magnesium production	**22,200**

Sources: ICBE 2007, IPCC 2001 Third Assessment Report

The likely NYCDEP sources of these gases are maintenance facilities that repair refrigeration and air conditioning equipment, which contain HFCs. Since these are also ozone depleting substances, federal and state rules require that records be kept when HFCs are removed or recharged from equipment. These records could provide information for the 2005 inventory.

Fugitive emissions refer to GHG emissions that are not physically controlled, but result from the unintentional or intentional release of emissions. Methane emissions from a wastewater treatment digestion process is one example, in the instance that methane escapes through system leaks or is otherwise not captured and combusted.

A 2005 study provided estimates of digester gas leakage from four WPCP plants, including 26th Ward, Red Hook, Hunt's Point, and Oakwood Beach (CDM 2005). The purpose of this study was to identify system improvements necessary for providing a consistent and reliable source of digester methane gas for use at the eight fuel cells that NYPA owns and operates at these four plants. The study estimated the amount of digester gas produced at each WPCP, subtracted the known amount combusted in boilers and flare, and estimated the difference to be leakage. **Table 2.4-3** summarizes greenhouse gas emission calculations for those fugitive emissions.

NYCDEP also prepared estimates of fugitive emissions for all fourteen WPCPs for the purpose of GHG emissions estimation, and this data will be used to develop the GHG inventory in Phase 2 of the project. It should be noted, however, that in **Table 2.4-3**

and the NYCDEP calculations, these potential losses are based on solids loads to the anaerobic digesters and estimated gas production versus actual measured gas usage or wasting, and are not measured gas leaks.

The calculations of GHG emissions in **Table 2.4-3** were prepared assuming a standard methane content of sixty percent for digester gas. The 2005 report provided low and high estimates for digester gas leakage for the four WPCPs based upon identified visible cracks and leaks in the systems, the potential for digester gas production based on the volatile solids destruction, and a rate of 15 cubic feet of gas per pound of volatile solids destroyed in the digester. Any available usage rates, such as flow meter data, were subtracted from the theoretical production rate to quantify the total potential gas leakage.

Table 2.4-3 Estimated Fugitive GHG Emissions from 2005 Study of Four WPCPs

WPCP	Biogas (cf/year)		Carbon Dioxide (metric tons/year)		Methane (metric tons/year)		GHG Emissions ($MTCO_2E$/Year)	
	Low	High	Low	High	Low	High	Low	High
26th Ward	365,000	83,950,000	6	1,492	4	966	103	23,710
Hunts Point	365,000	365,000	6	6	4	4	103	103
Red Hook	1,003,750	18,250,000	18	324	12	210	283	5,154
Oakwood Beach	730,000	18,250,000	13	324	8	210	206	5,154
Total	**2,098,750**	**120,815,000**	**43**	**2,146**	**28**	**1,390**	**695**	**34,121**

Note: $MTCO_2E$ = Metric Tons Carbon Dioxide Equivalent

All of the potential gas losses in the table are considered fugitive emissions for 2005 and are not appropriate data for inclusion in the 1995 baseline emissions inventory data. The system leaks are the result of the condition and age of equipment, and it cannot be assumed that these leaks existed in 1995. In order to estimate fugitive digester gas emissions for the 1995 baseline inventory, NYCDEP will need to examine past records of volatile solids destruction rates and digester gas use while considering the age of the systems at that time, and improvements that were made to the systems. This estimate may be difficult to quantify and it should be noted that all estimates given above and those estimated by NYCDEP are based on potential, not actual, leakage.

2.4.3 Recommendations

Compared to the 1995 baseline inventory data, the data available for 2005 energy use and emissions is much more detailed and complete for GHG inventory purposes, enabling NYCDEP to conduct an accurate, regulatory-quality emissions inventory in Phase 2 of the project. The recommendations for obtaining the missing fuel use and emissions data provided in **Table 2.4-1** will be a necessary first step for Phase 2. It is also necessary to identify potential sources of the four other greenhouse gases

commonly reported, in addition to carbon dioxide and methane, as well as complete fugitive emissions estimates for all fourteen WPCPs.

2.5 Organizing Emissions Data

An important first step in preparing an emissions inventory is developing an understanding of the types of facilities, emissions sources, and sinks to be included, and the specific stationary combustion equipment for which emissions must be considered and accounted. This section provides an overview of NYCDEP facilities, major emissions sources at WPCPs, and recommendations for organizing emissions data for GHG inventory and management purposes. Following best practices in the organization of emissions data will facilitate efficient data collection and management over time, and is crucial for regulatory, reporting and data verification purposes.

2.5.1 Facility Types

NYCDEP owns and operates several hundred facilities. These include a variety of types that cover a large geographic area, from New York City to water supply facilities upstate, including WPCPs, manned pump stations, unmanned pump stations, grit chambers, combined sewer overflow (CSO) facilities, shafts, gatehouses, office buildings, vehicle fleets, and more. In addition, new water treatment facilities are being constructed and will be on line within the next few years. The list below provides a partial representation of the types and approximate numbers of NYCDEP facilities:

- 14 WPCPs (2005);
- 6 large pump stations, grit chambers, or CSO facilities (2005);
- 94 unmanned pump stations (2005);
- 9 gatehouses (1995);
- 15 grit chambers (1995);
- 31 regulators (1995);
- 43 shafts (1995);
- 9 office buildings (2005); and
- 2,150 vehicles (2005).

This is an incomplete listing of facilities based on the information available from 1995 and 2005 data, as noted. According to the 1995 data, approximately 400 facilities are listed by address, and about fifty-five of those are upstate facilities. It will be critical for inventory and management purposes in Phase 2 to confirm a complete, current list of facility types and locations for 2005.

2.5.2 Major Combustion Sources at WPCPs

Major sources of emissions can be easily identified through air permits and annual emissions statements, which provide emissions estimates, equipment data, and fuel consumption data for large facilities that meet the threshold for regulatory reporting. **Table 2.5-1** provides a matrix of major stationary combustion sources at the fourteen WPCPs. This matrix was constructed from 2005 Title V air permits and emissions statements, and contains information on planned equipment replacements as provided in those documents. It is provided to illustrate the available data sources and to provide a quick overview of WPCP combustion equipment. In Phase 2 this will be updated and refined for current inventory purposes.

In addition, **Appendix A** contains a detailed list of major emissions sources at each of the fourteen WPCPs. Tables for each WPCP provide a detailed list of all stationary combustion equipment by type, size, and fuel use requirements. Planned equipment replacements or upgrades are also noted.

2.5.3 Recommendations

The 1995 ICLEI data is organized by utility account number. Emissions data should be organized by facility type to aid in data collection and management. Similar facilities will likely yield similar emissions profiles as well as similar management issues. To develop a comprehensive 2005 inventory, NYCDEP will need to develop and confirm a list of current facilities and relevant details. Once this facility list is developed, it can serve as the basis for an emissions tracking database for future years, as well as for identifying potential emissions reductions opportunities.

2.6 1995 and 2005 WPCP Emissions Summaries

NYCDEP WPCP facilities account for a majority of the agency's GHG emissions. Although not included in the scope of work for this Feasibility Study, CDM and NYPA undertook a preliminary assessment and comparison of 1995 and 2005 GHG emissions at the fourteen WPCPs, based on currently available data. These emissions summaries are intended to provide an overall depiction of GHG emissions at the major facilities and are not to be used for emissions inventory purposes. This comparison contains WPCPs only because of their large emissions profile and the data available for 2005 at this time.

The emissions summaries are based on aggregated fuel consumption and electrical power data for 1995 and 2005 as presently available, and were calculated using the ICLEI CACP software for consistency with 1995 baseline emissions inventory data. This software program uses generic emissions factors for natural gas and fuel oil, which are not based on specific equipment. In Phase 2, to create the facility-specific GHG inventories, equipment-specific emissions factors will be used where possible to provide more accurate emissions calculations. See **Appendix A** for the detailed emissions summaries and energy costs for each WPCP by fuel type.

Table 2.5-1 2005 WPCP Combustion Equipment Matrix

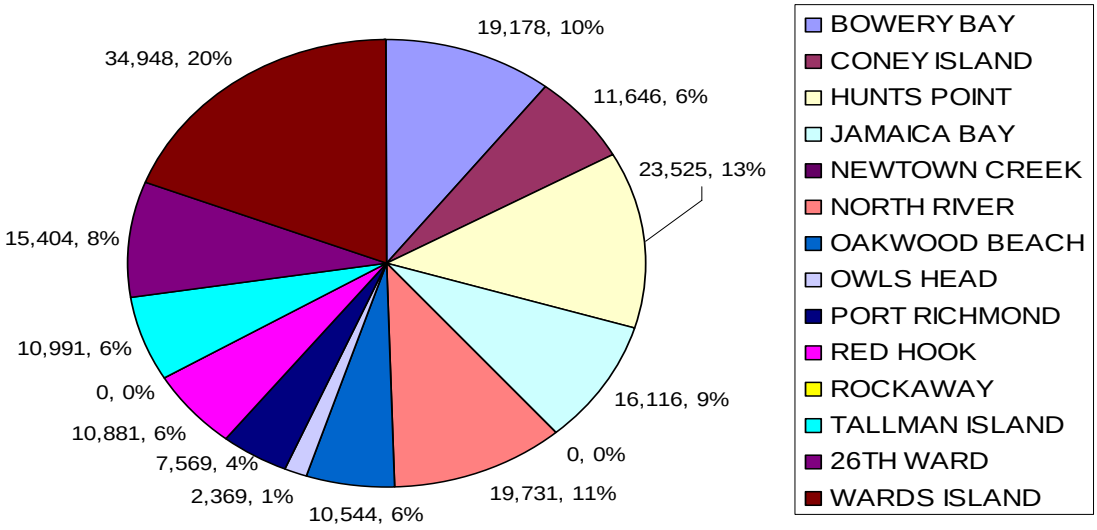
Facility Name	Year	Capacity (MGD)	Address	NYCDEP Air Permit Facility ID	Package boilers	Sludge dewater-ing boilers	Hot water boilers	Steam boilers	Boilers (non-specified)	Gas turbine generator	Engine generator	Diesel generator engines	Diesel engine	Blower engines	Pump engines	Digester gas burners (Flares)	Planned replacements in 2005 Air Permits
BOWERY BAY	1939	150	43-01 Berrian Blvd, Astoria, New York 11105	2-6301-00008		2			3			2				2	4 31.4MMBTU/hr boilers to replace 3 20.9 boilers in January 2007.
CONEY ISLAND	1935	110	2591 Knapp St., Brooklyn, New York 11235	2-6107-00004	3						4					2	None listed
HUNTS POINT	1952	200	1270 Ryawa Ave., Bronx, New York 10474	2-6007-00025	3	2				2						6	3 new flares to replace existing 5. 5 new boilers replace 4 old ones in 2005. 6 emergency diesel generators to replace existing 2.
JAMAICA	1943	100	150-20 134TH St., Jamaica, Queens New York 11430	2-6308-00021	3	2					2					2	3 700bhp package boilers (one standby) will be constructed on 7/12/2005 to replace 3 400bhp boilers. 3 new 150 bhp boilers will be constructed on 4/12/2007. 3 new waste digester gas burners will replace 2 existing gas burners.
NEWTOWN CREEK	1967	310	329 Greenpoint Ave., Brooklyn, New York 11222	2-6101-00025				3		4	2					3	2 350HP gas fired boilers to be installed during interim upgrade. 9 29.5MMBTU/HR Cleaver Brooks boilers to replace existing 3 boilers and 2 interim boilers. 4 enclosed flares will replace 3 existing flares.
NORTH RIVER	1986	170	725 W. 135TH St., New York, New York 10027	2-6202-00007			4				1			5	5	1	None listed
OAKWOOD BEACH	1956	39.9	751 Mill Road, Staten Island, New York 10306	2-6404-00065		2			3			3				3	2 800kw diesel generators to be replaced with 1000kw diesel generators
OWLS HEAD	1952	120	6700 Shore Road, Brooklyn, New York 11220	2-6102-00005					5		3		1			2	55 kw Stirling engines to be installed as pilot project
PORT RICHMOND	1953	60	1801 Richmond Terrace & Bodine St., Staten Island, New York 10310	2-6401-00012			2		2		1		1			2	None listed
RED HOOK	1987	60	63 Flushing Ave., Unit 101, Brooklyn, New York, 11205-1069	2-6101-00023					3			2				1	2 rental 2000kw diesel generators to be replaced with permanent 2000kw diesel gen.
ROCKAWAY	1952	45	106-21 Beach Channel Dr., Rockaway, New York, 11694	2-6309-00003	2							2				1	2 emergency diesel generators (800kw, 1000Kw) to be replaced by 9/04 with 2 1000kw generators
TALLMAN ISLAND	1939	80	127-01 Powell Cove Blvd., & East River, College Point, New York 11356	2-6302-00012					0		2			5	5	2	5 blower engines scheduled for replacement with high efficiency, clean burning engines by 2003. 5 pump engines to be replaced by electric motors by 2008.
26TH WARD	1944	85	122-66 Flatlands Ave., Brooklyn, New York 11207	2-6105-00009	3	2			1	2		1	1			3	Plant will be installing 9 pump engines and trailer mounted boiler for repairs to sewage pump and boiler.
WARDS ISLAND	1937	275	Wards Island, New York 10035	2-6203-00005			2	1				4				1	Plant's non-functioning gas flare burner is scheduled to be replaced.

