Estrella Mountain Regional Park

APPENDICES

Master Plan Update
2016-2036

Maricopa County
Parks and Recreation

Appendix A – Public Participation Program

(Insert all materials behind this cover page)

Stakeholder Advisory Group (SAG)

Purpose

The purpose of the SAG was to establish a diverse group representing a range of opinions in a forum small enough to allow for education of the participants, detailed discussion of issues, and informal dialogue. The group's comments and concerns were integrated into the planning process and assisted in the development of park improvement recommendations.

Meetings

The SAG met three times between January and September 2015 at the Estrella Mountain Regional Park Nature Center.

- January 29, 2015 (9:00-11:00am) – introduction and discussion
- March 26, 2015 (8:30-11:30am) - site visit and discussion
- September 28, 2015 (2:00-4:00pm) – draft recommendations and discussion

After draft improvement recommendations were developed, the group met to discuss and provided additional feedback in order to fine-tune the options. The group agreed no additional meetings were needed.

Participants

The SAG was comprised of a variety of government agencies, avid park users, and concessionaires. A National Park Service, Rivers Trails and Conservation Assistance program staff member served as facilitator. Invited members include representatives from at least the following:

- Aravaipa Running
- Arizona Game and Fish Department
- Arizona State Land Department
- Arizona State University (Centennial Trail)
- Bureau of Land Management (Reality Division)
- Bureau of Land Management (Lower Sonoran Field Office)
- Bureau of Reclamation
- Citizen's for Estrella Mountain Park
- City of Avondale (Parks and Recreation)
- City of Goodyear (Parks and Recreation, Water Resources, Traffic, and Public Art)
- Corral West Trail Rides
- Estrella Foothills High School
- Estrella Youth Sports
- Flood Control District of Maricopa County
- Maricopa County Board of Supervisors, District 5
- Maricopa County Department of Transportation
- Maricopa County Parks and Recreation Commissioner, District 5
- Maricopa County Planning and Development
- Maricopa County Sherriff's Office
- Maricopa Trail
- Three Rivers Historical Society (Centennial Trail)
- Tres Rios Golf Course (and its parent management company C-Bons Golf Group)
- West Valley Trail Alliance

Comments and Feedback

Initial comments received at the January 29, 2015 meeting expressed the need for general upgrades and improvements to the park. Briefly, the group's comments included:

- Need to do youth outreach as part of the planning process
- Need trail connections and trailhead improvements (e.g. signage on trails; shade, signage at trailheads)
- Competitive Track improvements (e.g. shade, water, restroom)
- Better camping options (RV and tent)
- Signage
- Need river/water access
- Improve turf grass area

During the site visit on March 26, 2015, participants reiterated the need for trailhead improvements (i.e. better signage, landscaping, shade, and parking) and the need for upgrades at the Competitive Track to include a full restroom, shade, and running water. Safe road crossings and various camping options were also discussed as needs for the park,

Finally, at the September 28, 2015 meeting, the participants reviewed and discussed the draft park improvement projects and made recommendations. The group decided that the alternatives as presented at that time needed to be simplified and better maps should be provided. The group also expressed the interest in having the turf area open for play, lighting and noise issues from a sports field, and to maintain a family-friendly atmosphere. Those comments were incorporated into the draft alternatives to the extent feasible. At the conclusion of this meeting, the group decided no additional meetings were necessary.

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SUMMARY

This public meeting was conducted in an open house format. Display boards were stationed throughout the room and the public was invited to work their way around the room to view each board. Department staff and special guests were available to answer any questions and to engage in discussions. Comment cards were available for interested parties to provide their comments and feedback. Approximately 40 people signed in for the meeting and 15 comment cards were received in additional to a number of "postie notes" that were used on display boards. The Department allowed a 30-day comment period, concluding on May 30, 2015, to provide the general public adequate time to comment. Table 1 details how the 134 pieces of communications (e.g. comment cards, postie notes, emails, etc.) were received. These comments and Department staff response to the comments was posted on the park's webpage at http://www.maricopa.gov/parks/estrella/emproject.aspx.

Table 1: Comments Received by Source		
At public meeting:	46% of total	
Comment cards from Public Meeting		15
Postie Notes from Public Meeting		42
Flip chart comments from Public Meeting		4
30-Day Comment Period:	54% of total	
Survey Monkey responses		31
Comment cards after meeting		2
Email or other sources		40
TOTAL all sources		134

Department planning staff reviewed each of the 134 comment cards, postie notes, emails, or other form of communication received. Out of those 134 communications, Department planning staff recognized 261 unique comments. Further, out of the 261 unique comments, 156 (or about 60 percent) were considered to the out of the scope of the Master Plan Update. *Out of scope* means that the comment or suggestion is already covered by another planning document; it may also mean that the comment pertains to an operational matter; or it may mean that the comment does not otherwise fall under the purview of a master plan. Other comments deemed out of scope may also be too generalized or vague to work with.

Table 2: Unique and Out of Scope Comments	
Unique Comments:*	261
Out of Scope Comments:	156
Percent out of scope	60%

*One comment card may have contained more than one type of comment. Total will exceed number of respondents.

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A master plan does not dictate hours of operation, staffing, programing or other day-to-day activities. A master plan also does not dictate activities that occur outside of park boundaries. As noted at the public meeting, the purpose of a master plan is **to outline the long-range vision for the park as well as development priorities that will provide for both the public's enjoyment and the protection of the park's resources.** A master plan also:

- Serves as a guide and policy document for current and future park staff, partnering agencies, elected officials, and interested members of the public.
- Guides management of natural, cultural, and recreational resources.
- Considers a range of issues such as staffing, funding, encroachment, wildlife corridors, public needs, and more.
- Considers staff, stakeholder, and public recommendations.
- Identifies park enhancement opportunities including possible upgrades to park facilities, recreation infrastructure, restoration opportunities, etc.

The remaining substantive comments will be further evaluated and potentially carried forward into the draft alternatives for the master plan. Table 3 details each unique comment received and the Department response.

Over one-third of meeting participants did not specify their preferred outdoor activity. Of those that did specify, Figure 1 shows that "Bicyclists / Mountain Bikers" represented 15% of respondents.

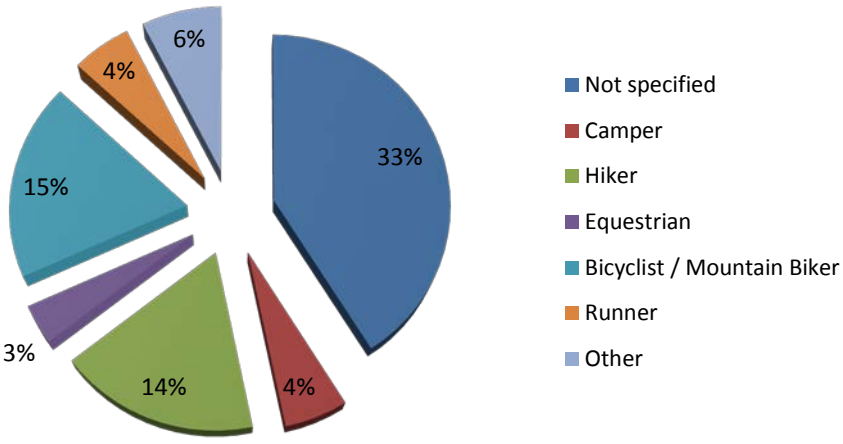

Figure 1: Breakdown of activity group (if specified)

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Table 3: Public Comment Evaluation - Public Open House Meeting #1 and 30-day open comment period					
Public Meeting:					
Method	**Respondent**	**Comments/Questions**	**Visitor Group (if specified)**	**Out of Scope**	**MCPRD Response**
Comment Card	1	I am one of the people who go to corral west the reason I think corral west should stay is because corral west is where I got on a horse for the first time that was also where my brother and sister got on a horse for the first time so there are lots of fun memories there at corral west. Corral west has taught me a lot about horses. They have given me the chance to be around horses. Without them my chance to ride a horse and see horses would be less often. Please keep the horses at Estrella mountain Regional Park.		x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
Comment Card	2	update the water lines so park does not run out of water. Drinking water!!!			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	2	Have an entrance that stands out. People see golf course not park.			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	2	talk to local people and they don't know park is here		x	Refer to 2011 marketing plan.
Comment Card	3	Continue horse use in park. Great to see horse trail riders and wagon rides to enjoy the desert.	equestrian	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
Comment Card	3	I would love to see some more activity in the arena, rodeo, roping, horse shows, concerts.	equestrian	x	Operational. Refer to 2011 marketing plan.
Comment Card	3	Overnight facilities for private horse users would be great.	equestrian		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	4	Thank you for all you do with the parks. I use Estrella and White Tank 3-4 times a month. I love all the trails and thank you for maintaining them.	runner	x	Thank you, too.
Comment Card	4	I would like to see more trails with elevation gain at Estrella. Especially into the southeast corner of the park.	runner		The 2012 trails plan amendment added a trail at elevation. This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	4	I love that Estrella has open gate policy to allow early morning entry (4-5am). I would love to see White Tank accept this policy.	runner	x	Operational.
Comment Card	5	I am 50 years old. Born and raised here. Been coming to this park since I was little.	hiker	x	Thank you.
Comment Card	5	Back in the day the grass was green and well kept. The play areas were large and fun - now - the turf is dirt and weeds. The play areas are torn down. The ball fields are a mess. Why build ball fields and take away nature. FIX - repair/ replace what is here.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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Comment Card	5	This park is the 1st one here. Put your $ into fixing it up and people will come.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	6	Your 1988 Master Plan has been changed since I saw the Master Plan when CEMP was started. This tells me that the Regional Park Management can chance anything at any time. Including withdrawing funds to control outcome.	camper/hiker	x	The 1988 Master Plan has not been changed or amended since it was approved and adopted in 1988. Revenue and some general fund dollars go into the park budget each year and are detailed in the annual operating budget and/or the 10-year CIP.
Comment Card	6	Why don't you let more people know the park is here?	camper/hiker	x	Refer to 2011 marketing plan.
Comment Card	7	I would like a {unreadable} gardin			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	8	I think that the most important things is to make sure the park remains connected to and open to the community, which will increase the revenue generating capacity for the long term.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	8	To the degree that the ballfields will increase youth participation from the entire community, I support that - but the local community uses the park as a place to picnic, celebrate weddings & quinceneras, throw festivals, and hold group functions. Decreasing common space in the surrounding community makes this an extremely valuable resource.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	8	I also support making the trails and backcountry more accessible, better marked, w/o a lot of development. That's a great way to increase the number of people who can use the park while reducing the environmental impact, so that I can remain a community natural resource for generations to come.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Trail building follows the Parks Department Trail Management Manual.
Comment Card	8	Please continue to make efforts to reach local communities of color as well.	hiker	x	Thank you. We will do our best. Refer to 2011 marketing plan.
Comment Card	9	I am so appreciative that EMRP remains on the radar for growth of amenities and family entertainment.			Thank you. The growth of amenities is carefully considered via the planning process.
Comment Card	9	I am so glad that the horse riding amenity is growing in popularity as {unreadable} the years (past {unreadable}) so many were disappointed in the lack of riding access.		x	Operational
Comment Card	9	This has great potential. Let's keep looking for partners to make things happen.			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	10	I come here because it is quiet and there is a lot of wildlife to observe. I have seen how loud baseball and soccer fields are. Along with noise comes the traffic. I live near here and I have seen the traffic from the Goodyear Ballpark.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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Comment Card	10	I do not want this park to become a money making scheme for wealthy investors.	hiker	x	The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, racquetball, playgrounds, and a full service concession stand. The Department began discussion with a local non-profit group several years ago in its effort to implement the 1988 plan.
Comment Card	10	You will already be taking kids playgrounds and our ramadas.	hiker	x	Old playgrounds throughout the park system, including EMRP, that do not meet safety standards are being replaced with new desert-inspired equipment and positioned where they will meet the highest demand. No net loss to ramadas/picnic space is expected.
Comment Card	10	Then you will need a lot more room for parking.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	10	The park could use some changes but massive sports fields is not the way.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	11	I come here to hike and so quiet. I love the plants grew and more gardins and I want to save it.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	12	For safety issues - add a crosswalk on Vineyard for people hiking from the park east to the riparian area and onto the Jackie Meck Lakes. Sonoran Audubon Society leads a bird hike every second Saturday of the month with numbers of participants from 7-30.	bird walk leader		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	13	Investigate the scale working model of the Mississippi River on the island located on the east side of that river at Memphis Tennessee. This model is more than a few thousand feet long, with city maps embedded in the concretic materials which contain the flowing water in the model. Scale-wise is extends from the river's source in Minnesota to its delta at the Gulf of Mexico.	retired civil engineer	x	Refer to 2006 El Rio Watercourse Master Plan.
Comment Card	14	Some wonderful ideas.	hiker, star gazer, love outdoors	x	Thank you for your input.
Comment Card	14	Centennial Trail is a great idea/plan. Please don't drop it.	hiker, star gazer, love outdoors		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	14	Have concerts & perhaps art shows.	hiker, star gazer, love outdoors	x	Thank you for your response; will be forwarded to operational staff.
Comment Card	14	Thanks for having this gathering.	hiker, star gazer, love outdoors	x	Thank you for attending.
Comment Card	15	Overall I think the trail system here is good.	bicyclist	x	Thank you.

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Comment Card	15	It would be nice to see some more technical trails being developed.	bicyclist		The 2012 trails plan amendment provided and expansion area for the competitive track. This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Comment Card	15	South Mountain has a trail called "National" which is a great example of what is missing from our park.	bicyclist	x	The 2012 trails plan amendment provided additional trails alignments.
Comment Card	15	There is a strong biking community in the West Valley and I am sure we could all be willing to help design and build new trails.	bicyclist	x	Trail design and building follows the Parks Department Trail Management Manual. The Parks Department has volunteer opportunities for some trail maintenance projects.
Comment Card	15	I think with this addition you would see a significant increase in mountain bike use within the park.	bicyclist	x	Thank you for your input.
Comment Card	15	Thank you for all your efforts!	bicyclist	x	Thank you, too.
Flip Chart	16	Bike path/trails along Agua Fria River area		x	Outside of park boundary. However, there is an existing short trail in the Gila River bed called the El Rio Plant Research Trail for pedestrian use.
Flip Chart	16	Bike trail/path from bottom of Estrella Pkwy / MC85 to Tower		x	Outside of park boundary.
Flip Chart	16	Horse camp for youth		x	Operational.
Flip Chart	16	nature trails			The park currently has over 33 miles of trails. Other trail-related opportunities will be further evaluated for inclusion in the draft master plan alternative(s).
Postie note from El Rio Board	17	El Rio is a HUGE project. It really needs multiple IGAs and a dedicated group for it. Keeping it a small part of EMRP is good but a separate group needs to be in charge of it. Something like a conservancy should be a steward of it.		x	Refer to 2006 El Rio Watercourse Master Plan.
Postie note from Master Plan Board	18	Weekly astronomy night		x	Thank you for your response; will be forwarded to operational staff.
Postie note from Master Plan Board	18	Later hours for star gazers		x	Thank you for your response; will be forwarded to operational staff.
Postie note from Centennial Trail Board	19	YES!!!			The Centennial Trail will be further evaluated for inclusion in the draft master plan alternative(s).
Postie note from Centennial Trail Board	20	Develop a volunteer group dedicated to only the Centennial Trail. Have one main contact within the park with scheduled timelines to follow up with volunteers.		x	Thank you for your response; will be forwarded to operational staff.
Postie note from EYS Board	21	Prefer the picnic, relaxing setting over a sports complex			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from EYS Board	22	RV camping			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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Postie note from EYS Board	23	Develop a path around the fields. Use it as way to get around the fields and park. Could be used for kids run events.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from EYS Board	24	This is a good idea. The park needs users and this brings them in.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from EYS Board	25	Amphitheater is neat. Keep it.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from EYS Board	26	Where is $ going? Be more open & transparent with public.	x	Revenue and some general fund dollars go into the park budget each year and are detailed in the annual operating budget and/or the 10-year CIP.
Postie note from EYS Board	27	arena - lack of marketing for park and arena	x	Refer to 2011 marketing plan.
Postie note from EYS Board	27	get in front of parents, not the school principals	x	Refer to 2011 marketing plan.
Postie note from EYS Board	27	get in front of the moms and dads	x	Refer to 2011 marketing plan.
Postie note from EYS Board	27	keep arena - asked for jackpot and jr. rodeo association		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from EYS Board	27	don’t realize park is self-sufficient	x	Thank you for your input.
Postie note from EYS Board	28	arena - don’t know its there.	x	Refer to 2011 marketing plan.
Postie note from EYS Board	28	keep the agricultural background	x	Thank you for your input.
Postie note from EYS Board	28	think out of the box on funding		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from EYS Board	28	change lights at arena - power company charges too much	x	Thank you for response, will be forwarded to operational staff.
Postie note from EYS Board	29	1-2 ball fields		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from EYS Board	29	why on County lands?	x	The Department often engages in partnerships to provide amenities and/or services that the Department otherwise cannot.
Postie note from EYS Board	29	if market demands it, then expand.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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Postie note from EYS Board	29	locals won't use for more than 3 months	x	Thank you for your input.
Postie note from Idea Board	30	outdoor concerts and art shows	x	Thank you for response, will be forwarded to operational staff.
Postie note from Idea Board	31	Provide Sonoran Audubon Society 3 or 4 cones to put in place on Vineyard to indicate a temporary crosswalk for the monthly Saturday bird hike (which goes east along the river).		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	32	Encourage more youth equestrian programs	x	Thank you for response, will be forwarded to operational staff.
Postie note from Idea Board	33	Entrance for horse arena to bypass fields		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	34	Trail for handicapped loop around main 1 mile area		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	35	restrooms, showers		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	36	rodeos: senior high school, Jr gymkhana	x	Thank you for response, will be forwarded to operational staff.
Postie note from Idea Board	37	make more use of the arena	x	Thank you for response, will be forwarded to operational staff.
Postie note from Idea Board	38	We don’t need change of purpose. We need to invest in what is here and do a gradual change to see what gets used.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	39	Work with other government agencies. IGAs are the only way to fund large projects.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	39	Develop a dedicated volunteer group/stewards of the park. Volunteering is a difficult task.	x	Operational. Refer to Citizens for Estrella Mountain Park (CEMP) for information on how to join CEMP. The Department also has a park host and volunteer program.
Postie note from Idea Board	40	Fix up communal picnic areas / more outlets		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	41	Movie nights. Silent disco (w/ headphones).	x	Thank you for response, will be forwarded to operational staff.
Postie note from Idea Board	42	church group hikes	x	Thank you for response, will be forwarded to operational staff.
Postie note from Idea Board	43	clearer trail markings on longer trails		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Refer to Parks Department Trail Management Manual.

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Postie note from Idea Board	44	youth programs with horses - inside and outside the arena	x	Operational. Thank you for your input.
Postie note from Idea Board	45	1. More dedicated camp sites to include RV sites and remote sites well into the park such as the south end of Pedersen.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Idea Board	45	2. Develop infield to encourage more users to use the park and experience not just their field sport but the trail system		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Wall Map	46	A good beginner is desperately needed, something with little elevation gain		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Wall Map	47	Improve wash crossings on existing trails (re-routes). Ex. Gadsden is horrible.	x	Refer to Trails Maintenance Manual
Postie note from Wall Map	48	What about this massive hill here ->		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Refer to Trails Plan and 2012 Trail Amendment.
Postie note from Wall Map	49	Real toilets & garbage cans & gazebos		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Wall Map	50	real facilities and camping for events. You could partner with PIR too. They would want it.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Wall Map	51	Re-open trails closed to hiking & biking	x	Refer to Trails Plan and 2012 Trail Amendment.
Postie note from Wall Map	52	Go around this hill. Its getting destroyed.	x	Comment it unclear. Refer to Trails Plan and 2012 Trail Amendment. Existing trails (BU, CO, CW, GD) go around the hill (Knob Hill). The hillside itself should not be in use.
Postie note from Wall Map	53	Hi loop		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Refer to Trails Plan and 2012 Trail Amendment.
Postie note from Wall Map	54	need trail etequite signs		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Postie note from Wall Map	55	Move towards not just 4 foot trails. More challenging features in the trails. Something like South Mtn to draw users.	x	Refer to Trails Plan and 2012 Trail Amendment. Refer to Trails Maintenance Manual.
Postie note from Wall Map	56	Set up backpacking / dry camping area. After end of PD trail.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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Postie note from Wall Map	57	YAY trails as "competitive loop" type trails. Switchbacks, etc as req'd			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Refer to Trails Plan and 2012 Trail Amendment.
Postie note from Wall Map	58	Why not go all the way south to encourage long rides /hikes. It opens the comp track to endurance events that are growing.			This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Refer to Trails Plan and 2012 Trail Amendment.
30-day Comment Period:					
Method	**Respondent**	**Comments/Questions**	**Visitor Group**	**Out of Scope**	**MCPRD Response**
Survey Monkey	1	A bike lane on the loop around the large turf area, more bike/caution driver signage.	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	1	Interpretive signage along the main road naming the trees, cacti along the entrance to the park.	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	1	An air pump station for bikes	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	1	paint warnings on roadway for drivers to be aware of bikes - start seeing bikes.	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	2	Repair the existing 2 ball fields and see how it goes before destroying the grass play area for soccer fields and more ball fields.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	2	Repair or replace the kids play area and swing sets.	hiker		Old playgrounds throughout the park system, including EMRP, that do not meet safety standards are being replaced with new desert-inspired equipment and positioned where they will meet the highest demand.
Survey Monkey	2	Allow camping in the Navy Area.	hiker	x	Department preference is to keep day use separate from overnight use. Alternative areas for camping will be explored for inclusion in the master plan draft alternatives.
Survey Monkey	2	Restore the grass areas, repair the ramadas and clean up the Primitive Camping area.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Alternative areas for camping will be explored for inclusion in the master plan draft alternatives.
Survey Monkey	2	Keep the county park as a family park and the only one with a true grass play area.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	2	Find another place for the 8 ball fields and multiple soccer fields.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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Survey Monkey	2	Our families need a green park to gather and play and not another commercial area.	hiker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	3	I am disturbed, upset & dismayed to see the inclusion of a sports complex for PRIVATE groups use - even is this private group is funding all or part of the project.	hiker, trail runner, picnic/day use		The parks current 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, racquetball, playgrounds, and a full service concession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan.
Survey Monkey	3	A sports complex of almost 20 new soft ball and multi use fields is not in line with the vision and mission to "preserve the natural setting and environmental aspects of the park by heavily restricted use and recreational public access"??? How does a sports complex with grass fields that need watering contribute to a natural setting?	hiker, trail runner, picnic/day use		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, racquetball, playgrounds, and a full service concession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan.
Survey Monkey	3	My opinion is that a private group sould not be given access to public lands, even if they bring $$$$ to the deal.	hiker, trail runner, picnic/day use	x	Operational. The Department often allows third party partnerships access to its public lands in order to provide services or amenities that it otherwise be unable to provide such as horse rental concessionaires, golf courses, etc.
Survey Monkey	3	My use of this park is for hiking and relaxing day use for picnics - the proposed sports complex will GREATLY interfer with the relaxing and natural setting that I have enjoyed for many years - if you must push this sports complex and private use, please RESTRICT it to the existing ball diamond area in the far west end and leave the main picnic/ramada/trees section as it is currently being used!!!!!	hiker, trail runner, picnic/day use		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Hiking, day use, and picnic use will remain prominent features of the park.
Survey Monkey	3	If the county does not have money to make improvements, I would rather see no improvements at all than what you are proposing with this private development of our public park.	hiker, trail runner, picnic/day use		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	4	I would like to see some more technical trails being developed in the park.	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Refer to Trails Plan and 2012 Trail Amendment.
Survey Monkey	5	Better Trail design, especially regarding run-off w/rains, and then any/better trail maintenance.	bicyclist	x	Refer to Trails Plan and 2012 Trail Amendment. Refer to Trails Maintenance Manual.
Survey Monkey	6	great	bicyclist	x	Not clear what "great" refers to, but thank you.
Survey Monkey	7	Provide better mtn bike trails.	bicyclist	x	All trails are multi-use unless otherwise designated.
Survey Monkey	8	Mountain bike trails are my main interest.	bicyclist	x	All trails are multi-use unless otherwise designated.

