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## Chapter 9. Greenhouse Gas Emissions

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### 9.1 Overview

This chapter describes the environmental and regulatory setting for GHG emissions. It also describes GHG emissions resulting from current operations at ARC. Relevant plans, policies, and strategies that ensure ARC's continued successful operation in support of Agency-wide GHG reduction goals are also discussed. Information and data presented in the following sections was obtained from the EPA, state and regional air quality management authorities, and other sources.

### 9.2 Regulatory Background

#### 9.2.1 Federal Regulations

##### 9.2.1.1 *Title 40 Code of Federal Regulations 98*

On October 30, 2009, the USEPA published a rule for the mandatory reporting of GHGs from sources that in general emit 25,000 metric tons or more of carbon dioxide equivalent per year in the United States. Smaller sources and certain sectors such as the agricultural sector and land use changes are not included in the mandatory reporting. Implementation of 40 CFR Part 98 is referred to as the Greenhouse Gas Reporting Program (GHGRP) (USEPA 2013a).

##### 9.2.1.2 *Executive Order 13514*

President Obama signed EO 13514 On October 5, 2009, setting sustainability goals for federal agencies. The EO makes reductions of GHG emissions a priority. It requires agencies to develop and update annually, a Strategic Sustainability Performance Plan (SSPP) which includes plans to reduce scope 1-3 GHG emissions.

Per EO 13514, "scope 1, 2, and 3" mean:

- (i) *scope 1: direct greenhouse gas emissions from sources that are owned or controlled by the Federal agency;*
- (ii) *scope 2: direct greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by a Federal agency; and*
- (iii) *scope 3: greenhouse gas emissions from sources not owned or directly controlled by a Federal agency but related to agency activities such as vendor supply chains, delivery services, and employee travel and commuting;*



### **9.2.1.3 *Draft National Environmental Policy Act Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions***

In February 2010, the CEQ issued this draft guidance memorandum on the ways in which federal agencies can improve their consideration of the effects of GHG emissions and climate change in their evaluation of proposals for federal actions under NEPA. The draft guidance was intended to help explain how agencies of the federal government should analyze the environmental effects of GHG emissions and climate change when they describe the environmental effects of a proposed agency action in accordance with Section 102 of NEPA and the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR parts 1500-1508).

On December 18, 2014, the CEQ issued a second draft guidance intended to provide further direction on how federal agencies should address the effects of GHG emissions and climate change under NEPA. The proposed guidance supersedes the earlier draft guidance issued by the CEQ in 2010.

## **9.2.2 State Regulations**

### **9.2.2.1 *California Global Warming Solutions Act (Assembly Bill 32)***

In 2006 California approved AB 32, the California Global Warming Solutions Act of 2006, which requires California to reduce its GHG emissions to 1990 levels by 2020. AB 32 includes the major GHGs and groups of GHGs that are being emitted into the atmosphere. The gases include CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride.

Under AB 32, CARB is required to develop a Scoping Plan with strategies to meet the GHG emission reduction goals. The first report was developed in 2008 and updated in 2014. The Scoping Plan has a range of GHG reduction actions which include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market-based mechanisms, and an AB 32 program implementation fee regulation to fund the program (CARB 2013).

## **9.2.3 Local Regulations**

### **9.2.3.1 *Bay Area Air Quality Management District Greenhouse Gas Fee***

On May 2008 the BAAQMD approved a new fee on GHG emissions from stationary sources that are subject to an Air District permit requirement. The GHG fee schedule applies to all permitted facilities with GHG emissions, there are no threshold for lesser amounts of GHG emissions. The approved GHG fee was 4.4 cents per metric ton of GHG emissions.

## **9.3 Regional Setting**

The BAAQMD prepared a GHG source inventory report that estimates direct and indirect GHG emissions in the Bay Area for 2007, later updated in February 2010. The report states that in 2007 the GHG emissions for the Bay Area were 95.8 million metric tons (MT) of



(CO<sub>2</sub>E. The emissions estimate includes emissions from imported electricity, 7.1 million MTCO<sub>2</sub>E. The breakdown of the emissions per pollutant is shown in Table 9-1.

**Table 9-1. Bay Area 2007 GHG Emissions by Pollutant**

Pollutant	Percentage	CO <sub>2</sub> E (Million MT)
CO <sub>2</sub>	91.6	87.8
CH <sub>4</sub>	2.6	2.5
NO <sub>x</sub>	1.6	1.5
HFC, PFC, SF <sub>6</sub>	4.1	4

Source: BAAQMD 2010b.

Table 9-2 shows the breakdown of the GHG emissions by sector. The largest sources of emissions were transportation and industrial/commercial use.

**Table 9-2. Bay Area 2007 GHG Emissions by Sector**

Sector	Percentage	CO <sub>2</sub> E (Million MT)
Industrial/Commercial	36.4	34.86
Residential Fuel Usage	7.12	6.82
Electricity/Co-Generation	15.87	15.20
Off-Road Equipment	3.05	2.92
Transportation	36.41	34.87
Agriculture/Farming	1.16	1.11

Source: BAAQMD 2010b.