Source: 2005 Air permits and air emissions reports provided by NYCDEP

2.6.1 1995 WPCP Emissions

1995 GHG emissions data for WPCPs are provided in **Figure 2.6-1**. As discussed in **Section 2.3**, the 1995 inventory did not include any emissions data for fuel oil usage. The WPCP data for 1995 also omits data for Newtown Creek and Rockaway WPCPs. Total GHG emissions calculated for 1995 WPCPs are 182,902 metric tons carbon dioxide equivalents ($MTCO_2E$). This differs from previous inventory 1995 summary reports in unit only; although previous reporting and analysis for 1995 was shown in

Figure 2.6-1 1995 WPCP GHG EMISSIONS ($MTCO_2E$)

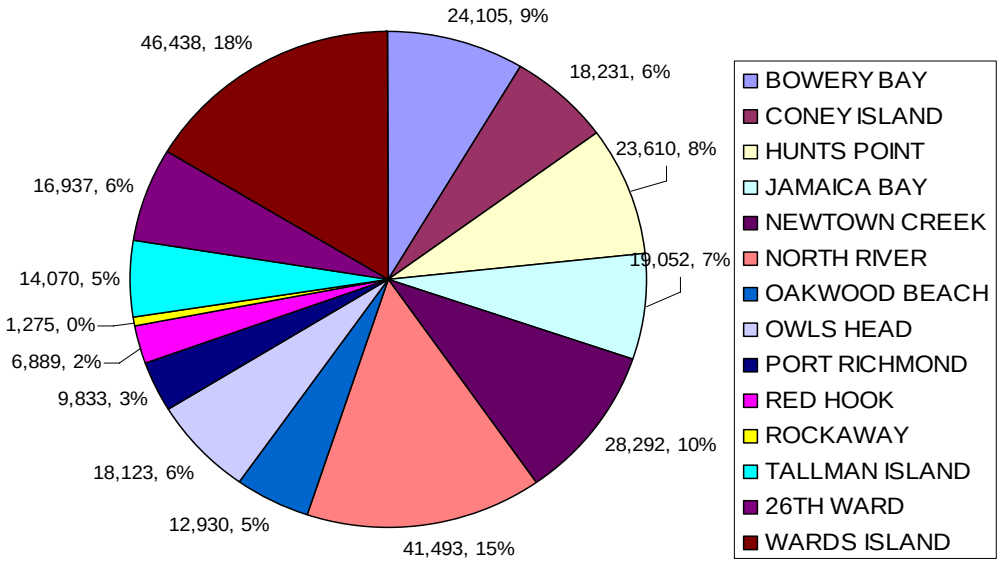


short tons or metric tons, $MTCO_2E$ is the standard unit for GHG emissions inventories.

2.6.2 2005 WPCP Emissions

The total GHG emissions in 2005 from WPCPs are much higher than 1995 at least in

Figure 2.6-2 2005 WPCP GHG EMISSIONS ($MTCO_2E$)

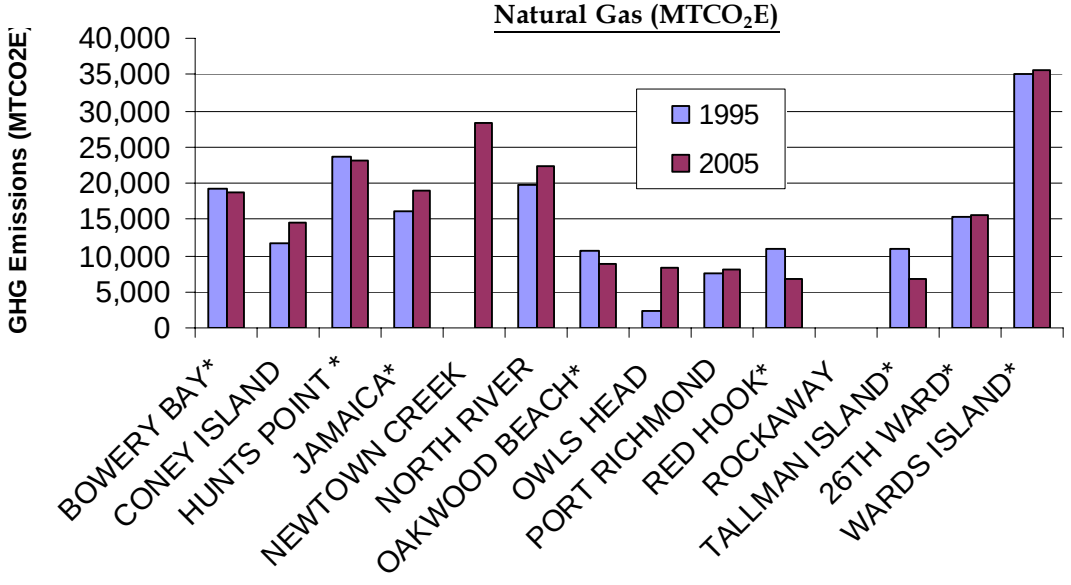


part because they include emissions from fuel oil combustion; the total WPCP emissions for 2005 is 281,278 $MTCO_2E$. **Figure 2.6-2** shows the GHG emissions at each WPCP, and detailed emissions summaries are provided in **Appendix A**.

2.6.3 WPCP Comparison

It is not possible to equitably compare the data available for 1995 and 2005 WPCP emissions, given the lack of fuel oil data for 1995.; however, to provide a preliminary comparison, the GHG emissions from only natural gas and electricity consumption for years 1995 and 2005 are compared in **Figure 2.6-3**. The total GHG emissions for 2005 WPCPs from natural gas and electricity are 215,410 $MTCO_2E$. Compared to the 1995 total of 182,902 $MTCO_2E$, this represents a 32,508 ton, or 18% increase, over 1995 WPCP emissions. **Figure 2.6-3** shows which WPCP emissions decreased (Red Hook, Tallman Island, Oakwood Beach, Hunt's Point, Bowery Bay) and which increased from 1995 to 2005 based on natural gas and electricity consumption (Coney Island, Jamaica, North River, Owl's Head, Port Richmond, 26th Ward, and Wards Island). The 18% overall increase in GHG emissions could be almost entirely attributable to the omission of Newtown Creek and Rockaway WPCPs in the 1995 emissions inventory data. The difficulty in comparing 1995 and 2005 emissions helps to emphasize the importance of complete, accurate, and consistent emissions inventory practices.

Figure 2.6-3 1995 and 2005 WPCP GHG Emissions From Electricity and Natural Gas ($MTCO_2E$)



*Note: Starred WPCPs have Dewatering Facility

2.7 Carbon Sequestration and Carbon Sinks

As a component of preserving New York City's water supply through watershed protection, NYCDEP purchased and protected thousands of acres of land within the 1,969 square miles of the New York City Water Supply System (NYCDEP BWS 2006). Much of this acquired land is forested, which can potentially be accounted for in NYCDEP emissions inventory as a carbon sink, or a net emissions reduction. In

addition, NYCDEP is planting trees on a number of large, closed landfills, and this could potentially also be included as carbon sinks in the emissions inventory. Although there are very few examples to draw from for incorporating forest carbon sinks in an entity level GHG emissions inventory, this section provides information on the latest guidance available and recommendations for consideration for both the 1995 and the 2005 emissions inventories.

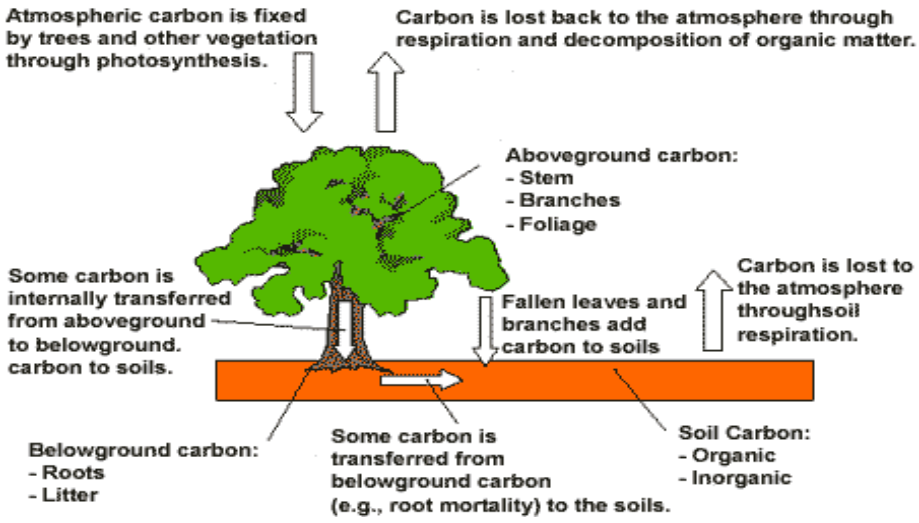
2.7.1 Introduction

Carbon sequestration is the process of incorporating atmospheric carbon into plants, soils, and water. Those resources or processes that absorb atmospheric carbon are commonly referred to as "carbon sinks" because of their ability to absorb, as opposed to emit, GHG emissions. Practices and processes that sequester carbon dioxide from the atmosphere include:

- Conservation of riparian buffers;
- Conservation tillage on croplands;
- Grazing land management;
- Afforestation;
- Reforestation;
- Forest preservation or avoided deforestation;
- Forest management;
- Underground geologic depositories; and
- Oceanic uptake.

Sequestration occurs in forests and soils primarily through photosynthesis. Carbon dioxide in the atmosphere is incorporated as fixed carbon into the roots, trunk, branches, and leaves of trees, with roughly fifty percent of tree carbon storage occurring in the woody biomass (EPA 2007). Carbon is released to both the soil and the atmosphere when the biomass decays. **Figure 2.7-1** shows the processes through which trees and soils gain and lose carbon. Soil carbon pools in forest lands and croplands can increase or decrease depending on inputs from plant-fixed carbon in leaves, stems, and roots; human-related inputs (e.g., fertilizer); and type of management practice (e.g., conventional vs. conservation tillage) (EPA 2007a).

Figure 2.7-1 Carbon Sequestration in Trees and Soil



Source: EPA 2007a

Several factors affect how much carbon trees can absorb, including tree size, age, and species. A mature tree can absorb up to 48 pounds of carbon dioxide a year (McAliney 1993). In fact, large trees at maturity can store approximately 1,000 times more carbon dioxide than saplings (Nowak 2001). This difference highlights the importance of maintaining large tracts of healthy, mature forest, which will be much more useful in establishing carbon sinks than planting saplings. Different species of trees will also absorb different amounts of carbon dioxide (ICLEI 2006).

Another component that affects the carbon sequestration rates of forests is the amount of decomposition versus new growth occurring. If a forest is experiencing growth in the number and size of trees, it will function as a more effective sink because new growth will absorb carbon lost from decay; however, if the area of forested land is getting smaller (due to tree removal, disease, acid rain, etc.), net carbon storage will be lower, due to both a reduction of the sequestration rate and the carbon released from tree removal and uprooting, and soil disruption.

2.7.2 Calculating Emissions Sinks from Forested Land

There is growing interest in quantifying the storage capacity of carbon sinks, especially in forested land area, because of the need to quantify and reduce an organization's carbon footprint; however, current practice supports including carbon sinks in either national emissions inventories or those of forest- or agricultural-based companies, and not at the entity level for most organizations. In addition, these calculations can be difficult to perform; however, as scientific investigations continue to develop, our understanding of how carbon cycles through the environment improves. Many factors, including geographic location, temperature, humidity, and species dominance, will affect the rate of carbon sequestered by forested land in a given area.

Table 2.7-1 provides examples of different methods for carbon sequestration in forest practices, the resultant effects on greenhouse gases, and the range of carbon sequestration rates provided by the U.S. Environmental Protection Agency (EPA) (EPA 2007b). In light of NYCDEP's practice of land acquisition and forest protection, the most relevant category may be forest management for preservation, which results in avoided carbon dioxide emissions from the conservation of existing carbon stocks. Notice particularly that forests provide a very long period of carbon sequestration before becoming saturated with carbon. Secondary forests and other types of degraded forests can become effective sinks when allowed to reestablish themselves as healthy productive forestland.

Table 2.7-1: Methods and Rates for Carbon Sequestration in Forests

Key Forestry Practices	Typical definition and some examples	Effect on greenhouse gases	Carbon sequestration rate in U.S. Metric tons CO_2 /acre/year	Time over which sequestration may occur before saturating
Afforestation a)	Tree planting on lands previously not in forestry (e.g., conversion of marginal cropland to trees).	Increases carbon storage through sequestration.	0.6 – 2.6 b)	90 – 120+ years
Reforestation c)	Tree planting on lands that in the more recent past were in forestry, excluding the planting of trees immediately after harvest (e.g., restoring trees on severely burned lands that will demonstrably not regenerate without intervention).	Increases carbon storage through sequestration.	0.3 – 2.1 d)	90 – 120+ years
Forest preservation or avoided deforestation	Protection of forests that are threatened by logging or clearing for development.	Avoids CO_2 emissions via conservation of existing carbon stocks.	Based on existing carbon stock	Depends on age of existing carbon stocks
Forest management	Modification to forestry practices that produce wood products to enhance sequestration over time (e.g., lengthening the harvest-regeneration cycle, adopting low-impact logging).	Increases carbon storage by sequestration and may also avoid CO_2 emissions by altering management. May generate some N_2O emissions due to fertilization practices.	0.6 – 0.8 e) 0.2 f)	If wood products included in accounting, saturation does not necessarily occur if C continuously flows into products

Note: Any associated changes in emissions of methane (CH_4), nitrous oxide (N_2O), or fossil CO_2 not included.

a) Values are for average management of forest after being established on previous croplands or pasture.
b) Values calculated over 120-year period. Low value is for spruce-fir forest type in Lake States; high value for Douglas Fir on Pacific Coast. Soil carbon accumulation included in estimate.
c) Values are for average management of forest established after clearcut harvest.
d) Values calculated over 120-year period. Low value is for Douglas Fir in Rocky Mountains; high value for Douglas Fir in Pacific Coast. No accumulation in soil carbon is assumed.
e) Select examples, calculated over 100 years. Low value represents change from 25-year to 50-year rotation for loblolly pines in Southeast; high value is change in management regime for Douglas Fir in Pacific Northwest. Carbon in wood products included.
f) Forest management here encompasses regeneration, fertilization, choice of species and reduced forest degradation. Average estimate here is not specific to U.S., but averaged over developed countries.
g) Assumed that carbon sequestration rates are same as average rates for lands under USDA Conservation Reserve Program.

