

# APPENDIX A

## Cooperating Agency Requests and Acceptance Letters





**Cooperating Agency Request Letter to the Department of the Navy and U.S. Marine Corps  
September 20, 2011**



**DEPARTMENT OF THE AIR FORCE**  
WASHINGTON DC

OFFICE OF THE ASSISTANT SECRETARY

20 SEP 2011

MEMORANDUM FOR DEPUTY ASSISTANT SECRETARY OF THE NAVY  
(ENVIRONMENT)

FROM: SAF/IEE

SUBJECT: Cooperating Agency (CA) Request for the Proposed U.S. Air Force Environmental Impact Statement (EIS) for Divert Activities and Exercises, Commonwealth of the Northern Mariana Islands

The Air Force requests Navy and Marine Corps formal participation in preparation of its Divert Activities and Exercises, Commonwealth of the Northern Mariana Islands EIS as prescribed in the President's Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations, 40 CFR §1501.6, Cooperating agencies.

As a cooperating agency, the Air Force requests that you participate in various portions of the EIS development as may be required. Specifically, the Air Force requests your support as a Cooperating Agency by:

- (a) Participating in scoping, review, and hearing processes;
- (b) Making staff support available to enhance interdisciplinary analysis and review;
- (c) Assuming responsibility, upon request, for developing information and preparing analyses on topics for which the Navy and/or Marine Corps has special expertise; and,
- (d) Responding, in writing, to this request.

Air Force staff will contact Navy and Marine Corps staffs to address specific details of this cooperating agency relationship. To avoid unnecessary delays in the NEPA process, the Air Force must have timely support from cooperating agencies. In turn, the Air Force will ensure it provides the necessary information and related materials in a timely fashion to enable your agency to complete its review and respond promptly. Should you or your staff have questions regarding this memo, our points of contact are Mr. Jack Bush, Bases and Units (AF/A7C1), (703) 614-0237, email [jack.bush@pentagon.af.mil](mailto:jack.bush@pentagon.af.mil); and Mr. Les Reed, Office of the Deputy General Counsel (Environment & Installations), (703) 614-8071, email [les.reed@pentagon.af.mil](mailto:les.reed@pentagon.af.mil).

A handwritten signature in cursive script that reads "Timothy K. Bridges".

TIMOTHY K. BRIDGES  
Deputy Assistant Secretary  
(Environment, Safety & Occupational Health)

cc:  
SAF/IEI/GCN  
HQ AF/A4/7/8  
HQMC I&L & DC/A  
HQ PACAF/A5/A7

Cooperating Agency Request Letter to Department of Interior, Office of Insular Affairs  
October 21, 2011



DEPARTMENT OF THE AIR FORCE  
WASHINGTON DC

OFFICE OF THE ASSISTANT SECRETARY

SAF/IEE  
1665 Air Force Pentagon  
Washington, DC 20330-1665

21 OCT 2011

Mr. Anthony Babauta  
Assistant Secretary  
U.S. Department of the Interior, Office of Insular Affairs  
1849 C Street, NW  
Washington, DC 20240

Dear Mr. Babauta:

The Air Force requests your formal participation in the preparation of an Environmental Impact Statement (EIS) for the Divert Activities and Exercises, Guam and Commonwealth of the Northern Mariana Islands as prescribed in the President's Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations, 40 CFR § 1501.6 *Cooperating Agencies*.

As a cooperating agency, the Air Force requests your office participate in various portions of the EIS development as may be required. Specifically the Air Force asks for your support as a Cooperating Agency by:

- a. Responding, in writing, to this request;
- b. Participating in the scoping process;
- c. Assuming responsibility, upon request by the Air Force, for developing information and preparing analyses on issues for which you have special expertise; and,
- d. Making staff available for interdisciplinary reviews.

To avoid unnecessary delays in the NEPA process, the Air Force must have timely support from cooperating agencies. In turn, the Air Force will ensure it provides the necessary information and related materials in a timely fashion to enable your agency to complete its review and respond promptly. Should you or your staff have any questions regarding this letter, our point of contact is Mr. Mark Petersen, (808) 449-1078, [Mark.Petersen@hickam.af.mil](mailto:Mark.Petersen@hickam.af.mil).

Sincerely,

A handwritten signature in cursive script that reads "Timothy K. Bridges".

TIMOTHY K. BRIDGES  
Deputy Assistant Secretary of the Air Force  
(Environment, Safety, & Occupational Health)

cc:  
SAF/IEI  
SAF/GCN  
HQ USAF/A7C  
HQ USAF/A3O  
HQ PACAF/A7PI  
ALCOM/J42

Cooperating Agency Request Letter to Department of Interior, U.S. Fish and Wildlife Service  
October 21, 2011



DEPARTMENT OF THE AIR FORCE  
WASHINGTON DC

OFFICE OF THE ASSISTANT SECRETARY

21 OCT 2011

SAF/IEE  
1665 Air Force Pentagon  
Washington, DC 20330-1665

Mr. Daniel M. Ashe  
Director  
U.S. Department of the Interior, U.S. Fish and Wildlife Service  
1849 C Street, NW  
Washington, DC 20240

Dear Mr. Ashe:

The Air Force requests your formal participation in the preparation of an Environmental Impact Statement (EIS) for the Divert Activities and Exercises, Guam and Commonwealth of the Northern Mariana Islands as prescribed in the President's Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations, 40 CFR § 1501.6 *Cooperating Agencies*.

As a cooperating agency, the Air Force requests your office participate in various portions of the EIS development as may be required. Specifically, the Air Force asks for your support as a Cooperating Agency by:

- a. Responding, in writing, to this request;
- b. Participating in the scoping process;
- c. Assuming responsibility, upon request by the Air Force, for developing information and preparing analyses on issues for which you have special expertise; and,
- d. Making staff available for interdisciplinary reviews.

To avoid unnecessary delays in the NEPA process, the Air Force must have timely support from cooperating agencies. In turn, the Air Force will ensure it provides the necessary information and related materials in a timely fashion to enable your agency to complete its review and respond promptly. Should you or your staff have any questions regarding this letter, our point of contact is Mr. Mark Petersen, (808) 449-1078, [Mark.Petersen@hickam.af.mil](mailto:Mark.Petersen@hickam.af.mil).

Sincerely,

A handwritten signature in black ink that reads "Timothy K. Bridges".

TIMOTHY K. BRIDGES  
Deputy Assistant Secretary of the Air Force  
(Environment, Safety, & Occupational Health)

cc:  
SAF/IEI  
SAF/GCN  
HQ USAF/A7C  
HQ USAF/A3O  
HQ PACAF/A7PI  
ALCOM/J42

**Cooperating Agency Request Letter to Federal Aviation Administration  
October 21, 2011**



**DEPARTMENT OF THE AIR FORCE  
WASHINGTON DC**

**OFFICE OF THE ASSISTANT SECRETARY**

SAF/IEE  
1665 Air Force Pentagon  
Washington, DC 20330-1665

21 OCT 2011

Ms. Elizabeth L. Ray  
Director, Airspace Services  
Mission Support Services  
Federal Aviation Administration  
800 Independence Ave., SW, Suite 400 East  
Washington, DC 20591

Dear Ms. Ray:

The Air Force requests your formal participation in the preparation of an Environmental Impact Statement (EIS) for the Divert Activities and Exercises, Guam and Commonwealth of the Northern Mariana Islands as prescribed in the President's Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations, 40 CFR § 1501.6 *Cooperating Agencies*.

As a cooperating agency, the Air Force requests your office participate in various portions of the EIS development as may be required. Specifically, the Air Force asks for your support as a Cooperating Agency by:

- a. Responding, in writing, to this request;
- b. Participating in the scoping process;
- c. Assuming responsibility, upon request by the Air Force, for developing information and preparing analyses on issues for which you have special expertise; and,
- d. Making staff available for interdisciplinary reviews;

To avoid unnecessary delays in the NEPA process, the Air Force must have timely support from cooperating agencies. In turn, the Air Force will ensure it provides the necessary information and related materials in a timely fashion to enable your agency to complete its review and respond promptly. Should you or your staff have any questions regarding this letter, our point of contact is Mr. Mark Petersen (808) 449-1078, [Mark.Petersen@hickam.af.mil](mailto:Mark.Petersen@hickam.af.mil).

Sincerely,

TIMOTHY K. BRIDGES  
Deputy Assistant Secretary of the Air Force  
(Environment, Safety, & Occupational Health)

cc:  
SAF/IEI  
SAF/GCN  
HQ USAF/A7C  
HQ USAF/A3O  
HQ PACAF/A7PI  
ALCOM/J42

**Cooperating Agency Response Letter from the Department of the Navy  
November 4, 2011**



**DEPARTMENT OF THE NAVY**

OFFICE OF THE ASSISTANT SECRETARY  
(ENERGY, INSTALLATIONS & ENVIRONMENT)  
1000 NAVY PENTAGON  
WASHINGTON DC 20350-1000

NOV - 4 2011

MEMORANDUM FOR DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE  
(ENVIRONMENT, SAFETY AND OCCUPATIONAL  
HEALTH)

SUBJECT: Cooperating Agency Request for the Proposed U.S. Air Force Environmental Impact Statement for Divert Activities and Exercises, Commonwealth of the Northern Mariana Islands

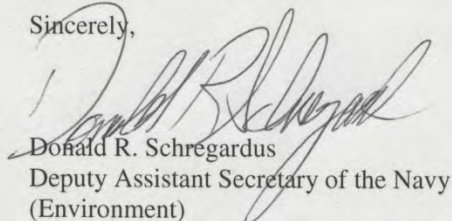
The Department of the Navy agrees to participate as a Cooperating Agency in the preparation of the U.S. Air Force Divert Activities and Exercises, Commonwealth of the Northern Mariana Islands Environmental Impact Statement (EIS). As a Cooperating Agency the Department of the Navy agrees to:

- Participate in scoping, review and hearing processes;
- Make staff support available to enhance interdisciplinary analysis and reviews;
- Upon request, develop information and prepare analyses on topics for which the Navy and/or Marine Corps has special expertise.

The Navy and Marine Corps points of contact to support this cooperating agency relationship are: Ms. Sue Goodfellow, Ph.D., Head, Planning and Conservation Section, Headquarters, U.S. Marine Corps (GF/MCI-COM), (571) 256-2781, email: [sue.goodfellow@usmc.mil](mailto:sue.goodfellow@usmc.mil) and Mr. Neil Sheehan, Environmental Planning Program Manager, Commander Pacific Fleet, (808) 474-7836, email: [neil.a.sheehan@navy.mil](mailto:neil.a.sheehan@navy.mil).

The Department of the Navy appreciates being afforded this opportunity to participate as a cooperating agency and looks forward to working closely with the Air Force on this important environmental planning effort.

Sincerely,

  
Donald R. Schregardus  
Deputy Assistant Secretary of the Navy  
(Environment)

Copy to:  
OPNAV N45  
ADC I&L/GF

**Cooperating Agency Response Letter from the Federal Aviation Administration  
November 15, 2011**



U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

NOV 15 2011

Timothy K. Bridges  
Deputy Assistant Secretary of the Air Force  
(Environment, Safety, & Occupational Health)  
US Department of the Air Force  
SAF/IEE  
1665 Air Force Pentagon  
Washington, DC 20330-1665

Dear Mr. Bridges:

Thank you for your letter requesting the Federal Aviation Administration participate as a cooperating agency in the environmental impact statement (EIS) for the Divert Activities and Exercises, Guam and Commonwealth of the Northern Mariana Islands.

The FAA is pleased to participate in the EIS process in accordance with the National Environmental Policy Act of 1969 as amended, and its implementing regulations. Since the proposal involves special use airspace (SUA), the FAA will cooperate following the guidelines described in the Memorandum of Understanding (MOU) between the FAA and the Department of Defense Concerning SUA Environmental Actions, dated October 4, 2005.

Modification of the SUA resides under the jurisdiction of the Western Service Center, Operations Support Group, Renton, WA. The Western Service Center will be the primary focal point for matters related to both airspace and environmental matters. Mr. John Warner is the Manager of the Operations Support Group. FAA Order 7400.2, Chapter 32 indicates the airspace and environmental processes should be conducted in tandem as much as possible; however, they are separate processes. Approval of either the aeronautical process or the environmental process does not automatically indicate approval of the entire proposal. I have enclosed Appendix 2, 3, and 4 of FAA Order 7400.2 for additional details.

A copy of the incoming correspondence and this response is being forwarded to Mr. Warner of the Western Service Center, Operations Support Group. Mr. Warner can be contacted at (425) 203-4500 for further processing of your proposal.

Sincerely,

A handwritten signature in black ink, appearing to read "Dennis E. Roberts".

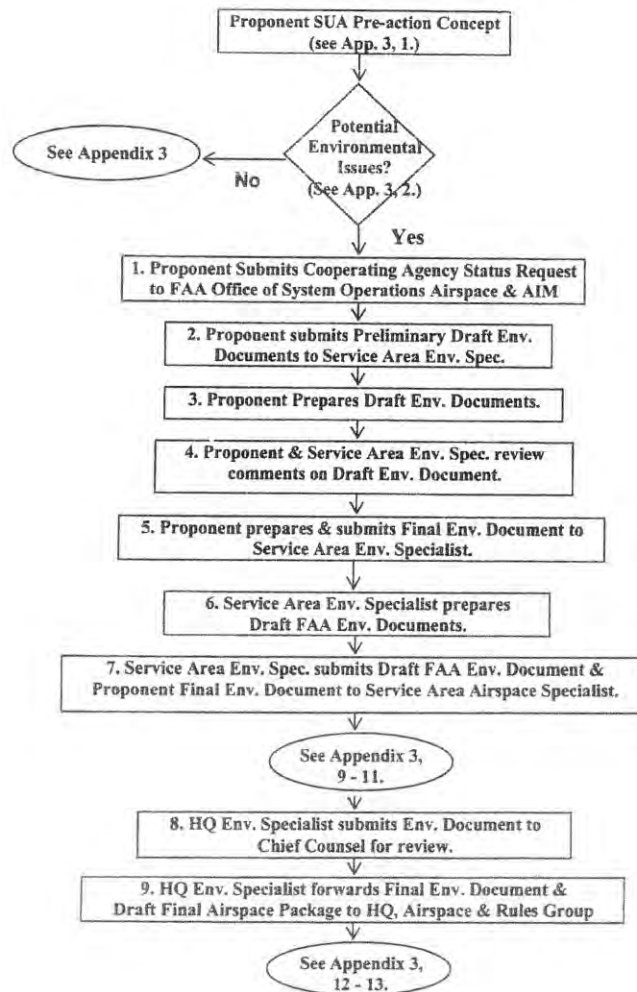
Dennis E. Roberts  
Director, Airspace Services  
Air Traffic Organization

3 Enclosures



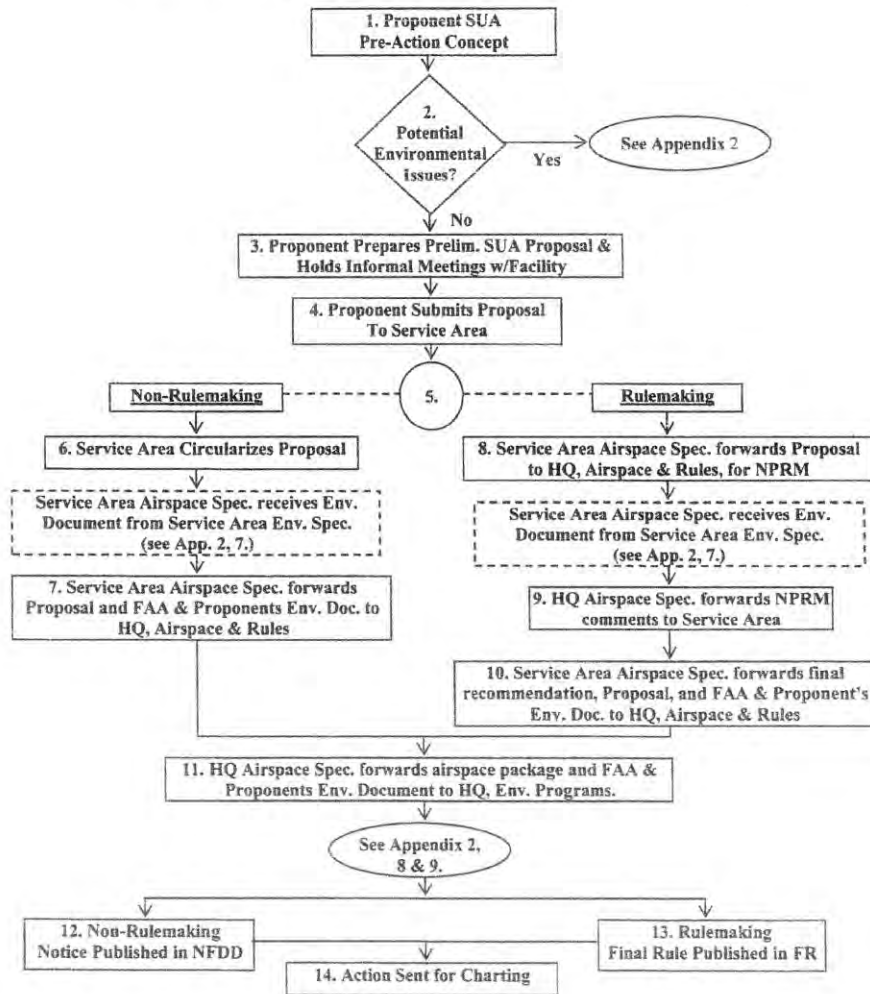
## Appendix 2. Procedures For Processing SUA Actions Environmental Process Flow Chart

(This Chart is for use with Appendix 4 and the numbers correlate to the numbers in the Environmental column of that table.)



### Appendix 3. Procedures For Processing SUA Actions Aeronautical Process Flow Chart

(This Appendix is for use with Appendix 4 and the numbers correlate to the numbers in the Aeronautical column of that table.)



### Appendix 4. FAA Procedures for Processing SUA Actions Aeronautical and Environmental Summary Table

(The aeronautical and environmental processes may not always occur in parallel.)  
(This Appendix is for use with Appendix 2 and Appendix 3, and the numbers correlate to numbers on those charts.)