## 9.4 Existing Site Conditions

### 9.4.1 U.S. EPA Greenhouse Gas Mandatory Reporting Rule (40 CFR 98)

The EPA published 40 CFR part 98 in 2009 and has been revised several times since its publication. The rule is referred as the GHG Mandatory Reporting Rule. Applicability depends on the source categories present at each facility. For combustion facilities like NASA Ames, facilities need to report if the total GHG emissions from all stationary combustion sources are 25,000 MTCO<sub>2</sub>E or more.

NASA Ames' GHG emissions from stationary combustion sources have not equal or exceeded the 25,000 MTCO<sub>2</sub>E threshold since the regulation was adopted. The majority of NASA Ames' GHG combustion emissions are from boilers combusting natural gas.

### 9.4.2 EO 13514 Annual Greenhouse Gas Inventory Reporting

This EO requires reporting on progress toward GHG reduction goals on an agency-wide basis. NASA HQ uses the annual energy reporting through the Department of Energy's (DOE's) annual GHG and sustainability workbook to report on this EO at the agency level. There is no additional Center reporting required (Fischer 2014.).

### 9.4.3 Mandatory State Greenhouse Gas Emissions Reporting (Title 17, California Code of Regulations, Section 95100-95158)

On December 2007, CARB approved the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions to comply with one of the requirements of AB 32 to adopt a GHG



reporting regulation. The Mandatory Reporting Regulation is applicable to industrial facilities, fuel suppliers and electricity importers.

The thresholds for GHG facility reporting depend on the source category present at each facility. Emissions need to be totaled across all applicable source categories at each facility. For facilities with stationary fuel combustion sources only, CARB initially set the threshold for reporting at 25,000 MTCO<sub>2</sub>E and required third party verification of emissions. On December 2010 CARB approved amendments to the reporting rule decreasing the reporting threshold to 10,000 MTCO<sub>2</sub>E. Facilities emitting 10,000 MTCO<sub>2</sub>E or more started reporting on June 1, 2013 for reporting 2012 GHG emissions. Facilities with emissions between 10,000 and 25,000 MTCO<sub>2</sub>E have the option to file an abbreviated report using simpler emission calculation methods and reports are not subject to third party verification.

ARC's GHG emissions have been between 10,000 and 25,000 MTCO<sub>2</sub>E since the inception of CARB's GHG mandatory reporting rule. In June 2013, NASA Ames became subject to the lowered 10,000 MTCO<sub>2</sub>E threshold and submitted its first annual GHG emissions abbreviated report.

ARC's GHG emissions subject to CARB's mandatory reporting for 2012 and 2013 were:

- 2012 NASA Ames GHG emissions: 18,205 MTCO<sub>2</sub>E
- 2013 NASA Ames GHG emissions: 18,364 MTCO<sub>2</sub>E

The GHG emissions were below 25,000 MTCO<sub>2</sub>E for both 2012 and 2013 and did not require third party verification.

## 9.5 Environmental Requirements

NASA has identified the following environmental plans, policies, and strategies that address the integration of Agency-wide GHG reduction goals with operations and future development at ARC.

### 9.5.1 NASA Procedural Directive 8500.1, NASA Environmental Management

Per NPD 8500.1, it is NASA policy to: maintain compliance with all applicable federal, state, and local environmental requirements; to incorporate environmental risk reduction and sustainable practices to the extent practicable throughout NASA's programs, projects, and activities (including improvement of energy efficiency and reduction of energy consumption and greenhouse gas emissions, among other practices; and to consider environmental factors throughout the life cycle of programs, projects, and activities (as defined in NPD 7120.4, *NASA Engineering and Program/Project Management Policy*, and related documents), including planning, development, execution, and disposition activities. Examples of environmental factors include consideration of environmental impacts as required by the NEPA and NHPA; the proposed use of hazardous materials; the potential for waste generation; the need to acquire necessary permits, waivers, and authorizations; and the use of environmentally-preferable materials and processes wherever practicable.



## 9.5.2 NASA Procedural Requirements 8553.1, NASA Environmental Management System

NPR 8553.1 sets forth requirements for the NASA EMS, which functions primarily to: (1) incorporate people, procedures, and work practices into a formal structure to ensure that the important environmental impacts of the organization are identified and addressed; (2) promote continual improvement, including periodically evaluating environmental performance; (3) involve all members of the organization, as appropriate; and (4) actively involve senior management in support of the EMS.