Source: EPA 2007b

2.7.3 Regulatory Context and Land Acquisition Data

In 1989, the EPA promulgated the Surface Water Treatment Rule requiring public water supply systems supplied by unfiltered surface water sources to either provide filtration or to meet a series of water quality, operational, and watershed control criteria. To meet these criteria, NYCDEP proposed a land acquisition program in 1993 along with revised watershed regulations. After years of negotiation, NYCDEP and the state and federal governments signed a Memorandum of Agreement in January 1997 that allocated $350 million in additional funding for upstate community support and provided a land acquisition permit allowing NYCDEP to purchase land in the watershed for the purpose of watershed protection and filtration avoidance. The State also approved a revision of the City Watershed Rules and Regulations in regards to land use within the watershed (NYCDEP 2007).

Maintaining healthy forest cover in the watershed is one of the most effective ways to ensure good water quality. According to the 2006 Watershed Protection Program Summary and Assessment Report, to date NYCDEP has acquired, or has under contract more than 70,000 acres of land in the Land Acquisition Program, tripling the land area acquired for watershed protection before the program began (NYCDEP BWS 2006). Although not all of this land area would likely be considered for carbon sequestration estimates, much of it is forested and may present a significant source of sequestration, or carbon sinks, for inclusion in the 2005 emissions inventory. It is also important to note that there appears to be data available, or at least known estimates, for acquired land prior to 1997, which would be necessary for inclusion in the 1995 baseline emissions inventory should NYCDEP decide to include carbon sinks as well as sources in their emissions inventories and management planning.

Further information, however, is needed to include the 70,000 acres of land in NYCDEP's emissions inventory as carbon sinks, such as:

- The location and size of forested properties;
- Species composition;
- Forest age;
- Estimates of forest cover; and
- Any management practices employed.

In addition to the most recent estimate for acres of land area purchased and protected from development by NYCDEP, several additional documents prepared by NYCDEP and the EPA provide historical information on the watershed protection program and could prove useful resources for creating a list of land areas by type for carbon sequestration estimation purposes (USEPA 2000).

2.7.4 Best Practices for Carbon Sinks Accounting

Accounting for carbon sinks in emissions inventories is an evolving practice, and one with little guidance developed to date at the organizational level. This section provides an overview of the guidance and standards currently available on

accounting for carbon sinks in emissions inventories, as well as a brief summary of the requirements for counting forestry projects as marketable carbon offsets.

2.7.4.1 IPCC Guidance

The IPCC's Good Practice Guidance for Land Use, Land Use Change and Forestry (LULUCF) provides guidance on estimation methodologies, quality assurance and control procedures, documentation and reporting, and quantification of uncertainties for carbon sinks accounting (IPCC 2003). This guidance is intended primarily for use in national GHG inventories as opposed to organizational level accounting; however, it provides the foundation for the estimation of GHG sinks on a smaller scale as used by other organizations and registries.

A preliminary element of determining carbon reductions from land use sequestration is the estimation of representative land use areas. Only broad descriptions are provided by IPCC as it is assumed each nation will use its own land use subcategories. The broad categories include forest land, crop land, grassland, wetlands, settlements, and "other." The main focus of this estimation is to determine the change in land uses over time. The actual estimation of GHG emissions sequestered or emitted is based on the following in relation to the land use categories defined by the nation or organization:

- Carbon assessments are done by the broad land use categories listed above;
- Uncertainties are also estimated and minimized where possible; and
- All emissions and calculations are reported and archived per the guidelines provided and quality control/assurance checks are implemented.

The first order approximations are calculated using **Equation 2-1**:

$$\Delta C = \sum_{ijk} \left[A_{ijk} \bullet \left(C_I - C_L \right)_{ijk} \right]$$

Where: ΔC = carbon stock change in the pool (tons of Carbon/year)

A = Area of Land (ha)

ijk = corresponds to climate type *i*, forest type *j*, management practice *k*, etc.

C_I = rate of gain of carbon (tonnes C ha^{-1} yr^{-1})

C_L = rate of loss of carbon (tonnes C ha^{-1} yr^{-1})

For purposes of this discussion, this guidance and formula for estimation can be applied to forested land acquired by NYCDEP and any land use changes in their acquisition inventory. Additional information on quantification of carbon sinks associated with wetlands, cropland, grasslands, and other land uses can be found in Chapter 3 of the IPCC Good Practice Guidance for LULUCF (IPCC 2003).

2.7.4.2 GHG Protocol Guidance

The GHG Protocol provides guidance for organizational level inventory and reduction project accounting. The LULUCF Guidance for GHG Project Accounting (WRI/WBCSD 2006) was recently developed by the GHG Protocol to supplement existing guidance on project accounting. This document provides more specific guidance and uses more appropriate terminology and concepts to quantify and report GHG reductions from LULUCF project activities.

The LULUCF guidance document focuses on reforestation and forest management, and can be used for avoided deforestation project activities, although they are not explicitly discussed. The main components of carbon sinks accounting relevant to NYCDEP as provided in this document are summarized briefly below:

- **Defining the assessment boundary:** carbon sinks under the operational control and ownership of the organization should be included in the assessment. The significance of secondary effects should be determined at this step, such as emissions from fertilizer use in afforestation projects.

- **Selecting a baseline procedure:** project-specific or performance based procedure should be selected, depending on the data available.

- **Identifying the baseline candidates:** identify alternative land uses or management practices on forestlands in a specific geographic region in a given temporal range.

- **Estimating the baseline GHG removals:** account for the carbon stocks, the change in carbon stocks, and the GHG removals associated with the baseline scenario.

- **Applying a land use or management trend factor:** estimate the rate at which land-use or management changes are occurring.

- **Estimating and quantifying carbon stocks**: identify living biomass, dead organic matter and soils to measure, and quantify through direct measurement, default values, or modeling.

- **Monitoring and quantifying GHG reductions:** to ensure that carbon sequestration is taking place, develop a monitoring and verification plan.

- **Carbon reversibility management:** intentional (harvesting) and unintentional activities (forest fires) can alter carbon stocks, and should be considered in management planning.

- **Reporting GHG reductions and net carbon stocks:** reporting requirements differ by program, and should be considered in developing data management and verification procedures.

2.7.4.3 ICLEI Urban Forestry Toolkit

The ICLEI CACP software for emissions inventories neither includes a module for carbon sinks accounting, nor do they generally advise on including carbon sinks in a municipal emissions inventory; however, given the increased amount of interest from

their local government members in including carbon sequestration in their carbon footprints and GHG reduction analysis, they recently developed guidance on this issue.

ICLEI's "Protocol for Including Urban Forestry in an Emissions Reduction Plan" focuses primarily on urban trees, or street trees, but can be applied to basic forestry sink accounting practices (ICLEI 2006). This document provides guidance on incorporating both the direct carbon dioxide sequestration and ambient climatic effects that shade, solar energy reflection, and transpiration have on energy use in an emissions inventory and reduction plan. ICLEI recommends including these emissions as "other" emissions, outside of the sectors normally included.

2.7.4.4 The Climate Registry

The Climate Registry (TCR), until recently known as the Multi-State Climate Registry, is a new organization in development to provide a GHG registry for voluntary and mandatory GHG reporting, based on the combined interest of over thirty states and organizations including the California Climate Action Registry. According to a recently released work plan, TCR is anticipating an early 2008 launch date. In a departure from existing U.S. based reporting programs at the organizational level, the MSCR has already indicated their intent to require the inclusion of carbon sinks in their GHG accounting and reporting program:

> There is significant state/tribe interest in developing a rigorous accounting framework that could also quantify and characterize CO2 removals from the atmosphere. These removals, or sinks, might include terrestrial sequestration activities (e.g. forest or agricultural soil based activities) as well as geologic sequestration. The Multi-State Climate Registry would develop a comprehensive framework for accounting and reporting for sink activities, from both a project and entity approach, as soon as reasonably feasible during implementation. (Multi-State Climate Registry 2006)

2.7.4.5 Carbon Offsets

A carbon offset is a marketable commodity that represents the reduction in GHG emissions from a specific project undertaken by an organization. In order to be considered as a "carbon offset" project, a project must meet the criteria of *additionality*. Although subject to interpretation, additionality is defined by the GHG Protocol (WRI/WBCSD 2004) as "a criterion for assessing whether a project has resulted in GHG emission reductions or removals in addition to what would have occurred in its absence." Installing energy-saving light fixtures, adopting fuel-reduction protocols, or permanently protecting forestland for the express purpose of carbon sequestration would all be examples of *additional* measures an organization could take to reduce its carbon footprint.

Because NYCDEP is acquiring land for watershed protection under rules and regulations for water supply protection, carbon sequestration from these activities cannot be considered additional; therefore, any resulting GHG emissions reductions would not apply as carbon offsets, but could be accounted for in annual emissions inventories. It is important to note that this does not rule out the inclusion of carbon sinks in NYCDEP's emissions inventory, it only prohibits the consideration of those

sinks as marketable offsets if they do not meet the additionality criterion. Although not applicable to NYCDEP at this time, the following brief discussion on existing programs and protocols for forestry carbon offsets is included for future consideration in emissions management.

Currently, the California Climate Action Registry (CCAR) accepts three types of forest projects as GHG reduction projects, including conservation-based forest management, reforestation, and conservation, or preventing the loss of forests to land use changes. Similar to other methodologies and requirements, the project must show long-term commitment to sustaining and maintaining the forest lands in order to qualify under CCAR. Also similar, what can be "counted" are those benefits in addition to the baseline or regulatory requirements already in place. For example, for a conservation project, the project must show there is no existing law or permit already requiring or allowing conservation of the proposed project area. On-going monitoring would be required to show the area has been protected.

The Chicago Climate Exchange (CCX) has also established rules and guidelines for estimating and issuing carbon offsets, or Carbon Financial Instruments (CFI™), for forest carbon sequestering. CCX has grouped eligible projects into three types: forestation and forest enrichment; combined forestation and forest conservation projects in specified regions; and urban tree planting. Key elements of project eligibility include:

- As with other emission reductions associated with CCX, eligible projects include those initiated on or after January 1, 1990; and
- Projects must show long-term commitment and sustainability.

Actual CFI™ offsets earned are estimated based on the annual increase in carbon stocks during the CCX program years (2003 through 2010). Offset quantification methodologies vary based on the project size:

- For small to medium forestation projects, carbon accumulation is estimated using carbon accumulation tables or use of direct, in-field measurement and sampling; and
- For large forestation projects, carbon accumulation is estimated using direct, in-field measurement and sampling or parameterized growth models.

2.7.5 Recommendations

Due to the potentially large amount of carbon dioxide sequestered by forested land acquired under the Watershed Protection Program, it is recommended that NYCDEP include carbon sequestration from land acquisition activities in their emissions inventory and management planning. Several items to note in considering this decision include:

- With over 70,000 acres acquired to date, tripling the amount acquired prior to 1997, the potential for claiming emissions reductions from the 1995 baseline is large, and

may help to mitigate other emissions increases in the 2005 emissions inventory since the 1995 baseline year;

- Given the emerging practices and opportunities for reporting, it is very important that NYCDEP follow the most up-to-date guidelines for carbon sinks accounting;
- Additional information and a more detailed inventory of acquired land will be required in order to provide accurate, current sequestration rates and emission sinks calculations;
- In addition, landfills that NYCDEP is presently closing and planting with large numbers of trees and shrubs could also be included in the program; and
- Although NYCDEP cannot count current land acquired under the Water Protection Program as carbon offsets because of the additionality criterion, there may be future opportunities for implementation of LULUCF projects as marketable carbon offsets.

2.8 Options for Emissions Tracking and Reporting

Emissions inventories for organizations with a large variety and number of facilities often face challenges in data collection and data management over time. This is especially important when considering registering or reporting GHG data. This section provides options for GHG emissions reporting and data management systems to aid in maintaining a relevant, accurate, consistent, complete, and transparent GHG inventory.

2.8.1 GHG Reporting and Registry Developments

A GHG registry is a database wherein companies, states, and other organizations can register and record their respective emissions and reductions of those emissions. Examples of such registries in the U.S. are the evolving Eastern Climate Registry (ECR) and TCR, CCAR, and CCX; however, CCX differs in that it requires a binding agreement for emissions reductions from its members and provides an emissions trading program to meet those targets.

Reporting of GHG emissions data serves a number of functions. The ECR states the following reasons for reporting GHG emissions with a public registry program (NESCAUM 2006):

- **Public recognition –** The public is becoming more aware of those public and private entities taking initiative against climate change;
- **Credibility and consistency –** Registry data would be verified by a neutral third party;
- **Baseline protection –** Voluntary reductions will be credited prior to enacted legislation or regulations;
- **Inventory quality and completeness –** Quality assurance that all data are complete and thorough according to accepted standards;

- **Voluntary reduction programs** – Registries can provide an organized venue to further explore emissions reduction measures;
- **Regulatory programs** – Registries can support the creation of proper legislation and provide a verifiable reporting method;
- **Technical support** – Registries contain participants and resources specific to greenhouse gases;
- **Stakeholder reference material** – Registries provide the information for investors or the public to promote positive environmental performance; and
- **Trading programs** – Should mitigation become required, registries can provide an easy, organized foundation whereby participants can trade emission credits.

Table 2.8-1 presents general descriptions and comparisons of the available registries and voluntary reporting programs relevant to NYCDEP and their program requirements. An important note about this information is that the ECR is developing the Multi-State Climate Registry in coordination with CCAR and about thirty other states, and it is anticipated that eventually there will be a single, multi-state or national registry available for both voluntary and mandatory GHG emissions reporting.

