

TECHNICAL EXHIBIT 27

YPG Installation Design Guide

YPG Installation Design Guide Subject to Revisions



U.S. Army Yuma Proving Ground, Arizona Real Property Master Plan



Installation Design Guide

**FINAL
NOVEMBER 2015**

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REAL PROPERTY MASTER PLAN

FINAL



PREPARED FOR:
U.S. ARMY ENGINEERING & SUPPORT CENTER, HUNTSVILLE
AND
U.S. ARMY YUMA PROVING GROUND

PREPARED BY: WOOLPERT, INC.

NOVEMBER 2015

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16 Regulating Plan

The Regulating Plan is the controlling document and principal tool for implementing how development should occur in each of the cantonment areas:

- Howard Cantonment Area (HCA)
- Walker Cantonment Area (WCA)
- Laguna Army Airfield (LAAF)
- Kofa Cantonment Area (KCA)
- Castle Dome Annex (CDA)
- Castle Dome Heliport (CDH)

Similar to a local community's zoning map, the Regulating Plan identifies the standards for each building site and any specific characteristics assigned to it. For the purposes of the IPS, only the cantonment areas have regulating plans. Each Regulating Plan is based on the preferred ADP found in the revised RPMP.

16.1 SITE PLANNING AND BUILDING ORIENTATION

Proper site planning results in a functional, attractive, and sustainable installation. Sustainable planning meets mission requirements without compromising the ability of future generations to meet their needs. The goal of sustainable development is to make the most effective use of limited resources and to create more compact and sustainable installations that still meet security and safety requirements.

General considerations applicable to site planning and building orientation in the cantonment areas include:

- Site buildings that have a common function in proximity to each other.
- Provide enough space around a complex to allow for expansion. Assume 10 percent for expansion when no other supporting data are available.
- Locate buildings so there is easy, direct pedestrian access between buildings in a complex. Only encourage driving when walking cannot be accommodated.



DPW

- Preserve natural site features such as topography, washes, water sources, vegetation, and tree cover.
- Locate facilities with consideration of climatic conditions. Whenever possible, building orientation should have the broad face of the building south-facing to minimize solar heat.
- Promote infill development opportunities. Buildings and compatible uses that are in close proximity minimize the need to extend costly infrastructure and create opportunities for sheltering pedestrians from the heat and sun.
- Promote form-based planning when appropriate. Form-based planning emphasizes principles that support sustainable development and promotes horizontal and vertical mixed uses.

16.2 AT/FP SETBACKS

All AT/FP requirements should follow the setbacks established in the DoD Minimum Antiterrorism Standards for Buildings (UFC 4-010-01). Due to varying setbacks based on building materials and other factors, building setbacks in the USAYPG IPS are assumed to be 82 feet unless otherwise noted.

16.3 DEVELOPMENT CAPACITY

According to UFC 2-100-01, the difference between the existing condition and the future build-out is the development capacity. Each Regulating Plan shows the development capacity in buildable areas (acreage) of each cantonment area based on AT/FP considerations, operational, and natural and cultural resource constraints. Development capacity in buildable areas includes unconstrained land, land that will require demolition of existing structures, or land that has some operational issues that will constrain the type of development.



Building 226

16.4 PARKING

There are two standards for Privately Owned Vehicle (POV) parking lots in the cantonment areas; paved lots and unpaved lots.

Paved Parking Lots—Located in the higher investment core areas in each cantonment area, these lots should be designed to be safe, efficient, convenient, and aesthetically pleasing. When possible, paved lots should be set back at least 20 feet from roadways and buffered with approved landscape material found in the landscape standards. Paved with durable asphalt, these parking lots should conform to striping, lighting, and signage standards found in the IDG and within approved Army criteria. Paved parking lots could include shade structures, where feasible. Solar panels should be incorporated into the shade structure.

Unpaved Parking Lots—Located in the periphery of cantonment areas and ranges, unpaved parking lots can provide a cost-effective solution for individual lots supporting industrial and non-permanent functions and facilities.

The following standards apply for all parking lots in the six developed cantonment areas:

- Encourage consolidated, joint-use parking lots whenever possible.
- All parking lots must meet AT/FP stand-off criteria. The use of landscaping and other natural materials is preferred to aid in meeting AT/FP requirements.
- All parking lots must be accessible to persons with disabilities and be Americans with Disabilities (ADA) accessible.



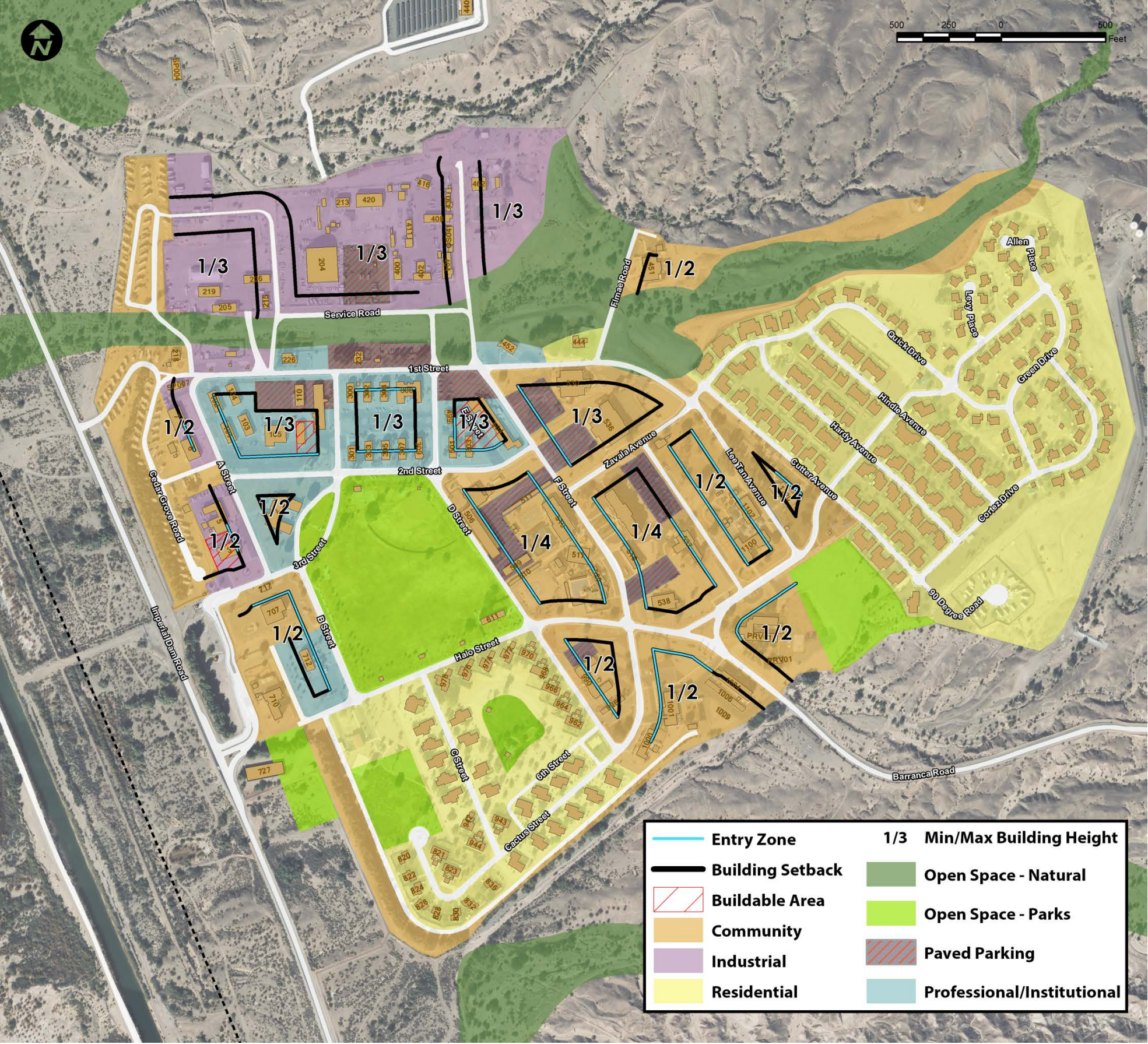
Walker Cantonment Area



Based on the preferred ADP found in the RPMP, the Regulating Plan enables HCA to become a great place to live and work by developing a hometown, small community atmosphere. Land use planning has been implemented well in HCA over the years and this cantonment area has the feel of a small town. However many facilities are quite old and do not meet modern requirements. Implementation of this goal will be accomplished through reuse and updating of older facilities to meet new requirements, and when funding is available, construction of new facilities. Relocation and consolidation in newer facilities will allow demolition of out-of-date facilities, which would create opportunities for mission expansion or accommodation of new missions.

Building setback lines are established based on the USAYPG Directorate of Emergency Services (DES) request to maintain a “planning level” 82 foot setback for building construction. Proposed entry locations are intended to maximize solar orientation and present a consistent presence along high visibility corridors. Building heights should be taller in the central portion of HCA, with the hotel providing the precedent for buildings with heights of up to four levels.

Development capacity in buildable areas is approximately two acres; however, redevelopment in these areas will require demolition of existing buildings.



16.6 WALKER CANTONMENT AREA—REGULATING PLAN

The goal of the WCA Regulating Plan is to consolidate uses and facilities into a sustainable campus while allowing for future mission growth and expansion. This flexibility will be accomplished through consolidation of existing functions, improvements to the connectivity between facilities and land uses, and the introduction of more pedestrian- friendly design elements.

Land uses shown in the WCA Regulating Plan are intended to maintain a strong administrative presence along the VIP route (Ocotillo Road) and reinforce the concept that administrative functions should be consolidated along the VIP route. Building setback lines are established based on the USAYPG DES request to maintain a “planning level” 82 foot setback for building construction. Proposed entry locations are intended to maximize solar orientation, to the extent feasible, and present a consistent presence along high visibility corridors such as Ocotillo Road. Building heights will be as high as four levels for administrative facilities along Ocotillo Road. Building heights in the industrial portions of the area will accommodate large-scale industrial buildings requiring high bay and high clearances.

Development capacity in buildable areas is approximately 39 acres. No demolitions are required within these developable areas.



16.7 LAAF—REGULATING PLAN

To Be Provided Following Preparation of the MFFS ADP and the update to the LAAF ADP, expected CY2016 under a separate task order.



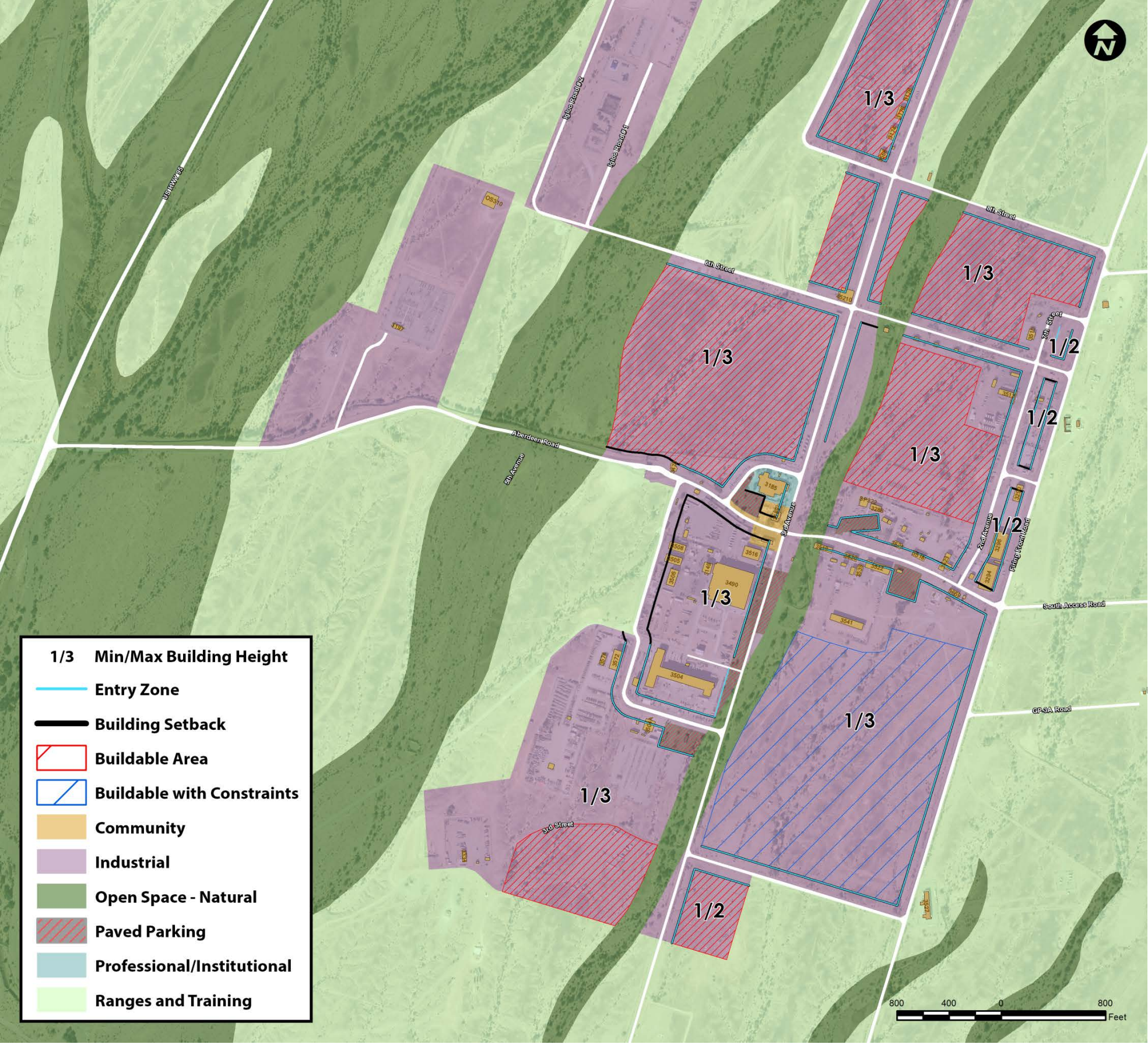
16.8 KOFA CANTONMENT AREA—REGULATING PLAN

The goal of the KCA Regulating Plan is to provide mission flexibility by maximizing the district development potential for testing and range support. This flexibility will be accomplished through the redevelopment of the transportation system and relocation of some uses to WCA. This will not only open space on KCA but also aligns with the overall USAYPG goal to consolidate units and functions where appropriate.