Agencywide, the EMS employs a standardized approach to managing environmental activities that allows for efficient, prioritized system execution, while at the same time helping to improve environmental performance and to maintain compliance with applicable environmental regulations and requirements. NASA's EMS approach involves identifying all activities, products, and services under each NASA center's control, and the environmental aspects associated with each center's continued engagement in those activities, products, and services. Once identified, priority environmental aspects are assigned a risk ranking (from 1 to 4, based on its severity and frequency of occurrence) and are evaluated on a continual basis as means of highlighting associated positive or negative impacts and setting objectives and targets to reduce environmental risk. Each center's EMS also identifies methods for ensuring compliance by keeping abreast of environmental requirements. This includes requirements by law (EOs, federal regulations, state and local laws) and voluntary commitments made by the center or NASA.

## 9.5.3 NASA 2014 Strategic Sustainability Performance Plan

In addition to outlining new requirements for GHG management and sustainable buildings and communities, to mention only a few of the requirements, EO 13514 (discussed above) requires NASA and all federal agencies to develop, implement, and annually update a SSPP.

Goal 1 of NASA's SSPP is devoted to its GHG emission reduction targets and performance against those targets. NASA GHG emission reduction targets reflect: identified reductions in energy use and intensity; reduced use of fossil fuels and increased use of alternative fuels in fleet vehicles; increased application of green building technologies and sustainable design; and innovative energy technologies and funding strategies which promote conservation and renewable energy use.

Currently, NASA is on target to meet its GHG emission reduction targets in FY 2020 (NASA 2014c). In FY 2013, from baselines established for FY 2008, NASA reductions are as follows:

- Scope 1 and 2 GHG emissions. Tracking with required energy reductions, NASA achieved 16.3% reductions versus an FY 2020 target of 18.3%.
- Scope 3 GHG emissions. Including Scope 3 renewable energy project hosting credits, NASA achieved 17.9% reductions versus an FY 2020 target of 12.6%.

Along with other NASA centers, ARC reports its fuel and electricity use to NASA Headquarters annually to assist with performance tracking under the SSPP.



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#### 9.5.4 NASA's NEPA Emission Estimation Tool

NASA has developed a methodology for estimating emissions of GHGs calculated using NASA's NEPA Emission Estimation Tool (N2E2). For major federal actions at ARC, and other actions requiring an estimation of GHG emissions, analysis will include a calculation of emissions using the N2E2, where the tool does not duplicate efforts necessary to meet other federal, state, or local requirements.

#### 9.5.5 Ames Procedural Requirements 8500.1, Ames Environmental Procedural Requirements

APR 8500.1 sets forth general procedural requirements to ensure compliance with applicable federal, state, and local environmental laws; regulations and EOs; and NASA policies and procedures. Organizational directors, division chiefs, branch chiefs, section heads, supervisors, managers, and CORs are responsible for planning, designing, constructing, managing, operating, and maintaining facilities in conformance with applicable regulatory directives, and should obtain environmental review from the Environmental Management Division early in project planning consistent with NASA's NEPA implementing procedures (NPR 8580.1 and EO 12114), NASA policies and procedures for programs and projects (NPR 7120), and NASA regulations related to environmental quality (14 CFR 1216). Program and project managers should coordinate with the Environmental Management Division in a timely manner to ensure that any new or modified programs, projects, and activities comply with regulatory requirements.

#### 9.5.6 Ames Procedural Requirements 8553.1, Ames Environmental Management System

APR 8553.1 sets forth requirements for the Center-level EMS in accordance with NPR 8553.1B, *NASA Environmental Management Systems*, as described above. The ARC EMS also includes consideration of the findings of NASA Headquarters' triennial (3-year) Environmental Functional Review and other external EMS audits, as required.

Under the ARC EMS, the Center conducts an annual risk analysis across Center activities to determine which of 16 environmental aspects are of high or medium priority. The Center then identifies objectives (goals) and targets and develops action plans known as Environmental Management Plans to reduce identified risks. Currently, the high- and medium-priority environmental aspects of Center business activities are *Air Emissions*, *Hazardous Material Management*, *Water and Energy Conservation*, and *Other Sustainability Practices*. Objectives associated with these medium- and high-priority environmental aspects include:

- Reducing air (including GHG) emissions through energy efficiency
- Improving hazardous material management
- Improving energy and water efficiency
- Providing for the integration of other sustainability practices into Center activities



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### 9.5.7 Ames Environmental Work Instructions

Ames's EWIs, which replace the previous Ames Environmental Handbook (APR 8800.3), set forth requirements to ensure that programs, projects, and activities at ARC comply with applicable federal, state, and local laws; regulations and EOs; and NASA policies and procedures. Each EWI lists relevant regulatory authorities and documents, assigns individual and organizational responsibilities within ARC, and identifies specific requirements applicable to the work being performed.

The following EWIs are relevant to operations and future development at ARC with the potential to generate GHGs.

- EWI 1, Air
- EWI 12, Public Involvement
- EWI 14, NEPA and Environmental Justice
- EWI 17 Pollution Prevention/Affirmative Procurement (P2/AP) (Under review)
- EWI 18, Environmental Requirements for Construction Projects (Under review)