(See note below.)

| AERONAUTICAL  | ENVIRONMENTAL   |
|---|---|
| <p>1. Proponent shall present to the Facility a Pre-draft concept (i.e., new/ revisions to SUA needed or required).</p> | <p>1. Proponent shall discuss with the Service Area, at the earliest time, the potential for environmental impacts associated with the proposal.</p>  |
|   | <p>2. If there is the potential for environmental impacts, Proponent shall make a request to the FAA for a Cooperating Agency (CA) status when Proponent decides to initiate the environmental process. Proponent shall forward the request to the Director of the System Operations Airspace and AIM. The Director will transmit the request to the Environmental Programs Group who prepares and forwards the response to Proponent. The Environmental Programs Group will send a courtesy copy of the response to the responsible Service Area. The Service Area environmental specialist works as the FAA point of contact throughout the process in development of any required environmental documentation.</p> |
|   | <p>3. Proponent submits a Preliminary Draft EA or EIS to the Service Area environmental specialist.</p> <p>The Service Area environmental specialist shall provide comments, in consultation with the airspace specialist and the Environmental Programs Group, back to Proponent.</p>  |

|   |  |
|---|--|
| <p>2. Proponent forwards the aeronautical proposal to the FAA Service Area for review and processing by the airspace specialist.</p>  | <p>4. Proponent prepares a Draft EA or EIS with a 45-day public comment period. As the FAA CA point of contact, the Service Area environmental specialist reviews the associated draft environmental documentation to ensure that the Proponent addressed adequately all environmental concerns submitted on the Preliminary Draft. If required, the Service Area environmental specialist forwards the draft environmental documentation to the Environmental Programs Group for review and comment by the headquarters environmental specialist and the Office of Chief Counsel.</p> |
| <p>3. The Service Area airspace specialist, in accordance with this order, determines the type of airspace action(s) necessary, either Non-Rulemaking or Rulemaking. FAA Service Area and Proponent determine if informal Airspace Meetings are required.</p>   |  |
| <p><b>For Non-Rulemaking:</b></p>   |  |
| <p>4. The Service Area airspace specialist sends out a circularization with a 45-day public comment period. The Service Area airspace specialist reviews and prepares, in consultation with the Proponent, responses to the aeronautical comments from the study and circularization in accordance with Chapter 21 of this order.</p> | <p>5. The Proponent reviews comments received on their Draft EA/FONSI or EIS and prepares their responses to the comments, in consultation with the FAA and other cooperating agencies, if necessary, and in accordance with Chapter 32 of this order.</p>   |
|   | <p>6. Proponent prepares and submits their Final EA/FONSI or EIS/ROD to the Service Area environmental specialist.</p>   |
|   | <p>7. The Service Area environmental specialist prepares a Draft FAA FONSI/ROD or Draft FAA Adoption Document/ROD.</p>   |
|   | <p>8. The Service Area environmental specialist submits the Draft FAA FONSI/ROD or Draft FAA Adoption Document/ROD and the Proponent's Final EA/FONSI or EIS/ROD to the Service Area airspace specialist for inclusion with the airspace proposal package.</p>   |
| <p>5. The Service Area airspace specialist then sends the completed package containing the aeronautical proposal, response to comments, Proponent's Final EA/FONSI, and the Draft FAA FONSI/ROD to the Headquarters Airspace and Rules Group with their recommendation.</p>   |  |

| <b>For Rulemaking:</b>   |   |
|--|---|
| 6. The Service Area airspace specialist sends the proposal to the Airspace and Rules Group who prepares a Notice of Proposed Rulemaking (NPRM). The Headquarters Airspace and Rules Group submits the NPRM for publication in the Federal Register with a 45-day comment period in accordance with Chapter 2 of this order.                          |   |
| 7. The Headquarters airspace specialist sends comments received on the NPRM to the Service Area airspace specialist for resolution.  |   |
| 8. The Service Area airspace specialist then sends the completed package containing the response to comments, final service area recommendation, the proposal, Proponent's Final EA/FONSI or EIS/ROD, and the Draft FAA FONSI/ROD or Draft FAA Adoption Document/ROD to the Headquarters Airspace and Rules Group for preparation of the Final Rule. |   |
| 9. The Headquarters airspace specialist forwards the draft final rule package or draft non-rulemaking case summary (NRCS) with all supporting documentation to the Headquarters Environmental Programs Group for review (after all aeronautical comments have been resolved).  | 9. The Headquarters environmental specialist reviews the package for environmental technical accuracy; then submits the environmental documentation to the Office of the Chief Counsel, Airports and Environmental Law Division, for legal sufficiency review (having collaborated throughout the process). |
|  | 10. The Chief Counsel's environmental attorney's comments are incorporated into the final FAA environmental decision and signed by Headquarters Environmental Programs Group Manager.<br><br>The package is then returned to the Headquarters Airspace and Rules Group.                                     |
| 10. For Non-rulemaking:<br>The non-rulemaking action is published in the National Flight Data Digest.  |   |
| 11. For Rulemaking:<br>The Final Rule is published in the Federal Register. The Final Rule will contain a reference to the decision rendered and location of documentation for the associated environmental process.   |   |

Consult the following documents throughout the process for further information:

- Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (NEPA), 40 CFR Parts 1500–1508
- FAA Order 1050.1E, “Environmental Impacts: Policies and Procedures”
- FAA Order 7400.2, “Procedures for Handling Airspace Matters,” Part 5
- FAA Order 7400.2, Chapter 32, “Environmental Matters” and the associated appendixes (for specific SUA environmental direction)

**NOTE:** The time periods below are for a non-controversial aeronautical proposal and its associated environmental process. The time periods are for FAA review/processing only. Times for proponent and/or environmental contract support processing must be added.

**ENVIRONMENTAL:** The estimated time of completion for EA processing is 12 to 18 months or, for EIS processing, 18 to 36 months.

**AERONAUTICAL (Non-Rulemaking):** A minimum 4 months is required from submission of the Formal Airspace Proposal by the Proponent to the Service Area through completion of the circularization process. Additionally, a minimum of 6 months is required from submission of the Formal Airspace Proposal by the Service Area to Headquarters through completion of the charting process.

**AERONAUTICAL (Rulemaking):** A minimum 6 weeks for Service Area processing, and a minimum of 9 months to complete rulemaking once the formal package is received at Headquarters.



## United States Department of the Interior



FISH AND WILDLIFE SERVICE  
Pacific Islands Fish and Wildlife Office  
300 Ala Moana Boulevard, Room 3-122, Box 50088  
Honolulu, Hawaii 96850

In Reply Refer To:  
2012-TA-0018

MAR 23 2012

Mr. Mark Petersen  
HQ-PACAF, D-306/A7PI  
25 E Street  
JB Pearl Harbor-Hickam, HI 96853-5412

Subject: Request for the U.S. Fish and Wildlife Service (Service) to be a Cooperating Agency for the Divert Activities and Exercises, Guam and the Commonwealth of the Mariana Islands, Environmental Impact Statement (EIS).

Dear Mr. Peterson:

This is in response to the letter dated 21 October, 2011, from Mr. Timothy Bridges requesting the Service to be a cooperating agency on the preparation of the subject EIS. Current staffing and workload constraints preclude our ability to accept this request, thus, we respectfully decline cooperating agency status.

The Service recognizes the importance of our collaboration in the development of the EIS, and in the section 7 consultation required under the Endangered Species (ESA) of 1973 (16 U.S.C. 1531 *et seq.*), as amended. The Service will continue to provide technical assistance with regard to biological surveys and impact assessment aspects of draft EIS documents, and to respond to Air Force requests for information. The Service will continue to work collaboratively with the Air Force and assist you with ensuring that the best available scientific information is used in the EIS, and that impacts to ESA-listed species and other natural resources are avoided and minimized.

If you have any questions or concerns regarding this consultation, please contact Rachel Rounds, Fish and Wildlife Biologist (phone: 808-792-9400, email: [rachel\\_rounds@fws.gov](mailto:rachel_rounds@fws.gov)).

Sincerely,

  
Loyal Mehrhoff  
Field Supervisor

TAKE PRIDE<sup>®</sup>  
IN AMERICA 

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# APPENDIX B

## ESA Section 7 Consultation Supporting Documentation





**Request for Section 7 Early Consultation/Meeting  
July 7, 2011**

"Ingoglia, Mark Civ USAF PACAF A7AN/A7AN" <Mark.Ingoglia@hickam.af.mil>

07/07/2011 07:00 AM To  
<Earl\_Campbell@fws.gov>

cc

"Leong, Robert Civ USAF PACAF A7PI/A7PI" <Robert.Leong@hickam.af.mil>, "Duffy, Christopher G LtCol USAF PACAF A7/A7P" <christopher.duffy@hickam.af.mil>, "Grannis, William E Civ USAF PACAF A7/A7AV" <William.Grannis@hickam.af.mil>, "Hong, Julie Y CTR USAF PACAF A7PI/A7PI" <Julie.Hong@hickam.af.mil>

Subject

RE: FA8903-08-D-8771-0135: EIS for Divert Activities and Exercises USFW early consultation/meeting request

Aloha Earl,

The Air Force is preparing an EIS for the Pacific Air Force Divert Activities and Exercises in Guam and Commonwealth of the Northern Mariana Islands (CNMI) (hereinafter referred to as the "Divert EIS"). The purpose of the Divert EIS is to identify and assess the potential impacts associated with the proposed development and expansion of existing airfields in the Mariana Islands on U.S. territory in proximity of the Philippine Sea. As always, early and open discussions with your agency is the best way to accomplish this task in a timely manner.

The proposed airfield improvements would be designed to increase joint military exercises, humanitarian assistance, and disaster relief capability for northeast Asia. The USAF intends to meet its mission needs through expansion of an existing FAA-regulated airport which should minimize any potential effects on species of concern in the Marianas. The initial planning for this document is underway and I was hoping to meet with you and/or other members of the USFW staff to pre-brief you on this EIS. We anticipate pre-NOI notification of the Congressional delegations and the Governors of Guam and CNMI in mid-August and public scoping to be held on Guam and the three main CNMI islands in October 2011.

To assure we have touched base with your agency early (as always, it's an "aggressive schedule"), we are suggesting an initial meeting with the Air Force on or about 14 or 15 July 2011. I know you have been designated as the deputy for your office so I'm not sure you are the appropriate point of contact. Please confirm that you are appropriate contact for USFWS and let me know if your office can accommodate that schedule, or if an alternative date is preferred as travel arrangements will have to be made for whatever date is selected.

Thanks in advance,

mi

J. Mark Ingoglia, Chief  
PACAF Environmental Branch  
DSN 449-1077  
808 449-1077

**Response to Request for Section 7 Early Consultation/Meeting  
July 8, 2011**

-----Original Message-----

From: Earl\_Campbell@fws.gov [[mailto:Earl\\_Campbell@fws.gov](mailto:Earl_Campbell@fws.gov)]

Sent: Friday, July 08, 2011 1:45 PM

To: Ingoglia, Mark Civ USAF PACAF A7AN/A7AN

Cc: Duffy, Christopher G LtCol USAF PACAF A7/A7P; Hong, Julie Y CTR USAF PACAF A7PI/A7PI; Leong, Robert Civ USAF PACAF A7PI/A7PI; Grannis, William E Civ USAF PACAF A7/A7AV;

Loyal\_Mehrhoff@fws.gov

Subject: MTG 1 PM July 15 ? : EIS for Divert Activities and Exercises USFW early consultation/meeting request

Mark:

Could we meet on Friday, July 15th at 1 PM at the Pacific Islands Fish and Wildlife Office? I can get a conference room and a PowerPoint projector. Loyal Mehrhoff, my Field Supervisor, will try to attend the meetings. I'll be attending the meeting as well as several biologists who would be working on future regulatory review.

aloha,

earl w. campbell, ph.d.  
assistant field supervisor, invasive species & marianas terrestrial issues  
interagency brown treesnake working group coordinator  
usfws - pacific islands fish and wildlife office  
300 ala moana blvd., room 3 - 122  
p.o. box 50088,  
honolulu, hawaii 96817

808.792.9414 office phone  
808.226.6076 cell phone  
earl.campbell@fws.gov e-mail

# APPENDIX C

## CZMA Compliance Supporting Documentation





**Coastal Zone Management Act (CZMA) Consistency Determination:  
Negative Determination Notice**



DEPARTMENT OF THE AIR FORCE  
PACIFIC AIR FORCES


MAY 18 2012

MEMORANDUM FOR MS. RITA C. CHONG  
DIRECTOR, COASTAL RESOURCES MANAGEMENT OFFICE  
COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS  
P.O. BOX 10007  
SAIPAN, MP 96950

FROM: HQ PACAF/A7  
25 E Street, Suite D-306  
JBPH-H, HI 96853

SUBJECT: Coastal Zone Management Act (CZMA) Consistency Determination:  
Negative Determination Notice for Divert Activities and Exercises

1. Headquarters Pacific Air Forces (HQ PACAF) wishes to inform you of its negative determination under the CZMA regarding the subject proposed action. The Draft Environmental Impact Statement (DEIS) for Divert Activities and Exercises, (Atch 1) proposes federal action to improve an existing airport or airports and associated infrastructure in support of expanding mission requirements in the western Pacific.
2. HQ PACAF proposes to construct facilities and infrastructure at an existing airport or airports to support a combination of cargo, fighter, and tanker aircraft with associated personnel to support periodic joint military exercises and humanitarian assistance and disaster relief (HADR) efforts during times of need. Occasional emergency divert landings could also occur at the proposed improved airport. This action considers both the Saipan International Airport and the Tinian International Airport. HQ PACAF considers the Saipan Airport to be the preferred alternative location as outlined in the Draft EIS. (Atch 2)
3. The DEIS explains the details associated with our proposed action and we refer you to the executive summary for an overview of the proposed action.
4. Should you or your staff have any questions regarding this proposed action, please contact my POC, Mr. Mark Petersen at (808) 449-1078, or at mark.petersen.1@us.af.mil.

  
for KARL S. BOSWORTH  
Director, Installations and Mission Support

- 2 Attachments:
1. Draft EIS for Divert Activities and Exercises, Guam and CNMI
  2. Summary of the Proposed Action

### Summary of the Proposed Action

Section 2.1 of the draft Divert Activities and Exercises EIS describes the proposed action, which includes the following:

1. **Construction Phase.** The KC-135 Stratotanker (KC-135) aircraft is indicative of tanker or cargo aircraft used by the USAF in the western Pacific. The KC-135 aircraft is being used as the design aircraft for cargo and tanker aircraft in the EIS. The following elements would be designed and then constructed or improved at the selected airport or airports:
  - a. *Runway* - Potential extension of the runway up to 10,000 feet in order to meet optimal KC-135 requirements as identified by PACAF Strategy, Policy and Requirements Division. Options that would expand the runway to less than 10,000 feet, or not at all are also analyzed.
  - b. *Parking apron* - The parking aprons at the airport selected for expansion would need to meet design requirements for KC-135 aircraft.
  - c. *Associated pavement markings, lighting, and navigational aids*- All pavement markings, lighting, and navigational aids would be installed, upgraded, or relocated, as appropriate.
  - d. *Temporary munitions storage area*- The temporary munitions storage area would mainly be used to store munitions safely from diverted aircraft until the aircraft could return to its place of origin, or proceed to its planned destination.
  - e. *Hazardous cargo pad and arm/disarm pad*- The hazardous cargo pad would mainly be used to safely handle munitions or other hazardous cargo from diverted aircraft until the aircraft could return to its place of origin, or planned destination. The arm/disarm pad would be used to perform final safety checks on aircraft before takeoff by aircraft maintenance personnel. The arm/disarm pad would also be used to perform initial safety checks on aircraft after landing. The hazardous cargo pad could be designed and constructed to double as an arm/disarm pad.
  - f. *Aircraft hangar*- The hangar would be a closed structure to store aircraft awaiting maintenance or being repaired.
  - g. *Maintenance facility* - The maintenance facility would be used as an Aircraft Maintenance Unit/Aircraft Spares Management and for storage to assist aircraft at the proposed airfield.
  - h. *Jet fuel receiving, storage, and distribution infrastructure*- USAF proposes to maintain a 30-day supply of jet fuel to be able to provide fuel to aircraft through a hydrant system. In order to maintain the 30-day supply of jet fuel, a combination of fuel tanks including bulk storage and smaller operating tanks would be required. The ability to receive jet fuel on the island and ability to transfer it to the airfield would also be required.
  - i. *Billeting*- Temporary billeting, including medical, transportation, and dining services, would be required for the personnel supporting aircraft operations.
2. **Implementation Phase.** It is assumed that any mix of joint fighter, cargo, and tanker aircraft, not to exceed the design capabilities of the airport, could be diverted to or exercised from the airport



or airports selected for improvements. KC-135s would remain the design aircraft for the implementation phase. The following activities would occur at the selected airport or airports:

- a. *Unscheduled/unplanned divert landings*- Unscheduled aircraft landings, also known as “divert” landings would occur; divert landings would occur at these airports if other locations in the western Pacific, for example Andersen Air Force Base (AFB), are unavailable for landing, such as during emergencies or natural disasters.
- b. *Unscheduled/unplanned humanitarian airlift staging*- Humanitarian airlift staging, including non-combatant evacuation operations (NEOs), would also occur at the airport or airports proposed for improvements in the event of an emergency or disaster.
- c. *Military exercises*- A limited number of scheduled joint, combined, and unit-level military training activities and exercises, as described and analyzed in the Mariana Islands Range Complex (MIRC) EIS, for which a Record of Decision (ROD) was issued on July 20, 2010, would occur. It is assumed that both unit-level training and joint military exercises would each take place annually for a combined total of 60 days per year at the airport or airports selected for improvement. This EIS addresses only the ground movements and immediate approaches and departures at the airport or airports selected for development (e.g., take-offs and landings) during unit-level training and exercises. Actual air warfare and air logistics training (i.e., above 10,000 feet) are addressed by the MIRC EIS, for which a ROD was issued on July 20, 2010.
- d. *Jet fuel receiving, storage, and distribution*- A fuel delivery system, jet fuel storage, and means of fuel resupply would be required for the airport or airports selected for improvements. The ability to store fuel and transfer fuel from the receiving port to the airfield would be developed.
- e. *Billeting*- Temporary billeting, including medical, transportation, and dining services, would be required for the personnel supporting aircraft operations. This could be accomplished by using under utilized local hotels or temporary facilities consisting of tents and other support on or near airport property.

Pursuant to Section 7 of P.L. 3-47 [2 CMC Section 1513] federal lands in the CNMI are excluded from the CNMI Coastal Resource Management Program. The proposed fuel tank location at the Saipan harbor would be on federal property and would be constructed with adequate containment in accordance with all applicable standards and requirements. The proposed temporary munitions storage area at the Tinian alternative site would be located within the Military Leased Area on Tinian. No “spillover impacts” on the coastal zone would be anticipated from either of these proposed facilities.

The USAF evaluated whether the construction phase and implementation phase of the Proposed Action at GSN or TNI would have reasonably foreseeable direct or indirect effects on any coastal use or resource of the coastal zone of the CNMI. The USAF determined that with the measures in place that are outlined in the table of required permits and consultations in the attached EIS, that the proposed action would be consistent to the maximum extent practicable with the enforceable policies of the CNMI Coastal Resource Management Program. The USAF would comply with permitting and consultation requirements ensuring consistency with the CNMI Coastal Resources Management Program.

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# APPENDIX D

## NHPA Section 106 Consultation Supporting Documentation





**Section 106 Consultation Request Letter**  
**February 1, 2012**



**DEPARTMENT OF THE AIR FORCE**  
**PACIFIC AIR FORCES**

FEB 01 2012

MEMORANDUM FOR MR. JOHN PALACIOS  
HISTORIC PRESERVATION OFFICER  
DIVISION OF HISTORIC PRESERVATION  
DEPARTMENT OF COMMUNITY AND CULTURAL AFFAIRS  
PO BOX 500090 CK OR CALLER BOX 10007  
SAIPAN, MP 96950

FROM: HQ PACAF/A7  
25 E Street, Suite D-306  
JBPH-H, HI 96853

SUBJECT: Environmental Impact Statement and Section 106 Consultation for Improvements Related to U.S. Air Force (USAF), Pacific Air Forces (PACAF), Divert Activities and Exercises, Francisco C. Ada/Saipan International Airport, Saipan and Tinian International Airport, Tinian, Commonwealth of the Northern Mariana Islands

1. My office is preparing an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) to evaluate possible infrastructure improvements at Francisco C. Ada/Saipan International Airport (GSN) and/or Tinian International Airport (TNI). These improvements would facilitate proposed USAF use of one or both airfields. This NEPA evaluation will comply with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR Part 800. USAF will conduct Section 106 consultation concurrently with development of the EIS as recommended by NEPA's implementing regulations, Title 40 Code of Federal Regulations (CFR) Part 1502.25(a). In accordance with 36 CFR Part 800.3(c), this letter initiates our Section 106 coordination for this undertaking.
2. We are still in the planning stages. Given the potential for impact to important cultural resources, USAF seeks consultation with the Commonwealth Historic Preservation Office (HPO) and other interested parties so concerns can be identified early in project planning. USAF seeks consultation on determining the Area of Potential Effect (APE) for cultural resources at both GSN and TNI. We also seek input for designing appropriate cultural resources survey strategies to catalog historic properties in the APE.
3. The proposed improvements involve construction of facilities and infrastructure to support cargo, fighter, and tanker aircraft and associated support personnel for periodic divert landings, joint military exercises, and humanitarian assistance. The undertaking is needed since there is no airfield on U.S. territory in proximity of the Philippine Sea designed and designated to provide strategic capabilities when needed and humanitarian airlift for natural disasters. USAF is considering two action alternatives for the undertaking to include improvements at GSN and TNI. Existing capabilities at each of these airfields will play a major role in determining what improvements need to be made and thus the extent of the undertaking. USAF may also choose to employ some combination of the proposed action elements at both airfields to meet the objective.

