Public Draft Environmental Assessment Relocation of Marine Unmanned Aerial Vehicle Squadron One (VMU-1) to Marine Corps Air Station Yuma

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Marine Corps Air Station
Yuma

September 2015

Draft

Environmental Assessment for the Relocation of Marine Unmanned Aerial Vehicle Squadron One to Marine Corps Air Station Yuma

Lead Agency:	United States Marine Corps
Title of Proposed Action:	Relocation of Marine Unmanned Aerial Vehicle Squadron One (VMU-1) to Marine Corps Air Station Yuma
Location of the Proposed Action:	State of Arizona, Yuma County; State of California, Imperial County
Document Type:	Environmental Assessment

Abstract

The United States Marine Corps has prepared this Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) of 1969, 42 United States Code §§ 4321–4370h, as implemented by the Council on Environmental Quality regulations, 40 Code of Federal Regulations Parts 1500–1508, and Marine Corps Order P5090.2A, Change 3, Chapter 12, dated 26 August 2013, *Environmental Compliance and Protection Manual*, which establishes procedures for implementing NEPA. The proposed action includes the relocation of Marine Unmanned Aerial Vehicle Squadron One (VMU-1) from Marine Corps Air Ground Combat Center Twentynine Palms to Marine Corps Air Station Yuma as part of a United Sates Marine Corps initiative to realign all VMU squadrons with their associated Marine Aircraft Group. This action also would ensure VMU-1 has adequate training opportunities with access to nearby military training ranges and needed infrastructure to meet mission requirements. This Environmental Assessment describes the potential environmental consequences resulting from two action alternatives (Alternatives 1 and 2) and the No-Action Alternative on the following resource areas: airspace, air quality, noise, biological resources, cultural resources, hazardous materials and waste, safety and environmental health, community facilities and services, transportation, and utilities and infrastructure.

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Acronyms

ACM	asbestos-containing materials
ADEQ	Arizona Department of Environmental Quality
AGL	above ground level
AMSL	above mean sea level
APE	Area of Potential Effects
APZ	Accident Potential Zone
ARB	Air Resources Board
BASH	Bird Aircraft Strike Hazard
BMGR	Barry M. Goldwater Range
BO	Biological Opinion
BSTRC	Bob Stump Training Range Complex
CAAQS	California Ambient Air Quality Standards
CADC	Cannon Air Defense Complex
CAOC	CERCLA Area of Concern
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CH_4	methane
CMAGR	Chocolate Mountain Aerial Gunnery Range
CNEL	Community Noise Equivalent Level
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COA	Certificate of Authorization or Waiver
dB	decibel
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DoN	Department of the Navy
EA	Environmental Assessment
EO	Executive Order
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity Distance
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FR	Federal Register
GHG	greenhouse gas
GWP	global warming potential
HMMWV	High Mobility Military Wheeled Vehicle
HP	horsepower
HVAC	heating, ventilation, and air conditioning
ICAPCD	Imperial County Air Pollution Control District
IRP	Installation Restoration Program

IVPA	Imperial Valley Planning Area
JO	Joint Order
LEED®	Leadership in Energy and Environmental Design
L_{max}	Maximum Noise Level
LOS	Level of Service
MAG	Marine Aircraft Group
MAGTF	Marine Air Ground Task Force
MALS	Marine Aviation Logistics Squadron
Marine Corps	United States Marine Corps
MAWTS-1	Marine Aviation Weapons and Tactics Squadron One
MBTA	Migratory Bird Treaty Act
MCAGCC	Marine Corps Air Ground Combat Center
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCI	Marine Corps Installation
MCO	Marine Corps Order
MMMR	Minimization, Mitigation, Monitoring, and Reporting
MOU	Memorandum of Understanding
MRP	Munitions Response Program
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NATOPS	Naval Air Training and Operating Procedures Standardization
NAVMC	Navy/Marine Corps
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
O_3	ozone
OSHA	Occupational Safety and Health Administration
OU	Operable Units
PM	particulate matter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RMO	Range Management Office
ROI	Region of Influence
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SSAB	Salton Sea Air Basin
UAS	Unmanned Aircraft System
UFC	Unified Facilities Criteria
USAF	United States Air Force

USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corps
VMU-1	Marine Unmanned Aerial Vehicle Squadron One
VOC	volatile organic compound
WTI	Weapons and Tactics Instructor

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Executive Summary

The United States Marine Corps (USMC) has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) of 1969, 42 United States Code (USC) §§ 4321-4370h, as implemented by the Council on Environmental Quality (CEQ) regulations, 40 Code of Federal Regulations (CFR) Parts 1500-1508, and Marine Corps Order (MCO) P5090.2A, Change 3, Chapter 12, dated 26 August 2013, *Environmental Compliance and Protection Manual*, which establishes procedures for implementing NEPA. This EA describes the potential environmental consequences resulting from a proposal to relocate the Marine Unmanned Aerial Vehicle Squadron One (VMU-1) from Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms to Marine Corps Air Station (MCAS) Yuma.

The *purpose* of the proposed action is twofold: 1) ensure VMU-1 has adequate training opportunities with easy access to nearby military training ranges and needed infrastructure to meet mission requirements; and 2) support the USMC initiative to realign all VMU squadrons with their associated Marine Aircraft Group (MAG). The proposed action is *needed* to alleviate airspace and training constraints that VMU-1 currently experiences at MCAGCC. VMU-1 also needs to be aligned with a facility that can support the future fielding of larger Unmanned Aircraft System platforms that require a full-sized runway and associated infrastructure (control tower, parking apron, ordnance loading, fueling stations, etc.); this type of airfield infrastructure is currently lacking at MCAGCC. Furthermore, the proposed action is *needed* to achieve increased operational and logistical efficiencies by co-locating VMU-1 with their associated MAG manned aviation units, Marine Aviation Logistics Squadron support, and Group headquarters, in accordance with the guidance contained in the *Marine Aviation Plan 2015* (USMC 2014), to allow the VMU community to closely coordinate and train with other components of the MAG.

The following resource areas were evaluated for potential environmental consequences: airspace; air quality; noise; biological resources; cultural resources; hazardous materials and waste; noise; safety and environmental health; community facilities and services; transportation; and utilities and infrastructure. The potential environmental consequences associated with implementation of Alternative 1, Alternative 2, and the No-Action Alternative are summarized in Table ES-1. Alternative 1 would include 1) relocation of VMU-1 aircraft and personnel to MCAS Yuma; 2) temporary relocation in existing, transient facilities; 3) construction of new facilities (aircraft hangar and support facilities); and 4) training and readiness operations within the Bob Stump Training Range Complex. Alternative 2 would include the same relocation of aircraft and personnel and proposed training operations as Alternative 1, except the ground support facilities would be built at the Cannon Air Defense Complex instead of at MCAS Yuma.

As shown in Table ES-1, no significant impacts to any resource area would occur with implementation of either action alternative or their associated Special Conservation Measures. Based on the analysis presented in this EA, the USMC has identified Alternative 1 as the Preferred Alternative.

Table ES-1. Summary of Potential Environmental Consequences

Resource	***Alternative 1***	***Alternative 2***	***No-Action Alternative***
Airspace	The proposed operations would have little effect on other airspace users in the region of influence. MCAS Yuma scheduling services, Naval Air Training and Operations Procedure Standardization Instructions and MCAS Yuma Stations Orders, and other safety initiatives that regulate military flight operations throughout the area would serve to effectively and safely integrate VMU-1 aircraft operations into this high use training environment. Therefore, no significant impacts on airspace would occur.	Under Alternative 2, impacts on airspace would be the same as those described for Alternative 1. No significant impacts on airspace would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on airspace would occur.
Air Quality	Emissions generated by Alternative 1 would be below the conformity *de minimis* levels or the United States Environmental Protection Agency Prevention of Significant Deterioration threshold. Implementation of Special Conservation Measure 1 (*Fugitive Dust Control Measures*) and Special Conservation Measure 2 (*Construction Equipment Emission Control Measures*) would minimize fugitive dust and equipment combustion emissions from construction activities. Therefore, no significant impacts on air quality would occur.	Similar to Alternative 1, emissions generated by Alternative 2 would be below the conformity *de minimis* levels or the United States Environmental Protection Agency Prevention of Significant Deterioration threshold. Implementation of Special Conservation Measure 1 (*Fugitive Dust Control Measures*) and Special Conservation Measure 2 (*Construction Equipment Emission Control Measures*) would minimize fugitive dust and equipment combustion emissions from construction activities. Therefore, no significant impacts on air quality would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on air quality would occur.
Noise	Noise generated during construction on MCAS Yuma and the CADC would be compatible with current and ongoing military activities in the affected areas, and would be isolated from any off-station communities. Noise generated during construction of the new communication line would be localized and short-term, and would not violate Yuma City Code relating to noise control. Although UAS operations would be audible at certain times, particularly when other aircraft or munition training is not under way in the local area, the proposed UAS operations would not add to overall noise levels, which are dominated by other military high-performance manned aircraft training. Therefore, no significant impacts on noise would occur.	Under Alternative 2, construction-related noise would be of longer duration at the CADC and shorter duration at MCAS Yuma when compared with Alternative 1. Otherwise, Alternative 2 impacts would be the same as those described under Alternative 1. Therefore, no significant impacts on noise would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on noise would occur.

Table ES-1. Summary of Potential Environmental Consequences (continued)

Resource	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Biological Resources	One special status species (flat-tailed horned lizard) and two federally listed species (Agassiz's desert tortoise, Sonoran pronghorn) could be impacted by the proposed action. Implementation of Special Conservation Measure 3 (*Direct VMU-1 Operations by Existing and Pending Biological Opinions for Training Activities in the BSTRC*) would require the following: training and operations based out of the BSTRC would be directed by the existing CMAGR BO issued to MCAS Yuma (1-6-95-F-40); the project-consultation for VMU-1 operations within the CMAGR, which summarizes and specifies existing rangewide requirements; and the pending issuance of a BO for training and operations within BMGR-West. In addition, implementation of Special Conservation Measure 4 (*Flat-tail Horned Lizard Monitoring*) would require that construction activities within and near the CADC comply with the 2003 Flat-tail Horned Lizard Rangewide Management Strategy. With implementation of these measures, significant impacts to biological resources would not occur.	Under Alternative 2, construction activities within the Yuma Desert Management Area for the flat-tailed horned lizard would be of longer duration than under Alternative 1. Otherwise, Alternative 2 impacts would be the same as those described under Alternative 1. Similar to Alternative 1, with the incorporation of Special Conservation Measure 3 (*Direct VMU-1 Operations by Existing and Pending Biological Opinions for Training Activities in the BSTRC*) and Special Conservation Measure 4 (*Flat-tail Horned Lizard Monitoring*), impacts on biological resources would not be significant.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on biological resources would occur.
Cultural Resources	No historic properties would be affected by proposed construction or operations. Potential impacts to possible post-review discoveries would be reduced by implementing Special Conservation Measure 5 (*Post Review Discovery Procedures*). Therefore, no significant impacts on cultural resources would occur.	Similar to Alternative 1, no historic properties would be affected by proposed construction or operations. Potential impacts to possible post-review discoveries would be reduced by implementing Special Conservation Measure 5 (*Post Review Discovery Procedures*). Therefore, no significant impacts on cultural resources would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on cultural resources would occur.

Table ES-1. Summary of Potential Environmental Consequences (continued)

Resource	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Hazardous Materials and Waste	Asbestos-containing material, lead-based paint, and other hazardous materials would be removed, characterized, managed, transported, and disposed of according to applicable federal and state requirements for protecting human health and safety and the environment. All construction, renovation, and demolition activities within Installation Restoration Program and Munitions Response Program sites would be conducted in accordance with Comprehensive Environmental Response, Compensation, and Liability Act requirements. Potential impacts would also be reduced with implementation of Special Conservation Measure 6 *(Health and Safety Plan*). Impacts associated with incidental spills and construction waste would be minimized with implementation of Special Conservation Measure 7 *(Hazardous Materials Best Management Practices*). Implementation of a National Pollutant Discharge Elimination System Stormwater Pollution Prevention Plan and compliance with federal, state, and local statutes and regulations regarding stormwater retention and treatment and soil and groundwater contamination would ensure no significant operational impacts would occur. Therefore, no significant impacts on hazardous materials and waste would occur.	Additional construction at the CADC under Alternative 2 would not fall within a recorded Installation Restoration Program and Munitions Response Program site. Therefore, Alternative 2 impacts would be the same as those described under Alternative 1. Similar to Alternative 1, implementation of Special Conservation Measure 6 (*Health and Safety Plan*), Special Conservation Measure 7 (*Hazardous Materials Best Management Practices)*, and applicable federal, state, and local regulations would ensure no significant impacts would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on hazardous materials and waste would occur.
Safety and Environmental Health	Proposed construction activities would be consistent with established airfield safety clearances, Accident Potential Zones, and Explosive Safety Quantity Distance arcs. Alternative 1 would add VMU-1 UAS operations within the BSTRC. Current aviation safety procedures, including BASH prevention, would continue to be implemented and additional training range flight operations would adhere to established safety procedures. In addition, the emergency and mishap response plans would be updated, as needed, to include procedures and response actions necessary to address a mishap involving any new aircraft platforms. With this update, safety conditions within the BSTRC would be similar to existing conditions. Therefore, no significant impacts on safety and environmental health would occur.	Additional construction at the CADC under Alternative 2 would not fall within an established safety clearance, APZ, or ESQD arc. Therefore, Alternative 2 impacts would be the same as those described under Alternative 1. Similar to Alternative 1, the emergency and mishap response plans would be updated, as needed, to include procedures and response actions necessary to address a mishap involving any new aircraft platforms. With this update, safety conditions within the BSTRC would be similar to existing conditions. Therefore, no significant impacts on safety and environmental health would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on safety and environmental health would occur.

Table ES-1. Summary of Potential Environmental Consequences (continued)

Resource	*Alternative 1*	*Alternative 2*	*No-Action Alternative*
Community Facilities and Services	Alternative 1 would result in an increase of about 350 military personnel, with an estimated 830 dependents. The increase in personnel and dependents associated with Alternative 1 would have little effect on housing, health services, security services, fire protection, education, or parks and recreation. In addition, Alternative 1 would be consistent with surges in demands for community facilities and services at MCAS Yuma and the BSTRC during large-scale training events. Therefore, no significant impacts on community facilities and services would occur.	Under Alternative 2, impacts would be the same as those described for Alternative 1. No significant impacts on community facilities and services would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on community facilities and services would occur.
Transportation	Construction-related traffic would comprise only a small portion of the total existing traffic volume at MCAS Yuma, the CADC, and in the surrounding area. Intermittent traffic delays and temporary road closures could occur in the immediate vicinity of the Alternative 1 footprint. Traffic delays would be minimized with the implementation of Special Conservation Measure 8 (*Construction Traffic Plan*). The increase in commuting trips to MCAS Yuma, the CADC, and the Speed Bag Airfield are minimal and within the capacity of the existing regional and local roadway system. The increase in daily commuting traffic trips could increase congestion and queuing at the MCAS Yuma Main Gate during rush hours. Should an issue arise, MCAS Yuma would coordinate with City of Yuma staff to adjust the timing of traffic lights to improve traffic flow. Regional and local access roads as well as the MCAS Yuma street network have adequate capacity to accommodate the amount of additional traffic without major impacts on traffic flow, circulation, or level of service. Therefore, no significant impacts on transportation would occur.	Under Alternative 2, construction-related traffic impacts would be of longer duration at the CADC and shorter duration at MCAS Yuma when compared with Alternative 1. As with Alternative 1, traffic delays would be minimized with the implementation of Special Conservation Measure 8 (*Construction Traffic Plan*). Alternative 2 also would split assigned squadron equipment and personnel between MCAS Yuma and the CADC, thereby resulting in an increase in daily commuter trips between MCAS Yuma and the CADC as compared to Alternative 1. However, less commuter trips would be needed between the two facilities when conducting VMU-1 aircraft operations at the CADC because much of the equipment would already be housed at the CADC. Regional and local access roads, as well as the MCAS Yuma street network have adequate capacity to accommodate the small amount of additional traffic without major impacts on traffic flow, circulation, or level of service. Therefore, no significant impacts on transportation would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on transportation would occur.

Table ES-1. Summary of Potential Environmental Consequences (continued)

Resource	***Alternative 1***	***Alternative 2***	***No-Action Alternative***
Utilities and Infrastructure	Alternative 1 would increase demands on electricity, natural gas, water, sewer, and solid waste disposal at MCAS Yuma and the BSTRC. However, the existing capacities of all utilities are adequate to accommodate Alternative 1. The potential increase in stormwater runoff associated with new impervious surfaces would be managed such that discharge exiting the site post-construction would be equal to or less than existing conditions through the use of appropriately designed conveyance structures and implementation of stormwater Best Management Practices. Therefore, no significant impacts on utilities and infrastructure would occur.	Although Alternative 2 would result in more construction at the CADC and less at MCAS Yuma when compared with Alternative 1, impacts on utilities and infrastructure would not change in any substantive way. As described for Alternative 1, no significant impacts on utilities and infrastructure would occur.	For the No-Action Alternative, the proposed action would not occur, and there would be no change in existing conditions. No impacts on utilities and infrastructure would occur.
APZ = Accident Potential Zone, BASH = Bird Aircraft Strike Hazard, BMGR-West = Barry M. Goldwater Range-West, BSTRC = Bob Stump Training Range Complex, CADC = Cannon Air Defense Complex, CMAGR = Chocolate Mountain Aerial Gunnery Range, ESQD = Explosive Safety Quantity Distance, MCAS = Marine Corps Air Station, UAS = Unmanned Aircraft System, VMU-1 = Marine Unmanned Aerial Vehicle Squadron One.			

1 Purpose and Need

1.1 Introduction

This Environmental Assessment (EA) has been prepared by the United States Marine Corps (Marine Corps or USMC) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] §§ 4321–4370h, as amended), the Council on Environmental Quality (CEQ) *Regulations for Implementing the Procedural Provisions of NEPA* (40 Code of Federal Regulations [CFR] Parts 1500–1508), and Marine Corps Order (MCO) P5090.2A, Change 3, Chapter 12, dated 26 August 2013, *Environmental Compliance and Protection Manual*. NEPA encourages public involvement in the environmental review process. The development of this EA includes stakeholder coordination and the publication of a Notice of Availability on September 11, 2015, informing interested parties or agencies of the existence of the report.

The USMC proposes to relocate Marine Unmanned Aerial Vehicle Squadron One (VMU-1) from Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms to Marine Corps Air Station Yuma (MCAS Yuma or air station) (Figure 1.1-1) as part of an USMC initiative to realign all VMU squadrons with their associated Marine Aircraft Group (MAG). This move would also ensure that VMU-1 has adequate training opportunities with easy access to nearby military trainings ranges and needed infrastructure to meet mission requirements. This EA describes the potential environmental consequences of transitioning Unmanned Aircraft Systems (UAS) and personnel associated with VMU-1 to MCAS Yuma. This EA also addresses associated construction-related activities as well as UAS operations within the Bob Stump Training Range Complex (BSTRC).

1.2 Project Location

The proposed action would be implemented at MCAS Yuma, which is one of the USMC's main aviation training installations, located in the southwest corner of Arizona (Figure 1.2-1). Yuma International Airport is a commercial service airport shared with MCAS Yuma, which makes MCAS Yuma the only shared-use air station in the USMC. The airfield currently supports fixed-wing, rotary-wing, and tilt-rotor aircraft, and has over 129,000 flight operations per year (Wyle Laboratories Inc. 2014).

MCAS Yuma is home to a number of tenant units, including Marine Aviation Weapons and Tactics Squadron One (MAWTS-1), MAG-13, Marine Wing Support Squadron-371, Marine Fighter Training Squadron-401, Marine Air Control Squadron One, and Combat Logistics Company 16. MCAS Yuma provides access to ranges, support facilities, and services that enable tenants and other Marine Corps commands to enhance their mission capability and combat readiness.

MCAS Yuma manages the BSTRC, which consists of Department of Defense (DoD)-controlled airspace and Department of the Navy (DoN)/USMC-controlled training ranges, including Barry M. Goldwater Range-West (BMGR-West) (R-2301W) in Arizona and the Chocolate Mountain Aerial Gunnery Range (CMAGR) (R-2507N, R-2507S) in California. The BSTRC encompasses about 1,900 square miles of land reserved as aerial bombing and gunnery ranges as well as 10,000 square nautical miles of associated special use airspace. This airspace allows military flight operations to occur without exposing civil aviation users, military aircrews, and the general public to hazards associated with military training and operations.

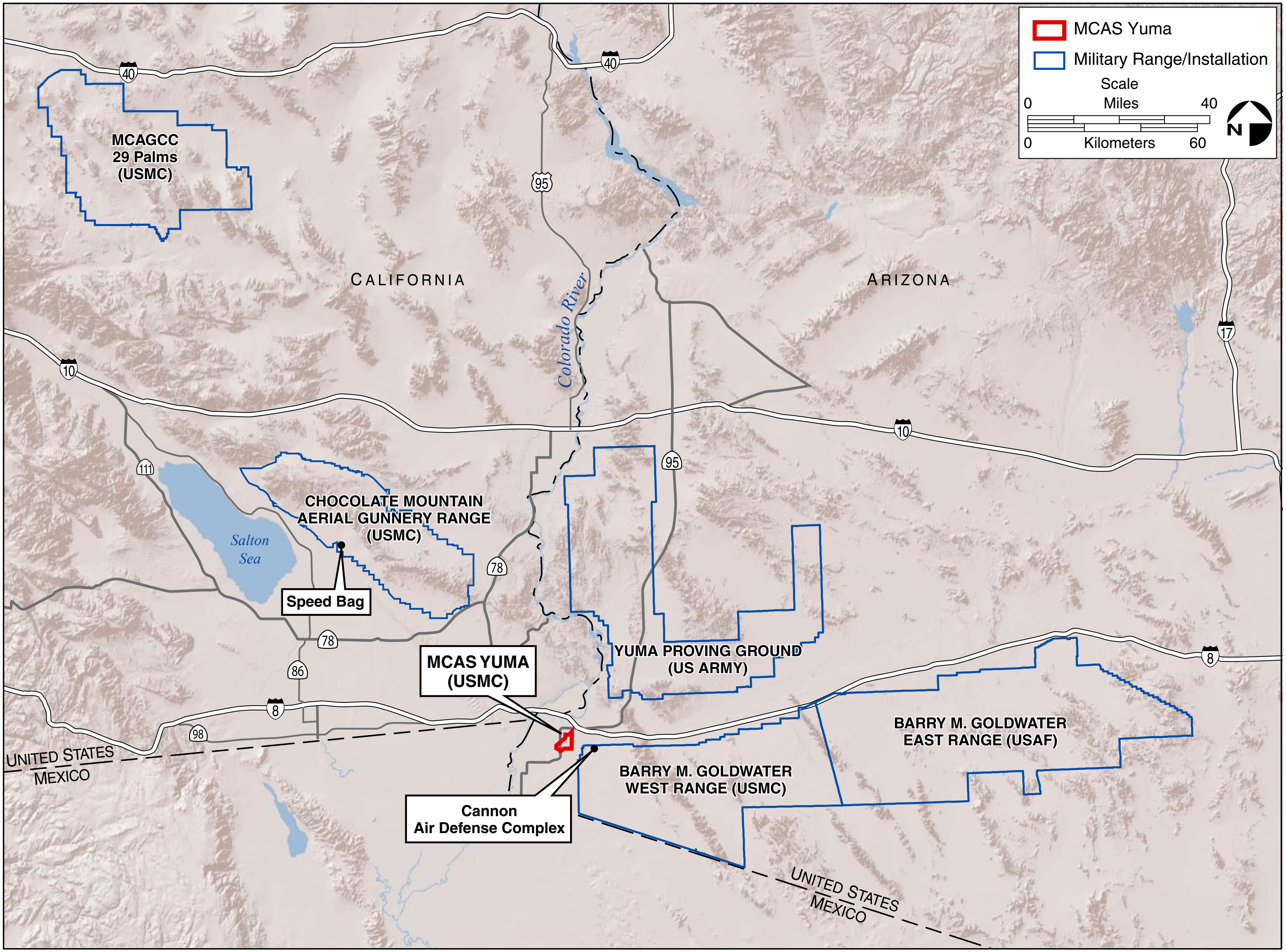

Figure 1.1-1. Regional Map

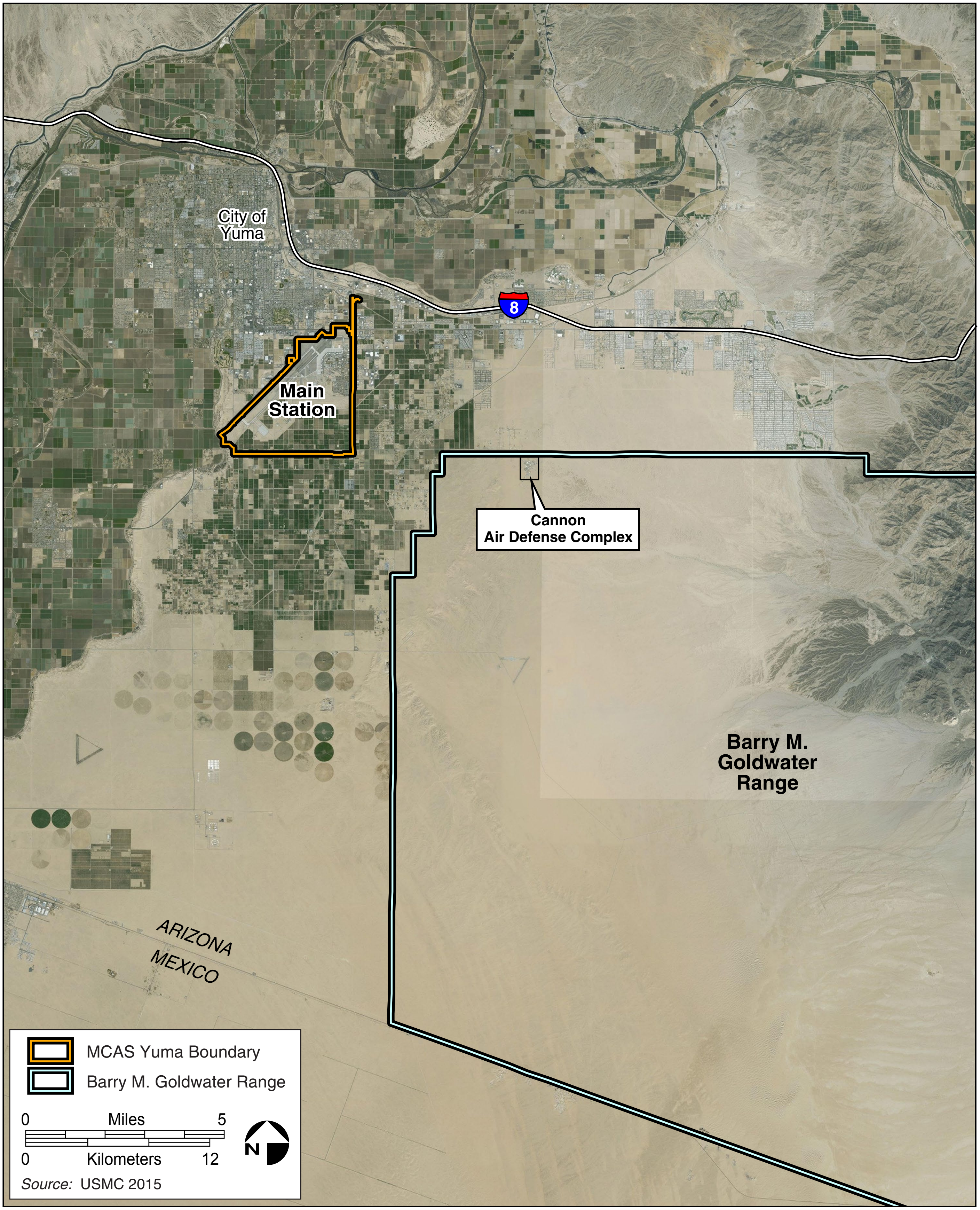

Figure 1.2-1. Project Vicinity Map

With easy access to live-fire ranges and ideal year-round flying weather, the air station provides suitable conditions that support Marine Air Ground Task Force[1] (MAGTF) aviation training.

1.3 Purpose and Need for the Proposed Action

The *purpose* of the proposed action is twofold: 1) ensure VMU-1 has adequate training opportunities with easy access to nearby military training ranges and needed infrastructure to meet mission requirements; and 2) support an USMC initiative to realign all VMU squadrons with their associated MAG. The proposed action is *needed* to alleviate airspace and training constraints that VMU-1 currently experiences at MCAGCC. VMU-1 also needs to be aligned with a facility that can support the future UAS fielding of larger platforms that require a full-sized runway and associated infrastructure (control tower, parking apron, ordnance loading, fueling stations, etc.); this type of airfield infrastructure is currently lacking at MCAGCC. Furthermore, the proposed action is *needed* to achieve increased operational and logistical efficiencies by co-locating VMU-1 with their associated MAG manned aviation units, Marine Aviation Logistics Squadron (MALS) support, and Group headquarters, in accordance with the guidance contained in the *Marine Aviation Plan 2015* (USMC 2014), to allow the VMU community to closely coordinate and train with other components of the MAG.

1.4 Applicable Regulatory Requirements

This EA discusses reasonable alternatives for meeting the purpose and need for the proposed action; existing environmental conditions in the vicinity of the proposed action; direct, indirect, and cumulative impacts that might result from the alternatives and No-Action Alternative; and measures to avoid, minimize, or mitigate potential adverse impacts. The decision to be made by the MCAS Yuma Commanding Officer relates to which alternative best fulfills the purpose and need for the proposed action.

This EA has been prepared in accordance with applicable federal regulations, instructions, and public laws including, but not limited to, those identified in Appendix A. NEPA requires consideration of potential impacts to the environment in the decision-making process for federal actions. CEQ regulations represent the "action forcing" provisions of NEPA to ensure that federal agencies comply with NEPA. MCO P5090.2A provides specific guidance for the Marine Corps in preparing environmental documentation for proposed actions subject to NEPA.

[1] The Marine Corps organizes its ground combat divisions and air wings into MAGTFs, which are composed of four organizational elements: a command or headquarters element; a ground combat element; a combat logistics element; and an aviation combat element. Marine aviation is an integral and essential component of every MAGTF by providing six functions: assault support; anti-aircraft warfare; offensive air support; electronic warfare; control of aircraft and missiles; and aerial reconnaissance.

2 Proposed Action and Alternatives

The proposed action addressed in this EA is the relocation of VMU-1 from MCAGCC to MCAS Yuma. This chapter describes the reasonable alternatives for accomplishing the proposed action. The CEQ, in its *Regulations for Implementing the Procedural Provisions of NEPA* (40 CFR Parts 1500–1508), establishes a number of policies for federal agencies, including “using the NEPA process to identify and assess reasonable alternatives to the proposed action that would avoid or minimize adverse effects of these actions on the quality of the human environment” (40 CFR §1500.2 (e)).

The Marine Corps identified several selection criteria to assist in developing reasonable alternatives that meet the purpose and need for the proposed action. These criteria include the following:

- Co-location with a MAG manned aviation unit and MALS support;
- Availability of space for needed facilities and infrastructure, such as access to a full-sized runway, apron space, hangar space, and support facilities to accommodate aircraft and personnel;
- Proximity of the facility to appropriate training areas and adequate special use airspace within a reasonable distance of the airfield;
- Ability to conduct year-round operations to meet all training requirements and ensure mission readiness;
- Compatibility with existing air operations and future proposed actions; and
- Avoidance or minimization of environmental impacts.

Two action alternatives were carried forward for full analysis, as described below. Alternatives considered but eliminated as infeasible are discussed in Section 2.5, *Alternatives Considered But Eliminated*.

2.1 Alternative 1

Alternative 1 would include the following: 1) relocation of VMU-1 aircraft and personnel to MCAS Yuma; 2) temporary relocation in existing, transient facilities; 3) construction of new facilities (aircraft hangar and support facilities) and related demolition activities; and 4) training and readiness operations within the BSTRC. MCAS Yuma offers year-round training opportunities in the BSTRC, which would allow VMU-1 to meet their training requirements and ensure mission readiness. MCAS Yuma has a full-sized runway and associated infrastructure to facilitate future UAS fielding of larger platforms. Relocating VMU-1 to MCAS Yuma would co-locate the VMU community with MAG-13 manned aviation units, MALS support, and Group headquarters to allow for closer coordination and enhanced training opportunities. VMU-1 would also be co-located with MAWTS-1, whose mission includes providing assistance in developing tactics and training for existing and emerging aviation weapons. Co-location with MAWTS-1 at the air station would promote coordination on deploying new and evolving UAS technologies. Alternative 1, therefore, meets the purpose and need of the proposed action.

2.1.1 Proposed Aircraft Transitions

VMU-1 is a fully equipped aircraft squadron that currently operates UAS, which are composed of one or more unmanned aircraft, controlled from the ground, and a variety of ground support and communication equipment that supports single or multiple-site flight operations. UAS are found in a variety of shapes and sizes, and serve diverse purposes. They are categorized into groups, numbered from 1 to 5, primarily based on aircraft gross takeoff weight, normal operating altitude, and airspeed.

VMU-1 currently operates the RQ-7B (Shadow), which is a Group 3 small tactical UAS (Figure 2.1-1). Small tactical UAS use payloads designed for a variety of tasks, such as detecting explosives, monitoring signals, tracking moving targets through cloud or tree cover, and cyber security (USMC 2014). The RQ-7B aircraft is catapult-launched with a hydraulic launcher mounted on a trailer. Recovery (landing) of the RQ-7B requires a small expeditionary runway with arresting gear to capture the aircraft. It has a range of about 65 nautical miles, a normal operating altitude of 3,000 to 8,000 feet above mean sea level (AMSL), has a maximum airspeed of 110 knots (127 miles per hour), and can remain in flight about six hours. VMU-1 currently operates 3 RQ-7B systems and 12 air vehicles.

VMU-1 is scheduled to acquire the smaller MQ-21A (Blackjack) Group 3 system over the next five years (Figure 2.1-1). The MQ-21A[2] is also catapult-launched, but unlike the RQ-7B, utilizes a recovery system known as Skyhook. This is a hook on the end of the wingtip used to catch a cable hanging from a pole or crane. This system eliminates the need for runways and enables a safe recovery and expeditionary capability for tactical missions on land or sea. The MQ-21A has a range of about 50 nautical miles, a normal operating altitude of 3,000 to 8,000 feet AMSL, a maximum airspeed of 85 knots (98 miles per hour), and can remain in flight for up to 15 hours. Under the Alternative 1, VMU-1 would field 9 MQ-21A systems and 45 air vehicles, with the first system arriving in early 2016.

RQ-7B - Shadow

MQ-21A - Blackjack

Figure 2.1-1. Photographs of RQ-7B and MQ-21A Preparing to Launch

Long term plans include replacement of the RQ-7B systems with a much larger Group 4 or 5 system that requires a full size paved runway, ordnance loading pavement, and a full size aircraft maintenance hangar. Group 4 UAS are propeller-driven, while Group 5 systems are generally jet-powered. Both are much larger than Group 3 systems, carry larger and heavier payloads, and have a longer operating range. Under Alternative 1, VMU-1 would replace their three RQ-7B systems with three Group 4 or 5 systems in 2024 (USMC 2014). Although the specific Group 4 or 5 airframe is not known at this time, Alternative 1 includes development of needed facilities along the flightline to accommodate these larger aircraft.

2.1.2 Relocation of Proposed Military Personnel

The proposed relocation of military personnel from MCAGCC to MCAS Yuma is considered a routine re-deployment of assets. Relocation of VMU-1 would result in 274 military personnel (approximately 23 officers and 251 enlisted) moving to MCAS Yuma in 2016. With the arrival of the Group 4 or 5 systems

[2] Formerly referred to as “RQ-21”.

in 2024, the total increase in military personnel would be about 350 individuals (approximately 30 officers and 320 enlisted), although the actual number may change based on which Group 4 or 5 airframe is selected.

Based on existing military dependent ratios at MCAS Yuma and using the estimated increase of 350 military personnel, this equates to about 830 family members arriving in the Yuma area, for a total population increase of about 1,180 persons. Approximately 67 percent of the relocated military personnel and dependents would be required to live off-station.

2.1.3 Relocation Schedule and Temporary Facilities

VMU-1 would relocate from MCAGCC to MCAS Yuma starting in January 2016 and would complete the move by summer 2016. VMU-1 would occupy existing Hangar 101 at MCAS Yuma until construction of a new hangar is completed just south of Hangar 101, at which time Hangar 101 would be demolished, as discussed below. While Hangar 101 is adequate as a short-term solution, it would not meet the requirements to support the larger Group 4 or 5 systems expected in 2024.

2.1.4 Construction and Demolition of Facilities

Basing a VMU squadron typically requires various categories of space for operations, maintenance, offices, vehicle parking, a training facility, storage, vehicle washing facility, etc. A planning study (USMC 2015) was prepared to develop alternative conceptual project layouts and preliminary construction cost estimates that meet VMU-1 facility requirements (see Appendix B). The facility requirements for the RQ-7B and MQ-21B systems used in the planning study were based on Naval Air Systems Command (2014a, 2014b) facility studies, which accounted for both the aircraft and associated ground support equipment. The planning study based the future Group 4 or 5 system requirements on the RQ-7B, while taking into account the size difference of the two systems and the need for access to a full-sized runway.

The conceptual project layouts proposed under Alternative 1 are based on the planning study layouts that had the fewest issues relating to potential squadron efficiency and are considered to be the most operationally feasible (see Appendix B). This includes construction of new facilities at MCAS Yuma and the nearby Cannon Air Defense Complex (CADC) located in the BMGR-West, as described below.

For the purposes of this EA analysis, the conceptual project layouts were designed to represent the maximum development footprint and level of disturbance, and all areas potentially disturbed are included within the Alternative 1 footprint. As the project is still in the conceptual design stage, modifications to the building sizes, configurations, and/or locations discussed below, could be refined during final design. However, all design modifications would occur within the Alternative 1 project footprint. Any design modifications would be reviewed and authorized by MCAS Yuma. Final design plans would be provided to the appropriate regulatory agencies for review and approval before commencement of construction.

Sustainable design principles and energy conservation measures would be integrated into the design, development, and construction of Alternative 1, in accordance with the Energy Policy Act of 2005 (Section 109), Executive Order (EO) 13693 — *Planning for Federal Sustainability in the Next Decade*, and other applicable laws.

2.1.4.1 Proposed Construction Activities at MCAS Yuma

Alternative 1 includes two construction components at MCAS Yuma: new hangar facilities along the flightline, and ground equipment support facilities built at an old van pad across the street from the proposed hangar (Figure 2.1-2). The hangar facilities would support VMU-1 aircraft operations, aircraft maintenance, and headquarters functions. The ground equipment support facilities would primarily accommodate storage and maintenance of VMU-1 ground support vehicles and equipment, such as High Mobility Military Wheeled Vehicles (HMMWV), 7-ton Medium Tactical Vehicle Replacements, trailers with generators, trailers with launch equipment, and numerous other assigned equipment that require regular maintenance to ensure operational readiness.

New Hangar Facilities

A new Type II aircraft maintenance hangar module would be constructed due south of Hangar 101 to support both the Group 3 systems and the future Group 4 or 5 equipment and operations (Figure 2.1-2). The hangar would be approximately 39,000 square feet and include a high bay maintenance space, crew and equipment area, planning and briefing area, and administrative areas. The building would be designed with a reinforced concrete foundation and slab, structural steel framing, steel trusses, concrete piles, and spread beam foundations. The facility would include communication systems and antiterrorism and force protection features. Additional ground control and ground support equipment would also be on the hangar deck for operations and testing of the systems prior to flights. The new hangar would be constructed at the current location of Hangar 97. Hangar 97 and other ancillary facilities are programmed to be demolished under a separate project (see pink building labels on Figure 2.1-2).

Other new facilities adjacent to the new hangar (Figure 2.1-2) would include a separate ready service locker (70 square feet), hazardous material storage locker (200 square feet), a tactical support van pad for a ground control station for the Group 4 or 5 systems (7,600 square feet), and new shade structures to cover up to nine aircraft sitting on the adjacent parking apron (3,500 square feet). Parking for personally owned vehicles would be provided within the existing parking lot adjacent to the new hangar (Figure 2.1-2), but parts of the lot may need to be repaired if damaged during construction. Additionally, existing Building 408 would support classroom and simulator training space requirements. Modifications to Building 408 interior systems (e.g., heating, ventilation, and air conditioning [HVAC]) and minor retrofitting would be required to support VMU-1, but no structural modifications would occur.

Alternative 1 would demolish Buildings 98 (storage and electrical building), 101 (maintenance hangar), 102 (maintenance shop), and a small hazardous materials accumulation shelter to make room for the new facilities. The removal and disposal of the buildings' associated structures and equipment would also occur, including foundations, hazardous material pads, plumbing, electrical, HVAC systems, and miscellaneous exterior equipment. Alternative 1 would also include relocating an existing fiber optic line that currently runs between Hangars 97 and 101, because it falls within the footprint of the new hangar.

Construction of the new hangar facilities would occur between 2020 and 2024. After the new hangar is completed, VMU-1 would relocate all operations to the new hangar.

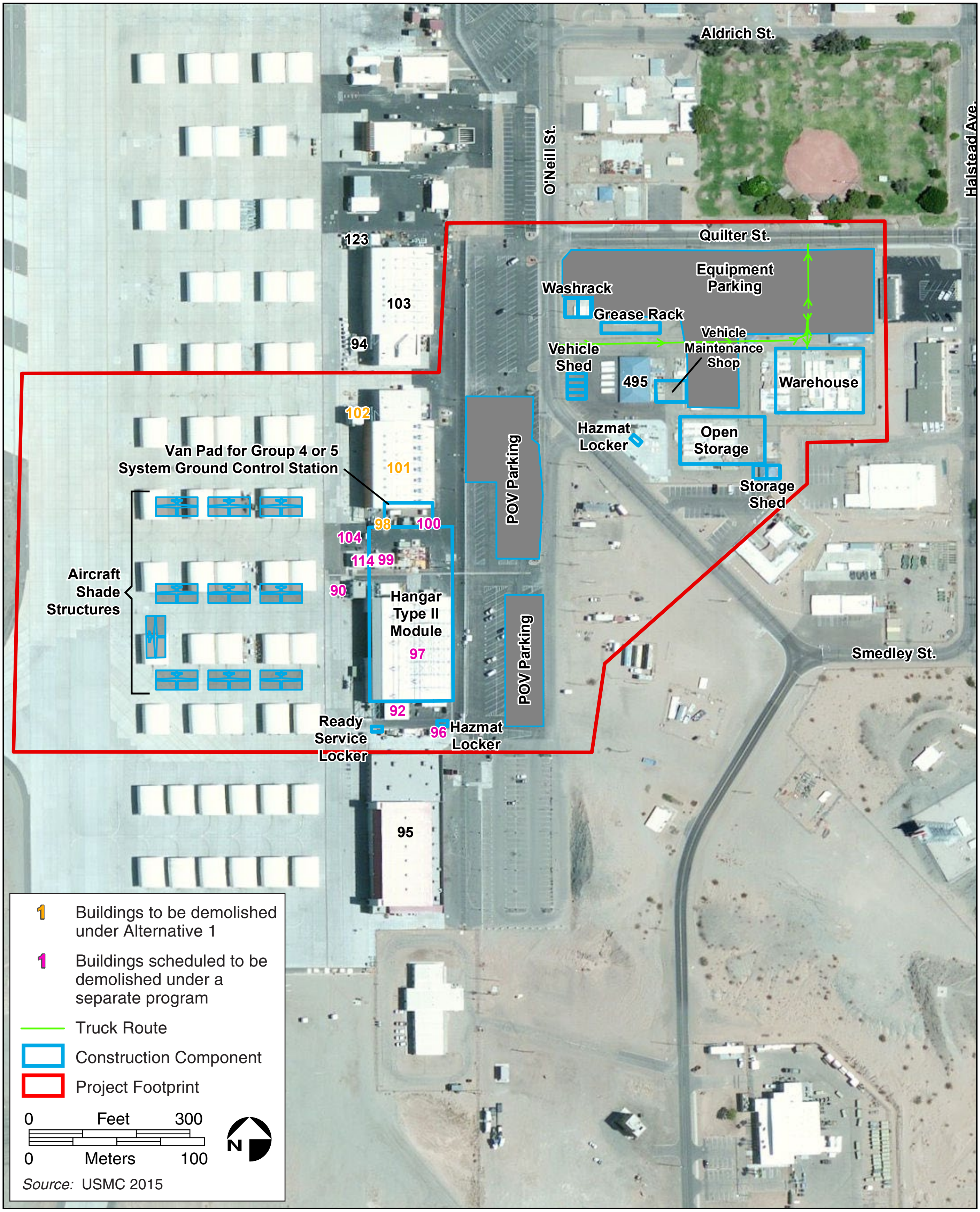

Figure 2.1-2. Alternative 1 - MCAS Yuma Conceptual Project Layout

New Support Facilities at the Old Van Pad

Alternative 1 would construct other support facilities within an existing fenced compound east of O'Neill Street that was previously used as van pads (Figure 2.1-2). The existing vehicle maintenance shop (Building 495) would remain, and a high-bay vehicle maintenance shop (2,300 square feet) would be constructed on the south side of the existing building. Other new facilities would include a two-story warehouse (35,500 square feet), grease racks (2,200 square feet), a vehicle washrack (1,700 square feet), a vehicle holding shed (1,700 square feet), a general storage shed (1,250 square feet), and a small hazardous material locker (200 square feet). There would also be an open storage area (14,000 square feet) and a large equipment parking area (94,500 square feet) with an underground stormwater infiltration/storage system (see *General Site Improvements* below). Three existing van pads would be retained to the greatest extent possible to support equipment parking.

No building demolition would be required for the new support facilities at the old van pad. Incidental pavement parking demolition may be required to accommodate facility footprints in areas not already cleared, and some existing chain link fence would be removed.

Construction of the support facilities at the old van pad would occur between 2018 and 2020.

2.1.4.2 Proposed Construction Activities at the Cannon Air Defense Complex

Alternative 1 includes construction of new, permanent facilities at the CADC to support VMU-1 training operations for the RQ-7B and the MQ-21A in a remote location that is away from manned aircraft operations (Figure 2.1-3). There would be a new fenced VMU compound (85,000 square feet) that would house equipment, air vehicle maintenance sunshades, and parking for personally owned vehicles. The compound would also include a new expeditionary air support training facility (5,000 square feet) with a high bay maintenance area, office, and shop to support preflight checks, tests, and low-level maintenance to ensure mechanical and communications systems are fully operational. A new communications line would run from MCAS Yuma to the new VMU compound at the CADC (about 40,000 linear feet), and would be installed via trenching and directional boring primarily along an existing utility corridor (Figure 2.1-4).

No building demolition would be required for the new support facilities at the CADC. Construction would occur between 2018 and 2020.

2.1.4.3 General Site Improvements

Construction areas within the Alternative 1 project footprints would be cleared and graded in preparation for the proposed facilities and support infrastructure. Site improvements would include paved sidewalks, pads for back-up generators, curbs/gutters, parking area, roadways, and other miscellaneous hardscape (e.g., outdoor break areas), drainage, signage, lighting, and landscaping/irrigation, as needed. All facilities would incorporate antiterrorism and force protection features in compliance with Unified Facilities Criteria (UFC) 4-010-01, change 1, including security fencing, barriers, gates, camera infrastructure, and turnstiles, as applicable.

Figure 2.1-3. Alternative 1 - Cannon Air Defense Complex Conceptual Project Layout

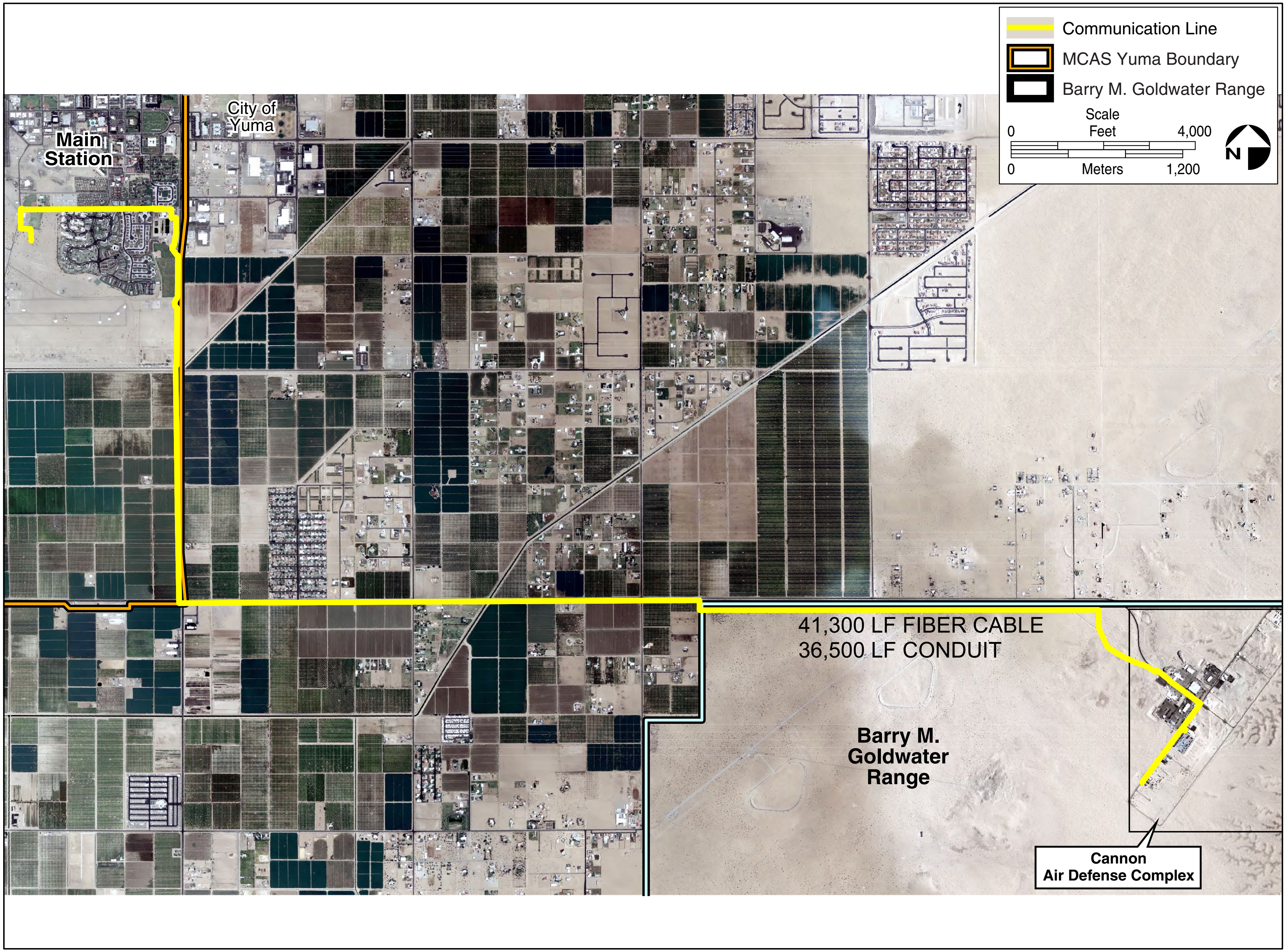

Figure 2.1-4. Alternative 1 – Route of New Communications Line

Drainage facilities would be designed to comply with design manuals and local standards and guidelines, and the regulations stipulated in Energy Independence and Security Act, National Pollutant Discharge Elimination System design standards, and official Navy, USMC, and DoD policies (2007, 2008, 2010).

Low Impact Development design technologies to reduce stormwater runoff (e.g., impervious drainage features) would be constructed to the extent feasible in accordance with UFC 3-210-10.

MCAS Yuma has existing construction staging/lay-down areas that have been used in the past for construction-related equipment and materials, and these areas would be used for the same purpose under this alternative. For the CADC, areas within the project footprint would be used for staging/lay-down areas, and would be restored to existing conditions once construction is completed.

2.1.4.4 Utilities

Utility system upgrades and modifications would be required to support the VMU-1 aircraft maintenance hangar and support facilities. Electrical and communication system improvements would include provisions for transformers and telecommunications infrastructure. Alternative 1 would also include exterior lighting for safety purposes to illuminate building areas. Additional utilities, including HVAC, water (potable and fire protection systems), and sewer would also be installed to support construction. All new utilities would connect directly to existing infrastructure and systems within the Alternative 1 project footprint, as shown in Figures 2.1-2, 2.1-3, and 2.1-4.

2.1.5 Proposed VMU-1 Operations

VMU-1 would conduct day and nighttime RQ-7B and MQ-21A operations within the BSTRC. Launch and recovery operations would primarily occur at the CADC for operations within the BMGR-West (R-2301W) and at the Speed Bag Airfield for operations within the CMAGR (R-2507N, R-2507S). VMU-1 is expected to conduct approximately 1,500 annual sorties[3] within the BSTRC to meet their training and readiness requirements (Table 2.1-1).

Table 2.1-1. Proposed VMU-1 Annual Sorties

Aircraft Type	*BMGR-West (R-2301W) from CADC*	*CMAGR (R-2507N, R-2507S) from the Speed Bag Airfield*	*Total Sorties*
RQ-7B	375	125	500
MQ-21A	750	250	1,000
Total	**1,125**	**375**	**1,500**
BMGR-West = Barry M. Goldwater Range-West, CADC = Cannon Air Defense Complex, CMAGR = Chocolate Mountain Aerial Gunnery Range.			

[3] A sortie consists of a single military aircraft flight from takeoff through landing. For example, an aircraft entering a specific restricted area, conducting its mission in the airspace, and then exiting the airspace has its activity counted as one sortie.

VMU-1 would conduct the majority of their training operations from the CADC, using the new expeditionary air support training facility described in Section 2.1.4.2 (*Proposed Construction Activities at the Cannon Air Defense Complex*). The USMC is currently developing a separate expeditionary ("Rhino Snot"[4]) runway (approximately 1,280 linear feet) at the CADC for use by UAS during Weapons and Tactics Instructor (WTI) training exercises (Figure 2.1-3). Although the runway could be used by VMU-1 for launch and recovery operations, the runway would have independent utility from the proposed action discussed in this EA and is therefore a separate NEPA action, the impacts of which have been analyzed and the project categorically excluded.

VMU-1 would use the Speed Bag Airfield, an existing expeditionary runway, for operations within the CMAGR (Figure 2.1-5). In addition to the runway itself, VMU-1 would use a previously disturbed but undeveloped area southwest of the airfield (approximately 1 acre) for maintenance, vehicle parking, and equipment staging; and a disturbed, but undeveloped bivouac area south of the airfield for a combat operations center (approximately 4.5 acre). Existing roads within the CMAGR would be used to access the area. No construction is needed to support VMU-1 operations at the Speed Bag Airfield.

While the proposed new hangar facilities at MCAS Yuma would support the Group 3 systems, VMU-1 would not conduct RQ-7B and MQ-21A launch and recovery operations at the air station because of hazards associated with flying small aircraft near larger aircraft. The Air Traffic Control tower which governs aircraft activity on and around the air station cannot detect small aircraft and pilots of manned aircraft have difficulty visually identifying/avoiding them.

2.1.5.1 Typical Training Scenario

The typical training scenario for the VMU involves both "regularly scheduled" training (approximately two weeks each month of flight-related activities) and "intermittent" training consisting of combined-forces support during larger training events, like the WTI course offered twice a year (April and September) by MAWTS-1. VMU-1 would set up tents, generators, antennas, HMMWVs, and mobile facilities to conduct operations at these expeditionary locations. VMU-1 would schedule range activities with MCAS Yuma using standard procedures that allow viewing and de-confliction by local and remote units.

Generally speaking, a training event would include equipment set up, training mission, and breakdown. For the RQ-7B, typically two HMMWV-mounted "ground control stations", with associated antennae and other equipment, would be staged within the bivouac area, and UAS operators would work from those facilities. For the MQ-21A, "ground control stations" are set up inside the operations center (tent facility). Approximately two tent facilities would serve as a combat operations center. Two additional tent facilities would serve as a maintenance hangar for all related vehicles, equipment, and containers. In the case of the RQ-7B platform, two launch trailers, two sets of arresting gear, and two nets would be staged adjacent to or on the Rhino Snot runway. Only one set of arresting gear and one net would be functional at any given time.

[4] Rhino Snot is a nickname given to an adhesive construction material (Envirotac) by the Marines who used the product at Camp Rhino in Afghanistan. Rhino Snot is a soil stabilizer that works well for dust and erosion control, and is often used by the USMC to stabilize aircraft landing zones or expeditionary runways.

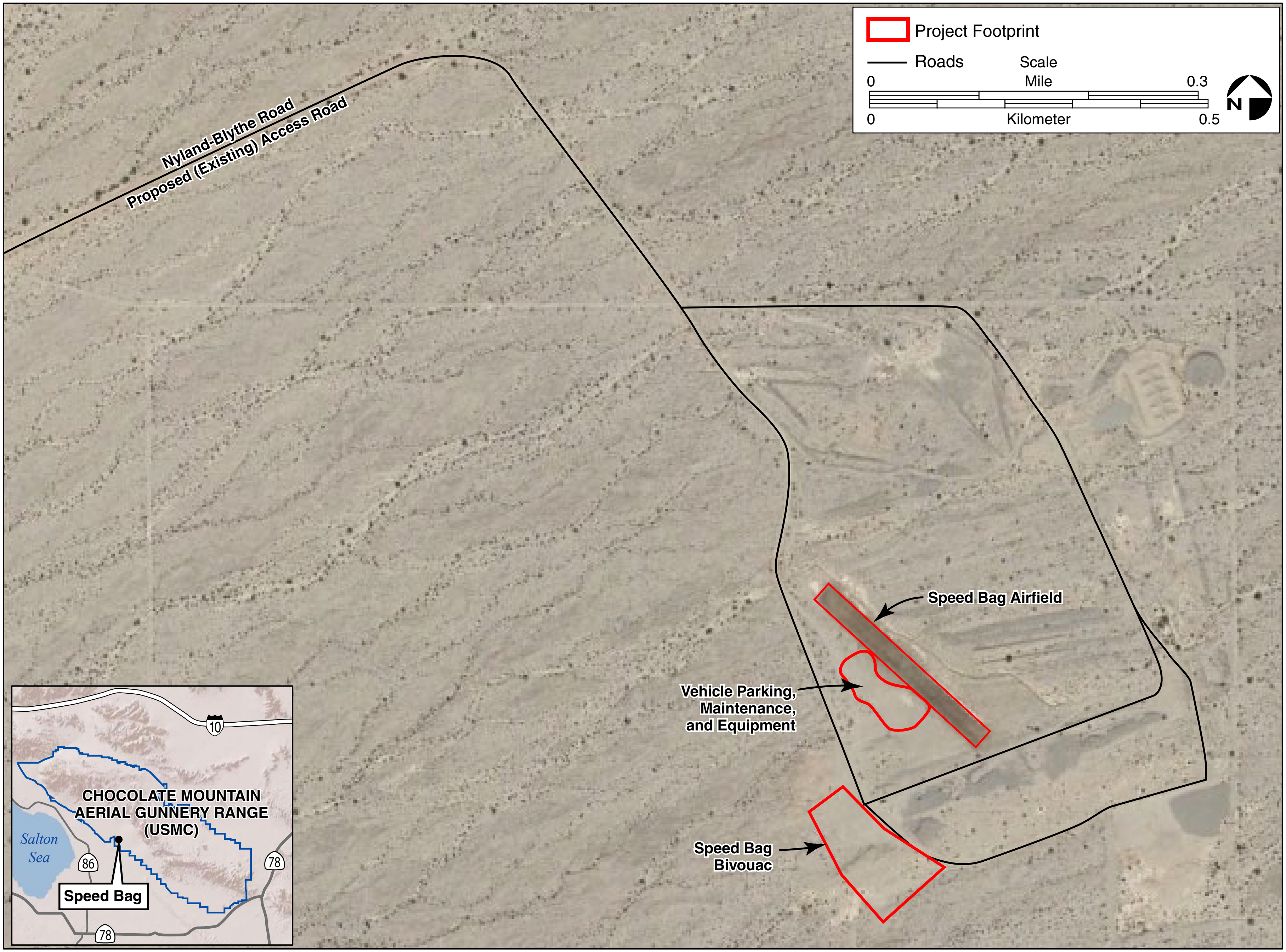

Figure 2.1-5. Alternative 1 – Speed Bag Airfield Conceptual Project Layout

A typical training event for the RQ-7B would involve set up, launch, and recovery. Set up would occur approximately four hours before launch and would include preparing the aircraft for flight and the flight crew briefing the flight, conducting a walk around inspection of the aircraft, loading the aircraft onto the launcher, and coordinating airspace and routing. The aircraft is launched into the wind on the runway heading and once in flight, it would follow local course rules and the instructions of the appropriate controlling agency to its working area. Clearances for airspace, routing and altitude would be dictated by the appropriate controlling agency. A mission could last between 1 to 9 hours but would typically last for approximately 2 to 3 hours. The aircraft would return to the runway after mission completion following the instructions of the appropriate controlling agency and the local course rules. An automated landing system would direct the aircraft along its final approach path to the runway, where the aircraft would make a rolling landing into the arresting gear. The net is a backup in case the aircraft hook does not engage the arresting gear. Maintenance crews would then prepare the aircraft for any follow-on missions, and the air crew would debrief the flight.

Set-up and launch of the MQ-21A would be similar to that described for the RQ-7B except that the MQ-21A does not require a runway. Aircraft are launched from a trailer and recovered with a trailer mounted Skyhook, where a hook on either wing of the aircraft engages the Skyhook line to arrest the aircraft mid-flight. Two launcher trailers and Skyhook recovery trailers would be staged adjacent to or on the runway.

A "Return Home Plan" is programmed into both types of aircraft in case link is lost with the aircraft during a training exercise. The flight crew continuously updates the Return Home Plan to account for changes in the aircraft's location. If the flight crew were to lose link with the aircraft, the Return Home Plan directs the aircraft to proceed to a predesignated return home point, which is typically a clear, unpopulated area near the base of operations. The flight crew would troubleshoot any problem continuously to regain link with the aircraft and immediately report the loss of link to the appropriate controlling agencies so that the airspace can be deconflicted, as necessary. At the Return Home point, the aircraft would hold and orbit and descend to a predesignated altitude. If link is not regained with the aircraft, the RQ-7B would continue to orbit until it runs out of fuel, at which time the aircraft computer would automatically deploy a parachute to bring the aircraft to the ground. The MQ-21A would continue to orbit until it reaches a predetermined time limit at which time the aircraft would execute a belly landing at the predesignated area. This area would not necessarily coincide with the Return Home point and would typically be a flat, unpopulated area near the base of operations.

2.1.5.2 Certificate of Authorization

Operation of UAS in the National Airspace System of the United States requires Federal Aviation Administration (FAA)-designated controlled airspace and special use airspace so there would be no conflicts between commercial and military aircraft, or between manned and unmanned aircraft. An Airspace Certificate of Authorization (COA) must be obtained from the FAA to allow UAS operations within currently defined airspace used by traditional fixed-wing and rotorcraft. COAs normally remain effective for one year and may be renewed. UAS flights from the CADC are outside of restricted airspace and require a COA to transit to restricted airspace (R-2301W) associated with the BMGR-West (see Appendix D for a copy of COA 2014-WSA-196 that is currently in effect for the MQ-21 until December 2016). The Speed Bag Airfield is located within restricted airspace (R-2507N), and no COA is needed for flights originating from the Speed Bag Airfield if they stay within restricted airspace. Future FAA rules may modify the requirement for a COA.

2.1.5.3 Other Operations

The larger Group 4 or 5 systems expected in 2024 would conduct takeoff and landing operations at the air station and would operate within the BSTRC. However, it is too speculative at this time to quantify those operations or analyze the related effect without knowing the capabilities and operational requirements for the pending (unknown) Group 4 or 5 airframe. Additional training areas and airspace could emerge as necessary or useful for applying the VMU-1 capabilities to ever-changing missions. Furthermore, the USMC expects to continue updating the VMU-1 training plans to reflect lessons learned from training evolutions and deployment experience. The environmental impacts associated with new training requirements, especially those associated with future Group 4 or 5 system operations at the air station and within the BSTRC, will be evaluated under NEPA prior to their arrival at MCAS Yuma, and will include consultations pursuant to the Endangered Species Act (ESA) and/or National Historic Preservation Act (NHPA) where applicable.

Similarly, VMU-1 does not currently conduct munitions operations. If/when weapons systems are fully developed and approved for use, VMU-1 would conduct air-to-ground ordnance delivery operations at locations where munition training is authorized for military aircraft, and in accordance with applicable range safety and operational requirements. Further NEPA analysis of air-to-ground ordnance delivery operations would be conducted, as appropriate, should the Marine Corps pursue this capability for the RQ-7B, MQ-21A, or the pending Group 4 or 5 systems.

2.2 Alternative 2

Similar to Alternative 1, Alternative 2 would include the following: 1) relocation of VMU-1 aircraft and personnel to MCAS Yuma; 2) temporary relocation in existing, transient facilities; 3) construction of new facilities (aircraft hangar and support facilities) and related demolition activities; and 4) training and readiness operations within the BSTRC. As described for Alternative 1, Alternative 2 would also meet the purpose and need of the proposed action by ensuring VMU-1 has adequate training opportunities with easy access to nearby military training ranges, needed infrastructure to meet mission requirements, and closer coordination and enhanced training opportunities with MAG-13.

Alternative 2 differs from Alternative 1 in that the proposed ground support facilities would be built at the CADC instead of the old van pad at MCAS Yuma, as described below. Alternative 2, therefore, would split assigned squadron equipment and personnel between MCAS Yuma and the CADC, thereby resulting in an increase in daily commuter trips between MCAS Yuma and the CADC as compared to Alternative 1. However, less commuter trips would be needed between the two facilities when conducting VMU-1 aircraft operations at the CADC because much of the equipment would already be housed at the CADC. All other project components, such as the relocation of aircraft and personnel, temporary facility use, and proposed training operations would be the same as described for Alternative 1 in Section 2.1.1, *Proposed Aircraft Transitions;* Section 2.1.2, *Relocation of Proposed Military Personnel;* Section 2.1.3, *Relocation Schedule and Temporary Facilities*; and Section 2.1.5; *Proposed VMU-1 Operations*, respectively.

Under this alternative, the only facilities constructed at MCAS Yuma would be the new hangar facilities and other hangar support facilities located west of O'Neill Street, as shown in Figure 2.2-1 and as described under *New Hangar Facilities* in Section 2.1.4.1 (*Proposed Construction Activities at MCAS Yuma*) under Alternative 1. No construction would occur at the old van pad east of O'Neill Street. Construction of the new hangar facilities would occur between 2020 and 2024, similar to Alternative 1.

Alternative 2 would construct the VMU-1 ground equipment support facilities at the CADC instead of the air station, as shown in Figure 2.2-2. This would include a vehicle maintenance shop, warehouse, grease racks, a vehicle washrack, a vehicle holding shed, a general storage shed, a small hazardous material locker, open storage area, and a large equipment parking area, similar to what was described for *New Support Facilities at the Old Van Pad* in Section 2.1.4.1 (*Proposed Construction Activities at MCAS Yuma*) under Alternative 1.

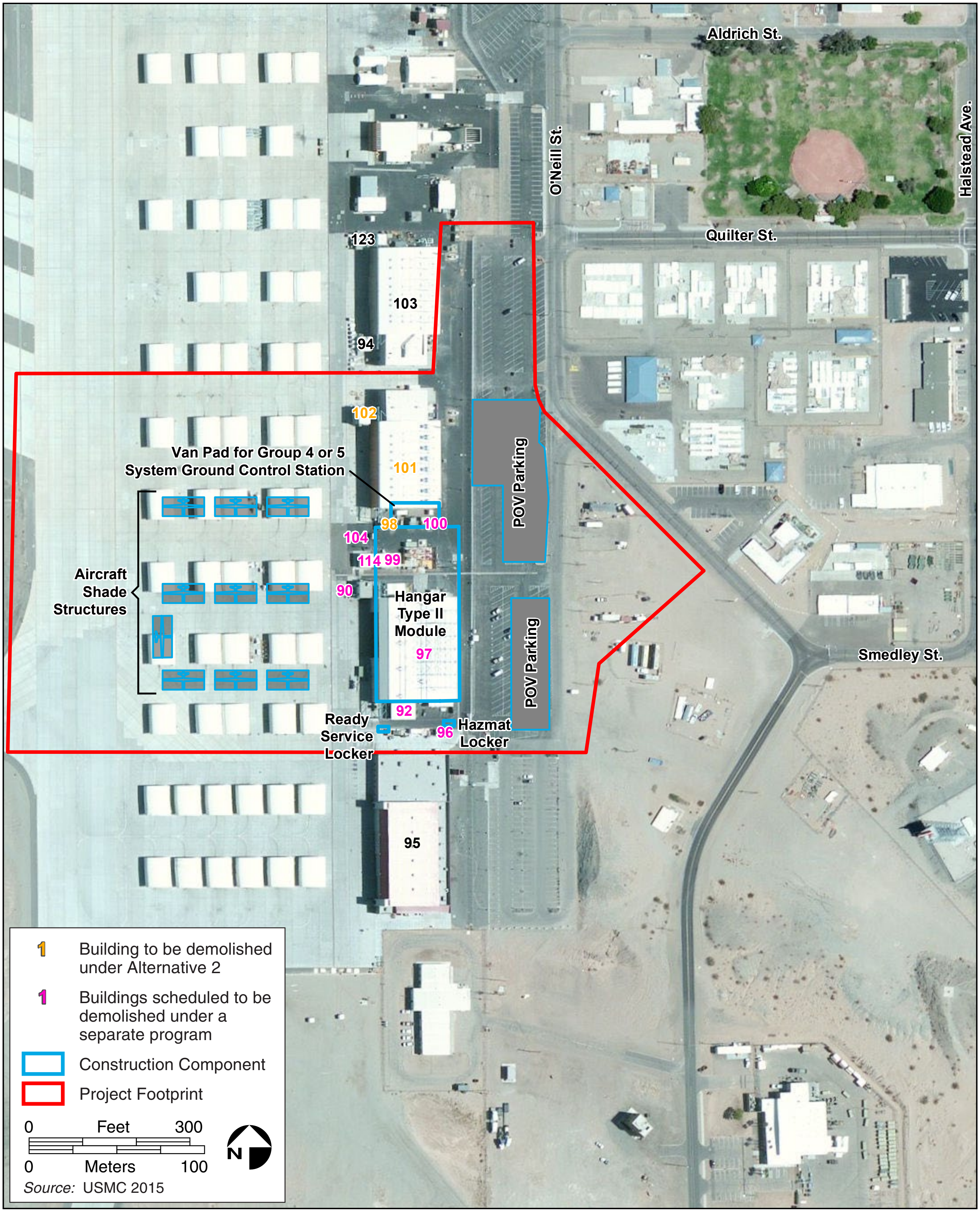

Figure 2.2-1. Alternative 2 - MCAS Yuma Conceptual Project Layout

Figure 2.2-2. Alternative 2 - Canon Air Defense Complex Conceptual Project Layout

The conceptual project layout for Alternative 2 also includes a vehicle filling station and personal parking. Similar to Alternative 1, a new communications line would run from MCAS Yuma to the new VMU compound (about 40,000 linear feet), and would be installed via trenching and directional boring primarily along an existing utility corridor (Figure 2.1-4).

No building demolition would be required for the new support facilities at the CADC. Construction at the CADC would occur between 2018 and 2020, similar to Alternative 1.

2.3 Preferred Alternative

The USMC has identified Alternative 1 as the Preferred Alternative.

2.4 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma and would remain at MCAGCC. VMU-1 is currently based in expeditionary facilities at MCAGCC, and operates under airspace and training constraints. This makes it difficult for VMU-1 to meet their training requirements and ensure mission readiness. Additionally, remaining at MCAGCC would not facilitate future UAS fielding of larger platforms that require a full-sized runway and associated infrastructure, because this type of airfield infrastructure is currently lacking at MCAGCC. As discussed in Chapter 1, *Purpose and Need*, without the relocation to MCAS Yuma, VMU-1 would not optimize operational and logistical efficiencies by co-locating with MAG-13 and MAWTS-1 at MCAS Yuma as stipulated in the *Marine Aviation Plan 2015* (USMC 2014).

The No-Action Alternative is not considered a reasonable alternative because it does not meet the purpose and need for the proposed action, nor does it meet the selection criteria described at the beginning of Chapter 2. However, it does provide a measure of the baseline conditions against which the impacts of the proposed action can be compared. In this EA, the No-Action Alternative represents the baseline conditions described in Chapter 3, *Affected Environment and Environmental Consequences*.

2.5 Alternatives Considered But Eliminated

As part of the Marine Corps' decision-making process, other alternatives were considered but eliminated as infeasible, as described below.

2.5.1 Alternative Basing Locations for VMU-1

The USMC considered keeping the VMU-1 squadron at MCAGCC and sending only a smaller VMU-1 detachment to MCAS Yuma to co-locate with a MAG and associated MALS support. However, training and readiness would remain compromised because of existing airspace and training constraints at MCAGCC. To stay at MCAGCC, VMU-1 would also need permanent facilities to replace the expeditionary facilities they currently occupy (see Naval Air Systems Command 2015 for a review of needed facilities at MCAGCC), and they would need a full-sized airfield and supporting facilities to accommodate the future fielding of a Group 4 or 5 system. Upgrading MCAGCC's expeditionary runway to a full-sized airfield facility with air traffic control, ordnance loading, aviation fueling, etc. would have high costs and high environmental constraints, and would not be compatible with the mission of the current expeditionary air facility. Therefore, this alternative was eliminated from further consideration because it would not ensure that VMU-1 has adequate training opportunities with easy access to nearby military training ranges, and development of needed infrastructure would not be compatible with the mission of MCAGCC's expeditionary air facility.

The USMC also considered basing VMU-1 at MCAS Camp Pendleton or MCAS Miramar, the only other USMC air stations on the west coast, as a way to co-locate with a MAG and associated MALS support. VMU-4, a reserve squadron, is already located at Marine Corps Base (MCB) Camp Pendleton, and according to the *Marine Aviation Plan 2015* (USMC 2014), would transition to MCAS Camp Pendleton. Basing two VMU squadrons at MCAS Camp Pendleton would exasperate current demands and constraints on space for facilities/infrastructure within MCAS Camp Pendleton, as well as contribute to scheduling conflicts for access to MCB Camp Pendleton range training areas and associated airspace. These constraints would compromise VMU-1's ability to fulfill their training requirements and ensure mission readiness. MCAS Miramar was also considered as a basing alternative, but the air station does not have access to operational training ranges and special use airspace to accommodate VMU-1's training requirements and ensure mission readiness. Therefore, these basing alternatives were eliminated from further consideration.

2.5.2 Alternative Siting Locations at MCAS Yuma

Available development space near the flightline is limited at MCAS Yuma, especially with the pending basing of the F-35B active squadrons. The USMC reviewed and evaluated the feasibility of potential siting areas for facilities related to the proposed action, including a potential siting area at the southern end of the runway. However, development space on the southern flightline is limited due to environmental constraints. Furthermore, development at this location would decrease the proximity of VMU-1 to MAWTS-1, potentially limiting collaboration efforts between the squadrons. Therefore, this alternative was eliminated from further consideration.

2.6 Resource Areas Eliminated From Detailed Consideration

Several resource areas have not been carried forward for detailed analysis in this EA because potential impacts were determined to be non-existent or negligible. Resources not addressed further in this EA include aesthetics, environmental justice, geology/seismicity, land use, socioeconomics, and water resources.

Aesthetics: The proposed action would be visually compatible with existing military development and activities in the project vicinity. Therefore, no impacts would occur.

Environmental Justice: Proposed construction, renovation, and demolition activities at MCAS Yuma and CADC would not result in disproportionate impacts to minority and low-income populations or environmental health and safety risks to children. Similarly, proposed VMU-1 operations would not result in disproportionate impacts to minority and low-income population housing because aircraft operations would occur in military training areas and associated restricted airspace and not over civilian populations. No impacts on environmental justice would occur.

Geology/Seismicity: The project footprint is located in a seismically active region, which is subject to events along regional, major active faults. No major active faults traverse the project footprint. However, the Basement Saddle Fault traverses the southwestern portion of the air station and the Yuma Hills Fault is adjacent to the station's eastern boundary. Active faults located within 60 miles of the project footprint could result in strong seismically induced ground motion and associated ground shaking from naturally occurring processes. The proposed action would be built to comply with International Building Code guidelines and applicable seismic design standards. Therefore, no impacts on geology/seismicity would occur.

Land Use: The proposed action would be consistent with existing land uses within MCAS Yuma, the BSTRC, the City and County of Yuma, and established land use development guidelines addressing safety, functionality, and environmental protection zones. Therefore, the proposed action would be compatible with existing and planned land uses in the project vicinity, and no impacts on land use would occur.

Socioeconomics: As described in Section 2.1.2, *Relocation of Proposed Military Personnel*, the proposed action would result in about 350 additional military personnel (approximately 30 officers and 320 enlisted) and about 830 family members, for a total population increase of approximately 1,180 persons by 2024. This increase in military personnel and dependents would represent a 0.6 percent increase in the general population of Yuma County (estimated population of 201,201 in 2013 [U.S. Census Bureau 2015]). Approximately 67 percent of the relocated military personnel and dependents would be required to live off-station. The population increase and associated economic effects (income/employment and housing) would occur over a period of years (2016 – 2024). Therefore, negligible beneficial impacts on socioeconomics would occur.

Water Resources: The proposed action would potentially discharge waste materials that would affect the quality of surface water or groundwater. Stormwater runoff during construction activities would be covered under the Arizona Pollutant Discharge Elimination System Construction General Permit AZG2008-001. A Notice of Intent would be filed with the Arizona Department of Environmental Quality (ADEQ) to obtain coverage under the Construction General Permit prior to commencement of construction activities, in addition to the implementation of a site-specific Storm Water Pollution Prevention Plan and associated Best Management Practices. The potential increase in stormwater runoff as a result of the proposed action would be managed such that discharge exiting the site post-construction would be equal to or less than existing conditions through the use of appropriately designed conveyance structures and Best Management Practices. Construction-related erosion control measures would include, but not be limited to, erosion control blankets, soil stabilizers, temporary seeding, silt fencing, hay bales, sand bags, and storm drain inlet protection devices. Therefore, negligible impacts on water resources would occur.

2.7 Anticipated Permits and Approvals

Any agency permits, concurrence, and/or determinations would be obtained as necessary before moving forward with implementation of the proposed action.

2.8 Special Conservation Measures

Measures that would be incorporated into Alternative 1 and Alternative 2 to avoid, minimize, and mitigate impacts are included in the Minimization, Mitigation, Monitoring, and Reporting (MMMR) tracking sheet provided in Appendix C. These measures would be included as contract requirements on all relevant project scoping, scheduling, and planning documents.

3 Affected Environment and Environmental Consequences

3.1 Airspace

The section addresses airspace within the Region of Influence (ROI) considered relevant to the proposed action and any effects it could have on existing airspace users in this region. Of particular interest is the special use airspace associated with the BSTRC. Aviation safety, including aircraft mishap potential and hazards from bird strikes, are discussed in Section 3.7, *Safety and Environmental Health*. Relocation of aircraft to MCAS Yuma would have negligible impacts on airspace at or near MCAGCC and, therefore, this is not addressed further.

3.1.1 Affected Environment

Congress has charged the FAA with the responsibility of governing and managing the nation's navigable airspace to ensure its safe and efficient use by all concerned. In doing so, the FAA has structured the National Airspace System in a manner that is regulated and managed to meet both the individual and common needs of all military, commercial, and general aviation interests, including UAS.

Specific rules and regulations concerning airspace designation and management are contained in FAA Joint Order (JO) 7400.2, while specific instructions for UAS operations are addressed in FAA JO 7610.4, *Special Operations* and FAA JO 7210.766, *Unmanned Aircraft Operations in the National Airspace System*. Military aircraft operations are regulated by FAA and USMC regulations, Naval Air Training and Operating Procedures Standardization (NATOPS) Instructions, MCAS Yuma Station Orders, and other safety initiatives that regulate military flight operations throughout the area. COAs are also used where necessary to permit UAS operations outside of designated special use airspace, as described below.

Relevant special use airspace proposed for UAS operations includes several restricted areas associated with the BSTRC (Figure 3.1-1). Restricted areas are established to contain hazardous air and ground-based activities, and separate such activities from non-participating military and civilian aircraft. The restricted area (R-2301W) associated with BMGR-West extends from the ground surface to 80,000 feet AMSL (DoN 2010) and supports about 20,000 aircraft operations annually. The restricted areas (R-2507N/S) associated with the CMAGR extend from the ground surface to 40,000 feet AMSL and supports about 10,000 aircraft operations annually (DoN 2010). These restricted areas are controlled and scheduled by MCAS Yuma. Non-participating military and civilian aircraft operating within the ROI cannot enter the restricted areas while active unless specifically authorized by the controlling/using agencies.

Overall, the manner in which the relevant airspace is managed and the standard flight routes and operating procedures military pilots adhere to while operating within this environment have collectively provided for the safe, compatible use of this airspace by all civil and military interests.

3.1.1.1 Certificate of Authorization

The FAA requires that the DoD obtain a COA waiver to conduct UAS operations within currently defined airspace used by traditional fixed-wing and rotary-wing aircraft. A COA permits an agency to operate a specific UAS type for a particular purpose within a defined area that ensures that such operations do not jeopardize the safety of other aviation operations. An agency's COA request requires an extensive FAA application process that addresses all of the technical, operational, and safety aspects of UAS operations.

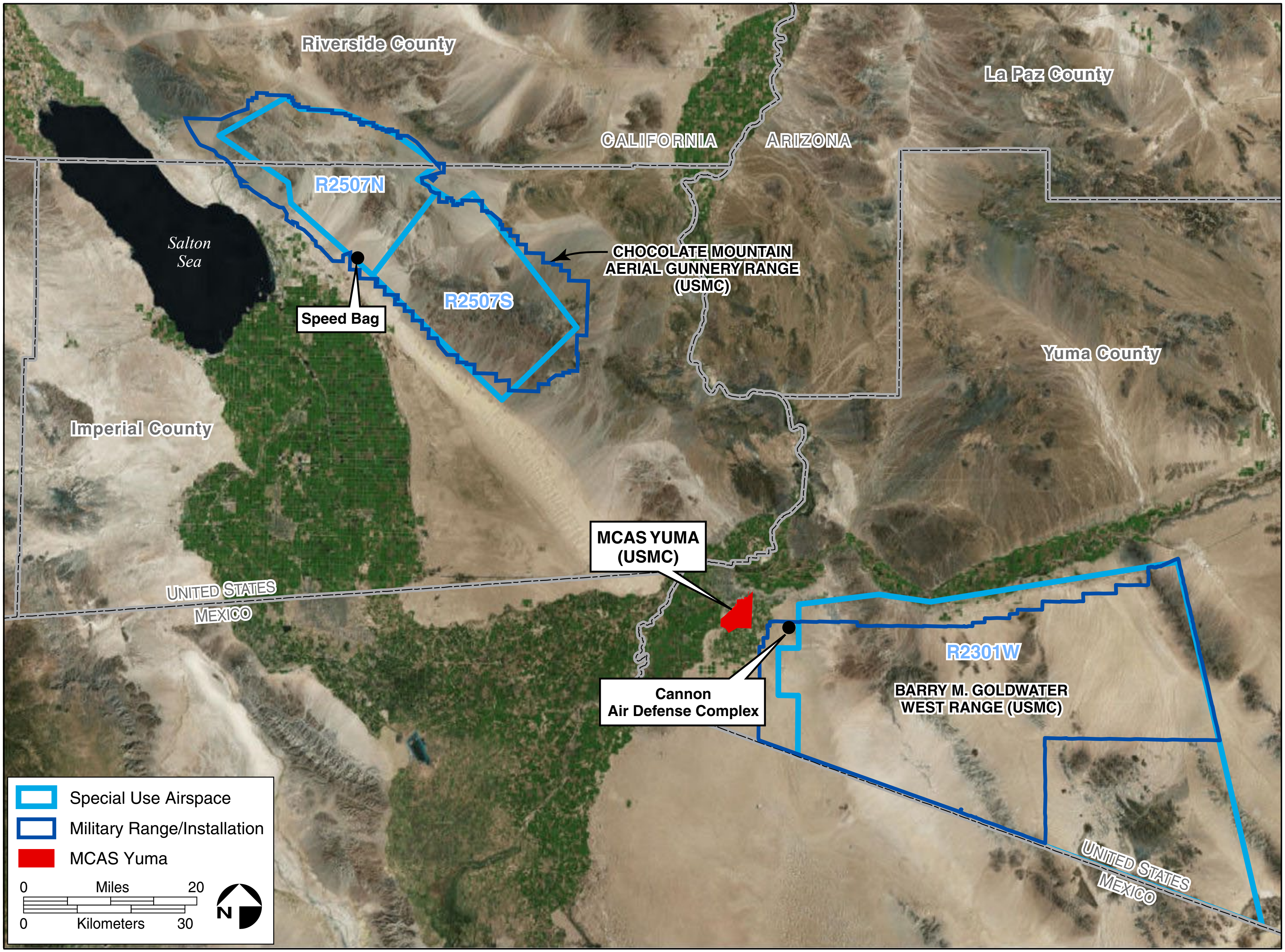

Figure 3.1-1. Special Use Airspace

The FAA conducts a comprehensive review of the application and, upon approval, identifies those conditions/limitations that provide an equivalent level of safety as manned aircraft, while ensuring that the UAS do not operate over populated areas. Such provisions include actions to be taken by the operator and ground controller in the event a mechanical or data link malfunction occurs during a UAS flight. A COA does not waive any FAA, state law, or local ordinance. The USMC is responsible for resolving any UAS operations that may conflict with any state law or local ordinance or require the permission of local authorities or property owners.

3.1.2 Environmental Consequences

The potential for any consequences the proposed action could have on the airspace environment considers if and to what extent the proposed VMU-1 aircraft operations could affect other airspace users within the ROI. As noted in Chapter 2, *Proposed Action and Alternatives,* VMU-1 would not conduct RQ-7B and MQ-21A launch and recovery operations at the air station. The proposed action would not require any changes to the current airspace structure or the routes currently flown by other aircraft between MCAS Yuma and the BSTRC training areas. Additionally, the proposed action would not affect standing MCAS Yuma operating procedures that govern how military flight activities are conducted within the airspace environment.

3.1.2.1 Alternative 1

VMU-1 would conduct about 1,500 annual sorties within the BSTRC. Launch and recovery operations would primarily occur at the CADC for operations within the BMGR-West (R-2301W) and at the Speed Bag Airfield for operations within the CMAGR (R-2507N/S). UAS typically train in restricted areas where they do not require constant monitoring by ground-based or airborne observers. A COA currently covers MQ-21 operations for the short distance between the CADC and R-2301W (Appendix D), and VMU-1 is currently working on a similar COA for RQ-7B operations. The Speed Bag Airfield is located within restricted airspace (R-2507N), and no COA is needed for flights originating from the Speed Bag Airfield as long as they stay within restricted airspace.

BMGR-West (R-2301W) and CMAGR (R-2507N/S) are currently used by other aircraft conducting a wide variety of military training, including munitions delivery. Under baseline conditions, R-2301W is used for about 20,000 aircraft operations per year, and R-2507N/S for about 10,000 operations per year. The majority of these operations are performed by F-35B aircraft with the remainder being conducted by other fixed-wing, tilt-rotor, or rotary-wing aircraft (DoN 2010). Proposed VMU-1 operations within these restricted areas would be consistent with those air- and ground-based mission activities currently performed within these designated areas. UAS operations would be integrated and conducted in accordance with the FAA and USMC requirements governing the different system types and their airspace uses. The proposed VMU-1 operations would have a nominal increase in flight operations compared to current flight operations. This nominal increase would have minimal effects on the scheduled use of these areas.

The proposed operations, therefore, would have little effect on other airspace users in the ROI. MCAS Yuma scheduling services, NATOPS Instructions and MCAS Yuma Stations Orders, and other safety initiatives that regulate military flight operations throughout the area would serve to effectively and safely integrate VMU-1 aircraft operations into this high use training environment. Therefore, no significant impacts on airspace would occur.

3.1.2.2 Alternative 2

Aircraft operations under this alternative would be the same as those under Alternative 1. Therefore, the proposed operations would have little effect on other airspace users in the ROI, and no significant impacts on airspace would occur.

3.1.2.3 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma, and the UAS operations described above would not take place. Existing airspace conditions would remain as described in Section 3.1.1, *Affected Environment*. Therefore, no impacts on airspace would occur.

3.2 Air Quality

The following section describes the existing air quality conditions of the project region and potential air quality impacts that would occur from the proposed action. Because proposed activities would occur within two states (Arizona and California) and in varying air quality conditions, the analysis splits the project region in two parts: 1) the MCAS Yuma region (Arizona) and 2) the CMAGR region (California). Relocation of aircraft and personnel to MCAS Yuma would result in minor beneficial impacts on air quality to the MCAGCC region and, therefore, this is not addressed further.

3.2.1 Affected Environment

Air quality at a given location can be described by the concentrations of various air pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing its concentration to an appropriate national and/or state ambient air quality standard. These standards represent allowable atmospheric concentrations that protect public health and welfare and include a reasonable margin of safety to protect the more sensitive individuals in the population. The United States Environmental Protection Agency (USEPA) established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns (one millionth of a meter) in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Units of concentration for these standards are generally expressed in parts per million (ppm) or micrograms per cubic meter. The ADEQ has adopted the NAAQS to regulate sources of air pollution in Arizona. In addition, the California Air Resources Board (ARB) establishes the California Ambient Air Quality Standards (CAAQS) to regulate sources of air pollution in California. The national and California ambient air quality standards are shown in Table 3.2-1.

Air emissions produced from the proposed action would affect air quality within the immediate area of MCAS Yuma, the CADC, the Speed Bag Airfield, and proposed training airspaces within BMGR-West (R-2301W) and the CMAGR (R-2507N/S). Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert (stable) pollutants (such as CO and particulates in the form of fugitive dust), the ROI generally is limited to a few miles downwind from a source. The ROI for reactive pollutants such as O3 could extend much farther downwind than for inert pollutants. O3 is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. O3 precursors are mainly nitrogen oxides (NO_x) and photochemically reactive volatile organic compounds (VOCs). In the presence of sunlight, the maximum effect of precursor emissions on O3 levels usually occurs several hours after they are emitted and many miles from their source.

The analysis of proposed aircraft operations is limited to emissions that would occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where emissions released into this layer could affect ground-level pollutant concentrations. Emissions released above the mixing layer generally would not appreciably affect ground-level air quality.

Table 3.2-1. National and California Ambient Air Quality Standards

Pollutant	*Averaging Time*	*California Standards*	*National Standards*[a]	
			Primary[b,c]	*Secondary*[b,d]
O_3	1-hour	0.09 ppm (180 μg/m^3)	—	—
	8-hour	0.070 ppm (137 μg/m^3)	0.075 ppm (147 μg/m^3)	Same as primary
CO	8-hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	—
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	—
NO_2	Annual	0.030 ppm (57 μg/m^3)	0.053 ppm (100 μg/m^3)	Same as primary
	1-hour	0.18 ppm (339 μg/m^3)	0.10 ppm (188 μg/m^3)	—
SO_2	24-hour	0.04 ppm (105 μg/m^3)	—	—
	3-hour	—	—	0.5 ppm (1,300 μg/m^3)
	1-hour	0.25 ppm (655 μg/m^3)	0.075 ppm (105 μg/m^3)	—
PM_{10}	Annual	20 μg/m^3	—	—
	24-hour	50 μg/m^3	150 μg/m^3	Same as primary
$PM_{2.5}$	Annual	12 μg/m^3	12 μg/m^3	15 μg/m^3
	24-hour	—	35 μg/m^3	—
Lead	Rolling 3-month average	—	0.15 μg/m^3	Same as primary
	30-day average	1.5 μg/m^3	—	—

Source: California Air Resources Board 2013.

Notes:

a. Standards other than the 8-hour O_3, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year.
b. Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parentheses.
c. Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.
d. Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

μg/m^3 = micrograms per cubic meter, mg/m^3 = milligrams per cubic meter, CO = carbon monoxide, NO_2 = nitrogen dioxide, O_3 = ozone, PM_{10} = particulate matter less than 10 microns in diameter, $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter, ppm = parts per million, SO_2 = sulfur dioxide.

3.2.1.1 Existing Air Quality

The USEPA designates all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. An area generally is in nonattainment for a pollutant if its NAAQS has been exceeded more than once per year. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas. The USEPA classifies Yuma County as in attainment for all NAAQS, except the southwest portion of the county is in moderate nonattainment for PM_{10} (USEPA

2015). The Yuma PM_{10} nonattainment area encompasses MCAS Yuma, the CADC, and the northwest corner of the BMGR-West. Its boundary extends from the southwest corner of the county east to the Gila Mountains, north to the intersection of Highway 95, and then west to Martinez Lake.

The CMAGR project region occurs within the Salton Sea Air Basin (SSAB), which includes all of Imperial County and the southwest third of Riverside County in California. With respect to the NAAQS, all of Imperial County presently is classified as in marginal nonattainment for O_3 and attainment for CO, SO_2, and lead. The western two-thirds of Imperial County also is in serious nonattainment for PM_{10}. This nonattainment area is known as the Imperial Valley Planning Area (IVPA) and it encompasses the Speed Bag Airfield and the southwest two-thirds of the CMAGR. It is conservatively assumed that all activities proposed within the CMAGR would occur within this PM_{10} nonattainment area. Lastly, the region surrounding the CMAGR also attains the NAAQS for $PM_{2.5}$.

The ARB also designates areas of the state as either in attainment or nonattainment of the CAAQS (ARB 2015). An area is in nonattainment for a pollutant if its CAAQS has been exceeded more than once in three years. With regard to the CAAQS, the SSAB attains the CAAQS for all criteria pollutants except O_3 and PM_{10}.

O_3 concentrations are highest during warmer months of the year and tend to be uniformly spread throughout a region, because it often takes several hours to convert precursor emissions to O_3 in the atmosphere. Inert pollutants, such as CO, tend to have the highest concentrations during the colder months of the year, when light winds and nighttime/early morning temperature changes inhibit dispersion of the pollutant in the atmosphere. Maximum inert pollutant concentrations are usually found closest to an emission source.

The arid conditions within the MCAS Yuma and CMAGR project regions produce low soil moisture and a high potential for fugitive dust (PM_{10}/$PM_{2.5}$) emissions, which is one of the main air pollution issues in these regions. Ambient PM_{10} concentrations within the project region occur from emissions of fugitive dust and the combustion of fuels in vehicles. Maximum PM_{10} impacts usually occur in combination with fugitive dust generated by ground-disturbing activities (such as the operation of vehicles on unpaved surfaces) and high wind events.

Air emissions from current operations at MCAS Yuma occur from: 1) stationary sources that combust fuels and release VOCs from fuels storage and transfer; 2) mobile sources such as aircraft and tactical vehicles/support equipment; and 3) fugitive dust generated by the operation of vehicles and aircraft on unpaved surfaces. Air emissions from current operations within the CMAGR mainly occur from: 1) the combustion of fossil fuels by aircraft and tactical vehicles/support equipment; 2) fugitive dust generated by the operation of tactical vehicles/support equipment and aircraft on unpaved surfaces; and 3) the use of ordnance (combustive and fugitive dust emissions).

3.2.1.2 Applicable Rules and Regulations

The federal Clean Air Act of 1970 and its subsequent amendments establish air quality regulations and the NAAQS and delegate the enforcement of these standards to the states. The Clean Air Act establishes air quality planning processes and requires areas in nonattainment of a NAAQS to develop a State Implementation Plan that details how the state will attain the standard within mandated time frames. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area. The following summarizes the air quality rules and regulations that apply to the proposed action.

Federal Regulations

Section 176(c) of the Clean Air Act, as articulated in the USEPA *General Conformity Rule*, states that a federal agency cannot issue a permit or support an activity unless the agency determines that it will conform to the most recent USEPA-approved State Implementation Plan. This means that projects using federal funds or requiring federal approval in nonattainment or maintenance areas cannot: 1) cause or contribute to new violations of a NAAQS; 2) increase the frequency or severity of any existing violation; or 3) delay timely attainment of any standard, interim emission reduction, or other milestone. Conformity determinations are required when the annual direct and indirect emissions from a federal action exceed an applicable *de minimis* (not significant) threshold. Applicable *de minimis* levels vary by pollutant and the severity of nonattainment conditions. Based on existing air quality designations, the applicable conformity *de minimis* thresholds that pertain to the proposed action include the following: 1) 100 tons per year of PM_{10} for the MCAS Yuma project region; and 2) 100 tons per year of VOCs and NO_x and 70 tons per year of PM_{10} for the CMAGR project region (USEPA 2014a).

State Regulations

The Air Quality Division of the ADEQ is responsible for controlling sources of air pollution within Arizona. Title 18, Chapter 2 of the Arizona Administrative Code identifies the rules used by the Air Quality Division of the ADEQ to regulate air quality (ADEQ 2015a). The following summarizes the air quality rules and regulations that would apply to the project and its alternatives:

- R18-2-604. *Open Areas, Dry Washes, or Riverbeds*. This rule limits excessive amounts of particulate matter (PM) from becoming airborne due to excavation or earth-moving activities. To minimize dust emissions, the rule requires implementation of Best Management Practices, such as use of approved dust suppressants or adhesive soil stabilizers, paving, covering, landscaping, continuous wetting, detouring, barring access, or other acceptable means; and
- R18-2-606. *Material Handling*. This rule requires crushing, screening, handling, transporting or conveying of materials or other operations likely to result in significant amounts of airborne dust to take reasonable precautions, such as the use of spray bars, wetting agents, dust suppressants, covering the load, and hoods to prevent excessive amounts of particulate matter from becoming airborne.

The ARB is responsible for the coordination and administration of both federal and state air pollution control programs within California and implementation of the California Clean Air Act (CCAA). The CCAA required the ARB to establish the CAAQS (see Table 3.2-1). In general, the CAAQS are at least as stringent as the NAAQS. The CCAA requires local air districts in the state to achieve and maintain the CAAQS by the earliest practical date.

The CMAGR project site is within the jurisdiction of the Imperial County Air Pollution Control District (ICAPCD). The ICAPCD has developed air quality plans that are designed to bring the region into attainment of the national and state ambient air quality standards. Through this attainment planning process, the ICAPCD develops the *ICAPCD Rules and Regulations* to regulate stationary sources of air pollution in Imperial County (ICAPCD 2015).

3.2.1.3 Greenhouse Gases

It is well-documented that the Earth's climate has fluctuated throughout its history. However, scientific evidence indicates a correlation between increasing global temperatures over the past century and the worldwide proliferation of greenhouse gas (GHG) emissions by human activity. The main source of GHGs from human activities is the combustion of fossil fuels, such as crude oil and coal. Climate change associated with global warming is predicted to produce negative environmental, economic, and social consequences across the globe.

GHGs trap heat in the atmosphere by absorbing the sun's natural energy. GHGs are released from natural processes and human activities. The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Examples of GHGs created and emitted primarily through human activities include fluorinated gases and sulfur hexafluoride.

Each GHG is assigned a global warming potential (GWP). The GWP is a measure of the ability of a gas or aerosol to trap heat in the atmosphere. The GWP rating system is standardized to CO_2, which has a value of one. For example, CH_4 has a GWP of 28, which means that it has a global warming effect 28 times greater than CO_2 on an equal-mass basis (Intergovernmental Panel on Climate Change 2014), which means that CH_4 can be more detrimental to Earth's climate. To simplify GHG analyses, total GHG emissions from a source are often expressed as a CO_2 equivalent (CO_{2e}). The CO_{2e} is calculated by multiplying the emissions of each GHG by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. While CH_4 and N_2O have much higher GWPs than CO_2, CO_2 is emitted in such higher quantities that it is the overwhelming contributor to CO_{2e} from both natural processes and human activities.

Federal agencies address emissions of GHGs by reporting and meeting reductions mandated in federal laws, EOs, and agency policies. Some of these requirements include EO 13693 and the USEPA *Final Mandatory Reporting of Greenhouse Gases Rule*. The state of Arizona has developed the Climate Change Action Plan to reduce statewide GHG emissions. In California, the California Global Warming Solutions Act of 2006 (Assembly Bill 32) directs the state of California to reduce statewide GHG emissions to 1990 levels by the year 2020. Groups of states, such as the Western Climate Initiative (with Arizona and California as founding members), also have formed regionally-based collectives to jointly address GHG pollutants.

The USMC takes proactive measures to reduce their overall emissions of GHGs. In an effort to reduce energy consumption, reduce dependence on petroleum, and increase the use of renewable energy resources in accordance with the goals set by EOs and the Energy Policy Act of 2005, the Marine Corps and DoD have implemented a number of renewable energy projects (e.g., photovoltaic solar systems, geothermal power, wind generation) within the jurisdiction of Marine Corps Installations West (MCI West) (MCI West 2009, Marine Corps Expeditionary Energy Office 2011).

On 18 December 2014, the CEQ released revised draft guidance for public comment that describes how federal departments and agencies should consider the effects of GHGs and climate change in their NEPA reviews (CEQ 2014). The revised draft guidance supersedes the draft GHG and climate change guidance released by the CEQ in February 2010. This guidance explains that agencies should consider both the potential effects of a proposed action on climate change, as indicated by its estimated GHGs, and the implications of climate change for the environmental effects of a proposed action. The guidance also emphasizes that agency analyses should be commensurate with projected GHGs and climate impacts, and should employ appropriate quantitative or qualitative analytical methods to ensure useful information is developed to adequately distinguish between alternatives and mitigations. The guidance recommends that agencies consider 25,000 metric tons per year of CO_{2e} emissions as a reference point below which a quantitative analysis of GHGs is not recommended unless it is easily accomplished based on available tools and data. Similar to the 2010 guidance, the revised guidance does not propose a reference point as an indicator of a level of GHG emissions that may significantly affect the quality of the human environment.

The potential effects of proposed GHG emissions are by nature global and cumulative impacts because individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, the impact of proposed GHG emissions to climate change is discussed in the context of cumulative impacts, as presented in Chapter 4, *Cumulative Impacts*, of this EA.

3.2.2 Environmental Consequences

Air quality impacts from the alternatives were reviewed for significance relative to federal, state, and local air pollution standards and regulations. For purposes of this analysis, if proposed emissions were projected not to exceed an applicable conformity *de minimis* threshold within a project region, then impacts would be less than significant. If proposed emissions were projected to exceed an applicable conformity *de minimis* threshold within a project region, further analysis would be needed to determine whether impacts were significant. In such cases, if emissions conform to the approved State Implementation Plan, then impacts would be less than significant. In the case of a criteria pollutant for which a project region attains an NAAQS, the analysis used the USEPA Prevention of Significant Deterioration (PSD) permitting program for major stationary sources of emissions as the evaluation criteria for determining the potential for significance of air quality impacts for the project alternatives. Although the PSD permitting program is not applicable to mobile sources, PSD thresholds are being used as criteria for measuring air quality impacts under NEPA.

3.2.2.1 Alternative 1

Construction

Air quality impacts from construction of Alternative 1 would occur from: 1) combustive emissions due to the use of fossil fuel-powered equipment and trucks; and 2) fugitive dust emissions from demolition and earth-moving activities and the use of equipment and trucks on exposed soils. Site construction and demolition activity data associated with Alternative 1 were used to estimate combustive and fugitive dust emissions. Proposed construction activities would begin in 2018 and would finish by 2024. However, as a conservative approach for use in comparison to the NEPA emission significance thresholds, the analysis combined the following proposed activities into two calendar years: 1) for year 2018, construction of ground equipment support facilities at MCAS Yuma and the operations facility at the CADC; and 2) for year 2020, construction of the hanger facilities at MCAS Yuma. Appendix E includes data and assumptions used to calculate emissions from these proposed activities.

Factors needed to derive source emission factors for construction activities were obtained from the Compilation of Air Pollutant Emission Factors, AP-42, Volume I (USEPA 1995), the USEPA NONROAD2008a model for nonroad construction equipment (USEPA 2009), and the USEPA MOVES2014 model for on-road trucks (USEPA 2014b). The analysis assumes that implementation of Special Conservation Measure 1 (*Fugitive Dust Control Measures*) and Special Conservation Measure 2 (*Construction Equipment Emission Control Measures*) described below would reduce fugitive dust emissions from construction activities by 50 percent from uncontrolled levels.

*Special Conservation Measure 1: Fugitive Dust Control Measures***.** The construction contractor would implement the following measures during all proposed ground disturbance activities:

1. Use water trucks or sprinkler systems to keep all areas of vehicle movement damp enough to prevent dust from leaving the construction area;
2. Minimize the amount of disturbed ground area at a given time;
3. Minimize traffic speeds on all unpaved roads;

4. Install gravel pads at construction area access points to prevent tracking of soil onto paved roads;
5. Provide temporary wind fencing around sites being graded or cleared;
6. Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site. Stabilize all disturbed areas at this time;
7. Cover truck loads that haul dirt, sand, or gravel;
8. After completion of clearing, grading, earthmoving, or excavation, treat the disturbed areas by watering, re-vegetation, or by spreading non-toxic soil binders until they are paved or otherwise developed to prevent dust generation; and
9. Designate personnel to monitor the dust control program and to order increased watering, as necessary, to prevent the transport of dust off-site. Their duties shall include holiday and weekend periods when work may not be in progress.

Special Conservation Measure 2: Construction Equipment Emission Control Measures. The construction contractor would implement the following measures during all proposed construction activities, where feasible:

1. Maintain equipment according to manufacturer specifications;
2. Restrict idling of equipment and trucks to a maximum of five minutes at any location;
3. Use diesel oxidation catalysts and/or catalyzed diesel particulate traps;
4. Use electricity from power poles rather than temporary diesel- or gasoline-powered generators;
5. Provide temporary traffic control, such as a flag person, to maintain smooth traffic flow;
6. Keep construction equipment and equipment staging areas away from sensitive receptors (such as day care centers);
7. Re-route construction trucks away from congested streets or sensitive receptors;
8. Use construction equipment with engines that meet USEPA Tier 3 and 4 nonroad standards; and
9. Use alternative fuel construction equipment, such as natural gas- or electric-powered.

Table 3.2-2 summarizes the annual emissions estimated for construction and demolition activities under Alternative 1. These data show that annual air emissions generated from these activities over a two-year construction period would be well below their applicable NEPA significance thresholds. As a result, construction of Alternative 1 would not result in significant air quality impacts.

Operations

Air emissions produced by the proposed action would occur from combustion of fossil fuels by UAS aircraft and tactical vehicles/support equipment. The analyses focused on peak annual operations that would occur with the full fielding of proposed UAS.

Factors needed to derive operational source emission rates for the RQ-7B and MQ-21A power plants are not available. Therefore, factors for the T-41B aircraft were used as surrogates to estimate emissions from proposed UAS (Air Force Civil Engineer Center 2014). These data were factored by the ratio of UAS/T-41B engine horsepower (HP) ratings to estimate associated fuel usages and resulting emissions for RQ-7B and MQ-21A operations. Emissions for proposed tactical vehicles/support equipment activities were based on factors obtained from the USEPA NONROAD2008a model.

Table 3.2-2. Annual Emissions Due to Construction of Alternative 1

Year/Activity/Location	Air Pollutant Emissions (Tons)						
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
Year 2018 - Ground Equipment Support Facilities - MCAS Yuma							
Excavate/Demo Concrete/Grade	0.00	0.00	0.01	0.00	0.02	0.00	3.04
Place Structural Fill	0.00	0.01	0.02	0.00	0.02	0.00	6.12
Building Construction	0.03	0.14	0.30	0.00	1.30	0.15	78.25
Install Utilities	0.01	0.02	0.05	0.00	0.04	0.01	13.51
Asphalt Paving	0.00	0.01	0.03	0.00	0.16	0.02	8.62
Concrete Work	0.00	0.00	0.01	0.00	0.01	0.00	3.23
Total Emissions - MCAS Yuma	**0.04**	**0.18**	**0.42**	**0.00**	**1.55**	**0.18**	**112.76**
Year 2018 - Operations Facility at the CADC							
Excavate/Demo Concrete/Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.27
Place Structural Fill	0.00	0.00	0.00	0.00	0.00	0.00	0.54
Building Construction	0.01	0.05	0.10	0.00	0.05	0.01	24.33
Install Utilities	0.01	0.03	0.06	0.00	0.05	0.01	16.38
Asphalt Paving	0.00	0.01	0.02	0.00	0.14	0.01	7.08
Concrete Work	0.00	0.00	0.00	0.00	0.00	0.00	0.31
Install Communication Lines	0.02	0.12	0.24	0.00	0.18	0.03	59.99
Total Emissions - CADC	**0.04**	**0.21**	**0.43**	**0.00**	**0.43**	**0.07**	**108.90**
Year 2018 Total Construction Emissions	**0.09**	**0.39**	**0.86**	**0.00**	**1.98**	**0.25**	**221.66**
Year 2020 - Hanger Facilities							
Excavate/Demo Concrete/Grade	0.00	0.01	0.02	0.00	0.08	0.01	6.18
Place Structural Fill	0.00	0.01	0.03	0.00	0.06	0.01	11.50
Building Construction	0.07	0.30	0.70	0.00	2.01	0.24	206.19
Install Utilities	0.01	0.02	0.04	0.00	0.04	0.01	13.89
Asphalt Paving	0.00	0.01	0.02	0.00	0.10	0.01	6.02
Concrete Work	0.00	0.00	0.01	0.00	0.01	0.00	2.37
Demolish All Buildings	0.01	0.03	0.08	0.00	0.22	0.03	30.75
Total Emissions - MCAS Yuma	**0.10**	**0.38**	**0.89**	**0.00**	**2.53**	**0.30**	**276.91**
Year 2020 Total Construction Emissions	**0.10**	**0.38**	**0.89**	**0.00**	**2.53**	**0.30**	**276.91**

Notes: CADC = Cannon Air Defense Complex, CO = carbon monoxide, CO_{2e} = CO_2 equivalent, MCAS = Marine Corps Air Station, NO_x = nitrogen oxides, PM_{10} = particulate matter less than or equal to 10 microns in diameter, $PM_{2.5}$ = particulate matter less than or equal to 2.5 in diameter, SO_2 = sulfur dioxide, VOC = volatile organic compound.

Table 3.2-3 presents an estimate of the peak annual operational emissions that would occur with the implementation of Alternative 1. These data show that Alternative 1 operations would generate emissions that would remain well below any applicable conformity *de minimis* or PSD threshold for either the MCAS Yuma or CMAGR project region. This would also be the case if any proposed construction activities also occur during the same year as proposed operations within the MCAS Yuma project region. Since emissions from all activities proposed under Alternative 1 would not exceed any applicable conformity *de minimis* or PSD threshold, Alternative 1 would not result in significant air quality impacts.

3.2.2.2 Alternative 2

Construction

Alternative 2 would include the same construction activities as Alternative 1, except the proposed ground support facilities would be built at the CADC instead of MCAS Yuma. Therefore, all of the construction emissions identified in Table 3.2-2 for Alternative 1 in year 2018 would occur at the CADC and not MCAS Yuma. The data in Table 3.2-2 show that annual air emissions from the construction of Alternative 2 would be well below their applicable NEPA significance thresholds. As a result, construction of Alternative 2 would not result in significant air quality impacts.

Operations

Annual air emissions from Alternative 2 operations would be similar to those estimated for Alternative 1 (as presented in Table 3.2-3). Alternative 2 would split assigned squadron equipment and personnel between MCAS Yuma and the CADC, thereby resulting in an increase in daily commuter trips between MCAS Yuma and the CADC as compared to Alternative 1. However, less commuter trips would be needed between the two facilities to support VMU-1 aircraft operations because much of the equipment would already be housed at the CADC. Either way, any additional activities would result in minor amounts of emissions. Therefore, Alternative 2 operations would generate emissions that would remain well below any applicable conformity *de minimis* or PSD threshold for the project region. Since emissions from all activities proposed under Alternative 2 would not exceed any applicable conformity *de minimis* or PSD threshold, Alternative 2 would not result in significant air quality impacts.

Table 3.2-3. Annual Emissions Due to Operation of Alternative 1

Location/Activity	*Air Pollutant Emissions (Tons)*						
	VOC	*CO*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*	*CO_{2e}*
BMGR-West							
Aircraft Operations	0.34	14.05	0.09	0.02	0.59	0.58	47.19
TSE	0.02	0.10	0.21	0.00	0.02	0.01	30.12
Vehicle Transport	0.00	0.00	0.01	0.00	0.00	0.00	7.43
Total Annual Emissions - BMGR-West	**0.36**	**14.16**	**0.31**	**0.02**	**0.60**	**0.60**	**84.74**
NEPA Significance Thresholds	**250**	**250**	**250**	**250**	**100**	**250**	**NA**
Exceed NEPA Significance Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**NA**
CMAGR							
Aircraft Operations	0.02	0.13	0.00	0.00	0.01	0.01	0.47
TSE	0.00	0.02	0.03	0.00	0.00	0.00	4.52
Vehicle Transport	0.00	0.00	0.00	0.00	0.00	0.00	1.49
Total Annual Emissions - CMAGR	0.02	0.14	0.03	0.00	0.01	0.01	6.48

Notes: BMGR-West = Barry M. Goldwater Range-West; CMAGR = Chocolate Mountain Aerial Gunnery Range, CO = carbon monoxide, CO_{2e} = CO_2 equivalent, NA = Not applicable, NEPA = National Environmental Policy Act, NO_x = nitrogen oxides, PM_{10} = particulate matter less than or equal to 10 microns in diameter, $PM_{2.5}$ = particulate matter less than or equal to 2.5 in diameter, SO_2 = sulfur dioxide, TSE = tactical support equipment, VOC = volatile organic compound.

3.2.2.3 No-Action Alternative

Under the No-Action Alternative, the VMU-1 squadron would not relocate from the MCCAGCC to MCAS Yuma. Existing air quality conditions would remain as described in Section 3.2.1, *Affected Environment*. Therefore, no impacts on air quality would occur.

3.3 Noise

The predominant noise sources associated with the proposed action consist of aircraft operations at MCAS Yuma and within the BSTRC. Aircraft are not the only sources of noise in an urban or suburban environment, where interstate and local roadway traffic, rail, industrial, and neighborhood sources also contribute to or detract from the everyday quality of life. Nevertheless, aircraft are readily identified by their noise output and are typically given special attention. This section analyzes the potential noise generated by proposed VMU-1 aircraft operations within the BSTRC. It also addresses construction-related noise at MCAS Yuma and the CADC. Potential noise impacts on humans will be discussed in this section, while noise impacts on Biological Resources will be discussed in Section 3.4, *Biological Resources*. Relocation of aircraft and personnel to MCAS Yuma would have negligible noise impacts at MCAGCC and, therefore, this is not addressed further.

3.3.1 Noise Descriptions

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. Measurement and perception of sound involve two basic physical characteristics: amplitude and frequency.

Amplitude **-** The loudest sounds the human ear can comfortably hear have acoustic energy one trillion times the acoustic energy of sounds the ear can barely detect. Due to this vast range, attempts to represent sound amplitude by pressure are generally unwieldy. Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB (Figure 3.3-1).

Due to the logarithmic nature of the dB scale, sound levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level, for example:

60 dB + 60 dB = 63 dB, and
80 dB + 80 dB = 83 dB

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two, for example:

60.0 dB + 70.0 dB = 70.4 dB

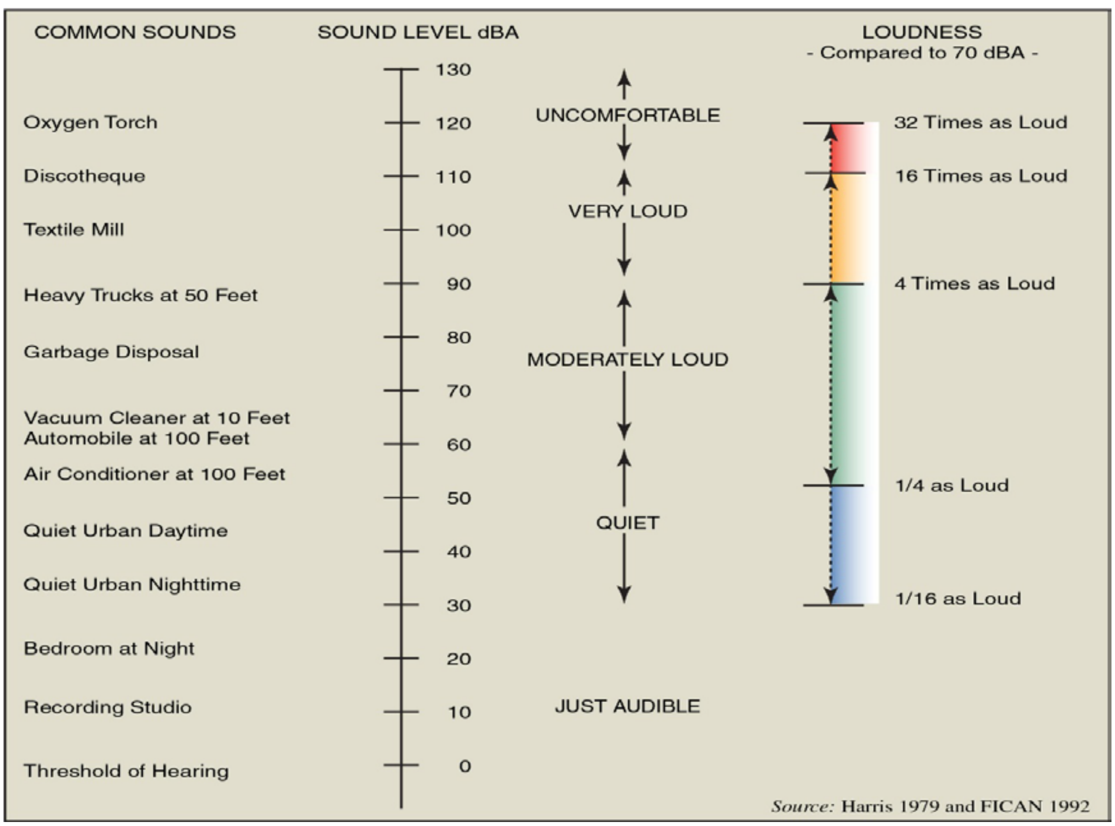

Figure 3.3-1. Typical A-Weighted Sound Levels of Common Sounds

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as “dB addition” or “energy addition”. The latter term arises from the fact that the combination of dB values consists of first converting each dB value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its dB equivalent.