Most future building construction in KCA is likely to be industrial—reflected in the land use categories—and require high clearances/high bays, which results in building heights up to three levels. Entry locations are intended to maintain a consistent building frontage along primary and secondary streets.

Unpaved POV and Government-owned vehicle (GOV) parking is not sited due to the unknown development patterns for the future development areas; however unpaved POV and GOV parking in these areas should not be located along roads, but behind buildings.

Development capacity in buildable areas is approximately 131 acres. There are approximately 65 acres of land that are constrained by operations. Future development in this area will be limited to acceptable functions.

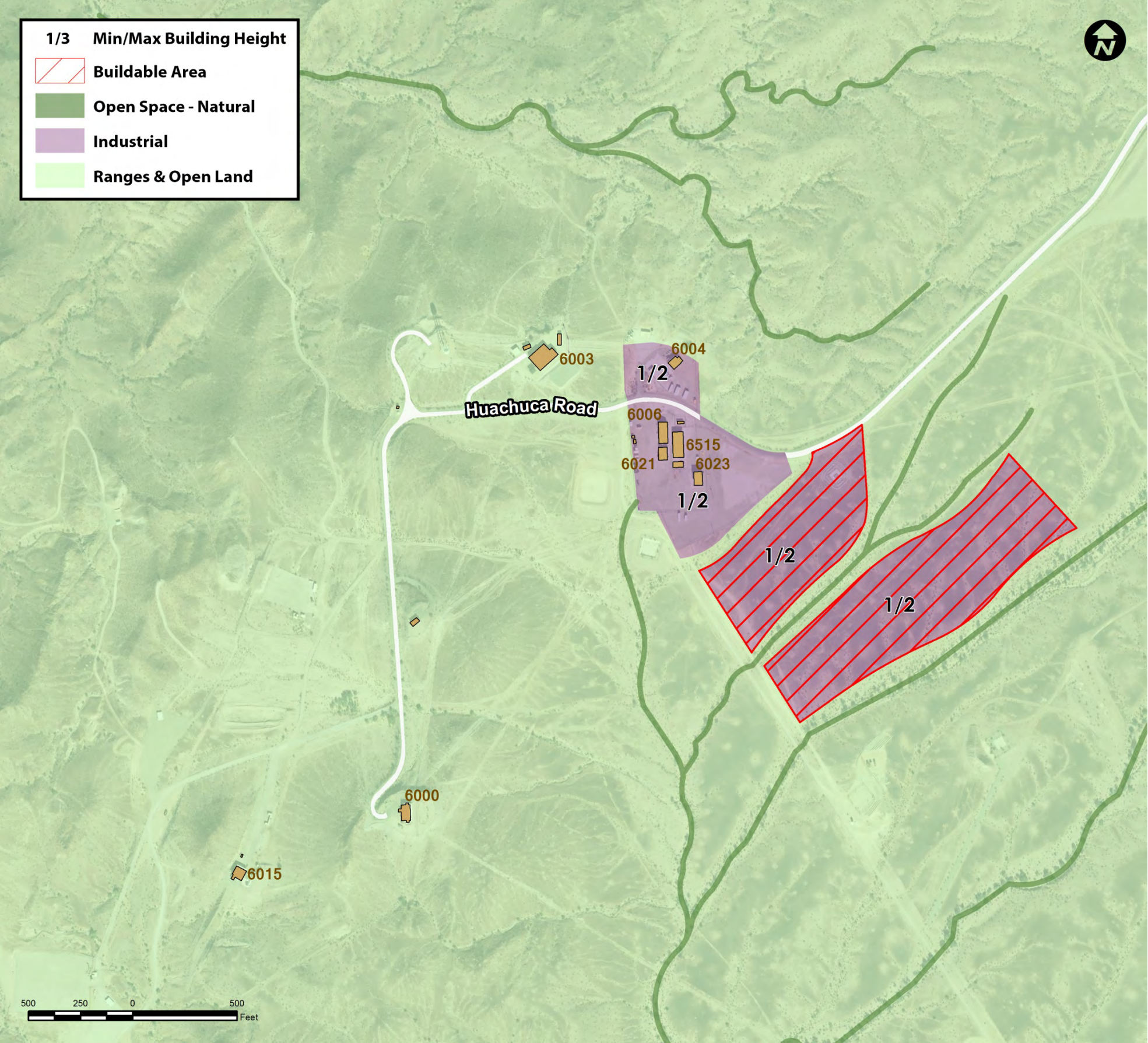


16.9 CASTLE DOME ANNEX—REGULATING PLAN

The CDA Regulating Plan focuses on continued growth of the current functions and capacities in the CDA District. Existing facilities should be improved to increase capacity to meet future needs of the CASD. A climate controlled storage facility would be constructed to support functions at the FOB. Minimal future development is expected at CDA.

The CDA area is primarily categorized as Ranges and Training, with the clusters of buildings east of Building 6003 designated as Industrial. Building heights will range from 1-story to 2-story maximum to accommodate buildings compatible with the existing facilities. Minimal additional development is expected to occur in this area.

Development capacity in buildable areas is approximately 24 acres south of the FOB. The future development areas are intended to avoid small washes that drain throughout this area.

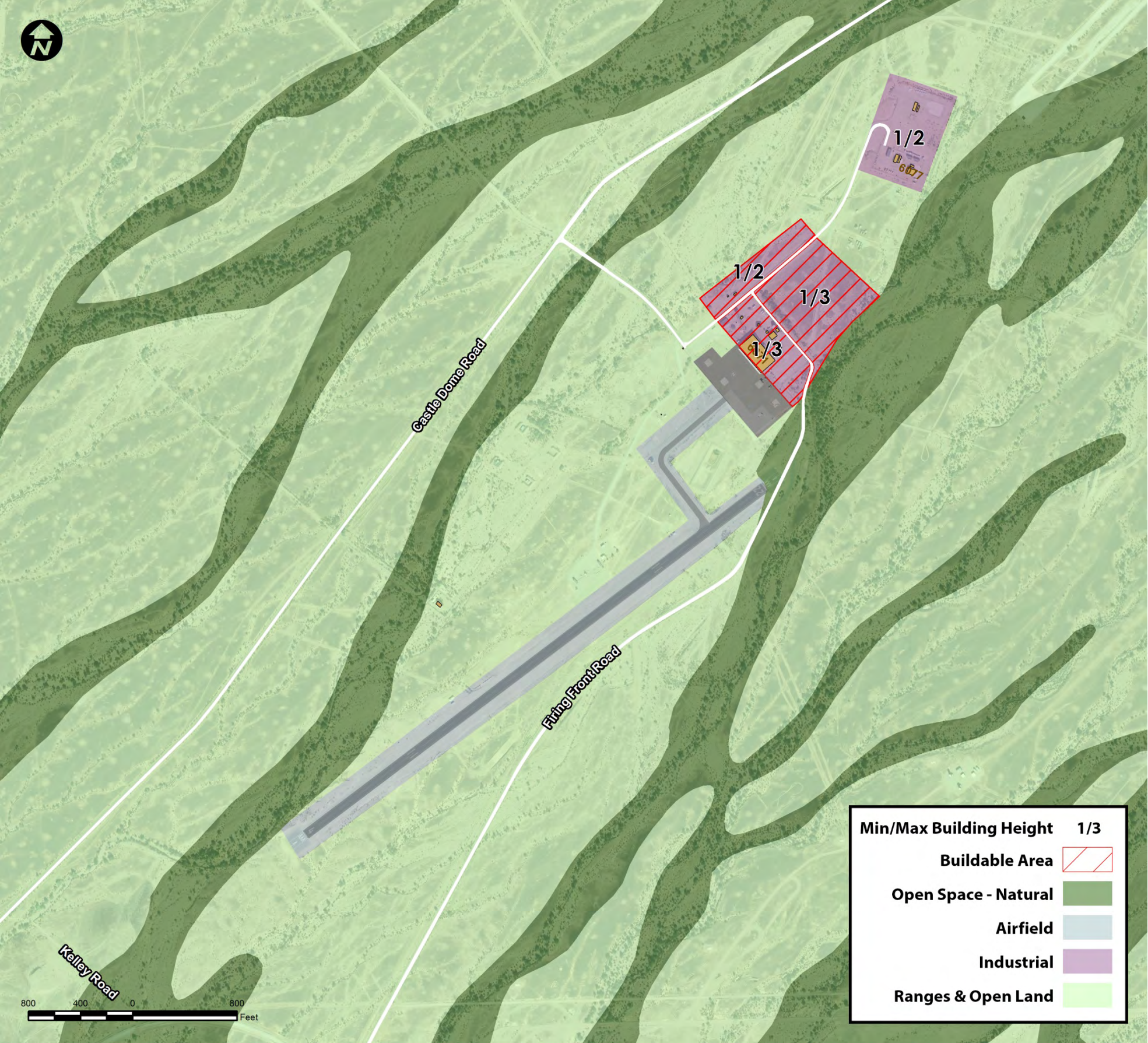


16.10 CASTLE DOME HELIPORT—REGULATING PLAN

The CDH Regulating Plan promotes smart and sustainable development while allowing for future UAS mission growth and expansion. It proposes the build-out and construction of key identified projects; as quality upgrades to the CDH UAS campus will be accomplished through consolidation of existing functions, improvements to the connectivity between facilities and land uses, and where applicable, airfield facility standardization.

The entire CDH area is designated as an Airfield land use and future development opportunities exist to the north and west. Building heights will range from 1-story to 3-story maximum to accommodate aircraft hangars or other buildings with high bay requirements.

Development capacity in buildable areas is approximately 22 acres northeast and west of the existing airfield facilities.



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17 Building Standards

17.1 INTRODUCTION

The purpose of the Building Standards is to help guide designers and facility planners in maintaining the architectural themes established at USAYPG. This includes bolstering continuity, from the standpoints of aesthetics, community accommodation, and sustainability; all important factors that will lead to improved mission-critical functions at USAYPG.

In order to achieve this purpose, certain goals and characteristics are defined in the form of major building types. This will give the planning and design team the flexibility and discretion to use a unified, interchangeable architectural vernacular that will blend well with existing buildings at cantonment areas and ranges throughout USAYPG

17.2 GOALS

The goals of this section define and enhance specific unifying features of existing buildings at USAYPG. They will also help determine the future appearance of the installation. These goals include:

- Highlight the design language already defined in current buildings on the installation.
- Establish material and color palettes that will set the framework for building hierarchy and function. The unique climate and natural landscape palette in southwest Arizona poses multiple challenges and opportunities.
- Encourage design methods that allow for future flexibility and re-use. With future missions comes change. Mitigating costly facility reconstruction is essential to expediting the needs of the mission itself.

17.3 VISION AND HISTORY

The following is an excerpt from the 2011 USAYPG Installation Design Guidelines, and lays the groundwork for an appropriate design philosophy that should be adhered to for future buildings at USAYPG.

“USAYPG consists of several major cantonment areas that differ in their primary missions but operate as one installation. Because USAYPG has developed over a period of decades, the architectural design has been inconsistent and is

expressed in a wide variety of interpretations of ‘southwestern’ styles, resulting in a disjointed collection of buildings that are inconsistent with the surrounding context.”

“Building design should respond to today's ‘time and place;’ it should be desert-appropriate architecture that does not mimic historical styles or styles and materials from other geographical regions. The use of architectural style, materials, and colors that are indigenous to a region often results in a more sustainable development. In addition, the preservation of historically and culturally significant structures adds to an installation's character and provides a sense of history and continuity in relationship to past generations. Imitations of arches, superfluous Spanish Colonial details, Santa Fe forms and details, and other stylistic gestures which may be intended to ‘ground the architecture in the southwest’ may seem trite to informed residents and should be avoided. Inspiration for an appropriate design aesthetic should be taken from the natural setting, the culture and the history of the Yuma area.”



USAYPG Heritage Center



KCA Fire Station



Walker Cantonment Area



17.4 OVERVIEW

Building Design Standards

The building design component encompasses the character of the buildings as well as the arrangement of buildings to one another and to their environment. In general, architectural style, materials, and colors indigenous to the region are to be used. It is important to blend the new and old structures with a cohesive architecture style but one that also differentiates between the historical structures and the new developments. Planning for the use of architectural elements that provide a common and unifying appearance will aid in the renovation of a building. Careful review of existing site plans may produce opportunities to transform, enhance or reinforce the installation design theme.

Basic design principles are used to assess, define, and classify visual elements. This visual assessment of structures includes accessibility, use of materials, placement of entrances, incorporation of additions and renovations, and the incorporation of plazas and courtyards. This assessment becomes the design criteria used to determine the visual character of the installation. These design criteria are used for design decisions in the review of existing visual context and determination of project recommendation.

Structural Character

Structural character varies depending on the use of the structure and when it was built. Variations in structural character may also occur as a result of adjacent buildings. Coordinating structural characteristics, such as form, compatible scales, massing, color, texture, materials, and fenestration, helps provide a consistent and coherent sense of order and place.