2.8.2 Challenges and Opportunities for Emissions Tracking

Tracking greenhouse gas emissions from single facilities is typically a simple task. It can be done by local personnel with spreadsheet software such as Microsoft Excel or Lotus 123. Simple facilities often have a few personnel charged with the tasks, little input data to collect, and few reporting requirements with which to comply.

However, larger facilities, and organizations with multiple facilities, often have many environmental managers, with numerous staff in charge of reporting data for numerous processes. Such facilities often have multi-discipline environmental compliance obligations, and staff from varied disciplines are required to care for their respective versions of their environmental compliance puzzle. For such facilities or organizations, environmental management software makes this task less challenging.

When undertaking environmental management (including emissions inventories) for an entire agency's facilities, especially for one as complex as NYCDEP, software can be used to incorporate technological advances in database management. These databases have the capacity to perform calculations, automatically send reminders for information, create customized reports and analyses, and perform quality assurance. Some database software providers are capable of tracking entire multi-discipline

Table 2.8-1 Greenhouse Gas Emissions Registries and Reporting Programs in the U.S.

NAME OF PROGRAM	TYPE OF PROGRAM	FOCUS (Organization, project, facility)	GASES COVERED	ORGANIZATIONAL PROJECT BOUNDARIES	OPERATIONAL BOUNDARIES	NATURE/ PURPOSE OF PROGRAM	BASE YEAR	TARGET	VERIFICATION
California Climate Action Registry www.climateregisty.org	Voluntary registry, mandatory registry in 2007, trading scheme in 2008	Organization and Projects	Organizations report CO2 for first three years of participation, all six GHGs thereafter.	Equity share or control for California or U.S. operations	Scope 1 and 2 required, scope 3 to be decided	Baseline protection, public reporting, possible future targets	Specific to each organization, recalculation consistent with GHG Protocol Corporate Standard required	Encouraged but optional	Required through certi fied third party verifier
US EPA Climate Leaders www.epa.gov/climateleaders	Voluntary reduction program	Organization	Six	Equity share or control for U.S. operations at a minimum	Scope 1 and 2 required, scope 3 optional	Public recognition, assistance setting targets and achieving reductions	Year that organization joins program, recalculation consistent with GHG Protocol Corporate Standard required	Required, specific to each organization	Optional, provides guidance and checklist of components that should be included if undertaken
WWF Climate Savers www.worldwildlife.org/climatesavers	Voluntary registry	Organization	CO2	Equity share or control for worldwide operations	Scope 1 and 2 required, scope 3 optional	Achieve targets, public recognition, expert assistance	Chosen year since 1990, specific to each organization, recalcula-tion consistent with GHG Protocol Corporate Standard required	Required, specific to each organization	Third party verifier
Chicago Climate Exchange www.chicagoclimateexchange.com	Voluntary allowance trading scheme: binding emission reduction targets for participants	Organization and Projects	Six	Equity share	Direct combustion and process emission sources and indirect emissions optional.	Achieve annual targets through tradable allowance market	Average of 1998 through 2001	1% below its baseline in 2003, 2% below baseline in 2004, 3% below baseline in 2005 and 4% below baseline in 2006	Third party verifier
The Climate Registry (formerly the Multi-State Climate Registry) In development, over 30 states in negotiations.	Policy-neutral voluntary and mandatory reporting of "regulatory quality" data, provide common reporting platform for all states/tribes.	Organization	Six	Financial or operational control, or both for U.S. operations	Scope 1 and 2 required, scope 3 optional	Ensure consistency across states/tribes, provide regulatory quality data reporting platform.	Single base year for which verifiable emissions data are available. States to determine for mandatory reporting.	Not required for voluntary reporting, but may depend on individual states/tribes for mandatory reporting.	Third party verification required for voluntary reporting. Up to states/tribes for mandatory reporting.

Source: WRI/WBCSD 2004

Scope 1: Direct combustion (stationary and mobile)

Scope 2: Indirect (purchased electricity and steam)

Scope 3: Optional (solid waste, business travel)

environmental compliance programs, including air, water, wastewater, hazardous waste, materials management, OSHA, and ISO14001.

2.8.3 Comparison of Emissions Tracking Software

There are a number of different vendors and organizations that provide software for clients to calculate and manage greenhouse gas emissions, each with different capabilities and features. **Table 2.8-2** presents a review of some different compliance and greenhouse gas tracking software available. The table lists their general use method, key features, limitations, and potential costs.

Six options are available from private vendors whose capabilities extend far beyond simple greenhouse gas emissions tracking. These companies are able to provide software to allow the purchaser to track all facets of their environmental compliance requirements, and were included in this assessment because of the expressed interest at NYCDEP in tracking criteria air pollutant emissions. These environmental management systems (EMS) provide full capacity to serve a client's compliance needs, and may be web-based to enable user access from different departments, regardless of location. Additionally, users can be tiered so that they only have access to the information for which they are responsible. These systems are often customized to meet the client's permitting and reporting needs.

The web-based systems are located on the vendor's server, and the vendor is responsible for backup, security, and software upgrades, all of which are transparent to the user.

The remaining three vendors are non-profit organizations and GHG registries that provide basic software with paid membership in their programs. These systems are specific to GHG emissions only and are limited in function and utilization as compared with the other, customizable systems. These systems will not be able to track complete environmental compliance, and they have limited data manipulation or reporting capabilities.

2.8.4 Recommendations

If NYCDEP moves forward with either updating the 1995 baseline inventory or creating a new inventory for year 2005, and developing management plans for emissions reductions, it would greatly benefit the agency to register their emissions with one of the public reporting programs for the reasons given by the ECR in **Section 2.8.1**. To maximize coverage and recognition, NYCDEP could be one of the first public organizations to voluntarily report their emissions to The Climate Registry when it is launched in early 2008, but that will depend on the schedule and project goals for NYCDEP GHG management.

Without defined criteria at this stage, it is difficult to recommend an appropriate emissions tracking system; however, if NYCDEP is requiring the use of the software for multiple departments to coordinate emissions, or if NYCDEP would be planning on incorporating multiple environmental disciplines, then an environmental management system would be recommended.

Table 2.8-2 Emissions Tracking Software

Company	AVS MIRS	Enverity	Enviance	Epoch	ESP	WebPE	CARROT (CCAR Tool)	Eastern Climate Registry Reporting Tool	ICLEI CACPS
Website	www.mirsinfo.com	www.enverity.com	www.enviance.com	www.logicalds.com	www.esp-net.com	www.webpe.com	www.climateregistry.org	www.easternclimateregistry.org	www.4cleanair.org
Online Demo (Y/N)	Yes	No	Yes	Yes	Yes	No	Yes	No	No
General									
Hosting Options (Web, Local, both)	Both	Web-based recommended	Web-based	Locally installed	Both	Web-based	Web-Based	Web-Based	Locally installed
Modular (Y/N)	Y	N	N	Y	Y	Y	N	N	N
Specific GHG Tracking	N	N	N	N	Y	N	Y	Y	Y
GHG Tracking Method	General air emissions software	General air emissions software or Custom GHG software	General air emissions software	General air emissions software	opsGHG and ecoGHG modules	General air emissions software	GHG emissions software	GHG emissions software	General air emissions software
Other Capabilities	Air, SARA, Chemical Inventory Tracking, Chemical lists, OSHA, MSDS, Training	Easily configured to support other regulatory programs (RCRA, Haz, UST, etc.)	Air, Water, Waste, SARA, ISO14001	Air, Chemical, Haz, Water, Tanks	Air, Water, SARA, Waste, Incident reporting	Air, Water, Health & Safety, Solid waste, Tanks, etc.	None	None	None
Key Features									
	Can be purchased as a package (MIRS-RELEASES)	Automatic calculations, permit limit comparisons, and threshold limits	Security; backup redundancy	"What if" scenario calculator	Specific GHG tracking software	90 Standard reports	GHG Specific	GHG Specific	GHG and Criteria Pollutants
	Easily integrates with other modules	Configurable warnings and notices	Easily upload and download data	User-defined reporting	Data Ticklers (warnings)	Handles GIS data	Public Access		Free to government officials
	Full suite of modules available	Ability to monitor staff tasks to assure compliance	Creates custom reports and forms	Detailed permit tracking	User-defined reporting	Manages all environmental programs	Ease of use		
	Confidential	Confidential	Confidential	Confidential	Customizable calculation engine	Confidential			
			Data Ticklers (warnings		Confidential				
Limitations									
	No Limitations, Fully Customizable	No Limitations, Fully Customizable	No Limitations, Fully Customizable	No Limitations, Fully Customizable	No Limitations, Fully Customizable	No Limitations, Fully Customizable	GHG Specific only, Not Customizable	GHG Specific only, Not Customizable	Not Customizable
	Training Recommended	Training Recommended	Training Recommended	Training Recommended	Training Recommended	Training Recommended			Not for regulatory purposes
									Single user based
Costs									
Initial Fee	Depends on modules purchased	$3,000	up to $180 per user depending on level of access	Depends on modules purchased	$20000 for local, $2000/mo for hosting	$15,000 + $1650/mo for 10 users	Membership Fee	Membership Fee	Membership Fee
Initial Fee Includes	Software; One year of Tech Support	Web-based application; Software updates	Tiered access	Software; 90 days for single PC, 1 yr for networked	Software; maintenance	Complete hosting solution	Online Calculations, Reporting, and Certification	Online Calculations and Reporting tools	One software installation
Annual Fee	10-20% of purchase price	$15,000	None	Maintenance fee of 15% for 2 yrs, 20% for 1 yr	20%	None	$400-4000 depending on annual budget	Membership Fee	Membership Fee
Annual Fee Includes:	Software Updates; Tech support	Optional Unlimited customer support	None	Software upgrades, tech support	All upgrades and new releases; attendance at users meeting	None	Use of online tool, training sessions, reduced conference fees and other member benefits	Unknown	Technical assistance and software training and other member benefits
Customization Fee Rate	$125/hr programmer; $185/hr project manager	1st 60 days included; $85/hr; Software bugs and feedback not charged.	User Customizable; Major integration requires separate scope/fee	Mainly user customizable; otherwise $85-$120/hr plus expenses	User Customizable; Major integration requires separate scope/fee	$100/hr ($30,000 to setup & upload data)	N/A	N/A	N/A

Advantages of using a system like this are that the entire agency's environmental reporting information is located in one accessible location, and improved efficiencies in data collection, reporting, and compliance. Such systems could initially be used for greenhouse gas reporting, and, as desired, other environmental compliance items can be incorporated into the system; however, since these systems are fairly complex and customized to the client's needs, costs may become prohibitive. It is recommended that NYCDEP meet with a few vendors to discuss their purpose and needs, and the individual vendors' capabilities and costs.

2.9 References

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Section 3
Emissions Management

Managing GHG emissions at NYCDEP facilities will be a large undertaking due to the vast number of facilities owned and operated by the department; however, the major GHG contributors are the fourteen existing WPCPs as they produce a high percentage of GHG emissions within the agency-wide emissions profile. The two water treatment facilities presently being constructed will also be major GHG contributors once they become operational. In Phase 2 of the GHG Management Project for NYCDEP, an emissions baseline will be developed and facility-specific GHG management plans will be created to identify opportunities for reduction at all facilities, and specifically at all fourteen WPCPs. This section of the report provides best practices and guidance for GHG management planning, a proposed outline for facility specific WPCP GHG management plans, approaches for incorporating energy efficiency and renewable energy into existing facilities, and considerations for new facility design to minimize GHG emissions.

3.1 Introduction to GHG Management and Planning

Creating and implementing facility specific GHG management plans will be an important and necessary step for NYCDEP facilities to meet any agency-wide reduction targets, maximize energy efficiency, minimize waste, and reduce fuel and energy costs. Multiple facility-specific management plans are preferable to a single agency plan for several reasons:

- It is easier to accurately identify and quantify the sources of GHG emissions when GHG accounting is done at the facility level.
- It is at individual facilities that specific equipment and building energy services are controlled.

In addition to the benefits of managing emissions at the facility level, several challenges will need to be addressed:

- GHG management plans must be focused on implementation and provide specific guidance and actions, as well as timelines and costs involved;
- Management plans must also be integrated into facility operations and management, and tied to NYCDEP ten-year capital plans; and
- Management plans must be flexible, responsive to changes in operations, budgets, and expenses over time; the essence of adaptive management is the integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn.

3.2 Management Plan Structure

For GHG management to be effective in reducing emissions and energy costs in both the short- and long-term, best management practices should be adopted. Best practices include establishing strict systems and common formats for monitoring and reporting data, setting guidelines on the scope of emissions, source inclusion, operational and facility boundaries, maintaining consistent internal GHG management systems at facilities in order to monitor total agency-wide GHG emissions over time, and adopting consistent annual emissions accounting and reporting practices.

The GHG management plans are intended to focus on monitoring and reducing facility-specific and equipment-specific emissions, and should include the following components:

- **Emissions inventory and trends**: including sources and sinks, goals and objectives, mitigation actions taken, historical trends, and achievements to date;
- **Forecast of future emissions**: based on past data trends, and accounting for anticipated growth, project future emissions with no action and with planned projects and emissions reductions;
- **Identify emissions reduction targets:** list and prioritize emissions management projects including fugitive emissions capture, energy efficiency, fuel switching, and carbon sinks and their potential contribution to managing GHG emissions;
- **Perform cost-benefit analysis:** rank emissions reductions opportunities based on cost for implementation and operation versus benefits of emissions and operational cost reductions.
- **Operations and maintenance:** identify the impacts of facility operations and maintenance (i.e., heating, cooling, power consumption/demands, equipment operation) on GHG emissions, and opportunities for reducing emissions outputs;
- **Personnel and training:** include facilities' personnel and their role in GHG management plan implementation, as well as any additional training required; and
- **Annual monitoring and progress reporting:** perform regular inventories to monitor progress and adapt emission reduction strategies to meet targets for emissions and energy use.