Under laboratory conditions, differences in sound levels of 1 dB can be detected by the human ear. In the community, the smallest change in average noise level that can be detected is about 3 dB. A change in noise level of 0.4 dB would not be detected under field or laboratory conditions.

***Frequency* -** The frequency (i.e., pitch) of a sound is also important in determining how the sound will be perceived. All dB values referenced in this document can be assumed to be “A-weighted”, meaning that they have been adjusted to emphasize frequencies heard most clearly by the human ear.

This document uses three noise level metrics to describe noise events and overall noise environments: maximum noise level (L_{max}), Monthly Onset-rate adjusted Day-Night Average Sound Level (DNL_{mr}), and Monthly Onset-rate adjusted Community Noise Equivalent Level ($CNEL_{mr}$). L_{max} is the sound level at the loudest point during an event, such as an aircraft overflight. It is an intuitively understood metric that is useful for predicting interference with conversation and other common activities. Although speech interference is difficult to predict because people generally raise their voices when noise levels increase, the lowest sound level at which speech interference could be an issue is 50 dB.

The DNL_{mr} metric averages noise levels over a 24-hour period, adding a 10 dB “penalty” to those events that occur between 10:00 PM and 7:00 AM to account for the increased intrusiveness of late-night noise. To account for the high degree of operations tempo variability in military training airspace, the DNL_{mr} metric reflects the month with the highest number of operations. The metric also includes a “penalty” of up to 11 dB to account for the potential “startle effect” caused by low-altitude, high-speed overflights.

In the state of California, $CNEL_{mr}$ is used instead of DNL_{mr}. $CNEL_{mr}$ is identical to DNL_{mr}, except a 5 dB penalty is added to noise events in the “evening” period between 7:00 PM and 10:00 PM. DNL_{mr} and $CNEL_{mr}$ are useful for predicting the percentage of a population that will become highly annoyed by noise, and 65 dB DNL_{mr} / $CNEL_{mr}$ is a commonly used threshold level above which noise impacts are more likely to be considered significant. Because the DNL_{mr} / $CNEL_{mr}$ metrics use the logarithmic dB scale, adding a noise source that is more than 10 dB quieter than the dominant noise source will generally have an inconsequential effect on overall DNL_{mr} / $CNEL_{mr}$.

3.3.2 Methodology

Proposed noise levels were considered in the context of baseline noise levels and local levels of noise sensitivity to assess noise impacts. Baseline aircraft noise levels were calculated using the DoD NOISEMAP suite of programs, as documented in the EA for the Operational Test and Evaluation Center at MCAS Yuma (MCAS Yuma 2015) and the Environmental Impact Statement for F-35B West Coast Basing (DoN 2010). Time averaged noise levels associated with proposed UAS operations were calculated using the program SELCALC and dB math, as explained below. Construction noise levels were estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (FHWA 2006).

The RQ-7B and MQ-21A are propeller-driven aircraft powered by single 38 HP and 8 HP engines, respectively. Noise level measurements have not yet been conducted that would support adding these two aircraft types to the DoD NOISEFILE aircraft source noise database. In this situation, it is standard DoD procedure to select a noise surrogate for use in noise impacts analysis. Surrogates are selected on the basis of having a similar type of propulsion and engine power, factors which are strongly linked to aircraft noise level. After reviewing aircraft available in the NOISEFILE database, the T-41 (military version of the Cessna 172) was selected as the most appropriate basis for noise surrogates for the RQ-7B and MQ-21A. The T-41 included in the NOISEFILE database is propeller-driven, and powered by a 145 HP engine. Other aircraft types available in the NOISEFILE database are less similar to the RQ-7B and MQ-21A in terms of propulsion type. To generate surrogate RQ-7B and MQ-21A noise levels, T-41 noise levels were scaled according to the expected engine power to better represent the RQ-7B and MQ-21A, respectively.

3.3.3 Affected Environment

3.3.3.1 MCAS Yuma

The sound environment on MCAS Yuma is dominated by aircraft noise. Of the approximately 133,000[5] airfield operations conducted per year at the airfield under baseline conditions, 57 percent are military aircraft and 43 percent are conducted by civil/commercial users at Yuma International Airport, which shares the airfield with MCAS Yuma. Military aircraft that are based or that will soon be based at MCAS Yuma include a wide variety of fixed-wing, rotary wing, tilt-rotor, and UAS. The entire developed portion of the installation is exposed to aircraft noise levels at or greater than 65 dB DNL (MCAS Yuma 2015). Noise sources on MCAS Yuma other than aircraft include the use of trucks and heavy equipment and ongoing construction to support existing facility operations and facility upgrades. While these transitory ground vehicle sources contribute to the noise environment at MCAS Yuma, their effects rarely extend beyond the air station boundary and aircraft noise dominates the environment.

The area surrounding proposed construction sites on MCAS Yuma is used for airfield-related purposes, and is relatively insensitive to noise. Individuals working in high noise exposure locations are subject to the occupational noise regulations in accordance with Occupational Safety and Health Administration (OSHA) and National Institute of Occupational Safety and Health regulations, and DoD and USMC programs. USMC guidance includes MCO 5100.8 (*Marine Corps Occupational Safety and Health Program Manual*), MCO 5100.29A (*Marine Corps Safety Program*), and MCO 6260.1E (*Marine Corps Hearing Conservation Program*). On-station offices and housing are designed and modified in accordance with UFC 3-45-01 (*Noise and Vibration Control*).

3.3.3.2 Cannon Air Defense Complex and BMGR-West (R-2301W)

Because the CADC is located within BMGR-West and near MCAS Yuma, it is overflown regularly by aircraft transiting to and from these facilities. Aircraft types overflying the CADC include aircraft based at MCAS Yuma (e.g., F-35B, MV-22, and H-1) as well as aircraft operating in the local area in a transient capacity. A noise study conducted as part of the VMX-22 basing showed calculated noise levels in the vicinity of the CADC between 45 to 55 dB DNL_{mr} (MCAS Yuma 2015). Non-aircraft noise sources on the CADC include ground vehicle traffic and ongoing construction to support existing military operations and facility upgrades. The proposed project footprints under the proposed action are located approximately 4,000 feet south of the BMGR-West boundary. Scattered residences are located on privately owned parcels immediately north of the CADC/BMGR-West boundary.

BMGR-West and R-2301W are used by aircraft conducting a wide variety of military training, including munitions delivery. Under baseline conditions, R-2301W is used for about 20,000 aircraft operations per year. Approximately half of these operations are conducted by F-35B aircraft with the remainder being conducted by other fixed-wing, tilt-rotor, or rotary-wing aircraft. Supersonic training is conducted

[5] Baseline conditions include proposed VMX-22 operations, which are in the process of being beddown at MCAS Yuma.

primarily at altitudes above 25,000 feet AMSL, and sonic booms are experienced on the ground about once per day. Subsonic noise levels are location-dependent, with heavily-used areas in R-2301W being exposed to noise levels in excess of 65 dB DNL_{mr} (DoN 2010).

The CADC, BMGR-West, and R-2301W are located in areas that are rural and quiet while military training operations are not under way. Under normal circumstances while military training is not under way, typical sound levels in a rural setting range between 35 and 44 dB DNL (USEPA 1974).

3.3.3.3 Speed Bag Airfield and CMAGR (R-2507N/S)

The CMAGR and R-2507N/S are used for a variety of aircraft training operations, including munitions delivery. Under baseline conditions, the R-2507 complex accommodates about 10,000 operations per year. Approximately 90 percent of these operations are conducted by F-35B aircraft with the remainder being conducted by other fixed-wing, tilt-rotor, or rotary-wing aircraft. Noise levels exceed 65 dB $CNEL_{mr}$ on the majority of the CMAGR and are approximately equal to 65 dB $CNEL_{mr}$ at the Speed Bag Airfield (DoN 2010). Noise levels at the Speed Bag Airfield and R-2507N/S are reported using the metric $CNEL_{mr}$ rather than DNL_{mr} because use of $CNEL_{mr}$ is standard in California. The Speed Bag Airfield is located on the CMAGR several miles from the closest residence or privately-owned land. The airfield is occupied only when training is under way. The Speed Bag Airfield and R-2507N/S are located in areas that are rural, and sound levels probably typically range between 35 and 44 dB DNL while military training operations are not under way.

3.3.4 Environmental Consequences

3.3.4.1 Alternative 1

Construction

Under Alternative 1, construction and demolition activities would be conducted at MCAS Yuma, the CADC, and along a corridor between MCAS Yuma and the CADC. Proposed construction equipment includes backhoes, cranes, dozers, excavators, forklifts, loaders, dump trucks, pickup trucks, concrete mixers, compactors, electrical generators, air compressors, saws, welding equipment, and miscellaneous small equipment (e.g., pumps). Short-term noise associated with construction activities could range from 80 to 90 dB at 50 feet from the source (FHWA 2006). Noise generated during construction on MCAS Yuma and the CADC would be compatible with current and ongoing military activities in the affected areas, and would be isolated from any off-station communities. Installation of the new communications line in a corridor between MCAS Yuma and the CADC would involve trenching in existing right-of-ways which run adjacent to residences. Trenching and cable installation would result in localized increases in noise, typically lasting less than a day at any one location along the route. Construction noise levels would not violate Yuma City Code relating to noise control, which specifically regulates electronically amplified sound. Construction noise would be localized and temporary, and no significant impacts on noise would occur as a result of the proposed construction.

Operations

Table 3.3-1 lists estimated direct overflight noise levels (L_{max}) of an RQ-7B and MQ-21A. When operating at 3,000 feet above ground level (AGL), direct overflight by an RQ-7B or MQ-21A would generate noise levels that are noticeable but not overly intrusive. At this altitude, the RQ-7B would have some potential for minimal effect on conversation (i.e., people would need to momentarily raise their voices slightly), but the MQ-21A would not have any potential to effect conversation. At 6,000 feet AGL, direct overflight by VMU-1 UAS may or may not be audible depending on local conditions at the time.

As a point of reference, an F-35B flying at about 3,000 feet AGL at 75 percent *Engine Thrust Request* power generates about 98 dB L_{max} (DoN 2010). Table 3.3-1 also lists estimated percentages of total training time that would be spent by the RQ-7B and MQ-21A in different altitude bands. Approximately 99 percent of UAS training would be conducted at altitudes above 3,000 feet AGL. Listeners not located directly beneath the UAS flight path would hear noise levels less than the maximum noise levels listed in Table 3.3-1.

Table 3.3-1. UAS Direct Overflight Maximum Noise Levels and Time Spent in Various Altitude Bands

	Maximum Noise Level (L_{max}) at Overflight Distance in Feet			
Aircraft	***500***	***1,000***	***3,000***	***6,000***
RQ-7B[1]	71	64	53	45
MQ-21A[1]	64	57	46	38
	Percentage of Total Training Time			
Aircraft	***500***	***1,000***	***3,000***	***6,000***
RQ-7B	Launch and recovery only	1%	74%	25%
MQ-21A		1%	25%	74%

Notes:
[1]Scaled from T-41 at 100 percent revolutions per minute (RPM) maximum Omega 10 result
L_{max} = maximum noise level

VMU-1 would conduct approximately 375 RQ-7B and 750 MQ-21A sorties per year from the CADC to conduct training within BMGR-West (R-2301W). UAS training events would be more frequent during large training exercises such as WTI. For the purposes of this analysis, it is assumed that the busiest month in a typical year would include twice the number of operations of an average month. Operations during the late-night period between 10:00 PM and 7:00 AM would be relatively rare, making up 1 percent of total operations, while operations between 7:00 and 10:00 PM would make up 20 percent of total operations. Assuming each of the UAS sorties proposed to be flown from the CADC in the nominal "busiest month" of operations were to directly overfly over a single point on the ground twice at full power and 3,000 feet AGL, the resulting noise level would be only 21 dB DNL_{mr}.

VMU-1 would conduct approximately 125 RQ-7B and 250 MQ-21A sorties per year from the Speed Bag Airfield to conduct training within the CMAGR (R-2507N/S). Assuming each of the UAS sorties launched from the Speed Bag Airfield into R-2507N/S were to overfly a point on the ground twice at full power and 3,000 feet AGL, the resulting noise level would be only 19 dB $CNEL_{mr}$[6].

The resulting aircraft noise levels from proposed UAS operations are substantially below baseline noise levels at the CADC (45 – 55 dB DNL_{mr}), R-2301W (greater than or equal to 65 dB DNL_{mr} in frequently used areas), the Speed Bag Airfield (approximately 65 dB DNL_{mr}), and R-2057N/S (greater than or equal to 65 dB DNL_{mr} in frequently-used areas). Because noise levels generated by the proposed operations are below baseline levels by 10 dB or more in all affected areas, there would be no measurable increase in time-averaged noise levels associated with implementation of the proposed action.

Although UAS operations would be audible at certain times, particularly when other aircraft or munition training is not under way in the local area, the proposed UAS operations would not add to overall noise levels, which are dominated by other military high-performance manned aircraft training. Therefore, no significant impacts on noise would occur from proposed UAS operations.

[6] The time-averaged noise level at Speed Bag Airfield and R-2507N/S is reported using the metric $CNEL_{mr}$ rather than DNL_{mr} because the airfield is located in California where use of $CNEL_{mr}$ is standard.

3.3.4.2 Alternative 2

Alternative 2 would be the same as Alternative 1, except the ground support facilities would be built at the CADC instead of the old van pad at MCAS Yuma. Therefore, construction-related noise would be of longer duration at the CADC and shorter duration at MCAS Yuma when compared with Alternative 1. Noise generated during construction at either location would be compatible with current and ongoing military activities in the affected areas, and would be isolated from any off-station communities. Installation of the new communications line in a corridor between MCAS Yuma and the CADC would generate temporary noise level increases lasting less than a day at any one location along the route and would not violate Yuma City Code relating to noise control. Therefore, no significant impacts on noise would occur as a result of the proposed construction. Furthermore, UAS operations under Alternative 2 would be the same as those described under Alternative 1. As described above, UAS operations may be audible at certain times when other military training is not under way. However**,** noise levels generated by the proposed operations are below baseline levels by 10 dB or more in all affected areas, so there would be no measurable increase in time-averaged noise levels associated with implementation of the proposed action. Therefore, no significant impacts on noise would occur.

3.3.4.3 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma, and none of the proposed construction or UAS operations described above would take place. Existing noise conditions would remain as described in Section 3.3.3, *Affected Environment*. Therefore, no impacts on noise would occur.

3.4 Biological Resources

The following section describes vegetation, general wildlife species, and special status species within the project site and ROI and provides analyses of the potential effects on these resources from the proposed action. No wetlands or other Waters of the United States are present within the project footprint and, therefore, this issue is not discussed further.

Biological resources are grouped and analyzed in this EA as follows:

- *Vegetation* includes the most prominent vegetation and landforms encountered at the proposed project areas. The best available vegetation and land cover data for the BSTRC is based on Gap Analysis Program land cover data (GAP 2008), CMAGR Integrated National Resource Management Plan (INRMP) (MCAS Yuma 2014b) and BMGR INRMP 2012 Update (United States Air Force [USAF] and USMC 2013). No project specific vegetation surveys were completed.
- *General wildlife* includes the characteristic animal species that occur in the project site and vicinity.
- *Special status species* include plants or animals that are federally listed as threatened or endangered, proposed for listing as threatened or endangered, or are candidates for such listing under the federal ESA, most notably the desert tortoise. Also included in this category is the flat-tailed horned lizard (proposed for federal listing) as well as birds associated with the federal Migratory Bird Treaty Act (MBTA) and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*.

3.4.1 Affected Environment

The areas evaluated for biological resources include all areas wherein biological resources may be directly or indirectly affected due to operational use or ground disturbance. For the purposes of the proposed action, this includes MCAS Yuma and the CADC where hangars and other facilities would be constructed, the Speed Bag Airfield for operations within the CMAGR (R-2507N/S), and at the CADC for operations within the BMGR-West (R-2301W).

3.4.1.1 Data Sources

Information in support of this analysis was derived from the following sources:

- The *Final CMAGR INRMP* (MCAS Yuma 2014b), which provides general biological information about plant and wildlife species;
- *Biological Opinion (BO) for Military Use of the CMAGR* (1-6-95-F-40) (United States Fish and Wildlife Service [USFWS] 1996 and 2003), which provides general biological information and outlines measures to avoid take and minimize impacts on desert tortoise and associated habitats;
- USFWS emergency ruling listing the Mojave population of the desert tortoise[7] as endangered (54 *Federal Register* [FR] 42270) and USFWS listing of the Mojave population of the desert tortoise as threatened (55 FR 12178), which provides detailed information about the desert tortoise range, life history, habitat, and abundance;
- *Revised Recovery Plan for the Mojave Population of the Desert Tortoise* (USFWS 2011a);
- *Final Legislative Environmental Impact Statement for the Renewal of the CMAGR Land Withdrawal* (DoN 2013);
- Desert tortoise survey data (MCAS Yuma 2014b);
- *Barry M. Goldwater Range INRMP 2012 Update* (USAF and USMC 2013);
- *Flat-tailed Horned Lizard Rangewide Management Strategy* (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003); and
- *Draft Recovery Plan for the Sonoran Pronghorn (Antilocapra americana sonoriensis), Second Revision* (USFWS 2015).

Proposed operations are located in the known range of two federally listed species. Proposed operations within the CMAGR (R-2507N/S) would occur within the known range of Agassiz's desert tortoise (*Gopherus agassizii*) and operations within the BMGR-West (R-2301W) would occur within the known range of the Sonoran pronghorn (*Antilocapra americana sonoriensis*). The Marine Corps is consulting with the USFWS under Section 7 of the ESA. Project-specific consultation will occur for proposed activities within the CMAGR (desert tortoise). The USMC is currently initiating a range-wide consultation for all USMC operations at the BMGR-West, which will include activities associated with the proposed action. The Final EA will include information on the results of these consultation efforts.

3.4.1.2 Vegetation

MCAS Yuma

MCAS Yuma is a developed air station with limited native vegetation and wildlife habitat. Areas within the project footprint are developed and do not support any natural resources.

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[7] Agassiz's desert tortoise was identified as a genetically unique species in 2011 (Murphy et al. 2011). The stated term "Mojave population of the desert tortoise" is retained here because it is included as part of published records and rulings that occurred prior to the 2011 species determination.

Speed Bag Airfield and the CMAGR (R-2507N/S)

The Speed Bag Airfield is located in an area southwest of the Chocolate Mountains dominated by basin and *bajada* (coalesced alluvial fans) landforms. Vegetation in the vicinity of the Speed Bag Airfield is typical for the Colorado desert region, which is widespread creosote (*Larrea tridentata*) desert scrub that has scattered ocotillo (*Fouquieria splendens*), a variety of cactus, and expansive dry desert washes (MCAS Yuma 2014b). The specific Speed Bag Airfield and associated bivouac and vehicle parking, maintenance, and equipment areas are existing features that have a record of prior disturbance. The airfield is located within a larger inactive rock quarry site in which the ground surfaces, surface drainages, and vegetative communities have been previously and completely altered from the undisturbed natural condition (MCAS Yuma 2014b).

Cannon Air Defense Complex and BMGR-W (R-2301W)

The CADC is located in the far northwestern corner of BMGR West, near the range boundary, and approximately three miles southeast of MCAS Yuma. Natural communities present west of the Tinajas Altas Mountains, where the CADC is located, are identified as creosote-white bursage desert scrub (USAF and USMC 2013). In general, vegetation associated with this community is primarily dominated by creosotebush with woody and non-woody cacti and rosette succulents commonly occurring on rocky slopes, and seasonally present perennial grasses with some perennial forbs dominating the sparse herbaceous layer (USAF and USMC 2013). Although adjacent lands are representative of the creosote-white bursage community, the CADC is a developed training and administrative site and has complete levels of disturbance to ground surfaces, surface drainages, and vegetative communities (USAF and USMC 2013).

3.4.1.3 General Wildlife

MCAS Yuma

Wildlife habitat on MCAS Yuma is limited by the lack of native vegetation and the development and use of facilities on the installation. Apart from developed and landscaped areas, wildlife habitats are generally disturbed and devoid of native vegetation. These existing habitats are exposed to high noise levels and human activity, particularly within the project footprint. As a result, the majority of the wildlife species that occur at MCAS Yuma are widely distributed, urban-adapted species such as European starling (*Sturnus vulgaris*), mourning dove (*Zenaida macroura*), and hummingbird (*Calypte sp.*).

Speed Bag Airfield and the CMAGR (R-2507N/S)

As a consequence of the harsh climatic extremes, limited habitat resources, and regional geographic barriers in the Colorado Desert, the diversity and density of animal species in the CMAGR is typically low relative to other parts of the Sonoran and Mojave deserts (MCAS Yuma 2014). In addition, the CMAGR lacks surface or open water sources for wildlife, with the exception of ephemeral pools that develop after seasonal storm events, artificial tanks or wildlife water sources (guzzlers), and water that accumulates in *tinajas* (natural bedrock depressions).

The wildlife species expected to occur in the vicinity of the airfield based on suitable habitat include the great basin whiptail lizard (*Aspidoscelis tigris tigris*), zebra-tailed lizard (*Callisaurus draconoides*), desert horned lizard (*Phrynosoma platyrhinos*), common side blotched lizard (*Uta stansburiana*), desert iguana (*Dipsosaurus dorsalis*), sidewinder (*Crotalus cerastes*), verdin (*Auriparus flaviceps*), cactus wren (*Campylorhynchus brunneicapillus*), black-chinned sparrow (*Spizella atrogularis*), and black-tailed jackrabbit (*Lepus californicus*) (MCAS Yuma 2014b). Desert tortoise, the only federally listed wildlife species having the potential to occur within the vicinity of the Speed Bag Airfield, is discussed in Section 3.4.1.4, *Special Status Species*.

Cannon Air Defense Complex and BMGR-W (R-2301W)

Wildlife expected to occur in the vicinity of the CADC would be similar to those species described as associated with the Speed Bag Airfield. Although wildlife guzzlers are located within BMGR-West, all facilities are to the east of the CADC and positioned within the mountain ranges. The CADC is located within the management area for the flat-tailed horned lizard, a species with special status under Arizona law and managed through interagency cooperation. In addition, the range of the Sonoran pronghorn intersects the easterly flight range of the proposed operations based out of the CADC. Both species are described in Section 3.4.1.4, *Special Status Species*.

3.4.1.4 Special Status Species

For the purposes of this assessment, special status species are those that are federally listed as threatened or endangered, proposed for listing as threatened or endangered, or are candidates for such listing under the ESA. It also includes species with special status under Arizona law, as well as migratory bird species protected by the MBTA and EO 13186. Sensitive habitats include those that support federally listed or sensitive species and, therefore, are important to the conservation of these species. Three special status species have the potential to occur within the ROI. These three species occur within the BSTRC, with one species (desert tortoise) occurring within the CMAGR and two species (Sonoran pronghorn and flat-tailed horned lizard) occurring within the BMGR-West. No special status species occur within the project footprint at MCAS Yuma; therefore, the air station is not discussed further in this analysis. The regulatory status and occurrence of species listed, proposed, or designated candidates for federal protection as threatened or endangered within the BSTRC are summarized in Table 3.4-1.

Agassiz's desert tortoise (Gopherus agassizii)

On 4 August 1989, the USFWS published an emergency ruling listing the Mojave population of the desert tortoise (now referred to as Agassiz's desert tortoise) as endangered (54 FR 42270). On 2 April 1990, the USFWS determined the Mojave population of the desert tortoise to be threatened (55 FR 12178). Federal listing and detailed information about the desert tortoise range, life history, habitat, and abundance can be found in the *Federal Register* (*www.ecos.fws.gov*). On 8 February 1994, the USFWS designated approximately 6.45 million acres of critical habitat for the Mojave population of the desert tortoise in portions of California, Nevada, Arizona, and Utah; 59 FR 5820-5846). The Speed Bag Airfield and adjacent areas are not located within designated critical habitat for desert tortoise.

The desert tortoise primarily occurs in the *bajadas*, mountain foothills, and valleys of the Mojave and Colorado deserts west of the Colorado River. This species usually occurs below 4,000 feet in creosote bush, saltbush scrub habitats, tree yucca (Joshua tree and Mojave yucca) communities, and some ocotillo-creosote habitats (Brennan and Holycross 2006). Creosote bush, white bursage, tree yucca, galleta grass, and blackbrush are indicator species of overall desert tortoise habitat (Brennan and Holycross 2006; Nussear et al. 2009). Desert tortoises occupy a wide variety of soil types and substrates that include sandy dunes, rocky hillsides, and caliche caves in washes, sandy soils, and desert pavements. Desert tortoises must have suitable substrates and terrain for digging burrows (Brennan and Holycross 2006). The availability of adequate forage resources consisting of native grasses, herbaceous perennials and annuals, and cacti are important for determining habitat suitability for the desert tortoise (Brennan and Holycross 2006; Stebbins 2003; Nussear et al. 2009).

Table 3.4-1. Special Species Known to Occur or Potentially Occur in the Project Vicinity

Species	*Status Federal/State*	*Habitat/Occurrence in Project Footprint*
Flat-tailed Horned Lizard *Phrynosoma mcallii*	WSC (Arizona)	Open country, especially sandy areas, washes, floodplains, and windblown deposits below 6,000 feet. The CADC is located within a Designated Management Area for the species.
Agassiz's desert tortoise *Gopherus agassizii*	FT/ST (California)	Agassiz's desert tortoise occurs on rocky slopes in desert scrub to semi-desert grassland, as well as along washes, and extends into creosote bush flats throughout the CMAGR. The CADC is outside the known range of the species. Desert tortoise usually occurs in areas with gentle slopes but has been documented on rocky slopes of up to 40 percent. This species is known to occur throughout the CMAGR and is considered present; suitable habitat exists throughout the project site. The Speed Bag Airfield and adjacent areas are not located within designated critical habitat for desert tortoise.
Sonoran Pronghorn *Antilocapra americana sonoriensis*	FE/WSC (Arizona)	Prefers open, flat valleys. Present on the eastern portion of BMGR-West (especially the Mohawk Valley) and adjacent Cabeza Prieta National Wildlife Refuge.

Notes:

Federal Status (determined by USFWS):
FT = Federally Listed Threatened
FE = Federally Listed Endangered

State Status:
WSC = Wildlife of Special Concern (Arizona)
ST = California State-Listed Threatened (California)

BMGR-West = Barry M. Goldwater Range-West, CADC = Cannon Air Defense Complex, CMAGR = Chocolate Mountain Aerial Gunnery Range,

Agassiz's desert tortoises are known to occur throughout the CMAGR. The USFWS recovery program for desert tortoises in the Mojave and Colorado deserts includes range-wide, long-term monitoring to determine whether recovery goals are met. Ongoing studies are conducted across Recovery Units for estimating rangewide desert tortoise density using distance sampling methods (USFWS 2012). The CMAGR supports this program. In 2012, approximately 21 tortoises at a density of 6.1 per square kilometer were documented in the Chocolate Mountains Recovery Unit stratum (USFWS 2012).[8]

The western flats of the CMAGR have low suitability for desert tortoise (MCAS Yuma 2014a). In addition, the project footprint at the Speed Bag Airfield within the CMAGR has been previously disturbed by prior and ongoing military training activities and has been previously and completely altered from the undisturbed natural condition (MCAS Yuma 2014a). Limited native vegetation and a history of compaction and disturbance reduce the suitability of the site for desert tortoise.

Sonoran Pronghorn (Antilocapra americana sonoriensis)

The Sonoran pronghorn is an endangered subspecies of the American pronghorn. The following species account is drawn with minor modifications from the BMGR INRMP (USAF and USMC 2013). A full description of the species and the regulatory environment can be found at *www.ecos.fws.gov*. Habitat loss; habitat fragmentation from the development of roads, railroads, and canals; hunting (prior to the 1920s); and competition from livestock grazing have all led to a population decline for the pronghorn. The current distribution of the Sonoran pronghorn is limited to three geographically isolated populations—one in the United States and two in Mexico. Virtually the entire distribution of Sonoran pronghorn in the United

[8] Over the first six years of range-wide monitoring (2001- 2005, and 2007) tortoises were least abundant in the Northeast Mojave Recovery Unit (1 to 3.7 tortoises per square kilometer), and the highest reported densities occurred in the Upper Virgin River Recovery Unit (15 to 27 tortoises per kilometer (USFWS 2011a).

States is within four contiguous areas of federally administered land south of the Gila River (BMGR West, BMGR East, Cabeza Prieta National Wildlife Refuge, and Organ Pipe National Monument), as well as an additional population north of the Gila River associated with the Kofa National Wildlife Refuge.

The Sonoran pronghorn's distribution extends into the eastern third of BMGR-West. Its distribution to the west is apparently limited by unsatisfactory habitat conditions (USAF and USMC 2013), possibly related to increasingly sparse vegetation associated with decreased precipitation and elevation moving westward. South of the Gila River, the western limit of Sonoran pronghorn is given as the Copper and Cabeza (Prieta) Mountains on BMGR-West and Cabeza Prieta National Wildlife Refuge, respectively. The CADC is located approximately 30 miles to the west of the western range limit of the species. However, some areas underlying restricted airspace (R-2301W) associated with BMGR-W intersect the western range boundary of the species.

Flat-Tailed Horned Lizard (Phrynosoma mcallii)

The flat-tailed horned lizard was proposed for listing as a threatened species in 1993 (58 FR 62624) and subsequently the subject of numerous regulatory actions withdrawing and restoring "candidate" status for the species. In 2011, the USFWS ultimately withdrew the proposed rule removing the species from consideration for protection under the ESA (76 FR 14210). However, the flat-tailed horn lizard is currently managed under an Interagency Conservation Agreement (1997) and subsequent Rangewide Management Strategy. State and federal agencies that own or manage land or natural resources within the range of the flat-tailed horned lizard are participating agencies in the Conservation Agreement and the Rangewide Management Strategy (last revised 2003). MCAS Yuma, Naval Air Facility El Centro, and Naval Facilities Engineering Command Southwest are participants (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). Five Management Areas have been designated, four in California and one in Arizona. Of these, the Yuma Desert Management Area lies to the south and east of MCAS Yuma and extends into BMGR-West, and includes the CADC.

The complete natural history and habitat description is summarized in the Flat-tailed Horned Lizard Rangewide Management Strategy (2003). The flat-tailed horned lizard is endemic to the Salton Trough and the region north of the Gulf of California in Mexico and the United States. Typical habitat can be characterized by sandy flats and low relief features with packed, fine sand or desert pavement surfaces overlain with loose, fine sand (Turner et al. 1980). Although the existing facilities and site of the CADC is primarily disturbed and developed, it is located within what would otherwise be considered suitable habitat and adjacent to undeveloped areas that likely support the species.

Migratory Bird Treaty Act

The MBTA is an international agreement among the United States, Canada, and Mexico that protects designated species of birds. Specifically, the MBTA controls the taking of these birds, their nests, eggs, parts, or products. Virtually all birds are protected under the MBTA, with only a few exceptions, such as the California quail. A complete list of all species of all migratory birds protected by the MBTA is in the *Federal Register* (50 CFR 10.13). EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, directs federal agencies to take actions to further implement the MBTA. A Memorandum of Understanding (MOU) between the DoD and the USFWS was developed under EO 13186 to promote the conservation of migratory birds. A total of 14 bird species designated a Species of Management Concern under the MBTA have the potential to occur in the project vicinity and are shown in Table 3.4-2 (USFWS 2011b).

Table 3.4-2. Avian Species of Concern under the MBTA Known to Occur or Potentially Occur in the Region of Influence

Common Name	*Scientific Name*
Vultures, Hawks, Falcons	
Peregrine falcon	*Falco peregrinus*
Golden eagle	*Aquila chrysaetos*
Pigeons	
White-winged dove	*Zenaida asiatica*
Mourning dove	*Zenaida macroura*
Swifts, Hummingbirds	
Costa's hummingbird	*Calypte costae*
Allen's hummingbird	*Selasphorus sasin*
Woodpeckers	
Gilded flicker	*Colaptes chrysoides*
Gila woodpecker	*Melanerpes uropygialis*
Shrikes, Vireos	
Loggerhead shrike	*Lanius ludovicianus*
Larks, Wrens, Gnatcatchers	
Verdin	*Auriparus flaviceps*
Cactus wren	*Campylorhynchus brunneicapillus*
Flycatchers	
Phainopepla	*Phainopepla nitens*
Sparrows	
Sage sparrow	*Amphispiza belli*
Black-chinned sparrow	*Spizella atrogularis*

3.4.2 Environmental Consequences

Several types of impacts on biological resources could result from the proposed action, including permanent and temporary impacts, as well as direct and indirect impacts. The definitions of the four types of impacts to biological resources are described below.

- *Direct Impact.* Any alteration, disturbance, or destruction of biological resources (specifically through vegetation/habitat removal) that would result from project-related activities and occur at the same time and place as the action is considered a direct effect.
- *Indirect Impact.* As a result of project-related activities, biological resources may also be impacted in an indirect manner. Indirect impacts are defined as those impacts that are caused by, or would result from, a proposed project and are later in time, but are still reasonably certain to occur.
- *Temporary Impact.* Any impact to biological resources that is considered reversible can be viewed as temporary. Examples include the generation of fugitive dust during construction or the removal of plant communities for construction activities and subsequent revegetation of the affected area.
- *Permanent Impact.* Any impacts that result in the irreversible removal of biological resources are considered permanent. Examples include construction a building or permanent road on an area containing biological resources.

3.4.2.1 Alternative 1

Vegetation

The Alternative 1 footprint at MCAS Yuma is developed and does not support any natural resources. As a result, no impacts to vegetation would occur.

At the Speed Bag Airfield, habitat within the Alternative 1 footprint is moderately to completely disturbed as result of prior uses (former rock quarry site). If native vegetation grows or exists within the disturbed areas, individual plants could be crushed or destroyed by vehicles, bivouacking or other activities associated with UAS operations. The magnitude of disturbance would be on the order of a few to several individual plants, if any. As a result, impacts to vegetation would not be significant.

Similar to impacts associated with the Speed Bag Airfield, the CADC is a disturbed/developed facility and subject to ongoing administrative and training uses. If native vegetation grows or exists within or adjacent to areas proposed for development, individual plants could be crushed or removed during construction activities; however, the magnitude of disturbance would be on the order of a few to several individual plants, if any. VMU-1 operations at the CADC would not be expected to result in impacts to vegetation. As a result, impacts to vegetation would not be significant.

General Wildlife

Wildlife habitat is limited in the Alternative 1 footprint at MCAS Yuma by the lack of native vegetation and the development and use of existing military facilities. Apart from developed and landscaped areas, wildlife habitats at MCAS Yuma are generally disturbed and devoid of native vegetation. During construction activities at MCAS Yuma, any urban-adapted wildlife in the vicinity of the project footprint would be subjected to temporary increases in noise and activity associated with construction of the facilities. Urban-adapted wildlife sensitive to construction related activity would disperse and seek shelter in nearby areas. Because operations of the new facilities would be comparable to existing operations throughout MCAS Yuma, wildlife would be expected to habituate quickly. As a result, impacts to wildlife at MCAS Yuma would not be significant.

The Speed Bag Airfield is a disturbed area surrounded with limited to no vegetation and surrounded by thousands of acres of undeveloped desert habitat. No construction would occur at the Speed Bag Airfield. Incorporating the operation of VMU-1 squadrons into the existing training environment at the Speed Bag Airfield and the associated airspace at CMAGR (R-2507N/S) would only nominally increase military activity at this location. Any wildlife that exists in the vicinity of the airfield and underlying the restricted airspace within R-2507N/S has already habituated to current training. Proposed operations associated with Alternative 1 would not reduce the quality of the existing disturbed habitat or materially change activity or noise levels (see Section 3.3, *Noise*). Therefore, impacts to wildlife at the Speed Bag Airfield or within the CMAGR (R-2507N/S) would not be significant.

Alternative 1 would construct new facilities at the CADC. Impacts to wildlife species as a result of construction activities would be the same as those described above for MCAS Yuma. Any wildlife in the vicinity of proposed construction areas would be subjected to temporary increases in noise and activity associated with construction of the facilities. Wildlife sensitive to the construction-related activity would disperse and likely seek refuge in the adjacent and abundant undeveloped desert habitat. VMU-1 operations at the CADC and BMGR-W (R-2301W) would be comparable to those described for the CMAGR in terms of impacts to wildlife. Any wildlife that exists in the vicinity of the CADC and underlying the restricted airspace within R-2301W has already habituated to current training activities. Proposed operations associated with Alternative 1 would not reduce the quality of the existing disturbed habitat or materially change activity or noise levels (see Section 3.3, *Noise*). Therefore, impacts to wildlife at the CADC and underlying the restricted airspace in BMGR-W (R-2301W) would not be significant.

Special Status Species

Agassiz's Desert Tortoise

Alternative 1 has the potential to impact desert tortoise due to VMU-1 operations within the CMAGR. The primary causes of injury or mortality to desert tortoise associated with Alternative 1 would include direct impact from ground vehicles. Ground vehicles that use existing access roads may kill or injure tortoises; however, the level of use is not expected to substantially increase beyond currently authorized levels and all activity would occur within the existing road network at the CMAGR. Speed limits of 25 miles per hour would be strictly adhered to and off-road activities would be prohibited, except at the identified locations (bivouac and vehicle parking, maintenance, equipment areas adjacent to the Speed Bag Airfield) (Special Conservation Measure 3), thereby reducing the potential for vehicle collisions. Tortoises encountered along the existing access roads would be allowed to move away from harm's way unaided. In addition, vehicle inspections would be conducted before moving any parked equipment to ensure that no tortoises would be run-over (Special Conservation Measure 3). Any tortoises encountered would be allowed to move away unaided or the Tortoise Management Representative, or qualified appointee(s), would be contacted to remove the animal from harm's way.

Habitat within the proposed vehicle parking, maintenance, and equipment storage, and bivouac areas are moderately to completely disturbed as result of prior uses (former rock quarry site). Although unlikely, if tortoises or burrows are encountered within these areas, then operational activities in these locations could damage or kill individuals or otherwise alter life processes. Ground operations associated with VMU-1 have the potential to disturb surface materials at undeveloped areas adjacent to the Speed Bag Airfield and increase the potential for weed establishment. Further, removal of native plants, if present, would increase exposure for individual tortoises, if present, which could become more vulnerable to predation (particularly those species attracted to human activity such as common ravens [*Corvus corax*] or coyotes [*Canis latrans*]) and thermal stress in the absence of shrub cover. Additional existing requirements (Special Conservation Measure 3) include obligations that require site maintenance to limit the possibility for predation by ravens or other wildlife, and reporting and notification measures, which would further minimize impacts on the desert tortoise.

Alternative 1 would introduce additional aircraft-related noise into the operation areas within 50 to 65 nautical miles of the Speed Bag Airfield (the ranges of the MQ-21A and RQ-7B respectively). However, the most noticeable noise would be concentrated immediately adjacent to the airfield and would be associated with take-off and landing operations, which represent approximately 1 percent of the total training time. The current time-averaged noise levels at the Speed Bag Airfield are 65 dB and maximum instantaneous noise attributed to take-off and landing operations would be 64 and 71 dB for the MQ-21A and RQ-7B respectively. These short-term (on the order of minutes), instantaneous noise increases would be less than any other aircraft that train within the CMAGR. At 3,000 feet or above (99 percent of the flight) noise resulting from Alternative 1 would be substantially below baseline noise levels at the Speed Bag Airfield and would be imperceptible or slightly perceptible. As a result, noise effects on desert tortoise would not be significant.

Special Conservation Measure 3. Direct VMU-1 Operations by Existing and Pending Biological Opinions for Training Activities in the BSTRC. Training and operations based out of the BSTRC will be directed by the existing CMAGR BO issued to MCAS Yuma (1-6-95-F-40), dated April 18, 1996; the project-consultation for VMU-1 operations within the CMAGR, which summarizes and specifies existing rangewide requirements; and the pending issuance of a BO for training and operations within BMGR-

West. These documents include speed limits and restrictions on off-road travel, flight restrictions and minimum altitude requirements, notification and reporting procedures, and site maintenance responsibilities, among others.

Sonoran Pronghorn

MCAS Yuma, the Speed Bag Airfield, and the CADC are all outside of the known range of the Sonoran pronghorn. However, VMU-1 operations within BMGR-W (R-2301W) could occur in airspace over the known range for the species. Based on the distance from the CADC, any operations over Sonoran pronghorn range would likely fly at 3,000 feet or higher and noise introduced by the aircraft would be below baseline noise levels for BMGR-West and not likely perceptible by wildlife on the ground. Implementation of Special Conservation Measure 3 (*Direct VMU-1 Operations by Existing and Pending BOs for Training Activities in the BSTRC*) would further minimize the low likelihood of impacts to Sonoran pronghorn. As a result, noise effects on Sonoran pronghorn would not be significant.

Flat-tailed Horned Lizard

The CADC and part of the proposed new communication line between MCAS Yuma and the CADC are located within the Yuma Desert Management Area for the flat-tailed horned lizard. Military activities, among others, are described as threats to the species (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). Construction at the CADC would be concentrated in a previously disturbed area inside the fenced complex and existing roads would be used to access the site. As a result, no off-road vehicle use is expected and ground disturbance would be minimized in areas where the species could occur. Because a portion of the Alternative 1 footprint, including part of the proposed communication line, lies within the Yuma Desert Flat-tailed Horned Lizard Management Area, a flat-tailed horned lizard monitor must be present during construction activities at the CADC and any other areas where construction activities would potentially disturb suitable habitat unless the site has been cleared and a flat-tailed horned lizard perimeter barrier fence erected (Special Conservation Measure 4) in compliance with the 2003 Flat-tailed Horned Lizard Rangewide Management Strategy. Proposed operations at the CADC would not reduce the quality of the existing disturbed habitat or materially change activity or noise levels (see Section 3.3, *Noise*). No other components of Alternative 1 would result in impacts to the flat-tailed horned lizard or its habitat. Therefore, with implementation of Special Conservation Measure 4 (*Flat-tail Horned Lizard Monitoring*), impacts would not be significant.

Special Conservation Measure 4. Flat-tailed Horned Lizard Monitoring. Proposed ground-disturbing project components that are located within a Management Area for flat-tailed horned lizard will comply with Mitigation Measures described in the 2003 Flat-tailed Horned Lizard Rangewide Management Strategy. More specifically, a flat-tailed horned lizard monitor must be present during construction activities at and in support of the CADC (including the portions of the proposed communication from MCAS Yuma to the CADC that would occur within the existing Management Area) unless the site(s) have been cleared and a flat-tailed horned lizard perimeter barrier fence erected.

3.4.2.2 Alternative 2

Alternative 2 would be similar to Alternative 1, except the ground support facilities would be built at the CADC instead of the old van pad at MCAS Yuma, as described for Alternative 1. Therefore, construction activities within the Yuma Desert Management Area for the flat-tailed horned lizard would be of longer duration than under Alternative 1. VMU-1 operations under Alternative 2 would be the same as described for Alternative 1. Due to the disturbed nature of the Alternative 2 footprint at MCAS Yuma and the CADC, and the ongoing operations and training that occur, the small change in footprint at these facilities as compared to Alternative 1 would not increase the magnitude of the impact in any quantifiable way. Similar to Alternative 1, with the incorporation of Special Conservation Measure 3 (*Direct VMU-1*

Operations by Existing and Pending BOs for Training Activities in the BSTRC) and Special Conservation Measure 4 (*Flat-tail Horned Lizard Monitoring*), impacts on biological resources would not be significant.

3.4.2.3 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma and would remain at MCAGCC. As a result, no construction at MCAS Yuma or the CADC would be required, and proposed VMU-1 operations would not occur. Therefore, no impacts on biological resources would occur.

3.5 Cultural Resources

Cultural resources is an inclusive label used to encompass historic properties or traditional cultural properties and sacred sites valued by traditional communities (often, but not necessarily, Native American groups). Cultural resources are finite, nonrenewable resources, whose salient characteristics are easily diminished by physical disturbance; certain types of cultural resources also may be negatively affected by visual, auditory, and atmospheric intrusions.

Historic properties are defined in the federal regulations outlining Section 106 of the NHPA, as amended (54 USC §300101 *et seq.*), 36 CFR 800, as prehistoric and historic sites, buildings, structures, districts, or objects listed or eligible for listing on the National Register of Historic Places (NRHP), as well as artifacts, records, and remains related to such properties. Compliance with Section 106 of the NHPA, which directs federal agencies to take into account the effect of a federal undertaking on a historic property, is outlined in the Advisory Council on Historic Preservation’s regulations, *Protection of Historic Properties* (36 CFR Part 800). A traditional cultural property can be defined generally as one that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are rooted in that community’s history and are important in maintaining the continuing cultural identity of the community.

In order to be eligible for the NRHP, a property must possess integrity of location, design, setting, workmanship, feeling, and association, and meet the criteria for evaluation in at least one area of significance as defined by the *Secretary of the Interior’s Standards for Evaluation* (36 CFR 60):

a. associated with events that have made a significant contribution to the broad patterns of American history; or

b. associated with the lives of persons significant in our past; or

c. embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or

d. have yielded, or may likely yield, information important in prehistory or history.

Once the NRHP-eligibility of the properties has been determined, the federal agency must assess the effects that the undertaking or proposed action may have on any historic properties (i.e., finding of effect). Through consultation with federally recognized tribes who assert ancestral ties to the area, the federal agency attempts to identify any traditional cultural properties and sacred sites that may be affected by the undertaking. The agency then seeks concurrence from the State Historic Preservation Officer (SHPO) on their determinations and findings.

3.5.1 Affected Environment

The affected environment for cultural resources is based on the establishment of the area of potential effects (APE) of an undertaking, through consultation with SHPO. An APE is defined in 36 CFR 800.16(d) as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist". The APE, and therefore the affected environment, for the proposed action includes the construction, renovation, and demolition footprint at MCAS Yuma and the CADC, as well as all areas within the BSTRC with potential ground disturbance from proposed operations. In particular, the APE for proposed operations includes the Speed Bag Airfield, an existing improved runway in the CMAGR along with an adjacent maintenance, vehicle, and equipment area (approximately 1 acre) and a nearby bivouac area (approximately 4.5 acre). The affected environment for the proposed action includes buffers around the project components to provide a limit of potential ground disturbance.

3.5.1.1 Prehistoric and Historic Setting

The following discussion of prehistory and history of the Sonoran Desert region of southwestern Arizona is condensed from the overview in the Barry M. Goldwater Range Integrated Cultural Resources Management Plan – Part I (56th Range Management Office [RMO] and MCAS Yuma 2008), the Phase I Cultural Resources Survey for the Proposed Consolidated Club at Marine Corps Air Station Yuma (Apple 1996) and site forms for two archaeological sites. The brief outline of the cultural context for the CMAGR in California is drawn from Schaefer and Dalope's 2011 survey (Schaefer and Dalope 2011).

Regional Prehistory

The regional prehistory is divided into the Paleo-Indian (or Early), Archaic, and Late Prehistoric periods. The Paleo-Indian period ranges from approximately 12,000 to 5000 BC. This period is represented by an artifact assemblage known as the San Dieguito complex that consists almost entirely of flaked stone tools associated with a hunting and gathering economy, including the hunting of big game. Sites typically are located on terraces near water bodies such as washes and now extinct Pleistocene Lakes (Apple 1996, MCAS Yuma 2010).

The Archaic period ranges from 5000 BC to AD 700. This period is generally characterized as a time when regional adaptations became well established within diverse local conditions, but is not well represented in the project region. Potential causes for the paucity of Archaic-period sites in the region include climatic conditions unfavorable to human exploitation and occupation, or destruction or obscuration of sites by later natural or human processes.

The Late Prehistoric period is represented by the Patayan I cultural complex, which dates roughly from AD 700 to the historic period. This period is characterized by marked changes in human settlement patterns, economic system, and the artifact assemblage. Artifacts typically encountered from this period include paddle and anvil ceramics and small projectile points indicative of adoption of the bow and arrow. Subsistence included floodplain horticulture featuring maize, beans, squash, and other crops (Schaefer and Dalope 2011). During the Patayan II Phase, Lake Cahuilla (950 AD) covered a large amount of the nearby Imperial Valley in California. Approximately 500 AD, the lake began to recede and a third phase began; Patayan III. Traits of Patayan II continued; however, kinship systems, rock art, and trading networks became increasingly complex (Apple 1996, 56th RMO and MCAS Yuma 2008).

History of the MCAS Yuma Area (including the CADC)

As early as 1539, the Spanish began to explore parts of the Southwest, and were the first Europeans to venture into the area around the lower Colorado River. Spanish exploration for the next 200 years was intermittent in this area as it was considered remote and difficult to access. A transportation route called Camino del Diablo, or the Devil's Highway, followed various routes throughout the course of history that stretched between Mexico and California. This route would be used by Melchior Diaz in 1540, and later by Father Eusebio Kino in 1699 and 1701 as he traveled to establish missions in the Southwest (Arizona State Parks 1976, Apple 1996, MCAS Yuma 2010).

In the late 1700s, various Spanish expeditions led by Father Francisco Garcés (1771), Pedro Fages (1772), and Captain Juan Bautista de Anza (1774) established overland routes to travel between missions, thus, opening up the region to travel through the area that is now Yuma. Two missions were established near the confluence of the Gila and Colorado rivers. Attacks on these missions by the Quechan caused the Spanish to abandon their overland routes. Development in the Sonoran Desert was largely dependent on transportation and water. With the transfer of portions of Mexico to the United States and the discovery of gold in California in 1848, an influx of immigrants from the east into California led to the establishment of wagon roads, a mail route, and a stage line along Anza's route (Apple 1996, MCAS Yuma 2010).

When gold and silver were discovered along the Colorado River and throughout the western portions of Arizona and with the influx of people and the demand for supplies, Yuma became a hub for supplies from ships and wagons that would load the supplies and bring them to smaller mining camps. The Camino del Diablo route reopened around the 1840s and 1850s to accommodate the rush of people searching for gold. The route was unsafe, causing people to start using the Santa Cruz-Gila River Route. Transportation to and through the area advanced further with the 1872 construction of the Southern Pacific Railroad from Los Angeles to present-day Indio and Yuma, and the 1881 linking of the Southern Pacific and the Atchison, Topeka, and Santa Fe railroads (Arizona State Parks 1976, Apple 1996, MCAS Yuma 2010).

MCAS Yuma began as a municipal airfield, Fly Field, and continued as such for over 10 years until World War II. Fly Field was taken over by the Army Air Force to develop an advanced flying school for training purposes. The field was renamed Yuma Army Air Base. The increase in military activity in the region began to strengthen regional economies until after World War II when Yuma was declared surplus. Most of the buildings were sold and many people moved into the neighboring towns. The airfield was reopened to civilian flights. In 1951, during the Cold War, Yuma Air Base was reactivated. The base was renamed after reactivation in 1956 to Vincent Air Force Base; and in 1959 to Marine Corps Auxiliary Air Station. MCAS Yuma continues to host military training and civilian flights out of the airfield (Apple 1996, MCAS Yuma 2010, MCAS Yuma 2015b).

History of the CMAGR Area

As early as 1539, the Spanish began to explore parts of California, and were the first Europeans to venture into the region surrounding the Chocolate Mountain Range. Spanish exploration for the next 200 years was intermittent in this area as California was considered remote and difficult to access. In the late 1700s, various Spanish expeditions led by Father Francisco Garcés (1771), Pedro Fages (1772), and Captain Juan Bautista de Anza (1774) established overland routes, opening up the region to travel, but the desert conditions were still too harsh for Euro-American settlement.

Development in the Colorado Desert was largely dependent on transportation and water. With the discovery of gold in California in 1848, an influx of immigrants from the east into California led to the establishment of wagon roads, a mail route, and a stage line along de Anza's route. By 1862, a route to Yuma from Dos Palmas along the east side of the Salton Basin ran south of the Chocolate Mountains, and an overland stage route from San Bernardino to La Paz skirted the northern edges of the Chocolate Mountains. By 1868, the Castle Dome cutoff route through the Chocolate Mountains was in use. Transportation to and through the area advanced further with the 1872 construction of the Southern Pacific Railroad from Los Angeles to present-day Indio and Yuma, and the 1881 linking of the Southern Pacific and the Atchison, Topeka, and Santa Fe railroads. The railroads provided quick and easy access to the Chocolate Mountains region for mining, which was at its peak between 1890 and 1910, and again during the depression era of the 1930s.

A canal along the old Alamo River channel was completed in 1901, carrying water from the Colorado River to what was then renamed the Imperial Valley, providing a viable water source to support agricultural development and settlement. Populations increased in the area, and El Centro was established in 1905. The Salton Sea was inadvertently created when attempts to cut a new channel to relieve silting of the Alamo Canal led to the accidental flow of the Colorado River into the Imperial Valley between 1904 and 1907.

Military training use of the CMAGR region began during World War II when General George S. Patton, Jr., established the Desert Training Center/California-Arizona Maneuver Area, encompassing 18,000 square miles in southeastern California, western Arizona, and southern Nevada, for training in desert survival and warfare. In addition to the Army's use of the area, the Navy established Camp Dunlap as a Marine artillery training base, which expanded to include portions of the Chocolate Mountains and later became the CMAGR. The CMAGR land and airspace have served as a bombing range since World War II.

3.5.1.2 Cultural Resources within the Affected Environment

The APE for the proposed action includes the construction, renovation, and demolition footprint at MCAS Yuma and the CADC, as well as all areas within the BSTRC with potential ground disturbance. MCAS Yuma staff conducted a record search for the project footprint at MCAS Yuma and the CADC to determine if there were any historic properties that could be affected by the proposed action. An additional record search at the South Coastal Information Center was conducted for the Speed Bag Airfield at the CMAGR in July 2015. The results of this analysis are provided below.

Traditional Cultural Resources

There are no known traditional cultural resources within the APE. MCAS Yuma is currently consulting with interested tribal governments on the proposed action. The Final EA will summarize the results of these consultation efforts.

Archaeological Resources

MCAS Yuma. A records search, conducted by MCAS Yuma staff, identified four sites within a 1-mile radius of the APE, two of which are located on MCAS Yuma. The four sites include a quartz excavation site, a historic debris scatter, historic State Route 80, and a World War II railroad spur. None of the sites are located within or immediately adjacent to the APE and, therefore, they are not discussed further. Additionally, the air station is underlain by native soils that have been disturbed to the point that a survey would not produce any intact evidence of previous use.

CADC. An archaeological inventory and survey of the CADC conducted by Carrico and Chase (1997) did not identify any prehistoric or historic sites, nor was there much likelihood of undetected subsurface deposits (Carrico and Chase 1997). The SHPO concurred with the finding of the inventory report that no historic properties are located at the CADC (SHPO 1998).

New Communication Line between MCAS Yuma and the CADC. Lawson (2006) conducted a cultural resources inventory of the proposed route for the new communications line that would run from MCAS Yuma to the CADC. Three historic-period features are recorded along the route: two irrigation canals from 1942 (AZ X:6:82, AZ X:6:83) and the remains of a World War II Gunnery Training Range (AZ X:6:81). All three were determined eligible for the NRHP by the Arizona SHPO in 2003 (Lawson 2006).

Speed Bag Airfield and Associated Facilities (CMAGR). Records searches conducted by MCAS Yuma staff as well as one with the South Coastal Information Center identified one site within a 1-mile radius of the APE. This site, P-13-011464/CA-IMP-10383, is composed of a historic transportation route, the old Niland-Blythe Road (Schaefer et al. 2009). The road is not located within or immediately adjacent to the APE and, therefore, it is not discussed further. Additionally, the Speed Bag Airfield and associated facilities are located in a highly disturbed area, and additional surveys would not produce any intact evidence of previous use.

Historic Buildings and Structures

Of the buildings and structures at MCAS Yuma that could be affected by the proposed action, Buildings 98 and 101 were determined not eligible for listing in the NRHP with SHPO concurrence (SHPO 2010, 2015); and Building 102 is too recent to be considered for listing. No historic buildings or structures are located in the APE related to the CADC or the Speed Bag Airfield.

3.5.2 Environmental Consequences

The regulations implementing Section 106 of the NHPA require that federal agencies take into account the effects (impacts) of their undertakings (proposed actions) on historic properties (cultural resources that are eligible for nomination to the NRHP). Impacts on cultural resources are considered significant if a historic property, as defined in 36 CFR 60.4, would be physically damaged or altered, would be isolated from the context considered significant, or would be affected by project elements that would be out of character with the significant property or its setting.

3.5.2.1 Alternative 1

It is anticipated that no buildings outside of the construction and demolition footprint (Alternative 1 footprint) would be directly or indirectly impacted by the proposed action; visually, aesthetically, or otherwise. The demolition and construction would be completed in a manner that is consistent with other recent facility construction projects, and would be visually compatible with existing military development in the project vicinity.

The only historic properties recorded in the APE are the remains of a World War II Gunnery Training Range (AZ X:6:81) and two irrigation canals from 1942 (AZ X:6:82, AZ X:6:83) that cross the proposed route for the new communication line that would run between MCAS Yuma and the CADC. The closest existing feature of the recorded World War II Gunnery Training Range is located about 1,000 feet to the south of the proposed construction corridor; therefore, proposed installation of the new communication line would not affect this historic property. Because the communication line would be installed under the irrigation canals with an angle bore, the canals would not be affected by this process.

Although nothing in the literature review and consultation efforts indicates a potential for subsurface deposits, the possibility for unanticipated discoveries exists. Potential impacts to possible post-review discoveries would be reduced by implementing Special Conservation Measure 5 (*Post Review Discovery Procedures*). Therefore, no significant impacts on cultural resources would occur.

Special Conservation Measure 5. Post Review Discovery Procedures. While not anticipated, in the event that previously unrecorded archaeological resources, cultural items, or human remains are encountered during ground disturbing activities, MCAS Yuma would manage these resources in accordance with the NHPA and other federal laws and regulations, Marine Corps and DoD regulations and instructions and orders, and DoD American Indian and Alaska Native Policy.

The Marine Corps is currently seeking concurrence from the SHPO on their findings, and the results will be provided in the Final EA.

3.5.2.2 Alternative 2

Alternative 2 would be similar to Alternative 1, except the ground support facilities would be built at the CADC instead of the old van pad at MCAS Yuma. As with Alternative 1, the only historic properties recorded within the Alternative 2 footprint are the remains of a World War II Gunnery Training Range (AZ X:6:81) and two irrigation canals from 1942 (AZ X:6:82, AZ X:6:83). However, none of these would be affected by proposed construction of the new communication line, as described above. Similar to Alternative 1, potential impacts to possible post-review discoveries would be reduced by implementing Special Conservation Measure 5 (*Post Review Discovery Procedures*). Therefore, no significant impacts on cultural resources would occur.

3.5.2.3 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma and would remain at MCAGCC. Existing cultural resources conditions would remain as described in Section 3.5.1, *Affected Environment*. Therefore, no impacts on cultural resources would occur.

3.6 Hazardous Materials and Waste

The following section describes the existing hazardous materials and waste conditions in the project region and potential impacts that would occur from the proposed action. Relocation of aircraft to MCAS Yuma would have negligible impacts on hazardous materials and waste at or near MCAGCC and, therefore, this is not addressed further.

3.6.1 Affected Environment

The affected environment for hazardous materials and waste is related to the past and present hazardous materials use and hazardous waste disposal practices within and adjacent to the project footprint. Hazardous materials are defined as chemical substances that pose a substantial hazard to human health or the environment. In general, these materials pose hazards because of their quantity, concentration, physical, chemical, or infectious characteristics. Hazardous materials can be found in the form of a solid, liquid, semi-solid, or contained gaseous material that alone or in combination could 1) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or 2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Hazardous waste is regulated under the Resource Conservation and Recovery Act (RCRA), which provides the USEPA with authority to control hazardous waste from "cradle-to-grave", including its generation, transportation, treatment, storage, and disposal. RCRA identifies hazardous sites with lists of specific wastes, and categorizes wastes that exhibit a specific characteristic (e.g., ignitable, corrosive, reactive, or toxic) in accordance with RCRA-specific definitions. The USEPA uses the term "hazardous substance" for chemicals that, if released into the environment above a certain amount, must be reported and, depending on the threat to the environment, federal involvement in handling the incident can be authorized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Activities at MCAS Yuma and the BSTRC require the use and storage of a variety of hazardous materials and wastes, including flammable and combustible liquids, acids, corrosives, caustics, compressed gases, solvents, paints, paint thinners, and various other petroleum oils and lubricants. Hazardous Waste Accumulation Areas are used at MCAS Yuma to store hazardous waste for up to 90 days prior to being transported off-station. Hazardous materials are stored in various locations, including storage tanks, flammable storage lockers, shelves, and materials storage warehouses. The CADC is operated by MCAS Yuma and is therefore subject to the same hazardous waste storage accumulation and disposal protocol. There is only one 180-day Hazardous Waste Accumulation Area located on the CMAGR, at the Camp Billy Machen Navy SEAL training compound. No satellite accumulation areas for hazardous wastes are on the CMAGR. Hazardous materials storage and disposal at MCAS Yuma and the BSTRC is regulated by Navy/Marine Corps (NAVMC) Directive 5800.1, Chapter 17, *Hazardous Materials Control*, and MCAS Yuma *Hazardous Waste Management Plan* (USMC 1997, DoN 2013).

Asbestos-containing materials (ACMs) could be present in buildings (i.e., Buildings 98, 101, and 102) or other facilities at MCAS Yuma that would be demolished as part of the proposed action. The USEPA has classified ACMs as a hazardous air pollutant, in accordance with Section 112 of the Clean Air Act (USEPA 2002). Lead-based paint could also be present in buildings or other facilities proposed for demolition under the proposed action.

3.6.1.1 Installation Restoration Program Sites

In the 1980s, the DoD developed the Installation Restoration Program (IRP) to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous materials spills. The DoD instructed each branch of the armed services to comply with the requirements of CERCLA. In response, the IRP was developed by the DoD to remediate contamination at military facilities caused by past use, storage, handling, and disposal of hazardous and other potential toxic substances, as required by CERCLA Section 121. The DoD's clean-up program identifies, assesses, characterizes, and cleans up or manages any contamination. The IRP also handles removal and remediation of sites under RCRA.

IRP sites that have contaminants may or may not cause short- or long-term health effects. The risk of health effects is dependent upon methods of exposure (touching, breathing, or ingesting), time of exposure, and amount of material that a person was exposed to. The risk of health effects can also be dependent upon age, gender, genetics, life style, and a person's health. Thus, while a contaminant may have potential effects, it may not necessarily lead to any type of negative health effect. Standards for exposure risks are based on the above factors and what the projected land use would be (e.g., residential, commercial, industrial). Residential health standards are typically more stringent than commercial/industrial standards. The project footprint falls under the commercial/industrial category.

The USEPA classifies sites with a Hazard Ranking System, and those sites with the potential to pose an ecological or health risk are placed on the National Priorities List. MCAS Yuma is on the National Priorities List and as such, there is a Federal Facilities Agreement to facilitate clean-up of the IRP sites. IRP sites on National Priorities List locations are classified as Operable Units (OUs) and sub classified as CERCLA Areas of Concern (CAOCs). On MCAS Yuma, there are two OUs: OU-1 is the groundwater contamination plume under the station; and OU-2 consists of several surface contamination sites. OU-1 is located outside of and approximately 900 feet north of the project footprint at MCAS Yuma, while a portion of OU-2 underlies the project footprint. Neither OU-1 nor OU-2 underlies the proposed communication line corridor or the CADC. Similarly, no other IRP sites or other known hazardous waste sites are present beneath the proposed communication line corridor, the CADC, or the Speed Bag Airfield (DoN 2013, MCAS Yuma 2014a, ADEQ 2015b).

Operable Unit 2

A Remedial Investigation performed on OU-2 in 1996 revealed there are 18 soil contamination sites, all of which have been addressed as part of the IRP. Of the 18 soil contamination sites, 12 have been determined to require no further action, three sites required institutional controls, and three sites required cleanup, which has been completed (MCAS Yuma 1996; USEPA 2015). These IRP sites are also referred to as CAOCs. One CAOC (IRP Site 1 - Flightline) associated with OU-2 underlies a portion of the project footprint (Figure 3.6-1). During the 1940s, aircraft maintenance was reportedly performed on the runways, taxiways, and aprons. It was routine at the time to drain waste aircraft oil on the ground where the aircraft were parked. Waste oil was also used for dust suppression along runways, adjacent to hangars and at the edges of taxiways and aprons. Other contaminants made up 5 to 15 percent of the oils used for dust control and include the following: JP-4, JP-5, AVGAS, methyl ethyl ketone, paint stripper (containing methylene chloride), carbon tetrachloride, Freon, paint thinner, and carburetor cleaner. This practice continued from the 1950s to 1996, when the Remedial Investigation was published (MCAS Yuma 1996). Institutional controls, which have been implemented for IRP Site 1/CAOC 1, restrict land use at the location to industrial or commercial use. No residential uses are allowed at the site. The USEPA and ADEQ must be notified and their approval must be obtained before commencing construction within IRP Site 1/CAOC 1 (MCAS Yuma 2014a).

OU-2 does not underlie the CADC (Britain, J., personal communication 2015), proposed communication line corridor, or the Speed Bag Airfield (MCAS Yuma 2014a).

3.6.1.2 Munitions Response Program Sites

The DoN's Munitions Response Program (MRP) involves response actions, including investigation and removal actions, to address the explosives safety, human health, or environmental risks presented by unexploded ordnance, discarded military munitions, or munitions constituents. Preliminary Assessments have been performed for a number of suspected MRP sites on MCAS Yuma.

The Preliminary Assessment is an integral part of the MRP to identify, assess and respond to Munitions and Explosives of Concern, munitions constituents, and other incidental contaminants at other than operational ranges (e.g., closed, transferred and transferring ranges). The MRP was established in 2001 to manage the environmental and health and safety issues presented by Munitions and Explosives of Concern; these issues are an element of the Defense Environmental Restoration Program. The MRP adheres to the CERCLA process.

Portions of one MRP site (MRP Site 4) overlap with the MCAS Yuma project footprint (Figure 3.6-1). The other MRP sites at MCAS Yuma are not located within the project footprint at MCAS Yuma and, therefore, will not be discussed further. Similarly, no MRP sites underlie the proposed communication line corridor, the CADC, or the Speed Bag Airfield (DoN 2013).

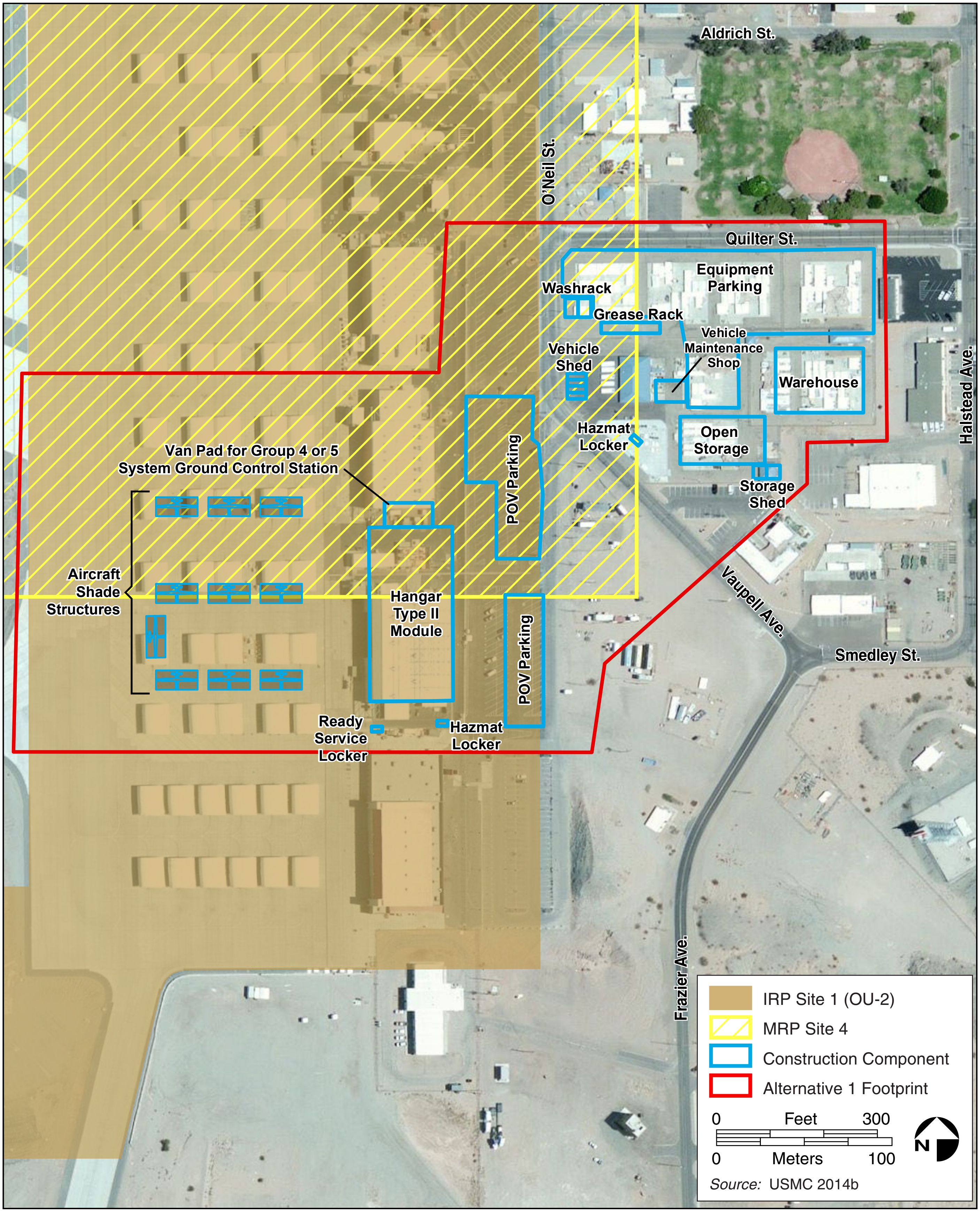

Figure 3.6-1. Installation Restoration and Munitions Response Program Sites

MRP Site 4

MRP Site 4 supported a small arms range (Arizona Militia Target Range), which was established in 1910 and abandoned before 1942. No fixed firing facilities were established on this 240-acre range. Most of this site has been developed as part of the current runway and aircraft parking apron (DoN 2010). The primary hazard at this site is the potential for munitions constituents (e.g., chemicals released from the use of small arms) (MCAS Yuma 2014a). A site inspection conducted in 2010 indicated that further action was required at MRP Site 4. Land use controls are planned for MRP Site 4 and all future projects considered at this site should be coordinated through the MCAS Yuma Environmental Department while formal remediation requirements are being developed (MCAS Yuma 2014a).

3.6.2 Environmental Consequences

3.6.2.1 Alternative 1

Construction

Asbestos-Containing Material

ACMs could be present in MCAS Yuma structures proposed for demolition under Alternative 1 (i.e., Buildings 98, 101, and 102) (Figure 2.1-2). Surveys would be conducted for ACMs, as required by 40 CFR 61.145, prior to demolition of structures. Any ACMs found in the structures proposed for demolition would be categorized and an Arizona licensed asbestos abatement contractor would determine the proper technique for removing the ACMs and demolishing the facilities. ACMs would be removed, characterized, managed, transported, and disposed according to applicable federal and state requirements for protecting human health and safety and the environment. Therefore, no significant impacts associated with ACMs would occur.

No building demolition would be required for new support facilities at the CADC and no construction would occur at the Speed Bag Airfield; therefore, no impacts would occur with respect to ACMs.

Lead-Based Paint

Similar to ACMs, surveys for lead-based paint would be conducted before demolition of structures at MCAS Yuma. Lead-based paint sampling would be conducted and analyzed in accordance with USEPA approved Toxicity Characteristic Leaching Procedure methodology. If lead-based paint were detected at hazardous concentrations, these materials would be removed prior to demolition. Lead-based paint would be characterized, managed, transported, and disposed according to applicable federal and state requirements for protecting human health and safety and the environment. Therefore, no significant impacts associated with lead-based paint would occur.

No building demolition would be required for new support facilities at the CADC and no construction would occur at the Speed Bag Airfield; therefore, no impacts would occur with respect to lead-based paint.

Other Hazardous Materials

Alternative 1 would include the removal and disposal of structures and equipment associated with the buildings proposed for demolition at MCAS Yuma and the removal of a small hazardous materials accumulation shelter. Hazardous materials would be characterized, managed, transported, and disposed according to applicable federal and state requirements for protecting human health and safety and the environment. No demolition would be required for construction of the new support facilities at the CADC and the proposed communication line corridor. Therefore, disposal of hazardous materials/waste would not be required. No significant impacts associated with other hazardous materials would occur.

Installation Restoration Program Sites

Under Alternative 1, the MCAS Yuma VMU-1 aircraft shade structures, Type II aircraft maintenance hangar module, system ground control station, ready service locker, hazardous materials storage locker, and personal operating vehicle parking would be constructed within IRP Site 1/CAOC 1 (part of OU-2) (Figure 3.6-1). The USMC would notify USEPA and ADEQ and obtain their approval before commencement of proposed construction, renovation, and demolition activities within these sites. It is possible that residual contamination exists in the subsurface at these locations and could be excavated or disturbed during construction. In addition, unknown or undocumented subsurface contamination could also be encountered in construction areas located outside of designated IRP sites. No IRP sites underlie the proposed communication line corridor or the CADC, and no construction would occur at the Speed Bag Airfield.

Potential impacts associated with encountering contaminated soil or groundwater during construction, renovation, or demolition activities would be minimized because removal actions, pursuant to CERCLA, would be conducted to remove hazardous substances, pollutants, or contaminants present within the Alternative 1 footprint, prior to or in conjunction with the commencement of grading and construction activities, in coordination with the USEPA and ADEQ, as appropriate. Furthermore, all removal actions and excavations would be conducted in compliance with all federal and state regulations pertaining to soil and groundwater contamination. All contaminated soil excavated or otherwise disturbed during construction, renovation, and demolition would be transported to an appropriate off-site disposal facility.

The USMC would coordinate with CERCLA program managers before construction, renovation, and demolition activities to ensure conformance with CERCLA requirements. In addition, construction in contaminated areas would be conducted in accordance with the National Contingency Plan (40 CFR 300, CERCLA Section 105), 29 CFR 1910.120 (regulates hazardous waste releases and health and safety of workers); *Department of the Navy Environmental Restoration Program Manual, August 2006* (protocol to evaluate, characterize, and control the potential migration of possible contaminants resulting from past operations and disposal practices at DoD facilities); and *EM 385-1-1 USACE Safety and Health Requirement Manual, September 2008* (regulates health and safety issues for workers handling potentially hazardous materials or waste).

Construction personnel with current OSHA 40-hour training for hazardous materials would complete excavations in areas with potentially contaminated soil. An OSHA 40-hour trained monitor, with experience in identification of contaminated soil, would also be present during grading and excavations to determine whether petroleum-based contaminated soil and/or groundwater are encountered. Contaminated soils would be segregated from clean soils prior to disposal. The contractor would also prepare and implement a Health and Safety Plan prior to commencement of grading/excavating to establish policies and procedures to protect workers and the public from hazards posed by potentially contaminated soil. The plan requirements are provided below in Special Conservation Measure 6 (*Health and Safety Plan*) (refer to Appendix C for details). Therefore, no significant impacts associated with IRP sites would occur.

Special Conservation Measure 6: Health and Safety Plan. Before the start of construction, renovation, and demolition activities, the construction contractor would prepare and submit a Health and Safety Plan for the USMC's approval, as well as obtain all the necessary permits and approvals. The Health and Safety Plan would include detailed precautionary measures to substantially reduce potential exposure of on-site personnel to hazardous materials in the event construction, renovation, and/or demolition activities encounter contaminated soil or groundwater. The Health and Safety Plan would describe the strategy for handling and disposing of all demolition debris. Part of this strategy would be to divert as much of the demolition waste from landfills as possible using demolition deconstruction techniques to reduce, reuse, or recycle the various types of waste. The removal methods, health and safety procedures, and disposal methods would conform to the regulations of federal, state, and local regulatory agencies. The construction contractor would make the required notifications to USEPA and ADEQ.

Munitions Response Program Sites

The northern portion of the proposed Type II aircraft maintenance hangar module, a tactical support van pad, six of ten new shade structures, a parking area for personally owned vehicles, a washrack, grease rack, vehicle shed, and one of two hazardous materials storage sheds at MCAS Yuma would be located within the boundaries of MRP Site 4 (Figure 3.6-1). Most of MRP Site 4 has been developed with the existing runway and aircraft parking apron. During the Preliminary Assessment for MRP Site 4 associated with the existing runway development, no Munitions and Explosives of Concern or munitions constituents were found and the potential of unearthing contamination is low (DoN 2010). Additionally, there is potential to encounter unknown or undocumented subsurface munitions waste in construction areas located outside of designated MRP sites. No MRP sites underlie the proposed communication line corridor or the CADC, and no construction would occur at the Speed Bag Airfield.

Potential impacts associated with encountering munitions waste during construction, renovation, and demolition activities at MCAS Yuma would be minimized because excavations at MRP sites would be conducted in accordance with CERCLA regulations, removal activities would be conducted in accordance with CERCLA and in coordination with the USEPA and ADEQ, and no construction would occur on contaminated sites until the site has been remediated, in accordance with MCO P5090.2A. In addition, the construction contractor would prepare and implement a Health and Safety Plan prior to commencement of construction, renovation, and demolition activities (Special Conservation Measure 6). Therefore, no significant impacts associated with MRP sites would occur.

Incidental Spills and Construction Waste

Construction at MCAS Yuma, the CADC, and along the proposed communication line corridor would include the use of heavy equipment that would be subject to potential spills of fuel, oil, lubricants, coolant, transmission fluid, hydraulic oil, or other miscellaneous fluids. Servicing these vehicles could similarly result in spills of such petroleum products. In addition, Alternative 1 could generate small quantities of hazardous waste, such as solvents, adhesives, and paint. Spills of petroleum products or hazardous waste could potentially penetrate into on-site soils resulting in soil and/or groundwater contamination. However, implementation of Best Management Practices (Special Conservation Measure 7) would be required as specified below.

Special Conservation Measure 7: Hazardous Materials Best Management Practices. The construction contractor would implement the following measures during all proposed construction, renovation, and demolition activities:

1. Maintain equipment according to manufacturer specifications;
2. Contractors would be adequately prepared to respond to and clean up accidental spills and releases of hazardous materials used or contained in equipment and heavy machinery. Spill response equipment, such as sorbent pads and containment booms, would be available in fueling and maintenance areas;
3. Construction-generated petroleum and hazardous waste (e.g., gasoline, solvents, adhesives, and paint) would be managed and disposed of properly. Contractors would identify, manage, transport, and dispose of regulated wastes (solid waste, hazardous waste, recyclable waste, etc.) in accordance with Titles 40 and 49 of the CFR and Title 18 of the Arizona Administrative Code;

4. Shipping paperwork (hazardous waste manifests, special waste manifests, bills of laden, etc.) used to transport waste from the station would be reviewed and signed by MCAS Yuma Environmental Department, Hazardous Waste Management Division;
5. All excavation activities would be coordinated with the MCAS Yuma Environmental Department, Hazardous Waste Management Division to reduce potential exposure of on-site personnel to contaminated soil and groundwater within and adjacent to IRP Site 1 (OU-2);
6. Cleared construction and demolition materials would be recycled in accordance with the DoD Green Procurement Program; and
7. Contractors would remove excess hazardous materials from the site once work is completed.

In addition, any construction, renovation, or demolition activities that involve the storage of oils in quantities equal to or greater than 55 gallons would be subject to Spill Prevention, Control, and Countermeasures requirements, as presented in 40 CFR 112 and MCO P5090.2A, Chapter 7. These requirements pertain to containers used for standby storage, seasonal storage, temporary storage, or storage not otherwise considered "permanently closed". Spill containment structures would be provided to prevent spills, leaks, and unauthorized discharges. Therefore, no significant impacts associated with incidental spills and construction waste would occur.

Operations

Potential impacts to surface or groundwater quality through the accidental release of chemicals during VMU-1 operations at MCAS Yuma and the BSTRC would be reduced with implementation of a National Pollutant Discharge Elimination System Stormwater Pollution Prevention Plan and compliance with federal, state, and local regulations regarding stormwater retention and treatment and soil and groundwater contamination. The Stormwater Pollution Prevention Plan includes a Spill Prevention, Control, and Countermeasures Plan, which provides protective and corrective measures for accidental releases of hazardous substances or petroleum products. Additionally, VMU-1 would be required to use the Hazardous Materials Management System to track hazardous material storage, usage, and waste. Therefore, no significant impacts on hazardous materials and waste would occur.

Proposed VMU-1 operations would be incorporated into existing training scenarios within the BSTRC. Aircraft fueling at the BSTRC would be completed at either the CADC or the Speed Bag Airfield, and these areas would be equipped with appropriate spill prevention and spill control features. Therefore, no significant impacts on hazardous materials and waste would occur.

3.6.2.2 Alternative 2

Alternative 2 would be similar to Alternative 1, except the ground support facilities would be built at the CADC instead of the old van pad at MCAS Yuma. Demolition and construction of the hangar facilities west of O'Neill Street would be the same as for Alternative 1. Similar to Alternative 1, this includes project components within the boundaries of IRP Site 1/CAOC 1 (part of OU-2) and MRP Site 4; however, with implementation of Special Conservation Measure 6 (*Health and Safety Plan*), Special Conservation Measure 7 (*Hazardous Materials Best Management Practices)*, and applicable federal, state, and local regulations described above, no significant impacts would occur. Additional construction at the CADC under Alternative 2 would not fall within a recorded IRP or MRP site; therefore, no hazardous waste related impacts would occur with respect to soil excavations during construction. Impacts related to incidental spills of petroleum products and generation of small quantities of hazardous waste during construction would be similar to those described for Alternative 1.

Proposed VMU-1 operations under Alternative 2 would be the same as those described under Alternative 1. Implementation of a National Pollutant Discharge Elimination System Stormwater Pollution Prevention Plan and compliance with federal, state, and local regulations regarding stormwater retention and treatment and soil and groundwater contamination would minimize operational impacts. Therefore, no significant impacts on hazardous materials and waste would occur.

3.6.2.3 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma and would remain at MCAGCC. Existing hazardous materials and waste conditions would remain as described in Section 3.6.1, *Affected Environment*. Therefore, no impacts on hazardous materials and waste would occur.

3.7 Safety and Environmental Health

The USMC practices Operational Risk Management as outlined in DoN Office of the Chief of Naval Operations 3500.39A and MCO 3500.27A. Requirements outlined in these documents provide for a process to maintain readiness in peacetime and achieve success in combat while safeguarding people and resources. The safety and environmental health analysis contained in the following sections addresses issues related to the health and well-being of both military personnel and civilians living on or in the vicinity of MCAS Yuma. Specifically, this section provides information on hazards associated with aviation safety, airfield safety zones, and explosives safety at the air station and within the BSTRC. Safety issues associated with hazardous materials and waste are discussed in Section 3.6, *Hazardous Materials and Waste*. Relocation of aircraft and personnel to MCAS Yuma would have negligible impacts on safety and environmental health at MCAGCC and, therefore, this is not addressed further.

3.7.1 Affected Environment

3.7.1.1 Aviation Safety

The primary concern with regard to military training flights is the potential for aircraft mishaps (i.e., crashes) to occur, which could be caused by mid-air collisions with other aircraft or objects, weather difficulties, mechanical failures, pilot error, or bird-aircraft strikes. Comprehensive operating procedures are employed by the USMC to reduce the potential for aircraft accidents and increase aviation safety. For example, flight activities must conform to FAA-mandated restrictions, NATOPS flight instructions (e.g., Chief of Naval Operations Instruction 3710.7U), and applicable MCAS Yuma Station Orders (e.g., Station Orders 3710.6, P3710.4L, 3750.1B).

MCAS Yuma Station Order 3750.1B created the MCAS Yuma Bird Aircraft Strike Hazard (BASH) Reduction Program to minimize aircraft exposure to potentially hazardous bird and animal strikes through awareness, avoidance monitoring, and actively controlling bird and animal population movements. The MCAS Yuma BASH Program applies to all primary Marine Corps training airspace and ranges as they are scheduled, controlled, and utilized by MCAS Yuma personnel. Some of the procedures outlined in the program include monitoring the airfield for bird activity, issuing bird hazard warnings, initiating bird avoidance procedures when potentially hazardous bird activities are reported, and submitting BASH reports for all incidents.

Other standard procedures include holding routine briefings for pilots and range operations personnel to review established safety practices and procedures. Pilots are required to exercise caution to remain within approved flight routes and holding patterns. Flight leaders are assigned the responsibility for monitoring aircraft operations, correcting procedural errors, and directing aircraft to maintain safe operating procedures.

MCAS Yuma air traffic control manages the airspace surrounding the station and its ranges and ensures deconfliction of both military and non-military traffic (refer to Section 3.1, *Airspace*, for more details). Therefore, controllers familiar with military aircraft capabilities and experienced at handling aircraft emergencies continuously monitor the regional airspace. Should an emergency occur, MCAS Yuma maintains detailed emergency and mishap response plans to react to an aircraft accident. These plans assign agency responsibilities and prescribe functional activities necessary to react to major mishaps, whether on- or off-station.

3.7.1.2 Airfield Safety Zones

Airfield safety clearances and Accident Potential Zones (APZs) are established around runways and identify where aircraft mishaps are most likely to occur. Land uses in these areas are limited for the protection of people and property on the ground. Three types of APZs apply to airfields based on aircraft mishap patterns: APZ I; APZ II; and the Clear Zone. The standard Clear Zone is a trapezoidal area that extends 3,000 feet from the end of a runway and has the highest probability of being impacted by a mishap. APZ I, which typically extends 5,000 feet from the end of the Clear Zone, has a lower mishap probability. APZ II, which typically extends 7,000 feet from the end of APZ I, has the lowest mishap probability of the three zones. APZs established at MCAS Yuma, based on departure and arrival routes, are shown on Figure 3.7-1.

3.7.1.3 Explosive Safety

Siting requirements for explosive materials storage (e.g., ordnance) and handling facilities are based on safety and security criteria established by the DoD Explosive Safety Board. Specific locations on the airfield at MCAS Yuma are designed for loading and unloading of ordnance (e.g., Combat Aircraft Loading Area), and ammunition and bulk explosives are stored in magazines specifically designed, sited, and designated for this purpose. Additionally, Explosive Safety Quantity Distance (ESQD) arcs are used to determine the distance between ordnance storage and handling facilities and other land uses.

3.7.2 Environmental Consequences

3.7.2.1 Alternative 1

Aviation Safety

VMU-1 would conduct about 1,500 annual sorties within the BSTRC. Launch and recovery operations would primarily occur at the CADC for operations within the BMGR-West (R-2301W) and at the Speed Bag Airfield for operations within the CMAGR (R-2507N/S). VMU-1 would not conduct RQ-7B or MQ-21A flight operations at MCAS Yuma or over civilian populations. BMGR-West (R-2301W) and CMAGR (R-2507N/S) are currently used by other aircraft conducting a wide variety of military training, including munitions delivery. Under baseline conditions, R-2301W is used for about 20,000 aircraft operations per year, and R-2507N/S is used for about 10,000 operations per year. The majority of these operations are by F-35B aircraft with the remainder being conducted by other fixed-wing, tilt-rotor, or rotary-wing aircraft (DoN 2010).

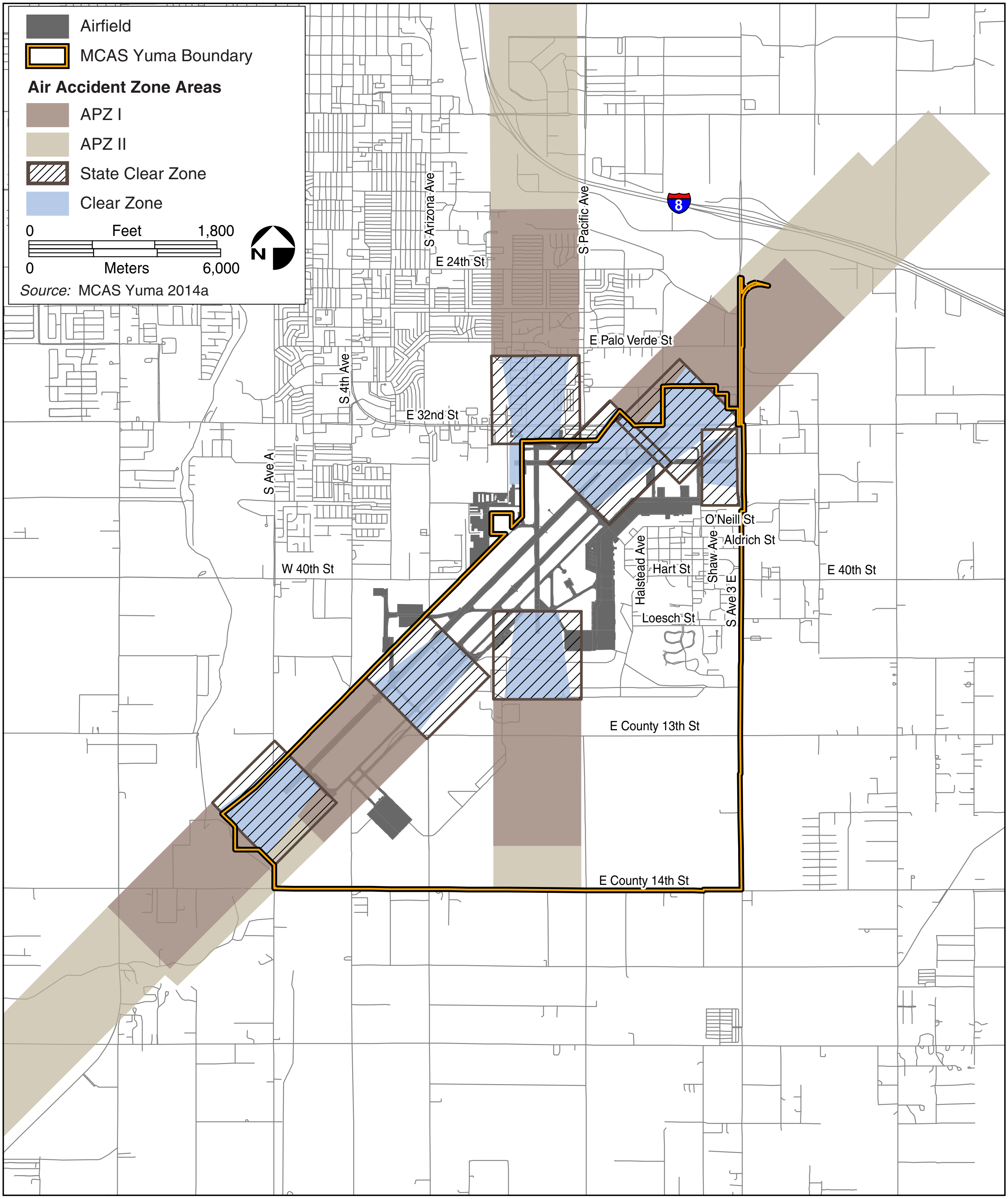

Figure 3.7-1. MCAS Yuma Accident Potential Zones and Clear Zones

Similar to manned aircraft, UAS are subject to accidents and mishaps resulting from engine failure, aircraft mechanical or data link malfunctions, operator error, BASH, collisions with other aircraft or objects, weather factors, or other such circumstances. Such occurrences can cause fires and other damage within the BSTRC. However, current aviation safety procedures, including BASH prevention, would continue to be implemented and additional training range flight operations would adhere to established safety procedures. In addition, the emergency and mishap response plans would be updated, as needed, to include procedures and response actions necessary to address a mishap involving any new aircraft platforms. With this update, safety conditions within the BSTRC would be similar to existing conditions. Therefore, no significant impacts associated with aircraft mishaps or mishap response would occur.

Airfield Safety Zones

Proposed construction and operational activities related to Alternative 1 would be consistent with established safety clearances and APZs at the air station. VMU-1 would not conduct RQ-7B or MQ-21A flight operations at MCAS Yuma and, therefore, would not affect or create a need to change the established safety clearances and APZs. Additionally, the Alternative 1 project footprint is located well outside any established APZ or Clear Zone. Therefore, Alternative 1 would not result in any greater safety risks than existing conditions, and no significant impacts related to airfield safety zones would occur.

Explosive Safety

The Alternative 1 project footprint is not located within an established ESQD arc, and proposed construction, renovation, and infrastructure improvements related to Alternative 1 would be consistent with established ESQD siting requirements. Therefore, construction activity and subsequent operations at the air station would not result in any greater risks, and no significant impacts on safety and environmental health would occur.

3.7.2.2 Alternative 2

Alternative 2 would be the same as Alternative 1, except the ground support facilities would be built at the CADC instead of the old van pad at MCAS Yuma. Additional construction at the CADC under Alternative 2 would not fall within an established safety clearance, APZ, or ESQD arc. Therefore, Alternative 2 impacts would be the same as those described under Alternative 1.

Similar to Alternative 1, construction-related activities would be consistent with established safety clearances, APZs, and ESQD arcs. Although Alternative 2 would result in a slight increase in operations over existing conditions, the associated safety risk would not be substantially greater than existing conditions. Therefore, no significant impacts on safety and environmental health would occur.

3.7.2.3 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma, and none of the proposed construction or UAS operations described above would take place. Existing safety and environmental health conditions would remain as described in Section 3.7.1, *Affected Environment*. Therefore, no impacts on safety and environmental health would occur.

3.8 Community Facilities and Services

Community facilities and services include housing, health services, security services, fire protection, education, and parks and recreational services. The following section evaluates whether increased military personnel and their families associated with the proposed action would have an effect on community services available in the Yuma area. Relocation of personnel to MCAS Yuma would have negligible impacts on community facilities and services at MCAGCC or other areas outside of the Yuma region, and, therefore, this is not addressed further.

3.8.1 Affected Environment

3.8.1.1 Housing

Military family housing at MCAS Yuma includes 821 units, the majority of which are located on the air station (DoN 2010). As of January 2009, 780 units (95 percent) were occupied by 823 military personnel and 1,646 family members. In addition, a total of 1,832 permanent and transient personnel live in barracks on the station (DoN 2010). Outside of the air station, there were 74,140 housing units in Yuma County in 2000, 72.6 percent of which were occupied (DoN 2010). This is compared to 76.2 percent for the City of Yuma and 86.8 percent for Arizona (DoN 2010).

The CADC does not have permanent housing for personnel; rather field housing is erected twice a year for WTI (MCAS Yuma 2014a). MCAS Yuma is planning to construct field barracks to support operations at the CADC (MCAS Yuma 2014a).

3.8.1.2 Health Services

Health services on MCAS Yuma are provided by the Branch Health Clinic, an outpatient ambulatory healthcare facility, which provides services to active duty service members and their family members. Services provided at the clinic include radiology, immunizations, optometry, physical therapy, mental and occupational health, laboratory services, and dental services (Branch Health Clinic 2010, Naval Hospital Camp Pendleton 2014). The Yuma Regional Medical Center, a not-for-profit hospital, provides medical services for the City of Yuma and surrounding communities. The hospital is complemented by other outpatient clinics, long-term retirement homes, and assisted living complexes (DoN 2010, Yuma Regional Medical Center 2015).

3.8.1.3 Security Services

At MCAS Yuma, the Provost Marshal’s Office provides law enforcement and security. The Provost Marshal’s Office advises the Commanding Officer on physical security and law enforcement at MCAS Yuma and coordinates with the Naval Criminal Investigative Service in security and counterintelligence matters. The jurisdiction of the Provost Marshal’s Office extends from MCAS Yuma to the local training ranges including the BSTRC (DoN 2010). Law enforcement and security in the region surrounding MCAS Yuma is provided by the Yuma County Sheriff’s Office and the Yuma Police Department. The Yuma County Sheriff’s Office is comprised of three bureaus: the Administration Bureau; the Detention Bureau; and the Patrol Bureau. The Yuma Police Department, which has 266 certified peace officers, provides law enforcement and security within the 112 square mile area of the City of Yuma (City of Yuma 2015a).

3.8.1.4 Fire Protection

MCAS Yuma provides fire protection for the air station and the BSTRC. The MCAS Yuma Fire Station and Search and Rescue are located in the flightline area of MCAS Yuma and maintain fire protection mutual assistance agreements with the City of Yuma, Somerton, San Luis, Niland, and Wellton in Arizona, as well as with the City of Winterhaven and Imperial County in California (DoN 2010). MCAS Yuma is planning to construct an additional fire station within the air station as well as constructing a new fire station at the CADC to improve response times to the CADC and BMGR (MCAS Yuma 2014a). The

Yuma Fire Department provides fire protection services for the City of Yuma, including emergency medical services, training, prevention, emergency management, support, and administrative services. The Yuma Fire Department operates six stations with six companies staffed with seven emergency apparatus strategically located throughout the city (City of Yuma 2015b).

3.8.1.5 Education

There are 50 K-12 schools in Yuma County, including 43 public schools and 7 private schools. In the 11 public school districts in Yuma, there are 32 elementary schools, 17 middle schools, 13 high schools and 44 pre-schools (Education.com 2015). Students residing on-station usually attend public schools located in the City of Yuma, including Palmcroft and Rolle Elementary Schools, Woodard Junior High School, and Kofa High School (DoN 2010). Northern Arizona University and the University of Phoenix have branch campuses in Yuma. Southern Illinois University and University of Phoenix have off-campus education programs at MCAS Yuma (DoN 2010).

3.8.1.6 Park and Recreation Facilities

Recreational facilities at MCAS Yuma include three baseball fields, little league field, running track and gymnasium (recently renovated), movie theater, bowling alley, youth center, new community center, and a Consolidated Officer/Enlisted Club. The Marine Corps Community Services manages the Lake Martinez Recreation Area, which offers activities including camping, fishing, boating, water sports, and wildlife viewing, located 39 miles north of MCAS Yuma (DoN 2010). The City of Yuma and Yuma County offer numerous parks and recreational features, golf courses, and multiple sports facilities, including tennis complexes, swimming pools, handball and racquetball facilities, and baseball, softball, and soccer fields (DoN 2010).

Recreational facilities at the CADC include a fitness center located in Building 3224. MCAS Yuma is planning to develop additional recreational areas (recreational field running track) (MCAS Yuma 2014a).

3.8.2 Environmental Consequences

3.8.2.1 Alternative 1

MCAS Yuma is required to proactively plan for and assess all essential services to ensure that the existing community facilities and services are adequate to accommodate military personnel and their families. MCAS Yuma routinely evaluates community facilities and services to account for fluctuations associated with new units assigned to the air station, deployment of existing units, and large-scale training events (e.g., WTI training) (DoN 2010). Under Alternative 1, there would be an increase of about 350 military personnel (30 officers and 320 enlisted) and 830 dependents. This increase in military personnel and dependents would represent a 0.6 percent increase in the general population of Yuma County (estimated population of 201,201 in 2013 [U.S. Census Bureau 2015]). Alternative 1 would result in a 5.7 percent increase in military personnel at MCAS Yuma (estimated population of 6,100 active duty personnel, civilian employees, and contractors [MCAS Yuma 2014a]). Approximately 67 percent of the relocated military personnel and their dependents would be required to live off-station. The small increase in military personnel and dependents associated with Alternative 1 would have little effect on housing, health services, security services, fire protection, education, or parks and recreation. In addition, Alternative 1 would be consistent with surges in demands for community facilities and services at MCAS Yuma and BSTRC during large-scale training events. Therefore, no significant impacts on community facilities and services would occur.

3.8.2.2 Alternative 2

Proposed changes in military personnel and dependents under Alternative 2 would be the same as those described under Alternative 1. Alternative 2 would have little effect on community facilities and services, and would be consistent with surges in demands during large-scale training events. Therefore, no significant impacts on community facilities and services would occur.

3.8.2.3 No-Action Alternative

Under the No-Action Alternative, the relocation of VMU-1 from MCAGCC to MCAS Yuma would not occur. Existing community facilities and services conditions would remain as described in Section 3.8.1, *Affected Environment*. Therefore, no impacts on community facilities and services would occur.

3.9 Transportation

Transportation infrastructure includes the public roadway network, public transportation systems, airports, railroads, pedestrian/bicycle facilities, and waterborne transportation required for the movement of people, materials, and goods. The following section evaluates whether the proposed action would have the potential to impact public roadways that provide access to MCAS Yuma, the CADC, and the Speed Bag Airfield, access control points or gates, and the internal roadway system. Relocation of aircraft and personnel to MCAS Yuma would have negligible transportation impacts at or around MCAGCC and, therefore, this is not addressed further.

3.9.1 Affected Environment

3.9.1.1 Traffic Circulation at MCAS Yuma

MCAS Yuma is bordered by South Avenue 3E to the east, County 14th Street to the south, South 4th Avenue to the west, and 32nd Street (Business Highway 8) to the north. Regional access is provided from the east and west via Interstate 8 and US-95 from the north and south (DoN 2010). South Avenue 3E is a four-lane principal arterial between 32nd Street and East 40th Street that serves as an access point for MCAS Yuma; South Avenue 3E is a two-lane minor arterial between East 40th Street and County 13th Street. County 14th Street is a two-lane major collector between South Avenue A and South Avenue 3E. County 13th Street is a two-lane major collector that serves as an access point for the southern portion of MCAS Yuma. The level of service (LOS) of the roadway network serving MCAS Yuma and its vicinity is generally operating at LOS C or better (City of Yuma 2013). However, the segment of South Avenue 3E that provides access to MCAS Yuma currently operates at LOS F (DoN 2010).

The primary entrance to MCAS Yuma (Main Gate) is located where Quilter and Hart Streets converge at South Avenue 3E. A second gate (North Gate) is on South Avenue 3E at the intersection of South Avenue 3E and O'Neill Street. A third gate, for ordnance movements only, is located at the southern boundary of the station. The Main Gate presently does not meet security requirements or have sufficient room for vehicle queuing and inspection. The major constraints affecting potential alterations to the Main Gate are its alignment with the existing traffic signal and the nearby Parade Deck. The North Gate also does not meet security requirements or have adequate truck inspection/turn around. Truck inspection is currently accomplished by utilizing the adjacent parking lot to the north, which impacts parking availability (MCAS Yuma 2014a).

The existing street network at MCAS Yuma consists mostly of low-speed two-lane roads that are well connected and generally sufficient. Vehicle circulation issues are primarily related to the streets leading to and from the gates, particularly during morning and afternoon peak periods (MCAS Yuma 2014a).

Regular hours of operation at MCAS Yuma are 7:30 AM to 10:30 PM Mountain Standard Time, Monday through Friday and 10:00 AM to 6:00 PM Mountain Standard Time Saturday and Sunday. According to the 2008 Circulation & Parking Study, the station could add two additional squadrons and maintain an acceptable LOS on all streets except Quilter Street near the Main Gate (MCAS Yuma 2014a).

The MCAS Yuma street network includes the following:

- *Quilter Street and Cycle Track* – connects the Main Gate with the flightline. It is one of the major circulation routes on the station and serves high volumes of vehicle traffic and large numbers of pedestrians and cyclists on the separated cycle track;
- *O'Neill Circulator* – serves as the primary route for accessing the hangars and the North Gate. It is intended for relatively high vehicle volumes with low to moderate use by pedestrians and cyclists;
- *Secondary Streets* – are the most common type of streets on MCAS Yuma and are intended to serve moderate volumes of vehicle, pedestrian, and cycle traffic;
- *Residential Streets* – are located exclusively within the Family Housing district and are intended to serve mostly local residents; and
- *Service Streets* – provide access to special purpose areas on MCAS Yuma. They are used by trucks and other heavy vehicles. They are not ideal for use by pedestrians or cyclists.

3.9.1.2 Traffic Circulation at the Cannon Air Defense Complex

The CADC is located entirely within BMGR-West approximately 3 miles southeast of MCAS Yuma. Similar to MCAS Yuma, regional access is provided from the east and west via Interstate 8 and from the north and south via US-95 (DoN 2010). Regional access is also provided via State Route 195 (Araby Road) from the north and south. State Route 195 is a minor arterial that connects Intestate 8 with US-95 in the City of San Luis. In the vicinity of the CADC, State Route 195 is a divided four-lane freeway with an interchange at County 14th Street (City of Yuma 2013). County 14th Street is a two-lane, east-west major collector road between South Avenue G and State Route 195 (Araby Road) that serves as an access point for the CADC (Main Gate). East County 14th Street currently operates at a LOS C or better (City of Yuma 2013). The CADC is accessed from MCAS Yuma via South Avenue 3E Street (a two-lane, north-south minor arterial that carries cross-town traffic) and East County 14th Street. The existing street network at the CADC consists of one primary road, Cannon Way, which connects the facility to East County 14th Street. The back portion of the CADC is served by Boyington Loop, referred to as "the loop road". The Main Gate to the CADC presently does not meet security requirements or have sufficient room for vehicle queuing and inspection. MCAS Yuma is planning to upgrade the Main Gate to improve traffic conditions as part of a separate project (P-558) that is programmed for 2018 (MCAS Yuma 2014a).

3.9.1.3 Traffic Circulation at the Speed Bag Airfield

The Speed Bag Airfield is located entirely within the CMAGR, approximately 100 miles northwest of MCAS Yuma. Regional access is provided by Interstate 10, the principal east-west, arterial route, which supports large amounts of regional traffic. The CMAGR is bordered by four principal arterials. State Route 78 is near the southeast boundary of the CMAGR and passes through Algondones Sand Dunes and Glamis, to its terminus in Blythe. Southwest of the CMAGR is State Route 111, which is the main north-south corridor through Calipatria and Niland (MCAS Yuma 2014b). State Route 86 splits off from State Route 111 and provides north-south access through the Imperial Valley near El Centro and Brawley, and near the western side of the Salton Sea into the Coachella Valley. Major and minor collector roads support the areas surrounding the CMAGR. Due to the relatively remote location of the CMAGR in the desert region, there are very few direct access points to the range (MCAS Yuma 2014b).

Access to the Speed Bag Airfield is provided via the Niland-Blythe Road from where it enters the CMAGR near Slab City. Personnel and equipment from MCAS Yuma transit to the Speed Bag Airfield via Interstate 8 and one of three regional access routes (State Route 115, State Route 78, and/or State Route 11). Local access is provided via Beal Road and Coachella Canal Road.

3.9.2 Environmental Consequences

To assess the potential environmental consequences associated with transportation, this section analyzes increased utilization of the existing roadway system and access gates from construction activities, changes in personnel, and VMU-1 operations. Impacts could occur from physical changes to circulation, construction-related traffic delays, and changes in traffic volumes. Adverse impacts on roadway capacities would be significant if roads with no history of capacity exceedance had to operate at or above their full design capacity as a result of implementation of the proposed action.

3.9.2.1 Alternative 1

Construction

Construction, renovation, and demolition activities would require the delivery of materials to and removal of construction-related debris from the Alternative 1 footprint at MCAS Yuma, the CADC, and along the proposed communication line corridor between MCAS Yuma and the CADC. No construction would occur at the Speed Bag Airfield in the CMAGR. Trucks associated with construction activities, along with construction crews, would either access MCAS Yuma via the North Gate using the O'Neill circulator or two secondary gates (open as needed) located off of South Avenue 3E at Loesch Street and North Ordnance Loop. Trucks associated with construction activities would access the CADC via the Main Gate using East County 14th Street. Construction-related traffic would comprise only a small portion of the total existing traffic volume in the area and at MCAS Yuma and the CADC. Increased traffic associated with these activities could contribute to short-term increased congestion at the entry gates, delays in the processing of access passes, and degradation of the affected road surfaces.

Additionally, intermittent traffic delays and temporary road or lane closures could result in the immediate vicinity of the Alternative 1 footprint, including along the proposed communication line corridor. Potential congestion impacts could be avoided or minimized by scheduling truck deliveries outside the peak inbound traffic time and using the secondary gates at MCAS Yuma. Also, many of the heavy construction vehicles could be kept on-site or at existing construction staging/lay-down areas for the duration of the construction, renovation, and demolition activities, resulting in fewer additional trips. The construction contractor would be required to implement a Construction Traffic Plan as described in Special Conservation Measure 8. Potential traffic delays would be temporary, ending once construction activities have ceased. Therefore, no significant impacts on transportation would occur from construction-related activities.

Special Conservation Measure 8. Construction Traffic Plan. A construction traffic management and detour plan would be developed before the start of construction activities. This plan would specify necessary lane closures, detours, signage, lighting, flaggers, and other traffic control measures, as needed. The traffic plan would specify routes for emergency service vehicles in the event of an emergency.

Personnel Changes

The proposed relocation of military personnel from MCAGCC to MCAS Yuma is considered routine re-deployment of assets and is consistent with population surges at MCAS Yuma during large-scale training events. Under Alternative 1, there would be about 350 additional military personnel (approximately 30 officers and 320 enlisted) working at MCAS Yuma by 2024. Approximately 67 percent of the relocated military personnel would be required to live off-station. This would equate to an increase of approximately 235 daily commuting trips to and from the station, assuming all personnel drive individually to the station. This increase in daily commuting traffic trips could increase congestion and queuing at the Main Gate during morning and evening rush hours. Should an issue arise, MCAS Yuma would coordinate with City of Yuma staff to adjust the timing of traffic lights to improve traffic flow. Because South Avenue 3E has a history of capacity exceedance, the marginal contribution of operations-related traffic to that exceedance would not be significant. Regional and local access roads as well as the MCAS Yuma street network have adequate capacity to accommodate the amount of additional traffic without major impacts on traffic flow, circulation, or LOS. Therefore, no significant impacts on transportation would occur from proposed changes in personnel at MCAS Yuma.

Operations

Under Alternative 1, VMU-1 is expected to conduct approximately 1,500 annual sorties within the BSTRC to meet their training and readiness requirements (Table 2.1-1), with 1,125 sorties proposed annually at the CADC within BMGR-West (R-2301W) and 375 at the Speed Bag Airfield within the CMAGR (R-2507N/S). This would equate to approximately 100 commuting trips to the CADC and 5 communing trips to the Speed Bag Airfield from MCAS Yuma annually. Regional and local access roads as well as the existing BSTRC road network have adequate capacity to accommodate the amount of additional traffic associated with proposed operations without major impacts on traffic flow, circulation, or LOS. Therefore, no significant impacts on transportation would occur from proposed VMU-1 operations.

3.9.2.2 Alternative 2

Alternative 2 would be similar to Alternative 1, except the ground support facilities would be built at the CADC instead of the old van pad at MCAS Yuma. Although construction-related traffic impacts would be of longer duration at the CADC and shorter duration at MCAS Yuma when compared with Alternative 1, impacts would be short-term and negligible with the implementation of Special Conservation Measure 8 (*Construction Traffic Plan)*. Proposed changes in military personnel and dependents under Alternative 2 would be the same as those described under Alternative 1. However, Alternative 2 would split assigned squadron equipment and personnel between MCAS Yuma and the CADC, thereby resulting in an increase in daily commuter trips between MCAS Yuma and the CADC as compared to Alternative 1. However, less commuter trips would be needed between the two facilities when conducting VMU-1 aircraft operations at the CADC because much of the equipment would already be housed at the CADC. Regional and local access roads as well as the MCAS Yuma street network have adequate capacity to accommodate the small amount of additional traffic associated with the change in personnel and operations without major impacts on traffic flow, circulation, or LOS. Therefore, no significant impacts on transportation would occur.

3.9.2.3 No-Action Alternative

Under the No-Action Alternative, VMU-1 would not relocate to MCAS Yuma and would remain at MCAGCC. Existing transportation conditions would remain as described in Section 3.9.1, *Affected Environment*. Therefore, no impacts on transportation would occur.

3.10 Utilities and Infrastructure

Utilities and infrastructure include electricity, natural gas, water systems, sanitary sewer, solid waste disposal, and stormwater drainage. The following section evaluates whether construction, renovation, and demolition activities and increased military personnel associated with the proposed action would have an effect on existing utilities and infrastructure in the Yuma area. Proposed operations at the Speed Bag Airfield within the CMAGR would not affect utilities or infrastructure. Additionally, relocation of personnel to MCAS Yuma would have negligible impacts on utilities or infrastructure at MCAGCC; therefore, these issues are not addressed further.

3.10.1 Affected Environment

3.10.1.1 Electricity

In 2010, 84 percent of the electrical power supplied to MCAS Yuma and the CADC was provided by Arizona Public Service, with the remaining 16 percent provided by hydroelectric power through the Western Area Power Administration (DoN 2010). Arizona Public Service is planning construction of the North Gila – Orchard 230 kilovolt transmission line, with construction beginning in 2016. This project serves the need for electric energy, improved reliability, and continuity of service for the greater Yuma area. The North Gila-Orchard line is expected to be in service in 2018 (Arizona Public Service 2014). Power for MCAS Yuma is distributed through Arizona Public Service lines to the MCAS Yuma substation, located near the water tower, and distributed throughout the station via five electrical distribution circuits (MCAS Yuma 2014a). A majority of the overhead lines at MCAS Yuma were replaced from 1990 through 2000 and the system is considered to be reliable (MCAS Yuma 2000). Electrical cables are present throughout MCAS Yuma, including along the flightline, and in the immediate project vicinity (MCAS Yuma 2014a). In addition, 19 photovoltaic (solar) projects have been installed, with a capacity of 964 kilowatts (MCAS Yuma 2014a). The photovoltaic projects are typically located on parking shades and shed structures. A comparison of energy usage shows a 20 percent reduction in electricity usage from fiscal year 2003 to fiscal year 2012 (MCAS Yuma 2014a).

3.10.1.2 Natural Gas

Natural gas is provided to MCAS Yuma and the CADC by a private utility, Southwest Gas Corporation (DoN 2010). Natural gas used on-station is obtained through the Defense Fuel Support Contract Program, allowing the station to competitively purchase natural gas at reduced rates from various suppliers. There are two gas meters located on-station, one south of the Main Gate and one north of the North Gate (DoN 2010). Natural gas is distributed through Southwest Gas Corporation lines to the on-station distribution system, with distribution lines maintaining a constant pressure of 25 pounds per square inch (MCAS Yuma 2014a). Natural gas lines are located near the project footprint, generally south and east of O’Neill Street (MCAS Yuma 2014a).

3.10.1.3 Water System

The water supply system at MCAS Yuma provides the station with water for industrial and domestic consumption and fire suppression. The potable water supply for MCAS Yuma is obtained from the United States Bureau of Reclamation and on-station wells. The United States Bureau of Reclamation provides water sourced from the Colorado River downstream of the Davis Dam (Bureau of Reclamation 2015). Water at the CADC is provided by local wells (MCAS Yuma 2014a).

The MCAS Yuma Water Treatment Plant is comprised of three settling basins with a combined total capacity of 7.5 million gallons of water. After treatment, water is stored in various covered reservoirs and elevated storage tanks throughout the station and distributed to users through main and lateral distribution lines (MCAS Yuma 2014a). Water storage on-station includes one 500,000-gallon elevated water storage tank, two 750,000-gallon elevated tanks, two clear wells with a water storage capacity of 1.2 million gallons, a backwater tank with a capacity of 300,000 gallons, and an underground well that pumps water from below the station to provide an alternative backup source of water for the water treatment plant. This water is dispersed to various substations located throughout MCAS Yuma (MCAS Yuma 2014a). Existing water supplies at MCAS Yuma are adequate and accommodate surges in demands during large-scale training events.

3.10.1.4 Sanitary Sewer

MCAS Yuma generates wastewater from sanitary and industrial processes, including vehicle, equipment, and aircraft washing; fuels and aircraft component testing; and vehicle, aerospace ground equipment, and aircraft maintenance (DoN 2010). The wastewater system on-station operates using a gravity flow system with three sanitary sewer lift stations. The wastewater is collected through a series of clay, poly vinyl chloride, and polyethylene pipes, ranging from 6 to 18 inches in diameter, and is delivered to the City of Yuma's interceptor line via Avenue 3E which is owned and maintained by MCAS Yuma (MCAS Yuma 2014a). Wastewater generated by MCAS Yuma is disposed of at the Figueroa Wastewater Treatment Facility within the City of Yuma. The City of Yuma provides wastewater treatment at the Figueroa Avenue Water Pollution Control Facility and the Desert Dunes Water Reclamation Facility, which began service in June 2005 (City of Yuma 2012). The Figueroa Avenue Water Pollution Control Facility has the capacity to treat 12 million gallons a day and the Desert Dunes Water Reclamation Facility currently has the capacity to treat 3 million gallons a day. The Desert Dunes Water Reclamation Facility buildout capacity would handle twelve million gallons per day, with expansion occurring in three million gallon modules (City of Yuma 2012). Sanitary sewer at the CADC is provided by a septic system (MCAS Yuma 2014a).

All wastewater discharges from MCAS Yuma and the CADC are regulated under Sections 301, 304(b)(c)(e)(g), 306(b)(c), 307(b)(c), 308, and 501 of the Clean Water Act. The applicable regulations are found in 40 CFR Part 433.10, Subpart A, Metal Finishing. This permit is administered by the City of Yuma Pretreatment Division. MCAS Yuma is regulated as a significant industrial user, under Permit Number 0001. The permit requires MCAS Yuma to conduct monitoring for compliance at eight industrial outfall locations within the MCAS Yuma sanitary sewer collection system (MCAS Yuma 2014a). The outfalls consist of one recreational vehicle dump site and seven outfalls that are sampled, including five wash rack discharges and two sewer manholes that discharge into the City of Yuma wastewater collection system (DoN 2010).