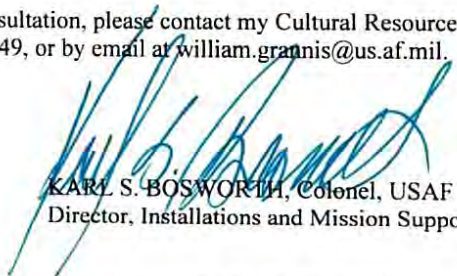
Attachment 1: Proposed Schedule for Divert Activities and Exercises Section 106 Consultation

1. USAF provides HPO information describing conceptual project plans in Feb 2012.
2. Once HPO has had an opportunity to review the conceptual project plans, the USAF will work with HPO to determine appropriate APEs for the Saipan (GSN) and Tinian (TNI) project alternatives. USAF proposes 30 days for completion of negotiations. Our anticipated completion date is 15 Mar 2012.
3. USAF will prepare and submit a draft cultural resources report to HPO for review. USAF proposes a 30 day review period for HPO. Our anticipated submittal date is 30 Mar 12. Upon receipt of comments from HPO, USAF will prepare and submit a final draft, scheduled for no later than 30 Jun 2012.
4. If the USAF, in consultation with HPO, determines the undertaking will have adverse effects on historic properties, USAF will invite the ACHP to join in the Section 106 consultations with the goal of entering into a PA by 28 Sep 2012.

4. HDR Inc. has been contracted to support development of the EIS. HDR Inc. archaeologists and architectural historians found Isley Field Historic District listed on the National Register of Historic Places. Isley Field Historic District encompasses numerous architectural and engineering features within and near the modern boundaries of GSN on Saipan. While most of the contributing elements to the district are visible, well-documented, and, therefore, easily avoided by construction and implementation activities, secondary impacts are possible.

5. Pursuant to 36 CFR 800.5, the USAF will consult with HPO to determine if the undertaking will have adverse effects to historic properties in the APEs. If the parties agree that historic properties will suffer adverse effects, the USAF will consult the Advisory Council on Historic Preservation (ACHP) as prescribed in 36 CFR 800.6 with the goal of entering into a Programmatic Agreement (PA) to address these issues and any others that might arise through the Section 106 consultation process. If the parties agree the undertaking has no effect or no adverse effect on historic properties, the USAF will notify ACHP of the finding and conclude Section 106 consultations. A proposed schedule for this Section 106 consultation is attached.

6. If you have any questions regarding this consultation, please contact my Cultural Resources Manager, Mr. William Grannis at (808) 449-4049, or by email at [william.grannis@us.af.mil](mailto:william.grannis@us.af.mil).



KARL S. BOSWORTH, Colonel, USAF  
Director, Installations and Mission Support

cc: Barbara Alberti, National Park Service, Superintendent War in the Pacific National Historical Park, Guam, and American Memorial Park, CNMI

Attachment:  
Proposed Schedule

**Response to Section 106 Consultation Request Letter  
February 9, 2012**

---

**From:** Melvin LO Faisao (DCCA-GMAIL) [mailto:mlof65@gmail.com]  
**Sent:** Wednesday, February 08, 2012 2:09 PM  
**To:** 'Grannis, William E Civ USAF PACAF A7/A7AV'; John D. Palacios-HPO Compliance Supervisor; 'Mertie T. Kani (HPO)'  
**Cc:** Hokanson, Jeffrey H; Lynch, Edward J; Edwards, Matthew; Pyle, Stephen G; Jennings, Michael H; Gallison, James D; Fischer, Ben C; mtkani@cmnihpo.net; jdcamacho@cmnihpo.net; 'Melvin Faisao (DCCA)'; 'Melvin Faisao'; 'Gilbert J. Birnbrich Chief of the Civil Division'; 'Frank Rabaulman'; Rita Chong-CRMO  
**Subject:** FW: Section 106 Consultation for Improvements Related to PACAF Divert Activities and Exercises, CNMI  
**Importance:** High

2/9/2012 6:04:55 AM

-  
*Dear Ms. Mertie Kani (Administrator, Div. HPO):*

*Please review the attachment and provide an official correspondence for my concurrence to the request stated therein. In addition, see e-mail message thread below. Please expedite ASAP!*

*Melvin Faisao  
Secretary, DCCA  
SHPO, CNMI*

-----Original Message-----

From: Grannis, William E Civ USAF PACAF A7/A7AV  
[mailto:William.Grannis@hickam.af.mil]  
Sent: Thursday, February 09, 2012 4:37 AM  
To: [jdpalacios1@hotmail.com](mailto:jdpalacios1@hotmail.com); [Mlof65@gmail.com](mailto:Mlof65@gmail.com)  
Cc: Hokanson, Jeffrey H; Lynch, Edward J; Edwards, Matthew; Pyle, Stephen G;  
[Michael.Jennings@hdrinc.com](mailto:Michael.Jennings@hdrinc.com); [James.Gallison@hdrinc.com](mailto:James.Gallison@hdrinc.com);  
[Benjamin.Fischer@hdrinc.com](mailto:Benjamin.Fischer@hdrinc.com); [mtkani@cmnihpo.net](mailto:mtkani@cmnihpo.net); [jdcamacho@cmnihpo.net](mailto:jdcamacho@cmnihpo.net)  
Subject: Section 106 Consultation for Improvements Related to PACAF Divert Activities and Exercises, CNMI



Hafa A dai Mr. Palacios and Mr. Faisao,

I hope this message finds you well. As you are aware, the HQ Pacific Air Forces has initiated an Environmental Impact Statement (EIS) for Divert Activities and Exercises, CNMI. The EIS is evaluating alternatives that include proposed infrastructure improvements at Saipan International Airport and Tinian International Airport. Concurrently, we would like to initiate Section 106 consultation with your office. Attached you will find the letter from our HQ Pacific Air Forces/A7 with regards to the Divert Activities Exercises EIS and Section 106 consultation. A hard copy of this letter is in the mail. This letter is addressed to Mr. Palacios as he was the primary contact that the HDR project team interacted with during a recent trip to Saipan. We understand that Mr. Faisao is now the Historic Preservation Officer.

Should you have any questions, please don't hesitate to contact us. We would appreciate any info you can provide on who we should be working directly with during the consultation and any preferred methods of communication and contact information.

I am the Natural/Cultural Resources Manager at HQ PACAF/A7. The cultural resources project team from HDR Environmental, Operations and Construction, Inc. is copied here. We look forward to engaging with you on this effort.

Respectfully,

Bill

William Grannis  
Environmental Program Manager  
HQ PACAF/A7AV  
DSN:(315)449-4049  
COM:(808)449-4049

**Request for HPO and NPS Review of Draft Phase I Cultural Resources Report  
April 16, 2012**



**DEPARTMENT OF THE AIR FORCE  
PACIFIC AIR FORCES**

16 APR 2012

MEMORANDUM FOR MS. MERTIE KANI  
HPO ACTING DIRECTOR  
DIVISION OF HISTORIC PRESERVATION  
DEPARTMENT OF COMMUNITY AND CULTURAL AFFAIRS  
SAIPAN, MP 96950

FROM: HQ PACAF/A7AV  
25 E Street, Suite B-206  
Joint Base Pearl Harbor-Hickam HI 96853-5420

SUBJECT: Request for Review of Draft Phase I Cultural Resources Survey Supporting the  
Environmental Impact Statement for Divert Activities and Exercises on Saipan  
Commonwealth of the Northern Mariana Islands

1. As indicated in the previously provided memo from our Director, Installations and Mission Support, dated 1 Feb 12, the US Air Force is preparing an Environmental Impact Statement (EIS) for Divert Activities and Exercises. The Francisco C. Ada/Saipan International Airport is one of the alternatives being considered in the EIS. To address data gaps related to this alternative, the Air Force has conducted a survey of historic resources and is pleased to submit the subject draft survey report for your review.
2. The study area is contained within the boundaries of the NRHP-listed Isley Field Historic District (NRIS No.: 81000667), which itself is included in the Saipan Landing Beaches, Aslito/Isley Field and Marpi Point National Historic Landmark (NHLS No.: 85001789). As such, the U.S. Air Force evaluated these resources according to whether or not they constitute contributing elements of the Historic District/National Historic Landmark. Results of this evaluation are provided in the attached report.
3. Request your comments or concurrence by 20 May 12. Should you have any questions or concerns, please contact me at (808) 449-4049, or by email at [william.grannis@us.af.mil](mailto:william.grannis@us.af.mil).

A handwritten signature in cursive script, appearing to read "William Grannis", is positioned above the typed name.

WILLIAM GRANNIS  
Environmental Program Manager,  
HQ PACAF/A7AV

Attachment: Draft Phase I Cultural Resources Survey Report

cc:  
Barbara Alberti, National Park Service, Superintendent, War in the Pacific National Historical  
Park, Guam, and American Memorial Park, CNMI  
Katry Harris, Program Analyst, Advisory Council on Historic Preservation

# APPENDIX E

## Air Quality Calculations and Modeling





|                              |   |
|------------------------------|---|
| <b>Summary</b>               | Summarizes total emissions by calendar year for Alternative 1 - Construction Phase (GSN).   |
| <b>Combustion</b>            | Estimates emissions from non-road equipment exhaust.  |
| <b>Fugitive</b>              | Estimates particulate emissions from construction activities including earthmoving, vehicle traffic, and windblown dust.            |
| <b>Grading</b>               | Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions. |
| <b>Construction Commuter</b> | Estimates emissions for construction workers commuting to the site.   |
| <b>Haul Truck On-Road</b>    | Estimates emissions from hauling construction materials to the project site.  |

**Summary of Air Quality Emissions from Divert EIS - Alternative 1 - Construction Phase (GSN)**

|                            | <b>NO<sub>x</sub><br/>(ton)</b> | <b>VOC<br/>(ton)</b> | <b>CO<br/>(ton)</b> | <b>SO<sub>2</sub><br/>(ton)</b> | <b>PM<sub>10</sub><br/>(ton)</b> | <b>PM<sub>2.5</sub><br/>(ton)</b> | <b>CO<sub>2</sub><br/>(ton)</b> |
|----------------------------|---------------------------------|----------------------|---------------------|---------------------------------|----------------------------------|-----------------------------------|---------------------------------|
| Construction Combustion    | 18.08                           | 2.33                 | 7.83                | 1.21                            | 1.26                             | 1.22                              | 2,083.77                        |
| Construction Fugitive Dust | -                               | -                    | -                   | -                               | 107.45                           | 8.90                              | -                               |
| Construction Commuter      | 8.81                            | 8.77                 | 79.32               | 0.10                            | 0.83                             | 0.53                              | 10,518.55                       |
| Haul Truck On-Road         | 17.73                           | 12.82                | 52.11               | 1.40                            | 21.09                            | 5.48                              | 4,489.83                        |
| <b>TOTAL</b>               | <b>44.63</b>                    | <b>23.92</b>         | <b>139.27</b>       | <b>2.71</b>                     | <b>130.64</b>                    | <b>16.13</b>                      | <b>17,092.15</b>                |

**Annual Summary of Air Quality Emissions from Divert EIS - Alternative 1 - Construction Phase (GSN)\***

|       | <b>Point and Area Sources Combined</b> |                      |                     |                                 |                                  |                                   |   |
|-------|--|----------------------|---------------------|---------------------------------|----------------------------------|-----------------------------------|---|
|       | <b>NO<sub>x</sub><br/>(tpy)</b>        | <b>VOC<br/>(tpy)</b> | <b>CO<br/>(tpy)</b> | <b>SO<sub>2</sub><br/>(tpy)</b> | <b>PM<sub>10</sub><br/>(tpy)</b> | <b>PM<sub>2.5</sub><br/>(tpy)</b> | <b>CO<sub>2</sub><br/>(metric tons)</b> |
| CY 01 | 14.88                                  | 7.97                 | 46.42               | 0.90                            | 43.55                            | 5.38                              | 5697.38                                 |
| CY 02 | 14.88                                  | 7.97                 | 46.42               | 0.90                            | 43.55                            | 5.38                              | 5697.38                                 |
| CY 03 | 14.88                                  | 7.97                 | 46.42               | 0.90                            | 43.55                            | 5.38                              | 5697.38                                 |

\* Construction duration is estimated to be 36 months and the emissions are assumed to be distributed evenly over the construction period.

**Combustion Emissions - Alternative 1 (GSN)**

Combustion Emissions of VOC, NO<sub>x</sub>, SO<sub>2</sub>, CO, PM<sub>2.5</sub>, PM<sub>10</sub>, and CO<sub>2</sub> due to Construction

**Assumptions**

When multiple options exist under the general construction activities the most conservative value will be used to quantify air emission.

| General Construction Activities                                   | Area Disturbed (ft <sup>2</sup> ) |
|---|-----------------------------------|
| Construct Aircraft Hangar   | 35,100 ft <sup>2</sup>            |
| Construct Maintenance Facility                                    | 6,000 ft <sup>2</sup>             |
| Construct Jet Fuel System (operational, Bulk and at the Port of S | 400,400 ft <sup>2</sup>           |
| Construct Billeting   | 775,400 ft <sup>2</sup>           |
| Construct Hazardous Cargo Pad and Arm/Disarm Pad                  | 195,000 ft <sup>2</sup>           |
| Construct Maximum Runway Extension                                | 275,000 ft <sup>2</sup>           |
| Construct Parking Apron   | 900,000 ft <sup>2</sup>           |
| Construct Temporary Munitions Storage Area (TCM and Multi C)      | 43,700 ft <sup>2</sup>            |

|                                     |                           |   |
|-------------------------------------|---------------------------|---|
| Total General Construction Area:    | 1,411,900 ft <sup>2</sup> |   |
|                                     | 32.4 acres                |   |
| Total Demolition Area:              | 0 ft <sup>2</sup>         |   |
|                                     | 0.0 acres                 |   |
| Total Pavement Area:                | 1,218,700 ft <sup>2</sup> |   |
|                                     | 28.0 acres                |   |
| Total Disturbed Area:               | 2,630,600 ft <sup>2</sup> |   |
|                                     | 60.4 acres                |   |
| Construction Duration:              | 36 months                 |   |
| 1 Yr Project Construction Activity: | 240 days/yr               | Assume 12 months, 4 weeks per month, 5 days per week. |

**Emission Factors Used for Construction Equipment**

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0  
 Emission factors are taken from the NONROAD model and were provided to e<sup>2</sup>M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.  
 Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

**Grading**

| Equipment                             | No. Reqd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|--|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Bulldozer                             | 1                                      | 13.60                       | 0.96                         | 5.50           | 1.02                                     | 0.89                         | 0.87                          | 1456.90                     |
| Motor Grader                          | 1                                      | 9.69                        | 0.73                         | 3.20           | 0.80                                     | 0.66                         | 0.64                          | 1141.65                     |
| Water Truck                           | 1                                      | 18.36                       | 0.89                         | 7.00           | 1.64                                     | 1.00                         | 0.97                          | 2342.98                     |
| <b>Total per 10 acres of activity</b> | <b>3</b>                               | <b>41.64</b>                | <b>2.58</b>                  | <b>15.71</b>   | <b>0.83</b>                              | <b>2.55</b>                  | <b>2.47</b>                   | <b>4941.53</b>              |

**Paving**

| Equipment                             | No. Reqd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|--|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Paver                                 | 1                                      | 3.83                        | 0.37                         | 2.06           | 0.28                                     | 0.35                         | 0.34                          | 401.93                      |
| Roller                                | 1                                      | 4.82                        | 0.44                         | 2.51           | 0.37                                     | 0.43                         | 0.42                          | 536.07                      |
| Truck                                 | 2                                      | 36.71                       | 1.79                         | 14.01          | 3.27                                     | 1.99                         | 1.93                          | 4685.95                     |
| <b>Total per 10 acres of activity</b> | <b>4</b>                               | <b>45.37</b>                | <b>2.61</b>                  | <b>18.58</b>   | <b>0.91</b>                              | <b>2.78</b>                  | <b>2.69</b>                   | <b>5623.96</b>              |

**Demolition**

| Equipment                             | No. Reqd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|--|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Loader                                | 1                                      | 13.45                       | 0.99                         | 5.58           | 0.95                                     | 0.93                         | 0.90                          | 1360.10                     |
| Haul Truck                            | 1                                      | 18.36                       | 0.89                         | 7.00           | 1.64                                     | 1.00                         | 0.97                          | 2342.98                     |
| <b>Total per 10 acres of activity</b> | <b>2</b>                               | <b>31.81</b>                | <b>1.89</b>                  | <b>12.58</b>   | <b>0.64</b>                              | <b>1.92</b>                  | <b>1.87</b>                   | <b>3703.07</b>              |

**Building Construction**

| Equipment <sup>d</sup>                | No. Reqd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|--|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| <b>Stationary</b>                     |  |                             |                              |                |  |                              |                               |                             |
| Generator Set                         | 1                                      | 2.38                        | 0.32                         | 1.18           | 0.15                                     | 0.23                         | 0.22                          | 213.06                      |
| Industrial Saw                        | 1                                      | 2.62                        | 0.32                         | 1.97           | 0.20                                     | 0.32                         | 0.31                          | 291.92                      |
| Welder                                | 1                                      | 1.12                        | 0.38                         | 1.50           | 0.08                                     | 0.23                         | 0.22                          | 112.39                      |
| <b>Mobile (non-road)</b>              |  |                             |                              |                |  |                              |                               |                             |
| Truck                                 | 1                                      | 18.36                       | 0.89                         | 7.00           | 1.64                                     | 1.00                         | 0.97                          | 2342.98                     |
| Forklift                              | 1                                      | 5.34                        | 0.56                         | 3.33           | 0.40                                     | 0.55                         | 0.54                          | 572.24                      |
| Crane                                 | 1                                      | 9.57                        | 0.66                         | 2.39           | 0.65                                     | 0.50                         | 0.49                          | 931.93                      |
| <b>Total per 10 acres of activity</b> | <b>6</b>                               | <b>39.40</b>                | <b>3.13</b>                  | <b>17.38</b>   | <b>3.12</b>                              | <b>2.83</b>                  | <b>2.74</b>                   | <b>4464.51</b>              |

**Architectural Coatings**

| Equipment                             | No. Reqd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|--|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Air Compressor                        | 1                                      | 3.57                        | 0.37                         | 1.57           | 0.25                                     | 0.31                         | 0.30                          | 359.77                      |
| <b>Total per 10 acres of activity</b> | <b>1</b>                               | <b>3.57</b>                 | <b>0.37</b>                  | <b>1.57</b>    | <b>0.25</b>                              | <b>0.31</b>                  | <b>0.30</b>                   | <b>359.77</b>               |

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO<sub>2</sub> emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

**PROJECT-SPECIFIC EMISSION FACTOR SUMMARY**

| Source                                   | Equipment Multiplier* | Project-Specific Emission Factors (lb/day) |        |        |                    |                  |                   |                 |
|--|-----------------------|--|--------|--------|--------------------|------------------|-------------------|-----------------|
|  |                       | NO <sub>x</sub>                            | VOC    | CO     | SO <sub>2</sub> ** | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
| Grading Equipment                        | 6                     | 249.847                                    | 15.462 | 94.259 | 4.997              | 15.273           | 14.815            | 29649.158       |
| Paving Equipment                         | 3                     | 136.102                                    | 7.817  | 55.735 | 2.722              | 8.328            | 8.078             | 16871.871       |
| Demolition Equipment                     | 1                     | 31.808                                     | 1.886  | 12.584 | 0.636              | 1.923            | 1.865             | 3703.074        |
| Building Construction                    | 3                     | 118.189                                    | 9.389  | 52.147 | 9.349              | 8.487            | 8.233             | 13393.535       |
| Air Compressor for Architectural Coating | 3                     | 10.722                                     | 1.120  | 4.696  | 0.753              | 0.928            | 0.900             | 1079.320        |
| Architectural Coating**                  |                       |  | 96.841 |        |                    |                  |                   |                 |

\*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

\*\*Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO<sub>x</sub> = (Total Grading NO<sub>x</sub> per 10 acre)\*(Equipment Multiplier)

**Summary of Input Parameters**

|                        | Total Area (ft <sup>2</sup> ) | Total Area (acres) | Total Days |  |
|------------------------|-------------------------------|--------------------|------------|--|
| Grading:               | 2,630,600                     | 60.39              | 6          | (from "Grading" worksheet)                                     |
| Paving:                | 1,218,700                     | 27.98              | 45         |  |
| Demolition:            | 0                             | 0.00               | 0          |  |
| Building Construction: | 1,411,900                     | 32.41              | 240        |  |
| Architectural Coating  | 1,411,900                     | 32.41              | 20         | (per SMAQMD "Air Quality of Thresholds of Significance", 1994) |

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative.