NYCDEP expects to spend over $9 million more in FY2007 on energy due to escalating fuel costs. In addition to these costs, NYCDEP's five year Capital Improvement Program (CIP) budget is over $9 billion, the bulk of which is dedicated to WPCP upgrades and new treatment plant construction (NYC Water Board 2006). These large financial commitments could be further enhanced by fully examining opportunities for energy efficiency as well as alternatives to fossil fuel energy, in order to help lower operating costs and reduce GHG emissions; however, it is critical

to link these opportunities directly to the CIP, include these energy improvement projects in the CIP planning process, and provide a mechanism for prioritizing projects and incorporating operating cost savings and GHG reductions in the selection criteria.

3.3 Energy Efficiency and Renewable Energy at Existing Facilities

Due to the large capital planning program and constant infrastructure needs, the opportunity for retrofitting equipment is ongoing across NYCDEP facilities. In order to take advantage of these opportunities to reduce GHG emissions through energy efficiency improvements and the use of renewable energy and alternative fuels, NYCDEP may need to revise some of its specifications. The process and specific methods incorporating energy efficiency and renewable energy into existing facilities will be developed in Phase 2 of the GHG Management Project. This section of the report outlines the approach and major factors to consider in developing specifications and purchasing procedures for managing GHG emissions.

3.3.1 Energy Efficiency

The approach for HVAC evaluations for energy efficiency and alternative energy reviews of existing facilities is to follow the intent of the current Building Code of The City of New York and code referenced standards. Evaluation of existing HVAC equipment, existing systems' operational efficiencies, and general HVAC design should be reviewed for energy performance. These evaluations would involve:

- Boiler efficiency assessments to evaluate opportunities to reduce GHG emissions through improved equipment efficiencies (such as high efficiency boiler systems, reduced operating temperatures and pressures, more efficient control strategies).

- Heating system efficiency assessments would evaluate opportunities to reduce fuel consumption through system design modification, system operating set point adjustments, and enhanced thermal insulation for mechanical equipment and building envelopes.

- Ventilation system assessments would evaluate opportunities to reduce fuel consumption through ventilation system design modifications, ventilation rate reduction while meeting code requirements, system operating set point adjustments, control strategy modifications, and enhanced thermal insulation for mechanical equipment and systems.

- Chiller condition and efficiency assessments would evaluate opportunities to reduce GHG emissions through replacement of equipment containing HFC's, and to evaluate possible reductions in operating energy costs through improved equipment efficiencies, through equipment replacement, system design modification, system operating set point adjustments, and enhanced thermal insulation for mechanical equipment and building envelopes.

- Assessments of operating efficiency improvements available would consider improved Operations and Maintenance, such as energy efficient motor retrofits, periodic equipment and system cleaning, HVAC system retesting and rebalancing, and HVAC system temperature controls maintenance and temperature control strategy modifications.

- Assessments of plant fossil fuel energy reduction strategies would consider heat recovery and reuse. For the technologies that produce waste heat, such as landfill gas combustion and fuel cell technologies, the waste heat stream would be evaluated for generation potential. Fully utilizing the waste heat can increase overall system effectiveness to greater than 80%.

In addition to HVAC systems, equipment specifications, operations and maintenance protocols should also address energy efficiency of motors, lighting, transformers, and emergency generators.

3.3.2 Renewable Energy

GHG management plans should also identify technically feasible, cost-effective renewable energy and alternative fuel options. This requires a thorough understanding of the "true" costs of renewable energy supplies and their application to WPCP processes, operations, and energy needs. In addition to the potential for GHG mitigation and costs, critical considerations in analyzing the potential for meeting energy demands with renewable energy include:

- Energy demand and time of use;

- Reliability of renewable energy sources and technologies;

- Ability to provide backup, emergency power during grid outages;

- Financing or incentives available from New York State, federal agencies, or other outside sources;

- Visibility and community relations; and

- Risk management and liability.

Specific tasks for identifying renewable energy opportunities at existing facilities include determining the financial basis for the analysis, conducting a broad scope analysis of all potential renewable energy options, selecting best alternatives based on financial, management and GHG criteria, and providing an in depth analysis of those selected options.

Although a wide array of renewable energy possibilities exist, NYCDEP can use off-the-shelf tools and analysis to narrow down the list based on the various electrical generation technologies, financial incentives and funding opportunities for the various technologies, and facilities' needs. The RET Screen software analysis tool is

one example that can provide the first cut financial analysis for renewable energy projects, and can significantly decrease the costs of site analysis and feasibility studies (RETScreen 2007).

3.4 Designing New Facilities for GHG Management

For new facilities and for significant upgrades of existing plants, the NYCDEP should consider the development of design standards and design specifications to minimize future GHG emissions by maximizing energy efficiency, maximizing the use of alternative energy sources where economical and practical, and by minimizing the unnecessary or inefficient use of fossil fuels where possible.

The U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) guidelines should be considered for application to future facilities and upgrades. New York City has passed Local Law 86 in October, 2005, which requires many of the City's municipal structures to achieve standards of sustainability or LEED certification in order to use energy and water more efficiently than the current codes and standards. While industrial buildings are exempt from Local Law 86's LEED rating provision, any added green design approach to buildings of this occupancy classification will benefit the owner, occupants, and public through effects on economics and the environment. Due to the unique operational needs of wastewater treatment facilities, additional design standards and specifications will need to be developed to supplement and adapt LEED or similar requirements to NYCDEP facility design requirements.

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Section 4
Conclusion

Although still in development, GHG accounting standards and reporting programs today offer improved opportunities for accurate collection and presentation of emissions data. The GHG Protocol reporting principles—relevance, completeness, consistency, transparency, and accuracy—should be taken into consideration in all accounting and reporting of data. This section of the Feasibility Study report summarizes the recommendations for emissions accounting and management planning, with an emphasis on specific actions and considerations for Phase 2 of the Project.

4.1 GHG Emissions Inventory Recommendations

Although this report provides an overview of available data sources, creating a complete GHG emissions inventory will require additional data collection beyond what was obtained for the Feasibility Study. In addition to fulfilling these data needs, NYCDEP will also need to address the selection of a baseline year for measuring progress and comparing future emissions years. The New York City Mayor's Office recommends that NYCDEP use the 1995 baseline year for the purpose of consistency with existing citywide efforts; however, due to the inconsistency and incompleteness of those data, it may be more appropriate and accurate to identify a more current year for baseline purposes. For that reason, 2005 could be used as a current baseline year since it provides the most recent, complete year of data available.

The assessment of current available data needed to complete an emissions inventory demonstrates that NYCDEP's 2005 data is more complete, accurate, and consistent than the data that was available for 1995 emissions estimates. The status of the 2005 data will facilitate and greatly enhance the quality of NYCDEP's GHG emissions inventory, and will provide a solid foundation for future emissions tracking.

An important first step for NYCDEP to manage the large amount of data from multiple facilities is to develop and maintain a list of current facilities. It is recommended that NYCDEP organize data by facility type to aid in data collection and management. Similar facilities will likely yield similar emissions profiles, and will ultimately face similar management issues. A comprehensive facility list can serve as the basis for an emissions tracking database in the future, as well as for identifying potential emissions reductions opportunities.

Another future consideration for GHG emissions accounting is the inclusion of NYCDEP carbon sinks. If the carbon absorption capabilities created by the Watershed Protection Program or other vegetated lands such as closed landfills, are to be quantified in a GHG inventory, forest carbon modeling may be necessary. NYCDEP would need to follow strict guidelines for carbon sinks accounting in order for the data to be acceptable by GHG registry standards.

NYCDEP should consider developing a normalization factor to account for facility expansion over time and the resulting growth in emissions. Examples of normalization factors that may be suitable for NYCDEP include gallons of water supplied or treated, or tonnage of water pollutants removed; however, it is noted that the agency may not be able to identify one single factor for all facilities and may elect to use different factors for various types of facilities.

Finally, it is recommended that NYCDEP consider participating in a public reporting program to take advantage of early reductions and potential offset credit trading. Registry membership would also increase visibility and public recognition of NYCDEP's effort to establish a GHG inventory and reduce emissions. The assessment of NYCDEP's achievements and goals, as well as emerging reporting program development, will serve as guidance for selecting an appropriate venue for public reporting.

4.2 GHG Management Plan Recommendations

In Phase 2 of the project, NYCDEP will create facility-specific GHG management plans for all fourteen WPCPs to focus efforts on the actions with the greatest emissions reduction potential. The plans should be focused on implementation, integrated into the CIP, and adaptive to changes in energy pricing or GHG regulations. Key components of the plans will include;

- Energy and emissions summary by source for each WPCP, including current profile plus historical trends and future projects;
- Identification and prioritization of potential equipment retrofits, including digester gas systems, and fuel switching to reduce GHG emissions;
- Screening level assessments of renewable energy opportunities;
- Description of emissions sinks and opportunities for inclusion in net emissions calculations; and
- Quantification of impacts of new construction or plant upgrades on the GHG emissions profile.

4.3 Next Steps

NYCDEP will need to resolve several remaining questions regarding goals and objectives before moving forward with Phase 2, including:

- What year will be used for the baseline emissions inventory? This will determine whether NYCDEP should attempt to complete the 1995 inventory or use a more current year for measuring progress.

- What are the objectives for public reporting? Will NYCDEP be required to report to the City in a specific format? These answers will guide the level of detail and quality of data collected.

- Will the emissions tracking database include other pollutants or environmental compliance information? Almost all of the information necessary to calculate GHG emissions is also useful in maintaining and reporting criteria pollutant emission inventories, for example. CDM recommends that if NYCDEP chooses a database approach, that it be a multi-purpose program.

After these questions have been resolved, Phase 2 will involve developing an agency-wide GHG emissions inventory for 2005 or the most recent year available, and creating GHG management plans for each of the fourteen WPCPs. Assuming the timely availability of emissions and equipment data, the selection of efficient emissions database program, and adequate resources provided for management plan development, the following timeline is provided for general scheduling purposes:

Month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Data Collection										
Emissions Inventory										
QA/QC Inventory										
WPCP GHG Management Plans										
Review & Integration with CIP and Operations										

The above schedule is intended to illustrate the potential time involved, and is based on sufficient staff and resources available. The schedule is condensed into a ten month timeframe to enable NYCDEP to expeditiously respond to increasing interest and pressure for GHG accounting and management.

Appendix A

WPCP Combustion Equipment & Emission Summaries

8-Jan-07
CONTENTS

This spreadsheet contains the following stationary combustion equipment data and relative GHG emissions, fuel usage and cost data for NYCDEP's fourteen WPCPs as available for years 1995 and 2005:

➢ **A matrix showing stationary combustion equipment at all 14 WPCP facilities and general facility information including address and NYCDEC facility numbers.**

➢ **For each WPCP, the available 1995 and 2005 GHG emissions, energy use, and costs data are compiled in a summary table. Several items should be noted here:**

- The 1995 baseline inventory only include natural gas and electricity usage and costs, and do not include fuel
- 1995 GHG emissions were converted to Metric Tons Carbon Equivalents (MTCE) from short tons for consistency with standards in GHG emissions inventories.
- The 2005 fuel usage and kWh data were converted to MTCE using the ICLEI Clean Air and Climate Protection (CACP) software, which CDM has obtained a copy of.
- Data for natural gas and fuel oil for 2005 is based on NYCDEP financial year – all other data is collected on a calendar year basis.
- Electricity cost data for 2005 is based on NYPA rates of $.052270/kWh for sewage treatment accounts.

➢ **Each WPCP worksheet also includes a detailed listing of combustion equipment, as provided by the 2005 air permit applications available from NYCDEP.**

- Those listings of combustion equipment do not include specific fuel consumption because that information was not made available at this time, and is not reported to NYCDEC.
- For the six WPCPs that NYCDEP provided annual emissions reports, the total fuel usage was recorded in the combustion equipment table, as provided in the reports.

Cells shaded in Tan are equipment that has been, or is scheduled to be replaced.
Cells shaded in Light Blue are equipment that has replaced or is scheduled to replace obsolete equipment.
Cells shaded in Lavender are insignificant sources.
Cells shaded in Rose are exempt sources.

➢ **A summary table is provided at the end of the workbook totaling the GHG emissions in MTCE, and energy costs for each WPCP for years 1995 an 2005.**

- Graphics and charts of this summary data are provided in a separate PDF document.