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Survey Monkey	9	I love the existing trails out there. Any additions or connectors to trails outside the park would be awesome! Keep up the great work.	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). The 2012 trails plan amendment provides some additional trails and the Maricopa Trail Manager is currently and actively working with local jurisdictions to determine the preferred location of a Maricopa Trail connection.
Survey Monkey	10	Make the park friendly to all users, and educate bikers and hikers to share the trail.	bicyclist	x	All trails are multi-use unless otherwise designated.
Survey Monkey	11	I currently have a season pass and ride my bike in the park often.	bicyclist	x	Thank you.
Survey Monkey	11	I would like to see more entrances into the park that connect with the Estrella Mountain Ranch community. I would also like to see connector trails between the park and the competitive loops.	bicyclist	x	The trails plan and 2012 trails plan amendment provides three entry points along the west bounday. One is currently open. The remaining two will be opened as additional development occurs and in cooperation with the City of Goodyear's Parks Trails Open Space Master Plan preferences.
Survey Monkey	11		bicyclist	x	The 2012 trails plan amendment added a connector trail between approximately the rodeo arena and the competitive track.
Survey Monkey	11	Lastly, I would like the trails to be a bit more bike friendly especially in the south end of the park.	bicyclist	x	All trails are multi-use unless otherwise designated. Refer to Trails Maintenance Manual.
Survey Monkey	11	Many of the trails are found within the wash and are nearly impossible to ride. Some of the trails are so sandy that they are nearly impossible to ride. Better trails that are ride-able will bring more revenue to the park.	bicyclist	x	The 2012 trails plan amendment provides for alternative trails near south washes. Refer to Trails Maintenance Manual.
Survey Monkey	12	More multi use trails	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	13	A Northern entrance into the park from Estrella would allow us to make a loop from and to the community instead of having to turn around would be great.	bicyclist	x	Comment is unclear. The main park entreance is on the north side. However, the 2012 trails plan amendment provides three entry points along the west bounday. One is currently open. The remaining two will be opened as additional development occurs and in cooperation with the City of Goodyear's Parks Trails Open Space Master Plan preferences.
Survey Monkey	13	A re-opening of the World-Class trails "that were closed" are my second item.	bicyclist	x	Comment is unclear as to location of "world class trails that were closed". The only trails that have been closed in recent years, are rouge trails that were built illegally.
Survey Monkey	14	Love the park and use it regularly. Development needs to maintain big open spaces and not overdevelop.	Hiker, Bicyclist, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	14	Would love to help in any way I could.	Hiker, Bicyclist, Trail Runner	x	Thank you. Please contact the Park or the Volunteer Coordinator to get signed up.

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Survey Monkey	15	1. Better sustainable trails - reroute problem areas	Bicyclist, Mountain biker	x	Refer to Trails Plan and 2012 Trail Ammendment. Refer to Trails Maintenance Manual. This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). Refer to Trails Plan and 2012 Trail Ammendment.
Survey Monkey	15	2. More technically challenging trails further back	Bicyclist, Mountain biker		
Survey Monkey	15	3. 4 foot trails only for beginner type trails	Bicyclist, Mountain biker	x	Refer to Trails Plan and 2012 Trail Ammendment. Refer to Trails Maintenance Manual. This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	15	4. Better facilities at competitive track	Bicyclist, Mountain biker		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, raquetball, playgrounds, and a full service consession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan.
Survey Monkey	16	Generations have been attending Estrella Mountain Regional Park. Changing the structure from a family oriented park to a sports facility is not what the community wants or needs.	Camper, Hiker, Equestrian, Picnics		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	16	Re-seed the picnic area, repair the irrigation system, add new playgrounds, replace picnic tables and BBQ's, purchase lawn mowers, bring better water and electric to the Ramada's so guests can use them. Bring back our customers.	Camper, Hiker, Equestrian, Picnics		Operational. The park has been very active with large groups in the past, however annual visitation and ASU Visitor Use surveys show that this is no longer the case. Adobe Dam and Lake Pleasant Regional Parks are typically the "highest income producers", not Estrella. The turf area at Estrella is indeed the only turf grass in the park system as turf grass is not our typical park ammenity.
Survey Monkey	16	When the park had grass and playgrounds nearly 20,000 visitors came to the park over Easter weekend. The Ramada's were filled every weekend with birthdays, anniversaries, family reunions, and wedding receptions. Estrella Park was the highest income producer next to Lake Pleasant. People came for the grass. Boy Scouts, girl scouts and families stayed over night to camp and setup tents on real grass. It was the only grass in the Maricopa County Park System.	Camper, Hiker, Equestrian, Picnics	x	
Survey Monkey	17	Hunting within the park boundaries has been a factor in my less frequent visits (noise and safety factors).	Hiker	x	Hunting locations and rules are determined by Arizona Game and Fish Department.
Survey Monkey	17	I love the bird walks and hiking along the river (as well as the desert trails), but too many "undesirable" folks are hunting, camping and basically trashing the riparian areas.	Hiker	x	Thank you for your response, will be forwarded to operational staff.
Survey Monkey	18	I went there more when Pat was leading the night hikes. She did a wonderful job & I love night hikes!	Hiker	x	Thank you for your comment.
Survey Monkey	19	I believe the horse venue is an exciting addition to the West Valley...not having to drive to Cave Creek or Scottsdale is wonderful.	Hiker, Equestrian	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.

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Survey Monkey	19	Please do not stop Horse Adventures just as they are getting established.	Hiker, Equestrian	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
Survey Monkey	20	I look at your declining numbers on park attendance and activities and I blame the park itself and the upkeep.	Native to Arizona, Grew up coming to the park	x	Thank you for your response, it will be forwarded to operational staff.
Survey Monkey	20	I grew up coming to the park for Masonic picnics, family gatherings, Church picnics and had NICE turf areas to play in. The last time I walked the turf my shoes were so full of spurs it hurt my feet. I would not want to have my now grandkids play in that.	Native to Arizona, Grew up coming to the park	x	Operational.
Survey Monkey	20	We don't need ball fields and soccer fields.	Native to Arizona, Grew up coming to the park		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	20	We need what we already have taken care of!	Native to Arizona, Grew up coming to the park		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	21	The park needs resort style trails like a flow trail with jumps which was discussed years ago that we could use machinery to build.	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	21	The park could also benefit from a pump track similar to the one outside the park that is bringing people from all over the valley.	bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). The Parks Department has many volunteer opportunities for trail maintenance projects and has also worked with WVTA on several projects. Trail building follows the Parks Department Trail Management Manual.
Survey Monkey	21	Build a jump trail with the West Valley Trail Alliance and a pump track, you will see numbers double.	bicyclist		
Survey Monkey	22	Thanks for the Iron Ranger from EMR.	Bicyclist	x	You're welcome.
Survey Monkey	22	The mountain biking in the park is awesome.	Bicyclist	x	Thank you.
Survey Monkey	22	The more trails the better so we would love to help.	Bicyclist	x	Thank you. The Deparment has a Volunteer Coordinator to match up interested parties to available projects.
Survey Monkey	22	Maybe you could offer some recognition to employers who support the park.	Bicyclist	x	Operational. Thank you for your input.
Survey Monkey	23	Would like to see more trails to the peaks and not just in the valleys.	Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s). The 2012 trails plan amendment provides for a trail at elevation.
Survey Monkey	23	I like that I can get in before it opens (I have annual pass)	Trail Runner	x	Operational. Thank you for your input.

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Survey Monkey	24	Trail leading from main park to comp track would be great.	Bicyclist	x	The 2012 trails plan amendment, added a connector trail between approximately the rodeo arena and the competitive track.
Survey Monkey	24	Also periodic maintaince of the comp track. It has seen better days on the second half	Bicyclist	x	Thank you for your response, will be forwarded to operational staff.
Survey Monkey	25	I'm especially fond of the youth sports plan, this will be a welcomed resource.	Hiker, Bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	25	I'd also like to see improved trails for mountain biking/hiking.	Hiker, Bicyclist		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	26	Thanks for all the recent trail work! As a mtn biker it's great to have maintained trails to ride without the fear of falling!	Hiker, Bicyclist	x	Thank you.
Survey Monkey	27	Cant see the boards, the page opened up to just this so I don't know what you are talking about.	Bicyclist	x	Boards were linked just underneath the survey link on the "park projects" page.
Survey Monkey	28	Things I would be most excited to see: hike-in camping	Camper, Hiker, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	28	more hiking trails. Especially a summit hike and river trail.	Camper, Hiker, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	28	updated picnic areas	Camper, Hiker, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	28	shooting range	Camper, Hiker, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	29	Things I would be most excited to see: hike-in camping	Camper, Hiker, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	29	more hiking trails. Especially a summit hike and river trail.	Camper, Hiker, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	29	updated picnic areas	Camper, Hiker, Trail Runner		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	30	5/27/2015 - To whom it may concern I am writing to comment on the new Master Plan being considered for Estrella Mt Regional Park. This issue is very important to many people, and I hope you'll take comments into consideration when making your final decision to change this family park into a sports complex.	Camper, Hiker, Equestrian, Other	x	All comments are taken into consideration as the Department progresses through the master plan update process.
Survey Monkey	30	My husband & I were park hosts at this beautiful park years ago, and were saddened that even though it was the 2nd top money maker for the park system, the funds were disbursed to other parks without maintaining Estrella to its full potential.	Camper, Hiker, Equestrian, Other	x	Operational. Speculation. All budget requests are contingent on available funds and the urgency of the request (i.e. human health or public safety related).

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Survey Monkey	30	During the years we were there, there were issues with an inadequate sprinkler system, the barbeques were not maintained, the Ramadas needed repair, and even proper tools for trimming trees were not supplied by the County.	Camper, Hiker, Equestrian, Other	x	Thank you for your input; it will forward to operations staff as the listed items will continue to be addressed daily.
Survey Monkey	30	The funds earned by the park were diverted to other parks in the system leaving the Citizens group the job of fundraising to come up with supplies to repair the rusty BBQ'S and purchase items for the park that should have rightfully been supplied by the County.	Camper, Hiker, Equestrian, Other	x	All budget requests are contingent on available funds and the urgency of the request (i.e. human health or public safety related). Friend groups are sometimes willing to fund or volunteer for small projects.
Survey Monkey	30	With that said, in previous years the park was extremely busy with family gatherings, Easter picnics, scout events, SCA gatherings & other events attended by the thousands. The Ramada's were full every weekend.	Camper, Hiker, Equestrian, Other	x	Thank you for input.
Survey Monkey	30	The guests were allowed to 'rent' the park after hours, at a fair price, and were required to pay for security from Park Rangers, then ultimately the Sheriff's Dept. This was not a problem to those who wanted to enjoy the facilities, and take advantage of the beautiful area with trees, open spaces and grass.	Camper, Hiker, Equestrian, Other	x	Operational. It is not Department policy to "rent" the park after established park hours. It may have been a special provision made by a previous Park Supervisor on a case-by-case basis.
Survey Monkey	30	Many camped out with tents, and comments were constantly given to the park hosts of the appreciation for the grass and trees.	Camper, Hiker, Equestrian, Other	x	Thank you for input.
Survey Monkey	30	No other facility in the area had such wonderful accommodations for families to use.	Camper, Hiker, Equestrian, Other	x	Thank you for input.
Survey Monkey	30	The desert areas are nice for their purpose, but many crave the 'green' terrain, and it gives the feel of a vacation away from the dry desert. To do away with this unique facility and turn it into a sports park would be a travesty.	Camper, Hiker, Equestrian, Other		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	30	There are plenty of places for sports events, but not any other that allows dry camping, open space to play family football in the grass, nearby river, hiking a spell and returning to a BBQ under the trees.	Camper, Hiker, Equestrian, Other	x	Thank you for input.
Survey Monkey	30	This park has always been unappreciated by the County, but it is truly needed and appreciated by those who used the park.	Camper, Hiker, Equestrian, Other	x	Inaccurate statement that the County does not appreciate the park. Thank you for your support. Park fees remain low to allow all families reasonable access to the park and its facilities. Neighboring cities such as the Cities of Goodyear and Avondale require home builders to include parks of varying sizes into their development plans. Aditionally, each city maintains its own parks, for example Goodyear Community Park that offers ramada rentals and other family-friendly activities.
Survey Monkey	30	We hear lots of rhetoric about helping the underprivileged and those in lower socio-economic levels, so this is an opportunity for the County to show that they do care about the people who can not afford their own grassy areas for family use.	Camper, Hiker, Equestrian, Other	x	
Survey Monkey	30	The County claims that the attendance has dropped off in the past few years.	Camper, Hiker, Equestrian, Other	x	Park records, in fact, show declining visitation over the last decade.

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Survey Monkey	30	That may be due to their lack of upkeep, their lack of advertising, and the lack of events available to the public.	Camper, Hiker, Equestrian, Other	x	Declining visitation unfortunately results in declining revenue for park projects. Refer to 2011 Marketing Plan. Demand for large scale events has declined over the years as other venues have been established.
Survey Monkey	30	The 20,000 plus visitors who used to line up to use the park shows how badly a park of this type is needed.	Camper, Hiker, Equestrian, Other	x	Park records in fact show declining visitation over the last decade.
Survey Monkey	30	This lack of attendance was caused by the County… • Sunday's were busy with baseball teams…. until the fields were left to deteriorate.	Camper, Hiker, Equestrian, Other	x	Operational. Thank you for your input.
Survey Monkey	30	• Ramada's were full with picnickers….. until the picnic benches and barbeque pits were worn out or damaged beyond usage.	Camper, Hiker, Equestrian, Other	x	Operational. Thank you for your input.
Survey Monkey	30	• Campers enjoyed the trees and grass….. until things were left to dry out because the irrigation system wasn't repaired.	Camper, Hiker, Equestrian, Other	x	Operational. Thank you for your input.
Survey Monkey	30	• Events were held at the Rodeo ground, and trails rides were planned….. until the County made so many restrictions that entrepreneurs gave up trying to jump through hoops.	Camper, Hiker, Equestrian, Other	x	No new or additional "restrictions" have been put into place. Events have been planned, however, when attendance is low the consessionaires are not able to make the even finacially viable for their operation.
Survey Monkey	30	Requests have been made over the years asking for funding and manpower to improve the park, or at a minimum, at least keep it maintained properly. Using the prison workers helped with picking up litter, but they had little heart for their chores. Maintenance men employed by the County were needed and we saw the labor pool shrink from 4 to 2 in just a couple of years. This was a set-up for failure with over 65 acres of grass and trees to maintain, 10 covered Ramadas, two playgrounds, picnic tables, two lighted ball fields, and a rodeo arena.	Camper, Hiker, Equestrian, Other	x	Operational. Thank you for your input.
Survey Monkey	30	Equipment was requested and promised, only to be diverted to other parks a little more 'upscale'. It seemed that Estrella made the money, but got the scraps.	Camper, Hiker, Equestrian, Other	x	Declining visitation unfortunately results in declining revenue for park projects.
Survey Monkey	30	The County would not even have this beautiful addition to the Park system if it had not been for the forward thinking, civic minded ranchers like Jim King, who donated time, money, and solicited other ranchers and companies like APS and Caterpillar to donate towards this well- needed and disserved amenity to the west valley.	Camper, Hiker, Equestrian, Other	x	Thank you for your comment. The park was, indeed, founded between a community grassroots effort and the County acquiring additional federal lands.
Survey Monkey	30	In the Article "Life of J.L. King" he comments: "This could be one of the greatest parks in the state because it will be diversified in its type. We have the mountain range, flat and rolling ground with good soil for a city type park, and possible golf course, and the lake would be stocked with fish for the sportsman. The surface has just been scratched." J. L. King, Chairman, Estrella Mountain Park	Camper, Hiker, Equestrian, Other	x	Thank you for input.
Survey Monkey	30	When the Park was created, the County was "focused on having the foresight in designating land for public use so that future generations will have a place to go and connect to the desert, and the natural habitat and settings". What happened to that focus??	Camper, Hiker, Equestrian, Other	x	The Departments current vision and mission support the focus mentioned in the quote. The park is over 18,000 acres and has miles of trails to connect with nature and view natural habitat settings.

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Survey Monkey	30	In your comment "While certain elements of the 1988 Park Master Plan have been completed; other elements are no longer relevant as recreation trends and park uses have changed over time." Imagine if Tempe had thought in that manner when contemplating the construction of Tempe Town Lakes. That project caused a burst of tourist business and economic growth in that area. They had VISION.	Camper, Hiker, Equestrian, Other	x	Tempe Town Lakes relies on a source of water via dams and has major infrastructure and heavy development surrounding it. It is not the intention of the Department to spearhead such major infrastructure/construction projects.
Survey Monkey	30	Not many areas are fortunate enough to have access to a river and it's many benefits, so why not make Estrella Park the 'destination point" that it can be with a little work, imagination, and return of some of the money that the Park has earned for the County over the years.	Camper, Hiker, Equestrian, Other		River access is being considered for inclusion in the master plan draft alternative(s) and in accordance to the El Rio Watercourse Master Plan implementation.
Survey Monkey	30	I have filled out one of the ASU Visitor Survey used by the Park, and found the questions to be a little 'directional' in that it fails to ask questions relating to what people WISHED for the park.	Camper, Hiker, Equestrian, Other	x	Thank you. This feedback will be relayed to ASU for future visitor use surveys.
Survey Monkey	30	Those who remember back to the beautiful area, as it was, are sad to see it in such a disheveled mess. No wonder they look for other options for family gatherings.	Camper, Hiker, Equestrian, Other	x	Operational.
Survey Monkey	30	There are such wonderful possibilities available for this park. A water feature, fishing pond, the amphitheater improved and events advertised, open up the park with more trailhead access for horses (iron rangers), craft shows, work in conjunction with the Tres Rios festival (also be available to host the event in the case of them being rained out along the Gila River as was done in 2010), open up more camping space and build shower facilities. These are only a few ideas available for this beautiful piece of ground.	Camper, Hiker, Equestrian, Other		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	30	There is nothing wrong with the current purpose, only the deplorable condition that the County has let it evolve to.	Camper, Hiker, Equestrian, Other		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
Survey Monkey	30	You state in your Master plan revision that you have not made up your minds yet and are accepting public input…. So, if that is the case, why are the playgrounds being removed? It seems that you are only giving lip service to what has already been decided.	Camper, Hiker, Equestrian, Other	x	Playgrounds were a safety issue and in need of replacement throughout the Department regardless of this master plan update. New playground equipment was chosen to focus on desert life rather than standard metal equipment.
Survey Monkey	30	I have included an article from the West Valley View celebrating the 50th celebration for Estrella Park. It tells a little about all the hard work and community commitment involved in developing the Park. The intention was to create a recreation area for families to enjoy in perpetuity. This park is a fabulous recreational resource for the public to go out and just enjoy. It was created as a benefit for the common people & to deviate so far from the original intention is an egregious abandonment of trust by County officials. The land, improvements and purpose were secured and accepted by men of character and honor. Their vision was true and honest, as important today as it was then. There are no excuses to justify such an abandonment of trust.	Camper, Hiker, Equestrian, Other	x	The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, racquetball, playgrounds, and a full service concession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan. The planning process includes evaluating all existing conditions and potential park improvement opportunities - as well as asking for public input - something that has been done with past planning efforts and continues today with current planning efforts.
Survey Monkey	30	Do you remember your VISION for the Park system? Vision: Our vision is to connect people with nature through regional parks, trails and programs, inspire an appreciation for the Sonoran desert beauty and natural open spaces, and create life-long positive memories. Somehow I don't find baseball fields mentioned in your 'Vision".	Camper, Hiker, Equestrian, Other	x	The Department is updating the park's master plan, not its system-wide vision.

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Survey Monkey	30	WEST VALLEY VIEW APRIL 14, 2004 50th Anniversary for Estrella Mt. Regional Park Excerpts… A family affair Dennis McCarthy, director of the Maricopa County Parks Department, and Jim King secured Caterpillar Tractor Co. to build about 2½ miles of roads in the park. The company donated its labor for the project, which would have cost $25,000. The location of the roads, however, needed to be staked out first. "But the park didn't have any employees yet, so I took my three little kids," King said. "They carried bundles of lath and hammers and things, and we went out there and staked out the roads." He also was hands-on in building Estrella Mountain Golf Course adjacent to the park, operating the heavy equipment to clear the desert floor. His major role in the creation of the park, as well as businesses in the West Valley, was bringing the relevant parties together, King said. "He just had a genuine interest in seeing Goodyear develop, culturally and everyway," King's wife, Gloria, said. She and King remain active in the community, including as members of the new organization Friends of the Park, a group dedicated to promoting and raising money for Estrella Mountain Regional Park. ("Friends" refers to Citizens For Estrella Mt. Park, CEMP) "If it wasn't for the foresight of Jim King and some of the original founders, we wouldn't be here," said Mollyann Garrett, supervisor of the park. "I think it's just a huge asset to have this kind of open, public space saved, and that they had the foresight 50 years ago to save this for the future."	Camper, Hiker, Equestrian, Other	x	Reference to article.
Survey Monkey	30	I appreciate your true consideration on this matter	Camper, Hiker, Equestrian, Other		All comments are taken into consideration as the Department progresses through the master plan update process.
Survey Monkey	31	Number one question: If soccer fields and baseball fields are so vital to the recreational well being of the area/community, why do they need to be placed in the county park rather than appropriate nearby land that should be available or (re-purposed) for recreational sports? Still no clear answer to this question without further research and investigation. Answers on May 12 were unsatisfactory.	Hiker, Picnicker		The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, racquetball, playgrounds, and a full service concession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan. The Department held no meeting regarding this park on May 12 - unsure what this is in regards to.
comment card	32	would like to see notebook, dry erase board, chalk board or any other place to write down what has been seen in the park recently - birds, mammals, reptiles, etc		x	Thank you for your input.
comment card	33	We are excited to see new development with the playground area, however are hoping that we will not lose the equipment. A splash pad would be an absolute wonderful addition to the recreational areas.	Other: parent		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

email	34	I am a horse LOVER and I used to help my parents with their Quarter Horse Ranch south of beautiful Billings, Montana! We called it Shangrila! AND, IT WAS! We took, without question, the occasional odors, blocked poo paths, fleas, ticks, biting flies, Giant Bumble Bee's and ALL the things that COME with HAVING, breeding, riding, and LOVING these MAGNIFICENT animals God gave US!!! Not to mention the PURE ENJOYMENT WE GLEANED FROM THEM!!! I am in COMPLETE DIS BELIEF that this Concerns ANYONE who enjoys playing in the BEAUTIFUL OUTDOORS, and I CAN'T BELIEVE ANYONE would want to BAN an animal for doing what comes naturally!! I personally have had MANY mishaps while riding, feeding, grooming,and / OR transporting our horses.The times this is done, is at the Race, Show, or OUR home STABLES(On a daily basis!) IF, I was visiting a friend, in their yard, in town, and he relieved himself, of course, I'd clean THAT up! But, I would NEVER HAVE THOUGHT of doing it, while out riding the Range! That's just ABSURED, RIDICULOUS, LUDICROUS, and REALLY UN NATURAL! ! Has HE NEVER had to " Find a bush " while out hiking? And did HE clean it up???? I rather doubt it! So, WHY, NOW, is it NO longer ACCEPTABLE to a few people, who find it offensive, hard to step around, or a cause for insect parties? What is the the BIG DEAL? The Good Lord made NATURAL garbage disposals for ALL His creatures, and it's worked for a Million plus years, with NO PROBLEMS!!! I SINCERELY HOPE YOU DO NOT BAN HORSES, OR ANY OTHER CRITTERS FROM YOUR RANCH(which would BE IMPOSSIBLE)!! THAT WOULD BE A MAJOR CRIME AND THEE BIGGEST MISTAKE OF THIS CENTURY!!!! The handful if people that MAY consider the BAN a NECESSITY before THEY would visit your Ranch or the Park , will have to find a new place to hike, which would be THEIR LOSS, or accept NATURE, AS IT IS INTENEDED, in ALL ITS GLORY!! DO NOT GIVE IN OR GIVE UP ON THIS MAJOR ISSUE!! PLEASE feel free to ask me to vote or comment on your behalf! I am on YOUR SIDE TO KEEP HORSES on your Ranch!!!	x	The Parks Department will remain a multi-use trail system to welcome human foot traffic, bike riders, and equistrians.
email	35	understand that you all are making decisions on the recreational and future events for the beautiful Estrella Mountain Park. I would like to express my request for supporting the continuance of the events and horseback riding provided by the Corral Horseback Riding Adventures company. Our girl scout troop enjoy this establishment, as a group, and we personally, as a family, love to take part on occasion for family outings. Please try and keep this special provider on your grounds for future use.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	36	We absolutely LOVE the services that Corral West provides, both for our extended family events as well as for our school and Girl Scout events. Its such a wonderful option to have available at Estrella. It seems that most things are always being located in the far east valley or up north, making them not feasible for the west side families. Please keep them in our park, we look forward to seeing them in the spring and fall. Great group of kind, caring, professional people.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.

