4.12 Topography, Geology, and Soils

4.12.1 Approach to Analysis

The impact analysis for topography, geology, and soils focuses on the surface and subsurface features of land. Aviation training would not affect topography, geology, and soils so analysis of this resource focuses on ground training and construction. For topography, changes to the physical features of an area could potentially result in slope instability that could cause slumping or landslides. The analysis of geology assesses the effects of any large-scale soil or rock removal and the effect on geological functions such as the ability to filter and transmit groundwater. For soils, the analysis focuses on the disturbance of soils and the potential for erosion as a result of training events and construction. Increased soil erosion may also indirectly impact water quality (Sections 4.13 Groundwater and Hydrology and 4.14 Surface Water and Wetlands) and terrestrial biological resources (Section 4.4 Biological Resources).

Prime farmland soils exist within the Military Lease Area. The intent of the Farmland Protection Policy Act (7 U.S.C. section 4201, et seq.) is to minimize the unnecessary and irreversible conversion of farmland (including prime farmland) to nonagricultural uses by federal actions. In accordance with 7 CFR 658.3(b), acquisition or use of farmland by a federal agency for national defense purposes during a national emergency is exempted from compliance with Prime Farmland regulations. Nevertheless, this analysis considers whether prime farmland soils would be irreversibly converted to nonagricultural use under the Proposed Action.

The Proposed Action includes the establishment of a new lease and the reuse of the existing facilities including up to four of the communications towers at the former USAGM site on Saipan. No military training is proposed to occur on Saipan, but ongoing vegetation maintenance would occur at the USAGM site on Saipan. Thus, there would be no impacts to topography, geology, and soils related to the Saipan site.

4.12.2 No Action Alternative

Under the No Action Alternative, training events would continue in the Military Lease Area with the same type of activities and at the same tempo as described in previous NEPA documents (DON 2015). The No Action Alternative includes the U.S. Air Force Divert project improvements (U.S. Air Force 2016, 2020) which were evaluated in previous NEPA documents and are currently under construction and expected to be completed prior to the Proposed Action. No change would occur under the No Action Alternative; therefore, there would be no additional impact on topography, geology or soils.

4.12.3 Alternative 1

4.12.3.1 Training

Topography

Maneuver training on foot would occur in the Military Lease Area. Although repetitive pedestrian movement in the same areas could result in the creation of pathways, changes to the physical features are not expected and this impact is not likely to result in slope instability that could cause slumping or landslides. Ground training operations using vehicles would not result in additional slope instability because this training would be conducted on new or existing roads, around Landing Zones/cleared areas, and previously disturbed areas in the Military Lease Area.

The use of explosives in the Explosives Training Range would cause localized disturbance to the ground, resulting in a crater up to approximately 5 to 7 feet deep and 6 to 8 feet in diameter (i.e., for explosives with a maximum net explosive weight of 40 pounds). Following any detonation resulting in cratering, the area would be refilled by training units. The use of explosives is not expected to initiate landslides because the Explosives Training Range is located in a relatively level area and nearby slopes are composed of limestone.

Other training activities could include road repair and paving; runway repair; installation of AM2 matting on Runway Baker; and simple temporary structures such as tents and temporary fueling bladders. The AM2 matting would be periodically removed, inspected, and replaced to meet maintenance and training requirements. These activities would comply with management measures (Appendix D) to maintain the existing topography, be confined to previously developed areas, and be of intermittent and short duration. Therefore, there would be less than significant impacts to topography associated with training under Alternative 1.

Geology

Neither foot maneuver nor vehicle maneuver training would result in impacts to geology because these activities would not cause any large-scale soil or rock removal or would have minor effect on geological functions such as the ability to filter and transmit groundwater. For any areas that undergo compaction from training (e.g., foot paths or roads) surface runoff and recharge would occur in areas immediately adjacent, resulting in negligible impacts to recharge. The use of explosives in the Explosives Training Range is expected to impact the ground to approximately 5 to 7 feet deep, resulting in disturbance to the underlying bedrock, which is estimated to be at a depth of 1.7 to 3.3 feet in this area (U.S. Department of Agriculture 1989). However, this would impact a relatively small area, resulting in negligible impacts to recharge. Therefore, there would be less than significant impacts to geology associated with training events under Alternative 1.