The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition.

The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

**Total Project Emissions by Activity (lbs)**

|                               | NO <sub>x</sub>  | VOC             | CO               | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub>  |
|-------------------------------|------------------|-----------------|------------------|-----------------|------------------|-------------------|------------------|
| Grading Equipment             | 1,499.08         | 92.77           | 565.56           | 29.98           | 91.64            | 88.89             | 177,895          |
| Paving                        | 6,079.22         | 349.17          | 2,489.51         | 121.58          | 372.00           | 360.84            | 753,610          |
| Demolition                    | -                | -               | -                | -               | -                | -                 | 0                |
| Building Construction         | 28,365.35        | 2,253.46        | 12,515.26        | 2,243.77        | 2,036.91         | 1,975.80          | 3,214,448        |
| Architectural Coatings        | 214.44           | 1,959.21        | 93.93            | 15.07           | 18.56            | 18.00             | 21,586           |
| <b>Total Emissions (lbs):</b> | <b>36,158.09</b> | <b>4,654.61</b> | <b>15,664.25</b> | <b>2,410.41</b> | <b>2,519.11</b>  | <b>2,443.53</b>   | <b>4,167,540</b> |

**Results: Total Project Annual Emission Rates**

|                                | NO <sub>x</sub> | VOC      | CO        | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|--------------------------------|-----------------|----------|-----------|-----------------|------------------|-------------------|-----------------|
| Total Project Emissions (lbs)  | 36,158.09       | 4,654.61 | 15,664.25 | 2,410.41        | 2,519.11         | 2,443.53          | 4,167,540       |
| Total Project Emissions (tons) | 18.08           | 2.33     | 7.83      | 1.21            | 1.26             | 1.22              | 2,083.77        |

**Construction Fugitive Dust Emissions - Proposed Action (Phase 1 - Current, Annual)**

**Construction Fugitive Dust Emission Factors**

|                                 | <b>Emission Factor</b> | <b>Units</b>                     | <b>Source</b>                |
|---------------------------------|------------------------|----------------------------------|------------------------------|
| General Construction Activities | 0.19                   | ton PM <sub>10</sub> /acre-month | MRI 1996; EPA 2001; EPA 2006 |
| New Road Construction           | 0.42                   | ton PM <sub>10</sub> /acre-month | MRI 1996; EPA 2001; EPA 2006 |

**PM<sub>2.5</sub> Emissions**

|                              |      |  |                    |
|------------------------------|------|--|--------------------|
| PM <sub>2.5</sub> Multiplier | 0.10 | (10% of PM <sub>10</sub> emissions assumed to be PM <sub>2.5</sub> ) | EPA 2001; EPA 2006 |
|------------------------------|------|--|--------------------|

**Control Efficiency**

|      |  |                    |
|------|--|--------------------|
| 0.50 | (assume 50% control efficiency for PM <sub>10</sub> and PM <sub>2.5</sub> emissions) | EPA 2001; EPA 2006 |
|------|--|--------------------|

**Project Assumptions**

**New Roadway Construction (0.42 ton PM<sub>10</sub>/acre-month)**

|                                  |            |
|----------------------------------|------------|
| Duration of Construction Project | 12 months  |
| Area                             | 28.0 acres |

**General Construction Activities (0.19 ton PM<sub>10</sub>/acre-month)**

|                                  |            |
|----------------------------------|------------|
| Duration of Construction Project | 12 months  |
| Area                             | 32.4 acres |

|                                 | <b>Project Emissions (tons/year)</b> |                                   |                                      |                                    |
|---------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|------------------------------------|
|                                 | <b>PM<sub>10</sub> uncontrolled</b>  | <b>PM<sub>10</sub> controlled</b> | <b>PM<sub>2.5</sub> uncontrolled</b> | <b>PM<sub>2.5</sub> controlled</b> |
| New Roadway Construction        | 141.01                               | 70.50                             | 14.10                                | 7.05                               |
| General Construction Activities | 73.90                                | 36.95                             | 3.70                                 | 1.85                               |
| <b>Total</b>                    | <b>214.91</b>                        | <b>107.45</b>                     | <b>17.80</b>                         | <b>8.90</b>                        |

**Construction Fugitive Dust Emission Factors**

**General Construction Activities Emission Factor**

**0.19 ton PM<sub>10</sub>/acre-month** Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM<sub>10</sub>/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM<sub>10</sub>/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM<sub>10</sub>/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM<sub>10</sub>/acre-month) and 75% of the average emission factor (0.11 ton PM<sub>10</sub>/acre-month). The 0.19 ton PM<sub>10</sub>/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM<sub>10</sub>/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM<sub>10</sub> and PM<sub>2.5</sub> in PM nonattainment areas.

**New Road Construction Emission Factor**

**0.42 ton PM<sub>10</sub>/acre-month** Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM<sub>10</sub>/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM<sub>10</sub>/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

**PM<sub>2.5</sub> Multiplier**

**0.10**

PM<sub>2.5</sub> emissions are estimated by applying a particle size multiplier of 0.10 to PM<sub>10</sub> emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

**Control Efficiency for PM<sub>10</sub> and PM<sub>2.5</sub>**

**0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM<sub>10</sub> and PM<sub>2.5</sub> in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

**References:**

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.



**Grading Schedule - Proposed Action (Phase 1 - Current, Annual)**

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 60.4 acres/yr (from Combustion Worksheet)  
 Qty Equipment: 19.0 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.  
 An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.  
 200 hp bulldozers are used for site clearing.  
 300 hp bulldozers are used for stripping, excavation, and backfill.  
 Vibratory drum rollers are used for compacting.  
 Stripping, Excavation, Backfill and Compaction require an average of two passes each.  
 Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

| Means Line No. | Operation     | Description                              | Output | Units      | Acres per equip-day | equip-days per acre | Acres/yr (project-specific) | Equip-days per year |
|----------------|---------------|--|--------|------------|---------------------|---------------------|-----------------------------|---------------------|
| 2230 200 0550  | Site Clearing | Dozer & rake, medium brush               | 8      | acre/day   | 8                   | 0.13                | 60.39                       | 7.55                |
| 2230 500 0300  | Stripping     | Topsoil & stockpiling, adverse soil      | 1,650  | cu. yd/day | 2.05                | 0.49                | 60.39                       | 29.52               |
| 2315 432 5220  | Excavation    | Bulk, open site, common earth, 150' haul | 800    | cu. yd/day | 0.99                | 1.01                | 30.20                       | 30.45               |
| 2315 120 5220  | Backfill      | Structural, common earth, 150' haul      | 1,950  | cu. yd/day | 2.42                | 0.41                | 30.20                       | 12.49               |
| 2315 310 5020  | Compaction    | Vibrating roller, 6 " lifts, 3 passes    | 2,300  | cu. yd/day | 2.85                | 0.35                | 60.39                       | 21.18               |
| <b>TOTAL</b>   |               |  |        |            |                     |                     |                             | <b>101.19</b>       |

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 101.19  
 Qty Equipment: 19.00  
 Grading days/yr: 5.33

**Construction/Staff Commuter Emissions - Alternative 1 (GSN)**

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

**Assumptions:**

Passenger vehicle emission factors for scenario year 2011-2015 are used

- The average roundtrip commute for a construction/staff worker = 40 miles
- Number of construction days = 240 days
- Number of construction/Staff workers (daily) = 2000 people

**Note: None**

**Passenger Vehicle Emission Factors for Year 2011-2016 (lbs/mile)**

| NO <sub>x</sub> | VOC        | CO         | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|-----------------|------------|------------|-----------------|------------------|-------------------|-----------------|
| 0.00091814      | 0.00091399 | 0.00826276 | 0.00001077      | 0.00008698       | 0.00005478        | 1.09568235      |

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC

**Construction Commuter Emissions**

|      | NO <sub>x</sub> | VOC       | CO         | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|------|-----------------|-----------|------------|-----------------|------------------|-------------------|-----------------|
| lbs  | 17628.307       | 17548.575 | 158644.933 | 206.875         | 1669.993         | 1051.800          | 21037101.087    |
| tons | 8.814           | 8.774     | 79.322     | 0.1034          | 0.8350           | 0.5259            | 10518.551       |

Example Calculation: NO<sub>x</sub> emissions (lbs) = 60 miles/day \* NO<sub>x</sub> emission factor (lb/mile) \* number of construction days \* number of workers

No Statistical Area Available for GSN

| Row #                    | State | County | Tier-1 | Point Source Emissions |                 |                  |                   |                 | Area Source Emissions (Non-Point and Mobile Sources) |    |                 |                  |                   |                 |     |
|--------------------------|-------|--------|--------|------------------------|-----------------|------------------|-------------------|-----------------|--|----|-----------------|------------------|-------------------|-----------------|-----|
|                          |       |        |        | CO                     | NO <sub>x</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | SO <sub>2</sub> | VOC  | CO | NO <sub>x</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | SO <sub>2</sub> | VOC |
| <b>No Data Available</b> |       |        |        |                        |                 |                  |                   |                 |  |    |                 |                  |                   |                 |     |
| Grand Total              |       |        |        | 0                      | 0               | 0                | 0                 | 0               | 0  | 0  | 0               | 0                | 0                 | 0               | 0   |

SOURCE:

<http://www.epa.gov/ttn/chief/einformation.html>

USEPA - AirData NET Tier Report

\*Net Air pollution sources (area and point) in tons per year (2002)

Site visited on 02 February 2012.

No Air Quality Control Region Identified

CNMI  
CNMI DEQ

| CO    | NO <sub>x</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | SO <sub>2</sub> | VOC   |
|-------|-----------------|------------------|-------------------|-----------------|-------|
| #REF! | #REF!           | #REF!            | #REF!             | #REF!           | #REF! |
| 0     | 0               | 0                | 0                 | 0               | 0     |

**Construction/Haul Truck Emissions - Alternative 1 (GSN)**

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

**Concrete Mixing and Dump Truck Assumptions:**

Dump trucks carry 11 cubic yards of material per trip.

Concrete mixing trucks carry 10 cubic yards of material per trip.

The average distance from the port to Commercial Concrete Supply Company is 7 miles; therefore, dump trucks will travel 14 miles round trip.

The average distance from the Commercial Concrete Supply Company (CCSC) to the project site is 2 miles; therefore, concrete trucks will travel 4 miles round trip.

**Fill Materials Assumptions:**

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 20 miles; therefore, building material haul trucks will travel 40 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris = 0 cubic yards  
 Amount of concrete transported from port to CCSC = 1,674 cubic yards  
 Amount of concrete transported from CCSC to project site = 26,797 cubic yards

No Demolition in the Proposed Action

Amount of fill material = 665,000 cubic yards  
 Amount of Excavation Materials for New Buildings = 627,511 cubic yards  
 Amount of Building Materials = 470,633 cubic yards

Amount of fill material required for runway construction. The borrow pits are located 4 miles from the project site, a haul truck will travel 8 miles round trip. Construction area multiplied by depth of disturbance which is assumed to be 12 Construction area multiplied by 9 feet.

Number of dump trucks required (port to CCSC) = 153 heavy duty diesel haul truck trips, Cells rounded up  
 Number of concrete mixing trucks required (CCSC to project site) = 2680 heavy duty diesel haul truck trips, Cells rounded up  
 Number of trucks required (Borrow Pits) = 33,250 heavy duty diesel haul truck trips  
 Number of trucks required (Building Materials) = 54,908 heavy duty diesel haul truck trips  
 Miles per trip (port to CCSC) = 14 miles  
 Miles per trip (CCSC to project site) = 4 miles  
 Miles per trip (Borrow Pits) = 8 miles  
 Miles per trip (Building Materials) = 40 miles

**Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)**

|      | NO <sub>x</sub> | VOC    | CO    | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|------|-----------------|--------|-------|-----------------|------------------|-------------------|-----------------|
| HDDV | 6.500           | 4.7000 | 19.10 | 0.512           | 7.7              | 2.01              | 1646            |

Notes:

Emission factors for all pollutants except CO<sub>2</sub> are from USAF IERA 2003.

Emission factors for PM, PM<sub>10</sub>, SO<sub>x</sub> are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO<sub>x</sub> are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO<sub>2</sub> per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO<sub>2</sub> emission factor = 22.384 lbs CO<sub>2</sub>/gallon diesel \* gallon diesel/6.17 miles \* 453.6 g/lb

**HDDV Haul Truck Emissions**

|      | NO <sub>x</sub> | VOC       | CO         | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|------|-----------------|-----------|------------|-----------------|------------------|-------------------|-----------------|
| lbs  | 35,468.88       | 25,646.73 | 104,223.93 | 2,793.86        | 42,180.68        | 10,968.07         | 8,979,655.41    |
| tons | 17.73           | 12.82     | 52.11      | 1.40            | 21.09            | 5.48              | 4,489.83        |

Example Calculation: NO<sub>x</sub> emissions (lbs) = 60 miles per trip \* 8787.5 trips \* NO<sub>x</sub> emission factor (g/mile) \* lb/453.6 g

|   |  |
|---|--|
| <b>Summary</b>                                    | Summarizes total emissions by calendar year for Alternative 1 - Implementation Phase (GSN).  |
| <b>Airfield Operations</b>                        | Aircraft operations consist of taxi, take-off and landings (sorties or LTOs), touch-and-go operations (TGOs), and low flybys (LFB) by base aircraft. |
| <b>Fuel Truck and Commuter Vehicle Emissions</b>  | Estimates emissions for workers and operational vehicles commuting to the site of the Proposed Action.   |
| <b>Fuel Transfer Emissions</b>                    | Fuel loading operations under the Proposed Action involves the loading of fuel into tanker trucks and aircraft.                                      |
| <b>Internal Combustion Engine (ICE) Emissions</b> | Estimates Emissions from Internal Combustion Engines (e.g Generators)  |
| <b>Fuel Storage Tanks</b>                         | Estimates emissions from Above Ground Storage Tanks.   |

**Criteria Pollutant and VOC Emissions Summary for Alternative 1 - Implementation Phase (GSN) (tons/year)**

| Source Category   | PM10        | PM2.5       | CO          | NOx          | SOx         | VOCs        |
|---|-------------|-------------|-------------|--------------|-------------|-------------|
| Airfield Operations*  | 0.423       | 0.419       | 1.661       | 0.024        | 0.096       | 0.218       |
| Fuel Truck and Commuter Vehicle Emissions                     | 0.04306     | 0.03444     | 0.51397     | 2.15436      | 0.00206     | 0.11774     |
| Fuel Transfer   | N/A         | N/A         | N/A         | N/A          | N/A         | 0.339       |
| ICE   | 1.824       | 1.824       | 5.538       | 25.701       | 1.700       | 2.073       |
| Fuel Storage Tanks  | N/A         | N/A         | N/A         | N/A          | N/A         | 1.383       |
| <b>Total Criteria and VOC Pollutant Emissions (tons/year)</b> | <b>2.29</b> | <b>2.28</b> | <b>7.71</b> | <b>27.88</b> | <b>1.80</b> | <b>4.13</b> |

\*Highest emission value from either proposed aircraft mix extreme

**Greenhouse Gas (GHG) Emissions Summary for Alternative 1 - Implementation Phase (GSN) (metric tonnes/year)**

| Source Category                           | CO <sub>2</sub> (lb/year) | CO <sub>2</sub> (kg/year) | CO <sub>2</sub> (metric tonne/year) |
|---|---------------------------|---------------------------|-------------------------------------|
| Airfield Operations*                      | 388,888,889               | 176,400,000               | 176,400                             |
| Fuel Truck and Commuter Vehicle Emissions | 485,571                   | 220,255                   | 220                                 |
| Fuel Transfer                             | 0                         | 0                         | 0                                   |
| ICE                                       | 1,906,838                 | 864,942                   | 865                                 |
| Fuel Storage Tanks                        | 0                         | 0                         | 0                                   |
| <b>Total GHG Emissions</b>                | <b>391,281,298</b>        | <b>177,485,197</b>        | <b>177,485</b>                      |

**DATA - Airfield Operations for Alternative 1 - Implementation Phase (GSN)**

For purposes of establishing the worst case scenario the maximum number allowed at one time for each aircraft scenario will be used to calculate airfield operational emissions. 12 aircraft (KC-135) and 24 fighters(F-22), are the two worst case scenarios which will be used during this analysis. It is assumed that each aircraft would take off and land twice each day during exercises

**Landing and takeoff (LTO) and touch and go (TGO) Cycles Estimation**

| Description                       | Quantity |
|-----------------------------------|----------|
| Weeks of Exercises                | 8        |
| Days of Exercises                 | 56       |
| # of LTO's per exercise day       | 2        |
| # of TGO's per exercise day       | 0        |
| # of KC-135 (Worst Case Scenario) | 12       |
| # of F-22 (Worst Case Scenario)   | 24       |
| # of KC-135 LTO's per year        | 24       |
| # of F-22 LTO's per year          | 48       |
| # of KC-135 TGO's per year        | 0        |
| # of F-22 TGO's per year          | 0        |

**Legend**

Input Data

**Airfield Activity Data (Worst Case Scenario)**

| Aircraft Model | Aircraft Model Used to Match to Available Emission Factors | Engine Model | # Engines | APU Model | # APUs | Notes | Fiscal year 1 |            |
|----------------|--|--------------|-----------|-----------|--------|-------|---------------|------------|
|                |  |              |           |           |        |       | LTO Cycles    | TGO Cycles |
| F-22           | F-22   | F119-PW-100  | 2         | G250      | 1      |       | 48            | 0          |
| KC-135         | KC-135-R   | F108-CF-100  | 4         |           |        |       | 24            | 0          |

Emission factors from AFCEE 2009 Mobile Emissions Guide, Table 1-2, Table 1-4

**Emission Factors (EFs) and Constants - Airfield Operations for Alternative 1 - Implementation Phase (GSN)**

**Aircraft Criteria Pollutant Emission Factors**

| Aircraft Model | Engine Model | # Eng. | Reference Thrust Mode | LTO/TGO Thrust Mode | Fuel Flow (lb/hr) | Emission Factors in lb Pollutant per 1000 lb Fuel Burned |         |       |                 |                 |      |      |
|----------------|--------------|--------|-----------------------|---------------------|-------------------|--|---------|-------|-----------------|-----------------|------|------|
|                |              |        |                       |                     |                   | PM10   | PM2.5   | CO    | NO <sub>x</sub> | SO <sub>2</sub> | VOCs | TIM  |
| F-22           | F119-PW-100  | 2      | Idle                  | Idle                | 1377              | 2.49   | 2.24    | 48.2  | 3               | 1.4             | 6.48 | 29.8 |
| F-22           | F119-PW-100  | 2      | Approach              | Approach            | 2740              | 2  | 1.8     | 7.9   | 6.6             | 1.4             | 0.29 | 3.5  |
| F-22           | F119-PW-100  | 2      | Intermediate          | Climbout            | 10100             | 1.41   | 1.27    | 2.1   | 12.4            | 1.4             | 0.48 | 0.8  |
| F-22           | F119-PW-100  | 2      | Military              | Takeoff             | 18612             | 1.12   | 1.01    | 0.8   | 19.8            | 1.4             | 0    | 0.4  |
| KC-135         | F108-CF-100  | 4      | Idle                  | Idle                | 1136              | 9.08   | 8.99646 | 27.19 | 3.94            | 1.4             | 0.92 | 47.7 |
| KC-135         | F108-CF-100  | 4      | Approach              | Approach            | 2547              | 1.55   | 1.53574 | 6.39  | 6.96            | 1.4             | 0.04 | 5.2  |
| KC-135         | F108-CF-100  | 4      | Intermediate          | Climbout            | 5650              | 0.65   | 0.64402 | 1.61  | 13.53           | 1.4             | 0.03 | 2.5  |
| KC-135         | F108-CF-100  | 4      | Military              | Takeoff             | 6458              | 1.59   | 1.57537 | 0.63  | 15.28           | 1.4             | 0.03 | 0.7  |

Emission factors from AFCEE 2009 Mobile Emissions Guide, Table 1-2, Table 1-4

Emission Factors (EFs) and Constants - Airfield Operations for Alternative 1 - Implementation Phase (GSN)

**APU Emission Factors**

| Aircraft Model | # APU | APU Model | APU Emission Factors in lb Pollutant per hour |       |    |                 |                 |      | APU (hr) |
|----------------|-------|-----------|---|-------|----|-----------------|-----------------|------|----------|
|                |       |           | PM10  | PM2.5 | CO | NO <sub>x</sub> | SO <sub>2</sub> | VOCs |          |
| F-22           | 1     | G250      | No emissions data available.                  |       |    |                 |                 |      |          |

**Default Time-In-Mode**

| Aircraft Type      | Typical Duration by Mode (minutes) |         |          |          |              |       |
|--------------------|------------------------------------|---------|----------|----------|--------------|-------|
|                    | Taxi/Idle-out                      | Takeoff | Climbout | Approach | Taxi/Idle-in | Total |
| KC-135             | 32.8                               | 0.7     | 2.5      | 5.2      | 14.9         | 56.1  |
| F-22 (Combat USAF) | 18.5                               | 0.4     | 0.8      | 3.5      | 11.3         | 34.5  |

Emission factors from AFCEE 2009 Mobile Emissions Guide, Table 1-8

**Greenhouse Gas Emission Factors**

| Units       | CO <sub>2</sub> |
|-------------|-----------------|
| kg/gal fuel | 9.80            |
| kg/lb fuel  | 1.43            |

Reference: Table 3-6 "GHG Emission Factors for Aircraft LTO Cycle"  
AFMC Interim GHG Inventory Guidance, AFCEE, February 2009.