Scale

Scale is the proportion of one object to another. Human or intimate scale incorporates buildings and landscape elements that are moderate in size. Monumental scale incorporates large or grand building elements. In general, human scale involves more horizontal elements, while monumental scale accentuates the vertical elements. The scale of most buildings at USAYPG

should be more human scale than monumental. Where the scale of different buildings is consistent in a single area, it results in a strong unified image. All new construction should maintain compatibility of scale with adjacent buildings. Scale and relief should be provided through proper use of roof form, fenestration, building articulation and landscape plantings.

Massing

The massing of a building refers to its overall bulk or volume of space. The size and proportion of the exterior envelope and elevations of a new building must be compatible with adjacent structures. A massive facility will fit better in an existing area of smaller facilities if its mass is divided into smaller elements. The height of a new building should be determined partially by the height of its neighbors. Taller buildings should not be built directly adjacent to lower-rise buildings without a transitional element. A transitional element can be provided by increased spatial interval, a gradual increase in the building height, or the incorporation of horizontal human scale features. The massing of the forms that comprise a building also influences the character of the building. A symmetrical composition will result in a very formal appearance appropriate to some administrative buildings. An asymmetrical composition is applicable to most other buildings on the installation.

Color/Texture/Materials

The use of a consistent color scheme throughout USAYPG, where possible, results in a continuity of buildings and contributes to a sense of place. The use of similar textures, materials in the exterior finish and trim of buildings help to provide visual continuity for the installation.

Fenestration

Windows, doors, roof design, eaves, and other design details found on building facades are defined as fenestration. Building fenestration include the design details that provide interest and articulation to a building. These design details provide building scale and relieve building mass. Fenestration should be designed to be compatible with existing adjacent buildings to enhance the visual appeal of the installation. All fenestration (window size, placement, window and

glazing, doorway, shutters, trim, etc.) shall be similarly sized and proportioned to create a harmonious impression.

Rhythm

The rhythm and proportion of openings in a building facade also contribute to the building's character. The visual patterns of solids and voids that are created by structural expression, fenestration, and shadow lines, must be recognized and used as a design tool to help relate buildings into compatible groups, and to integrate new buildings into existing groups. Sequences of building masses and open spaces between buildings also contribute to the pattern of rhythm that may be uniform or varied, as well as horizontal or vertical in accent.

Unity

Repetition of scale, form, color and texture results in a unified visual aesthetic. All of the building elements should blend and complement one another. Relative consistency can bring a cohesive visual aesthetic.

Form

The form of a building is determined by its size, mass, shape, and proportions. The use of similar building forms, such as similar roof styles, provides continuity to the installation's architectural impact. The result is a more aesthetically pleasing environment. New buildings at USAYPG should be contemporary architectural expressions that are compatible with the architectural forms of existing buildings.

Sustainability

New buildings at USAYPG should be planned; designed; constructed and operated by practicing the principles of sustainable design. The intent is to construct safe buildings that are high-performance, healthy, and energy and water efficient.



HCA Low Roof Slope



HCA 2-Story Buildings



HCA Shade and Entry Feature



17.5 BUILDING DESIGN PRINCIPLES



Simple
Rectangle shape with surface articulations to denote entrances or highlight architectural form.

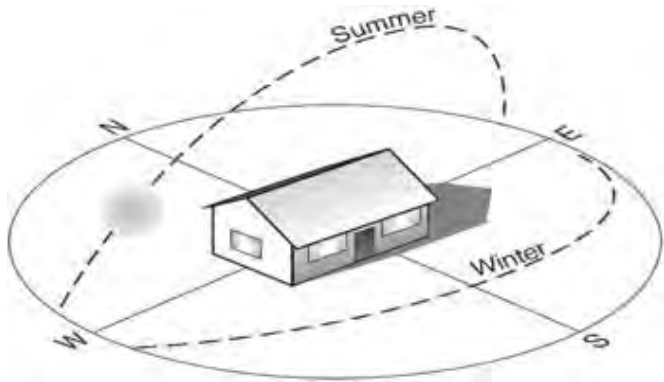


Compound
More than one rectangular shape with similar proportions that are connected.



Plan Types

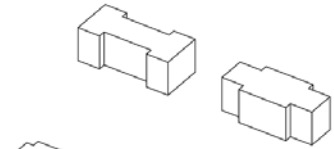
Buildings first take shape in plan to determine how functions will be accommodated. Most buildings at USAYPG are based on a simple rectangular plan. From there, variations are allowed to occur, depending on the building’s prototype and district where the new structure is built. Building plans must be related to the plans of adjacent buildings within a district to maintain a uniform aesthetic.



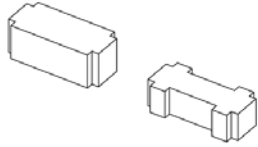
Building Shape and Orientation

Building orientation in regards to the location of the sun is an important factor in the design of a building. A compact shape minimizes energy losses and gains thru the surface of the building, as it is naturally more thermally efficient. An elongated design puts more building area on the perimeter, but increases surface area that allows for more windows and natural daylighting. However, a well-designed daylighting system, along with proper building orientation can compensate for the inefficiencies of an elongated building.

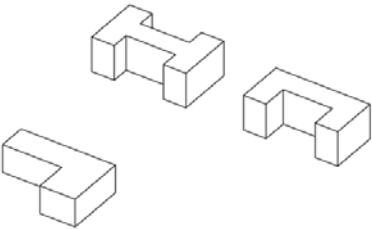
At USAYPG, important factors to daylighting design include orienting the building with the long axis east-west, providing sunshade devices or deep roof overhangs, and keeping windows on the north and south sides of the building.



Simple
Single rectilinear form of uniform height.



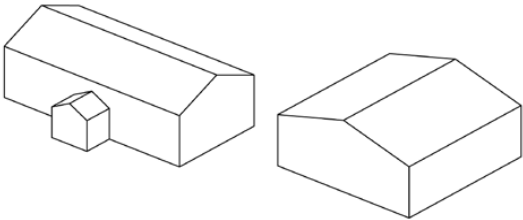
Compound
More than one rectilinear form of uniform height.



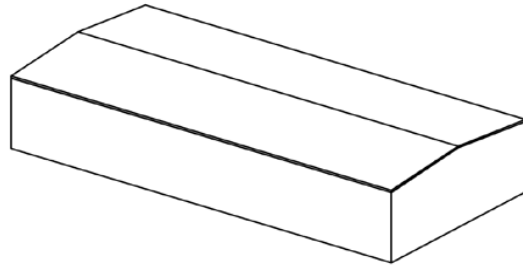
Massing Types

Building massing is the projection of a plan in a three- dimensional form. Most buildings on the installation are either a simple rectilinear cube or a variation of it. When determining massing, the structure will be of similar proportions to adjacent buildings within a district to maintain a uniform aesthetic.

The overall scale/massing or structural character of each building is important to consider. Sensitivity to context and coordination among buildings located within close proximity to each other will help enhance the overall installation and instill a “sense of order.” The scale of most buildings shall be more human than monumental to create an inviting and comfortable environment for working and living. A larger, more formal scale may be acceptable for some ceremonial buildings such as a headquarters facility, as long as the style fits within the overall guidelines set forth in these planning standards.



Gable
Having two sloping planes jointed at a central ridge with a triangular gable wall at each end.



Low-Slope Gable
Having a slight pitch for drainage (a minimum of 1/2:12 slope).

Roof Types

Roofs on most buildings are a sloped, gabled form. The roof pitch is determined by the height of the ridge and the overall depth of the building. As the depth increases, the slope must diminish in relative fashion. Roof form will be of similar proportions to adjacent buildings within a district to maintain a uniform aesthetic.

Window Types

Many buildings on the installation observe a simple architectural design aesthetic. Their windows are usually arranged in a manner that fits load-bearing wall construction.

Buildings in most areas will follow the punched window styles. On the first floor, window openings can make up 10-90 percent of the wall area, depending on the use. For upper floors, the window openings will make up 10-20 percent of the wall area. For all windows, the style, configurations, and proportions must complement or match those of adjacent buildings.

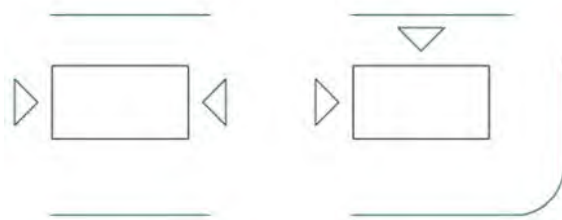


17.5 BUILDING DESIGN PRINCIPLES (CONTINUED)

Primary Entrance



Secondary Entrance



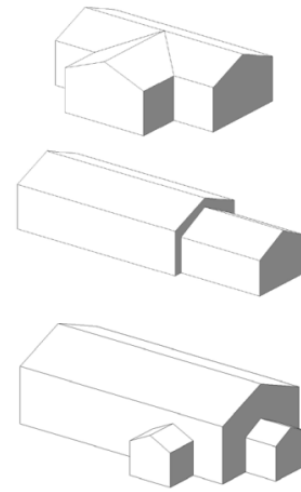
Building Entrance Types

A building entrance is a primary feature of any building design. It shall be well defined and recognizable as the point of access, regardless of the size or scale of the building. In some instances, there may be two or three primary entrances/facades or a secondary entry/façade requiring special treatment due to its location on the installation. The entry treatment, in terms of level of architectural detail and prominence, must adhere to a logical order of hierarchy and aesthetic design within the context of the building and site.

The building entrance shall be in a prominent location and oriented toward primary adjacent public spaces, such as courtyard, lawn, parking lot, or street.

Design details of a building entrance shall provide continuity with its other entrances and those of adjacent buildings.

The style, color, texture, and scale of an entrance canopy or porch shall be compatible with existing buildings.



Major

Additions that account for greater than 10 percent of the overall floor area must incorporate materials, colors, and architectural detailing that matches or is compatible with the existing building. May be symmetrically or asymmetrically disposed.

Minor

Additions that account for less than 10 percent of the overall floor area must be located in less prominent locations at the side or rear.

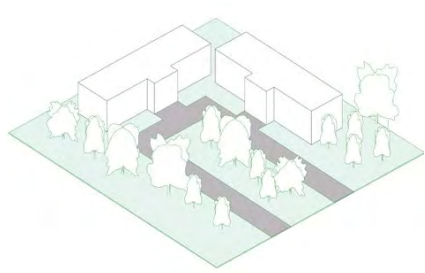
Building Addition Types

Additions and major alterations shall complement the existing building. It is imperative that modifications and ongoing building maintenance

respect and enhance the existing or intended character of each district.

Additions must be of an architectural style consistent and compatible with the existing building. Respect the massing, form, and scale of the original building. Roof forms of additions must match the roof forms of the existing building. All gabled or hipped roof slopes within a single building must be equal.

Additions must generally be ancillary to the existing building, occurring to the rear or to the side as a separate wing. They shall not be of larger floor area than the original building. All additions must comply with life safety and AT/FP standards. If an addition increases the building's area by 50 percent, the whole building must meet current AT/FP requirements.



Courtyard Spaces: Designed to provide exterior spaces and amenities for the pedestrian.



Inward-Focused and Outward-Focused Design Diagrams

Plazas and Courtyards

Exterior spaces such as plazas, courtyards, break areas, and recreation areas provide desirable places between the outdoors and indoors. Within these spaces, people can enjoy a variety of functions, from passive activities to more active uses. These spaces can be formal, informal, private, semi-private, or public places. They can be designed as a transition that takes the user from one building to another, a place to sit and relax, or a formal entrance space to a building or group of buildings. The design of a plaza or courtyard depends heavily on the building's function and number of occupants.

Maintain a 1:1, 2:1, or 3:1 ratio between the horizontal plane and height of vertical elements to ensure a user- friendly space.

Design spaces suitable for pedestrian use by integrating seating, lighting, planting, and special paving.

Provide an east-west orientation, a screen for north winds, and shade against the summer sun



17.6 ADMINISTRATIVE/COMMUNITY BUILDINGS

This building type is intended for administrative offices and community functions where a higher level of distinction is desired in the cantonment areas. Standards for this building type include:

- **Form:** The building style at USAYPG generally consists of simple, rectilinear forms. Administrative and community buildings have a higher level of detailing and formality, especially in the HCA. Major building entrances are well defined and materials may be mixed and varied to indicate the building's hierarchy within the complex. Roof slopes are symmetrical and gabled with a broad fascia. Low-slope roofs with parapets may also be used.

- **Elevation:** The overall building height shall be proportional to surrounding buildings, with a maximum of two stories allowed in general. Walls are typically flat with little to no delineation. Higher level of delineation may be used to indicate a building's significance. The main facade shall address the most prominent street or open space.
- **Windows:** Openings will normally be vertically proportioned, and compliment the style of the buildings and adjacent structures. Although most windows should be punched openings, some ribbon windows or curtain walls may be used at major building entrances. Window mullion patterns shall be kept simple in appearance. Materials may be extruded aluminum or painted, galvanized steel frame. Glass can be tinted, reflective dark grey to minimize solar heat gain and glare permeating the building. Windows shall be predominantly fixed.

- **Doors:** Door openings will be clearly defined, with vertical or square proportions that match the style of the building. The primary entry will be emphasized to conform to the hierarchical order of ingress. Placement on the main facade shall be at the center of the building, unless an asymmetrical massing is employed. Materials may be extruded aluminum or painted, galvanized steel. Doors may include glass panes in similar materials and configurations to compliment the windows.
- **Exterior Materials:** Generally, walls are composed of Exterior Insulation Finish System (EIFS). Adobe brick is used to indicate a building of higher level of precedence. Roofs and metal trim are pre-finished metal. Refer to the facing page for more detail.
- **Accessibility:** New buildings and renovations at USAYPG shall follow the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Uniform Federal Accessibility Standards (UFAS).