email	37	I am writing to you to express my strong support of the continued operation of Corral West Adventures in the Estrella Mountain Regional Park. I visit family in the Phoenix area regularly. My family has visited Corral West's operation near Goodyear. My daughter is a wrangler with the Bittons' Idaho operation in the summer. I own a sheep ranch in Idaho that operates on more than 875,000 acres of public and private rangeland. (See {website redacted} for details.) I have worked with many outfitters over the years. I have known Jeff and Deb Bitton for more than 15 years, have used their services many times in Idaho, and can honestly tell you that I know of no other horse outfitter that operates with the same competence, professionalism and commitment to service. During the busy fall of 2002, when all of our horses were busy with sheep bands in the mountains, the Bittons outfitted a 184-mile trip on horseback from Lava Lake Ranch to Stanley, Idaho, during which we toured 13 of our grazing allotments, all without incident in very challenging terrain. Although the rides in the Estrella Mountains may be at a different scale, I know Corral West delivers what the public increasingly yearns for – an authentic experience with dust and horse sweat, through beautiful country, with friendly helpful people. As the years go by, it is harder to find this sort of opportunity. I think the citizens of and visitors to Maricopa County deserve to have this amenity continue to be available to them. I am delighted to address any questions you may have.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	38	I would like to take a moment to mention a great asset at and to Estrella Mountain Regional Park and that is the Corral West Horse Adventures located at the Rodeo/Horse Arena. Myself, as well, as many of my friends have used Corral West many times a year over the past three years. We have enjoyed it and continue to go back for more. It is a great way to see parts of the park that would otherwise go unnoticed except for the few that would venture out into its depths hiking or biking. Corral West offers a unique experience of horseback rides, wagon rides, and cookouts for families and friends. I believe it would be a huge disservice to the community to lose such a business as this. One that adds a unique experience that can not be found anywhere else close to Goodyear. In closing, consider Corral West an amenity to the park and the public while reevaluating the plan for parks usage and what it has to offer to the public now and in the future. If you would like additional feedback feel free to contact me at {phone number redacted}. Thanking you in advance for your time.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	39	My daughter is in a girls scout troop and we have been going to Corral West for the last three years. This is an event that our troop loves so very much and they look forward to it every year. They work extra hard in cookie sales so that they are able to go ride horses and have smores by the fireplace. It is an amazing experience for them. This year a couple of the girls have gone more than once and have made many great memories. We hope those fun times and memories continue for them. The owners, Deb and Jeff are wonderful people. They run a first class business.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.

email	40	I understand that as part of the plan for the park you are considering the inclusion of horseback riding in the park. If the plan is anything like the current operation I would urge you not to include horseback riding in the park. The reason is that the horse operators do a poor job when it comes to sharing trails with other park users. That is because they do not pick-up or clean-up after their mounts. If I take a dog in the park I have to clean-up after it. Why don't the horse riders do the same. At times trails are not useable by hikers because they are covered with horse droppings. Hikers can't enjoy the scenery because they are too busy watching where they step. Park rule R-105 No. 5 Prohibits "Allowing dogs and/or other animals to create a nuisance, noise or disturbance in any area." I think that blocking park trails with horse manure, a product that attracts flies and gives off a foul odor, is clearly a nuisance. Why you would consider including such an activity is beyond comprehension. Park rule R-105 No. 6 Prohibits the "Failure of owners of pets to properly remove and dispose of any waste." Why would you permit a park concessionaire to avoid this rule when private individuals riding the own pet horses are required to comply. I have taken the liberty of cc'ing Jennifer Waller since she and I have discussed this issue on several occasions. I would like to address the Commission about this issue when they are next considering the inclusion of horses in the park. Can you please let me know how to arrange this.	x	Operational. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park. The commentor has been contacted and given information on how to address the Parks Commission.
email	41	Wanted to take a moment to tell you how important it is for the community to have Corral West Adventures at your park. It's my understanding there are planning discussions under way as to what activities/programs will be offered. This is one program, without doubt, that brings a great deal of value to the park. The experience our family, Girl Scout troop and many other friends of ours have had with Corral West Adventures is amazing, memories that last forever. Not only do Jeff and Deb run an incredibly well established business - they are so connected with their visitors it only makes us come back for more. This just means more revenue for the park as well as bringing awareness of the park and its other programs to more people. My daughter attended a Girl Scout horseback trail ride in March - it was intended to be a one time event for the year. It was so amazing (we brought 16 riders) that since end of March...we have gone back three more times! Including one night for a cookout which was the most magical evening ever. Not only have we gone back three more times in the last month, but we brought friends each time = more visitors to the park because of Corral West Adventures. I realize there are lots of options you may be considering for the park overall, Corral West Adventures is one that should remain part of your program offering. It's a business based on creating memories for their riders - managed based on strong ethical business practices - and we already have plans to visit all the time next year! As a community we need Corral West Adventures at Estrella Mountain Ranch Park - we ask that you continue to make this part of the valuable programs and resources you provide. It is an amazing opportunity to experience horse back riding and cookouts with them. Can't wait for next year. Thank you for your consideration.	x	Operational. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park. The commentor has been contacted and given information on how to address the Parks Commission.
email	42	Duplicate comments from SurveyMonkey #30 entry.	x	See responses to SurveyMonkey #30 entry.
email	43	Deb and Jeff of Corral West adventures where professional and caring while working with our boy scout troop. They served roughly 50 scouts for us the day that we where their. I have not worked with a team as great as theirs during an outing. They out real emphasis on each and every one of our scouts having a fun and safe time. As a troop we were beginning to work with them on being available to the whole of the scouting community over the coming years. I know that camping at the park and enjoying the trail rides really went hand in hand. we were unable to find a location that could accommodate us as well s Corral West Adventures did. Thanks Deb and Bob for your dedication to the outdoors .	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.

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email	44	I couldn't make it to tonight's meeting regarding the future park planning so I thought I would email my thoughts. I am an outdoor enthusiast and enjoy spending my time on the trails, hiking and horseback riding. I enjoy the recreation that Maricopa County Parks provide, especially the Estrella Regional Park. My hope would be that the Estrella Regional Park would continue to host guided horseback ride concessionaires. This is a great option for horse-lovers who may not have horses or for people who can't physically hike the trails to see the beautiful views that the park provides. I enjoy seeing a variety of users on the trails and having a place that I can take friends and family to do safe, guided horseback activities. I believe that it is a wonderful service to offer park users as many people dream of seeing the desert on horseback.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	45	I would like to express my extreme concern regarding the future at our beloved park. The open space and the opportunities that are in place now have been a blessing to my friends and family. We have especially been enjoying the fairly new addition of the horses! Friends and family have learned how to ride and care for these lovely animals by taking lessons given by Corral West Adventures. Our family has taken trail rides and many fabulous rides in the wagon. We absolutely love the bon fires and BBQ's. We hope that this operation will continue for many years to come.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	46	We have visited phoenix for the past few years and were thrilled to find Corral West in Estrella park. We now make you a destination just so we can partake in the Horse rides to view your beautiful area. We have enjoyed the wagon/dinner rides so much, we gather our friends and family there to enjoy the activities of Corral West. Deb and Jeff Bitton (and the rest of their team) are wonderful to work with. Bittons have gone out of their way to be personable and knowledgeable. Deb facilitated and advised us to help make our visit to your park fantastic. We have Estrella and Corral West on our yearly schedules. I hope you do everything you can to keep this wonderful activity available for the rest of us. They are a gem!	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	47	I am writing in reply to your comments regarding the Master Plan for Estrella Park, where there's consideration of removing the grassed area of the park, and putting in a ball field . We volunteered as hosts there for 2 years and totally enjoyed the wonderful people who worked so hard for the Park. In fact, we were the ones who formed the Citizens for Estrella Mt Park (CEMP) as a non-profit organization. The feature that sets Estrella Park apart from the other County Parks is the wonderful grassed area, surrounded by trees and open areas for families to enjoy Frisbee, kick ball, and just run around. Each Park has it's own unique feature, and Estrella Park's was the expanse of grass and beautiful trees. Once this is taken away, it can never be replaced. Don't make changes for change sake..... save the money and use it to improve what is there. Yes, the Ramada's need repair, but structurally they are reparable, and you can replace a lot of tables and benches for the cost of building another baseball diamond. I respectfully request that you please do not remove this wonderful area to accommodate the baseball teams. Remodel what field you have (which will save you money) and improve the large grassed area for families to enjoy.... Easter egg hunts, Scout campouts, family reunions with field games, etc.		All comments are taken into consideration as the Department progresses through the master plan update process.
email	48	Is there any plan to increase the number of campsites available at Estrella Park? It's the perfect place to stop when cycling to Gila Bend, but there are not enough campsites, restrooms and showers.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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email	49	Please find below an email that I posted on our community email last week following a wonderful evening with Corral West Horse Adventures. I feel this venue is just coming into its own and is such a wonderful asset to the West Valley. Many people are just learning of this and are excited that we would not have to drive to Scottsdale or the far East Valley to enjoy some of the history of this area. Our grandkids were so thrilled to be "cowboys" and ride into the desert mountains. City kids need experiences like this. Please do not stop Corral West from continuing their programs in the park. / Just want to share a great evening that we experienced last night at Corral West Horse Adventures in the Estrella Mtns. We enjoyed a one hour horse back ride through the regional park, arriving at a lovely site surrounded by mountains and overlooking the Phoenix valley. There we were treated to appetizers and a catered BBQ supper. Later a huge bonfire was lit and a guitar playing, singing cowboy hosted a sing along. Lastly we toasted marshmallows and enjoyed s'mores. We were taken back to our cars in a large wagon, pulled by two energetic draft horses. If someone does not want to ride horseback, the wagon is available...esp. for younger children. All this and right in our own back yard...less that 1/2 hr. away! We had taken our kids and grands from MN there over spring break and they loved it. They also furnish hats, chaps, boots and toy guns if desired. The owners, Deb and Jeff Bitton are closing down for the season this week and going back to Utah. They will return with all the horses in the fall when the temps allow. Give them a try...it's so much fun and a great time for visiting friends and family.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	50	Keep the horse concessions in the parks. They are one of the few money generators at Estrella.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	51	My husband and I enjoyed a sunset horseback riding in the Estrella mountains last year. It was in April and the desert flowers were in bloom. Gorgeous! We are in our mid sixties and we always felt safe and the guide pointed out various cactus, flowers and landmarks. It would be a shame if this were no longer available for all to enjoy.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	52	IN THE REVISED MASTER PLAN FOR ESTRELLA PARK, WE ENCOURAGE YOU TO INCLUDE THE HORSE RIDING ADVENTURES CURRENTLY PROVIDED BY CORRAL WEST HORSE ADVENTURES. THIS IS ONE OF THE FINEST USES THE PARK PROVIDES FOR YOUNG PEOPLE AND OLD ALIKE WITH HORSE RIDES AND HORSE DRAWN WAGON RIDES FOR THOSE THAT CANNOT RIDE A HORSE. . IT TAKES YOU BACK IN TIME WHEN COWBOYS ROAMED THE RANGE. IT HAS THE CHUCKWAGON BBQ REMINISCENT OF THE OLD CATTLE DRIVES WHEN COOKIE SERVED UP THE BEANS AND HARDTACK. BEING OUT THERE IN THE ESTRELLA MOUNTAINS AS THE SUN SETS IS A THING OF GREAT BEAUTY AND LOOKING UP AT THE STARS THAT SHINE SO CLEARLY WITH AN OCCASIONAL FALLING STAR IS ABOUT AS CLOSE TO HEAVEN AS CITY SLICKERS FROM THE WEST VALLEY WILL EVER GET ON THIS EARTH. THIS IS THE DEFINITION OF RECREATION AND WE ENCOURAGE YOU TO CONTINUE TO PROVIDE IT AND PROMOTE IT. WHEN MY FAMILY AND FRIENDS COME FROM BACK EAST, I TAKE THEM TO ESTRELLA PARK AND THE CORRAL WEST HORSE ADVENTURES. THEY JUST LOVE IT, AND MORE AND MORE PEOPLE HERE IN PEBBLE CREEK ARE DISCOVERING THIS JEWEL IN THE DESERT MOUNTAINS, AND WHEN WE SIT AROUND THE CAMPFIRE AND SING THE OLD HOME ON THE RANGE", WE GET VISIONS OF ROY AND GENE AND TOM MIX RIDING HARD TO CATCH THE RUSTLERS AND I STILL SEE GABBY SAYING "YER DERN TOOTIN'". PLEASE KEEP THIS LINK WITH THE OLD WEST. IT IS ONE OF THE BEST RECREATIONS WE HAVE. THANK YOU.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.

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email	53	Please keep Estrella horse friendly. Coral West Adventures has really made a difference at the park. Our park system in Maricopa County, more and more seem to be less friendly to our Western Heritage that tamed this great land. Please keep this tradition for our kids and their kids.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	54	Thank you for reaching out the Audubon Important Bird Area program. The lower Salt and Gila Rivers IBA is adjacent to Estrella Mountain Park. The park has been a historic and valued partner in celebrating the river, including hosting the Tres Rios Nature Festival in past years. Our local chapter, Sonoran Audubon Society, has a partnership with the park, offering guided bird walks at the park. It appears the park only identifies the guide, Joe Ford, and not his affiliation with Sonoran Audubon Society. I am hoping that members of this chapter have been engaged in the earlier public meeting held in January. Your communication is the first I had heard of this effort. I will forward your email to them, as they will likely have more site specific comments. As a note, Audubon is keenly interested in the unfolding of the El Rio project and any remediation of adjacent sand and gravel operations along the river. We would encourage restoration of natural channel functions as much as is possible. The current value of this IBA is largely found in the river channel and associated backwaters that are suitable for the Federally endangered Yuma Ridgeways' (formerly clapper) rail and native riparian habitats that would be suitable for breeding neotropical migrants. From a park planning perspective a route offering safe pedestrian passage from the park to the river with appropriate river edge trails would be highly desirable. Feel free to contact me if you would like additional information.		Audubon contact(s) will be added to future stakeholder communications. These options are being considered for inclusion in the master plan alternative(s).
email	55	I had a few more ideas for the park but I don't want to flood your email. If it would be best to wait until the next meeting please let me know. In the meantime here are a few things I thought of. The EYS sports complex drew a few negative remarks due to it taking away from the quite are in the park. Perhaps the amphitheater could be made into a bit of a quiet area. Add a ramada or two at the top maybe. It just seems a shame to have it not used. I'm still trying to find a use for it. One other thought was a beginner or youth trail through the infield of the park. Possibly even run up a hill a bit. Nearly all the trails in the park go up. That can be intimidating to the younger crowd. Having a place for them to run or ride would be great. The EYS facility could attract a younger crowd that may have never experienced the enjoyment of trails. Making it easily accessible for them would be a nice way to introduce them to the fun that awaits up the hills. Thanks for all your hard work. I have the survey out to those I know. With any luck you are getting some good ideas and information.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
email	56	As a once a week hiker at Estrella Park, I would like to see the horses gone. They are a hazard to hikers who must constantly side step the horse poop. I'm surprised we don't have a lot of broken or sprained ankles. If you keep the horses they should be limited to a few trails so hikers can get back to enjoying the area.	x	The Parks Department will remain a multi-use trail system to welcome human foot traffic, bike riders, and equestrians.
email	57	I hope you will consider the great nitch that the horses and wagons, cowboys and buckboards and BBQ's fill so appropriately in the environs of Estrella Mt. Regional Park, as something that should continue to be part of the future of the park. It seems to me to be the perfect place for such an activity.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.

email	58	I am writing in support of Equestrian recreational activities in Estrella Mountain Regional Park. This is an excellent recreational activity to be offered in the park. Corral West Horse Adventures has enhanced this service to visitors and residents of the West Valley. The West Valley has limited recreational resources to draw tourists and visitors. Corral West has entertained visitors from all over the world bringing them to enjoy the beautiful desert in Estrella Mountain Regional Park. They have enjoyed the fun, exciting trail rides through out the park with their family and friends. The horse drawn wagon tours and cowboy cookouts have brought visitors back to the park again and again for an experience they can not get anywhere else in the west valley. Equestrian activities in Estrella Mountain Regional park should always be available as a recreational activity. These activities also brings additional income to the park which makes Equestrian recreational activities a must.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	59	The Corral West Horse Adventure is a Recreation we DO NOT want to lose. IN THE REVISED MASTER PLAN FOR ESTRELLA PARK, WE ENCOURAGE YOU TO INCLUDE THE HORSE RIDING ADVENTURES CURRENTLY PROVIDED BY CORRAL WEST HORSE ADVENTURES. THIS IS ONE OF THE FINEST USES THE PARK PROVIDES FOR YOUNG & OLD PEOPLE ALIKE WITH HORSE RIDES AND HORSE DRAWN WAGON RIDES FOR THOSE THAT CANNOT RIDE A HORSE. IT TAKES YOU BACK IN TIME WHEN COWBOYS ROAMED THE RANGE. BEING OUT THERE IN THE ESTRELLA MOUNTAINS AS THE SUN SETS IS A THING OF GREAT BEAUTY AND LOOKING UP AT THE STARS THAT SHINE SO CLEARLY WITH AN OCCASIONAL FALLING STAR IS ABOUT AS CLOSE TO HEAVEN AS CITY SLICKERS FROM THE WEST VALLEY WILL EVER GET ON THIS EARTH. THIS IS THE DEFINITION OF RECREATION AND WE ENCOURAGE YOU TO CONTINUE TO PROVIDE IT AND PROMOTE IT. WHEN OUR FAMILY AND FRIENDS COME TO VISIT US, WE TAKE THEM TO ESTRELLA PARK AND THE CORRAL WEST HORSE ADVENTURES. THEY JUST LOVE IT, AND MORE AND MORE PEOPLE HERE IN PEBBLECREEK ARE DISCOVERING THIS JEWEL IN THE DESERT MOUNTAINS. PLEASE KEEP THIS LINK WITH THE OLD WEST. IT IS ONE OF THE BEST RECREATIONS WE HAVE. THANK YOU.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	60	To Estrella Mountain Regional Park Master Plan Representatives; My wife and I are very distressed over the counties plan to restructure Estrella Mountain Park from a family oriented picnic and environmental recreational area to a sport's facility for the city of Goodyear. We have been neighbors, volunteers and park hosts to Estrella Mountain Regional Park for 15 years and have the following comments.	x	Thank you for your service.
email	60	1) We do not need to reduce Ramada's. They have been a major source of income. Improvement of these is needed. We are not happy in how negotiations with the group supposedly redoing the baseball fields has been going. We have lost revenue in the nearly 3 years since negotiations started. The idea to put in some soccer fields might be somewhat merited, but the plan for 6 fields and then turning over operation of these fields will impact picnic areas.	x	The Department is not anticipating any net loss of ramadas. Declining visitation/revenue has been in a steady decline for nearly a decade and is not likey in response to sports field discussions. The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, raquetball, playgrounds, and a full service consession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan.

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email	60	2) Generations have been attending Estrella Mountain Regional Park. Changing the structure from a family oriented park to a sports facility is not what the community wants or needs. Re-seed the picnic area, repair the irrigation system, add new playgrounds, replace picnic tables and BBQ's, purchase lawn mowers, bring better water and electric to the Ramada's so guests can use them. Bring back our customers. When the park had grass and playgrounds nearly 20,000 visitors came to the park over Easter weekend. The Ramada's were filled every weekend with birthdays, anniversaries, family reunions, and wedding receptions. Estrella Park was the highest income producer next to Lake Pleasant. People came for the grass. Boy Scouts, girl scouts and families stayed over night to camp and setup tents on real grass. It was the only grass in the Maricopa County Park System.	x	The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, raquetball, playgrounds, and a full service consession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan. The proposed sport facility is not initiated by the City of Goodyear but rather from a local non-profit, community and youth-based organization. If considered for the final master plan, land ownership would not be transferred to other parties but rather use a lease or similar mechanism.
email	60	3) The city of Goodyear has land they can use for these sports facilities. They should use their own property and water and not the County Park's. Will the City of Goodyear or this facility group maintain the ball fields. If so are they going to maintain the water pumps, hiking, biking and horse riding trails too? We do not want the county to loose control of our park.	x	
email	60	4) The Park has two baseball fields that are not being used because they are not being maintained. Why would adding more ball fields in the current picnic area be better? Maintain the current ball fields and bring back the Sunday League games.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
email	60	5) Market the park to get people into the park. Place events in the West Valley View like the White Tanks do. They have something going on every day in the 9 Days events section. Place large signs on the edged on the park property advertising playgrounds, picnic areas, camping areas with grass, hiking, biking and horse trails, horseback riding facilities, amphitheater, baseball, RV camping, desert trails and river trails, bird watching, quail, roadrunners, coyotes, javelins, desert flowers, cacti and trees etc..	x	Refer to 2011 Marketing Plan.
email	60	6) Add an entrance to the East side of the Park with an Iron Ranger so hikers, bikers and horse riders have an entrance. Currently park neighbors from the East side of the Park have no entrance. They have to drive 6 miles to the entrance and up to the trailhead to use the trails that are across the road.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
email	61	Well said. Thanks for your input. There is room enough in our desert for all to recreate. Separate paths for the horses is a great solution, and where paths cross, they only need a small sign indicating the direction for horses. Like you said, some people like horses and don't mind horse manure on the trail, and they may well want to hike that trail as well. I have loved horses since I used to plow with them on grandmother's little farm in West Virginia. I used to plow up Wyandot (small warlike tribe) arrowheads I'm content to watch them round the curve at the head of the stretch and hope I have the ticket on the one coming across the wire first. The folks at Corral West take their horses back to their Mystic Saddle Ranch in Stanley, Idaho. They will return here in the Fall. We are so fortunate. It only takes about 15 minutes to get from Pebble Creek to the Horse Operation at Corral West in Estrella Park. They have great picnic facilities in Estrella Park. If you have never been, you've got to go on down, and take a gang (family or club) with you. You will be glad you did. / I would make one correction ... Having specific trails for the humans and horses WOULD be a terrific idea!! That would solve the problem, RIGHT??	x	Operational. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park.