**Conversion of CH4 and N2O to CO2 Equivalent (CO2e)**

| Pollutant       | Multiplier | CO <sub>2</sub> e |
|-----------------|------------|-------------------|
| CO <sub>2</sub> | * 1 =      |                   |

Ref: Table A-5, AFMC Interim Greenhouse Gas Inventory Guidance, AFCEE, February 2009.

**Calculations - Airfield Operations for Alternative 1 - Implementation Phase (GSN)**

**Criteria Pollutant and VOC Emissions per LTO by Aircraft Type**

Calculated as the sum of the products of [(minutes) \* (fuel flow/minute) \* (lbs pollutant/lb fuel)] for each of the thrust modes  
Plus [(APU hr) \* (lb/hr)] for each pollutant, for those aircraft that are equipped with APUs

| Reported Aircraft Model | APU | Emission in lb Pollutant per LTO |           |            |         |                      |                      |           | APU  |
|-------------------------|-----|----------------------------------|-----------|------------|---------|----------------------|----------------------|-----------|------|
|                         |     | Fuel (lb)                        | PM10 (lb) | PM2.5 (lb) | CO (lb) | NO <sub>x</sub> (lb) | SO <sub>x</sub> (lb) | VOCs (lb) |      |
| F-22                    | 1   | 2205.0                           | 4.7       | 4.2        | 69.2    | 14.5                 | 3.1                  | 9.1       | G250 |
| KC - 135                | 0   | 5738.5                           | 35.3      | 34.9       | 105.6   | 37.7                 | 8.0                  | 3.4       |      |

| Reported Aircraft Model | Emission in lb Pollutant per TGO |           |            |         |                      |                      |           |
|-------------------------|----------------------------------|-----------|------------|---------|----------------------|----------------------|-----------|
|                         | Fuel (lb)                        | PM10 (lb) | PM2.5 (lb) | CO (lb) | NO <sub>x</sub> (lb) | SO <sub>x</sub> (lb) | VOCs (lb) |
| F-22                    | 837.2                            | 1.3       | 1.2        | 3.3     | 10.4                 | 1.2                  | 0.2       |
| KC - 135                | 2126.0                           | 2.5       | 2.4        | 7.3     | 23.5                 | 3.0                  | 0.1       |

**Total Criteria Pollutant and VOC Emissions for maximum LTO's by Aircraft Type**

| Reported Aircraft Model | APU | Total LTO's | Fuel (gal)        | PM10 (tons) | PM2.5 (tons) | CO (tons)   | NO <sub>x</sub> (tons) | SO <sub>x</sub> (tons) | VOCs (tons) | APU  |
|-------------------------|-----|-------------|-------------------|-------------|--------------|-------------|------------------------|------------------------|-------------|------|
|                         |     |             |                   |             |              |             |                        |                        |             |      |
| F-22                    | 1   | 48          | 105,839.0         | 0.11        | 0.10         | 1.66        | 0.02                   | 0.07                   | 0.22        | G250 |
| KC - 135                | 0   | 24          | 137,723.5         | 0.42        | 0.42         | 1.27        | 0.01                   | 0.10                   | 0.04        |      |
| Worst Case Scenario     |     |             | <b>137,723.52</b> | <b>0.42</b> | <b>0.42</b>  | <b>1.66</b> | <b>0.02</b>            | <b>0.10</b>            | <b>0.22</b> |      |

**Total Criteria Pollutant and VOC Emissions for maximum TGOs by Aircraft Type**

| Reported Aircraft Model | Total TGO's | Fuel (lb) | PM10 (lb) | PM2.5 (lb) | CO (lb) | NO <sub>x</sub> (lb) | SO <sub>x</sub> (lb) | VOCs (lb) |
|-------------------------|-------------|-----------|-----------|------------|---------|----------------------|----------------------|-----------|
|                         |             |           |           |            |         |                      |                      |           |
| F-22                    | 0           | 0.0       | 0.0       | 0.0        | 0.0     | 0.0                  | 0.0                  | 0.0       |
| KC - 135                | 0           | 0.0       | 0.0       | 0.0        | 0.0     | 0.0                  | 0.0                  | 0.0       |

**Calculations - Airfield Operations for Alternative 1 - Implementation Phase (GSN)**

**Greenhouse Gas Emission**

Assume 300,000 gallons per day for 60 days.

| Quantity (gallons) | Fuel Type | CO <sub>2</sub> (kg) | CO <sub>2</sub> (metric tonne) |
|--------------------|-----------|----------------------|--------------------------------|
| 18,000,000         | JP-8      | 176,400,000          | 176,400                        |

**DATA - Fuel Truck and Commuter Vehicle Emissions for Alternative 1 - Implementation Phase (GSN)**

Given: Six 10,000 gal Fuel Trucks will take 14 days at 10hrs/day to provide initial fill from Saipan port to Saipan International Airport (Site of Proposed Action). The six 10,000 gallon Fuel trucks will operate 10hrs/day for the duration of the exercises. The total exercise time is 8 weeks (56 days), therefore the fuel trucks will operate an additional 42 days after the initial fill.

Under the commercial lodging option fourteen busses will transport a total of 700 personnel 4 trips/day for a total of 56 trips/day for 8 weeks.

Assumptions: A Gross Vehicle Weight (GVW) of 36,200 lbs will be used, based off of an 84 passenger Blue Bird bus.

Assume fuel truck GVW > 60,000 lbs since fuel load alone is 83,400 lbs.

Assume fuel trucks travel at 55 miles per hour

Assume 40 miles per roundtrip for busses.

**Vehicle Weight Classes for Which Emission Factors are Published**

| Vehicle Category | Description   | SCC         |
|------------------|---|-------------|
| LDGV             | Light-Duty Gasoline Vehicles (i.e., passenger cars) does not include SUVs, vans or pickups                    | A2201001000 |
| LDGT1            | Light-Duty Gasoline Trucks 1 (0-6,000 lbs GVW - includes pickup trucks, sport utility vehicles and vans)      | A2201020000 |
| LDGT3            | Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVW - includes pickup trucks, sport utility vehicles and vans) | A2201040000 |
| HDBGV2B          | Class 2b Heavy-Duty Gasoline Vehicles (8501-10,000 lbs GVW)   | A2201070000 |
| HDBGV5           | Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs GVW)  | A2201070000 |
| HDBGV8A          | Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs GVW)   | A2201070000 |
| LDDV             | Light-Duty Diesel Vehicles (Passenger Cars)   |             |
| LDDT34           | Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs GVW)  | A2230002000 |
| HDDV2B           | Class 2b Heavy-Duty Diesel Vehicles (8501-10,000 lbs GVW - includes pickup trucks)                            | A2230070000 |
| HDDV5            | Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs GVW)  | A2230070000 |
| HDDV8A           | Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW)   | A2230070000 |
| HDDV8B           | Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)   | A2230070000 |
| MC               | Motorcycles   | A2201080000 |

**Emission Factors - Fuel Truck and Commuter Vehicle Emissions for Alternative 1 - Implementation Phase (GSN)**

**Emission Factors for Calendar Year 2013**

| Vehicle Class | Model Year | Emission Factors in grams per Mile <sup>a</sup> |                   |      |                 |                 |      |                 |                           |                            |  |
|---------------|------------|---|-------------------|------|-----------------|-----------------|------|-----------------|---------------------------|----------------------------|--|
|               |            | PM <sub>10</sub>                                | PM <sub>2.5</sub> | CO   | NO <sub>x</sub> | SO <sub>x</sub> | VOCs | CO <sub>2</sub> | Fugitive PM <sub>10</sub> | Fugitive PM <sub>2.5</sub> |  |
| HDDV8A*       | 2000       | 0.2   | 0.19              | 2.87 | 12.18           | 0.01            | 0.66 | 1544.1          | 0.05                      | 0.01                       |  |
| HDDV8B**      | 2000       | 0.2   | 0.19              | 3.45 | 13.85           | 0.02            | 0.78 | 1615.2          | 0.05                      | 0.01                       |  |

\* Low Altitude Emission Factors for Heavy Duty Diesel Vehicles Class 8a

\*\*Low Altitude Emission Factors for Heavy Duty Diesel Vehicles Class 8b

a) Emission factors from Appendix A of Air Emissions Factor Guide to Air Force Mobile Sources, AFCEE, December 2005

**Greenhouse Gas Emission Factors for Calendar Year 2013**

| Vehicle Class | Fuel Econ (mpg) <sup>a</sup> | (gal/mi) | CO <sub>2</sub> kg/gal | Emission Factors                     |
|---------------|------------------------------|----------|------------------------|--------------------------------------|
|               |                              |          |                        | g/mi<br>CO <sub>2</sub> <sup>b</sup> |
| LDGV          | 24.1                         | 0.041    | 8.81                   | 365.6                                |
| LDGT1         | 17.2                         | 0.058    | 8.81                   | 512.2                                |
| LDGT2         | 17.2                         | 0.058    | 8.81                   | 512.2                                |
| HDBGV         | 9.5                          | 0.105    | 8.81                   | 927.4                                |
| LDDT          | 19.0                         | 0.053    | 10.15                  | 534.2                                |
| HDDV          | 7.2                          | 0.139    | 10.15                  | 1,409.7                              |

a) Table 3.5 "Fuel Economy by Vehicle Class" Air Force Materiel Command Interim Greenhouse Gas Inventory Guidance, February 2009. Fuel economy factors suggested in Table 4-51 of the AF IERA 2003 guidance document are comparable, but correspond to 1995 model year vehicles  
CH<sub>4</sub> and N<sub>2</sub>O emission factors are from Table 3.3 of AFMC 2009.

b) CO<sub>2</sub> is estimated from the fuel use per mile using the emission factors:  
8.81 kg/gal gasoline  
10.15 kg/gal diesel  
from Table 3.2 "CO<sub>2</sub> Vehicle Emission Factors for Method 1 (GRP) by Fuel Type"  
Air Force Materiel Command Interim Greenhouse Gas Inventory Guidance, February 2009.

**Conversion of CH<sub>4</sub> and N<sub>2</sub>O to CO<sub>2</sub> Equivalent (CO<sub>2</sub>e)**

| Pollutant       | Multiplier | CO <sub>2</sub> e |
|-----------------|------------|-------------------|
| CO <sub>2</sub> | * 1 =      |                   |

Ref: Table A-5, AFMC Interim Greenhouse Gas Inventory Guidance, AFCEE, February 2009.

Also agrees with Table B.1 of The Climate Registry "General Reporting Protocol", Version 1.1, May 2008.



Emission Calculations - CFuel Truck and Commuter Vehicle Emissions for Alternative 1 - Implementation Phase (GSN)

Miles for Commuter Emissions for 8 week training exercise:

| Vehicle Class  | Speed      |            | Total Trips/Day | Hours/Day | Total Days | Total Miles |
|--|------------|------------|-----------------|-----------|------------|-------------|
|  | Miles/hour | Miles/Trip |                 |           |            |             |
| HDDV8A - Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW) |            | 40         | 56              |           | 56         | 125,440     |
| HDDV8B - Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)       | 55         |            |                 | 10        | 56         | 30,800      |

Criteria and VOC Emissions for Commuters

| Vehicle Class  | Model Year | Annual Miles | Criteria Pollutant Emissions (tons/year) |                   |              |              |              |              |
|--|------------|--------------|--|-------------------|--------------|--------------|--------------|--------------|
|  |            |              | PM <sub>10</sub>                         | PM <sub>2.5</sub> | CO           | NOx          | SOx          | VOCs         |
| HDDV8A - Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW) | 2000       | 125,440      | 0.035                                    | 0.028             | 0.397        | 1.684        | 0.001        | 0.091        |
| HDDV8B - Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)       | 2000       | 30,800       | 0.008                                    | 0.007             | 0.117        | 0.470        | 0.001        | 0.026        |
| <b>Total</b>   |            |              | <b>0.043</b>                             | <b>0.034</b>      | <b>0.514</b> | <b>2.154</b> | <b>0.002</b> | <b>0.118</b> |

Particulate emissions include exhaust, brake wear, tire wear. Assume paved road.

Greenhouse Gas Emissions for Commuters

| Vehicle Class  | Annual Miles | Annual Gal | GHG Pollutant Emissions (lb/year) | GHG Pollutant Emissions (metric tonne/year) |
|--|--------------|------------|-----------------------------------|---|
|  |              |            | CO <sub>2</sub>                   | CO <sub>2</sub>                             |
| HDDV8A - Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW) | 125,440      | 17,422     | 389,849.11                        | 176.84                                      |
| HDDV8B - Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)       | 30,800       | 4,278      | 95,721.88                         | 43.42                                       |
| <b>Total</b>   |              |            | <b>485,570.99</b>                 | <b>220.26</b>                               |

Emission Calculations Method - Fuel Truck and Commuter Vehicle Emissions for Alternative 1 - Implementation Phase (GSN)

Calculation Method: Equation 4-1, AFCEE 2009, Mobile Emissions Guide

$$EP = VMTVehCat * EFPoVehCat * 0.002205$$

Where,

EP = Emissions of each individual pollutant (lb/yr)

VMTVehCat = Annual vehicle miles traveled by each vehicle category (LDGV, LDGT1, LDDV, etc.) (mi/yr)

EFPoVehCat = Emission factor of each pollutant for each vehicle category (g/mi)

0.002205 = Factor for converting grams to pounds (g/lb).

**DATA - Fuel Loading Emissions for Alternative 1 - Implementation Phase (GSN)**

Given:

|  |            |
|--|------------|
| Total Exercise Days (8 weeks)              | 56         |
| Initial Fuel Fill Days                     | 14         |
| Remaining Fuel Fill Days                   | 42         |
| Total # of Fuel Trucks                     | 6          |
| Total Gallons per Fuel Truck               | 10,000     |
| Trips per day per Fuel Truck               | 5          |
| 1 bbl conversion to gallons                | 42         |
| Total Fuel (gal) during Initial Fill       | 4,200,000  |
| Total Fuel (gal) during Remaining Exercise | 12,600,000 |
| Total Fuel (gal) during Exercise (8 Weeks) | 16,800,000 |

**Proposed Action Fuel Loading Operations**

| Location                                   | Description                    | Fuel Type | Fuel Transferred (gal) | Category |
|--|--------------------------------|-----------|------------------------|----------|
| Flightline                                 | Loading Aircraft from Hydrants | JP-8      | 16,800,000.0           | Loading  |
| Seaport, Loading Racks (50,000 bbl tank 1) | Loading Refueler Trucks        | JP-8      | 8400000                | Loading  |
| Seaport, Loading Racks (50,000 bbl tank 2) | Loading Refueler Trucks        | JP-8      | 8400000                | Loading  |

**Emission Factors - Fuel Loading Emissions for Alternative 1 - Implementation Phase (GSN)**

| JP-8 emission factors (lb/Mgal)  | Dispensing | Loading     |
|----------------------------------|------------|-------------|
|                                  | Splash     | Bottom fill |
| Molecular Weight =               | 130        | 0.020       |
| True Vapor Pressure (psia) =     | 0.011      |             |
| Dispensing Displacement losses = | 0.0487     |             |
| Spillage =                       | 0.7        |             |
| Total =                          | 0.749      |             |

AP-42 Table 7.1-2 dated 11/06  
 AP-42 Table 7.1-2 dated 11/06 @ 70F (annual avg.)  
 AP-42 Section 5.2 dated 6/08 Equation (1)  
 AP-42 Table 5.2-7 dated 6/08

**Emission Calculations - Fuel Loading Emissions for Alternative 1 - Implementation Phase (GSN)**

| Location                                   | Description                    | Fuel Type | Fuel Transferred  | Displaced Vapor | Spillage | Total VOC  | Total VOC    |
|--|--------------------------------|-----------|-------------------|-----------------|----------|------------|--------------|
|  |                                |           | (gal)             | (lb)            | (lb)     | (lb)       | (ton)        |
| Flightline                                 | Loading Aircraft from Hydrants | JP-8      | 16,800,000        | 338.9           | 0        | 338.9      | 0.169        |
| Seaport, Loading Racks (50,000 bbl tank 1) | Loading Refueler Trucks        | JP-8      | 8,400,000         | 169.4           | 0        | 169.4      | 0.085        |
| Seaport, Loading Racks (50,000 bbl tank 2) | Loading Refueler Trucks        | JP-8      | 8,400,000         | 169.4           | 0        | 169.4      | 0.085        |
| <b>Total</b>                               |                                |           | <b>33,600,000</b> | <b>678</b>      | <b>0</b> | <b>678</b> | <b>0.339</b> |

**Emission Calculations Method - Fuel Loading Emissions for Alternative 1 - Implementation Phase (GSN)**

Displacement emissions for Diesel and JP-8 were estimated using Equation (1) from AP-42 Section 5.2, Transportation and Marketing of Petroleum Liquids, dated 6/08

$$L_L = 12.46 (SPM)/T$$

Where

$L_L$  = Loading loss in lb/10<sup>3</sup> gal

S = Saturation Factor 1.45 for splash loading, 0.6 for bottom loading

M = molecular weight,

T = temperature of bulk liquid (assume average annual ambient temperature)

DATA - Internal Combustion Engine Emissions for Alternative 1 - Implementation Phase (GSN)

Given:

|  |      |
|--|------|
| Generator Peak Demand (kW)               | 920  |
| Generator Operating Time - 8 weeks (hrs) | 1344 |

Emission Factors

| Pollutant                  | Emission Factor (lb/10 <sup>3</sup> gal) | Emission Factor (lb/10 <sup>3</sup> hp-hr) (lb/hp-hr) |
|----------------------------|--|---|
| <b>Criteria Pollutants</b> |  |   |
| CO                         | 130.0                                    | 6.7   |
| NO <sub>x</sub>            | 604.0                                    | 31.0  |
| PM                         | 42.5                                     | 2.2   |
| PM <sub>10</sub>           | 42.5                                     | 2.2   |
| SO <sub>x</sub>            | 39.7                                     | 2.1   |
| TOC                        | 49.3                                     | 2.5   |
| CO <sub>2</sub>            |  | 1.15  |

EF's obtained from AFCEE 2009 except CO2 was obtained from AP-42, all assume JP-8 EF's are similar to Diesel EF's

Emissions Calculation - Internal Combustion Engine Emissions for Alternative 1 - Implementation Phase (GSN)

| Description          | Criteria Pollutant Emissions (tons/year) |                        |           |             |                        |            |
|----------------------|--|------------------------|-----------|-------------|------------------------|------------|
|                      | CO (tons)                                | NO <sub>x</sub> (tons) | PM (tons) | PM10 (tons) | SO <sub>x</sub> (tons) | TOC (tons) |
| 920 kW Generator Set | 5.54                                     | 25.70                  | 1.82      | 1.82        | 1.70                   | 2.07       |

| Description          | GHG Pollutant Emissions |                        |
|----------------------|-------------------------|------------------------|
|                      | CO <sub>2</sub> (lbs)   | CO <sub>2</sub> (tons) |
| 920 kW Generator Set | 1,906,838               | 864.94                 |

AFCEE Stationary Source Air Emissions Inventory Guidance, Dec 2009, Equation 32-4

$$E_{pol} = (PD \times 1.341 \times OT/1000) \times EF \text{ Equation 32-4}$$

Where

E<sub>pol</sub> = Emissions of a particular pollutant (lb/yr)

PD = Peak demand of the generator (kW) 1.341 = Factor for converting "kW" to - "hp"

OT = Operating time of the generator (hr)

1000 = Factor for converting - "hp-hr" to - "10<sup>3</sup> hp-hr"

EF = Emission Factor (lb/10<sup>3</sup> hp-hr).