3.10.1.5 Solid Waste Disposal

Municipal solid waste at MCAS Yuma and the BSTRC is managed in accordance with the guidelines specified in the MCO P5090.2A (*Environmental Compliance and Protection Manual)*, Station Order P6280.3G (*Environmental Compliance and Protection Standard Operating Procedures)*, Station Order 4010.2E (*Solid Waste [Non-Hazardous] Recyclable Materials Program Standard Operating Procedure)*, and other applicable federal regulations, MCOs, and DoD Directives. In general, these regulations establish the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for handling, storage, collection, recycling, and disposal of solid waste; recordkeeping and reporting; and pollution prevention.

MCAS Yuma and the CADC generate solid waste in the form of office trash, non-hazardous industrial wastes, normal municipal waste, and construction debris. These nonhazardous solid wastes are collected in dumpsters located throughout the respective stations and are picked up by a contractor for disposal off-station. Solid waste collection and disposal are handled by a private contractor (currently Allied Waste Company) and delivered to one of five residential transfer sites managed by Yuma County: North Gila Valley, Dome Valley, Wellton, Tacna, and Dateland. The existing solid waste contract with Allied Waste Company will meet the needs of city residents and MCAS Yuma for the next 15 to 25 years (DoN 2010). Commercial, industrial, and large load wastes not accepted at the transfer sites are delivered to Cocopah or Copper Mountain landfills. Hazardous waste is disposed under a separate contract through Defense Reutilization Management Organization. Industrial waste is managed by Installation & Logistics Contracts Division (MCAS Yuma 2014a).

3.10.1.6 Stormwater Drainage

Stormwater drainage at MCAS Yuma consists of a series of dry wells, catch basins, retention basins, and inlets. Drainage primarily occurs by overland flow to storm drain inlets connected to a series of underground pipes, or percolates into the groundwater system via subsurface soils. Stormwater drainage at the CADC consists of 10 above ground stormwater basins (USMC 2015). Given the unique nature of the desert environment, including a low annual rainfall of approximately 1.75 inches (per year average from 1996 through 2008), rapid soil absorption rates, and relatively flat topography (slopes on-station are less than two percent), for a majority of the year demands on the storm drainage system are minimal (Western Regional Climate Center 2015). However, when rainfall does occur, localized flooding inundates the station's limited stormwater capacity (DoN 2009).

In general, the station is composed of four general drainage areas (watersheds) and three corresponding outfalls. Drainage from a majority of the station discharges to Parade Field or to the retention basins located between the runways and percolates into the ground. If overflow occurs at the Parade Field, stormwater runoff flows east through Outfall 2 into catch basins that discharge into the City of Yuma municipal separate storm sewer system. Outfall 1 collects runoff from the southwest portion of the station into a natural drainage swale. Outfall 3 collects stormwater runoff from the northern portion of the station where it joins runoff from the Yuma County Airport Authority's property line and discharges as overland flow into Yuma County-owned retention basins (MCAS Yuma 2006).

3.10.2 Environmental Consequences

3.10.2.1 Alternative 1

Under Alternative 1, there would be an increase of about 350 military personnel (30 officers and 320 enlisted) and 830 dependents at MCAS Yuma. This increase in military personnel and dependents would represent a 0.6 percent increase in the general population of Yuma County (estimated population of 201,201 in 2013 [U.S. Census Bureau 2015]). Alternative 1 would result in a 5.7 percent increase in military personnel at MCAS Yuma (estimated population of 6,100 active duty personnel, civilian employees, and contractors [MCAS Yuma 2014a]). Approximately 67 percent of the relocated military personnel and their dependents would be required to live off-station. The small increase in personnel associated with Alternative 1 would have little effect on existing utilities and infrastructure. In addition, Alternative 1 would be consistent with surges in demands for utilities and infrastructure use at MCAS Yuma during large-scale training events.

Alternative 1 also would result in an increase in building facilities at MCAS Yuma and the CADC, resulting in an incremental increase of utilities. MCAS Yuma contains just over 400 buildings (excluding family housing), with total square footage in excess of 2,850,000 square feet. The CADC contains approximately 35 buildings. The increase in square footage under Alternative 1 would equate to a nominal percent increase in overall facility square footage on the station and at the CADC. Additionally, utility system modifications would be implemented to support the proposed facilities at MCAS Yuma and the CADC. Electrical and communication system improvements would include provisions for transformers and telecommunications infrastructure, including a new communications line to the CADC, to support VMU-1 operations (Figure 2.1-4). Alternative 1 would also include exterior lighting for safety purposes to illuminate building areas. Additional utilities, including HVAC, water (potable and fire protection systems), and sewer would also be installed to support construction and renovation of airfield facilities. All new utility lines would connect directly to existing infrastructure and systems within the Alternative 1 footprint, and existing utilities are considered adequate to accommodate the small increase in demands resulting from construction of new facilities.

Construction, renovation, and demolition activities would generate debris (e.g., steel, siding, concrete) that would require disposal. All materials would be disposed of in compliance with federal, state, local, and Marine Corps regulations for the collection and disposal of municipal solid waste from the station. Much of this material would be recycled or reused, or otherwise diverted from landfills. All non-recyclable construction and demolition waste would be collected in a dumpster until removal off-site and would be hauled away by the contractor to local landfills. All construction would comply with MCAS Yuma Solid Waste Management Plan, the *Environmental Compliance and Protection Manual* (MCOP5090.2A), and other applicable federal regulations, MCOs, Station Orders, and DoD Directives. In addition, all construction, renovation, and demolition materials would be recycled in accordance with the DoD Green Procurement Program and DoN Green Procurement Implementation Guide (2009).

The proposed personally owned vehicle parking, large equipment parking, and paved access/staging areas adjacent to the proposed facilities would result in new impervious surfaces, potentially increasing stormwater runoff volume and peak discharge rates. This potential increase in stormwater runoff would be managed such that discharge exiting the Alternative 1 footprint post-construction would be equal to or less than existing conditions through the use of appropriately designed conveyance structures and implementation of stormwater Best Management Practices. This includes the requirement that new projects be designed to provide on-site stormwater management that addresses a two-hour 100-year storm, an addition factor of 25 percent, plus six inches of freeboard.

Additionally, proposed construction, renovation, and demolition activities could temporarily affect the quality of stormwater runoff through potential increases in soil erosion. These activities can expose soils and during storm events, increasing sediment loading of the stormwater runoff. Alternative 1 would include Best Management Practices to manage stormwater runoff during construction, renovation, and demolition activities, including but not limited to the use of well-maintained silt fences or straw wattles, minimizing the surface area disturbed, stabilization of cut/fill slopes, minimization of earth-moving activities during wet weather, and covering soil stockpiles, as appropriate. Following construction, disturbed areas not covered with impervious surface would be reestablished with appropriate vegetation and native seed mixtures and managed to minimize future erosion potential.

In accordance with the Clean Water Act Section 402 Arizona Pollutant Discharge Elimination System Program, Best Management Practices would be implemented during construction, renovation, and demolition to minimize runoff. A Notice of Intent would be filed with the ADEQ to obtain coverage under the Construction General Permit and a site-specific Storm Water Pollution Prevention Plan and associated Best Management Practices would be implemented for construction sites where one or more acres would be disturbed.

Construction, renovation, and demolition activities could result in short-term interruptions of utility services (e.g., electricity, water, gas) in the immediate project vicinity during construction activities. These interruptions would be temporary and are typical of construction activities. There could be a slight increase in utility demands during construction, renovation, and demolition activities. The energy supply at MCAS Yuma, the CADC, and in the region is adequate and would not be affected by temporary increases in demands related to construction, renovation, and demolition activities. Therefore, no significant impacts on utilities and infrastructure would occur.

3.10.2.2 Alternative 2

Alternative 2 would be similar to Alternative 1, except the ground support facilities would be built at the CADC instead of at MCAS Yuma. Although Alternative 2 would result in more construction at the CADC and less at MCAS Yuma when compared with Alternative 1, impacts on utilities and infrastructure would not change in any substantive way. All new utility lines would connect directly to existing infrastructure and systems within the Alternative 2 footprint, and existing utilities are considered adequate to accommodate the small increase in demands resulting from construction of new facilities. Similar to Alternative 1 and in accordance with the Clean Water Act Section 402 Arizona Pollutant Discharge Elimination System Program, Best Management Practices would be implemented during construction, renovation, and demolition to minimize runoff. A Notice of Intent would be filed with the ADEQ to obtain coverage under the Construction General Permit and a site-specific Storm Water Pollution Prevention Plan and associated Best Management Practices would be implemented for construction sites where one or more acres would be disturbed. Finally, proposed changes in military personnel and dependents under Alternative 2 would be the same as those described under Alternative 1. Existing station utilities are considered adequate to accommodate the nominal increase in demand resulting from increased military personnel and associated day-to-day operational activities. Therefore, no significant impacts on utilities and infrastructure would occur.

3.10.2.3 No-Action Alternative

Under the No-Action Alternative, the relocation of VMU-1 from MCAGCC to MCAS Yuma would not occur. Existing utility and infrastructure conditions would remain as described in Section 3.10.1, *Affected Environment*. Therefore, no impacts on utilities and infrastructure would occur.

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4 Cumulative Impacts

4.1 Introduction

CEQ regulations implementing NEPA require that the cumulative impacts of a proposed action be assessed (40 CFR Parts 1500–1508). A cumulative impact is defined as the following:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7).

CEQ's guidance for considering cumulative effects states that NEPA documents "should compare the cumulative effects of multiple actions with appropriate national, regional, state, or community goals to determine whether the total effect is significant" (CEQ 1997).

The first step in assessing cumulative effects, therefore, involves identifying and defining the scope of other actions and their interrelationship with the proposed action or alternatives. The assessment must consider other projects that are near or coincide, spatially or temporally, with the proposed action and other actions. Section 4.2, *Projects Considered in the Cumulative Analysis*, identifies relevant past, present, and reasonably foreseeable future actions. Projects were selected because they are either similar to the proposed action, large enough to have far reaching effects, or in proximity to the proposed action. Section 4.4, *Cumulative Impact Analysis*, provides an analysis of cumulative impacts for relevant environmental resources, and further defines the ROI and relevant projects for each resource area.

4.2 Projects Considered in the Cumulative Analysis

Information on past, present, and reasonably foreseeable future projects and their associated anticipated impacts was gathered through a review of available environmental documentation (conducted in February 2015). The majority of reasonably foreseeable future projects are construction, renovation, and/or demolition of air station facilities and support infrastructure identified in the MCAS Yuma Master Plan (MCAS Yuma 2014a). A list of the cumulative projects, summary information, and their associated impacts are presented in Table 4-1.

4.3 Methodology

4.3.1 Geographic Scope of the Cumulative Effects

For this analysis, a geographic scope, or ROI, for each cumulative effects issue was established. The ROI is generally based on the natural boundaries of the resources affected, rather than jurisdictional boundaries. The geographic scope may be different for each cumulative effects issue. The geographic scope of cumulative effects often extends beyond the scope of the direct effects, but not beyond the scope of the direct and indirect effects of the proposed action and alternatives.

Table 4-1. Cumulative Projects

Project Name	*Project Location*	*Project Description*	*Project Timeframe*	*Relevant Areas of Potential Cumulative Impact*
		MCAS Yuma		
Operational Test and Evaluation Center and Relocation of VMX-22 at MCAS Yuma	MCAS Yuma (Flight Line District) and BSTRC	Construction, demolition, and renovation of facilities associated with relocating Operational Test and Evaluation Center to MCAS Yuma	2015-2020s	Airspace, Air Quality/GHGs, Noise, Cultural Resources
MILCON P-587 Taxiway Improvements	MCAS Yuma (Flight Line District)	Construct a taxiway for rotary wing aircraft to access runways west of Hangar 76	2015-2017	Air Quality/GHGs, Noise
MALS-13 Facilities Renovation	MCAS Yuma (Flight Line District)	Renovate MALS-13 facilities to accommodate the F-35B (86,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Hangar 95 Renovation	MCAS Yuma (Flight Line District)	Renovate Hangar 95 for F-35B (39,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Hangar 101 Demolition	MCAS Yuma (Flight Line District)	Demolish Hangar 101 and related facilities to construct F-35B maintenance facility (5,000 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Hangar 97 Demolition	MCAS Yuma (Flight Line District)	Demolish Hangar 97 and related facilities to construct F-35B squadron hangar (53,000 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
MAG-13 Headquarters	MCAS Yuma (Mission Support & Training District)	Construct MAG-13 Headquarters; demolish Buildings 495, 500, 505, and 507; build consolidated parking lot A (Phase 1) (21,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Unit Marshalling Area	MCAS Yuma (Mission Support & Training District)	Construct unit marshalling area (7 acres)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Fire Station Relocation	MCAS Yuma (Mission Support & Training District)	Relocate fire station	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Arizona Adventures Relocation	MCAS Yuma (Mission Support & Training District)	Relocate Arizona Adventures, upgrade car wash, and construct indoor recreational shooting range	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
MAWTS-1 SCIF/SAPF/ Tactical Command	MCAS Yuma (Mission Support & Training District)	Construct MAWTS-1 SCIF/SAPF/Tactical Command; demolish Building 510; relocate contractor trailers; construct interim recreational field; and expand parking lot (16,700 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources

Table 4-1. Cumulative Projects (continued)

Project Name	Project Location	Project Description	Project Timeframe	Relevant Areas of Potential Cumulative Impact
Armory Consolidation	MCAS Yuma (Mission Support & Training District)	Consolidate armory; demolish Building 480, 490, and 491 (Existing use relocated to CADC) (12,900 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Hart Street Expansion	MCAS Yuma (Mission Support & Training District)	Extend Hart Street; close/remove Vaupell Avenue, Frazier Avenue, and Smedley Street (3,000 linear feet)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Water Survival Tank Construction	MCAS Yuma (Mission Support & Training District)	Construct water survival tank/pool and demolish softball field (18,200 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
MCCS Operations Facility	MCAS Yuma (Mission Support & Training District)	Construct MCCS operations and grounds maintenance facility (4,000 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Consolidated Parking Lot A (Phase 2)	MCAS Yuma (Mission Support & Training District)	Demolish Building 610 and build consolidated Parking Lot A (Phase 2) (4 acres)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Fitness Center Renovation	MCAS Yuma (Community Support District)	Renovate fitness center (22,788 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Enlisted Dining Facility	MCAS Yuma (Community Support District)	Construct an enlisted dining facility (39,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Consolidated Parking Lot C (Phase 1)	MCAS Yuma (Community Support District)	Build consolidated Parking Lot C (Phase 1) (1 acre)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Construct MCX mini mart	MCAS Yuma (Community Support District)	Construct MCX mini mart (MCCS) (5,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Construct New Path	MCAS Yuma (Community Support District)	Build a new path from the Consolidated Club to the Ramada Complex (1,700 linear feet)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Ramada Complex Field House	MCAS Yuma (Community Support District)	Construct field house and storage for Ramada Complex fields; relocate RV storage to southeast corner of North Ordnance Look and South Avenue 3E (83,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
MCCS Operations Consolidation	MCAS Yuma (Community Support District)	Consolidate MCCS operations, services, and educational facility (40,000 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Air Station Headquarters	MCAS Yuma (Community Support District)	Construct Air Station Headquarters, administrative facility, and auditorium; demolish Buildings 850 and 852 (50,000 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources

Table 4-1. Cumulative Projects (continued)

Project Name	Project Location	Project Description	Project Timeframe	Relevant Areas of Potential Cumulative Impact
Retail Expansion	MCAS Yuma (Community Support District)	Build retail expansion; demolish Building 691 (15,000 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Consolidated Parking Lot C (Phase 2)	MCAS Yuma (Community Support District)	Build consolidated Parking Lot C (Phase 2)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Construct Cycle Track	MCAS Yuma (Community Support District)	Develop cycle track on Quilter Street (4,000 linear feet)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Quilter-to-Hart pedestrian promenade	MCAS Yuma (Community Support District)	Construct a pedestrian promenade between Quilter Street and Hart Street	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Recreational Facility	MCAS Yuma (Barracks District)	Construct a Marine recreation facility (7,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Retail Pavilion and Plaza	MCAS Yuma (Barracks District)	Develop retail pavilion and plaza; demolish Building 662 (5,000 sf)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Consolidated Parking Lot B	MCAS Yuma (Barracks District)	Build consolidated parking lot B; demolish Building 633 (2.5 acres)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Transient Barracks	MCAS Yuma (Barracks District)	Construct transient barracks (Phase 1); demolish Building 740; close Thomas Avenue between Aldrich and Worley Streets (98,000 sf)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Recreational Courts	MCAS Yuma (Barracks District)	Build recreation courts and shade canopy; demolish Building 920 (1.5 acres)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Pedestrian Promenade	MCAS Yuma (Barracks District)	Construct Aldrich Street pedestrian promenade (720 linear feet)	2018-2022	Air Quality/GHGs, Noise, Cultural Resources
Building 328 Renovation	MCAS Yuma (Logistics District)	Renovate MALS-13 (portion of Building 328) to accommodate the F-35B	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
New Gas Station	MCAS Yuma (Logistics District)	Construct a new gas station (DLA)	2013-2017	Air Quality/GHGs, Noise, Cultural Resources
Bob Stump Training Range Complex				
Target Complex Invader	CMAGR	Construction and operation of a training range complex that includes a target area and associated land zone and three observation posts within restricted airspace R-2507S	2016	Airspace, Air Quality/GHGs; Biological Resources; Cultural Resources

Table 4-1. Cumulative Projects (continued)

Project Name	Project Location	Project Description	Project Timeframe	Relevant Areas of Potential Cumulative Impact
CMAGR Land Withdrawal Renewal	CMAGR	BLM withdrawn lands within the CMAGR would continue to be withdrawn and reserved for continued military use	2015	Air Quality/GHG; Biological Resources; Cultural Resources
Range Redesign of SWATs 4 and 5	Western Area of CMAGR	Proposed designs to reconfigure existing training ranges	Draft EA prepared in May 2015	Air Quality/GHGs; Biological Resources; Cultural Resources
Proposed Establishment of Special Use Airspace Restricted Area R-R2507W	CMAGR	Establishment of restricted airspace over SWATs 4 and 5	FONSI signed in June 2014	Airspace; Air Quality/GHGs; Noise; Biological Resources
Infrastructure Improvements at Camp Billy Machen (P-771)	CMAGR	Utility upgrades, construction of instructional spaces, materials handling and materials preparation facilities, and berthing	FONSI signed in April 2012; supplemental EA for additional utility upgrades in process	Air Quality/GHGs; Biological Resources
Communication Towers Project	CMAGR	Establishment of two radio communication towers	NEPA not yet started	Air Quality/GHGs; Utilities
Temporary facilities for VMU-1	CADC (BMGR-West)	Construction of temporary facilities for the VMU-1 Squadron including relocatable trailers, two hangars, HAZMAT pit, parking area, and launch/recovery strip	2015-2018	Air Quality/GHGs; Noise; Biological Resources; Transportation
Fire Station #3 (P-501)	CADC (BMGR-West)	Construction of a new 7,900 sf fire station within the CADC	2014-2018	Air Quality/GHGs; Biological Resources; Safety and Environmental Health; Transportation
Field Barracks	CADC (BMGR-West)	Construction of new field barracks (30,000 sf) at the CADC	2014–2018	Air Quality/GHGs; Biological Resources; Community Facilities and Services; Transportation
Recreational Field and Running Track	CADC (BMGR-West)	Construction of a new recreational field and running track (1.5 acres)	2019-2023	Air Quality/GHGs; Biological Resources; Community Facilities and Services
Construct mess hall, gym, and mini-mart	CADC (BMGR-West)	Construct a new mess hall, gym, and mini-mart (13,400 sf)	2019-2023	Air Quality/GHGs; Biological Resources; Community Facilities and Services

Table 4-1. Cumulative Projects (continued)

Project Name	Project Location	Project Description	Project Timeframe	Relevant Areas of Potential Cumulative Impact
Gate Improvement (P558)	CADC (BMGR-West)	Improve the main gate to the CADC	2014 – 2018	Air Quality/GHGs; Transportation

Source: MCAS Yuma 2014a

Notes: BLM = Bureau of Land Management, BMGR-West = Barry M. Goldwater Range-West, BSTRC = Bob Stump Training Range Complex, CADC = Cannon Air Defense Complex, CMAGR = Chocolate Mountain Aerial Gunnery Range, DLA = Defense Logistics Agency, EA = Environmental Assessment, FONSI = Finding of No Significant Impact, GHG = greenhouse gas, HAZMAT = Hazardous Materials, MAG = Marine Aircraft Group, MALS = Marine Aviation Logistics Squadron, MAWTS-1 = Marine Aviation Weapons and Tactics Squadron 1, MCAS = Marine Corps Air Station, MCCS = Marine Corps Community Service, MCX = Marine Corps Exchange, MILCON = military construction, NEPA = National Environmental Policy Act, SAPF = Special Access Program Facility, SCIF = Sensitive Compartmented Information Facility, sf = square feet, SWAT = Special Warfare Training Areas, VMU-1 = Marine Unmanned Aerial Vehicle Squadron 1

However, if the proposed action and alternatives are determined to have no direct or indirect effects on a resource, no cumulative effects analysis is necessary. ROIs are defined in Section 4.4, *Cumulative Impact Analysis*, for each resource listed below. Because ROIs vary for different resources, not all of the cumulative projects would be located within the ROIs defined for a particular resource.

4.3.2 Time Frame of the Cumulative Effects Analysis

A time frame for each issue related to cumulative effects has been determined. The time frame is defined as the duration of the effects anticipated. Time frames, like geographic scope, can vary by resource. Each project in a region has its own implementation schedule, which may or may not coincide or overlap with the schedule for implementing the proposed action. This is a consideration for short-term impacts from the proposed action. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the proposed action.

Past actions are projects that have been approved and/or permitted, and that have either very recently completed construction/implementation or have yet to complete construction/be implemented. Present actions are actions that are ongoing at the time of the analysis. Reasonably foreseeable future actions are those for which there are existing decisions, funding, or formal proposals, or which are highly probable based on known opportunities or trends. However, these are limited to within the designated geographic scope and time frame. Reasonably foreseeable future actions are not limited to those that are approved for funding. However, this analysis does not speculate about future actions that are merely possible, but not highly probable based on information available at the time of this analysis.

For this cumulative effects analysis, the time frame considered for cumulatively considerable projects includes projects recently approved or completed that are not yet addressed as part of the existing conditions of the area, projects under construction, and projects that are in the environmental review or planning process and for which enough information is available to discern their potential impacts. Projects for which no or insufficient information is known, or for which substantial uncertainty exists regarding the project, are considered speculative and are not evaluated as part of this analysis.

4.4 Cumulative Impact Analysis

This section addresses the potential cumulative impacts of the proposed action in conjunction with the aforementioned cumulative projects. These projects represent past, present, and reasonably foreseeable actions with the potential for cumulative impacts when considered in conjunction with the potential impacts from the proposed action. However, if a project would not result in direct or indirect impacts on a resource area, it would not contribute to a cumulative impact on that resource area and no further evaluation from a cumulative impact perspective is warranted. The cumulative impact analysis focuses on 1) those resource areas with the potential to be significantly impacted by the proposed action; and/or 2) those resource areas currently in poor or declining health or at risk even if impacts associated with the proposed action would be relatively small (less than significant). The resources that do not meet these criteria are hazardous materials and waste (Section 3.6, *Hazardous Materials and Waste*), safety and environmental health (Section 3.7, *Safety and Environmental Health*), community facilities and services (Section 3.8), transportation (Section 3.9, *Transportation*), and utilities and infrastructure (Section 3.10, *Utilities and Infrastructure*). Therefore, the proposed action would not cumulatively contribute to impacts to these resources areas, and they are not evaluated further in this section.

4.4.1 Airspace

The geographic scope of the airspace cumulative analysis includes the airspace over much of southern California and western Arizona. This regional airspace (and elsewhere) is becoming more and more crowded due to increasing commercial, private, and military aviation demands. The FAA has to consider multiple and sometimes competing demands, while managing airspace conditions to satisfy all aviation users. Regarding the proposed action, the change in proposed aircraft operations under Alternatives 1 and 2 would not alter any airspace configurations, and it would not impact current or future military and general aviation users of the airspace. One proposed military project, the relocation of the VMX-22 squadron to MCAS Yuma, could affect airspace use by increasing military aircraft operations in the BSTRC. Similar to the proposed action, VMX-22 operations would be integrated and conducted in accordance with the FAA and USMC requirements governing the different system types and their airspace uses. Another proposed military project would create a new restricted airspace over the CMAGR (R-2507W). The proposed restricted area would allow a wider range of aviation activities (e.g., live-fire combat training) to occur above portions of the CMAGR where these activities are not currently permitted. The proposed airspace would not result in an increase in aircraft sorties flown in the R-2507 complex, and the concentration of aircraft activity in the existing portions of R-2507N/S would actually decrease slightly. Therefore, the cumulative impacts identified for airspace from the proposed action, in conjunction with other projects on and in the regional vicinity, would not be cumulatively significant.

4.4.2 Air Quality

4.4.2.1 Criteria Pollutants

The ROI for the criteria air pollutant cumulative analysis is primarily the southwest portion of Yuma County and the southeast portion of Imperial County that encompasses the CMAGR. As described in Section 3.2, *Air Quality*, construction and operation of the alternatives would produce emissions that would remain well below all emission significance thresholds. Emissions from cumulative projects potentially would contribute to ambient pollutant impacts generated from proposed activities. However, these emissions would occur far enough away from the locations of proposed construction and operational activities such that they would produce low ambient pollutant impacts in proximity to the project footprint. Therefore, air quality impacts from proposed construction and operational emissions, in combination with emissions from cumulative projects, would not be substantial enough to contribute to an exceedance of an ambient air quality standard. Implementation of standard fugitive dust and construction equipment emission control measures (Special Conservation Measures 1 and 2; Appendix B) would ensure that air emissions from proposed construction activities would produce less than significant impacts. As a result, proposed construction and operational activities would not produce cumulatively significant impacts on criteria pollutant levels.

4.4.2.2 Greenhouse Gases

The potential effects of proposed GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change only would occur when proposed GHG emissions combine with GHG emissions from other human activities on a global scale.

Currently, there are no formally adopted or published NEPA thresholds of significance for GHG emissions. Therefore, in the absence of an adopted or science-based NEPA significance threshold for GHGs, this EA compares the maximum amount of combined construction and operational GHG emissions that would occur from either project alternative to the United States net GHG emissions inventory of 2013 (USEPA 2015c) to determine the relative increase in proposed GHG emissions. Appendix C presents estimates of GHG emissions generated by the alternatives.

The maximum annual GHG emissions generated from either project alternative would equate to 334 tons of CO_{2e}. The ratio of CO_{2e} emissions from the alternatives to the CO_{2e} emissions associated with the net United States sources in 2013 is approximately 0.0003/5,791 million metric tons, or about 0.000001 percent of the United States CO_{2e} emissions inventory. Because GHG emissions from the alternatives would equate to minimal amounts of the United States inventory, they would not substantially contribute to global climate change. The CEQ revised draft guidance (see Section 3.2.1.3, *Greenhouse Gases*) also states that 25,000 metric tons per year of CO_{2e} emissions is a reference point below which a quantitative analysis of GHGs is not recommended unless it is easily accomplished with available tools and data. Therefore, GHG emissions from the alternatives would not produce cumulatively significant impacts to global climate change.

Although the alternatives would not produce significant cumulative impacts to global climate change, the new buildings proposed under Alternative 1 would include sustainable design principles and energy conservation measures, including Leadership in Energy and Environmental Design (LEED®) standards to the extent feasible. These design measures are consistent with the broad-based programs the USMC and DoN implement to reduce energy consumption and to shift to renewable and alternative fuels, thereby reducing overall emissions of GHGs.

Renewable energy projects currently implemented and planned within the jurisdiction of MCI West would reduce emissions of GHGs by about 250,000 metric tons from current operations over a 25-year life cycle (MCI West 2009). These projects include thermal and photovoltaic solar systems, geothermal power plants, and wind generators. These renewable energy initiatives are not proposed as emission reductions to directly offset GHG emissions produced by either action alternative, but rather demonstrate initial responses for DoN compliance with EO 13693 and to factor GHG management into DoN proposals and impact analyses.

Climate Change Adaptation

In addition to assessing whether the alternatives would potentially impact climate change, the following considers how climate change could impact these actions and what adaptation strategies, if any, would be required to respond to these future conditions. For projects within southwest Arizona and southeast California, the main effect of climate change to consider is increased aridity, as documented in Climate

Change Impacts in the United States: The Third National Climate Assessment (United States Global Change Research Program 2014). This report predicts that in the future, this region will experience increased droughts, temperatures, wildfires, and scarcities of water supplies. Current operations at MCAS Yuma and the CMAGR have adapted to droughts, high temperatures, and scarce water supplies in the area. Exacerbation of these conditions in the future could impede proposed activities during extreme events. Due to its desert surroundings and sparse vegetation, an increase in wildfires in the region would have little to no effect on activities at MCAS Yuma, the CADC, or the CMAGR. No other substantial effects from future climate change would impact proposed construction and operational activities.

4.4.3 Noise

The ROI for potential cumulative impacts to noise consists of the project footprint and adjacent areas on MCAS Yuma and the CADC. Development throughout MCAS Yuma and the surrounding areas would result in intermittent, short-term, construction-related noise impacts. The duration of these localized impacts would be limited to the construction phases of the individual projects and confined to the immediate construction area. Cumulative projects would comply with applicable federal, state, and local regulations and/or requirements. Therefore, cumulative construction-related noise impacts from the proposed action, in conjunction with other projects in the regional vicinity, would not be cumulatively significant.

One proposed military project (creation of R-2507W) would affect the operation of and noise generated by military aircraft operating at the CMAGR. The proposed restricted area would allow a wider range of aviation activities (e.g., live-fire combat training) to occur above portions of the CMAGR where these activities are not currently permitted. The proposed airspace would not result in an increase in aircraft sorties flown in the R-2507 complex, and the concentration of aircraft activity in the existing portions of R-2507N/S (and related aircraft noise) would actually decrease slightly. Therefore, the cumulative noise impacts of VMU-1 operations, in conjunction with other cumulative projects, would not be cumulatively significant.

4.4.4 Biological Resources

The ROI, with respect to desert tortoise is the Chuckwalla Desert Wildlife Management Area, which is within the Colorado Desert recovery unit for the tortoise; the ROI for the Sonoran pronghorn is the current known range of the species; and the ROI for the flat-tailed horned lizard extends to the boundary of the Yuma Desert Management Area. Approximately 41 percent of the CMAGR is designated as desert tortoise critical habitat within the Chuckwalla Desert Wildlife Management Area (DoN 2013). Reasonably foreseeable actions include renewable energy and transmission projects, as well as ongoing military training within existing DoD-owned properties. These projects likely would result in incremental habitat loss or conversion, and could act as barriers to wildlife movements. However, DoD-owned lands also serve as a barrier to encroachment, commercial development, and off-road recreation. No habitat would be permanently lost or removed and temporary disturbance would be restricted to previously disturbed areas.

For the Sonoran pronghorn, virtually the entire distribution of Sonoran pronghorn in the United States is within five areas of federally administered land, which affords additional protections from habitat loss for the species. Reasonably foreseeable actions include federal activities within the BMGR (East and West), the Cabeza Prieta National Wildlife Refuge, Organ Pipe Cactus National Monument, and Kofa National Wildlife Refuge. The proposed action would not disturb habitat, temporarily or permanently, or increase noise beyond negligible levels within the known range of the species.

Reasonably foreseeable projects at the CADC could incrementally disturb habitat within the Yuma Desert Management Area for the flat-tailed horned lizard. Other unidentified activities, including unauthorized off-road recreation, utility infrastructure, and renewable energy projects all have the potential to incrementally remove or reduce the quality of habitat for the species. All reasonably foreseeable projects at the CADC and most other activities that occur on public lands would be regulated and managed in accordance with the 2003 Rangewide Management Strategy for Flat-tailed Horned Lizard, which provides mitigation and avoidance measures to reduce the level of impact. The CADC is primarily disturbed so the potential for substantial additional habitat loss for projects that are reasonably foreseeable to occur at that complex is low.

All reasonably foreseeable projects that have the potential to impact the desert tortoise or the Sonoran pronghorn would be subject to oversight by the USFWS because of the potential presence of federally listed species, as required under Section 7, 9, or 10 of the ESA, in addition to NEPA review for all activities occurring on federal land, funded, permitted, or directed by a federal agency. Oversight means that all reasonably foreseeable projects would likely include measures to maximize conservation of the species and associated habitats. Under Alternatives 1 and 2, which are virtually identical with respect to impacts on biological resources, the cumulative impacts identified for biological resources from the proposed action, in conjunction with other projects on and in the regional vicinity, would not be cumulatively significant.

4.4.5 Cultural Resources

The ROI for potential cumulative impacts on cultural resources consists of MCAS Yuma, the BSTRC, and adjacent communities. Regional development and urbanization in southwestern Arizona and southeastern California has resulted in extensive impacts on cultural resources, especially the destruction of archaeological sites and historic buildings. These types of cultural resources are limited, which is one of the reasons why strict federal and state regulations have been implemented to provide management and regulatory oversight. Regarding the proposed action, no historic properties would be affected by proposed construction or operations under Alternative 1 or 2, and potential impacts to possible post-review discoveries would be reduced by implementing Special Conservation Measure 5 (*Post Review Discovery Procedures*). Other present and reasonably foreseeable projects at MCAS Yuma and the BSTRC that involve ground disturbing activities and/or modification or demolition of buildings or structures could result in impacts to cultural resources. Federal projects that have the potential to affect historic properties (assuming the presence of such properties) would undergo NHPA Section 106 review to consider any effects that the project may have on historic properties (as defined at 36 CFR 800.16). The significance of any effects would also be reviewed under NEPA. Therefore, the proposed action, combined with other cumulative projects, would not result in significant cumulative impacts to cultural resources.

5 List of Preparers

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GIS = Geographic Information Systems, NEPA = National Environmental Policy Act				

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Appendix A

Applicable Federal Regulations, Instructions, and Public Law

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Applicable Federal Regulations, Instructions, and Public Law

Name	*Regulation*
National Environmental Policy Act of 1969	42 USC §§ 4321–4370h
Council on Environmental Quality Regulations for Implementing the Procedural Provisions of National Environmental Policy Act	40 CFR Parts 1500–1508
Department of the Navy Procedures for Implementing National Environmental Policy Act	32 CFR Part 775
Environmental Compliance and Protection Manual Chapter 12	Marine Corps Order P5090.2A, Change 3
National Historic Preservation Act	54 USC §300101 *et seq*
Clean Water Act	33 USC §§ 1251–1387
Clean Air Act, as amended, including 1990 General Conformity Rule	USC §§ 7401–7671q
Comprehensive Environmental Response, Compensation, and Liability Act	42 USC §§ 9601–9675
Resource Conservation and Recovery Act	42 USC §§ 6901–6992k
Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, 11 February 1994	Executive Order 12898
Protection of Children from Environmental Health Risks and Safety Risks, 23 April 1997	Executive Order 13045
Endangered Species Act	16 USC §§ 1531–1544
Migratory Bird Treaty Act	16 USC §§ 703–712
Responsibility of Federal Agencies to Protect Migratory Birds, 11 January 2001	Executive Order 13186
Invasive Species	Executive Order 13112
Native Americans Graves Protection and Repatriation Act	25 USC §§ 3001–3013 and 40 CFR Part 10
Federal Compliance with Pollution Control Standards	Executive Order 12088
Greening the Government through Waste Prevention, Recycling, and Federal Acquisition	Executive Order 13101
Greening the Government through Efficient Energy Management	Executive Order 13123
Greening the Government through Leadership in Environmental Management	Executive Order 13148
Planning for Federal Sustainability in the Next Decade	Executive Order 13693
United Facilities Criteria for Low Impact Development	United Facilities Criteria 3-210-10
American Indian Religious Freedom Act	PL 95-341; 42 USC §§ 1996 and 1996a
Archaeological Resource Protection Act	16 USC §§ 470aa–470mm; PL 96-95 and Amendments
Federal Leadership in Environmental, Energy and Economic Performance	Executive Order 13514
Federal Aviation Administration Order 7400.2	49 USC § 40103(b)
Operation Risk Management	Marine Corps Order 3500.27A
Range Regulations for Activities Scheduled by MCAS Yuma	MCAS Yuma Station Order 3710.6

Applicable Federal Regulations, Instructions, and Public Law

Name	***Regulation***
Pre-mishap Plan	MCAS Yuma Station Order 3750.2
National Register of Historic Places	36 CFR Part 60
Operational Risk Management	Office of the Chief of Naval Operations 3500.39A
Pollution Prevention Act of 1990	42 USC §§ 13101–13109
Sikes Act	16 USC §§ 670–670f, 74 Stat. 1052, as amended, PL 86-797, approved 15 September 1960
Waste Discharge Requirements for Discharge of Storm Water Runoff Associated with Construction and Land Disturbance Activities	State of California Water Resources Control Board Order No. 2009-0009-DWQ; National Pollutant Discharge Elimination System General Permit No. CAS000002
Notes: CFR = Code of Federal Regulations; MCAS = Marine Corps Air Station; PL = Public Law; USC = United States Code.	

Appendix B

Planning Study for VMU-1 Relocation to MCAS Yuma

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UNITED STATES MARINE CORPS
Marine Unmanned Aerial Vehicle Squadron

PLANNING STUDY FOR VMU-1 RELOCATION TO MARINE CORPS AIR STATION YUMA

JUNE 2015

Unclassified/ For Official Use Only

This Planning Study for Relocation of VMU-1 to Marine Corps Air Station Yuma was prepared by KTU+A for Naval Facilities Engineering Command Southwest under Leidos contract # N62473-08-D8807.

KTU+A, 3916 Normal Street, San Diego, California 92103, (619) 294-4477

Contents

Appendices

Figures

Tables

Acronyms- Abbreviations

ACA	Airspace Coordination Areas
ALF	Auxiliary Landing Field
APZ	Accident Potential Zones
ATC	Air Traffic Control
AUX II	Auxiliary Airfield II
AvPlan	Marine Aviation Plan
BMGR	Barry M. Goldwater Range
CADC	Cannon Air Defense Complex
CALA	Combat Aircraft Loading Area
CCN	Category Code Number
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLC-16	Combat Logistics Company - 16
COA	Course of Action
dB	Decibel
FAA	Federal Aviation Administration
FAA/COAW	Federal Aviation Administration Certificate of Authorization of Waiver
FY	Fiscal Year
GCS	Ground Control Station
GDT	Ground Data Terminal
HMMWV	High Mobility Military Wheeled Vehicles
HQ	Headquarters
LHA	Landing Helicopter, Assault
MACS-1	Marine Air Control Squadron One
MAG	Marine Aircraft Group
MAG-13	Marine Aircraft Group 13
MALS	Marine Aviation Logistics Squadron
MALS-13	Marine Aviation Logistics Squadron - 13
MCAGCC	Marine Corps Air Station Ground Combat Center
MCAS	Marine Corps Air Station
MGCS	Mobile Ground Control Station
MILCON	Military Construction Documentation
MOS	Military Occupational Specialty
MRP	Munitions Response Plan
MWSS	Marine Wing Support Squadron
MWSS-371	Marine Wing Support Squadron Three Seven One
NAVAIR	Naval Air Systems Command
NEPA	National Environmental Policy Act
PBFR	Platform Basic Facility Requirements
POV	Privately Owned Vehicle
RA	Restricted Airspace
ROZ	Restricted Operations Zones
SER	Site Evaluation Report
STUAS	Small Tactical Unmanned Aircraft Systems
TACTS	Tactical Air Combat Training System
TALS	Tactical Automated Landing System
UAS	Unmanned Aerial System
UAS Study	Unmanned Aircraft Systems Study
UAV	Unmanned Air Vehicle
UFC	Unified Facilities Criteria
VMU	Marine Unmanned Aerial Vehicle
VMU-1	Marine Unmanned Aerial Vehicle Squadron 1
VMX	Marine Operational Test and Evaluation Squadron
WTI	Weapons and Tactics Instructor

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

PURPOSE

The purpose of this study is to determine the ideal facility location, concept site plan and preliminary construction cost estimates to support the relocation of Marine Unmanned Aerial Vehicle Squadron 1 (VMU-1) from the Marine Corps Air Ground Combat Center Twenty-Nine Palms to the Marine Corps Air Station (MCAS) Yuma. Both short term and long term facility requirements are included in the analysis. Short term requirements focus around Small Tactical Unmanned Aircraft Systems (STUAS) operations and support facilities. Long term requirements add Group 4 or 5 Unmanned Aerial System (UAS) operations. The second purpose of this study is to develop operationally feasible alternatives to support follow-on National Environmental Policy Act (NEPA) documentation of potential impacts resulting from the proposed actions.

PROCESS

This study began in 2013 with the relocation of Reserve Squadron Marine Unmanned Aerial Squadron 4 from the MCAS Yuma to the Marine Corps Base Camp Pendleton. In 2014, the relocation of VMU-1 from the Marine Corps Air Ground Combat Center Twenty-Nine Palms to the MCAS Yuma was added to the study. The Marine Unmanned Aerial Squadron 4 planning study for Marine Corps Base Camp Pendleton is in a separate document. The kickoff meeting and initial fieldwork for Yuma occurred 28 January 2014. A draft planning study, with preliminary site development concepts, was submitted in June of 2014. A revised planning study that incorporates the final selected site, facility configuration and a preliminary construction cost estimate were submitted in March of 2015.

ASSUMPTIONS

VMU-1 is a fully equipped aircraft squadron that currently operates Group 3 STUAS including three RQ-7B Shadow systems with twelve unmanned air vehicles (UAV). Nine RQ-21A Black Jack systems with forty-five UAVs will be added to the squadron within the next five years. The naming convention of the RQ-21A is changing to MQ-21A to reflect an increase in payload and additional capabilities. This study uses MQ-21A from this point forward. Long term plans include replacement of the three RQ-7B systems with three much larger Group 4 or 5 systems that require a full size paved runway, ordnance loading area and aircraft maintenance hangar.

The RQ-7B and the MQ-21A are launched from trailer mounted pneumatic catapult systems. The RQ-7B requires a very small paved, or unpaved, expeditionary type runway to land and be recovered. After the RQ-7B is replaced with a Group 4 or 5 system, this small expeditionary runway will no longer be required. The MQ-21A is recovered by its wing hook on a rope that is attached to the top of a crane, so no expeditionary runway is required for the MQ-21A.

UAS flights from the Main Station or the Cannon Air Defense Complex (CADC) are outside of restricted airspace and require a Federal Aviation Administration Certificate of Authorization or Waiver to transit to restricted airspace. Future Federal Aviation Administration rules may modify the requirement for a

Federal Aviation Administration Certificate of Authorization or Waiver. However, it is assumed that the need for a Federal Aviation Administration Certificate of Authorization or Waiver is not a significant issue and should not be considered a constraint to using the CADC for STUAS launch and recovery operations.

Facility requirements for the three RQ-7B systems and nine MQ-21A systems were developed by Naval Air Systems Command and provided as part of their August 2014 *Site Evaluation Report* and their October 2014 *Site Activation Support Plan*. Facility requirements for the Group 4 or 5 systems were not included in the Naval Air Systems Command reports, but were assumed to predominantly match the facility requirements of the platform it will replace (the RQ-7B). The primary facility requirement differences between the RQ-7B and Group 4 or 5 UAS are the size of the aircraft maintenance hangar, the aircraft parking apron and the switch from a small expeditionary runway to a full size runway.

This study used the seventy-nine foot wingspan by thirty-six foot long MQ-9 Reaper aircraft dimensions to determine Group 4 or 5 UAS hangar and parking apron facility requirements. All other facility requirements for the three Group 4 or 5 systems were assumed to be the same as three RQ-7B systems. Facility requirements for nine systems of MQ-21A as developed by Naval Air Systems Command for a standard Marine Unmanned Aerial Vehicle squadron are in addition to the Group 4 or 5/RQ-7B facility requirements.

ALTERNATIVES

Concept site plans were developed for three locations, including the Main Station, the CADC and the Auxiliary Airfield II. The new Auxiliary Landing Field was not considered because it is being fully utilized to support manned aircraft training.

In addition to the three locations, facilities were split into various categories including long term support and Group 4 or 5 UAS air operations, and short term STUAS support and air operations. Air operations facilities include a runway, aircraft maintenance hangar, parking apron and the airspace for flights. Secondary support facilities include a warehouse, vehicle maintenance shop, grease rack, open paved areas for parking organizational vehicles and other small miscellaneous facilities. Additional support buildings are required for remote STUAS training.

Between the three locations and various facility categories, thirteen alternative site plans were developed for splitting the facilities between the Main Station, the CADC and the Auxiliary Airfield II. A general assessment of each alternative or course of action (COA) is color coded in Table ES.1: Alternatives Assessment. Red indicates a highly inefficient or operationally infeasible condition. Yellow indicates a moderately inefficient or operationally undesirable condition. Green indicates the alternative has the fewest impacts to squadron efficiency and is considered to be the most operationally feasible.

Site	Figure	Configuration	COA 1 Detachment Alt 1	COA 1 Detachment Alt 2	COA 1 Detachment Alt 3	COA 2 RQ-7 and MQ-21 Alt 1	COA 2 RQ-7 and MQ-21 Alt 2	COA 2 RQ-7 and MQ-21 Alt 3	COA 2 RQ-7 and MQ-21 Alt 4	COA 2 RQ-7 and MQ-21 Alt 5	COA 3 Group 4 or 5 and MQ-21 Alt 1	COA 3 Group 4 or 5 and MQ-21 Alt 2	COA 3 Group 4 or 5 and MQ-21 Alt 3	COA 3 Group 4 or 5 and MQ-21 Alt 4	COA 3 Group 4 or 5 and MQ-21 Alt 5
Main Station	5.1a/5.1b	Group 4 or 5 & MQ-21 Full Buildout											X	X	X
	5.2	RQ-7/MQ-21 Shared Type II Hangar							X	X					
	5.3	Group 4 or 5 UAS Facilities & HQ Only									X	X			
CADC	5.5	Detachment Hangar and Runway	X												X
	5.6	Detachment Hangar/Maint. Only			X										
	5.7	Expeditionary Runway Only							X				X		
	5.8	RQ-7/MQ-21 Full Buildout				X									
	5.9	RQ-7/MQ-21 Support Facilities & HQ						X							
	5.10	MQ-21 & Full Support									X				
AUX II	5.11	Detachment Hangar and Runway		X											
	5.12	Expeditionary Runway Only			X					X				X	
	5.13	RQ-7/MQ-21 Full Buildout					X								
	5.14	RQ-7/MQ-21 Hangars, Runway						X							
	5.15	MQ-21 and Full Support										X			

Legend
- (red) = Alternative is highly inefficient or operationally infeasible for the squadron.
- (yellow) = Alternative is moderately inefficient or operationally undesirable for the squadron.
- (green) = Alternative is the most operationally efficient and feasible for the squadron.

Note: COA=Course of Action, Alt=Alternative, HQ=Headquarters, AUX II=Auxiliary Airfield II.

Table ES.1: Alternatives Assessment

FINAL SITE

COA 3 Alternative 5 is the final site and configuration selected for VMU-1 facilities. This configuration includes a new Type II Hangar on the Main Station flightline, new secondary support facilities within walking distance of the hangar and STUAS flight operations at a new permanent detachment operations facility at the CADC. See Figure ES-1, Main Station, MQ-21 & Group 4 or 5 UAS Full Buildout (old Van Pad) Preferred Alternative and Figure ES-2, CADC, Detachment Hangar and Runway Preferred Alternative for the final selected sites and layouts.

After submitting the draft planning study in June 2014, the decision to have Group 4 or 5 UAS flight operations primarily originate from the Main Station was confirmed. It was additionally confirmed that support facilities should be in close proximity to the Group 4 or 5 aircraft maintenance hangar. This close proximity of all facilities promotes operational efficiency and better equipment accounting for the squadron. It was also confirmed that remote STUAS operations will occur at the CADC. Additional STUAS flight operations could still occur in remote training ranges east of Yuma.

The draft study also found that Comprehensive Environmental Response Compensation and Liability Act cleanup sites at the south end of the flightline below Hangar 75 will not be cleared in time for construction of new VMU-1 facilities. With layouts for the south end of the flightline eliminated from final selection, that left the old Van Pad site as the remaining location for VMU-1 secondary support facilities. This also coincides with the 2015 Marine Aviation Plan that indicates four F-35B Joint Strike Fighter squadrons will be assigned to the Main Station. The four Joint Strike Fighter squadrons will occupy the four new hangars constructed at the south end of the flightline (Hangars 75, 76, 78 and 80). This enables existing Hangars 97 and 101 to be reutilized by VMU-1, as the hangars no longer need to be reserved for additional Joint Strike Fighter squadrons.

By early 2016, VMU-1 will start occupying Hangar 101. General upgrades to the Hangar will start near the end of 2016. Hangar 101 will be a short term facilities solution (about eight years) that relocates VMU-1 from the Marine Corps Air Ground Combat Center Twenty-nine Palms to the MCAS Yuma. Existing Building 408 will support classroom and simulator training space requirements.

Proposed construction under the Preferred Alternative has been separated into three phases, and is supported by three separate Military Construction Documents (MILCONs) and associated cost estimates.

Two projects will support long term VMU-1 facility requirements at the Main Station. One project (P-606) constructs secondary support facilities just east of existing Hangar 101 on the old Van Pad site. This project is programmed for Fiscal Year 2018.

The second project (P-605) constructs a new Type II hangar on the site of existing Hangar 97 and is planned for Fiscal Year 2022. Hangar 97 will be demolished by a separate project prior to 2022. The new hangar is sized to support four fully assembled Group 4 or 5 UAVs plus five MQ-21A UAVs. Additional ground control and ground support equipment will also be on the hangar deck for operations and testing of the systems prior to flights. A separate MQ-21A hangar will not need to be constructed if a full size Type II hangar module is constructed for VMU-1 on the flightline. After the new hangar is constructed, VMU-1 will relocate out of Hangar 101 and into the new hangar. Hangar 101 will then be demolished under this project.

The third project (P-604) is the construction of permanent operations facilities at the CADC planned for Fiscal Year 2018. Permanent facilities include a new fenced compound with office, shop, and maintenance space. Under a separate action, a “Rhino-snot” STUAS runway with temporary training support structures will be constructed and utilized by transient units in association with training exercises such as Weapons and Tactics Instructor. When the permanent facilities are constructed under the VMU-1 action, the “Rhino-snot” runway will be refurbished and improved to support the increased usage by both permanent squadron and transient units.

COST ESTIMATE

Preliminary cost estimates for construction of the Type II hangar, secondary support facilities at the old Van Pad and the permanent STUAS training facilities are summarized in Table ES-2, Preliminary Cost Estimate. A list of the facilities included in each project are shown in Table ES-3, Project Components. Each project component is listed by its standard Navy functional Category Code Number followed by a descriptive title. Activity level Military Construction Documentation 1391s are included in Appendix B, Military Construction Documentation 1391s.

Project	Fiscal Year	$ Million	Location
P-606 UAS Aviation Logistics Support Complex	18	19.4	Main Station
P-604 Group 3 UAS Operations Facility	18	13.7	CADC
P-605 UAS Maintenance Hangar	22	50.3	Main Station

Table ES.2: Preliminary Cost Estimate

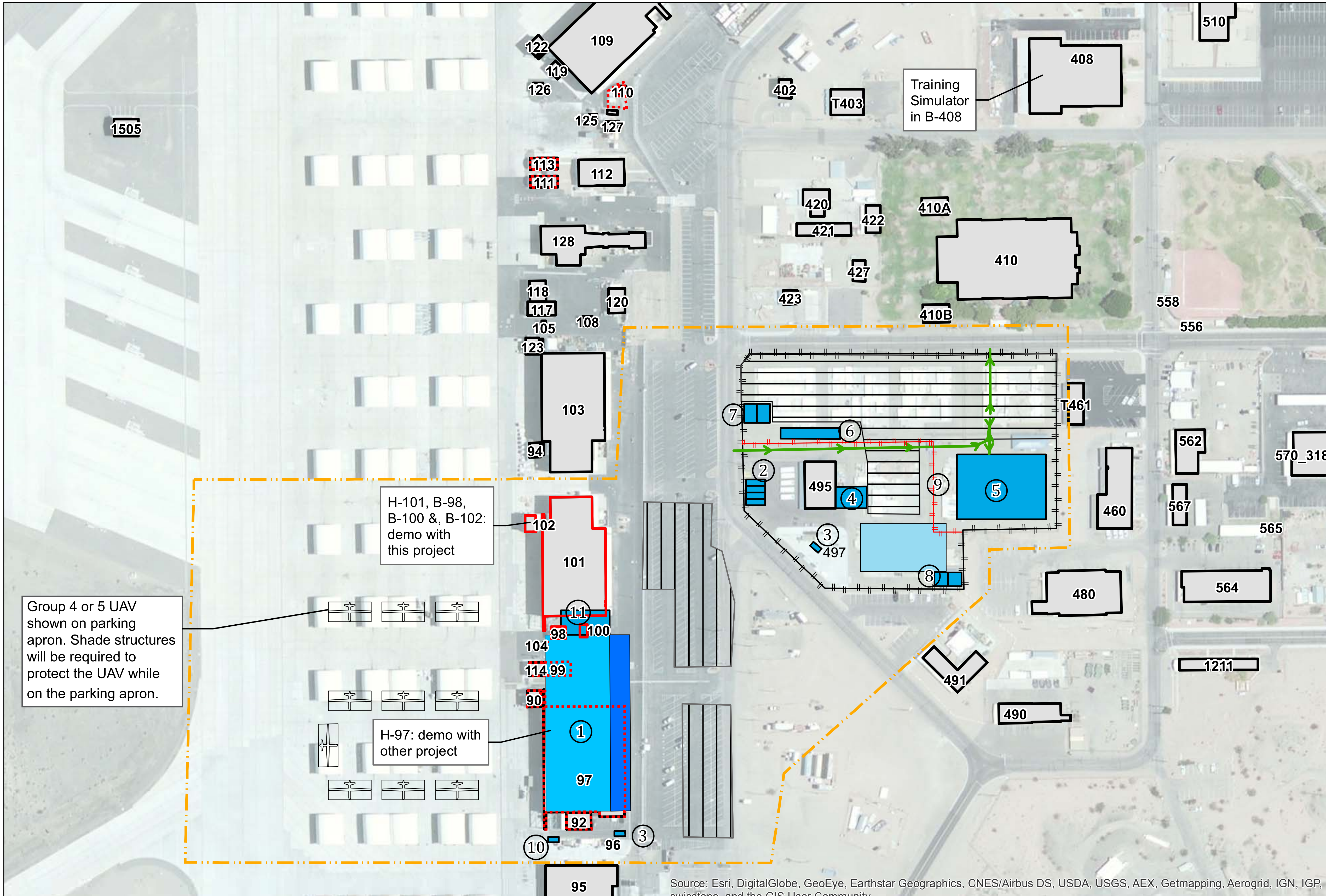
P-606 UAS Aviation Logistics Support Complex		Square Feet	Notes
CCN	Description		
171-20	Applied Instruction Building	600	Existing classroom upgrades in B-408
171-35	Operational Trainer Facility	-	B408 upgrades for electrical & toilets
143-45	Armory	800	Temporary Prefab Armory as FFE in 1391
214-40	Vehicle Holding Shed	1,680	On new concrete slab
214-51	Automotive Shop	2,280	High-bay portion of B-495 for 7 ton truck repairs (reduced from BFR 6,460 square feet)
214-55	Vehicle Wash Platform	1,680	Includes pressure wash equipment in a small building (2 @ 840 square feet)
214-56	Grease Rack	2,200	110' x 20' wide elevated (2' high) vehicle grease rack system
441-12	Storage for Marine Corps	35,607	Two story warehouse w/ 8’ x 8’ freight elevator
441-30	HazFlam Store	200	
441-35	General Storage Shed	1,250	
451-10	Open Storage Area	14,000	Reinforced concrete
851-10	Roads and Other Paving	63,000	Infill paving at existing & proposed facilities
852-10	Parking Equipment (asphalt)	94,500	Add underground stormwater infiltration/ storage system to entire area
852-20	Sidewalk with Curbs	7,200	1200’ x 6’ = 7,200 square feet
Note: BFR=Basic Facility Requirement, CCN=Category Code Number, FFE=Fixtures, Furnishings and Equipment			

Table ES.3: Project Components

P-604 Group 3 UAS Operations Facility CCN Description		Square Feet	Notes
111-10	Runway (rhino snot)	77,312	http://envirotac.com/ Clear & grade
211-05	Aircraft Hangar High-bay	3,000	Detachment support building
211-06	Aircraft Hangar Shop	1,000	Detachment support building
211-07	Aircraft Hangar Office	1,000	Detachment support building
851-10	Roads and Other Paving	85,000	VMU compound area only
852-10	Parking	52,000	VMU equipment and POV parking lot
852-35	Other Paved Areas (concrete)	17,500	Air Vehicle Parking 2,500 square feet + Ground Control Station 10,000 square feet + Launcher Pad 5,000 square feet
Communications line from Main Station to Cannon (linear feet)		40,000	One-5” communications conduit, 288 bundle fiber in one of the innerducts, city/county/bureau reclamation permits
Septic system to proposed building			Size for 50 people
Extend water and power to proposed building (linear feet)		3,000	Water source at tanks at corner of main roads
P606 UAS Maintenance Hangar **CCN Description**		**Square Feet**	**Notes**
116-65	Tactical Van Pad (square feet)	7,648	Construct after demo of Hangar 101
123-16	Overhead Cover-Airfield	3,588	Eight shade structures for aircraft on apron
211-05	Aircraft Hangar High-bay	38,675	Group 4 or 5 and MQ-21A
211-06	Aircraft Hangar Shop	12,000	
211-07	Aircraft Hangar Office	12,000	Includes SCIF space (2,440 square feet SCIF + 9,560 square feet Hangar Admin = 12,000 square feet)
211-96	Maint Aircraft Spares/Storage	200	Storage inside hangar
421-35	Ready Service Locker	70	
441-30	HazFlam Store	200	
851-10	Roads and Other Paving	50,000	Infill paving at existing & proposed facilities
852-10	POV Parking	63,630	Existing lot damage during construction. Include funds to replace.
852-20	Sidewalk with Curbs	8,400	Along back side of hangar and along street
Landscape with Irrigation		48,500	Rock garden along back of hangar and along road edge
Demolition H-101 and B-102		33,186	Existing buildings between H101 and H97 will already be demolished.
Reroute ATC fiber cable (linear feet)		2,000	Coordinate with MCAS Yuma S-6 Department

Note: ATC=Air Traffic Control, POV=Privately Owned Vehicle , SCIF=Sensitive Compartmented Information Facility, VMU=Marine Unmanned Aerial Vehicle

Table ES.3: Project Components (continued)



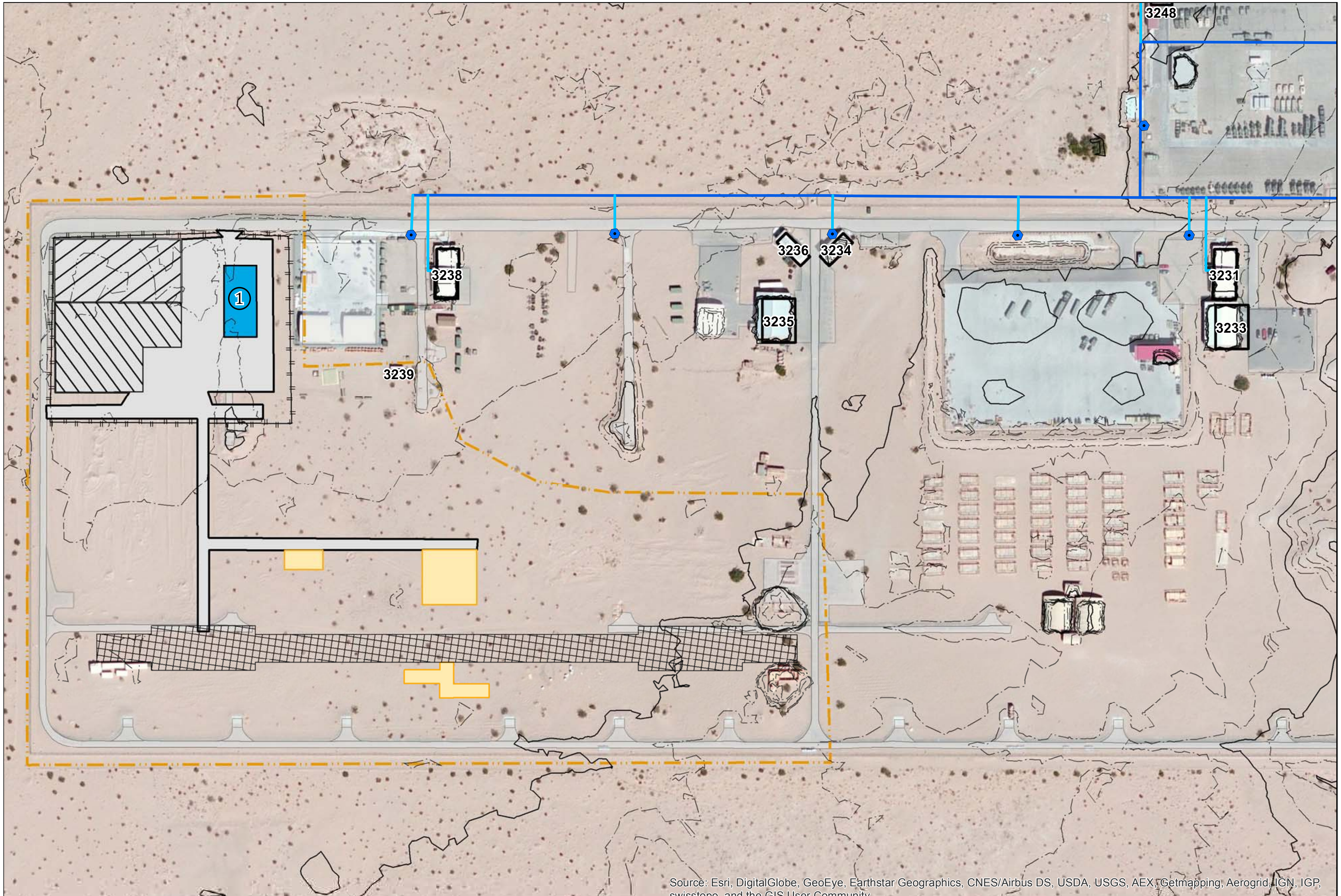
1. Hangar Type II Module for 3/Group 4 or 5 and 9/MQ-21A
2. Vehicle Shed
3. Hazmat Locker
4. Vehicle Maintenance Shop
5. Warehouse (two story)
6. Grease Rack
7. Washrack
8. Storage Shed
9. Armory (portable outside)
10. Ready Service Locker
11. Van Pad for Group 4 or 5 Ground Control Station

Truck Route
New Demolition
Programmed Demolition
Existing Structure
Existing Fence Demo
Existing Fence Remains
New Structure
2nd Deck Admin/HQ
Open Storage
POV Parking
Equipment Parking
Project Boundary

N

Feet
0 90 180 360

Figure ES.1: Main Station, MQ-21 & Group 4 or 5 UAS Full Buildout (Old Van Pad) Preferred Alternative



1. Permanent detachment operations facility: includes office, shop and high-bay maintenance space for VMU-1 detachment training and aircraft maintenance.

10 Foot Contour
2 Foot Contour
Existing Paving
Existing Structure
Water Main Line
Water Fire Line
New Fence
Rhino Snot Runway
Paving
New Structure
POV Parking
Equipment Parking
Concrete Paving
Site

Feet
0 75 150 300

Figure ES.2: CADC, Detachment Hangar and Runway Preferred Alternative

CHAPTER 1: INTRODUCTION

Marine Unmanned Aerial Vehicle Squadron One

1.0 INTRODUCTION

The United States Marine Corps (USMC) established the Marine Unmanned Aerial Vehicle Squadron 1 (VMU-1) in 1987 (formerly known as the 1st/3rd Remotely Piloted Vehicle Companies). Since its establishment, VMU-1 has been homebased at the Marine Corps Air Ground Combat Center (MCAGCC) Twenty-Nine Palms. The current study investigates the potential relocation of VMU-1 to the Marine Corps Air Station (MCAS) Yuma as enabled by the relocation of the reserve squadron Marine Unmanned Aerial Vehicle Squadron 4 from the MCAS Yuma to the Marine Corps Base Camp Pendleton. Included in the report are analyses and site planning documentation related to the relocation. The site plans will be used for follow-on National Environmental Policy Act (NEPA) documentation of potential impacts resulting from the proposed actions.

1.1 LOCATION

The MCAS Yuma is located approximately 175 miles east of San Diego, immediately across the California border in southwestern Arizona (see Figure 1.1: Regional Map). Interstate 8 is approximately one mile to the north of the Main Station. The western boundary of the Barry M. Goldwater Range (BMGR) is a five mile drive from the Main

Figure 1.1: Regional Map

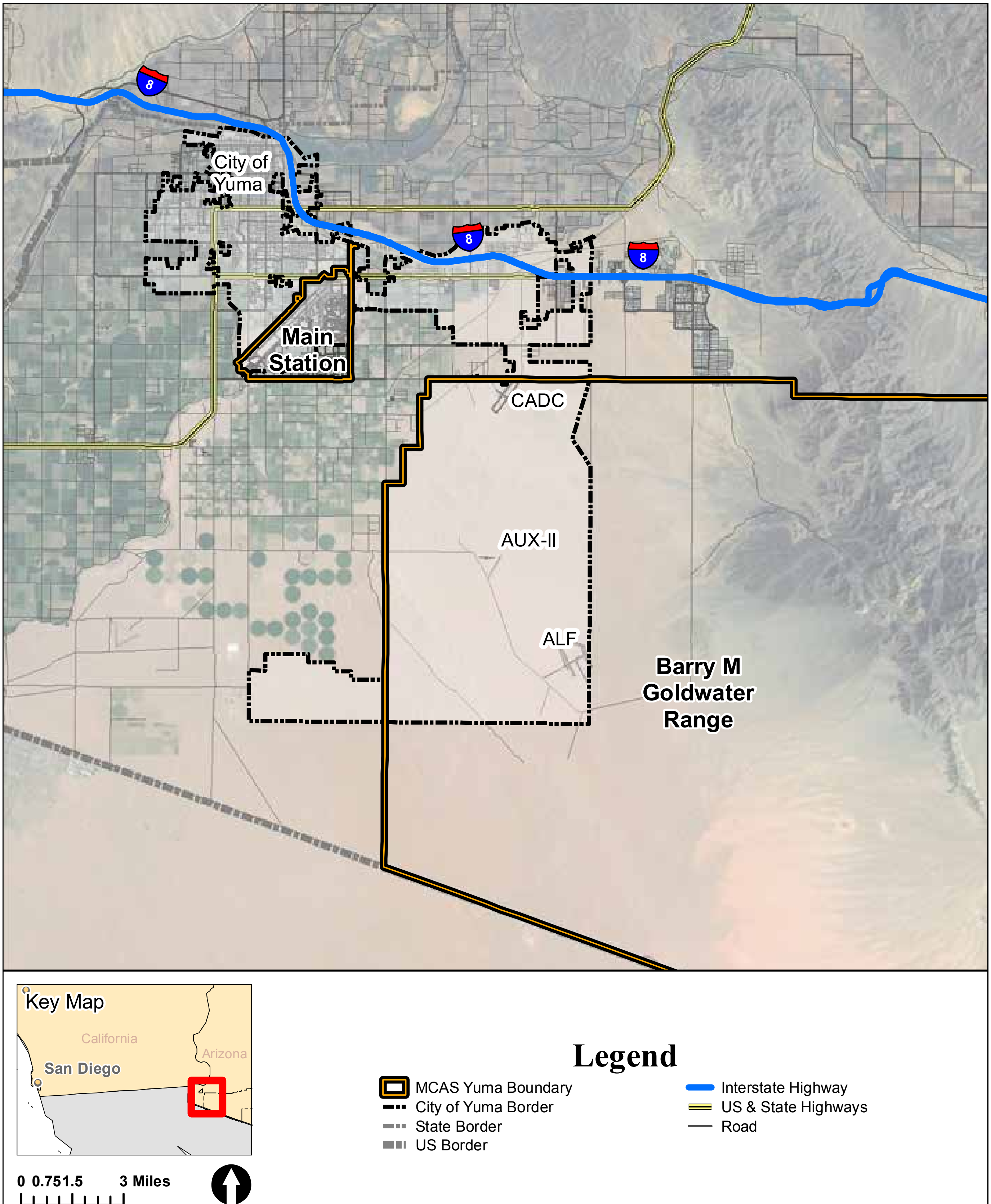


Figure 1.2: Main Station and Outlying Training Areas

Station and is the location for training areas such as the Cannon Air Defense Complex (CADC) and the Auxiliary Airfield II (AUX II). The CADC is a small compound six miles southeast of the Main Station that supports the operational facilities for the Marine Wing Support Squadron Three Seven One (MWSS-371) and the Marine Air Control Squadron One (MACS-1). The AUX II is an expeditionary type runway twelve miles southeast of the Main Station that supports manned aircraft landing practice. There are no buildings and minimal utilities at the AUX II.

1.2 MCAS YUMA

The Main Station at the MCAS Yuma is a 4,500 acre installation in the southwest corner of Arizona. Under federal control since the late 1920s, the Air Station began its service in the 1940s as an Army Air Base, transitioned into an Air Force Base, and was designated a MCAS in 1962. Today, the MCAS Yuma is the busiest air station in the Marine Corps. Its greatest assets are its ideal year-round flying weather and proximity to live-fire ranges. The Air Station manages the western half of the BMGR, the aerial ranges above the Yuma Proving Ground, and the Chocolate Mountain Aerial Gunnery Range in California. Approximately 6,100 active duty personnel, civilian employees, and contractors currently work at the Installation. The population increases significantly during Weapons and Tactics Instructor (WTI) training, which adds between 2,000 to 3,000 students and support personnel to the Air Station.

Figure 1.2: Main Station and Outlying Training Areas displays the location of the Main Station in relation to the CADC and the AUX II training areas. The U.S. International Border with Mexico serves as the southern boundary of the BMGR. Interstate 8 runs east-west approximately three miles north of the range approximately parallel to the BMGR northern boundary. The Mohawk Mountains are at the eastern boundary of the restricted airspace (RA), and the Yuma Desert is the western range boundary. The BMGR is comprised of facilities in support of training functions ranging from the development of individual aircrew skills to the employment of large mixes of aircraft and aviation associated with ground troops in complex tactical exercises. Moving Sands, Cactus West, AUX II, Auxiliary Landing Field (ALF), and the Tactical Air Combat Training System (TACTS) ranges are located within R-2301W. The CADC is located within the BMGR but outside of R-2301W.

1.3 MARINE UNMANNED AERIAL VEHICLE SQUADRON ONE

VMU-1 is in the midst of an organizational transition from the Marine Air Control Group 38 to the Marine Aircraft Group 13 (MAG-13). Marine Unmanned Aerial Vehicle (VMU) squadrons operations include reconnaissance with real-time video feed, information analysis and synthesis to provide real-time precision weapon coordinates, indirect fire control as an observer or target spotter, and terminal guidance operations with laser designators and real-time video for target acquisition and damage assessment.

VMU-1 currently operates the RQ-7B Shadow Unmanned Aerial System (UAS) which requires an expeditionary type runway for training operations. One RQ-21A Black Jack UAS will be fielded in 2015 growing to nine systems by 2020; the RQ-21A does not require a runway for launch or recovery operations. The naming convention of the RQ-21A is changing to MQ-21A to reflect an increase in payload and additional capabilities. This study uses MQ-21A from this point forward. Each RQ-7B system will be replaced in kind by a larger Group 4 or 5 class UAS by the mid-2020s. The Group 4 or 5 UAS will require a full size paved runway with an ordnance loading/unloading area. The systems for each RQ-7B, MQ-21A and Group 4 or 5 include four, five and four UASs, respectively.

1.4 PREVIOUS STUDIES

Previous efforts that helped guide this study include the Naval Air Systems Command (NAVAIR) Site Evaluation Report (SER), the NAVAIR 2014 Site Activation Support Plan, the NAVAIR 2013 Platform Basic Facility Requirements (PBFR) and the 2012 Marine Corps Installations West-MCAS Yuma Unmanned Aircraft Systems Study (UAS Study).

1.4.1 SITE EVALUATION REPORT

An initial NAVAIR 2013 SER was prepared for the relocation of Marine Unmanned Aerial Vehicle Squadron 4 from the MCAS Yuma to the Marine Corps Base Camp Pendleton. The SER recommended that small unmanned air vehicles (UAV) operations occur at the CADC with the support of Military Construction Documentation (MILCON) P-123-Reserve Training Facility.

Two follow-on NAVAIR 2014 SER and Site Activation Support Plan documents focused on the relocation of VMU-1 from the MCAGCC Twenty-nine Palms to the MCAS Yuma. The reports provided additional assessments of existing facilities to support a full VMU squadron at the Main Station and small UAS permanent detachment operations at the CADC.

1.4.2 PLATFORM BASIC FACILITY REQUIREMENTS

PBFRs were developed as a part of the NAVAIR 2014 SER and Site Activation Support Plan reports. The PBFRs document the facilities required to support a VMU squadron with three RQ-7B and nine MQ-21A systems. The NAVAIR PBFRs did not include facility requirements for large Group 4 or 5 UAS. The PBFRs utilized in this study are discussed in Section 3.0.

1.4.3 UNMANNED AERIAL SYSTEMS STUDY

The UAS Study for the MCAS Yuma provides detailed information about RA, UAS training requirements, current usage, proposed training scenarios, condition of landing strip surfaces and landing approach obstructions, and recommendations for supporting Group 1, 2 and 3 UASs. Group 1 UASs include the Small UAS that have been incorporated into ground units. The RQ-7B and MQ-21A are Group 3 Small Tactical Unmanned Aircraft Systems (STUAS). The UAS Study did not address the larger Group 4 or 5 UAS.

The UAS study concluded with recommendations that support continued operations of UAS squadrons, whether tenant or transient, at each airfield/landing zone.

1.5 PLANNING OBJECTIVES

The planning objectives for this study are as follows:

- Establish the optimal facilities siting and footprint for VMU-1 at the MCAS Yuma.
- Identify the preferred location and facility configuration to meet the full complement of equipment and personnel.
- Develop concept alternatives for three potential sites including the Main Station, the CADC, and the AUX II.

1.6 PLANNING ASSUMPTIONS

Assumptions used in this planning study are as follows:

- The RQ-7B systems will be replaced by the mid-2020s with a larger Group 4 or 5 UAS.
- The Group 4 or 5 UAS facility requirements were not available. For the purpose of the current study, the RQ-7B PBFRs will be utilized for the Group 4 or 5 UAS.
- The Group 4 or 5 UAS will require a full size runway (minimum of 6,000 feet), aircraft hangar, and parking apron space.
- The quantity of support equipment and ground vehicles (green gear) will be reduced when the RQ-7B is replaced with the Group 4 or 5 UAS. This will primarily reduce ground vehicle parking requirements. Vehicle maintenance support facilities will still be required.
- The MQ-21A and Group 4 or 5 UASs will remain with the squadron for the long term.

1.7 PLANNING STUDY PROCESS

The process for generating site development plans is as described below:

- Requirements were defined by the NAVAIR with the PBFRs.
    - ◊ Arrival timelines were considered as defined in the Draft 2015 Aviation Plan (AvPlan).
    - ◊ Training and operational differences for each UAS were identified.
    - ◊ Facility requirements were estimated for Group 4 or 5 hangar and parking apron space.
- Initial locations for VMU-1 facilities were determined.
- Constraints were mapped and analyzed for each location.
- Meetings were held with Station planners for initial review, data collection, and options.
- Short term and long term planning considerations were developed for each site.
- Site layout options were developed.
- Report submittal for review, comment and revision as needed (Draft, Pre-Final and a Final submittal).

1.8 COURSE OF ACTION

A course of action (COA) is any planned event at any scale from the regional level to the installation, site specific or even building level. This study identified alternative COAs for relocation of VMU-1 from the MCAGCC Twenty-nine Palms to the MCAS Yuma. Alternative COAs were developed for the Main Station, the CADC, and the AUX II, then compared to each other and a final preferred COA was selected.

1.8.1 INSTALLATION SITE COURSE OF ACTION

Three over arching COAs were developed with options of splitting the squadrons facilities across multiple locations. The three over arching COAs include:

- COA 1: VMU-1 Detachment.
- COA 2: Full Squadron, 3 Systems RQ-7B/9 Systems MQ-21A (Short term).
- COA 3: Full Squadron, 3 Systems of Group 4 or 5 UAS/9 Systems MQ-21A (Long term).

1.8.2 GENERAL CONSIDERATIONS

The goal of having all daily operational facilities within walking distance of each other is common to all units and organizations. If daily operations are split across multiple sites, such as managerial functions being geographically separate from maintenance or storage operations and personnel, then productivity will decrease due to decreased face-to-face communication and increased transit times.

The only exception to this walk-ability topic relates to flight operations of RQ-7B and RQ-21A that must be performed in remote locations to allow safe separation of small UASs from manned aircraft. UAS ground vehicles can be driven to a remote location, equipment set up for flight training operations, and within a couple of days all equipment is returned to their buildings for maintenance, storage and general administrative functions.

1.8.3 SHORT TERM CONSIDERATIONS

Both the MQ-21A and RQ-7B are small, tactical UAVs that are catapult launched and do not require a runway for takeoff. The MQ-21A lands, or is recovered, with a crane mounted rope or 'skyhook' that 'snares' the MQ-21A in the air, and therefore does not require a runway to land. The RQ-7B, on the other hand, does require a very small expeditionary type runway that is 50 feet wide and has a maximum length of 1,280 feet. Aside from the need for the remote flight operations location to be within a reasonable distance of the secondary support buildings, the flight operations location is not considered a 'driver' for the location of the secondary support facilities.

MQ-21A on transport cart (photo: AINonline.com)

RQ-7B with wing protective covers

Small UAS operations cannot occur at the Main Station due to hazards associated with flying near larger aircraft. The Air Traffic Control (ATC) tower which governs aircraft activity on and around the Main Station cannot detect small UAVs and pilots of manned aircraft have difficulty visually identifying/avoiding them. Two primary locations have been identified for small UAS launch and recovery operations near the Main Station: the CADC and the AUX II.

Maintenance of small aerial and ground support vehicles would occur primarily at the consolidated support facility compound, not at the launch/recover location or expeditionary runway. The size of the aircraft maintenance building for the RQ-7B and MQ-21A does not need to be as tall as a typical aircraft hangar due to the small size of the UAV. A small pre-engineered building at the remote RQ-7B runway would help with operations, but is not absolutely necessary.

The RQ-7B system requires a maximum 1,280 foot long runway when counting the arresting gear and net runout area as part of the runway. This requirement could not be fulfilled at the Main Station for the reasons stated above, so it must be provided at the CADC or the AUX II. This system is scheduled to be replaced in the mid-2020s by the larger Group 4 or 5 system, which will require a 6,000 foot long runway. Once this transition occurs, the RQ-7B runway will either need to be expanded to meet the Group 4 or 5 requirements or abandoned and the Group 4 or 5 be sited at the Main Station to use the existing runway. The MQ-21s will not require a runway for operations in the short or long term, and thus, could continue operations at the CADC or other remote locations.

Ground vehicle intermediate maintenance is supported by Combat Logistics Company - 16 (CLC-16). CLC-16 is currently located at the Main Station, but long term plans have them relocating to the CADC. Once this occurs, there would be a potential benefit in having VMU-1 ground vehicles at the CADC. However, the benefits of ground equipment consolidation needs to be weighed against operational impacts to VMU-1 as a cohesive unit.

UAV intermediate maintenance will be provided by the Marine Aviation Logistics Squadron - 13 (MALS-13), which is located at the Main Station, so there is potential benefit with keeping UASs at the Main Station.

The lack of physical security patrols at the CADC and AUX II creates additional concern for equipment security and protection. If VMU-1 equipment is stored at the CADC and/or the AUX II, but the main part of the squadron is located at the Main Station for Group 4 or 5 UAS operations, then equipment kept at the CADC or AUX II could become vulnerable to theft or vandalism. Either the VMU compound would need to be located very near or within the MWSS-371 or the MACS-1 compound, or the VMU facilities would need to be made extremely secure.

1.8.4 LONG TERM CONSIDERATIONS

The RQ-7B will be replaced with a much larger Group 4 or 5 UAS that requires a 6,000 foot long runway and a hangar space for aircraft assembly and preflight testing. Additionally, ordnance training with the Group 4 or 5 UAS will require a Combat Aircraft Loading Area (CALA), arming/dearming pad, ordnance magazines, and an ordnance operations building near the runway.

MQ-21A flight operations would continue to occur at remote training areas due to potential conflicts with manned aircraft.

1.9 INITIAL SITE SELECTION

Based on the general considerations discussed above, the following sections discuss the areas that were initially identified to support VMU-1 at either the Main Station, the CADC or the AUX II. A red/yellow/green table is provided for each COA representing the following:

- Green indicates the location is considered good for the associated functions.
- Yellow indicates moderate issues are expected for the location and required functions.
- Red indicates significant issues are expected for the location and required functions.

In addition, the following terms are used in Tables 1.1 - 1.3 when analyzing the types of facilities proposed in the relocation as they relate to the various sites:

- Support Facilities: These facilities provide support for non-flight operations. Examples include Headquarters (HQ)/office space, warehousing, armory, vehicle maintenance, etc.
- Runway and Hangar: These facilities provide flight-related maintenance and operational capability. Examples include hangars, parking apron, taxiways, and runways.
- Small UAS Ops: This category relates to operations (and not facilities), since for the small UASs, the hangar could potentially be in a different location than where the operations are conducted.
- Federal Aviation Administration (FAA)/Certificate of Authorization or Waiver (COAW): The FAA/COAW details the day, time, flight rack, air vehicle flown, altitude, ATC coordination, notice to airmen, and various other requirements that must be met prior to flying outside of the RA.

Lastly, for several scenarios, travel between multiple sites would be required. Any split-site configuration would create a moderate constraint as compared to collocated facilities. Even though travel distances between the three sites vary (between approximately three and ten miles), any split-site configuration was assessed as having a moderate constraint for travel.

1.9.1 SHORT TERM SITE SELECTION

FLIGHT OPERATIONS

- The ALF is a future Joint Strike Fighter and other manned aircraft training airfield located in the BMGR, thus this is not a possible location for UAS operations. Further, it was noted that aircraft training operations cannot simultaneously occur at the AUX II and the new ALF due to their proximity to each other.
- The AUX II is a training airfield with an existing 3,800 foot long asphalt runway that supports KC-130, AV-8, CH-53, MV-22 and other aircraft. The previously noted UAS Study indicates the AUX II has been used in the past by Marine Unmanned Aerial Vehicle Squadron 4 for STUAS launch and recovery operations. Located within R2301W, an RA within the BMGR, operations can occur without an FAA/COAW.
- The AUX II Landing Helicopter, Assault (LHA) deck is a rotary and fixed-wing aircraft facility made up of expeditionary type metal runway matting (AM-2 matting) 120 feet wide by 835 feet long with matting approaches at each end. The current deck is not aligned with the prevailing winds, which can cause training delays when winds are out of aircraft tolerance.
- An airfield does not currently exist at the CADC and an FAA/COAW is required to conduct any UAS operations from the CADC. There is vacant land that could support an expeditionary runway.
- The primary runway is located at the Main Station. It is comprised of four runways and a supporting taxiway system that supports the MAG-13, The Marine Fighter Training Squadron-401, and civilian flight operations. In addition to assigned squadron operations, the Marine Aviation Weapons and Tactics Squadron One provides a six-week WTI course twice a year, bringing additional fixed and rotary wing aircraft operations to the Station.

SUPPORT FACILITIES

- Support facilities do not currently exist at the AUX II.
- The CADC currently supports MWSS-371 and MACS-1. There are no available facilities for VMU to occupy, although there is vacant land, utilities, limited food services and limited security.
- The Main Station would be suitable for construction of new support facilities, but all STUAS operations (including RQ-7B runway) would need to be sited elsewhere.

COA 1 - VMU-1 Detachment

Table 1.1: COA 1 - VMU-1 Detachment, provides a summary of the areas considered for a VMU-1 Detachment location. The Detachment includes one MQ-21A and one RQ-7B system. COA 1 considers all VMU-1 Detachment operations at either the CADC (Alternative 1) or the AUX II (Alternative 2). Alternative 3 splits Detachment operations between the CADC and the AUX-II with MQ-21A operations at the CADC and RQ-7B operations on the runway at the AUX II.

Additionally, the facilities required for Detachment operations would be very minimal. Non-flight support facilities (HQ, warehouse, maintenance, etc.) would be located with the remainder of the squadron at a different location.

Component	Alt 1	Alt 2	Alt 3
Support Facilities	N/A	N/A	N/A
Runway & Hangar	CADC	AUX II	CADC
Small UAS Ops	CADC	AUX II	AUX II
Issues:	1/2/3	4/5/7	2/4/5/6/7

Table 1.1: COA 1 - VMU-1 Detachment

"Issues" key:

1. No runway currently exists at the CADC.
2. The BMGR RA does not currently include the CADC. A FAA/COAW exists for access to the RA from the CADC, but must be renewed on a regular basis.
3. RQ-7B operations may conflict with WTI temporary facilities at the CADC.
4. Small UAS operations may conflict with C-130/rotary wing training at the LHA/AUX II.
5. The AUX II is an unsecured airfield, requiring construction of fencing or stationing of security personnel.
6. The distance between the CADC and the AUX II creates a moderate constraint.
7. Existing air traffic at the AUX II combined with the two day set-up time required for the RQ-7B makes operations at the AUX II a much less viable option when compared to other locations.

COA 2 - FULL SQUADRON, SHORT TERM

Table 1.2: COA 2 - Full Squadron, Short Term, provides a summary of the areas considered for the full VMU-1 squadron location in the short term. The runway and hangar referenced in COA 2 are related to RQ-7B operations (since the Group 4 or 5 UASs are not part of this short term option).

Component	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Support Facilities - HQ/Administration	CADC	AUX II	CADC	Main Station	Main Station
Support Facilities - Vehicle Maintenance	CADC	AUX II	CADC	Main Station	Main Station
Runway & Hangar	CADC	AUX II	AUX II	CADC	AUX II
Small UAS Ops	CADC	AUX II	AUX II	CADC	AUX II
Issues:	1/2/3/8/9	4/5/6/8/9 /11	4/5/6/7/8/9/10 /11	1/2/3/7/10	4/5/6/7/10 /11

Table 1.2: COA 2 - Full Squadron, Short Term

"Issues" key:

1. No runway currently exists at the CADC.
2. The BMGR RA does not currently include the CADC. A FAA/COAW exists for access to the RA from the CADC, but must be renewed on a regular basis.
3. RQ-7B operations may conflict with WTI temporary facilities at the CADC.
4. Small UAS operations may conflict with C-130/rotary wing training at the LHA/AUX II.
5. The AUX II is an unsecured airfield, requiring construction of fencing or stationing of security personnel.
6. The AUX II has electrical and telephone connections but no water or sewer.
7. Distance between the Main Station, the CADC, and the AUX II creates a moderate constraint.
8. The RQ-7B Shadow systems require the most ground gear vehicle support. Although most maintenance of ground gear occurs organically, support from CLC-16 is sometimes requested/required. Therefore, distance from CLC-16 (located at the Main Station) is a potential constraint.
9. UAV intermediate maintenance is provided through MALS-13, located at the Main Station. Distance from MALS-13 is a potential constraint.
10. Support facilities would be separated from operations.
11. Existing air traffic at the AUX II combined with the two day set-up time required for the RQ-7B makes operations at the AUX II a much less viable option when compared to other locations.

1.9.2 LONG TERM SITE SELECTION

FLIGHT OPERATIONS

- At the AUX II, the existing 3,800 foot long runway would have to be extended to 6,000 feet to support the larger Group 4 or 5 UAS. Additional operational facilities such as an ATC tower and a CALA would also be required to support the Group 4 or 5 UAS. For planning purposes, this study considered the alternative infeasible because of the additional infrastructure and logistical/ staffing support required to operate these facilities.
- An airfield does not currently exist at the CADC and land is not available to support a 6,000 foot runway.
- The Main Station's existing runways and CALA would be able to support the larger Group 4 or 5 UAS that will replace the smaller RQ-7B. The existing CALA and ordnance-related facilities can also support UAS ordnance-related training.

SUPPORT FACILITIES

- If an investment in UAS facilities at the CADC is made in the short term, continued use for small UAS operations would be efficient. Outside of support facility considerations, the MQ-21s could conduct training at additional remote locations other than the CADC due to not requiring a runway.
- The HQ/Administration for the Group 4 or 5 UAS should be near the operation runway. All vehicle maintenance would occur in a typical maintenance hangar at the airfield.

COA 3 - FULL SQUADRON, LONG TERM

Table 1.3: COA 3 - Full Squadron, Long Term, provides a summary of the long term alternative combinations considered for VMU-1 facilities. The runway and hangar referenced in COA 3 are related to Group 4 or 5 UAS operations (since the RQ-7Bs will be phased out between the short and long term timeframes). The MQ-21A could share the hangar with the Group 4 or 5 UAS.

Component	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Support Facilities - HQ/Administration	Main Station	Main Station	Main Station	Main Station	CADC	AUX II
Support Facilities - Vehicle Maintenance	CADC	AUX II	Main Station	Main Station	CADC	AUX II
Runway & Hangar	Main Station	Main Station	Main Station	Main Station	AUX II	AUX II
Small UAS Ops	CADC	AUX II	CADC	AUX II	AUX II	AUX II
Issues:	1/5	2/3/4/5/6/9	1/5/6/7	2/3/5/6/7/9	2/3/4/5/7/8/9/10/11	2/3/4/6/8/9/10/11

Table 1.3: COA 3 - Full Squadron, Long Term

"Issues" key:

1. The BMGR RA does not currently include the CADC. A FAA/COAW exists for access to the RA from the CADC, but must be renewed on a regular basis.

2. Small UAS operations may conflict with manned aircraft training at the LHA/AUX II.
3. The AUX II is an unsecured airfield, requiring construction of fencing or stationing of security personnel.
4. The AUX II has only electrical connections; no water/sewer or communications infrastructure.
5. Distance between the Main Station, the CADC, and the AUX II creates a moderate constraint.
6. The replacement of the RQ-7Bs with the Group 4 or 5 UAS reduces the amount of ground gear requiring maintenance from CLC-16, although some would still remain. Therefore, distance from CLC-16 is a potential constraint. Please note: although currently at the Main Station, long term plans call for CLC-16 to relocate to the CADC. The constraint would then be in distance from the CADC as shown above.
7. Training inefficiencies because small UAS ops and vehicle maintenance support facilities are not collocated.
8. Infrastructure/operational costs are prohibitively high to support Group 4 or 5 UASs.
9. Existing air traffic at the AUX II combined with the two day set-up time required for the RQ-7B makes operations at the AUX II a much less viable option when compared to other locations.
10. The AUX II runway extension would require Flat Tailed Horned Lizard habitat investigation and potential mitigation costs.
11. The AUX II runway extension would require investigation for Munitions and Explosives of Concern and possible development of a Munitions Response Program site clean-up plan.

1.9.3 COURSE OF ACTION SITE SELECTION

Based on the short term and long term issues noted in Tables 1.1, 1.2, and 1.3, all alternative locations were evaluated except for COA 3, Alternatives 5 and 6 due to cost and logistical considerations. Table 1.4: Site Layout COAs provides a summary of the alternative COAs that are included in Section 5-Development Plans based on the flight operations, support facilities and issues associated with each location.

	COA 1 (Detachment)	COA 2 (Short Term)	COA 3 (Long Term)
UAS #1	1/RQ-7B systems	3/RQ-7B systems	3/Group 4 or 5 UASs (replace RQ-7B)
UAS #2	1/MQ-21A systems	9/MQ-21A systems	9/MQ-21A systems
Support Facilities	AUX II / CADC	AUX II / CADC	Main Station / CADC /AUX II
Air Operations	AUX II / CADC	AUX II / CADC	Main Station / CADC /AUX II

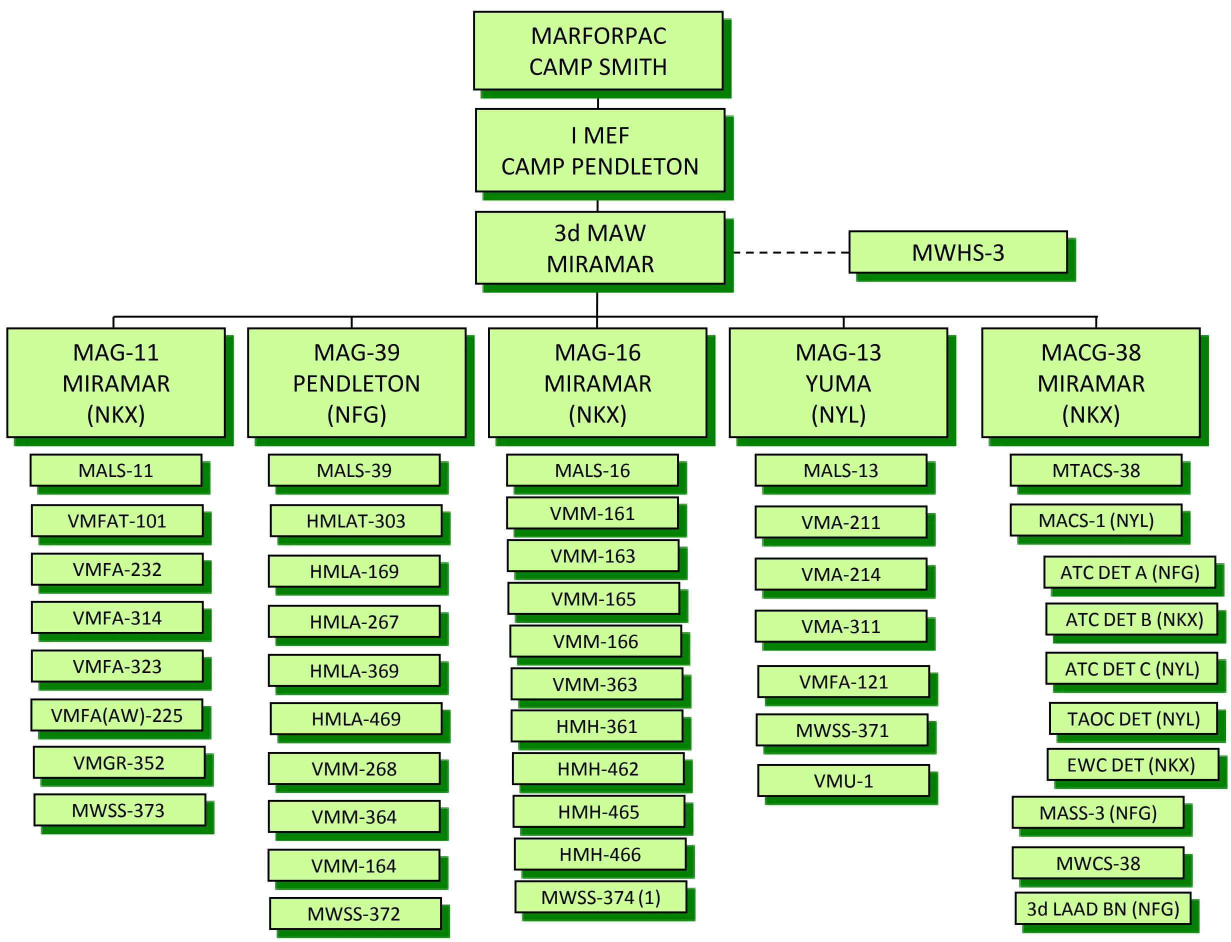
Table 1.4: Site Layout COAs

CHAPTER 2: MISSION AND ORGANIZATION

2.0 MISSION AND ORGANIZATION

VMU-1 was originally a component of Marine Air Control Group 38 but recent changes have realigned the squadron to be a component of MAG-13 with the Third Marine Aircraft Wing. Figure 2.1: Third Marine Aircraft Wing Organizational Chart, shows these changes.

The mission statement listed on the 2015 AvPlan for an active duty VMU squadron is to: "Support the Marine Air Ground Task Force commander by conducting electromagnetic spectrum warfare, multi-sensor reconnaissance and surveillance, supporting arms coordination and control, and destroying targets, day or night, under all-weather conditions, during expeditionary, joint, and combined operations."



Note: NKX=airport code for MCAS Miramar, NFG=airport code for MCAS Camp Pendleton, NYL=airport code for MCAS Yuma
Source: 2015 AvPlan.

Figure 2.1: Third Marine Aircraft Wing Organizational Chart

2.1 SQUADRON MANNING

The table of organization concept is: “The VMU squadron is organic to the MAW and is structured to operate as a subordinate unit of one of the Marine Aircraft Groups (MAGs). The VMU squadron is organized into various sections that give it the capability to operate and maintain one UAS and associated support equipment. The MALS augment section is designed to normally function as part of a MALS to provide intermediate level aviation maintenance and supply support.”

Table 2.1: VMU Squadron and Detachment Personnel Summary, shows the number of personnel in an active duty squadron with nine MQ-21A and three RQ-7B systems (UAS Detachment in Table 2.1), totaling 282 full time personnel (not including 24 non-chargeable billets) in the short term. Detachment requirements assume a total loading of 80 personnel based on the largest possible combination of personnel from the VMU table of organization (i.e. UAS Detachment #3 and STUAS Tier II Detachment C as shown below). The term ‘system’ refers to all of the equipment associated with a particular airframe. The term ‘detachment’ refers to an operational group of personnel and a limited amount of equipment used for the operation being conducted on a particular day.

The following estimates for long term personnel quantities are based on the United States Marine Corps model and the understanding that each VMU squadron will receive three Group 4 or 5 UASs. Each of the three RQ-7B Detachments have 53 personnel. This Detachment size will be replaced with the larger Group 4 or 5 Detachment size which are expected to have 73 personnel. This is a 60 person increase across three detachments. There will also be 15 new mission personnel added to the squadron after the EA-6B aircraft is sundowned and new mission tasks are required. An overall long term increase of 75 plus the current Table of Organization of 282 totals 357 personnel estimated for the squadron in the long term timeframe.

Analysis related to COA 1 (detachment only) utilized a personnel loading of 80 and analysis related to COAs 2 and 3 utilized a personnel loading of 357.

	Long Term	Changes	2014 TO	
Department	Chargeable Personnel	with Group 4/5 UAS	Chargeable Personnel	Non-Chargeable
HQ, S1, S2, S3, S4, S6, Medical, Maint.	42		42	16
UAS Detachment #1	53		53	3
UAS Detachment #2	53		53	1
UAS Detachment #3	53		53	1
STUAS Tier II Detachment A, 1-2-3 Section	26		26	0
STUAS Tier II Detachment B, 1-2-3 Section	26		26	0
STUAS Tier II Detachment C, 1-2-3 Section	29		29	0
UAS Det increase w/ Group 4/5 UAS	20	20		
UAS Det increase w/ Group 4/5 UAS	20	20		
UAS Det increase w/ Group 4/5 UAS	20	20		
New Mission Personnel (MOS 7588)	15	15		
Total Personnel	**357**	**75**	**282**	**24**

Note: MOS=Military Occupational Specialty, TO=Table of Organization.

Table 2.1: VMU Squadron and Detachment Personnel Summary

2.2 OPERATIONS AND TRAINING

All military UAS training must be performed within a designated FAA RA. Potential changes to FAA rules regarding the operation of UASs outside of a RA were not considered in this study. If a non-RA is required for UAS training, the unit must acquire an FAA/COAW.

2.2.1 AIRSPACE COORDINATION AREA AND RESTRICTED OPERATIONS ZONES

To help maximize airspace utilization in the safest manner possible, two airspace control measures may be used during joint operations: Airspace Coordination Areas (ACA) and Restricted Operations Zones (ROZ). An ACA is a three-dimensional block of airspace established in a target area to ensure safe operations between friendly aircraft and friendly surface fires. The UAV often orbits within the target area of an ACA. A ROZ is reserved for specific activities in which the operation of one or more airspace uses are restricted. The ACA and ROZ are used by the MCAS Yuma Range Operations Department and UAS operators to safely coordinate flight operations.

With regard to the establishment of permanent facilities, VMU-1 indicated that a permanent compound would become a "hub" for the various "spoke" locations dispersed throughout the BMGR. Although the Main Station has limitations as a combined "hub" and a small UAS flight operations center, the Main Station could potentially operate as the "hub" that connects to the ranges. Alternative locations for a permanent "hub" then become the CADC and the AUX II.

2.2.2 TRAINING SCENARIOS

The MCAS Yuma UAS Study included site surveys for areas shown in Figure 2.2: Regional Training Areas: Camp Billy Machen Helipads 1 and 2; Speed Bag UAS Airfield; TACTS UAS Airfield; AUX II; CADC; and the ALF. The AUX VI and the Stoval Airfield were also surveyed since they are used by VMU Squadrons as forward Ground Control Station (GCS) sites, or "spokes", to support RQ-7B operations in R2301 East (just east of R2301W), R2304 (120 miles east of the Main Station), and R2305 (between R2304 and R2301 East). All of these sites are characterized as expeditionary training environments, offering few existing facilities - at many the only facility is an expeditionary runway or landing pad. VMU-1 brings tents, generators, antennas, High Mobility Military Wheeled Vehicles (HMMWVs), and mobile facilities to conduct operations.

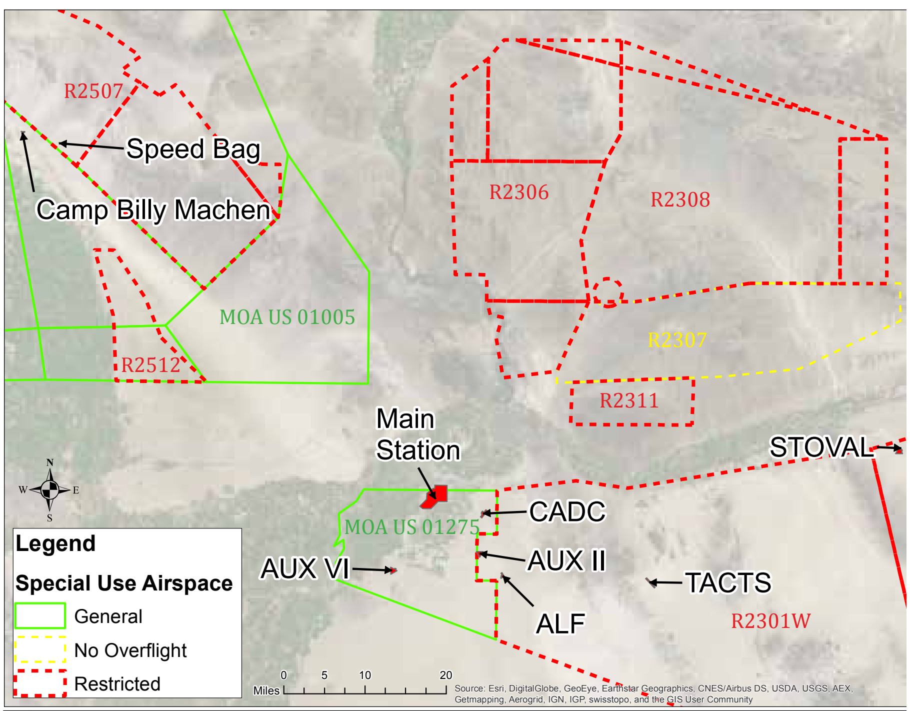


Figure 2.2: Regional Training Areas

Training scenario discussions include establishing a ROZ during WTI at the TACTS and Speedbag Airfields to support UAV launch and recovery operations. The ROZ is activated for approximately 15 minutes to allow the UAV to takeoff or land. During WTI, the UAV may launch from the TACTS and/or Speedbag, transit to the training area and establish an orbit in the target area of the ACA. Based on the operation it may be necessary to set up a spoke (alternate GCS) at Stoval Airfield or in an area close to the training due to distance and/or intervening small mountains. VMU also supports Marine Aviation Weapons and Tactics Squadron training within the Yuma Proving Ground during the flight stage of WTI.

2.2.3 TRAINING REQUIREMENTS

Three crew positions must complete various phases of training prior to being awarded the military occupational specialty (MOS) to fly the RQ-7B or MQ-21A. The 7314 MOS supports two positions, the vehicle operator and the payload operator. The 7315 MOS is for the unmanned aircraft commander. Initial training occurs with the Air Force's Remotely Piloted Aircraft Course followed by the Unmanned Aircraft Commander course at Fort Huachuca, Arizona. Upon completion of this training, the Marines are transferred to VMU squadrons to begin follow-on training. One simulator is used to support RQ-7B training. The Institutional Mission Simulation is housed in a building and can be linked to other simulators for coordinated training simulations. The Multiple Unified Simulation Environment, which uses the RQ-7B's GCS, can be used as a simulator, although it cannot be linked to other simulators. Existing Building 408 has been identified as the most suitable location for the simulators.

The following list summarizes initial training requirements totaling 17 sorties and 34 flight hours for the 7314 MOS and 15 sorties with 59 flight hours for the 7315 MOS. To maintain proficiency/certification, the crew members must conduct proficiency training at 180 and 365 day intervals totaling similar quantities of sorties and flight hours per year. Some of the 3000/4000 phase sorties require integration with other MAGTF units for coordinated/combined training events.

- 1000 phase Core Skill Introduction (Fort Huachuca).
- 2000 phase, Core Skills (7314 MOS: 7 sorties/14 flight hours, 7315 MOS: 6/20).
- 3000 phase, Mission Skills (7314 MOS: 4/8, 7315 MOS: 5/22).
- 4000 phase, Core plus Skills (7314 MOS: 3/9, 7315 MOS: 2/10).
- 5000 phase, Instructor Training (7314 MOS: 1/2, 7315 MOS: 1/5).
- 6000 phase, Certification, Qualification and Designation (7314 MOS: 2/4, 7315 MOS: 1/2).

2.3 INTERMEDIATE MAINTENANCE

Maintenance capabilities for a VMU squadron are stated on the table of organization as:

> *The squadron will be capable of conducting 1st and 2nd echelon maintenance on assigned Marine Corps ground equipment including transport, engineering and communications equipment, and infantry weapons. The Combat Service Support Detachment will perform 3rd and 4th echelon maintenance on ground equipment. The squadron will be capable of performing organizational level maintenance on aviation equipment to include UASs. The Marine Aviation Logistics Squadron (MALS) will perform limited, specialized intermediate level maintenance on aviation equipment.*

As a component of MAG-13, VMU-1 'blue gear', or aircraft systems, will be supported by MALS-13 at the Main Station. Aircraft components will be transported to MALS facilities for repairs and then returned to VMU-1. CLC-16/1st Maintenance Battalion will provide intermediate maintenance of 'green gear', or ground equipment, for MAG-13 squadrons.

2.4 SUPPORT EQUIPMENT

The equipment assigned to a VMU squadron consists of the UAVs and their storage and transport containers, HMMWV to transport the UAV and pull trailers with expeditionary equipment (i.e. launcher and recovery), and medium tactical 7-ton trucks for equipment logistics. Different versions of the GCS will be included, depending upon the system for piloting the UAV, including the mobile GCS (MGCS), the dual control MGCS, and the launch and recover GCS. The tactical automated landing system (TALS) is unique to the RQ-7B. Ground data terminals (GDT) provide signal relay and military electric power generators provide power in remote locations. A capability set is a collection of tents with tables. A satellite ground data terminal is unique to the Group 4 or 5 UAS for beyond line of sight operations.

Generally, all rolling stock like HMMWV, trailers, generators, launchers and recovery equipment will be stored in an open parking area preferably under a shade structure to extend the life of the equipment. The UAV, if not stored in the transport HMMWV, will be stored in an aircraft maintenance hangar either fully assembled or stored in the UAV shipping container. Empty shipping containers can be stored in a warehouse or in the hangar. The GCS, GDT, TALS and ruggedized aircraft maintenance test station will all be kept around the aircraft hangar or UAV storage/transport HMMWV as a consolidated location for aircraft related equipment.

One system of MQ-21A consists of five UAVs, two GCSs, four GDTs, one towable launcher, one towable skyhook, trucks, trailers, generators and various support equipment (source: UAS Program Status slides provided at start of project, undated). According to current plans, VMU-1 will have nine MQ-21A systems with a total of forty-five UAVs. A summary of the larger support equipment items is shown in Table 2.2: Support Equipment Items. The quantity of trucks, trailers and generators is shown in Table 2.3: VMU Trucks, Trailers and Generators for a VMU Squadron and a VMU Detachment. Quantities are based on the revised 2014 table of organization and equipment.

One system of RQ-7B consists of four UAVs, two GCS HMMWVs, two GDTs, one Portable GCS, one Portable GDT, one TALS, one trailer launcher, trucks, trailers, generators and various supporting equipment (source: NAVAIR NOTICE 13100, 22 July 2011, Weapons System Planning Document for RQ-7B). VMU-1 will have three RQ-7B systems with a total of twelve UAVs.

Long term plans include transition of the RQ-7B to a larger Group 4 or 5 UAS that is similar in size and scope to the MQ-9 Reaper. One system of MQ-9 Reapers consists of four UAVs, a GCS, a GDT, a satellite ground data terminal, trucks, trailers, generators and various support equipment (source: DoD Selected Acquisition Report RCS:DD-A&T(Q&A)823-424, MQ-9 UAS Reaper, as of December 31, 2011). According to the Fiscal Year (FY) 15 AvPlan, VMU-1 will have a Group 4 or Group 5 UAS of unknown quantity by the mid FY 2020s.

MQ-21A	Qty. per
(1 System has 5 UAVs)	System
GCS	2
GDT	4
Launcher	1
Recovery Skyhook	1

RQ-7B	Qty. per
(1 System has 4 UAVs)	System
GCS (HMMWV)	2
GDT	2
Portable GCS	1
Portable GDT	1
TALS	1
Trailer Launcher	1

MQ-9	Qty. per
(1 System has 4 UAVs)	System
GCS	1
GDT	1
satellite ground data terminal	1
MGCS	1
launch and recover GCS	1
dual control MGCS	1

Table 2.2: Support Equipment Items

TAMCN	Nomenclature	Qty VMU Squadron	Fuel Type	Gallons per Veh.	Gallons Total	Qty VMU Detachment	Gallons Total
Stand Alone							
B00167G	GEN-MEP903A	9	Diesel	1	9	9	9
B07307B	GEN-MEP831A	10	Diesel	4	40	10	40
B08917B	GEN-MEP803A	14	Diesel	9	126	14	126
B09807B	GEN-MEP531A	15	Diesel	1.6	24	15	24
B25617B	FORK LIFT	3	Diesel	10	30	3	30
D00037K	TRUCK-AMK23A1	2	Diesel	80	160	2	160
D00057K	TRUCK-AMK27A1	2	Diesel	80	160	2	160
D00347K	TRUCK-M1165A1B	1	Diesel	25	25	1	25
D01987K	TRUCK-MK23A1	5	Diesel	80	400	5	400
D10627K	TRUCK-MK27A1	5	Diesel	80	400	5	400
D00817K	TRAILER-MK353	2				2	
D08627K	TRAILER-MK105	2				2	
B00187BA	TRAILER INTEGR	6	Diesel	40	240		
D00227KA	TRUCK-M1152	24	Diesel	25	600		
D00317KA	TRUCK-M1165	6	Diesel	25	150		
D00167KC	TRAILER-M1102	12					
D0880K	TRAILER-M149A2	3				2	
RQ-7B (three systems)							
B00167GA	GEN- MEP903A	6	Diesel	1	6	2	2
B08917BF	GEN-MEP803A	6	Diesel	9	54	2	18
B09807BB	GEN-MEP531A	15	Diesel	1.6	24	5	8
D00227KH	TRUCK-M1152A1	21	Diesel	25	525	5	125
D00317KB	TRUCK-M1165A1	9	Diesel	25	225	3	75
D00167KB	TRAILER-M1102	3				2	
D00167KB	TRAILER-M1102	15				5	
MQ-21A (nine systems)							
B00187BA	TRAILER INTEGR	9	Diesel	40	360	1	
MRC							
D11587KK	TRUCK-M1123	6	Diesel	25	150	4	100
D11587KK	TRUCK-M1123	8	Diesel	25	200	5	125
		219				111	
				Gallons Subtotal	3,908		1,902
				Times 2 x per UFC instruction	2		2
				Total gallons	7,816		3,804

Note: TAMCN=Table of Authorized Material Control Number, Qty=Quantity, Veh=Vehicle

Table 2.3: VMU Trucks, Trailers, and Generators for a VMU Squadron and VMU Detachment

CHAPTER 3: FACILITY REQUIREMENTS

3.0 FACILITY REQUIREMENTS

A summary of the NAVAIR PBFRs based on the number of systems is shown in Table 3.1: Summary of Facility Requirements. The table groups the requirements into four categories based on their functional relationships that should stay together if the squadron's facilities are split across several locations.

PBFRs were unavailable for a VMU detachment. Requirements for a VMU detachment (one RQ-7B and one MQ-21A system) are based on the 2014 SER recommendation of a 5,000 square feet structure with 20,000 square feet of Privately Owned Vehicle (POV) parking and 32,000 square feet of truck and equipment parking.

Facility requirements for three RQ7B systems and nine MQ-21A systems are based on the PBFR developed in December 2013 by the NAVAIR Program Management Air 263 and Holmes-Tucker International, Inc.

Requirements for the larger Group 4 or 5 system were not available. Runway, hangar, and CALA requirements were developed based on draft MILCON projects P-XXZ from the MCAGCC Twentynine Palms; P-194 from the MCAS Cherry Point, North Carolina; and custom spatial analysis. For the remainder of the Group 4 or 5 UAS requirements, the RQ-7B PBFR quantities were utilized.

VMU HQ	1/RQ-7B 1/MQ-21A	3/RQ-7B	9/MQ-21A	3/Group 4-5
111-10 Runway (linear feet)	900 (1,280*)	900 (1,280*)		6,000
113-20 Aircraft Parking Apron (square yards)				27,753
116-65 Van Pad				7,648
121-50 Aircraft Ready Fuel Storage		120	0	6,000
141-42 Air Intelligence Support Center		600	200	2,240
211-05 Aircraft Hangar High-bay	3,000	13,824	17,664	38,675
211-06 Aircraft Hangar Shop	1,000	5,601	2,148	12,000
211-07 Aircraft Hangar Office	1,000	4,418	3,025	12,000
211-96 Maint Aircraft Spares/Storage		200	600	200
441-30 HazFlam Store		200	200	200
852-10 POV Parking	20,000	63,630		
Vehicle Maintenance	**1/RQ-7B 1/MQ-21A**	**3/RQ-7B**	**9/MQ-21A**	**3/Group 4-5**
123-10 Filling Station (outlets)		1		
123-30 Vehicle Ready Fuel Storage (gallons)		6,016		
143-45 Armory		800	0	800
214-40 Vehicle Holding Shed		1,260	420	1,260
214-51 Automotive Shop		6,460		

Table 3.1: Summary of Facility Requirements *(continued next page)*

Vehicle Maintenance (continued)	1/RQ-7B 1/MQ-21A	3/RQ-7B	9/MQ-21A	3/Group 4-5
214-55 Vehicle Wash Platform		840	840	840
214-56 Grease Rack		1		
441-30 HazFlam Store		200	200	200
852-10 Parking Area Trucks, Equipment	32,000	94,500		
Storage		3/RQ-7B	9/MQ-21A	3/Group 4-5
441-12 Storage for Marine Corps**		15,953	9,776	15,953
441-12 Storage Group 4 or 5 Caskets**				9,878
441-35 General Storage Shed		625	625	625
451-10 Open Storage Area		14,000		
Training		3/RQ-7B	9/MQ-21A	3/Group 4-5
171-20 Applied Instruction Building		300	300	300
171-35 Operational Trainer Facility		300	150	300

**Note: RQ-7B Runway = 900 linear feet. However, if including the maximum Arresting Gear and Net Run-Out Area, an overall length to use for site planning purposes is 1,280 linear feet.*

***Note: Total 441-12 Warehouse Storage is 35,607 square feet for the Group 4 or 5 plus the MQ-21A systems. Warehouse building will be constructed as a two story warehouse with footprint of 120 feet X 150 feet, including a freight elevator.*

Measurements are in square feet unless noted otherwise. HQ=Headquarters, POV=Privately Owned Vehicle

Table 3.1: Summary of Facility Requirements (continued)

3.1 ARRIVAL TIMELINES AND QUANTITIES

The arrival of RQ-7B and MQ-21A systems to VMU is based on the Draft FY 2015 AvPlan with follow-up clarifications with Marine Corps personnel, as shown below in Table 3.2: Systems Arrival Timelines. VMU-1 is expected to field three RQ-7B Version 2 (v2) and nine MQ-21A starting in FY 2015. Version 2 is a variant that uses an encrypted data link. Required facility sizes are not affected by this data link upgrade. The long term transition of the RQ-7B to the larger Group 4 or 5 UAS is expected to occur by 2024.

VMU-1	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
RQ-7B	3 RQ-7B	3 RQ-7Bv2									
MQ-21A			1 2 3	4	5	6	7	8 9			
Group 4 or 5								3 Systems arrival time TBD			

Note: A dark green cell indicates existing UAS.
A light green cell indicates the year the system is expected to arrive to the squadron.
Yellow cells indicate the years that transition of RQ-7B to Group 4 or 5 is expected to occur.

Table 3.2: Systems Arrival Timelines

3.2 RUNWAY REQUIREMENTS

Runway requirements vary with the UAV that is being flown. The MQ-21A has no runway requirements as it is launched from a trailer mounted catapult system and retrieved with a trailer mounted crane and rope 'sky hook' system. The UAV is caught on the wing by a rope that is attached to the top of the crane.

