

Ogden Air Logistics Center



U.S. AIR FORCE

Preparing a Greenhouse Gas Baseline Inventory at Hill Air Force Base in Conjunction with Newly Promulgated Greenhouse Gas Rulemaking

17 June 2010
Sara Van Klooster
sara.vanklooster@ch2m.com



Innovation & Excellence

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 17 JUN 2010		2. REPORT TYPE		3. DATES COVERED 00-00-2010 to 00-00-2010	
4. TITLE AND SUBTITLE Preparing a Greenhouse Gas Baseline Inventory at Hill Air Force Base in Conjunction with Newly Promulgated Greenhouse Gas Rulemaking				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Ogden Air Logistics Center,Hill AFB,UT,84056				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 14-17 June 2010 in Denver, CO.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 17	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Authors



Ogden Air Logistics Center

- **Steve Rasmussen and Glenn R. Palmer, Hill Air Force Base**
- **Sara Van Klooster, Michelle York, and Megan Carter, CH2M Hill**



Purpose

Ogden Air Logistics Center

Two-Fold

- 1) To establish a baseline of GHG emission sources from all activities while preparing for reporting requirements:
 - Mandatory Reporting of Greenhouse Gases Rule (Proposed Apr. 2009)
 - PSD/Title V GHG Tailoring Rule (Proposed Sept. 2009)
 - EO13514 (Oct. 2009)
- 2) A quick and easy reference when responding to data calls, public comments, and other GHG related or rule-making processes

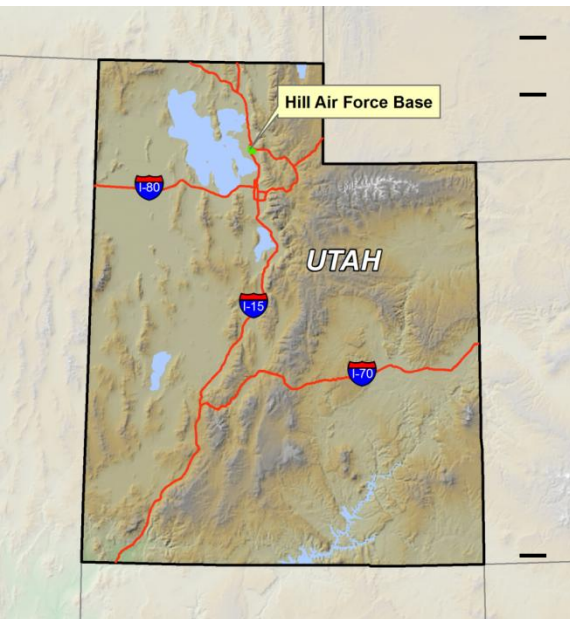


Hill AFB Background

Ogden Air Logistics Center

Main Base

- Located 35 miles north of Salt Lake City
- Covers over 6,650 acres
- Ogden Air Logistics Center serves as the host organization
 - The 75th Air Base Wing (ABW) provides service and support for the many tenant organizations
 - 388th and 419th Fighter Wing (FW)
 - 84th Combat Sustainment Wing
 - 309th Maintenance Wing (MWX)
 - 526th ICBM Systems Group
 - 508th Aircraft Sustainment Wing
- Provide engineering and logistics management for:
 - F-16 Fighting Falcon
 - A-10 Thunderbolt II
 - Minuteman III intercontinental ballistic missile
 - Depot maintenance for the C-130 Hercules aircraft





Hill AFB Background



Ogden Air Logistics Center

Utah Test and Training Range

- West of the Main Base
- Covers approximately 1,500 square miles
- Separate major source subject to all rules and requirements under the Title V
- Includes the North Range, South Range, Wendover Air Field, and Wendover Peak





Applicability



Ogden Air Logistics Center

Major source applicability

- Under the Title V Operating Permit all satellite locations, tenant organizations, and contractor support companies are subject to the same environmental regulations as those imposed on the host organization
- Result: two separate baseline GHG inventories; Hill AFB - Main Base, and Hill AFB - UTTR



Guidance in Methodology



Ogden Air Logistics Center

- Primary methodology: *Air Force Materiel Command Greenhouse Gas Inventory Guidance (Feb. 2009)*
 - provided general GHG inventory guidelines and emission estimation techniques for common source categories
- Other references used for: methodology, emission factors, material characteristics, and global warming potentials (GWPs):
 - EPA's MRR (Final, Oct. 2009)
 - Draft Air Force Institute for Operational Health (AFIOH; 2009) *Air Emissions Inventory Guidance Volume 1: Stationary Sources*
 - Draft AFIOH (2009) *Air Emissions Inventory Guidance Volume 2: Flightline Ground Support Equipment*
 - The IPCC Second Assessment Report (SAR; 1995)
 - The IPCC Third Assessment Report (TAR; 2001)
 - The IPCC Fourth Assessment Report (FAR; 2007)
 - The Climate Registry's *General Reporting Protocol* (May 2008)



Emission Calculations



Ogden Air Logistics Center

- **Simple scenarios:**
 - Multiply material use by a set of provided emission factors
 - Material use of many sources may already be tracked for different purposes
- **Complex scenarios: (discussion of specific challenges and how they were overcome)**
 - For almost all categories, rules and guidance not yet clearly established
 - Data may not be readily available
 - Calculations became significantly more involved