**DATA - Fuel Storage Tank Emissions for Alternative 1 - Implementation Phase (GSN)**

Fuel storage tank emissions were estimated using the U.S. EPA TANKS storage tank emissions calculation software (Version 4.0.9d). The emissions calculations algorithms in the TANKS program are based on Chapter 7 of EPA's AP-42. In order to estimate HAP emissions from tanks, the VOC estimates generated by the TANKS software are subdivided into the chemical fractions in the fuel liquid and vapor. The following mixtures and speciation profiles were used to describe JP-8 fuel in TANKS. This profile was obtained from the AFCEE 2009 Stationary Source Guide.

**Emission Calculations Summary from TANKS\***

| <b>Tank Type</b>                                     | <b>Throughput</b> | <b>Working Loss<br/>(lbs)</b> | <b>Breathing Loss<br/>(lbs)</b> | <b>VOC Total<br/>(lbs)</b> | <b>VOC Total<br/>(tons)</b> |
|--|-------------------|-------------------------------|---------------------------------|----------------------------|-----------------------------|
| Tank 1 (Seaport)- 50,000 bbl, cut and cover or AST   | 8400000           | 428.42                        | 237.56                          | 665.98                     | 0.33                        |
| Tank 2 (Seaport)- 50,000 bbl, cut and cover or AST   | 8400000           | 428.42                        | 237.56                          | 665.98                     | 0.33                        |
| Tank 3 (Airport) - 100,000 bbl, cut and cover or AST | 16800000          | 856.84                        | 577.78                          | 1,434.62                   | 0.72                        |
| <b>Total</b>   |                   | <b>1713.68</b>                | <b>1052.9</b>                   | <b>2766.58</b>             | <b>1.38</b>                 |

\*See the following references for TANKS printouts. (SM11 - TANKS) & (SM12 - TANKS)

- Summary** Summarizes total emissions by calendar year for Alternative 2 - Construction Phase (TNI).
- Combustion** Estimates emissions from non-road equipment exhaust.
- Fugitive** Estimates particulate emissions from construction activities including earthmoving, vehicle traffic, and windblown dust.
- Grading** Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
- Construction Commuter** Estimates emissions for construction workers commuting to the site.
- Haul Truck On-Road** Estimates emissions from hauling construction materials to the project site.

**Summary of Air Quality Emissions from Divert EIS - Alternative 2 - Construction Phase (TNI)**

|                            | <b>NO<sub>x</sub><br/>(ton)</b> | <b>VOC<br/>(ton)</b> | <b>CO<br/>(ton)</b> | <b>SO<sub>2</sub><br/>(ton)</b> | <b>PM<sub>10</sub><br/>(ton)</b> | <b>PM<sub>2.5</sub><br/>(ton)</b> | <b>CO<sub>2</sub><br/>(ton)</b> |
|----------------------------|---------------------------------|----------------------|---------------------|---------------------------------|----------------------------------|-----------------------------------|---------------------------------|
| Construction Combustion    | 25.758                          | 3.014                | 11.115              | 1.640                           | 1.781                            | 1.727                             | 2,982.524                       |
| Construction Fugitive Dust | -                               | -                    | -                   | -                               | 178.204                          | 15.406                            | -                               |
| Construction Commuter      | 8.814                           | 8.774                | 79.322              | 0.1034                          | 0.835                            | 0.526                             | 10,518.551                      |
| Haul Truck On-Road         | 22.640                          | 16.370               | 66.527              | 1.783                           | 26.924                           | 7.001                             | 5,731.771                       |
| <b>TOTAL</b>               | <b>57.21</b>                    | <b>28.16</b>         | <b>156.96</b>       | <b>3.53</b>                     | <b>207.74</b>                    | <b>24.66</b>                      | <b>19,232.85</b>                |

**Annual Summary of Air Quality Emissions from Divert EIS - Alternative 2 - Construction Phase (TNI)\***

|       | <b>Point and Area Sources Combined</b> |                      |                     |                                 |                                  |                                   |   |
|-------|--|----------------------|---------------------|---------------------------------|----------------------------------|-----------------------------------|---|
|       | <b>NO<sub>x</sub><br/>(tpy)</b>        | <b>VOC<br/>(tpy)</b> | <b>CO<br/>(tpy)</b> | <b>SO<sub>2</sub><br/>(tpy)</b> | <b>PM<sub>10</sub><br/>(tpy)</b> | <b>PM<sub>2.5</sub><br/>(tpy)</b> | <b>CO<sub>2</sub><br/>(metric tons)</b> |
| CY 01 | 19.07                                  | 9.39                 | 52.32               | 1.18                            | 69.25                            | 8.22                              | 6410.95                                 |
| CY 02 | 19.07                                  | 9.39                 | 52.32               | 1.18                            | 69.25                            | 8.22                              | 6410.95                                 |
| CY 03 | 19.07                                  | 9.39                 | 52.32               | 1.18                            | 69.25                            | 8.22                              | 6410.95                                 |

\* Construction duration is estimated to be 36 months and the emissions are assumed to be distributed evenly over the construction period.

**Combustion Emissions - Alternative 2 (TNI)**

Combustion Emissions of VOC, NO<sub>x</sub>, SO<sub>2</sub>, CO, PM<sub>2.5</sub>, PM<sub>10</sub>, and CO<sub>2</sub> due to Construction

**Assumptions**

When multiple options exist under the general construction activities the most conservative value will be used to quantify air emission.

| General Construction Activities   | Area Disturbed (ft <sup>2</sup> ) |
|---|-----------------------------------|
| Construct Aircraft Hangar   | 35,100 ft <sup>2</sup>            |
| Construct Maintenance Facility  | 6,000 ft <sup>2</sup>             |
| Construct Jet Fuel System (Operational, Bulk and at the Port of Tinian) | 680,000 ft <sup>2</sup>           |
| Construct Billeting   | 669,000 ft <sup>2</sup>           |
| Construct Hazardous Cargo Pad and Arm/Disarm Pad                        | 455,000 ft <sup>2</sup>           |
| Construct Maximum Runway Extension                                      | 555,000 ft <sup>2</sup>           |
| Construct Parking Apron   | 1,660,000 ft <sup>2</sup>         |
| Construct Temporary Munitions Storage Area (ECM and Multi Cube)         | 30,700 ft <sup>2</sup>            |

|                                     |                           |   |
|-------------------------------------|---------------------------|---|
| Total General Construction Area:    | 1,845,100 ft <sup>2</sup> |   |
|                                     | 42.4 acres                |   |
| Total Demolition Area:              | 0 ft <sup>2</sup>         |   |
|                                     | 0.0 acres                 |   |
| Total Pavement Area:                | 2,245,700 ft <sup>2</sup> |   |
|                                     | 51.6 acres                |   |
| Total Disturbed Area:               | 4,090,800 ft <sup>2</sup> |   |
|                                     | 93.9 acres                |   |
| Construction Duration:              | 36 months                 |   |
| 1 Yr Project Construction Activity: | 240 days/yr               | Assume 12 months, 4 weeks per month, 5 days per week. |

**Emission Factors Used for Construction Equipment**

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0  
 Emission factors are taken from the NONROAD model and were provided to e<sup>2</sup>M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.  
 Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

**Grading**

| Equipment                             | No. Req'd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|---|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Bulldozer                             | 1                                       | 13.60                       | 0.96                         | 5.50           | 1.02                                     | 0.89                         | 0.87                          | 1456.90                     |
| Motor Grader                          | 1                                       | 9.69                        | 0.73                         | 3.20           | 0.80                                     | 0.66                         | 0.64                          | 1141.65                     |
| Water Truck                           | 1                                       | 18.36                       | 0.89                         | 7.00           | 1.64                                     | 1.00                         | 0.97                          | 2342.98                     |
| <b>Total per 10 acres of activity</b> | <b>3</b>                                | <b>41.64</b>                | <b>2.58</b>                  | <b>15.71</b>   | <b>0.83</b>                              | <b>2.55</b>                  | <b>2.47</b>                   | <b>4941.53</b>              |

**Paving**

| Equipment                             | No. Req'd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|---|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Paver                                 | 1                                       | 3.83                        | 0.37                         | 2.06           | 0.28                                     | 0.35                         | 0.34                          | 401.93                      |
| Roller                                | 1                                       | 4.82                        | 0.44                         | 2.51           | 0.37                                     | 0.43                         | 0.42                          | 536.07                      |
| Truck                                 | 2                                       | 36.71                       | 1.79                         | 14.01          | 3.27                                     | 1.99                         | 1.93                          | 4685.95                     |
| <b>Total per 10 acres of activity</b> | <b>4</b>                                | <b>45.37</b>                | <b>2.61</b>                  | <b>18.58</b>   | <b>0.91</b>                              | <b>2.78</b>                  | <b>2.69</b>                   | <b>5623.96</b>              |

**Demolition**

| Equipment                             | No. Req'd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|---|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Loader                                | 1                                       | 13.45                       | 0.99                         | 5.58           | 0.95                                     | 0.93                         | 0.90                          | 1360.10                     |
| Haul Truck                            | 1                                       | 18.36                       | 0.89                         | 7.00           | 1.64                                     | 1.00                         | 0.97                          | 2342.98                     |
| <b>Total per 10 acres of activity</b> | <b>2</b>                                | <b>31.81</b>                | <b>1.89</b>                  | <b>12.58</b>   | <b>0.64</b>                              | <b>1.92</b>                  | <b>1.87</b>                   | <b>3703.07</b>              |

**Building Construction**

| Equipment <sup>d</sup>                | No. Req'd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|---|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| <b>Stationary</b>                     |   |                             |                              |                |  |                              |                               |                             |
| Generator Set                         | 1                                       | 2.38                        | 0.32                         | 1.18           | 0.15                                     | 0.23                         | 0.22                          | 213.06                      |
| Industrial Saw                        | 1                                       | 2.62                        | 0.32                         | 1.97           | 0.20                                     | 0.32                         | 0.31                          | 291.92                      |
| Welder                                | 1                                       | 1.12                        | 0.38                         | 1.50           | 0.08                                     | 0.23                         | 0.22                          | 112.39                      |
| <b>Mobile (non-road)</b>              |   |                             |                              |                |  |                              |                               |                             |
| Truck                                 | 1                                       | 18.36                       | 0.89                         | 7.00           | 1.64                                     | 1.00                         | 0.97                          | 2342.98                     |
| Forklift                              | 1                                       | 5.34                        | 0.56                         | 3.33           | 0.40                                     | 0.55                         | 0.54                          | 572.24                      |
| Crane                                 | 1                                       | 9.57                        | 0.66                         | 2.39           | 0.65                                     | 0.50                         | 0.49                          | 931.93                      |
| <b>Total per 10 acres of activity</b> | <b>6</b>                                | <b>39.40</b>                | <b>3.13</b>                  | <b>17.38</b>   | <b>3.12</b>                              | <b>2.83</b>                  | <b>2.74</b>                   | <b>4464.51</b>              |

**Architectural Coatings**

| Equipment                             | No. Req'd. <sup>a</sup><br>per 10 acres | NO <sub>x</sub><br>(lb/day) | VOC <sup>b</sup><br>(lb/day) | CO<br>(lb/day) | SO <sub>2</sub> <sup>c</sup><br>(lb/day) | PM <sub>10</sub><br>(lb/day) | PM <sub>2.5</sub><br>(lb/day) | CO <sub>2</sub><br>(lb/day) |
|---------------------------------------|---|-----------------------------|------------------------------|----------------|--|------------------------------|-------------------------------|-----------------------------|
| Air Compressor                        | 1                                       | 3.57                        | 0.37                         | 1.57           | 0.25                                     | 0.31                         | 0.30                          | 359.77                      |
| <b>Total per 10 acres of activity</b> | <b>1</b>                                | <b>3.57</b>                 | <b>0.37</b>                  | <b>1.57</b>    | <b>0.25</b>                              | <b>0.31</b>                  | <b>0.30</b>                   | <b>359.77</b>               |

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO<sub>2</sub> emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

**PROJECT-SPECIFIC EMISSION FACTOR SUMMARY**

| Source                                   | Equipment Multiplier* | Project-Specific Emission Factors (lb/day) |         |         |                    |                  |                   |                 |
|--|-----------------------|--|---------|---------|--------------------|------------------|-------------------|-----------------|
|  |                       | NO <sub>x</sub>                            | VOC     | CO      | SO <sub>2</sub> ** | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
| Grading Equipment                        | 9                     | 374.771                                    | 23.193  | 141.389 | 7.495              | 22.910           | 22.222            | 44473.737       |
| Paving Equipment                         | 5                     | 226.836                                    | 13.029  | 92.892  | 4.537              | 13.880           | 13.464            | 28119.784       |
| Demolition Equipment                     | 1                     | 31.808                                     | 1.886   | 12.584  | 0.636              | 1.923            | 1.865             | 3703.074        |
| Building Construction                    | 4                     | 157.585                                    | 12.519  | 69.529  | 12.465             | 11.316           | 10.977            | 17858.047       |
| Air Compressor for Architectural Coating | 4                     | 14.296                                     | 1.493   | 6.262   | 1.005              | 1.237            | 1.200             | 1439.093        |
| Architectural Coating**                  |                       |  | 110.705 |         |                    |                  |                   |                 |

\*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

\*\*Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994  
 Example: SMAQMD Emission Factor for Grading Equipment NO<sub>x</sub> = (Total Grading NO<sub>x</sub> per 10 acre)\*(Equipment Multiplier)

**Summary of Input Parameters**

|                        | Total Area (ft <sup>2</sup> ) | Total Area (acres) | Total Days |  |
|------------------------|-------------------------------|--------------------|------------|--|
| Grading:               | 4,090,800                     | 93.91              | 6          | (from "Grading" worksheet)                                     |
| Paving:                | 2,245,700                     | 51.55              | 49         |  |
| Demolition:            | 0                             | 0.00               | 0          |  |
| Building Construction: | 1,845,100                     | 42.36              | 240        |  |
| Architectural Coating: | 1,845,100                     | 42.36              | 20         | (per SMAQMD "Air Quality of Thresholds of Significance", 1994) |

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEAI Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving than demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

**Total Project Emissions by Activity (lbs)**

|                               | NO <sub>x</sub>  | VOC             | CO               | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub>  |
|-------------------------------|------------------|-----------------|------------------|-----------------|------------------|-------------------|------------------|
| Grading Equipment             | 2,248.63         | 139.16          | 848.33           | 44.97           | 137.46           | 133.33            | 266,842          |
| Paving                        | 11,160.35        | 641.01          | 4,570.29         | 223.21          | 682.92           | 662.43            | 1,383,493        |
| Demolition                    | -                | -               | -                | -               | -                | -                 | 0                |
| Building Construction         | 37,820.47        | 3,004.62        | 16,687.02        | 2,991.70        | 2,715.88         | 2,634.41          | 4,285,931        |
| Architectural Coatings        | 285.93           | 2,243.96        | 125.23           | 20.09           | 24.75            | 24.00             | 28,782           |
| <b>Total Emissions (lbs):</b> | <b>51,515.37</b> | <b>6,028.74</b> | <b>22,230.88</b> | <b>3,279.97</b> | <b>3,561.00</b>  | <b>3,454.17</b>   | <b>5,965,049</b> |

**Results: Total Project Annual Emission Rates**

|                                | NO <sub>x</sub> | VOC      | CO        | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|--------------------------------|-----------------|----------|-----------|-----------------|------------------|-------------------|-----------------|
| Total Project Emissions (lbs)  | 51,515.37       | 6,028.74 | 22,230.88 | 3,279.97        | 3,561.00         | 3,454.17          | 5,965,049       |
| Total Project Emissions (tons) | 25.76           | 3.01     | 11.12     | 1.64            | 1.78             | 1.73              | 2,982.52        |

**Construction Fugitive Dust Emissions - Proposed Action (Phase 1 - Current, Annual)**

**Construction Fugitive Dust Emission Factor:**

|                                 | <b>Emission Factor</b>                | <b>Units</b> | <b>Source</b>                |
|---------------------------------|---------------------------------------|--------------|------------------------------|
| General Construction Activities | 0.19 ton PM <sub>10</sub> /acre-month |              | MRI 1996; EPA 2001; EPA 2006 |
| New Road Construction           | 0.42 ton PM <sub>10</sub> /acre-month |              | MRI 1996; EPA 2001; EPA 2006 |

**PM<sub>2.5</sub> Emissions**

|                              |      |  |                    |
|------------------------------|------|--|--------------------|
| PM <sub>2.5</sub> Multiplier | 0.10 | (10% of PM <sub>10</sub> emissions assumed to be PM <sub>2.5</sub> ) | EPA 2001; EPA 2006 |
|------------------------------|------|--|--------------------|

**Control Efficiency**

|  |      |  |                    |
|--|------|--|--------------------|
|  | 0.50 | (assume 50% control efficiency for PM <sub>10</sub> and PM <sub>2.5</sub> emissions) | EPA 2001; EPA 2006 |
|--|------|--|--------------------|

**Project Assumptions**

**New Roadway Construction (0.42 ton PM<sub>10</sub>/acre-month)**

|                                  |            |
|----------------------------------|------------|
| Duration of Construction Project | 12 months  |
| Area                             | 51.6 acres |

**General Construction Activities (0.19 ton PM<sub>10</sub>/acre-month)**

|                                  |            |
|----------------------------------|------------|
| Duration of Construction Project | 12 months  |
| Area                             | 42.4 acres |

|                                 | <b>Project Emissions (tons/year)</b> |                                   |                                      |                                    |
|---------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|------------------------------------|
|                                 | <b>PM<sub>10</sub> uncontrolled</b>  | <b>PM<sub>10</sub> controlled</b> | <b>PM<sub>2.5</sub> uncontrolled</b> | <b>PM<sub>2.5</sub> controlled</b> |
| New Roadway Construction        | 259.83                               | 129.92                            | 25.98                                | 12.99                              |
| General Construction Activities | 96.58                                | 48.29                             | 4.83                                 | 2.41                               |
| <b>Total</b>                    | <b>356.41</b>                        | <b>178.20</b>                     | <b>30.81</b>                         | <b>15.41</b>                       |

**General Construction Activities Emission Factor**

**0.19 ton PM<sub>10</sub>/acre-month** Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM<sub>10</sub>/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM<sub>10</sub>/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM<sub>10</sub>/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM<sub>10</sub>/acre-month) and 75% of the average emission factor (0.11 ton PM<sub>10</sub>/acre-month). The 0.19 ton PM<sub>10</sub>/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM<sub>10</sub>/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM<sub>10</sub> and PM<sub>2.5</sub> in PM nonattainment areas.