Kofa Cantonment Fire Department—Building 3189



Sketches from USAYPG IDG



Administrative/Community Materials and Colors

Walls



W-1 Stucco Beige



B-1 Adobe Brick

Roofing & Trim



R-1 Standing Seam Red



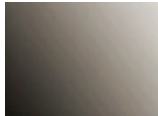
T-1 Metal Red

Steel Doors & Trim



T-1 Metal Red

Glazing & Trim



F-1 Glass Dark Grey

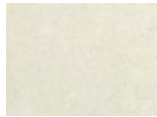


T-2 Clear Anodized Aluminum

Site Elements



B-1 Adobe Brick



S-1 Cast Stone Beige



17.7 INDUSTRIAL/SERVICE BUILDINGS

This building type is intended for buildings that serve a more utilitarian purpose. Buildings such as hangars and storage facilities fall into this category. The level of architectural detail on these buildings is minimal, and should only be reserved to indicate the administrative section of the facility if applicable. Standards for this building type include:

- **Form:** The building style at USAYPG generally consists of simple, rectilinear forms. Industrial and service buildings have a modest level of detailing which reflects the use of the facility itself. Roof slopes are symmetrical and gabled. Low-slope roofs with parapets may also be used.
- **Elevation:** The overall building height shall be proportional to surrounding buildings, with a maximum of two stories allowed in general. Walls are typically flat with little to no delineation. Higher level of delineation may be used to indicate primary building entry.
- **Windows:** Openings will normally be vertically proportioned, punched openings as required for functional use. structures. Window mullion patterns shall be kept simple in appearance. Materials may be extruded aluminum or painted, galvanized steel frame. Glass can be tinted, reflective dark grey to minimize solar heat gain and glare permeating the building. Windows shall be predominantly fixed.
- **Doors:** Door openings will be clearly defined, with vertical or square proportions that match the style of the building. The primary entry will be emphasized to conform to the hierarchical order of ingress. Placement on the main facade shall be at the center of the building, unless an asymmetrical massing is employed. Materials may be extruded aluminum or painted, galvanized steel.
- **Exterior Materials:** Generally, walls are composed of pre-finished metal Panels or EIFS. Roofs and metal trim are pre-finished metal. Refer to the facing page for more detail.
- **Accessibility:** New buildings and renovations at USAYPG shall follow the ADAAG and the UFA).



LAAF Temporary Hangar



Sketches from USAYPG IDG

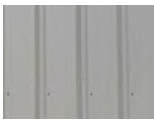


Industrial/Service Materials and Colors

Walls

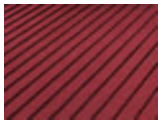


W-1 Stucco Beige



W-2 Metal Panel Beige

Roofing & Trim



R-1 Standing Seam Red



T-1 Metal Red

Steel Doors & Trim



T-1 Metal Red



T-3 Metal Beige

Glazing & Trim



F-1 Glass Dark Grey

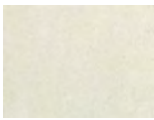


T-2 Clear Anodized Aluminum

Site Elements



B-1 Adobe Brick



S-1 Cast Stone Beige



18 Street Standards

The USAYPG Street Standards outline street types and circulation elements for the cantonment areas and ranges.

18.1 UPAYPG ROAD NETWORK

The road network within the USAYPG boundary is composed of a US highway, county roads, primary, secondary, tertiary, range roads, and test vehicle courses spread throughout the 1,309 square mile installation. Not all roads within the USAYPG boundary are owned and maintained by the Army. US Highway 95 bisects the installation east of WCA and is a high traffic corridor, particularly during the fall and early spring. Martinez Lake Road provides access from US Highway 95 to the private development along Martinez Lake. Although these roads are public, they are extremely important in providing USAYPG personnel access throughout the ranges. Imperial Dam Road is owned and maintained by USAYPG; however this road is also used by the general public.

The network should separate types of traffic by function and volume, ranging from through-traffic to local traffic. The visual character of each segment of the network should appropriately convey its role and function within each identified area and overall network. The following goals apply to all road networks throughout USAYPG:

- Provide separation between POV traffic and tactical and test vehicles
- Ensure that all roadways (other than those in residential areas) are wide enough for tactical and test vehicles
- Meet applicable AT/FP setback distances as defined in UFC 4-010-01
- Provide pedestrian connections in cantonment areas. Sidewalks, curb, and gutter are only required in appropriate locations within the cantonment areas and bike lanes should be limited to HCA

Primary and Public Roads

Primary and public roads are typically arterial routes that connect major activity centers. These roadways carry the heaviest volume of traffic and are higher speed facilities and high visibility corridors. An example of a high visibility corridor is Ocotillo Road in WCA, which requires a higher level of streetscape investment because this is the primary location for high level visitors. In addition to higher



Imperial Dam Road—A Public Road

volumes of traffic, primary roads carry large, heavy vehicles ranging from commercial delivery trucks to wheeled test vehicles.

Secondary Roads

Secondary roads serve as connectors between primary roads and tertiary roads, and accommodate moderate-to-slow traffic speeds. Although there is less traffic volume, secondary roads still require lane widths that will accommodate large, heavy vehicles.

Tertiary Roads

Tertiary roads provide access to individual facilities, parking, and service areas, and include residential streets. They are designed to handle low speed, low volumes of traffic with one lane in each direction and still be able to accommodate large vehicles, heavy vehicles.

The basic road network hierarchy and design varies depending on the area it serves. For example, a primary road in the HCA has a different character, appearance, and set of standards than a primary road in the KCA. Therefore, each cantonment area has its own set of street standards.

18.2 PEDESTRIAN CIRCULATION

Well-designed and properly located sidewalks encourage the use of walking as an alternative form of transportation. At USAYPG, pedestrian walkways shall be designed and located to provide a comfortable (weather permitting), enjoyable experience for the user. The use of walkways within the installation promotes sustainability by conserving energy, and contributes to a healthy lifestyle. In order to achieve this goal the following objectives must be met:

- Provide walkways that are designed at a pedestrian scale to be comfortable and pleasant
- Provide safe and secure pedestrian facilities that are separate from vehicular traffic
- Provide amenities for pedestrians
- Provide equal access to all users in a manner that integrates handicapped accessibility with ordinary accessibility. All street and driveway crossings



The South Side of 1st Street in HCA Shows Features of a Primary Street in Cantonment Areas

shall be ramped, marked and accessible to persons with disabilities in accordance with requirements of the ADAAG and the UFAS

- Provide design consistency throughout the walkway system

18.3 STREET DESIGN PRINCIPLES

Flexible Roadway Design

The unique functions and landscape of USAYPG requires a flexible approach to roadway design and the hierarchy of the road system within the cantonment areas and ranges. Although there is a road hierarchy established for USAYPG, the road system may have differing cross sections for each cantonment area at USAYPG, and in some cases, within each cantonment area. Flexibility in roadway design will allow context sensitive road systems that meet the immediate needs of each area and the operational needs of the installation.

Maintain Natural Landform

The alignment of roads should be designed to minimize landform disturbance and blend with the natural setting of the desert landscape. To the extent possible steep terrain should be avoided, which will reduce construction costs.

Preserve Vegetation

The desert environment is not conducive to extensive vegetative growth; however roadway design should, to the extent possible minimize vegetation removal. The roadway design process should include plans for re-vegetation of disturbed areas with native plant materials to mitigate visual and ecological impacts to the surrounding landscape.

Centralize POV Parking

POV parking typically absorbs a large percentage of land. To mitigate this effect, options which reduce the impact of parking areas should be implemented wherever possible. One option is to minimize smaller parking lots that serve individual buildings and focus POV parking in centralized areas that serve multiple facilities. This reduces redundant parking, and in conjunction with a strong pedestrian circulation system should help reduce unnecessary traffic.

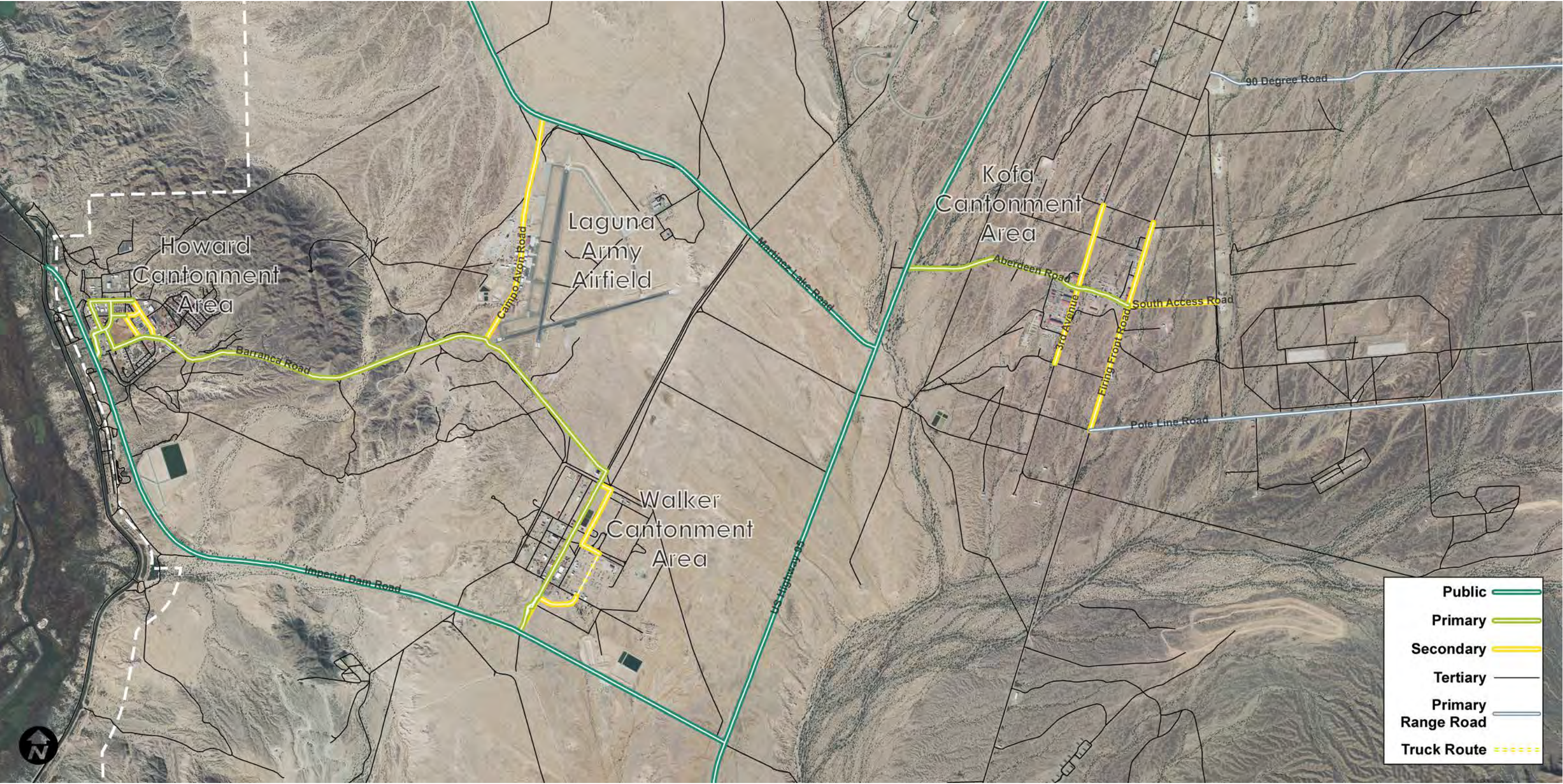


Detached Sidewalk with Crosswalk



Street Network

The street network connecting HCA, LAAF, WCA, and KCA includes a variety of public, primary, secondary, and tertiary roadways. Street standards for each cantonment area are detailed in the following sections.



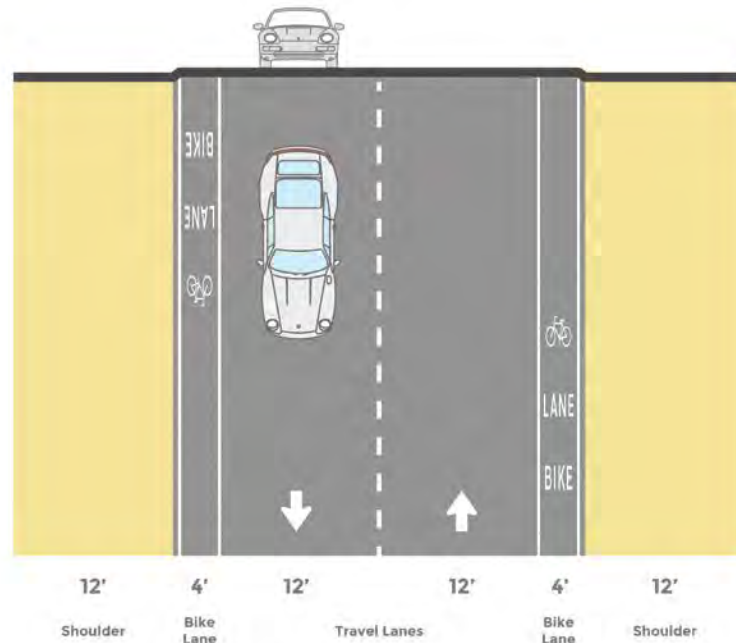
18.4 HOWARD CANTONMENT AREA (HCA)

Street standards for the HCA are based on the community support, housing, industrial and administrative land uses that characterize the district. The established street network originates from the main gate on Imperial Dam Road and promotes circulation to the east towards the Price School Gate on Barranca Road. The area has a strong, well-defined pedestrian system with recently constructed sidewalks throughout the cantonment area. All roads are designed with pedestrians in mind.