MQ-21A on recovery rope (crane arm on left)

The RQ-7B is similar to the MQ-21A in that it is launched with a trailer mounted catapult. However, landing the RQ-7B requires a small prepared surface that is 900 feet in length, or 1,280 feet if also counting the arresting gear and net runout area on either end and a minimum 50 foot width. See Figure 3.1: RQ-7B Runway Requirements for a spatial representation of these requirements.

RQ-7B on landing strip (launcher in background)

When the RQ-7B is replaced with a larger Group 4 or 5 UAS, a minimum 6,000 foot long paved runway and aircraft maintenance hangar will be required to support their operations. In addition to a runway and access to a full size aircraft maintenance hangar, the Group 4 or 5 UAS will require an area to safely load and arm ordnance on the UAV prior to takeoff when training with ordnance. Finally, once loaded the UAV would need to enter the National Airspace and fly to a nearby bombing range, then return to the runway to land. Additional coordination between VMU-1 and the FAA will be required to transit airspace to get to a nearby range.

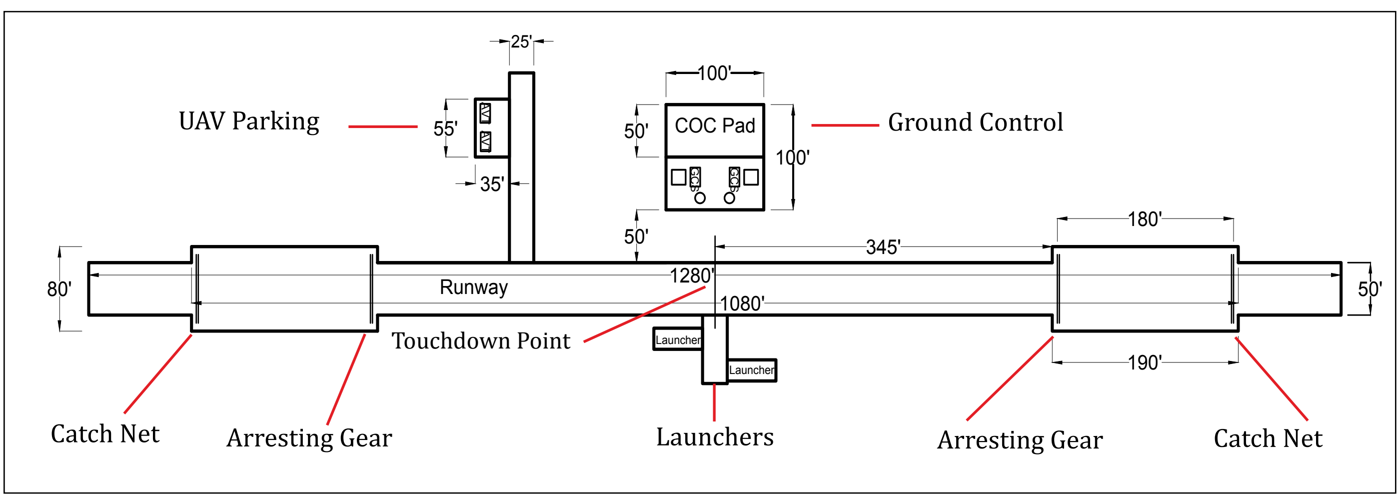


Figure 3.1: RQ-7B Runway Requirements

3.3 GROUP 4 OR 5 UAS AIRCRAFT MAINTENANCE HANGAR

The Unified Facilities Criteria (UFC) 2-000-05N, facility sizing instructions provides no direction on the quantity of hangar spaces or hangar size for Group 4 or 5 UAS aircraft. UFC directions for Broad Area Maritime Surveillance UAS, which is understood to be the MQ-4C Triton (131 foot wingspan, 48 foot length), is to provide one hangar space per two aircraft.

The hangar size is based on the typical ratio of one hangar space for every three aircraft. This equates to four hangar spaces for the proposed twelve Group 4 or 5 UAVs and a 79 foot wingspan by 36 foot length. The resultant hangar layout is shown in Figure 3.2: Type II Hangar Module for Group 4 or 5 UAS. The overall dimensions are consistent with a standard Type II hangar module and 1391 MILCON documents noted previously for Group 4 or 5 UASs considered at the MCAGCC Twenty-nine Palms and the MCAS Cherry Point. A Type II Hangar module high-bay is 38,675 square feet (315 foot width by 119 foot depth), shops behind the high-bay are 12,000 square feet and administrative space on the second floor over the shops space is 12,000 square feet. Space in the high-bay is also available for one MQ-21A system with five assembled UAVs. A separate MQ-21A hangar facility will not be required if a standard Type II hangar module is provided.

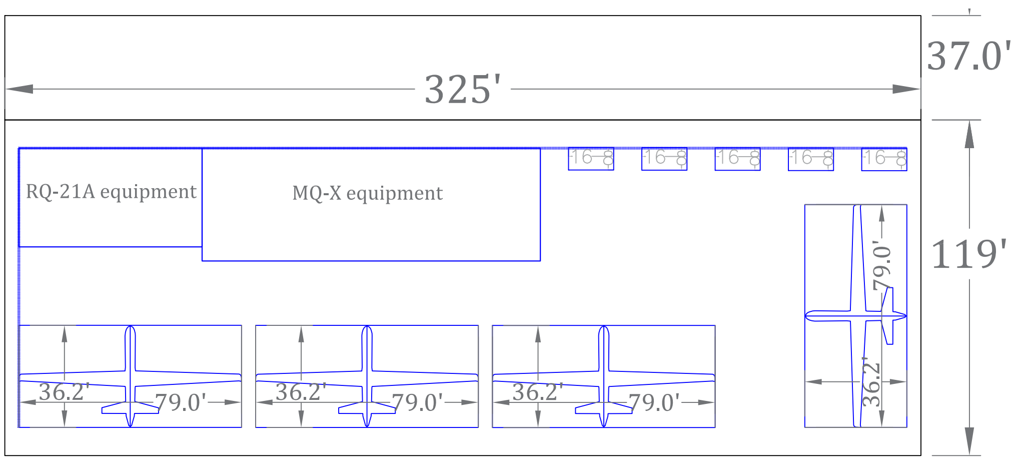


Figure 3.2: Type II Hangar Module for Group 4 or 5 UAS

3.3.1 VMU DETACHMENT UAS MAINTENANCE HANGAR

A VMU Detachment requires a building in close proximity to the STUAS launch and recovery area that provides operational space to maintain the UASs. Offices, classrooms, and administrative common space are also included within this facility. The size of this facility is based on the information found in the 2014 SER and identified in Table 3.1: Summary of Facility Requirements.

3.4 GROUP 4 OR 5 UAS SECONDARY SUPPORT FACILITIES

Due to the lack of PBFRs for the Group 4 or 5 UAS, this study relies on the RQ-7B PBFRs to estimate secondary support facility requirements like warehouse and vehicle shop space. The RQ-7B PBFRs were used instead of the MQ-21 because secondary support facility requirements may be similarly sized. The only adjustment was the size of the Aircraft Maintenance Hangar Category Code Number 21105, 21106 and 21107 as described above in Section 3.3, Group 4 or 5 UAS Aircraft Maintenance Hangar. Table 3.1: Facility Requirements, lists the secondary support facility sizes for the Group 4 or 5 UAS based on the RQ-7B PBFR sizes.

3.4.1 PRIVATELY OWNED VEHICLE PARKING

POV parking requirements were not included in the NAVAIR PBFRs for RQ-7B or MQ-21A systems. Per UFC facility sizing instructions, the number of POV spaces is based on the number of personnel multiplied by a percentage for the functional category the person works. The UFC categories considered for determining the number of parking spaces required for VMU squadron personnel include administrative (70 percent of personnel in this category), maintenance (38 percent), and warehousing (25 percent). Per UFC instructions, these percentages are based on eligible vehicles, multiple utilization, time and space intervals, available public transportation, group-car riding and government-furnished transportation.

Table 3.3: POV Parking summarizes the UFC calculation based on the 2014 VMU Table of Organization structure and previously noted 357 personnel resulting in 202 total POV spaces required for a full squadron. COA 2 and 3 full squadron layouts include an area for this quantity of parking spaces. Detailed parking layouts would be required to determine the actual number of spaces that can fit into the actual site.

Building Personnel Expected to Work	Function	Personnel	Percent	POV Spaces
143-45 Armory	Maintenance	1	38%	1
211-06 Aircraft Hangar Shop	Maintenance	58	38%	23
211-07 Aircraft Hangar Office	Administrative	190	70%	133
214-51 Vehicle Maintenance	Maintenance	21	38%	8
441-12 Warehouse	Warehouse	12	25%	3
New Mission Personnel	Administrative	15	70%	11
Group 4 or 5 Additional Personnel	Maintenance	60	38%	23
	Total Personnel	357		
			Total POV Spaces	202
			Square Yards per Space	35
			Total Square Yards	7,070
			Square Feet per Square Yard	9
			Total Square Feet	63,630

Note: Privately Owned Vehicle Parking for a VMU Detachment = 20,000 Square Feet

Table 3.3: POV Parking

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CHAPTER 4: EXISTING CONDITIONS

4.0 EXISTING CONDITIONS

The MCAS Yuma is a premiere training location because of its ability to host varied training programs throughout the year. The MCAS Yuma, combined with its nearby training ranges, affords unique training opportunities to both resident and transient units. The following chapter provides an overview of elements affecting operations at the Main Station and the two potential sites for VMU-1 facilities: the CADC and the AUX II.

4.1 OPERATIONAL CONTEXT

The mission of the MCAS Yuma is to provide aviation ranges, support facilities and services that enable its tenants, other Marine Corps commands, visiting military and interagency forces to enhance their mission capability and combat readiness. The MCAS Yuma serves as the base of operations for the Marine Aviation Weapons and Tactics Squadron One, MAG-13, MWSS-371, Marine Fighter Training Squadron-401, MACS-1 and CLC-16.

The Main Station is a shared-use airfield comprised of four runways with a supporting taxiway system. The Yuma County Airport Authority controls and operates approximately 300 acres for the Yuma International Airport consisting of a civil airport terminal and aircraft support facilities. Runways 17-35 and 8-26 are primarily used for military rotary wing, commercial, and general aviation operations. They may also be used for military operations when required by wind conditions. Runways 3R-21L and 3L-21R are parallel runways and used primarily by military aircraft.

4.2 NATURAL CONTEXT

The MCAS Yuma is largely free of natural constraints. Seismicity is the most prominent natural constraint affecting the Main Station. Seismicity does not constrain height of structures but it does increase the construction cost for all facilities due to the requirement for additional structural reinforcement.

4.3 RESTRICTED AIRSPACE

Airspace assets include the FAA managed National Airspace System and the Special Use Airspace that supports military training. Figure 4.1: Restricted Airspace identifies the Military Operations Area and RA surrounding the MCAS Yuma.

The MCAS Yuma has scheduling and operational control of the Ajo West RA (R-2301W), the Dome Military Operations Area (US 01275) and the Chocolate Mountain Aerial Gunnery Range (R-2507E/W/N/S). The R-2507 is located approximately fifty miles to the northwest of the Main Station and used for remote UAS training operations. The R-2301W is located on the western portion of the BMGR.

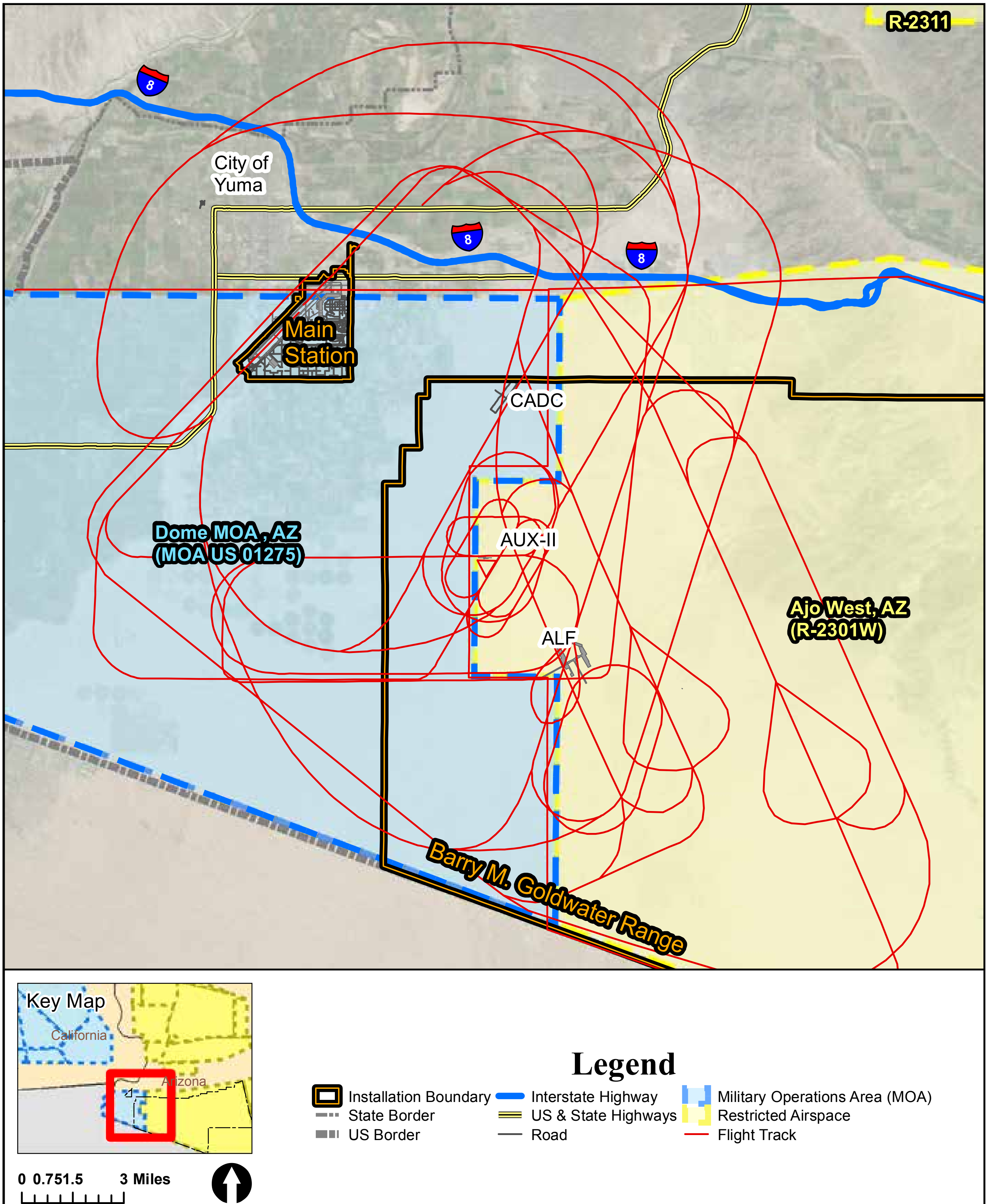


Figure 4.1: Restricted Airspace

4.4 MAIN STATION

The Main Station at the MCAS Yuma provides the greatest support and opportunity for collaboration with other units, but as such, is also in the highest demand by other users - especially the airfield. The most logical component of VMU-1 to locate at the Main Station is the support and operations facilities related to the Group 4 or 5 UAS, which requires a full-size runway and operates in a similar manner as manned aircraft. Because of these requirements, the Main Station is the only viable location for the Group 4 or 5 UAS operational facilities. Likewise, the headquarters and administrative support functions of the squadron would benefit from the close proximity to the MAG and Main Station administrative nodes. The following analysis provides discussion of the existing conditions at the Main Station for accommodating these facilities.

4.4.1 OPERATIONAL & MAN-MADE CONTEXT

The Main Station has varying degrees of constraint. Generally, areas near the airfield, CALA, magazines, and core of the Main Station are the most constrained by either operations or existing facilities. While the southern portion of the Main Station is largely undeveloped, environmental contamination complicates new development and distance from the airfield/core of the Main Station increases inefficiencies.

Figure 4.2: MCAS Yuma Main Station Developable Area (Post-Master Plan) depicts the areas considered developable after known projects in the 2014 Master Plan are implemented. After Master Plan projects are complete, conditionally developable areas along the flightline include the former fire station site along the north flightline (just west of Hangar 146), the former line maintenance facilities (Buildings 117, 120, and 136-138) along the north flightline, and existing conditionally developable area at the extreme southern extent of the airfield (near the Ordnance Loop roadways). Although not identified in the 2014 Master Plan or shown on Figure 4.2, the area south of Hangar 95 is considered developable. The site of the old MALS Van Pad, just east of Hangar 101, is also noted as available after all van pad functions relocate to the new van pad compound at the south end of the flightline.

The area just south of Hangar 75 is considered conditionally developable due to a known Munitions Response Plan (MRP) site that requires investigation and potential cleanup prior to construction. Additionally, there are several buildings in the area south of Hangar 75 that would need to demolished.

Operational considerations are typical of development at any airfield and would include imaginary surface clearance, accident potential zones (APZ) and noise zones. Imaginary surfaces primarily impact facilities at the northwestern extent of the flightline as they sit closest to runway 03R/21L as shown on Figure 4.3: Main Station Imaginary Surfaces. New development along the flightline must meet a 7:1 transitional slope. Existing APZs are not a significant factor for future development on the Air Station. Noise impacts generated from aircraft operations affect land uses to varying degrees. The majority of the Main Station flightline falls within the >75 decibel (dB) contour, although the southern end of the flightline falls within the 70-75 dB contour. The higher noise levels are expected for operational facilities, but for support facilities, lower noise levels are more appropriate. See Figure 4.4: Main Station APZs and Figure 4.5: Main Station Noise Contours.

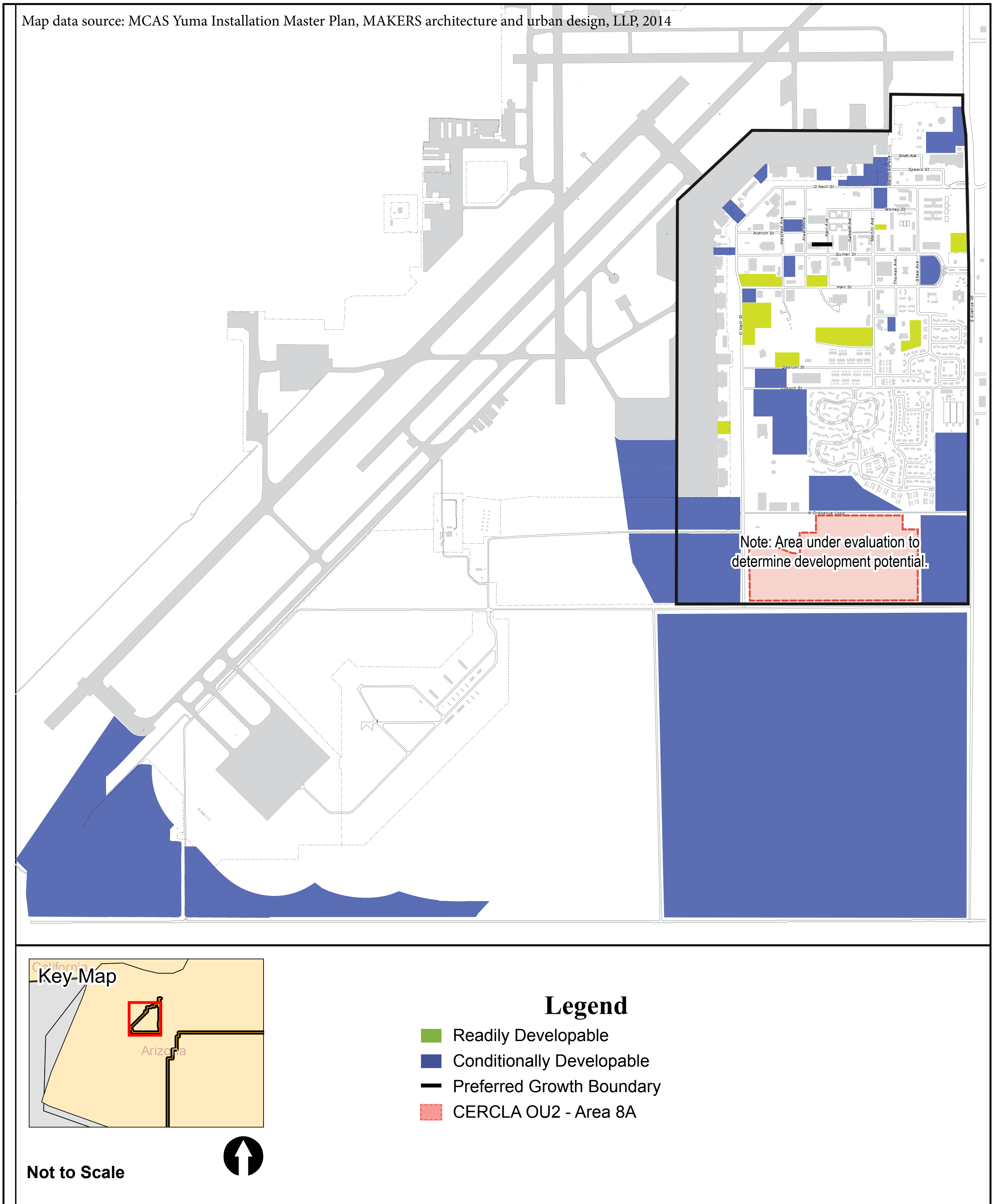
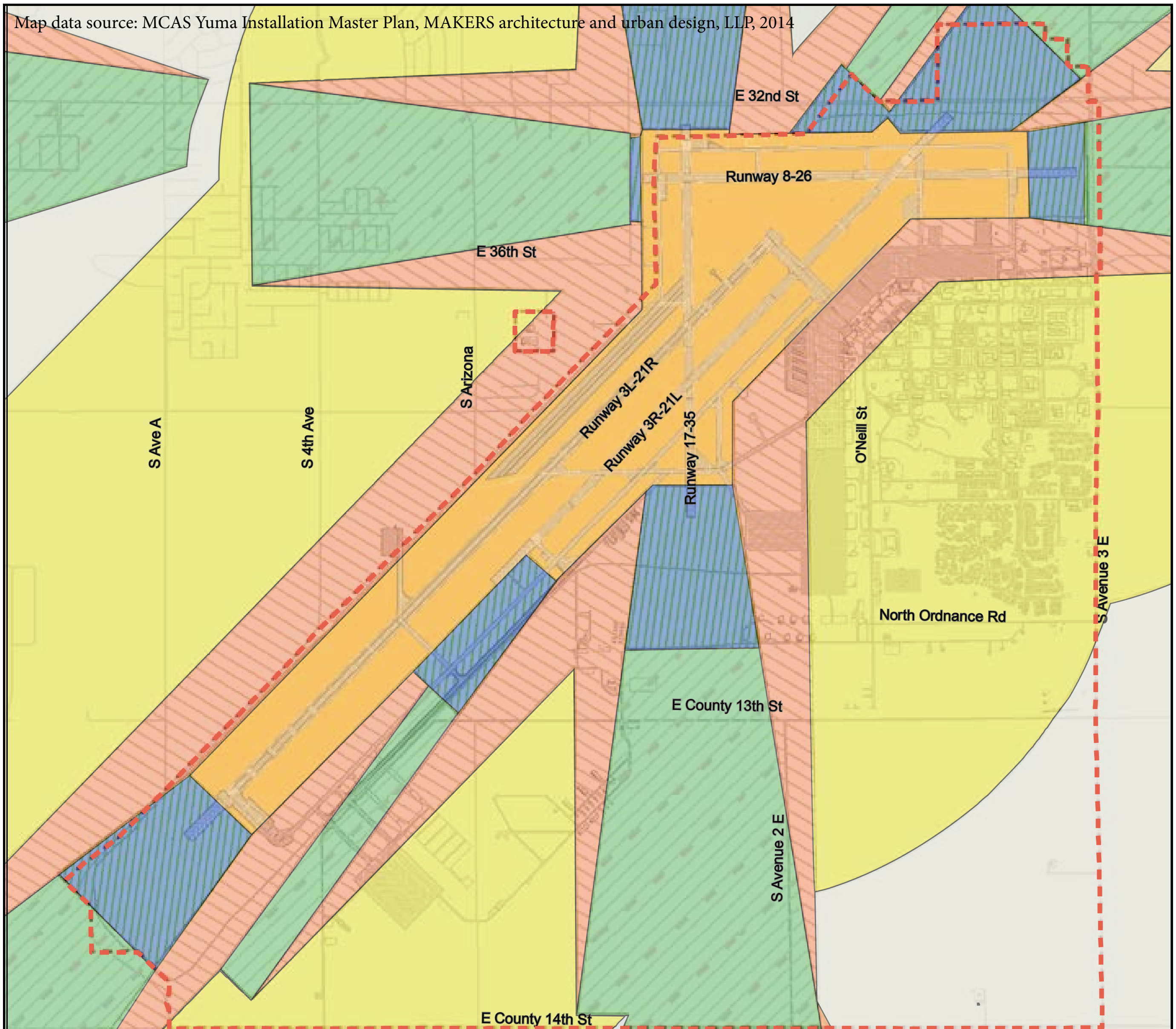


Figure 4.2: Main Station Developable Areas (Post-Master Plan)



Note: This graphic is directly from the 2014 Master Plan due to updated Geographical Information Systems (GIS) data not being available for this report. The airfield safety areas shown are not in compliance with the UFC 3-260-01, Airfield And Heliport Planning And Design with regard to its depiction of; Primary Surfaces, Clear Zones, and Accident Potential Zones for the four Class B runways at MCAS Yuma. FAA defined imaginary surfaces DO NOT apply to MCAS Yuma (a DoD facility). However, no facilities proposed for VMU at MCAS Yuma in this study conflict with these airfield safety zones.

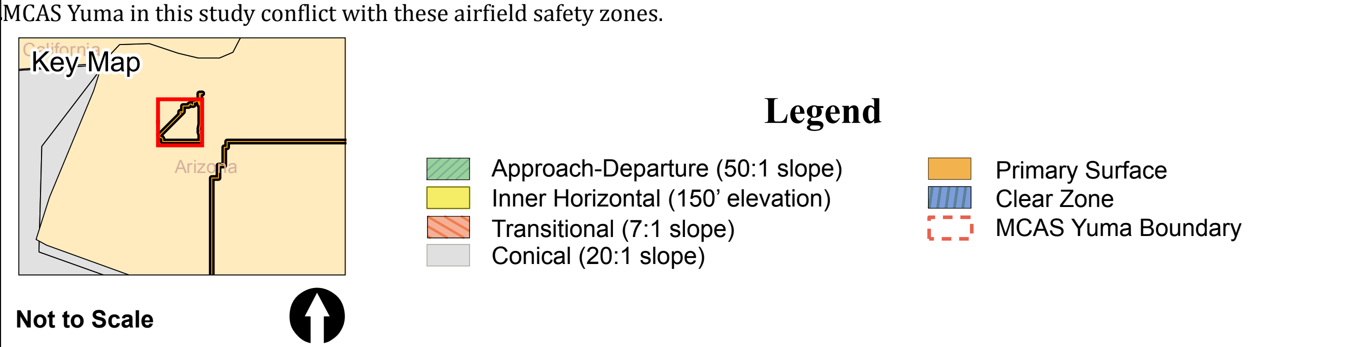


Figure 4.3: Main Station Imaginary Surfaces

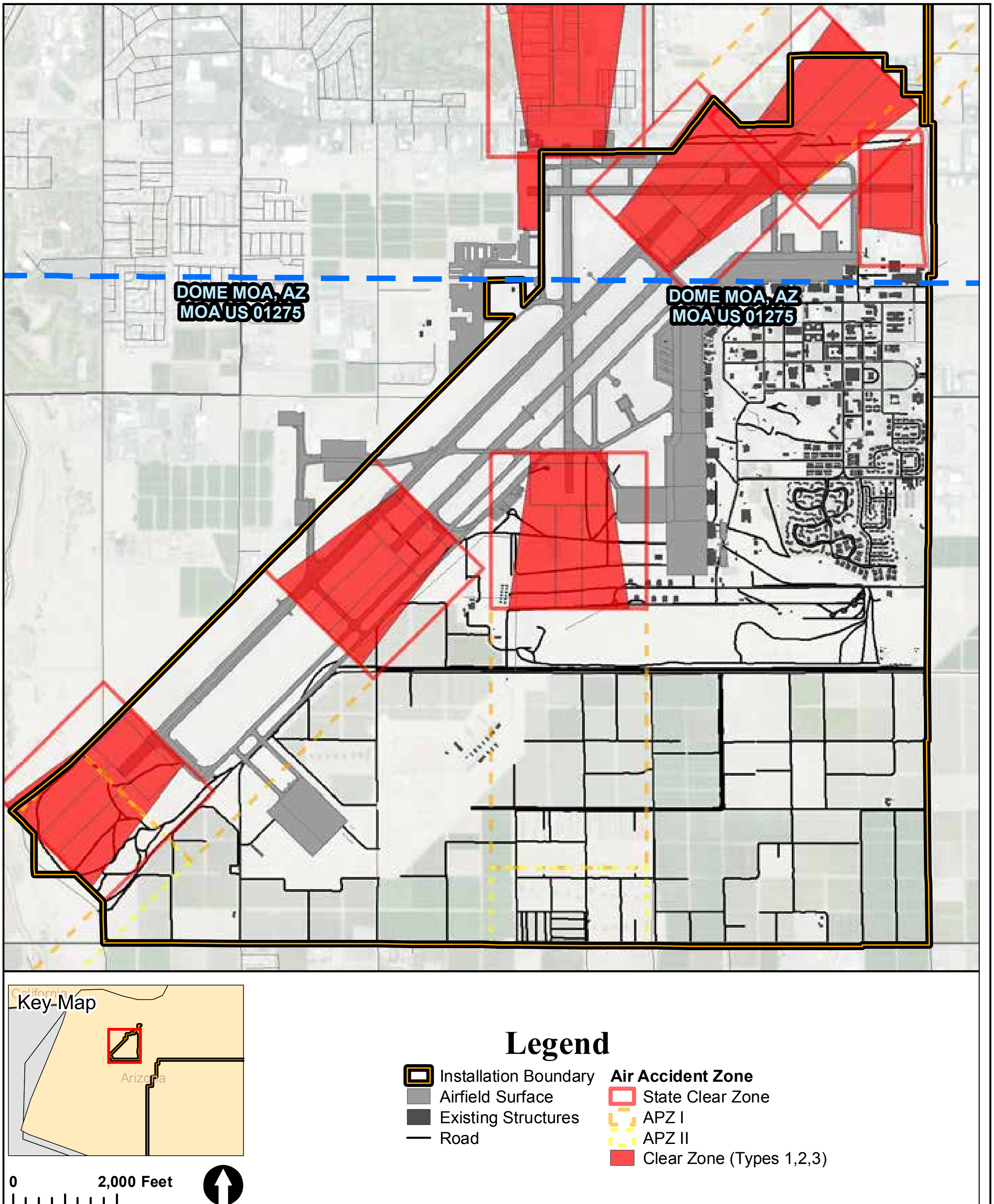


Figure 4.4: Main Station APZs

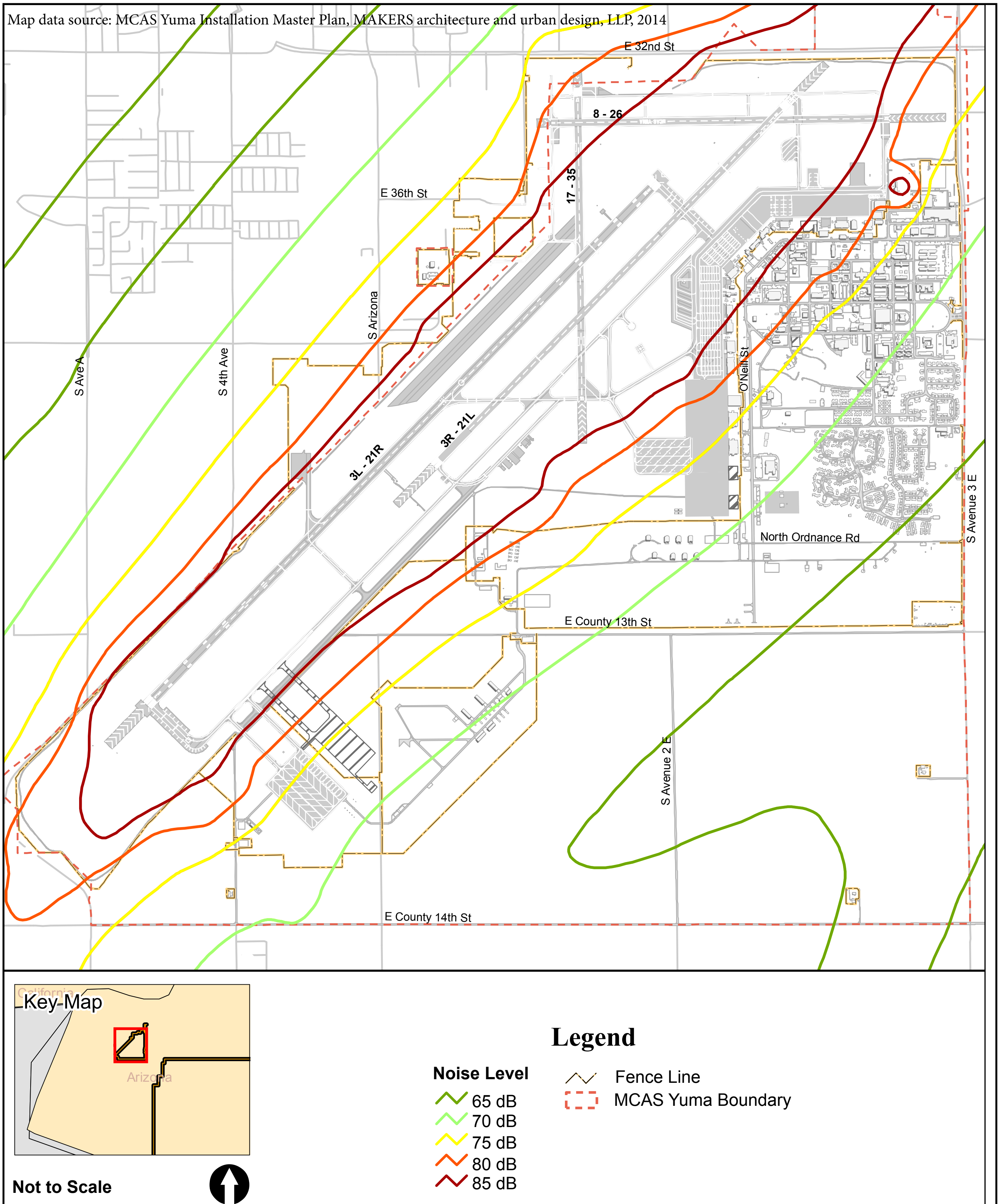


Figure 4.5: Main Station Noise Contours

Environmental contamination is the second most prevalent constraint to development. While not insurmountable, assessment and remediation add time and cost to a potential project. The Main Station has numerous and widespread areas of concern due to past activities. Related to the readily available and conditionally available sites mentioned above, the sites along the north flightline are classified as Comprehensive Environmental Response Compensation and Liability Act (CERCLA)groundwater/soil areas and MRP areas, and the south flightline area is classified as an MRP area (see Figure 4.6: Main Station Environmental Context).

4.4.2 NATURAL CONTEXT

The MCAS Yuma Master Plan does not identify any issues related to natural constraints aboard the Main Station. These constraints usually relate to sensitive species, topographical hazards, surface waterways, wetlands, or habitat. The Main Station is largely developed or in active agricultural production.

4.4.3 OPPORTUNITIES

The Main Station, although constrained by many other existing users, presents several key opportunities for VMU-1 facilities:

- The south flightline site provides the most flexible site in terms of land area and least constraint from surrounding users/existing facilities. Although projects are planned near the south flightline, they remain unprogrammed (P-542 MWSS Facility, P-551 Aircraft Maintenance Hangar, P-579 Aviation Mission Equipment Warehouse, and Master Plan projects MALS-13 Consolidated Facility and the Unit Marshalling Area). If the MALS compound were realized, it would provide functional efficiencies for VMU to be in close proximity to MALS for maintenance/repair of UAVs.
- The sites at the northwestern corner of the flightline provide a more central location, although they are much more constrained in terms of site size. The central location provides more convenient access to MALS existing facilities (although they are dispersed throughout the Main Station) and would also provide synergistic opportunities with the planned Marine Operational Test and Evaluation Squadron (VMX). The MCAS Yuma Master Plan identified two hangars for VMX: one for fixed wing aircraft (Hangar 95) and one for rotary wing aircraft (rebuilt Hangar 143). However, the concurrently running VMX siting study has recommended the area west of Hangar 157 after Hangar 146 is demolished for a new VMX hangar.

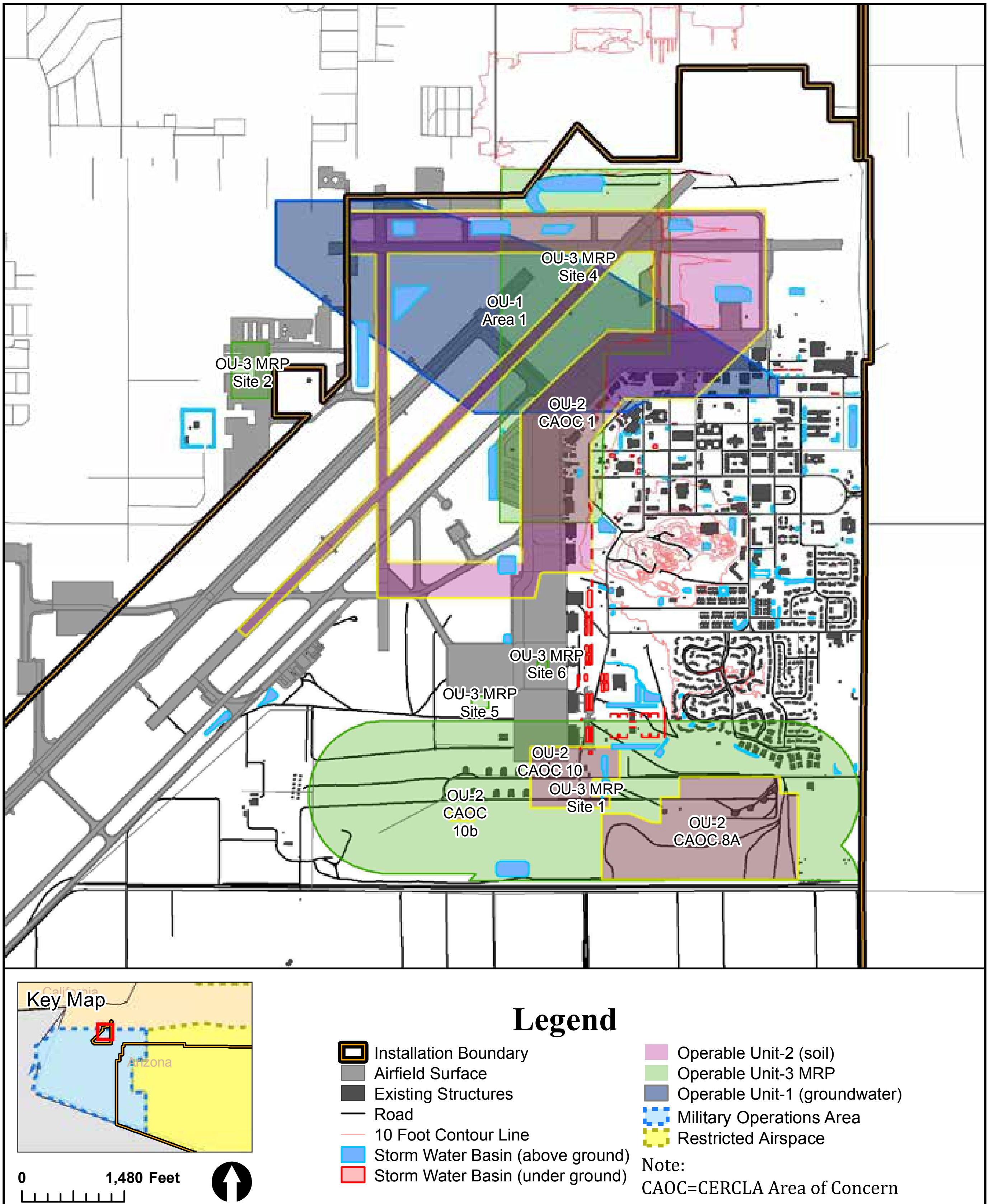


Figure 4.6: Main Station Environmental Context

4.5 CANNON AIR DEFENSE COMPLEX

The CADC is a location which affords some of the benefits of a developed station outpost, while providing some of the remoteness and openness of an expeditionary training environment. In terms of the three locations considered in this planning study, it represents the middleground between the developed nature of the Main Station and the minimalistic nature of the AUX II.

4.5.1 OPERATIONAL & MAN-MADE CONTEXT

According to the MCAS Yuma Master Plan, approximately half of the CADC is classified as readily developable as shown on Figure 4.7: CADC Developable Areas. Approximately one-quarter is classified as conditionally developable and the other quarter is currently occupied by existing facilities and/or paved areas.

Within the fenceline of the CADC the largest constraint is proposed project locations and existing user operating areas as shown on Figure 4.8: CADC Operational & Man-made Context. The Master Plan identifies nine projects for the CADC, most of which replace/consolidate many of the existing inadequate facilities. The projects that would bring new uses/users to the CADC include relocation of CLC-16 (P-568), construction of a fire station (P-501), construction of a gas station (DLA/no number), and construction of a recreational field/running track (no number). The Master Plan also identifies a project to construct field barracks, although these would replace existing wooden structures that are used during WTI and are temporary facilities.

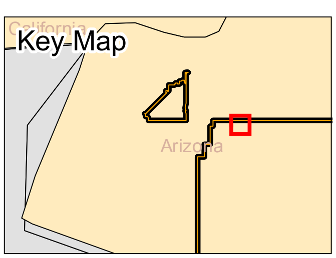
Some of the open space in the western extent of the complex is also used by MWSS-371 for its maneuvering and site preparation training. This function could potentially be relocated to another undeveloped portion of the CADC, but the current location works well for its close proximity to the MWSS facilities and its unvegetated, flat topography. MACS-1 also uses some of the hilltops in the middle of the complex for antenna setup, but this too could potentially be relocated.

Under a separate action, a ‘Rhino-snot’ expeditionary runway is being constructed in the southwestern corner of the CADC and temporary STUAS training support structures will be utilized by transient units during training exercises such as WTI.

The airspace above the CADC is also relatively free of constraints. The largest complicating factor for UAS operations at the CADC is the temporary nature of airspace access. The CADC sits outside the RA that covers most of the BMGR; UAS flights are currently allowed from the CADC to the RA through a FAA/COAW which will need to be renewed in 2015 (and then every two years thereafter). Once within the RA, the UASs have unrestricted freedom of movement provided plans are approved in advance with Range Management.

While several flight tracks are located directly above the complex, they do not conflict with the low-level air operations typical of launch/recovery of UASs. The MCAS Yuma Range Operations Department provides ground to air de-confliction. All range scheduling must be requested 14-20 days prior to a planned training event with certain training events having a higher priority than others. Air operations have the potential to impact small arms training at the small arms ranges located to the southwest of the CADC (located off E County 19th Street). According to Range personnel, firing at the small arms range must cease when aircraft fly within 1,000 feet of the range.

Map data source: MCAS Yuma Installation Master Plan, MAKERS architecture and urban design, LLP, 2014



Not to Scale

Legend

- Readily Developable
- Conditionally Developable
- Substandard and Inadequate Buildings
- Site Boundary
- Fence Line

Figure 4.7: CADC Developable Areas

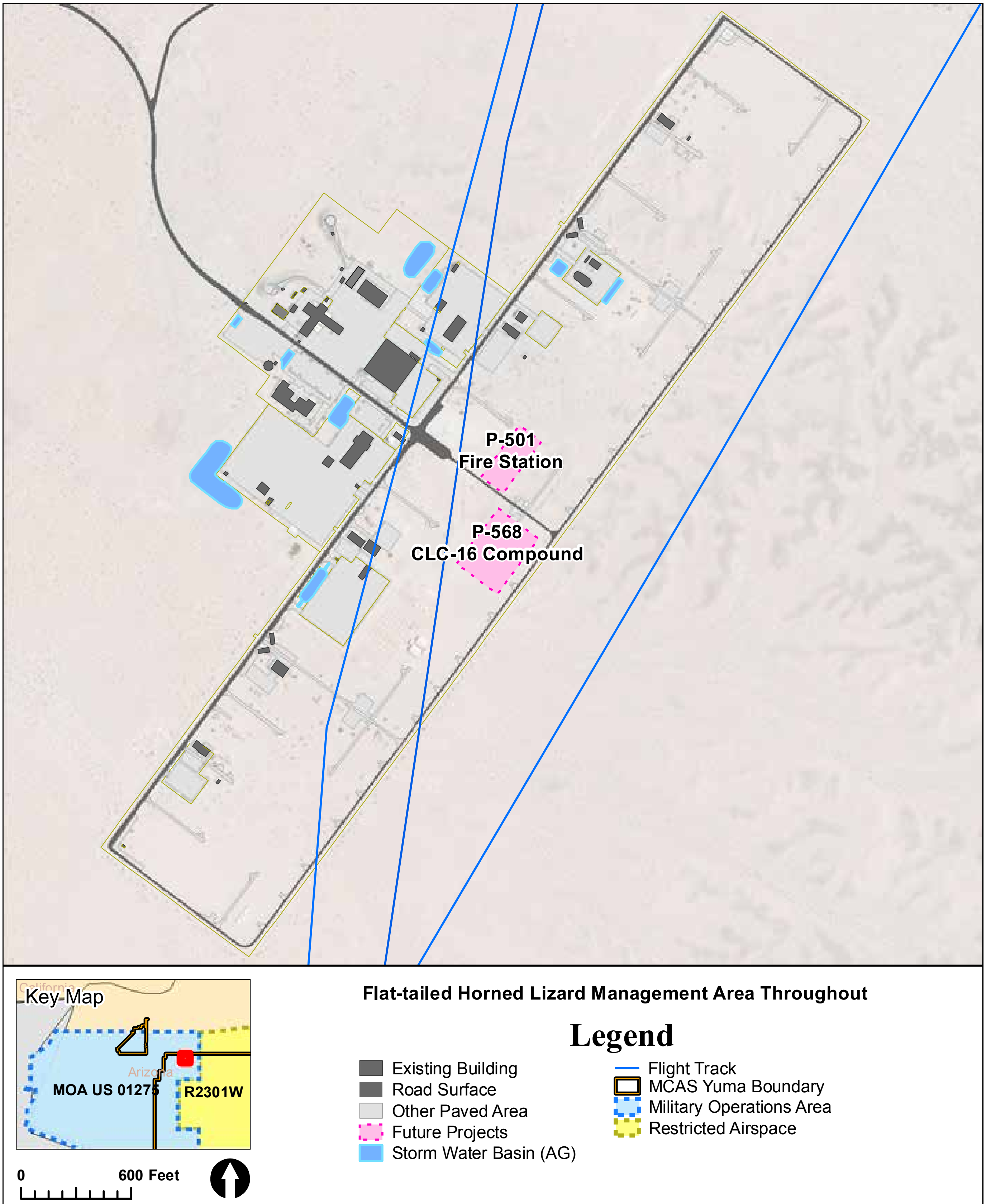


Figure 4.8: CADC Operational & Man-made Context

4.5.2 NATURAL CONTEXT

There is minor topographical variance within the fenceline of the CADC. Generally, the land near/ just north of Cannon Way is characterized by small, rolling hills whereas the land south/southwest of Cannon Way is flatter. The 2014 Master Plan does not document any constraints related to flooding or environmental remediation. It does, however, note that the CADC is within the habitat of the flat-tailed horned lizard and development would require a Species of Special Concern Permit from the Arizona Game and Fish Department. This constraint affects all of the land within the perimeter of the CADC.

4.5.3 OPPORTUNITIES

The CADC offers an array of options for the VMU-1 Squadron. Its location on the BMGR, its access to the RA (via a temporary FAA/COAW), and the availability of land all are benefits to the squadron. Below are key opportunities available at the CADC:

- A 'Rhino-snot' expeditionary runway is being constructed for transient RQ-7B systems under a separate action.
- There is land available for varying levels of support facilities, whether a basic pre and post-launch preparation k-span or full support facilities for the Group 3 UAVs.
- If CLC-16 is relocated to the CADC in the future, then siting the Group 3 component of the squadron at the CADC would afford efficiencies related to ground equipment maintenance.
- Whether through the existing renewable FAA/COAW or a permanent expansion of the RA, the CADC provides access to the BMGR for Group 3 UASs whereas the Main Station does not.

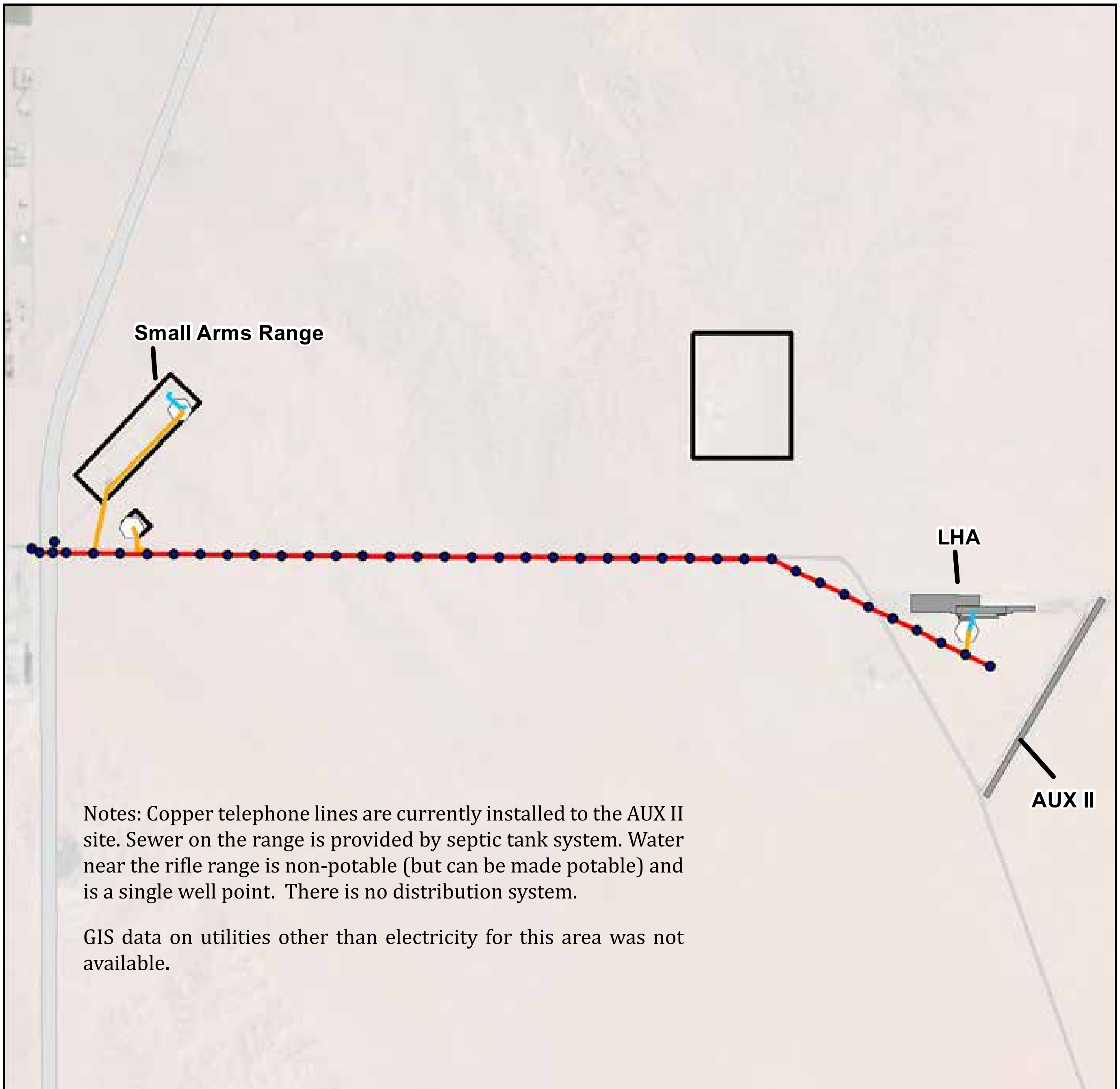
4.6 AUXILIARY AIRFIELD II

The AUX II represents the most remote site being evaluated for siting portions of the VMU-1 squadron. It is located inside the BMGR along the alignment of E County 19th Street and is comprised of several different landing surfaces including a chip seal runway with aggregate shoulders for fixed wing aircraft and an AM-2 matting LHA deck for both rotary, fixed wing, and tilt-rotor aircraft.

4.6.1 OPERATIONAL & MAN-MADE CONTEXT

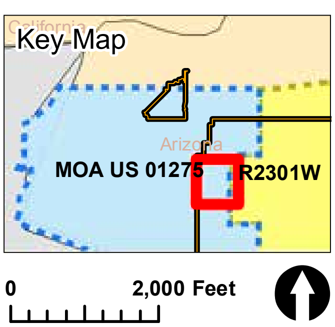
The AUX II is used solely for training and does not include any facilities for housing units. As such, there is little by the way of built infrastructure to constrain future uses. However, the lack of facilities also means a lack of basic utilities. Currently, only electricity and telephone is run to the LHA for landing lighting. The closest connection for water is the small arms range further west on E County 19th Street (see Figure 4.9: AUX II and Surrounding Utilities). Sewer would have to be a septic tank with a leach field.

The airfield and LHA are used by various aircraft for training, although their use by the AV-8B/F-35s will cease with the completion of the ALF. Use of the airfield by UASs would continue to be shared with other manned aircraft, potentially creating scheduling conflicts. In addition, even though the number of users utilizing the airfield may decrease after activation of the ALF, the airspace above the AUX II will remain crowded. Deconflicting with other air units may reduce or even eliminate some VMU-1 training opportunities.



Notes: Copper telephone lines are currently installed to the AUX II site. Sewer on the range is provided by septic tank system. Water near the rifle range is non-potable (but can be made potable) and is a single well point. There is no distribution system.

GIS data on utilities other than electricity for this area was not available.



Legend

- Road
- Range Area
- Utility Pole
- Transformer Bank
- Electric Line (Primary Underground Segment)
- Electric Line (Primary Overhead Segment)
- Electric Line (Secondary Underground Segment)
- Installation Boundary
- Military Operations Area
- Restricted Airspace

Figure 4.9: AUX II and Surrounding Utilities

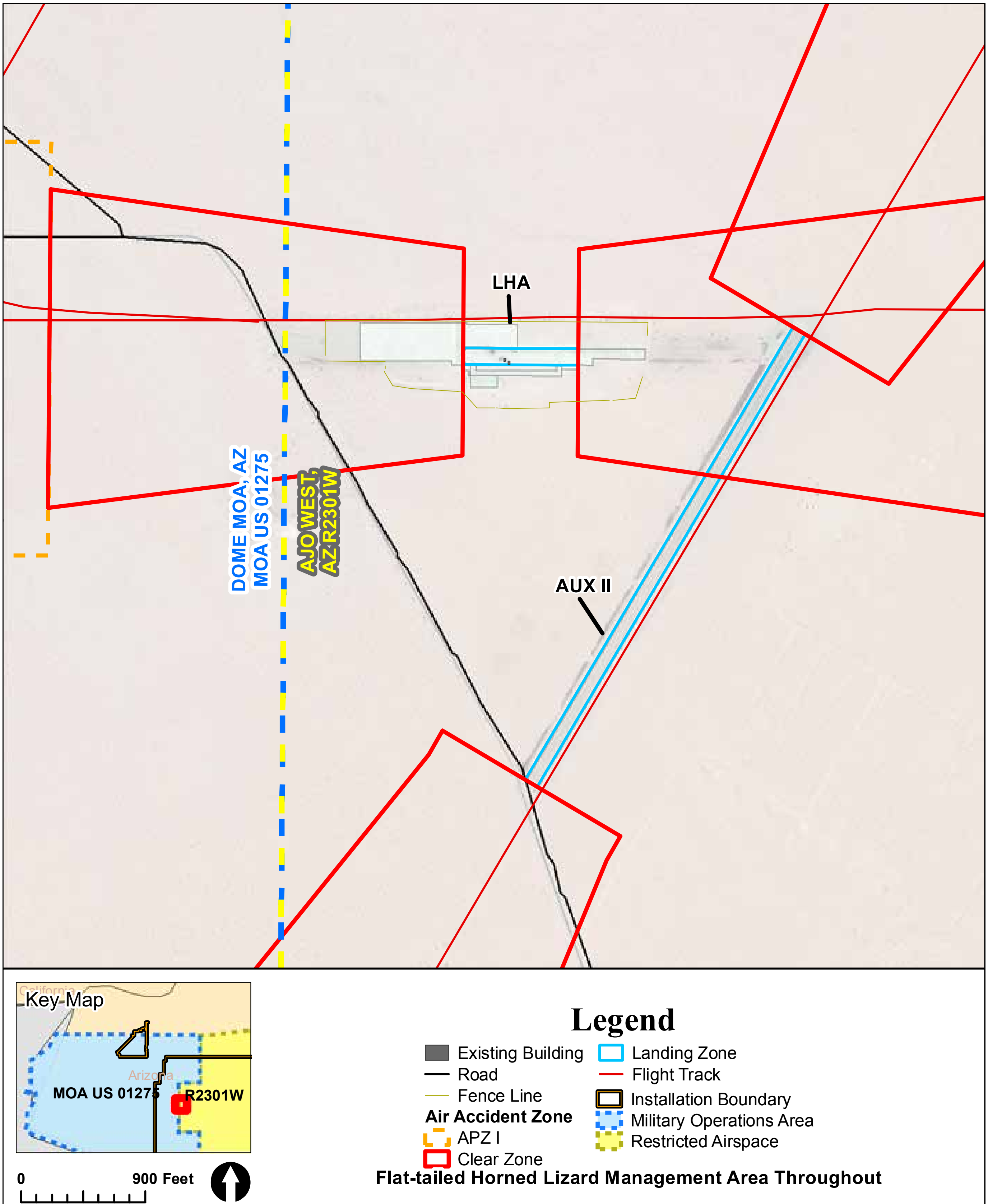


Figure 4.10: AUX II Operational & Man-made Context

A current benefit of the AUX II over the CADC is that it is located within the existing RA (see Figure 4-10; AUX II Operational & Man-made Context). This ensures maximum training flexibility and would help to justify investment in permanent facilities at this location. This might only be a temporary benefit, however, since the FAA is considering whether or not to loosen restrictions on UAS operations in unrestricted airspace. The AUX II's location within the RA is also mitigated by the fact that although both runways lie within the existing RA, aircraft may cross into unrestricted airspace when taking off to the west or approaching from the west depending on aircraft type and approach path.

4.6.2 NATURAL CONTEXT

The 2014 Master Plan does not provide analysis of the AUX II in terms of natural constraints. Given the similar characteristics of the site and its close proximity to the CADC, however, it is reasonable to assume that the same restrictions related to the flat-tailed horned lizard apply.

4.6.3 OPPORTUNITIES

The AUX II provides the most unconstrained land use with the least amount of support in terms of infrastructure and proximity to other users. This creates certain advantages even in spite of the potential drawbacks:

- Both the existing C-130 chip seal runway and the multi-use LHA deck are sufficient for RQ-7B training. No new runway would need to be constructed and VMU would have its choice of two runways.
- The location within the existing RA would mean permanent ability to fly UASs and immediate access to the RA covering the BMGR. As previously mentioned, direction of travel would be a concern given the immediate adjacency of the RA boundary.
- Ample land area is available for the construction of support facilities.

CHAPTER 5: DEVELOPMENT PLANS

5.0 DEVELOPMENT PLANS AND SITE DISCUSSION

The following analysis and site plans consider alternative siting at the three locations: the Main Station, the CADC, and the AUX II. Although the site plans are unique to each alternative, the variations are fairly minor, that is, they present different combinations of locations. As such, below is a discussion of the pros and cons of each site, which remain constant throughout the alternatives. This discussion is followed by a narrative explaining the site plans for the various alternatives.

5 .1 MCAS YUMA MAIN STATION

The Main Station is the only option for facilities associated with the Group 4 or 5 UAS, but presents challenges for both the RQ-7s and MQ-21s.

Pros:

- The Main Station runways and ordnance loading area meets the Group 4 or 5 system requirements which are compatible with the concurrent manned aircraft operations. This eliminates the need to construct a runway and ordnance loading area elsewhere.
- MAG-13 and MALS-13 are collocated on the Main Station, which will provide communication and operational efficiencies.
- The VMX squadron, which includes various UASs, will also be collocated at the Main Station. The relationship between VMX and VMU will be important for equipment maintenance and implementation of system modifications/improvements.
- UAS training simulators will likely be located adjacent to existing manned aircraft simulators for coordinated training exercises at the Main Station. Collocation of the squadron primary facilities avoids excess travel time between locations for training.
- The Main Station has existing robust utilities, transportation infrastructure, and community support facilities. Other functions such as warehousing and the armory could be collocated with existing assets.
- The Main Station has a secured perimeter and manned entry control point.

Cons:

- Competition for facility space at the Main Station is high, especially near the flightline.
- Small UAS operations cannot occur at the Main Station due to hazards associated with flying them in close proximity to larger manned aircraft. Small UASs evade detection by the ATC which governs aircraft activity on and around the Main Station and pilots of manned aircraft have difficulty visually identifying/avoiding them.
- MWSS-371 is located at the CADC and CLC-16 is planned to relocate to the CADC. Siting an operational vehicle maintenance function at the Main Station would separate it from similar functions and prohibit certain efficiencies between the units.

5.2 CANNON AIR DEFENSE COMPLEX

The CADC provides a crucial balance between the facility and operational needs of VMU-1. No one site under consideration could fully meet VMU-1's long term needs.

Pros:

- There is sufficient land to accommodate short term STUAS facility requirements.
- A 'Rhino-snot' expeditionary runway is being constructed under a separate action that will support the RQ-7Bs.
- The CADC has existing infrastructure, but the capacity/condition of all utilities will need to be verified.
- The CADC is marginally closer to the Main Station than the AUX II (approximately three miles).
- The CADC offers existing security through a perimeter fence with an intrusion detection system and a manned entry control point on Cannon Way.
- If the planned project to relocate CLC-16 from the Main Station to the CADC is realized, then equipment maintenance support would be in close proximity.
- A small food services function exists at the CADC.

Cons:

- The CADC is approximately seven miles from the Main Station.
- Communications lines will need to be extended from the Main Station.
- No facilities are currently available for reutilization by VMU.
- The RA does not currently include the CADC. A FAA/COAW exists for VMU flights from the CADC to the RA, but it must be renewed on a regular basis (one year duration for the first year and two year duration thereafter).
- The CADC is home to MWSS-371, MACS-1, and various other units during WTI training. Although undeveloped land is available, the presence of VMU facilities/operations at the CADC could limit future operations and/or create conflicts.
    - ◊ MWSS-371 has informally been given the southern half of the CADC for their facilities and training activities. Although not all of this area is currently used, the proposed VMU-1 detachment facilities would impact MWSS-371's ability to grow beyond their current footprint.
    - ◊ The facilities most likely to be impacted by the proposed VMU-1 facilities are the current WTI field berthing tent frames/planned field barracks. Although the occupied land is not required for VMU-1 detachment facilities, safety clearances associated with the RQ-7B runway could require the relocation of these temporary facilities. Fortunately, other locations within the CADC could accommodate these functions just as well.

5.3 AUXILIARY AIRFIELD II

The AUX II provides the most unencumbered development and operational environment, but is also the most remote of the three locations and provides the least amount of existing infrastructure.

Pros:

- There is sufficient undeveloped land to accommodate the full range of proposed VMU facilities.
- The AUX II lies within the existing RA and does not require authorization of UAS operations beyond coordination with the MCAS Yuma Range Operations Department. However, flight tracks to the west are limited, due to the close proximity to the RA boundary.
- The AUX II has two different runways/landing zones that could be utilized for RQ-7Bs.

Cons:

- The AUX II is approximately 10 miles from the Main Station.
- Because of is proximity to the Gila Mountains, operations to the east of the Gila Mountains are the most constrained (reduced line-of-sight).
- The AUX II is unsecured. The VMU would be required to either setup and teardown with each operation, leave behind personnel to stand watch over equipment left at the AUX II, or construct fencing with appropriate intrusion detection system to secure equipment when personnel are not present. VMU-1 indicated that setup/teardown with each operation is not viable because it takes two days for each, which would leave only one day of training within a given week. They also stated that leaving a 24 hour fire watch was not feasible.
- Limited electric power and copper telephone wires are currently available at the AUX II. Sewer would have to be handled with new septic systems. The closest water source is a single non-potable water well approximately two miles to the west at the small arms ranges.
- Other than the runway for RQ-7Bs, no other facilities currently exist at the AUX II.
- No other users are located at the AUX II.
- The runway at the AUX II will continue to be shared use even after the ALF is fully operational. Although intermittent, VMU would need to coordinate training/operations with periodic use of the runway and LHA by non-Joint Strike Fighter aircraft.
- The Range Road (County 19th Street) from the west edge of the BMGR to the AUX II site will need to be rebuilt from a single sixteen foot wide lane to a nominal two lane standard geometry with graded shoulders. The existing road is designed for very low daily traffic use and is limited in load carrying capacity.
- This area is likely in the Flat Tailed Horned Lizard management area. Widening the road would require taking of additional habitat and require consultation and compensation.

5.4 SITE LAYOUTS

The COA facility sizes and locations that were developed for the Main Station, the CADC, and the AUX II are provided in Tables 5.1: COA 1 Site Layout Facility Sizes and Locations, 5.2: COA 2 Site Layout Facility Sizes and Locations, and 5.3: COA 3 Site Layout Facility Sizes and Locations. This information is based on the site selection summary tables provided in Section 1.9. Following the requirement tables is a discussion of each of the facility layout configurations at each of the locations.

COA 1 - VMU-1 Detachment				
CCN/Facility	1/RQ-7B 1/MQ-21A	Alt 1	Alt 2	Alt 3
Runway				
111-10 Runway/Fixed Wing (linear feet)	1,280	CADC	AUX II	AUX II
Combined Facility				
211-05 Aircraft Hangar High-bay	3,000	CADC	AUX II	CADC
211-06 Aircraft Hangar Shop	1,000	CADC	AUX II	CADC
211-07 Aircraft Hangar Office	1,000	CADC	AUX II	CADC
852-10 Parking Area Trucks, Equipment	32,000	CADC	AUX II	CADC
852-10 POV Parking	20,000	CADC	AUX II	CADC

Table 5.1: COA 1 Site Layout Facility Sizes and Locations
Note: CCN=Category Code Number, POV=Privately Owned Vehicle
All measurements are square feet unless noted otherwise.

COA 2 - Full Squadron, Short Term							
CCN/Facility	3/RQ-7B	9/MQ-21A	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Runway							
111-10 Runway/Fixed Wing (linear feet)	1,280	0	CADC	AUX II	AUX II	CADC	AUX II
VMU HQ							
121-50 Aircraft Ready Fuel Storage	120	0	CADC	AUX II	AUX II	MS	MS
141-42 Air Intelligence Support Center	600	200	CADC	AUX II	CADC	MS	MS
211-05 Aircraft Hangar High-bay	13,824	17,664	CADC	AUX II	AUX II	MS	MS
211-06 Aircraft Hangar Shop	5,601	2,148	CADC	AUX II	AUX II	MS	MS
211-07 Aircraft Hangar Office	4,418	3,025	CADC	AUX II	CADC	MS	MS
211-96 Maintenance Aircraft Spares/Storage	200	600	CADC	AUX II	AUX II	MS	MS
441-30 HazFlam Storage	200	200	CADC	AUX II	AUX II	MS	MS
852-10 POV Parking	63,630		CADC	AUX II	AUX II	MS	MS
Vehicle Maintenance							

COA 2 - Full Squadron, Short Term (continued)							
CCN/Facility	3/RQ-7B	9/MQ-21A	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
123-10 Filling Station (outlet)	1		CADC	AUX II	CADC	MS	MS
123-30 Vehicle Fuel Storage (gallons)	6,000		CADC	AUX II	CADC	MS	MS
143-45 Armory	800	0	CADC	AUX II	CADC	MS	MS
214-40 Vehicle Holding Shed	1,260	420	CADC	AUX II	CADC	MS	MS
214-51 Automotive Shop	6,460		CADC	AUX II	CADC	MS	MS
214-55 Vehicle Wash Platform	840	840	CADC	AUX II	CADC	MS	MS
214-56 Grease Rack	1		CADC	AUX II	CADC	MS	MS
441-30 HazFlam Store	200	200	CADC	AUX II	CADC	MS	MS
852-10 Parking Area Trucks, Equipment	94,500		CADC	AUX II	CADC	CADC / MS	AUX II / MS
Storage							
441-12 Storage for Marine Corps	15,953	9,776	CADC	AUX II	CADC	MS	MS
441-35 General Storage Shed	625	625	CADC	AUX II	CADC	MS	MS
451-10 Open Storage Area	Estimated at 14,000		CADC	AUX II	CADC	MS	MS
Training							
171-20 Applied Instruction Building	300	300	MS	MS	MS	MS	MS
171-35 Operational Trainer Facility	300	150	MS	MS	MS	MS	MS

Table 5.2: COA 2 Site Layout Facility Sizes and Locations
Note: CCN=Category Code Number, MS=Main Station, POV=Privately Owned Vehicle
All measurements are square feet unless noted otherwise.

COA 3 - Full Squadron, Long Term							
CCN/Facility	9/ MQ-21A	3/ Group 4-5	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Runway							
111-10 Runway/Fixed Wing (linear feet)	0	6,000	MS	MS	MS	MS	MS
113-20 Aircraft Parking Apron (square yards)	0	49,267	MS	MS	MS	MS	MS
VMU HQ							
121-50 Aircraft Ready Fuel Storage	0	6,000	MS	MS	MS	MS	MS
141-42 Air Intelligence Support Center	200	2,240	CADC/ MS	AUX II/ MS	MS	MS	MS

Table 5.3: COA 3 Site Layout Facility Sizes and Locations
Note: CCN=Category Code Number, MS=Main Station. All measurements are square feet unless noted otherwise.

COA 3 - Full Squadron, Long Term (continued)							
CCN/Facility	9/ MQ-21A	3/ Group 4-5	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
211-05 Aircraft Hangar High-bay	17,664	38,675	CADC/ MS	AUX II/ MS	MS	MS	MS
211-06 Aircraft Hangar Shop	2,148	12,000	CADC/ MS	AUX II/ MS	MS	MS	MS
211-07 Aircraft Hangar Office	3,025	12,000	CADC/ MS	AUX II/ MS	MS	MS	MS
211-96 Maint Aircraft Spares/Storage	600	200	CADC/ MS	AUX II/ MS	MS	MS	MS
441-30 HazFlam Store	200	200	CADC/ MS	AUX II/ MS	MS	MS	MS
852-10 POV Parking	63,630		CADC/ MS	AUX II/ MS	MS	MS	MS
Vehicle Maintenance							
123-10 Filling Station (outlet)	1		CADC	AUX II	MS	MS	MS
123-30 Vehicle Ready Fuel (gallons)	6,000		CADC	AUX II	MS	MS	MS
143-45 Armory	0	800	CADC	AUX II	MS	MS	MS
214-40 Vehicle Holding Shed	420	1,260	CADC	AUX II	MS	MS	MS
214-51 Automotive Shop	6,460		CADC	AUX II	MS	MS	MS
214-55 Vehicle Wash Platform	840	840	CADC	AUX II	MS	MS	MS
214-56 Grease Rack	1		CADC	AUX II	MS	MS	MS
441-30 HazFlam Store	200	200	CADC	AUX II	MS	MS	MS
852-10 Parking Trucks, Equipment	94,500		CADC/ MS	AUX II/ MS	MS	MS	MS
Storage							
441-12 Storage for Marine Corps	9,776	15,953	CADC	AUX II	MS	MS	MS
441-35 General Storage Shed	625	625	CADC	AUX II	MS	MS	MS
451-10 Open Storage Area	Est. at 14,000		CADC	AUX II	MS	MS	MS
Training							
171-20 Applied Instruction Building	300	300	MS	MS	MS	MS	MS
171-35 Operational Trainer Facility	150	300	MS	MS	MS	MS	MS

Note: all units in square feet unless noted otherwise. MS=Main Station, POV=Privately Owned Vehicle

Alternatives 3 and 4 site all permanent facilities at the Main Station, although operations for the MQ-21 systems are conducted at the CADC in Alternative 3 and AUX II for Alternative 4. Table 5.4: Facility Site Plan Summary Table and the following site plans provide additional detail.

Table 5.3: COA 3 Site Layout Facility Sizes and Locations (continued)

5.4.1 FACILITY SITE PLANS

Figures 5.1 through 5.15 show the proposed configurations as a part of one or more alternatives and the corresponding COAs. There is one site plan provided for each proposed facility configuration. A short discussion of the layout and impacts to existing facilities is included. This discussion supplements the overarching pros and cons previously discussed.

Each site plan estimates a maximum footprint under each COA and location configuration. Once a COA and site(s) are selected, it may be possible to reduce the total project footprint based on collocation/consolidation with nearby existing facilities. Opportunities for collocation/consolidation are greatest with armory, warehousing, fueling, and vehicle maintenance functions.

The design for COAs 2 and 3 include instruction space (CCN 171-20) and operational training (CCN 171-35) which will be housed in Building 408. In addition, the Air Intelligence Support Center (CCN 141-42) for COAs 2 and 3 is included in the aircraft hangar, and so, it does not appear as a stand-alone facility.

FACILITY SITE PLAN SUMMARY TABLE

Table 5.4: Facility Site Plan Summary provides a reference for which site plan configurations are paired together under each COA and alternative. Location, figure number and configuration information is displayed on the left side of the table, with COA and alternative information along the top.

			COA 1 Detachment			COA 2 RQ-7 and MQ-21					COA 3 Group 4 or 5 and MQ-21				
Site	Figure	Configuration	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Main Station	5.1a/5.1b	Group 4 or 5 & MQ-21 Full Buildout											X	X	X
	5.2	RQ-7/MQ-21 Shared Type II Hangar							X	X					
	5.3	Group 4 or 5 UAS Facilities & HQ Only									X	X			
CADC	5.5	Detachment Hangar and Runway	X												X
	5.6	Detachment Hangar/Maint. Only			X										
	5.7	Expeditionary Runway Only							X				X		
	5.8	RQ-7 & MQ-21 Full Buildout				X									
	5.9	RQ-7 & MQ-21 Support Facilities & HQ						X							
	5.10	MQ-21 & Full Support									X				
AUX II	5.11	Detachment Hangar and Runway		X											
	5.12	Expeditionary Runway Only			X					X				X	
	5.13	RQ-7 & MQ-21 Full Buildout					X								
	5.14	RQ-7 & MQ-21 Hangars, Runway						X							
	5.15	MQ-21 and Full Support										X			
Note: COA=Course of Action, HQ=Headquarters															

Table 5.4: Facility Site Plan Summary

Main Station, Full Buildout

Figure 5.1a: Main Station, MQ-21 & Group 4 or 5 UAS Full Buildout (South Flightline) shows the full buildout configuration at the Main Station. The VMU-1 facilities would be located at the Main Station under long term COA 3, Alternatives 3 and 4, where the systems include the MQ-21s and Group 4 or 5 UASs. As shown in Table 5.3, this configuration provides almost 39,000 square feet of high-bay hangar space at the extreme south end of the fixed wing flightline. There is 49,267 square yards of aircraft parking apron provided to accommodate nine UAVs with sun shades (four Group 4 or 5 UAVs are in the hangar). Headquarters and squadron administrative offices are included in the hangar. POV parking for all squadron personnel is provided east of the hangar.

The remainder of VMU facilities are located on the east side of O'Neill Street. This includes organizational parking, vehicle maintenance, fueling, storage (warehouse and open storage), armory, and MQ-21 hangar/maintenance/storage. These facilities fit within the existing North Ordnance Loop and South Ordnance Loop roads.

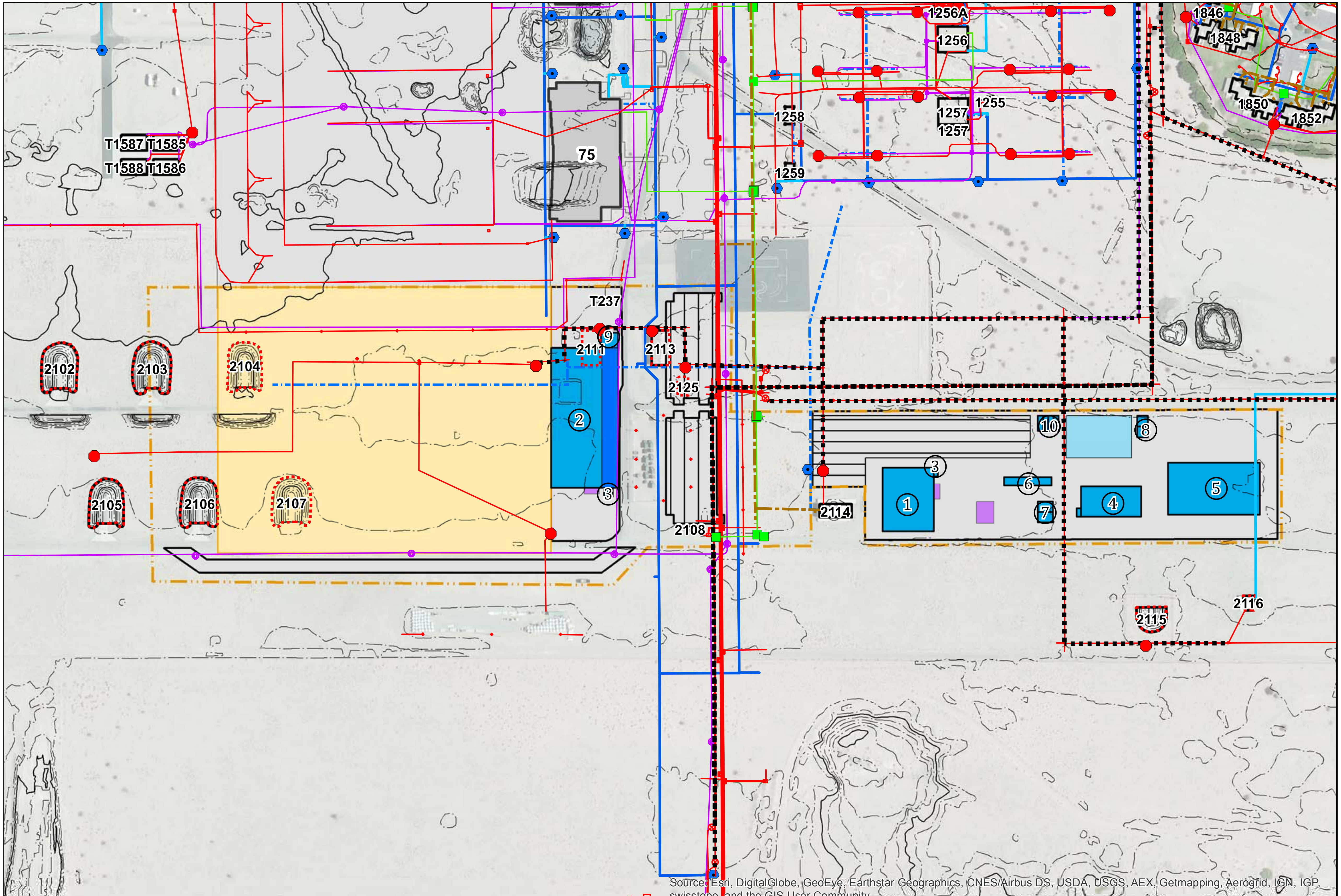
This configuration of facilities does not propose any demolitions above and beyond those already identified in the 2014 Master Plan. The proposed facilities are located on the sites for two unprogrammed MILCONs: P-551 Aircraft Maintenance Hangar and P-542 MWSS Facility; and one Master Plan project: unit marshalling area. These projects are low priority for the Main Station and the marshalling area could easily be proposed for another location. A Group 4 or 5 UAS hangar is consistent with the regulating plan established for the south flightline, even if it is not the exact use envisioned in P-551. Station planning personnel cite P-542 as tentative and unlikely to happen unless other trends/requirements justify the relocation of MWSS to the Main Station from the CADC.

This configuration is efficient in the sense that it keeps all parts of the VMU squadron in one location, but would result in operational inefficiencies for the MQ-21 portion of the squadron because it would then have to travel to a remote training site for each exercise.

Figure 5.1b: Main Station, MQ-21 & Group 4 or 5 UAS Full Buildout (Old Van Pad) shows the second site for full buildout at the Main Station. This configuration would locate all VMU-1 facilities at the Main Station under long term COA 3, Alternative 5. As shown in Table 5.3, this configuration provides almost 39,000 square feet of high-bay hangar space near the middle of the fixed wing flightline on the site of existing Hangar 97 currently scheduled for demolition. This Type II Hangar module will support organizational level aircraft maintenance requirements for both the Group 4 or 5 and the MQ-21 systems. A separate maintenance hangar for MQ-21 systems is not included in this alternative as the requirement is considered covered by the Type II Hangar.

Aircraft parking apron already exists to support nine parked Group 4 or 5 UAVs with sun shades. Up to four UAVs would be parked in the hangar. Headquarters and squadron administrative office requirements are included in the hangar. POV parking for all squadron personnel is provided on the east side of the hangar.

The remainder of VMU facilities are located on the old van pad site just east of the proposed hangar. This includes organizational parking, vehicle maintenance, warehouse, open storage and space for an armory. It may be possible to consolidate VMU's armory requirement into the future consolidated



1. Hangar 9/MQ-21A UASs Module
2. Hangar 3/Group 4 or 5 UASs Type II Module
3. Hazmat Locker
4. Vehicle Maintenance Shop
5. Warehouse
6. Grease Rack
7. Washrack
8. Storage Shed
9. Armory
10. Vehicle Shed

10 Foot Contour Line
2 Foot Contour Line
Programmed Demolition
Existing Structure
Primary OH Electric
Comm Line
Electric Line
wastewater_line
Gas Main Line
Gas Valve
Hydrant
Water Main Line
Water Fire Line
Water Service Line

New Structure
2nd Deck Admin/HQ
Open Storage
POV Parking
Equipment Parking
Project Boundary

Feet
0 112.5 225 450

N

Figure 5.1a: Main Station, MQ-21 & Group 4 or 5 UAS Full Buildout (South Flightline)

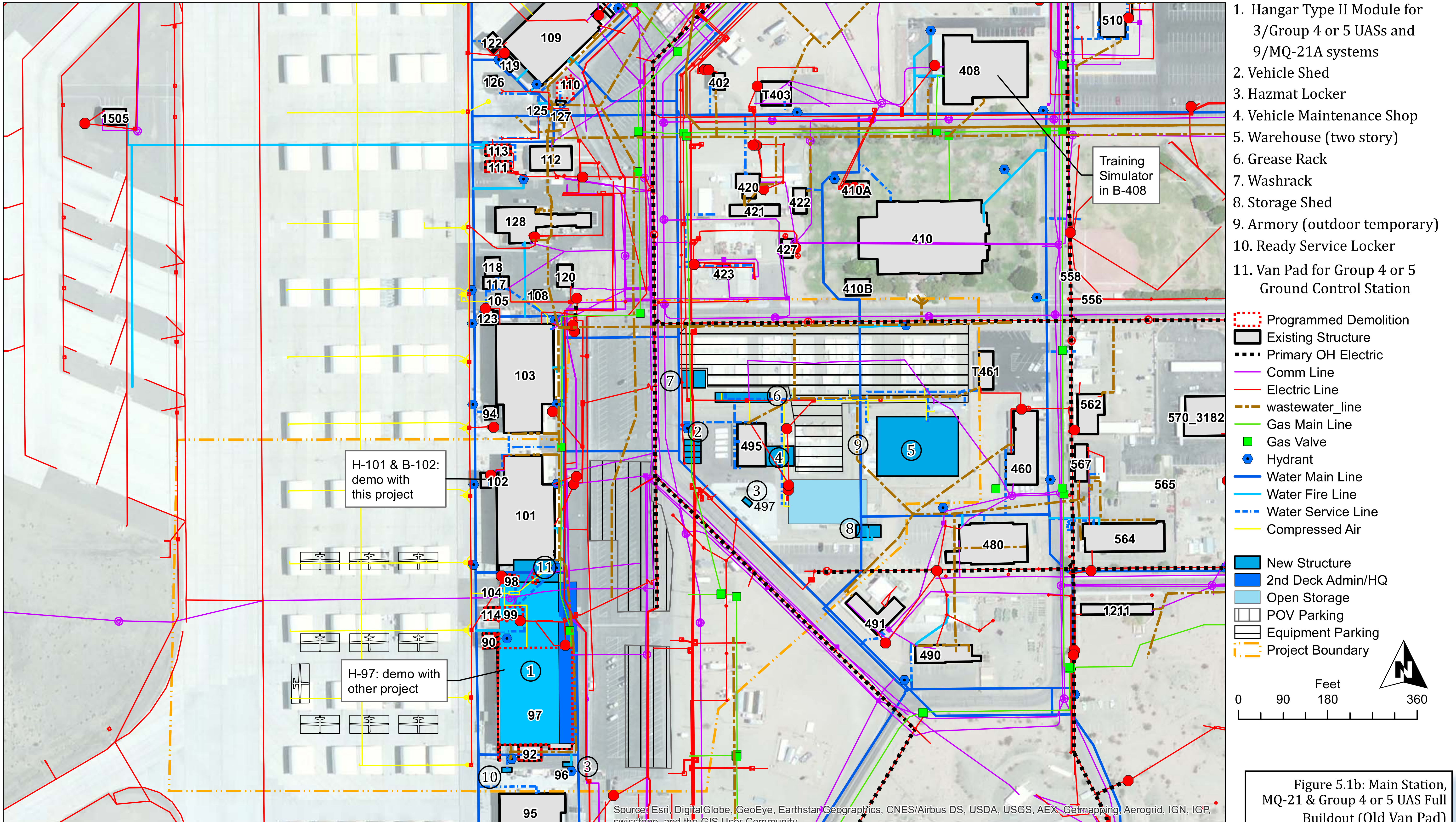
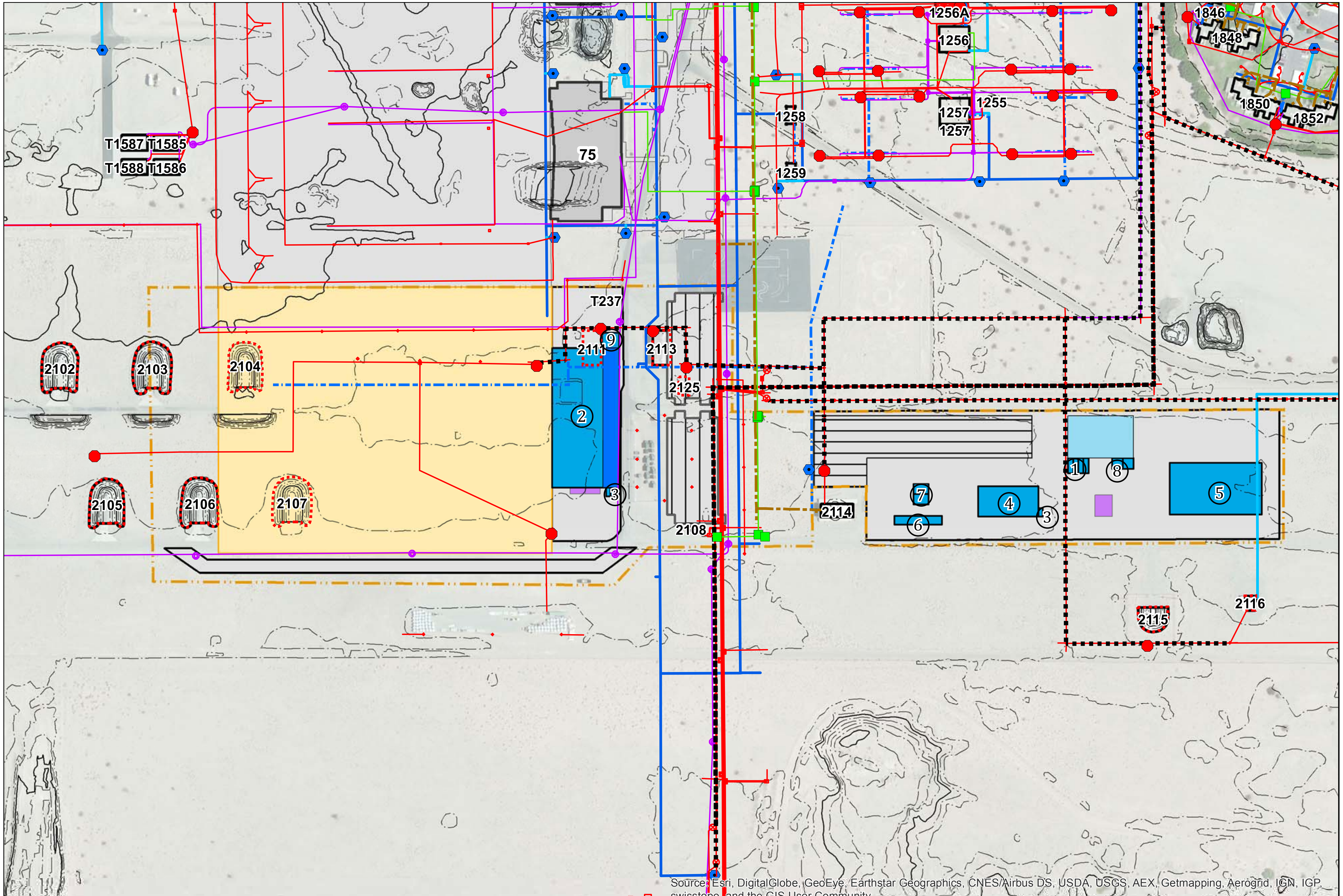


Figure 5.1b: Main Station, MQ-21 & Group 4 or 5 UAS Full Buildout (Old Van Pad)



1. Vehicle Shed
2. RQ-7B/MQ-21 Shared Type II Hangar Module
3. Hazmat Locker
4. Vehicle Maintenance Shop
5. Warehouse
6. Grease Rack
7. Washrack
8. Storage Shed
9. Armory

10 Foot Contour Line
2 Foot Contour Line
Programmed Demolition
Existing Structure
Primary OH Electric
Comm Line
Electric Line
wastewater_line
Gas Main Line
Gas Valve
Hydrant
Water Main Line
Water Fire Line
Water Service Line

New Structure
2nd Deck Admin/HQ
Open Storage
POV Parking
Equipment Parking
Project Boundary

Feet
0 112.5 225 450

Figure 5.2: Main Station, RQ-7B/MQ-21 Shared Hangar

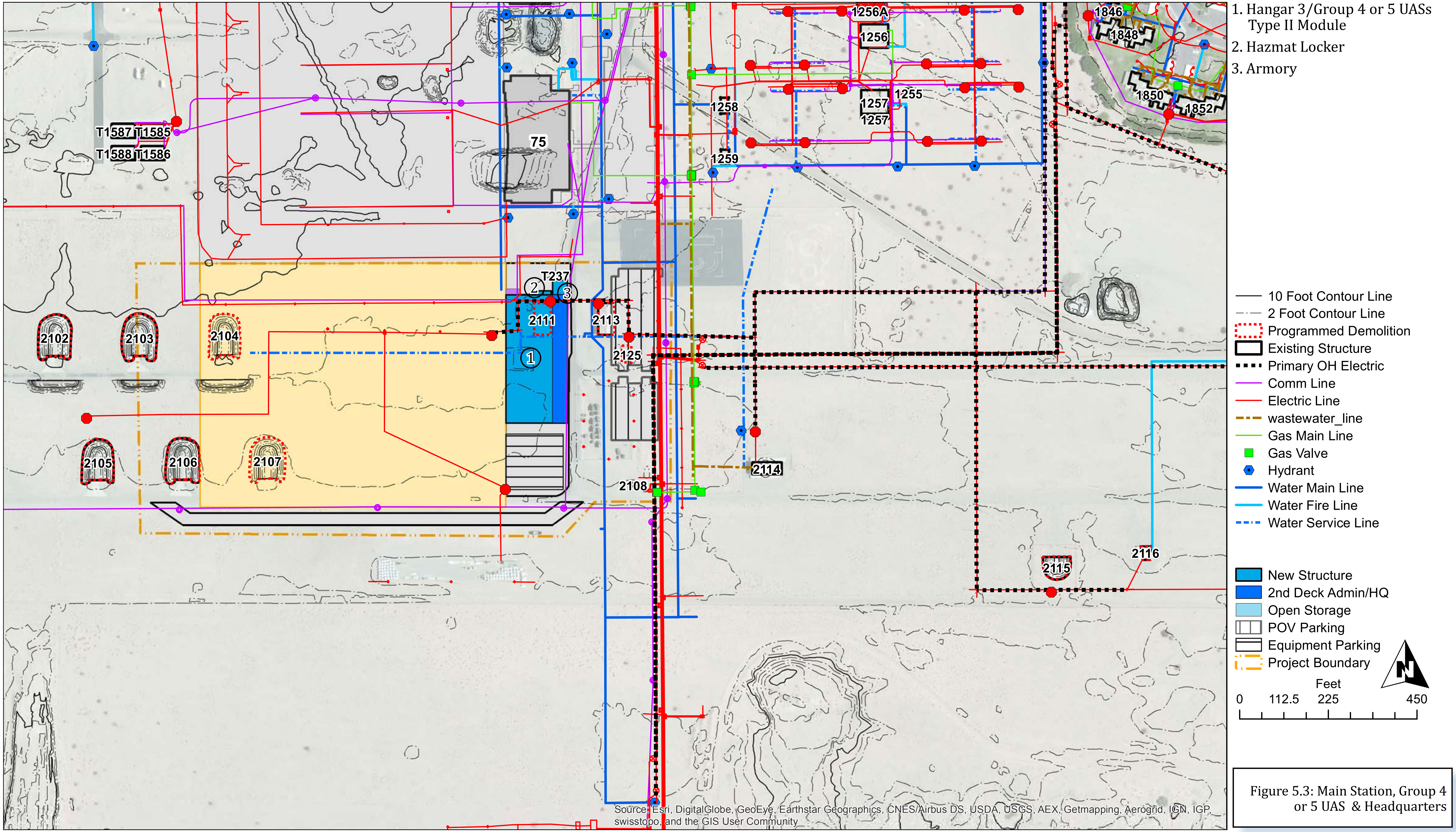


Figure 5.3: Main Station, Group 4 or 5 UAS & Headquarters

station armory. These facilities fit within the existing fenced compound previously used as the van pads. Aside from the MQ-21 and Group 4 or 5 UAS hangar requirements being supported by one Type II Hangar module on the flightline, another unique feature is the warehouse footprint being sized as a two story building with a freight elevator. This was necessary to fit all facilities within the existing fenced compound.

The proposed VMU Type II Hangar module on the flightline requires a one hundred foot separation from adjacent hangars to the north and south to accommodate safety arcs from ready service lockers. With a one hundred foot separation from Hangar 95 on the south side, it becomes necessary to demolish existing Hangar 101. Based on the latest squadron loading noted in the 2015 AvPlan, it appears Hangar 101 will be surplus and its demolition should not be an issue.

Similar efficiencies and inefficiencies noted for Figure 5.1a apply to this configuration. One additional efficiencies for this layout is the close proximity to training simulator Building 408.

Main Station, RQ-7B, MQ-21 Shared Hangar

Figure 5.2: Main Station, RQ-7B/MQ-21 Shared Hangar shows the full buildout scenario at the Main Station as it could occur under short term COA 2, Alternatives 4 and 5, with the RQ-7B and MQ-21 systems. The only difference between this scenario and the full buildout under COA 3 is that the hangar on the flightline is shared between the RQ-7s and the MQ-21s (no Group 4 or 5 UASs are included in COA 2), so no aircraft maintenance facilities are shown east of O'Neill Street.

This configuration of facilities would also require an expeditionary runway at either the CADC or the AUX II for RQ-7B operations.

Main Station, Group 4 or 5 UAS Facilities and HQ Only

Figure 5.3: Main Station, Group 4 or 5 UAS & Headquarters shows the least intensive facility configuration at the Main Station under long term COA 3, Alternatives 1 and 2. In this configuration, only the Group 4 or 5 UASs equipment and storage related facilities are located at the Main Station, occupying a footprint along the south flightline and between the proposed hangar and O'Neill Street.

This configuration prioritizes the Main Station for the facilities that need it most - the Group 4 or 5 UAS related facilities. All other functions are located at either the CADC or the AUX II, where the small UAS operations are supported and there are other vehicle maintenance functions. This configuration also avoids the sites chosen for the marshalling area/P-542 MWSS Facility, but continues to occupy the site of P-551 Aircraft Maintenance Hangar.

CADC, Detachment Hangar and Runway

COA 1, Alternative 1, as shown on the following pages in Figure 5.5: CADC Detachment Hangar and Runway, proposes a permanent detachment operations facility and utilization of the "Rhino-snot" runway at CADC for the RQ-7B. All administrative and support facilities would be collocated with the remainder of the squadron at either the Main Station or the AUX-II depending upon the preferred alternative identified.

Under a separate action, a "Rhino-snot" STUAS runway will be constructed and utilized by transient units in association with training exercises such as Weapons and Tactics Instructor. The "Rhino-snot" runway will be refurbished and improved under this alternative to support the increased usage by both permanent squadron and transient units. The location of the runway is compatible with VMU operations because of the prevailing wind patterns and the relatively level terrain (which would reduce costs for runway construction). Figure 5.4: Potential Conflict with RQ-7B Runway Imaginary Surface shows potential conflict with the height of facilities proposed under the Master Plan project for field barracks and operations from the proposed RQ-7B runway. The proposed footprint of the permanent detachment's facilities can be easily accommodated by currently under utilized land within the fenceline at the southwest edge of the CADC and adjacent to the runway. Proposed VMU permanent detachment facilities would be located southeast of the existing MWSS-371 facilities, storage areas, and training areas. Access is provided via an improved and extended driveway from the existing Boyington Loop road.

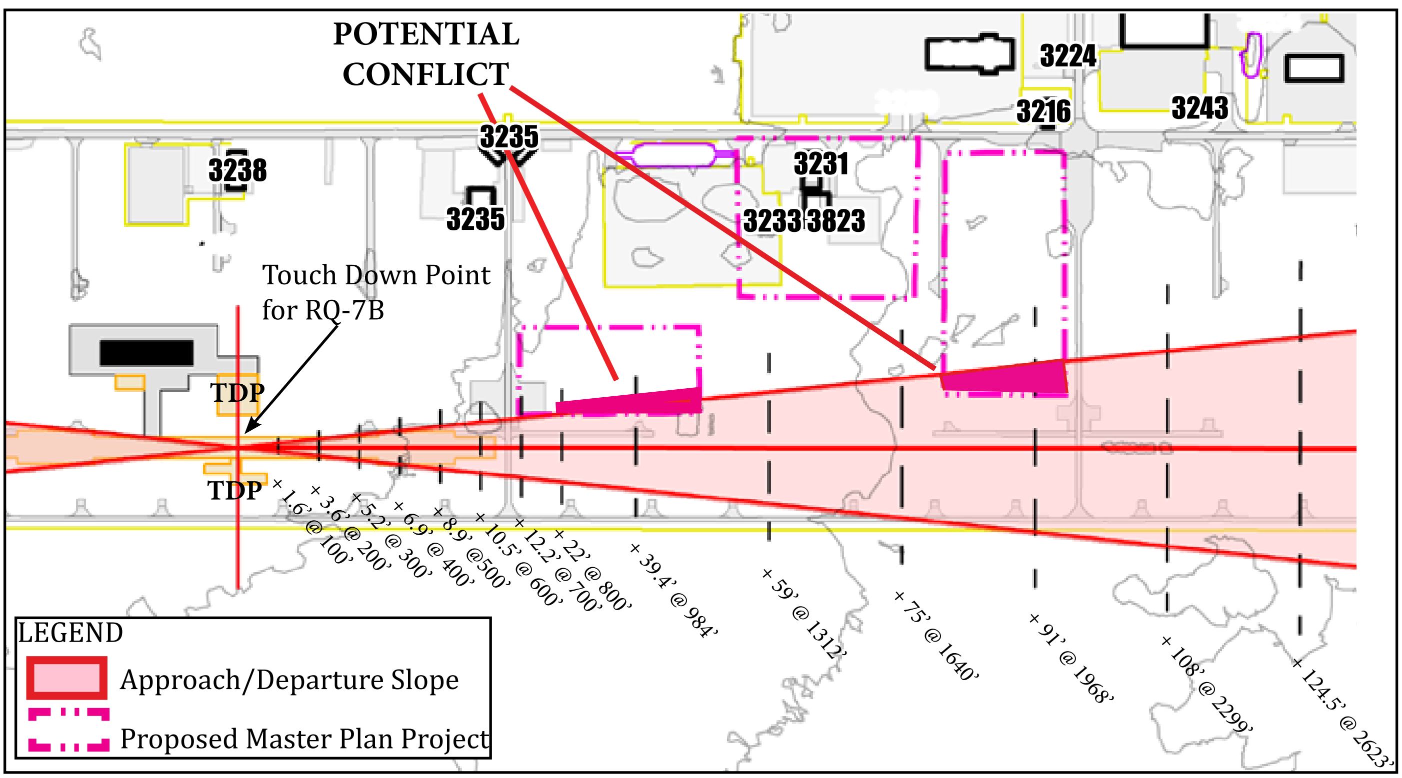


Figure 5.4: Potential Conflict with RQ-7B Runway Imaginary Surface

Based on the analysis shown in Figure 5.4, the proposed Master Plan projects under the approach/departure slopes will require minor modification to keep buildings, personnel and obstacles outside of this aircraft safety area.

CADC, Detachment hangar/Maintenance Only

COA 1, Alternative 3, splits the detachment's permanent facilities between the CADC and the AUX II. In this configuration, the combined hangar/vehicle maintenance facility is located at the CADC along with both organizational and POV parking areas (see Figure 5.6: CADC, Detachment Hangar Maintenance Only). The operational component of the detachment, the runway, would be located at the AUX II.

This configuration greatly reduces the amount of land required for VMU facilities. The hangar/vehicle maintenance facility can be placed closer to Boyington Loop and can fit between existing MWSS facilities. This would eliminate the operational conflict with the proposed field barracks and would leave more land available for future MWSS expansion, although there would be added transit time associated with the separation of maintenance and operational facilities.

CADC, Expeditionary Airfield Only

Figure 5.7: CADC, Expeditionary Runway Only Configuration shows a configuration of permanent facilities at the CADC that serve solely as an expeditionary airfield for the small UASs associated with the squadron. This configuration could be utilized in either short term COA 2, Alternative 4 or long term COA 3, Alternative 3. The defining facility is the RQ-7B runway, which can serve both the RQ-7B and MQ-21 systems. Similar to COA 1, Alternative 1, the "Rhino-snot" runway to be built under a separate action will be refurbished and improved under this alternative. The only other areas provided are a small quonset-style pre-operation hangar and parking for organizational vehicles.

This configuration occupies slightly less space than the detachment-only configuration, but remains within the same general footprint. Potential imaginary surface conflicts with the proposed field barracks remain.

CADC, RQ-7B/MQ-21 Full Buildout

Figure 5.8: CADC, MQ-21 & RQ-7B Full Buildout shows a potential configuration for location of full requirements for the RQ-7B and MQ-21 systems at the CADC. This configuration is for short term COA 2, Alternative 1. The configuration provides facilities for all small UAS functions, including the RQ-7B runway. Similar to COA 1, Alternative 1, the "Rhino-snot" runway to be built under a separate action will be refurbished and improved under this alternative.

This configuration remains outside the footprint of existing MWSS facilities, although it does encircle Buildings 3238, 3239, and two maintenance shade canopies along Boyington Loop. Warehousing/storage facilities are located closest to the roadway so as to ease deliveries/pick ups, while vehicle maintenance is located near the organizational parking lot. Hangars for both systems are located in the middle of the development block in order to provide access to the runway as well as setup/teardown space for before/after operations. Existing MWSS training area at the south end of the CADC is preserved, although the imaginary surfaces of the runway conflict with a portion of the proposed field barracks site as previously mentioned.

CADC, RQ-7B/MQ-21 Non-Airfield Uses Only

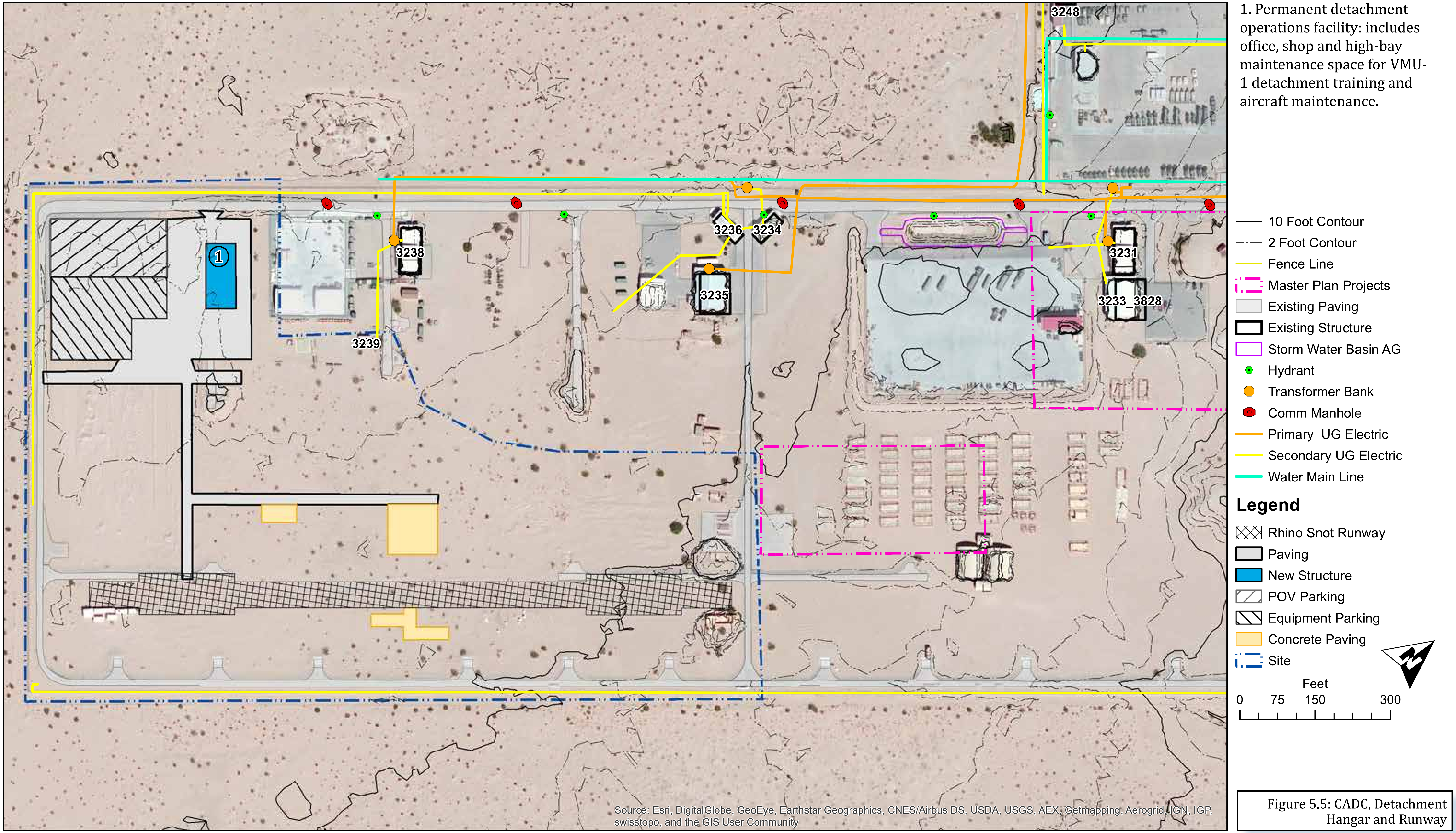
This configuration shows a potential layout for facilities of the RQ-7B and MQ-21 systems if they were split between the CADC and the AUX II, as proposed in short term COA 2, Alternative 3. Figure 5.9: CADC, Support Facilities & Headquarters displays the siting of all the squadron's support facilities at the CADC except for the hangar/aircraft maintenance facilities. Please note: this is the only scenario in which the HQ/administration function is not included in the hangars.

The footprint for this configuration is very similar to the full buildout scenario in that it surrounds multiple MWSS facilities, although it does not require the land along south Boyington Loop or the land immediately southeast of Building 3235. The use of the runway at the AUX II removes any operational constraints at the CADC, but presents logistical constraints for the ground vehicle which are maintained at the CADC, and would need to drive to the AUX II to transport the UASs to any remote training locations.

CADC, Full Squadron Minus Group 4 or 5 UAS

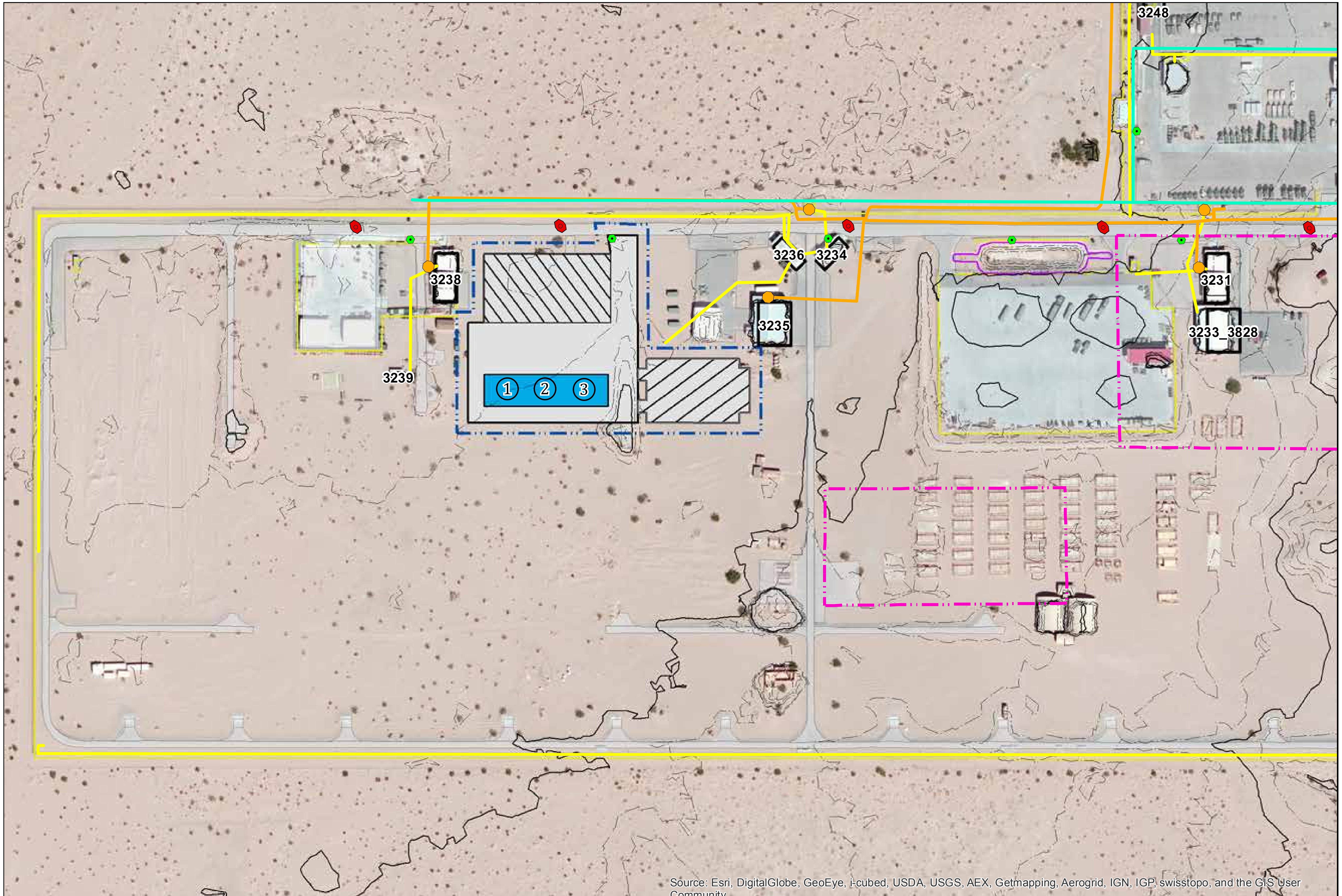
The last proposal at the CADC includes permanent facilities for all squadron functions except the Group 4 or 5 UAS/HQ/admin in the long term COA 3, Alternative 1 (see Figure 5.10: CADC, MQ-21 & Full Support). This configuration would allow for almost autonomous functioning of the two systems within the squadron, with the HQ/admin located at the Main Station near the MAG/Station HQ, the Group 4 or 5 UAS hangar/vehicle parking near the flightline, and the remainder of the facilities clustered at the CADC.

The footprint of the facilities is approximately the same as the full build alternatives without the RQ-7B hangar or the runway, although the MQ-21s would require launching pads and vehicle staging areas since they will be operating out of the CADC (versus using the existing runway at the AUX II). Maintenance for vehicles associated with the Group 4 or 5 UAS (located at the Main Station) would still be conducted at the CADC. This alternative would require short term RQ-7B operations to occur at the AUX II.



1. Permanent detachment operations facility: includes office, shop and high-bay maintenance space for VMU-1 detachment training and aircraft maintenance.