Soils

As discussed under topography, foot traffic would be dispersed throughout the Military Lease Area and is therefore not expected to generate repeated disturbance in any specific area on a regular basis within the Military Lease Area. Vehicle maneuver training would utilize only new or existing roadways or would occur within Landing Zones/cleared areas and previously disturbed areas. The use of explosives in the Explosives Training Range is expected to recurrently impact soils within a designated cleared area at the Explosives Training Range. Following any detonation resulting in cratering, the area would be refilled by training units. The periodic removal, inspection, and replacement of AM2 matting would occur on the existing paved Runway Baker. As a result, training events would result in less than significant impacts to soils.

Periodic vegetation clearing and thinning and/or maintenance would occur within established training and support areas and the Base Camp within the Military Lease Area. Table 4.12-1 provided areas that would require ongoing vegetation maintenance. There would be minimal direct disturbance of soils during this vegetation maintenance because clearing would be by hand or mechanical devices and not discing, resulting in preserving remaining vegetation, which would protect soils from erosion. Therefore, there would be less than significant impacts to soils associated with training under Alternative 1.

Table 4.12-1 Vegetation Maintenance Under Alternative 1

Facility	*Approximate Area (Acres)*	*Level of Maintenance*
Explosives Training Range	2.5	Requires clearing and thinning of vegetation
Drop Zone	89	Requires clearing and thinning of vegetation between runways Able and Charlie
Landing Zones	157	Requires clearing and maintaining of vegetation to 6-8 inches
Multi-Purpose Maneuver Range	34.7	Requires clearing and thinning of vegetation
New Roads	12	Requires clearing of vegetation
Base Camp	110	Requires continued maintenance mowing of vegetation in existing USAGM cleared areas

4.12.3.2 Construction

Topography

Alternative 1 would involve the construction of two live-fire ranges, an aircraft shelter, Landing Zones, ammunition holding areas, surface radar facilities, new paved and unpaved roads, and utilities. This construction would require earthwork including excavation, fill, transport, and compaction. To minimize the amount of earthwork required, the design of facilities including the radar towers and ammunition holding areas would seek to utilize existing on-site soils and balance the required quantities of excavation and fill. Each facility would be designed to balance cut and fill needs onsite. This eliminates the need for trucking of material and allows for efficient grading. Development of the Base Camp would primarily use the existing USAGM buildings. Other previously disturbed, cleared areas within the USAGM site would accommodate other proposed Base Camp new construction needs, resulting in negligible impacts to topography. Therefore, there would be less than significant impacts to topography associated with construction under Alternative 1.

Geology

Project design and construction would minimize impacts to karst geology by avoiding identified locations of sinkholes, caves, and other karst features. Nearly all proposed infrastructure is located in areas with no known karst features, including the project footprint for the Base Camp (Figure 4.12-1) (Doan et al. 1960). However, the Base Camp Well Field Option B, the proposed water lines, and the aircraft shelter would occur in areas with identified collapsed surface features (Figure 4.12-1). Impacts from development of the Base Camp Well Field Option B and the proposed water lines in areas with identified collapsed surface features are expected to be negligible because the infrastructure associated with these features (i.e., buried pipeline and small equipment buildings) are not expected in land subsident in these areas. The aircraft shelter would be constructed on an area that has already been leveled and stabilized under the U.S. Air Force Divert project improvements, so impacts related to the collapsed surface features are expected to be negligible. For these reasons, and with implementation of design and the management measures listed in Appendix D, there would be less than significant impacts to geology associated with construction under Alternative 1.

Soils

Construction would result in vegetation clearance and direct ground disturbance from cut and fill and grading. Construction activities on Tinian would not occur in areas with highly erodible soils (Figure 4.12-2). As discussed in Section 4.4.3 Biological Resources and presented in Table 4.4-1, approximately 343 acres of vegetation (or 2.3 percent of vegetation in the Military Lease Area) would be permanently cleared to develop the Landing Zones, Multi-Purpose Maneuver Range (i.e., objective/target areas, fire break around the range), utility alignments, Base Camp, Explosives Training Range, drop zone, surface radar towers, potable water well fields (Options A or B), and new roads. Within these areas, direct ground disturbance during construction are shown in Table 4.12-2. A perimeter road would be constructed around the Multi-Purpose Maneuver Range and new access road would be constructed to the Explosives Training Range and three of the Landing Zones (Table 4.12-2). Improvements to existing paved and unpaved roads would primarily include clearance of overgrown vegetation.