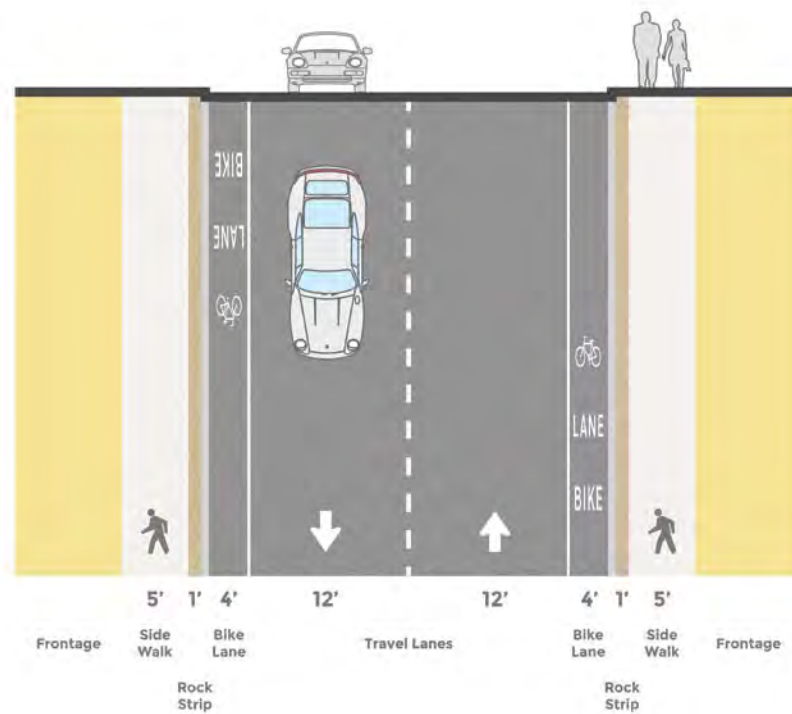
18.4.1 PRIMARY AND PUBLIC STREET STANDARDS (HCA)

Primary Roads provides primary access throughout the HCA and connects major activity centers in this cantonment area. These roadways traverse the HCA; carry the heaviest volume of traffic and are high “visibility” corridors. Imperial Dam Road, a public street, is used by USAYPG and public vehicles that travel at high speeds and at higher volumes of traffic than streets on USAYPG. Imperial Dam Road is also an attractive route for bicyclists. Direct access to Imperial Dam Road should be restricted to USAYPG entrances, the occasional vehicle test course access road and the intersection with US Highway 95.



Design Characteristics of the Public Street

- Continuous, through-traffic alignment that is relatively straight or large-radii curvilinear to handle heavy traffic at high speeds from US Highway 95 to Imperial County Route S24
- One moving lane in each direction with bike lanes and shoulders on each side. Each lane should be 12 feet in width. Bike lanes should be four feet wide and shoulders 12 feet wide
- Controlled access and a minimum of curb cuts limited to entranceways to cantonment areas, building groups and ranges. Turn lanes provided at the entrance road to HCA

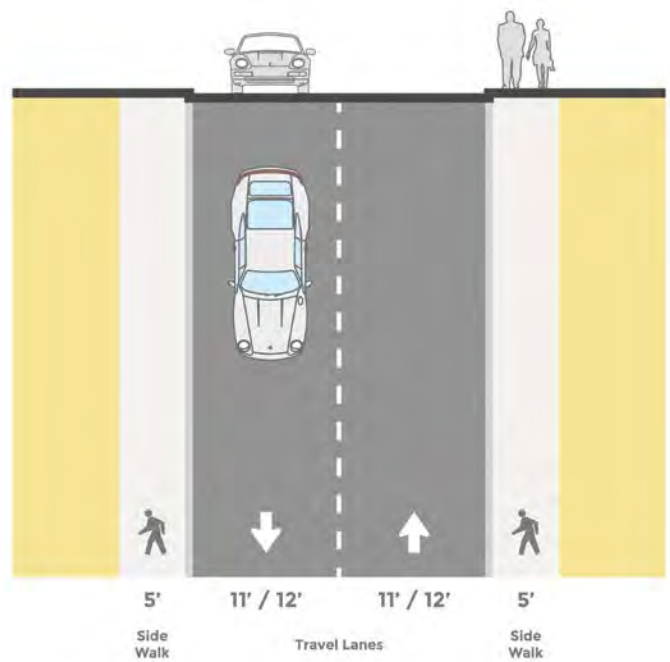


Design Characteristics of Primary Streets

- Continuous, through-traffic alignment that can handle moderate traffic volumes
- One moving lane in each direction. Each travel lane should be 12 feet in width. Bike lanes would be four feet wide
- Controlled access and a minimum of curb cuts limited to entranceways to major facilities, building groups or industrial areas
- On-street parking limited to 90-degree parking stalls
- Curbs, gutters, and sidewalks provided on both sides of street. Sidewalks should be five feet in width and separated from the road by a one foot rock strip
- Street lighting, signage, and landscape planting enforce the moderate traffic volume and importance of the road



18.4.2 SECONDARY AND TERTIARY STREET STANDARDS (HCA)

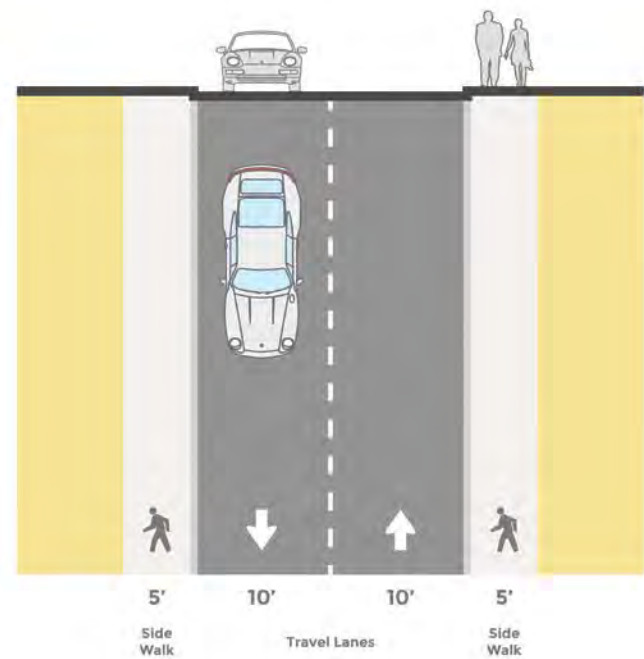


Secondary Roads

Secondary roads serve as connectors between primary roads and tertiary roads and provide access to adjacent land use zones. Secondary roads accommodate moderate to slow traffic speeds with one moving lane in each direction. On-street parking should be prohibited and left turn lanes provided at intersections with primary roads.

Design Characteristics of Secondary Streets

- Direct access to abutting property and funnels traffic to primary streets
- One traffic lane in each direction. Each lane should be 11 feet minimum with a maximum width of 12 feet
- On-street parking prohibited
- Sidewalks abutting both sides of the road due to lower traffic speeds and volume. Sidewalks should be five feet in width
- Curb and gutter provided
- Street lighting, signage, and landscape planting that reflect the moderate-to-slow speed nature of traffic in the cantonment area



Tertiary Roads

Tertiary roads provide access to individual facilities, parking, and service areas. They are designed to handle low speed, low volumes of traffic, with one lane in each direction. Tertiary roadways make use of “T” intersections and cul-de-sacs to reduce through traffic, promote safety, and limit noise impacts from truck traffic.

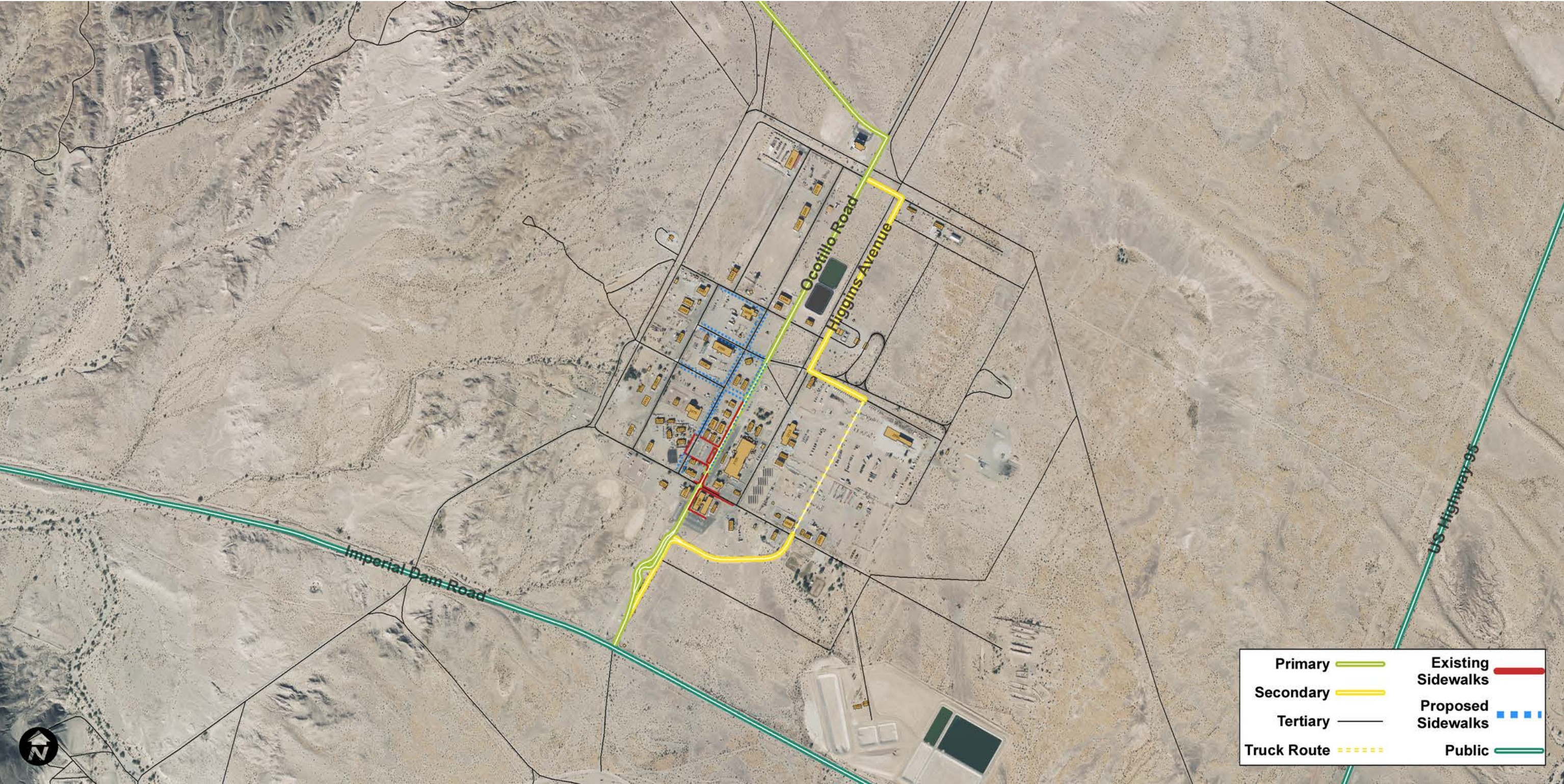
Design Characteristics of Tertiary Streets

- Alignments designed to discourage through-traffic, where feasible
- Alignments are relatively short and in response to immediate land use and functions, will require slow speeds
- One traffic lane in each direction. Each lane should be 10 feet in width
- Curb, gutter, and sidewalks provided. Sidewalks abutting roadway due to slow speeds and lower traffic volumes. Sidewalks should be five feet in width
- Street lighting, signing, and limited landscape planting in character with slow speed s and low traffic volumes



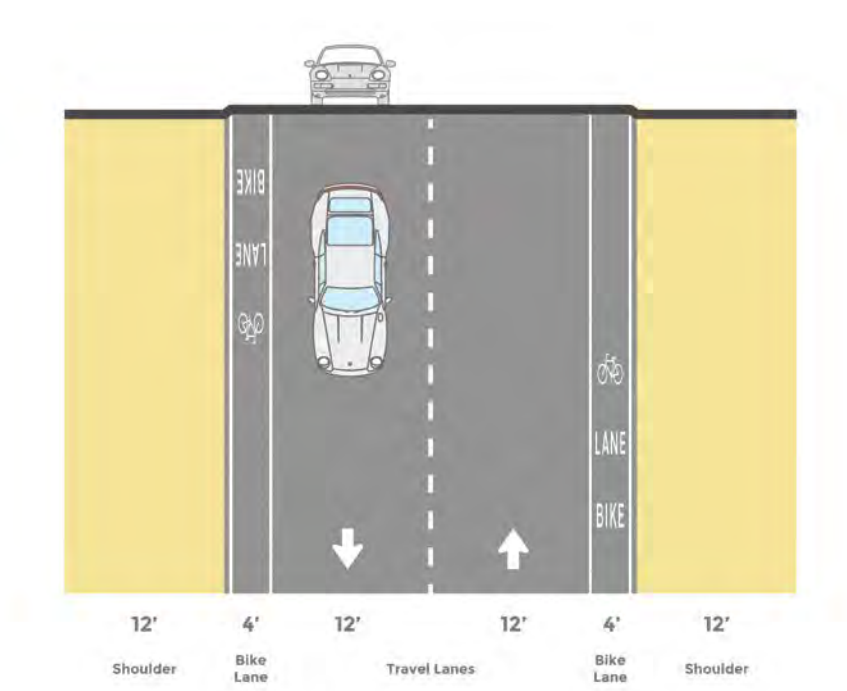
18.5 WALKER CANTONMENT AREA (WCA)

Ocotillo Road is the only primary road within the WCA. It defines a VIP route from the Walker Gate to the ROC, which is the YTC and Garrison Headquarters building. Secondary roads have been specifically designed to handle large truck and delivery traffic. Tertiary Roads provide access to industrial functions and storage facilities and have capacity for large vehicles.