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email	62	My three children and I have enjoyed the Corral West Services offered this past year in the regional park. As home schoolers, we were thrilled with the opportunity to take horse care and riding lessons through the Corral on a regular basis this year. Our entire co-op (Estrella Mountain Home Schoolers, consisting of about 80 local families) were all abuzz about this rare chance and many took advantage. I truly felt blessed this year to be able to give my children the chance to be so close to nature and close to the large animals without traveling far from home. My eight-year old daughter, Mia, absolutely loves horses, and unfortunately, living in the city we haven't the acreage to own a horse personally. Corral West gave us what just what we needed. Lessons included horse care, grooming, safety, horse anatomy, horse history, games, riding lessons and more. My family and fellow home schoolers are so pleased that the Regional Park opened its doors once again in support of the home school local community (we've used the park in the past for our annual camp outs and have attended the nature talks from time to time). It's my hope that horses will continue to be a part of the Regional Park's offerings as my family has already made plans to visit the park many times again this fall, if only to see the "Big Mist" and the rest of the horses at Corral West.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	63	I have been a West Valley resident for 13 years. I am an outdoor enthusiast with 3 children. I am writing this email specifically to the plans for your park. My family has been using the park for the last tens years in multiple facets. We run, hike, bike and explore the trails frequently as this has become a bonding time for our family. Over the last two years my daughter has come of age to ride horses. What better location than the corral at your park. What I opened my eyes to was a very powerful experience that Corral West provides our kids through their horse camp that my daughter has been attending. Madison rides in small groups led by Ms. Deb and her staff on Wednesday afternoon. The lessons in horse care, anatomy, proper riding technique and western life these kids are getting extends their education in a unique way that I don't know can be done in other settings. The park provides a safe atmosphere that combined with Deb and Jeff's expertise and respect for the land is relayed to the kids. I can't tell how many lessons about the park Madison has come back to tell me. Lessons about the landscape, the plants native to the park, the animals and climate, to name a few. My son in turn has become excited about the outdoors. He will hike with my wife and I while Madison rides. On occasion AJ will ride with the family. During these rides I have seen some spectacular views I would not have been exposed to if not for riding with Coral West. In your plans moving forward I ask and encourage as a member of this community to keep Corral West in your plans for the park. They respect the rules of the park, they respect the people using the park, they appreciate the park for its spectacular landscapes and unique views and true beauty. They educate all their riders on these points. I truly believe that Corral West and Estrella Mountain Park could become a destination that people from all over the Valley come to experience. Thank you for you time and I look to hearing about your decisions.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place.
email	64	Enclosed is an attachment with our response to the Master Plan Update. We are the Citizens for Estrella Mountain Park, a group that has supported the park in numerous ways over its many years. We appreciate your consideration of our comments and ideas and look forward to continuing, substantial discussion of the matter. Email Attachment: Our county park support group, The Citizens for Estrella Mountain Park, wishes to comment on the proposed Master Plan Update as presented on May 12, 2015 at the Estrella Mountain Park Visitor Center.	x	The Department held no meeting regarding this park on May 12 - unsure what this is in regards to.

email	64	Estrella Park, over the years, has attempted to serve the many diverse communities surrounding it. The provision of a large "infield" area, previously grassy and fairly well maintained, was unique among the county parks. It contained contemporary playground equipment for youngsters, moderately large grassy areas on which games of many types could be played by people of all ages, numerous well-kept ramadas for picnicking as well as many quickly accessible surrounding areas for easy, short (or long) hiking and exploration opportunities for short-stay guests. A well maintained baseball field was often available for official (and even pick-up) games. This well maintained park has deteriorated in the previous few years. There is not one single reason for the lack of care, but rather several factors, as enumerated and recorded at the May 12 meeting. The most important impacting reasons that were pointed to as causes, however, seemed to be: (1) the slowdown in park attendance over the last few years, thus reducing the funding available for maintenance; (2) the inability of the County Park system to provide funding above a (less than) 10% level of the park's needed monies to maintain its ongoing infrastructure (water systems, grounds care, trail maintenance and much more); and (3) the lack of will, or at least action, to address and hopefully remedy the ongoing buildup of park deterioration. Yes, there have been upgrades to some facilities over the years; however, we are not in the present situation because of the adequacy of those needed upgrades, as essential as they have been. The desire to change the nature of the experience one has at Estrella Park is, in our view, misguided. The imposition of soccer fields and additional baseball facilities converts a natural park setting with light recreational equipment into a "sports complex" setting with the picnic and play facilities relegated to physical positioning that is not conducive to an experience many would choose to engage in. My afternoon picnic with family would hardly be planned next to soccer fields with dozens in attendance.	x	The Department held no meeting regarding this park on May 12 - unsure what this is in regards to. The 1988 master plan (p99) calls for an approx 50 acre sports complex to include 12 softball fields, football/soccer, volleyball, tennis, basketball, raquetball, playgrounds, and a full service consession stand. The Department began discussion with the youth sports group several years ago following the direction of the 1988 plan.
email	64	There are other ways and means by which, we believe, the area in Estrella Park could be utilized to help it capture additional revenues. Although, admittedly, several ways need to be more fully explored, a couple of ideas do seem to merit consideration right now: providing several, even many, campsites at various locations within the park. These could be operational for any determined times. Also, holding and publicizing serious park events that would be considered "draws" for public attendance, with recognition of the park's existence and its willingness to engage more community members as well as outsiders. While the events idea may seem somewhat less than concrete at this moment, a plan with more specifics can be presented for all to consider. A plan to increase park revenues should not begin with changing its central reasons for existence over these many years, however, which does not reduce simply to "recreation" planning.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
email	64	The idea of plopping many soccer fields and additional baseball fields in the middle of a county park is, to us, unsatisfactory. If such a real need is present within the community for these sports fields, alternative locations most assuredly should be explored before forever changing the present experience of park visitors to the Estrella Mountain Regional Park.	x	A sports field is not a new concept for the park. The 1988 Master Plan calls for a sports field - even allowing a third party or city to operate it. (Even older planning documents from the 1960s called for high density uses of various types in this area including tennis courts and an indoor gymnasium among other things.) As part of the City of Goodyear's Parks Trails Open Space Master Plan update in late 2014, their analysis showed a lack of and a need for sports fields within the City's planning area.

		Thank you for taking the time to respond to my complaint. I considered the implications of planting and maintaining turf in a park this size. The cost of water, maintenance and manpower is monumental to say the least. I am confident the right decisions will be made. Adding additional toys to the kid area is also good news. Please let me know if there is anything we can do to further along the process. It's an important landmark that needs to be developed for all the people in the west side of town. I would further suggest updating the open air amphitheater and renting it out for events. Local churches, couples planning marriage and concert goers would flock to events at this location if made available to the public. Please continue the good fight for this beautiful landmark. We would like for it to remain plain and simple, but manifest destiny appears to be on the march throughout the west valley. New homes and residents will only increase. I can only ask that you would keep in mind those old enough to remember when the old amphitheater was in service and Maricopa County had the money to maintain some of the greenest grass for miles around. I personally knew the landscaper (George Sanchez). He knew every gopher by name. Memories of my youth jogging the back trails into my late thirties will always be with me. I would hope one day my son and grandson will be able to do the same. Again, thank you for your response. Please let me know if I can be of assistance.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).
email	65			
email	66	Duplicate comments from email #64 entry.	x	See responses to email #64 entry.
email	67	Below are a couple of viewpoints. I maintain the horse operations are a major form of recreation in Estrella Park, and one that benefits both young and old alike. This is a wonderful adventure that brings the modern population closer to the traditions of the old West. It is an ideal form of recreation that brings us in tune with nature and, in my viewpoint, are what Parks are all about…..land set aside for public recreation and enjoyment where families and groups of friends can get away from the stress of the modern world and get in tune with nature, the great outdoors, and the Old West here in the wonderful Sonoran Desert. {Name redacted}, who enjoys the Park by hiking through it, has the viewpoint that horses leave products of the natural process of defecation that he finds offensive. Having been downwind of many a defecating horse, I can sympathize; however, in the end, I say that is all horse manure. Not Bull, but Horse. {Name redacted} would like it cleaned up. For Heaven's sake, this is a desert, not the sidewalks and manicured lawns of Pebble Creek. I would like to know who is cleaning up the droppings of the Coyote, the Bobcat, the Grey Fox, the Javelina, the Mule Deer, the Jackrabbit, and all the other wild animals roaming the Sonoran Desert. Horses have been a part of the West and Desert for a very long time. Nature has excellent methods of returning the excrements of all animals to the earth, and while they may temporarily inconvenience those walking the same path as the horse, I would suggest, if unbearable, take another path. Let's not get rid of the source of recreation fpr the sake of convenience. Now, that would be Bull Manure.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park.
email	67	Email attachment: I have to take a different view of this topic. I find the horses to be major spoilers of the park. As a frequent hiker in this park I often find trails blocked by piles of horse manure. The manure is offensive, smelly and attracts flies and other pests. Often I am forced off the trail to avoid stepping in the horse droppings. Park rules require users to avoid having their animals create a nuisance, Horse owners and operators ignore this rule.Park rules also require people to pick up after their pets but this rule is also ignored. Until horse owners and operators can learn to share the parks and cleanup after themselves I think they should be eliminated from the parks. I would urge all park users to write the Maricopa County Parks and Recreation Commission and urge them to either ban horses from the park or require all hose operators in the park to clean-up after their animals.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park.

email	67	Email Attachment: Fellow PebbleCreekers, I encourage each of you to send a note to the Parks address listed below and ask them to keep the wonderful horse recreation we have in our own back yard down in Estrella Park next to the Tres Rios Golf Course. Here is what happened: I received the following message regarding the revision of the Parks Master Plan. "Friends of Corral West Horse Adventures: Maricopa County Parks is revising the master plan for the Estrella Mountain Regional Park. This is the park that we operate in providing horseback rides, wagon rides, cowboy cook-outs and arena events. The park is holding a public meeting tomorrow night, Thursday April 30th at 6:00 inside the Visitor Center at Estrella Mtn. Regional Park. They are asking for public input on what recreational opportunities should be provided by this park in the future. We are asking you to attend, call or e-mail your thoughts and others you know that have used our services for the past three years on the horse activities that are being provided at the park for the recreating public. Your voice is EXTREMELY important as park personnel will be evaluating public comments for the next 20 years of future planning for the park. Thanks for your help. Let us know if you have additional questions. Thanks in advance for your your time in this matter. Jeff & Deb" The Corral West Horse Adventure is a Recreation we DO NOT want to lose. I sent the following to the Park person listed below: "IN THE REVISED MASTER PLAN FOR ESTRELLA PARK, WE ENCOURAGE YOU TO INCLUDE THE HORSE RIDING ADVENTURES CURRENTLY PROVIDED BY CORRAL WEST HORSE ADVENTURES. THIS IS ONE OF THE FINEST USES THE PARK PROVIDES FOR YOUNG PEOPLE AND OLD ALIKE WITH HORSE RIDES AND HORSE DRAWN WAGON RIDES FOR THOSE THAT CANNOT RIDE A HORSE. . IT TAKES YOU BACK IN TIME WHEN COWBOYS ROAMED THE RANGE. IT HAS THE CHUCKWAGON BBQ REMINISCENT OF THE OLD CATTLE DRIVES WHEN COOKIE SERVED UP THE BEANS AND HARDTACK. BEING OUT THERE IN THE ESTRELLA MOUNTAINS AS THE SUN SETS IS A THING OF GREAT BEAUTY AND LOOKING UP AT THE STARS THAT SHINE SO CLEARLY WITH AN OCCASIONAL FALLING STAR IS ABOUT AS CLOSE TO HEAVEN AS CITY SLICKERS FROM THE WEST VALLEY WILL EVER GET ON THIS EARTH. THIS IS THE DEFINITION OF RECREATION AND WE ENCOURAGE YOU TO CONTINUE TO PROVIDE IT AND PROMOTE IT. WHEN MY FAMILY AND FRIENDS COME FROM BACK EAST, I TAKE THEM TO ESTRELLA PARK AND THE CORRAL WEST HORSE ADVENTURES. THEY JUST LOVE IT, AND MORE AND MORE PEOPLE HERE IN PEBBLE CREEK ARE DISCOVERING THIS JEWEL IN THE DESERT MOUNTAINS, AND WHEN WE SIT AROUND THE CAMPFIRE AND SING THE OLD "HOME ON THE RANGE", WE GET VISIONS OF ROY AND GENE AND TOM MIX RIDING HARD TO CATCH THE RUSTLERS AND I STILL SEE GABBY SAYING "YER DERN TOOTIN'". PLEASE KEEP THIS LINK WITH THE OLD WEST. IT IS ONE OF THE BEST RECREATIONS WE HAVE. THANK YOU.”	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park.
email	68	It is true that no one cleans up after the coyote or the mule deer, but these are wild animals who roam freely in the desert. The horses on the other hand are property owned by people and companies. While we do not expect much from wild animals we do have different standards for people. We expect people to clean-up after themselves. We don’t tolerate littering and we expect pet owners to clean-up after their pets. Why should we expect less of horse owners than we do of dog owners? Both want to enjoy our parks with their animals. Both should be respectful of other park users. For example, park signage encourages users to share the trails. Hard to do when the trail is blocked by piles of horse manure. Park rule R-105 No. 5 Prohibits “Allowing dogs and/or other animals to create a nuisance, noise or disturbance in any area.” I think that blocking park trails with horse manure, a product that attracts flies and gives off a foul odor, is clearly a nuisance. Horse owners or operators should be required to prevent their animals from creating such a nuisance and forcing people off the trails. Park rule R-105 No. 6 Prohibits the “Failure of owners of pets to properly remove and dispose of any waste.” This rule applies to horses, as much as it does to dogs. After all, horse make a much larger mess than dogs and they have the hauling capacity to easily cart their wastes to a disposal site. There are many different reasons for visiting our county’s parks and all should be able to use and enjoy our parks. Horse should be allowed, but only if they are good visitors who don’t spoil the ability of others to also enjoy the parks. The old adage was “take only pictures, leave only footprints”. Leaving large piles of horse manure is hardly in the spirit of this kind of gentle, non-invasive, non-destructive use of park land.	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park.

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email	69	I think {name redacted} has some excellent points here. The Parks should be able to accommodate all….. humans, horses, wildlife, dogs, etc. The wildlife, coyotes and such, cannot be controlled. Humans, horses and dogs can be controlled, and should be. I would like to suggest the establishment of separate trails for humans and horses. This would eliminate the problem of humans having to stumble over piles of horse feces. Horses essentially need only one trail. Simply designate which is the trail for horses, and the rest can be for human enjoyment. If the trails cross, clearly mark the one for horses. Dogs….they can take their pick. Humans may still encounter the product of wild animals. I don't think the horses will care much one way or the other. So, Happy Trails to all, and	x	Operational. The Department is not considering eliminating Corral West horse rentals from the park. Corral West is operating under the terms of its contract and may continue to do so for as long as their contract is in place. The Department is not considering changing a park rule or policy to ban or otherwise eliminate horses or other animals from the park. It is outside of the scope of work for the master plan to change trail uses; this comment will be forwarded to the Trails Supervisor to keep on file for future trail use discussions.
letter	70	We are not able to attend the April 30, 2015 public hearing meeting and have requested that these comments be read into the minutes. We have been hosts at Estrella Mountain Regional Park for the past three winter seasons. What makes Estrella special is not that is has a turn area, but how the area is utilized by the community. In this day and age when we hear about families not connecting, loss of the skills needed for social interactions due to texting instead od conversations, and Nature Deficit Disorder the Estrella picnic area helps Maricopa county residents combast against these trends. Come visit our park any weekend, and often during the week, and you will find families relaxing and enjoying time together. You will smell charcoal grills cooking hamburgers and wood fired with marshmallows being toasted to a just right golden brown. You will hear a variety of music, voices, and laughter. You will see a familiy playing soccer, a group shooting hoops, people dancing, dads grilling, and kite flying. At all three playgrounds you will find kids being able to just be kids, climbing and swinging, while families keep watch from nearby ramadas. The groups you will pass will more often than npt be multi-generational. We have families who have been marking life's moments in Estrella for generations. They come to our ramadas for baby and wedding showers, baptismal, christening, and first communion celebrations, birthdays, family reunions, wedding, and memorial services. You should have stopped by to witness the Spring Festival of Kite Flying, the Gypsy Rendezvous, a Boy or Girl Scout campout, the Neo Tribale Gatherings, Soul Brothers Picnic, or Easter Sunday! Do we have picnic table crumbling with age? Yes. Are some of our ramadas and restrooms in need of repair. Very much so. Our new Super Playground is wonderful. Our other two playgrounds need some updating. Even so, they are enjpyed and ramadas reserved so parents can be close at hand as children play. We don't know what your master plan for Estrella contains. We can only hope you do nto just eliminate what is in need of repair. We ask you to keep Estrella a park with ramadas for gatherings big and small, more than one playground for children to enjoy and turf for kity flying and campouts. We implore you to maintain our turn area so guests can pass on the tradition of celebrating life to their future generations in Estrella Mountain Regional Park.		This option will be considered for inclusion in the master plan alternative(s).
social media	71	can't make it tonight, but need more trails with elevation gain and to peaks		This option will be considered for inclusion in the master plan alternative(s). The 2012 trails plan amendment added a trail at elevation.
social media	72	Please send in your comments regarding the County's Master Plan. This park has such potential and your input is needed. Thoughts might include better access from the East side of the park for hikers & horses... renew the grass areas .... repair Ramadas, BBQ's, tables & improve electric at the ramada sites. A water feature would be nice too to allow children to cool off. Keep the ideas coming and send them in to the County Parks Dept.		This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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letter	73	My wife and I live on the east border of Estrella Mountain Regional Park. There is no entrance on the East side. We would like to have an entrance on the East side of the park for hikers, bikers and horsemen. The entrance could include an iron ranger to collect park fees. Entrance locations could be near the intersection of 143rd Avenue and Indian Springs Road or in/near the wash near 143rd Avenue and W. South Mountain Road. Both locations are close to park road and/or trail. To access the park now, we have to drive a total of 4.5 miles from home, to the main entrance and then to the tail head. While the park water hydrant is only a few hundred yards from our house. We have been your neighbors for 14 years and enjoy the park very much. A park entrance on the East side would be very much appreciated by us and our neighbors.	This suggestion(s) or statement(s) will be further evaluated for inclusion in the master plan draft alternative(s).

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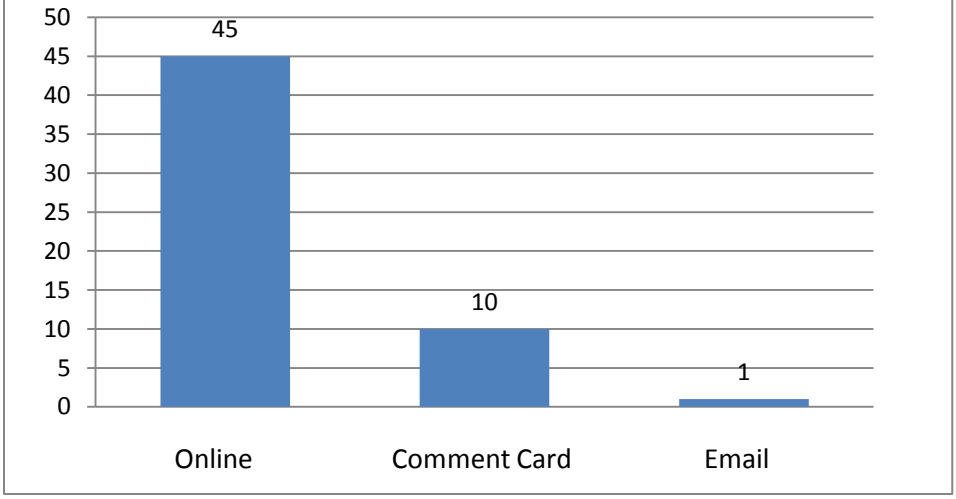
SUMMARY

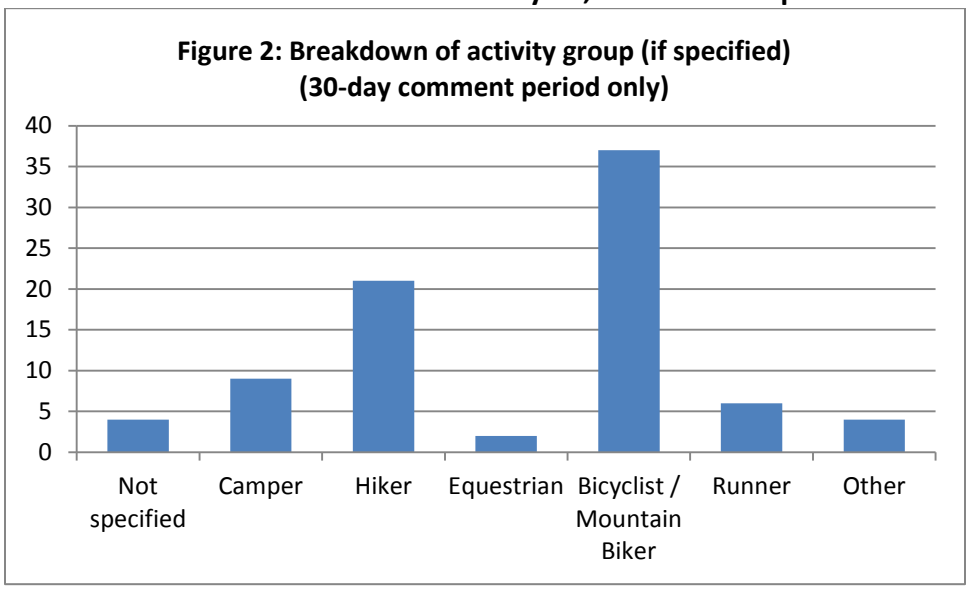
This public meeting was conducted in a presentation style format; a Power Point presentation was given along with questions and answers throughout the presentation. Additionally, display boards were stationed throughout the room and the public was invited to work their way around the room to view each board after the presentation. Department staff was available to answer any questions and to engage in discussions during the presentation and afterward. Comment cards were available for interested parties to provide their comments and feedback. Approximately 36 people signed in for the meeting but zero comment cards were received.

The Department allowed a 30-day comment period, concluding on February 29, 2016, to provide the general public adequate time to comment. Figure 1 demonstrates how the various pieces of communications were received during the 30-day comment period.

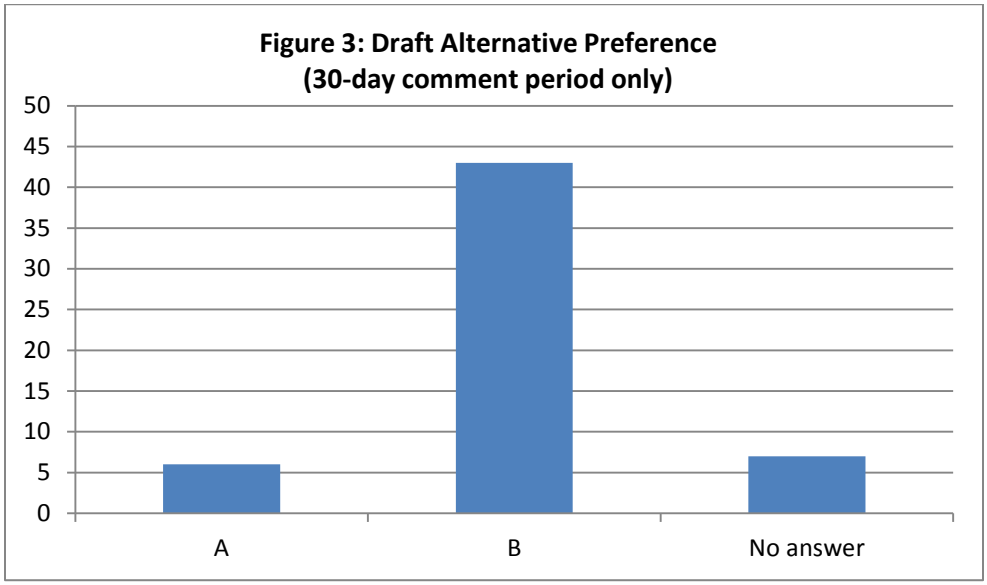
Figure 1: Comment Source
(30-day comment period only)



Commenters were allowed to choose more than one activity group that best represents themselves. Of those that specified their preferred activity, “Bicyclists / Mountain Bikers” represented 82% of respondents, followed by “Hiker” at 47% (figure 2).



When public participants were asked if they preferred draft alternative A or draft alternative B, about 76% selected draft alternative B (figure 3). Some participants provided additional comments to express how they might alter or enhance draft alternative B.



Department planning staff reviewed each of the comment cards and surveys received. Out of those 56 communications, Department planning staff recognized 155 unique comments. Further, out of the 155 unique comments, 28 (or about 18 percent) were considered to the out of the scope of the Master Plan Update. *Out of scope* means that the comment or suggestion is already covered by another planning document; it may also mean that the comment pertains to an operational matter; or it may mean that the comment does not otherwise fall under the purview of a master plan. Other comments deemed out of scope may also be too generalized or vague to work with. In any case, all comments were forwarded to park management for their reference.