Vegetation clearance and direct ground disturbance during construction activities could lead to increased erosion and sediment loads in stormwater runoff. In compliance with the National Pollutant Discharge Elimination System Construction General Permit, a Stormwater Pollution Prevention Plan and construction-specific stormwater management practices such as retention ponds, swales, silt fences, fiber rolls, gravel bag berms, mulch, and erosion control blankets would be implemented to provide erosion and sediment control during construction (Appendix D). These on-site measures would reduce the flow and velocity of stormwater and minimize the transport of soils and sediment off site. This management measure would also include inspection and water sampling performed throughout the construction phase.

Table 4.12-2 Construction Disturbance Under Alternative 1

Facility	*Approximate Area of Direct Ground Disturbance (Acres)*
Aircraft Shelter	1.29
Ammunition Holding Area 1	0.62
Base Camp	4.15
Port Biosecurity/Wash Rack	0.60
Potable Water Well Field and Water Line from Well Field Option A[1]	11.64
Potable Water Well Field and Water Line from Well Field Option B[1]	9.70
Electrical and Communication Line inside the Military Lease Area[2]	5.48
Communication Line outside the Military Lease Area[2]	0.45
Landing Zones 6, 7 and 8 Access Roads	0.62
Multi-Purpose Maneuver Range Perimeter Road	8.93
Explosives Training Range and Access Road	1.55
Surface Radar Tower 1	0.05
Surface Radar Tower 2	0.05

Notes: [1] This analysis assumes a 10-foot wide trench for water lines.
[2] This analysis assumes a 3-foot wide trench for electrical and communication lines.