Figure 5.5: CADC, Detachment Hangar and Runway



1. Vehicle Maintenance
2. Administrative
3. Detachment Hangar

10 Foot Contour
2 Foot Contour
Fence Line
Master Plan Projects
Existing Paving
Existing Structure
Transformer Bank
waterHydrant
Comm Manhole
Water Main Line
Primary UG Electric
Secondary UG Electric
Paving
New Structure
Equipment Parking
POV Parking
Site

Feet
0 90 180 360

Figure 5.6: CADC, Detachment Hangar Maintenance Only

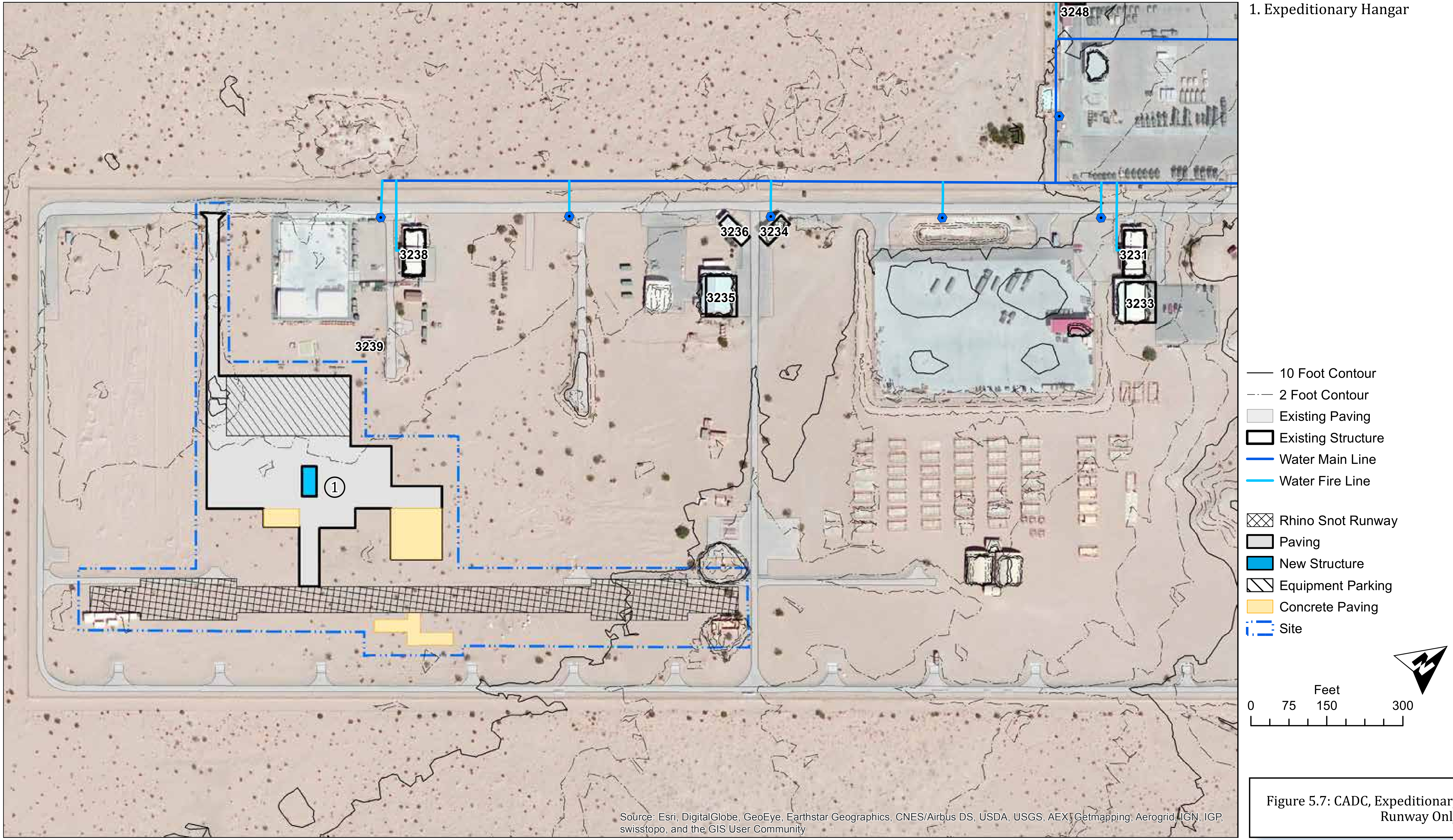
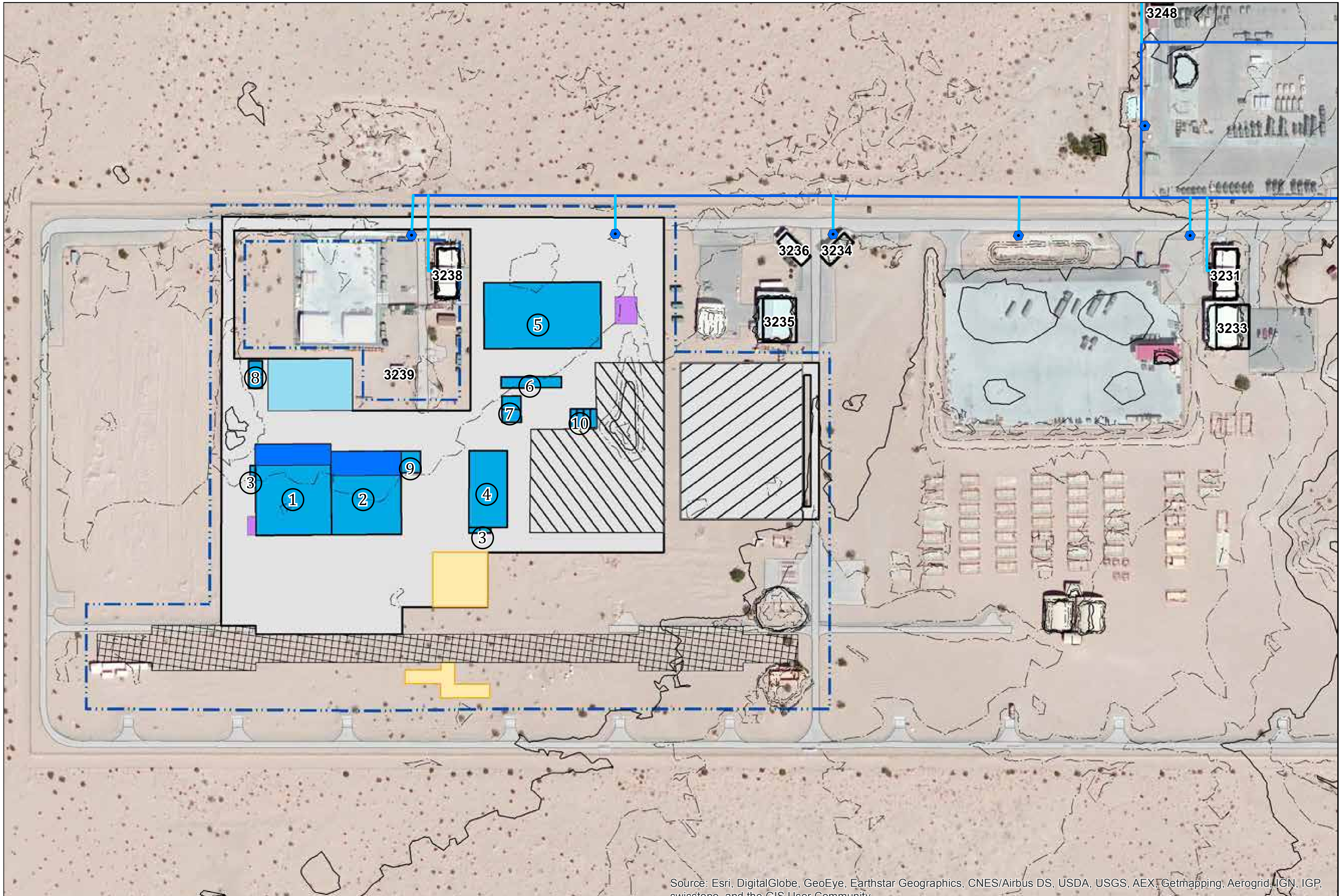


Figure 5.7: CADC, Expeditionary Runway Only



1. Hangar 9/MQ-21A Module
2. Hangar 3/RQ-7 Module
3. Hazmat Locker
4. Vehicle Maintenance Shop
5. Warehouse
6. Grease Rack
7. Washrack
8. Storage Shed
9. Armory
10. Vehicle Shed

10 Foot Contour
2 Foot Contour
Existing Paving
Existing Structure
Water Main Line
Water Fire Line
Rhino Snot Runway
Paving
New Structure
Admin/HQ
Open Storage
POV Parking
Equipment Parking
Vehicle Filling Station
Concrete Paving
Site

Feet
0 75 150 300

Figure 5.8: CADC, RQ-7 & MQ-21 Full Buildout

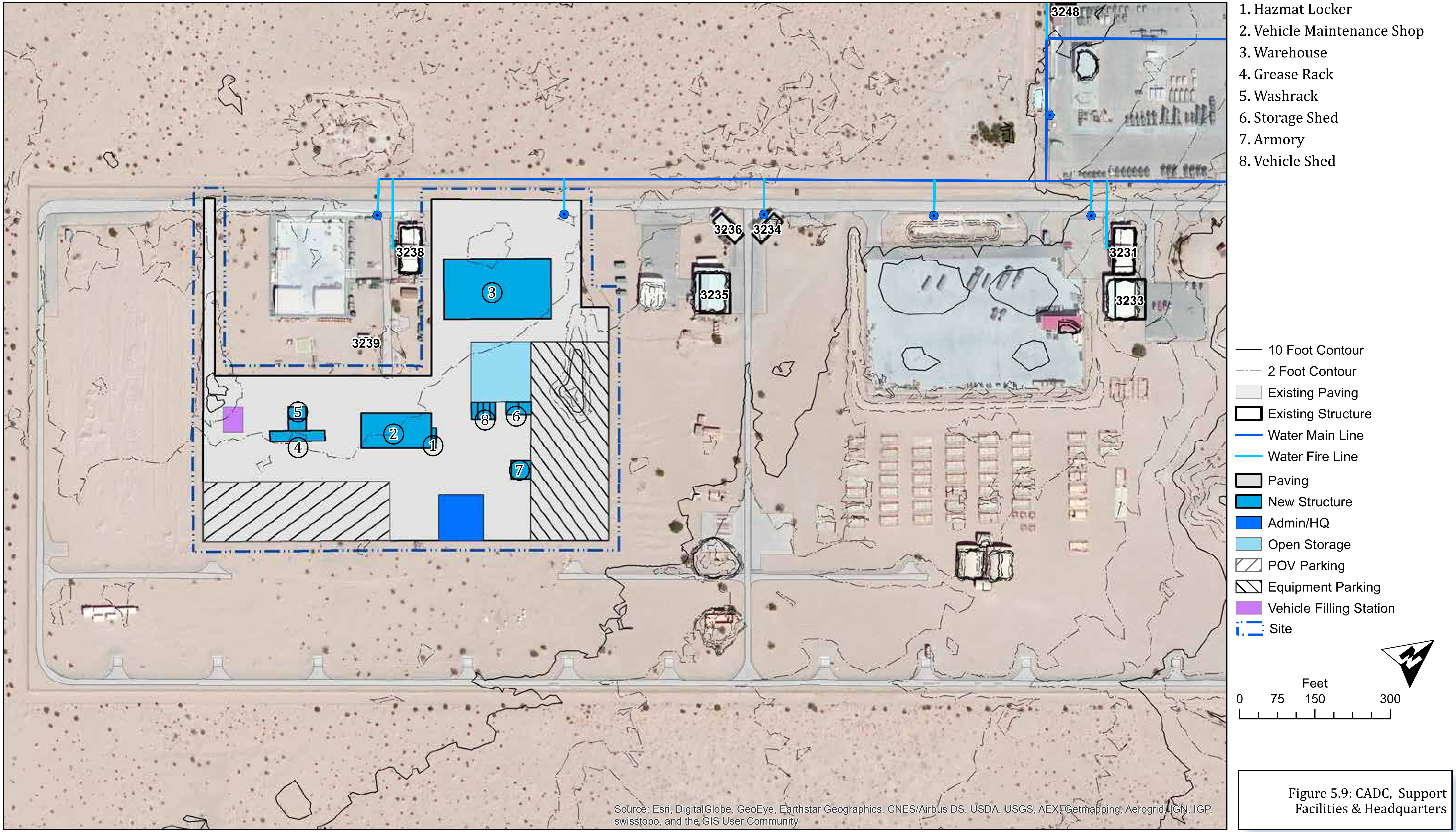


Figure 5.9: CADC, Support Facilities & Headquarters

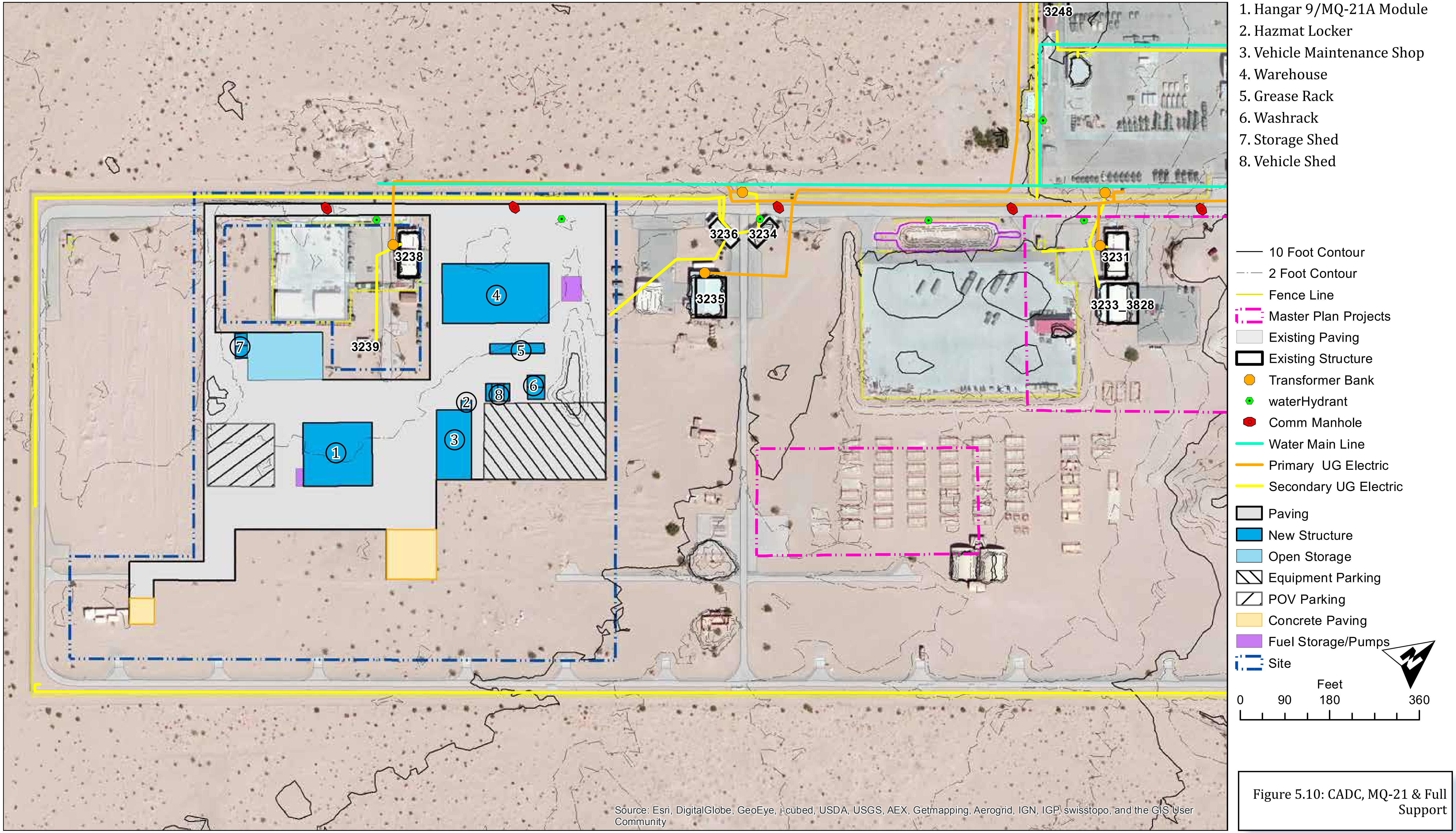


Figure 5.10: CADC, MQ-21 & Full Support

AUXILIARY AIRFIELD II SITE PLANS

AUX II, Detachment All Facilities

Figure 5.11: AUX II, Detachment Hangar and Runway shows the configuration of facilities at the AUX II under COA 1, Alternative 2. Facilities in this configuration include a maintenance hangar and RQ-7B runway. All other administrative and support facilities would be collocated with the remainder of the squadron at either the Main Station or the CADC depending on the selected preferred alternatives.

This configuration is able to utilize the existing C-130 runway for RQ-7B training. The other facilities are sited in the middle of the “triangle” created by this runway, the LHA, and the access roadway. This central location keeps the facilities outside of the imaginary surfaces and APZs of the runways, but allows for easy access to both the C-130 runway and the LHA for training, as needed. The proposed footprint of the detachment’s facilities can be easily be accommodated by the unutilized land in the middle of the triangle.

This configuration provides efficiencies in that existing facilities/safety clearances ensure there are no conflicts with VMU operations, although the remote location decreases efficiencies due to the considerable distance from all other units at the Main Station and the CADC. Existing infrastructure is also limited at the AUX II and the site is lacking security or even a fence to protect equipment/facilities.

AUX II, Expeditionary Runway Only

Figure 5.12: AUX II, Expeditionary Runway Only Configuration shows utilization of the AUX II solely as an expeditionary runway. This configuration is planned in conjunction with alternatives under COA 1 (Alternative 3), COA 2 (Alternative 5), and COA 3 (Alternative 4). The only new facilities would be organizational vehicle parking, a small quonset-style pre-operation hangar, and pads for airfield support operations. These improvements are located in the middle of the triangle for the benefits previously mentioned.

This configuration capitalizes on the existing assets of the AUX II airfield, but minimizes further investment due to the remote location. Nevertheless, this option would still require transit from either the Main Station or the CADC, increasing travel time and logistical inefficiencies.

AUX II, RQ-7B/MQ-21 Full Buildout

Figure 5.13: AUX II, MQ-21 & RQ-7B Full Buildout shows a potential configuration for location of full requirements for the RQ-7B and MQ-21 systems at the AUX II. This configuration is an alternative under COA 2, Alternative 2. This configuration provides facilities for all functions of the small UASs, utilizing the existing C-130 runway for the RQ-7Bs.

While this configuration has a larger footprint than the detachment configuration previously presented, the lack of existing facilities and constraints in the middle of the triangle accommodates the additional land area required. The compound would be complete and usable, and would keep all VMU functions together, although the remote location would decrease synergies with other units.

AUX II, RQ-7B/MQ-21 Hangars, Runway

Figure 5.14: AUX II, MQ-21 & RQ-7B Hangars Only shows the configuration for COA 2, Alternative 3 which sites the RQ-7B/MQ-21 hangars at the AUX II to provide access to the existing the AUX II runway, with all remaining facilities at the CADC in a split-site configuration. The facilities are sited in the middle of the triangle to provide access to both the C-130 runway and the LHA, as well as to avoid imaginary surface/APZ conflicts. This option would require transit from the CADC, increasing travel time and logistical inefficiencies. Further, by siting the aircraft maintenance function at the AUX II, the squadron would split the same system between ground and air functions.

AUX II, Full Squadron Minus Group 4 or 5 UASs

The last proposal at the AUX II includes facilities for all squadron functions except the Group 4 or 5 UAS/HQ/admin in the long term COA 3, Alternative 2 (see Figure 5.15: AUX II, MQ-21 & Full Support). This configuration would allow for almost autonomous functioning of the two systems within the squadron, with the HQ/admin located at the Main Station near the MAG/Station HQ, the Group 4 or 5 UAS hangar/vehicle parking near the flightline, and the remainder of the facilities at the AUX II.

The footprint of the facilities is approximately the same as the full build alternative without the RQ-7B hangar. The C-130 runway and/or LHA could be used for MQ-21 operations. Maintenance for vehicles associated with the Group 4 or 5 UAS (located at the Main Station) would still be conducted at the AUX II.

1. Vehicle Maintenance
2. Administrative
3. Detachment Hangar

10 Foot Contour
2 Foot Contour
Existing Paving
RQ-7 Runway Requirement
Paving
New Structure
POV Parking
Equipment Parking
Concrete Paving
Site

Feet
0 100 200 400

Figure 5.11: AUX II, Detachment Hangar and Runway

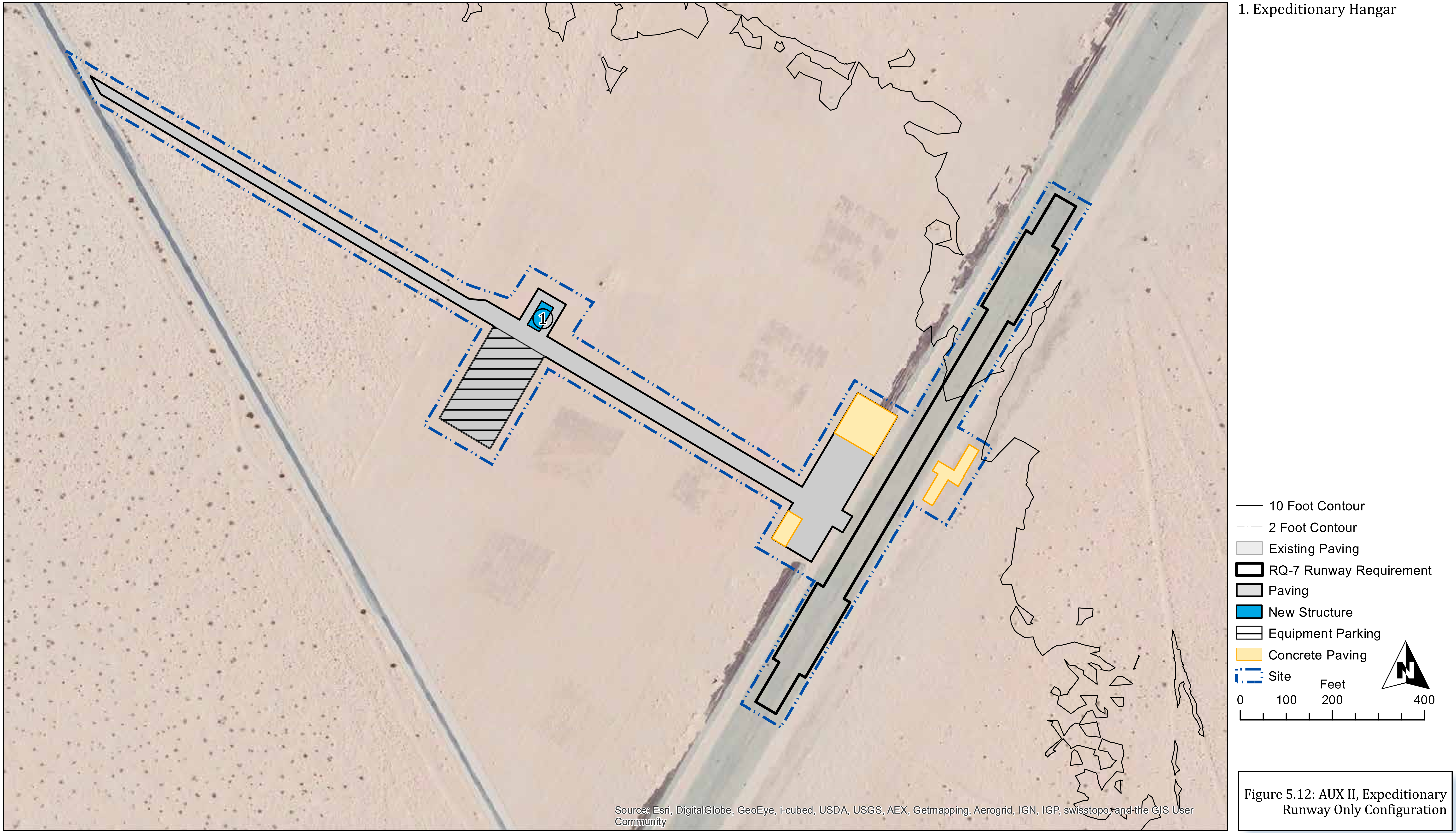


Figure 5.12: AUX II, Expeditionary Runway Only Configuration

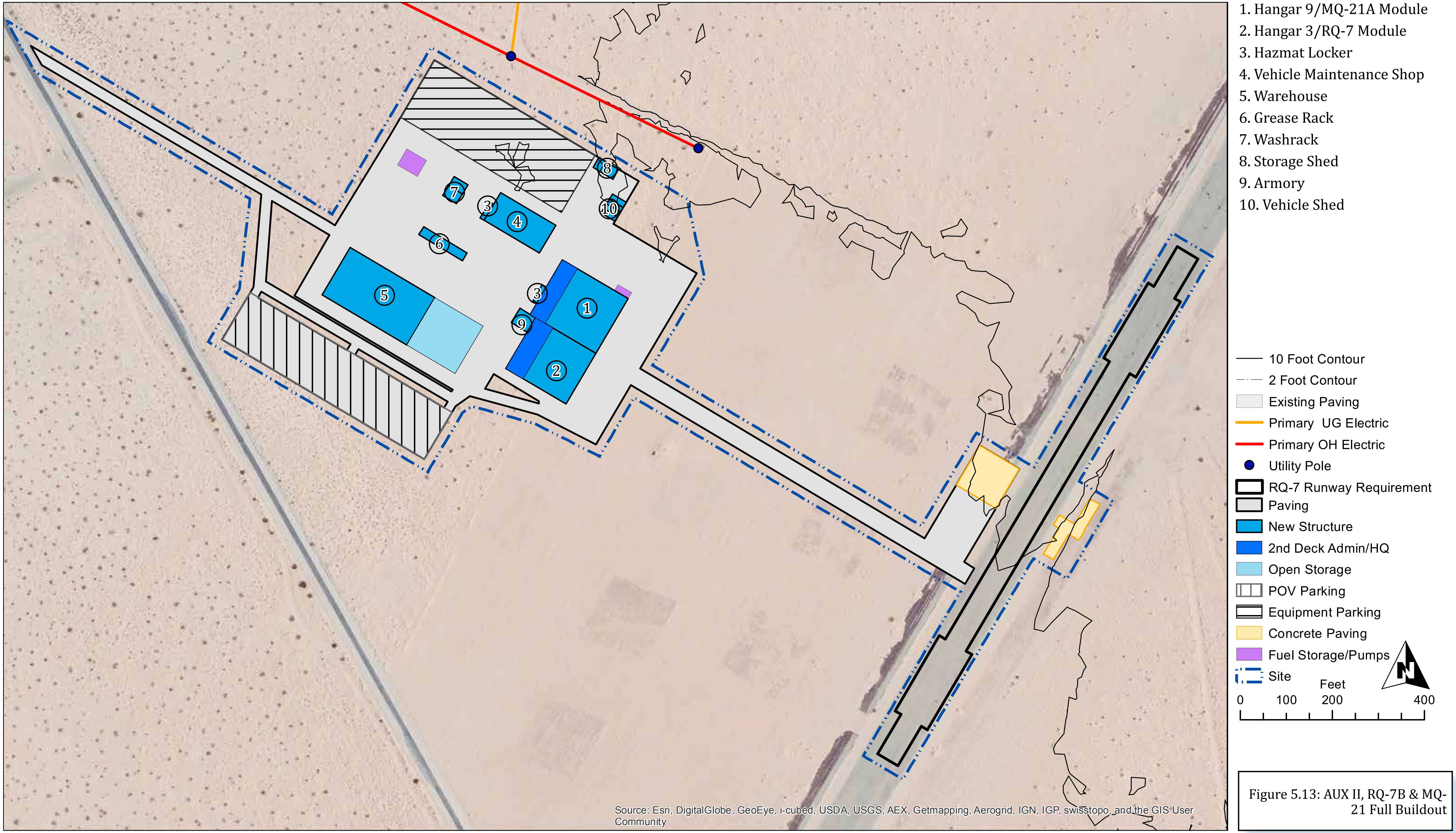
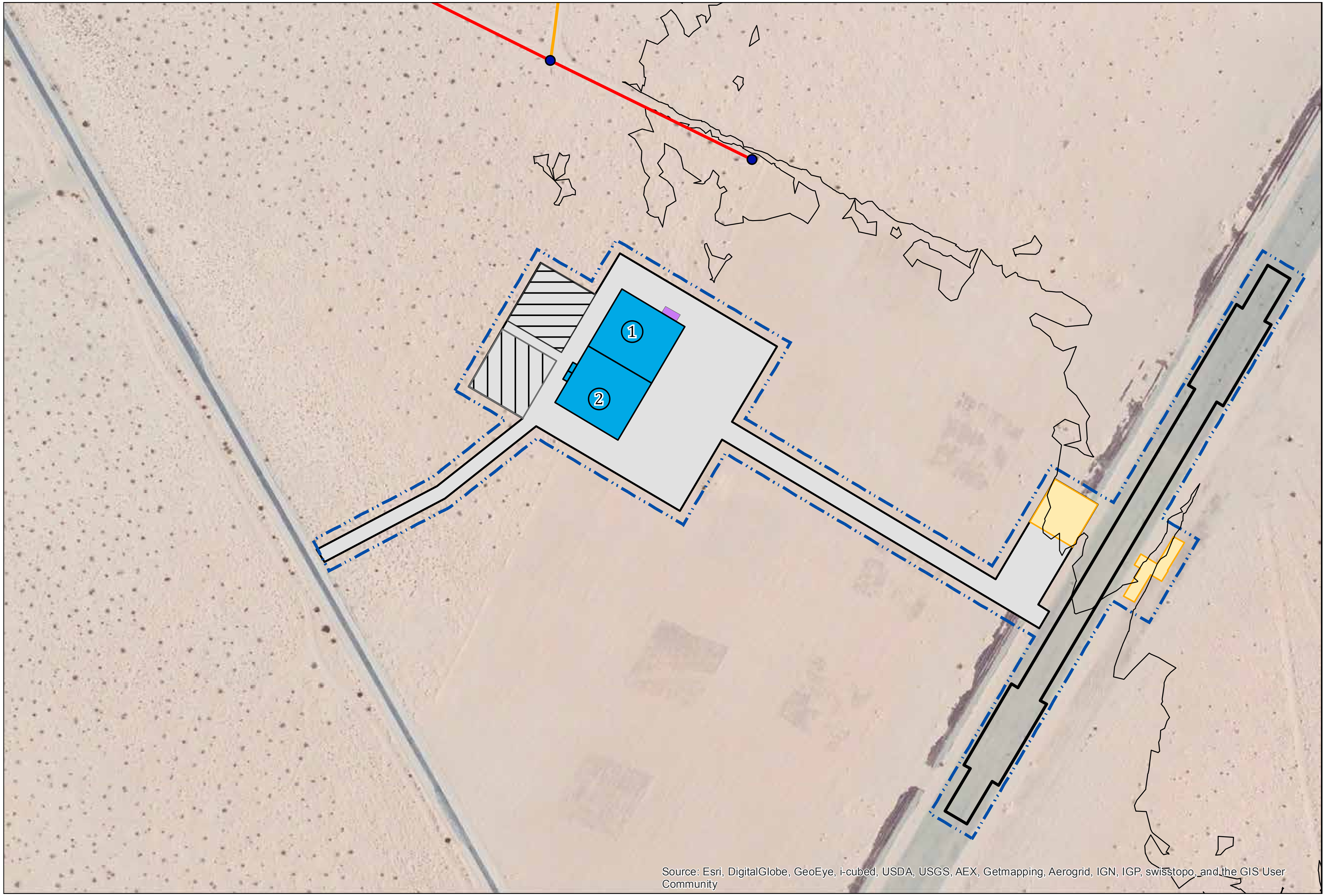


Figure 5.13: AUX II, RQ-7B & MQ-21 Full Buildout



1. Hangar 9/MQ-21A Module
2. Hangar 3/RQ-7 Module

10 Foot Contour
2 Foot Contour
Existing Paving
Utility Pole
Primary UG Electric
Primary OH Electric
RQ-7 Runway Requirement
Paving
New Structure
0_Parking_Personal
Equipment Parking
Concrete Paving
Site

Feet
0 100 200 400

Figure 5.14: AUX II, RQ-7B & MQ-21 Hangars Only

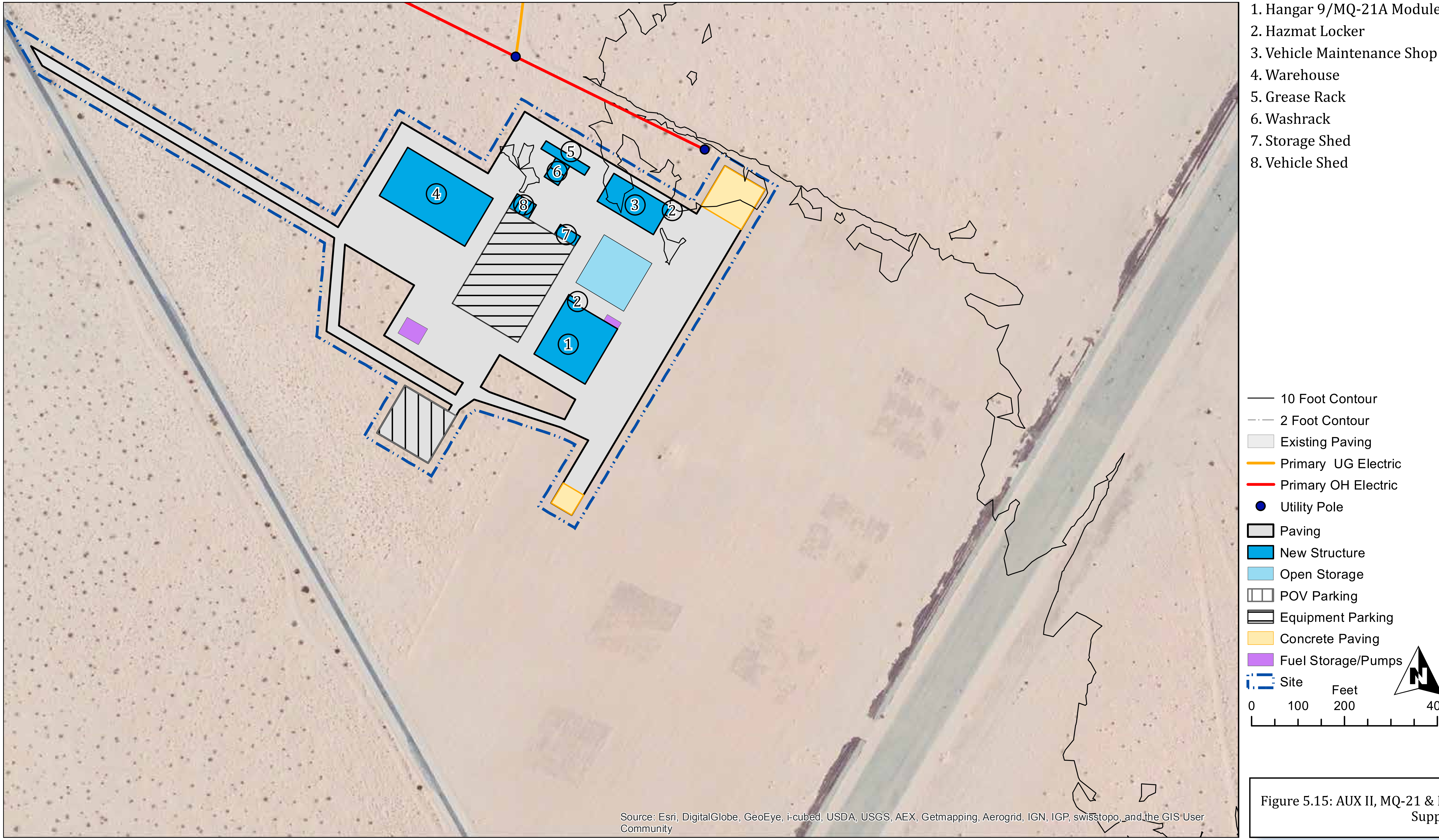


Figure 5.15: AUX II, MQ-21 & Full Support

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5.5 RECOMMENDATIONS

This section provides recommendations on the ideal location and facility configuration to support VMU-1 at the MCAS Yuma. The ideal location for VMU-1 facilities (Main Station, CADC or AUX II) needs to consider the two operational conditions that VMU-1 is tasked with completing. The first is Group 3 STUAS training operations that will continue to occur into the foreseeable future at remote locations. The second condition is Group 4 or 5 UAS operations that are expected to start around 2024. Consideration must also be given to the requirements for daily management of squadron activities including administration, air vehicle maintenance, ground vehicle maintenance, warehouse storage and miscellaneous support functions.

5.5.1 GROUP 3 OPERATIONS

Group 3 STUAS operations involve very small aircraft that are difficult to see by pilots in manned aircraft. This can result in elevated concern for a collision and damage to aircraft and people. For this reason, STUAS flight operations need to occur in remote locations that do not have a large quantity of manned aircraft operations. Of the three locations considered, only the CADC meets this criteria. The Main Station has extensive manned aircraft operations with the four assigned fixed wing squadrons, periodic influx of aircraft during large training exercises and civilian traffic on the public side of the runway. The AUX II is not ideal, when compared to the CADC, due to daily operational and management issues that result from the additional distance to/from the Main Station combined with the lack of food services and general security of equipment and structures that might be left overnight at the site.

5.5.2 GROUP 4 OR 5 OPERATIONS

Group 4 or 5 UAS operations involve full size aircraft that are more visible to pilots and thus there is less of a concern regarding a chance of mid-air collision. As a result, Group 4 or 5 UAV takeoffs and landings at the Main Station are considered operationally acceptable in terms of safety. A FAA/COAW will still be required to transit to the RA. Operationally speaking, both the CADC and the AUX II are considered acceptable for Group 4 or 5 takeoffs and landings - if there were an existing runway at least 6,000 feet long at either location. There is no land within the fenced property at the CADC large enough to support a new, full-sized runway. The AUX II runway is rough asphalt and is too short to support Group 4 or 5 operations. Therefore, the Main Station is the preferred location for Group 4 or 5 operations.

5.5.3 DAILY MANAGEMENT OF SQUADRON ACTIVITIES

The general goal of having all operational facilities within walking distance of each other is common to all units and organizations. If daily operations are split across multiple sites, such as managerial functions being separated from maintenance or storage operations and personnel, then additional travel time would be required for daily operations and equipment accounting could become more challenging. An overall reduction in efficiency and readiness could result. This leads to the third criteria of having all facilities in the alternative concentrated in a single compound, or at least within walking distance of each other. The primary exception to this is the location of the Group 3 STUAS flight operations area that is intentionally put in a remote location for manned aircraft safety reasons.

5.5.4 ASSESSMENT OF COURSE OF ACTION 1 ALTERNATIVES

A general assessment of each alternative is color coded in Table 5.5: Alternatives Assessment. Red indicates a highly inefficient or operationally infeasible condition. Yellow indicates a moderately inefficient or operationally undesirable condition. Green indicates the alternative has the fewest issues relating to potential squadron efficiency and is considered to be the most operationally feasible.

COA 1 Alternative 1 at the CADC adequately supports the short term and long term STUAS Detachment operational facility requirements. This alternative is recommended as the STUAS Detachment operational location (GREEN).

COA 1 Alternative 2 at the AUX II can support the short term and long term STUAS Detachment operational facility requirements; however, the lack of food services and lack of physical security would make leaving equipment and daily operations highly inefficient. Potential conflicts with other manned aircraft training that occurs at the AUX-II would also be an issue. This alternative is not recommended as the STUAS Detachment operational location (YELLOW).

			COA 1 Detachment			COA 2 RQ-7 and MQ-21					COA 3 Group 4 or 5 and MQ-21				
Site	Figure	Configuration	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Main Station	5.1a/5.1b	Group 4 or 5 & MQ-21 Full Buildout											X	X	X
	5.2	RQ-7/MQ-21 Shared Type II Hangar							X	X					
	5.3	Group 4 or 5 UAS Facilities & HQ Only									X	X			
CADC	5.5	Detachment Hangar and Runway	X												X
	5.6	Detachment Hangar/Maint. Only			X										
	5.7	Expeditionary Runway Only							X				X		
	5.8	RQ-7/MQ-21 Full Buildout				X									
	5.9	RQ-7/MQ-21 Support Facilities & HQ						X							
	5.10	MQ-21 & Full Support									X				
AUX II	5.11	Detachment Hangar and Runway		X											
	5.12	Expeditionary Runway Only			X					X				X	
	5.13	RQ-7/MQ-21 Full Buildout					X								
	5.14	RQ-7/MQ-21 Hangars, Runway						X							
	5.15	MQ-21 and Full Support										X			

Legend
= Alternative is highly inefficient or operationally infeasible for the squadron.
= Alternative is moderately inefficient or operationally undesirable for the squadron.
= Alternative is the most operationally efficient and feasible for the squadron.

Note: COA=Course of Action, Alt=Alternative, HQ=Headquarters, UAS=Unmanned Aerial Systems.

Table 5.5: Alternatives Assessment

COA 1 Alternative 3 combines the CADC and the AUX II to support STUAS detachment training in both the short term and long term. Flight operations would occur at the AUX II and minor UAS storage and maintenance would occur at the CADC. This would split an integrated operation across two sites and was considered a highly inefficient configuration and is not recommended (RED).

5.5.5 ASSESSMENT OF COURSE OF ACTION 2 ALTERNATIVES

COA 2 Alternative 1 at the CADC locates all long term STUAS operational and support facilities, plus a portion of the organizational vehicle parking at the CADC. This configuration is undesirable when considering the long term end state that would result for the squadron. Group 4 or 5 UAS operations and the maintenance hangar would be at the Main Station while a large portion of the squadrons operations would be at the CADC. Investment in this alternative would potentially establish a long term split of primary squadron operational facilities (Group 4 or 5 UAS versus STUAS) that is considered highly inefficient and not recommended (RED).

COA 2 Alternative 2 at the AUX II is the same as COA 2 Alternative 1, except all long term STUAS facilities and operations are located at the AUX II. For the same reasons noted for COA 2 Alternative 1, this configuration is undesirable. This site is also undesirable due to the need to construct additional utilities, the lack of food services and potential conflicts with other fixed wing training that occurs at the AUX-II (RED).

COA 2 Alternative 3 at the AUX II and the CADC separates STUAS flight operations from all other STUAS support facilities by placing the runway at the AUX II and all STUAS support facilities the CADC. This creates an undesirable operational inefficiency. This configuration is also undesirable when considering the long term end state that would result for the squadron. Group 4 or 5 UAS operations and maintenance hangar would be at the Main Station while a large portion of the squadrons operations would be at the CADC. This alternative is not recommended for either the short term or long term STUAS operational configuration (RED).

COA 2 Alternative 4 at the Main Station and the CADC concentrates all short term and long term STUAS support facilities at the south end of the flightline at the Main Station. The only operations that occurs at the CADC are STUAS launch and recovery operations. No support buildings are provided at the STUAS runway at the CADC in this alternative. This alternative is desirable as it collocates all daily operational facilities in one location that can support both short term and long term STUAS requirements. The primary drawback to this alternative is the CERCLA related cleanup requirements on this site at the south end of the flightline that will not be completed in time for construction to begin (YELLOW).

COA 2 Alternative 5 at the Main Station and the AUX II is the same as COA 2 Alternative 4, except the STUAS runway is located at the AUX II. This alternative has the same drawbacks as COA 2 Alternative 4 except having the STUAS runway at the AUX II creates additional issue with travel time and potential conflict with other fixed wing training that is expected to continue at the AUX II (RED).

5.5.6 ASSESSMENT OF COURSE OF ACTION 3 ALTERNATIVES

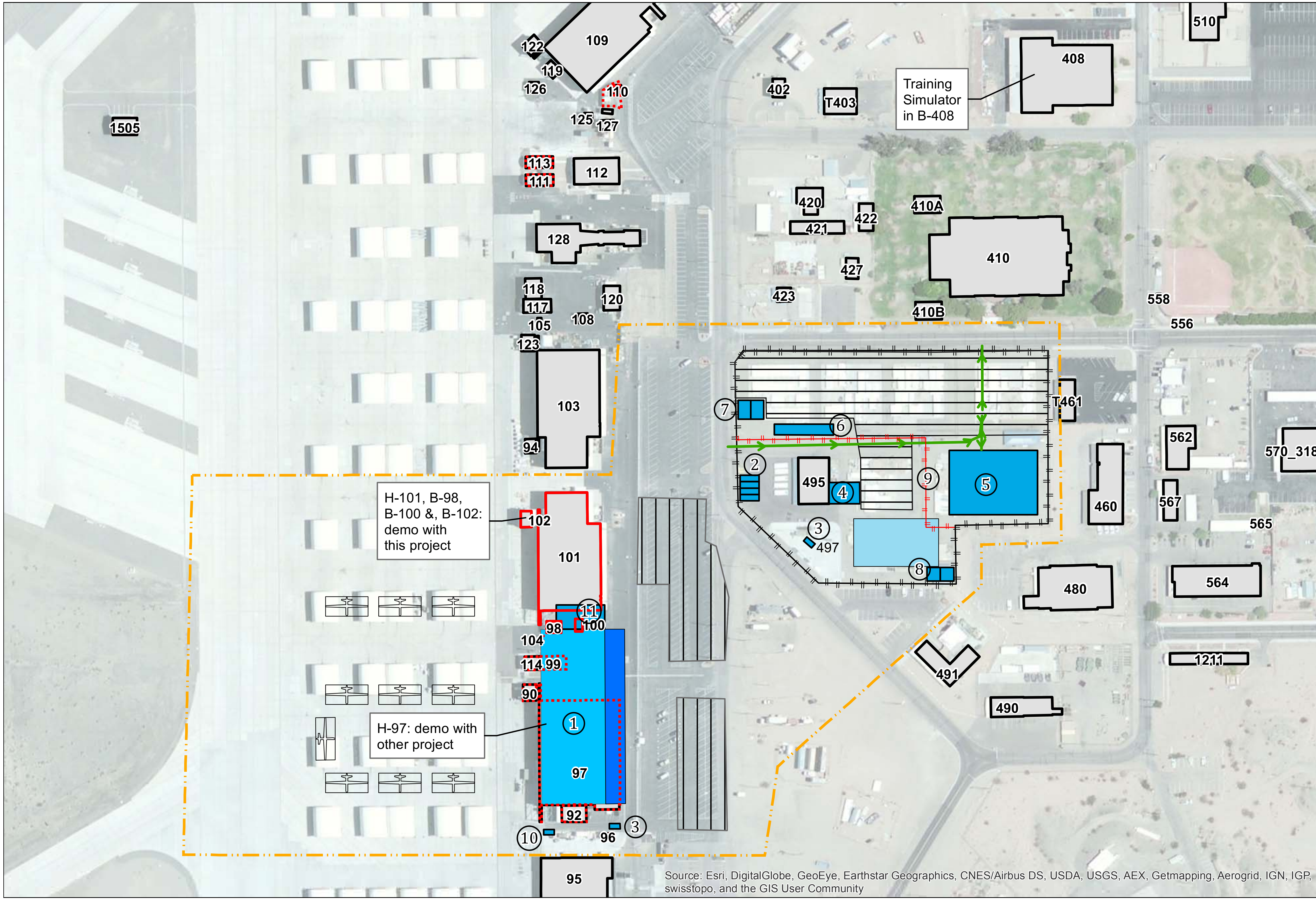
COA 3 Alternative 1 at the Main Station and the CADC has the Group 4 or 5 UAS hangar at the south end of the flightline at the Main Station and all other support facilities at the CADC. This alternative would split assigned squadron equipment and personnel between two sites thereby creating an equipment security and operational efficiency issue. A better configuration would have all equipment is one compound or within walking distance of each other. This alternative also has CERCLA related cleanup requirements on the site that will not be completed in time for construction to begin (YELLOW).

COA 3 Alternative 2 at the Main Station and the AUX II is the same as COA 3 Alternative 1 and has the same drawbacks, except the support facilities are located at the AUX II. The additional distance when comparing the CADC to the AUX II combined with conflicts with existing manned aircraft training and the lack of utilities and food services make this alternative highly undesirable (RED).

COA 3 Alternative 3 at the Main Station and the CADC puts all facilities on the CERCLA cleanup site at the south end of the Main Station flightline plus has an expeditionary STUAS runway at the CADC. A permanent detachment operations facility at the CADC is not included in this alternative. The combination of the site being a CERCLA cleanup site and no support building at the CADC makes this alternative less than ideal (YELLOW).

COA 3 Alternative 4 at the Main Station and the AUX II is the same as COA 3 Alternative 3 and has the same drawbacks, except the STUAS runway is located at the AUX II. The location of the STUAS runway at the AUX II makes this alternative less desirable than COA 3 Alternative 3 due to the lack of utilities, food services and expected conflicts with ongoing manned aircraft training that occurs at the AUX II (RED).

COA 3 Alternative 5 at the Main Station and the CADC is the same as COA 3 Alternative 3 except the proposed site at the Main Station is on the old Van Pad site and a permanent detachment operations facility is provided at the CADC. One drawback to this layout is that the warehouse will need to be a two story building to fit within the site fenceline. This alternative is recommended (GREEN).



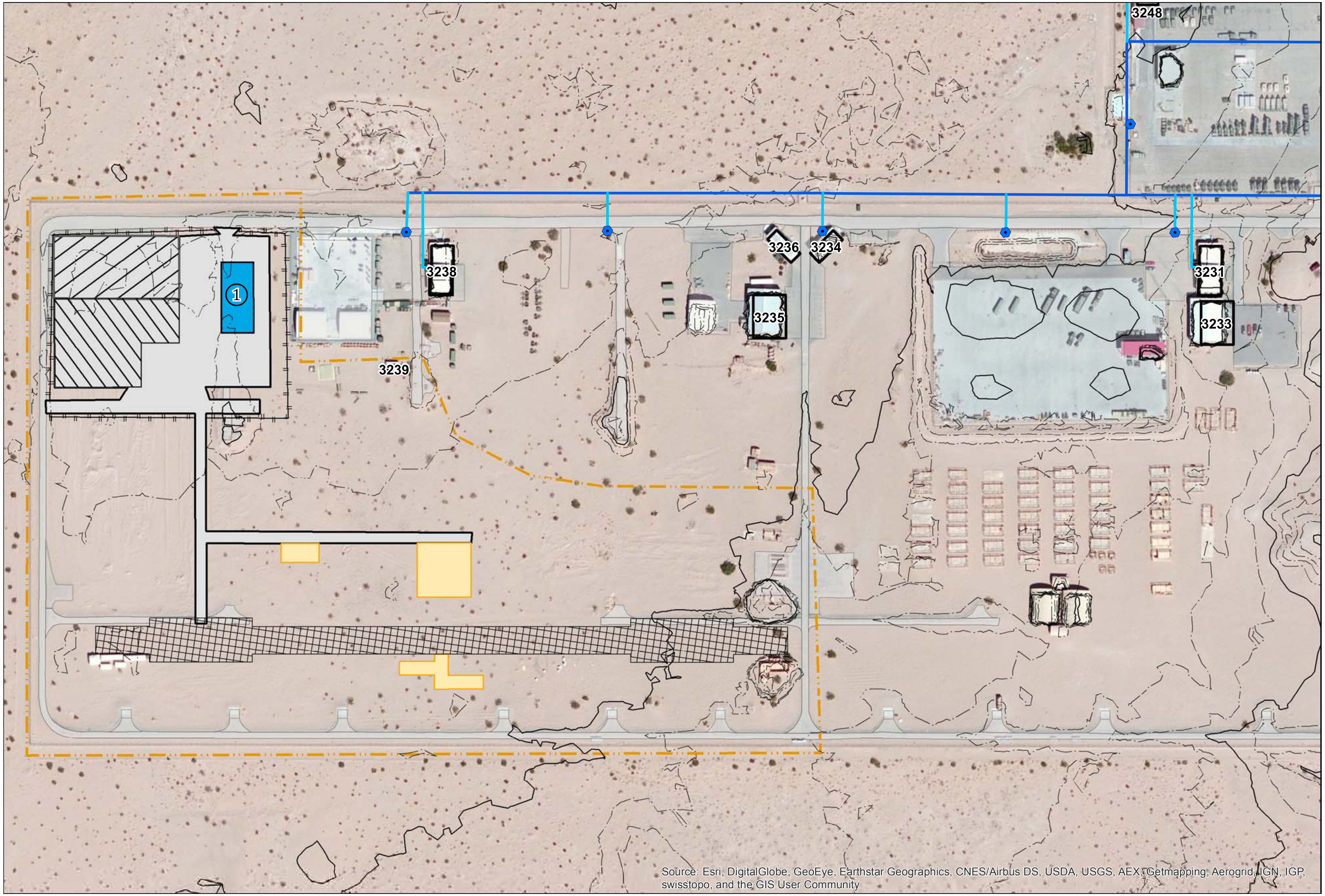
1. Hangar Type II Module for 3/Group 4 or 5 and 9/MQ-21A
2. Vehicle Shed
3. Hazmat Locker
4. Vehicle Maintenance Shop
5. Warehouse (two story)
6. Grease Rack
7. Washrack
8. Storage Shed
9. Armory (portable outside)
10. Ready Service Locker
11. Van Pad for Group 4 or 5 Ground Control Station

Truck Route
New Demolition
Programmed Demolition
Existing Structure
Existing Fence Demo
Existing Fence Remains
New Structure
2nd Deck Admin/HQ
Open Storage
POV Parking
Equipment Parking
Project Boundary

N

Feet
0 90 180 360

Figure 5.16: Main Station, MQ-21 & Group 4 or 5 Full Buildout (Old Van Pad)Preferred Alternative



1. Permanent detachment operations facility: includes office, shop and high-bay maintenance space for- VMU-1 detachment training and aircraft maintenance.

10 Foot Contour
2 Foot Contour
Existing Paving
Existing Structure
Water Main Line
Water Fire Line
New Fence
Rhino Snot Runway
Paving
New Structure
POV Parking
Equipment Parking
Concrete Paving
Site

Feet
0 75 150 300

Figure 5.17: CADC, Detachment Hangar and Runway Preferred Alternative

Appendix A: References

- Department of the Navy, Naval Air Systems Command, Program Executive Officer, Unmanned Aviation and Strike Weapons, Navy & Marine Corps Small Tactical UAS (PMA-263), Technical Systems Integration Inc., Facilities Site Evaluation Report Marine Unmanned Aerial Vehicle Squadron 4 Marine Corps Base Camp Pendleton, California. 31 January 2013.
- Department of the Navy, Naval Air Systems Command, Program Executive Officer, Unmanned Aviation and Strike Weapons, Navy & Marine Corps Small Tactical UAS (PMA-263), Technical Systems Integration Inc., Marine Unmanned Aerial Vehicle Squadron One Facilities Site Evaluation Report Marine Corps Air Station Yuma, Arizona. 13 August 2014.
- Department of the Navy, Naval Air Systems Command, Program Executive Officer, Unmanned Aviation and Strike Weapons, Navy & Marine Corps Small Tactical UAS (PMA-263), Technical Systems Integration Inc., Facilities Site Activation Support Plan, Marine Unmanned Aerial Vehicle Squadron One, Marine Corps Air Station Yuma, Arizona. 4 November 2014.
- Marine Corps Installations West – Marine Corps Air Station Yuma Unmanned Aircraft Systems Study, December 2012.
- Department of Defense, 2005. Unified Facilities Criteria (UFC) 3-260-01, Airfield and Heliport Planning and Design. 17 November.
- Department of Defense, 2005. Unified Facilities Criteria (UFC) 2-000-05N, Facility Planning for Navy and Marine Corps Shore Installations.
- HQMC AVIATION, UAS Walking Brief and UAS Program Status slides provided at start of project, undated.
- NAVAIR NOTICE 13100, 22 July 2011, Weapons System Planning Document for RQ-7B.
- DoD Selected Acquisition Report RCS:DD-A&T(Q&A)823-424, MQ-9 UAS Reaper, as of December 31, 2011

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Appendix B: MILCON 1391s

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Cover Sheet/Team List for:

Project Title: UAS Aviation Logistics Support Complex **Project Number:** P606

Location: YUMA, ARIZONA **Date:** 28-MAY-15

Prepared By: MCAS YUMA AZ **FY:** 2018 **UIC:** M62974

A. Team Check List: Completed: Working:

B. Team Meeting: Date:

On-Site: VTC: Conference Call:

Project Cost ($000)

19440

C. Team Members:

Name	Position	Command	Phone Number

D. Remarks:

E. Required Attachments:

- ☐ MILCON CHECKLIST
- ☐ Economic Analysis
- ☐ Site Plan
- ☐ Facility Planning Document(s)/P-80 Calculations
- ☐ R19 (Bachelor Housing Survey)
- ☐ Notice of Violation (NOV)
- ☐ Other
- ☐ PHOTOGRAPHS

F. Endorsements:

Signature	Position	Date

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 28 MAY 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Aviation Logistics Support Complex

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
0216496M	44112	P606	19,440

9. COST ESTIMATES

Item	UM	Quantity	Unit Cost	Cost($000)
UAS AVIATION LOGISTICS SUPPORT COMPLEX (46,747SF)	m2	4,342.95		8,830
STORAGE FACILITY CC44112 (35,607SF)	m2	3,308	1,519.70	(5,030)
VEHICLE HOLDING SHED CC21440 (1,680SF)	m2	156.08	1,774.64	(280)
GENERAL STORAGE SHED CC44135 (1,250SF)	m2	116.13	1,828.38	(210)
HAZARDOUS/FLAMMABLE STORAGE CC44130 (200SF)	m2	18.58	6,396.90	(120)
VEHICLE WASH PLATFORM CC21455 (1,680SF)	m2	156.08	1,384.15	(220)
VAN MAINT/STORAGE WHSE CC44112 (2,280SF)	m2	211.82	2,997.84	(640)
OPERATIONAL TRAINER FACILITY CC17135 (1,850SF) (RENOVATE)	m2	171.87	1,514.98	(260)
GREASE RACK CC21456 (2,200SF)	m2	204.39	1,615.28	(330)
BUILT-IN EQUIPMENT	LS			(150)
SPECIAL COSTS	LS			(1,480)
SUSTAINABILITY AND ENERGY FEATURES	LS			(110)
SUPPORTING FACILITIES				7,330
PAVEMENT FACILITIES	LS			(500)
SITE PREPARATIONS	LS			(420)
SPECIAL FOUNDATION FEATURES	LS			(360)
PAVING AND SITE IMPROVEMENTS	LS			(5,220)
ELECTRICAL UTILITIES	LS			(470)
MECHANICAL UTILITIES	LS			(360)
SUBTOTAL				16,160
CONTINGENCY (10%)				1,620
TOTAL CONTRACT COST				17,780
SIOH (5.7%)				1,010
SUBTOTAL				18,790
DESIGN/BUILD - DESIGN COST (4%)				650
TOTAL REQUEST ROUNDED				19,440
TOTAL REQUEST				19,440
EQUIPMENT FROM OTHER APPROPRIATIONS (NON ADD)				(1,945)

Guidance Unit Cost Analysis

Cat Code	Facility	OSD Guid.	Guid. Cost	Guid. Size	Project Scope	Room Size Fctr	Size Fctr	Area Cost Fctr	Esc. Factor	Unit Cost
44112	STORAGE FACILITY		1,275.00	2508 m2	3308 m2		.9728	1.080	1.134485666	1,519.70
21440	VEHICLE HOLDING SHED		1,774.64	156.08	156.08		1.0000	1.000	1.000000000	1,774.64

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 28 MAY 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Aviation Logistics Support Complex

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
0216496M	44112	P606	19,440

			m2	m2				
17120	OPERATIONAL TRAINER FACILITY	1,514.98	171.87 m2	171.87 m2	1.0000	1.000	1.000000000	1,514.98
44135	GENERAL STORAGE SHED	1,611.64	116.13 m2	116.13 m2	1.0000	1.000	1.134485666	1,828.38
21455	VEHICLE WASH PLATFORM	1,384.15	156.08 m2	156.08 m2	1.0000	1.000	1.000000000	1,384.15
21451	VAN MAINT/STORAGE WHSE	2,997.84	211.82 m2	211.82 m2	1.0000	1.000	1.000000000	2,997.84
44130	HAZARDOUS/FLAMMABLE STORAGE	5,042.63	18.58 m2	18.58 m2	1.0000	1.080	1.174596246	6,396.90
21456	GREASE RACK	1,615.28	204.39 m2	204.39 m2	1.0000	1.000	1.000000000	1,615.28

For the renovation of Building 408, primary facilities costs are based upon an A-E cost estimate prepared by GMH Associates for category codes (CCN) 17120 and 17135, dated March 2015. Unit costs were developed using R.S. Means 2015. All costs were adjusted for the area cost factor for MCAS Yuma, AZ and were escalated to 1 October 2019 to reflect the projected two-year construction period. Then the costs for each CCN were averaged to create a composite guidance unit cost (GUC) for the renovation.

CCN 17120: $1,237.31 x 1.08 (ACF) x 1.1344857 (Escl) = $1,516.01.
$1,485.87 x 92.90 m2 = $140,837.08 construction cost
CCN 17135: $1,235.49 x 1.08 (ACF) x 1.1344857 (Escl) = 1,513.78
$1,483.68 x 78.97 m2 = $119,543.00 construction cost
($140,837.08 + 119,543.00)/(92.90 + 78.97) = $1,514.98 UGUC

For CCN 44112, the GUC for General Purpose Storage, low bay, from Table 2 of UFC 3-701-01, Change 6, was adjusted for the ACF for MCAS Yuma, adjusted by the size factor (size), and escalated to 1 October 2019 to reflect the projected two-year construction period: $1,275 x 0.9728 (size) x 1.08 (ACF) x 1.1119309 (Escl) = $1,489.48.

For CCN 21440, the GUC for General Purpose Storage, low bay, from Table 2 of UFC 3-701-01, Change 6, was adjusted for the ACF for MCAS Yuma, adjusted by the size factor (SF), and escalated to 1 October 2019 to reflect the projected two-year construction period: $1,275 x 1.136 (size) x 1.08 (ACF) x 1.1344857 (Escl) = $1,774.64.

For CCN 21451, the addition of military vehicle maintenance space to Building 495, the GUC from Table 2 of UFC 3-701-01, Change 6, was adjusted for the ACF for MCAS Yuma, adjusted by the size factor (SF), and escalated to 1 October 2019 to reflect the projected two-year construction period: $1,919 x 1.275 (size) x 1.08 (ACF) x 1.1344857 (Escl) = $2,997.84.

For CCN 44135, the GUC for General Purpose Storage, low bay, from Table 2 of UFC 3-701-01, Change 6, was adjusted for the ACF for MCAS Yuma, adjusted by the size factor (SF), and escalated to 1 October 2019 to reflect the projected two-year construction period: $1,275 x 1.1704 (size) x 1.08 (ACF) x 1.1344857 (Escl) = $1,828.38.

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 28 MAY 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Aviation Logistics Support Complex

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
0216496M	44112	P606	19,440

For CCN 41130, the DoD GUC for Hazardous/Flammable Storage < 1,000 SF was adjusted for the ACF for MCAS Yuma, adjusted by the size factor (SF), and escalated to 1 October 2019 to reflect the projected two-year construction period: $3,955 x 1.275 (size) x 1.08 (ACF) x 1.1745962 (Escl) = $6,396.89.

For CCN 21455, primary facilities costs are based upon an A-E cost estimate prepared by GMH Associates and J.B. Young & Associates, dated March 2015. Unit costs were developed using R.S. Means 2015. All costs were adjusted for the area cost factor for MCAS Yuma, AZ and were escalated to 1 October 2019 to reflect the projected two-year construction period. $1,091.11 x 1.08 (ACF) x 1.1745962 (Escl) = $1,384.15.

For CCN 21456, primary facilities costs are based upon an A-E cost estimate prepared by GMH Associates and J.B. Young & Associates, dated March 2015. Unit costs were developed using R.S. Means 2015. All costs were adjusted for the area cost factor for MCAS Yuma, AZ and were escalated to 1 October 2019 to reflect the projected two-year construction period. $1,423.80 x 1.08 (ACF) x 1.1344857 (Escl) = $1,615.28.

10. Description of Proposed Construction:

Construct a low-rise storage facility with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include storage space, work benches, administrative space, toilet room and supporting spaces.

Construct a low-rise vehicle holding shed with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include storage space, work benches, administrative space, toilet room and supporting spaces.

Construct a low-rise storage shed with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof.

The facility will include storage space, work benches, administrative space, toilet room and supporting spaces.

Construct low-rise hazardous/flammable storage facilities with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include hazardous materials storage space and hazardous waste storage space.

Construct vehicle wash platforms and high pressure wash systems with concrete slab on grade, canopy, vehicle platforms, and high pressure wash equipment.

Construct a low rise high bay vehicle maintenance space adjacent to the existing Building

495 with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include work benches, administrative space, and supporting spaces.

Construct a vehicle grease rack with steel frame, bar grate, safety rails, ramps and deck and concrete spill containment slab.

Renovate space within Building 408 to provide applied instruction and flight simulator spaces. The work includes interior partitions; exterior and interior doors and door hardware; flooring; acoustic ceiling systems; paint; toilet partitions; fixtures and accessories; modifications to the existing heating, ventilating and air conditioning; and all associated mechanical, plumbing, sewer, electrical, fire alarm/mass notification system, and all incidental related work. Demolition is limited to selected non-bearing walls, finishes, and fixtures.

Information systems include basic telephone, computer network, fiber optic, cable television, security and fire alarm systems and infrastructure.

This project will provide Anti-Terrorism/Force Protection (AT/FP) features and comply with AT/FP regulations, and physical security mitigation in accordance with DoD Minimum AntiTerrorism Standards for Buildings. Both DoD Guidance Unit Costs and User Generated Unit Costs were used for this project. The costs for specific AT/FP features are included in the unit costs.

Built-in Equipment includes a freight/passenger elevator in the warehouse and sound attenuation in Building 408.

Special costs include Post Construction Contract Award Services (PCAS) and Arizona's Transaction Privilege Tax for Yuma County and the city of Yuma.

Operations and Maintenance Support Information (OMSI) is included in this project.

Department of Defense and Department of the Navy principles for high performance and sustainable building requirements will be included in the design and construction of the project in accordance with federal laws and Executive Orders. Low Impact Development will be included in the design and construction of this project as appropriate.

SUPPORTING FACILITIES: Pavement facilities include an open storage facility.

Site preparation includes site clearing, excavation, demolition of existing asphalt concrete and 121.92 m of chain link fencing, Portland concrete, and preparation for construction.

3. Installation(SA) and Location/UIC: M62974	4. Project Title
MCAS YUMA AZ YUMA, ARIZONA	UAS Aviation Logistics Support Complex

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
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Special foundation features include structural fill.

Paving and Site Improvements include an equipment parking facility, roadways, sidewalks, space for a portable armory and a storm water retention system.

Electrical utilities include primary and secondary distribution systems, lighting, transformers, a secondary switchboard, renewable energy systems and telecommunications infrastructure.

Mechanical utilities include heating, ventilation and air conditioning, plumbing and plumbing fixtures, water lines, sanitary sewer lines, storm drain lines, oil/water separator and fire protection systems.

Facilities will be designed to meet or exceed the useful service life specified in DoD Unified Facility Criteria. Facilities will incorporate features that provide the lowest practical life cycle cost solutions satisfying the facility requirements with the goal of maximizing energy efficiency.

11. Requirement: 3580 m2 **Adequate:** **Substandard:**

FACILITY PLANNING DATA:

Category Code		Requirement	UM	Adequate	Substandard	Inadequate	Deficit/ Surplus
44112	STORAGE OF AIR OR GROUND ORGANIC UNITS FOR MARINE CORPS	3308	m2				
21440	VEHICLE HOLDING SHED	156	m2				
44135	GENERAL STORAGE SHED	116	m2				
44130	HAZARDOUS AND FLAMMABLES STOREHOUSE		m2				
21455	VEHICLE WASH-PLATFORM						
21451	AUTOMOTIVE ORGANIZATIONAL SHOP		m2				
17120	APPLIED INSTRUCTION BUILDING						
21456	GREASE RACK						

NOTES:

SCOPE:

The project scope was derived using Facility Planning for Navy and Marine Corps Shore Installations (UFC 2-000-05N, formerly known as P-80) based on criteria for category code number (CCN) 171-20 Applied Instruction Building, CCN 171-35 Operational Trainer Facility, CCN 143-45 Armory, CCN 214-40 Automotive Shop, CCN 214-55 Vehicle Wash Platform, CCN 214-

56 Grease Rack, CCN 441-12 Storage for Marine Corps, CCN 441-30 Hazard Material Storage, CCN 451-10 Open Storage Area and CCN 852-10 POV Parking. Facility requirements were developed by Naval Air Systems Command (NAVAIR) in 2014 based on the equipment and personnel assigned to the squadron.

PROJECT:

Constructs a support facility compound that includes a low-rise equipment storage warehouse, a high bay ground vehicle maintenance bay, a vehicle wash platform, a vehicle grease rack and storage sheds at Marine Corps Air Station (MCAS) Yuma.

(New Mission)

REQUIREMENT:

OVERVIEW:
These are new requirements for MCAS Yuma with the relocation of VMU-1 from Marine Corps Air Ground Combat Center (MCAGCC) 29 Palms to MCAS Yuma. Requirements are needed by FY 2020.

Support Facilities:
Adequate facilities are required to support VMU-1 ground equipment maintenance and storage requirement to support relocation of the squadron to MCAS Yuma. VMU-1 is a standard sized squadron with twelve Group 4 and 5 unmanned aerial vehicles (UAV) and forty five catapult launched Group 3 UAV. The squadron has multiple High Mobility Military Wheeled Vehicles, 7-ton Medium Tactical Vehicle Replacements (MTVR), trailers with generators, trailers with UAV launch equipment and numerous other assigned equipment that require regular maintenance to ensure operational readiness. The vehicle maintenance facilities are needed to support organizational maintenance requirements of assigned ground equipment used in conjunction with the UAV.

CURRENT SITUATION:

Relocation of VMU-1 from MCAGCC 29 Palms to MCAS Yuma is a new requirement for the air station. Adequate storage and ground vehicle maintenance space is not available at MCAS Yuma to support VMU-1 long term facility requirements. Existing Building 495 (substandard condition in iNFADS) is undersized to support organizational level vehicle maintenance by squadron personnel. The height of the building is less than is required to allow an MTVR to be pulled in for general maintenance functions. An addition to Building 495, that is tall enough to allow an MTVR to enter the building and be maintained, is required. Warehouse storage space adequate to support the AV, the containers used to ship the UAV and all ancillary support equipment is not available at MCAS Yuma. A new facility that VMU-1 can securely store UAV and related equipment is needed. Additional organizational level maintenance support facilities to support VMU-1 are lacking at MCAS Yuma. Vehicle wash racks, grease racks, hazard material storage, vehicle holding sheds and general storage sheds are required to allow maintenance of assigned equipment.

IMPACT IF NOT PROVIDED:

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 28 MAY 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Aviation Logistics Support Complex

5. Program Element 0216496M	6. Category Code 44112	7. Project Number P606	8. Project Cost ($000) 19,440

Without this project, VMU-1 will not have the facilities necessary to maintain and repair equipment assigned to the squadron to ensure operational readiness.

ADDITIONAL: Economic Alternatives Considered:

A. Status Quo:

The status quo does not meet the requirement. This is not a viable option.

B. Renovation/Modernization:

There are not enough existing facilities that are both under utilized and properly sized to meet VMU's requirement. This is not a viable option.

C. Lease:

N/A

D. New Construction:

New construction, along with the renovation of Building 408, is the only viable alternative to meet the requirement.

E. Other Alternatives:

N/A

F. Analysis Results:

New construction is the only viable alternative. No cost analysis was performed at this time.

12. Supplemental Data:

Site Approval:

[ ]	Yes, obtained date:
[X]	No, expected date: 06/2015

Issues (If yes, please provide discussion under issue):

Yes	No	
	X	DDESB, AICUZ, Airfield, EMR, or wetlands
	X	Endangered species/sensitive habitat
	X	Air quality
	X	Cultural/archeological resources
	X	Clearing of trees
	X	Known contamination at selected site
	X	Operational problems
	X	Traffic patterns impact
	X	Existing utilities upgrade
	X	Ordnance sweep required prior to Construction

Planning (If no, please provide an explanation):

Yes	No	
	X	Consistent w/ Master Plan or Base/Regional Dev.

Host Nation Approval: N/A

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 28 MAY 2015

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National Capital Region Approval: N/A

NEPA Documentation:

Yes	No	
	X	Complete

Level of NEPA:

Yes	No	
	X	Categorical Exclusion
X		Environmental Assessment(EA)
	X	Environmental Impact Statement(EIS)
	X	Memorandum of Negative Decision

Mitigation Issues:

Yes	No	
	X	Wetlands replacement/enhancement
	X	Hazardous waste
	X	Contaminated soil/water
	X	Other

Environmental Cleanup: N/A

Project Issues:

Yes	No	
	X	System safety
X		Soils - foundation and seismic conditions
	X	Construction/operational permits
	X	Local air quality/wastewater permits
	X	Complies with Final Governing Standard (Environmental standard for Spain, Italy & Greece)
	X	Land Acquisition (i.e. location, quantity)
	X	Technical Operating Manuals
	X	Feasibility/Constructibility in FY
	X	Historical Preservation
	X	Does the facility have an overhead crane requirement?
	X	Navy Crane Center contacted to assist with dev. of crane estimate (lifting capacity < 10-tons)?
	X	Navy Crane Center contacted to coord. procurement and timelines (lifting capacity >= 10-tons)?

Yes	No	
X		Physical Security:

	Shielding
	SCIF
	Fencing
X	IDS

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Other Type:

BUDGET ESTIMATE SUMMARY SHEET:

Item	UM	Quantity	Unit Cost	Total Cost
BUILT-IN EQUIPMENT	LS			154,323
Sound attenuation	m2	171.87	203.03	34,895
Elevator	ST	2.00	59,713.99	119,428
Special Construction Features:				
SPECIAL COSTS	LS			1,477,287
Arizona Transaction Privilege Tax (8.412%)	LS	1	1,317,386.25	1,317,386
PCAS	EA	.01	15,990,057.04	159,901
LEED AND EPACT 2005 COMPLIANCE (Inside)	LS			113,165
Enhanced building systems commissioning	m2	3691.69	11.81	43,599
Carbon dioxide sensors	m2	3963.9	17.55	69,566
Utilities and Site Improvements:				
PAVEMENT FACILITIES	LS			501,605
Open storage facility, concrete	m2	1300.64	385.66	501,605
SITE PREPARATIONS	LS			418,724
Site preparation, excavation and grading	m2	2807.89	124.93	350,790
Site cleanup	m2	19409.66	3.50	67,934
SPECIAL FOUNDATION FEATURES	LS			361,855
Structural fill	m2	2517.08	143.76	361,855
PAVING AND SITE IMPROVEMENTS	LS			5,218,268
Equipment parking facility, asphalt	m2	8779.34	224.97	1,975,088
Roads and other paving	m2	5852.89	160.69	940,501
Sidewalk	m2	668.9	128.55	85,987
Stormwater retention system (LID)	m2	8779.34	251.70	2,209,760
Demolish fencing, chain link	m	121.92	56.86	6,932
ELECTRICAL UTILITIES	LS			468,054
Concrete encased underground feeder	m	152.4	555.09	84,596
Electrical feeder	m	230.29	156.06	35,939
Electrical and telephone manholes	EA	3	16,587.22	49,762
500KVA pad-mounted transformer	EA	1	60,819.81	60,820
160KVA pad-mounted transformer	EA	1	33,174.44	33,174
Secondary switchboard, WP, concrete pad, bollards	EA	1	30,409.90	30,410
Communications, concrete encased underground feede	m	76.2	272.11	20,735
Cable TV, telecomm cable and feeders	m	289.65	145.13	42,037
25 KW Photovoltaic system, warehouse	kw	25	4,423.26	110,582
MECHANICAL UTILITIES	LS			359,772

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 28 MAY 2015

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5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
0216496M	44112	P606	19,440

Item	UM	Quantity	Unit Cost	Total Cost
Extend potable water/fire water service	m	266.7	610.11	162,716
Extend sewer service	m	182.88	293.86	53,741
Extend storm drainage system	m	152.4	548.56	83,601
Oil/Water separator, 100 gpm, with controls/alarm	EA	1	59,713.99	59,714

A. Estimated Design Data:

1. Status:
   - (A) Date design or Parametric Cost Estimate started
   - (B) Date 35% Design or Parametric Cost Estimate complete
   - (C) Date design completed
   - (D) Percent completed as of September 2016
   - (E) Percent completed as of January 2017
   - (F) Type of design contract
   - (G) Parametric Estimate used to develop cost
   - (H) Energy Study/Life Cycle Analysis performed
2. Basis:
   - (A) Standard or Definitive Design
   - (B) Where design was previously used
3. Total cost (C) = (A) + (B) = (D) + (E):
   - (A) Production of plans and specifications
   - (B) All other design costs
   - (C) Total $0
   - (D) Contract
   - (E) In-house
4. Contract award:
5. Construction start:
6. Construction complete:

B. Equipment associated with this project which will be provided from other appropriations:

Major Equipment	Funding Source	Fund Year	Installation Start-End Mo/Yr	Shakedown Start-End Mo/Yr	IOC Date Mo/Yr	Cost
Collateral Equipment	O&MMC	2018				1,231,391
Portable armory (ARMAGs)	PMC	2018				713,943

JOINT USE CERTIFICATION:

The (CERTIFYING OFFICIAL) certifies that this project has been considered for joint use potential. (TYPE OF CONSTRUCTION RECOMMENDED)is recommended. (UNILATERAL STATEMENT, if Unilateral Construction is selected)

Activity POC: Ronald L. Kruse Phone No: 928-269-3523

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 28 MAY 2015

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5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
0216496M	44112	P606	19,440

Attachments:

P606, UAS Aviation Logistics Support Complex	QTY	UOM	UNIT COST	TOTAL COST
PRIMARY FACILITIES				**$ 8,830.00**
Renovate Building 408	171.87	m2	1,515	$ (260)
Storage Facility	3,308.00	m2	1,520	$ (5,030)
Vehicle Holding Shed	156.08	m2	1,775	$ (280)
Building 495 Expansion, VMS	211.82	m2	2,998	$ (640)
General Storage Shed	116.13	m2	1,828	$ (210)
Hazardous/Flammable Storage	18.58	m2	6,397	$ (120)
Vehicle Wash Platform	156.08	m2	1,384	$ (220)
Grease Rack	204.39	m2	1,615	$ (330)
Built-in Equipment	1	LS	154,322	$ (150)
Special Costs	1	LS	1,476,200	$ (1,480)
LEED and EPACT 2005 Compliance (Inside)	1	LS	113,165	$ (110)
SUPPORTING FACILITIES				**$ 7,330.00**
SPECIAL CONSTRUCTION	1	LS	-	$ -
PAVEMENT FEATURES	1	LS	501,601	$ (500)
SPECIAL FOUNDATION FEATURES	1	LS	361,845	$ (360)
SITE PREPARATIONS	1	LS	418,697	$ (420)
PAVING AND SITE IMPROVEMENTS	1	LS	5,218,205	$ (5,220)
SITE ELECTRICAL UTILITIES	1	LS	468,039	$ (470)
SITE CIVIL/MECHANICAL UTILITIES	1	LS	359,773	$ (360)
BUILDING DEMOLITION	1	LS	-	$ -
Sub-Total				**$ 16,160**
Contingency (10%)				$ 1,620
Total Contract Cost				**$ 17,780**
SIOH (5.7%)				$ 1,010
Sub-Total				**$ 18,790**
Contractor Design Cost (4%)				$ 650
Total Request				**$ 19,440**
Total Request Rounded				**$ 19,440**

Unit costs include General Contractor's Overhead and Profit.
Unit costs reflect the Area Cost Factor for MCAS Yuma, AZ.
UGUC for primary facilities derived from DoD/NAVFAC Guidance dated August 2013 and adjusted as indicated on Primary Facilities worksheet.
Supporting facilities costs were derived from an A-E estimate prepared with information received from the installation. Most unit costs are based upon RS Means 2015.

P606 UAS Aviation Logistics Support Complex
FY2018

	P606, UAS Aviation Logistics Support Complex					Escalation:		1.10581467
	PRIMARY FACILITIES						**$**	**8,820,577**
17120	**Renovate Building 408**	171.87	m2	$	1,514.98	$ 260,380		
44112	**Storage Facility**	3,308.00	m2	$	1,519.70	$ 5,027,152		
21440	**Vehicle Holding Shed**	156.08	m2	$	1,774.64	$ 276,986		
24151	**Building 495 Expansion, VMS**	211.82	m2	$	2,997.84	$ 635,002		
44135	**General Storage Shed**	116.13	m2	$	1,828.38	$ 212,330		
44130	**Hazardous/Flammable Storage**	18.58	m2	$	6,396.89	$ 118,854		
21455	**Vehicle Wash Platform**	156.08	m2	$	1,384.15	$ 216,037		
21456	**Grease Rack**	204.39	m2	$	1,615.28	$ 330,147		
	Built-in Equipment						**$**	**154,322**
	Elevator	2.00	ST	$	59,713.99	$ 119,428		
	Sound Attenuation	171.87	m2	$	203.03	$ 34,894		
	Special Costs						**$**	**1,476,200**
	PCAS	1.00	LS	$	159,888.49	$ 159,888		
	Arizona Transaction Privilege Tax (8.412%)	1.00	EA	$	1,316,311.44	$ 1,316,311		
	LEED and EPACT 2005 Compliance (Inside)						**$**	**113,165**
	Enhanced Building Systems Commissioning	3,691.69	m2	$	11.81	$ 43,599		
	Carbon Dioxide Sensors	3,963.90	m2	$	17.55	$ 69,566		
	SUPPORTING FACILITIES						**$**	**7,328,160**
	PAVEMENT FEATURES						**$**	**501,601**
	Open Storage Facility, Concrete	1,300.64	m2	$	385.66	$ 501,601		
	SPECIAL FOUNDATION FEATURES						**$**	**361,845**
	Structural fill	2,517.08	m	$	143.76	$ 361,845		
	SITE PREPARATIONS						**$**	**418,697**
	Site Preparation, excavation and grading	2,807.89	m2	$	124.93	$ 350,778		
	Site cleanup	19,409.66	m2	$	3.50	$ 67,919		

	PAVING AND SITE IMPROVEMENTS							**$**	**5,218,205**
		Equipment Parking Facility, asphalt	8,779.34	m2	$	224.97	$ 1,975,057		
		Roads and other Paving, asphalt	5,852.89	m2	$	160.69	$ 940,503		
		Sidewalk	668.90	m2	$	128.55	$ 85,989		
		Fencing demolition, remove chain link posts & footing, 6' to 8' high, includes disposal	121.92	m	$	56.88	$ 6,935		
		Stormwater Retention System	8,779.34	m2	$	251.70	$ 2,209,721		
	SITE ELECTRICAL UTILITIES							**$**	**468,039**
		Concrete Encased Underground Feeder	152.40	m	$	555.09	$ 84,596		
		Electrical Feeder	230.29	m	$	156.06	$ 35,939		
		Electrical and Telephone Manholes	3.00	EA	$	16,587.22	$ 49,762		
		500KVA, 12.47KV-480Y/277V, 3P, 4W Pad-Mtd	1.00	EA	$	60,819.81	$ 60,820		
		150KVA, 12.47KV-208Y/120V, 3P, 4W Pad-Mtd	1.00	EA	$	33,174.44	$ 33,174		
		Secondary Switchboard, WP, Concrete Pad, Bollards,	1.00	EA	$	30,409.90	$ 30,410		
		Communications, Concrete Encased Underground	76.20	m	$	272.11	$ 20,735		
		Cable TV, Telecomm cable and feeders	289.56	m	$	145.13	$ 42,023		
		25 KW Photovoltaic System for warehouse	25.00	KW	$	4,423.26	$ 110,581		
	SITE CIVIL/MECHANICAL UTILITIES							**$**	**359,773**
		Extend potable water/fire water service	266.7	m	$	610.11	$ 162,717		
		Extend sewer service	182.88	m	$	293.86	$ 53,742		
		Extend storm drainage system	152.40	m	$	548.56	$ 83,600		
		Oil/Water Separator, 100 gpm, with controls/alarm	1.00	EA	$	59,713.99	$ 59,714		

	P606, UAS Aviation Logistics Support Complex	ACF	1.08			
	PRIMARY FACILITIES					**$ 8,623,439**
17120	**Renovate Building 408**	171.87	m2	$ 1,514.98	$ 260,380	
44112	**Storage Facility**	3,308.00	m2	$ 1,519.70	$ 5,027,152	
21440	**Vehicle Holding Shed**	156.08	m2	$ 1,774.64	$ 276,986	
24151	**Building 495 Expansion, VMS**	211.82	m2	$ 2,997.84	$ 635,002	
44135	**General Storage Shed**	116.13	m2	$ 1,828.38	$ 212,330	
44130	**Hazardous/Flammable Storage**	18.58	m2	$ 6,396.89	$ 118,854	
21455	**Vehicle Wash Platform**	156.08	m2	$ 1,384.15	$ 216,037	
21456	**Grease Rack**	204.39	m2	$ 1,615.28	$ 330,147	
	Built-in Equipment					$ 108,000.00
	Elevator	2.00	ST	$ 54,000.00	$ 108,000	
	AFFF Fire Protection System	-	Ea.	$ 1,988.79	$ -	
	Compressed Air System	-	-	$ -	$ -	
	Sound Attenuation	171.87	m2	$ 183.60	$ 31,555	
	Special Costs					$ 1,325,383.89
	PCAS	1.00	LS	$ 135,029.41	$ 135,029	
	Arizona Transaction Privilege Tax (8.412%)	1.00	EA	$ 1,190,354.48	$ 1,190,354	
	Temporary Facilities	-	m2	$ 1,862.87	$ -	
	Temporary potable water utility connections	-	m2	$ 354.33	$ -	
	Temporary electrical utility connections	-	m	$ -	$ -	
	LEED and EPACT 2005 Compliance (Inside)					$ 113,165.30

		Enhanced Building Systems Commissioning	3,691.69	m2	$	11.81	$	43,599		
		Carbon Dioxide Sensors	3,963.90	m2	$	17.55	$	69,566		
	SUPPORTING FACILITIES								**$**	**6,173,331**
	PAVEMENT FEATURES								**$**	**453,603**
		Open Storage Facility, Concrete	1,300.64	m2	$	348.75	$	453,603		
	SPECIAL FOUNDATION FEATURES								**$**	**327,220**
		Structural fill	2,517.08	m	$	130.00	$	327,220		
	SITE PREPARATIONS								**$**	**378,632**
		Site Preparation, excavation and grading	2,807.89	m2	$	112.97	$	317,212		
		Site cleanup	19,409.66	m2	$	3.16	$	61,420		
	PAVING AND SITE IMPROVEMENTS								**$**	**4,718,878**
		Equipment Parking Facility, asphalt	8,779.34	m2	$	203.44	$	1,786,065		
		Roads and other Paving, asphalt	5,852.89	m2	$	145.31	$	850,507		
		Sidewalk	668.90	m2	$	116.25	$	77,760		
		Fencing demolition, remove chain link posts & footing, 6' to 8' high, includes disposal	121.92	m	$	51.44	$	6,272		
		Stormwater Retention System	8,779.34	m2	$	227.61	$	1,998,274		
G40	**SITE ELECTRICAL UTILITIES**								**$**	**423,253**
		Concrete Encased Underground Feeder	152.40	m	$	501.97	$	76,501		
		Electrical Feeder	230.29	m	$	141.13	$	32,500		
		Electrical and Telephone Manholes	3.00	EA	$	15,000.00	$	45,000		
		500KVA, 12.47KV-480Y/277V, 3P, 4W Pad-Mtd Transformer, concrete pad, grounding & Testing for Warehouse	1.00	EA	$	55,000.00	$	55,000		
		150KVA, 12.47KV-208Y/120V, 3P, 4W Pad-Mtd Transformer, concrete pad, grounding & testing	1.00	EA	$	30,000.00	$	30,000		
		Secondary Switchboard, WP, Concrete Pad, Bollards, 600A, 208Y/120V, 3P, 4W	1.00	EA	$	27,500.00	$	27,500		
		Communications, Concrete Encased Underground Ductbank for	76.20	m	$	246.07	$	18,751		
		Cable TV, Telecomm cable and feeders	289.56	m	$	131.24	$	38,002		
		25 KW Photovoltaic System for warehouse	25.00	KW	$	4,000.00	$	100,000		
G30	**SITE CIVIL/MECHANICAL UTILITIES**								**$**	**325,347**

		Extend potable water/fire water service		266.70	m	$ 551.73	$ 147,147	
		Extend sewer service		182.88	m	$ 265.74	$ 48,599	
		Extend storm drainage system		152.40	m	$ 496.07	$ 75,600	
		Oil/Water Separator, 100 gpm, with controls/alarm		1.00	EA	$ 54,000.00	$ 54,000	

P606 UAS Aviation Logistics Support Complex
FY2018

	Item			m2 Cost	Size Factor	ACF	Escalation	Subtotal	UGUC		
UAS Hangar											
Renovate Building 408		**171.87**	**m2**				**$ 1,514.98**	**260,380.08**	$ 1,514.98		
17120	Applied Instruction Facility	92.90	m2	$ 1,237.31	1	1.08	**1.1344857**	$ 140,837.08	$ 1,516.01		
17135	Operational Trainer Facility	78.97	m2	$ 1,235.49	1	1.08	**1.1344857**	$ 119,543.00	$ 1,513.78		
44112	**Storage Facility**	**3,308.00**	**m2**	**$ 1,275.00**	**0.9728**	**1.08**	**1.1344857**	**$ 5,027,151.99**	**$ 1,519.70**		
21440	**Vehicle Holding Shed**	**156.08**	**m2**	**$ 1,275.00**	**1.136**	**1.08**	**1.1344857**	**$ 276,986.46**	**$ 1,774.64**		
21451	**Building 495 Expansion, VMS**	**211.82**	**m2**	**$ 1,919.00**	1.275	1.08	**1.1344857**	**$ 635,001.71**	**$ 2,997.84**		
44135	**General Storage Shed**	**116.13**	**m2**	**$ 1,275.00**	**1.1704**	**1.08**	**1.1344857**	**$ 212,330.16**	**$ 1,828.38**		
41130	**Hazardous/Flammable Storage**	**18.58**	**m2**	**$ 3,955.00**	1.275	**1.08**	1.1745962	**$ 118,854.26**	**$ 6,396.89**		
21455	**Vehicle Wash Platform**	**156.08**	**m2**	**$ 1,091.11**	1	1.08	1.1745962	**$ 216,037.38**	**$ 1,384.15**		
21456	**Grease Rack**	**204.39**	**m2**	**$ 1,423.80**	1	1	**1.1344857**	**$ 330,147.29**	**$ 1,615.28**		
Sound Attenuation		171.87	m2	$ 170.00	1	1.08	1	$ 31,555.33	$ 183.60		
Built-in Equipment											
	Elevator	2	ST	$ 50,000.00	1	1.08	1	$ 108,000.00	$ 54,000.00		

VMU-Support Facilities											
Line Number	Description	Quantity	Unit	Unit Material	Ext. Material	Unit Labor	Ext. Labor	Unit Equipment	Ext. Equipment	Unit Total	Ext. Total
Division 02 Existing Conditions		**0.000**	**m2**							**$0.00**	**$0**
024116172500*	Buillding footings and foundations demolition, plain concrete, 12" thick, (B497)	0.000	m2			$9.90	$0	$16.68	$0	$26.58	$0
024116174250*	Buillding footings and foundations demolition, add for disposal, up to 5 miles, (B497)	0.000	m3			$15.88	$0	$24.67	$0	$40.55	$0
	Electrical Demolition	0.000	EA							$12,500.00	$0
024113601700*	Fencing demolition, remove chain link posts & footing, 6' to 8' high, includes disposal	121.920	m	$0.00	$0	$46.42	$5,660	$5.02	$612	$51.44	$6,272
Totals for Division 02 Existing Conditions					**$0**		**$0**		**$0**		**$0**
Division 03 Concrete											
033053403800*	Structural concrete, in place, spread footing (3000 psi), includes, Grade 60 rebar, concrete (Portland cement Type I), placing and finishing (Vehicle Holding Shed)	6,116.440	m3	$401.62	$2,456,485	$678.08	$4,147,436	$2.75	$16,820	$1,082.45	$6,620,740
033053403800*	Structural concrete, in place, spread footing (3000 psi), under 1 C.Y., includes, Grade 60 rebar, concrete (Portland cement Type I), placing and finishing (Vehicle Wash Rack)	6,116.440	C.Y.	$401.62	$2,456,485	$678.08	$4,147,436	$2.75	$16,820	$1,082.45	$6,620,740
Totals for Division 03 Concrete					**$4,912,969**		**$8,294,871**		**$33,640**		**$13,241,481**
Division 10 Specialties											
107316201700*	Canopies, wall hung, aluminum, prefinished, 12' x 40', 032" (Vehicle Holding Shed)	4.000	Ea.	$21,052.43	$84,210	$5,639.88	$22,560	$843.77	$3,375	$27,536.08	$110,144
107316201700*	Canopies, wall hung, aluminum, prefinished, 12' x 40', 032" (Vehicle Wash Rack)	4.000	Ea.	$21,052.43	$84,210	$5,639.88	$22,560	$843.77	$3,375	$27,536.08	$110,144
Totals for Division 10 Specialties					**$168,419**		**$45,119**		**$6,750**		**$220,289**
Division Non Unit Costs											
	Prefabricated Armory, 10'x20'x10', grounding, dehumidifer, intrusion detection system, day door, freight, excludes weapons rack and work benches	4.000	Ea	$153,689.07	$614,756					$153,689.07	$614,756
	Upgrade classrooms, finishes, mech, electr, data	55.740	m2	$838.40	$46,732	$398.91	$22,235			$1,237.31	$68,968
	Upgrade similator rooms, finishes, mech, electr, data	41.810	m2	$837.22	$35,004	$398.27	$16,652			$1,235.49	$51,656
	Vehicle Grease Rack, 110' x 20', steel frame, bar grate, safety rails, ramps and deck	1.000	Ea.	$265,343.18	$265,343	$11,138.74	$11,139			$276,481.91	$276,482
Totals for Division Non Unit Costs					**$961,836**		**$50,026**		**$0**		**$1,011,862**
Estimate Subtotal					**$6,043,225**		**$8,390,016**		**$40,391**		**$14,473,631**
Armory		**4**	**Ea**							**$153,690.00**	**$614,760**
											$683,571

Activity:		Spec No:		Firm Name:				Sheet		of
Project Title:				**JB Young & Associates**						
MCAS Yuma (201501)		Estimator:						Date: March 18, 2015		
		Status of Design:								
P603 UAS Logistics Support Complex								Job No.:		
Spec#	Description	Quantity	Unit	Material Unit Cost	Material Total	Labor Unit Cost	Labor Total	Engineering Unit Cost		Total
CIVIL										
Grease Rack		**204.39**	**m2**					**$**	**1,423.80**	**$ 291,011**
	Spill containment slab for Grease Rack	204.39	m2					$	107.64	$ 22,001
	Vehicle Grease Rack, 110' x 20', steel frame, bar grate, safety rails, ramps and deck	1.00	Ea.					$	269,010.00	$ 269,010
Vehicle Wash Platform		**156.08**	**m2**					**$**	**1,091.11**	**$ 170,301**
	Reinforced concrete slab for wash platform	156.08	m2					$	107.64	$ 16,800
	Canopies, wall hung, aluminum, prefinished, 12' x	4.00	Ea.					$	3,375.07	$ 13,500
	Install high pressure wash equipment	2.00	EA					$	70,000.00	$ 140,000
Open Storage Facility, Concrete		**1,300.64**	**m2**					**$**	**322.92**	**$ 420,003**
	Site preparation, pavement demolition and grading for open storage area	1,300.64	m2					$	161.46	$ 210,001
	Reinforced concrete pavement & aggregate base for open storage	1,300.64	m2					$	161.46	$ 210,001
Site Preparation, excavation and grading		**2,808**	**m2**					**$**	**104.60**	**$ 293,715.13**
	Site preparation, pavement demolition and grading for Vehicle Wash Platform	156.08	m2					$	107.64	$ 16,800
	Site preparation, pavement demolition and removal for Vehicle Holding Shed	156.08	m2					$	102.64	$ 16,020
	Site preparation, pavement demolition and removal for Automotive Shop	211.82	m2					$	107.64	$ 22,800
	Site preparation, pavement demolition and removal for warehouse	1,654.05	m2					$	107.64	$ 178,042

Site preparation, pavement demolition and grading for Haz/Flam Storage	37.16	m2					$ 107.64	$ 4,000
Site preparation, pavement demolition and grading for storage shed	116.13	m2					$ 107.64	$ 12,500
Excavation, backfill and compaction for oil/water separator	91.75	m3					$ 65.40	$ 6,000
Trenching, Backfill, Compaction for Electrical Utilities	381.00	m					$ 98.43	$ 37,502
Disposal of excess material	3.82	m3					$ 13.08	$ 50
Equipment Parking Facility, asphalt	**8,779.34**	**m2**					**188.37**	**$ 1,653,764**
Site preparation, pavement demolition and grading for equipment parking	8,779.34	m2					$ 107.64	$ 945,008
AC Surface pavement, 4" AC, 7" aggregate base	8,779.34	m2					$ 80.73	$ 708,756
Roads and other Paving, asphalt	**5,852.89**	**m2**					**$ 134.55**	**$ 787,506**
Infill AC paving and aggregate base, 4" AC, 7" base	5,852.89	m2					$ 107.64	$ 630,005
Paint markings and install traffic control signs and bollards	5,852.89	m2					$ 26.91	$ 157,501
Stormwater Retention System	**8,779.34**	**m2**					**$ 210.75**	**$ 1,850,254**
Excavate Site for Stormwater Retention System	13,761.99	m3					$ 26.16	$ 360,014
Backfill excavation with 3/4" crushed rock	6,880.99	m3					$ 45.78	$ 315,012
HDPE storm chambers	2,080.00	EA					$ 512.00	$ 1,064,960
Underlayment filter fabric	8,779.34	m2					$ 12.56	$ 110,269
Extend potable water/fire water service	**266.70**	**m**					**$ 510.86**	**$ 136,247.05**
Extend potable water/fire water service for VHS	60.96	m					$ 328.03	$ 19,997
Extend potable water/fire water service for Auto Shop	30.48	m					$ 328.08	$ 10,000
Extend potable water/fire water service for Wash Rack	30.48	m					$ 492.13	$ 15,000
Extend potable water/fire water service for Warehouse	91.44	m					$ 656.17	$ 60,000
Extend potable water/fire water service for storage shed	30.48	m					$ 656.17	$ 20,000
Extend fire service for Haz/Flam Storage	22.86	m					$ 492.13	$ 11,250

Extend sewer service	**182.88**	**m**					**$ 246.06**	**$ 44,999.45**
Extend sewer service for VHS	60.96	m					$ 246.06	$ 15,000
Extend sewer service for Wash Platform	45.72	m					$ 246.06	$ 11,250
Extend sewer service for Warehouse	45.72	m					$ 246.06	$ 11,250
Extend sewer service for storage shed	30.48	m					$ 246.06	$ 7,500
Extend storm drainage system	**152.40**	**m**					**$ 459.32**	**$ 70,000.37**
Extend storm drainage system for open storage	91.44	m					$ 492.13	$ 45,000
Extend storm drainage system for warehouse	30.48	m					$ 492.13	$ 15,000
Drainage pipe connection to oil/water separator	30.48	m					$ 328.08	$ 10,000
Total Civil for P603								**$ 5,717,800**
Oil/Water Separator, 100 GPM, with controls/alarm	**1.00**	**EA**					**$ 50,000.00**	**$ 50,000.00**
Oil/Water Separator, 100 gpm, with controls/alarm	1.00	EA					$ 50,000.00	$ 50,000
Not used								
Shed concrete slab, reinforced for VHS	156.08	m2					$ 161.46	$ 25,201
Shop concrete slab, reinforced for Auto Shop	211.82	m2					$ 107.64	$ 22,800
Warehouse concrete slab foundation, reinforced	1,654.05	m2					$ 161.46	$ 267,063
Concrete slab for Haz/Flam Storage	37.16	m2					$ 107.64	$ 4,000
Concrete foundation for storage shed, reinforced	116.13	m2					$ 161.46	$ 18,750
								$ 6,155,615

Activity:	Spec No:		Firm Name:				Sheet	of	
Project Title:			**C&G Engineering, Inc.**						
VMU-1 Planning	Estimator:		**C. Zuniga**				Date: March 17, 2015		
MCAS Yuma AZ	Status of Design:								
							Job No.: 008-15-101		
Project 2 (Support Facilities)									
Spec# Description	Quantity	Unit	Material Unit Cost	Material Total	Labor Unit Cost	Labor Total	Engineering Unit Cost	Total	
ELECTRICAL SUPPORTING FACILITIES COSTS									
Electrical Demolition Work Including:	0	EA	$ 2,500.00	$ -	$ 10,000.00	$ -	$ 12,500.00	$ -	
Disconnection, Removing, Disposing, @ Capping									
Existing Electrical Utilities & Equipment									
Trenching, Backfill, Compaction for Electrical Ut	**381.00**	**m**					**$ 98.43**	**$ 37,501.83**	
Trenching, Backfill, Compaction for electrical utilities	167.64	m	$ 32.81	$ 5,500	$ 65.62	$ 11,001	$ 98.43	$ 16,500.81	
Trenching, Backfill, Compaction for electrical utilities	213.36	m	$ 32.81	$ 7,000	$ 65.62	$ 14,001	$ 98.43	$ 21,001.02	
Concrete Encased Underground Feeder	**152.40**	**m**					**$ 501.97**	**$ 76,500.84**	
12KV, Concrete Encased Underground Feeder for v	60.96	m	$ 262.47	$ 16,000	$ 262.47	$ 16,000	$ 524.94	$ 32,000.34	
12KV, Concrete Encased Underground Feeder	60.96	m	$ 262.47	$ 16,000	$ 262.47	$ 16,000	$ 524.94	$ 32,000.34	
600V, Concrete Encased Underground Feeders for	30.48	m	$ 213.26	$ 6,500	$ 196.85	$ 6,000	$ 410.11	$ 12,500.15	
Electrical Feeder	**230.29**	**m**					**$ 141.13**	**$ 32,500.09**	
Electrical Feeder (50A, 208Y/120V, 3P, 4W) for arm	30.48	m	$ 65.62	$ 2,000	$ 32.81	$ 1,000	$ 98.43	$ 3,000.15	
Electrical Feeder (100A, 208Y/120V, 3P, 4W) for au	30.48	m	$ 98.43	$ 3,000	$ 49.21	$ 1,500	$ 147.64	$ 4,500.07	
100A, 208Y/120V, 3P,4W UG Feeders	169.33	m	$ 98.43	$ 16,667	$ 49.21	$ 8,333	$ 147.64	$ 24,999.88	
Electrical and Telephone Manholes	**3**	**EA**					**$ 15,000.00**	**$ 45,000.00**	
Electrical Manholes for warehouse	1	EA	$ 8,000.00	$ 8,000	$ 7,000.00	$ 7,000	$ 15,000.00	$ 15,000.00	
Electrical Manholes	1	EA	$ 8,000.00	$ 8,000	$ 7,000.00	$ 7,000	$ 15,000.00	$ 15,000.00	
Telephone Manholes for warehouse	1	EA	$ 8,000.00	$ 8,000	$ 7,000.00	$ 7,000	$ 15,000.00	$ 15,000.00	
500KVA, 12.47KV-480Y/277V, 3P, 4W Pad-Mtd Transformer, concrete pad, grounding & Testing for Warehouse	**1**	**EA**	**$ 40,000.00**	**$ 40,000**	**$ 15,000.00**	**$ 15,000**	**$ 55,000.00**	**$ 55,000.00**	

150KVA, 12.47KV-208Y/120V, 3P, 4W Pad-Mtd Transformer, concrete pad, grounding & testing	**1**	**EA**	**$ 20,000.00**	**$ 20,000**	**$ 10,000.00**	**$ 10,000**	**$ 30,000.00**	**$ 30,000.00**
Secondary Switchboard, WP, Concrete Pad, Bollards, 600A, 208Y/120V, 3P, 4W	**1**	**EA**	**$ 20,000.00**	**$ 20,000**	**$ 7,500.00**	**$ 7,500**	**$ 27,500.00**	**$ 27,500.00**
Communications, Concrete Encased Underground Ductbank for warehouse	**76.20**	**m**	**$ 98.43**	**$ 7,500**	**$ 147.64**	**$ 11,250**	**$ 246.07**	**$ 18,750.53**
Cable TV, Telecomm cable and feeders	**289.56**	**m**					**$ 131.24**	**$ 38,001.55**
50 Pair Base Telephone Cable for warehouse	76.20	m	$ 65.62	$ 5,000	$ 65.62	$ 5,000	$ 131.24	$ 10,000.49
Telecom Feeders for armory	30.48	m	$ 32.81	$ 1,000	$ 16.40	$ 500	$ 49.21	$ 1,499.92
Telecom Feeders for auto shop	30.48	m	$ 32.81	$ 1,000	$ 16.40	$ 500	$ 49.21	$ 1,499.92
24 Fiber Optic Cable for warehouse	76.20	m	$ 98.43	$ 7,500	$ 98.43	$ 7,500	$ 196.86	$ 15,000.73
Cable TV for warehouse	76.20	m	$ 65.62	$ 5,000	$ 65.62	$ 5,000	$ 131.24	$ 10,000.49
25 KW Photovoltaic System for warehouse	**25**	**KW**	**$ 3,000.00**	**$ 75,000**	**$ 1,000.00**	**$ 25,000**	**$ 4,000.00**	**$ 100,000.00**
Total								
Tax 7.5%								
Bound 1%								
General Conditions 2%								
Overhead & Profit 15%								
TOTAL ELECTRICAL				**$ 278,670**		**$ 182,085**		**$ 460,755**

COLLATERAL EQUIPMENT
For P606, UAS Aviation Logistics Support Complex

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

The cost of FF&E is based on a square footage price taken from the Tri Services Cost Estimating Guide May 2013 for a specific facility. The square footage cost will be projected in the spreadsheet when you enter the fiscal year of your project. Fill in the highlighted areas for as many facilities as you have in your project. This cost does not include shop equipment or equipment not considered FF&E. The PM and user should formulate a seperate list for those items.

Shop and station funded equipment costs should be entered for the fiscal year; no inflation factor has been added. Also, costs shouldn't include installation, shipping and contingency;they will be added at the bottom of the spreadsheet.

Enter the project Fiscal Year: 2018

	Facility Unit Cost ($)	Facility Size (SF)	Subtotal
Facility 1	26	600	$ 15,864
Facility 2	$ 42	450	$ 18,720
Facility 3	$ 21	1,680	$ 34,759
Facility 4	$ 21	2,280	$ 47,173
Facility 5	$ 21	35,607	$ 736,709
Facility 6	$ 21	1,250	$ 25,863
Facility 7			
Facility 8			
Facility 9			
Facility 10			

Subtotal FF&E: $ 879,088

SHOP TYPE AND STATION FUNDED EQUIPMENT

Audio / Visual Equipment

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
A/V Equipment for Conference/Briefing Rooms	-	SF	$ 5.68	$0

Subtotal Audio / Visual Equipment: $ -

Subtotal Miscellaneous Equipment: $ -

COLLATERAL EQUIPMENT
For P606, UAS Aviation Logistics Support Complex

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

Subtotal FF&E:	$	879,088
Subtotal Shop and Station Equipment:	$	-
Total FF&E, Shop and Station Equipment:	$	879,088
Area Cost Factor	$	949,415
Installation (13%):	$	123,424
Shipping (6%):	$	56,965
SIOH (5.7%):	$	54,117
Contingency (5%):	$	47,471
Total Collateral Equipment:	$	1,231,391

Naval Facilities Engineering Command
LEED for New Construction v3.0 Workbook
Cover Sheet

Purpose

The Navy LEED for New Construction v3.0 Workbook is a planning tool to assist the area planners in adjusting primary facility unit costs to account for acquiring LEED Certification credits by facility type. This workbook is a tool which assists in preliminary program budgeting establishing a viable assessment of LEED credits to be incorporated into the project. This workbook will allow LEED points to be assigned and determine a preliminary budget. It should only be used as a benchmark to assess basis of programming costs until further study, design & RFP development sessions and performance / prescriptive specifications are prepared by experienced professionals.

Project Information

Project Number:	P-606	Project Title:	Group 3 UAS Operations Facility
Project Year:	2018	Project Location:	CADC, MCAS Yuma, AZ
Zip Code:	85365	Facility Type:	MOU Required Credits

Primary Facility Information

Cost of Primary Facility ($):	$13,715,270
Size of Primary Facility (m2):	4,268.43
Number of Occupants:	100

Additional Cost Information

Area Cost Factor:	1.08
Escalation Rate (%):	115.27%

LEED Checklist Prepared By: GMH Associates

LEED for New Construction v3.0
Regional Credits Worksheet

[Click here to visit the USGBC site containing information on regional credits for your project.]

Search the database by zip code to identify which LEED credits are regional priorities for your project. If your zip code does not exist in the database, find the nearest large city to determine appropriate regional credits. Indicate which credits are a priority for your region using the drop-down menus in the pink cells and setting the four most likely credits to "Y". These will then be factored into your expected building score on the project's LEED Checklist. If you set more than four credits to "Y", the worksheet will only use the first four credits indicated.

Project Title:	Group 3 UAS Operations Facility	Project Number:	P-606
Project Location:	CADC, MCAS Yuma, AZ	Prepared by:	GMH Associates
Facility Type:	MOU Required Credits	Zip Code:	85365

Regional Priority?			
		Sustainable Sites	**26** Points
	SS Prereq 1	**Construction Activity Pollution Prevention**	Required
N	SS Credit 1	**Site Selection**	1
N	SS Credit 2	**Development Density & Community Connectivity**	5
N	SS Credit 3	**Brownfield Redevelopment**	1
N	SS Credit 4.1	**Alternative Transportation -** Public Transportation Access	6
N	SS Credit 4.2	**Alternative Transportation -** Bicycle Storage & Changing Rooms	1
N	SS Credit 4.3	**Alternative Transportation -** Low-Emitting and Fuel-Efficient Vehicles	3
N	SS Credit 4.4	**Alternative Transportation -** Parking Capacity	2
N	SS Credit 5.1	**Site Development -** Protect or Restore Habitat	1
N	SS Credit 5.2	**Site Development -** Maximize Open Space	1
N	SS Credit 6.1	**Stormwater Design -** Quantity Control	1
N	SS Credit 6.2	**Stormwater Design -** Quality Control	1
N	SS Credit 7.1	**Heat Island Effect -**Nonroof	1
N	SS Credit 7.2	**Heat Island Effect -** Roof	1
N	SS Credit 8	**Light Pollution Reduction**	1
		Water Efficiency	10 Points
	WE Prereq 1	**Water Use Reduction**	Required
N	WE Credit 1	**Water Efficient Landscaping**	2 to 4
N	WE Credit 2	**Innovative Wastewater Technologies**	2
Y	WE Credit 3	**Water Use Reduction**	2 to 4
		Energy & Atmosphere	35 Points
	EA Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
	EA Prereq 2	**Minimum Energy Performance**	Required
	EA Prereq 3	**Fundamental Refrigerant Management**	Required
Y	EA Credit 1	**Optimize Energy Performance**	1 to 19
Y	EA Credit 2	**On-Site Renewable Energy**	1 to 7
N	EA Credit 3	**Enhanced Commissioning**	2
N	EA Credit 4	**Enhanced Refrigerant Management**	2
N	EA Credit 5	**Measurement & Verification**	3
N	EA Credit 6	**Green Power**	2

continued…

		Materials & Resources	14 Points
	MR Prereq 1	**Storage & Collection of Recyclables**	Required
N	MR Credit 1.1	**Building Reuse**, Maintain Existing Walls, Floors & Roof	1 to 3
N	MR Credit 1.2	**Building Reuse**, Maintain Interior Nonstructural Elements	1
Y	MR Credit 2	**Construction Waste Management**	1 to 2
N	MR Credit 3	**Materials Reuse**	1 to 2
N	MR Credit 4	**Recycled Content**	1 to 2
N	MR Credit 5	**Regional Materials**	1 to 2
N	MR Credit 6	**Rapidly Renewable Materials**	1
N	MR Credit 7	**Certified Wood**	1

		Indoor Environmental Quality	15 Points
	EQ Prereq 1	**Minimum Indoor Air Quality Performance**	Required
	EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
N	EQ Credit 1	**Outdoor Air Delivery Monitoring**	1
N	EQ Credit 2	**Increased Ventilation**	1
N	EQ Credit 3.1	**Construction Indoor Air Quality Management Plan -** During Construction	1
N	EQ Credit 3.2	**Construction Indoor Air Quality Management Plan -** Before Occupancy	1
N	EQ Credit 4.1	**Low-Emitting Materials -** Adhesives & Sealants	1
N	EQ Credit 4.2	**Low-Emitting Materials -** Paints & Coatings	1
N	EQ Credit 4.3	**Low-Emitting Materials -** Flooring Systems	1
N	EQ Credit 4.4	**Low-Emitting Materials -** Composite Wood & Agrifiber Products	1
N	EQ Credit 5	**Indoor Chemical & Pollutant Source Control**	1
N	EQ Credit 6.1	**Controllability of Systems -** Lighting	1
N	EQ Credit 6.2	**Controllability of Systems -** Thermal Comfort	1
N	EQ Credit 7.1	**Thermal Comfort -** Design	1
N	EQ Credit 7.2	**Thermal Comfort -** Verification	1
N	EQ Credit 8.1	**Daylight & Views -** Daylight	1
N	EQ Credit 8.2	**Daylight & Views -** Views	1

LEED for New Construction v3.0
Project Checklist

Project Title:	Group 3 UAS Operations Facility	Project Number:	P-606
Project Location:	CADC, MCAS Yuma, AZ	Prepared by:	GMH Associates
Facility Type	MOU Required Credits	Zip Code:	85365

Yes	?	No			
5	14	7		**Sustainable Sites**	**26** Points
Y			SS Prereq 1	**Construction Activity Pollution Prevention**	Required
1			SS Credit 1	**Site Selection**	1
	5		SS Credit 2	**Development Density & Community Connectivity**	5
		1	SS Credit 3	**Brownfield Redevelopment**	1
		6	SS Credit 4.	**Alternative Transportation -** Public Transportation Access	6
	1		SS Credit 4.:	**Alternative Transportation -** Bicycle Storage & Changing Rooms	1
	3		SS Credit 4.:	**Alternative Transportation -** Low-Emitting and Fuel-Efficient Vehicles	3
	2		SS Credit 4.·	**Alternative Transportation -** Parking Capacity	2
	1		SS Credit 5.	**Site Development -** Protect or Restore Habitat	1
	1		SS Credit 5.:	**Site Development -** Maximize Open Space	1
1			SS Credit 6.	**Stormwater Design -** Quantity Control	1
1			SS Credit 6.:	**Stormwater Design -** Quality Control	1
1			SS Credit 7.	**Heat Island Effect -**Nonroof	1
1			SS Credit 7.:	**Heat Island Effect -** Roof	1
	1		SS Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
6	4	0		**Water Efficiency**	10 Points
Y			WE Prereq 1	**Water Use Reduction**	Required
2	2		WE Credit 1	**Water Efficient Landscaping**	2 to 4
			2	Reduce by 50%	
	2		WE Credit 2	**Innovative Wastewater Technologies**	2
4			WE Credit 3	**Water Use Reduction**	2 to 4
			4	Reduce by 40%	

Yes	?	No			
14	19	2		**Energy & Atmosphere**	35 Points
Y			EA Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			EA Prereq 2	**Minimum Energy Performance**	Required
Y			EA Prereq 3	**Fundamental Refrigerant Management**	Required
7	12		EA Credit 1	**Optimize Energy Performance**	1 to 19
			7	Improved by 24% for New Buildings or 20% Existing Building Renovations	
3	4		EA Credit 2	**On-Site Renewable Energy**	1 to 7
			3	5% Renewable Energy	
2			EA Credit 3	**Enhanced Commissioning**	2
2			EA Credit 4	**Enhanced Refrigerant Management**	2
	3		EA Credit 5	**Measurement & Verification**	3
		2	EA Credit 6	**Green Power**	2

Yes	?	No			
4	10	0		**Materials & Resources**	**14** Points
Y			MR Prereq 1	**Storage & Collection of Recyclables**	Required
	3		MR Credit 1.	**Building Reuse**, Maintain Existing Walls, Floors & Roof	1 to 3
			0	Not Pursued	3
	1		MR Credit 1.	**Building Reuse**, Maintain Interior Nonstructural Elements	1
1	1		MR Credit 2	**Construction Waste Management**	1 to 2
			1	50% Recycled or Salvaged	2
	2		MR Credit 3	**Materials Reuse**	1 to 2
			0	Not Pursued	2

Yes	?	No			
2			MR Credit 4	**Recycled Content**	1 to 2
				2 — 20% of Content	2
	2		MR Credit 5	**Regional Materials**	1 to 2
				0 — Not Pursued	2
1			MR Credit 6	**Rapidly Renewable Materials**	1
	1		MR Credit 7	**Certified Wood**	1

Yes	?	No			
12	3	0		**Indoor Environmental Quality**	**15** Points
Y			EQ Prereq 1	**Minimum Indoor Air Quality Performance**	Required
Y			EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			EQ Credit 1	**Outdoor Air Delivery Monitoring**	1
1			EQ Credit 2	**Increased Ventilation**	1
1			EQ Credit 3.	**Construction Indoor Air Quality Management Plan -** During Construction	1
	1		EQ Credit 3.	**Construction Indoor Air Quality Management Plan -** Before Occupancy	1
1			EQ Credit 4.	**Low-Emitting Materials -** Adhesives & Sealants	1
1			EQ Credit 4.	**Low-Emitting Materials -** Paints & Coatings	1
1			EQ Credit 4.	**Low-Emitting Materials -** Flooring Systems	1
	1		EQ Credit 4.	**Low-Emitting Materials -** Composite Wood & Agrifiber Products	1
1			EQ Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			EQ Credit 6.	**Controllability of Systems -** Lighting	1
1			EQ Credit 6.	**Controllability of Systems -** Thermal Comfort	1
1			EQ Credit 7.	**Thermal Comfort -** Design	1
1			EQ Credit 7.	**Thermal Comfort -** Verification	1
1			EQ Credit 8.	**Daylight & Views -** Daylight	1
	1		EQ Credit 8.	**Daylight & Views -** Views	1

Yes	?	No			
5	1	0		**Innovation in Design**	6 Points
4	1		ID Credit 1	**Innovation in Design**	1 to 5
				1 — Innovation in Design: Moisture Control Plan	1
				1 — Innovation in Design: Bio-Based Products	2
				1 — **Innovation in Design**: Sustainability Education Program	3
				1 — **Innovation in Design**: Energy Star Appliances	4
				0 — **Innovation in Design**: Provide Specific Title	5
1			ID Credit 2	**LEED® Accredited Professional**	1

Yes	?	No			
4	0	0		**Regional Priority**	4 Points
4			Credit 1	**Regional Priority**	1 to 4
				1 — WE Credit 3 — Water Use Reduction	1
				1 — EA Credit 1 — Optimize Energy Performance	2
				1 — EA Credit 2 — On-Site Renewable Energy	3
				1 — MR Credit 2 — Construction Waste Management	4

Yes	?	No			
50	51	9		**Project Totals** **(Pre-certification estimates)**	110 Points

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

Notes:

Legend: Credits in **ORANGE** are required to be met at some level by policy or Federal mandate and must be achieved on all projects unless adequate justification can be provided to show that they are not life-cycle cost effective or not achievable due to geographic location, site or facility type.

Credits in **GREEN** are strategies recommended based on past NAVFAC project experience and can be changed based on project specifics.

Credits in **BLACK** are not mandated or recommended but should be considered for projects on a case-by-case basis.

LEED for New Construction v3.0
Project Cost Worksheet - MOU Required Credits

NAVFAC

Note: All costs are editable in this worksheet based on specific project information and requirements; changes can be made directly in Column P for unit costs or Column R if a lump sum cost is known.