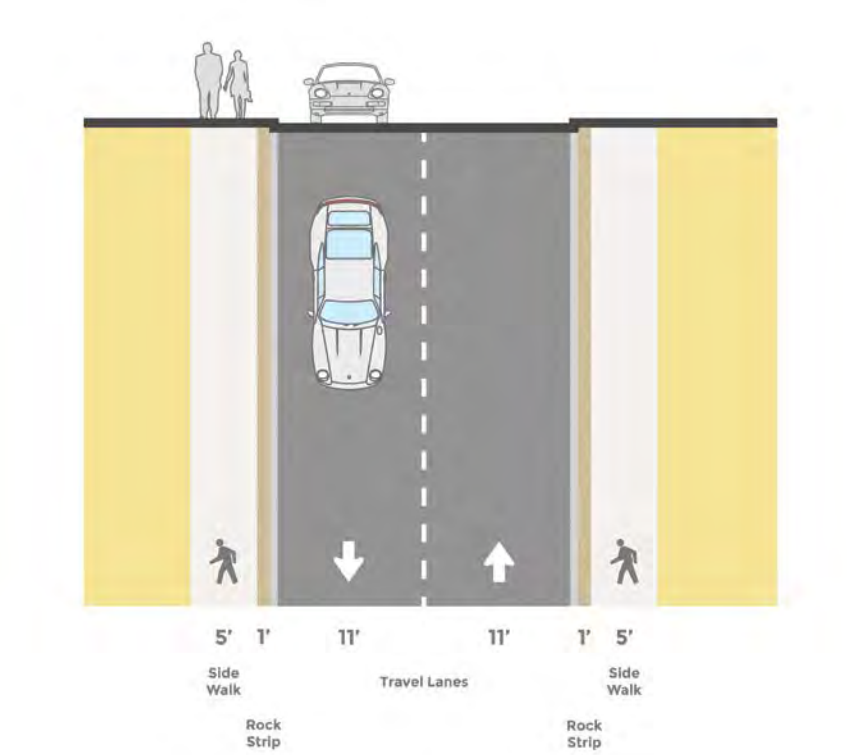
18.5.1 PRIMARY AND PUBLIC STREET STANDARDS (WCA)

These roads connect major activity centers and provide the primary access through the WCA to other areas on USAYPG. The Primary Street in WCA is Ocotillo Road, which extends from the Walker Gate and beyond WCA. Ocotillo Road carries the heaviest volume of traffic along this high visibility corridor. The Public Street (Imperial Dam Road) is a high speed road that continues from HCA, intersects with the entry roads to the WCA, the USAYPG Visitor Center, range roads and ends at the intersection with US Highway 95.



Design Characteristics of the Public Street

- Continuous, through-traffic alignment that accommodates heavy traffic at high speeds from US Highway 95 to Imperial County Route S24
- One moving lane in each direction with bike lanes and shoulders on each side. Each vehicle lane should be 12 feet in width and bike lanes four feet in width. Shoulders should be 12 feet in width
- Controlled access and a minimum of curb cuts limited to entranceways to ranges, WCA and the USAYPG Visitor Center. Turn lanes provided at the entrance road to WCA; the USAYPG Visitor Center, and the intersection with US Highway 95

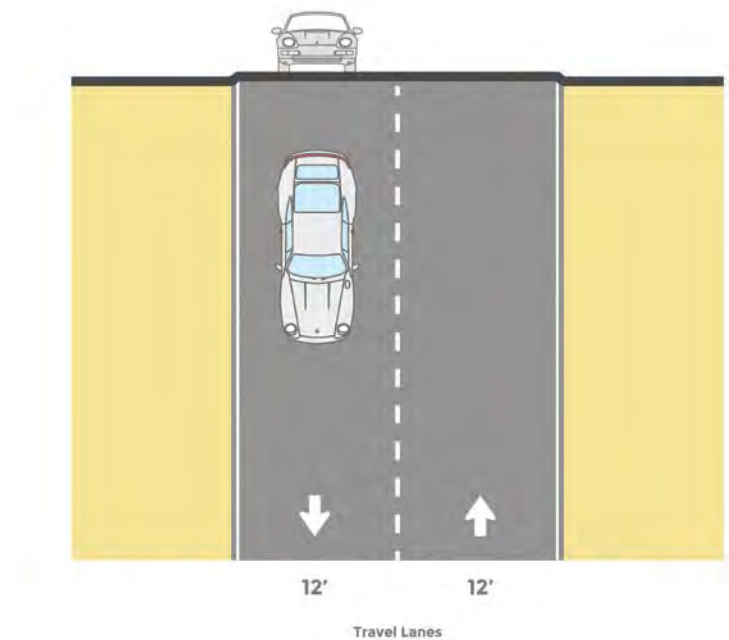


Design Characteristics of Primary Streets

- Continuous, through-traffic alignment that handles moderate traffic levels in WCA
- One moving lane in each direction. Each travel lane should be 11 feet in width
- Minimize curb cuts
- Off-street parking provided along Ocotillo Road
- Curbs, gutters, and sidewalks provided on both sides of street. Sidewalks should be five feet in width and separated from the road by a one foot rock strip. Sidewalks on Ocotillo Road extend from Sanchez Street to Rivera Street
- Street lighting, signage, and enhanced landscape planting reinforce the importance of Ocotillo Road, which is a VIP route



18.5.2 SECONDARY AND TERTIARY STREET STANDARDS (WCA)

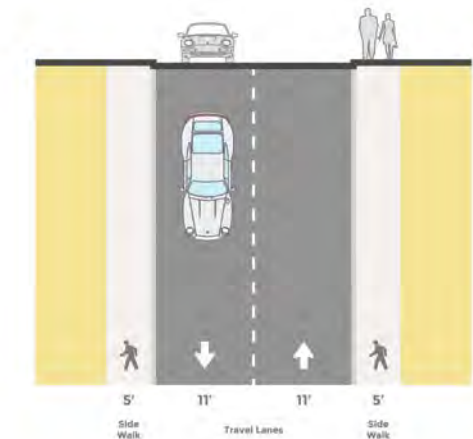


Secondary Roads

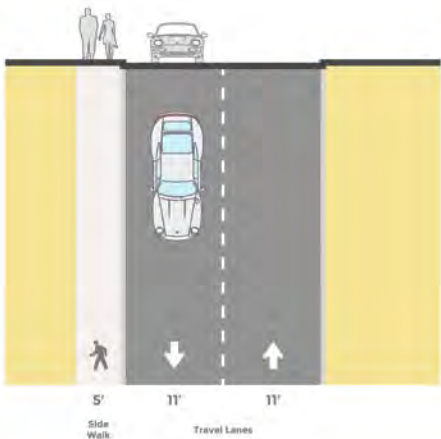
Secondary roads serve as connectors between Ocotillo Road and tertiary roads and typically connect primary roads to adjacent facilities. Secondary roads accommodate moderate to slow traffic speeds with one moving lane in each direction. On-street parking should be prohibited and left turn lanes provided at intersections with primary roads.

Design Characteristics of Secondary Streets

- Direct access to abutting property and funnels traffic to primary streets
- One traffic lane in each direction. Each lane should be 12 feet wide
- On-street parking prohibited
- Street lighting and signage that reflect the moderate-to-slow speed nature of traffic along this road. Minimal, or no landscaping



Tertiary (A)



Tertiary (B)
1 sidewalk where appropriate

Tertiary Roads

Tertiary roads provide access to individual facilities, parking, and service areas. They are designed to handle low speed, low volumes of traffic, with one lane in each direction. Tertiary roadways are typically not through streets to reduce traffic, promote safety, and limit noise impacts from truck traffic.

Design Characteristics of Tertiary Streets

- Alignments are relatively short and in response to immediate land use and functions. Will require slow speeds
- One traffic lane in each direction. Each lane should be a minimum of 11 feet in width and maximum of 12 feet
- Curb, gutter, and sidewalks provided, as appropriate. One or two sidewalks along street, depending on location. Sidewalks abutting roadway due to slow speeds and lower traffic volumes. Sidewalks should be five feet in width
- Street lighting and signage in character with slow speed nature of traffic and the land use area. Minimal, or o landscaping



18.6 LAGUNA ARMY AIRFIELD (LAAF)

Martinez Lake Road, a public roadway maintained by Yuma County, is the main access to LAAF from the north. Barranca Road is a primary road to the south of LAAF that connects to the Howard and Walker cantonment areas. Campo Avion Road is the main roadway through the western developed area of the airfield proposed to be classified as a secondary road. Campo Avion Road would be reused for “local,” airfield-related traffic with significant amounts of pedestrian traffic related to the MFFS. A new bypass road (primary road) is proposed along the western edge of LAAF to carry non-airfield related traffic away from the airfield and will intersect with Barranca Road.

The preferred alternative is expected in CY2016 following preparation of the MFFS ADP and update to the LAAF ADP, both under a separate task order.



18.7 KOFA CANTONMENT AREA (KCA)

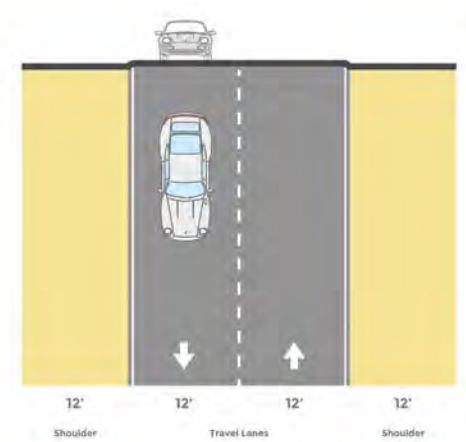
US Highway 95 is the main public road used to access the KCA. Aberdeen Road is the only primary road in the district and is the main east-west roadway extending from US Highway 95 to Firing Front Road. The central core of KCA is located at the intersection of Aberdeen Road and 3rd Avenue. Secondary roads extend from this core area and include portions of 3rd Avenue, Firing Front Road, and South Access Road. Pole Line Road is the main road used to access the Kofa Firing Range, and therefore has been classified as a “primary range road”. Only a handful of other roads make up the vehicular transportation system of KCA and are classified as tertiary.

Public Roads traversing this area include US Highway 95 and Martinez Lake Road. Neither road is controlled nor maintained by USAYPG and are not considered part of the street system for KCA.



18.7.1 PRIMARY STREET STANDARDS (KCA)

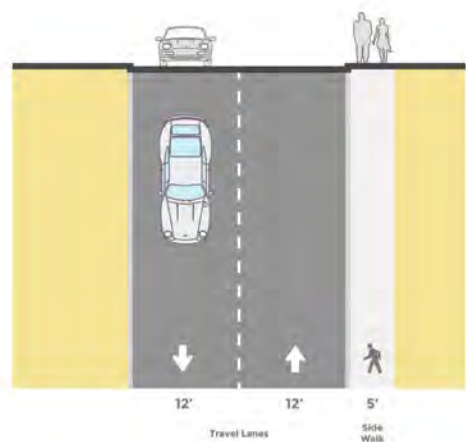
The Primary Street in KCA is Aberdeen Road, which provides the primary access to the area. This road carries the heaviest volume of traffic into and out of KCA.



Design Characteristics of the Primary Street

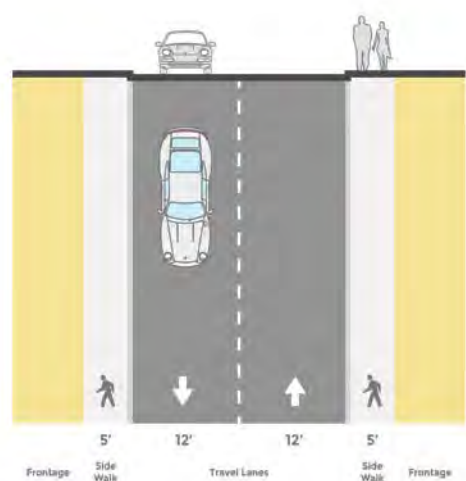
Primary Street Cross-Section for Street Outside Cantonment Area (West of KCA ACP)

- Continuous, through-traffic alignment that is relatively straight or large-radii curvilinear to handle heavy traffic, with a high volume of large vehicles.
- One moving lane in each direction and shoulders on each side. Each lane should be 12 feet in width. Shoulders should be up to 12 feet wide.
- Controlled access and a minimum of curb cuts limited to entranceways to building groups and ranges. To the extent possible minimize entrances to building groups, by using shared entrances to parking lots.



Primary Street Cross-Section for Street East of ACP

- One moving lane in each direction. Each lane should be 12 feet in width.
- Provide sidewalk on one side of the street. Sidewalk would be five feet wide.
- Controlled access and a minimum of curb cuts limited to entranceways to building groups, by using shared entrances to parking.

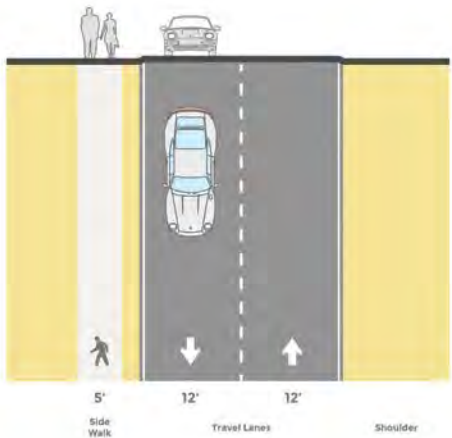


Primary Street Cross-Section for Street East of 3rd Avenue

- One moving lane in each direction. Each lane should be 12 feet in width.
- Provide sidewalk on both sides of the street. Sidewalks would be five feet wide.
- Controlled access and a minimum of curb cuts limited to entranceways to building groups and ranges, by using shared entrances to parking.