➢ **This file does not contain any data regarding mobile source emissions or fugitive emissions (digester gas leaks).**

Facility:	NYC-DEP 26TH WARD WPCP
Location:	122-68 FLATLANDS AVE., BROOKLYN, NY 12207
Fac. DEC ID:	2-6105-00009
Plant in operation	1944
Capacity (MGD)	85
Population served	283,428

26th WARD WPCP EMISSIONS SUMMARY - Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	**GHG Emissions (MTCE)**	**Cost**	**Notes**	**Consumption**	**GHG Emissions (MTCE)**	**Cost**	**Notes**
No.2 Fuel Oil (gals)				Not included in 1995 inventory	55,696	585	$105,822	$1.9/gal
No. 4 Fuel Oil (gals)				Not included in 1995 inventory	124,156	1,260	$198,650	
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	396,736	2,224	$315,108		49.873	2,851	$598,476	$1.20/100ft^3
Electricity (KWH)	30,921,600	13,180	$1,682,197		36,061,518	12,826	$ 1,884,936	
	TOTAL	**15,404**	**$1,997,305**		**TOTAL**	**16,937**	**$2,682,061**	

Note: 2005 non-electric consumption and costs are for FY 2005

ION EMISSIONS SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-COMBU	MBBR1	Cleaver Brooks CB350HP	Boiler	14.7	MMBtu/hr				NA				NA
1-COMBU	MBBR2	Cleaver Brooks CB350HP	Boiler	14.7	MMBtu/hr				NA				NA
1-COMBU	MBBR3	Cleaver Brooks CB350HP	Boiler	14.7	MMBtu/hr				NA				NA
TOTAL													
1-COMBU	TBLER	Trailer-Mounted	Boiler	10.5	MMBtu/hr								
TOTAL													
1-COMBU	DWBR1	Cleaver Brooks CB200-400	Boiler	16.7	MMBtu/hr								
1-COMBU	DWBR2	Cleaver Brooks CB200-400	Boiler	16.7	MMBtu/hr								
TOTAL													
1-COMBU	EGTG3	European Gas Turbines	Turbine	3500	kW								
1-COMBU	EGTG4	European Gas Turbines	Turbine	3500	kW								
TOTAL													
1-COMBU	CUMMI	Cummins Diesel Generator	Generator	350	kW								
TOTAL													
1-COMBU	BSDG1	Detroit Diesel	Engine	185	Hp								
TOTAL													
1-COMBU	WGBR-1	6" Varec Gas Burner	Flare	24000	ft^3/hr	NA	NA		NA	NA	NA		NA
1-COMBU	WGBR-2	6" Varec Gas Burner	Flare	24000	ft^3/hr	NA	NA		NA	NA	NA		NA
1-COMBU	WGBR-3	6" Varec Gas Burner	Flare	24000	ft^3/hr	NA	NA		NA	NA	NA		NA
TOTAL													
1-COMBU	HPAE1	Undefined	Pump	151	Hp								
1-COMBU	HPAE2	Undefined	Pump	151	Hp								
1-COMBU	HPAE3	Undefined	Pump	151	Hp								
1-COMBU	HPAE4	Undefined	Pump	151	Hp								
1-COMBU	HPAE5	Undefined	Pump	151	Hp								
1-COMBU	LPAE1	Undefined	Pump	151	Hp								
1-COMBU	LPAE2	Undefined	Pump	151	Hp								
1-COMBU	LPAE3	Undefined	Pump	151	Hp								
1-COMBU	LPAE4	Undefined	Pump	151	Hp								
TOTAL													

/ide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP BOWERY BAY WPCP

Location: 43-01 BERRIAN BLVD, ASTORIA, NY 11105

Fac. DEC ID: 2-6301-00008

Plant in operation 1939

Capacity (MGD) 150

2005 Flow 848,328

BOWERY BAY WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	525,047	5,511	$997,544	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	125,083	701	$59,567		9.862	564	$118,344	$1.20/100ft^3
Electricity (KWH)	43,348,800	18,477	$2,337,937		50,692,800	18,030	$ 2,649,713	
	TOTAL	**19,178**	**$2,397,504**		**TOTAL**	**24,105**	**$3,765,600**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-BOILR	1DBB1	Cleaver Brooks CB200-200	Boiler	8.4	MMBtu/hr			NA				NA	
1-BOILR	1DBB2	Cleaver Brooks CB200-200	Boiler	8.4	MMBtu/hr			NA				NA	
1-BOILR	1MBB1	Cleaver Brooks CB200-500	Boiler	20.9	MMBtu/hr				NA				NA
1-BOILR	1MBB2	Cleaver Brooks CB200-500	Boiler	20.9	MMBtu/hr				NA				NA
1-BOILR	1MBB3	Cleaver Brooks CB200-500	Boiler	20.9	MMBtu/hr				NA				NA
1-BOILR	1NMB1	Cleaver Brooks CB200-750	Boiler	31.4	MMBtu/hr			NA				NA	
1-BOILR	1NMB2	Cleaver Brooks CB200-750	Boiler	31.4	MMBtu/hr			NA				NA	
1-BOILR	1NMB3	Cleaver Brooks CB200-750	Boiler	31.4	MMBtu/hr			NA				NA	
1-BOILR	1NMB4	Cleaver Brooks CB200-750	Boiler	31.4	MMBtu/hr			NA				NA	
1-BOILR TOTAL													
2-GENER	2ENG1	Caterpillar	Generator	1750	kW			NA	NA			NA	NA
2-GENER	2ENG2	Caterpillar	Generator	1750	kW			NA	NA			NA	NA
2-GENER TOTAL													
5-WGTRE	5WGB1	Undefined	Flare	7.3	MMBtu/hr	NA			NA	NA			NA
5-WGTRE	5WGB2	Undefined	Flare	7.3	MMBtu/hr	NA			NA	NA			NA
5-WGTRE TOTAL													

Note: Blue highlighted boilers will replace Tan highlighted boilers 1MBB1, 1MBB2 and 1MBB3 in January 2007.

L STORAGE TANKS

Emission Unit ID	Process ID or Emission Source ID	Location/Facility Description	Fuel Type	Capacity (gal)	1995 Max. Throughput (gal)	2005 Max. Throughput (gal)
6-GASST	6-GT1	Gasoline Storage Facility	Gasoline	4,000		
6-GASST	6-GT2	Diesel Storage Facility	Diesel	4,000		

/ide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP CONEY ISLAND WPCP

Location: 2591 KNAPP STREET, BROOKLYN, NY 11235

Fac. DEC ID: 2-6107-00004/00017

Plant in operation 1935

Capacity (MGD) 110

Population served 596,326

CONEY ISLAND WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				2005			
	Consumption	**GHG Emissions (MTCE)**	**Cost**	**Notes**	Consumption	**GHG Emissions (MTCE)**	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	354,895	3,725	$674,301	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory	193.739		$0	From 2005 Air permits
Natural Gas (Therms/ MMCF)	813,059	4557	$649,865		39.195	2241	$470,340	$1.20/100ft^3
Electricity (KWH)	16,632,000	7089	$864,961		34,483,200	12,265	$ 1,802,437	
	TOTAL	**11,646**	**$1,514,826**		**TOTAL**	**18,231**	**$2,947,077**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-ENGIN	1ES01	Delaval(Entrprise's) DGSR-46	Generator	2246	Hp								
1-ENGIN	1ES02	Delaval(Entrprise's) DGSR-46	Generator	2246	Hp								
1-ENGIN	1ES03	Delaval(Entrprise's) DGSR-46	Generator	2246	Hp								
1-ENGIN	1ES04	Delaval(Entrprise's) DGSR-46	Generator	2246	Hp								
1-ENGIN TOTAL										**364,281**		**91.877**	**0**
2-BLERS	BLER1	Cleaver Brooks CB-200-600	Boiler	25	MMBtu/hr								
2-BLERS	BLER2	Cleaver Brooks CB-200-600	Boiler	25	MMBtu/hr								
2-BLERS	BLER3	Cleaver Brooks CB-200-600	Boiler	25	MMBtu/hr								
2-BLERS TOTAL										**0**		**82.052**	**49.573**
0-5MISC	FLAR1	8" Varec	Flare	Undefined		NA			NA	NA			NA
0-5MISC	FLAR2	8" Varec	Flare	Undefined		NA			NA	NA			NA
0-5MISC TOTAL										**0**		**19.81**	**0**
NA	NA	NA	Generator	125	kW								

FUEL STORAGE TANKS

Emission Unit ID	Process ID or Emission Source ID	Location/Facility Description	Fuel Type	Capacity (gal)	1995 Max. Throughput (gal)		2005 Max. Throughput (gal)
0-5MISC	DPUMP	Gasoline/Diesel Station	Diesel	550			insignificant source
0-5MISC	GPUMP	Gasoline/Diesel Station	Gasoline	550			insignificant source

Wide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYC-DEP HUNTS PT WPCP

Location: COSTER ST. & RYAWA AVE., BRONX, NY 10474

Fac. DEC ID: 2-6105-00203

Plant in operation 1952

Capacity (MGD) 200

Population served 684,569

HUNTS PT WPCP EMISSIONS SUMMARY - Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	54,202	569	$102,984	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	270,380	1,515	$146,036		34.2004	1955	$410,405	$1.20/100ft^3
Electricity (KWH)	51,638,400	22,010	$2,755,409		59,284,113	21,086	$ 3,098,781	
	TOTAL	**23,525**	**$2,901,445**		**TOTAL**	**23,610**	**$3,612,170**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-BLERS	BLRD1	Cleaver Brooks CB400HP	Boiler	16.7	MMBtu/hr								
1-BLERS	BLRD2	Cleaver Brooks CB400HP	Boiler	16.7	MMBtu/hr								
1-BLERS	BLRN1	Cleaver Brooks CB750HP	Boiler	29.7	MMBtu/hr	NA				NA			
1-BLERS	BLRN2	Cleaver Brooks CB750HP	Boiler	29.7	MMBtu/hr	NA				NA			
1-BLERS	BLRN3	Cleaver Brooks CB750HP	Boiler	29.7	MMBtu/hr	NA				NA			
1-BLERS	BLRN4	Cleaver Brooks CB750HP	Boiler	29.7	MMBtu/hr	NA				NA			
1-BLERS	BLRN5	Cleaver Brooks CB750HP	Boiler	29.7	MMBtu/hr	NA				NA			
TOTAL BOILERS													
4-WDGBR	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
4-WDGBR	WDGB1	Undefined	Flare	21.3	MMBtu/hr	NA			NA	NA			NA
4-WDGBR	WDGB2	Undefined	Flare	21.3	MMBtu/hr	NA			NA	NA			NA
4-WDGBR	WDGB3	Undefined	Flare	21.3	MMBtu/hr	NA			NA	NA			NA
TOTAL FLARES													
5-MISC	NA	Typhoon	Turbine	4000	kW	NA		NA		NA		NA	
5-MISC	NA	Typhoon	Turbine	4000	kW	NA		NA		NA		NA	
TOTAL TURBINES													
5-MISC	EEGS1	Undefined	Generators	2000	kW			NA	NA			NA	NA
5-MISC	EEGS2	Undefined	Generators	2000	kW			NA	NA			NA	NA
5-MISC	EEGS3	Undefined	Generators	2000	kW			NA	NA			NA	NA
5-MISC	EEGS4	Undefined	Generators	2000	kW			NA	NA			NA	NA
5-MISC	EEGS5	Undefined	Generators	2000	kW			NA	NA			NA	NA
5-MISC	EEGS6	Undefined	Generators	2000	kW			NA	NA			NA	NA
TOTAL GENERATORS													
T-BOILE	RBLR1	350 Hp Unit	Boiler	14.7	MMBtu/hr	NA		NA		NA		NA	
T-BOILE	RBLR2	350 Hp Unit	Boiler	14.7	MMBtu/hr	NA		NA		NA		NA	
TOTAL BOILERS													

Note: Blue highlighted boilers will replace Tan highlighted boilers BLRD1and BLRD 2 and temporary boilers RBLR1 and RBLR2.

Blue highlighted flares will replace five Tan highlighted existing digester gas flares.

Blue highlighted generators will replace two Tan highlighted existing turbines.

CAL STORAGE TANKS						
Emission Unit ID	**Process ID or Emission Source ID**	**Location/Facility Description**	**Chemical**	**Capacity (gal)**	**1995 Max. Throughput (gal)**	**2005 Max. Throughput (gal)**
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	

Vide Emissions Caps (tpy)					
Pollutant	**NOx**	**SO2**	**CO**	**PM**	**VOCs**
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYC-DEP JAMAICA WPCP

Location: 150-20 134 ST, JAMAICA, NY 11430

Fac. DEC ID: 2-6308-00021/02002

Plant in operation 1943

Capacity (MGD) 100

Population served 728,123

JAMAICA WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	4,331	45	$8,229	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	216,142	1,211	$168,782		123.407	7,056	$1,480,884	$1.20/100ft^3
Electricity (KWH)	34,970,400	14,905	$1,835,604		33,600,000	11,951	$ 1,756,272	
	TOTAL	16,116	$2,004,386		TOTAL	19,052	$3,245,385	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission	Process or Emission		Combustion	Equip. Design Capacity		Annual Fuel Consumption							
						1995 No. 2 Fuel Oil (gals)	1995 No. 4 Fuel Oil (gals)	1995 Digester Gas (MMCF)	1995 Natural Gas (MMCF)	2005 No. 2 Fuel Oil (gals)	2005 No. 4 Fuel Oil (gals)	2005 Digester Gas (MMCF)	2005 Natural Gas (MMCF)
Unit ID	Source ID	Equip. Make and Model	Type	Size	Units	Throughput	Throughput	Throughput	Throughput	Throughput	Throughput	Throughput	Throughput
1-BLERS	BLER1	Cleaver Brooks	Boiler	13.39	MMBtu/hr	NA				NA			
1-BLERS	BLER2	Cleaver Brooks	Boiler	13.39	MMBtu/hr	NA				NA			
1-BLERS	BLER3	Cleaver Brooks	Boiler	13.39	MMBtu/hr	NA				NA			
1-BLERS	MBPA1	Cleaver Brooks	Boiler	23.43	MMBtu/hr	NA				NA			
1-BLERS	MBPA2	Cleaver Brooks	Boiler	23.43	MMBtu/hr	NA				NA			
1-BLERS	MBPA3	Cleaver Brooks	Boiler	23.43	MMBtu/hr	NA				NA			
1-BLERS	DWBR1	Cleaver Brooks	Boiler	6.7	MMBtu/hr	NA				NA			
1-BLERS	DWBR2	Cleaver Brooks	Boiler	6.7	MMBtu/hr	NA				NA			
1-BLERS	ADBR1	Cleaver Brooks	Boiler	5.02	MMBtu/hr	NA				NA			
1-BLERS	ADBR2	Cleaver Brooks	Boiler	5.02	MMBtu/hr	NA				NA			
1-BLERS	ADBR3	Cleaver Brooks	Boiler	5.02	MMBtu/hr	NA				NA			
1-BLERS TOTAL													
3-SLUDG	DWMA1	Methane Abatement System											
3-SLUDG	DWMA2	Methane Abatement System											
3-SLUDG TOTAL													
4-WGBRN	WGBRA	Undefined	Flare		MMBtu/hr	NA			NA	NA			NA
4-WGBRN	WGBRB	Undefined	Flare		MMBtu/hr	NA			NA	NA			NA
4-WGBRN	WGBR1	Undefined	Flare	18.33	MMBtu/hr	NA			NA	NA			NA
4-WGBRN	WGBR2	Undefined	Flare	18.33	MMBtu/hr	NA			NA	NA			NA
4-WGBRN	WGBR3	Undefined	Flare	18.33	MMBtu/hr	NA			NA	NA			NA
4-WGBRN TOTAL													
5-EMGEN	EMGE1	Caterpillar 3500	Generator	1750	kW			NA	NA			NA	NA
5-EMGEN	EMGE2	Caterpillar 3501	Generator	1750	kW			NA	NA			NA	NA
5-EMGEN TOTAL													

Note: Blue highlighted boilers will replace Tan highlighted boilers BLER1, BLER2 & BLER3 IN 2007
Blue highlighted boilers will be installed at the new Administration and Maintenance building in 2007.
Blue highlighted flares will replace Tan highlighted flares WGBRA and WGBRB.