Project Title:	Group 3 UAS Operations Facility	Year of Project:	2018
Project Number:	P-606	Cost of Primary Facility:	13,715,270
Project Location:	CADC, MCAS Yuma, AZ	Size of Primary Facility (m2):	4,268.43
Prepared By:	GMH Associates	Number of Occupants:	100

LEED Total Cost Less Than 4% of Primary Facility Cost

2.32

Sustainable Sites		Include in 1391	Modifications to Project 1391 Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Construction Activity Pollution Prevention**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 1	**Site Selection**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 2	**Development Density & Community Connectivity**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 3	**Brownfield Redevelopment**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4.1	**Alternative Transportation**, Public Transportation Access						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms						
	Cost Premiums Captured By GUC	Y	None	m2	0	0.00	0
Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 4.4	**Alternative Transportation**, Parking Capacity						
	Carpool and Vanpool Preferred Parking	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5.1	**Site Development,** Protect of Restore Habitat						
	Native Drought Resistant Plants	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5.2	**Site Development,** Maximize Open Space						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 6.1	**Stormwater Design,** Quantity Control						
	Increased Landscape Area	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Vegetated Roofs	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Pervious Surfaces	Y	Site LEED and Federal Energy Acts Compliance	m2	8,779	26.98	236,857
Credit 6.2	**Stormwater Design,** Quality Control						
	Subsurface Sand Filter System	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Sustainable Design Strategies: Low Impact Development	Y	Site LEED and Federal Energy Acts Compliance	m2	8,779	0.00	0
Credit 7.1	**Heat Island Effect,** Nonroof						
	Improved Design Reducing Heat Islands	N	Site LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
	High Albedo Material	N	Site LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
	Vegetated Roofs	N	Site LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
	Pervious Surfaces	Y	Site LEED and Federal Energy Acts Compliance	m2	8,779	0.00	0

		Include in 1391	Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Credit 7.2	**Heat Island Effect,** Roof						
	Highly Reflective Energy Star Roof Material	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 8	**Light Pollution Reduction**						
	Improved Design Reducing Light Pollution	Y	Site LEED and Federal Energy Acts Compliance	m2	0	0.77	0
	Light Pollution Reducing Fixtures	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0

Water Efficiency		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Pereq 1	**Water Use Reduction,** 20% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 1	**Water Efficient Landscaping,** Reduce by 50%						
	Native Drought Resistant Plants	Y	Site LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 1	**Water Efficient Landscaping,** No Potable Use or No Irrigation						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 2	**Innovative Wastewater Technologies**						
	Innovative Wastewater Technologies	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Water Use Reduction, 3**0% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	0	3.00	0
Credit 3	**Water Use Reduction,** 35% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Water Use Reduction,** 40% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0

Energy and Atmosphere		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Fundamental Commissioning of the Building Energy Systems**						
	Fundamental Building Systems Commissioning	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Prereq 2	**Minimum Energy Performance:** 10% New Bldgs or 5% Existing Bldg Renovations						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Prereq 3	**Fundamental Refrigerant Management**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 1	**Optimize Energy Performance**						
	Daylight Dimming Systems	Y	LEED and Federal Energy Acts Compliance	m2	0	64.19	0
	Occupancy Sensor Controls	Y	LEED and Federal Energy Acts Compliance	m2	0	12.00	0
	Premium Efficiency Motors	Y	LEED and Federal Energy Acts Compliance	m2	0	1.58	0
	Modulating Condensing Boilers	Y	LEED and Federal Energy Acts Compliance	m2	0	12.07	0
	High - Efficiency Chillers	Y	LEED and Federal Energy Acts Compliance	m2	0	21.67	0
	Variable Frequency Drive Cooling Tower Fans	Y	LEED and Federal Energy Acts Compliance	m2	0	19.25	0
	Energy Recovery Units	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Domestic Solar Hot Water	Y	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Air Barrier Construction	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 2	**On-Site Renewable Energy**						
	Photovoltaics	Y	LEED and Federal Energy Acts Compliance	m2	25	4786.59	119,665
Credit 3	**Enhanced Commissioning**						
	Enhanced Building Systems Commissioning	Y	LEED and Federal Energy Acts Compliance	m2	3,617	11.81	42,723
Credit 4	**Enhanced Refrigerant Management**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0

		Include in 1391	Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Credit 5	**Measurement & Verification**						
	Continuous Metering Equipment	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Measurement and Verification Plan	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 6	**Green Power**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0

Materials and Resources		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Storage & Collection of Recyclables**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 1.1	**Building Reuse**, Maintain 50% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.1	**Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.2	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 2	**Construction Waste Management**, Divert 50% from Disposal						
	Waste Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 2	**Construction Waste Management**, Divert 75% from Disposal						
	Waste Management Plan with additional measures	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Materials Reuse**, 5%						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 3	**Materials Reuse**, 10%						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)						
	Materials with Recycled Content	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 4	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)						
	Materials with Recycled Content at a higher level	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 5	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally						
	Materials Manufactured Regionally	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally						
	Materials Manufactured Regionally	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 6	**Rapidly Renewable Materials**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 7	**Certified Wood**						
	*Certified Wood Materials***	N	LEED and Federal Energy Acts Compliance	m2	0	1.00	0

Indoor Environmental Quality		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Minimum Indoor Air Quality Performance**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 1	**Outdoor Air Delivery Monitoring**						
	Carbon Dioxide Sensors	Y	LEED and Federal Energy Acts Compliance	m2	3,890	17.55	68,275
Credit 2	**Increased Ventilation**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0

Credit 3.1	**Construction IAQ Management Plan**, During Construction						
	Construction IAQ Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy						
	Pre-Occupancy IAQ Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	0	19.62	0
Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 4.2	**Low-Emitting Materials**, Paints & Coatings						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 4.3	**Low-Emitting Materials**, Flooring Systems						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products						
	Composite Wood & Agrifiber Products	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5	**Indoor Chemical & Pollutant Source Control**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 6.1	**Controllability of Systems**, Lighting						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 6.2	**Controllability of Systems**, Thermal Comfort						
	Thermal and Humidity Monitoring Systems	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 7.1	**Thermal Comfort**, Design						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 7.2	**Thermal Comfort**, Verification						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 8.1	**Daylight & Views**, Daylight						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 8.2	**Daylight & Views**, Views						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0

Innovation & Design Process		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Credit 1	**Innovation in Design**: Moisture Control Plan						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 1	**Innovation in Design**: Bio-Based Products						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	4,268	0.00	0
Credit 1	**Innovation in Design**: Sustainability Educational Program						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 1	**Innovation in Design**: Energy Star Appliances						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	4,268	0.00	0
Credit 1	**Innovation in Design**: Provide Specific Title						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 2	**LEED® Administration Costs**						
	LEED Project Registration	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0
	*LEED Certification**	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0
	LEED Documentation	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0

Total Marginal Cost = 3.41%

***Note:**

Users should go directly to the GBCI web site to obtain the latest cost for LEED Certification relevant for their project:

http://www.gbci.org/DisplayPage.aspx?CMSPageID=127

Cost values can be substituted directly into the appropriate rows in Column P to adjust project costs.

Purpose

This LID Workbook is a planning tool to assist the planning estimator in crafting credible LID costs as a component of project construction costs for 1391 budgetary purposes. During the project design stage, performance and/or prescriptive specifications will establish the actual LID features and amounts along with their associated costs.

Project Information

Project Number:	P-606	**Project Title:**	UAS Aviation Logistics Support Complex
Project Year:	2018	**Project Location:**	MCAS Yuma, AZ

LID Cost Prepared By: GMH Associates
Phone Number: 619-285-9885
Email Address: kathyv@gmhainc.com

Cost Information

$13,715,270 = **The Construction Cost Value (Before LID Costs)**

Entered cost must be equal to or greater than $1,000,000

Additional Cost Information

1.130	=	**Escalation Rate (%)**	**Unit costs, shown on the [Cost Calcs] page, are dated at Apr 2014**
1.08	=	**Area Cost Factor**	**Unit costs have an ACF of 1**

Site Information

Quantity	UM	Item
750	M	Site Width
450	M	Site Length

Existing Site Impervious Surfaces

Quantity	UM	Item
1,169	SM	Existing Building/s Foot Print/s
0	SM	Existing POV Parking Lot
0	SM	Existing Sidewalks
0	SM	Existing Access Road

25,000	SM	**Other Existing Hard Surface Areas**

New Building and New Impervious Surface Information (Used in the Cost Cals Worksheet)

Quantity	UM	Item
4,269	SM	**New Building Foot Print**
8,779	SM	**New POV Parking Lot**
26	M	**AT/FP building setback at the Front of the Building (Used in conjunction with the "Site Width" to determine area in front of the building available for LID features)**
26	M	**AT/FP building setback at the Side of the Building (Used in conjunction with the "Site Length" to determine area to one side of the building available for LID features)**

Post Construction Site Impervious Surfaces

Quantity	UM	Item
4,685	SM	Post Construction Building/s Foot Print/s
8,779	SM	Post Construction POV Parking Lot
669	SM	Post Construction Sidewalks
5,853	SM	Post Construction Access Road
7,154	SM	Other Post Construction Hard Surface Areas

Calculations (below) Based on Entered Information (No entries are required below)

337500.00	SM	Total Site Area
26168.73	SM	Total Existing Site Impervious Area
27139.45	SM	Total Post Construction Site Impervious Area

Overall Pervious-Areas Soil Characteristics: Soil Type and Soil Cover

When in doubt on a selection, gravitate towards the lower number

3 **Soil Classification Type: Enter at left the best assessment**

- **1 = Clay**
- **2 = Clay/silt (silty soil encompasses organic soils)**
- **3 = Silty sand (silty soil encompasses organic soils)**
- **4 = Sand**

1 **Soil Ground Cover Type: Enter at left the best assessment**

- **1 = Bare soil, no vegetative cover**
- **2 = Grassed area**
- **3 = Woods having light underbrush**
- **4 = Woods having heavy underbrush**

Summary Information For the LID Cost % Calc

7.75%	=	LID: The Existing Site Impervious Percentage
8.04%	=	LID: The Completed Project Site Impervious Percentage
-----------------------		
0.29%	=	LID: The Impervious Increase Percentage
3	=	Soil Classification Type
1	=	Soil Ground Cover Type

Quantity	UM	Item
337,500	SM	Site Area based on Width & Length
19,431	SM	Setback Area in Front of Building
476	SM	Setback Area to One Side of Building

LID Features & Premiums

$13,715,270 = **The PreFinal Construction Cost Value**

0.016% = **The LID Cost Percentage of the 1391 Subtotal Construction Cost**

$2,157 = **The LID % Cost Calc**

Cost	Include in 1391?	Item Name	Quantity	UM	Quantity Modifier	Unit Cost	Escalation Factor	ACF
$0	N	LID **Lump Sum** Cost	1	LS		$2,157		
$0	N	A LID **Add-In** Cost	1	LS		$0		

Itemized Listing — **Unit costs are dated at Apr 2014**

Cost	Include in 1391?	Item Name	Quantity	UM	Quantity Modifier	Apr 2014 Unit Cost	Escalation Escalation	ACF
$0	N	Bioretention Cells	575	SM		$232	1.130	1.08
		Bioretention Cells: Adj. Unit Cost = $0/SM						
$0	N	Dry Wells	0	EA		$4,110	1.130	1.08
		Dry Wells: Adj. Unit Cost = $0/EA						
$0	N	Filter Strips	19,431	SM	1.00	$10.86	1.130	1.08
		Filter Strips: Adj. Unit Cost = $0/SM						
$0	N	**Vegetated Buffers - Grass Buffers**	476	SM	1.00	$0.15	1.130	1.08
		Vegetated Buffers - Grass Buffers: Adj. Unit Cost = $0.00/SM						
$0	N	**Vegetated Buffers - Forest Buffers**	476	SM	1.00	$0.26	1.130	1.08
		Vegetated Buffers - Forest Buffers: Adj. Unit Cost = $0.00/SM						
$0	N	**Grassed Swales**	450	M	1.00	$138	1.130	1.08
		Grassed Swales: Adj. Unit Cost = $0/M						
$0	N	**Infiltration Trench/Basin**	450	M	1.00	$104	1.130	1.08
		Infiltration Trench/Basin: Adj. Unit Cost = $0/M						
$0	N	**Inlet Device**	5	EA		$3,376	1.130	1.08
		Inlet Device: Adj. Unit Cost = $0/EA						
$0	N	**Rain Barrels, Cisterns**	0	EA		$176	1.130	1.08
		Rain Barrels, Cisterns: Adj. Unit Cost = $0/EA						
$0	N	**Tree Box Filters**	4	EA		$10,341	1.130	1.08
		Tree Box Filters: Adj. Unit Cost = $0/EA						

$0	N	**Vegetated Rooftops**	0	SM	0.00	$545	1.130	1.08
		Vegetated Rooftops: Adj. Unit Cost = $0/SM						
$2,158	Y	**Permeable Pavement - Asphalt**	108	SM	0.01	$16.44	1.130	1.08
		Permeable Pavement - Asphalt: Adj. Unit Cost = $20/SM						
$0	N	**Permeable Pavement - Concrete**	8,779	SM	1.00	$103	1.130	1.08
		Permeable Pavement - Concrete: Adj. Unit Cost = $0/SM						
$0	N	**Permeable Pavement - Concrete Blocks**	8,779	SM	1.00	$164	1.130	1.08
		Permeable Pavement - Concrete Blocks: Adj. Unit Cost = $0/SM						
$0	N	**Permeable Pavement - Grass/Gravel Paver**	8,779	SM	1.00	$94	1.130	1.08
		Permeable Pavement - Grass/Gravel Paver: Adj. Unit Cost = $0/SM						
$0	N	**Constructed Wetland**	0	SM		$44.00	1.130	1.08
		Constructed Wetland: Adj. Unit Cost = $0.00/SM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						

$2,158 The Grand Total of LID Premium Costs Crafted on this page

1391 LID Cost Line Items

2018

Project Title: UAS Aviation Logistics Support Complex **Project Number: P-606**
Location: MCAS Yuma, AZ
Prepared by: GMH Associates

The PreFinal Construction Cost Value **$13,715,270**

ITEM	UM	QUANTITY	UNIT COST	TOTAL COST
LID Lump Sum Cost	LS	1	$0.00	$0
A LID Add-In Cost	LS	1	$0.00	$0
Bioretention Cells	SM	575	$0.00	$0
Dry Wells	EA	0	$0.00	$0
Filter Strips	SM	19,431	$0.00	$0
Vegetated Buffers - Grass Buffers	SM	476	$0.00	$0
Vegetated Buffers - Forest Buffers	SM	476	$0.00	$0
Grassed Swales	M	450	$0.00	$0
Infiltration Trench/Basin	M	450	$0.00	$0
Inlet Device	EA	5	$0.00	$0
Rain Barrels, Cisterns	EA	0	$0.00	$0
Tree Box Filters	EA	4	$0.00	$0
Vegetated Rooftops	SM	0	$0.00	$0
Permeable Pavement - Asphalt	SM	108	$20.06	$2,158
Permeable Pavement - Concrete	SM	8,779	$0.00	$0
Permeable Pavement - Concrete Blocks	SM	8,779	$0.00	$0
Permeable Pavement - Grass/Gravel Pavei	SM	8,779	$0.00	$0
Constructed Wetland	SM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0

TOTAL LID Premium Costs				**$2,158**

The LID Cost Percentage of the 1391 Subtotal Construction Cost **0.016%**

Cover Sheet/Team List for:

Project Title: Group 3 UAS Operations Facility **Project Number:** P604

Location: YUMA, ARIZONA **Date:** 21-MAY-15

Prepared By: MCAS YUMA AZ **FY:** 2018 **UIC:** M62974

Project Cost ($000)

13710

A. Team Check List: Completed: [ ] Working: [X]

B. Team Meeting: Date:

On-Site: [ ] VTC: [ ] Conference Call: [ ]

C. Team Members:

Name	Position	Command	Phone Number

D. Remarks:

E. Required Attachments:

- [ ] MILCON CHECKLIST
- [ ] Economic Analysis
- [ ] Site Plan
- [ ] Facility Planning Document(s)/P-80 Calculations
- [ ] R19 (Bachelor Housing Survey)
- [ ] Notice of Violation (NOV)
- [X] Other
- [ ] PHOTOGRAPHS
- [X]

F. Endorsements:

Signature	Position	Date

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 21 MAY 2015

3. Installation(SA) and Location/UIC: M62974(DA) MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	4. Project Title Group 3 UAS Operations Facility

5. Program Element	6. Category Code 21105	7. Project Number P604	8. Project Cost ($000) 13,710

9. COST ESTIMATES

Item	UM	Quantity	Unit Cost	Cost($000)
GROUP 3 UAS OPERATIONS FACILITY	LS			5,740
DETACHMENT OPERATIONS FACILITY CC21105 (5,000SF)	m2	464.51	3,569.48	(1,660)
SAPF (PREMIUM) CC14142	LS			(10)
COMMUNICATIONS LINE CC81232 (37,800LF)	m	11,521.44	199.78	(2,300)
RUNWAY, ENVIROTAC CC11110 (77,312SF)	m2	7,182.52	73.78	(530)
BUILT-IN EQUIPMENT	LS			(190)
SPECIAL COSTS	LS			(1,040)
SUSTAINABILITY AND ENERGY FEATURES	LS			(10)
SUPPORTING FACILITIES				5,660
PAVEMENT FACILITIES	LS			(240)
SITE PREPARATIONS	LS			(150)
SPECIAL FOUNDATION FEATURES	LS			(60)
PAVING AND SITE IMPROVEMENTS	LS			(2,850)
ELECTRICAL UTILITIES	LS			(1,920)
MECHANICAL UTILITIES	LS			(440)
SUBTOTAL				11,400
CONTINGENCY (10%)				1,140
TOTAL CONTRACT COST				12,540
SIOH (5.7%)				710
SUBTOTAL				13,250
DESIGN/BUILD - DESIGN COST (4%)				460
TOTAL REQUEST ROUNDED				13,710
TOTAL REQUEST				13,710
EQUIPMENT FROM OTHER APPROPRIATIONS (NON ADD)				(309)

Guidance Unit Cost Analysis

Cat Code	Facility	OSD Guid.	Guid. Cost	Guid. Size	Project Scope	Room Size Fctr	Size Fctr	Area Cost Fctr	Esc. Factor	Unit Cost
81232	COMMUNICATIONS LINE		172.69	11521.44 m	11521.44 m		1.0000	1.080	1.071155779	199.78
11110	RUNWAY, ENVIROTAC		63.78	7182.52 m2	7182.52 m2		1.0000	1.080	1.071155779	73.78
14142	SAPF (PREMIUM)		8,042.07	1 LS	1 LS		1.0000	1.000	1.000000000	8,042.07
21105	DETACHMENT OPERATIONS FACILITY		2,942.25	464.51 m2	464.51 m2		1.0000	1.080	1.123313659	3,569.48

For the Unmanned Aerial System (UAS) Hangar, the guidance unit costs (GUC) for category codes (CCN) 21105, 21106 and 21107 from Table of UFC 3-701-01, Change 6, were used. All

3. Installation(SA) and Location/UIC: M62974(DA) MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	4. Project Title Group 3 UAS Operations Facility

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
	21105	P604	13,710

costs were adjusted for the area cost factor for MCAS Yuma, AZ, the size factor (size) and were escalated to 1 October 2018 to reflect the projected one-year construction period. Then the costs for each CCN were averaged to create a composite CCN for the renovation.

CCN 21105: $2,546.00 x 1.275 (size) x 1.08 (ACF) x 1.1233137 (Escl) = $3,938.16.
$3,938.16 x 278.71 m2 = $1,097,604.63 construction cost
CCN 21106: $2,403.00 x 1 (size) x 1.08 (ACF) x 1.1233137 (Escl) = $2,915.27.
$2,915.27 x 92.90 m2 = $270,828.45 construction cost
CCN 21107: $2,569.78 x 1 (size) x 1.08 (ACF) x 1.1233137 (Escl) = $3,117.60.
$3,117.60 x 92.90 m2 = $289,625.27 construction cost
($1,097,604.63 + $270,828.45 + $289,625.27)/(278.71 + 92.9 + 92.9) = $3,569.48 UGUC

For CCN 81232 Communications Line, primary facilities costs are based upon an A-E cost estimate prepared by GMH Associates and C&G Engineering, dated March 2015. Unit costs were developed using R.S. Means 2015. All costs were adjusted for the area cost factor for MCAS Yuma, AZ and were escalated to 1 October 2018 to reflect the projected one-year construction period. $171.13 x 1.08 (ACF) x 1.0711558 = $199.78.

For CCN 11110 Runway, primary facilities costs are based upon an A-E cost estimate prepared by GMH Associates and J.B. Young & Associates, dated March 2015. Unit costs were developed using R.S. Means 2015. All costs were adjusted for the area cost factor for MCAS Yuma, AZ and were escalated to 1 October 2018 to reflect the projected one-year construction period. $63.78 x 1.08 (ACF) x 1.0711558 = $73.78.

10. Description of Proposed Construction:

Constructs a low-rise detachment operations facility for small unmanned aerial vehicle (UAV) maintenance and operational office space with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include maintenance space, work benches, administrative space, toilet room and supporting spaces.

Construct an expeditionary type runway to support small UAV launch and recover operations with Envirotac coating.

Construct a communication line extending from MCAS Yuma to the project site with fiber optic table, concrete handholes with traffic covers, and splice boxes.

Information systems include basic telephone, computer network, fiber optic, cable television, security and fire alarm systems and infrastructure.

This project will provide Anti-Terrorism/Force Protection (AT/FP) features and comply with AT/FP regulations, and physical security mitigation in accordance with DoD Minimum Anti-Terrorism Standards for Buildings. DoD Guidance Unit Costs and User Generated Unit Costs were used for this project. As such, the costs for specific AT/FP features are included in the unit costs.

Built-in Equipment includes an air compressor and aviation fire suppression system.

Special costs include Post Construction Contract Award Services (PCAS) and Arizona's Transaction Privilege Tax for Yuma County and the city of Yuma.

Special costs also include a Secure Access Program Facility (SAPF; including surveillance by Construction security Technicians and Cleared American Guards during secure space finish work in accordance with Intelligence Community guidance. Construction monitoring is required to observe the construction to ensure that there are no abnormalities that could affect and compromise the security of the SAPF.

Operations and Maintenance Support Information (OMSI) is included in this project.

Department of Defense and Department of the Navy principles for high performance and sustainable building requirements will be included in the design and construction of the project in accordance with federal laws and Executive Orders. Low Impact Development will be included in the design and construction of this project as appropriate.

SUPPORTING FACILITIES: Pavement facilities include a ground control station and launcher pad.

Site preparation includes site clearing, excavation, demolition of existing asphalt concrete and Portland concrete, and preparation for construction.

Special foundation features include structural fill.

Paving and Site Improvements include an equipment parking facility, roadways, 487.69 m2 of fencing, and air vehicle parking.

Electrical utilities include primary and secondary distribution systems, lighting, transformers, a 45KVA, 400 HZ frequency converter, lightning protection system, diesel generator, renewable energy systems and telecommunications infrastructure.

Mechanical utilities include heating, ventilation and air conditioning, plumbing and plumbing fixtures, water lines, septic tanks, and fire protection systems.

Facilities will be designed to meet or exceed the useful service life specified in DoD Unified Facility Criteria. Facilities will incorporate features that provide the lowest practical life cycle cost solutions satisfying the facility requirements with the goal of maximizing energy efficiency.

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 21 MAY 2015

3. Installation(SA) and Location/UIC: M62974(DA) MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	4. Project Title Group 3 UAS Operations Facility

5. Program Element	6. Category Code 21105	7. Project Number P604	8. Project Cost ($000) 13,710

11. Requirement: **Adequate:** **Substandard:**

FACILITY PLANNING DATA:

Category Code		Requirement	UM	Adequate	Substandard	Inadequate	Deficit/ Surplus
14142	AIR INTELLIGENCE SUPPORT CENTER	1	LS				
81232	UNDERGROUND ELECTRICAL DISTRIBUTION LINES	11521	m				
11110	RUNWAY / FIXED WING						
21105	MAINTENANCE HANGAR - OH SPACE (HIGH BAY)	9290	m2				

NOTES:

SCOPE:

The project scope was derived using Facility Planning for Navy and Marine Corps Shore Installations (UFC 2-000-05N, formerly known as P-80) based on criteria for category code number (CCN) 111-10 Runway, CCN 211-05 Aircraft Maintenance Hangar/OH Shop Space, CCN 211-06 Maintenance Hangar/01 Shop Space, CCN 211-07 Maintenance Hangar/01 Admin Space and CCN 852-10 POV Parking. Facility requirements were developed by Naval Air Systems Command (NAVAIR) in 2014 based on the equipment and personnel assigned to the squadron.

PROJECT:

Constructs a detachment operations facility support building, expeditionary runway and communication line to support VMU-1 training operations of small tactical unmanned aerial systems (STUAS).

(New Mission)

REQUIREMENT:

OVERVIEW:
These are new requirements for MCAS Yuma with the relocation of VMU-1 from Marine Corps Air Ground Combat Center (MCAGCC) 29 Palms to MCAS Yuma. Requirements are needed by FY 2020.

DETACHMENT OPERATIONS FACILITY:
Adequate facilities are required to support VMU-1 STUAS training operations in a remote location that is away from manned aircraft operations. VMU-1 operates the RQ-7B STUAS which requires a small expeditionary runway that has an overall length of approximately 1,280 lineal feet when including the arresting gear and net run-out areas. The runway is required to land and recover the RQ-7B after flight operations. The detachment operations facility support building is needed for preflight checks, tests and maintenance to ensure the STUAS mechanical and communications systems are fully operational.

CURRENT SITUATION:

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 21 MAY 2015

3. Installation(SA) and Location/UIC: M62974(DA) MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	4. Project Title Group 3 UAS Operations Facility

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
	21105	P604	13,710

Relocation of VMU-1 from MCAGCC 29 Palms to MCAS Yuma is a new requirement for the Air Station. Adequate expeditionary type training support facilities are not available at MCAS Yuma to support VMU-1 facility requirements. The closest training area to MCAS Yuma is nearly 40 miles to the east of the Air Station at the end of an undeveloped desert dirt road. The extreme remote location and poor condition of the roads cause excessive wear on all of the equipment and vehicles thereby increasing repair and maintenance costs and reducing operational readiness.

IMPACT IF NOT PROVIDED:

Without this project, VMU-1 will not have adequate remote training facilities to efficiently support the required training syllabus to conduct VMU operational requirements. Increased wear on the vehicles and personnel will reduce training time and increase costs.

ADDITIONAL: Economic Alternatives Considered:

A. Status Quo:

The status quo does not meet the requirement. This is not a viable option.

B. Renovation/Modernization:

There are no existing facilities to renovate to meet the requirement. This is not a viable option.

C. Lease:

N/A

D. New Construction:

New construction meets the requirement for detachment operations facilities to support VMU-1. This is the only viable alternative.

E. Other Alternatives:

N/A

F. Analysis Results:

New construction is the only viable alternative. A life cost analysis has not been performed at this time.

12. Supplemental Data:

Site Approval:

- [ ] Yes, obtained date:
- [x] No, expected date: 06/2015

Issues (If yes, please provide discussion under issue):

Yes	No	
	X	DDESB, AICUZ, Airfield, EMR, or wetlands
	X	Endangered species/sensitive habitat
	X	Air quality
	X	Cultural/archeological resources

3. Installation(SA) and Location/UIC: M62974(DA) MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	4. Project Title Group 3 UAS Operations Facility

5. Program Element	6. Category Code 21105	7. Project Number P604	8. Project Cost ($000) 13,710

	X	Clearing of trees
	X	Known contamination at selected site
	X	Operational problems
	X	Traffic patterns impact
	X	Existing utilities upgrade
	X	Ordnance sweep required prior to Construction

Planning (If no, please provide an explanation):

Yes	No	
X		Consistent w/ Master Plan or Base/Regional Dev.

Host Nation Approval: N/A

National Capital Region Approval: N/A

NEPA Documentation:

Yes	No	
	X	Complete

Level of NEPA:

Yes	No	
	X	Categorical Exclusion
X		Environmental Assessment(EA)
	X	Environmental Impact Statement(EIS)
	X	Memorandum of Negative Decision

Mitigation Issues:

Yes	No	
	X	Wetlands replacement/enhancement
	X	Hazardous waste
	X	Contaminated soil/water
	X	Other

Environmental Cleanup: N/A

Project Issues:

Yes	No	
	X	System safety
X		Soils - foundation and seismic conditions
	X	Construction/operational permits
	X	Local air quality/wastewater permits
	X	Complies with Final Governing Standard (Environmental standard for Spain, Italy & Greece)
	X	Land Acquisition (i.e. location, quantity)
	X	Technical Operating Manuals
	X	Feasibility/Constructibility in FY
	X	Historical Preservation
	X	Does the facility have an overhead crane requirement?

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 21 MAY 2015

3. Installation(SA) and Location/UIC: M62974(DA)	4. Project Title
MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	Group 3 UAS Operations Facility

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
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Yes	No	
	X	Navy Crane Center contacted to assist with dev. of crane estimate (lifting capacity < 10-tons)?
	X	Navy Crane Center contacted to coord. procurement and timelines (lifting capacity >= 10-tons)?

Yes	No	
X		Physical Security:

- [ ] Shielding
- [x] SCIF
- [x] Fencing
- [x] IDS
- [ ] Other Type:

BUDGET ESTIMATE SUMMARY SHEET:

Item	UM	Quantity	Unit Cost	Total Cost
BUILT-IN EQUIPMENT	LS			188,316
AFFF Fire Protection System	EA	65.00	1,874.52	121,844
Sound attenuation	m2	92.90	196.66	18,270
Compressed air system	EA	1.00	48,202.01	48,202
Special Construction Features:				
SPECIAL COSTS	LS			1,035,046
PCAS	EA	.01	11,287,380.40	112,874
Arizona Transaction Privilege Tax (8.412%)	LS	1	922,172.66	922,173
LEED AND EPACT 2005 COMPLIANCE (Inside)	LS			13,424
Enhanced building systems commissioning	m2	464.51	11.62	5,398
Carbon dioxide sensors	m2	464.51	17.28	8,027
Utilities and Site Improvements:				
PAVEMENT FACILITIES	LS			241,014
Ground control station	m2	929.03	172.95	160,676
Launcher pad	m2	464.52	172.95	80,339
SITE PREPARATIONS	LS			146,014
Site preparation, excavation and grading	m2	464.51	165.62	76,932
Site cleanup	m2	22000.56	3.14	69,082
SPECIAL FOUNDATION FEATURES	LS			64,683
Structural fill	m2	464.51	139.25	64,683
PAVING AND SITE IMPROVEMENTS	LS			2,851,867
Parking Facility, Equipment	m2	4830.96	317.07	1,531,752
Roads and other paving	m2	7896.76	144.12	1,138,081
Parking, air vehicle, reinforced concrete	m2	232.26	172.95	40,169
Fencing and rolling gates, chain link, 8'	m2	487.69	290.89	141,864
ELECTRICAL UTILITIES	LS			1,920,362
Concrete encased underground feeder	m	1005.84	552.18	555,405

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 21 MAY 2015

3. Installation(SA) and Location/UIC: M62974(DA) MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	4. Project Title Group 3 UAS Operations Facility

5. Program Element	6. Category Code 21105	7. Project Number P604	8. Project Cost ($000) 13,710

Item	UM	Quantity	Unit Cost	Total Cost
Electrical and telephone manholes	EA	24	16,067.34	385,616
150KVA pad-mounted transformer	EA	1	32,135.00	32,135
Comm concrete-encased underground ductbank	m	990.6	263.58	261,102
Cable TV, telephone and fiber optic cable	m	2971.8	164.01	487,405
Parking lot LED light fixtures, concrete base	EA	12	4,284.62	51,415
45KVA, 400HZ Frequency converter	EA	2	29,456.78	58,914
50KW Diesel emergency generator	EA	1	40,168.34	40,168
5 KW Photovoltaic system (LEED)	kw	5	4,284.62	21,423
Lightning protection system	EA	1	26,778.89	26,779
MECHANICAL UTILITIES	LS			441,746
Extend potable water/fire water service	m	792.48	481.73	381,761
Septic tanks, 1500 gal., and leach lines (300 LF)	EA	4	14,996.18	59,985

A. Estimated Design Data:

1. Status:
   - (A) Date design or Parametric Cost Estimate started
   - (B) Date 35% Design or Parametric Cost Estimate complete
   - (C) Date design completed
   - (D) Percent completed as of September 2016
   - (E) Percent completed as of January 2017
   - (F) Type of design contract
   - (G) Parametric Estimate used to develop cost
   - (H) Energy Study/Life Cycle Analysis performed
2. Basis:
   - (A) Standard or Definitive Design
   - (B) Where design was previously used
3. Total cost (C) = (A) + (B) = (D) + (E):
   - (A) Production of plans and specifications
   - (B) All other design costs
   - (C) Total $0
   - (D) Contract
   - (E) In-house
4. Contract award:
5. Construction start:
6. Construction complete:

B. Equipment associated with this project which will be provided from other appropriations:

1. Component NAVY	FY 2018 MILITARY CONSTRUCTION PROGRAM	2. Date 21 MAY 2015

3. Installation(SA) and Location/UIC: M62974(DA) MCAS YUMA AZ (CANNON AIR DEF COMPLEX) YUMA, ARIZONA	4. Project Title Group 3 UAS Operations Facility

5. Program Element	6. Category Code 21105	7. Project Number P604	8. Project Cost ($000) 13,710

Major Equipment	Funding Source	Fund Year	Installation Start-End Mo/Yr	Shakedown Start-End Mo/Yr	IOC Date Mo/Yr	Cost
Collateral Equipment	O&MMC	2018				278,434
Intrusion Detection System	PMC	2018				30,372

JOINT USE CERTIFICATION:

The (CERTIFYING OFFICIAL) certifies that this project has been considered for joint use potential. (TYPE OF CONSTRUCTION RECOMMENDED)is recommended. (UNILATERAL STATEMENT, if Unilateral Construction is selected)

Activity POC: Ronald L. Kruse Phone No: 928-269-3523

Attachments:

Other

			UNIT	TOTAL
P604, Group 3 UAS Operations Facility	QTY	UOM	COST	COST
PRIMARY FACILITIES				**$ 5,740.00**
UAS Hangar	464.51	m2	3,569	$ (1,660)
SAPF (Premium)	1.00	m2	8,042	$ (10)
Communications Line	11,521.44	m2	200	$ (2,300)
Runway, Envirotac	7,182.52	m2	74	$ (530)
Built-in Equipment	1	LS	188,316	$ (190)
Special Costs	1	LS	1,035,046	$ (1,040)
LEED and EPACT 2005 Compliance (Inside)	1	LS	13,424	$ (10)
SUPPORTING FACILITIES				**$ 5,660.00**
SPECIAL CONSTRUCTION	1	LS	-	$ -
PAVEMENT FEATURES	1	LS	241,013	$ (240)
SPECIAL FOUNDATION FEATURES	1	LS	64,683	$ (60)
SITE PREPARATIONS	1	LS	145,980	$ (150)
PAVING AND SITE IMPROVEMENTS	1	LS	2,851,914	$ (2,850)
SITE ELECTRICAL UTILITIES	1	LS	1,920,352	$ (1,920)
SITE CIVIL/MECHANICAL UTILITIES	1	LS	441,747	$ (440)
BUILDING DEMOLITION	1	LS	-	$ -
Sub-Total				**$ 11,400**
Contingency (10%)				$ 1,140
Total Contract Cost				**$ 12,540**
SIOH (5.7%)				$ 710
Sub-Total				**$ 13,250**
Contractor Design Cost (4%)				$ 460
Total Request				**$ 13,710**
Total Request Rounded				**$ 13,710**

Unit costs include General Contractor's Overhead and Profit.
Unit costs reflect the Area Cost Factor for MCAS Yuma, AZ.
UGUC for primary facilities derived from DoD/NAVFAC Guidance dated August 2013 and adjusted as indicated on Primary Facilities worksheet.
Supporting facilities costs were derived from an A-E estimate prepared with information received from the installation. Most unit costs are based upon RS Means 2015.

P604 Group 3 UAS Operations Facility
FY2018

	P604, Group 3 UAS Operations Facility					Escalation:	1.071155779
	PRIMARY FACILITIES						**$ 5,734,487**
21105	**UAS Hangar**		464.51	m2	$ 3,569.48	$ 1,658,058	
14142	**SAPF (Premium)**		1.00	LS	$ 8,042.07	$ 8,042	
81232	**Communications Line**		11,521.44	m	$ 199.77	$ 2,301,688	
11110	**Runway, Envirotac**		7,182.52	m2	$ 73.78	$ 529,913	
	Built-in Equipment						$ 188,316.08
		Sound Attenuation	92.90	m2	$ 196.66	$ 18,270	
		AFFF Fire Protection System	65.00	Ea.	$ 1,874.52	$ 121,844	
		Compressed Air System	1.00	Ea.	$ 48,202.01	$ 48,202	
	Special Costs						$ 1,035,045.70
		PCAS	1.00	LS	$ 112,873.03	$ 112,873	
		Arizona Transaction Privilege Tax (8.412%)	1.00	EA	$ 922,172.66	$ 922,173	
	LEED and EPACT 2005 Compliance (Inside)						$ 13,424.34
		Enhanced Building Systems Commissioning	464.51	m2	$ 11.62	$ 5,398	
		Carbon Dioxide Sensors	464.51	m2	$ 17.28	$ 8,027	
	SUPPORTING FACILITIES						**$ 5,665,689**
	PAVEMENT FEATURES						**$ 241,013**
		Ground control station	929.03	m2	$ 172.95	$ 160,675	
		Launcher pad	464.52	m2	$ 172.95	$ 80,338	

P604 Group 3 UAS Operations Facility
FY2018

	SPECIAL FOUNDATION FEATURES							**$**	**64,683**
		Structural fill	464.51	m2	$	139.25	$	64,683	
	SITE PREPARATIONS							**$**	**145,980**
		Site preparation, excavation and grading	464.51	m2	$	165.62	$	76,931	
		Site cleanup	22,000.56	m2	$	3.14	$	69,048	
	PAVING AND SITE IMPROVEMENTS							**$**	**2,851,914**
		Parking Facility, Equipment	4,830.96	m2	$	317.07	$	1,531,766	
		Roads and other Paving	7,896.76	m2	$	144.12	$	1,138,113	
		Air Vehicle Parking	232.26	m2	$	172.95	$	40,169	
		Fencing and rolling gates, chain link, 8'	487.69	m2	$	290.89	$	141,867	
	SITE ELECTRICAL UTILITIES							**$**	**1,920,352**
		Concrete Encased Underground Feeder	1,005.84	m	$	552.18	$	555,400	
		Electrical and telephone manholes	24.00	EA	$	16,067.34	$	385,616	
		150KVA, 12.47KV-208Y/120V, 3P, 4W Pad-Mtd Transformer, concrete pad, grounding & Testing	1.00	EA	$	32,134.67	$	32,135	
		Communications, Concrete Encased Underground Ductbank	990.60	m	$	263.58	$	261,102	
		Cable TV, telephone and fiber optic cable	2,971.80	m	$	164.01	$	487,400	
		Parking Lot LED Light Fixtures, Concrete Base,	12.00	EA	$	4,284.62	$	51,415	
		45KVA, 400Hz Frequency Converter	2.00	EA	$	29,456.78	$	58,914	
		Lightning Protection System	1.00	EA	$	26,778.89	$	26,779	
		50KW Diesel Emergency Generator, WP, ATS	1.00	EA	$	40,168.34	$	40,168	
		5 KW Photovoltaic System	5.00	KW	$	4,284.62	$	21,423	
	OUTSIDE COMMUNICATIONS							**$**	**-**
		0	-	m	$	-	$	-	
	SITE CIVIL/MECHANICAL UTILITIES							**$**	**441,747**
		Extend potable water/fire water service	792.48	m	$	481.73	$	381,762	
		Individual septic tanks (1,500 gal) and leach lines (300 LF)	4	EA	$	14,996.18	$	59,985	

P604 Group 3 UAS Operations Facility
FY2018

	P604, Group 3 UAS Operations Facility	ACF	1.08			
	PRIMARY FACILITIES					**$ 5,645,358**
21105	**UAS Hangar**	464.51	m2	$ 3,569.48	$ 1,658,058	
14142	**SAPF (Premium)**	1.00	LS	$ 8,042.07	$ 8,042	
81232	**Communications Line**	11,521.44	m	$ 199.77	$ 2,301,688	
11110	**Runway, Envirotac**	7,182.52	m2	$ 73.78	$ 529,913	
	Built-in Equipment					$ 175,806.44
	Sound Attenuation	92.90	m2	$ 183.60	$ 17,056	
	AFFF Fire Protection System	65.00	Ea.	$ 1,750.00	$ 113,750	
	Compressed Air System	1.00	Ea.	$ 45,000.00	$ 45,000	
	Special Costs					$ 958,426.21
	PCAS	1.00	LS	$ 97,512.53	$ 97,513	
	Arizona Transaction Privilege Tax (8.412%)	1.00	EA	$ 860,913.68	$ 860,914	
	LEED and EPACT 2005 Compliance (Inside)					$ 13,424.34
	Enhanced Building Systems Commissioning	464.51	m2	$ 11.62	$ 5,398	
	Carbon Dioxide Sensors	464.51	m2	$ 17.28	$ 8,027	
	SUPPORTING FACILITIES					**$ 5,064,320**
	PAVEMENT FEATURES					**$ 225,003**
	Ground control station	929.03	m2	$ 161.46	$ 150,001	
	Launcher pad	464.52	m2	$ 161.46	$ 75,001	

P604 Group 3 UAS Operations Facility
FY2018

	SPECIAL FOUNDATION FEATURES						**$ 60,386**
		Structural fill	464.51	m2	$ 130.00	$ 60,386	
	SITE PREPARATIONS						**$ 136,282**
		Site preparation, excavation and grading	464.51	m2	$ 154.62	$ 71,821	
		Site cleanup	22,000.56	m2	$ 2.93	$ 64,462	
	PAVING AND SITE IMPROVEMENTS						**$ 2,662,465**
		Parking Facility, Equipment	4,830.96	m2	$ 296.01	$ 1,430,012	
		Roads and other Paving	7,896.76	m2	$ 134.55	$ 1,062,509	
		Air Vehicle Parking	232.26	m2	$ 161.46	$ 37,501	
		Fencing and rolling gates, chain link, 8'	487.69	m2	$ 271.57	$ 132,442	
G40	**SITE ELECTRICAL UTILITIES**						**$ 1,792,785**
		Concrete Encased Underground Feeder	1,005.84	m	$ 515.50	$ 518,506	
		Electrical and telephone manholes	24.00	EA	$ 15,000.00	$ 360,000	
		150KVA, 12.47KV-208Y/120V, 3P, 4W Pad-Mtd Transformer, concrete pad, grounding & Testing	1.00	EA	$ 30,000.00	$ 30,000	
		Communications, Concrete Encased Underground Ductbank	990.60	m	$ 246.07	$ 243,757	
		Cable TV, telephone and fiber optic cable	2,971.80	m	$ 153.11	$ 455,022	
		Parking Lot LED Light Fixtures, Concrete Base,	12.00	EA	$ 4,000.00	$ 48,000	
		45KVA, 400Hz Frequency Converter	2.00	EA	$ 27,500.00	$ 55,000	
		Lightning Protection System	1.00	EA	$ 25,000.00	$ 25,000	
		50KW Diesel Emergency Generator, WP, ATS	1.00	EA	$ 37,500.00	$ 37,500	
		5 KW Photovoltaic System	5.00	KW	$ 4,000.00	$ 20,000	

P604 Group 3 UAS Operations Facility
FY2018

	OUTSIDE COMMUNICATIONS						**$ -**
		0	-	m	$ -	$ -	
G30	**SITE CIVIL/MECHANICAL UTILITIES**						**$ 412,402**
		Extend potable water/fire water service	792.48	m	$ 449.73	$ 356,402	
		Individual septic tanks (1,500 gal) and leach lines (300 LF)	4.00	EA	$ 14,000.00	$ 56,000	

P604 Group 3 UAS Operations Facility
FY2018

	Item			m2 Cost	Additional Fire Protection Engineering Requirements	Size Factor	ACF	Escalation	Subtotal	UGUC
UAS Hangar										
UAS Hangar		**464.51**	**m2**					**$ 3,569.48**	**1,658,058.35**	$ 3,569.48
21105	OH Space	278.71	m2	$ 2,546.00	0	1.275	**1.08**	1.1233137	$ 1,097,604.63	$ 3,938.16
21106	Shop Space	92.90	m2	$ 2,403.00	0	1	**1.08**	1.1233137	$ 270,828.45	$ 2,915.27
21107	Admin Space	92.90	m2	$ 2,569.78	0	1	**1.08**	1.1233137	$ 289,625.27	$ 3,117.60
81232	***Communications Line***	***11,521.44***	***m***	***$ 172.69***	***0***	***1***	***1.08***	**1.0711558**	***$ 2,301,688.18***	***$ 199.77***
11110	**Runway, Envirotac**	**7,182.52**	**m2**	**$ 63.78**	**0**	**1**	**1.08**	**1.0711558**	**$ 529,912.73**	**$ 73.78**
SAPF (Premium)		**1.00**	**LS**						**$ 8,042.07**	**$ 8,042.07**
	SAPF (Premium)	**4.65**	**m2**	**$ 1,614.59**		1	1	1.0711558	**$ 8,042.07**	**$ 1,729.48**
Sound Attenuation		92.90	m2	$ 170.00	0	1	1.08	1	$ 17,056.44	$ 183.60
Built-in Equipment										
	Elevator	0	ST	$ 50,000.00	0	1	1.08	1	$ -	$ 11.01
	AFFF Fire Protection System	65.00	Ea.	$ 1,750.00		1	1	1	$ 113,750.00	$ 1,750.00
	Compressed Air System	1.00	Ea.	$ 45,000.00		1	1	1	$ 45,000.00	$ 45,000.00

Activity:		Spec No:		Firm Name:				Sheet	of
Project Title:				**JB Young & Associates**					
MCAS Yuma (201501)		Estimator:						Date: March 18, 2015	
		Status of Design:							
P604 UAS Operations Facility, MCAS Yuma - CADC								Job No.:	
				Material	Material	Labor	Labor	Engineering	
Spec#	Description	Quantity	Unit	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total
CIVIL									
Site Preparation									
Runway, Envirotac		**7,182.52**	**m2**					**$ 63.78**	**$ 458,065.90**
	Grade Site Level	10,933.13	m3					$ 6.54	$ 71,503
	Runway, Envirotac	7,182.52	m2					$ 53.82	$ 386,563
Site preparation, excavation and grading		**464.51**	**m2**					**$ 143.16**	**$ 66,500.66**
	Site preparation and grading for hangar	278.71	m2					$ 107.64	$ 30,000
	Site preparation and grading for hangar shop space	92.90	m2					$ 107.64	$ 10,000
	Site preparation and grading for hangar admin space	92.90	m2					$ 107.64	$ 10,000
	Trenching, Backfill, Compaction for electrical utilit	167.64	m	$ 32.81	#####	$ 65.62	###	$ 98.43	$ 16,500.81
Parking Facility, Equipment		**4,830.96**	**m2**					**$ 296.01**	**$1,430,012.47**
	Site preparation and grading for equipment parking	4,830.96	m2					$ 107.64	$ 520,005
	AC pavement, 4", and aggregate base, 7"	4,830.96	m2					$ 161.46	$ 780,007
	Paint traffic control markings, striping, signs and bollards	4,830.96	m2					$ 26.91	$ 130,001
Roads and other Paving		**7,896.76**	**m2**					**$ 134.55**	**$ 1,062,509**
	Infill AC paving and aggregate base, 4" AC, 7" base	7,896.76	m2					$ 107.64	$ 850,007
	Paint markings and install traffic control signs and bollards	7,896.76	m2					$ 26.91	$ 212,502

	Individual septic tanks (1,500 gal) and leach lines (300 LF)	**4.00**	**EA**					**$14,000.00**	**$ 56,000**
Air Vehicle Parking		**232.26**	**m2**					**$ 161.46**	**$ 37,501**
	Prep and grade site level	232.26	m2					$ 53.82	$ 12,500
	Concrete foundation slabs, reinforced	232.26	m2					$ 107.64	$ 25,000
Fencing and rolling gates, chain link, 8'		**487.69**	**m2**					**$ 271.57**	**$ 132,442**
	Fence, chain link industrial, galvanized steel, 6 ga. wire, 2-1/2" posts @ 10' OC, 8' high, includes excavation, in concrete, excludes barbed wire	487.690	m2					$ 219.62	$ 107,106
	Fence, chain link industrial, rolling gate, 8' high, 20' opening, includes excavation, posts & hardware in concrete	5.000	EA					$ 5,067.20	$ 25,336
Ground control station		**929.03**	**m2**					**$ 161.46**	**$ 150,001**
	Prep and grade site level	929.03	m2					$ 53.82	$ 50,000
	Concrete foundation slabs, reinforced	929.03	m2					$ 107.64	$ 100,001
Launcher pad		**464.52**	**m2**					**$ 161.46**	**$ 75,001**
	Prep and grade site level	464.52	m2					$ 53.82	$ 25,000
	Concrete foundation slabs, reinforced	464.52	m2					$ 107.64	$ 50,001
Extend potable water/fire water service		**792.48**	**m**					**$ 416.42**	**$ 330,002.08**
	Extend potable/fire water service for OH Hangar	609.60	m					$ 492.13	$ 300,002
	Extend potable water/fire water service for Hangar shop	91.44	m					$ 164.04	$ 15,000
	Extend potable water/fire water service for Hangar shop	91.44	m					$ 164.04	$ 15,000
Total Civil for P604									**$ 3,403,090**
Not used									
	Concrete foundation slab, reinforced	*278.71*	*m2*					*$ 161.46*	*$ 45,001*
	Concrete foundation slab, reinforced	*92.90*	*m2*					*$ 53.82*	*$ 5,000*
	Concrete foundation slab, reinforced	*92.90*	*m2*					*$ 53.82*	*$ 5,000*
									$ 3,458,090

Activity:	Spec No:		Firm Name:				Sheet	of
Project Title:			**C&G Engineering, Inc.**					
VMU-1 Planning	Estimator:		**C. Zuniga**				Date: March 17, 2015	
MCAS Yuma AZ	Status of Design:							
							Job No.: 008-15-101	
Project 3 (Cannon)								
Spec# Description	Quantity	Unit	Material Unit Cost	Material Total	Labor Unit Cost	Labor Total	Engineering Unit Cost	Total
ELECTRICAL SUPPORTING FACILITIES COSTS								
Trenching, Backfill, Compaction for electrical utilitie:	1,996.44	m	$ 32.81	$ 65,503	$ 65.62	$ 131,006	$ 98.43	$ 196,509.59
Concrete Encased Underground Feeder	**1,005.84**	**m**					**$ 515.50**	**$ 518,505.64**
12KV, Concrete Encased Underground Feeder	975.36	m	$ 262.47	$ 256,003	$ 262.47	$ 256,003	$ 524.94	$ 512,005.48
250V, Concrete Encased Underground Feeders	30.48	m	$ 114.83	$ 3,500	$ 98.43	$ 3,000	$ 213.26	$ 6,500.16
Electrical and telephone manholes	**24.00**	**EA**					**$ 15,000.00**	**$ 360,000.00**
Electrical Manholes	12	EA	$ 8,000.00	$ 96,000	$ 7,000.00	$ 84,000	$ 15,000.00	$ 180,000.00
Telephone Manholes	12	EA	$ 8,000.00	$ 96,000	$ 7,000.00	$ 84,000	$ 15,000.00	$ 180,000.00
150KVA, 12.47KV-208Y/120V, 3P, 4W Pad-Mtd Transformer, concrete pad, grounding & Testing	**1**	**EA**	**$ 20,000.00**	**$ 20,000**	**$ 10,000.00**	**$ 10,000**	**$ 30,000.00**	**$ 30,000.00**
Communications, Concrete Encased Underground Ductbank	**990.60**	**m**	**$ 98.43**	**$ 97,505**	**$ 147.64**	**$ 146,252**	**$ 246.07**	**$ 243,756.94**
Cable TV, telephone and fiber optic cable	**2,971.80**	**m**					**$ 153.11**	**$ 455,022.20**
50 Pair Base Telephone Cable	990.60	m	$ 65.62	$ 65,003	$ 65.62	$ 65,003	$ 131.24	$ 130,006.34
24 Fiber Optic Cable	990.60	m	$ 98.43	$ 97,505	$ 98.43	$ 97,505	$ 196.86	$ 195,009.52
Cable TV	990.60	m	$ 65.62	$ 65,003	$ 65.62	$ 65,003	$ 131.24	$ 130,006.34
Parking Lot LED Light Fixtures, Concrete Base,	**10**	**EA**	**$ 1,750.00**	**$ 17,500**	**$ 2,250.00**	**$ 22,500**	**$ 4,000.00**	**$ 40,000.00**
Conduit, Wiring, Trenching								

45KVA, 400Hz Frequency Converter	**2**	**EA**	**$ 20,000.00**	**$ 40,000**	**$ 7,500.00**	**$ 15,000**	**$ 27,500.00**	**$ 55,000.00**
Lightning Protection System	**1**	**EA**	**$ 10,000.00**	**$ 10,000**	**$ 15,000.00**	**$ 15,000**	**$ 25,000.00**	**$ 25,000.00**
50KW Diesel Emergency Generator, WP, ATS	**1**	**EA**	**$ 30,000.00**	**$ 30,000**	**$ 7,500.00**	**$ 7,500**	**$ 37,500.00**	**$ 37,500.00**
5 KW Photovoltaic System	**5**	**KW**	**$ 3,000.00**	**$ 15,000**	**$ 1,000.00**	**$ 5,000**	**$ 4,000.00**	**$ 20,000.00**
New Comm Line from MCAS to Cannon	**11,521.44**	**m**					**$ 172.69**	**$ 1,989,619.82**
Directional Drilling	121.92	m	$ 114.83	$ 14,000	$ 82.02	$ 10,000	$ 196.85	$ 23,999.95
5" PVC Sch 40 Conduit with 4 Inner-Ducts	11,521.44	m	$ 52.49	$ 604,760	$ 32.81	$ 378,018	$ 85.30	$ 982,778.83
Trenching, Backfill, Compaction, Markers	11,521.44	m	$ 16.40	$ 188,952	$ 16.40	$ 188,952	$ 32.80	$ 377,903.23
288 Bundle Fiber Optic Cable	11,521.44	m	$ 19.69	$ 226,857	$ 6.56	$ 75,581	$ 26.25	$ 302,437.80
4' x 4' Concrete Handholes with Traffic Cover	100	EA	$ 1,600.00	$ 160,000	$ 825.00	$ 82,500	$ 2,425.00	$ 242,500.00
4 x 6 Splice Box	30	EA	$ 1,000.00	$ 30,000	$ 1,000.00	$ 30,000	$ 2,000.00	$ 60,000.00
Total								
Tax 7.5%								
Bound 1%								
General Conditions 2%								
Overhead & Profit 15%								
TOTAL ELECTRICAL				**$ 2,133,588**		**$ 1,640,817**		**$ 3,970,914**

COLLATERAL EQUIPMENT
For P604, Group 3 UAS Operations Facility

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

The cost of FF&E is based on a square footage price taken from the Tri Services Cost Estimating Guide May 2013 for a specific facility. The square footage cost will be projected in the spreadsheet when you enter the fiscal year of your project. Fill in the highlighted areas for as many facilities as you have in your project. This cost does not include shop equipment or equipment not considered FF&E. The PM and user should formulate a seperate list for those items.

Shop and station funded equipment costs should be entered for the fiscal year; no inflation factor has been added. Also, costs shouldn't include installation, shipping and contingency;they will be added at the bottom of the spreadsheet.

Enter the project Fiscal Year: 2018

	Facility Unit Cost ($)	Facility Size (SF)	Subtotal
Facility 1	34	5,000	$ 170,857
Facility 2			$ -
Facility 3			$ -
Facility 4			
Facility 5			
Facility 6			
Facility 7			
Facility 8			
Facility 9			
Facility 10			

Subtotal FF&E: $ 170,857

SHOP TYPE AND STATION FUNDED EQUIPMENT

Audio / Visual Equipment

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
A/V Equipment for Conference/Briefing Rooms	5,000	SF	$ 5.58	$27,916

Subtotal Audio / Visual Equipment: $ 27,916
Subtotal Photographic Equipment: $ -

Physical Security Equipment (PSE)

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
Intrusion Detection System	0	EA	$ 21,682	$ -

Subtotal Physical Security Equipment (PSE $ -

COLLATERAL EQUIPMENT
For P604, Group 3 UAS Operations Facility

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

Subtotal FF&E:	$	170,857
Subtotal Shop and Station Equipment:	$	27,916
Total FF&E, Shop and Station Equipment:	$	198,773
Area Cost Factor	$	214,675
Installation (13%):	$	27,908
Shipping (6%):	$	12,881
SIOH (5.7%):	$	12,236
Contingency (5%):	$	10,734
Total Collateral Equipment:	$	278,434

COLLATERAL EQUIPMENT
For P604, Group 3 UAS Operations Facility

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

The cost of FF&E is based on a square footage price taken from the Tri Services Cost Estimating Guide May 2013 for a specific facility. The square footage cost will be projected in the spreadsheet when you enter the fiscal year of your project. Fill in the highlighted areas for as many facilities as you have in your project. This cost does not include shop equipment or equipment not considered FF&E. The PM and user should formulate a seperate list for those items.

Shop and station funded equipment costs should be entered for the fiscal year; no inflation factor has been added. Also, costs shouldn't include installation, shipping and contingency;they will be added at the bottom of the spreadsheet.

Enter the project Fiscal Year: 2018

	Facility Unit Cost ($)	Facility Size (SF)	Subtotal
Facility 1	34	-	$ -
Facility 2			$ -
Facility 3			$ -
Facility 4			
Facility 5			
Facility 6			
Facility 7			
Facility 8			
Facility 9			
Facility 10			

Subtotal FF&E: $ -

SHOP TYPE AND STATION FUNDED EQUIPMENT

Audio / Visual Equipment

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
A/V Equipment for Conference/Briefing Rooms	-	SF	$ 5.58	$0

Subtotal Audio / Visual Equipment: $ -
Subtotal Photographic Equipment: $ -

Physical Security Equipment (PSE)

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
Intrusion Detection System	1	EA	$ 21,682	$ 21,682

Subtotal Physical Security Equipment (PSE $ 21,682

COLLATERAL EQUIPMENT
For P604, Group 3 UAS Operations Facility

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

Subtotal FF&E:	$	-
Subtotal Shop and Station Equipment:	$	21,682
Total FF&E, Shop and Station Equipment:	$	21,682
Area Cost Factor	$	23,417
Installation (13%):	$	3,044
Shipping (6%):	$	1,405
SIOH (5.7%):	$	1,335
Contingency (5%):	$	1,171
Total Collateral Equipment:	$	30,372

Naval Facilities Engineering Command
LEED for New Construction v3.0 Workbook
Cover Sheet

Purpose

The Navy LEED for New Construction v3.0 Workbook is a planning tool to assist the area planners in adjusting primary facility unit costs to account for acquiring LEED Certification credits by facility type. This workbook is a tool which assists in preliminary program budgeting establishing a viable assessment of LEED credits to be incorporated into the project. This workbook will allow LEED points to be assigned and determine a preliminary budget. It should only be used as a benchmark to assess basis of programming costs until further study, design & RFP development sessions and performance / prescriptive specifications are prepared by experienced professionals.

Project Information

Project Number:	P-604	Project Title:	Group 3 UAS Operations Facility
Project Year:	2022	Project Location:	CADC, MCAS Yuma, AZ
Zip Code:	85365	Facility Type:	MOU Required Credits

Primary Facility Information

Cost of Primary Facility ($):	$11,365,329
Size of Primary Facility (m2):	464.51
Number of Occupants:	10

Additional Cost Information

Area Cost Factor:	1.08
Escalation Rate (%):	111.87%

LEED Checklist Prepared By: GMH Associates

LEED for New Construction v3.0
Regional Credits Worksheet

[Click here to visit the USGBC site containing information on regional credits for your project.]

Search the database by zip code to identify which LEED credits are regional priorities for your project. If your zip code does not exist in the database, find the nearest large city to determine appropriate regional credits. Indicate which credits are a priority for your region using the drop-down menus in the pink cells and setting the four most likely credits to "Y". These will then be factored into your expected building score on the project's LEED Checklist. If you set more than four credits to "Y", the worksheet will only use the first four credits indicated.

Project Title:	Group 3 UAS Operations Facility	Project Number:	P-604
Project Location:	CADC, MCAS Yuma, AZ	Prepared by:	GMH Associates
Facility Type:	MOU Required Credits	Zip Code:	85365

Regional Priority?			
		Sustainable Sites	**26** Points
	SS Prereq 1	**Construction Activity Pollution Prevention**	Required
N	SS Credit 1	**Site Selection**	1
N	SS Credit 2	**Development Density & Community Connectivity**	5
N	SS Credit 3	**Brownfield Redevelopment**	1
N	SS Credit 4.1	**Alternative Transportation -** Public Transportation Access	6
N	SS Credit 4.2	**Alternative Transportation -** Bicycle Storage & Changing Rooms	1
N	SS Credit 4.3	**Alternative Transportation -** Low-Emitting and Fuel-Efficient Vehicles	3
N	SS Credit 4.4	**Alternative Transportation -** Parking Capacity	2
N	SS Credit 5.1	**Site Development -** Protect or Restore Habitat	1
N	SS Credit 5.2	**Site Development -** Maximize Open Space	1
N	SS Credit 6.1	**Stormwater Design -** Quantity Control	1
N	SS Credit 6.2	**Stormwater Design -** Quality Control	1
N	SS Credit 7.1	**Heat Island Effect -**Nonroof	1
N	SS Credit 7.2	**Heat Island Effect -** Roof	1
N	SS Credit 8	**Light Pollution Reduction**	1
		Water Efficiency	10 Points
	WE Prereq 1	**Water Use Reduction**	Required
N	WE Credit 1	**Water Efficient Landscaping**	2 to 4
N	WE Credit 2	**Innovative Wastewater Technologies**	2
Y	WE Credit 3	**Water Use Reduction**	2 to 4
		Energy & Atmosphere	35 Points
	EA Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
	EA Prereq 2	**Minimum Energy Performance**	Required
	EA Prereq 3	**Fundamental Refrigerant Management**	Required
Y	EA Credit 1	**Optimize Energy Performance**	1 to 19
Y	EA Credit 2	**On-Site Renewable Energy**	1 to 7
N	EA Credit 3	**Enhanced Commissioning**	2
N	EA Credit 4	**Enhanced Refrigerant Management**	2
N	EA Credit 5	**Measurement & Verification**	3
N	EA Credit 6	**Green Power**	2

continued…

		Materials & Resources	14 Points
	MR Prereq 1	**Storage & Collection of Recyclables**	Required
N	MR Credit 1.1	**Building Reuse**, Maintain Existing Walls, Floors & Roof	1 to 3
N	MR Credit 1.2	**Building Reuse**, Maintain Interior Nonstructural Elements	1
Y	MR Credit 2	**Construction Waste Management**	1 to 2
N	MR Credit 3	**Materials Reuse**	1 to 2
N	MR Credit 4	**Recycled Content**	1 to 2
N	MR Credit 5	**Regional Materials**	1 to 2
N	MR Credit 6	**Rapidly Renewable Materials**	1
N	MR Credit 7	**Certified Wood**	1

		Indoor Environmental Quality	15 Points
	EQ Prereq 1	**Minimum Indoor Air Quality Performance**	Required
	EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
N	EQ Credit 1	**Outdoor Air Delivery Monitoring**	1
N	EQ Credit 2	**Increased Ventilation**	1
N	EQ Credit 3.1	**Construction Indoor Air Quality Management Plan -** During Construction	1
N	EQ Credit 3.2	**Construction Indoor Air Quality Management Plan -** Before Occupancy	1
N	EQ Credit 4.1	**Low-Emitting Materials -** Adhesives & Sealants	1
N	EQ Credit 4.2	**Low-Emitting Materials -** Paints & Coatings	1
N	EQ Credit 4.3	**Low-Emitting Materials -** Flooring Systems	1
N	EQ Credit 4.4	**Low-Emitting Materials -** Composite Wood & Agrifiber Products	1
N	EQ Credit 5	**Indoor Chemical & Pollutant Source Control**	1
N	EQ Credit 6.1	**Controllability of Systems -** Lighting	1
N	EQ Credit 6.2	**Controllability of Systems -** Thermal Comfort	1
N	EQ Credit 7.1	**Thermal Comfort -** Design	1
N	EQ Credit 7.2	**Thermal Comfort -** Verification	1
N	EQ Credit 8.1	**Daylight & Views -** Daylight	1
N	EQ Credit 8.2	**Daylight & Views -** Views	1

LEED for New Construction v3.0
Project Checklist

Project Title:	Group 3 UAS Operations Facility	Project Number:	P-604
Project Location:	CADC, MCAS Yuma, AZ	Prepared by:	GMH Associates
Facility Type	MOU Required Credits	Zip Code:	85365

Yes	?	No			
3	16	7		**Sustainable Sites**	**26** Points
Y			SS Prereq 1	**Construction Activity Pollution Prevention**	Required
1			SS Credit 1	**Site Selection**	1
	5		SS Credit 2	**Development Density & Community Connectivity**	5
		1	SS Credit 3	**Brownfield Redevelopment**	1
		6	SS Credit 4.	**Alternative Transportation -** Public Transportation Access	6
	1		SS Credit 4.	**Alternative Transportation -** Bicycle Storage & Changing Rooms	1
	3		SS Credit 4.	**Alternative Transportation -** Low-Emitting and Fuel-Efficient Vehicles	3
	2		SS Credit 4.	**Alternative Transportation -** Parking Capacity	2
	1		SS Credit 5.	**Site Development -** Protect or Restore Habitat	1
	1		SS Credit 5.	**Site Development -** Maximize Open Space	1
	1		SS Credit 6.	**Stormwater Design -** Quantity Control	1
	1		SS Credit 6.	**Stormwater Design -** Quality Control	1
1			SS Credit 7.	**Heat Island Effect -**Nonroof	1
1			SS Credit 7.	**Heat Island Effect -** Roof	1
	1		SS Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
6	4	0		**Water Efficiency**	10 Points
Y			WE Prereq 1	**Water Use Reduction**	Required
2	2		WE Credit 1	**Water Efficient Landscaping**	2 to 4
				2 Reduce by 50%	
	2		WE Credit 2	**Innovative Wastewater Technologies**	2
4			WE Credit 3	**Water Use Reduction**	2 to 4
				4 Reduce by 40%	

Yes	?	No			
14	19	2		**Energy & Atmosphere**	35 Points
Y			EA Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			EA Prereq 2	**Minimum Energy Performance**	Required
Y			EA Prereq 3	**Fundamental Refrigerant Management**	Required
7	12		EA Credit 1	**Optimize Energy Performance**	1 to 19
				7 Improved by 24% for New Buildings or 20% Existing Building Renovations	
3	4		EA Credit 2	**On-Site Renewable Energy**	1 to 7
				3 5% Renewable Energy	
2			EA Credit 3	**Enhanced Commissioning**	2
2			EA Credit 4	**Enhanced Refrigerant Management**	2
	3		EA Credit 5	**Measurement & Verification**	3
		2	EA Credit 6	**Green Power**	2

Yes	?	No			
4	10	0		**Materials & Resources**	**14** Points
Y			MR Prereq 1	**Storage & Collection of Recyclables**	Required
	3		MR Credit 1.	**Building Reuse**, Maintain Existing Walls, Floors & Roof	1 to 3
				0 Not Pursued	3
	1		MR Credit 1.	**Building Reuse**, Maintain Interior Nonstructural Elements	1
1	1		MR Credit 2	**Construction Waste Management**	1 to 2
				1 50% Recycled or Salvaged	2
	2		MR Credit 3	**Materials Reuse**	1 to 2
				0 Not Pursued	2

Yes	?	No	Credit	Title	Points
2			MR Credit 4	**Recycled Content**	1 to 2
			2	20% of Content	2
	2		MR Credit 5	**Regional Materials**	1 to 2
			0	Not Pursued	2
1			MR Credit 6	**Rapidly Renewable Materials**	1
	1		MR Credit 7	**Certified Wood**	1
Yes	**?**	**No**			
12	3	0		**Indoor Environmental Quality**	**15** Points
Y			EQ Prereq 1	**Minimum Indoor Air Quality Performance**	Required
Y			EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			EQ Credit 1	**Outdoor Air Delivery Monitoring**	1
1			EQ Credit 2	**Increased Ventilation**	1
1			EQ Credit 3.	**Construction Indoor Air Quality Management Plan -** During Construction	1
	1		EQ Credit 3.	**Construction Indoor Air Quality Management Plan -** Before Occupancy	1
1			EQ Credit 4.	**Low-Emitting Materials -** Adhesives & Sealants	1
1			EQ Credit 4.	**Low-Emitting Materials -** Paints & Coatings	1
1			EQ Credit 4.	**Low-Emitting Materials -** Flooring Systems	1
	1		EQ Credit 4.	**Low-Emitting Materials -** Composite Wood & Agrifiber Products	1
1			EQ Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			EQ Credit 6.	**Controllability of Systems -** Lighting	1
1			EQ Credit 6.	**Controllability of Systems -** Thermal Comfort	1
1			EQ Credit 7.	**Thermal Comfort -** Design	1
1			EQ Credit 7.	**Thermal Comfort -** Verification	1
1			EQ Credit 8.	**Daylight & Views -** Daylight	1
	1		EQ Credit 8.	**Daylight & Views -** Views	1
Yes	**?**	**No**			
5	1	0		**Innovation in Design**	6 Points
4	1		ID Credit 1	**Innovation in Design**	1 to 5
			1	Innovation in Design: Moisture Control Plan	1
			1	Innovation in Design: Bio-Based Products	2
			1	**Innovation in Design**: Sustainability Education Program	3
			1	**Innovation in Design**: Energy Star Appliances	4
			0	**Innovation in Design**: Provide Specific Title	5
1			ID Credit 2	**LEED® Accredited Professional**	1
Yes	**?**	**No**			
4	0	0		**Regional Priority**	4 Points
4			Credit 1	**Regional Priority**	1 to 4
			1	WE Credit 3 — Water Use Reduction	1
			1	EA Credit 1 — Optimize Energy Performance	2
			1	EA Credit 2 — On-Site Renewable Energy	3
			1	MR Credit 2 — Construction Waste Management	4
Yes	**?**	**No**			
48	53	9		**Project Totals (Pre-certification estimates)**	110 Points

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

Notes:

Legend: Credits in **ORANGE** are required to be met at some level by policy or Federal mandate and must be achieved on all projects unless adequate justification can be provided to show that they are not life-cycle cost effective or not achievable due to geographic location, site or facility type.

Credits in **GREEN** are strategies recommended based on past NAVFAC project experience and can be changed based on project specifics.

Credits in **BLACK** are not mandated or recommended but should be considered for projects on a case-by-case basis.

LEED for New Construction v3.0
Project Cost Worksheet - MOU Required Credits

Note: All costs are editable in this worksheet based on specific project information and requirements; changes can be made directly in Column P for unit costs or Column R if a lump sum cost is known.

Project Title:	Group 3 UAS Operations Facility	Year of Project:	2022
Project Number:	P-604	Cost of Primary Facility:	11,365,329
Project Location:	CADC, MCAS Yuma, AZ	Size of Primary Facility (m2):	464.51
Prepared By:	GMH Associates	Number of Occupants:	10

LEED Total Cost Less Than 4% of Primary Facility Cost

2.29

Sustainable Sites		Include in 1391	Modifications to Project 1391 Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Construction Activity Pollution Prevention**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 1	**Site Selection**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 2	**Development Density & Community Connectivity**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 3	**Brownfield Redevelopment**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4.1	**Alternative Transportation**, Public Transportation Access						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms						
	Cost Premiums Captured By GUC	Y	None	m2	0	0.00	0
Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 4.4	**Alternative Transportation**, Parking Capacity						
	Carpool and Vanpool Preferred Parking	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5.1	**Site Development,** Protect of Restore Habitat						
	Native Drought Resistant Plants	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5.2	**Site Development,** Maximize Open Space						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 6.1	**Stormwater Design,** Quantity Control						
	Increased Landscape Area	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Vegetated Roofs	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Pervious Surfaces	N	Site LEED and Federal Energy Acts Compliance	m2	0	26.98	0
Credit 6.2	**Stormwater Design,** Quality Control						
	Subsurface Sand Filter System	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Sustainable Design Strategies: Low Impact Development	Y	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 7.1	**Heat Island Effect,** Nonroof						
	Improved Design Reducing Heat Islands	N	Site LEED and Federal Energy Acts Compliance	m2	465	0.00	0
	High Albedo Material	N	Site LEED and Federal Energy Acts Compliance	m2	465	0.00	0
	Vegetated Roofs	N	Site LEED and Federal Energy Acts Compliance	m2	465	0.00	0
	Pervious Surfaces	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0

Credit 7.2	**Heat Island Effect,** Roof						
	Highly Reflective Energy Star Roof Material	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 8	**Light Pollution Reduction**						
	Improved Design Reducing Light Pollution	Y	Site LEED and Federal Energy Acts Compliance	m2	0	0.76	0
	Light Pollution Reducing Fixtures	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0

Water Efficiency		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Water Use Reduction,** 20% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 1	**Water Efficient Landscaping,** Reduce by 50%						
	Native Drought Resistant Plants	Y	Site LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 1	**Water Efficient Landscaping,** No Potable Use or No Irrigation						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 2	**Innovative Wastewater Technologies**						
	Innovative Wastewater Technologies	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Water Use Reduction, 3**0% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	0	2.95	0
Credit 3	**Water Use Reduction,** 35% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Water Use Reduction,** 40% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0

Energy and Atmosphere		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Fundamental Commissioning of the Building Energy Systems**						
	Fundamental Building Systems Commissioning	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Prereq 2	**Minimum Energy Performance:** 10% New Bldgs or 5% Existing Bldg Renovations						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Prereq 3	**Fundamental Refrigerant Management**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 1	**Optimize Energy Performance**						
	Daylight Dimming Systems	Y	LEED and Federal Energy Acts Compliance	m2	0	63.18	0
	Occupancy Sensor Controls	Y	LEED and Federal Energy Acts Compliance	m2	0	11.81	0
	Premium Efficiency Motors	Y	LEED and Federal Energy Acts Compliance	m2	0	1.56	0
	Modulating Condensing Boilers	Y	LEED and Federal Energy Acts Compliance	m2	0	11.88	0
	High - Efficiency Chillers	Y	LEED and Federal Energy Acts Compliance	m2	0	21.33	0
	Variable Frequency Drive Cooling Tower Fans	Y	LEED and Federal Energy Acts Compliance	m2	0	18.95	0
	Energy Recovery Units	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Domestic Solar Hot Water	Y	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Air Barrier Construction	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 2	**On-Site Renewable Energy**						
	Photovoltaics	Y	LEED and Federal Energy Acts Compliance	m2	50	4786.59	239,330
Credit 3	**Enhanced Commissioning**						
	Enhanced Building Systems Commissioning	Y	LEED and Federal Energy Acts Compliance	m2	465	11.62	5,399
Credit 4	**Enhanced Refrigerant Management**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0

		Include in 1391	Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Credit 5	**Measurement & Verification**						
	Continuous Metering Equipment	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Measurement and Verification Plan	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 6	**Green Power**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0

Materials and Resources		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Storage & Collection of Recyclables**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 1.1	**Building Reuse**, Maintain 50% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.1	**Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.2	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 2	**Construction Waste Management**, Divert 50% from Disposal						
	Waste Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 2	**Construction Waste Management**, Divert 75% from Disposal						
	Waste Management Plan with additional measures	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Materials Reuse**, 5%						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 3	**Materials Reuse**, 10%						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)						
	Materials with Recycled Content	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 4	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)						
	Materials with Recycled Content at a higher level	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 5	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally						
	Materials Manufactured Regionally	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally						
	Materials Manufactured Regionally	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 6	**Rapidly Renewable Materials**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 7	**Certified Wood**						
	*Certified Wood Materials***	N	LEED and Federal Energy Acts Compliance	m2	0	1.00	0

Indoor Environmental Quality		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Minimum Indoor Air Quality Performance**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 1	**Outdoor Air Delivery Monitoring**						
	Carbon Dioxide Sensors	Y	LEED and Federal Energy Acts Compliance	m2	465	17.28	8,025
Credit 2	**Increased Ventilation**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0

Credit 3.1	**Construction IAQ Management Plan**, During Construction						
	Construction IAQ Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy						
	Pre-Occupancy IAQ Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	0	19.31	0
Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 4.2	**Low-Emitting Materials**, Paints & Coatings						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 4.3	**Low-Emitting Materials**, Flooring Systems						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products						
	Composite Wood & Agrifiber Products	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5	**Indoor Chemical & Pollutant Source Control**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 6.1	**Controllability of Systems**, Lighting						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 6.2	**Controllability of Systems**, Thermal Comfort						
	Thermal and Humidity Monitoring Systems	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 7.1	**Thermal Comfort**, Design						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 7.2	**Thermal Comfort**, Verification						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 8.1	**Daylight & Views**, Daylight						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 8.2	**Daylight & Views**, Views						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0

Innovation & Design Process		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Credit 1	**Innovation in Design**: Moisture Control Plan						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 1	**Innovation in Design**: Bio-Based Products						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	465	0.00	0
Credit 1	**Innovation in Design**: Sustainability Educational Program						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 1	**Innovation in Design**: Energy Star Appliances						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	465	0.00	0
Credit 1	**Innovation in Design**: Provide Specific Title						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 2	**LEED® Administration Costs**						
	LEED Project Registration	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0
	*LEED Certification**	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0
	LEED Documentation	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0

***Note:**

NEW!

Users should go directly to the GBCI web site to obtain the latest cost for LEED Certification relevant for their project:

http://www.gbci.org/DisplayPage.aspx?CMSPageID=127

Cost values can be substituted directly into the appropriate rows in Column P to adjust project costs.

Total Marginal Cost = **2.22%**

Purpose

This LID Workbook is a planning tool to assist the planning estimator in crafting credible LID costs as a component of project construction costs for 1391 budgetary purposes. During the project design stage, performance and/or prescriptive specifications will establish the actual LID features and amounts along with their associated costs.

Project Information

Project Number:	P-604	**Project Title:**	Group 3 UAS Operations Facility
Project Year:	2018	**Project Location:**	CADC, MCAS Yuma, AZ

LID Cost Prepared By: GMH Associates
Phone Number: 619-285-9885
Email Address: kathyv@gmhainc.com

Cost Information

$11,400,176	=	**The Construction Cost Value (Before LID Costs)**

Entered cost must be equal to or greater than $1,000,000

Additional Cost Information

1.119	=	**Escalation Rate (%)**	**Unit costs, shown on the [Cost Calcs] page, are dated at Apr 2014**
1.08	=	**Area Cost Factor**	**Unit costs have an ACF of 1**

Site Information

Quantity	UM	Item
335	M	Site Width
488	M	Site Length

Existing Site Impervious Surfaces

Quantity	UM	Item
500	SM	Existing Building/s Foot Print/s
0	SM	Existing POV Parking Lot
0	SM	Existing Sidewalks
0	SM	Existing Access Road

2,000	**SM**	**Other Existing Hard Surface Areas**

New Building and New Impervious Surface Information (Used in the Cost Cals Worksheet)

Quantity	UM	Item
465	**SM**	**New Building Foot Print**
4,831	**SM**	**New POV Parking Lot**
26	**M**	**AT/FP building setback at the Front of the Building (Used in conjunction with the "Site Width" to determine area in front of the building available for LID features)**
26	**M**	**AT/FP building setback at the Side of the Building (Used in conjunction with the "Site Length" to determine area to one side of the building available for LID features)**

Post Construction Site Impervious Surfaces

Quantity	UM	Item
965	SM	Post Construction Building/s Foot Print/s
0	SM	Post Construction POV Parking Lot
0	SM	Post Construction Sidewalks
7,897	SM	Post Construction Access Road
8,457	SM	Other Post Construction Hard Surface Areas

Calculations (below) Based on Entered Information (No entries are required below)

163499.29	SM	Total Site Area
2500.00	SM	Total Existing Site Impervious Area
17318.03	SM	Total Post Construction Site Impervious Area

Overall Pervious-Areas Soil Characteristics: Soil Type and Soil Cover

When in doubt on a selection, gravitate towards the lower number

3 **Soil Classification Type: Enter at left the best assessment**

1 = Clay
2 = Clay/silt (silty soil encompasses organic soils)
3 = Silty sand (silty soil encompasses organic soils)
4 = Sand

1 **Soil Ground Cover Type: Enter at left the best assessment**

1 = Bare soil, no vegetative cover
2 = Grassed area
3 = Woods having light underbrush
4 = Woods having heavy underbrush

Summary Information For the LID Cost % Calc

1.53%	=	LID: The Existing Site Impervious Percentage
10.59%	=	LID: The Completed Project Site Impervious Percentage
-----------------------		
9.06%	=	LID: The Impervious Increase Percentage
3	=	Soil Classification Type
1	=	Soil Ground Cover Type

Quantity	UM	Item
163,499	SM	Site Area based on Width & Length
8,686	SM	Setback Area in Front of Building
514	SM	Setback Area to One Side of Building

LID Features & Premiums

$11,400,176	=	**The PreFinal Construction Cost Value**
0.536%	=	**The LID Cost Percentage of the 1391 Subtotal Construction Cost**
$61,052	=	**The LID % Cost Calc**

Cost	Include in 1391?	Item Name	Quantity	UM	Quantity Modifier	Unit Cost	Escalation Factor	ACF
$0	N	LID **Lump Sum** Cost	1	LS		$61,052		
$0	N	A LID **Add-In** Cost	1	LS		$0		

Itemized Listing — **Unit costs are dated at Apr 2014**

Cost	Include in 1391?	Item Name	Quantity	UM	Quantity Modifier	Apr 2014 Unit Cost	Escalation Escalation	ACF
$0	N	Bioretention Cells	575	SM		$232	1.119	1.08
		Bioretention Cells: Adj. Unit Cost = $0/SM						
$0	N	Dry Wells	0	EA		$4,110	1.119	1.08
		Dry Wells: Adj. Unit Cost = $0/EA						
$0	N	Filter Strips	8,686	SM	1.00	$10.86	1.119	1.08
		Filter Strips: Adj. Unit Cost = $0/SM						
$0	N	**Vegetated Buffers - Grass Buffers**	514	SM	1.00	$0.15	1.119	1.08
		Vegetated Buffers - Grass Buffers: Adj. Unit Cost = $0.00/SM						
$0	N	**Vegetated Buffers - Forest Buffers**	514	SM	1.00	$0.26	1.119	1.08
		Vegetated Buffers - Forest Buffers: Adj. Unit Cost = $0.00/SM						
$0	N	**Grassed Swales**	488	M	1.00	$138	1.119	1.08
		Grassed Swales: Adj. Unit Cost = $0/M						
$0	N	**Infiltration Trench/Basin**	488	M	1.00	$104	1.119	1.08
		Infiltration Trench/Basin: Adj. Unit Cost = $0/M						
$0	N	**Inlet Device**	0	EA		$3,376	1.119	1.08
		Inlet Device: Adj. Unit Cost = $0/EA						
$0	N	**Rain Barrels, Cisterns**	0	EA		$176	1.119	1.08
		Rain Barrels, Cisterns: Adj. Unit Cost = $0/EA						
$0	N	**Tree Box Filters**	4	EA		$10,341	1.119	1.08
		Tree Box Filters: Adj. Unit Cost = $0/EA						

$0	N	**Vegetated Rooftops**	0	SM	0.00	$545	1.119	1.08
		Vegetated Rooftops: Adj. Unit Cost = $0/SM						
$60,963	Y	**Permeable Pavement - Asphalt**	3,069	SM	0.64	$16.44	1.119	1.08
		Permeable Pavement - Asphalt: Adj. Unit Cost = $20/SM						
$0	N	**Permeable Pavement - Concrete**	4,831	SM	1.00	$103	1.119	1.08
		Permeable Pavement - Concrete: Adj. Unit Cost = $0/SM						
$0	N	**Permeable Pavement - Concrete Blocks**	4,831	SM	1.00	$164	1.119	1.08
		Permeable Pavement - Concrete Blocks: Adj. Unit Cost = $0/SM						
$0	N	**Permeable Pavement - Grass/Gravel Paver**	4,831	SM	1.00	$94	1.119	1.08
		Permeable Pavement - Grass/Gravel Paver: Adj. Unit Cost = $0/SM						
$0	N	**Constructed Wetland**	0	SM		$44.00	1.119	1.08
		Constructed Wetland: Adj. Unit Cost = $0.00/SM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						

$60,963 The Grand Total of LID Premium Costs Crafted on this page

1391 LID Cost Line Items

2018

Project Title: Group 3 UAS Operations Facility **Project Number: P-604**
Location: CADC, MCAS Yuma, AZ
Prepared by: GMH Associates

The PreFinal Construction Cost Value **$11,400,176**

ITEM	UM	QUANTITY	UNIT COST	TOTAL COST
LID Lump Sum Cost	LS	1	$0.00	$0
A LID Add-In Cost	LS	1	$0.00	$0
Bioretention Cells	SM	575	$0.00	$0
Dry Wells	EA	0	$0.00	$0
Filter Strips	SM	8,686	$0.00	$0
Vegetated Buffers - Grass Buffers	SM	514	$0.00	$0
Vegetated Buffers - Forest Buffers	SM	514	$0.00	$0
Grassed Swales	M	488	$0.00	$0
Infiltration Trench/Basin	M	488	$0.00	$0
Inlet Device	EA	0	$0.00	$0
Rain Barrels, Cisterns	EA	0	$0.00	$0
Tree Box Filters	EA	4	$0.00	$0
Vegetated Rooftops	SM	0	$0.00	$0
Permeable Pavement - Asphalt	SM	3,069	$19.86	$60,963
Permeable Pavement - Concrete	SM	4,831	$0.00	$0
Permeable Pavement - Concrete Blocks	SM	4,831	$0.00	$0
Permeable Pavement - Grass/Gravel Pavei	SM	4,831	$0.00	$0
Constructed Wetland	SM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0

TOTAL LID Premium Costs				**$60,963**

The LID Cost Percentage of the 1391 Subtotal Construction Cost **0.535%**

Cover Sheet/Team List for:

Project Title: UAS Maintenance Hangar **Project Number:** P605

Location: YUMA, ARIZONA **Date:** 02-JUN-15

Prepared By: MCAS YUMA AZ **FY:** 2022 **UIC:** M62974

Project Cost ($000)

50300

A. Team Check List: Completed: Working:

B. Team Meeting: Date:

On-Site: VTC: Conference Call:

C. Team Members:

Name	Position	Command	Phone Number

D. Remarks:

E. Required Attachments:

- [ ] MILCON CHECKLIST
- [ ] Economic Analysis
- [ ] Site Plan
- [ ] Facility Planning Document(s)/P-80 Calculations
- [ ] R19 (Bachelor Housing Survey)
- [ ] Notice of Violation (NOV)
- [ ] Other
- [ ] PHOTOGRAPHS

F. Endorsements:

Signature	Position	Date

1. Component NAVY	FY 2022 MILITARY CONSTRUCTION PROGRAM	2. Date 02 JUN 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Maintenance Hangar

5. Program Element	6. Category Code 21105	7. Project Number P605	8. Project Cost ($000) 50,300

9. COST ESTIMATES

Item	UM	Quantity	Unit Cost	Cost($000)
UAS MAINTENANCE HANGAR (63,145SF)	m2	5,866.37		29,390
UNMANNED AERIAL SYSTEM (UAS) HANGAR CC21105 (62,875SF)	m2	5,841.29	3,712.37	(21,690)
SAPF (PREMIUM) CC14142	LS			(470)
READY SERVICE LOCKER CC42135 (70SF)	m2	6.5	4,573.22	(30)
HAZARDOUS/FLAMMABLE STORAGE CC44130 (200SF)	m2	18.58	6,924.62	(130)
BUILT-IN EQUIPMENT	LS			(2,840)
SPECIAL COSTS	LS			(4,050)
SUSTAINABILITY AND ENERGY FEATURES	LS			(180)
SUPPORTING FACILITIES				12,440
PAVEMENT FACILITIES	LS			(1,080)
SITE PREPARATIONS	LS			(1,120)
SPECIAL FOUNDATION FEATURES	LS			(740)
PAVING AND SITE IMPROVEMENTS	LS			(4,950)
ELECTRICAL UTILITIES	LS			(1,390)
MECHANICAL UTILITIES	LS			(140)
DEMOLITION	LS			(3,020)
SUBTOTAL				41,830
CONTINGENCY (10%)				4,180
TOTAL CONTRACT COST				46,010
SIOH (5.7%)				2,620
SUBTOTAL				48,630
DESIGN/BUILD - DESIGN COST (4%)				1,670
TOTAL REQUEST ROUNDED				50,300
TOTAL REQUEST				50,300
EQUIPMENT FROM OTHER APPROPRIATIONS (NON ADD)				(4,055)

Guidance Unit Cost Analysis

Cat Code	Facility	OSD Guid.	Guid. Cost	Guid. Size	Project Scope	Room Size Fctr	Size Fctr	Area Cost Fctr	Esc. Factor	Unit Cost
14142	SAPF (PREMIUM)		465,361.94	1 LS	1 LS		1.0000	1.000	1.000000000	465,361.94
21105	UNMANNED AERIAL SYSTEM (UAS) HANGAR		2,703.41	5841.29 m2	5841.29 m2		1.0000	1.080	1.271497163	3,712.37
42135	READY SERVICE LOCKER		2,612.00	325 m2	6.5 m2		1.2750	1.080	1.271497163	4,573.22
44130	HAZARDOUS/FLAMMABLE STORAGE		3,955.00	399 m2	18.58 m2		1.2750	1.080	1.271497163	6,924.62

For the UAS Hangar, the guidance unit costs (GUC) for category codes (CCN) 21105, 21106,

1. Component NAVY	FY 2022 MILITARY CONSTRUCTION PROGRAM	2. Date 02 JUN 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Maintenance Hangar

5. Program Element	6. Category Code 21105	7. Project Number P605	8. Project Cost ($000) 50,300

21107 and 21196 from Table of UFC 3-701-01, Change 6, were used. All costs were adjusted for the area cost factor for MCAS Yuma, AZ, the size factor (size) and were escalated to 1 October 2023 to reflect the projected two-year construction period. Then the costs for each CCN were averaged to create a composite CCN for the renovation.

CCN 21105: $2,546.00 x 1.275 (size) x 1.08 (ACF) x 1.2714972 (Escl) = $3,907.36.
$3,907.36 x 3,593.03 m2 = $14,039,278.42 construction cost.
CCN 21106: $2,403.00 x 1 (size) x 1.08 (ACF) x 1.2714972 (Escl) = $3,299.84.
$3,299.84 x 1,114.84 m2 = $3,678,793.96 construction cost
CCN 21107: $2,569.78 x 1 (size) x 1.08 (ACF) x 1.2714972 (Escl) = $3,529.17.
$3,529.17 x 1,114.84 m2 = $3,934,457.12 construction cost
CCN 21196: $1,275.00 x 1 (size) x 1.08 (ACF) x 1.2714972 (Escl) = $1,750.85.
$1,750.85 x 18.58 m2 = $32,530.82 construction cost
($14,039,278.42 + 3,678,793.96 + 3,934,457.12 + 32,530.82) / (3,593.03 + 1,114.84 + 1,114.84 + 18.58) = $3,712.36 UGUC

For CCN 42135, the DoD GUC for Ready Service Locker was adjusted for the ACF for MCAS Yuma, adjusted by the size factor (SF), and escalated to 1 October 2023 to reflect the projected two-year construction period: $2,612.00 x 1.275 (size) x 1.08 (ACF)x 1.2714972 (Escl) = $4,573.22.

For CCN 41130, the DoD GUC for Hazardous/Flammable Storage < 1,000 SF was adjusted for the ACF for MCAS Yuma, adjusted by the size factor (SF), and escalated to 1 October 2023 to reflect the projected two-year construction period: $3,955 x 1.275 (size) x 1.08 (ACF) x 1.2714972 (Escl) = $6,924.62.

10. Description of Proposed Construction:

Constructs a low-rise aircraft maintenance hangar with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include high bay maintenance space, shop space work benches, administrative space, toilet room and supporting spaces.

Construct low-rise ready storage locker with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include storage space and supporting space.

Construct low-rise hazardous/flammable storage facilities with reinforced concrete slab-on-grade with spread beam foundation, reinforced concrete masonry (CMU) exterior walls and standing seam metal roof. The facility will include hazardous materials storage space and hazardous waste storage space.

Information systems include basic telephone, computer network, fiber optic, cable television, security and fire alarm systems and infrastructure.

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3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Maintenance Hangar

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
	21105	P605	50,300

This project will provide Anti-Terrorism/Force Protection (AT/FP) features and comply with AT/FP regulations, and physical security mitigation in accordance with DoD Minimum Anti-Terrorism Standards for Buildings.

Built-in Equipment includes AFFF in a trench system, an elevator, an air compressor and sound attenuation.

Special costs include Post Construction Contract Award Services (PCAS) and Arizona's Transaction Privilege Tax for Yuma County and the city of Yuma.

Special costs also include a Secure Access Program Facility (SAPF; including surveillance by Construction security Technicians and Cleared American Guards during secure space finish work in accordance with Intelligence Community guidance. Construction monitoring is required to observe the construction to ensure that there are no abnormalities that could affect and compromise the security of the SAPF.

Operations and Maintenance Support Information (OMSI) is included in this project.

Department of Defense and Department of the Navy principles for high performance and sustainable building requirements will be included in the design and construction of the project in accordance with federal laws and Executive Orders. Low Impact Development will be included in the design and construction of this project as appropriate.

SUPPORTING FACILITIES: Pavement facilities include a tactical support van pad.

Site preparation includes site clearing, excavation, demolition of existing asphalt concrete and Portland concrete, and preparation for construction.

Special foundation features include structural fill.

Paving and Site Improvements include an equipment parking facility, privately owned vehicle parking, roadways, sidewalks, and landscape.

Electrical utilities include primary and secondary distribution systems, lighting, transformers, a substation, a 45KVA, 400 HZ frequency converter, lightning protection system, diesel emergency generator, relocation of existing fiber, renewable energy systems and telecommunications infrastructure.

Mechanical utilities include heating, ventilation and air conditioning, plumbing and plumbing fixtures, water lines, sanitary sewer lines, storm drain lines, and fire protection systems.

Building #100, a 9.20 m2 hazardous waste storage shelter, and Building #98, a 55.18 m2

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3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Maintenance Hangar

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
	21105	P605	50,300

miscellaneous storage facility will be demolished to clear the site for this project. Building #101, a 2,990.18 m2 maintenance hangar and Building #102, a 111.48 m2 maintenance shop will be demolished upon completion of this project because the functions they now house will be relocated and they will no longer be needed.

Facilities will be designed to meet or exceed the useful service life specified in DoD Unified Facility Criteria. Facilities will incorporate features that provide the lowest practical life cycle cost solutions satisfying the facility requirements with the goal of maximizing energy efficiency.

11. Requirement: 6167 m2 **Adequate:** **Substandard:**

FACILITY PLANNING DATA:

Category Code		Requirement	UM	Adequate	Substandard	Inadequate	Deficit/ Surplus
42135	READY MAGAZINE	325	m2				
14142	AIR INTELLIGENCE SUPPORT CENTER	1	LS				
44130	HAZARDOUS AND FLAMMABLES STOREHOUSE		m2				
21105	MAINTENANCE HANGAR - OH SPACE (HIGH BAY)	5841	m2				

NOTES:

SCOPE:

The project scope was derived using Facility Planning for Navy and Marine Corps Shore Installations (UFC 2-000-05N, formerly known as P-80) based on criteria for category code number (CCN) 116-65 Tactical Support Van Pad, CCN 211-05 Aircraft Maintenance Hangar/OH Shop Space, CCN 211-06 Maintenance Hangar/01 Shop Space, CCN 211-07 Maintenance Hangar/01 Admin Space, CCN 211-96 Maintenance Aircraft Spares/Storage, CCN 421-35 Ready Service Locker, CCN 441-30 Hazard Material Flammable Store and CCN 852-10 POV Parking. The aircraft maintenance hangar and secondary support buildings are sized per standard allowance for a typical aircraft squadron similar to VMU-1.

PROJECT:

Constructs an aircraft maintenance hangar, ready service locker, and hazard material storage to support aircraft operations and headquarters functions at Marine Corps Air Station (MCAS) Yuma.

(New Mission)

REQUIREMENT:

OVERVIEW:
These are new requirements for MCAS Yuma with the relocation of VMU-1 from Marine Corps Air Ground Combat Center (MCAGCC) 29 Palms to MCAS Yuma. Requirements are needed by FY

3. Installation(SA) and Location/UIC: M62974	4. Project Title
MCAS YUMA AZ YUMA, ARIZONA	UAS Maintenance Hangar

5. Program Element	6. Category Code	7. Project Number	8. Project Cost ($000)
	21105	P605	50,300

2024.

AIRCRAFT MAINTENANCE HANGAR REQUIREMENT:
Adequate facilities are required to support VMU-1 aircraft operations, maintenance and headquarters functions to support the relocation of the squadron to MCAS Yuma. VMU-1 is a standard sized squadron with twelve Group 4 or 5 unmanned aerial vehicles (UAV) and forty five catapult launched Group 3 UAV. The hangar requirement includes space for four of the Group 4 or 5 UAV assembled and fully tested using operational ground control stations that are set up in the hangar. The hangar also supports five of the Group 3 UAV assembled and full tested using ground control stations set up on the hangar deck. The Group 4 or 5 UAV has a wingspan of seventy-nine feet and length of thirty-six feet. The Group 3 UAV has a wingspan of sixteen feet and length of eight feet.

By constructing a consolidated hangar for one set of each system UAV in the squadron, the need to construct a separate Group 3 maintenance hangar is avoided. By providing a consolidated hangar, the headquarters element can be collocated alongside the primary operations of the squadron. Secondary support facility requirements include shade structures that protect the Group 4 or 5 UAV from the sun on the parking apron, a small aircraft parts storage space, a ready service locker for storage of flares or similar items, a small hazard material storage building and personally owned vehicle parking space.

CURRENT SITUATION:

Relocation of VMU-1 from MCAGCC 29 Palms to MCAS Yuma is a new requirement for the Air Station. An adequate aircraft maintenance hangar and headquarters facility is not available at MCAS Yuma to support VMU-1 long term facility requirements.

Existing Hangar 101 (Inadequate condition in iNFADS) is available for use by VMU-1 in the short term prior to the Group 4 or 5 UAS arrival to the squadron. Hangar 101 is approximately half the size needed to support VMU-1 long term hangar requirements with the Group 4 or 5 UAS. By constructing a Type II hangar for VMU-1 on the old footprint of Hangar 97, then the land under Hangar 101 will become available for another function or new facility; after Hangar 101 is demolished.

Demolition of Hangar 101 will be required after the new hangar is constructed due to the requirement for a one hundred foot separation between the proposed hangar and existing Hangar 95 to the south. This separation requirement pushes the new Type II hangar within ten feet of existing Hangar 101, thereby necessitating its demolition. Demolition of Hangar 101 would occur after VMU-1 moves into the new hangar.

IMPACT IF NOT PROVIDED:

Without this project, VMU-1 will have to continue to work out of Inadequate and undersized Hangar 101. Assigned Group 4 or 5 UAS air vehicle maintenance and pre-flight testing will have to be performed on the parking apron.

1. Component NAVY	FY 2022 MILITARY CONSTRUCTION PROGRAM			2. Date 02 JUN 2015
3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA		4. Project Title UAS Maintenance Hangar		
5. Program Element	6. Category Code 21105	7. Project Number P605	8. Project Cost ($000) 50,300	

ADDITIONAL: Economic Alternatives Considered:

A. Status Quo:

The existing facilities do not meet the requirements for VMU-1 as it relocates from MCAGCC Twentynine Palms. This is not a viable option.

B. Renovation/Modernization:

Existing facilities cannot be renovated to meet the requirement. This is not a viable alternative.

C. Lease:

N/A

D. New Construction:

New construction is a viable option to meet the requirements of VMU-1.

E. Other Alternatives:

N/A

F. Analysis Results:

New construction is the only viable alternative to meet the requirement. A life cycle cost analysis was not performed at this time.

12. Supplemental Data:

Site Approval:

- [ ] Yes, obtained date:
- [X] No, expected date: 06/2015

Issues (If yes, please provide discussion under issue):

Yes	No	
	X	DDESB, AICUZ, Airfield, EMR, or wetlands
	X	Endangered species/sensitive habitat
	X	Air quality
	X	Cultural/archeological resources
	X	Clearing of trees
	X	Known contamination at selected site
	X	Operational problems
	X	Traffic patterns impact
	X	Existing utilities upgrade
	X	Ordnance sweep required prior to Construction

Planning (If no, please provide an explanation):

Yes	No	
X		Consistent w/ Master Plan or Base/Regional Dev.

Host Nation Approval: N/A

National Capital Region Approval: N/A

NEPA Documentation:

1. Component NAVY	FY 2022 MILITARY CONSTRUCTION PROGRAM		2. Date 02 JUN 2015
3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA		4. Project Title UAS Maintenance Hangar	
5. Program Element	6. Category Code 21105	7. Project Number P605	8. Project Cost ($000) 50,300

Yes	No	
	X	Complete

Level of NEPA:

Yes	No	
	X	Categorical Exclusion
X		Environmental Assessment(EA)
	X	Environmental Impact Statement(EIS)
	X	Memorandum of Negative Decision

Mitigation Issues:

Yes	No	
	X	Wetlands replacement/enhancement
	X	Hazardous waste
	X	Contaminated soil/water
	X	Other

Environmental Cleanup: N/A

Project Issues:

Yes	No	
	X	System safety
X		Soils - foundation and seismic conditions
	X	Construction/operational permits
	X	Local air quality/wastewater permits
	X	Complies with Final Governing Standard (Environmental standard for Spain, Italy & Greece)
	X	Land Acquisition (i.e. location, quantity)
	X	Technical Operating Manuals
	X	Feasibility/Constructibility in FY
	X	Historical Preservation
	X	Does the facility have an overhead crane requirement?
	X	Navy Crane Center contacted to assist with dev. of crane estimate (lifting capacity < 10-tons)?
	X	Navy Crane Center contacted to coord. procurement and timelines (lifting capacity >= 10-tons)?

Yes	No	
X		Physical Security:

	Shielding
X	SCIF
X	Fencing
X	IDS
	Other Type:

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BUDGET ESTIMATE SUMMARY SHEET:

Item	UM	Quantity	Unit Cost	Total Cost
BUILT-IN EQUIPMENT	LS			2,844,750
AFFF fire protection system	EA	876.00	2,154.67	1,887,491
Aircraft exhaust system	EA	1.00	538,668.58	538,669
Sound attenuation	m2	1,114.84	219.78	245,020
Elevator	ST	2.00	59,852.06	119,704
Compressed air system	EA	1.00	53,866.86	53,867
Special Construction Features:				
SPECIAL COSTS	LS			4,048,056
PCAS	EA	.01	41,407,671.39	414,077
Arizona Transaction Privilege Tax (8.412%)	LS	1	3,633,979.58	3,633,980
LEED AND EPACT 2005 COMPLIANCE (Inside)	LS			177,166
Enhanced Building Systems Commissioning	m2	5841.29	12.20	71,264
Carbon Dioxide Sensors	m2	5841.29	18.13	105,903
Utilities and Site Improvements:				
PAVEMENT FACILITIES	LS			1,077,724
Tactical Support Van Pad	m2	710.52	1,516.81	1,077,724
SITE PREPARATIONS	LS			1,121,744
Site preparation, excavation and grading	m2	4732.95	225.25	1,066,097
Site cleanup	m2	15853.72	3.51	55,647
SPECIAL FOUNDATION FEATURES	LS			736,542
Structural fill	m2	4732.95	155.62	736,542
PAVING AND SITE IMPROVEMENTS	LS			4,953,961
Parking facilities, asphalt (POV)	m2	5911.4	410.52	2,426,748
Roads and other asphalt concrete pavement	m2	4645.15	444.53	2,064,909
Sidewalk	m2	780.39	139.16	108,599
Landscape	m2	4505.8	78.50	353,705
ELECTRICAL UTILITIES	LS			1,388,810
Concrete encased underground feeder	m	152.4	559.65	85,291
Electrical and telephone manholes	EA	3	17,955.62	53,867
Cable TV, telephone and fiber optic cable	m	457.2	229.10	104,745
Communications concrete encased underground feeder	m	152.4	294.56	44,891
1,500 KVA pad-mounted Transformer	EA	1	191,526.61	191,527
250KW Diesel emergency generator	EA	1	143,644.96	143,645
Parking lot LED light fixtures, concrete base, con	EA	20	4,788.17	95,763
45KVA, 400HZ Frequency converter	EA	5	32,918.64	164,593
Lightning protection system	EA	1	149,630.16	149,630
50 KW Photovoltaic system (LEED)	kw	50	4,788.17	239,409
Relocation of existing fiber under Hangar	m	492.68	234.33	115,450

1. Component NAVY	FY 2022 MILITARY CONSTRUCTION PROGRAM	2. Date 02 JUN 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Maintenance Hangar

5. Program Element	6. Category Code 21105	7. Project Number P605	8. Project Cost ($000) 50,300

Item	UM	Quantity	Unit Cost	Total Cost
B-97				
MECHANICAL UTILITIES	LS			143,882
Reroute potable water/fire line for UAS hangar, 6"	m	60.96	424.14	25,856
Reroute sanitary sewer line for UAS hangar, 6"	m	60.96	424.14	25,856
Storm drain improvements	m	146.3	630.01	92,170
DEMOLITION	LS			3,020,337
Demolish Building 101	m2	2990.18	971.95	2,906,305
Demolish Building 102	m2	111.48	837.33	93,346
Demolish Building 98	m2	55.18	326.93	18,040
Demolish Building 100	m2	9.2	287.65	2,646

A. Estimated Design Data:

1. Status:
   - (A) Date design or Parametric Cost Estimate started
   - (B) Date 35% Design or Parametric Cost Estimate complete
   - (C) Date design completed
   - (D) Percent completed as of September 2020
   - (E) Percent completed as of January 2021
   - (F) Type of design contract
   - (G) Parametric Estimate used to develop cost
   - (H) Energy Study/Life Cycle Analysis performed
2. Basis:
   - (A) Standard or Definitive Design
   - (B) Where design was previously used
3. Total cost (C) = (A) + (B) = (D) + (E):
   - (A) Production of plans and specifications
   - (B) All other design costs
   - (C) Total $0
   - (D) Contract
   - (E) In-house
4. Contract award:
5. Construction start:
6. Construction complete:

B. Equipment associated with this project which will be provided from other appropriations:

Major Equipment	Funding Source	Fund Year	Installation Start-End Mo/Yr	Shakedown Start-End Mo/Yr	IOC Date Mo/Yr	Cost
Collateral Equipment	O&MMC	2022				4,055,289

JOINT USE CERTIFICATION:

1. Component NAVY	FY 2022 MILITARY CONSTRUCTION PROGRAM	2. Date 02 JUN 2015

3. Installation(SA) and Location/UIC: M62974 MCAS YUMA AZ YUMA, ARIZONA	4. Project Title UAS Maintenance Hangar

5. Program Element	6. Category Code 21105	7. Project Number P605	8. Project Cost ($000) 50,300

The (CERTIFYING OFFICIAL) certifies that this project has been considered for joint use potential. (TYPE OF CONSTRUCTION RECOMMENDED)is recommended. (UNILATERAL STATEMENT, if Unilateral Construction is selected)

Activity POC: Ronald L Kruse Phone No: 928-269-3523

Attachments:

P605, UAS Maintenance Hangar	QTY	UOM	UNIT COST	TOTAL COST
PRIMARY FACILITIES				**$ 29,390.00**
UAS Hangar	5,841.29	m2	3,712	$ (21,690)
SAPF (Premium)	1.00	m2	465,362	$ (470)
Ready Service Locker	6.50	m2	4,573	$ (30)
Hazardous/Flammable Storage	18.58	m2	6,925	$ (130)
	-	m2	-	$ -
	-	m2	-	$ -
Built-in Equipment	1	LS	2,844,750	$ (2,840)
Special Costs	1	LS	4,048,061	$ (4,050)
LEED and EPACT 2005 Compliance (Inside)	1	LS	177,166	$ (180)
SUPPORTING FACILITIES				**$ 12,440.00**
SPECIAL CONSTRUCTION	1	LS	-	$ -
PAVEMENT FEATURES	1	LS	1,077,723	$ (1,080)
SPECIAL FOUNDATION FEATURES	1	LS	736,520	$ (740)
SITE PREPARATIONS	1	LS	1,122,236	$ (1,120)
PAVING AND SITE IMPROVEMENTS	1	LS	4,953,966	$ (4,950)
SITE ELECTRICAL UTILITIES	1	LS	1,388,809	$ (1,390)
SITE CIVIL/MECHANICAL UTILITIES	1	LS	143,882	$ (140)
BUILDING DEMOLITION	1	LS	3,020,336	$ (3,020)
Sub-Total				**$ 41,830**
Contingency (10%)				$ 4,180
Total Contract Cost				**$ 46,010**
SIOH (5.7%)				$ 2,620
Sub-Total				**$ 48,630**
Contractor Design Cost (4%)				$ 1,670
Total Request				**$ 50,300**
Total Request Rounded				**$ 50,300**

Unit costs include General Contractor's Overhead and Profit.
Unit costs reflect the Area Cost Factor for MCAS Yuma, AZ.
UGUC for primary facilities derived from DoD/NAVFAC Guidance dated October or May 2013 and adjusted as indicated on Primary Facilities worksheet.
Supporting facilities costs were derived from an A-E estimate prepared with information received from the installation. Most unit costs are based upon RS Means 2015.

	P605, UAS Maintenance Hangar						Escalation:		1.197041299
	PRIMARY FACILITIES							**$**	**29,378,786**
21105	**UAS Hangar**	5,841.29	m2	$	3,712.38	$	21,685,060		
14142	**SAPF (Premium)**	1.00	LS	$	465,361.94	$	465,362		
42135	**Ready Service Locker**	6.50	m2	$	4,573.22	$	29,726		
44130	**Hazardous/Flammable Storage**	18.58	m2	$	6,924.62	$	128,659		
	Built-in Equipment							$	2,844,750.24
	Elevator	2.00	ST	$	59,852.06	$	119,704		
	Aircraft exhaust system	1.00	Ea.	$	538,668.58	$	538,669		
	AFFF Fire Protection System	876.00	Ea.	$	2,154.67	$	1,887,495		
	Compressed Air System	1.00	Ea.	$	53,866.86	$	53,867		
	Sound Attenuation	1,114.84	m2	$	219.78	$	245,016		
	Special Costs							$	4,048,061.35
	PCAS	1.00	LS	$	414,081.77	$	414,082		
	Arizona Transaction Privilege Tax (8.412%)	1.00	EA	$	3,633,979.58	$	3,633,980		
	LEED and EPACT 2005 Compliance (Inside)							$	177,166.33
	Enhanced Building Systems Commissioning	5,841.29	m2	$	12.20	$	71,264		
	Carbon Dioxide Sensors	5,841.29	m2	$	18.13	$	105,903		
	SUPPORTING FACILITIES							**$**	**12,443,473**
	PAVEMENT FEATURES							**$**	**1,077,723**
	Tactical Support Van Pad	710.52	m2	$	1,516.81	$	1,077,723		
	SPECIAL FOUNDATION FEATURES							**$**	**736,520**
	Structural Fill	4,732.95	m2	$	155.62	$	736,520		
	SITE PREPARATIONS							**$**	**1,122,236**
	Structural Site preparation, excavation and grading	4,732.95	m2	$	225.25	$	1,066,119		
	Site cleanup	16,000.02	m2	$	3.51	$	56,117		

	PAVING AND SITE IMPROVEMENTS							**$**	**4,953,966**
	Parking Facilities, Asphalt (POV)	5,911.40	m2	$	410.52	$	2,426,731		
	Roads and other asphalt concrete pavement	4,645.15	m2	$	444.53	$	2,064,924		
	Sidewalk	780.39	m2	$	139.16	$	108,597		
	Landscape with irrigation	4,505.80	m2	$	78.50	$	353,714		
	SITE ELECTRICAL UTILITIES							**$**	**1,388,809**
	Concrete Encased Underground Feeder	152.40	m	$	559.65	$	85,290		
	Electrical and Telephone Manhooles	3.00	EA	$	17,955.62	$	53,867		
	Cable TV, Telephone and Fiber Optic Cable	457.20	m	$	229.10	$	104,743		
	Communications, Concrete Encased Underground	152.40	m	$	294.56	$	44,890		
	1,500KVA, 12.47KV-480Y/277V, 3P, 4W Substation, WP,	1.00	EA	$	191,526.61	$	191,527		
	Parking Lot LED Light Fixtures, Concrete Base, Conduit,	20.00	EA	$	4,788.17	$	95,763		
	45KVA, 400Hz Frequency Converter	5.00	EA	$	32,918.64	$	164,593		
	Lightning Protection System	1.00	EA	$	149,630.16	$	149,630		
	250KW Diesel Emergency Generator, WP, ATS	1.00	EA	$	143,644.96	$	143,645		
	50 KW Photovoltaic System (LEED)	50.00	KW	$	4,788.17	$	239,408		
	Relocation of Exist. Fiber Under Hangar H-97	492.68	m	$	234.33	$	115,452		
	SITE CIVIL/MECHANICAL UTILITIES							**$**	**143,882**
	Reroute potable water/fire water line for UAS hangar, 6"	60.96	m	$	424.14	$	25,856		
	Reroute sanitary sewer line for UAS hangar, 6"	60.96	m	$	424.14	$	25,856		
	Storm drain improvements	146.30	m	$	630.01	$	92,170		
	BUILDING DEMOLITION							**$**	**3,020,336**
	Demolish Building 101	2,990.18	m2	$	971.95	$	2,906,304		
	Demolish Building 102	111.48	m2	$	837.33	$	93,346		
	Demolish Building 98	55.18	m2	$	326.93	$	18,040		
	Demolish Building 100	9.20	m2	$	287.65	$	2,646		

	P605, UAS Maintenance Hangar	ACF	1.08			
	PRIMARY FACILITIES					**$ 28,241,833**
21105	**UAS Hangar**	5,841.29	m2	$ 3,712.38	$ 21,685,060	
14142	**SAPF (Premium)**	1.00	LS	$ 465,361.94	$ 465,362	
42135	**Ready Service Locker**	6.50	m2	$ 4,573.22	$ 29,726	
44130	**Hazardous/Flammable Storage**	18.58	m2	$ 6,924.62	$ 128,659	
	Built-in Equipment					$ 2,376,484.62
	Elevator	2.00	ST	$ 50,000.00	$ 100,000	
	Aircraft exhaust system	1.00	Ea.	$ 450,000.00	$ 450,000	
	AFFF Fire Protection System	876.00	Ea.	$ 1,800.00	$ 1,576,800	
	Compressed Air System	1.00	Ea.	$ 45,000.00	$ 45,000	
	Sound Attenuation	1,114.84	m2	$ 183.60	$ 204,685	
	Special Costs					$ 3,379,374.62
	PCAS	1.00	LS	$ 343,573.27	$ 343,573	
	Arizona Transaction Privilege Tax (8.412%)	1.00	EA	$ 3,035,801.34	$ 3,035,801	
	LEED and EPACT 2005 Compliance (Inside)					$ 177,166.33
	Enhanced Building Systems Commissioning	5,841.29	m2	$ 12.20	$ 71,264	
	Carbon Dioxide Sensors	5,841.29	m2	$ 18.13	$ 105,903	
	SUPPORTING FACILITIES					**$ 9,494,869**
	SPECIAL CONSTRUCTION					**$ -**
	Tension structure canopies, aircraft	-	m2	$ 362.84	$ -	
	PAVEMENT FEATURES					**$ 900,322**
	Tactical Support Van Pad	710.52	m2	$ 1,267.13	$ 900,322	

	SPECIAL FOUNDATION FEATURES								**$**	**615,284**
		Structural Fill	4,732.95	m2	$	130.00	$	615,284		
	SITE PREPARATIONS								**$**	**937,509**
		Structural Site preparation, excavation and grading	4,732.95	m2	$	188.18	$	890,629		
		Site cleanup	16,000.02	m2	$	2.93	$	46,880		
	PAVING AND SITE IMPROVEMENTS								**$**	**4,138,509**
		Parking Facilities, Asphalt (POV)	5,911.40	m2	$	342.94	$	2,027,274		
		Roads and other asphalt concrete pavement	4,645.15	m2	$	371.36	$	1,725,023		
		Sidewalk	780.39	m2	$	116.25	$	90,721		
		Landscape with irrigation	4,505.80	m2	$	65.58	$	295,490		
G40	**SITE ELECTRICAL UTILITIES**								**$**	**1,160,202**
		Concrete Encased Underground Feeder	152.40	m	$	467.53	$	71,251		
		Electrical and Telephone Manhooles	3.00	EA	$	15,000.00	$	45,000		
		Cable TV, Telephone and Fiber Optic Cable	457.20	m	$	191.39	$	87,502		
		Communications, Concrete Encased Underground Ductbank	152.40	m	$	246.07	$	37,501		
		1,500KVA, 12.47KV-480Y/277V, 3P, 4W Substation, WP, Grounding, Testing	1.00	EA	$	160,000.00	$	160,000		
		Parking Lot LED Light Fixtures, Concrete Base, Conduit, Wiring, Trenching	20.00	EA	$	4,000.00	$	80,000		
		45KVA, 400Hz Frequency Converter	5.00	EA	$	27,500.00	$	137,500		
		Lightning Protection System	1.00	EA	$	125,000.00	$	125,000		
		250KW Diesel Emergency Generator, WP, ATS	1.00	EA	$	120,000.00	$	120,000		
		50 KW Photovoltaic System (LEED)	50.00	KW	$	4,000.00	$	200,000		
		Relocation of Exist. Fiber Under Hangar H-97	492.68	m	$	195.76	$	96,448		

G30	**SITE CIVIL/MECHANICAL UTILITIES**								**$**	**120,198**
		Reroute potable water/fire water line for UAS hangar, 6"	60.96	m	$	354.33	$	21,600		
		Reroute sanitary sewer line for UAS hangar, 6"	60.96	m	$	354.33	$	21,600		
		Storm drain improvements	146.30	m	$	526.31	$	76,999		
	BUILDING DEMOLITION								**$**	**2,523,168**
		Demolish Building 101	2,990.18	m2	$	811.96	$	2,427,907		
		Demolish Building 102	111.48	m2	$	699.50	$	77,980		
		Demolish Building 98	55.18	m2	$	273.11	$	15,070		
		Demolish Building 100	9.20	m2	$	240.30	$	2,211		

P605 UAS Hangar, MCAS Yuma, AZ

Item				m2 Cost	Size Factor	ACF	Escalation	Subtotal	UGUC
UAS Hangar									
UAS Hangar		**5,841.29**	**m2**				**$ 3,712.38**	**21,685,060.32**	$ 3,712.38
21105	OH Space	3,593.03	m2	$ 2,546.00	1.1176	1.08	1.2714972	$ 14,039,278.42	$ 3,907.36
21106	Shop Space	1,114.84	m2	$ 2,403.00	1	1.08	1.2714972	$ 3,678,793.96	$ 3,299.84
21107	Admin Space	1,114.84	m2	$ 2,570.00	1	1.08	1.2714972	$ 3,934,457.12	$ 3,529.17
21196	Maint Aircraft Spares/Storage	18.58	m2	$ 1,275.00	1	1.08	1.2714972	$ 32,530.82	$ 1,750.85
SAPF (Premium)		**1.00**	**LS**					**$ 465,361.94**	**$ 465,361.94**
	SAPF (Premium)	**226.68**	**m2**	**$ 1,614.59**	1	1	1.2714972	**$ 465,361.94**	**$ 2,052.95**
42135	**Ready Service Locker**	**6.50**	**m2**	**$ 2,612.00**	1.275	1.08	1.2714972	**$ 29,725.96**	**$ 4,573.22**
41130	**Hazardous/Flammable Storage**	**18.58**	**m2**	**$ 3,955.00**	1.275	1.08	1.2714972	**$ 128,659.40**	**$ 6,924.62**
Sound Attenuation		1,114.84	m2	$ 170.00	1	1.08	1	$ 204,684.62	$ 183.60
Built-in Equipment									
	Elevator	2	ST	$ 50,000.00	1	1	1	$ 100,000.00	$ 50,000.00
	Aircraft exhaust system	1.00	Ea.	$ 450,000.00	1	1	1	$ 450,000.00	$ 450,000.00
	AFFF Fire Protection System	876.00	Ea.	$ 1,750.00	1	1	1	$ 1,533,000.00	$ 1,750.00
	Compressed Air System	1.00	Ea.	$ 45,000.00	1	1	1	$ 45,000.00	$ 45,000.00

Line Number	Description	Quantity	Unit	Unit Material	Ext. Material	Unit Labor	Ext. Labor	Unit Equipment	Ext. Equipment	Unit Total	Ext. Total
Division 02 Existing Conditions		**111.48**	**m2**							**$699.50**	**$77,980**
024116130650*	Building demolition, small building, masonry, elevated slabs, includes 20 mile haul, excludes salvage, exludes foundation (B-102)	16,055.650	m3	$0.00	$0	$1.28	$7,975	$0.93	$8,400	$2.21	$35,515
024116170440*	Buillding footings and foundations demolition, floors, concrete slab on grade, concrete, rod reinforced, 6" thick, (B-102)	5.570	m2	$0.00	$0	$6.19	$14	$10.32	$34	$16.51	$92
024116171120*	Buillding footings and foundations demolition, remove concrete footing, (B-102)	30.480	m	$0.00	$0	$107.32	$1,200	$44.11	$710	$151.43	$4,616
024116174250*	Buillding footings and foundations demolition, add for disposal, up to 5 miles,	76.460	m3	$0.00	$0	$15.53	$495	$24.12	$1,100	$39.64	$3,031
024119211020*	Selective demolition, gutting, building interior, utility disconnects, commercial building, includes disposal, (B-102)	111.480	m2	$0.00	$0	$149.83	$6,175	$56.27	$3,300	$206.10	$22,976
	Grade site, cap with Envirotac dust control coating, B-102	111.480	m2							$26.91	$3,000
	Electrical Demolition	1.000	EA							$8,750.00	$8,750
Totals for Division 02 Existing Conditions					**$0**		**$15,859**		**$13,544**		**$77,980**
Division 13 Special Construction		**333.340**	**m2**							**$362.84**	**$120,949**
133123500200*	Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell, clear span, excl. foundations (aircrafts / apron)	333.340	m2	$284.35	$94,787	$45.43	$6,750	$4.91	$1,050	$334.69	$111,565
	Arizona Transaction Privilege Tax	0.084	EA							$111,564.51	$9,385
Totals for Division 13 Special Construction					**$94,787**		**$6,750**		**$1,050**		**$111,565**
Division 14 Conveying Equipment		**2.000**								**$ 49,032.55**	**$98,065**
142423102050*	Hydraulic passenger elevators, base unit, standard finish, 1500 lb, 100 fpm, 2 stop (P-605 Hanger)	1.000	Ea.	$62,260.46	$62,260	$31,585.13	$13,400			$93,845.59	$93,846
142423102100*	Hydraulic passenger elevators, for 2500 lb capacity, (P605 Hanger)	1.000	Ea.	$4,219.51	$4,220					$4,219.51	$4,220
Totals for Division 14 Conveying Equipment					**$66,480**		**$13,400**		**$0**		**$98,065**
Estimate Subtotal					**$161,267**		**$36,009**		**$14,594**		**$287,610**
Building Demolition for Hangar 101 was based upon Project YU1580M, Demolish Hangar 97.											