18.7.2 SECONDARY, TERTIARY AND RANGE STREET STANDARDS (KCA)

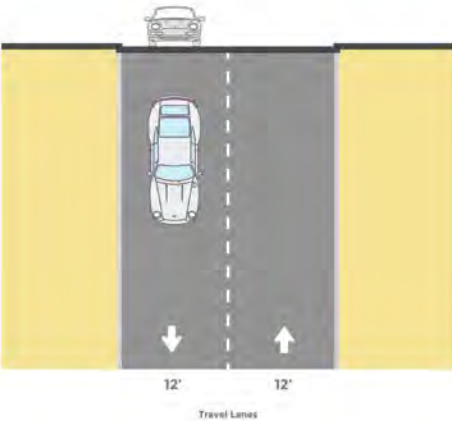


Secondary Roads

Secondary roads serve as connectors between primary roads and tertiary roads and typically connect primary roads to adjacent land use zones. Secondary roads accommodate moderate to slow traffic speeds with one moving lane in each direction. On-street parking should be limited and left turn lanes provided at intersections with primary roads.

Design Characteristics of Secondary Streets

- Direct access to abutting property and funnels traffic to primary streets
- One traffic lane in each direction. Each lane should be 12 feet wide. Five foot sidewalk on the north side of the street
- On-street parking limited to 90-degree parking stalls
- Street lighting and signage that reflect the moderate-to-slow speed nature of traffic along this road. Minimal, or no landscaping

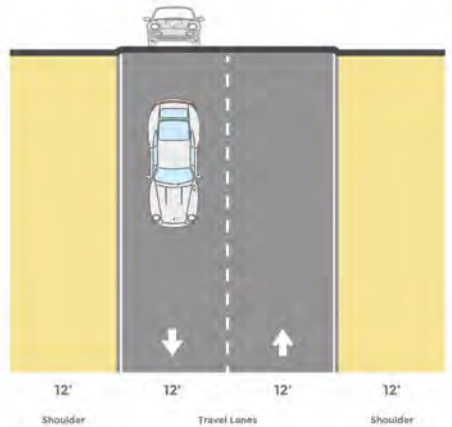


Tertiary Roads

Tertiary roads provide access to individual facilities, parking, and service areas. They are designed to handle low speed, low volumes of traffic, with one lane in each direction. Tertiary roadways make use of “T” intersections and cul-de-sacs to reduce through traffic, promote safety, and limit noise impacts from truck traffic.

Design Characteristics of Tertiary Streets

- Direct access to abutting property and funnels traffic to secondary or primary streets
- One traffic lane in each direction. Each lane should be 12 feet wide
- On-street parking limited to 90-degree parking stalls
- Street lighting and signage that reflect the moderate-to-slow speed nature of traffic along this road



Roads Outside of KCA Cantonment

Although secondary and tertiary roads will typically have some variation in cross-section and pedestrian amenities, the area outside of the cantonment is operational, so all roads outside of the cantonment area will generally have the same cross-section and no pedestrian amenities or landscaping.

Range Roads

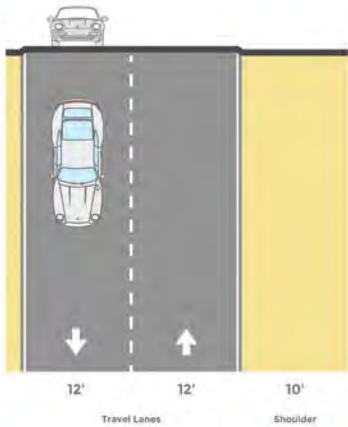
Except for Pole Line Road in the Kofa Firing Range, range roads are unpaved and maintained to the cross-section required for testing operations in the vicinity of the road. These roads require maintenance and the occasional repair, but will likely remain unpaved.

Pole Line Road is the only “Primary Range Road” at USAYPG. It is two lanes each direction and is paved for approximately 21 miles. Shoulders should be maintained at 12 feet. Pole Line Road continues to the east as Growl Road, which is unpaved. This primary road provides access to numerous unpaved roads and remote sites.



18.8 CASTLE DOME ANNEX (CDA)

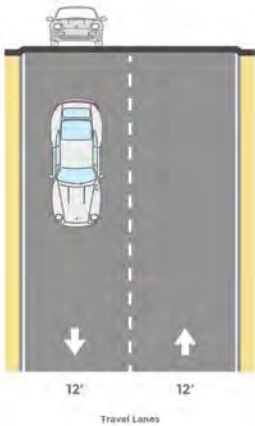
US Highway 95 is the main public road used to access the Castle Dome Annex. Huachuca Road is designated as a secondary road and is the only road providing access to this area. Two short tertiary roads provide access facilities in CDA from Huachuca Road.



Secondary Road
Secondary roads typically serve as connectors between tertiary roads and primary or public roads. Secondary roads accommodate moderate to slow traffic speeds with one moving lane in each direction.

Design Characteristics of the Secondary Street

- Direct access to abutting property and funnels traffic to US Highway 95
- One traffic lane in each direction with a 10 foot shoulder on one side of the road. Each travel lane would have a width of 12 feet
- On-street parking prohibited
- There would be no street lighting, landscape planting or pedestrian circulation provided



Tertiary Roads
Tertiary roads provide access to individual facilities, parking, and service areas from Huachuca Road. They are designed to handle low speed, low volumes of traffic, with one lane in each direction.

Design Characteristics of Tertiary Streets

- Alignments are relatively short with slow traffic speeds and low traffic volumes
- One traffic lane in each direction. Each lane should be 12 feet in width. No shoulders required
- There would be no street lighting, landscape planting or pedestrian circulation provided
- Parking is limited to individual facilities



18.9 CASTLE DOME HELIPORT (CDH)

US Highway 95 is the main public road used to access CDH. Castle Dome Road is the only road providing access to this area from the highway. Castle Dome Road is designated as a secondary road.



Secondary Road

Castle Dome Road is classified as a secondary road, which serves as connectors between tertiary roads and primary or public roads. These roads accommodate moderate to slow traffic speeds with one moving lane in each direction.

Design Characteristics of the Secondary Street

- Direct access to abutting property and funnels traffic to US Highway 95
- One traffic lane in each direction with a shoulder on each side of the road. Travel lanes and shoulders are 12 feet wide
- On-street parking prohibited
- There would be no street lighting, landscape planting or pedestrian circulation provided

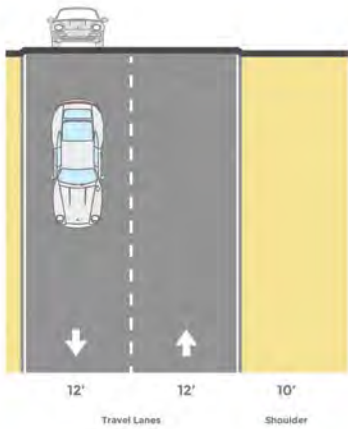


Tertiary Roads

The tertiary road provides direct access to individual facilities, CDH parking, and service areas from Castle Dome Road. It should be designed to handle low speed, low volumes of traffic and with one lane in each direction.

Design Characteristics of Tertiary Streets

- Alignments are relatively short with slow traffic speeds
- One traffic lane in each direction. Each lane should be 12 feet in width. One 10 foot wide shoulder would be provided
- There would be no street lighting, landscape planting or pedestrian circulation provided
- Parking is limited to individual facilities at CDH



19 Landscape Standards

19.1 LANDSCAPE GOALS AND OBJECTIVES

The overall goal of the use of plant material within the installation is “to improve the physical and psychological well-being of the people who live and work on the installation, within the limitations of the desert climate”. Due to the unique operations of USAYPG and the climate of southwest Arizona, landscape design elements will be limited to the cantonment areas and plant materials that require low amounts of moisture. This is achieved through the following objectives:

- Use native plant materials, which require a low amount of maintenance and water to survive
- Preserve and enhance appropriate trees, natural areas, and detailed planting features such as shrubs and groundcovers in cantonment areas
- Eliminate excessive turf and other vegetation that requires extensive irrigation
- Blend natural environment with the built environment
- Provide scale and comfort to pedestrian environments
- Screen unsightly views or elements
- Buffer incompatible land uses
- Enhance antiterrorism capabilities

19.2 LANDSCAPE DESIGN PRINCIPLES

Aesthetic landscape design is based on the following principles, which are the fundamental building blocks of a successful design. These standards dictate how the elements come together to create an aesthetic landscape setting. The following landscape design principles should be used to guide future development and exterior building renovations and streetscape enhancements at USAYPG.

Unity: The selection and placement of plant material can be used to blend, screen, and soften incompatible architectural or other unattractive visual impacts. Plant material as a unifying element can be placed in front of a building or view to frame and enhance the visual impact.

Balance: Plant material can be selected and placed to provide visual equilibrium or balance through the use of either a symmetrical or asymmetrical planting scheme. Symmetrical plantings are generally more formal while asymmetrical plantings are informal.

Contrast: Plant material can be selected and placed to provide differences in size and shape that add interest to the environment. Plants can be located to provide a backdrop for other plants such as a hedge behind a bed of annuals or perennials.

Rhythm: Repetition of a single plant or a mass of plants provides visual interest and formality to the landscape. Rhythm produces emphasis and unity and is especially effective in articulating main circulation routes.

Color and Texture: Plants can be selected and placed to provide visual interest according to their color and texture. Colors are classified as either warm (red, orange, yellow) or cool (violet, blue, green). Texture is classified as either coarse or fine.

Simplicity: Landscape plans should be broad and simple in form to limit excessive maintenance. Plant material should be grouped in beds with simple edges that are easy to mow. Small turf areas should be avoided because of the difficulty of mowing. The use of annuals should be minimal because of the high maintenance involved.

Ultimate Effect: The landscape plan should be prepared with consideration for the mature size of all plants. The spacing of all material should use nursery industrial standards for mature material to account for spread as well as height. The ultimate height of the material should also be considered in relation to windows and other visual concerns.

Spatial Articulation: Plants can be selected and placed to create enclosed spaces or to separate spaces from one another. They can also be used to direct people by visually defining and reinforcing patterns of movement. The degree of enclosure, separation, or movement is dependent upon the density, form, and type of plants used.



Wildflowers in Bloom



The Natural Landscape Should Influence Cantonment Area Landscape Design



19.3 LANDSCAPE DESIGN GUIDELINES

Foundation Planting

Foundation planting provides a green background for additional plantings, adds scale and character to the building, helps to integrate the building with its surroundings, screens heating, ventilation, air conditioning (HVAC) and other utilities, and helps create a sense of arrival. Foundation planting plans will include antiterrorism measures.

- Focal plantings should be located at building entries and along VIP roadways for pedestrian interest
- Use the architecture of the building to evaluate the planting design and selection of plants
- Plant materials should not block windows and views from interior spaces
- Trees shall be setback from the building walls to provide space for mature growth and to prevent root systems from damaging the foundation
- Plant larger trees on the southern and western sides of buildings whenever possible to provide relief from solar radiation, which would reduce energy requirements for climate control

Landscape Buffers/Screening

Landscaping features provide a buffer between buildings and the street, protecting pedestrians, screening views, and supporting AT/FP measures. In order to improve the aesthetic condition of the entire installation, landscape screening can be used to screen unsightly structures, service areas, and parking from view. Additionally, a vegetated buffer will improve the aesthetic quality of AT/FP setbacks and provide space for storm water and erosion control measures. Native trees, hedges, and shrubs should be used as a landscape buffers.

Street Trees

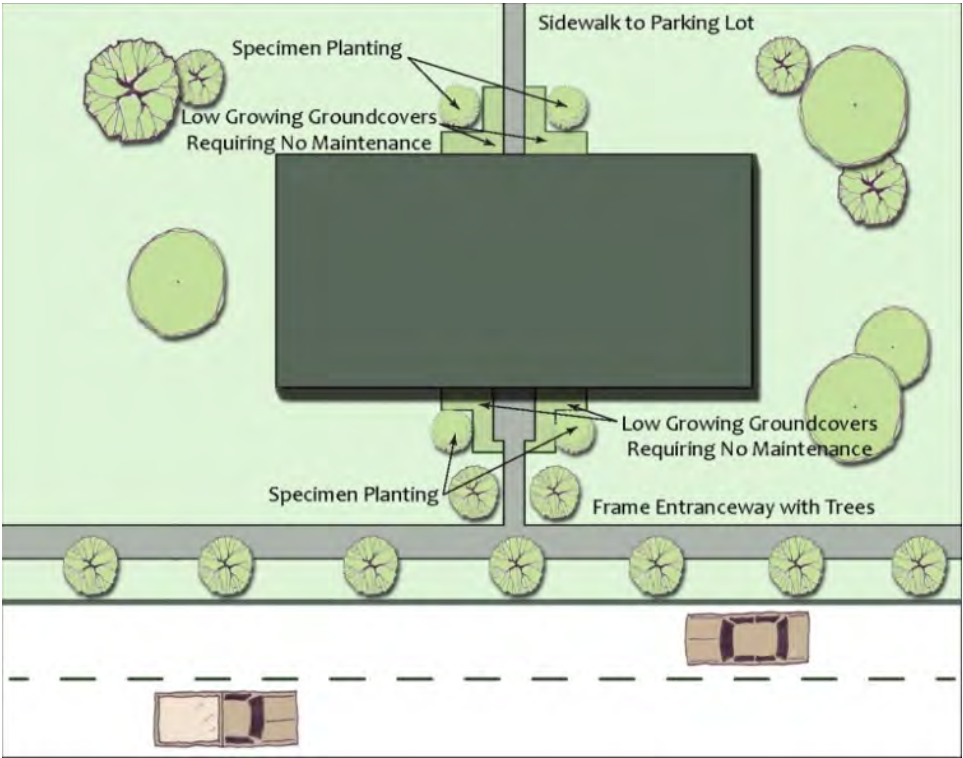
Street tree or shrub plantings should be infrequent due to watering requirements, but can reinforce vehicular hierarchy in the cantonment areas, frame views and to de-emphasize parking areas. Street trees are reserved for the cantonment areas in select areas only. As an example, Ocotillo Road in the WCA will function as a VIP Route and requires a higher investment of street trees, shrubs and other plant material to reinforce the importance of the this portion of the installation.