**New Road Construction Emission Factor**

**0.42 ton PM<sub>10</sub>/acre-month** Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 ton PM<sub>10</sub>/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM<sub>10</sub>/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

**PM<sub>2.5</sub> Multiplier**

**0.10**

PM<sub>2.5</sub> emissions are estimated by applying a particle size multiplier of 0.10 to PM<sub>10</sub> emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

**Control Efficiency for PM<sub>10</sub> and PM<sub>2.5</sub>**

**0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM<sub>10</sub> and PM<sub>2.5</sub> in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

**References:**

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.



**Grading Schedule - Proposed Action (Phase 1 - Current, Annual)**

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 93.9 acres/yr (from Combustion Worksheet)  
 Qty Equipment: 29.0 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.  
 An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.  
 200 hp bulldozers are used for site clearing.  
 300 hp bulldozers are used for stripping, excavation, and backfill.  
 Vibratory drum rollers are used for compacting.  
 Stripping, Excavation, Backfill and Compaction require an average of two passes each.  
 Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

| Means Line No. | Operation     | Description                              | Output | Units      | Acres per equip-day | equip-days per acre | Acres/yr (project-specific) | Equip-days per year |
|----------------|---------------|--|--------|------------|---------------------|---------------------|-----------------------------|---------------------|
| 2230 200 0550  | Site Clearing | Dozer & rake, medium brush               | 8      | acre/day   | 8                   | 0.13                | 93.91                       | 11.74               |
| 2230 500 0300  | Stripping     | Topsoil & stockpiling, adverse soil      | 1,650  | cu. yd/day | 2.05                | 0.49                | 93.91                       | 45.91               |
| 2315 432 5220  | Excavation    | Bulk, open site, common earth, 150' haul | 800    | cu. yd/day | 0.99                | 1.01                | 46.96                       | 47.35               |
| 2315 120 5220  | Backfill      | Structural, common earth, 150' haul      | 1,950  | cu. yd/day | 2.42                | 0.41                | 46.96                       | 19.42               |
| 2315 310 5020  | Compaction    | Vibrating roller, 6" lifts, 3 passes     | 2,300  | cu. yd/day | 2.85                | 0.35                | 93.91                       | 32.94               |
| <b>TOTAL</b>   |               |  |        |            |                     |                     |                             | <b>157.36</b>       |

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 157.36  
 Qty Equipment: 29.00  
 Grading days/yr: 5.43

**Construction/Staff Commuter Emissions - Alternative 2 (TNI)**

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

**Assumptions:**

Passenger vehicle emission factors for scenario year 2011-2015 are used.  
 The average roundtrip commute for a construction/staff worker = 40 miles  
 Number of construction days = 240 days  
 Number of construction/Staff workers (daily) = 2000 people

**Note:** None

**Passenger Vehicle Emission Factors for Year 2011-2016 (lbs/mile)**

| NO <sub>x</sub> | VOC        | CO         | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|-----------------|------------|------------|-----------------|------------------|-------------------|-----------------|
| 0.00091814      | 0.00091399 | 0.00826276 | 0.00001077      | 0.00008698       | 0.00005478        | 1.09568235      |

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed 27 May 2009.

**Notes:**

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

**Construction Commuter Emissions**

|      | NO <sub>x</sub> | VOC        | CO          | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|------|-----------------|------------|-------------|-----------------|------------------|-------------------|-----------------|
| lbs  | 17,628.307      | 17,548.575 | 158,644.933 | 206.875         | 1,669.993        | 1,051.800         | 21,037,101.087  |
| tons | 8.814           | 8.774      | 79.322      | 0.103           | 0.835            | 0.526             | 10,518.551      |

Example Calculation: NO<sub>x</sub> emissions (lbs) = 60 miles/day \* NO<sub>x</sub> emission factor (lb/mile) \* number of construction days \* number of workers

No Statistical Area Available for TN

| Row #             | State | County | Tier-1 | Point Source Emissions |                 |                  |                   |                 |     | Area Source Emissions (Non-Point and Mobile Sources) |                 |                  |                   |                 |     |
|-------------------|-------|--------|--------|------------------------|-----------------|------------------|-------------------|-----------------|-----|--|-----------------|------------------|-------------------|-----------------|-----|
|                   |       |        |        | CO                     | NO <sub>x</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | SO <sub>2</sub> | VOC | CO   | NO <sub>x</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | SO <sub>2</sub> | VOC |
| No Data Available |       |        |        |                        |                 |                  |                   |                 |     |  |                 |                  |                   |                 |     |
| Grand Total       |       |        |        | 0                      | 0               | 0                | 0                 |                 | 0   | 0  | 0               | 0                | 0                 | 0               | 0   |

SOURCE:

<http://www.epa.gov/ttn/chiefs/information.html>

USEPA - AirData NET Tier Report

\*Net Air pollution sources (area and point) in tons per year (2002)

Site visited on 02 February 2012.

No Air Quality Control Region Identified

|          | CO    | NO <sub>x</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | SO <sub>2</sub> | VOC   |
|----------|-------|-----------------|------------------|-------------------|-----------------|-------|
| CNMI     | #REF! | #REF!           | #REF!            | #REF!             | #REF!           | #REF! |
| CNMI DEQ | 0     | 0               | 0                | 0                 | 0               | 0     |

**Construction/Haul Truck Emissions - Alternative 2 (TNI)**

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

**Concrete Mixing and Dump Truck Assumptions:**

Dump trucks carry 11 cubic yards of material per trip.

Concrete mixing trucks carry 10 cubic yards of material per trip.

The average distance from the port to Commercial Concrete Supply Company is 1.7 miles; therefore, dump trucks will travel 3.4 miles round trip.

The average distance from the Commercial Concrete Supply Company (CCSC) to the project site is 2.3 miles; therefore, concrete trucks will travel 4.6 miles round trip.

**Fill Materials Assumptions:**

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 20 miles; therefore, building material haul trucks will travel 40 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

|  |   |   |
|--|---|---|
| Amount of demolition debris =                                      | 209,170 cubic yards                                       | No Demolition in the Proposed Action  |
| Amount of concrete transported from port to CCSC =                 | 3,089 cubic yards   |   |
| Amount of concrete transported from CCSC to project site =         | 49,426 cubic yards  |   |
| Amount of fill material =  | 665,000 cubic yards                                       | Amount of fill material required for runway construction. The borrow pits are located 4 miles from the project site, a haul truck will travel 8 miles round trip. |
| Amount of Excavation Materials for New Buildings =                 | 820,044 cubic yards                                       | Construction area multiplied by depth of disturbance which is assumed to be 12 feet.  |
| Amount of Building Materials =                                     | 615,033 cubic yards                                       | Construction area multiplied by 9 feet.   |
| Number of dump trucks required (port to CCSC) =                    | 281 heavy duty diesel haul truck trips, Cells rounded up  |   |
| Number of concrete mixing trucks required (CCSC to project site) = | 4943 heavy duty diesel haul truck trips, Cells rounded up |   |
| Number of trucks required (Borrow Pits) =                          | 33,250 heavy duty diesel haul truck trips                 |   |
| Number of trucks required (Building Materials) =                   | 71,754 heavy duty diesel haul truck trips                 |   |
| Miles per trip (port to CCSC) =                                    | 3.4 miles   |   |
| Miles per trip (CCSC to project site) =                            | 4.6 miles   |   |
| Miles per trip (Borrow Pits) =                                     | 8.0 miles   |   |
| Miles per trip (Building Materials) =                              | 40.0 miles  |   |

**Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)**

|      | NO <sub>x</sub> | VOC  | CO    | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|------|-----------------|------|-------|-----------------|------------------|-------------------|-----------------|
| HDDV | 6.50            | 4.70 | 19.10 | 0.51            | 7.73             | 2.01              | 1,645.60        |

Notes:

Emission factors for all pollutants except CO<sub>2</sub> are from USAF IERA 2003.

Emission factors for PM, PM<sub>10</sub>, SO<sub>x</sub> are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO<sub>x</sub> are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO<sub>2</sub> per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO<sub>2</sub> emission factor = 22.384 lbs CO<sub>2</sub>/gallon diesel \* gallon diesel/6.17 miles \* 453.6 g/lb

**HDDV Haul Truck Emissions**

|      | NO <sub>x</sub> | VOC       | CO         | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2</sub> |
|------|-----------------|-----------|------------|-----------------|------------------|-------------------|-----------------|
| lbs  | 45,280.02       | 32,740.94 | 133,053.60 | 3,566.67        | 53,848.39        | 14,001.98         | 11,463,542.07   |
| tons | 22.64           | 16.37     | 66.53      | 1.78            | 26.92            | 7.00              | 5,731.77        |

Example Calculation: NO<sub>x</sub> emissions (lbs) = 60 miles per trip \* 8787.5 trips \* NO<sub>x</sub> emission factor (g/mile) \* lb/453.6 g

- Summary** Summarizes total emissions by calendar year for Alternative 2 - Implementation Phase (TNI).
- Airfield Operations** Aircraft operations consist of taxi, take-off and landings (sorties or LTOs), touch-and-go operations (TGOs), and low flybys (LFB) by base aircraft.
- Fuel Truck and Commuter Vehicle Emissions** Estimates emissions for workers and operational vehicles commuting to the site of the Proposed Action.
- Fuel Transfer Emissions** Fuel loading operations under the Proposed Action involves the loading of fuel into tanker trucks and aircraft.
- Internal Combustion Engine (ICE) Emissions** Estimates Emissions from Internal Combustion Engines (e.g Generators)
- Fuel Storage Tanks** Estimates emissions from Above Ground Storage Tanks.

**Criteria Pollutant and VOC Emissions Summary for Alternative 2 - Implementation Phase (TNI) (tons/year)**

| Source Category   | PM10        | PM2.5       | CO          | NOx          | SOx         | VOCs        |
|---|-------------|-------------|-------------|--------------|-------------|-------------|
| Airfield Operations*  | 0.42        | 0.42        | 1.66        | 0.45         | 0.10        | 0.22        |
| Fuel Truck and Commuter Vehicle Emissions                     | 0.04        | 0.03        | 0.51        | 2.15         | 0.00        | 0.12        |
| Fuel Transfer   | N/A         | N/A         | N/A         | N/A          | N/A         | 0.34        |
| ICE   | 1.96        | 1.96        | 5.95        | 27.61        | 1.83        | 2.23        |
| Fuel Storage Tanks  | N/A         | N/A         | N/A         | N/A          | N/A         | 1.97        |
| <b>Total Criteria and VOC Pollutant Emissions (tons/year)</b> | <b>2.43</b> | <b>2.41</b> | <b>8.12</b> | <b>30.21</b> | <b>1.92</b> | <b>4.87</b> |

\*Highest emission value from either proposed aircraft mix extreme

**Greenhouse Gas (GHG) Emissions Summary for Alternative 2 - Implementation Phase (TNI) (metric tonnes/year)**

| Source Category                           | CO <sub>2</sub> (lb/year) | CO <sub>2</sub> (kg/year) | CO <sub>2</sub> (metric tonne/year) |
|---|---------------------------|---------------------------|-------------------------------------|
| Airfield Operations*                      | 388,888,889               | 176,400,000               | 176,400                             |
| Fuel Truck and Commuter Vehicle Emissions | 485,571                   | 220,255                   | 220                                 |
| Fuel Transfer                             | 0                         | 0                         | 0                                   |
| ICE                                       | 2,048,145                 | 929,038                   | 929                                 |
| Fuel Storage Tanks                        | 0                         | 0                         | 0                                   |
| <b>Total GHG Emissions</b>                | <b>391,422,605</b>        | <b>177,549,293</b>        | <b>177,549</b>                      |

**DATA - Airfield Operations for Alternative 2 - Implementation Phase (TNI)**

For purposes of establishing the worst case scenario the maximum number allowed at one time for each aircraft scenario will be used to calculate airfield operational emissions. 12 aircraft (KC-135) and 24 fighters(F-22), are the two worst case scenarios which will be used during this analysis. It is assumed that each aircraft would take off and land twice each day during exercises

**Landing and takeoff (LTO) and touch and go (TGO) Cycles Estimation**

| Description                       | Quantity |
|-----------------------------------|----------|
| Weeks of Exercises                | 8        |
| Days of Exercises                 | 56       |
| # of LTO's per exercise day       | 2        |
| # of TGO's per exercise day       | 0        |
| # of KC-135 (Worst Case Scenario) | 12       |
| # of F-22 (Worst Case Scenario)   | 24       |
| # of KC-135 LTO's per year        | 24       |
| # of F-22 LTO's per year          | 48       |
| # of KC-135 TGO's per year        | 0        |
| # of F-22 TGO's per year          | 0        |

Legend  
Input Data

**Airfield Activity Data (Worst Case Scenario)**

| Aircraft Model | Aircraft Model Used to Match to Available Emission Factors | Engine Model | # Engines | APU Model | # APUs | Notes | Fiscal year 1 |            |
|----------------|--|--------------|-----------|-----------|--------|-------|---------------|------------|
|                |  |              |           |           |        |       | LTO Cycles    | TGO Cycles |
| F-22           | F-22   | F119-PW-100  | 2         | G250      | 1      |       | 48            | 0          |
| KC-135         | KC-135-R   | F108-CF-100  | 4         |           |        |       | 24            | 0          |

Emission factors from AFCEE 2009 Mobile Emissions Guide, Table 1-2, Table 1-4

**Emission Factors (EFs) and Constants - Airfield Operations for Alternative 2 - Implementation Phase (TNI)**

**Aircraft Criteria Pollutant Emission Factors**

| Aircraft Model | Engine Model | # Eng. | Reference Thrust Mode | LTO/TGO Thrust Mode | Fuel Flow (lb/hr) | Emission Factors in lb Pollutant per 1000 lb Fuel Burned |          |       |                 |                 |      |      |
|----------------|--------------|--------|-----------------------|---------------------|-------------------|--|----------|-------|-----------------|-----------------|------|------|
|                |              |        |                       |                     |                   | PM10   | PM2.5    | CO    | NO <sub>x</sub> | SO <sub>2</sub> | VOCs | TIM  |
| F-22           | F119-PW-100  | 2      | Idle                  | Idle                | 1377              | 2.49   | 2.24     | 48.2  | 3               | 1.4             | 6.48 | 29.8 |
| F-22           | F119-PW-100  | 2      | Approach              | Approach            | 2740              | 2  | 1.8      | 7.9   | 6.6             | 1.4             | 0.29 | 3.5  |
| F-22           | F119-PW-100  | 2      | Intermediate          | Climbout            | 10100             | 1.41   | 1.27     | 2.1   | 12.4            | 1.4             | 0.48 | 0.8  |
| F-22           | F119-PW-100  | 2      | Military              | Takeoff             | 18612             | 1.12   | 1.01     | 0.8   | 19.8            | 1.4             | 0    | 0.4  |
| KC-135         | F108-CF-100  | 4      | Idle                  | Idle                | 1136              | 9.08   | 8.996464 | 27.19 | 3.94            | 1.4             | 0.92 | 47.7 |
| KC-135         | F108-CF-100  | 4      | Approach              | Approach            | 2547              | 1.55   | 1.53574  | 6.39  | 6.96            | 1.4             | 0.04 | 5.2  |
| KC-135         | F108-CF-100  | 4      | Intermediate          | Climbout            | 5650              | 0.65   | 0.64402  | 1.61  | 13.53           | 1.4             | 0.03 | 2.5  |
| KC-135         | F108-CF-100  | 4      | Military              | Takeoff             | 6458              | 1.59   | 1.575372 | 0.63  | 15.28           | 1.4             | 0.03 | 0.7  |

Emission factors from AFCEE 2009 Mobile Emissions Guide, Table 1-2, Table 1-4

**APU Emission Factors**

| Aircraft Model | # APU | APU Model | APU Emission Factors in lb Pollutant per hour |       |    |                 |                 |      | APU (hr) |
|----------------|-------|-----------|---|-------|----|-----------------|-----------------|------|----------|
|                |       |           | PM10  | PM2.5 | CO | NO <sub>x</sub> | SO <sub>2</sub> | VOCs |          |
| F-22           | 1     | G250      | No emissions data available.                  |       |    |                 |                 |      |          |

**Default Time-In-Mode**

| Aircraft Type      | Typical Duration by Mode (minutes) |         |          |          |              |       |
|--------------------|------------------------------------|---------|----------|----------|--------------|-------|
|                    | Taxi/Idle-out                      | Takeoff | Climbout | Approach | Taxi/Idle-in | Total |
| KC-135             | 32.8                               | 0.7     | 2.5      | 5.2      | 14.9         | 56.1  |
| F-22 (Combat USAF) | 18.5                               | 0.4     | 0.8      | 3.5      | 11.3         | 34.5  |

Emission factors from AFCEE 2009 Mobile Emissions Guide, Table 1-8

**Greenhouse Gas Emission Factors**

| Units       | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2</sub> e |
|-------------|-----------------|-----------------|------------------|-------------------|
| kg/gal fuel | 9.80            | 0.00180         | 0.00040          | 9.96              |
| kg/lb fuel  | 1.43            | 0.00026         | 0.00006          | 1.45              |

Reference: Table 3-6 "GHG Emission Factors for Aircraft LTO Cycle"  
AFMC Interim GHG Inventory Guidance, AFCEE, February 2009.

**Conversion of CH<sub>4</sub> and N<sub>2</sub>O to CO<sub>2</sub> Equivalent (CO<sub>2</sub>e)**

| Pollutant       | Multiplier | CO <sub>2</sub> e |
|-----------------|------------|-------------------|
| CO <sub>2</sub> | * 1 =      |                   |

Ref: Table A-5, AFMC Interim Greenhouse Gas Inventory Guidance, AFCEE, February 2009.