GMH Associates Inc

4190 Bonita Road, Ste. 207

Bonita, CA 91902

Demo B98, B100, Elect Conc Pad

Line Number	Description	Quantity	Unit	Unit Material	Ext. Material	Unit Labor	Ext. Labor	Unit Equipment	Ext. Equipment	Unit Total	Ext. Total	
Division 02 Existing Conditions (Demo B-98)		**55.18**	**m2**							**$273.11**	**$15,070**	
024116130050*	B98, building demolition, small projects, concrete, excludes foundation demolition, dump fees	6,534.000	C.F.			$0.46	$3,016	$0.37	$2,446	$0.84	$5,462	
024116170300*	B98, buillding footings and foundations demolition, floors, concrete slab on grade, concrete, rod reinforced, 4" thick, excludes disposal costs and dump fees	594.000	S.F.			$0.44	$263	$0.75	$446	$1.19	$709	
024116171080*	B98, buillding footings and foundations demolition, remove concrete footing, 1'-6" thick, 2' wide, excludes disposal costs and dump fees	100.000	L.F.			$30.38	$3,038	$12.57	$1,257	$42.95	$4,295	
024116171220*	B98 building footing add		L.F.									
024119180400*	B98, B100, Selective demolition, buildings, masonry construction, includes loading and 5 mile haul to dump	180.000	C.Y.			$11.31	$2,036	$10.01	$1,802	$21.32	$3,838	
024119190725*	B100, Selective demolition, rubbish handling, dumpster, 20 C.Y., 5 ton capacity, weekly rental, includes one dump per week,	0.900	Week	$851.50	$766					$851.50	$766	
Division 02 Existing Conditions (Demo B-100)		**9.2**	**m2**							**$240.30**	**$2,211**	
024116130600*	B100, steel canopy, excludes concrete footing and slab,	1,920.000	C.F.			$0.45	$861	$0.40	$771	$0.85	$1,632	
024116170440*	B100, buillding footings and foundations demolition, floors, concrete slab on grade, concrete, rod reinforced, 6" thick, excludes disposal costs and dump fees	96.000	S.F.			$0.56	$54	$0.93	$90	$1.49	$144	
024119180400*	B98, B100, Selective demolition, buildings, masonry construction, includes loading and 5 mile haul to dump	20.000	C.Y.			$11.31	$226	$10.01	$200	$21.32	$426	
024119190725*	B100, Selective demolition, rubbish handling, dumpster, 20 C.Y., 5 ton capacity, weekly rental, includes one dump per week,	0.010	Week	$851.50	$9					$851.50	$9	
Site Improvements: Demolish concrete pads		**41.810**	**m2**							**$16.10**	**$673**	
024116170440*	Electric concrete pad on grade, concrete, rod reinforced, 6" thick, excludes disposal costs and dump fees	50.000	S.F.			$0.56	$28	$0.93	$47	$1.50	$75	
Totals for Division 02 Existing Conditions											**$17,954**	**($522)**

Estimate Subtotal				**$0**		**$0**		**$0**		**$17,954**	
Material Markup (10%)				**$58**						**$58**	
Labor Markup (57%)						**$2,175**				**$2,175**	
Equipment Markup (10%)								**$405**		**$405**	
Subcontractor Fee											
Total Estimate										**$11,100**	
Contingency				**$13**		**$120**		**$89**		**$222**	
G.C. O&P (15%)											
General Conditions (10%)	**1.21904193**										

Activity: | Spec No: | Firm Name: | Sheet | of

Project Title:

JB Young & Associates

MCAS Yuma (201501)

Estimator:

Date: March 18, 2015

Status of Design:

P605 UAS Hangar, MCAS Yuma

Job No.:

Spec#	Description	Quantity	Unit	Material Unit Cost	Material Total	Labor Unit Cost	Labor Total	Engineering Unit Cost	Total
CIVIL									
Tactical Support Van Pad		**710.52**	**m2**					**$ 1,173.27**	**833,632**
	Site preparation, pavement demolition and grading for Tactical Support Van Pad	710.52	m2					$ 1,076.39	$ 764,797
	Tactical Support Van Pad with reinforced concrete and aggregate base	710.52	m2					$ 96.88	$ 68,835
Structural Site preparation, excavation and grading		**3,668.28**	**m2**					**$ 174.24**	**639,150.90**
	Site preparation and pavement demolition for UAS Hangar	3,601.39	m2					$ 161.46	$ 581,480
	Site preparation, pavement demolition and grading for Ready Service Locker	6.50	m2					$ 1,076.39	$ 6,997
	Site preparation, pavement demolition and grading for Haz/Flam Storage	18.58	m2					$ 1,076.39	$ 19,999
	Site Improvements: Demolish concrete pads								
	Demolish pavement and grade site for storage	41.81	m2					$ 16.10	$ 673
	Trenching, Backfill, Compaction for Electrical Utilities	304.80	m					$ 98.43	$ 30,001
Parking Facilities, Asphalt (POV)		**5,911.40**	**m2**					**$ 317.54**	**$ 1,877,106**
	Site preparation, pavement demolition and removal for POV Parking	5,911.40	m2					$ 107.64	$ 636,303
	Parking facilities, asphalt concrete and aggregate base	5,911.40	m2					$ 182.99	$ 1,081,727
	Paint markings and install traffic control signs and bollards	5,911.40	m2					$ 26.91	$ 159,076
Roads and other asphalt concrete pavement		**4,645.15**	**m2**					**$ 371.36**	**1,725,023**
	Site preparation, pavement demolition and removal for roads	4,645.15	m2					$ 161.46	$ 750,006
	Roads and other asphalt concrete pavement, including aggregate base	4,645.15	m2					$ 182.99	$ 850,016
	Paint markings and install traffic control signs and bollards	4,645.15	m2					$ 26.91	$ 125,001

Storm drain improvements		**146.30**	**m**					**$ 526.31**	**76,998.56**
	Storm drain, 6", for van pad	30.48	m					$ 656.17	$ 20,000
	Reroute storm drain line for UAS hangar, 15"	115.82	m					$ 492.13	$ 56,998
Reroute potable water/fire water line for UAS hangar, 6"		**60.96**	**m**					**$ 328.08**	**19,999.76**
Reroute sanitary sewer line for UAS hangar, 6"		**60.96**	**m**					**$ 328.08**	**19,999.76**
									$ -
Civil Demolition for Building 102									
	Demolish and dispose of concrete foundation, B-102	130.99	m2					$ 161.46	$ 21,150
	Grade site, cap with Envirotac dust control coating, B-102	130.99	m2					$ 26.91	$ 3,525
Total Civil Costs - P605									**$ 5,886,865**
									$ 5,890,015

Activity:	Spec No:		Firm Name:				Sheet	of
Project Title:			**C&G Engineering, Inc.**					
VMU-1 Planning	Estimator:		**C. Zuniga**				Date: March 17, 2015	
MCAS Yuma AZ	Status of Design:							
							Job No.: 008-15-101	
Project 1 (Flightline Facilities)								
Spec# Description	Quantity	Unit	Material Unit Cost	Material Total	Labor Unit Cost	Labor Total	Engineering Unit Cost	Total
ELECTRICAL SUPPORTING FACILITIES COSTS								
H-101 Electrical Demolition Work Including:	1	EA	$ 7,500.00	$ 7,500	$ 18,750.00	$ 18,750	$ 26,250.00	$ 26,250.00
Disconnection, Removing, Disposing, @ Cappin	2,990	m2					$ 8.78	26,250
Existing Electrical Utilities & Equipment								
B-102 Electrical Demolition Work Including:	1	EA	$ 2,500.00	$ 2,500	$ 6,250.00	$ 6,250	$ 8,750.00	$ 8,750.00
Disconnection, Removing, Disposing, @ Capping								
Existing Electrical Utilities & Equipment								
Concrete Encased Underground Feeder	**152.40**	**m**					**$ 467.53**	**$ 71,250.81**
12KV, Concrete Encased Underground Feeder	76.20	m	$ 262.47	$ 20,000	$ 262.47	$ 20,000	$ 524.94	$ 40,000.43
600V, Concrete Encased Underground Feeders	76.20	m	$ 213.26	$ 16,250	$ 196.85	$ 15,000	$ 410.11	$ 31,250.38
Electrical and Telephone Manhooles	**3.00**	**EA**					**$ 15,000.00**	**$ 45,000.00**
Electrical Manholes	1	EA	$ 8,000.00	$ 8,000	$ 7,000.00	$ 7,000	$ 15,000.00	$ 15,000.00
Telephone Manholes	2	EA	$ 8,000.00	$ 16,000	$ 7,000.00	$ 14,000	$ 15,000.00	$ 30,000.00
Cable TV, Telephone and Fiber Optic Cable	**457.20**	**m**					**$ 191.39**	**$ 87,501.98**
200 Pair Base Telephone Cable	152.40	m	$ 114.83	$ 17,500	$ 131.23	$ 19,999	$ 246.06	$ 37,499.54
24 Fiber Optic Cable	152.40	m	$ 98.43	$ 15,001	$ 98.43	$ 15,001	$ 196.86	$ 30,001.46
Cable TV	152.40	m	$ 65.62	$ 10,000	$ 65.62	$ 10,000	$ 131.24	$ 20,000.98
Communications, Concrete Encased Underground Ductbank	**152**	**m**	**$ 98.43**	**$ 15,001**	**$ 147.64**	**$ 22,500**	**$ 246.07**	**$ 37,501.07**

1,500KVA, 12.47KV-480Y/277V, 3P, 4W Substation, WP, Grounding, Testing	**1**	**EA**	**$120,000.00**	**$ 120,000**	**$ 40,000.00**	**$ 40,000**	**$ 160,000.00**	**$ 160,000.00**
Trenching, Backfill, Compaction for Electrical Utilitie	304.80	m	$ 32.81	$ 10,000	$ 65.62	$ 20,001	$ 98.43	$ 30,001.46
Parking Lot LED Light Fixtures, Concrete Base, Conduit, Wiring, Trenching	**20**	**EA**	**$ 1,750.00**	**$ 35,000**	**$ 2,250.00**	**$ 45,000**	**$ 4,000.00**	**$ 80,000.00**
45KVA, 400Hz Frequency Converter	**5**	**EA**	**$ 20,000.00**	**$ 100,000**	**$ 7,500.00**	**$ 37,500**	**$ 27,500.00**	**$ 137,500.00**
Lightning Protection System	**1**	**EA**	**$ 50,000.00**	**$ 50,000**	**$ 75,000.00**	**$ 75,000**	**$ 125,000.00**	**$ 125,000.00**
250KW Diesel Emergency Generator, WP, ATS	**1**	**EA**	**$ 90,000.00**	**$ 90,000**	**$ 30,000.00**	**$ 30,000**	**$ 120,000.00**	**$ 120,000.00**
50 KW Photovoltaic System (LEED)	**50**	**KW**	**$ 3,000.00**	**$ 150,000**	**$ 1,000.00**	**$ 50,000**	**$ 4,000.00**	**$ 200,000.00**
Relocation of Exist. Fiber Under Hangar H-97	**492.68**	**m**					**$ 195.76**	**$ 96,447.81**
Disconnect and Remove Existing Fiber	1	LS	$ 2,500.00	$ 2,500	$ 7,500.00	$ 7,500	$ 10,000.00	$ 10,000.00
2-4" PVC Sch 40 Conduits	91.44	m	$ 65.62	$ 6,000	$ 39.37	$ 3,600	$ 104.99	$ 9,600.29
Sawcutting Existing Concrete, Trenching, Backfill, C	91.44	m	$ 164.04	$ 15,000	$ 360.89	$ 33,000	$ 524.93	$ 47,999.60
24 Fiber Optic Cable	304.80	m	$ 16.40	$ 4,999	$ 49.21	$ 14,999	$ 65.61	$ 19,997.93
4' x 4' Concrete Handholes with Traffic Cover	2	EA	$ 1,600.00	$ 3,200	$ 825.00	$ 1,650	$ 2,425.00	$ 4,850.00
4 x 6 Splice Box	2	EA	$ 1,000.00	$ 2,000	$ 1,000.00	$ 2,000	$ 2,000.00	$ 4,000.00
Total								
Tax 7.5%								
Bound 1%								
General Conditions 2%								
Overhead & Profit 15%								
TOTAL ELECTRICAL				**$ 716,452**		**$ 508,751**		**$ 1,225,203**

COLLATERAL EQUIPMENT
For P605, UAS Hangar

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

The cost of FF&E is based on a square footage price taken from the Tri Services Cost Estimating Guide May 2013 for a specific facility. The square footage cost will be projected in the spreadsheet when you enter the fiscal year of your project. Fill in the highlighted areas for as many facilities as you have in your project. This cost does not include shop equipment or equipment not considered FF&E. The PM and user should formulate a seperate list for those items.

Shop and station funded equipment costs should be entered for the fiscal year; no inflation factor has been added. Also, costs shouldn't include installation, shipping and contingency;they will be added at the bottom of the spreadsheet.

Enter the project Fiscal Year: 2022

	Facility Unit Cost ($)	Facility Size (SF)	Subtotal
Facility 1	38	62,675	$ 2,364,032
Facility 2			$ -
Facility 3			$ -
Facility 4			
Facility 5			
Facility 6			
Facility 7			
Facility 8			
Facility 9			
Facility 10			

Subtotal FF&E: $ 2,364,032

SHOP TYPE AND STATION FUNDED EQUIPMENT

Audio / Visual Equipment

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
A/V Equipment for Conference/Briefing Rooms	62,675	SF	$ 6.16	$386,255
	Subtotal Audio / Visual Equipment:			$ 386,255

Miscellaneous Equipment

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
Tension structure canopies	333.34	m2	$ 434	$ 144,776
		LS	$ 150,000	$ -
	Subtotal Miscellaneous Equipment:			$ 144,776

COLLATERAL EQUIPMENT
For P605, UAS Hangar

INTERIOR FURNITURE, FURNISHINGS AND EQUIPMENT (FF&E)

Subtotal FF&E:	$	2,364,032
Subtotal Shop and Station Equipment:	$	531,031
Total FF&E, Shop and Station Equipment:	$	2,895,063
Area Cost Factor	$	3,126,668
Installation (13%):	$	406,467
Shipping (6%):	$	187,600
SIOH (5.7%):	$	178,220
Contingency (5%):	$	156,333
Total Collateral Equipment:	$	4,055,289

Naval Facilities Engineering Command
LEED for New Construction v3.0 Workbook
Cover Sheet

Purpose

The Navy LEED for New Construction v3.0 Workbook is a planning tool to assist the area planners in adjusting primary facility unit costs to account for acquiring LEED Certification credits by facility type. This workbook is a tool which assists in preliminary program budgeting establishing a viable assessment of LEED credits to be incorporated into the project. This workbook will allow LEED points to be assigned and determine a preliminary budget. It should only be used as a benchmark to assess basis of programming costs until further study, design & RFP development sessions and performance / prescriptive specifications are prepared by experienced professionals.

Project Information

Project Number:	P-605	Project Title:	UAS Hangar
Project Year:	2022	Project Location:	MCAS Yuma, AZ
Zip Code:	85365	Facility Type:	MOU Required Credits

Primary Facility Information

Cost of Primary Facility ($):	$41,330,869
Size of Primary Facility (m2):	5,841.29
Number of Occupants:	50

Additional Cost Information

Area Cost Factor:	1.08
Escalation Rate (%):	122.36%

LEED Checklist Prepared By: GMH Associates

LEED for New Construction v3.0
Regional Credits Worksheet

[Click here to visit the USGBC site containing information on regional credits for your project.]

Search the database by zip code to identify which LEED credits are regional priorities for your project. If your zip code does not exist in the database, find the nearest large city to determine appropriate regional credits. Indicate which credits are a priority for your region using the drop-down menus in the pink cells and setting the four most likely credits to "Y". These will then be factored into your expected building score on the project's LEED Checklist. If you set more than four credits to "Y", the worksheet will only use the first four credits indicated.

Project Title:	UAS Hangar	Project Number:	P-605
Project Location:	MCAS Yuma, AZ	Prepared by:	GMH Associates
Facility Type:	MOU Required Credits	Zip Code:	85365

Regional Priority?			
	Sustainable Sites		**26** Points
	SS Prereq 1	**Construction Activity Pollution Prevention**	Required
N	SS Credit 1	**Site Selection**	1
N	SS Credit 2	**Development Density & Community Connectivity**	5
N	SS Credit 3	**Brownfield Redevelopment**	1
N	SS Credit 4.1	**Alternative Transportation -** Public Transportation Access	6
N	SS Credit 4.2	**Alternative Transportation -** Bicycle Storage & Changing Rooms	1
N	SS Credit 4.3	**Alternative Transportation -** Low-Emitting and Fuel-Efficient Vehicles	3
N	SS Credit 4.4	**Alternative Transportation -** Parking Capacity	2
N	SS Credit 5.1	**Site Development -** Protect or Restore Habitat	1
N	SS Credit 5.2	**Site Development -** Maximize Open Space	1
N	SS Credit 6.1	**Stormwater Design -** Quantity Control	1
N	SS Credit 6.2	**Stormwater Design -** Quality Control	1
N	SS Credit 7.1	**Heat Island Effect -**Nonroof	1
N	SS Credit 7.2	**Heat Island Effect -** Roof	1
N	SS Credit 8	**Light Pollution Reduction**	1
	Water Efficiency		10 Points
	WE Prereq 1	**Water Use Reduction**	Required
N	WE Credit 1	**Water Efficient Landscaping**	2 to 4
N	WE Credit 2	**Innovative Wastewater Technologies**	2
Y	WE Credit 3	**Water Use Reduction**	2 to 4
	Energy & Atmosphere		35 Points
	EA Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
	EA Prereq 2	**Minimum Energy Performance**	Required
	EA Prereq 3	**Fundamental Refrigerant Management**	Required
Y	EA Credit 1	**Optimize Energy Performance**	1 to 19
Y	EA Credit 2	**On-Site Renewable Energy**	1 to 7
N	EA Credit 3	**Enhanced Commissioning**	2
N	EA Credit 4	**Enhanced Refrigerant Management**	2
N	EA Credit 5	**Measurement & Verification**	3
N	EA Credit 6	**Green Power**	2

continued…

		Materials & Resources	14 Points
	MR Prereq 1	**Storage & Collection of Recyclables**	Required
N	MR Credit 1.1	**Building Reuse**, Maintain Existing Walls, Floors & Roof	1 to 3
N	MR Credit 1.2	**Building Reuse**, Maintain Interior Nonstructural Elements	1
Y	MR Credit 2	**Construction Waste Management**	1 to 2
N	MR Credit 3	**Materials Reuse**	1 to 2
N	MR Credit 4	**Recycled Content**	1 to 2
N	MR Credit 5	**Regional Materials**	1 to 2
N	MR Credit 6	**Rapidly Renewable Materials**	1
N	MR Credit 7	**Certified Wood**	1

		Indoor Environmental Quality	15 Points
	EQ Prereq 1	**Minimum Indoor Air Quality Performance**	Required
	EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
N	EQ Credit 1	**Outdoor Air Delivery Monitoring**	1
N	EQ Credit 2	**Increased Ventilation**	1
N	EQ Credit 3.1	**Construction Indoor Air Quality Management Plan -** During Construction	1
N	EQ Credit 3.2	**Construction Indoor Air Quality Management Plan -** Before Occupancy	1
N	EQ Credit 4.1	**Low-Emitting Materials -** Adhesives & Sealants	1
N	EQ Credit 4.2	**Low-Emitting Materials -** Paints & Coatings	1
N	EQ Credit 4.3	**Low-Emitting Materials -** Flooring Systems	1
N	EQ Credit 4.4	**Low-Emitting Materials -** Composite Wood & Agrifiber Products	1
N	EQ Credit 5	**Indoor Chemical & Pollutant Source Control**	1
N	EQ Credit 6.1	**Controllability of Systems -** Lighting	1
N	EQ Credit 6.2	**Controllability of Systems -** Thermal Comfort	1
N	EQ Credit 7.1	**Thermal Comfort -** Design	1
N	EQ Credit 7.2	**Thermal Comfort -** Verification	1
N	EQ Credit 8.1	**Daylight & Views -** Daylight	1
N	EQ Credit 8.2	**Daylight & Views -** Views	1

LEED for New Construction v3.0
Project Checklist

Project Title:	UAS Hangar	Project Number:	P-605
Project Location:	MCAS Yuma, AZ	Prepared by:	GMH Associates
Facility Type	MOU Required Credits	Zip Code:	85365

Yes	?	No			
5	14	7	**Sustainable Sites**		**26** Points
Y			SS Prereq 1	**Construction Activity Pollution Prevention**	Required
1			SS Credit 1	**Site Selection**	1
	5		SS Credit 2	**Development Density & Community Connectivity**	5
		1	SS Credit 3	**Brownfield Redevelopment**	1
		6	SS Credit 4.	**Alternative Transportation -** Public Transportation Access	6
	1		SS Credit 4.:	**Alternative Transportation -** Bicycle Storage & Changing Rooms	1
	3		SS Credit 4.:	**Alternative Transportation -** Low-Emitting and Fuel-Efficient Vehicles	3
	2		SS Credit 4.·	**Alternative Transportation -** Parking Capacity	2
	1		SS Credit 5.	**Site Development -** Protect or Restore Habitat	1
	1		SS Credit 5.:	**Site Development -** Maximize Open Space	1
1			SS Credit 6.	**Stormwater Design -** Quantity Control	1
1			SS Credit 6.:	**Stormwater Design -** Quality Control	1
1			SS Credit 7.	**Heat Island Effect -**Nonroof	1
1			SS Credit 7.:	**Heat Island Effect -** Roof	1
	1		SS Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
6	4	0	**Water Efficiency**		10 Points
Y			WE Prereq 1	**Water Use Reduction**	Required
2	2		WE Credit 1	**Water Efficient Landscaping**	2 to 4
				2 Reduce by 50%	
	2		WE Credit 2	**Innovative Wastewater Technologies**	2
4			WE Credit 3	**Water Use Reduction**	2 to 4
				4 Reduce by 40%	

Yes	?	No			
14	19	2	**Energy & Atmosphere**		35 Points
Y			EA Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			EA Prereq 2	**Minimum Energy Performance**	Required
Y			EA Prereq 3	**Fundamental Refrigerant Management**	Required
7	12		EA Credit 1	**Optimize Energy Performance**	1 to 19
				7 Improved by 24% for New Buildings or 20% Existing Building Renovations	
3	4		EA Credit 2	**On-Site Renewable Energy**	1 to 7
				3 5% Renewable Energy	
2			EA Credit 3	**Enhanced Commissioning**	2
2			EA Credit 4	**Enhanced Refrigerant Management**	2
	3		EA Credit 5	**Measurement & Verification**	3
		2	EA Credit 6	**Green Power**	2

Yes	?	No			
4	10	0	**Materials & Resources**		**14** Points
Y			MR Prereq 1	**Storage & Collection of Recyclables**	Required
	3		MR Credit 1.	**Building Reuse**, Maintain Existing Walls, Floors & Roof	1 to 3
				0 Not Pursued	3
	1		MR Credit 1.	**Building Reuse**, Maintain Interior Nonstructural Elements	1
1	1		MR Credit 2	**Construction Waste Management**	1 to 2
				1 50% Recycled or Salvaged	2
	2		MR Credit 3	**Materials Reuse**	1 to 2
				0 Not Pursued	2

Yes	?	No	Credit	Description	Points
2			MR Credit 4	**Recycled Content**	1 to 2
				2 — 20% of Content	2
	2		MR Credit 5	**Regional Materials**	1 to 2
				0 — Not Pursued	2
1			MR Credit 6	**Rapidly Renewable Materials**	1
	1		MR Credit 7	**Certified Wood**	1

Yes	?	No	Credit	Description	Points
12	3	0		**Indoor Environmental Quality**	**15** Points
Y			EQ Prereq 1	**Minimum Indoor Air Quality Performance**	Required
Y			EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			EQ Credit 1	**Outdoor Air Delivery Monitoring**	1
1			EQ Credit 2	**Increased Ventilation**	1
1			EQ Credit 3.	**Construction Indoor Air Quality Management Plan -** During Construction	1
	1		EQ Credit 3.	**Construction Indoor Air Quality Management Plan -** Before Occupancy	1
1			EQ Credit 4.	**Low-Emitting Materials -** Adhesives & Sealants	1
1			EQ Credit 4.	**Low-Emitting Materials -** Paints & Coatings	1
1			EQ Credit 4.	**Low-Emitting Materials -** Flooring Systems	1
	1		EQ Credit 4.	**Low-Emitting Materials -** Composite Wood & Agrifiber Products	1
1			EQ Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			EQ Credit 6.	**Controllability of Systems -** Lighting	1
1			EQ Credit 6.	**Controllability of Systems -** Thermal Comfort	1
1			EQ Credit 7.	**Thermal Comfort -** Design	1
1			EQ Credit 7.	**Thermal Comfort -** Verification	1
1			EQ Credit 8.	**Daylight & Views -** Daylight	1
	1		EQ Credit 8.	**Daylight & Views -** Views	1

Yes	?	No	Credit	Description	Points
5	1	0		**Innovation in Design**	6 Points
4	1		ID Credit 1	**Innovation in Design**	1 to 5
				1 — Innovation in Design: Moisture Control Plan	1
				1 — Innovation in Design: Bio-Based Products	2
				1 — **Innovation in Design**: Sustainability Education Program	3
				1 — **Innovation in Design**: Energy Star Appliances	4
				0 — **Innovation in Design**: Provide Specific Title	5
1			ID Credit 2	**LEED® Accredited Professional**	1

Yes	?	No	Credit	Description	Points
4	0	0		**Regional Priority**	4 Points
4			Credit 1	**Regional Priority**	1 to 4
				1 — WE Credit 3 — Water Use Reduction	1
				1 — EA Credit 1 — Optimize Energy Performance	2
				1 — EA Credit 2 — On-Site Renewable Energy	3
				1 — MR Credit 2 — Construction Waste Management	4

Yes	?	No			
50	51	9		**Project Totals (Pre-certification estimates)**	110 Points

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

Notes:

Legend: Credits in **ORANGE** are required to be met at some level by policy or Federal mandate and must be achieved on all projects unless adequate justification can be provided to show that they are not life-cycle cost effective or not achievable due to geographic location, site or facility type.

Credits in **GREEN** are strategies recommended based on past NAVFAC project experience and can be changed based on project specifics.

Credits in **BLACK** are not mandated or recommended but should be considered for projects on a case-by-case basis.

LEED for New Construction v3.0
Project Cost Worksheet - MOU Required Credits

Note: All costs are editable in this worksheet based on specific project information and requirements; changes can be made directly in Column P for unit costs or Column R if a lump sum cost is known.

Project Title:	UAS Hangar	Year of Project:	2022
Project Number:	P-605	Cost of Primary Facility:	41,330,869
Project Location:	MCAS Yuma, AZ	Size of Primary Facility (m2):	5,841.29
Prepared By:	GMH Associates	Number of Occupants:	50

LEED Total Cost Less Than 4% of Primary Facility Cost

2.40

Sustainable Sites		Include in 1391	Modifications to Project 1391 Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Construction Activity Pollution Prevention**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 1	**Site Selection**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 2	**Development Density & Community Connectivity**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 3	**Brownfield Redevelopment**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4.1	**Alternative Transportation**, Public Transportation Access						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms						
	Cost Premiums Captured By GUC	Y	None	m2	0	0.00	0
Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 4.4	**Alternative Transportation**, Parking Capacity						
	Carpool and Vanpool Preferred Parking	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5.1	**Site Development,** Protect of Restore Habitat						
	Native Drought Resistant Plants	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5.2	**Site Development,** Maximize Open Space						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 6.1	**Stormwater Design,** Quantity Control						
	Increased Landscape Area	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Vegetated Roofs	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Pervious Surfaces	Y	Site LEED and Federal Energy Acts Compliance	m2	10,410	26.98	280,869
Credit 6.2	**Stormwater Design,** Quality Control						
	Subsurface Sand Filter System	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Sustainable Design Strategies: Low Impact Development	Y	Site LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 7.1	**Heat Island Effect,** Nonroof						
	Improved Design Reducing Heat Islands	N	Site LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
	High Albedo Material	N	Site LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
	Vegetated Roofs	N	Site LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
	Pervious Surfaces	Y	Site LEED and Federal Energy Acts Compliance	m2	10,410	0.00	0

Credit 7.2	**Heat Island Effect,** Roof						
	Highly Reflective Energy Star Roof Material	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 8	**Light Pollution Reduction**						
	Improved Design Reducing Light Pollution	Y	Site LEED and Federal Energy Acts Compliance	m2	0	0.79	0
	Light Pollution Reducing Fixtures	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0

Water Efficiency		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Water Use Reduction,** 20% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 1	**Water Efficient Landscaping,** Reduce by 50%						
	Native Drought Resistant Plants	Y	Site LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 1	**Water Efficient Landscaping,** No Potable Use or No Irrigation						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 2	**Innovative Wastewater Technologies**						
	Innovative Wastewater Technologies	N	Site LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Water Use Reduction, 3**0% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	0	3.10	0
Credit 3	**Water Use Reduction,** 35% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Water Use Reduction,** 40% Reduction						
	Low Flow Plumbing Fixtures	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0

Energy and Atmosphere		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Fundamental Commissioning of the Building Energy Systems**						
	Fundamental Building Systems Commissioning	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Prereq 2	**Minimum Energy Performance:** 10% New Bldgs or 5% Existing Bldg Renovations						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Prereq 3	**Fundamental Refrigerant Management**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 1	**Optimize Energy Performance**						
	Daylight Dimming Systems	Y	LEED and Federal Energy Acts Compliance	m2	0	66.31	0
	Occupancy Sensor Controls	Y	LEED and Federal Energy Acts Compliance	m2	0	12.39	0
	Premium Efficiency Motors	Y	LEED and Federal Energy Acts Compliance	m2	0	1.63	0
	Modulating Condensing Boilers	Y	LEED and Federal Energy Acts Compliance	m2	0	12.46	0
	High - Efficiency Chillers	Y	LEED and Federal Energy Acts Compliance	m2	0	22.38	0
	Variable Frequency Drive Cooling Tower Fans	Y	LEED and Federal Energy Acts Compliance	m2	0	19.88	0
	Energy Recovery Units	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Domestic Solar Hot Water	Y	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Air Barrier Construction	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 2	**On-Site Renewable Energy**						
	Photovoltaics	Y	LEED and Federal Energy Acts Compliance	m2	50	4786.59	239,330
Credit 3	**Enhanced Commissioning**						
	Enhanced Building Systems Commissioning	Y	LEED and Federal Energy Acts Compliance	m2	5,841	12.20	71,261
Credit 4	**Enhanced Refrigerant Management**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0

		Include in 1391	Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Credit 5	**Measurement & Verification**						
	Continuous Metering Equipment	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
	Measurement and Verification Plan	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 6	**Green Power**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0

Materials and Resources		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Storage & Collection of Recyclables**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 1.1	**Building Reuse**, Maintain 50% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.1	**Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 1.2	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 2	**Construction Waste Management**, Divert 50% from Disposal						
	Waste Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 2	**Construction Waste Management**, Divert 75% from Disposal						
	Waste Management Plan with additional measures	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 3	**Materials Reuse**, 5%						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 3	**Materials Reuse**, 10%						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 4	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)						
	Materials with Recycled Content	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 4	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)						
	Materials with Recycled Content at a higher level	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 5	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally						
	Materials Manufactured Regionally	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally						
	Materials Manufactured Regionally	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 6	**Rapidly Renewable Materials**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 7	**Certified Wood**						
	*Certified Wood Materials***	N	LEED and Federal Energy Acts Compliance	m2	0	1.00	0

Indoor Environmental Quality		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Prereq 1	**Minimum Indoor Air Quality Performance**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 1	**Outdoor Air Delivery Monitoring**						
	Carbon Dioxide Sensors	Y	LEED and Federal Energy Acts Compliance	m2	5,841	18.13	105,910
Credit 2	**Increased Ventilation**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0

Credit 3.1	**Construction IAQ Management Plan**, During Construction						
	Construction IAQ Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy						
	Pre-Occupancy IAQ Management Plan	Y	LEED and Federal Energy Acts Compliance	m2	0	20.27	0
Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 4.2	**Low-Emitting Materials**, Paints & Coatings						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 4.3	**Low-Emitting Materials**, Flooring Systems						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products						
	Composite Wood & Agrifiber Products	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0
Credit 5	**Indoor Chemical & Pollutant Source Control**						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 6.1	**Controllability of Systems**, Lighting						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 6.2	**Controllability of Systems**, Thermal Comfort						
	Thermal and Humidity Monitoring Systems	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 7.1	**Thermal Comfort**, Design						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 7.2	**Thermal Comfort**, Verification						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 8.1	**Daylight & Views**, Daylight						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 8.2	**Daylight & Views**, Views						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	LEED and Federal Energy Acts Compliance	m2	0	0.00	0

Innovation & Design Process		Include in 1391	Modifications to Project 1391				
			Applicable Section of 1391	UM	Quantity	Unit Cost	Cost
Credit 1	**Innovation in Design**: Moisture Control Plan						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 1	**Innovation in Design**: Bio-Based Products						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	LEED and Federal Energy Acts Compliance	m2	5,841	0.00	0
Credit 1	**Innovation in Design**: Sustainability Educational Program						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 1	**Innovation in Design**: Energy Star Appliances						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	Y	None	m2	5,841	0.00	0
Credit 1	**Innovation in Design**: Provide Specific Title						
	No Identified Cost Premiums - Identify Feature and Add Cost Premiums If Needed	N	None	m2	0	0.00	0
Credit 2	**LEED® Administration Costs**						
	LEED Project Registration	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0
	*LEED Certification**	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0
	LEED Documentation	Y	LEED and Federal Energy Acts Compliance	ea	1	0.00	0

***Note:**

NEW!

Users should go directly to the GBCI web site to obtain the latest cost for LEED Certification relevant for their project:

http://www.gbci.org/DisplayPage.aspx?CMSPageID=127

Cost values can be substituted directly into the appropriate rows in Column P to adjust project costs.

Total Marginal Cost = 1.69%

Purpose

This LID Workbook is a planning tool to assist the planning estimator in crafting credible LID costs as a component of project construction costs for 1391 budgetary purposes. During the project design stage, performance and/or prescriptive specifications will establish the actual LID features and amounts along with their associated costs.

Project Information

Project Number:	P-605	**Project Title:**	UAS Hangar
Project Year:	2022	**Project Location:**	MCAS Yuma, AZ

LID Cost Prepared By: GMH Associates
Phone Number: 619-285-9885
Email Address: kathyv@gmhainc.com

Cost Information

$41,480,499	=	**The Construction Cost Value (Before LID Costs)**
		Entered cost must be equal to or greater than $1,000,000

Additional Cost Information

1.224	=	**Escalation Rate (%)**	**Unit costs, shown on the [Cost Calcs] page, are dated at Apr 2014**
1.08	=	**Area Cost Factor**	**Unit costs have an ACF of 1**

Site Information

Quantity	UM	Item
206	M	**Site Width**
320	M	**Site Length**

Existing Site Impervious Surfaces

Quantity	UM	Item
3,102	SM	Existing Building/s Foot Print/s
5,911	SM	Existing POV Parking Lot
0	SM	Existing Sidewalks
0	SM	Existing Access Road
50,000	SM	Other Existing Hard Surface Areas

New Building and New Impervious Surface Information (Used in the Cost Cals Worksheet)

Quantity	UM	Item
4,733	SM	New Building Foot Print
5,911	SM	New POV Parking Lot
26	M	AT/FP building setback at the Front of the Building (Used in conjunction with the "Site Width" to determine area in front of the building available for LID features)
26	M	AT/FP building setback at the Side of the Building (Used in conjunction with the "Site Length" to determine area to one side of the building available for LID features)

Post Construction Site Impervious Surfaces

Quantity	UM	Item
4,733	SM	Post Construction Building/s Foot Print/s
5,911	SM	Post Construction POV Parking Lot
780	SM	Post Construction Sidewalks
4,645	SM	Post Construction Access Road
45,000	SM	Other Post Construction Hard Surface Areas

Calculations (below) Based on Entered Information (No entries are required below)

65845.03	SM	Total Site Area
59013.06	SM	Total Existing Site Impervious Area
61069.94	SM	Total Post Construction Site Impervious Area

Overall Pervious-Areas Soil Characteristics: Soil Type and Soil Cover

When in doubt on a selection, gravitate towards the lower number

3 **Soil Classification Type: Enter at left the best assessment**

1 = Clay
2 = Clay/silt (silty soil encompasses organic soils)
3 = Silty sand (silty soil encompasses organic soils)
4 = Sand

1 **Soil Ground Cover Type: Enter at left the best assessment**

1 = Bare soil, no vegetative cover
2 = Grassed area
3 = Woods having light underbrush
4 = Woods having heavy underbrush

Summary Information For the LID Cost % Calc

89.62%	=	LID: The Existing Site Impervious Percentage
92.75%	=	LID: The Completed Project Site Impervious Percentage
-----------------------		
3.12%	=	LID: The Impervious Increase Percentage
3	=	Soil Classification Type
1	=	Soil Ground Cover Type

Quantity	UM	Item
65,845	SM	Site Area based on Width & Length
5,330	SM	Setback Area in Front of Building
346	SM	Setback Area to One Side of Building

LID Features & Premiums

$41,480,499 = **The PreFinal Construction Cost Value**

0.089% = **The LID Cost Percentage of the 1391 Subtotal Construction Cost**

$36,930 = **The LID % Cost Calc**

Cost	Include in 1391?	Item Name	Quantity	UM	Quantity Modifier	Unit Cost	Escalation Factor	ACF
$0	N	LID Lump Sum Cost	1	LS		$36,930		
$0	N	A LID Add-In Cost	1	LS		$0		

Itemized Listing — Unit costs are dated at Apr 2014

Cost	Include in 1391?	Item Name	Quantity	UM	Quantity Modifier	Apr 2014 Unit Cost	Escalation Escalation	ACF
$0	N	Bioretention Cells	575	SM		$232	1.224	1.08
		Bioretention Cells: Adj. Unit Cost = $0/SM						
$0	N	Dry Wells	0	EA		$4,110	1.224	1.08
		Dry Wells: Adj. Unit Cost = $0/EA						
$0	N	Filter Strips	5,330	SM	1.00	$10.86	1.224	1.08
		Filter Strips: Adj. Unit Cost = $0/SM						
$0	N	**Vegetated Buffers - Grass Buffers**	346	SM	1.00	$0.15	1.224	1.08
		Vegetated Buffers - Grass Buffers: Adj. Unit Cost = $0.00/SM						
$0	N	**Vegetated Buffers - Forest Buffers**	346	SM	1.00	$0.26	1.224	1.08
		Vegetated Buffers - Forest Buffers: Adj. Unit Cost = $0.00/SM						
$0	N	**Grassed Swales**	320	M	1.00	$138	1.224	1.08
		Grassed Swales: Adj. Unit Cost = $0/M						
$0	N	**Infiltration Trench/Basin**	320	M	1.00	$104	1.224	1.08
		Infiltration Trench/Basin: Adj. Unit Cost = $0/M						
$0	N	**Inlet Device**	5	EA		$3,376	1.224	1.08
		Inlet Device: Adj. Unit Cost = $0/EA						
$0	N	**Rain Barrels, Cisterns**	0	EA		$176	1.224	1.08
		Rain Barrels, Cisterns: Adj. Unit Cost = $0/EA						
$0	N	**Tree Box Filters**	4	EA		$10,341	1.224	1.08
		Tree Box Filters: Adj. Unit Cost = $0/EA						

$0	N	**Vegetated Rooftops**	0	SM	0.00	$545	1.224	1.08
		Vegetated Rooftops: Adj. Unit Cost = $0/SM						
$36,930	Y	**Permeable Pavement - Asphalt**	1,700	SM	0.29	$16.44	1.224	1.08
		Permeable Pavement - Asphalt: Adj. Unit Cost = $22/SM						
$0	N	**Permeable Pavement - Concrete**	5,911	SM	1.00	$103	1.224	1.08
		Permeable Pavement - Concrete: Adj. Unit Cost = $0/SM						
$0	N	**Permeable Pavement - Concrete Blocks**	5,911	SM	1.00	$164	1.224	1.08
		Permeable Pavement - Concrete Blocks: Adj. Unit Cost = $0/SM						
$0	N	**Permeable Pavement - Grass/Gravel Paver**	5,911	SM	1.00	$94	1.224	1.08
		Permeable Pavement - Grass/Gravel Paver: Adj. Unit Cost = $0/SM						
$0	N	**Constructed Wetland**	0	SM		$44.00	1.224	1.08
		Constructed Wetland: Adj. Unit Cost = $0.00/SM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						
$0	N	**Write In LID Item**	0	UM		$0.00	1.000	1.00
		Write In LID Item: Adj. Unit Cost = $0.00/UM						

$36,930 The Grand Total of LID <u>Premium</u> Costs Crafted on this page

1391 LID Cost Line Items

2022

Project Title: UAS Hangar **Project Number: P-605**
Location: MCAS Yuma, AZ
Prepared by: GMH Associates

The PreFinal Construction Cost Value **$41,480,499**

ITEM	UM	QUANTITY	UNIT COST	TOTAL COST
LID Lump Sum Cost	LS	1	$0.00	$0
A LID Add-In Cost	LS	1	$0.00	$0
Bioretention Cells	SM	575	$0.00	$0
Dry Wells	EA	0	$0.00	$0
Filter Strips	SM	5,330	$0.00	$0
Vegetated Buffers - Grass Buffers	SM	346	$0.00	$0
Vegetated Buffers - Forest Buffers	SM	346	$0.00	$0
Grassed Swales	M	320	$0.00	$0
Infiltration Trench/Basin	M	320	$0.00	$0
Inlet Device	EA	5	$0.00	$0
Rain Barrels, Cisterns	EA	0	$0.00	$0
Tree Box Filters	EA	4	$0.00	$0
Vegetated Rooftops	SM	0	$0.00	$0
Permeable Pavement - Asphalt	SM	1,700	$21.73	$36,930
Permeable Pavement - Concrete	SM	5,911	$0.00	$0
Permeable Pavement - Concrete Blocks	SM	5,911	$0.00	$0
Permeable Pavement - Grass/Gravel Pave	SM	5,911	$0.00	$0
Constructed Wetland	SM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0
Write In LID Item	UM	0	$0.00	$0

TOTAL LID Premium Costs **$36,930**

The LID Cost Percentage of the 1391 Subtotal Construction Cost **0.089%**

Appendix C: Meeting Minutes

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VMU Relocation Planning Study and EA
MCAS Yuma Project Kickoff Meeting
28 January 2014, 1000 - 1200
MCAS Yuma – Building 888

Name	Organization	Telephone	E-mail
RICHARD SAMRAH	S&L	928.261.3163	richard.samrah@usmc.mil
Nicholas Martinez (SNCOIC)	ATC	928 269 9564	nicholas.martinez@usmc.mil
Christopher Jackson (RDR Chief)	ATC	928 269 ~~9564~~ 8978	Christopher.b.Jackso@usmc.mil
Adam Sanders (Twr Chief)	ATC	928 269 9564	Adam.J.Sanders1@usmc.mil
Jason Crutchfield (A.ATCFO)	ATC	928 269 9113	Jason.Crutchfield@usmc.mil
Greg McShane	S-3 Airfield ops	269-3327	gregory.mcshane@usmc.mil
BRAD CHITTENDEN	HQMC AVN	703-693-9777	Brad.Chittenden@usmc.mil
Darren Jacobsen	KTUA	619 294 4477 x126	darren@ktua.com
Sandy Shane Ciarne	KTUA	619 294-4477 x124	sandy@ktua.com
ROBERT EFIRD	KTUA	"	robert@ktua.com

Name	Organization	Telephone	E-mail
SEAN K. BUTLER	YUMA RANGE	928.269.5573	sean.butler@usmc.mil
DREW HASCALL CAPT, CEC, USN	MCASY I&L	928-269-2051	andrew.hascall@usmc.mil
KAREN FOSTER	LEIDOS	805-636-7401	FOSTERKA@LEIDOS.com
Pam Montroy	NAVFAC SW	619-532-4817	pamela.montroy@navy.mil
ANDREW DIVENEY, LTCOL USMC	MAG-13	928 269-3188	ANDREW.DIVENEY@USMC.MIL
RON KRUSE	MCAS I&L	928 269 3523	RONALD.KRUSE@usmc.mil
Rod Hartleib	PWD I&L	928-269-2602	rodney.hartleib@usmc.mil
LTCOL KEVIN MURRAY USMC	VMU-1	760-830-5677	KEVIN.F.MURRAY@USMC.mil
MAJ NOAH SPATARO USMC	VMU-1	775-910-2261 520-335-4359 760-830-5678	noah.spataro@usmc.mil

VMU Relocation Planning Study
MCAS Yuma Kick-off Meeting

DATE: 28 January 2014
TIME: 1000 – 1200 MST

ATTENDEES:

Brad Chittenden (HQMC AVN)
Major Patrick Williams (via teleconference)
Richard Samrah (Yuma Facilities Planner)
Greg McShane (Airfield Ops)
Sean Butler (Yuma Range)
Capt Drew Hascall (MCASY 1 & 2)
LtCol Andrew Diviney (MAG-13)
Ron Kruse (MCAS I&L)
Rod Hartleib (PWD I&L)
LtCol Kevin Murray (VMU-1)
Major Noah Spataro (VMU-1)
Nicholas Martinez (ATC)
Christopher Jackson (ATC)
Adam Sanders (ATC)
Jason Crutchfield (ATC)
Pam Montroy (NAVFAC SW)
Sandy Swaner (KTU+A)
Darren Jacobson (KTU+A)
Robert Efird (KTU+A)
Karen Foster (Leidos)

- **Welcome and Introduction (Pam Montroy)**
    - Everyone was welcomed to the meeting, and roll call was taken.

- **Goals of the Meeting (Pam Montroy)**
  - The goals of the meeting were the following:
    - Review the project history
    - Kickoff the Planning Study, which will evaluate potential basing and training locations for VMU-1 at Marine Corps Air Station (MCAS) Yuma
    - Determine the next steps in moving forward with the Planning Study
    - Preview the National Environmental Policy Act (NEPA) process

- **General Overview of the Project (Brad Chittenden)**
  - VMU-1 is currently based at Marine Corps Air Ground Combat Center (MCAGCC) in Twentynine Palms. HQMC Aviation is exploring the option to relocate VMU-1 to MCAS Yuma in an effort to align VMU-1 with MAG-13 for operational and logistical efficiencies.
  - This Planning Study will look at possible long-term basing solutions for VMU-1 at MCAS Yuma, including accommodating future platforms (e.g., Group 4/5 UAS such as MQ-9 Reaper).
  - A different contractor will also be preparing a Site Evaluation Report (SER) for MCAS Yuma, starting sometime in February or March 2014.
  - There are two separate, but somewhat concurrent actions that help form the “big picture” at MCAS Yuma:
    - Establishment of a Marine Aviation Operational Test and Evaluation Center (OTEC) and relocation of the Aviation Test and Evaluation Center of Excellence

    - (VMX) to MCAS Yuma. Because the VMX will have a UAS component separate from VMU-1, some coordination may be needed between the two planning studies.
    - The proposed school house is currently being considered for either Cherry Point or Yuma. If appropriate, the proposed school house can be added to the Planning Study's concept plans if the school house plans are provided to KTU+A.

- **Proposed Action & Requirements (Brad Chittenden)**
  - The proposed action will look at full basing of VMU-1 at MCAS Yuma and, alternatively, a VMU-1 detachment.
  - There is no longer an alternative to send a detachment of VMU-4 (Reserves) to MCAS Yuma.

- **Planning Study Courses of Action (COAs) and Siting Locations (Darren Jacobson)**
  - *Yuma COA 1* – Permanent basing of VMU-1 w/ 3 RQ-7B & 9 RQ-21 systems
    - Facility requirements (e.g., hangars/equipment storage, maintenance, administrative, contractor support) sited mainside at the air station.
    - Plans should accommodate future Group 4/5 UAS.
    - RQ-7B and RQ-21 operations at either Canon Air Defense Center (CADC) or AUX-2 (in Barry M. Goldwater Range); may need new facilities to accommodate operations. VMU-1 expressed preference for use of the CADC, but MCAS Yuma says there may be operational constraints at the CADC.
    - Timeframe - 2016 to 2020s.
  - *Yuma COA 2* - Permanent basing of VMU-1 w/ 3 MQ-9 & 9 RQ-21 systems
    - Facility requirements (e.g., hangars/equipment storage, maintenance, administrative, contractor support) sited mainside at the air station.
    - MQ-9 operations require air station runway/flight line access, tow lane, CALA access, apron space, sun shades, etc.
    - RQ-21 operations at either CADC or AUX-2; may need new facilities to accommodate operations.
    - Timeframe – 2020s.
  - *Yuma COA 3* - VMU-1 Detachment w/ 1 RQ-7B & 1 RQ-21 systems
    - Facility requirements and operations at either CACD or AUX-2.
    - Facility requirements will be based on P-123 [*side note – the USMC is going to ask Congress to cancel P-123 because this Reserve's project is no longer being considered; it is up to Congress to cancel*].

- **Planning Study (Darren Jacobson)**
  - *Purpose and Goal* – establish optimal VMU-1 facility siting footprints for the three COAs, and identify the preferred location and facility configuration to meet the full complement of equipment and personnel.
  - *Planning Process and Coordination* –
    - NAVAIR SER will run parallel to this Planning Study; need to coordinate the two studies so that facility requirements developed by SER team can be used in the Planning Study.

- The facility requirements for the RQ-7B and RQ-21 will be based on the Platform Base Facility Requirements (PBFRs).
- The facility requirements for the MQ-9 will be based on available Air Force planning documents provided by Major Williams.
- KTU+A suggests that a standard Type II Hangar may be applicable to COA 1 and COA 2; VMU-1 notes that the hangar should have appropriate Ground Control Integration.
- ***Action*** **–** KTU+A and Pam Montroy will work with Richard Samrah to set up interviews with MCAS Yuma and VMU-1 personnel.

- **Potential Issues and Data Needs (Darren Jacobson)**
  - *CERCLA* **–** COA 1 and COA 2 may involve CERCLA clean-up, which could affect overall environmental planning schedule.
    - ***Action*** **–** Pam Montroy will coordinate with Angela Wimberly.
  - *BEQs* **–** the Planning Study can note current and proposed loading, based on input from MCAS Yuma, to identify potential deficiencies, but the study will not develop siting footprints for new BEQs or other secondary support systems.
    - ***Action*** **–** Major Williams will provide TO&E for VMU-1 *[update - file was provided 30 January 2014]*.
  - *Operations Constraints* **–** Air Traffic Control (ATC) does not see any known issues with MQ-9 flights at the air station (they'll be treated like any other manned aircraft), assuming the UAS operator has good communications with ATC to ensure safety of flight for other aircraft operating around the UAS. If ATC can't maintain a reliable line of in flight communication with the UAS then we put other aircraft at risk. A second concern is runway sharing. ATC expressed concern over the launch and recovery duration on the airport and potential delays it may cause with civilian airlines.

- **Schedule and Critical Path Items (Darren Jacobson)**
  - *Current Schedule* - Planning Study Draft 1 scheduled for early May 2014; Draft 2 about June 2014, and completion of the Final Report in early September 2014.
  - KTUA will develop a 1391 of the preferred alternative, and will submit with the Draft 2 Report (assuming the preferred alternative can be identified based on the Draft 1 Report).
  - ***Action*** **–** Major Williams will determine who should be on the review team for the Planning Study.

- **Other Items and Closing Remarks (Pam Montroy)**
  - Discussed possible near-term movement of VMU-1 to MCAS Yuma and possible split assets at MCAGCC and MCAS Yuma; note that the Planning Study will only evaluate long-term (full-basing) alternatives at MCAS Yuma.
  - After the Planning Study is completed, a separate kick-off meeting will be held to start the NEPA process.

- **Additional Data Needs (based on post-meeting discussions)**
  - ***Action* –** LtCol Kevin Murray (VMU-1) to provide the discussed MQ-9 non-classified report if it contains equipment sizing information that can be used to estimate the size of the hangar and associated hangar storage space requirements (AMRDEC should work).
  - ***Action* –** Richard Samrah to provide the following items:
    a. Latest CAD or GIS basemap files for MCAS Yuma showing the latest hangar, roads, parking, utilities, etc constructed for the Joint Strike Fighter (JSF) and nearby projects to update basemaps and generate site plans (not provided in AMRDEC data received 29 January 2014). If you have a digital aerial image of the proposed VMU site that shows the latest JSF hangars, apron, POV parking, support buildings across the street, can we get that file also?
       i. The attached excel file, “GIS Data Collected 28Jan2014.xlsx”, is a list of the GIS data layers provided to KTU+A. Additional data requested is highlighted in yellow for each location (e.g., MCAS Yuma, CADC, AUX-II).
       ii. Ideal option would be to get a comprehensive geodatabase that includes all relevant data layers for MCAS Yuma, CADC, Barry M. Goldwater Range, and the ALF in a single geodatabase.
    b. CAD or scale-able floor plan of the JSF hangars showing the size of the SCIF/SAPF space so we can add it to the size of the proposed hangar.
    c. BFR's for all activities at MCAS Yuma and special areas to generate a summary of community services and barracks changes that would result from VMU additional personnel.
    d. R-19, R-21, R-22 related to barracks assets and requirements to show an increase that would result from VMU additional personnel.

Meeting Minutes, VMU-1 Interview
VMU-4 Relocation Planning Study

Meeting Title:	VMU-1 Interview, VMU-4 Relocation Planning Study	
Date:	7 March 2014	
Time (Place):	1000-1530 (Building 1559, Camp Wilson)	
Attendees:		
LtCol Kevin Murray (VMU-1)	760-830-5677	Kevin.f.murray@usmc.mil
Andres Fuentes (Range)		Andres.m.fuentes@usmc.mil
Robert Efird (KTU+A)	619-294-4477 ext. 125	robert@ktua.com
Sandra Swaner-Carmona	619-294-4477 ext. 124	sandy@ktua.com

KTU+A met with VMU-1 at Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms to gather information and get a better understanding of VMU-1 operations. A representative from MCAGCC Range Operations (G3) provided additional information with regard to range scheduling. The following items were discussed:

- VMU-1 has a warehouse and administrative space at the Main Station at MCAGCC Twentynine Palms and uses the Strategic Expeditionary Landing Field (SELF) for launch and recovery. VMU-3 has a complex of temporary facilities at the Main Station and will be relocating to Hawaii in June 2014. VMU-1 hopes to take over VMU-3's facilities at Main Station when they leave in June.
- The SELF has primary and secondary runways: the VMU squadrons have exclusive use of the secondary runway (White Rhino), which measures 2,000 feet in length. Current facilities supporting White Rhino consist of a k-span hangar and several refurbished trailers acquired from DRMO. Supplemental support space is provided via VMU squadrons tents, storage containers, and vehicles. Currently, there is no power to the hangar or trailers and squadrons must utilize generators to produce electricity.
- White Rhino's current location does not meet required setback distances from the main runway and plans have been developed to relocate the runway further south. Along with the relocation of the runway, the Base would construct a second k-span hangar and install ground power. The project is scheduled to be completed the summer of 2014.
- The SELF and Combat Aircraft Loading Area (CALA) will support the MQ-9 when it arrives.
- VMU-1 core competency training is conducted at the 1000 (basic), 2000 (Fly and Tactics), 3000/ 4000 (Integrated Training) level and 5000 and 6000 level?
- Currently, VMU-1 flies in conjunction with exercise support in 29 Palms. There are six Integrated Training Exercises (ITXs) annually of which VMU-1

supports three. The ITXs are conducted at the 3000 and 4000 level training events. When another VMU unit participates in the ITXs VMU-1 cannot fly and must stand down.

- Range Operations provides ground to air de-confliction and makes sure everyone is safe and stays in their designated areas. Deconfliction occurs 5 days advance of exercises, and scheduling occurs at least 30 days in advance.
- At 29 Palms, VMU training is scheduled by TTECG as a part of the ITX they are supporting. At Yuma, combined training is scheduled through MAWTS. For any training not related to MAWTS exercises, VMU is scheduled like any other user.
- The range at 29 Palms is heavily used and VMU-1 cannot complete its core competency training at the 1000 and 2000 level. This training is necessary prior to participating in the ITXs and is currently being scheduled at MCAS Yuma ranges. VMU-1 pays $450,000 to conduct 1000 and 2000 level training in Yuma for one month.
- There are also two MAWTS-1 WTI training events each year in Yuma (April and October). Those events are globally sourced between the VMU squadrons; so typically, VMU-1 has one of those events every other year. (Their last was October 2012 and are participating in the one in April 2014).
- In between ITX and WTI events, the squadron does not fly unless a deployment for training is paid for, typically at Yuma, in order to achieve the lower level, non-integrated, 2000 level training codes. This is because they rely heavily on exercise funds to pay for fuel and maintenance of equipment due to the lack of fixed-facilities and the fact that they have to set up their expeditionary equipment (tents, generators, etc.) wherever they go to train, including the SELF for ITX support.
- The three visual flight rule (VFR) levels that operate at Yuma are low, medium, and high. VMU-1 operates in a dogleg at the low level (2000 feet) on the southern edge of range 2301W while manned aircraft operate to the north. Range operations de-conflicts the altitudes. (Please confirm range number).
- MAWTS has requested an extension of the restricted airspace to encompass Cannon Air Defense Complex (CADC). If the restricted airspace is extended to CADC it has potential to accommodate the Group 3 UAS while the Group 4/5 would need to operate from the MCAS Yuma airfield utilizing a Federal Aviation Administration (FAA) Certificate of Authorization (COA) or a chase plane.
- VMU-1 falls under the Marine Air Wing (MAG). VMU-1 conducts organizational maintenance and MWSS provides intermediate maintenance. MCCESS provides maintenance of communications equipment.

Meeting Minutes, VMU-1 Interview
VMU-4 Relocation Planning Study

Meeting Title:	VMU-1 Interview, VMU-4 Relocation Planning Study	
Date:	16 April 2014	
Time (Place):	1000-1530 (Building 800, Building 645, TACTS Facility)	
Attendees:		
LtCol Kevin Murray (VMU-1)	760-830-5677	Kevin.f.murray@usmc.mil
Major Sparato (VMU-1)	520-335-4359	Noah.spataro@usmc.mil
Richard Samrah (MCAS Yuma I&L)	928-269-3163	Richard.samrah@usmc.mil
Timothy Szymanski (Range Safety)	928-269-5574	Timothy.szymanski@usmc.mil
Sean Butler (Range Ops Officer)	928-269-5573	Sean.butler@usmc.mil
Robert Efird (KTU+A)	619-294-4477 ext. 125	robert@ktua.com
Sandra Swaner-Carmona (KTU+A)	619-294-4477 ext. 124	sandy@ktua.com

KTU+A met with VMU-1 at Marine Corps Air Station (MCAS) Yuma to gather information and get a better understanding of VMU-1 operations during Weapons & Tactics Instructor (WTI) training. A representative from MCAS Yuma Installation & Logistics (I&L) and MCAS Range Operations provided additional information with regard to MCAS facilities and range scheduling. The following items were discussed:

- VMU-1 has requested an extension of the Restricted Airspace (RAS) to encompass Cannon Air Defense Complex (CADC). If the RAS is extended to CADC, VMU-1 would not need to operate with a waiver. This request has been forwarded to 3rd Marine Air Wing (3rd MAW).
- A potential constraint at CADC is the SDZs of small arms ranges to the south/southwest. Currently, range activities have to be halted when an aircraft is within 1,000 feet. Flight patterns to the east would avoid this conflict.
- For the concept at AUX II, VMU-1 facilities could be placed in the middle of the triangle – this would allow easy access to both the LHA and the runway. It would also keep facilities away from imaginary surfaces/operational areas.
    - The LHA has power, but no sewer or water. It may be possible to tap into the well water that supports the gas chamber near the small arms ranges at the edge of Barry M. Goldwater Range (BMGR).
    - The C-130s will continue to use AUX II when the ALF becomes operational.
- Range scheduling at MCAS Yuma must be requested 14 -20 days prior to planned training event. There are several activities that have a higher priority including:

- Priority 1: Major Command Exercises (MEF/3rd Fleet/CSFTWP) – Greater than 90 days advance notice via Naval Message/AMHS. RFMSS Priority Access greater than 45 days before the event.

- Priority 2: WTI – RFMSS Priority Access 30-45 days prior to the course

- Priority 3: Large Force Exercise (Wing/Group/MEB/PTP Assessment) – 60-89 days advance notice via Naval Message/AMHS. RFMSS Priority Access 28-34 days before the event.

- Priority 4: Fleet Replacement Squadron/Deployed Strike Detachments -- 30-59 days advance notice via Naval Message/AMHS. RFMSS Priority Access 21-27 days before the event.

- Priority 5: Marine Corps Combat Readiness Evaluation/PTP Event -- 14-20 days advance notice via Naval Message/AMHS. RFMSS Priority Access 14-20 days before the event.

- Priority 6: Squadron-level Close Air Support -- Schedule 14-20 days before the event.

- Priority 7: Tactical Air Control Party Exercise -- 14-20 days advance notice via Naval Message/AMHS from EWTGPAC. RFMSS Priority Access 14-20 days before the event.

- Priority 8: Individual units (like VMU) on space available basis -- schedule 14-20 days before the event.

- VMU-1 Special Use Airspace (SUA) training areas include:
  - Speed Bag for expeditionary training (no power)
  - AUX II or Yodaville for Basic Training
  - TACTS for all
- There is room in the new trainer facility to accommodate VMU simulators.
- Military Construction (MILCON) Project P-551, Aircraft Maintenance Hangar; P-579, AME Warehouse; and P-542, MWSS Facility (JSF) are unprogrammed. Recommendations for VMU need to identify any conflicts/impacts to MCAS Yuma Master Plan projects.
- Aircraft shelters are required at MCAS Yuma. Need to verify if needed at MCAS Camp Pendleton.

An interview and field visit to observe training at the TACTS was conducted with VMU-1. During WTI VMU-1 operates with a hub and spoke scenario. They currently have 2 hubs: Twentynine Palms and TACTS. Spokes consist of Speedbag, Stovall, and Firebase Burt.

- TACTS is about 1-1.5 hours travel distance from Main Station.
- Speedbag is about 2 hours travel distance from Main Station.
- VMU-1 operates from the 2nd floor of Building 645 when they train at MCAS Yuma.
- VMU-1 has requested a Certificate of Authorization (COA) from the FAA to operate from Cannon. This request has been approved for one year and will be renewed for a two-year period.
- It is only necessary for the MQ9 to be located at the airfield. RQ21s do not require being co-located with the MQ9.
- If VMU-1 relocated to MCAS Yuma, its permanent facilities could serve as a hub during WTI, eliminating the need for a hub at the TACTS, saving both transportation expense and wear and tear on equipment.
- With the arrival of the MQ9s, it is anticipated that they will need to fit 2 aircraft in the hangar and 2 on the flightline. The remainder would be stored in coffins.
    - MQ9s are large enough to tie down on the apron if needed. They would require aircraft shelters, however.

Action Items:

1. Major Spatarro to provide documentation/paperwork related to recently approved COA with the FAA.

Meeting Minutes – Conference Call
VMU-1 & 4 Relocation Planning Studies and Environmental Assessment

<table>
<tr><td>Meeting Title:</td><td>Comment Review and Way Ahead Conference Call,
VMU-1 and VMU-4 Relocation Planning Studies</td></tr>
<tr><td>Date:</td><td>12 September 2014</td></tr>
<tr><td>Time (Place):</td><td>1500-1545 EDT</td></tr>
<tr><td colspan="2">Attendees:
<u>(In person)</u>
<u>(via teleconference)</u>
Major Williams (MCHQ)
Pam Montroy (NAVFAC SW)
Karen Foster (Leidos)
Robert Efird (KTU+A)
Darren Jacobson (KTU+A)</td></tr>
</table>

The teleconference call was held to coordinate the way ahead for the VMU-1 and VMU-4 Planning Studies at MCAS Yuma and MCB Camp Pendleton.

Next steps:

1- Major Williams to determine who will make the ultimate decision on which sites are viable and which are not (i.e. CADC, AUX II, HOLF, etc.). Planning studies will retain initial analysis/alternatives at these sites and include additional rationale provided by reviewers for elimination. Revisions of site layouts will occur for the preferred alternative only.

2- Either meet with, or have a conference call with, the installation planners to finalize selection of the preferred alternative for layout refinement and 1391 development. Potential meeting date for MCB Camp Pendleton is 22 September. Will likely have a conference call for MCAS Yuma.

3- Pam to email planning study reviewers regarding questions on comments. She will copy Leidos/KTU+A and Major Williams and the A/E can correspond directly with the reviewers about resolution of comment questions.

4- Adjust the schedule for submittal of the revised document after meeting with installation planners for selection of the preferred alternative.

5- Refine the selected preferred alternative layouts, develop the 1391 and revise the document for submittal.

General Note:

RQ-21 system's name will be transitioning to MQ-21 in the future. Replace all instances of RQ-21 with MQ-21 in the planning studies and add a note explaining the naming transition.

MCAS Yuma:

VMU-1's preference is a hybrid of the SER alternatives and the planning study alternatives. End goal is to have as many facilities at the Main Station as possible (similar to COA 3, Alt 3), with enough facilities at

CADC to accommodate three systems of RQ/MQ-21s (similar to COA 1, Alt 1). AUX-II is not preferred by the operators. CADC is not preferred by the current occupants due to potential crowding concerns.

Major Williams will request additional information from VMU-1 regarding their proposed facilities at CADC. Planning study shows two low-intensity scales: detachment-scale facilities and an expeditionary-scale hangar facility. What (if any) functions does VMU-1 envision in the long-term for the RQ/MQ-21s at CADC in addition to a hangar and runway?

MCB Camp Pendleton:

Initial ideas from 4th MAW on the preferred alternative include a combination of a Group 5 UAS hangar at the MCAS and all other support facilities at the 22 Area (Long Term COA Alt 6). A specific site/location was not identified for either MCAS or the 22 Area. Final site locations will need to be determined at the planned meeting with MCB Camp Pendleton installation planners. Historical preservation of the Quonset huts may limit development at Camp Talega.

Draft Meeting Minutes
VMU-1 Relocation MCAS Yuma
Draft Planning Study Review Meeting

Meeting Title:	Draft Review Meeting, VMU-1 Relocation Planning Study
Date:	09 October 2014
Time (Place):	0800-0945, Phone Conference and MCAS Yuma

Attendees:

(In person at MCAS Yuma)

Richard Samrah (MCAS Yuma PWD)
Ron Kruse (MCAS Yuma PWD)
Brad Chittenden (HQMC)
Gregory McShane (MCAS Yuma Air Ops)
Randy English (MCAS Yuma)
Karen Foster (LEIDOS)

(via teleconference)

LtCol Kain Anderson (VMU-1 CO)
Anthony Worrell
Major Tegan Owen
Ron Harvey
David Rodriguez
Major Patrick Williams (HQMC Aviation)
Jeff Lovelady (NAVAIR)
Joseph Bryant (HTII)
Michael Ohlhaver (TSI)
Jim Patterson (TSI)
Major Christopher Story (MALS-13 Supply)
Paula Ross (NAVAIR)
Joe Britton (MCAS Yuma Environmental)
Dan Karls (MCAS Yuma Legal Department)
Major Timothy Kuhn (Legal Department)
Pam Montroy (NAVFAC SW)
Sandy Swaner-Carmona (KTU+A)
Darren Jacobsen (KTU+A)

1. **Welcome and Introduction (Pam Montroy)**
    - Everyone was welcomed to the meeting, and roll call was taken.

2. **Goals of the Meeting (Pam Montroy)**
    - The goals of the meeting were the following:
        - Review any remaining issues or comments on the Draft Planning Study that required additional clarification
        - Identify the Preferred Site and Layout for 1391 development
        - Adjust the schedule for the next steps
        - Collect additional direction or comment (incorporated in the details below)

3. **Comment Review**
    - All comments provided on the draft report were considered straight forward adjustments to the document and detailed discussions were not needed.

    - However, one point of follow-up clarification is that the MQ-X should be based on an 79 foot wingspan (Yuma and Pendleton), per email from Major Williams dated 10 October 2014.

4. **Identify the preferred site/location/layout**
    - Both VMU-1 and MCAS Yuma I&L prefer to have most VMU-1 facilities at the main station.
    - <u>Figure 5.1: MCAS, RQ-21 & MQ-9 Full Buildout</u> was noted as having all of the facilities needed to support the long term requirements, except the additional storage space to accommodate MQ-X shipping containers (8'x8'x40' each). A two story warehouse with freight elevator and 16 ft stack height per floor should be included in the MCON.
        - The site shown in Figure 5.1 was noted as infeasible to support the expected timeline for the VMU-1 MCON due to the time needed for cleanup of the munitions contaminations area that generally covers the entire area of the proposed layout. IRP site 8 will not be cleaned up until at least 2020, and timing is dependent on access to clean-up funding.
        - The old van pad area (shown in the Yuma SER as COA 2) was recommended as the final site for VMU-1 long term full build out. Hangar 101 and Hangar 97 were noted as being available for VMU-1. Hangar 97 is planned for demo in 2015.
            - Exactly how to construct the addition to support all of VMU-1 was not known (extension of the existing hangar or stand alone new addition built directly adjacent the existing Hangar 101). A crane in Hangar 101 is not recommended.
            - Existing paving at the old van pad could save MCON funds for vehicle paving. Existing parking apron in front of Hangars 101 and 97 were noted as being in excellent condition and would save on MCON funds. If funds are available, barracks funding may be possible.
            - Hangar 101 is currently undergoing electrical, communications, HVAC and plumbing upgrades to make it good for another twenty years.
            - AFFF in Hangar 101 is based on the overhead nozzle/cannons and monitoring system that may limit the quantity of aircraft that can fit into the highbay space. Alternative layouts of the 79 foot wing MQ-X needs to be generated to assess AFFF affects and potential need to install new trench system AFFF in the hangar.
            - A new location for the proposed Fire Station and MAG HQ would be determined by MCAS Yuma Planning Department as part of revising their Master Plan.
    - <u>Figure 5.4: CADC, Detachment Configuration</u> was noted as being close to the preferred layout for VMU-1 and transient long-term remote operations.
        - The facilities in Figure 5.4 need to be moved to the top left corner of the undeveloped area and a gravel road extended from the facilities to the runway.

The runway will be 'rhino-snot' type material and not concrete as noted on the graphic (adjust graphic label).

- The MCON needs to include water, sewer and power capacity extended to CADC to support VMU-1.
- The facilities shown in P-123 (nearly 4000 square feet) should be adequate for the detachment operations at CADC. Minimal operational rolling stock would be at CADC. The facilities need to be secured with a perimeter fence, and turnstiles to allow storage of aircraft in the building.
- Archeological/historic building information needs to be reviewed for CADC to determine if there are any potential issues.
- Short term VMU-1 and transient operations can be supported with temporary structures and a dirt runway (rhino snot) at CADC, and it may be possible to move forward with a CATEX (5 year time limit on temporary facilities). Ron is coordinating with MCAS Yuma environmental department on the site layout for the temporary facilities and CATEX feasibility.
- A certificate of authorization from the FAA already exists to fly RQ-7 out of CADC. Long term goals are to modify the restricted airspace to cover CADC.
- VMU-1 is planning to move to MCAS Yuma in the summer of 2016. Exact quantities of personnel and equipment, and the CATEX for the move, will be coordinated by Major Williams as a separate effort from the Planning Study and EA.

5. Schedule

- A second draft of the Planning Study can be completed by the end of November (which will include a draft 1391), review comments to mid December and a final Planning Study by the end of January 2015.
- Getting an early start on the EA, by using the expected preferred site/layouts, could support completion by December (possibly October) 2015.
- The MCON should be planned for FY18.

6. Action Items/Data Needs

Action	Person Responsible	Due Date
Provide copy of the latest CADC layout showing the relocated facilities (CAD, jpg, anything).	Ron Kruse	
Provide CAD file of Hangar 101 to KTUA for concept layout of 79 foot wingspan MQ-X (for use in AFFF assessment).	Richard Samrah	
Provide latest insignia image file for VMU-1.	VMU-1	
Generate final layout at old van pad and Hangar 101 and Hangar 97 for VMU-1. Adjust CADC layout Figure 5.4, as described above.	KTUA	

Draft Meeting Minutes
VMU-1 Relocation MCAS Yuma
Yuma - New Layout Conference Call

Meeting Title:	New Layout Coordination, VMU-1 Relocation Planning Study
Date:	02 February 2015
Time (Place):	1030-1230, Phone Conference and MCAS Yuma

<table>
<tr><td>Attendees:
<u>(In person at MCAS Yuma)</u>
Richard Samrah (MCAS Yuma PWD)
Ron Kruse (MCAS Yuma PWD)
Gregory McShane (MCAS Yuma Air Ops)</td><td><u>(via teleconference)</u>
Brad Chittenden (HQMC)
LtCol Kain Anderson (VMU-1 CO)
Ron Harvey
Major Patrick Williams (HQMC Aviation)
Jeff Lovelady (NAVAIR)
Joseph Bryant (HTII)
Paula Ross (NAVAIR)
Pam Montroy (NAVFAC SW)
Sandy Swaner-Carmona (KTU+A)
Mark Carpenter (KTU+A)
Darren Jacobsen (KTU+A)
Karen Foster (Leidos)</td></tr>
</table>

A. Welcome and Introduction

1. Everyone was welcomed to the meeting, and roll call was taken.

B. Goals of the Meeting

1. The goal of the meeting was to confirm that the new layout at MCAS Yuma is still planned to occur at the Hangar 97/101 location and the 'old' MALS Van Pad location as shown as COA 2 in the NAVAIR Site Evaluation Report (SER) for Yuma and to get clarification on various topics relating to the new site layout. This was confirmed during the meeting.
2. The Cannon Air Defense Complex (CADC) was also noted as being part of the final preferred COA.

C. Follow-on questions/clarifications:

1. Flight Line Hangar Location
   i. <u>Demo of Hangar 97</u> should not be incorporated into the DD1391 because it is already scheduled to occur this summer.
   ii. <u>Hangar 101</u> utility upgrades project is planned to be determined and calculated by Ron Kruse by March 2015 in an FSRM project planned for completion in FY17. These costs will need to be incorporated into the FY18 VMU DD1391 - in case the FSRM project does not get funded or gets delayed. Additional upgrades to support VMU will also need to be incorporated into the DD1391.

iii. The RQ-21 hangar maintenance function, and facility requirement, should be incorporated into the larger flightline hangar that supports the Group 4/5 UAS. The Group 4/5 hangar needs to support 4 MQ-X air vehicles (AV) plus support equipment plus 1 RQ-21A system with 5 AV. The option of parking trucks under shade structures in front of the hangar high bay door was discussed. Potential foreign object damage (FOD) concern was noted. VMU-1 already has a FOD control plan in place.

iv. The aircraft parking apron layout should be limited to just the amount needed by VMU.

v. There may be an existing primary fiber cable running between Hangar 101 and Hangar 97 that will need to be avoided or relocated when planning for the VMU hangar expansion and developing the DD1391.

vi. Three hangar design idea sources were discussed. A final selection of the preferred hangar design is needed and the concept floor plan provided to allow site layout and costing:

- A Global Hawk hangar at Air Force Base Andersen, Guam.
- NAVFAC is developing a standard UAV hangar design. Hangar developed by Mr Hile at Leidos that includes a split site design that includes ground control stations (GCS) plugged directly into the hangar. This is beneficial because communications links are expected to be installed on top of the hangars to help increase height and clearance for the radio signals. Having the GCS on the flightline will make deploying aircraft more efficient.
- The Special Access Program Facility (SAPF) space for VMU needs to be sized the same as the space provided in the JSF/F35B hangars. The JSF/F35B hangar also includes a second story storage space that may be of use in the VMU hangar.

2. Supporting Facilities at the 'old' MALS Van Pad location

i. It is not an option to expand the VMU footprint beyond the fence line of the 'old' MALS Van Pad area. The SER layout will be built on to include all direct support facilities listed in the SER.

ii. Hart Street will not be straightened to connect with O'Neil Avenue in time for VMU at Yuma.

iii. The warehouse should be two story building with an 8ft x 8ft freight elevator & 8000 pound capacity.

3. Cannon Air Defense Complex (Utilities)

i. Communications: coordination with Bob Zittle is needed to determine exact content and method of extending new communications to CADC. KTUA to collect data from Bob Zittle.

ii. Sanitary sewer for new VMU facilities at CADC will be septic systems included in the DD1391.

iii. The following utilities do not need to be extended to CADC to support VMU.

- Water: an existing project is addressing water and storage requirements at CADC.
- Electric Power was upgraded 3 years ago and is considered adequate for CADC and VMU-1 facility requirements.

4. Other
    i. Existing Yuma Master Plan project locations (e.g., new parking structure at Hart Street and O'Neil Avenue) were best estimates at the time but are not currently programmed.
    ii. Include a perimeter fire protection buffer around the proposed site layout.
    iii. There is potential for additional radar towers associated with ground-based sense and avoid capabilities needing to be installed at some point in the future. The Federal Aviation Administration (FAA) will be visiting Yuma in the near future and may have additional direction on where the radar towers will need to be located. POC for new radar tower locations from LtCol Anderson.
    iv. A CATEX exists for the UAS deploy for training (DFT) facility to be established at CADC for use by all UAS. The EA related to VMU-1's move to Yuma must be completed NLT November 2015 IOT allow for a January 2016 VMU-1 advance party movement to Yuma from 29 Palms.
    v. Temporary potential conflicts between VMX and VMU stand-up in Hangar 101 or Hangar 97 should not be considered a major issue that requires changes to the planning study.
    vi. No tenants/activities will be displaced by this new planning study COA so the planning study does not need to address re-location issues.
5. *Update*
    i. Per a separate conference call on 3 February 2015 with Major Williams, Richard Samrah, and Ron Kruse, the following changes in directions for the new site layout and Planning Study DD1391 were recommended (see meeting notes from 3 February 2015 for full details):
        - To avoid construction complications and an abbreviated lifespan of existing Hangar 101, demolish Hangar 101 and place VMU-1 in a new Type II hangar module on the flightline in the area of Hangar 97 and 101.
        - Planning Study DD1391 would include demolition of Hangar 101 but not the Hangar 101 M2R2 upgrades.

D. Schedule

1. Scheduling priority is on completing the FONSI in November 2015. The DD1391 needs to be as accurate as possible IOT feed into the DOTMLPF/C process. It will need to be the "90% solution" during the month of March. NAVFAC/Leidos/KTUA will coordinate with Major Williams on refining project schedule.
2. The VMU Transition Task Force (TTF) is planned for late February.
3. Next steps include:
    i. New Site Layout within 2 weeks.

ii. Approve Final Layout.
iii. DD1391 will be developed based on the Approved Final Layout.

E. Action Items/Data Needs

Action	Person Responsible	Due Date
Provide KTUA POC information for Bob Zittle to get direction on Communications line extension to CADC.	Ron Kruse	
Provide KTUA with his version of CADC design.	Ron Kruse	
Provide KTUA with JSF/F35B Hangar floor plan to understand SAPF space requirements and second deck storage function.	Richard Samrah	
Provide KTUA with hangar design by Mr Hile-Leidos.	Karen Foster or LtCol Anderson	
Provide KTUA with NAVFAC standard VMU hangar module size and/or designs.	Pam Montroy	
Provide KTUA with AFB Andersen MQ-4C BAMS hangar design/floorplan to consider for incorporation into site plan.	Pam Montroy	
Provide KTUA with POC info to collect direction on new radar tower locations that support ground based sense and avoid capabilities.	LtCol Anderson	
Coordinate on latest logistics numbers for VMU squadron (e.g., number of generators)	KTUA and Major Williams	
Generate new layout for old van pad, Hangar 101, Hangar 97. Adjust CADC layout Figure 5.4.	KTUA	
Review layout and provide comments to allow DD1391 development.	All	

Draft Meeting Minutes
VMU-1 Relocation MCAS Yuma
Yuma – Coordination #2 New Layout Conference Call

<table>
<tr><td>Meeting Title:</td><td colspan="2">New Layout Coordination, VMU-1 Relocation Planning Study</td></tr>
<tr><td>Date:</td><td colspan="2">03 February 2015</td></tr>
<tr><td>Time (Place):</td><td colspan="2">0900-1000, Phone Conference and MCAS Yuma</td></tr>
<tr><td colspan="2">Attendees:
<u>(In person at MCAS Yuma)</u>
Richard Samrah (MCAS Yuma PWD)
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Major Patrick Williams (HQMC Aviation)
Pam Montroy (NAVFAC SW)
Robert Efird (KTU+A)
Darren Jacobsen (KTU+A)
Karen Foster (LEIDOS)</td></tr>
</table>

A. Welcome and Introduction

1. Everyone was welcomed to the meeting, and roll call was taken.

B. Goals of the Meeting

1. The goal of the meeting was to provide/collect detailed recommendation on the new layout at MCAS Yuma and overall project schedule.

C. Clarifications:

1. Ron Kruse and Richard Samrah presented a revised COA not discussed on the conference call the day prior. To avoid the construction complications and abbreviated lifespan of an alternative built around existing Hangar 101, the new alternative would demolish Hangar 101 and place VMU-1 in a new hangar on the flightline in the area of Hangar 97 and 101 (Hangar 97 is already programmed for demolition). Interim steps are as follows:
   i. VMU-1 will occupy Hangar 101 starting in January 2016, with a full move in Summer 2016 with Group 3 UAS.
   ii. Hangar 101 M2R2 upgrades will start as soon as funded, but currently an FY17 project. M2R2 items should not be included in the Planning Study DD1391.
      - The M2R2 will include conversion of Hangar 101 second deck to a Special Access Program Facility (SAPF). Similar SAPF upgrades to other hangars were approximately $1.2 million.
   iii. A separate project will be demolishing Hangar 97 and facilities currently between Hangar 101 and Hangar 97, including B-92, B-97A (AFFF system), B-98, B-99, and B-118. Hangar 97 demolition should not be included in the Planning Study DD1391.
2. Based on the above revised COA, the Planning Study DD1391 for FY18 should include the following:
   i. FY18 MCON: includes the MALS VAN Pad construction, CADC facility construction, and all other construction not related to Hangar 101

ii. FY2X MCON includes the type II hangar module that will accommodate not only the current group 3 system, but also a future group 5 system as well. This additional MCON will need to be discussed more once the site survey and site lay out are completed by KTU+A.

iii. A **Type II hangar module** constructed due south of Hangar 101. This will support both the Group 3 UAS and the Group 4/5 long term UAS equipment and operations.
   - Project P-535 at $35 million and 60k square feet is a good place holder for this future hangar.
   - Hangar fire-fighting foam system (AFFF) is standard to all new hangars and is based on the "in-ground pop-ups" system.
   - The site location for the new Type II hangar module should be at a low detail concept level to help avoid locking in a site layout that would likely be adjusted during construction level design efforts.
   - Aerial photos show the location of the cables between Hangar 101 and Hangar 97 that will need to be considered for the DD1391.

iv. **Hangar 101 demolition** will be included in the Planning Study DD1391, but not the M2R2 upgrade costs or demolition of Hangar 97.

v. All VMU-1 operational facilities sited at the **old MALS Van Pad**.
   - Ron recommends underground storm water storage tank facilities at the old MALS van pad site to meet low impact design requirements.

vi. **Cannon Air Defense Complex (CADC)** rhino snot runway, supporting paved areas, and an expeditionary air support facility with maintenance, admin and briefing spaces.
   - This is the short term solution, meant to accommodate the UAS deploy for training (DFT) facility. Also included in this project are temporary hangars, not to be included in the 1391. Long term, a 4-5K SF detachment site facility (modeled off of MILCON P123) needs to be built to accommodate group 3 UAS operations. This 4-5k SF facility needs to be included into the 1391.

vii. ATFP standoff distances have been adjusting recently and the latest information is needed. A POC is needed for follow-up on standoff distance requirements.

viii. No new aircraft washrack should be sited/included in project.

3. Draft DD1391 cost estimate should be conservative to account for potential contingencies as the project is finalized. This cost will be compared against the proposed 29 Palms project for cost/benefit purposes.
4. Major Williams will brief Brad Chittenden on the new preferred direction.

D. Schedule

1. KTUA hopes to do field investigation one day in the last two week of February 2015 to help develop the 1391 for an end of March submittal – additional coordination required.

   i. A transition task force (TTF) meeting will occur 23-27 February. VMU will be discussed.

ii. Hangar 101 may need to be inventoried to allow cost estimating its demolition as part of the Planning Study DD1391.
iii. The old MALS Van Pad will include cursory review of existing site conditions and major utility locations. The existing space in Building 495 will be retained for indirect vehicle maintenance support and smaller vehicle maintenance operations. A new high bay maintenance bay space will need to be constructed to support 7 ton truck vehicle maintenance and use of hydraulic lifts.

2. Next steps include:
    i. New Site Layout within 2 weeks.
    ii. Approve Final Layout.
    iii. DD1391 will be developed based on the Approved Final Layout. Draft 1391 and the revised Planning Study (v2) to be delivered the end of March.

E. Action Items/Data Needs

Action	**Person Responsible**	**Due Date**
Verify if UAVs are defueled prior to maintenance in hangar bays	Major Williams	Completed 4 Feb 2015
Provide project information/costs associated with 29 Palms VMU-1 project	Major Williams	Completed 3 Feb 2015
Brief Brad on new alternative direction using demo/new construction vs. Hangar 101 upgrades.	Major Williams	
Provide KTUA with copy of P-535 project costs and concept floor plan.	Pam Montroy	
Provide KTUA with ATFP Point of Contact.	Pam Montroy	
Coordinate end of February field visit for cost estimating survey.	Ron/Richard/KTUA/GMH	
Review layout and provide comments to allow DD1391 development.	All	

Darren Jacobsen <darren@ktua.com>

RE: VMU-1 Revised Yuma layouts

1 message

Kruse CIV Ronald L <ronald.kruse@usmc.mil> Mon, Mar 16, 2015 at 7:36 AM
To: Montroy Pamela S <pamela.montroy@navy.mil>
Cc: "Foster, Karen A." <KAREN.A.FOSTER@leidos.com>, "darren@ktua.com" <darren@ktua.com>, Williams Maj Patrick S <patrick.williams1@usmc.mil>, Hartleib CIV Rodney D <rodney.hartleib@usmc.mil>

Pam,

The layouts in the attached PDF are correct.

I'm available 26 & 27 March for a NEPA kick-off meeting. Please let me know if you need more dates.

v/r

Ron Kruse

-----Original Message-----
From: Montroy, Pamela S CIV NAVFAC SW [mailto:pamela.montroy@navy.mil]
Sent: Thursday, March 12, 2015 2:22 PM
To: Kruse CIV Ronald L
Cc: Foster, Karen A.; darren@ktua.com; Williams Maj Patrick S
Subject: RE: VMU-1 Revised Yuma layouts

Hello Ron,

Please confirm if the attached revised site layouts are what we agreed to in our last call. Please also see the highlighted notes below for further clarification. When are you available for a NEPA kick-off meeting at Yuma?

Thanks,

Pam Montroy
Environmental Planner
Central IPT, NAVFAC Southwest
(619) 532-4817
pamela.montroy@navy.mil

-----Original Message-----
From: Williams Maj Patrick S [mailto:patrick.williams1@usmc.mil]
Sent: Monday, March 09, 2015 10:26 AM
To: Montroy, Pamela S CIV NAVFAC SW; Kruse, Ronald L CIV MARFORPAC, Engineering Division
Cc: Foster, Karen A.; darren@ktua.com
Subject: RE: VMU-1 Revised Yuma layouts

Pam,

The site layout looks fine to me.

I am available the rest of March, preferably on Tuesdays, Thursdays, or Fridays between 1300-1530 Eastern Time. Mondays and Wednesdays are hit and miss.

S/F,
Major Pat Williams

HQMC Aviation, ASL-40D
Pentagon, Room 5E542
Office: 703.695.6421
Cell: 760.566.8021

-----Original Message-----
From: Montroy, Pamela S CIV NAVFAC SW [mailto:pamela.montroy@navy.mil]
Sent: Monday, March 09, 2015 12:00 PM
To: Kruse CIV Ronald L; Williams Maj Patrick S
Cc: Foster, Karen A.; darren@ktua.com
Subject: VMU-1 Revised Yuma layouts

Hello Ron and Major Williams,

Attached are the revised Yuma site layouts. This includes the following changes discussed on the phone call on 17 February 2015:

1- 100 foot offset from H-95, pushes the proposed Type II hangar farther north onto fiber cable and requires demo of H-101.

2- Remove fuel station from layouts- VMU should use the station fuel facility.

3- Move Hazmat lockers 25 feet from public roads and other buildings. Put them on top of the triangular paving area

4- Armory-leave footprint of warehouse as-is. 1391 add text "Temporary Prefabricated Armory" as FFE.

5- The proposed sites at the old MALS Van Pad are clear of CERCLA issues per Ron. The airfield/hangar location at H-97 is ok also. No drilling is expected on the apron so should not be an issue there either.

One side note is that the fiber optic cable is no longer shown on these figures because utilities will be shown on a different graphic in the planning study (KTUA is now working on incorporating the new layouts into the planning study).

Please review and confirm if these new layouts are what we discussed and would like to see in the Planning Study.

If these new layouts are agreeable, I'd like to start planning the kick-off meeting for the NEPA portion of the VMU-1 at Yuma. Please let me know when you're available in March for this meeting. I'll also send out an e-mail to the larger group asking for their availability after I get your feedback on the new layouts.

Thanks,

Pam Montroy
Environmental Planner
Central IPT, NAVFAC Southwest
(619) 532-4817
pamela.montroy@navy.mil

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Appendix D: Review Comments

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VMU-1 Planning Study for MCAS Yuma v1 (1 August 2014)
Combined Comment Matrix

#	Page	Section	Reviewer	Comment	Response
1.	General	General	B. Joseph	Note: CCN 441-12, additional storage space for MQ-9 caskets. Based on the measurements given for the caskets (40’ x 8’ x 7’= 2,240 CF per casket) multiplied by total caskets (2,240 x 12 = 26,880 CF) equals 26,880 cubic feet. When plugged into the UFC requirements and using 16 ft. for the stacking height two (2) cases stacked over each other with an additional 12 inches for clearance) the space requirement equals 9,878 Gross square feet. The calculation includes a 20% growth factor.	1- Additional warehouse space incorporated into Table 3.1 and the final revised site layout near Hangar 101 as a two story warehouse per recommendations. 2-Existing layouts in draft submittal are not adjusted but have the existing warehouse footprint shown. MCAS PWD recommended a two story warehouse with freight elevator. The existing layouts in the draft submittal have a larger footprint than the two story option. Final area impacted by the proposed warehouse would be slightly smaller than currently shown on the plans.
2.	1	1.1	G. McShane	Figure 1.1 Regional Map: missing CMAGR.	Added polygon and label for CMAGR.
3.	2	1.4	B. Joseph	31 January 2013 PBFRs are outdated, updated PBFRs (5Dec13) are available.	Adjusted text as noted. The December 2013 BFR quantities were used, just the first paragraph had the wrong date referenced.
4.	4	1.4.1	P. Montroy	Change “An SER” to “A SER”	Changed.
5.	4	1.4.2	B. Joseph	Group 1 UAS include the very small hand held AV that have been incorporated into ground units. Recommend: Group 1 UAS include the Small Unmanned Aerial System (SUAS) that have been incorporated into ground units.	Changed and added acronym to table.
6.	6	1.8.2	G. McShane	Current FAA UAS operating restrictions/limitations are a general & short term consideration for operations out of the airfield proper.	Reworded.
7.	6	1.8.3	Maj Williams	Ground vehicle I-level maintenance is performed by CLC-16 at Yuma. CLC-16 is a subordinate company of 1^{st} Maintenance Battalion, 1^{st} MLG	Corrected and added note about CLC’s current location on the Main Station, but long-term plans for facilities at CADC. Added CLC to acronym list.
8.	6	1.8.3	P. Montroy	First paragraph, first sentence, change AV to plural.	Changed.
9.	6	1.8.3	P. Montroy	Provide photos of RQ-21A and RQ-7B.	Added.

VMU-1 Planning Study for MCAS Yuma v1 (1 August 2014)
Combined Comment Matrix

#	Page	Section	Reviewer	Comment	Response
10.	6	1.8.3	B. Joseph	Both the RQ-21A and RQ-7B are small, lightweight AV that are catapult launched and do not require a runway for takeoff. Recommend: Both the RQ-21A and RQ-7B are small, tactical AVs that are catapult launched and do not require a runway for takeoff.	Changed.
11.	6	1.8.3	B. Joseph	Maintenance of small AV and ground support vehicles would occur at the consolidated support facility compound, not at the launch/recover location or expeditionary runway. Recommend: Maintenance of the UAS and ground support vehicles would occur primarily at the consolidated support facility compound, not at the launch/recover location or expeditionary runway.	Changed.
12.	8	1.9.1	G. McShane	Change Airfield Landing Field to Auxiliary Landing Field (ALF).	Added Executive Summary section with this acronym.
13.	8	Flight Operations	P. Montroy	Please explain further, "Most of VMU's flight operations originate from AUX II."	Changed sentence to: "The previously noted UAS Study indicates AUX-II has been used in the past by VMU-4 for STUA launch and recovery operations."
14.	9, 25, 42		LtCol Kain Anderson, VMU-1 CO	AUX II is not a viable small UAS operating area. Look at the amount of traffic over AUX II compared to the CADC on slide 25. One of my senior SNCOs served in VMU-4 when that squadron was flying from AUX II and states that when maintenance issues forced them outside of their short launch and recovery windows their sorties were simply cancelled. On the other hand, there is virtually no traffic overhead the CADC. UAS could launch and recover at will and spiral up and down to deconflict from other range traffic. MAWTS-1 operations and AGS departments concur with this assessment.	Added the following issue to 'issues' for tables in sections 1.9.1 and 1.9.2 and changed 'ranking' from green to yellow: "Existing air traffic at AUX-II combined with the two day set-up time required for the RQ-7B makes operations at AUX-II a much less viable option when compared to other locations." Also adjusted text in section 4.6.1 to discuss crowded airspace issue and potential loosening of FAA UAV rules regarding operations in unrestricted airspace. Delete text in section 4.6.3 regarding "unconstrained operational environment"
15.	9, 25, 42		LtCol Kain Anderson, VMU-1 CO	Furthermore, the study notes that there is no security available at AUX II and states that the system would have to be set up and torn down for each flight operation. What the study doesn't state is that it takes two days to set up an	Added text in section 5.1.3 providing this additional information.

#	Page	Section	Reviewer	Comment	Response
				RQ-7B shadow system. Thus, if we set it up on Monday we can fly on Wednesday before we have to tear it down on Thursday and Friday. That is, unless we run a 24 hour fire watch, which we're not going to do.	
16.	9, 25, 42		LtCol Kain Anderson, VMU-1 CO	Finally, Aux II is much closer to the Gila mountains than the CADC. Electronic line of site to the East side of the Gila mountains is much more limited from AUXII. The CADC is further away from the Gila mountains and supports long-range UAS operations into the R2301E during WTI and unit-level training.	Added text in section 5.1.3 providing this additional information.
17.	9-11	Tables 1.1 – 1.3	P. Montroy	Provide a brief explanation on what the various alternatives mean for each of the tables as you did for the red/yellow/green summary under section 1.9. Alternatives may get confused with the COAs. They're basically sub-COAs within each of the COAs.	Adjusted the last sentence in section 1.8.1 Installation Site COA to : "….As such, three over arching COAs were established for MCAS Yuma. In addition to the over arching COAs, various alternatives to split site squadron operations across multiple locations were evaluated. The three over arching COAs include:"
18.	10	Spt Fac, #8	Maj Williams	CLC-16 will support I-level ground maintenance for VMU-1	Adjusted text and table.
19.	11	Spt Fac, #6	Maj Williams	MWSS does not perform maintenance on UAS green gear. VMUs are capable of O-level maintenance, and CLC-16 provides I-level maintenance	Adjusted text (CLC's relocation to CADC in the long-term keeps the constraint analysis the same)
20.	13	Table	Maj Williams	Total squadron personnel numbers, with the inclusion of MQ-9, were estimated as follows: I would like to provide clarification regarding the personnel numbers to be used to calculate the personnel space requirements for a squadron consisting of (9) RQ-21 and (3) MQ-9. This squadron construct would no longer contain (3) RQ-7. The calculation is given below. 274 + 15 - (3)(53) + (3)(73) = 349 personnel in a squadron consisting of (9) RQ-21 and (3) MQ-9 systems	Adjusted text in section 2.1 and Table 2.1 to convey quantity changes described in comment. Details in the table were based on the TO provided prior to the draft submittal.

#	Page	Section	Reviewer	Comment	Response
				-"274" is the current UAS T/O strength -"15" reflects the addition of MOS 7588 officers to be added to the squadron once the EA-6B is sundowned -"(3)(53)" reflects removing the three RQ-7 dets from the T/O (each det consists of 53 Marines) -"(3)(73)" reflects the addition of three MQ-9 dets, with each det consisting of approximately 73 personnel based on the Air Force model Please let me know if you have questions regarding the above calculation. Keep in mind that this is only a rough estimate based on how the Air Force builds the personnel structure for their MQ-9 systems.	
21.	14	2.2.2	G. McShane	The ALF is not limited to an "F-35B ALF"; suggest change to "ALF".	Adjusted as noted.
22.	15	2.3	Maj Williams	CLC-16/1st Maintenance Battalion provide I-level on ground equipment	Adjusted as noted.
23.	17	Table	Maj Williams	The trucks and trailers fielded for nine RQ-21A have been removed as component TAMCNs and are now listed at stand-alone TAMCNs. follows (this is based on a recent TOECR reduction) for the entire squadron: M1152: 24 ; M1165: 6 ; ITEG: 9 per system, 6 stand alone; M1102: 12. Call with questions if this doesn't make sense: 703-695-6421.	Adjusted vehicle loading table as noted and as noted in follow-on emails and coordination post initial comment.
24.	18	3.0	B. Joseph	The facility requirements for three RQ7B systems and nine RQ-21A systems are based on the PBFR developed in December 2013 by the NAVAIR Program Office PMA263 and TSI Inc. Change to: The facility requirements for three RQ7B systems and nine RQ-21A systems are based on the PBFR developed in December 2013 by the NAVAIR Program Office PMA263 and HTII.	Adjusted as noted.
25.	19	Table 3.1	B. Joseph	9/RQ-21A Vehicle maintenance 214-51 6,460. PBFR shows 3,160.	Table adjusted to show the 6,460 as a total for the combined Vehicle shop for all RQ-7B plus RQ-21 vehicles. This is also consistent with the 4 November 2014 Draft Site Activation Support Plan for MCAS

#	Page	Section	Reviewer	Comment	Response
					Yuma pg 3-39. Table 3.1 reflects the revised calculation KTUA generated based on combined total vehicles from RQ7 and RQ21 systems and adjustments to the TO/E as coordinated with Major Williams.
26.	20	3.1	P. Montroy	Explain RQ-7B Version 2 (v2). How is it different from version 1?	Added sentence: "Version 2 is a variant that uses an encrypted data link. Facility sizes are not affected by this data link upgrade."
27.	20	3.1	P. Montroy	Put "&" between numbers so that for example 4 & 5 doesn't look like forty five	Adjusted all occurrences throughout document. Made same change in the MCBCP study.
28.	20	3.2	P. Montroy	Provide photos of RQ-21A and RQ-7B to include takeoff and landing photos so reader visually understands the take-off and landing operations. For example, visually show "skyhook".	Added photos.
29.	21	Figure 3.1	P. Montroy	Lower figure so that it doesn't overlap with header. Also add a space between figure and section 3.3.	Adjusted.
30.	21	3.3	R Samrah	A 50% hangar requirement seems excessive – most ratios are between 25% to 33% of total aircraft. With a 33% hangar requirement we could utilize a Type I hangar thereby reducing footprint and cost. Ask that this requirement be revisited.	Adjusted text to 33%, results in 4 hangar spaces. Follow-on discussions/meetings concluded that a Type II module to support both MQ-X and RQ-21A is the preferred hangar configuration to show on the final layout.
31.	24	4.1	R Samrah	CSSD-16 is now Combat Logistics Company 16 (CLC-16)	Adjusted as noted.
32.	24	4.1	G. McShane	Change to "MCAS Yuma is a shared-use airfield" (not "joint-use").	Adjusted as noted.
33.	24	4.1	G. McShane	I suggest, "Runways 17-35 and 8-26 are primarily used for military rotary wing, commercial, and general aviation operations".	Adjusted as noted.
34.	24	4.3	G. McShane	No mention of the CMAGR (R-2507E/W/N/S)?	Adjusted start of second paragraph to "MCAS Yuma has scheduling and

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					operational control of the SUA R2301W, Dome MOA and CMAGR R-2507E/W/N/S. R-2507 is located approximately fifty miles to the northwest of MCAS Yuma and used for remote UAS training operations. Also added CMAGR to Figure 1.1 Regional Location map.
35.	26	4.4.1	R Samrah	The area between Hangar #157 and Hangar #220 is an Aircraft Wash Facility and will not be going away anytime soon. Please take this developable area out of the mix.	Deleted "between Hangars 157 and 220 and" in third paragraph.
36.	28	Figure 4.3	G. McShane	Clear Zones reflected not IAW UFC 3-260-01, Airfield And Heliport Planning (Rwy 8/26).	Used the 2014 Master Plan Update graphic. Follow-on coordination with MCAS Yuma GIS department found that updated versions of the imaginary surfaces are not available. Retained the existing master plan graphic shown but added the following note: "Note: This graphic is directly from the 2014 Master Plan due to updated Geographical Information Systems (GIS) data not being available for this report. The airfield safety areas shown are not in compliance with the UFC 3-260-01, Airfield And Heliport Planning And Design with regard to its depiction of; Primary Surfaces, Clear Zones, and Accident Potential Zones for the four Class B runways at MCAS Yuma. FAA defined imaginary surfaces DO NOT apply to MCAS Yuma (a DoD facility). However, no facilities proposed for VMU at MCAS Yuma in this study conflict with these airfield safety zones."
37.	29	Figure 4.4	G. McShane	Clear Zones and APZs reflected not IAW UFC 3-260-01, Airfield And Heliport Planning (Rwy 8/26 & 17/35).	Used GIS data provided. Follow-on coordination with MCAS Yuma GIS department found that updated versions of the Clear Zones and APZs are not available.

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					Retained the existing graphic shown.
38.	31	4.4.3	R Samrah	Project for VMX-22 Rotary Wing is P-612, VMX-22 Squadron Hangar and it would be constructed west of Hangar #157 after Hangar #146 (not #143) was demo'd.	Adjusted last sentence, second bullet to "The concurrently running VMX siting study has recommended a location for a new VMX hangar west of Hangar 157 after Hangar 146 is demolished."
39.	31	4.4.1	P. Montroy	Add CERCLA in parenthesis after Comprehensive Environmental Response, Compensation and Liability Act.	Added Executive Summary that includes CERCLA acronym. Page 31 now just the acronym.
40.	32	Figure 4.6	P. Montroy	Provide a legend for AG, UG and OU. What do these acronyms represent (i.e., AG for above ground)? Or add them to the acronyms page.	Adjusted legend on graphic by spelling out Operable Unit, above ground, under ground
41.	N/A	N/A	Maj Williams	General comment: MWSS does not perform any vehicle or green gear equipment maintenance for the VMUs. All I-level maintenance for green gear is performed by CLC-16; eventually, all I-level AV and other "blue gear" maintenance will be performed by MALS-13.	Deleted last sentence in second paragraph of section 2.3: "VMU-1 green gear, like HMMWV, trailers and generators that require intermediate maintenance will be transported to MWSS-373 facilities located at CADC for repairs then returned to VMU-1."
42.	N/A	N/A	Maj Williams	General comment: throughout the document, replace "group 2/3 UAS" with "group 3 UAS". Group 2 UAS does not apply to the scope of this study	Revised throughout to "Group 3".
43.	40	5.11	Maj Williams	VMU-1 is under the direct operational control of the Marine Aircraft Group. Replace "Wing" with "Group,"	Adjusted as noted.
44.	41	5.11.2	Maj Williams	MWSS does not perform vehicle maintenance on VMU ground gear. VMU has a small organic maintenance capability. I-level maintenance is provided by CLC-16, 1st Maintenance Battalion.	Deleted "Collocation at CADC could potentially provide synergies with MWSS-371 for vehicle maintenance. MWSS-371 synergies would occur from the close location of intermediate-level ground vehicle maintenance support. Further, if"
45.	47	5.2.2	Maj Williams	Replace "RQ-12" with "RQ-21"	Adjusted as noted.
46.	47	5.2.2	Maj Williams	Sentence should read "12 parked Reaper AVs," not 9	NAVAIR site evaluation report notes 8 apron spaces are required for the MQ-X. However, the narrow apron width at Yuma

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					limits to 3 in a row, and to configure for the most likely operational situation, 3 rows of 3 MQ-X are shown on the layout in front of the hangar. Section: MCAS YUMA MAIN STATION, FULL BUILDOUT, first paragraph, second to last sentence adjusted to: “49,267 SY of aircraft parking apron is provided to accommodate nine parked MQ-X AVs with sun shades (up to four MQ-X are parked in the hangar). Headquarters and squadron administrative offices requirements are included in the hangar.”
47.	47	Last Paragraph	P. Montroy	In last sentence, write that vehicle maintenance support would be “7” miles away at CADC.	Sentence deleted due to clarification that CLC (at MCAS) does intermediate level maintenance.
48.	General	General	P. Montroy	Make short term and long term COA/ALT recommendations stand out. It’s currently buried in the document.	Added recommendations section.
49.	General		KTUA		Revised “MQ-9” or “MQ-X” to be only “Group 4 & 5 UAS” for better consistency throughout report.
50.	General		KTUA		Changed “RQ-21A” to “MQ-21A” throughout document per meeting discussions on 12 September 2014.

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1.			ASR	*1-What's the difference between UAS, UAV, and AV? Are there any that have to be manned, not programmable? If they are all unmanned use UAS or UAV* *2-Delete the labels for all Tables and Figures in the text. See comment ASR1* *3-Don't use acronyms unless it's used more than 3 times.* *4-COA is used for "Course of Action" and "Certificate of Authorization"* *5-Search and replace 'lineal" with "linear" throughout* *6-Insert "the" before proper nouns e.g., MCAS Yuma, Main Station, BMGR, CMAGR, Marine Corps, etc.* *7-spell out foot, feet, square feet, square yards, inch, etc.* *8-Don't use acronyms in headers* *9-Figures and Tables have to be stand alone. Provide all information necessary to interpret it.* *10- be consistent in referencing e.g., Main Station~~MCAS~~, CADC and AUX II* *11-In many instances UAS, UAV, and AV need to be plural.* *12--Search and replace "Group 4 & 5" with "Groups 4 & 5"* *13-Search and replace SF w/square feet* *14-Search and replace "29 Palms" w/ Twenty-nine Palms"*	1- None are manned – so changed AV to UAV if the sentence was specifically referring to a single unmanned air vehicle (UAV) and not the entire system (UAS) which includes multiple UAVs, the control station and support equipment. 2- Internal discussions concluded with leaving table/figure names in the text as-is. 3- Removed acronyms if they were used less than 3 times and are not commonly used acronyms. 4- Changed "FAA/COA" to "FAA/COAW" for "certificate of authorization or waiver." 5- Changed as noted. 6- Changed as noted. 7- Changed as noted. 8- Removed acronyms from section headings except for the following "MCAS Yuma" "…UAS…" 9- Changed as noted. 10- Adjusted text throughout using "MCAS Yuma" when discussing the overall Installation and "Main Station" when referring to only the area of the Main Station in relation to CADC or AUX II. 11- Changed as noted. 12- Our understanding is that the replacement UAS will be either a Group 4 or Group 5 or something between the two categories and not both Group(s). Note: the original format was "Group 4/5", but the slash "/" was considered confusing and recommended in a pre-final review comment to be changed to "&" – but not to imply multiple group(s) of UASs. Changed to "Group 4 or 5" throughout the document to hopefully avoid the confusion. 13- Adjusted as noted. 14- Adjusted as noted.

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2	ES-1	Para 1	ASR	…Marine Corps Air Ground Combat Center (MCAGCC) Twenty-Nine Palms ~~(MCAGCC)~~ to Marine… ~~Long term requirements add full size Group 4 & 5 Unmanned Aerial System (UAS) operations, a full size runway and hangar requirements.~~ Groups 4 & 5 operations include long term requirements for full size runways and hangers.	Adjusted second sentence to: "Long term requirements add Group 4 or 5 Unmanned Aerial System (UAS) operations."
3.	ES-1	Purpose	P. Montroy	Add NEPA after National Environmental Policy Act since everyone is more familiar with this term.	Adjusted as noted.
4.	ES-2	Table	ASR	*Define COA before table and include it as a footnote– Course of Action*	Adjusted to: "A general assessment of each alternative or course of action (COA) is color coded in Table ES.1…" Added foot note to table.
5.	ES-2	Table ES.1	P. Montroy	Provide a brief description of color codes on the table so you don't have to find it in the text on the following page.	Added legend to the table.
6.	ES-2	Table ES.1	P. Montroy	Introduce the acronym COA in description under Alternatives - Course of Action. This can be confusing since COA is described under section on Assumptions on page ES-1 under FAA/COA as Certificate of Authorization Waiver. It's described in detail on page 5, so just spell out the acronym here.	Adjusted as noted. Also changed "FAA/COA" to "FAA/COAW" in the main text.
7	ES-2	Para 4	ASR	In addition to the three locations, facilities were split into various categories including long term support ~~facilities~~, ~~long term~~ and Group 4s & 5 UAS air operations ~~facilities~~, and short term STUAS support ~~facilities~~ and ~~STUAS~~ air operations ~~facilities~~.	Adjusted as noted, except plural Group(s) per comment 1 above.
8.	ES-3	ES	tjk	Here, and throughout the document, the deploy for training facility (DFT) is discussed as integral to the proposed action. Several times we have sought clarification on this point. All times we received confirmation that the DFT was, in fact, a separate effort with independent utility (support of WTI and other training) and that no permanent relocation of personnel or equipment would occur as a result of establishing the DFT. We received an REIR to CATEX the DFT from our facilities division, so a number of sources confirm the independent utility of the action. If this is still the case, it should be	Changed all reference of "Deploy for Training" or "DFT" to "Permanent detachment Operations Facility" at the following locations in the report: ES-Final Site, 1st, 2nd and 5th paragraphs. Legend for Figures ES.2, 5.5 and 5.17.

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				spelled out crystal clear in this planning study; otherwise, it looks like we've improperly segmented the NEPA to accommodate our near-term needs.	5.2.2 CADC Site Plans section 1st paragraph. 5.5.4 Assessment of COA 3 Alt 3 and Alt 5. Also added text to explain that, under a separate action, a "Rhino-snot" STUAS runway with temporary training support structures will be constructed and utilized by transient units in association with training exercises such as Weapons and Tactics Instructor.
9	ES-3	Para 1	ASR	…color coded in Table ES.1[ASR1]~~: Alternatives Assessment~~. Red indicates a highly inefficient or operationally…for splitting the facilities between the Main Station~~MCAS~~, CADC and AUX II. A general assessment of each alternative or course of action (COA) is Comment ASR1 - Don't provide the table caption. Delete the captions in the text throughout the document. It's redundant.	Adjusted as noted - except for leaving table/figure names in the text as-is.
10.	ES-3	Final Site Layout	P. Montroy	Remove "and" from fourth paragraph, third sentence, "…MCAGCC Twenty-nine Palms and to MCAS Yuma."	Adjusted as noted.
11.	ES-3	Final Site	Maj Williams	The sentence "It was also confirmed that remote STUAS operations will be focused around a new DFT facility at CADC": it needs to be clear that the DFT facility at CADC is not part of VMU-1's move. This facility is for the use of all UAS in support of WTI.	See response to comment 8.
12.	ES-3	Final Site	Maj Williams	The sentence "General upgrades to the Hangar will start near the end of 2016. Hangar 101 will be a short term facilities solution (four to five years) that relocates VMU-1from MCAGCC Twenty-nine Palms and to MCAS Yuma": Most likely, VMU-1 will be in Hangar 101 from 2016-2024 (about eight years) before they can move into their type II hangar	Adjusted as noted.
13.	ES-4	Final Site	Maj Williams	The sentence "The third project constructs a new Type II hangar on the site of existing Hangar 97 and is programmed for FY 2022": change 'programmed' to 'planned'	Adjusted as noted.