CAL STORAGE TANKS						
Emission Unit ID	**Process ID or Emission Source ID**	**Location/Facility Description**	**Chemical**	**Capacity (gal)**	**1995 Max. Throughput (gal)**	**2005 Max. Throughput (gal)**
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	
MTANK	New	Biological Nutrient Removal	Methanol	12,000	--	

Wide Emissions Caps (tpy)					
Pollutant	**NOx**	**SO2**	**CO**	**PM**	**VOCs**
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility:	NYC-DEP NEWTOWN CREEK WPCP
Location:	329-69 GREENPOINT AVE., BROOKLYN, NY 11222
Fac. DEC ID:	2-6101-00025/00057
Plant in operation	1967
Capacity (MGD)	310
Population served	1,068,012

NEWTOWN CREEK WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	5,741	60	$10,667	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory	884.674		$0	From 2005 air permits
Natural Gas (Therms/ MMCF)	No entry for 1995				6.483	371	$77,796	$1.20/100ft^3
Electricity (KWH)	No entry for 1995				78,331,200	27,861	$ 4,094,372	
	TOTAL	**0**	**$0**		**TOTAL**	**28,292**	**$4,182,834**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Equip. Design Capacity Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-BLERS	0IUB1	Cleaver Brooks CB 700-400-15	Boiler	16.75	MMBtu/hr	NA				NA			
1-BLERS	0IUB2	Cleaver Brooks CB 700-400-15	Boiler	16.75	MMBtu/hr	NA				NA			
1-BLERS	0IUB3	Cleaver Brooks CB 700-400-15	Boiler	16.75	MMBtu/hr	NA				NA			
1-BLERS TOTAL												**215.692**	**3.596**
1-BLERS	8BLR1	Cleaver Brooks CB-LE	Boiler	14.3	MMBtu/hr	NA		NA		NA		NA	
1-BLERS	8BLR2	Cleaver Brooks CB-LE	Boiler	14.3	MMBtu/hr	NA		NA		NA		NA	
1-BLERS TOTAL (to be constructed at time of permit)													
1-BLERS	BLER1	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER2	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER3	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER4	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER5	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER6	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER7	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER8	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS	BLER9	Cleaver Brooks/CB-LE	Boiler	29.5	MMBtu/hr	NA				NA			
1-BLERS TOTAL (to be constructed at time of permit)													
6-FLARE	WDGB1	6" Varec	Flare		MMBtu/hr	NA			NA	NA			NA
6-FLARE	WDGB2	6" Varec	Flare		MMBtu/hr	NA			NA	NA			NA
6-FLARE	WDGB3	6" Varec	Flare		MMBtu/hr	NA			NA	NA			NA
6-FLARE TOTAL												**668.982**	
6-FLARE	NWGB1	Undefined	Enclosed Flare	46	MMBtu/hr	NA			NA	NA			NA
6-FLARE	NWGB2	Undefined	Enclosed Flare	46	MMBtu/hr	NA			NA	NA			NA
6-FLARE	NWGB3	Undefined	Enclosed Flare	46	MMBtu/hr	NA			NA	NA			NA
6-FLARE	NWGB4	Undefined	Enclosed Flare	46	MMBtu/hr	NA			NA	NA			NA
6-FLARE TOTAL (to be constructed at time of permit)													
7-GTURB	ENG01	Black Start Engines	Engine	7.5486	MMBtu/hr	NA		NA		NA		NA	
7-GTURB	ENG02	Black Start Engines	Engine	7.5486	MMBtu/hr	NA		NA		NA		NA	
7-GTURB TOTAL										**5,741**			
7-GTURB	GTUR1	Undefined	Turbine	58	MMBtu/hr	NA		NA		NA		NA	
7-GTURB	GTUR2	Undefined	Turbine	58	MMBtu/hr	NA		NA		NA		NA	
7-GTURB	GTUR3	Undefined	Turbine	58	MMBtu/hr	NA		NA		NA		NA	
7-GTURB	GTUR4	Undefined	Turbine	58	MMBtu/hr	NA		NA		NA		NA	
7-GTURB TOTAL (to be constructed at time of permit)													
NA	NA	EMD-RUDUX	Generator	2000	kW								
NA	NA	EMD-RUDUX	Generator	2000	kW								

Note: Tan highlighted boilers 0IUB1-3 were installed in 1998.
Blue highlighted boilers will replace boilers Tan highlighted 0IUB1, 0IUB2 & 0IUB3 and 8BLR1 & 8BLR2.
Tan highlighted boilers 8BLR1-2 will be interim boilers that will be replaced after construction.
Blue highlighted flares will replace Tan highlighted flares WDGB1, WBGB2 & WDGB3.

Wide Emissions Caps (tpy)					
Pollutant	**NOx**	**SO2**	**CO**	**PM**	**VOCs**
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP TALLMAN ISLAND WPCP

Location: 127-01 POWELLS COVE BLVD., COLLEGE POINT, NY 11356

Fac. DEC ID: 2-6302-00012

Plant in operation 1939

Capacity (MGD) 80

Population served 410,812

TALLMAN ISLAND WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	712,127	7,424	$1,353,041	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory	104.002			From 2005 air permits
Natural Gas (Therms/ MMCF)	1,247,493	6,992	$596,933		60.707	3,471	$728,484	$1.20/100ft^3
Electricity (KWH)	9,381,600	3,999	$509,028		8,928,000	3,175	$ 466,667	
	TOTAL	**10,991**	**$1,105,961**		**TOTAL**	**14,070**	**$2,548,192**	

Note: 2005 non-electric consumption and costs are for FY 2005

IBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	o. 4 Fuel Oil (gal No. 2 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	o. 4 Fuel Oil (gal No. 2 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
P-AROUD	PH1E1	Undefined	Generator	Undefined				NA	NA			NA	NA
P-AROUD	PH1E2	Undefined	Generator	Undefined				NA	NA			NA	NA
P-AROUD	PH2E1/SCR21	Cummins QSK60-G6 & SCR units	Generator	1600	kW			NA	NA			NA	NA
P-AROUD	PH2E2/SCR22	Cummins QSK60-G6 & SCR units	Generator	1600	kW			NA	NA			NA	NA
Generator TOTAL										**4,176**			
1-ENGBL	0ENG1	Delaval Enterprise DGSR-6	Engine	1013	Hp								
1-ENGBL	0ENG2	Delaval Enterprise DGSR-6	Engine	1013	Hp								
1-ENGBL	0ENG3	Delaval Enterprise DGSR-6	Engine	1013	Hp								
1-ENGBL	0ENG4	Delaval Enterprise DGSR-6	Engine	1013	Hp								
1-ENGBL	0ENG5	Delaval Enterprise DGSR-6	Engine	1013	Hp								
1-ENGBL TOTAL										**468,330**		**68.225**	**26.264**
2-ENGPU	PENG1	Delaval Enterprise DGSG-6	Engine	520	Hp								
2-ENGPU	PENG2	Delaval Enterprise DGSG-6	Engine	520	Hp								
2-ENGPU	PENG3	Delaval Enterprise DGSG-6	Engine	546	Hp								
2-ENGPU	PENG4	Delaval Enterprise DGSG-6	Engine	546	Hp								
2-ENGPU	PENG5	Delaval Enterprise DGSG-6	Engine	546	Hp								
2-ENGPU TOTAL										**245,588**		**35.777**	**13.277**
3-BLERS		Cleaver Brooks CB-250	Engine	10.5	MMBtu/hr			NA	NA			NA	NA
3-BLERS		Cleaver Brooks CB-251	Engine	10.5	MMBtu/hr			NA	NA			NA	NA
3-BLERS TOTAL										**98,744**		**0**	**3.677**
0-6MISC	FLAR1	Undefined	Flare	53,800	ft^3	NA			NA	NA			NA
0-6MISC	FLAR2	Undefined	Flare	53,800	ft^4	NA			NA	NA			NA
0-6MISC TOTAL (insignificant source)													
NA	NA	Caterpillar 1	Generator	1,500	kW								
NA	NA	Cleaver Brooks CB200-125	Boiler	5	MMBtu/hr								
NA	NA	Cleaver Brooks CB200-125	Boiler	5	MMBtu/hr								

Note: Blue highlighted generators with SCR units will replace tan highlighted existing generators in May 2006 (See Permit ASF 263020001200020, 5/18/06).
Tan highlighted sewage pump engines will be replaced with electric units in Fall 2008 (See Permit ASF 263020001200020, 5/18/06).

EL STORAGE TANKS

Emission Unit ID	Process ID or Emission Source ID	Location/Facility Description	Fuel Type	Capacity (gal)	1995 Max. Throughput (gal)	2005 Max. Throughput (gal)
0-6MISC	DDPMP	Diesel Dispensing Pump	No. 2 Fuel Oil	550		insignificant
0-6MISC	DPUMP	Diesel Dispensing Pump	No. 2 Fuel Oil	1,000		insignificant
3-SLUDG	0DGHT	Digester Gas Holder	Digester Gas	100,000 ft^3		

Vide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP WARDS ISLAND WPCP

Location: WARDS ISLAND, NEW YORK, NY 10035

Fac. DEC ID: 2-6203-00005/00047 and/00049

Plant in operation 1937

Capacity (MGD) 275

Population served 1,061,558

WARDS ISLAND WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	1,043,673	10,954	$1,982,979	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory	11.102			From 2005 air permits
Natural Gas (Therms/ MMCF)	---------				---------			
Electricity (KWH)	81,993,600	34,948	$4,384,617		99,763,200	35,484	$5,214,622	
	TOTAL	**34,948**	**$4,384,617**		**TOTAL**	**46,438**	**$7,197,601**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-BLERS	0BDW1	Cleaver Brooks CB200-400	Boiler	16.7	MMBtu/hr			NA	NA			NA	NA
1-BLERS	0BDW2	Cleaver Brooks CB200-400	Boiler	16.7	MMBtu/hr			NA	NA			NA	NA
1-BLERS	0BDW3	Cleaver Brooks W100-400	Boiler	16.7	MMBtu/hr			NA	NA			NA	NA
1-BLERS TOTAL										**264,574**		**0**	
1-BLERS	EGTG1	Undefined	Generator	3500	kW			NA	NA			NA	NA
1-BLERS	EGTG2	Undefined	Generator	3500	kW			NA	NA			NA	NA
1-BLERS	EGTG3	Undefined	Generator	3500	kW			NA	NA			NA	NA
1-BLERS	EGTG4	Undefined	Generator	3500	kW			NA	NA			NA	NA
1-BLERS TOTAL										**25,956**		**0**	
NA	NA	Methane Abatement System	--										
0-5MISC	0WDGB	John Zink	Flare	567	ft^3/min	NA			NA	NA			NA
0-5MISC TOTAL										**0**		**11.102**	
NA	NA	Caterpillar	Generator	305	hp								

L STORAGE TANKS

Emission Unit ID	Process ID or Emission Source ID	Location/Facility Description	Fuel Type	Capacity (gal)	1995 Max. Throughput (gal)			2005 Max. Throughput (gal)
05MISC	GPUMP	Diesel Dispensing Pump	No. 2 Fuel Oil	550				
05MISC	GPUMP	Diesel Dispensing Pump	No. 2 Fuel Oil	550				

/ide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility:	NYCDEP OAKWOOD BEACH WPCP
Location:	751 MILL ROAD, STATEN ISLAND, NY 10306
Fac. DEC ID:	2-6404-00065/02000
Plant in operation	1956
Capacity (MGD)	39.9
Population served	244,918

OAKWOOD BEACH WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				**FY2005**			
	Consumption	**GHG Emissions (MTCE)**	**Cost**	**Notes**	**Consumption**	**GHG Emissions (MTCE)**	**Cost**	**Notes**
No.2 Fuel Oil (gals)				Not included in 1995 inventory	396,082	4,157	$752,556	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	142,958	801	$112,375		13.017	744	$156,204	$1.20/100ft^3
Electricity (KWH)	22,857,600	9,743	$1,194,318		22,574,918	8,029	$ 1,179,991	
	TOTAL	**10,544**	**$1,306,693**		**TOTAL**	**12,930**	**$2,088,751**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

						Annual Fuel Consumption							
Emission Unit ID	**Process or Emission Source ID**	**Equip. Make and Model**	**Combustion Type**	**Equip. Design Capacity Size**	**Units**	**1995 No. 2 Fuel Oil (gals) Throughput**	**1995 No. 4 Fuel Oil (gals) Throughput**	**1995 Digester Gas (MMCF) Throughput**	**1995 Natural Gas (MMCF) Throughput**	**2005 No. 2 Fuel Oil (gals) Throughput**	**2005 No. 4 Fuel Oil (gals) Throughput**	**2005 Digester Gas (MMCF) Throughput**	**2005 Natural Gas (MMCF) Throughput**
NA	NA	Methane Abatement System	--										
NA	NA	Methane Abatement System	--										
NA	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
NA	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
NA	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
TOTAL Flares													
NA	NA	Undefined	Boiler	<10	MMBtu/hr				NA				NA
NA	NA	Undefined	Boiler	<10	MMBtu/hr				NA				NA
NA	NA	Undefined	Boiler	<10	MMBtu/hr				NA				NA
NA	NA	Undefined	Boiler	<10	MMBtu/hr	NA				NA			
NA	NA	Undefined	Boiler	<10	MMBtu/hr	NA				NA			
TOTAL Boilers													
NA	NA	Undefined	Generator	1500	kW			NA	NA			NA	NA
NA	NA	Undefined	Generator	800	kW			NA	NA			NA	NA
NA	NA	Undefined	Generator	800	kW			NA	NA			NA	NA
NA	NA	Undefined	Generator	1000	kW			NA	NA			NA	NA
NA	NA	Undefined	Generator	1000	kW			NA	NA			NA	NA
TOTAL Generators													

Note:Blue highlighted generators will replace the (2) tan highlighted 800 kW generators.