Formal planting of street trees or shrubs in single rows will reinforce primary roads such as Ocotillo Road in WCA or 2nd Street in HCA. Use regularly spaced and uniformly shaped trees/shrubs to provide a regimented appearance; however due to the climate in southwest Arizona, spacing may be much wider than a typical installation in the eastern U.S. Use trees and shrubs from the plant palette to screen on-street parking along roadways. Street trees will also provide relief from exposure to the sun for personnel walking along sidewalks. Trees should be planted at strategic locations along sidewalks leading to buildings.

Parking Lot Planting

Parking lots are not typically attractive elements on a military installation. The use of landscape plant material and earth berms can greatly improve the appearance of these areas as well as help define circulation and reduce heat gain in parked vehicles.

- Use shade tree plantings at parking lots to reduce glare and moderate ambient air temperatures on the lot, as well as in parked vehicles. Optimum spacing of parking lot shade trees is 35 to 40 feet on center
- Choose trees and shrubs that require minimum maintenance and will not litter the parking area with leaves, fruit, or nuts
- Consider sight distances near entrances and exits
- Select trees, shrubs, and ground covers that can withstand harsher conditions, such as sun, glare, heat, and limited water supply



Foundation Planting



Street Trees Along Ocotillo Road in WCA



Installation Entrances

The entrances and streetscapes into the installation are areas to place landscaping that will develop a strong visual image and provide visual interest. The entrance to the installation creates the first visual impression for the visitor. Landscape plantings should be designed to enhance static displays and signage, not overwhelm or hide those important site features.

The landscape materials and planting areas should be proportional in scale to the hierarchy of the street on which they are located.

Landscaping must be integrated with the AT/FP requirements. Low shrubs, groundcover, perennial plants and canopy trees provide seasonal interest as well as maintain views required to ensure force protection measures. Large trees or

shrubs are discouraged in these locations because they may obstruct sightlines and impact the need for force protection. Adequate lines of sight must be maintained for security personnel to observe vehicular and pedestrian traffic approaching the gate.

Sustainable Landscape Development/Restoration

The use of plant material on the installation promotes the sustainability of development. Trees, shrubs, groundcover, and vines provide aesthetic appeal as well as preservation of fauna and flora, energy conservation, climate modification, erosion control, air purification, and noise abatement.

Xeriscaping is the conservation of water and energy through creative and adaptive landscape design. Xeriscape landscapes provide attractive solutions

that save money, water, and maintenance. When properly placed, plants can provide environmental benefits, as well as address visual concerns. Use trees and shrubs at courtyards, buildings, and along streets to provide shade, moderate temperatures, and reduce glare. Locate plantings on the southwest corner of buildings or courtyards to mitigate solar radiation and glare during afternoon hours.

An example of landscape restoration is the vegetative and drainage restoration project proposed for HCA. This project will restore the channel morphology and riparian plant community along a 900-foot segment of a channel north of 1st Street. Recreating channel and floodplain morphology and establishing the appropriate vegetation will provide appropriate habitat for native birds and pollinators, as well as increased recreational and aesthetic value for residents.



Ecological Restoration Area Proposed for a Wash in HCA



Cox Field is USAYPG's "Central Park" and Serves Many Functions



Xeriscape Landscape Design

Plant Palette

The plant palette is intended to help the designer choose the best plant for each particular set of design requirements. The plants that appear on the palette were selected for their hardiness and their ability to survive the dry climate at USAYPG. Plants listed are intended for cantonment areas and will provide aesthetic, and in some areas, respite from solar radiation. Because there are higher expectations in cantonment areas, particularly along Ocotillo Road in the WCA and the Primary roads in the HCA, some low levels of irrigation may be necessary. This palette should be used in conjunction with a thorough investigation of the microclimate of the specific planting project and soil conditions. The listed plants are recommended species and their listing does not preclude selection of other species based on availability, cost or other factors.

The plant palette is organized by plant category: cacti, perennials, grasses, shrubs, trees, succulents, and vines and provides the following information for each:

- Common Name
- Botanical Name
- Height/Width
- Flower Color
- Light Requirements
- Water Requirements



Saguaro Cactus



An Appropriate Landscape Treatment



Preserve Natural Features



19.4 SUCCULENTS

		Botanical Name	Agave deserti	Nolina bigelovii	Sesuvium verrucosum	Trianthema portulacastrum
		Common Name	Desert Agave	Bigelow Nolina	Verrucose Seapurslane	Desert Horsepurslane
Size	Height (ft)	Characteristics	2	4	1.5	3
	Width (ft)		3	5	1.5	1.5
Type	Evergreen		Y	Y	Y	Y
	Flower Color		n/a	White	Pink	Pink
	Light Requirements		Full Sun	Full Sun	Full Sun	Full Sun
	Water Requirements		Low	Low	Low	Low

Desert Agave



Bigelow Nolina



Verrucose Seapurslane



Desert Horsepurslane



19.5 TREES

			Botanical Name	Acacia greggii	Condalia globosa	Olneya Tesota	Parkinsonia florida	Parkinsonia spp.	Psorothamnus spinosus
			Common Name	Cat Claw Acacia	Bitter Snakewood	Ironwood	Blue Palo Verde	Foothills Palo Verde	Smoke Tree
Size	Height (ft)	Characteristics	24	20	30	30	30	15	
	Width (ft)		25	15	25	25	25	10	
Type	Evergreen		N	N	N	N	N	Semi-Evergreen	
	Flower Color		Cream	Yellow	Yellow	Yellow	Yellow	Purple	
	Light Requirements		Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	
	Water Requirements		Low	Low	Low	Low	Low	Low	

Blue Palo Verde



Smoke Tree



Foothills Palo Verde



Cat Claw Acacia



19.6 CACTI

		Botanical Name	Common Name										
Size	Height (ft)	Carnegiea gigantea	Teddy Bear Cholla	Cylindropuntia bigelovii	Cylindropuntia ramosissima	Echinocereus engelmannii	Echinocereus nicholii	Ferocactus cylindraceus	Ferocactus wislizenii	Mammillaria grahamii	Opuntia basilaris	Peniocereus greggii	Sclerocactus johnsonii
	Width (ft)	Saguaro, Giant Cactus	Diamond Cholla	Hedgehog Cactus	Nichol's Hedgehog Cactus	California Barrel Cactus	Fishhook Barrel Cactus	Graham's Fishhook Cactus	Beaver Tail Cactus	Night Blooming Cereus	Johnson's Fishhook Cactus		
Type	Evergreen	n/a	Y	Y	n/a	n/a	Y	Y	Y	Y	Y	n/a	Y
	Flower Color	White	Greenish	Orange	Purple	Pink	Yellow-Red	Yellow	Pink	Pink	White	Yellow-Pink	
	Light Requirements	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	
	Water Requirements	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	

Saguaro, Giant Cactus



Teddy Bear Cholla



Fishhook Barrel Cactus



Hedgehog Cactus



19.7 GRASSES

		Botanical Name	Achnatherum speciosum	Bothriochloa barbinodis	Bouteloua trifida	Bromus marginatus	Eriochloa acuminata	Eriogonum wrightii	Heteropogon contortus	Panicum hirticaule	Pleuraphis rigida	Poa bigelovii	Tridens muticus	Vulpia microstachys
		Common Name	Desert Needle Grass	Cane Bluestem	Red Grama	Mountain Brome	Tapertip Cupgrass	Bastardsedge	Tanglehead	Mexican Panic Grass	Big Galleta	Bigelow Bluegrass	Rough Tridens	Pacific Fescue
Size	Height (ft)	Characteristics	2	4	1	2	3	0.5	5	3	3	1	2	2
	Width (ft)		1	3	1	1	1	0.5	2	2	4	0.5	0.5	0.5
	Light Requirements		Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun
	Water Requirements		Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low

Mountain Brome



Bigelow Bluegrass



Big Galleta



19.8 VINES

		Botanical Name	Brandegea bigelovii	Clematis drummondii	Funastrum cynanchoides	Janusia gracilis
		Common Name	Desert Starvine	Drummons Clematis	Fringed Twinevine	Slender Janusia
Size	Height (ft)	Characteristics	5	15	10	10
	Width (ft)		1	3	3	n/a
Type	Evergreen		N	N	N	N
	Flower Color		White	White	Pinkish	Yellow
	Light Requirements		Full Sun	Part Sun	Full Sun	Full Sun
	Water Requirements		Low	Low	Low	Low

Desert Starvine



Drummons Clematis



Fringed Twinevine



19.9 FLOWERS

		Botanical Name	Common Name	Characteristics															
Size	Height (ft)	Acourtia wrightii	Brownfoot		4	2	2	4	5	2	3	1.5	4	1	1.5	3	3	1.5	2
	Width (ft)	Adenophyllum porophylloides	San Felipe Dogwood		1	1	3	4	1	0.5	1	4	1	0.5	0.5	2	1.5	2	2
Type	Evergreen	Ambrosia deltoidea	Bursage		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Flower Color	Asclepias subulata	Desert Milkweed		Pink	Reddish Orange	Yellow	Cream	Yellow	Yellow	Purple	White	White	Yellow	Yellow	White	Red	Yellow	Yellow
	Light Requirements	Baileya pleniradiata	Western Tansy-mustard		Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Part Sun	Full Sun	Full Sun	Full Sun	Full Sun	Part Sun	Full Sun	Full Sun	Full Sun
	Water Requirements	Descurainia pinnata	Catchfly Prairie Gentian		Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
		Eustoma exaltatum	Salt Heliotrope																
		Heliotropium curassavicum	Desert Lily																
		Hesperocallis undulata	/cals.arizona.edu/yuma/plant_index/melampo																
		Hoffmannseggia glauca	p://cals.arizona.edu/yuma/plant_index/penst																
		Lesquerella gordonii	Bigelow Four O'clock																
		Mirabilis bigelovii	Bearded Tongue																
		Penstemon pseudospectabilis	Paperflower																
		Psilostrophe cooperi	Desert Senna																
		Senna covesii	Verucose Seapurslane																
		Sesuvium verrucosum	Salt Sandspurry																
		Spargularia salina	http://cals.arizona.edu/yuma/plant_index/pseud																
		Streptanthella longirostris																	

Indian Rushpea



Brownfoot



Gordon Bladderpod



Bursage



Paperflower



19.10 SHRUBS

		Botanical Name	Common Name	Characteristics	Atriplex canescens	Atriplex lentiformis	Baccharis emoryi	Bebbia juncea	Berberis haematocarpa	Calliandra eriophylla	Colubrina californica	Crossosoma bigelovii	Encelia farinosa	Ephedra viridis	Fouquieria splendens	Gutierrezia sarothrae	Hibiscus coulteri	Horsfordia alata
		Flowering Saltbush	Quailbush		Emorys Baccharis	Sweatbush	Red-fruited Barberry	Fairy Duster	Las Animas Nakedwood	Rock Crossosoma	Brittlebush	Ephedra, Mormon Tea	Ocotillo	Broom Snakeweed	Desert Rosemallow	Big feltplant		
Size	Height (ft)	5	6		13	3	10	3	9	5	4	4	25	20	5	6		
	Width (ft)	8	10		5	3	5	4	5	3	3	4	15	10	2	3		
Type	Evergreen	Y	N		N	N	Y	Y	N	N	Y	Y	N	N	N	N		
	Flower Color	Insignificant	Green		White	Orange	Yellow	Pink	Light Green	White	Yellow	n/a	Red	Yellow	Yellow	Pink		
	Light Requirements	Full Sun	Full Sun		Part Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun	Part Sun	Full Sun		
	Water Requirements	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low			

Flowering Saltbush



Ocotillo



Mormon Tea



Globe Mallow



19.10 SHRUBS (CONTINUED)

		Botanical Name	Hyptis emoryi	Justicia californica	Krameria erecta	Larrea tridentata	Menodora scabra	Psorothamnus schottii	Simmondsia chinensis	Simmondsia chinensis 'Vista'	Sphaeralcea ambigua	Ziziphus obtusifolia
		Common Name	Desert Lavender	Beloperone	Range Rhatany	Creosote Bush	Rough Menodora	Scott's Dalea	Jojoba	Compact Jojoba	Globe Mallow	Gray Thorn
Size	Height (ft)	Characteristics	10	4	3	10	2	6	8	4	3	10
	Width (ft)		8	2	2	10	1	2	8	4	3	4
Type	Evergreen		Y	N	N	Y	N	N	Y	Y	N	N
	Flower Color		Violet	Red	Pink	Yellow	Yellow	Blue	Yellow	Insignificant	Orange	Yellow-Green
	Light Requirements		Full Sun	Full Sun	Full Sun	Full Sun	Part Sun	Full Sun	Full Sun	Full Sun	Full Sun	Full Sun
	Water Requirements		Low	Low	Low	Low	Low	Low	Low	Low	Low	Low

Las Animas Nakedwood



Desert Rosemallow



Rough Menodora



Scott's Dalea



19.11 FERNS

		Botanical Name	Cheilanthes parryi
		Common Name	Parry's Lip Fern
Size	Height (ft)	Characteristics	5
	Width (ft)		1
Type	Evergreen		Y
	Flower Color		White
	Light Requirements		Full Sun
	Water Requirements		Low

Parry's Lip Fern



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