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14.	ES-4	Table E2	KruseRL	WRT Bldg. 408. Cost needs to consider if the project will need to upgrade the restrooms to support the increased number of personnel.	Adjusted costs to increase restrooms capacity for increased student loading.
15.	ES-4	Para 2	ASR	… Van Pad and the STUAS training facilities are summarized in Table ES-2[ASR2]~~, Preliminary Cost Estimate~~. See comment ASR1	Internal discussions concluded with leaving table/figure names in the text as-is.
16.	ES-4	Table ES.3	ASR	Table Header – Project Category Code Number Introduce/define/explain CCN in ES and report	Adjusted table header as noted and added the following sentence to preceding paragraph: "Each project component is listed by its standard Navy functional Category Code Number followed by a descriptive title."
17.	ES-4	Table ES.3	ASR	SF Column - ~~1 Each~~2,200 Notes Column Define in a footnote - FFE, BFR 8'x 8' Infill paving at existing & proposed facilities~~.~~ 1200' ~~LF~~ x 6' ~~FT~~ = 7,200 SF	Adjusted as noted.
18.	ES-5	Table 3	ASR	One-5" ~~inch~~ Define SAPF, ATC, POV	Adjusted as noted. Also changed SAPF to SCIF.
19.	ES-7	Fig. 1	ASR	*-Make the outline for Existing Structure consistent* *-What are the groups of structures on the left, bottom of the page?* *-Truck Route color hard to see*	-Existing structures to remain have a black outline. Existing structures to demolish have a red outline (dashed for existing demo projects). -Added note to graphic to clarify that the structures at bottom left are the Group 4 or 5 UAVs parked on the apron- to get an idea of their size and spacing requirements on the apron. -Adjusted Truck Route to be more visible.
20.	ES-8	Fig. 2	ASR	*-Align the black outline for "existing structure" with the aerial photo. Make them square instead of drawing them free-hand. -The outlines for structure 3233 and 3828 overlap – is this accurate?*	-All GIS data shown in the graphics is from MCAS Yuma. We cannot change the shape or location of the building outlines to align better with the aerial.
21.	1	General	P.	Provide a strong heading to clearly mark the chapter to allow for	Added dark header at top of first page for each chapter

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			Montroy	transition between chapters. Do for all chapters.	and renumbered.
22.	1	Para 1	ASR	VMU-1 has been homebased at Marine Corps Air Ground Combat Center (MCAGCC Twenty-Nine Palms~~ (MCAGCC~~). The current study investigates the potential relocation of VMU-1 to the Marine Corps Air Station (MCAS) Yuma as enabled by the relocation of the reserve squadron VMU-4 from the ~~Marine Corps Air Station~~ ~~(~~MCAS~~)~~ Yuma to Marine Corps Base Camp Pendleton (MCBCP).	Adjusted as noted.
23.	1	Para 1	ASR	1.1 Location The MCAS Yuma is located approximately 175 miles east of… The western boundary of the Barry M. Goldwater Range (BMGR) is a five mile drive from ~~MCAS Yuma~~ the Main Station and… *Look for "MCAS Yuma" and replace w/"the MCAS Yuma"*	Adjusted as noted. Also changed "MCAS Yuma" to "Main Station" as described in comment/response #1 above. Looked for "MCAS Yuma" and replaced w/ "the MCAS Yuma" throughout document.
24.	2	Para 2	ASR	Air Force Base, and was designated a ~~Marine Corps Air Station~~MCAS in 1962. Today, MCAS Yuma is the busiest ~~Air~~ air ~~Station~~ station in the Marine Corps… training, which adds between 2,000 ~~and~~ to 3,000 students and support personnel to the Air Station. …*OR*… ..training, which adds between 2,000 and 3,000 students and support personnel, respectively, to the Air Station.	Adjusted per first option.
25.	2	Par 5	ASR	~~Each RQ-7B system includes four Air Vehicle (AV), each MQ-21A system includes five AV, and each Group 4 & 5 system includes four AV~~; ... The systems for each RQ-7B, MQ-21A, and Groups 4 & 5 include four, five and four UASs, respectively.	Adjusted as noted.
26.	3	Figure 1.2	P. Montroy	Move figure after Section 1.1 Location	Switched pages for Figure 1.2 and text on the preceding page.
27.	4	Line 2	ASR	1 . 4 . 1 Site Evaluation Report~~SER~~ and Platform Basic Facility Requirement~~PBFR~~ *Don't use acronyms in headers* 1 . 4 . 2 ~~UAS~~ Unmanned Aerial Systems Study 1 . 8 . 1 Installation Site ~~COA~~Course of Action	Adjusted as noted.
28.	4	Line 14	ASR	…include the Small Unmanned Aerial System ~~(SUAS)~~ that have	Adjusted as noted.

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				been incorporated into ground units. The… *Delete from acronym table it is mentioned once in text.*	
29.	4	Section 1.4.2	P. Montroy	Spell out UAS in first sentence.	It is spelled out in section 1.3.
30.	4 & throughout document	Section Titles	P. Montroy	Make sections and sub-sections more distinct for ease of reading and understanding. These sections blend right now so it's harder to follow where you are in the study.	Indented the subsection heading slightly to visually cue the change. Also adjusted page numbers to include chapter prefix.
31.	4	Sect 1.6	ASR	Develop concept alternatives for three potential sites including ~~MCAS Yuma (~~Main Station~~)~~, CADC, and AUX II.	Adjusted as noted under section 1.5.
32.	4	Sect 1.6	ASR	The Groups 4 & 5 UAS will require a full size runway (minimum of 6,000 ~~foot length~~feet), aircraft…	Adjusted as noted- except the 's' on "Group".
33.	4	Sect 1.6	ASR	The quantity of support equipment and ground vehicles (green gear) will be reduce when the RQ-7B is replaced…	Adjusted as noted. Also added 'd' to "reduce".
34.	5	Sect 1.7	ASR	Requirements defined by the NAVAIR with the PBFRs *Check about inserting "the" before proper nouns*	Adjusted as noted.
35.	5	Sect 1.8	ASR	COAs for VMU-1 to be located at ~~MCAS Yuma~~Main Station, CADC, and/or AUX II.	Adjusted as noted and revised paragraph.
36.	6	Para 1	ASR	It ~~appears~~ is likely that the current Federal Aviation Administration (FAA) will relax UAS operating restrictions/limitations ~~will be loosened~~ in the future (CITE)~~, although in~~ In the ~~mean time~~meantime, it may be necessary for the squadrons to split operations between the ~~main MCAS Yuma~~Main Station runway and another more remote location.	Revised paragraph by deleting reference to FAA rule changes to allow UAS outside of restricted airspace.
37.	6	Para 3	ASR	Small Unmanned Aerial Vehicle (UAV) operations cannot occur at the Main Station due to hazards associated with flying ~~small aircraft~~ near larger aircraft.	Adjusted as noted.
38.	6	Para 4	ASR	Maintenance of small ~~AV~~ aerial and ground support ~~Vehicles~~vehicles…	Adjusted as noted.
39.	7	Para 2	ASR	…CLC-16 is currently located at ~~MCAS Yuma~~ the Main Station, but long term plans have them relocating to…	Adjusted as noted.
40.	7	Para 4	ASR	…located at ~~MCAS Yuma~~the Main Station for Groups 4 & 5 UAS	Adjusted as noted- except the 's' on "Group".

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				operations, then the facility at CADC would need to either…	
41.	8	Bullet 4	ASR	INSERT FAA Certificate of Authorization: The FAA/COA details the day, time, flight rack, air vehicle flown, altitude, ATC coordination, notice to airmen (NOTAM), and various other requirements that must be met prior to flying outside of the RA.	Added fourth bullet to section 1.9.
42.	8	1.9.1	KruseRL	Delete reference to F-18 use of AUX II.	Adjusted as noted.
43.	8	1.9.1, para 3	ASR	up of AM-2 matting 120 feet wide by 835 feet long with matting approaches at each end. *What's AM-2?*	Revised to "…expeditionary type metal runway matting (AM-2 matting)…"
44.	8	1.9.1, para 5	ASR	The primary runway is located at the Main Station ~~of MCAS Yuma~~. It is c~~C~~omprised of four runways and a supporting taxiway system that~~, it~~ supports the MAG-13, Marine Fighter Training Squadron (VMFT-401), and civilian flight operations.	Adjusted as noted.
45.	9	Para 1	ASR	Support facilities do ~~no~~ not currently exist at AUX II.	Adjusted as noted.
46.	9	Para 3	ASR	~~MCAS Yuma~~ the Main Station location would be suitable for support facilities, …	Adjusted as noted.
47.	9		ASR	Table 1.1: COA 1 - VMU-1 Detachment, provides a summary of the areas considered for a VMU-1 ~~detachment~~ Detachment location. The detachment includes one MQ-21A and one RQ-7B system. COA 1 considers all VMU-1 ~~detachment~~ Detachment operations at either CADC (Alternative 1) or AUX II (Alternative 2). Alternative 3 splits detachment operations ... Additionally, the facilities required for a Detachment's operations would be very minimal.	Adjusted as noted.
48.	11	1.9.2	KruseRL	Discussion of extending the AUX II runway should identify the area as being in the Flat Tailed Horned Lizard management area. The taking of additional habitat for extension of the runway and construction of a system parallel taxiway, parking apron and connecting taxiway systems would require consultation and compensation. Additionally, for all options relative to AUX II – environmental investigation for Munitions and Explosives of Concern (MEC) and possible development of a Munitions Response Program (MRP) site clean-up plan. We encountered this during the	Added to issues list for COA 3.

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				design and construction of the Auxiliary Landing Field.	
49.	11	Para 2	ASR	…considered this alternative infeasible because of the additional ~~extensive~~ infrastructure ~~required~~ and ~~the additional~~ logistical/staffing support ~~required from MCAS Yuma~~ required to operate these facilities.	Adjusted as noted.
50.	12		ASR	1 . 9 . 3 ~~COA~~ Course of Action Site Selection	Adjusted as noted.
51.	13	Para 1	ASR	All military UAS training ~~with military unmanned aircraft~~ must be performed within a designated FAA ~~designated~~ RA. Potential ~~future~~ changes to FAA rules regarding the operation of UASs ~~operating~~ outside of a~~n~~ RA ~~are~~ were not considered ~~for the current~~in this study. If ~~an area of~~a non-~~restricted airspace~~RA is ~~needed~~ required for UAS training, ~~then~~ the unit ~~flying the UAS~~ must acquire a FAA/COA ~~from the FAA~~. ~~The FAA/COA details the day, time, flight rack, air vehicle flown, altitude, ATC coordination, notice to airmen (NOTAM), and various other requirements that must be met prior to flying outside of the RA.~~[ASR3] Comment ASR3 - Move to where this is first introduced.	Adjusted as noted.
52.	13	Fig 2.1	ASR	Define NKX, NFG, and NYL	Added note to bottom of org chart.
53.	14	Squadron Manning	Maj Williams	The sentence "Recent information regarding long term adjustments to TO/E personnel quantities indicate 15 additional personnel will be added for a new mission and 20 additional personnel for each system of Group 4 & 5 UAS that replaces an RQ-7B system, bringing the total personnel to a maximum of 349 once the Group 4 & 5 UAS arrive": It needs to be clear that this additional personnel estimate is based upon the requirements of the USMC model and if the USMC were to be fielded (3) MQ-9's per VMU	Complete revision to this paragraph.
54.	14	Para 1	ASR	The TO concept ~~of organization~~ is:	Adjusted to "table of organization concept".
55.	14	Para 2	ASR	Table 2.1~~: VMU Squadron and Detachment Personnel Summary,~~ shows the number of personnel in an active duty squadron with nine MQ-21A and three RQ-7B [ASR4]systems, ~~which totals~~totaling 274 full time personnel (not including 24 non-chargeable billets) in the short term. ..(i.e. UAS Det[ASR5]atchment #3 and STUAS Tier II Detachment C as shown below).	Adjusted as noted. Added reference to RQ-7B and table data.

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				Comment ASR4- These aren't mentioned in the table Comment ASR5- Is this Detachment? If no, define it Recent[ASR6] information regarding long term adjustments to the TO/E ~~personnel quantities~~ indicate 15 and 20 additional personnel ~~will be added~~ for a new mission and ~~20 additional personnel for each system of~~ Groups 4 & 5 UAS, ~~that replaces an RQ-7B system~~respectively,~~,~~ bringing the total personnel to a maximum of 349 ~~once the Group 4 & 5 UAS arrive~~. Each of the three RQ-7B Detachments[ASR7] [ASR8]have 53 personnel. This Detachment size will be replaced with the larger Groups 4 & 5 Detachment sizes which are expected to have 73[ASR9] personnel. This is a 60 person increase. There will also be 15 new mission personnel added to the squadron after the EA-6B aircraft is sundowned and new mission tasks are required. An overall increase in personnel is expected to be 75 more than the current TO of 274 personnel. Comment ASR6- Mention RQ-7B first Comment ASR7- You mention RQ-7B systems and Detachments. What's the difference between a system and Detachment? Comment ASR8 - Not mentioned in table. Comment ASR9- These numbers are in the table.	Complete revision to this paragraph based on comment #53.
56.	15	Para 1	ASR	… acquire a Certificate of Authorization or Waiver~~COA~~ [ASR10]from the FAA. The FAA/COA details the day, time, flight track, air vehicle flown, altitude, Comment ASR10 - COA = Certificate of Authorization AND Course of Action it can't be both. Check through entire document	Changed to "FAA/COAW" to be distinct from "COA"
57.	15	Para 3	ASR	2 . 2 . 1 Airspace Coordination Areas~~ACA~~ and Restricted Operations Zones~~ROZ~~ With[ASR11] regard to the establishment of permanent facilities, VMU-1 indicated that a permanent compound would become a "hub" for the various "spoke" locations dispersed throughout the BMGR. Although the Main Station has limitations as a combined	Adjusted as noted. Kept acronym since used more than 3 times. Moved paragraph from section 2.2.2 to section 2.2.1 and adjusted as noted.

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				“hub” and a small UAV flight operations center, the Main Station could potentially operate as the “hub” that connects to the ranges. Alternative locations for a permanent “hub” then become CADC and AUX II. Comment ASR 11 - Move paragraph five here, The MCAS Yuma UAS Study included site surveys for: Camp Billy Machen Helipads 1 and 2; Speed Bag UAS Airfield; Tactical Air Combat Training System (TACTS) UAS Airfield; AUX II; CADC; and the ALF. AUX VI and Stoval Airfield … R2301 East, R2304, and R2305. *These airfields are previously mentioned, describe their location and include a map.*	Added map showing location of airfields noted to section 2.2.2. Added location info to text for R2304 and R2305.
58.	15	Para 4	ASR	Training scenario~~s discussed~~ discussions ~~in the study~~ included~~ the establishment~~ establishing ~~of~~ a ROZ during WTI at the TACTS and Speedbag Airfields to support UAS launch and recovery operations…Based on the operation ~~being conducted~~ it may be necessary to set up a spoke (alternate GCS) at Stoval Airfield or in an area close to the training due to distance and/or intervening small mountains.	Adjusted as noted.
59.	15	Para 5	ASR	~~With regard to the establishment of permanent facilities, VMU-1 indicated that a permanent compound would become a “hub” for the various “spoke” locations dispersed throughout the BMGR. This “hub” could potentially operate from MCAS Yuma Main Station and still connect to the ranges, although the Main Station has limitations as a combined “hub” and a small UAV flight operations center. The next most central locations for a permanent “hub” then become CADC and AUX II.~~ *Move and insert after 2 . 2 . 2 Training Scenarios. I’ve paraphrased it.*	Moved paragraph 5 from section 2.2.2 to become paragraph 2 in section 2.2.1
60.	16	2.2.3	KruseRL	Line 4, correct “Forces” to “Force’s”.	Adjusted as noted.
61.	16		ASR	2 . 3 Intermediate Maintenance Maintenance capabilities for a VMU squadron are stated on the TO as: ~~“~~remove quotes, HRT and indent	Removed quotes, new paragraph, italic, indented.

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				The squadron will be capable of conducting 1st and 2nd echelon maintenance on assigned Marine Corps ground …	
62.	17	2.4 Support Equipment	Maj Williams	The sentence "VMU-1 will have three Group 4 & 5 systems with a total of twelve AV by the mid-2020s.": Make the change to read: "According to the FY15 AVPLAN, VMU-1 will have a group 4 or group 5 UAS system of unknown quantity by the mid FY2020s"	Adjusted as noted.
63.	17	Para 1		2 . 4 Support Equipment[ASR12] The equipment assigned to a VMU squadron consists of the AVs and ~~containers for~~ their storage and transport containers, HMMWV to transport the AV and pull trailers with expeditionary equipment ~~and the~~(i.e., launcher and recovery ~~equipment~~), and medium tactical ~~vehicle replacement~~ 7-ton trucks for equipment logistics…A satellite ground data terminal ~~(SGDT)~~ [ASR13]is unique…Quantities are based on the revised ~~version of the~~ 2014 TO/E. Comment ASR12- Provide in a table – System, components and quantity. It's easier to compare and track. Comment ASR13- Delete from acronym table.	Added table and adjusted as noted, except retained SGDT as it is now in the table.
64.	17	Para 4	ASR	Portable ~~Ground Control Station~~GCS, one Portable ~~Ground Data Terminal~~GDT, one TALS, one trailer launchers,…	Adjusted as noted.
65.	18	Table 2.2	ASR	*Define TAMCN*	Added note to table.
66.	19	Para 1	ASR	A summary of the NAVAIR PBFRs based on the number of systems is shown in Table 3.1[ASR14]~~: Summary of Facility Requirements~~. Comment ASR 14- See comment ASR1.	Internal discussions concluded with leaving table/figure names in the text as-is.
67.	20	Para 1	ASR	A summary of the NAVAIR PBFRs based on the number of systems is shown in Table 3.1~~: Summary of Facility Requirements~~.	Internal discussions concluded with leaving table/figure names in the text as-is.
68.	20	3.1 Arrival Timeline	Maj Williams	Update the chart to reflect the fact VMU-1 is to be fielded (0) RQ-21 in 2015; (3) in 2016, (1) in 2017, (1) in 2018, (1) in 2019, (1) in 2020, (2) in 2021	Adjusted as noted.

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69.			ASR	No PBFRs were provided for a VMU detachment. Therefore, the~~The~~ facility size requirements for a VMU detachment (includes one RQ-7B and one MQ-21A system) were ~~therefore~~ based on the 2014 SER recommendation for a ~~detachment support building~~structure that is ~~approximate~~ approximately 5,000 square ~~foot~~feet.	Text revised for better clarity.
70.	19	Para 4	ASR	P-XXZ from MCAGCC Twentynine Palms~~, CA~~; P-194 from MCAS Cherry Point, ~~NC~~North Carolina;	Adjusted as noted.
71.	20	Para 1	ASR	…as shown below in Table 3.2[ASR15]~~: Systems Arrival Timelines~~. Comment ASR15- See comment ASR1.	Internal discussions concluded with leaving table/figure names in the text as-is.
72.	21	Para 2	ASR	…prepared surface that is 900 feet in length, or 1,280 [ASR16]feet if also counting the arresting gear and net runout area on either end and a minimum 50 foot width. See Figure 3.1[ASR17]~~: RQ-7B Runway Requirements~~ for a spatial representation of these requirements. Comment ASR 16- I don't see 900 or 1,280 reported Fig 3.1 Comment ASR 17- See Comment ASR1.	Internal discussions concluded with leaving table/figure names in the text as-is. 1280 visible in the middle of the runway. 900 is just a minimum amount.
73.	21	Para 3	ASR	When the RQ-7B is replaced with a larger Groups 4 & 5 UAS, a minimum 6,000 foot long paved runway and aircraft maintenance hangar will be required to support ~~Group 4 & 5 UAS~~their operations.	Adjusted as noted and "Group 4 or 5".
74.	22	Para 1	ASR	…quantity of hangar spaces or hangar size for Groups 4 & 5 UAS aircraft. UFC directions for Broad Area Maritime Surveillance UAS, which is understood to be the MQ-4C Triton (131 foot wingspan~~,~~ and 48 ~~feet long~~foot length)…	Adjusted as noted and "Group 4 or 5".
75.	22	Para 2	ASR	The ~~current study bases the~~ hangar size is based on the ~~a more~~ typical ratio of one hangar space for every three aircraft. This equates to four hangar spaces for the proposed ~~12~~ twelve Groups 4 & 5 ~~AV~~UASs[ASR18]. The hangar requirements ~~in this study~~ are based on UASs with a 79 ~~ft~~ foot wingspan and 36 ~~ft~~ foot length. The resultant hangar layout is shown in Figure 3.1~~: Type II Hangar Module for Group 4 & 5 UAS~~. ~~It is~~The layout is based on a standard Type II hangar module ~~to~~ that will accommodate a VMU squadron with three Groups 4 & 5 [ASR19]systems and twelve ~~AV~~UASs. Comment ASR19- Is it 12 or 3 Groups 4 & 5?	Adjusted as noted and revised for clarity.

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				… *Rewrite paragraph 2 – it is hard to follow*	
76.	22	Para 3	ASR	…provides operational space to maintain the ~~AV systems~~UASs… the information found in the 2014 SER and identified in Table 3.1~~:~~ ~~Summary of Facility Requirements~~.	Adjusted as noted except the table name was left as-is.
77.	23	Para 1	ASR	Define …and vehicle shop space. The RQ-7B PBFRs ~~for the RQ-7B~~ were used instead of the MQ-21… The only adjustment was the size of the Aircraft Maintenance Hangar Category Code Numbers (CCN) 21105, 21106 and 21107 as described above in Section 3.3 ~~Group 4 & 5 UAS Aircraft Maintenance Hangar~~. Table 3.1~~:~~ ~~Facility Requirements,~~ lists the secondary support facility sizes for the Groups 4 & 5 UAS based …	Adjusted as noted except the table name and "Group 4 or 5".
78.	23	Para 2	ASR	3 . 4 . 1 Personally Owned Vehicle ~~(POV)~~ Parking Personally Owned Vehicle (POV) parking requirements … Per UFC facility sizing instructions, the number of POV spaces is based on the number of personnel multiplied by a percentage for the functional category the person works. ~~When trying to generally fit all personnel into limited UFC categories, VMU squadron personnel roughly work as either administrative, maintenance, or warehousing. Corresponding percentages are 70%, 38% and 25~~[ASR20]~~% of the personnel that must be provided a parking space~~. The UFC categories considered for determining the number of parking spaces required VMU squadron personnel include administrative (70 percent), maintenance (38 percent), and warehousing (25 percent). Comment ASR20- These don't add up to 100%	Adjusted as noted and revised to "Privately Owned Vehicle" Adjusted to: "The UFC categories considered for determining the number of parking spaces required VMU squadron personnel include administrative (70 percent of personnel in this category), maintenance (38 percent), and warehousing (25 percent)." Note: the percentages applied to each category of function aren't supposed to add up to 100%.
79.	23	Para 3	ASR	Table 3.3~~: POV Parking~~ summarizes the UFC calculation based on the 2014 VMU ~~table of organization~~TO structure and previously noted 349 personnel resulting in 197 total POV spaces required for a full squadron. COA 2 and 3 full squadron layouts ~~(full squadron)~~ include an area for this quantity of parking spaces with extents of the parking area limited by site constraints[ASR21]. Detailed parking layouts would be required to determine the actual number of spaces that can fit into the ~~areas shown for parking on the site layouts~~actual site.	Adjusted as noted except the table name was left as-is. Deleted "with extents of the parking area limited by site constraints"

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				Comment ASR 21 - ??	
80.	25	Para 3	ASR	Yuma County Airport Authority ~~(YCAA)~~. The Yuma County Airport Authority~~YCAA~~ controls *It is used only once. Delete from acronym table.*	Adjusted as noted. Also see comment #81.
81.	25	4.1	KruseRL	Delete, "The Air Station has a long term lease with the Yuma County Airport Authority (YCAA)". Statement does not fully describe the inter-relationship and infers that the Air Station is a tenant to YCAA.	Adjusted as noted.
82.	25	Para 4	ASR	Seismicity is the most prominent ~~Of the~~ natural constraint~~s~~ affecting the Main Station~~., seismicity is the most prominent~~. ~~The constraint of s~~Seismicity does not ~~limit how~~constrain ~~high facilities can be constructed, but~~ height of structures but it does increase the construction cost~~s~~ ~~of construction~~ for all facilities due to the requirements for additional structural reinforcement.	Adjusted as noted.
83.	25	Para 5	ASR	Figure 4.1~~: Restricted Airspace~~ identifies the Military Operations Areas ~~(MOA)~~ and ~~restricted airspace~~RA surrounding the MCAS Yuma.	Adjusted as noted except the table name was left as-is.
84.	25	Para 6	ASR	The MCAS Yuma has scheduling and operational control of the SUA R2301W, Dome ~~MOA~~ Military Operations Area and CMAGR R-2507E/W/N/S. R-2507 is located approximately fifty miles to the northwest of MCAS Yuma and used for remote UAS training operations.R2301W is located on the western portion of the BMGR. The U.S. International Border with Mexico serves as the southern boundary of the range. Interstate 8 runs eastwest approximately three miles north of the range approximately parallel to its northern boundary. The Mohawk Mountains are at the eastern boundary of the restricted airspace, and the Yuma Desert is the western range boundary. The BMGR is comprised of facilities in support of training functions ranging from the development of individual aircrew skills to the employment of large mixes of aircraft and aviation associated with ground troops in complex tactical exercises. Moving Sands, Cactus West, AUX II, ALF, and the TACTS ranges are located within R2301W. CADC is located within BMGR but outside of SUA R2301W.[ASR22]	Adjusted as noted. Moved range description text to section 1.2 MCAS Yuma.

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				Delete acronym because it's only used once in the text. *Comment ASR22*- Move this to the beginning of the document	
85.	26	Fig 4.1	ASR	DOME MOA, AZ MOA, US 01275 – *are they the same?* AJO WEST, AZ R2301W – *are they the same?* *Use a better map that clearly outlines the MOAs and RAs*	Yes they are the same. Graphic adjusted to make more clear.
86.	25-40		ASR	*The information in section 4 should be presented near the beginning. Define Main Station, CADC, and AUX II early in the text since they are referenced throughout. Delete redundant text.*	In house discussions concluded with leaving section 4 in current location due to the potential ripple effect throughout the document. Added the following to section 1.1: "The CADC is a small compound six miles southeast of Main Station that supports the operational facilities for Marine Wing Support Squadron Three Seven One (MWSS-371) and Marine Air Control Squadron One (MACS-1). The AUX II is an expeditionary type runway twelve miles southeast of the Main Station that supports manned aircraft landing practice. There are no buildings and minimal utilities at the AUX II."
87.	27	4.4.1	KruseRL	Line 6, "... and one between Hangar 75 and P-545/Hangar 76". a) The area between Hangars 75 and 76 is not developable. There are Ready Service Lockers (RSLs) and associated ESQD arcs. b) Developable space is available south of Hangar 75, however, the area is associated with a known MRP site and would require investigation and remediation prior to start of construction. Additionally, there are several buildings in the area that would need to demo'd. c) The area south of Hangar 95 is not shown on Figure 4.2. d) Area shown on Figure 4.2 between 75 and 76 is actually shown between 76 and 78.	Adjusted the text to distinguish discussion about Pre Master Plan conditions from Post Master Plan conditions and the related Post Master Plan graphic included in the report. Also corrected the legend on the Post Master Plan graphic to match the Master Plan graphic/legend.
88.	29	Figure 4.3, Imaginary	Greg McShane /Airfield Operation	Figure 4.3 is not in compliance with the Unified Facilities Criteria (UFC) 3-260-01, Airfield And Heliport Planning And Design (The source document) with regard to its depiction of ; Primary Surfaces, Clear Zones, and Accident Potential Zones for the four Class B runways at MCAS Yuma. FAA defined imaginary surfaces DO NOT	Follow-on coordination with MCAS Yuma GIS department found that updated versions of the imaginary surfaces are not available. Retained the existing master plan graphic shown but added the following note: "Note: This graphic is directly from the 2014 Master

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		Surfaces	s Office	apply to MCAS Yuma (a DoD facility).	Plan due to updated Geographical Information Systems (GIS) data not being available for this report. The airfield safety areas shown are not in compliance with the UFC 3-260-01, Airfield And Heliport Planning And Design with regard to its depiction of; Primary Surfaces, Clear Zones, and Accident Potential Zones for the four Class B runways at MCAS Yuma. FAA defined imaginary surfaces DO NOT apply to MCAS Yuma (a DoD facility). However, no facilities proposed for VMU at MCAS Yuma in this study conflict with these airfield safety zones."
89.	38	Fig 4.9	KruseRL	a) Copper telephone lines are currently installed to the AUX II site. b) Sewer on the range is provided by septic tank system. c) Water near the rifle range is non-potable (but can be made potable) and is a single well point. There is no distribution system.	Added notes to graphic. Do not have GIS/CAD data for this area to show graphically.
90.	41	Para 1	ASR	**5.0 Development Plans and Site Discussion** The following analysis and site plans consider alternative siting at the three locations: ~~MCAS Yuma~~ Main Station, CADC, and AUX II… Although the site plans are unique to each alternative, the variations are fairly minor, that is, they present different combinations of locations~~. What distinguishes each alternative is the combination of locations contained within that alternative.~~ …This discussion is followed by a narrative explaining the site plans ~~developed~~ for the various alternatives. ~~**5 . 1 Site Discussion**~~ ~~As previously mentioned, the three locations being considered for the siting of the various VMU components include MCAS Yuma Main Station, CADC, and AUX II. The following section discusses the dynamics affecting development at each site.~~[ASR23] Comment ASR23- Delete. It's covered in the previous paragraph.	Adjusted as noted.
91.			ASR	**5 . 1 ~~. 1~~ MCAS Yuma Main Station** ~~MCAS Yuma Main Station, like CADC and AUX II, has a mix of~~	Adjusted as noted, with minor variations.

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				~~pros and cons for VMU facilities.~~ The Main Station is the only … **Pros:** • The Main Station runways ~~at the Main Station~~ meet the ~~requirements of the~~ Group 4 & 5 system requirements ~~and this system~~ which ~~is~~ are compatible with the concurrent manned aircraft operations ~~currently conducted at the Main Station~~. • MAG-13 and MALS-13 are collocated on the ~~MCAS Yuma~~ Main Station ~~is the location for MAG-13 and MALS-13~~, which will provide communication and operational efficiencies ~~as VMU comes under the organization of the Group~~. • ~~MCAS Yuma~~ The VMX, which includes various UASs, will also be collocated at the Main Station ~~will be the location for VMX, which includes various UAS~~. • UAS training simulators will likely be located adjacent to existing manned aircraft simulators for coordinated training exercises at ~~MCAS Yuma~~the Main Station. ~~Locating~~ Collecation of the squadron primary facilities ~~at MCAS Yuma Main Station~~ avoids excess travel time between locations for training. • The Main Station has existing robust~~Robust~~ utilities, transportation infrastructure, and community support ~~facilities all currently exist at the Main Station~~. Other functions such as warehousing and the armory could be collocated with existing assets. • The Main Station has a secured perimeter and ~~a~~ manned ~~Entry~~ entry ~~Control~~ control ~~Point~~ points ~~(ECP).~~ Cons: • Small UAV operations cannot occur at the Main Station due to hazards associated with flying ~~small unmanned aircraft near~~them in close proximity to larger manned aircraft. ~~The~~Small UAVs evade detection by the ATC which governs aircraft activity on and around the Main Station ~~cannot detect small aircraft~~ and pilots of manned aircraft have difficulty visually identifying/avoiding ~~small UAVs~~them.	
92.	42	5.1.2	ASR	**Pros:** • There is sufficient ~~Sufficient~~ undeveloped land to accommodate ~~the~~… from the Main Station~~MCAS Yuma~~	Adjusted as noted, with minor variations.

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				• The CADC has existing infrastructure ~~Existing utilities available at CADC~~, ~~although~~ but the capacity/condition of all utilities will need to be verified. • The CADC is marginally closer to ~~MCAS Yuma~~the Main Station than AUX II (approximately three miles ~~closer than AUX II~~). • The CADC offers existing security through a perimeter fence with an intrusion detection system ~~(IDS)~~ and a manned entry control point~~ECP~~ on Cannon Way. Cons: • The RA does not currently include the CADC. A~~n~~ FAA/~~-~~COA exists for RA access ~~to the RA from CADC,~~ but it must be renewed on a regular basis (one year duration for the first year and~~,~~ two year duration thereafter). ◊ ... Although the occupied land ~~occupied by the tent frames/planned field barracks~~ is not required for the VMU-1 detachment facilities, safety clearances associated with the RQ-7B runway could require the relocation of these temporary facilities. Fortunately, other locations within CADC could accommodate these functions just as well. ~~In addition, WTI occurs only twice a year and lasts for four to five weeks, so any impact would be temporary.~~	
93.	43	5.1.3	KruseRL	See comments regarding Figure 4.9 above.	Adjusted fourth bullet with utility info.
94.	43	5.1.3	ASR	**Pros:** • There is sufficient~~Sufficient~~ undeveloped land to accommodate the full range of proposed VMU facilities. • The AUX II lies within the existing RA ... However, flight~~Flight~~ tracks to the west are limited~~, however~~, due to the close proximity ~~to the edge of the~~ RA boundary. **Cons:** • Because of its proximity ~~AUX II is the potential siting location closest~~ to the Gila Mountains. ~~Because of this proximity~~, operations to the east of the Gila Mountains are the most constrained (reduced line-of-sight). • AUX II is unsecured. The VMU would be required to setup and teardown … appropriate intrusion detection system~~IDS~~ • Only electrical utilities are currently available at AUX II. The	Adjusted as noted. See also comment #93.

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				closest point of connection for water~~Water~~, sewer, and communications utilities ~~closest point of connection~~ is approximately ...	
95.	44	Para 1	ASR	The ~~site~~COA ~~layouts~~facility sizes and locations layout that were developed for ~~MCAS Yuma~~the Main Station, CADC, and AUX II ~~used the facility requirements shown~~are provided in Tables 5.1 [ASR24]through 5.3~~: COA 1 Site Layout Facility Sizes and Locations, 5.2: COA 2 Site Layout Facility Sizes and Locations, and 5.3: COA 3 Site Layout Facility Sizes and Locations~~. ~~In addition to requirements, Tables 5.1-5.3 show the sites associated with each requirement.~~ This information mirrors the site selection summary tables provided in Section 1.9. Following the requirement tables is a discussion of each of the facility layout configurations at each of the locations. Comment ASR24- These tables should be labeled as 5.2.1, 5.2.2 and 5.2.3	Adjusted as noted. Table numbering remained 5.1, 5.2, 5.3 for consistency with the rest of the document..
96.	44-46	Table 5.1		*Header row define CCN*	Added footer row and CCN definition
97.	45	Table 5.2		Why are some numbers spilt between two columns? Are they sharing this space?	Yes, they are sharing this space.
98.	46	Table 5.3	ASR	*Note: Alternatives 3 and 4 ~~both~~ site all permanent facilities at ~~MCAS Yuma~~the Main Station, although operations for the MQ-21 systems are conducted at the CADC in Alternative 3 and AUX II for Alternative 4. Table 5.4~~: Facility Site Plan Summary Table~~ and the following site plans provide additional detail.*	Adjusted as noted except table name/caption in text.
99.	47	5.2.2	ASR	Figures 5.1 through 5.15 [ASR25][ASR26][ASR27]show the ~~various~~ proposed configurations ~~proposed~~ as a part of one or more alternatives and the corresponding ~~with one of the previously discussed~~ COAs. There is one site plan provided for each proposed facility configuration~~proposed at each site~~. A short discussion of the layout ~~of facilities~~ and impacts to existing facilities is included ~~for each site plan~~. This discussion supplements the overarching pros and cons previously discussed ~~for each site~~. Comment ASR27- The figures don't report the associates Alts	Adjusted as noted. Added column in Table 5.4 to note the figure number that relates to each alternative.

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100.	47	Para 2	ASR	Each ~~of the following~~ site plan ~~s provides~~ estimates a maximum footprint ~~likely~~ under each COA and location configuration… Opportunities for collocation/ consolidation~~consolidate~~…	Adjusted as noted.
101.	47	Para 3	ASR	~~On this topic,~~The design -for COA 2 and 3 include ~~requirements listed above for~~ instruction space (CNN 171-20) and operational training (CNN 171-35) which will be housed in building 408.	Adjusted as noted.
102.	47	Para 4	ASR	*Combine w/Paragraph 3* In addition, ~~Regarding the requirement for~~ the Air Intelligence Support Center (CNN 141-42) ~~(COAs 2 and 3), this space~~is included in the aircraft hangar footprint ~~for the aircraft hangars~~, and so, it does not appear as a stand-alone facility.	Adjusted as noted.
103.	47	Table 5.4	ASR	Define COA	Added footer row for definition.
104.	48	Para 2	ASR	Figure 5.1a~~: MCAS, MQ-21 & Group 4 & 5 UAS Full Buildout (South Flightline)~~ shows the full buildout configuration at the Main Station. ~~This configuration would locate all~~The VMU-1 facilities would be located at the Main Station under COA 3, Alternatives 3 and 4, where the systems include the MQ-21s and Group 4 & 5 UASs….39,000 ~~SF~~ square feet … 49,267 ~~SY~~square yards of aircraft parking apron provided to accommodate nine ~~parked Group 4 & 5 AVs~~UASs with sun shades (four UASs are ~~parked~~ in the hangar). Headquarters and squadron administrative offices ~~requirements~~ are included in the hangar. POV parking for all squadron personnel is provided behind[ASR28] the hangar. Comment ASR28- Give cardinal direction N, S, E, or W	Adjusted as noted , with minor variations.
105.	65		KruseRL	AUX II site plans and all related discussions regarding AUX II need to include the requirement to upgrade the Range Road (County 19th Street) from the west edge of the Barry M. Goldwater Range to the AUX II site. The existing road is a single lane, 16 ft. wide, asphalt paved surface. The road is designed for very low daily traffic use and is limited in load carrying capacity. For purposes of supporting any development at AUX II in support to VMU-1 – the road would need to be completely rebuilt to a nominal two lane standard geometry with graded shoulders. Additionally, this area is in the Flat	Added two bullets to section 5.3 Auxiliary Airfield II – general pros/cons discussion section.

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				Tailed Horned Lizard management area. Widening the road would require the taking of additional habitat for widening of the road and require consultation and compensation.	
106.	74-76	Alternative Assessment	P. Montroy	Set apart COAs 1 – 3 for ease of read. Perhaps put a line under each. It's a lot of information and easy to get lost so make as clean as possible.	Added section breaks between COAs.
107.			KruseRL	P606: a) Arizona Transaction Privilege Tax is not shown on the DD1391 cost. 6.712% Yuma County plus 1.7% City of Yuma – 8.412% total. b) DD1391, Pg 3: Oil water separator is not addressed in the description of work or identified in the BESS. c) DD1391, Pg 6: For support facilities – need to ensure that the space needed for the portable armory is included in the description. d) DD1391, Pg 8: Under project issues – seismic conditions apply. An IDS (SPAWAR) system will be required on the portable armory. e) DD1391, Pg 9: Line item "Security for armory" cost is too low and needs to be carried under 'other appropriations', PMC. f) DD1391, Pg 10: Change Portable armory from OPN to PMC. Also – change phone number to (928)269-3523.	a) ATP Tax added. b) Added oil water separator. c) Revised Block 10 text to include space for the portable armory. d) Added seismic and IDS to Block 12. e) Revised cost for armory security and moved to other appropriations. f) Change made. Phone number corrected.
108.			KruseRL	P604: a) Address Arizona Transaction Privilege Tax. b) Pg 2: Cost for construction of the fiber optic communication line from Cannon to MCAS Yuma Main Station is not shown in the BESS or cost estimate information. (37,800 ft. /7.2 miles). c) Pg 4: Will the DFT support building require a SAPF or otherwise improved S-2 area within the building? Is SIPR required? (Shown as a requirement for P605). d) Pg 6: Seismic is required. Physical Security for IDS may	a) Added ATP Tax b) Cost for fiber optic comm line was put in primary facilities. (Otherwise the project would be "upside down".) We had estimated scope at 40,000 LF, but have revised to 37,800 LF. c) Added SAPF premium. d) Updated Block 12 information e) Removed word "asphalt". Changed electrical cost estimate to include underground lines rather than overhead. Cost impact is approximately $1.5 million.

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				be required if classified storage/processing is required. e) Pg 7: For paving and site improvements – change “Asphalt” to “pavement”. For electrical utilities – change “Overhead” electrical lines to “Underground”.	
109.			KruseRL	P605: a) Change title to UAS Maintenance Hangar. b) Pg 4: add units to size description for Hangar 101. c) Pg 7: Change seismic and add fencing to Physical Security. d) Pg 8: Tension structure canopies are funded under FF&E. e) Pg 9: Line 5 – correct spelling “hang”.	a) Title revised. b) Text corrected. c) Block 12 updated per comment. d) Moved costs for canopies to Equipment from Other Appropriations. e) Edited line item so that “hangar” is not cut short. f) Added demo of B-98 and B-100. The cost of concrete pad demolition is negligible (less than $1000) and was rolled into Site Preparation.

Appendix C

Minimization, Mitigation, Monitoring, and Reporting (MMMR) Tracking Sheet

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MINIMIZATION, MITIGATION, MONITORING, AND REPORTING (MMMR) TRACKING SHEET ***VMU-1 Relocation to MCAS Yuma***							
Number	***Minimization, Mitigation, Monitoring, Reporting Measures***	***Environmental Assessment Section***	***Implementation Procedure or Action***	***Responsible Organization***	***Deliverable/ Report***	***Compliance Schedule***	***Verification of Compliance***
Special Conservation Measures							
1	*Fugitive Dust Control Measures***.** The construction contractor would implement the following measures during all proposed ground disturbance activities: 1. Use water trucks or sprinkler systems to keep all areas of vehicle movement damp enough to prevent dust from leaving the construction area. 2. Minimize the amount of disturbed ground area at a given time. 3. Minimize traffic speeds on all unpaved roads. 4. Install gravel pads at construction area access points to prevent tracking of soil onto paved roads. 5. Provide temporary wind fencing around sites being graded or cleared. 6. Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site. Stabilize all disturbed areas at this time. 7. Cover truck loads that haul dirt, sand, or gravel. 8. After completion of clearing, grading, earthmoving, or excavation, treat the disturbed areas by watering, re-vegetation, or by spreading non-toxic soil binders until they are paved or otherwise developed to prevent dust generation. 9. Designate personnel to monitor the dust control program and to order increased watering, as necessary, to prevent the transport of dust off-site. Their duties shall include holiday and weekend periods when work may not be in progress.	Section 3.2	Implement fugitive dust control measures.	Contractor	None	During Construction	Verified by: Date:

MINIMIZATION, MITIGATION, MONITORING, AND REPORTING (MMMR) TRACKING SHEET ***VMU-1 Relocation to MCAS Yuma***							
Number	***Minimization, Mitigation, Monitoring, Reporting Measures***	***Environmental Assessment Section***	***Implementation Procedure or Action***	***Responsible Organization***	***Deliverable/ Report***	***Compliance Schedule***	***Verification of Compliance***
2	*Construction Equipment Emission Control Measures*. The construction contractor would implement the following measures during all proposed construction activities, where feasible: 1. Maintain equipment according to manufacturer specifications. 2. Restrict idling of equipment and trucks to a maximum of five minutes at any location. 3. Use diesel oxidation catalysts and/or catalyzed diesel particulate traps. 4. Use electricity from power poles rather than temporary diesel- or gasoline-powered generators. 5. Provide temporary traffic control, such as a flag person, to maintain smooth traffic flow. 6. Keep construction equipment and equipment staging areas away from sensitive receptors (such as day care centers). 7. Re-route construction trucks away from congested streets or sensitive receptors. 8. Use construction equipment with engines that meet United States Environmental Protection Agency (USEPA) Tier 3 and 4 nonroad standards. 9. Use alternative fuel construction equipment, such as natural gas- or electric-powered.	Section 3.2	Implement construction equipment emission control measures.	Contractor	None	During Construction	Verified by: Date:
3	*Direct VMU-1 Operations by Existing and Pending Biological Opinions for Training Activities in the Bob Stump Training Range Complex.* Training and operations based out of the Bob Stump Training Range Complex (BSTRC) will be directed by the existing Chocolate Mountains Aerial Gunnery Range (CMAGR) Biological Opinion (BO) issued to Marine Corps Air Station (MCAS) Yuma (1-6-95-F-	Section 3.4	Conduct operations in accordance with the applicable BOs.	Project Proponent	None	During Operations	Verified by: Date:

MINIMIZATION, MITIGATION, MONITORING, AND REPORTING (MMMR) TRACKING SHEET ***VMU-1 Relocation to MCAS Yuma***							
Number	***Minimization, Mitigation, Monitoring, Reporting Measures***	***Environmental Assessment Section***	***Implementation Procedure or Action***	***Responsible Organization***	***Deliverable/ Report***	***Compliance Schedule***	***Verification of Compliance***
	40), dated April 18, 1996; the project-consultation for VMU-1 operations within the CMAGR, which summarizes and specifies existing rangewide requirements; and the pending issuance of a BO for training and operations within Barry M. Goldwater Range-West (BMGR-West). These documents include speed limits and restrictions on off-road travel, flight restrictions and minimum altitude requirements, notification and reporting procedures, and site maintenance responsibilities, among others.						
4	*Flat-tailed Horned Lizard Monitoring*. Proposed ground-disturbing project components that are located within a Management Area for flat-tailed horned lizard will comply with Mitigation Measures described in the 2003 Flat-tailed Horned Lizard Rangewide Management Strategy. More specifically, a flat-tailed horned lizard monitor must be present during construction activities at and in support of the Cannon Air Defense Complex (CADC) (including the portions of the proposed communication from MCAS Yuma to the CADC that would occur within the existing Management Area) unless the site(s) have been cleared and a flat-tailed horned lizard perimeter barrier fence erected.	Section 3.4	Monitor for flat-tailed horned lizard during ground-disturbing activities in accordance with the 2003 Flat-tailed Horned Lizard Rangewide Management Strategy.	Contractor	None	During Construction	Verified by: Date:
5	*Post Review Discovery Procedures.* While not anticipated, in the event that previously unrecorded archaeological resources, cultural items, or human remains are encountered during ground disturbing activities, MCAS Yuma would manage these resources in accordance with the National Historic Preservation Act (NHPA) and other federal laws and regulations, Marine Corps and Department of Defense (DoD) regulations and instructions and orders, and DoD American Indian and Alaska Native	Section 3.5	Manage cultural resources in accordance with NHPA and other federal laws and regulations.	Project Proponent	None	During Construction and Operations	Verified by: Date:

MINIMIZATION, MITIGATION, MONITORING, AND REPORTING (MMMR) TRACKING SHEET ***VMU-1 Relocation to MCAS Yuma***							
Number	***Minimization, Mitigation, Monitoring, Reporting Measures***	***Environmental Assessment Section***	***Implementation Procedure or Action***	***Responsible Organization***	***Deliverable/ Report***	***Compliance Schedule***	***Verification of Compliance***
	Policy.						
6	*Health and Safety Plan*. Before the start of construction, renovation, and demolition activities, the construction contractor would prepare and submit a Health and Safety Plan for the United States Marine Corps (USMC's) approval, as well as obtain all the necessary permits and approvals. The Health and Safety Plan would include detailed precautionary measures to substantially reduce potential exposure of on-site personnel to hazardous materials in the event construction, renovation, and/or demolition activities encounter contaminated soil or groundwater. The Health and Safety Plan would describe the strategy for handling and disposing of all demolition debris. Part of this strategy would be to divert as much of the demolition waste from landfills as possible using demolition deconstruction techniques to reduce, reuse, or recycle the various types of waste. The removal methods, health and safety procedures, and disposal methods would conform to the regulations of federal, state, and local regulatory agencies. The construction contractor would make the required notifications to USEPA and Arizona Department of Environmental Quality (ADEQ).	Section 3.6	Develop a Health and Safety Plan	Project Proponent	Health and Safety Plan	Before the start of construction, renovation, and demolition activities.	Verified by: Date:
7	*Hazardous Materials Best Management Practices*. The construction contractor would implement the following measures during all proposed construction, renovation, and demolition activities: 1. Maintain equipment according to manufacturer specifications. 2. Contractors would be adequately prepared to respond to and clean up accidental spills and releases of hazardous materials used or	Section 3.6	Implement hazardous materials best management practices.	Contractor	None	During Construction	Verified by: Date:

MINIMIZATION, MITIGATION, MONITORING, AND REPORTING (MMMR) TRACKING SHEET ***VMU-1 Relocation to MCAS Yuma***							
Number	***Minimization, Mitigation, Monitoring, Reporting Measures***	***Environmental Assessment Section***	***Implementation Procedure or Action***	***Responsible Organization***	***Deliverable/ Report***	***Compliance Schedule***	***Verification of Compliance***
	contained in equipment and heavy machinery. Spill response equipment, such as sorbent pads and containment booms, would be available in fueling and maintenance areas. 3. Construction-generated petroleum and hazardous waste (e.g., gasoline, solvents, adhesives, and paint) would be managed and disposed of properly. Contractors would identify, manage, transport, and dispose of regulated wastes (solid waste, hazardous waste, recyclable waste, etc.) in accordance with Titles 40 and 49 of the Code of Federal Regulations (CFR) and Title 18 of the Arizona Administrative Code. 4. Shipping paperwork (hazardous waste manifests, special waste manifests, bills of laden, etc.) used to transport waste from the station would be reviewed and signed by MCAS Yuma Environmental Department, Hazardous Waste Management Division. 5. All excavation activities would be coordinated with the MCAS Yuma Environmental Department, Hazardous Waste Management Division to reduce potential exposure of on-site personnel to contaminated soil and groundwater within and adjacent to Installation Restoration Program (IRP) Site 1 (OU-2). 6. Cleared construction and demolition materials would be recycled in accordance with the DoD Green Procurement Program. 7. Contractors would remove excess hazardous materials from the site once work is completed.						

MINIMIZATION, MITIGATION, MONITORING, AND REPORTING (MMMR) TRACKING SHEET ***VMU-1 Relocation to MCAS Yuma***							
Number	***Minimization, Mitigation, Monitoring, Reporting Measures***	***Environmental Assessment Section***	***Implementation Procedure or Action***	***Responsible Organization***	***Deliverable/ Report***	***Compliance Schedule***	***Verification of Compliance***
8	*Construction Traffic Plan.* A construction traffic management and detour plan would be developed before the start of construction activities. This plan would specify necessary lane closures, detours, signage, lighting, flaggers, and other traffic control measures, as needed. The traffic plan would specify routes for emergency service vehicles in the event of an emergency.	Section 3.9	Develop a construction traffic management and detour plan.	Contractor	None	Before the start of construction	Verified by: Date:

Appendix D

Certificate of Waiver or Authorization

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CERTIFICATE OF WAIVER OR AUTHORIZATION

ISSUED TO

United States Marine Corps

Major Springfield
Marine Unmanned Aerial Vehicle Squadron Two (VMU-2)
Postal Service Center Box 8077
Cherry Point, NC 28533-8077

This certificate is issued for the operations specifically described hereinafter. No person shall conduct any operation pursuant to the authority of this certificate except in accordance with the standard and special provisions contained in this certificate, and such other requirements of the Federal Aviation Regulations not specifically waived by this certificate.

OPERATIONS AUTHORIZED

Operation of the RQ-21(Blackjack), Unmanned Aircraft System (UAS) in Class E and G airspace at or below 2,300 feet MSL (2100 feet AGL) to/from Cannon Air Defense Complex transiting to/from R-2301W restricted airspace under the jurisdiction Yuma Approach Control See attachment 1.

LIST OF WAIVED REGULATIONS BY SECTION AND TITLE

N/A

STANDARD PROVISIONS

1. A copy of the application made for this certificate shall be attached and become a part hereof.
2. This certificate shall be presented for inspection upon the request of any authorized representative of the Federal Aviation Administration, or of any State or municipal official charged with the duty of enforcing local laws or regulations.
3. The holder of this certificate shall be responsible for the strict observance of the terms and provisions contained herein.
4. This certificate is nontransferable.

Note-This certificate constitutes a waiver of those Federal rules or regulations specifically referred to above. It does not constitute a waiver of any State law or local ordinance.

SPECIAL PROVISIONS

Special Provisions are set forth and attached.

The certificate 2014-WSA-196 effective from December 16, 2014 to December 15, 2016 and is subject to cancellation at any time upon notice by the Administrator or his/her authorized representative.

BY DIRECTION OF THE ADMINISTRATOR

FAA Headquarters, AJV-115
(Region)

Jacqueline R. Jackson
(Signature)

December 16 , 2014
(Date)

Manager, UAS Tactical Operations Section
(Title)

FAA Form 7711-1 (7-74)

COA Number: 2014-WSA-196

Issued To: United States Marine Corps, referred herein as the "operator"

Address: Major Springfield
Marine Unmanned Aerial Vehicle Squadron Two (VMU-2)
Postal Service Center Box 8077
Cherry Point, NC 28533-8077

Activity: Operation of the RQ-21(Blackjack), Unmanned Aircraft System (UAS) in Class E and G airspace at or below 2300 feet MSL (2100 feet AGL) to/from Cannon Air Defense Complex transiting to/from R-2301W restricted airspace under the jurisdiction Yuma approach Control See attachment 1.

Purpose: To prescribe UAS operating requirements in the National Airspace System (NAS) for the purpose of training.

Dates of Use: This COA is valid from December 16, 2014through December 15, 2016. Should a renewal become necessary, the operator shall advise the Federal Aviation Administration (FAA), in writing, no later than 45 business days prior to the requested effective date.

Policy:

1. A public aircraft operation is determined by statute, 49 USC §40102(a)(41) and §40125.
2. All public aircraft flights conducted under a COA must comply with the terms of that statute.
3. All flights must be conducted per the declarations submitted on COA on-line.
4. In Order for the waiver of 14 CFR Part 91 §91.113(b) to be effective, the operator must comply with all terms of this COA.
5. All operations will be conducted in compliance with Title 14 CFR Part 91 and the conditions of the waiver issued herein. If the Operator cannot adhere to any of these requirements a separate FAA Form 7711-2 Waiver application may be required.

General:

1. The review of this activity is based upon current understanding of UAS operations and their impact in the NAS. This COA will not be considered a precedent for future operations. (As changes in or understanding of the UAS industry occur, limitations and conditions for operations will be adjusted.)
2. All personnel connected with the UAS operation must read and comply with the contents of this authorization and its provisions.
3. A copy of the COA including the special limitations must be immediately available to all operational personnel at each operating location whenever UAS operations are being conducted.
4. This authorization may be canceled at any time by the Administrator, the person authorized to grant the authorization, or the representative designated to monitor a

specific operation. As a general rule, this authorization may be canceled when it is no longer required, there is an abuse of its provisions, or when unforeseen safety factors develop. Failure to comply with the authorization is cause for cancellation and enforcement as determined by the Administrator. The operator will receive written notice of cancellation.

STANDARD PROVISIONS

A. **Airworthiness Certification and Supporting Documentation.**
The unmanned aircraft must be shown to be airworthy to conduct flight operations in the NAS. United States Marine Corps has made its own determination that the RQ-21 unmanned aircraft is airworthy. United States Marine Corps will ensure the airworthiness certificate remains valid for the duration of this COA. The RQ-21 must be operated in strict compliance with all provisions and conditions contained in the Airworthiness Safety Release, including all documents and provisions referenced in the COA application. It is the responsibility of the United States Marine Corp to ensure all supporting documents, i.e. frequency spectrum approval, pilot training, medical clearances, etc., are current and valid for the operations being performed.

B. **Operations.**

1. Unless otherwise authorized as a special provision, a maximum of one unmanned aircraft will be controlled:
   a. From a single control station, and
   b. By one pilot at a time.
2. A Pilot-in-Command (PIC) is the person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the PIC as described by 14 CFR Part 91 §91.3, Responsibility and Authority of the Pilot-in-Command, apply to the unmanned aircraft PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight.

Note: Flight Crew Member (UAS). In addition to the flight crew members identified in 14 CFR Part 1, Definitions and Abbreviations, an Unmanned Aircraft System flight crew members include pilots, sensor/payload operators, and visual observers and may include other persons as appropriate or required to ensure safe operation of the aircraft.

3. Operations (including lost link procedures) should not be conducted over populated areas, heavily trafficked roads, or an open-air assembly of people, unless authorized in the Airworthiness Certification.
4. When necessary, transit of airways and routes must be conducted as expeditiously as possible. The unmanned aircraft should not plan to loiter on Victor airways, jet routes, Q and T routes, IR routes, or VR routes.
5. For flights operating on an IFR, the PIC must ensure positional information in reference to established National Airspace System (NAS) fixes, NAVAIDs, and/or waypoints is provided to ATC. The use of latitude/longitude positions is not authorized, except oceanic flight operations.

6. If equipped, the unmanned aircraft must operate with
   a. An operational mode 3/A transponder with altitude encoding, or mode S transponder (preferred) set to an ATC assigned squawk
   b. Position/navigation and anti-collision lights on at all times during flight unless stipulated in the special provisions or the proponent has a specific exemption from 14 CFR Part 91 §91.209.

C. **Air Traffic Control (ATC) Communications.**

1. The pilot and/or PIC will maintain direct, two-way communication with ATC and have the ability to maneuver the unmanned aircraft in response to ATC instructions, unless addressed in the Special Provision Section.
   When required, ATC will assign a radio frequency for air traffic control during flight. The use of land-line and/or cellular telephones is prohibited as the primary means for in-flight communication with ATC.
2. The PIC must not accept an ATC clearance requiring the use of visual separation, sequencing, or visual approach.

D. **Safety of Flight.**

1. The operator or delegated representative is responsible for halting or canceling activity in the COA area if, at any time, the safety of persons or property on the ground or in the air is in jeopardy, or if there is a failure to comply with the terms or conditions of this Waiver and Authorization.
2. When operating in controlled airspace, ATC must be immediately notified in the event of any emergency, loss and subsequent restoration of command link, loss of PIC or observer visual contact, or any other malfunction or occurrence that would impact safety or operations.
3. Lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time (2-3 minutes) to communicate and coordinate with ATC prior to executing any lost link maneuver. It is preferred that at least the initial Lost Link Procedure include last assigned/coordinated heading and altitude.

4. **See-and-Avoid.**
   Unmanned aircraft have no on-board pilot to perform see-and-avoid responsibilities; therefore, when operating in the National Airspace System provisions must be made to provide an alternate means of compliance to 14 CFR Part 91 §91.113.
   a. The operator and/or delegated representatives are responsible at all times for collision avoidance with all aviation activities and the safety of persons or property on the surface with respect to the UAS.
   b. UAS pilots will ensure there is a safe operating distance between other aviation activities and the unmanned aircraft at all times.
   c. Any crew member responsible for performing see-and-avoid requirements for the UA must have and maintain instantaneous communication with the PIC.
   d. Visual or tactical observers must be used at all times except in Class A, airspace, active Restricted Areas, and Warning areas designated for aviation activities or as authorized in the Special Provisions.

      (1) Observers may either be ground-based or airborne in a chase plane.

(2) If the chase aircraft is operating more than 100 feet above/below and/or more than ½ NM laterally of the unmanned aircraft, the chase aircraft PIC will advise the controlling ATC facility.

e. The PIC is responsible to ensure visual observers are;
(1) Able to see the aircraft and the surrounding airspace throughout the entire flight, and
(2) Able to provide the PIC with the UA's flight path, and proximity to all aviation activities and other hazards (e.g., terrain, weather, structures) sufficiently to exercise effective control of the UA to:
(a) Comply with 14 CFR Parts 91 § 91.111, §91.113 and § 91.115, and
(b) Prevent the UA from creating a collision hazard, and
(c) Comply with all conditions of the waiver of 14 CFR 91 § 91.113 (b).

f. Observers must be able to communicate clearly to the pilot any instructions required to remain clear of conflicting traffic, using standard phraseology as listed in the Aeronautical Information Manual when practical.

g. A PIC may rotate duties as necessary to fulfill operational requirements; a PIC must be designated at all times.

E. **Notice to Airmen (NOTAM).**

1. A Distant (D) NOTAM must be issued when unmanned aircraft operations are being conducted unless operations are contained within Class A airspace, restricted or warning areas or the operating areas are designated within the appropriate aeronautical chart or airport directory. This requirement may be accomplished:
   a. Through the operator's local base operations or NOTAM issuing authority, or
   b. By contacting the Lockheed Martin Flight Service Station NOTAM Office at 1-877-4-US-NTMS (1-877-487-6867) not more than 72 hours in advance, but not less than 48 hours prior to the operation, unless otherwise authorized as a special provision. The issuing agency will require the:
   (1) Name and contact information of the pilot filing the NOTAM request
   (2) Location, altitude, or operating area
   (3) Time and nature of the activity.
2. For operators filing their NOTAM with the Department of Defense: The requirement to file with an Automated Flight Service Station (AFSS) is in addition to any local procedures/requirements for filing through the Defense Internet NOTAM Service (DINS).

F. **Data Reporting.**

1. Operators are strongly encouraged to provide documentation of all operations associated with UAS activities regardless of the airspace in which the UAS operates. This includes COA operations within Special Use airspace and International Airspace and the information will only be used for the development of civil standards and not released without prior consent of the owner.

NOTE: Negative (zero flights) reports are requested.

2. The operator is strongly encouraged to submit the following information through UAS COA On-Line on a monthly basis:

a. The number of flights conducted under this COA. (A flight during which any portion is conducted in the NAS must be counted only once, regardless of how many times it may enter and leave Special Use airspace between takeoff and landing)
b. Aircraft operational hours per flight
c. Ground control station operational hours in support of each flight, to include Launch and Recovery Element (LRE) operations
d. Pilot duty time per flight
e. Equipment malfunctions (hardware/software) affecting either the aircraft or ground control station

Note: The greater the detail, the better as it will provide the FAA critical insights and assist the FAA in the development of civil standards and certification, as well as accident and incident investigative techniques.

f. Deviations from ATC instructions and/or Letters of Agreement/Procedures
g. Operational/coordination issues
h. The number and duration of lost link events (control, vehicle performance and health monitoring, or communications) per aircraft per flight.

G. **Incident/Accident/Mishap Reporting.**

Operators are strongly encouraged after an incident or accident to provide initial notification of the following to the FAA Air Traffic Control Facility with jurisdiction over the airspace where the accident occurred and within 10 days via the UAS COA On-Line forms (Incident/Accident).

1. All accidents/mishaps involving UAS operations where any of the following occurs:
   a. Fatal injury, where the operation of a UAS results in a death occurring within 30 days of the accident/mishap
   b. Serious injury, where the operation of a UAS results in a hospitalization of more than 48 hours, the fracture of any bone (except for simple fractures of fingers, toes, or nose), severe hemorrhage or tissue damage, internal injuries, or second or third-degree burns
   c. Total unmanned aircraft loss
   d. Substantial damage to the unmanned aircraft system where there is damage to the airframe, power plant, or onboard systems that must be repaired prior to further flight
   e. Damage to property, other than the unmanned aircraft.
2. Any incident/mishap that results in an unsafe/abnormal operation including but not limited to
   a. A malfunction or failure of the unmanned aircraft's on-board flight control system (including navigation)
   b. A malfunction or failure of ground control station flight control hardware or software (other than loss of control link)
   c. A power plant failure or malfunction
   d. An in-flight fire on the Aircraft or Ground Control Station
   e. An aircraft collision

f. Any in-flight failure of the unmanned aircraft's electrical system requiring use of alternate or emergency power to complete the flight
g. A deviation from any provision contained in the COA
h. A deviation from an ATC clearance and/or Letter(s) of Agreement/Procedures
i. A lost control link event resulting in
   (1) Fly-away, or
   (2) Execution of a pre-planned/unplanned lost link procedure.

3. Initial reports should contain the information identified in FAA Form 8020-9 (10/03) and the COA On-Line Accident/Incident Report.
4. Follow-on reports describing the accident/incident/mishap(s) must be submitted by providing copies of operator aviation accident/incident reports upon completion of safety investigations.

Note: The greater the detail, the better as it will provide the FAA critical insights and assist the FAA in the development of civil standards and certification, as well as accident and incident investigative techniques.

AIR TRAFFIC CONTROL SPECIAL PROVISIONS

A. **Coordination Requirements.**

1. Proponent must provide NOTAM information and coordinate operational details to Yuma
   Approach Control at (928) 269-9231 24 hours prior to the start of UAS operations..

B. **Communication Requirements.**

1. Proponent must monitor MCAS Yuma Tower frequency (360.8/377.075/119.3 MHz) or
   Yuma Approach Control during all operations outside of active Restricted Area airspace.

C. **Emergency/Contingency Procedures.**

1. Lost Link Procedures: See attachment 2.

   a. In the event of a lost link, the UAS pilot will immediately notify Yuma Approach Control at (928) 269-9569 state pilot intentions, and comply with the following provisions:
   b. If lost link occurs within a restricted or warning area, or the lost link procedure above takes the UA into the restricted or warning area – the aircraft will not exit the restricted or warning areas until the link is re-established or coordination with ATC has occurred.
   c. The unmanned aircraft lost link mission should minimize transit or orbit over populated areas.
   d. Lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.

e. Lost link orbit points shall not coincide with the centerline of Victor airways.

2. Lost Communications: See attachment 3.

D. **Operations Area (See Attachments)**

AUTHORIZATION

This Certificate of Waiver or Authorization does not, in itself, waive any Title 14 Code of Federal Regulations, nor any state law or local ordinance. Should the proposed operation conflict with any state law or local ordinance, or require permission of local authorities or property owners, it is the responsibility of United States Marine Corps to resolve the matter. This COA does not authorize flight within regulatory Special Use airspace without approval from the using agency. United States Marine Corps is hereby authorized to operate the RQ-21 Unmanned Aircraft System in the operations area depicted in the Activity section of this attachment.

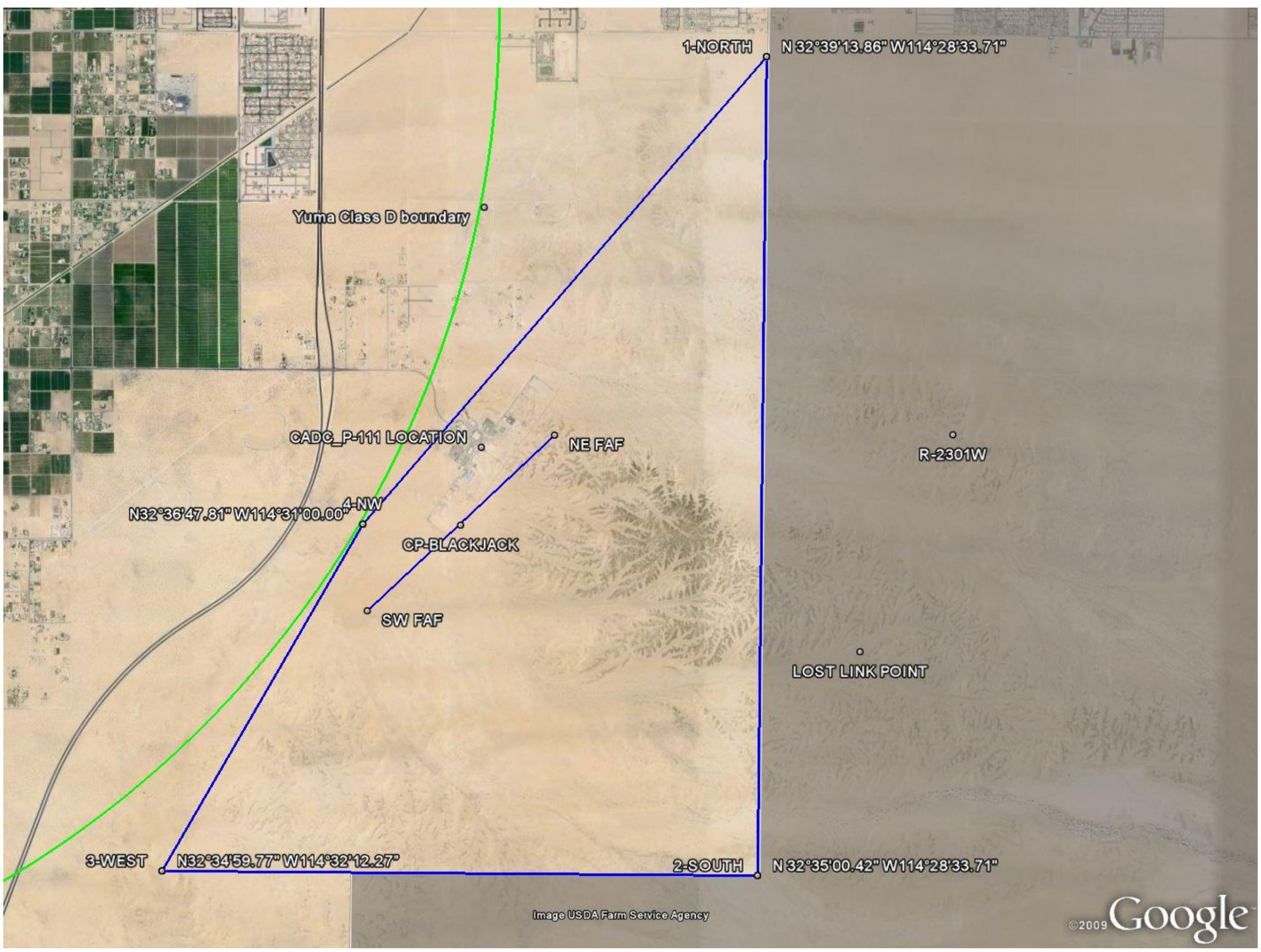
Attachment 1

Operations Area (Graphics/Maps)

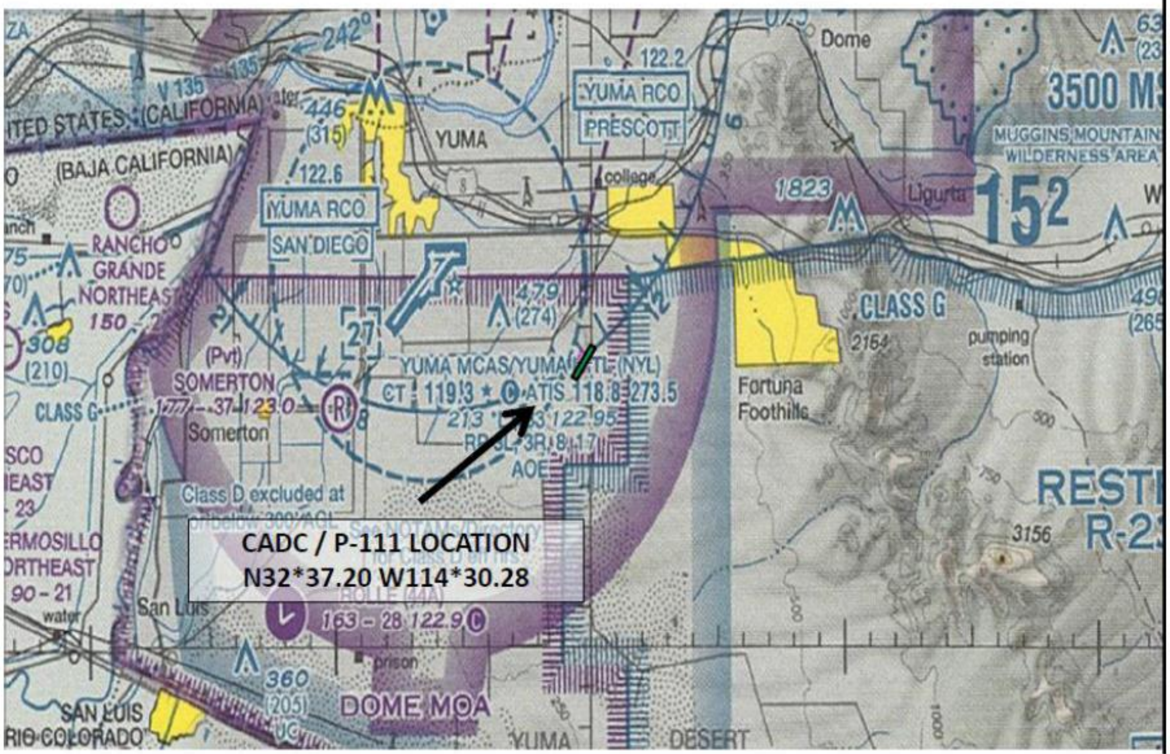
Coordinates

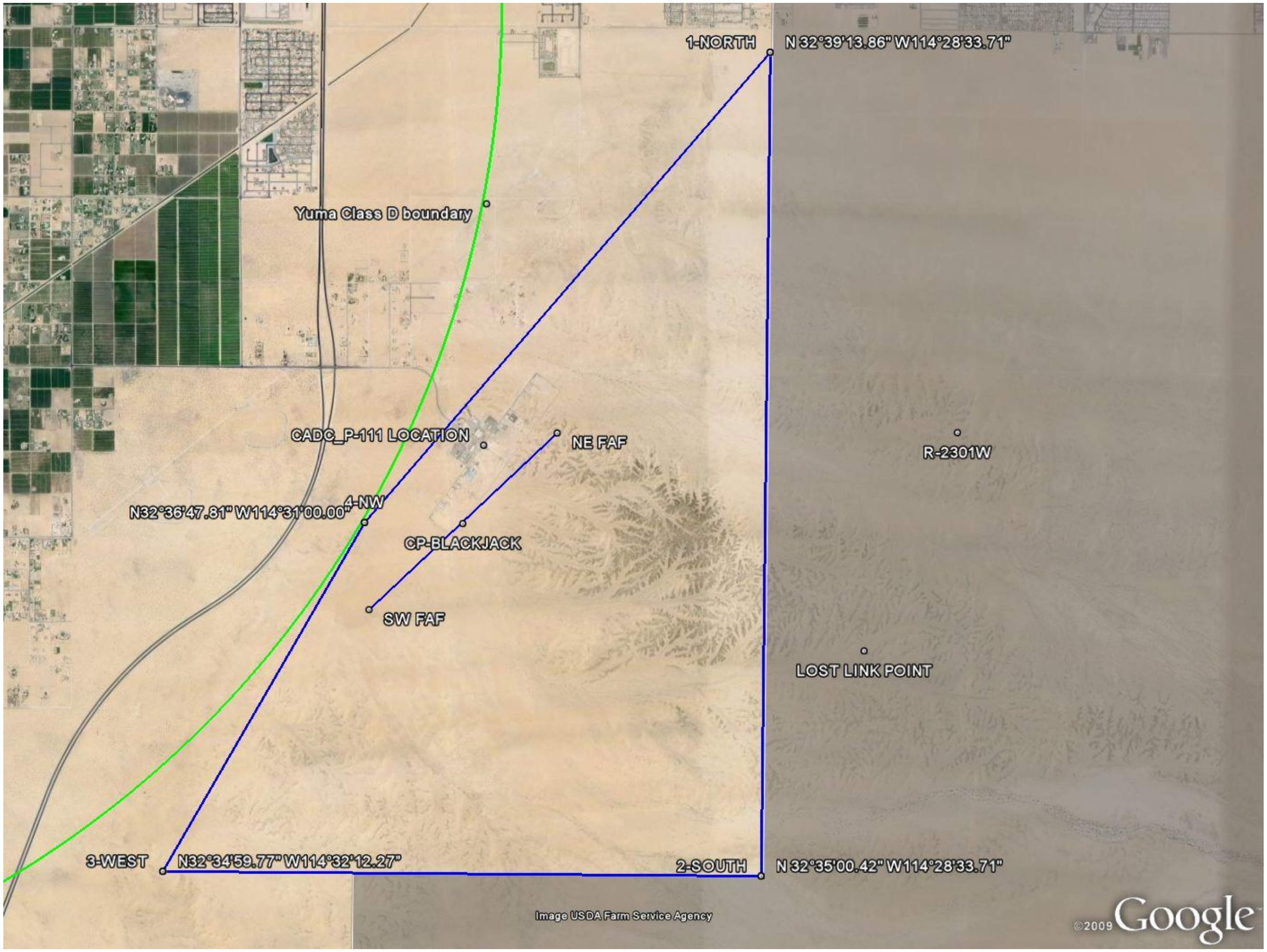
Lost Link Point - 11S QS 37816 10086/ N32:36:10 W114:27:57
NE FAF- 11S QS 34818 12043/ N32:37:16 W114:37:16
CP-BLACKJACK - N32:36:47.81 W114:30:24.11
SW FAF- 11S QS 33098 10306/ N32:36:21 W114:30:58

Yuma USMC Blackjack Operations area :
1-NORTH - N 32°39'13.86" W114°28'33.71"
2-SOUTH- N 32°35'00.42" W114°28'33.71"
3-WEST- N32°34'59.77" W114°32'12.27"
4-NW- N32°36'47.81" W114°31'00.00"
To 1



P-111 / CADC LOCATION




1-NORTH
N 32°39'13.86" W114°28'33.71"
Yuma Class D boundary
CADC_P-111 LOCATION
NE FAF
R-2301W
N32°36'47.81" W114°31'00.00"
4-NW
CP-BLACKJACK
SW FAF
LOST LINK POINT
3-WEST
N32°34'59.77" W114°32'12.27"
2-SOUTH
N 32°35'00.42" W114°28'33.71"
Image USDA Farm Service Agency
©2009 Google

Attachment 2

Lost Link Procedures:

Lost Link Procedures: In the event of a lost link, the UAS pilot will immediately notify MCAS Yuma Tower or Yuma Approach Control, state pilot intentions, and comply with the following provisions:

a. Emergency lost link procedures are loaded into the UAS prior to the mission and will remain the same whether the link is lost within Class E/G airspace or within R2301W. These procedures require the UAS to climb or descend to “Loiter Point 1” or “Loiter Point 2” within R2301W restricted airspace and maintain an altitude of 2300’ MSL. See Attachment 1 below for Loiter Point locations. These procedures can be updated in flight as the situation or phase of flight dictates. The PIC shall notify Yuma ATC Range immediately when the data link is lost as well as the pre-programmed routing of the aircraft. In the event that the link cannot be restored with the UAS during the predetermined holding period, the UAV will select the runway with the best headwind component and conduct a belly landing on the CADC runway.

b. The unmanned aircraft lost link mission will not transit or orbit over populated areas.

c. Lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.

d. Lost link orbit points shall not coincide with the centerline of Victor airways.

Attachment 3

RQ-21 Lost Communication Procedures

a. **Lost Communications Enroute to Restricted Area**. In the event the GCS loses communications while enroute to the restricted area, the UAS operator will squawk 7600, climb to and/or maintain 2,300’ MSL, and proceed to the restricted area exit/entry point. At that time the UAV pilot will execute the procedures outlined in paragraph 2.c. below.

b. **Lost Communications Enroute from Restricted Area**. UAV's losing communication enroute to the Cannon Air Defense Complex landing strip after exiting restricted airspace will continue to the landing strip. The UAS operator will squawk 7600 and program the UAS to proceed to the recovery orbit and carry out their auto-recovery sequence in order to make an active UAS landing. The UAS Area of Operations within Class G/E airspace (the transition corridor) is automatically sterilized once the aircraft is given clearance to exit R2301W restricted airspace and transition back to Cannon Air Defense Complex. No aircraft will exit R2301W without the appropriate clearance.

c. **Lost Communications in Restricted Airspace**. In the event the GCS loses communications while in the restricted area, the UAS shall remain in the restricted airspace while attempting to contact the controlling agency via secondary means to include land line. In the event the Ground Control Station (GCS) is unable to reestablish communication with the airspace controlling agency, the UAS operator will squawk 7600 and make a pre-programmed landing to Aux II landing field which is located within R2301W.

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Appendix E

Air Quality Technical Data

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Appendix E - Emission Calculations for Construction of the MCAS Yuma VMU-1 Project

	A	B	C	D	E	F	G	H	I
1	Table E-1. Construction Activity Data for Ground Equipment Support Facilities at MCAS Yuma - VMU-1 Project Alternative 1 - Year 2018 (page 1 of 2).								
2		*Hp*	*Ave. Daily*	*Number*	*Hourly*	*Hours/*	*Daily*	*Work*	*Total*
3	*Construction Activity/Equipment Type*	*Rating*	*Load Factor*	*Active*	*Hp-Hrs*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
4	*Excavate/Demo Concrete/Grade*								
5	Backhoe	160	0.37	1	59	4	237	1.5	350
6	Bulldozer - D8	310	0.43	1	133	8	1,066	1.0	1,050
7	Compactive Roller	165	0.38	1	63	6	376	1.0	371
8	Dump truck - Cat D25D - 18 CY	260	0.38	1	99	8	790	1.5	1,168
9	Grader	180	0.50	1	90	6	540	1.0	532
10	Loader	215	0.50	1	108	4	430	2.0	847
11	Water Truck - 5000 Gallons	175	0.38	1	67	4	266	3.0	786
12	Fugitive Dust (1)	NA	NA	0.5	NA	8	NA	3.0	1
13	*Place Structural Fill*								
14	Compactive Roller	165	0.38	2	125	6	752	1.6	1,200
15	Dump truck - Cat D25D - 18 CY	260	0.38	4	395	8	3,162	2.1	6,725
16	Grader	180	0.50	1	90	6	540	1.6	862
17	Loader	215	0.50	1	108	4	430	2.1	915
18	Water Truck - 5000 Gallons	175	0.38	1	67	4	266	2.1	566
19	Fugitive Dust (1)	NA	NA	0.5	NA	8	NA	2.1	1
20	*Building Construction*								
21	Air Compressor - 100 CFM	50	0.42	1	21	6	126	93	11,724
22	Concrete/Industrial Saw	84	0.42	1	35	6	212	93	19,696
23	Crane	190	0.29	1	55	6	331	93	30,761
24	Forklift	94	0.20	1	19	6	113	93	10,496
25	Generator	45	0.42	1	19	8	151	93	14,069
26	Loader	215	0.36	1	77	4	310	93	28,807
27	Concrete Trucks (2)	NA	NA	15	NA	14	210	4	888
28	Supply Trucks (2)	NA	NA	20	NA	10	200	7	1,410
29	Fugitive Dust (1)	NA	NA	1	NA	8	NA	93	93
30	*Install Utilities*								
31	Air Compressor - 100 CFM	50	0.42	1	21	6	126	14.0	1,759
32	Backhoe	160	0.37	1	59	6	355	14.0	4,957
33	Concrete/Industrial Saw	84	0.42	1	35	6	212	14.0	2,954
34	Crane	190	0.29	1	55	6	331	14.0	4,614
35	Forklift	94	0.20	1	19	4	75	14.0	1,050
36	Generator	45	0.42	1	19	6	113	14.0	1,583
37	Loader	215	0.36	1	77	4	310	13.6	4,215
38	Concrete Trucks (2)	NA	NA	15	NA	2	30	2.0	60
39	Haul Truck - Debris (1)	NA	NA	10	NA	1	10	2.9	29
40	Supply Trucks (2)	NA	NA	20	NA	1	20	3.0	60
41	Fugitive Dust (1)	NA	NA	0.2	NA	8	NA	14.0	3
42	Notes: (1) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								
43	(2) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								

	A	B	C	D	E	F	G	H	I
47	Table E-1. Construction Activity Data for Ground Equipment Support Facilities at MCAS Yuma - VMU-1 Project Alternative 1 - Year 2018 (page 2 of 2).								
48		*Hp*	*Ave. Daily*	*Number*	*Hourly*	*Hours/*	*Daily*	*Work*	*Total*
49	*Construction Activity/Equipment Type*	*Rating*	*Load Factor*	*Active*	*Hp-Hrs*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
50	*Asphalt Paving*								
51	Paving Machine	200	0.36	1	72	8	576	2.8	1,619
52	Water Truck - 5000 Gallons	175	0.38	1	67	4	266	5.6	1,496
53	Compactive Roller	165	0.38	2	125	8	1,003	2.8	2,820
54	Grader	180	0.41	1	74	8	590	2.8	1,660
55	Loader	215	0.36	1	77	8	619	2.8	1,741
56	Backhoe	160	0.37	1	59	4	237	2.8	666
57	Haul Truck - Paving (2)	NA	NA	10	NA	21	206	2.8	579
58	Haul Truck - Base (2)	NA	NA	10	NA	17	172	2.8	483
59	Supply Trucks (2)	NA	NA	10	NA	3	30	1.4	42
60	Fugitive Dust (1)	NA	NA	2	NA	8	NA	5.6	11
61	*Concrete Work*								
62	Concrete Paver	25	0.42	1	11	4	42	3.9	165
63	Concrete Pump Truck, 110' Boom	285	0.42	1	120	4	479	2.6	1,255
64	Concrete Vibrator	8	0.42	1	3	4	13	3.9	53
65	Loader	215	0.36	1	77	3	232	2.6	608
66	Water Truck - 5000 Gallons	175	0.38	1	67	2	133	5.2	697
67	Concrete Trucks (2)	NA	NA	15	NA	10	148	3.9	581
68	Supply Trucks (2)	NA	NA	20	NA	2	40	2.6	105
69	Fugitive Dust (1)	NA	NA	0.2	NA	8	NA	5.2	1
70	Notes: (1) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								
71	(2) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								

	A	B	C	D	E	F	G	H	I
75	Table E-2. Construction Activity Data for Operations Facility at the CADC - VMU-1 Project Alternative 1 - Year 2018 (page 1 of 2).								
76		*Hp*	*Ave. Daily*	*Number*	*Hourly*	*Hours/*	*Daily*	*Work*	*Total*
77	*Construction Activity/Equipment Type*	*Rating*	*Load Factor*	*Active*	*Hp-Hrs*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
78	*Excavate/Demo Concrete/Grade*								
79	Backhoe	160	0.37	1	59	2	118	1	35
80	Bulldozer - D8	310	0.43	1	133	3	400	1	79
81	Compactive Roller	165	0.38	1	63	2	125	1	25
82	Dump truck - Cat D25D - 18 CY	260	0.38	1	99	4	395	1	116
83	Grader	180	0.50	1	90	2	180	1	35
84	Loader	215	0.50	1	108	2	215	1	84
85	Water Truck - 5000 Gallons	175	0.38	1	67	2	133	1	78
86	Fugitive Dust (1)	NA	NA	0.5	NA	8	NA	1	0
87	*Place Structural Fill*								
88	Compactive Roller	165	0.38	2	125	2	251	1	74
89	Dump truck - Cat D25D - 18 CY	260	0.38	4	395	4	1,581	1	621
90	Grader	180	0.50	1	90	3	270	1	80
91	Loader	215	0.50	1	108	2	215	1	84
92	Water Truck - 5000 Gallons	175	0.38	1	67	2	133	1	52
93	Fugitive Dust (1)	NA	NA	0.5	NA	8	NA	1	0
94	*Building Construction*								
95	Air Compressor - 100 CFM	50	0.42	2	42	6	252	17	4,253
96	Concrete/Industrial Saw	84	0.42	2	71	6	423	17	7,144
97	Crane	190	0.29	2	110	6	661	17	11,158
98	Forklift	94	0.20	2	38	6	226	17	3,807
99	Generator	45	0.42	2	38	8	302	17	5,103
100	Loader	215	0.36	1	77	4	310	17	5,225
101	Concrete Trucks (2)	NA	NA	15	NA	14	210	1	161
102	Supply Trucks (2)	NA	NA	20	NA	10	200	1	256
103	Fugitive Dust (1)	NA	NA	0.2	NA	8	NA	17	3
104	*Install Utilities*								
105	Air Compressor - 100 CFM	50	0.42	1	21	6	126	16.9	2,126
106	Backhoe	160	0.37	1	59	6	355	16.9	5,994
107	Concrete/Industrial Saw	84	0.42	1	35	6	212	16.9	3,572
108	Crane	190	0.29	1	55	6	331	16.9	5,579
109	Forklift	94	0.20	1	19	4	75	16.9	1,269
110	Generator	45	0.42	1	19	6	113	16.9	1,914
111	Loader	215	0.36	1	77	4	310	16.5	5,096
112	Concrete Trucks (2)	NA	NA	15	NA	2	30	2.4	71
113	Haul Truck - Debris (2)	NA	NA	10	NA	1	10	3.5	35
114	Supply Trucks (2)	NA	NA	20	NA	1	20	4.7	94
115	Fugitive Dust (1)	NA	NA	0.2	NA	8	NA	16.9	3
116	Notes: (1) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								
117	(2) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								

	A	B	C	D	E	F	G	H	I
121	Table E-2. Construction Activity Data for Operations Facility at the CADC - VMU-1 Project Alternative 1 - Year 2018 (page 2 of 2).								
122		*Hp*	*Ave. Daily*	*Number*	*Hourly*	*Hours/*	*Daily*	*Work*	*Total*
123	*Construction Activity/Equipment Type*	*Rating*	*Load Factor*	*Active*	*Hp-Hrs*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
124	*Asphalt Paving*								
125	Paving Machine	200	0.36	1	72	8	576	2.4	1,409
126	Water Truck - 5000 Gallons	175	0.38	1	67	4	266	4.9	1,301
127	Compactive Roller	165	0.38	2	125	8	1,003	2.4	2,453
128	Grader	180	0.41	1	74	8	590	2.4	1,444
129	Loader	215	0.36	1	77	8	619	2.4	1,514
130	Backhoe	160	0.37	1	59	4	237	2.4	579
131	Haul Truck - Paving (2)	NA	NA	10	NA	13	130	2.4	319
132	Haul Truck - Base (2)	NA	NA	10	NA	17	172	2.4	420
133	Supply Trucks (2)	NA	NA	10	NA	3	30	1.2	37
134	Fugitive Dust (1)	NA	NA	2	NA	8	NA	4.9	10
135	*Concrete Work*								
136	Concrete Paver	25	0.42	1	11	4	42	1	20
137	Concrete Pump Truck, 110' Boom	285	0.42	1	120	4	479	1	148
138	Concrete Vibrator	8	0.42	1	3	4	13	1	6
139	Loader	215	0.36	1	77	3	232	1	72
140	Water Truck - 5000 Gallons	175	0.38	1	67	2	133	1	82
141	Concrete Trucks (2)	NA	NA	15	NA	5	78	1	36
142	Supply Trucks (2)	NA	NA	20	NA	2	40	1	12
143	Fugitive Dust (1)	NA	NA	0.2	NA	8	NA	1	0
144	*Install Communication Lines*								
145	Backhoe/Loader	125	0.37	1	46	4	185	86	15,857
146	Compactive Roller	80	0.38	1	30	8	243	29	6,949
147	Trencher	75	0.48	1	36	8	288	86	24,686
148	Water Truck - 5000 Gallons	175	0.38	1	67	4	274	114	31,303
149	Supply Trucks (2)	NA	NA	20	NA	2	40	114	4,571
150	Fugitive Dust (1)	NA	NA	0.1	NA	NA	NA	114	11.4
151	Notes: (1) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								
152	(2) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								

	K	L	M	N	O	P	Q	R	S	T
1	Table E-3. Air Emission Factors for Construction of the VMU-1 Project Alternatives at MCAS Yuma									
2		*Fuel*	*Emission Factors (Grams/Horsepower-Hour)*							
3	*Project Year/Source Type*	*Type*	*VOC*	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*	*CO2*	*References*
4	*Year 2018*									
5	Nonroad Equipment - 7-11 Hp	D	0.68	4.96	4.62	0.00	0.46	0.44	608	(1)
6	Nonroad Equipment - 12-16 Hp	D	0.56	2.79	4.65	0.00	0.41	0.40	614	(1)
7	Nonroad Equipment - 17-25 Hp	D	0.54	2.70	4.61	0.00	0.40	0.38	609	(1)
8	Nonroad Equipment - 26-40 Hp	D	0.25	0.98	3.62	0.00	0.15	0.15	610	(1)
9	Nonroad Equipment - 41-50 Hp	D	0.24	0.92	3.55	0.00	0.14	0.14	612	(1)
10	Nonroad Equipment - 51-75 Hp	D	0.31	2.06	3.68	0.00	0.26	0.25	608	(1)
11	Nonroad Equipment - 76-100 Hp	D	0.32	2.23	2.47	0.00	0.31	0.30	609	(1)
12	Nonroad Equipment - 101-175 Hp	D	0.25	0.89	2.09	0.00	0.19	0.18	547	(1)
13	Nonroad Equipment - 176-300 Hp	D	0.19	0.54	1.72	0.00	0.10	0.10	539	(1)
14	Nonroad Equipment - 301-600 Hp	D	0.18	0.85	2.27	0.00	0.12	0.12	535	(1)
15	Short Haul Truck >33k Lb. - 10 mph	D	0.46	1.45	4.64	0.03	0.13	0.12	2,953	(2)
16	Short Haul Truck >33k Lb. - 25 mph	D	0.20	0.85	2.99	0.02	0.10	0.09	2,147	(2)
17	Short Haul Truck >33k Lb. - 55 mph	D	0.11	0.55	2.14	0.01	0.05	0.04	1,569	(2)
18	Composite - Short Haul Truck >33k Lb.	D	0.20	0.82	2.90	0.02	0.08	0.08	2,054	(3)
19	*Year 2020*									
20	Nonroad Equipment - 7-11 Hp	D	0.64	4.82	4.53	0.00	0.43	0.41	608	(1)
21	Nonroad Equipment - 12-16 Hp	D	0.52	2.65	4.59	0.00	0.39	0.38	614	(1)
22	Nonroad Equipment - 17-25 Hp	D	0.51	2.59	4.56	0.00	0.38	0.37	610	(1)
23	Nonroad Equipment - 26-40 Hp	D	0.21	0.72	3.39	0.00	0.11	0.10	611	(1)
24	Nonroad Equipment - 41-50 Hp	D	0.20	0.66	3.33	0.00	0.10	0.09	612	(1)
25	Nonroad Equipment - 51-75 Hp	D	0.27	1.64	3.51	0.00	0.20	0.20	608	(1)
26	Nonroad Equipment - 76-100 Hp	D	0.28	1.77	1.93	0.00	0.24	0.23	609	(1)
27	Nonroad Equipment - 101-175 Hp	D	0.22	0.69	1.62	0.00	0.14	0.14	547	(1)
28	Nonroad Equipment - 176-300 Hp	D	0.17	0.40	1.31	0.00	0.07	0.07	539	(1)
29	Nonroad Equipment - 301-600 Hp	D	0.16	0.68	1.81	0.00	0.10	0.09	535	(1)
30	Short Haul Truck >33k Lb. - 10 mph	D	0.41	1.18	4.00	0.03	0.10	0.09	2,908	(2)
31	Short Haul Truck >33k Lb. - 25 mph	D	0.18	0.69	2.55	0.02	0.07	0.07	2,106	(2)
32	Short Haul Truck >33k Lb. - 55 mph	D	0.09	0.45	1.78	0.01	0.04	0.03	1,528	(2)
33	Composite - Short Haul Truck >33k Lb.	D	0.17	0.67	2.46	0.02	0.06	0.06	2,013	(3)
34	All Years									
35	Building Demolition (Lbs/1000 cf)						0.42	0.04		(4)
36	Disturbed Ground - Fugitive Dust						27.50	2.75		(5)
37	Notes: (1) Emissions factors estimated with the use of the EPA NONROAD2008a model for Yuma County, Arizona.									
38	(2) Estimated with the use of the EPA MOVES2014 model and based upon annual default parameters for Yuma County.									
39	(3) Equal to 10/60/30% 10/25/55 mph factors.									
40	(4) URBEMIS2007 (Jones&Stokes Ass. 2007).									
41	(5) Units in lbs/acre-day from section 11.2.3 of AP-42 (USEPA 1995). Emissions reduced by 50% from uncontrolled levels to simulate									
42	implementation of best management practices (BMPs) for fugitive dust control									

	V	W	X	Y	Z	AA	AB	AC
1	Table E-4. Emissions from Construction of Ground Equipment Support Facilities at MCAS Yuma - VMU-1 Project Alternative 1 - Year 2018 (page 1 of 2)							
2		Tons						
3	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
4	*Excavate/Demo Concrete/Grade*							
5	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.21
6	Bulldozer - D8	0.00	0.00	0.00	0.00	0.00	0.00	0.62
7	Compactive Roller	0.00	0.00	0.00	0.00	0.00	0.00	0.22
8	Dump truck - Cat D25D - 18 CY	0.00	0.00	0.00	0.00	0.00	0.00	0.69
9	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.32
10	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.50
11	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.47
12	Fugitive Dust					0.02	0.00	
13	Subtotal	0.00	0.00	0.01	0.00	0.02	0.00	3.04
14	*Place Structural Fill*							
15	Compactive Roller	0.00	0.00	0.00	0.00	0.00	0.00	0.72
16	Dump truck - Cat D25D - 18 CY	0.00	0.00	0.01	0.00	0.00	0.00	4.00
17	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.51
18	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.54
19	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.34
20	Fugitive Dust					0.01	0.00	
21	Subtotal	0.00	0.01	0.02	0.00	0.02	0.00	6.12
22	*Building Construction*							
23	Air Compressor - 100 CFM	0.00	0.01	0.05	0.00	0.00	0.00	7.90
24	Concrete/Industrial Saw	0.01	0.05	0.05	0.00	0.01	0.01	13.21
25	Crane	0.01	0.02	0.06	0.00	0.00	0.00	18.28
26	Forklift	0.00	0.03	0.03	0.00	0.00	0.00	7.04
27	Generator	0.00	0.01	0.06	0.00	0.00	0.00	9.49
28	Loader	0.01	0.02	0.05	0.00	0.00	0.00	17.12
29	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	2.01
30	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	3.19
31	Fugitive Dust					1.28	0.13	
32	Subtotal	0.03	0.14	0.30	0.00	1.30	0.15	78.25
33	*Install Utilities*							
34	Air Compressor - 100 CFM	0.00	0.00	0.01	0.00	0.00	0.00	1.19
35	Backhoe	0.00	0.00	0.01	0.00	0.00	0.00	2.99
36	Concrete/Industrial Saw	0.00	0.01	0.01	0.00	0.00	0.00	1.98
37	Crane	0.00	0.00	0.01	0.00	0.00	0.00	2.74
38	Forklift	0.00	0.00	0.00	0.00	0.00	0.00	0.70
39	Generator	0.00	0.00	0.01	0.00	0.00	0.00	1.07
40	Loader	0.00	0.00	0.01	0.00	0.00	0.00	2.50
41	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.14
42	Haul Truck - Debris	0.00	0.00	0.00	0.00	0.00	0.00	0.07
43	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.14
44	Fugitive Dust					0.04	0.00	
45	Subtotal	0.01	0.02	0.05	0.00	0.04	0.01	13.51

	V	W	X	Y	Z	AA	AB	AC
50	Table E-4. Emissions from Construction of Ground Equipment Support Facilities at MCAS Yuma - VMU-1 Project Alternative 1 - Year 2018 (page 2 of 2)							
51					*Tons*			
52	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
53	*Asphalt Paving*							
54	Paving Machine	0.00	0.00	0.01	0.00	0.00	0.00	1.09
55	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.90
56	Compactive Roller	0.00	0.00	0.01	0.00	0.00	0.00	1.70
57	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.99
58	Loader	0.00	0.00	0.00	0.00	0.00	0.00	1.03
59	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.40
60	Haul Truck - Paving	0.00	0.00	0.00	0.00	0.00	0.00	1.31
61	Haul Truck - Base	0.00	0.00	0.00	0.00	0.00	0.00	1.09
62	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.10
63	Fugitive Dust					0.15	0.02	
64	Subtotal	0.00	0.01	0.03	0.00	0.16	0.02	8.62
65	*Concrete Work*							
66	Concrete Paver	0.00	0.00	0.00	0.00	0.00	0.00	0.11
67	Concrete Pump Truck, 110' Boom	0.00	0.00	0.00	0.00	0.00	0.00	0.75
68	Concrete Vibrator	0.00	0.00	0.00	0.00	0.00	0.00	0.04
69	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.36
70	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.42
71	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	1.31
72	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.24
73	Fugitive Dust					0.01	0.00	
74	Subtotal	0.00	0.00	0.01	0.00	0.01	0.00	3.23
75	Total Emissions - MCAS Yuma	0.04	0.18	0.42	0.00	1.55	0.18	112.76

	V	W	X	Y	Z	AA	AB	AC
79	Table E-5. Emissions from Construction of Operations Facility at the CADC - VMU-1 Project Alternative 1 - Year 2018 (page 1 of 2).							
80		Tons						
81	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
82	*Excavate/Demo Concrete/Grade*							
83	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.02
84	Bulldozer - D8	0.00	0.00	0.00	0.00	0.00	0.00	0.05
85	Compactive Roller	0.00	0.00	0.00	0.00	0.00	0.00	0.01
86	Dump truck - Cat D25D - 18 CY	0.00	0.00	0.00	0.00	0.00	0.00	0.07
87	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.02
88	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.05
89	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.05
90	Fugitive Dust					0.00	0.00	
91	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.27
92	*Place Structural Fill*							
93	Compactive Roller	0.00	0.00	0.00	0.00	0.00	0.00	0.04
94	Dump truck - Cat D25D - 18 CY	0.00	0.00	0.00	0.00	0.00	0.00	0.37
95	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.05
96	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.05
97	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.03
98	Fugitive Dust					0.00	0.00	
99	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.54
100	*Building Construction*							
101	Air Compressor - 100 CFM	0.00	0.00	0.02	0.00	0.00	0.00	2.87
102	Concrete/Industrial Saw	0.00	0.02	0.02	0.00	0.00	0.00	4.79
103	Crane	0.00	0.01	0.02	0.00	0.00	0.00	6.63
104	Forklift	0.00	0.01	0.01	0.00	0.00	0.00	2.55
105	Generator	0.00	0.01	0.02	0.00	0.00	0.00	3.44
106	Loader	0.00	0.00	0.01	0.00	0.00	0.00	3.10
107	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.36
108	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.58
109	Fugitive Dust					0.05	0.00	
110	Subtotal	0.01	0.05	0.10	0.00	0.05	0.01	24.33
111	*Install Utilities*							
112	Air Compressor - 100 CFM	0.00	0.00	0.01	0.00	0.00	0.00	1.43
113	Backhoe	0.00	0.01	0.01	0.00	0.00	0.00	3.61
114	Concrete/Industrial Saw	0.00	0.01	0.01	0.00	0.00	0.00	2.40
115	Crane	0.00	0.00	0.01	0.00	0.00	0.00	3.32
116	Forklift	0.00	0.00	0.00	0.00	0.00	0.00	0.85
117	Generator	0.00	0.00	0.01	0.00	0.00	0.00	1.29
118	Loader	0.00	0.00	0.01	0.00	0.00	0.00	3.03
119	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.16
120	Haul Truck - Debris	0.00	0.00	0.00	0.00	0.00	0.00	0.08
121	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.21
122	Fugitive Dust					0.05	0.00	
123	Subtotal	0.01	0.03	0.06	0.00	0.05	0.01	16.38

	V	W	X	Y	Z	AA	AB	AC
128	Table E-5. Emissions from Construction of Operations Facility at the CADC - VMU-1 Project Alternative 1 - Year 2018 (page 2 of 2).							
129		Tons						
130	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
131	*Asphalt Paving*							
132	Paving Machine	0.00	0.00	0.01	0.00	0.00	0.00	0.95
133	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.78
134	Compactive Roller	0.00	0.00	0.01	0.00	0.00	0.00	1.48
135	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.86
136	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.90
137	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.35
138	Haul Truck - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.72
139	Haul Truck - Base	0.00	0.00	0.00	0.00	0.00	0.00	0.95
140	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.08
141	Fugitive Dust					0.13	0.01	
142	Subtotal	0.00	0.01	0.02	0.00	0.14	0.01	7.08
143	*Concrete Work*							
144	Concrete Paver	0.00	0.00	0.00	0.00	0.00	0.00	0.01
145	Concrete Pump Truck, 110' Boom	0.00	0.00	0.00	0.00	0.00	0.00	0.09
146	Concrete Vibrator	0.00	0.00	0.00	0.00	0.00	0.00	0.00
147	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.04
148	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.05
149	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.08
150	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.03
151	Fugitive Dust					0.00	0.00	
152	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.31
153	*Install Communication Lines*							
154	Backhoe/Loader	0.00	0.02	0.04	0.00	0.00	0.00	9.56
155	Compactive Roller	0.00	0.02	0.02	0.00	0.00	0.00	4.66
156	Trencher	0.01	0.06	0.10	0.00	0.01	0.01	16.55
157	Water Truck - 5000 Gallons	0.01	0.03	0.07	0.00	0.01	0.01	18.87
158	Supply Trucks (5)	0.00	0.00	0.01	0.00	0.00	0.00	10.35
159	Fugitive Dust					0.16	0.02	
160	Subtotal	0.02	0.12	0.24	0.00	0.18	0.03	59.99
161	Total Emissions - CDAC	0.04	0.21	0.43	0.00	0.43	0.07	108.90

	A	B	C	D	E	F	G	H	I
1	Table E-6. Construction Activity Data for New Hanger Facilities at MCAS Yuma - VMU-1 Project Alternative 1 - Year 2020 (page 1 of 2).								
2		*Hp*	*Ave. Daily*	*Number*	*Hourly*	*Hours/*	*Daily*	*Work*	*Total*
3	*Construction Activity/Equipment Type*	*Rating*	*Load Factor*	*Active*	*Hp-Hrs*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
4	*Excavate/Demo Concrete/Grade*								
5	Backhoe	160	0.37	1	59	4	237	3	710
6	Bulldozer - D8	310	0.43	1	133	8	1,066	2	2,133
7	Compactive Roller	165	0.38	1	63	6	376	2	752
8	Dump truck - Cat D25D - 18 CY	260	0.38	1	99	8	790	3	2,371
9	Grader	180	0.50	1	90	6	540	2	1,080
10	Loader	215	0.50	1	108	4	430	4	1,720
11	Water Truck - 5000 Gallons	175	0.38	1	67	4	266	6	1,596
12	Fugitive Dust (1)	NA	NA	1.0	NA	8	NA	6	6
13	*Place Structural Fill*								
14	Compactive Roller	165	0	2	125	6	752	3	2,257
15	Dump truck - Cat D25D - 18 CY	260	0	4	395	8	3,162	4	12,646
16	Grader	180	1	1	90	6	540	3	1,620
17	Loader	215	1	1	108	4	430	4	1,720
18	Water Truck - 5000 Gallons	175	0	1	67	4	266	4	1,064
19	Fugitive Dust (1)	NA	NA	1	NA	8	NA	4	4
20	*Building Construction*								
21	Air Compressor - 100 CFM	50	0.42	2	42	6	252	143	36,055
22	Concrete/Industrial Saw	84	0.42	2	71	6	423	143	60,572
23	Crane	190	0.29	2	110	6	661	143	94,601
24	Forklift	94	0.20	2	38	6	226	143	32,278
25	Generator	45	0.42	2	38	8	302	143	43,266
26	Loader	215	0.36	1	77	4	310	143	44,296
27	Concrete Trucks (2)	NA	NA	15	NA	14	210	7	1,366
28	Supply Trucks (2)	NA	NA	20	NA	10	200	11	2,168
29	Fugitive Dust (1)	NA	NA	1.0	NA	8	NA	143	143
30	*Install Utilities*								
31	Air Compressor - 100 CFM	50	0.42	1	21	6	126	14.3	1,803
32	Backhoe	160	0.37	1	59	6	355	14.3	5,082
33	Concrete/Industrial Saw	84	0.42	1	35	6	212	14.3	3,029
34	Crane	190	0.29	1	55	6	331	14.3	4,730
35	Forklift	94	0.20	1	19	4	75	14.3	1,076
36	Generator	45	0.42	1	19	6	113	14.3	1,622
37	Loader	215	0.36	1	77	4	310	14.0	4,321
38	Concrete Trucks (2)	NA	NA	15	NA	2	30	2.0	60
39	Haul Truck - Debris (1)	NA	NA	10	NA	1	10	3.0	30
40	Supply Trucks (2)	NA	NA	20	NA	1	20	4.0	80
41	Fugitive Dust (1)	NA	NA	0.2	NA	8	NA	14.3	3
42	Notes: (1) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								
43	(2) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								

	A	B	C	D	E	F	G	H	I
47	Table E-6. Construction Activity Data for New Hanger Facilities at MCAS Yuma - VMU-1 Project Alternative 1 - Year 2020 (page 2 of 2).								
48		*Hp*	*Ave. Daily*	*Number*	*Hourly*	*Hours/*	*Daily*	*Work*	*Total*
49	*Construction Activity/Equipment Type*	*Rating*	*Load Factor*	*Active*	*Hp-Hrs*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
50	*Asphalt Paving*								
51	Paving Machine	200	0.36	1	72	8	576	2.0	1,152
52	Water Truck - 5000 Gallons	175	0.38	1	67	4	266	4.0	1,064
53	Compactive Roller	165	0.38	2	125	8	1,003	2.0	2,006
54	Grader	180	0.41	1	74	8	590	2.0	1,181
55	Loader	215	0.36	1	77	8	619	2.0	1,238
56	Backhoe	160	0.37	1	59	4	237	2.0	474
57	Haul Truck - Paving (2)	NA	NA	10	NA	19	190	2.0	380
58	Haul Truck - Base (2)	NA	NA	10	NA	17	172	2.0	344
59	Supply Trucks (2)	NA	NA	10	NA	3	30	1.0	30
60	Fugitive Dust (1)	NA	NA	2	NA	8	NA	4.0	7
61	*Concrete Work*								
62	Concrete Paver	25	0	1	11	4	42	3	126
63	Concrete Pump Truck, 110' Boom	285	0	1	120	4	479	2	958
64	Concrete Vibrator	8	0	1	3	4	13	3	40
65	Loader	215	0	1	77	3	232	2	464
66	Water Truck - 5000 Gallons	175	0	1	67	2	133	4	532
67	Concrete Trucks (2)	NA	NA	15	NA	9	138	3	413
68	Supply Trucks (2)	NA	NA	20	NA	2	40	2	80
69	Fugitive Dust (1)	NA	NA	0	NA	8	NA	4	1
70	*Demolish All Buildings*								
71	Backhoe	160	0.37	2	118	8	947	8	7,926
72	Bulldozer	310	0.43	2	267	8	2,133	8	17,847
73	Concrete/Industrial Saw	84	0.42	1	35	4	141	8	1,181
74	Crane w/Wrecking Ball	180	0.29	1	52	8	418	8	3,494
75	Loader	215	0.36	3	232	8	1,858	8	15,544
76	Haul Truck - Debris (1)	NA	NA	15	NA	12	180	8	1,506
77	Building Demolition (3)	NA	NA	NA	NA	8	NA	8	745,674
78	Fugitive Dust (1)	NA	NA	0.5	NA	8	NA	8	4.2
79	Notes: (1) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								
80	(2) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								
81	(3) Total Hp-Hrs = total cubic feet (cf) of demolished buildings.								

	V	W	X	Y	Z	AA	AB	AC
1	Table E-7. Emissions from Construction of Operations Facility at the CADC - VMU-1 Project Alternative 1 - Year 2018 (pa							
2		Tons						
3	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
4	*Excavate/Demo Concrete/Grade*							
5	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.43
6	Bulldozer - D8	0.00	0.00	0.00	0.00	0.00	0.00	1.26
7	Compactive Roller	0.00	0.00	0.00	0.00	0.00	0.00	0.45
8	Dump truck - Cat D25D - 18 CY	0.00	0.00	0.00	0.00	0.00	0.00	1.41
9	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.64
10	Loader	0.00	0.00	0.00	0.00	0.00	0.00	1.02
11	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.96
12	Fugitive Dust					0.08	0.01	
13	Subtotal	0.00	0.01	0.02	0.00	0.08	0.01	6.18
14	*Place Structural Fill*							
15	Compactive Roller	0.00	0.00	0.00	0.00	0.00	0.00	1.36
16	Dump truck - Cat D25D - 18 CY	0.00	0.01	0.02	0.00	0.00	0.00	7.52
17	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.96
18	Loader	0.00	0.00	0.00	0.00	0.00	0.00	1.02
19	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.64
20	Fugitive Dust					0.06	0.01	
21	Subtotal	0.00	0.01	0.03	0.00	0.06	0.01	11.50
22	*Building Construction*							
23	Air Compressor - 100 CFM	0.01	0.03	0.13	0.00	0.00	0.00	24.31
24	Concrete/Industrial Saw	0.02	0.12	0.13	0.00	0.02	0.02	40.65
25	Crane	0.02	0.04	0.14	0.00	0.01	0.01	56.22
26	Forklift	0.01	0.06	0.07	0.00	0.01	0.01	21.66
27	Generator	0.01	0.03	0.16	0.00	0.00	0.00	29.18
28	Loader	0.01	0.02	0.06	0.00	0.00	0.00	26.33
29	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	3.03
30	Supply Trucks	0.00	0.00	0.01	0.00	0.00	0.00	4.81
31	Fugitive Dust					1.97	0.20	
32	Subtotal	0.07	0.30	0.70	0.00	2.01	0.24	206.19
33	*Install Utilities*							
34	Air Compressor - 100 CFM	0.00	0.00	0.01	0.00	0.00	0.00	1.22
35	Backhoe	0.00	0.00	0.01	0.00	0.00	0.00	3.06
36	Concrete/Industrial Saw	0.00	0.01	0.01	0.00	0.00	0.00	2.03
37	Crane	0.00	0.00	0.01	0.00	0.00	0.00	2.81
38	Forklift	0.00	0.00	0.00	0.00	0.00	0.00	0.72
39	Generator	0.00	0.00	0.01	0.00	0.00	0.00	1.09
40	Loader	0.00	0.00	0.01	0.00	0.00	0.00	2.57
41	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.13
42	Haul Truck - Debris	0.00	0.00	0.00	0.00	0.00	0.00	0.07
43	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.18
44	Fugitive Dust					0.04	0.00	
45	Subtotal	0.01	0.02	0.04	0.00	0.04	0.01	13.89

	V	W	X	Y	Z	AA	AB	AC
50	Table E-7. Emissions from Construction of Operations Facility at the CADC - VMU-1 Project Alternative 1 - Year 2018 (pa							
51		Tons						
52	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
53	*Asphalt Paving*							
54	Paving Machine	0.00	0.00	0.00	0.00	0.00	0.00	0.78
55	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.64
56	Compactive Roller	0.00	0.00	0.00	0.00	0.00	0.00	1.21
57	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.70
58	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.74
59	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.29
60	Haul Truck - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.84
61	Haul Truck - Base	0.00	0.00	0.00	0.00	0.00	0.00	0.76
62	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.07
63	Fugitive Dust					0.10	0.01	
64	Subtotal	0.00	0.01	0.02	0.00	0.10	0.01	6.02
65	*Concrete Work*							
66	Concrete Paver	0.00	0.00	0.00	0.00	0.00	0.00	0.08
67	Concrete Pump Truck, 110' Boom	0.00	0.00	0.00	0.00	0.00	0.00	0.57
68	Concrete Vibrator	0.00	0.00	0.00	0.00	0.00	0.00	0.03
69	Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.28
70	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.32
71	Concrete Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.92
72	Supply Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.18
73	Fugitive Dust					0.01	0.00	
74	Subtotal	0.00	0.00	0.01	0.00	0.01	0.00	2.37
75	*Demolish All Buildings*							
76	Backhoe	0.00	0.01	0.01	0.00	0.00	0.00	4.78
77	Bulldozer	0.00	0.01	0.04	0.00	0.00	0.00	10.53
78	Concrete/Industrial Saw	0.00	0.00	0.00	0.00	0.00	0.00	0.79
79	Crane w/Wrecking Ball	0.00	0.00	0.01	0.00	0.00	0.00	2.08
80	Loader	0.00	0.01	0.02	0.00	0.00	0.00	9.24
81	Haul Truck - Debris	0.00	0.00	0.00	0.00	0.00	0.00	3.34
82	Building Demolition					0.16	0.02	
83	Fugitive Dust					0.06	0.01	
84	Subtotal	0.01	0.03	0.08	0.00	0.22	0.03	30.75
85	Total Emissions - Year MCAS Yuma	0.10	0.38	0.89	0.00	2.53	0.30	276.91

Table E-8. Summary of Annual Construction Emissions for the MCAS Yuma VMU-1 Project Alternative 1 - Year 2018.

	Tons						
Location/Construction Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO_2e*
MCAS Yuma							
Excavate/Demo Concrete/Grade	0.00	0.00	0.01	0.00	0.02	0.00	3.04
Place Structural Fill	0.00	0.01	0.02	0.00	0.02	0.00	6.12
Building Construction	0.03	0.14	0.30	0.00	1.30	0.15	78.25
Install Utilities	0.01	0.02	0.05	0.00	0.04	0.01	13.51
Asphalt Paving	0.00	0.01	0.03	0.00	0.16	0.02	8.62
Concrete Work	0.00	0.00	0.01	0.00	0.01	0.00	3.23
Total Emissions - MCAS Yuma	0.04	0.18	0.42	0.00	1.55	0.18	112.76
CDAC							
Excavate/Demo Concrete/Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.27
Place Structural Fill	0.00	0.00	0.00	0.00	0.00	0.00	0.54
Building Construction	0.01	0.05	0.10	0.00	0.05	0.01	24.33
Install Utilities	0.01	0.03	0.06	0.00	0.05	0.01	16.38
Asphalt Paving	0.00	0.01	0.02	0.00	0.14	0.01	7.08
Concrete Work	0.00	0.00	0.00	0.00	0.00	0.00	0.31
Install Communication Lines	0.02	0.12	0.24	0.00	0.18	0.03	59.99
Total Emissions - CDAC	0.04	0.21	0.43	0.00	0.43	0.07	108.90
Total Construction Emissions - Year 2018	0.09	0.39	0.86	0.00	1.98	0.25	221.66

Table E-9. Summary of Annual Construction Emissions for the MCAS Yuma VMU-1 Project Alternative 1 - Year 2020.

	Tons						
Location/Construction Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO_2e*
MCAS Yuma							
Excavate/Demo Concrete/Grade	0.00	0.01	0.02	0.00	0.08	0.01	6.18
Place Structural Fill	0.00	0.01	0.03	0.00	0.06	0.01	11.50
Building Construction	0.07	0.30	0.70	0.00	2.01	0.24	206.19
Install Utilities	0.01	0.02	0.04	0.00	0.04	0.01	13.89
Asphalt Paving	0.00	0.01	0.02	0.00	0.10	0.01	6.02
Concrete Work	0.00	0.00	0.01	0.00	0.01	0.00	2.37
Demolish All Buildings	0.01	0.03	0.08	0.00	0.22	0.03	30.75
Total Emissions - MCAS Yuma	0.10	0.38	0.89	0.00	2.53	0.30	276.91
Total Construction Emissions - Year 2020	0.10	0.38	0.89	0.00	2.53	0.30	276.91

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