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Table 2: Unique and Out of Scope Comments	
Unique Comments:*	155
Out of Scope Comments:	28
Percent out of scope	18%

*One comment card may have contained more than one type of comment. Total will exceed number of respondents.

A master plan does not dictate hours of operation, staffing, programing or other day-to-day activities. A master plan also does not dictate activities that occur outside of park boundaries. As noted at the public meeting, the purpose of a master plan is **to outline the long-range vision for the park as well as development priorities that will provide for both the public's enjoyment and the protection of the park's resources.** A master plan also:

- Serves as a guide and policy document for current and future park staff, partnering agencies, elected officials, and interested members of the public.
- Guides management of natural, cultural, and recreational resources.
- Considers a range of issues such as staffing, funding, encroachment, wildlife corridors, public needs, and more.
- Considers staff, stakeholder, and public recommendations.
- Identifies park enhancement opportunities including possible upgrades to park facilities, recreation infrastructure, restoration opportunities, etc.

The remaining substantive comments will be further evaluated and potentially carried forward into the recommended or preferred alternative for the master plan. Many of the trail related comments will be deferred until the next Trail System Plan update and/or Trail Maintenance Manual update as many of the trail related comments would require a change in established trail use guidelines or perhaps park policy and that is beyond the scope of this Master Plan Update. Table 3 details each unique comment received.

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	Public Meeting #2	
	30-Day Public Comment Period	
Method	**What I like best:**	**Out of Scope**
Comment Card	RV sites in the arena area.	
Comment Card	More ballfields by existing field.	
Comment Card	The vision for park development.	
Comment Card	camping	
Comment Card	Yes to field improvements adding fields	
Comment Card	RV camping	
Comment Card	B16 B6 B5 B18 - but not sure how you clear turf of ground squirrels for sports fields without impacting wildlife.	
Comment Card	B 43 - but what about lighting of night games at sports fields	
Comment Card	The peak trail. Better & more challeging trails.	
Comment Card	new restrooms	
Comment Card	ramada renovation	
Comment Card	B43 Like Lightscape Plan but how does that square with a lighted soccer field?	
Comment Card	B16 new peak trail.	
Comment Card	B5 fixing up ramadas.	
Comment Card	B6 restroom imp.	
Comment Card	B16 new peak trail.	
Comment Card	B5 fixing up ramadas.	
Comment Card	B6 restroom improvements	
Survey Monkey	I like that there will be more camping options and potential trail expansion	
Survey Monkey	I would welcome additional trails	
Survey Monkey	I don't care for either alternative.	
Survey Monkey	It doesn't include new ball fields.	
Survey Monkey	I like addition of new multi-use trails. A connector trail to the Comp Loop is great! The community has lost way to much access to this amenity!	
Survey Monkey	Closer maintains natural areas of park for both people and wildlife	
Survey Monkey	no changes	
Survey Monkey	Jumps, drops	
Survey Monkey	Looking for fun trails to ride with my 2 young boys to grow and progress our skills.	x
Survey Monkey	Design and build advanced mountain bike trails	
Survey Monkey	Fast and flowy with smooth jumps and drops added to the mix.	
Survey Monkey	Flow trails, jump lines, drops, berms, etc	
Survey Monkey	Berms, technical rhythm sections, jumps, and more berms.	
Survey Monkey	Flow trails with good speed big berms, jumps and drops	
Survey Monkey	Jumps, Drops, Berms, Technical, Steep, Advanced, Challenging trails.	

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Survey Monkey	Fast, flowy trails with jumps and drops. Think Whistler.	
Survey Monkey	The possibility of helping to design, build, and maintain advanced trails for mountain bikers.	x
Survey Monkey	Ongoing improvement of existing infrastructure and development of a "best in class" trail system for bikes, hikers and horses.	
Survey Monkey	Educational opportunities for all should continue	x
Survey Monkey	New Trail Options	
Survey Monkey	Trail development-based out of nature center. The trail work that has been completed is exceptional and is drawing more use. Especially mtn bikers. Rainbow, butterfield all great trails.	
Survey Monkey	Trails	
Survey Monkey	Improving mountain bike/hiking trails.	
Survey Monkey	"design, build and incorporate more challenging trails for hikers and mountain bikers akin to National Trail…"	
Survey Monkey	I like the emphasis on trail improvements and additional trailheads (prioritize mountain biking access and challenges	
Survey Monkey	I am a mountain (and road) biker. The only reason that I buy a season pass is to ride the trails in this park. I was encouraged to buy a pass from my peers from the West Valley Trail Alliance. At first I couldn't believe how much better the trails are in the park. Wow. I have noticed an incredible improvement. I am spreading the word about the great trails. I expect others to see that the trails are getting better. I believe that the improved trails will increase revenue for the park.	
Survey Monkey	New proposed trails for Mt bikes and hikers.	
Survey Monkey	Connector trail to the comp loop.	
Survey Monkey	Mountain Biking/Hiking trails	
Survey Monkey	Development of challenging trails similar to National at South Mountain.	
Survey Monkey	Improvements and additions to the trails.	
Survey Monkey	Additional trails, more challenging trails	
Survey Monkey	More challenging trails akin to National and Mormon Trails at South Mountain	
Survey Monkey	Trails	
Survey Monkey	Anything trail	
Survey Monkey	more Mountain biking trails	
Survey Monkey	More challenging trails for mountain bikers and hikers.	
Survey Monkey	More challenging trails. Peak trails. More "backcountry" type areas.	
Survey Monkey	Ramada renovation/development	
Survey Monkey	more access(Trails!)	
Survey Monkey	More trails and trailheads	
Survey Monkey	Added camping RV and primitive. The park is missing out on what all the others offer.	
Survey Monkey	The cabin idea at the old theatre is really cool.	
Survey Monkey	Always a fan of any trail improvements too. The comp loop improvements are a must if the park wants to attract good events there.	
Survey Monkey	The ball fields are a great way to increase users and showcase amenities.	
Survey Monkey	Connector between park and comp track and more upgrading comp track	
Survey Monkey	I prefer neither alternative.	
Survey Monkey	I like the addition of new trails and upgrades.	

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Method	What I would add or change:	
Comment Card	Don't agree with B13 on Plan B / B29 on Plan B. Who will maintain? Will these fields be available for kite flying other play? How will gopher problem be solved?	
Comment Card	Navy area should still allow overnighters, many scout troops use these areas.	
Comment Card	more trees	
Comment Card	(add) full hook-up sites, water, electric	
Comment Card	B11 - we serve community with Scout groups that camp there.	
Comment Card	B13 - concern about environmental impact with gopher extinction, reduced picnic area for community, inability to host large exents as we do now.	
Comment Card	(add) full hook up campsites in the horse arena space. Many calls for "hook up" sites!	
Comment Card	More full hook-up sites up at rodeo arena	
Survey Monkey	I would like to have the soccer fields eliminated from the plan	
Survey Monkey	More trails and more trail racing events	
Survey Monkey	Forget about the ball fields. They have no place in our park.	
Survey Monkey	Build and improve things (trails and ramadas) for the folks who use the park most. Given the state of the existing ball fields and the number of events/people I see in the ramada areas and on the trails, I would guess that would NOT be kids playing organized sports.	
Survey Monkey	There are TOO many ball parks & soccer fields in this plan! Please reconsider this change. I would hate to see this beautiful nature park become a sports complex that would be better suited for municipalities! I know you have a partnership with Estrella Youth Sports but I worry about the disruption to the serenity EMP offers to both wildlife and people. (night lights, noise, traffic, water usage for fields etc..) In addition, what would happen when EYS increasingly reserves the "green space" leaving other returning large groups unable to schedule their activities/events? Another concern is that the park may be left with multiple fields to take care of if & when EYS decides to leave. If the fields are to be built, please consider reducing the number thus allowing more open space and scheduling flexibility for other community groups/events.	
Survey Monkey	More trails added as outlined in the alternative B. Estrella already has great trails and additional trails would be very good especially one to a high point for a view.	
Survey Monkey	Also the development of the wetlands area would be a great enhancement.	
Survey Monkey	no mountain bikers on the trails	
Survey Monkey	More freeride/technical downhill	
Survey Monkey	Progressive trail design...green to black trails to learn on. I love the flagstaff bike park setup.	
Survey Monkey	Depending on the current trail availability, if there already are lots of beginner and intermediate trails, then more advanced trails would be favorable.	
Survey Monkey	I would add nice wide smooth berms, flowy gap and filled in jumps and have alternate options for those who aren't ready for the jumps and have drop options as well	
Survey Monkey	Add safe passing sections for all trail users (hikers and mountain bikers especially).	
Survey Monkey	Flow trails with good speed big berms, jumps and drops	
Survey Monkey	Jumps, Drops, Berms, Technical, Steep, Advanced, Challenging trails.	
Survey Monkey	Berms, jumps, drops and biker only trails to keep everyone safer while out enjoying their preferred outdoor activities.	
Survey Monkey	Add Flow Trail with Berms and jumps Add Pump Track and Jump Lines	
Survey Monkey	Better mtn bike, multi-use trails	

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Survey Monkey	Expand trail system based out of nature center for hikers and bikers. Complete pederson trail work-find alternates to the return part of this loop that is a sand slog on the southern half. More advanced hiking biking terrain such as National trail is ok but it doesn't have to be that advanced.	
Survey Monkey	Additional water	x
Survey Monkey	Replace/improve and certainly service regularly, the latrine porta-john facility at the comp track.	x
Survey Monkey	I really like A9 from Alternative A. I think that there is a lot of potential in partnering with local volunteers like the West Valley Trail Alliance, MBAA and the local IMBA chapters. I think that there is a lot of untapped potential users of the park to be found with even better maintained and developed trails.	
Survey Monkey	Don't invest in concrete attractions like an entrance monument.	
Survey Monkey	Invest in needs like a restroom at the comp loop.	
Survey Monkey	Increase the priority to high instead of medium. I fear that medium priorities will be forgotten over high priority items.	
Survey Monkey	I used to use the trails at Estrella but have since abandoned them for more challenging and fun options.	x
Survey Monkey	A connector to the comp loop. Leave everything else the same.	
Survey Monkey	Perhaps another iron ranger at remote entry points.	
Survey Monkey	Also, annual pass that is park specific so maybe half of the entire system price.	x
Survey Monkey	Backcountry campsites not just close-in primitive sites.	
Survey Monkey	Add a trail connecting the main park to the Competitive Track.	
Survey Monkey	Add back country camping near the south end of Pederson trail. Simple area marked with primitive spots.	
Survey Monkey	Put a priority on a trail that hugs the base of the mountains to make a good loop back from Pedersen.	
Survey Monkey	Make RV camping a higher priority to access users from PIR and Spring Training.	
Survey Monkey	Perhaps use the area behind the nature center for a small, easy to build bike skills area.	
Survey Monkey	A granite trail on the inner turf area would be easy to build and entertaining if skills areas were placed near it.	
Survey Monkey	Plan for a more beginner friendly trail that stays closer to the base of the mountains instead of running right up them.	
Survey Monkey	Nothing	x
Survey Monkey	Get rid of the sports fields. That should be a city park item.	
Method	**Additional Comments**	
Comment Card	Would like to see better more causual picnic areas in the turf, better maintenance of the turf.	
Comment Card	Give the park the equipment it needs for better maintenance.	
Comment Card	I question the ASU survey conducted 2012. What time of year was the survey conducted? Were only hikers questioned during the survey? Was parts of the survey conducted during a large public event? Is the raw data from the survey available for public review? Were the alternative plans based on this questionable survey?	x
Comment Card	I love camping under the trees in this park	x
Comment Card	Need more camping spaces	
Comment Card	Good work!	x

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Comment Card	Need more camping spaces	
Comment Card	if an educational institute is used for surveys in the future a MCPRD employeee or volunteer should supervise to insure accuracy - some of the stats just don't seem accurate from 2012 survey - perhaps a 3rd party nuetral survey company should be used	x
Comment Card	Would hope to see grass in the turf (B13) area after weed control but not all concerned over soccer fields - please leave it for picnics and general recreation could include soccer fields for the gophers.	
Comment Card	(Also B11) save Navy area for Scouts overnights	
Comment Card	Keep up with water improvements on lawn area (*remaining text illegible*)	x
Email	I attended the meeting at Estrella Park and I will list my concerns below. I do see some advantages from the meeting. My problem with most of it is the areas that have not currently been maintained. If they aren't being maintained now how can you possibly add more? (Picnic areas, current ball field are a couple examples)	x
Email	This has appeared to me to be more of a wildlife park, adding any stadium lights, volleyball courts, soccer fields etc. would impact the wildlife. When you start adding all these you are also adding more traffic, noise and not to mention more trash!	x
Email	I also heard it mentioned at the meeting about having to get rid of the gopher holes/mounds, how would this be done? If you start using poisons wouldn't have an effect on the wildlife?	x
Email	Scouting events, races, Audubon bird hikes (which I personally enjoyed) and many other events seem to have served the needs of others and I have met many people attending these functions that have driven some distance. I'm sure there are more events that I am not aware of.	x
Email	I think it would be nice to add RV campsites where the rodeo arena is. Since I've been in Estrella Mtn. Ranch I've never heard of a rodeo being held there.	
Email	More trails would be nice, since so many people hike there! Thanks for your time!	
Survey Monkey	There was no support for EYA at the Master Plan Meeting. If this is so important to them why did they have Bo representation?	x
Survey Monkey	I like the park the way it is, I'm afraid with the addition of soccer and baseball fields it would eliminate the opportunities for races put on by Trail running clubs. In addition it would take away from the being out of the city and in nature. There are already many sports complex fields in the area and I would be afraid to lose the park as I see them getting more revenue from racing events and boy scout clubs, where the competition is not as great. Let's put our efforts into fixing up what we already have. We have two ball fields that are in disrepair and pavilions that need major fixing up. Let's fix up what we currently have so we can one again be proud of our park - then I am sure attendance will increase. We need to maintain the large open area we currently have for events that have nowhere else to go. Forget all of the new ball fields - the ones we have are not being used.	
Survey Monkey	A) There is no lack of empty lots in Goodyear to build ball fields. Why destroy the culture and feel of Estrella for kids who may or may not show up to play sports? I'm sure the rodeo arena seemed like a good idea at the time, too. Look how much it gets used now.	
Survey Monkey	B) If you can't keep the "grassy" areas around the ramadas green, how are you going to keep ball fields watered and maintained?	x
Survey Monkey	C) Why is this presented as "improve everything else in the park and build a zillion ball fields" or "improve nothing and leave everything as is"? If you have the budget to build expensive stuff nobody will use, you should have the same budget to build stuff people WILL use, right? Like trail improvements and ramada renovations.	

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Survey Monkey	I was very disturbed with the idea of turning the park into a sporting facility. Even though the presenters said the areas would be available for park goers use when games were not being held, I find it hard to believe an outside company would allow that kind of use. I didn't like the seemingly overcommercialization of the park. There seemed to be less concern for people who want to enjoy the park for recreational hiking, etc. and more for trying to get organized sports into the park which would have a detrimental effect on the park.	
Survey Monkey	The main problem with alternative B is the proposed sports complex. I'm sure there is a much better location for a sports complex. Locating one in Estrella Park would greatly increase traffic, trash, and hinder access for hikers/bikers/equestrians as well as limit the camping/day use areas available not to mention the harm to the wildlife which is a great draw for the park. I think it even more important to maintain these islands of nature for future use as the development in the valley keeps expanding.	
Survey Monkey	please slow the mountain bikers down, they ride to fast.	x
Survey Monkey	Please let everyone have a say in the trails and let others also enjoy the ride! Not everyone enjoys just distance riding. There are tons of different styles of riding and the sport is growing so having more options for people encourages them to push their skills and get out and ride. After that's what riding is all about right? Just getting out and riding!	x
Survey Monkey	The mountain biking economy is growing significantly. The medium income for mountain bikers is now well above the average, they are politically active, and stewards of the environment. I think option B is a great plan and should have a positive economic benefit to the surrounding area if executed and promoted well.	
Survey Monkey	More advanced trails can increase biker related tourism. I leave the valley, as well as hundreds of others, every year to ride Big Bear, Angelfire, Utah, and other parts of the state. Why not keep these people here and attract more to the valley?	
Survey Monkey	The Advanced Trails Maricopa County is severely lacking and needs to satisfy the demand for are Flow Trails. This type of trail can be constructed with beginners and advanced riders in mind. Various intermediate features such as table top jumps and drops can be built with "ride around" options. This would boost attendance numbers immensely and offer a wider range of rider experience. Resorts around the world are pulling in millions per season because of these trails.	
Survey Monkey	Thank you.	x
Survey Monkey	Would focus efforts on expanding trail system that has been started out of the nature center, rodeo arena region. This is the best single track in the west valley. The competitive loop is not enjoyable terrain. Expanding singletrack will draw more visitors. The excellent work already done has been noticed and should be embraced and built on. Mcdowell put showers at the pemberton trailhead-would this be a part of the bathroom work?	
Survey Monkey	We have a true gem at Estrella. It's every bit as nice as the more regarded McDowell and San Tan.	x
Survey Monkey	I would love to see the connector to the competitive loops. I live in Estrella Mountain Ranch. I am able to access the park from trails that the Trails Committee developed. It is possible to do 50+ mile loops when riding into the park from my neighborhood. I think this is something that can be communicated to my community as a way to build revenue and users.	

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Survey Monkey	Keep the park raw untouched desert as much as possible. I love this park because it's not full of concrete man-made attractions. We don't need ziplines, metal playgrounds or glass art in the desert. There are other venues for those things. Put the money into trail maintenance, plant and animal preservation and all the other reasons we already come to the park. We hike and ride bikes to escape the concrete jungle of the city. There's nothing better than feeling like you're in the middle of untouched desert. I love the south side of the park and the comp loop because it's raw desert. No bulldozer has been through there. Please don't build a city in the park. We have a city...that's encroaching on our desert. I'm an arizona native and i hate to see raw desert disappearing acre by acre.	
Survey Monkey	My family has bought an annual pass to the park for the past couple of years. We visit the park on a weekly basis, and we love the trail system, the running and biking events, and the horseback riding tours. The park is a beautiful, under utilized natural resource.	x
Survey Monkey	It is appreciated that the dialogue is happening. Thanks.	x
Survey Monkey	The park is great. Don't take all the "complaints" into account. The trails are stellar. There really needs to be nothing done, a connector would be nice though.	
Survey Monkey	Thanks for the improvements over the last couple of years to the trails. Awesome for mountain biking. I like the idea of more trails with a view that are still ride-able to the average rider and accessible to the average hiker.	
Survey Monkey	With the formation of the West Valley Trail alliance IMBA chapter the park will be able to utilize more volunteers for trail building and maintenance	
Survey Monkey	Thank you for all the time being put into the plan. The needs have changed and the timing couldn't be better.	x
Survey Monkey	Estrella is an awesome park but the name isn't out there like south mountain and other parks. With these upgrades it will draw more people	x
Survey Monkey	With gophers present, any sports fields would be hazardous. There will be twisted/broken ankles since you can't stop them from digging. Lawsuits will be in your future. We need open space for very large group activities.	x

Estrella Mountain Regional Park
Master Plan Update
COMMUNICATION PLAN

1.0 PURPOSE

The purpose of this plan is to provide guidance and direction for internal and external communications and public involvement activities associated with the Master Plan Update.

Goals

- Provide the public with accurate and consistent information regarding the proposed Master Plan Update, the public participation process, and opportunities to influence the decision; and
- Ensure that anyone potentially involved in the process is aware of the opportunities for input into the Master Plan Update.

2.0 ISSUE

The Maricopa County Parks and Recreation Department (MCPRD or Department) has initiated an update to Estrella Mountain Regional Park's 1988 Master Plan. The update is to serve the park for the next twenty years and will address changing trends in both demographics and activities.

3.0 MESSAGING

Accurate and consistent messaging and communications with the public is vital to a successful master plan update. Department staff shall make every effort to communicate with the public often and accurately. Some of those messages include:

- Turf grass area(s) are unsustainable compared to other needs in the park (trails, super playground, trailheads, signage, ramadas, etc.).
- Turf area sport field provides the opportunity to generate funds for programs, maintenance, operations and facilities (i.e., super playground, trails, signage, trailheads, ramadas, etc.).
- Park attendance had dropped over the years even when there was grass.
    - Historically, this was the only park with turf. Now neighborhoods have parks with turf closer to home.
- Current visitor trends reveal trail related used have surpassed all other uses.
- Ramadas are still a draw and will be updated and some relocated closer to the Super Playground area and restrooms.
- Changes and plan for the new super playground complex.
    - The old playgrounds became unsafe by current standards.
    - New ramadas are planned for the consolidated Super Playground area.

4.0 KEY AUDIENCES

The following list contains the agencies, entities, and public that was contacted during the Master Plan Update process. Others may have been contacted as needed.

Table 1: Key Audiences		
State Agencies and Local Governments		
Agency	**Name**	**Address**
Arizona Game and Fish Department	Dana Warnecke and Dustin Darveau	5000 W. Carefree Hwy. Phoenix, AZ 85086
Maricopa County Department of Transportation (MCDOT)	Denise Lacey and Bob Woodring	2901 W. Durango St. Phoenix, AZ 85009
Maricopa County Flood Control District	Doug Williams	2801 W. Durango St. Phoenix, AZ 85009

Maricopa County Sheriff's Office (MCSO)	Scott Baker	102 W. Madison Phoenix, AZ 85009
Arizona State Historic Preservation Office (SHPO)	James Garrison	Arizona State Parks 1300. W. Washington Street Phoenix, AZ 85007
Arizona State Land Department	Michelle Green	1616 W. Adams Phoenix AZ, 85007
Maricopa County Planning and Development	Matt Holm	501 N 44th St., Suite 200 Phoenix, AZ 85008
City of Goodyear Parks and Recreation	Nathan Torres	14455 W. Van Buren St. Goodyear, AZ 85338
City of Goodyear Water Resources	Mark Holmes, P.G. and Gretchen Irwin	4980 South 157th Avenue / PO Box 5100 Goodyear, AZ 85338
City of Avondale Parks and Recreation	Kirk Haines (previously Chris Reams) and Christina Underwood	11465 W Civic Center Drive Avondale, AZ 85323
Maricopa Trail	John Rose	41835 N. Castle Hot Springs Rd – Unit Operations Center Morristown, AZ 85342
City of Goodyear, Arts and Culture	Guylene Ozlanski	14455 W. Van Buren St. Suite C103 Goodyear, AZ 85338
City of Goodyear, Transportation	Luke Albert	14455 W. Van Buren St. Goodyear, AZ 85338
Elected Officials		
Title	**Name**	**Address**
Maricopa County Board of Supervisors, District 1	Denny Barney	301 W. Jefferson, 10th Floor Phoenix, AZ 85003
Maricopa County Board of Supervisors, District 2	Steve Chucri	301 W. Jefferson, 10th Floor Phoenix, AZ 85003
Maricopa County Board of Supervisors, District 3	Andy Kunasek	301 W. Jefferson, 10th Floor Phoenix, AZ 85003
Maricopa County Board of Supervisors, District 4	Clint Hickman	301 W. Jefferson, 10th Floor Phoenix, AZ 85003
Maricopa County Board of Supervisors, District 5	Steve Gallardo	301 W. Jefferson, 10th Floor Phoenix, AZ 85003
Federal Agencies		
Agency	**Name**	**Address**
Bureau of Land Management - Lower Sonoran Field Office	Ed Kender and Jim Andersen	21605 North 7th Avenue Phoenix 85027
National Park Service (RTCA)	Cate Bradley	255 N. Commerce Park Loop Tucson, AZ 85745
U.S. Bureau of Reclamation	Deborah Tosline, R.G.	6150 West Thunderbird Road Glendale, AZ 85306-4001
Tribal Interests		
Agency	**Name**	**Address**
Gila River Indian Community	Ondrea Barber and info@gilariver.org	P.O. Box 2140 Sacaton, AZ 85147
Advisory Commissions, Boards, or Councils		
Title	**Name**	**Address**

Maricopa County Parks and Recreation Commission	Carlton 'Carl' Yoshioka	411 N. Central Ave. # 550 Phoenix, AZ 85004
Maricopa County Parks and Recreation Commission	Rod Jarvis	Gallagher & Kennedy Attorneys At Law 2575 E Camelback Road, Suite 1100 Phoenix, AZ 85016
Maricopa County Parks and Recreation Commission	Denise Merdon	3878 E Claxton Ave Gilbert, AZ 85297
Maricopa County Parks and Recreation Commission	Jack Stapley	C/O Farnsworth Wholesale 27 W. Baseline Road Gilbert, AZ 85233
Maricopa County Parks and Recreation Commission	Anne Lynch	7509 North 14th Avenue Phoenix, AZ 85021
Maricopa County Parks and Recreation Commission	Dr. Robert Branch	18331 W Palo Verde Ave. Waddell, AZ 85355
Maricopa County Parks and Recreation Commission	Devin Del Palacio	C/O Goodwill of Central AZ 2702 E Washington Street Phoenix, AZ 85034
City of Goodyear Youth Commission	Lauren Valencia	190 N. Litchfield Rd. Goodyear, AZ 85338
City of Avondale Youth Commission	Chris Lopez	11465 W Civic Center Drive Avondale, AZ 85323
Maricopa County Trail and Parks Foundation	Jan Hancock	41835 N. Castle Hot Springs Rd. Morristown, AZ 85342

The following list of stakeholders may have a special interest in the park due to their preferred outdoor recreation activity or another area of interest. Those noted on this list, and others as needed, were also contacted during the Master Plan Update process.