Emission Calculation Challenges

Ogden Air Logistics Center

Challenge 1: Rules and guidance not yet clearly established

- All sources
- Open Burn and Open Detonation
- Rocket Motor Testing

Challenge 2: Data not readily available

- Compressed CO₂ (Direct Release)
- Sulfur Hexafluoride
- Fluorinated Material Use
- Electricity Purchase and Use
- Purchased Steam

Challenge 3: Calculations are significantly more involved

- Landfill (modeling)
- Nonroad (construction) equipment (modeling)
- GOVs and POVs (modeling)



Challenge 1: Guidance not yet clearly established

Ogden Air Logistics Center

- All sources in general
- Specific challenges with Emission Factors (always the case):
 - **Open Burn (OB) and Open Detonation (OD)**
 - Limited availability of emission factors for open detonation
 - Miscellaneous scrap propellant consists of propellant from various stages of various rocket motors
 - Emission factors estimated using Baroody (1996)
 - **Rocket Motor Testing**
 - Limited availability of emission factors for USAF rocket engines (MK40 and MK66)
 - MK66 emission factors were used to represent the emissions of rockets motors fired at Hill AFB in 2008



Challenge 2: Data not readily available

Ogden Air Logistics Center

1. Finding the material

- **Compressed CO₂ (Direct Release)**
 - Uses include welding, precision measurement testing under extreme temperatures, road repair
- **Sulfur Hexafluoride**

Material Use	Primary Purpose
Power Grid Equipment	Used as a gaseous dielectric insulator
Nondestructive Inspection	Used as a waveguide to maintain positive pressures
Testing Radar Systems of Aircraft	Used to service and troubleshoot the dual mode transmitter radar units in the F-16 aircraft.
Testing Power Supply Units of Aircraft	Used to prevent arcing of high-voltage aircraft power supply units while undergoing troubleshooting and repair.



Challenge 2: Data not readily available



Ogden Air Logistics Center

- **Fluorinated Materials**

Material Use	Primary Purpose
Spray Foam	Used in the construction and packing of various combat equipment.
Lubricants	Can be used in lubricants as a propellant or as a compound for absorbing excess water.
Aerosol Propellant	Various HFCs and an occasional HCFC can be found in the propellant used in aerosols.
Compressed Gases	Compressed gases used for cleaning and various spot treatment purposes.
Solvents	Used for cleaning, flushing, and degreasing
Freezing	Hydrofluorocarbons can be used in small aerosol cans for spot-freezing materials.
Medical Purposes	Performs testing and repair on various medical equipment used during combat. Isoflurane is contained in some equipment for use as anesthetic gas.



Challenge 2: Data not readily available



Ogden Air Logistics Center

2. Learning about the details

- **Electricity Purchase and Use**
 - Multiple electric providers
 - Tracked via meters and recorded monthly
 - Region-specific emission factors
- **Purchased Steam**
 - produced at a Waste to Energy plant east of the Base
 - producer was contacted to obtain boiler characteristics information



Challenge 3: Calculations significantly more involved

Ogden Air Logistics Center

– Landfill

- Emissions were calculated using LandGEM (Version 3.02)
- Landfill information required: year the landfill was opened, year the landfill was closed (if applicable), waste design capacity, climatology, material composition

– Nonroad (Construction) Equipment

- Data collection of hundreds of pieces of equipment
 - forklifts, low-speed vehicles, golf carts, lawn maintenance, dump trucks, and any other construction equipment
- Emission factors
 - CO₂ and CH₄ generated using NONROAD2005
 - » Estimates emission factors for nonroad gasoline- and diesel-fueled equipment
 - N₂O estimated using:
 - » AFMC GHG Guidance (for fuel use)
 - » NONROAD2005 (for operating-hours data)



Challenge 3: Calculations significantly more involved

Ogden Air Logistics Center

– Motor Vehicles (GOVs and POVs)

- GOVs (Government owned or contractor vehicles)
 - Organizations and contractors contacted to obtain vehicle description and miles traveled
- POV (Employee commuting)
 - data were obtained from a 2008 vehicle traffic counting study
 - » Traffic counters were placed at each of the four gates for 7 days; provided an estimate of vehicle traffic for the year
 - » Assumptions: average length of a trip on base, number of personnel per zip code (Defense Civilian Personnel Data System; out-of-state zip codes assumed airport location)
- Emission factors:
 - CO₂ and CH₄ estimated using the MOBILE6.2.
 - N₂O estimated using AFMC GHG Guidance (MOBILE6.2 is unable to approximate N₂O EF values)



Summary



Ogden Air Logistics Center

- **Significant challenges**
 - For almost all categories, rules and guidance not yet clearly established
 - Data may not be readily available
 - Calculations became significantly more involved
- **Baseline GHG Inventory documents have already been extremely useful**
 - referenced on a regular basis
 - enables a quick and easy reference when responding to data calls, public comments, and other GHG related or rule-making activities



Questions?



Ogden Air Logistics Center

Sara Van Klooster
sara.vanklooster@hill.af.mil
801-775-5173