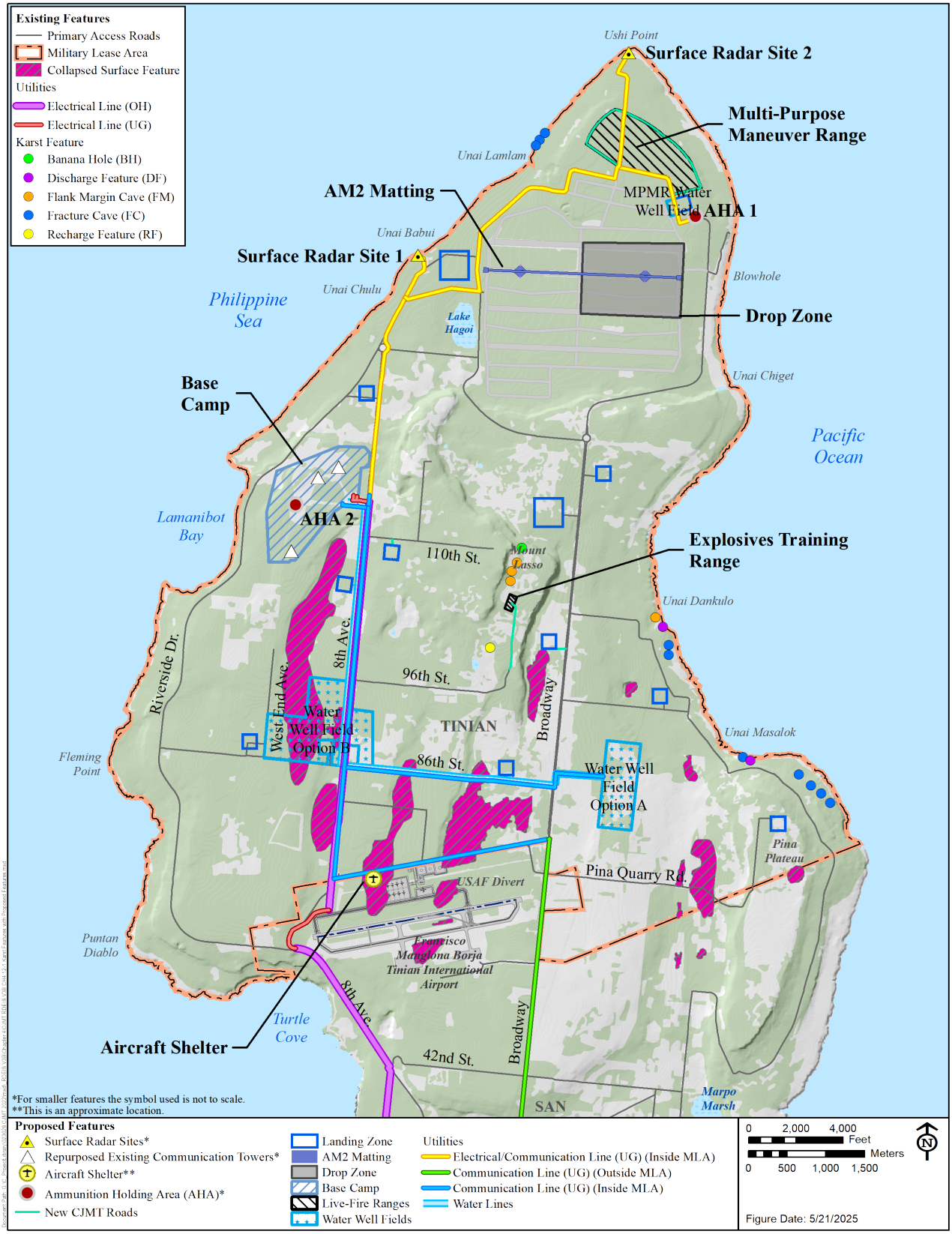

Figure 4.12-1 Karst Features in the Vicinity of the Project Area

Figure 4.12-2 Highly Erodible Soils and Prime Farmland Soils in the Project Area

The Proposed Action would largely avoid disturbance of prime farmland soils in the Military Lease Area, with the exception of a small corner of Landing Zone 8 proposed at a site south of 110th Street at 8th Avenue; portions of Base Camp; the southernmost communications tower; and proposed water line (Figure 4.12-2). The Landing Zone would only require vegetation maintenance and would not involve digging in the soil or the placement of a permanent structure. The Base Camp would utilize existing USAGM infrastructure, including the existing communications tower #16, and require minimal additional soil disturbance in areas of prime farmland soils. The proposed water line alignment north of West End Avenue and connecting to the Base Camp would result in minimal, short-term disturbance of prime farmland soils from trenching during installation. Therefore, there would be less than significant impacts to prime farmland or erodible soils on Tinian under Alternative 1.

4.12.4 Alternative 2

Under Alternative 2, training would continue and would increase over the No Action Alternative by approximately 5 percent, which is approximately 10 percent less than Alternative 1. This would result in less than significant impacts similar to those described under Alternative 1.

Construction for Alternative 2 would be the same as described for Alternative 1. With implementation of management measures, there would be short-term and less than significant impacts to topography, geology, and soils associated with Alternative 2.

4.13 Groundwater and Hydrology

4.13.1 Approach to Analysis

The analysis of potential impacts to groundwater and hydrology focuses on groundwater quantity and quality. Factors used to assess the impacts of the Proposed Action to groundwater and hydrology include: (1) the availability of groundwater to supply the potable water for both the Proposed Action and civilian populations; and (2) the potential for the Proposed Action to impact groundwater quality.

4.13.2 No Action Alternative

Under the No Action Alternative, ground and aviation training events would continue in the Military Lease Area with the same type of activities and at the same tempo as described in previous NEPA documents (DON 2015). In addition, all actions related to the U.S. Air Force Divert Activities project (U.S. Air Force 2016, 2020) would be implemented. No change would occur under the No Action Alternative, therefore, there would be no impact to groundwater or hydrology.

4.13.3 Alternative 1

4.13.3.1 Training

Groundwater Availability

The Proposed Action includes addition of new water infrastructure to support the Base Camp, which would not be connected to the Commonwealth Utilities Corporation water system. This new water infrastructure is proposed to consist of up to four new or rehabilitated groundwater wells, aboveground storage, and a booster pump station. Table 4.13-1 provides the average annual water demand for the new water infrastructure.