Table 2: Special Interest Groups		
Group	**Name**	**Address**
Audubon Arizona	Tice Supplee	3131 South Central Ave Phoenix, AZ 85040
Central Arizona Conservation Alliance (CAZCA)	Stacie Buete	1201 N. Galvin Pkwy Phoenix, AZ 85008
Citizens for Estrella Park (CEMP)	Gary Sawyer	Goodyear, AZ
Three Rivers Historical Society	Sally Kiko	P.O. Box 7251 Goodyear AZ 85338
Coral West Adventures	Deb Bitton	Goodyear, AZ
West Valley Trail Alliance (WVTA)	Brian Murphy	Goodyear, AZ
Estrella Youth Sports (EYS)	Joe Bruyer and Dale Camarata	Goodyear, AZ
Arizona State University (ASU)	Denise Bates	Phoenix, AZ
Aravaipa Running	Jamil Coury	Phoenix, AZ
Tres Rios Golf Course	Scott Jacques and Jon Siltcher	15205 W. Vineyard Ave Goodyear, AZ 85338
Mt. Pleasant Baptist Church, Youth Group	Pastor Burrell and Tonya Kemmer	403 N. 4th Street Buckeye, AZ 85326

5.0 CONSULTATIONS

Bureau of Land Management

Department staff has invited the Bureau of Land Management (BLM) Lower Sonoran Field Office to all stakeholder and public meetings. Department staff also consulted with the BLM to discuss the master plan and to get their approval and an approval letter to be included in the final master plan – as acknowledged by the signature page at the beginning of the master plan.

State Historic Preservation Office

The State Historic Preservation Office (SHPO) has not been consulted to date. After the final Master Plan is approved, cultural resource survey(s) will be performed on any new ground disturbing projects and the Department will follow any recommendations received from SHPO.

Land Water Conservation Fund (LWCF)

Many of the park's built facilities were constructed using LWCF monies. Any changes to the scope of the LWCF grant terms should be reported to and evaluated by Arizona State Parks' LWCF coordinator for approval. An initial discussion was held February 11, 2016 between planning staff and the LWCF coordinator; a follow up meeting and site visit will be required prior to any demolition and/or construction to existing facilities built with these funds. Public input received during the master plan update process will be taken into consideration by the LWCF coordinator.

Native American Tribes

The Department contacted representatives listed on the Community website for Natural and Cultural Resources department and the general information center was notified by email of the Master Plan Update and was extended an invitation to comment any issues that may affect the Community.

6.0 OUTREACH AND MEETINGS

The Department engages various opportunities to consult and interact with stakeholders and the public. As noted in Table 3, stakeholder meetings, public meetings and public announcements have been held throughout the planning process.

Table 3: List of Meetings or Communications, Topics, and Audiences

Date	Type	Description	Audience
4/10/14	Planning Team Meeting	Kick off the project, introduce project and timeline, review neighboring land uses	MCPRD staff
4/17/14	Partner Meeting	Introduce project, discussion to those with contractual obligations to the park (i.e. concessionaires)	Partners
5/8/14	Planning Team Meeting	To review demographics, park use, 1988 master plan, and issues	MCPRD staff
6/19/14	Planning Team Meeting	Brainstorming workshop for park enhancement ideas	MCPRD staff
6/30/14	Planning Team Meeting	Brainstorming workshop for park enhancement ideas (continuation of 6/19/14 meeting)	MCPRD staff
7/9/14	Planning Team Meeting	Front-country site visit and discussions	MCPRD staff
4/15/14	Presentation	Maricopa County Parks and Recreation Commission presentation with PowerPoint to update Commissioners on progress to date	General Public
8/4/14	Planning Team Meeting	Update since previous meetings, park enhancement opportunity discussion	MCPRD staff
9/15/14	Planning Team Meeting	Update since previous meetings, MCDOT assistance for road analysis	MCPRD staff
10/23/15	Partner Meeting	Discuss how adjacent agencies might be able to partner with	Partners

		the Park/Department and/or with its concessionaires	
11/18/14	Presentation	Maricopa County Parks and Recreation Commission presentation with PowerPoint to update Commissioners on progress to date	General Public
1/7/15	Email	Invitation email to Stakeholders for 1/19/15 meeting	Stakeholders
1/22/15	Planning Team Meeting	Backcountry site visit and discussions	MCPRD staff
1/29/15	Stakeholder Meeting	Introduce project, review demographics and trends, discussion	Stakeholders
2/17/15	Staff meeting	Kick-off meeting to introduce MCDOT's assistance to analyze internal park roads and nearby intersection	MCDOT, MCPRD staff and Stakeholders
3/25/15	Press release	To announce 4/30/15 public open house meeting	General Public
2/25/15	Email	Invitation email to Stakeholders for 3/26/15 meeting	Stakeholders
3/25/15	Youth outreach	Presented to City of Goodyear Youth Commission and received feedback	General Public
3/26/15	Stakeholder Meeting	Site visit, recommendations, discussion	Stakeholders
4/1/15	Email	To announce press release to Stakeholders and to the Estrella home owners community email address.	Stakeholders
4/11/15	Youth outreach	Attend City of Avondale's "Global Youth Service Day" to hold mini focus groups with Youth to receive feedback	General Public
4/15/15	News publication	Regarding Centennial Trail project, but mentions Master Plan Update (azcentral.com)	General Public
4/20/15	Social Media / Web	Facebook notification and Calendar entry for park events to announce 4/30/15 public meeting	General Public
4/23/15	News / Social Media	Information posted online at three sources: • http://www.buckeyevalleynews.net/#!press-release/c15mw • https://www.facebook.com/pages/Buckeye-Valley-News-Since-1912/176986262396647?ref=hl • https://www.facebook.com/pages/Buckeye-is-open-for-Business/705612529451489?ref=hl	General Public
4/30/15	Staff meeting	Progress update meeting regarding MCDOTs progress in analyzing park roads and recommendations	MCDOT, MCPRD staff and Stakeholders
4/30/15	Public Meeting	Introduce project, review demographics and trends, introduce potential projects, discussion. Includes a 30-day open comment period after the meeting.	General Public
5/18/15	Newsletter	Newsletter-style story posted to County GovDoc news subscribers. Also forwarded to Stakeholder group via email. • http://content.govdelivery.com/accounts/AZMARIC/bulletins/104e570	Subscribers and Stakeholders
5/19/15	Presentation	Maricopa County Parks and Recreation Commission presentation with PowerPoint to update Commissioners on progress to date	General Public
8/6/15	Planning Team Meeting	Facilitated workshop to make decisions and discuss enhancement opportunities	MCPRD and NPS staff
8/16/15	Youth outreach	Presented to Youth Group at Mt. Pleasant Baptist Church, engaged in discussion, and received feedback	General Public

8/17/15	Web posting	• Posted results of 4/30/15 public meeting to Park project page; includes all public comments received during public meeting plus 30-day comment period and Department response • A master plan update flyer was uploaded to the Park project page and made available as a handout at the park	General Public
8/26/15	Planning Team Meeting	Facilitated workshop to discuss enhancement opportunities and site planning	MCPRD and NPS staff
9/28/15	Stakeholder Meeting	Reviewed draft alternatives and received feedback	Stakeholders
10/15/15	Planning Team Meeting	To refine camping and trailhead related alternative options	MCPRD staff
10/21/15	Stakeholder Meeting	To review draft alternatives and received feedback	CEMP members
11/17/15	Presentation	Maricopa County Parks and Recreation Commission presentation with PowerPoint to request a recommendation of recommendation for approval of master plan	General Public
1/30/16	Public Meeting	To present draft alternatives and receive feedback	General Public
2/11/15	Staff meeting	To discuss change in scope to park facilities built with LWCF monies. A future site visit and additional discussion is to be arranged at a later date.	MCPRD and State Parks LWCF staff
2/22/16	Planning Team Meeting	To review public meeting #2, public comments, and to discuss alternatives	MCPRD staff
3/9/16 *(anticipated)*	Presentation	Presentation to City of Avondale's Parks and Recreation Commission	General Public
3/15/16	Presentation	Maricopa County Parks and Recreation Commission presentation with PowerPoint to request a recommendation of recommendation for approval of master plan	General Public
4/6/16 *(anticipated)*	Presentation	Presentation to City of Goodyear's Parks and Recreation Commission	General Public
MAR/APR 2016 *(anticipated)*	Presentation	Maricopa County Board of Supervisor's presentation to request approval and adoption of final plan	General Public

Surveys

Additional information was gathered from the public via surveys. Arizona State University (ASU) performs a formal visitor use surveys on a fairly regular basis, allowing the Department to analyze trends. This information assists the Department with programing and other decisions as well as provides the survey respondents an open ended question to report back their thoughts.

- ASU Visitor Use Survey (2012-2013)

Additionally, in the spring of 2015, park staff performed an informal survey at the ramadas to get a feel for how people were using the ramadas and other picnic sites.

- Park Staff Ramada Survey (2015)

Media/Social Media

Press releases are issued at least 30 calendar days prior to any public open house meeting. Occasionally, a news outlet or social media source will repost the press release on their respective platforms.

The Department will post or re-post its own press releases on the social media or web platforms that are available to the County. A sample press release is shown in Exhibit A.

Newsletters/Handouts

The Department released one or more newsletter format communications through its "GovDocs" email list-serve. This is a County sponsored system where the general public can register their email address to receive information regarding a variety of topics, including County Parks.

The Department also developed a Master Plan Update flyer or handout that is available on the Park's project page as well as at the park on paper for interested parties to take home.

Public Meetings

The staff will also schedule public information meetings in an Open House format on at least two different dates. The logistics of the public meetings will be announced at least 30 days in advance via a news release; postings on the Web; and emails and/or mailings to interested parties. During the public meetings, a formal PowerPoint presentation may be provided to ensure that all audiences/participants receive consistent information. The audiences/participants will be encouraged to view specific alternatives and depictions that will be displayed on large posters around the room. Department staff will be available to facilitate face-to-face communications aimed at fostering discussions and authentic opportunities for participation. Department staff will provide for the Administrative Record a summary of issues/concerns raised; however, the audiences/participants will be encouraged to write comments in their own words on provided comment cards and/or via an email address that will be provided. The planning process also allows for a 30-day public comment period after each public meeting.

All public meetings will be held in the Nature Center classroom at:

Estrella Mountain Regional Park
14805 West Vineyard Avenue
Goodyear, AZ 85338
Ph: 623-932-3811
estrellapark@mail.maricopa.gov

At all times, project information is available and will be updated at this Web site:
http://www.maricopa.gov/parks/estrella/emproject.aspx

April 30, 2015

This public meeting was conducted in an open house format. Display boards were stationed throughout the room and the public was invited to work their way around the room to view each board. Department staff was available to answer any questions and to engage in discussions. Comment cards were available for interested parties to provide their comments and feedback. Approximately 40 people signed in for the meeting and 15 comment cards were received in additional to a number of "post-it notes" that were used to record comments on display boards.

The Department allowed a 30-day comment period, concluding on May 30, 2015, to provide the general public adequate time to comment. Overall, over 134 pieces of communications (e.g. comment cards, post-it notes, emails, etc.) were received. These comments and Department staff response to the comments was posted on the park's webpage at http://www.maricopa.gov/parks/estrella/emproject.aspx.

January 30, 2016

The second public meeting was conducted in presentation format on January 30, 2016 (10:30am-12:30pm) at the Park's Nature Center. At this meeting 36 people signed in; however, no comment cards were received during the meeting itself. Planning staff presented the two draft park improvement alternatives and verbally answered questions throughout the presentation and afterward. Display boards were stationed throughout the room to facilitate discussion.

Again, the Department allowed a 30-day comment period, concluding on February 29, 2016, to provide the general public adequate time to comment on their preference regarding draft alternatives "A" or "B" as presented. Just over 76% of respondents preferred draft alterative B. Many trail and camping related comments were also received.

Youth Outreach

As a result of the Stakeholder Meetings, it was noted the Department should perform youth outreach to get a youth perspective to the planning process. The Department made arrangements to attend three youth events:

- March 25, 2015 - City of Goodyear Youth Commission
- April 11, 2015 - City of Avondale "Global Youth Service Day"
- August 16, 2015 - Mt. Pleasant Baptist Church Youth Ministry (Buckeye)

Citizens of Estrella Park

The park's "Friends" group, called Citizens of Estrella Park (CEMP), is a local non-profit group to advocate on the park's behalf. At least one CEMP Board Member was invited to each Stakeholder Meeting. CEMP was also invited to attend public open house meetings.

Department staff reached out in August 2015 for a personalized meeting with the group; however, CEMP was unable to attend the date Department staff had arranged. The Department staff rescheduled to October 21, 2015 and presented the draft plan as completed by that date. Staff received their feedback and made edits to the draft plan where appropriate.

7.0 CONTACTS

The following staff members were chosen in order to streamline the points of contact during the Master Plan Update process.

Table 4: Contact information

Master Plan Process	News Media Inquiries
Leigh Johnson, MCPRD, Park Planner 928-501-9207 leighjohnson@mail.maricopa.gov Cate Bradley, NPS-RTCA 520-791-6472 cate_bradley@nps.gov	Dawna Taylor, MCPRD, Public Information Officer 928-501-9204 dawnataylor@mail.maricopa.gov

Exhibit A: Sample Press Release

March 25, 2015

Estrella Mountain Regional Park reaches out to stakeholders for input on Master Plan Update

(Goodyear) The Maricopa County Parks and Recreation Department, with assistance from the National Park Service's River Trails and Conservation Area Program, has initiated an update to the 1988 Estrella Mountain Regional Park Master Plan.

"We have engaged many of the local stakeholders for this planning process, including local history and environmental groups, user groups, hikers, mountain bikers, equestrians and youth groups," said Maricopa County Supervisor Steve Gallardo. "The Department is also working closely with towns and cities that abut the park, land management agencies, other partners and park concessionaires to make sure they know about the Master Plan update. I am pleased with the outreach."

Proposed updates to the Master Plan include, but are not limited to, several new concepts such facility upgrades, additional shared-use and interpretive trails, a new multi-use sports field complex, brine wetlands, and inclusion of the El Rio Watercourse Master Plan concept. The Parks and Recreation Department is interested in understanding how the community and park visitors are currently using the park, and desired park uses.

"The updated Master Plan will serve as a long-range vision guide and policy document for current and future park staff, partnering agencies, elected officials, and interested members of the public. It will cover items such as facility

and infrastructure, as well as development priorities that will provide for both public enjoyment, and protection of park resources," added R.J. Cardin, Maricopa County Parks and Recreation Department Director.

The west Valley is projected to experience significant growth over the next 20-years. With good public input now, the Master Plan revision process aims to respond to, and accommodate, population and demographic changes and demands.

Estrella Mountain Regional Park is located in the southwest Valley adjacent to the Cities of Avondale and Goodyear and near the Town of Buckeye. Increasing levels of urban growth have changed some of the park use dynamics. The Master Plan revision is an opportunity for Maricopa County's Parks and Recreation Department to adapt to those changes and plan for the future.

The Master Plan revision project kicked off in the spring of 2014. The Master Plan update is expected to be completed by the end of 2015. A second public meeting will be held in Fall 2015. Certain elements of the 1988 Master Plan have been completed; other elements are no longer relevant as recreation trends and park uses have changed over time. Feedback from stakeholders is needed to help understand desired public uses, shape the future direction, and determine amenities needed in the park for the next 20-years.

To learn more about the April 30th 6 p.m. public meeting being hosted in the park's nature center, or the project, visit *http://www.maricopa.gov/parks/estrella/emproject.aspx*. The public comment period for the first phase of the project will remain open for 30-days concluding at the close of business on May 30.

Get involved by attending the public meetings or by contacting Leigh Johnson, Park Planner (leighjohnson@mail.maricopa.gov) or Cate Bradley, National Park Service's River Trails and Conservation Area Program (cate_bradley@nps.gov) to share your comments.

30

Appendix B – Photo Monitoring Program

(Insert all materials behind this cover page)

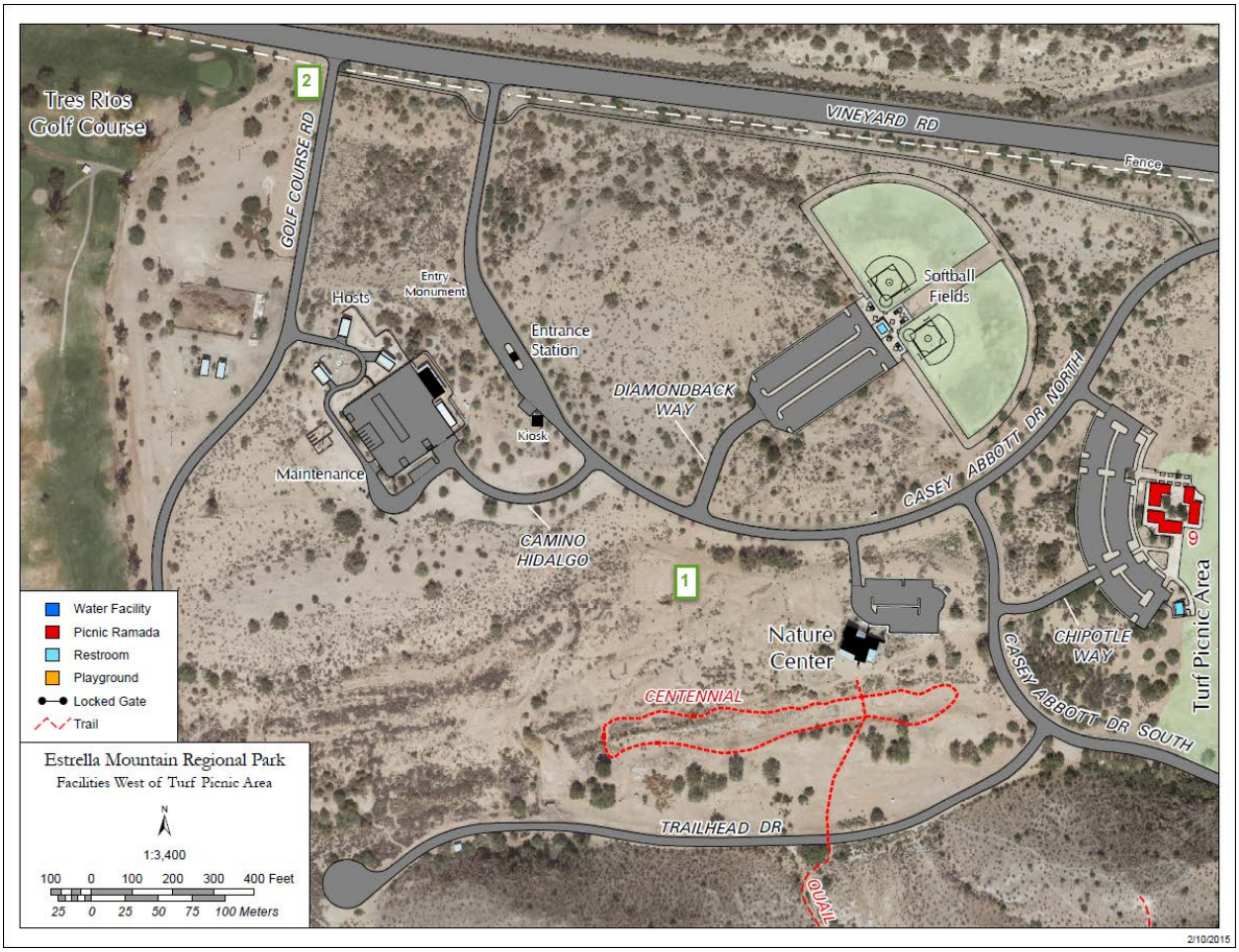
Photo Monitoring

A photo monitoring program has been established for the park to monitor scenic views, trails, and recreational resources over time. These photos will serve as the baseline conditions at each of the chosen points. Additional sites should be added as needed.

Using a digital camera and GIS will allow park staff to return to the same points each year to check for signs of change in its resources and assist managers in decision making.

The accompanying map shows the locations where photos were taken. A minimum of four photos were taken (using north, south, east, west points of view). Additional photos may also have been taken to highlight specific features at the location.

This section is to be updated as needed.



Map C-1: Map of locations

1 – behind nature center
2 – golf course entry

Location:	1 - Behind Nature Center		
Coordinates:	Lat: 33 23 1.6910	Long: 112 22 53.88599	Altitude: 283.7
Date:	1-9-2015		
Comments:	Clear sky		
Photos: DSC01209 (north)			
		DSC01210 (west)	

Location:	2 - Golf course entry		
Coordinates:	Lat: 33 23 12.8509	Long: 112 23 4.2229	Altitude: 278.1
Date:	1-9-2015		
Comments:	Clear sky		
Photos: DSC01213 (north)		DSC01213 (south)	
		DSC01212 (west)	

Appendix C – Water Resources

(Insert all materials behind this cover page)

NOTES TO USERS

This map is for use in administering the Nation Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Arizona State Plane Central zone (FIPSZONE 0202). The **horizontal datum** was NAD 83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. Map users wishing to obtain flood elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29) may use the following Maricopa County website application: http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm

This web tool allows users to obtain point-specific datum conversion values by zooming in and hovering over a VERTCON checkbox on the layers menu on the left side of the screen. The VERTCON grid referenced in this web application was also used to convert existing flood elevations from NGVD 29 to NAVD 88.

To obtain current elevation, description, and/or location information for National Geodetic Survey bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov. To obtain information about Geodetic Densification and Cadastral Survey bench marks produced by the Maricopa County Department of Transportation, please visit the Flood Control District of Maricopa County website at:
http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm.

Base map information shown on this FIRM was derived from multiple sources. Aerial imagery was provided in digital format by the Maricopa County Department of Public Works, Flood Control District. The imagery is dated October 2009 to November 2009. Additional National Agricultural Imagery Program (NAIP) imagery was provided by the Arizona State Land Department (ALRIS) and is dated 2007. The coordinate system used for the production of the digital FIRM is State Plane Arizona Central NAD83 HARN, International Feet.