Calculations - Airfield Operations for Alternative 2 - Implementation Phase (TNI)

**Criteria Pollutant and VOC Emissions per LTO by Aircraft Type**

Calculated as the sum of the products of [(minutes) \* (fuel flow/minute) \* (lbs pollutant/lb fuel)] for each of the thrust modes.  
 Plus [(APU hr) \* (lb/hr)] for each pollutant, for those aircraft that are equipped with APUs.

| Reported Aircraft Model | APU | Emission in lb Pollutant per LTO |           |            |         |          |          |           | APU  |
|-------------------------|-----|----------------------------------|-----------|------------|---------|----------|----------|-----------|------|
|                         |     | Fuel (lb)                        | PM10 (lb) | PM2.5 (lb) | CO (lb) | NOx (lb) | SOx (lb) | VOCs (lb) |      |
| F-22                    | 1   | 2205.0                           | 4.7       | 4.2        | 69.2    | 14.5     | 3.1      | 9.1       | G250 |
| KC - 135                | 0   | 5738.5                           | 35.3      | 34.9       | 105.6   | 37.7     | 8.0      | 3.4       |      |

**Criteria Pollutant and VOC Emissions per TGO by Aircraft Type**

Calculated as the sum of the products of [(minutes) \* (fuel flow/minute) \* (lbs pollutant/lb fuel)] for each of the thrust modes, with no idle time, and no APU emissions.

| Reported Aircraft Model | Emission in lb Pollutant per TGO |           |            |         |          |          |           |
|-------------------------|----------------------------------|-----------|------------|---------|----------|----------|-----------|
|                         | Fuel (lb)                        | PM10 (lb) | PM2.5 (lb) | CO (lb) | NOx (lb) | SOx (lb) | VOCs (lb) |
| F-22                    | 837.2                            | 1.3       | 1.2        | 3.3     | 10.4     | 1.2      | 0.2       |
| KC - 135                | 2126.0                           | 2.5       | 2.4        | 7.3     | 23.5     | 3.0      | 0.1       |

**Total Criteria Pollutant and VOC Emissions for maximum LTO's by Aircraft Type**

| Reported Aircraft Model    | APU | Total LTO's | Emission in lb Pollutant per LTO |             |              |             |             |             |             | APU  |
|----------------------------|-----|-------------|----------------------------------|-------------|--------------|-------------|-------------|-------------|-------------|------|
|                            |     |             | Fuel (gals)                      | PM10 (tons) | PM2.5 (tons) | CO (tons)   | NOx (tons)  | SOx (tons)  | VOCs (tons) |      |
| F-22                       | 1   | 48          | 105,839.0                        | 0.1         | 0.1          | 1.7         | 0.3         | 0.1         | 0.2         | G250 |
| KC - 135                   | 0   | 24          | 137,723.5                        | 0.4         | 0.4          | 1.3         | 0.5         | 0.1         | 0.0         |      |
| <b>Worst Case Scenario</b> |     |             | <b>137,723.52</b>                | <b>0.42</b> | <b>0.42</b>  | <b>1.66</b> | <b>0.45</b> | <b>0.10</b> | <b>0.22</b> |      |

**Total Criteria Pollutant and VOC Emissions for maximum TGOs by Aircraft Type**

| Reported Aircraft Model | Total TGO's | Emission in lb Pollutant per TGO |           |            |         |          |          |           |
|-------------------------|-------------|----------------------------------|-----------|------------|---------|----------|----------|-----------|
|                         |             | Fuel (lb)                        | PM10 (lb) | PM2.5 (lb) | CO (lb) | NOx (lb) | SOx (lb) | VOCs (lb) |
| F-22                    | 0           | 0.0                              | 0.0       | 0.0        | 0.0     | 0.0      | 0.0      | 0.0       |
| KC - 135                | 0           | 0.0                              | 0.0       | 0.0        | 0.0     | 0.0      | 0.0      | 0.0       |

**Greenhouse Gas Emission**

Assume 300,000 gallons per day for 60 days.

| Quantity (gallons) | Fuel Type | CO <sub>2</sub> (kg) | CO <sub>2</sub> (metric tonne) |
|--------------------|-----------|----------------------|--------------------------------|
| 18,000,000         | JP-8      | 176,400,000          | 176,400                        |

**DATA - Fuel Truck and Commuter Vehicle Emissions for Alternative 2 - Implementation Phase (TNI)**

Given: Six 10,000 gal Fuel Trucks will take 14 days at 10hrs/day to provide initial fill from Saipan port to Saipan International Airport (Site of Proposed Action). The six 10,000 gallon Fuel trucks will operate 10hrs/day for the duration of the exercises. The total exercise time is 8 weeks (56 days), therefore the fuel trucks will operate an additional 42 days after the initial fill.

Under the commercial lodging option fourteen busses will transport a total of 700 personnel 4 trips/day for a total of 56 trips/day for 8 weeks.

Assumptions: A Gross Vehicle Weight (GVW) of 36,200 lbs will be used, based off of an 84 passenger Blue Bird bus.

Assume fuel truck GVW > 60,000 lbs since fuel load alone is 83,400 lbs.

Assume fuel trucks travel at 55 miles per hour

Assume 40 miles per roundtrip for busses.

**Vehicle Weight Classes for Which Emission Factors are Published**

| Vehicle Category | Description   | SCC         |
|------------------|---|-------------|
| LDGV             | Light-Duty Gasoline Vehicles (i.e., passenger cars) does not include SUVs, vans or pickups                    | A2201001000 |
| LDGT1            | Light-Duty Gasoline Trucks 1 (0-6,000 lbs GVW - includes pickup trucks, sport utility vehicles and vans)      | A2201020000 |
| LDGT3            | Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVW - includes pickup trucks, sport utility vehicles and vans) | A2201040000 |
| HdGV2B           | Class 2b Heavy-Duty Gasoline Vehicles (8501-10,000 lbs GVW)   | A2201070000 |
| HdGV5            | Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs GVW)  | A2201070000 |
| HdGV8A           | Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs GVW)   | A2201070000 |
| LDDV             | Light-Duty Diesel Vehicles (Passenger Cars)   |             |
| LDDT34           | Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs GVW)  | A2230002000 |
| HDDV2B           | Class 2b Heavy-Duty Diesel Vehicles (8501-10,000 lbs GVW – includes pickup trucks)                            | A2230070000 |
| HDDV5            | Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs GVW)  | A2230070000 |
| HDDV8A           | Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW)   | A2230070000 |
| HDDV8B           | Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)   | A2230070000 |
| MC               | Motorcycles   | A2201080000 |

**Emission Factors - Fuel Truck and Commuter Vehicle Emissions for Alternative 2 - Implementation Phase (TNI)**

**Emission Factors for Calendar Year 2013**

| Vehicle Class | Model Year | Emission Factors in grams per Mile <sup>a</sup> |                   |      |       |      |      |                 |                           |                            |
|---------------|------------|---|-------------------|------|-------|------|------|-----------------|---------------------------|----------------------------|
|               |            | PM <sub>10</sub>                                | PM <sub>2.5</sub> | CO   | NOx   | SOx  | VOCs | CO <sub>2</sub> | Fugitive PM <sub>10</sub> | Fugitive PM <sub>2.5</sub> |
| HDDV8A*       | 2000       | 0.2   | 0.19              | 2.87 | 12.18 | 0.01 | 0.66 | 1544.1          | 0.05                      | 0.01                       |
| HDDV8B**      | 2000       | 0.2   | 0.19              | 3.45 | 13.85 | 0.02 | 0.78 | 1615.2          | 0.05                      | 0.01                       |

\* Low Altitude Emission Factors for Heavy Duty Diesel Vehicles Class 8a

\*\* Low Altitude Emission Factors for Heavy Duty Diesel Vehicles Class 8b

a) Emission factors from Appendix A of Air Emissions Factor Guide to Air Force Mobile Sources, AFCEE, December 2009

**Greenhouse Gas Emission Factors for Calendar Year 2013**

| Vehicle Class | Fuel Econ (mpg) <sup>a</sup> | (gal/mi) | CO <sub>2</sub> kg/gal | Emission Factors g/mi        |
|---------------|------------------------------|----------|------------------------|------------------------------|
|               |                              |          |                        | CO <sub>2</sub> <sup>b</sup> |
| LDGV          | 24.1                         | 0.041    | 8.81                   | 365.56                       |
| LDGT1         | 17.2                         | 0.058    | 8.81                   | 512.21                       |
| LDGT2         | 17.2                         | 0.058    | 8.81                   | 512.21                       |
| HdGV          | 9.5                          | 0.105    | 8.81                   | 927.37                       |
| LDDT          | 19.0                         | 0.053    | 10.15                  | 534.21                       |
| HDDV          | 7.2                          | 0.139    | 10.15                  | 1409.72                      |

a) Table 3.5 "Fuel Economy by Vehicle Class" Air Force Materiel Command Interim Greenhouse Gas Inventory Guidance, February 2009. Fuel economy factors suggested in Table 4-51 of the AF IERA 2003 guidance document are comparable, but correspond to 1995 model year vehicles. CH<sub>4</sub> and N<sub>2</sub>O emission factors are from Table 3.3 of AFMC 2009.

b) CO<sub>2</sub> is estimated from the fuel use per mile using the emission factors:  
 8.81 kg/gal gasoline  
 10.15 kg/gal diesel  
 from Table 3.2 "CO<sub>2</sub> Vehicle Emission Factors for Method 1 (GRP) by Fuel Type"  
 Air Force Materiel Command Interim Greenhouse Gas Inventory Guidance, February 2009.

**Conversion of CH<sub>4</sub> and N<sub>2</sub>O to CO<sub>2</sub> Equivalent (CO<sub>2</sub>e)**

| Pollutant       | Multiplier | CO <sub>2</sub> e |
|-----------------|------------|-------------------|
| CO <sub>2</sub> | * 1 =      |                   |

Ref: Table A-5, AFMC Interim Greenhouse Gas Inventory Guidance, AFCEE, February 2009.

Also agrees with Table B.1 of The Climate Registry "General Reporting Protocol", Version 1.1, May 2008.



Emission Calculations - Fuel Truck and Commuter Vehicle Emissions for Alternative 2 - Implementation Phase (TNI)

Miles for Commuter Emissions for 8 week training exercises

| Vehicle Class  | Speed      |            | Total Trips/Day | Hours/Day | Total Days | Total Miles |
|--|------------|------------|-----------------|-----------|------------|-------------|
|  | Miles/hour | Miles/Trip |                 |           |            |             |
| HDDV8A - Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW) |            | 40         | 56              |           | 56         | 125,440     |
| HDDV8B - Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)       | 55         |            |                 | 10        | 56         | 30,800      |

Criteria and VOC Emissions for Commuters

| Vehicle Class  | Model Year | Annual Miles | Criteria Pollutant Emissions (tons/year) |                   |             |             |             |             |
|--|------------|--------------|--|-------------------|-------------|-------------|-------------|-------------|
|  |            |              | PM <sub>10</sub>                         | PM <sub>2.5</sub> | CO          | NOx         | SOx         | VOCs        |
| HDDV8A - Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW) | 2000       | 125,440      | 0.03                                     | 0.03              | 0.40        | 1.68        | 0.00        | 0.09        |
| HDDV8B - Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)       | 2000       | 30,800       | 0.01                                     | 0.01              | 0.12        | 0.47        | 0.00        | 0.03        |
| <b>Total</b>   |            |              | <b>0.04</b>                              | <b>0.03</b>       | <b>0.51</b> | <b>2.15</b> | <b>0.00</b> | <b>0.12</b> |

Particulate emissions include exhaust, brake wear, tire wear. Assume paved road.

Greenhouse Gas Emissions for Commuters

| Vehicle Class  | Annual Miles | Annual Gal | GHG Pollutant Emissions (lb/year) | GHG Pollutant Emissions (metric tonnes/year) |
|--|--------------|------------|-----------------------------------|--|
|  |              |            | CO <sub>2</sub>                   | CO <sub>2</sub>                              |
| HDDV8A - Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVW) | 125,440      | 17,422     | 389,849.11                        | 176.84                                       |
| HDDV8B - Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVW)       | 30,800       | 4,278      | 95,721.88                         | 43.42  |
| <b>Total</b>   |              |            | <b>485,570.99</b>                 | <b>220.26</b>                                |

Emission Calculations Method - Fuel Truck and Commuter Vehicle Emissions for Alternative 2 - Implementation Phase (TNI)

Calculation Method: Equation 4-1, AFCEE 2009, Mobile Emissions Guide

$$EP = VMTVehCat * EFPoVehCat * 0.002205$$

Where,

EP = Emissions of each individual pollutant (lb/yr)

VMTVehCat = Annual vehicle miles traveled by each vehicle category (LDGV, LDGT1, LDDV, etc.) (mi/yr)

EFPoVehCat = Emission factor of each pollutant for each vehicle category (g/mi)

0.002205 = Factor for converting grams to pounds (g/lb).

**DATA - Fuel Loading Emissions for Alternative 2 - Implementation Phase (TNI)**

Given:

|  |            |
|--|------------|
| Total Exercise Days (8 weeks)              | 56         |
| Initial Fuel Fill Days                     | 14         |
| Remaining Fuel Fill Days                   | 42         |
| Total # of Fuel Trucks                     | 6          |
| Total Gallons per Fuel Truck               | 10,000     |
| Trips per day per Fuel Truck               | 5          |
| 1 bbl conversion to gallons                | 42         |
| Total Fuel (gal) during Initial Fill       | 4,200,000  |
| Total Fuel (gal) during Remaining Exercise | 12,600,000 |
| Total Fuel (gal) during Exercise (8 Weeks) | 16,800,000 |

**Proposed Action Fuel Loading Operations**

| Location                                   | Description                    | Fuel Type | Fuel Transferred (gal) | Category |
|--|--------------------------------|-----------|------------------------|----------|
| Flightline                                 | Loading Aircraft from Hydrants | JP-8      | 16,800,000.0           | Loading  |
| Seaport, Loading Racks (50,000 bbl tank 1) | Loading Refueler Trucks        | JP-8      | 8400000                | Loading  |
| Seaport, Loading Racks (50,000 bbl tank 2) | Loading Refueler Trucks        | JP-8      | 8400000                | Loading  |

**Emission Factors - Fuel Loading Emissions for Alternative 2 - Implementation Phase (TNI)**

| JP-8 emission factors (lb/Mgal)  | Dispensing | Loading     |   |
|----------------------------------|------------|-------------|---|
|                                  | Splash     | Bottom fill |   |
| Molecular Weight =               | 130        |             | AP-42 Table 7.1-2 dated 11/06                     |
| True Vapor Pressure (psia) =     | 0.011      |             | AP-42 Table 7.1-2 dated 11/06 @ 70F (annual avg.) |
| Dispensing Displacement losses = | 0.0487     | 0.020       | AP-42 Section 5.2 dated 6/08 Equation (1)         |
| Spillage =                       | 0.7        |             | AP-42 Table 5.2-7 dated 6/08                      |
| Total =                          | 0.749      |             |   |

**Emission Calculations - Fuel Loading Emissions for Alternative 2 - Implementation Phase (TNI)**

| Location                                   | Description                    | Fuel Type | Fuel Transferred  | Displaced Vapor | Spillage | Total VOC     | Total VOC   |
|--|--------------------------------|-----------|-------------------|-----------------|----------|---------------|-------------|
|  |                                |           | (gal)             | (lb)            | (lb)     | (lb)          | (tons)      |
| Flightline                                 | Loading Aircraft from Hydrants | JP-8      | 16,800,000        | 338.9           | 0        | 338.9         | 0.17        |
| Seaport, Loading Racks (50,000 bbl tank 1) | Loading Refueler Trucks        | JP-8      | 8,400,000         | 169.4           | 0        | 169.4         | 0.08        |
| Seaport, Loading Racks (50,000 bbl tank 2) | Loading Refueler Trucks        | JP-8      | 8,400,000         | 169.4           | 0        | 169.4         | 0.08        |
| <b>Total</b>                               |                                |           | <b>33,600,000</b> | <b>678</b>      | <b>0</b> | <b>677.75</b> | <b>0.34</b> |

**Emission Calculations Method - Fuel Loading Emissions for Alternative 2 - Implementation Phase (TNI)**

Displacement emissions for Diesel and JP-8 were estimated using Equation (1) from AP-42 Section 5.2, Transportation and Marketing of Petroleum Liquids, dated 6/08

$$L_L = 12.46 (SPM)/T$$

Where

$L_L$  = Loading loss in lb/10<sup>3</sup> gal

S = Saturation Factor 1.45 for splash loading, 0.6 for bottom loading

M = molecular weight,

T = temperature of bulk liquid (assume average annual ambient temperature)

DATA - Internal Combustion Engine Emissions for Alternative 2 - Implementation Phase (TNI)

Given:

|  |      |
|--|------|
| Generator Peak Demand (kW)                   | 920  |
| Generator Peak Demand (kW)                   | 550  |
| BEAR KIT Generator Operating Time - (hrs)*   | 1344 |
| Emergency Generator Operating Time - (hrs)** | 83.3 |

\*Assume BEAR KIT Generator Operates 24/7 for 8 weeks

\*\*Assume Standard Potential to Emit of 500hrs/year or 41.6hrs/month for 2 months

Emission Factors

| Pollutant                  | Emission Factor<br>(lb/10 <sup>3</sup> gal) | Emission Factor<br>(lb/10 <sup>3</sup> hp-hr) (lb/hp-hr) |
|----------------------------|---|--|
| <b>Criteria Pollutants</b> |   |  |
| CO                         | 130.0                                       | 6.7  |
| NOX                        | 604.0                                       | 31.0   |
| PM                         | 42.5  | 2.2  |
| PM10                       | 42.5  | 2.2  |
| SOX                        | 39.7  | 2.1  |
| TOC                        | 49.3  | 2.5  |
| CO <sub>2</sub>            |   | 1.2  |

EF's obtained from AFCEE 2009 except CO2 was obtained from AP-42, all assume JP-8 EF's are similar to Diesel EF's

Emissions Calculation - Internal Combustion Engine Emissions for Alternative 2 - Implementation Phase (TNI)

| Description          | Criteria Pollutant Emissions (tons/year) |               |              |                |               |               |
|----------------------|--|---------------|--------------|----------------|---------------|---------------|
|                      | CO<br>(tons)                             | NOx<br>(tons) | PM<br>(tons) | PM10<br>(tons) | SOx<br>(tons) | TOC<br>(tons) |
| 920 kW Generator Set | 5.54                                     | 25.70         | 1.82         | 1.82           | 1.70          | 2.07          |
| 550 kW Generator     | 0.21                                     | 0.95          | 0.07         | 0.07           | 0.06          | 0.08          |
| 550 kW Generator     | 0.21                                     | 0.95          | 0.07         | 0.07           | 0.06          | 0.08          |
| <b>Total</b>         | <b>5.95</b>                              | <b>27.61</b>  | <b>1.96</b>  | <b>1.96</b>    | <b>1.83</b>   | <b>2.23</b>   |

Emissions Calculation - Internal Combustion Engine Emissions for Alternative 1 - Implementation Phase (GSN)

| Description          | GHG Pollutant Emissions (lb/year) |                           |                                     |
|----------------------|-----------------------------------|---------------------------|-------------------------------------|
|                      | CO <sub>2</sub> (lbs)             | CO <sub>2</sub> (kg/year) | CO <sub>2</sub> (metric tonne/year) |
| 920 kW Generator Set | 1,906,838                         | 864,942                   | 865                                 |
| 550 kW Generator     | 70,654                            | 32,048                    | 32                                  |
| 550 kW Generator     | 70,654                            | 32,048                    | 32                                  |
| <b>Total</b>         | <b>2,048,145</b>                  | <b>929,038</b>            | <b>929</b>                          |

AFCEE Stationary Source Air Emissions Inventory Guidance, Dec 2009, Equation 32-4

Epoll = (PD x 1.341 x OT/1000) x EF Equation 32-4

Where

Epoll = Emissions of a particular pollutant (lb/yr)

PD = Peak demand of the generator (kW) 1.341 = Factor for converting "kW" to "hp"

OT = Operating time of the generator (hr)

1000 = Factor for converting - "hp-hr" to - "10<sup>3</sup> hp-hr"

EF = Emission Factor (lb/10<sup>3</sup> hp-hr).

**DATA - Fuel Storage Tank Emissions for Alternative 2 - Implementation Phase (TNI)**

Storage tank emissions were estimated using the U.S. EPA TANKS storage tank emissions calculation software (Version 4.0.9d). The emissions calculations algorithms in the TANKS program are based on Chapter 7 of EPA's AP-42. In order to estimate HAP emissions from tanks, the VOC estimates generated by the TANKS software are subdivided into the chemical fractions in the fuel liquid and vapor. The following mixtures and speciation profiles were used to describe JP-8 fuel in TANKS. This profile was obtained from the AFCEE 2009 Stationary Source Guide.

**Emission Calculations Summary from TANKS\***

| Tank Type  | Throughput | Working Loss<br>(lbs) | Breathing Loss<br>(lbs) | VOC Total<br>(lbs) | VOC Total<br>(tons) |
|--|------------|-----------------------|-------------------------|--------------------|---------------------|
| Tank 1 (Seaport)-100,000 bbl, cut and cover or AST   | 16,800,000 | 856.84                | 577.78                  | 1,434.62           | 0.72                |
| Tank 2 (Airport)-10,000 bbl, cut and cover or AST    | 8,400,000  | 428.42                | 105.76                  | 534.18             | 0.27                |
| Tank 3 (Airport) - 10,000 bbl, cut and cover or AST  | 8,400,000  | 428.42                | 105.76                  | 534.18             | 0.27                |
| Tank 4 (Airport) - 100,000 bbl, cut and cover or AST | 16,800,000 | 856.84                | 577.78                  | 1,434.62           | 0.72                |
| <b>Total</b>   |            | <b>2,570.52</b>       | <b>1,367.08</b>         | <b>3,937.60</b>    | <b>1.97</b>         |

\*See the following references for TANKS printouts. (SM12 - TANKS) & (SM13 - TANKS)