/ide Emissions Caps (tpy)

Pollutant	**NOx**	**SO2**	**CO**	**PM**	**VOCs**
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP OWLS HEAD WPCP

Location: 6700 SHORE ROAD, BROOKLYN, NY 11220

Fac. DEC ID: 2-6102-00005/00017

Plant in operation 1952

Capacity (MGD) 120

Population served 758,007

OWLS HEAD WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	941,313	9,880	$1,788,495	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	No entry for 1995				--------			
Electricity (KWH)	5,558,400	2,369	$396,347		23,174,400	8,243	$ 1,211,326	
	TOTAL	**2,369**	**$396,347**		**TOTAL**	**18,123**	**$2,999,821**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-ENGIN	0ENG1	Deval Enterprise DGSR	Engine	2250	kW				NA				NA
1-ENGIN	0ENG2	Deval Enterprise DGSR	Engine	2250	kW				NA				NA
1-ENGIN	0ENG3	Deval Enterprise DGSR	Engine	2250	kW				NA				NA
1-ENGIN TOTAL													
5-MISC	WDGB1	Undefined	Flare	Undefined		NA			NA	NA			NA
5-MISC	WDGB2	Undefined	Flare	Undefined		NA			NA	NA			NA
5-MISC TOTAL													
NA	NA	Undefined	Boilers	<10	MMBtu/hr								
NA	NA	Undefined	Boilers	<10	MMBtu/hr								
NA	NA	Undefined	Boilers	<10	MMBtu/hr								
NA	NA	Undefined	Boilers	<10	MMBtu/hr								
NA	NA	Undefined	Boilers	<10	MMBtu/hr								
NA	NA	Undefined	Generator	150	Hp								
TOTAL													
1-STIRL	STME1	Sterling Engine	Generator	55	kW	NA			NA	NA			NA
1-STIRL	STME2	Sterling Engine	Generator	55	kW	NA			NA	NA			NA
1-STIRL	STME3	Sterling Engine	Generator	55	kW	NA			NA	NA			NA
1-STIRL TOTAL													

Note: Lavender highlighted combustion units are listed as insignificant sources.

Rose highlighted generators are a pilot power plant that are solely research & development; therefore, exempt sources.

L STORAGE TANKS						
Emission Unit ID	Process ID or Emission Source ID	Location/Facility Description	Fuel Type	Capacity (gal)	1995 Max. Throughput (gal)	2005 Max. Throughput (gal)
0-5MISC	DPUMP	Diesel Dispensing Pump	No. 2 Fuel Oil	1,000		
0-5MISC	DPUMP	Diesel Dispensing Pump	No. 2 Fuel Oil	1,000		
3-SLUDG	0DGHT	Digester Gas Holder	Digester Gas	100,000 ft^3		
NA	NA	NA	No. 2 Fuel Oil	<300,000		
NA	NA	NA	No. 2 Fuel Oil	<300,000		
NA	NA	NA	No. 2 Fuel Oil	<300,000		
NA	NA	NA	No. 2 Fuel Oil	<300,000		
NA	NA	NA	No. 2 Fuel Oil	<300,000		
NA	NA	NA	No. 2 Fuel Oil	<300,000		
NA	NA	NA	No. 2 Fuel Oil	<300,000		
NA	NA	NA	No. 4 Fuel Oil	<10,000		
NA	NA	NA	No. 4 Fuel Oil	<10,000		
NA	NA	NA	No. 4 Fuel Oil	<10,000		
NA	NA	NA	No. 4 Fuel Oil	<10,000		
NA	NA	NA	No. 4 Fuel Oil	<10,000		

Note: Pink highlighted fuel storage tanks are listed as insignificant sources.

ide Emissions Caps (tpy)					
Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP NORTH RIVER WPCP

Location: 725 W 135TH ST., NEW YORK, NY 10031

Fac. DEC ID: 2-6202-00007/00019

Plant in operation 1986

Capacity (MGD) 170

Population served 558,772

NORTH RIVER WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	1,813,219	19,031	$3,445,116	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory	414.269		$0	From 2005 Air Permits
Natural Gas (Therms/ MMCF)	No entry for 1995				40.041	2,289	$480,492	
Electricity (KWH)	46,291,100	19,731	$2,398,060		56,716,800	20,173	$ 2,964,587	
	TOTAL	**19,731**	**$2,398,060**		**TOTAL**	**41,493**	**$6,890,195**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
1-PUMPE	PUMP1	Delavlal TransAmerican R-46	Engine	1700	Hp								
1-PUMPE	PUMP2	Delavlal TransAmerican R-46	Engine	1700	Hp								
1-PUMPE	PUMP3	Delavlal TransAmerican R-46	Engine	1700	Hp								
1-PUMPE	PUMP4	Delavlal TransAmerican R-46	Engine	1700	Hp								
1-PUMPE	PUMP5	Delavlal TransAmerican R-46	Engine	1700	Hp								
1-PUMPE TOTAL										**547,454**		**247.629**	**23.155**
2-BLENG	BLEN1	Mirrlees-Blackstone K5	Engine	940	Hp								
2-BLENG	BLEN2	Mirrlees-Blackstone K5	Engine	940	Hp								
2-BLENG	BLEN3	Mirrlees-Blackstone K5	Engine	940	Hp								
2-BLENG	BLEN4	Mirrlees-Blackstone K5	Engine	940	Hp								
2-BLENG	BLEN5	Mirrlees-Blackstone K5	Engine	940	Hp								
2-BLENG TOTAL										**1,341,440**		**0**	**0**
3-BLERS	0BLR1	Cleaver Brooks	Boiler	32.3	MMBtu/hr								
3-BLERS	0BLR2	Cleaver Brooks	Boiler	8.6	MMBtu/hr								
3-BLERS	0BLR3	Cleaver Brooks	Boiler	32.3	MMBtu/hr								
3-BLERS	0BLR4	Cleaver Brooks	Boiler	32.3	MMBtu/hr								
3-BLERS TOTAL										**0**		**165.086**	**15.437**
6-MISCL	WGBNR	Waste Gas Tower	Flare	Undefined		NA			NA	NA			NA
6-MISCL TOTAL												**1.554**	
7-ENGIN	0ENG1	Undefined	Generator	18.9	MMBtu/hr								
7-ENGIN TOTAL										**7,871**			
NA	NA	Solar Centaur-40	Generator	3000	kW								
NA	NA	Solar Centaur-40	Generator	3000	kW								
NA	NA	Blackstart	Generator	200	kW								
NA	NA	Trail-mounted Detroit	Generator	2000	kW								

STORAGE TANKS						
Emission Unit ID	**Process ID or Emission Source ID**	**Location/Facility Description**	**Fuel Type**	**Capacity (gal)**	**1995 Max. Throughput (gal)**	**2005 Max. Throughput (gal)**
5-SLUDG*, **	00ADT	Digester Gas Holder	Digester Gas	1.6 mill ft^3		
5-SLUDG*	00WGH	Digester Gas Holder	Digester Gas	135,000 ft^3		
6-MISCL	GPUMP	Gasoline Storage Facility	Gasoline	550		

Note:* Fugitive emissions from gas holder tank are vented to South Odor Control System.

** Capacity based on (8) 200,000 ft3 digestion tanks.

Wide Emissions Caps (tpy)					
Pollutant	**NOx**	**SO2**	**CO**	**PM**	**VOCs**
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.

6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP RED HOOK WPCP

Location: 63 FLUSHING AVE., BROOKLYN, NY 11205

Fac. DEC ID: 2-6101-00023/02000

Plant in operation 1987

Capacity (MGD) 60

Population served 192,050

RED HOOK WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	23,491	247	$44,633	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	731,994	4,103	$601,603		12.183	697	$146,196	$1.20/100ft^3
Electricity (KWH)	15,902,400	6,778	$860,549		16,715,136	5,945	$ 873,700	
	TOTAL	**10,881**	**$1,462,152**		**TOTAL**	**6,889**	**$1,064,529**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
NA	NA	Undefined	Boiler	11.7	MMBtu/hr								
NA	NA	Undefined	Boiler	11.7	MMBtu/hr								
NA	NA	Undefined	Boiler	11.7	MMBtu/hr								
TOTAL													
NA	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
TOTAL													
NA	NA	Caterpillar	Generator	2000	kW			NA	NA			NA	NA
NA	NA	Caterpillar	Generator	2000	kW			NA	NA			NA	NA
NA	NA	Caterpillar	Generator	2000	kW			NA	NA			NA	NA
NA	NA	Caterpillar	Generator	2000	kW			NA	NA			NA	NA
NA	NA	Caterpillar	Generator	2000	kW			NA	NA			NA	NA
NA	NA	Caterpillar	Generator	2000	kW			NA	NA			NA	NA
TOTAL													

Note: Tan highlighted generators became inoperative and were shutdown permanently. Date unknown.
Current generators are rental generators used to supply backup power.
Blue highlighted generators will replace the rental units. Date unknown.

Wide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP PORT RICHMOND WPCP

Location: 1801 RICHMOND TERR, STATEN ISLAND, NY 10310

Fac. DEC ID: 2-6401-00012

Plant in operation 1953

Capacity (MGD) 60

Population served 198,128

PORT RICHMOND WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	164,783	1,730	$313,088	$1.9/gal
No. 4 Fuel Oil (gals)								
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	No entry for 1995				-------			
Electricity (KWH)	17,757,600	7569	$960,244		22,783,200	8,103	$ 1,190,878	
	TOTAL	**7,569**	**$960,244**		**TOTAL**	**9,833**	**$1,503,966**	

Note: 2005 non-electric consumption and costs are for FY 2005

COMBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
NA	NA	Black Start	Engine	Undefined									
NA	NA	Undefined	Generator	2000	kW								
NA	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
NA	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
NA	NA	Undefined	Flare	Undefined		NA			NA	NA			NA
NA	NA	Undefined	Boiler	17	MMBtu/hr				NA				NA
NA	NA	Undefined	Boiler	17	MMBtu/hr				NA				NA
NA	NA	Undefined	Boiler	<10	MMBtu/hr				NA				NA
TOTAL													

Wide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.

Facility: NYCDEP ROCKAWAY WPCP

Location: 106-21BEACH CHANNEL DRIVE, ROCKAWAY, NY 11694

Fac. DEC ID: 2-6309-00003/02000

Plant in operation 1952

Capacity (MGD) 45

Population served 90,474

ROCKAWAY WPCP EMISSIONS SUMMARY- Comparing 1995 and 2005 using ICLEI and GHG Protocol Generic Emissions Factors

	1995				FY2005			
	Consumption	GHG Emissions (MTCE)	Cost	Notes	Consumption	GHG Emissions (MTCE)	Cost	Notes
No.2 Fuel Oil (gals)				Not included in 1995 inventory	2,987	31	$5,675	$1.9/gal
No. 4 Fuel Oil (gals)				Not included in 1995 inventory	125,662	**1275**	$201,059	$1.9/gal
Digester Gas (MMCF)				Not included in 1995 inventory				
Natural Gas (Therms/ MMCF)	No records for Rockaway							
Electricity (KWH)	No records for Rockaway				LIPA			
	TOTAL	**0**	**$0**		**TOTAL**	**1,275**	**$201,059**	

Note: 2005 non-electric consumption and costs are for FY 2005

IBUSTION SOURCES

Emission Unit ID	Process or Emission Source ID	Equip. Make and Model	Combustion Type	Equip. Design Capacity Size	Units	Annual Fuel Consumption 1995 No. 2 Fuel Oil (gals) Throughput	1995 No. 4 Fuel Oil (gals) Throughput	1995 Digester Gas (MMCF) Throughput	1995 Natural Gas (MMCF) Throughput	2005 No. 2 Fuel Oil (gals) Throughput	2005 No. 4 Fuel Oil (gals) Throughput	2005 Digester Gas (MMCF) Throughput	2005 Natural Gas (MMCF) Throughput
NA	NA	Undefined	Boiler	500	Hp	NA			NA	NA			NA
NA	NA	Undefined	Boiler	500	Hp	NA			NA	NA			NA
TOTAL - Boilers													
NA	NA	Undefined	Flare	Undefined		NA	NA		NA	NA	NA		NA
TOTAL - Flares													
NA	NA	Undefined	Generator	800	kW		NA	NA	NA		NA	NA	NA
NA	NA	Undefined	Generator	1000	kW		NA	NA	NA		NA	NA	NA
NA	NA	Caterpillar SR-4	Generator	1000	kW		NA	NA	NA		NA	NA	NA
NA	NA	Caterpillar SR-4	Generator	1000	kW		NA	NA	NA		NA	NA	NA
TOTAL - Generators													

Note: Blue highlighted generators replaced the tan highlighted 800 kW and 1000 kW generators in September, 2004.

/ide Emissions Caps (tpy)

Pollutant	NOx	SO2	CO	PM	VOCs
Emission Limit	22.5	Sulfur content of 0.2% by wgt	NA	NA	22.5

6 NYCRR Part 201, Section 201-7.3 - Emission Capping By Rule for NOx and VOCs.
6NYCRR Part 225, Section 225-1.2(a)2 - Sulfur in Fuel Limitations.