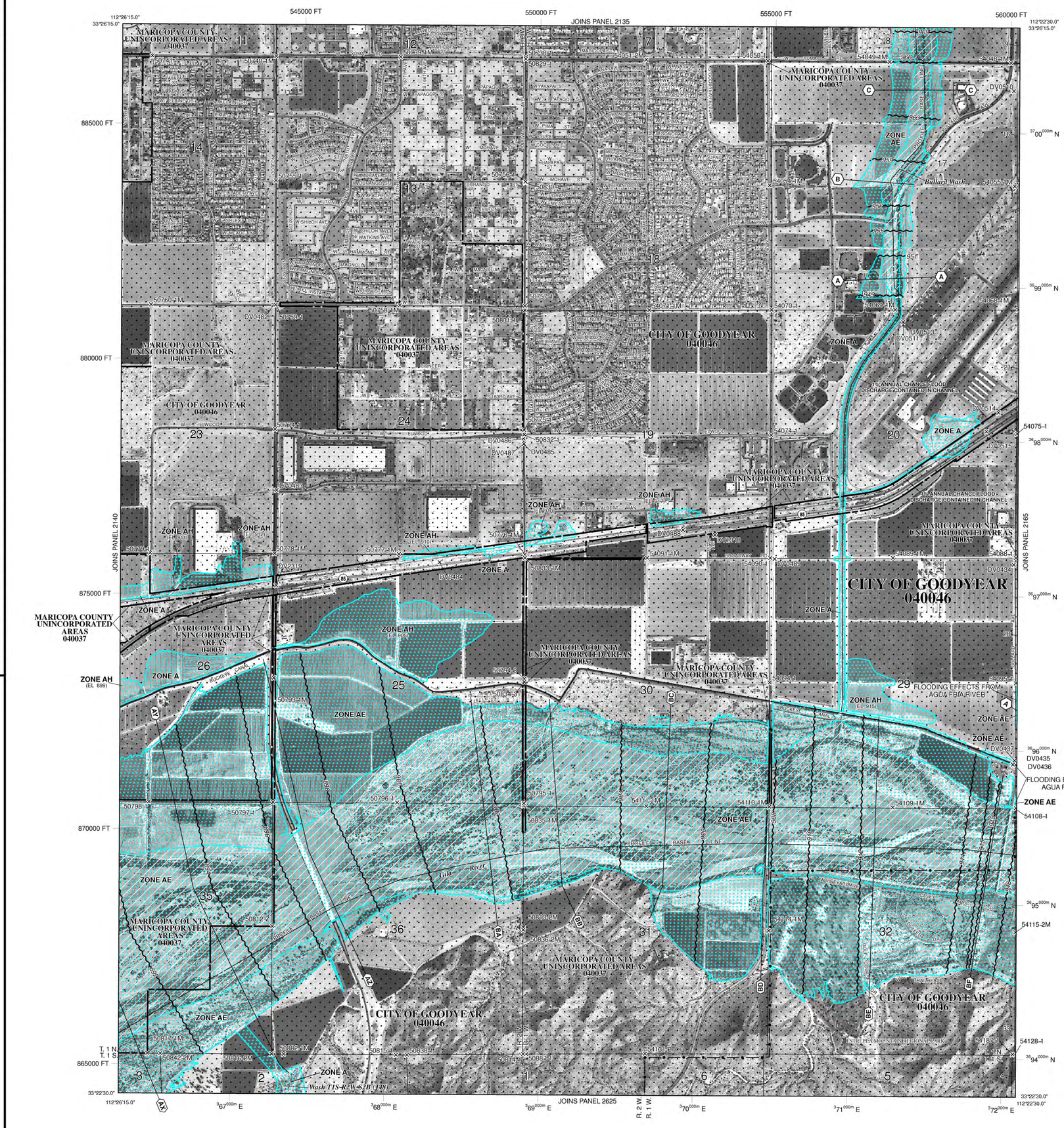
The **profile base line** depicted on this map represents the hydraulic modeling baselines that match flood profiles in the FIS report. As a result of improved topographic data, the profile base line, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community, as well as a listing of the panels on which each community is located.

For Information on available products associated with this FIRM, visit the **FEMA Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referred to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 12
- 6000000 M — 5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 0202), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 4, 1991 September 30, 1995 July 19, 2001 September 30, 2005
October 16, 2013 –to update corporate limits, to change base flood elevations, to incorporate previously issued letters of map revision, to advance suffix, to add roads and road names, to add special flood hazard areas, to add base flood elevation, to add floodway, and to change floodway.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2145L

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 2145 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	2145	L
GOODYEAR, CITY OF	040046	2145	L

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C2145L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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The projection used in the preparation of this map was Arizona State Plane Central zone (FIPSZONE 0202). The horizontal datum was NAD 83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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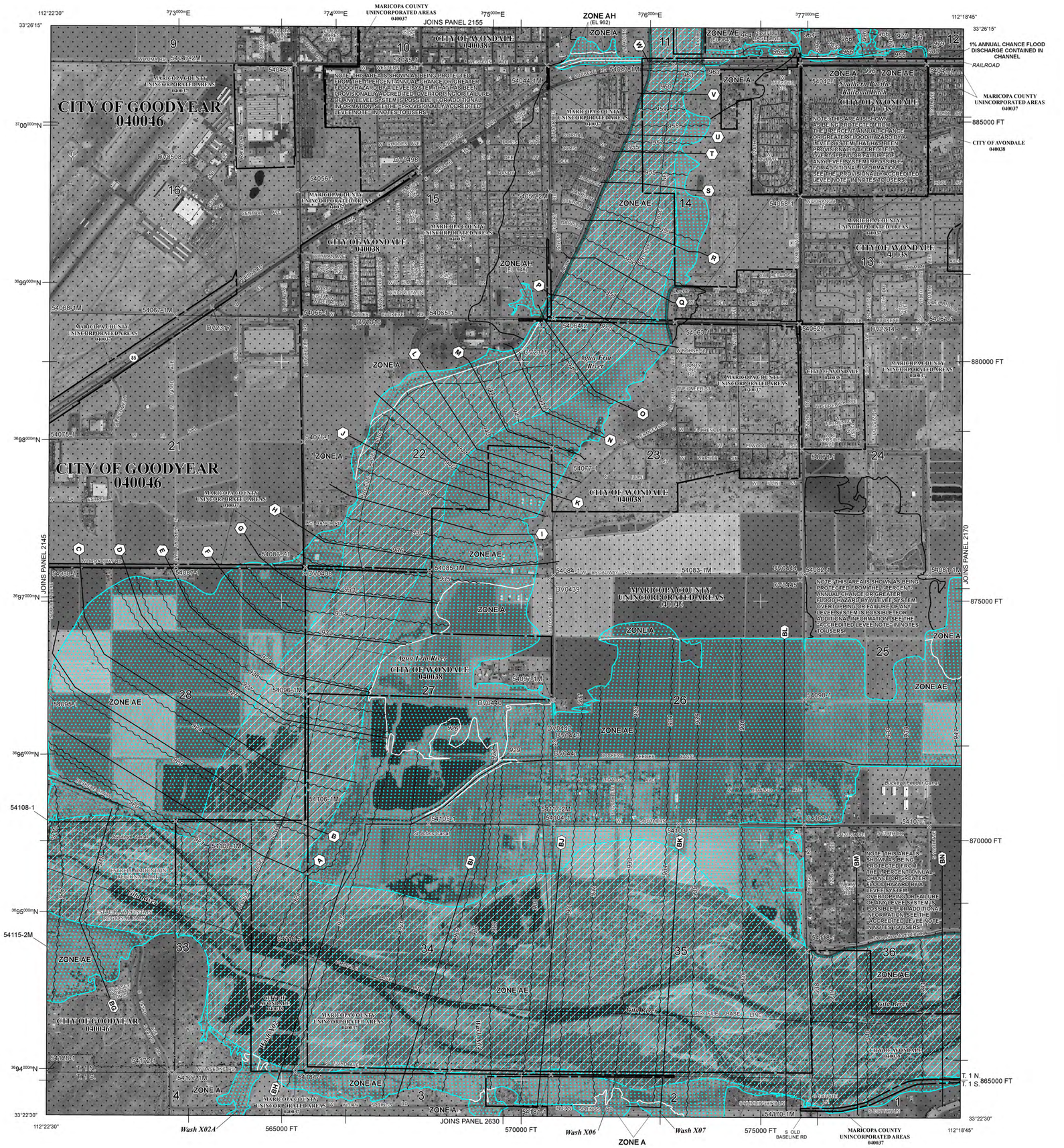
PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by June 25, 2011. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA website at http://www.fema.gov/business/nfip/index/shtm.

ACCREDITED LEVEE NOTES TO USERS: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA website at http://www.fema.gov/business/nfip/index.shtm.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 12
- 6000000 FT — 5000-foot grid values: Arizona State Plane coordinate system, Central Zone (FIPSZONE = 0202), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 29, 1989, July 19, 2001, September 30, 2005, October 16, 2013

November 4, 2015: to incorporate previously issued Letters of Map Revision, to add floodway, to change Base Flood Elevations, to advance suffix, to add Base Flood Elevations, to change floodway, to add Special Flood Hazard Areas, to update corporate limits, and to add roads and road names.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2165M

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2165 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AVONDALE, CITY OF	040038	2165	M
GOODYEAR, CITY OF	040046	2165	M
MARICOPA COUNTY	040037	2165	M

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C2165M

MAP REVISED
NOVEMBER 4, 2015

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Arizona State Plane Central zone (FIPSZONE 0202). The horizontal datum was NAD 83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. Map users wishing to obtain flood elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29) may use the following Maricopa County website application: http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm

This web tool allows users to obtain point-specific datum conversion values by zooming in and hovering over a VERTCON checkbox on the layers menu on the left side of the screen. The VERTCON grid referenced in this web application was also used to convert existing flood elevations from NGVD 29 to NAVD 88.

To obtain current elevation, description, and/or location information for National Geodetic Survey bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov. To obtain information about Geodetic Densification and Cadastral Survey bench marks produced by the Maricopa County Department of Transportation, please visit the Flood Control District of Maricopa County website at: http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm.

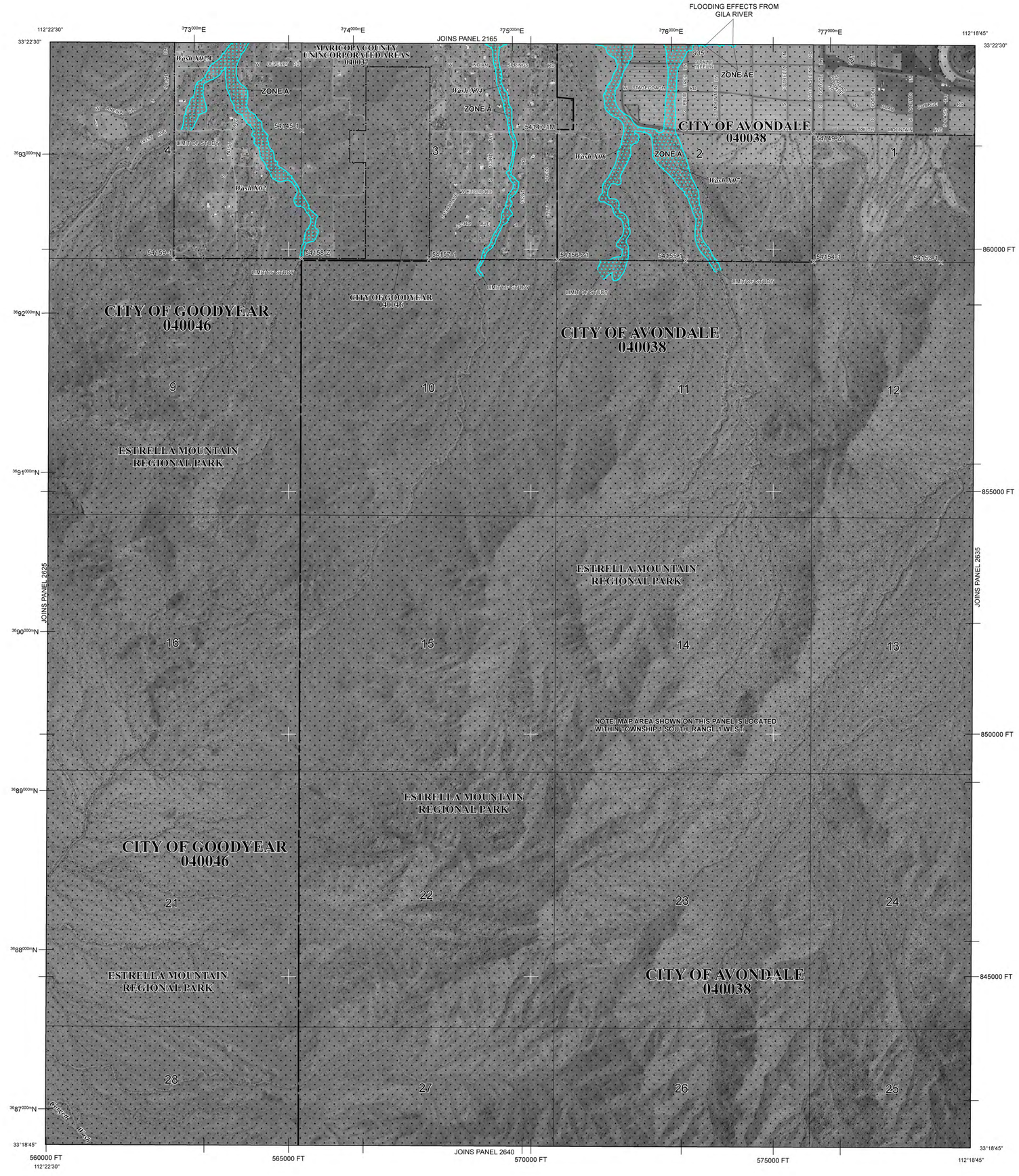
Base map information shown on this FIRM was derived from multiple sources. Aerial imagery was provided in digital format by the Maricopa County Department of Public Works, Flood Control District. The imagery is dated October to November 2009 and July to September 2010. Additional National Agricultural Imagery Program (NAIP) imagery was provided by the Arizona State Land Department (ALRIS) and is dated 2007. The coordinate system used for the production of the digital FIRM is State Plane Arizona Central NAD83 HARN, International Feet.

The **profile base line** depicted on this map represents the hydraulic modeling baselines that match flood profiles in the FIS report. As a result of improved topographic data, the profile base line, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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FLOODWAY AREAS IN ZONE AE

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OTHERWISE PROTECTED AREAS (OPAs)

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MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2630M

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 2630 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AVONDALE, CITY OF	040038	2630	M
GOODYEAR, CITY OF	040046	2630	M
MARICOPA COUNTY	040037	2630	M

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 04013C2630M

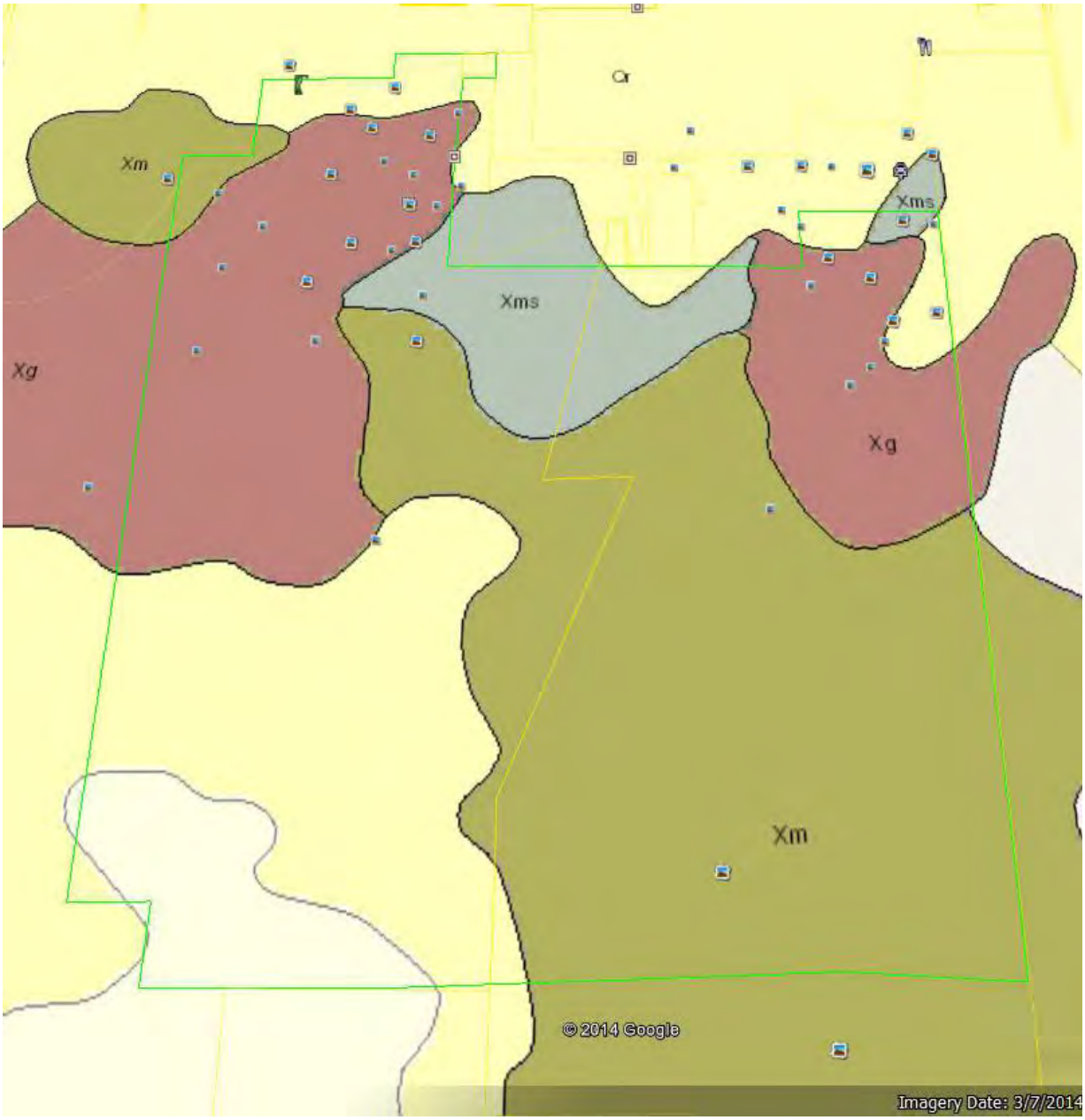
MAP REVISED NOVEMBER 4, 2015

Federal Emergency Management Agency

Appendix D – Earth Resources

(Insert all materials behind this cover page)

Soils



Map source: The Arizona Geological Survey, http://services.azgs.az.gov/arcgis/rest/services/GeologicMapOfArizona/MapServer/export as accessed January 8, 2014.

Cm

Late And Middle Pleistocene Surficial Deposits (10-750 ka)
Unconsolidated to weakly consolidated alluvial fan, terrace, and basin-floor deposits with moderate to strong soil development. Fan and terrace deposits are primarily poorly sorted, moderately bedded gravel and sand, and basin-floor deposits are primarily sand, silt, and clay.

Xg

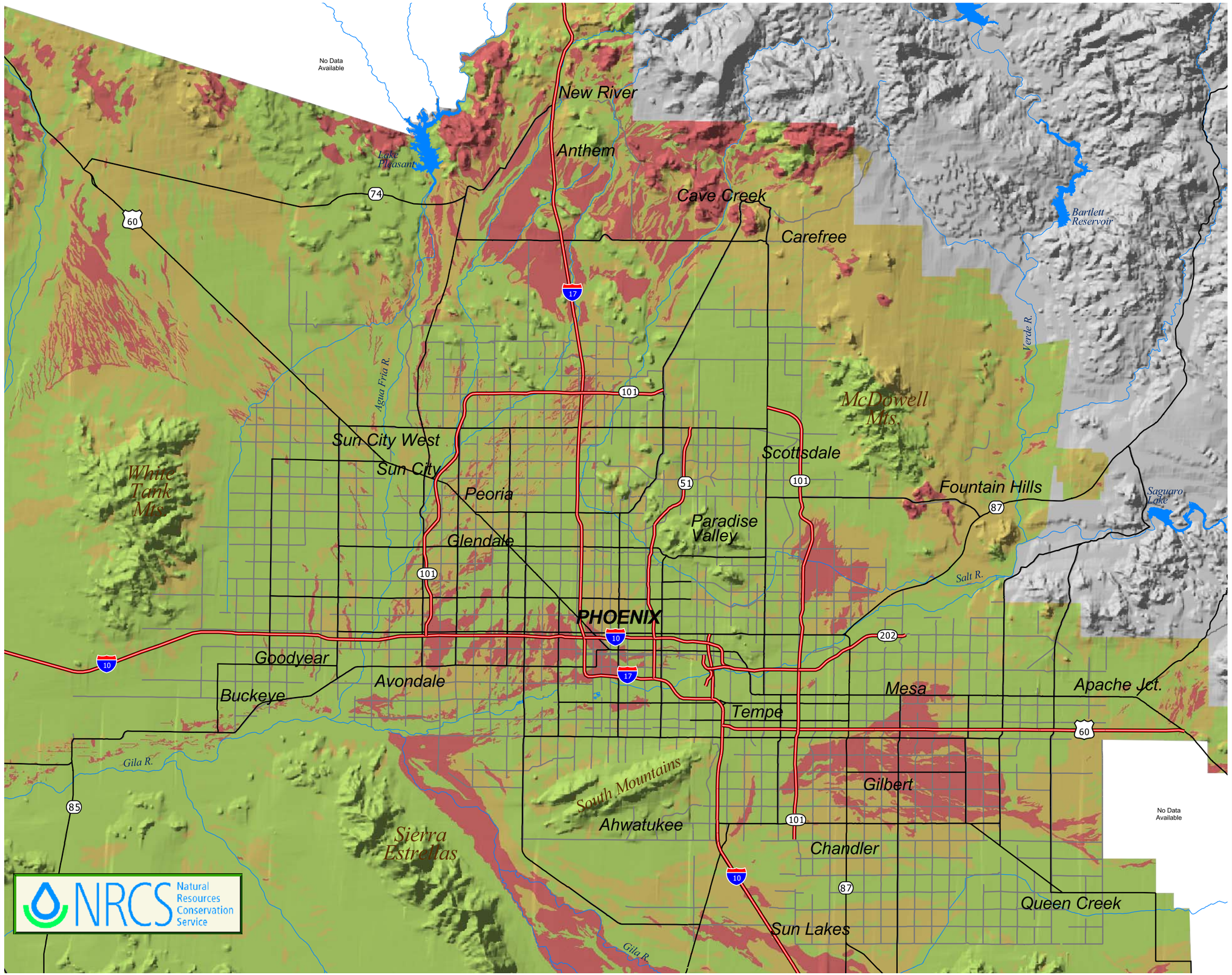
Early Proterozoic Granitic Rocks (1600-1800 Ma)
Wide variety of granitic rocks, including granite, granodiorite, tonalite, quartz diorite, diorite, and gabbro. These rocks commonly are characterized by steep, northeast-striking foliation.

Xm

Early Proterozoic Metamorphic Rocks (1600-1800 Ma)
Undivided metasedimentary, metavolcanic, and gneissic rocks.

Xms

Early Proterozoic Metasedimentary Rocks (1600-1800 Ma)
Metasedimentary rocks, mostly derived from sandstone and shale, with minor conglomerate and carbonate rock. Includes quartz-rich, mostly non-volcanic Pinal Schist in southeastern Arizona and variably volcanic-lithic sedimentary rocks in the Yavapai and Tonto Basin supergroups in central Arizona.



NRCS Natural Resources Conservation Service

SOIL SHRINK/SWELL POTENTIAL

GREATER PHOENIX AREA

- High
- Moderate
- Low
- U.S. Forest Service

USER NOTES:

THIS MAP WAS PRODUCED BY THE U.S. DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, PHOENIX, ARIZONA. FOR A LIMITED TIME, THIS MAP MAY BE VIEWED AND/OR DOWNLOADED AT THE FOLLOWING NRCS WEBSITE:
http://www.az.usda.gov

THE SOILS WERE MAPPED AT A SCALE OF 1:24,000. ENLARGEMENT OF THE MAP TO SCALES GREATER THAN THAT AT WHICH THE SOILS WERE ORIGINALLY MAPPED CAN CAUSE MISINTERPRETATION OF THE DETAIL OF THE MAPPING.
EACH RATED AREA MAY CONTAIN SOILS WITH DIFFERENT SHRINK/SWELL POTENTIALS.

THE DEPICTED SOIL BOUNDARIES AND INTERPRETATIONS ON THIS MAP DO NOT ELIMINATE THE NEED FOR ON-SITE SAMPLING, TESTING, AND DETAILED STUDY OF SPECIFIC SITES FOR INTENSIVE USES.

DIGITAL DATA FILES ARE PERIODICALLY UPDATED, AND USERS ARE RESPONSIBLE FOR OBTAINING THE LATEST VERSION OF THE DATA.

THE TRANSPORTATION DATA USED FOR THIS MAP WAS DERIVED FROM U.S. CENSUS BUREAU, 1990 TIGER DATA.

PLACEMENT OF POLITICAL NAMES IS APPROXIMATE.

Location Diagram

N

4 0 4 8 Miles

Map created 01/11/02

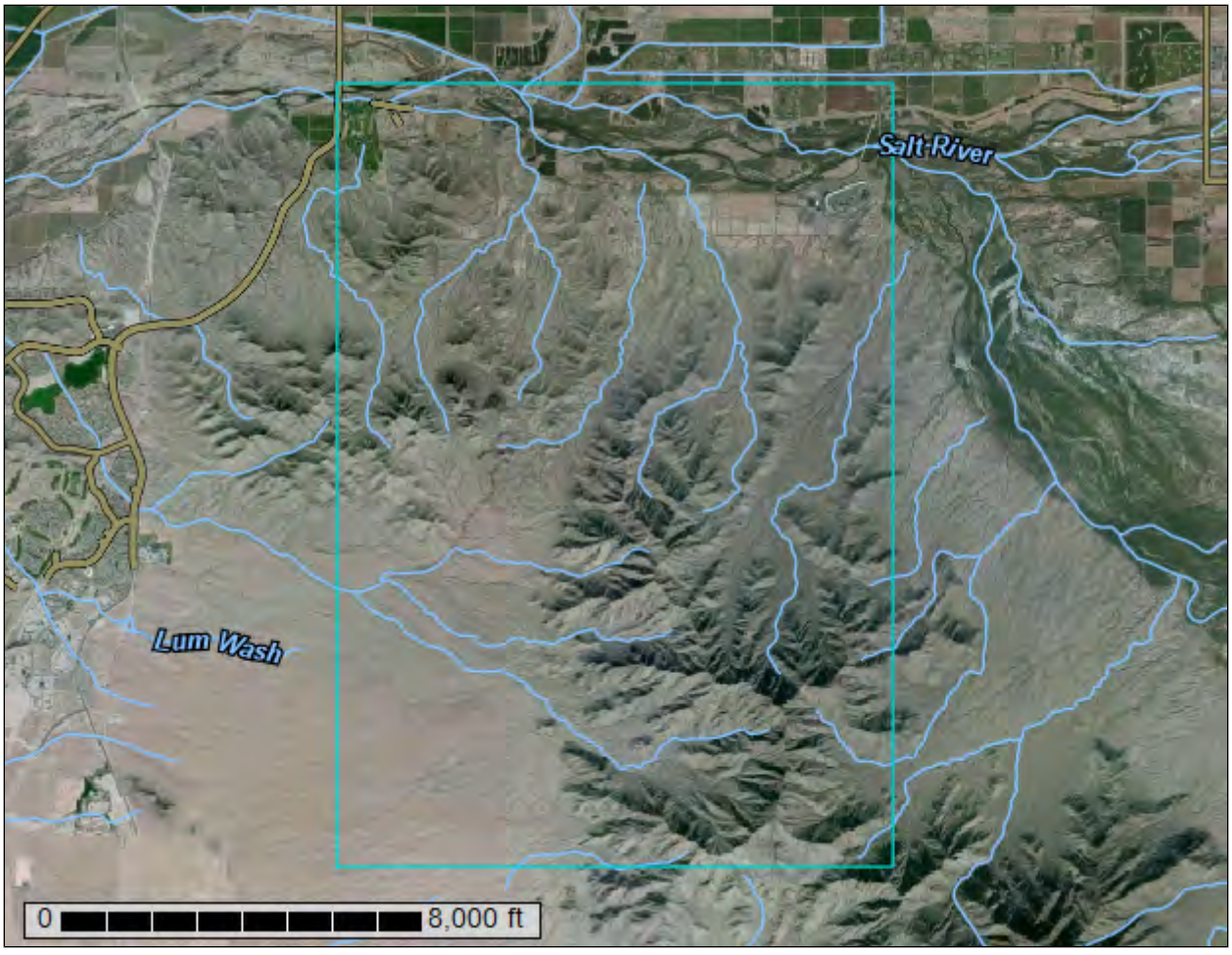
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Gila River Indian Reservation, Arizona, Parts of Maricopa and Pinal Counties; and Maricopa County, Arizona, Central Part



July 17, 2014

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

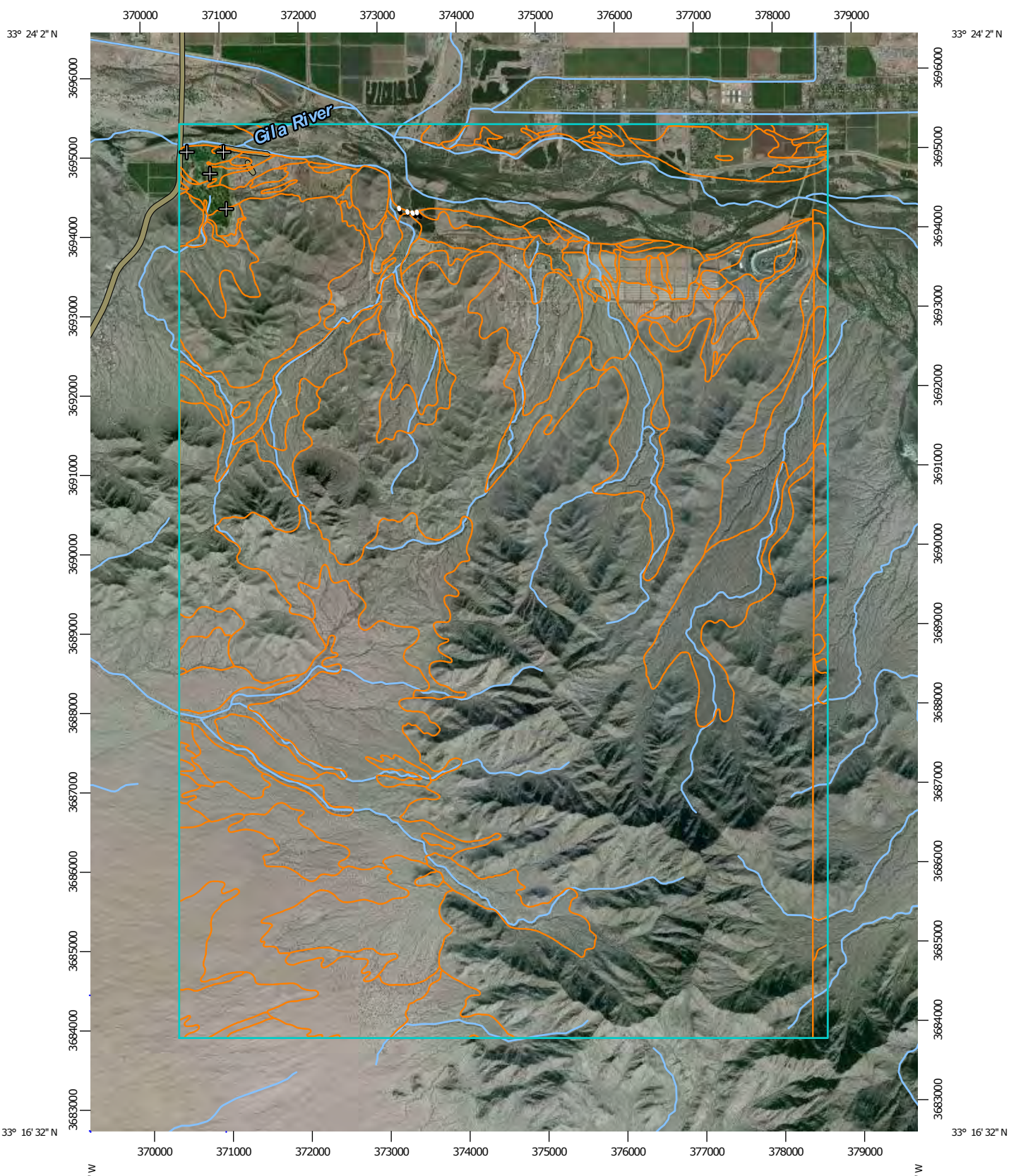
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:67,600 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 1000 2000 4000 6000

Feet
0 3000 6000 12000 18000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Gila River Indian Reservation, Arizona, Parts of Maricopa and Pinal Counties
Survey Area Data: Version 8, Dec 15, 2013

Soil Survey Area: Maricopa County, Arizona, Central Part
Survey Area Data: Version 7, Dec 12, 2013

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 1, 2010—Nov 27, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Gila River Indian Reservation, Arizona, Parts of Maricopa and Pinal Counties (AZ658)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
5	Carrizo very gravelly coarse sand, 0 to 1 percent slopes	3.5	0.0%
9	Cavelt-Carrizo-Gunsight complex, 1 to 10 percent slopes	86.1	0.4%
11	Cristobal-Gunsight complex, 3 to 15 percent slopes	38.7	0.2%
14	Denure-Pahaka complex, 3 to 5 percent slopes	9.0	0.0%
15	Gadsden, Glenbar, and Vint soils, saline-sodic, 0 to 2 percent slopes	23.4	0.1%
24	Momoli cobbly sandy loam, 5 to 15 percent slopes	35.9	0.2%
27	Quilotosa-Rock outcrop-Vaiva complex, 20 to 65 percent slopes	258.5	1.1%
29	Rillito-Gunsight complex, 3 to 15 percent slopes	16.6	0.1%
Subtotals for Soil Survey Area		**471.7**	**2.0%**
Totals for Area of Interest		**23,467.1**	**100.0%**

Maricopa County, Arizona, Central Part (AZ651)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Aa	Agualt loam	3.9	0.0%
AbA	Antho sandy loam, 0 to 1 percent slopes	95.3	0.4%
Ac	Antho sandy loam, saline-alkali	130.7	0.6%
AGB	Antho-Carrizo complex, 0 to 3 percent	139.5	0.6%
AL	Antho association	1,259.3	5.4%
Ao	Avondale clay loam	15.4	0.1%
Br	Brios loamy sand	4.0	0.0%
Bs	Brios sandy loam	53.0	0.2%
Bt	Brios loam	39.8	0.2%
CA2	Calciorthids and Torriorthents, eroded	5.1	0.0%
CF	Carrizo and Brios soils	1,530.0	6.5%
CO	Cherioni-Rock outcrop complex	1,582.6	6.7%
CV	Coolidge-Laveen association	204.0	0.9%
EPD	Ebon-Pinamt complex, 0 to 10 percent slopes	1,095.6	4.7%

Maricopa County, Arizona, Central Part (AZ651)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
GA	Gachado-Rock outcrop complex	52.2	0.2%
Ge	Gilman fine sandy loam	319.5	1.4%
Gf	Gilman fine sandy loam, saline-alkali	75.4	0.3%
GgA	Gilman loam, 0 to 1 percent slopes	224.3	1.0%
Gh	Gilman loam, saline-alkali	143.6	0.6%
GPI	Gravel pit	15.7	0.1%
Gt	Glenbar clay loam	20.9	0.1%
GWD	Gunsight-Pinal complex, 1 to 10 percent slopes	946.4	4.0%
GxB	Gunsight-Rillito complex, 1 to 3 percent	7.6	0.0%
GYD	Gunsight-Rillito complex, 0 to 10 percent slopes	1,474.5	6.3%
LcA	Laveen loam, 0 to 1 percent slopes	63.8	0.3%
Ma	Maripo sandy loam	3.6	0.0%
PRB	Perryville-Rillito complex, 0 to 3 percent slopes	245.2	1.0%
PT	Pinal gravelly loam	199.2	0.8%
PYD	Pinamt-Tremant complex, 1 to 10 percent slopes	160.0	0.7%
RbA	Rillito loam, 0 to 1 percent slopes	2.0	0.0%
RS	Rock outcrop-Cherioni complex	11,289.7	48.1%
TB	Torrifluvents	1,184.0	5.0%
TrB	Tremant-Rillito complex, 1 to 3 percent slopes	27.5	0.1%
TSC	Tremant-Rillito complex, 0 to 5 percent slopes	165.0	0.7%
Vg	Vint loamy fine sand	13.6	0.1%
Vh	Vint fine sandy loam	203.4	0.9%
Subtotals for Soil Survey Area		**22,995.4**	**98.0%**
Totals for Area of Interest		**23,467.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic

class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical

or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Gila River Indian Reservation, Arizona, Parts of Maricopa and Pinal Counties

5—Carrizo very gravelly coarse sand, 0 to 1 percent slopes

Map Unit Setting

Elevation: 500 to 2,500 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition

Carrizo and similar soils: 100 percent

Description of Carrizo

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stream alluvium

Typical profile

C1 - 0 to 52 inches: very gravelly coarse sand
C2 - 52 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

9—Cavelt-Carrizo-Gunsight complex, 1 to 10 percent slopes

Map Unit Setting

Elevation: 450 to 2,600 feet

Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition

Cavelt and similar soils: 35 percent
Carrizo and similar soils: 25 percent
Gunsight and similar soils: 20 percent

Description of Cavelt

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 1 inches: very gravelly loam
Bw - 1 to 8 inches: gravelly loam
2Bkm1 - 8 to 17 inches: cemented material
2Bkm2 - 17 to 27 inches: cemented material

Properties and qualities

Slope: 1 to 10 percent
Depth to restrictive feature: 3 to 20 inches to petrocalcic; 3 to 20 inches to petrocalcic
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 0.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Limy Upland 7-10" p.z. (R040XB210AZ)

Description of Carrizo

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fan alluvium

Typical profile

C1 - 0 to 39 inches: very gravelly coarse sand

C2 - 39 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

Description of Gunsight

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 1 inches: very gravelly sandy loam
Bw - 1 to 20 inches: very gravelly sandy loam
Bk - 20 to 30 inches: extremely gravelly coarse sandy loam
2Ck - 30 to 60 inches: very gravelly coarse sandy loam

Properties and qualities

Slope: 1 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to moderately saline (0.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

11—Cristobal-Gunsight complex, 3 to 15 percent slopes

Map Unit Setting

Elevation: 400 to 3,000 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition

Cristobal and similar soils: 50 percent
Gunsight and similar soils: 30 percent

Description of Cristobal

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 1 inches: very gravelly loam
Btk - 1 to 41 inches: extremely gravelly sandy clay loam
2Ckqm - 41 to 60 inches: cemented material

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 40 to 60 inches to petrocalcic
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

Description of Gunsight

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 1 inches: very gravelly sandy loam
Bk - 1 to 17 inches: very gravelly loam
2Ck - 17 to 60 inches: very gravelly loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 10 percent
Salinity, maximum in profile: Slightly saline to moderately saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 25.0
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

14—Denure-Pahaka complex, 3 to 5 percent slopes

Map Unit Setting

Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition

Denure and similar soils: 40 percent
Pahaka and similar soils: 25 percent

Description of Denure

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 2 inches: very gravelly fine sandy loam
Bk - 2 to 47 inches: fine sandy loam
2Ck - 47 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Description of Pahaka

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 1 inches: very gravelly fine sandy loam
Bnw - 1 to 30 inches: gravelly loam
2Btknzb - 30 to 60 inches: gravelly clay loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

15—Gadsden, Glenbar, and Vint soils, saline-sodic, 0 to 2 percent slopes

Map Unit Setting
Elevation: 940 to 1,400 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition
Vint and similar soils: 0 percent
Glenbar and similar soils: 0 percent
Gadsden and similar soils: 0 percent

Description of Gadsden

Setting
Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stream alluvium

Typical profile
A/C - 0 to 5 inches: silty clay loam
Cz - 5 to 60 inches: stratified silty clay loam to silty clay

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent

Salinity, maximum in profile: Slightly saline to strongly saline (8.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: D
Ecological site: Saline Bottom 7-10" p.z. (R040XB227AZ)

Description of Glenbar

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stream alluvium

Typical profile

Anz - 0 to 3 inches: silt loam
Cnz - 3 to 60 inches: stratified silt loam to silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Slightly saline to strongly saline (8.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: C
Ecological site: Saline Bottom 7-10" p.z. (R040XB227AZ)

Description of Vint

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stream alluvium

Typical profile

C - 0 to 43 inches: loamy fine sand
Cz - 43 to 60 inches: stratified very fine sandy loam to silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Slightly saline to strongly saline (8.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: B
Ecological site: Saline Bottom 7-10" p.z. (R040XB227AZ)

24—Momoli cobbly sandy loam, 5 to 15 percent slopes

Map Unit Setting

Elevation: 400 to 2,500 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition

Momoli and similar soils: 100 percent

Description of Momoli

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 2 inches: cobbly sandy loam

Bk - 2 to 43 inches: very gravelly sandy loam
2Btkb - 43 to 60 inches: very gravelly sandy clay loam

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Sandy Loam Upland 7-10" p.z. (R040XB218AZ)

27—Quilotosa-Rock outcrop-Vaiva complex, 20 to 65 percent slopes

Map Unit Setting

Elevation: 1,150 to 3,100 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition

Quilotosa and similar soils: 50 percent
Rock outcrop: 30 percent
Vaiva and similar soils: 10 percent

Description of Quilotosa

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium and/or colluvium

Typical profile

A - 0 to 1 inches: extremely gravelly sandy loam
Bw - 1 to 9 inches: extremely gravelly sandy loam
Crtk - 9 to 16 inches: bedrock
R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 20 to 65 percent
Depth to restrictive feature: 4 to 20 inches to paralithic bedrock; 4 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 8 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 0.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Granitic Hills 7-10" p.z. (R040XB206AZ)

Description of Vaiva

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium and/or colluvium

Typical profile

A - 0 to 1 inches: extremely gravelly sandy loam
Bt - 1 to 8 inches: extremely gravelly sandy clay loam
Crtk - 8 to 18 inches: bedrock
R - 18 to 60 inches: bedrock

Properties and qualities

Slope: 20 to 25 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock; 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 0.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Ecological site: Granitic Hills 7-10" p.z. (R040XB206AZ)

29—Rillito-Gunsight complex, 3 to 15 percent slopes

Map Unit Setting

Elevation: 1,100 to 1,500 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 70 to 73 degrees F
Frost-free period: 240 to 350 days

Map Unit Composition

Rillito and similar soils: 35 percent
Gunsight and similar soils: 20 percent

Description of Rillito

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 10 inches: gravelly sandy loam
Bk1 - 10 to 45 inches: gravelly loam
Bk2 - 45 to 60 inches: loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

Description of Gunsight

Setting

Landform: Fan terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fan alluvium

Typical profile

A - 0 to 1 inches: very gravelly loam
Bw - 1 to 16 inches: very gravelly fine sandy loam
Bk - 16 to 42 inches: very gravelly sandy loam
2Ck - 42 to 60 inches: loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

Maricopa County, Arizona, Central Part

Aa—Agualt loam

Map Unit Setting

Elevation: 800 to 1,500 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Agualt and similar soils: 100 percent

Description of Agualt

Setting

Landform: Alluvial fans, flood plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent mixed alluvium

Typical profile

Ap - 0 to 11 inches: loam
C1 - 11 to 27 inches: loam
2C2 - 27 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Loamy Swale 7-10" p.z. (R040XB211AZ)

AbA—Antho sandy loam, 0 to 1 percent slopes

Map Unit Setting

Elevation: 850 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Antho and similar soils: 100 percent

Description of Antho

Setting

Landform: Alluvial fans, stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

A/C1 - 0 to 13 inches: sandy loam
C2 - 13 to 36 inches: sandy loam
C3 - 36 to 47 inches: loamy sand
2Btb - 47 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Ac—Antho sandy loam, saline-alkali

Map Unit Setting

Elevation: 850 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Antho and similar soils: 100 percent

Description of Antho

Setting

Landform: Plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

A/C1 - 0 to 13 inches: sandy loam
C2 - 13 to 36 inches: sandy loam
C3 - 36 to 47 inches: loamy sand
2Btb - 47 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Sandy Loam Upland 7-10" p.z. Saline (R040XB226AZ)

AGB—Antho-Carrizo complex, 0 to 3 percent

Map Unit Setting

Elevation: 750 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Antho and similar soils: 35 percent
Carrizo and similar soils: 30 percent

Description of Antho

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

A/C1 - 0 to 13 inches: sandy loam
C2 - 13 to 36 inches: sandy loam
C3 - 36 to 47 inches: loamy sand
2Btb - 47 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Description of Carrizo

Setting

Landform: Alluvial fans

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

A - 0 to 5 inches: gravelly sandy loam
C - 5 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

AL—Antho association

Map Unit Setting

Elevation: 850 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Antho and similar soils: 55 percent
Antho and similar soils: 30 percent

Description of Antho

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

A/C1 - 0 to 13 inches: sandy loam
C2 - 13 to 36 inches: sandy loam
C3 - 36 to 47 inches: loamy sand
2Btb - 47 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Description of Antho

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

A/C1 - 0 to 13 inches: gravelly sandy loam
C2 - 13 to 36 inches: sandy loam
C3 - 36 to 47 inches: loamy sand
2Btb - 47 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Ao—Avondale clay loam

Map Unit Setting

Elevation: 750 to 1,350 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Avondale and similar soils: 100 percent

Description of Avondale

Setting

Landform: Plains, stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

Ap - 0 to 12 inches: clay loam
C1 - 12 to 37 inches: loam
C2 - 37 to 60 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B

Ecological site: Prosopis velutina-Prosopis glandulosa var. torreyana/Sporobolus wrightii (F040XB214AZ)

Br—Brios loamy sand

Map Unit Setting

Elevation: 700 to 1,300 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Brios and similar soils: 100 percent

Description of Brios

Setting

Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

A - 0 to 14 inches: loamy sand
C1 - 14 to 22 inches: coarse sand
C2 - 22 to 60 inches: stratified gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Farmland of unique importance
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

Bs—Brios sandy loam

Map Unit Setting

Elevation: 700 to 1,300 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Brios and similar soils: 100 percent

Description of Brios

Setting

Landform: Alluvial fans, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

Ap - 0 to 14 inches: sandy loam
C1 - 14 to 22 inches: coarse sand
C2 - 22 to 60 inches: stratified gravelly coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Farmland of unique importance
Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

Bt—Brios loam

Map Unit Setting

Elevation: 700 to 1,300 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Brios and similar soils: 100 percent

Description of Brios

Setting

Landform: Terraces, alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

A - 0 to 14 inches: loam
C1 - 14 to 22 inches: coarse sand
C2 - 22 to 60 inches: stratified gravelly coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Farmland of unique importance
Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

CA2—Calciorthids and Torriorthents, eroded

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Torriorthents and similar soils: 0 percent
Calciorthids and similar soils: 0 percent

Description of Calciorthids

Setting

Landform: Alluvial fans, stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Properties and qualities

Slope: 15 to 40 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Ecological site: Limy Slopes 7-10" p.z. (R040XB209AZ)

Description of Torriorthents

Setting

Landform: Stream terraces, alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Properties and qualities

Slope: 15 to 40 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Ecological site: Limy Slopes 7-10" p.z. (R040XB209AZ)

CF—Carrizo and Brios soils

Map Unit Setting

Elevation: 700 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Carrizo and similar soils: 45 percent
Brios and similar soils: 35 percent

Description of Carrizo

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent mixed alluvium

Typical profile

A - 0 to 5 inches: gravelly sandy loam
C - 5 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

Description of Brios

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

A - 0 to 14 inches: loamy sand
C1 - 14 to 22 inches: coarse sand
C2 - 22 to 60 inches: stratified gravelly coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

CO—Cherioni-Rock outcrop complex

Map Unit Setting

Elevation: 800 to 1,800 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 72 degrees F
Frost-free period: 270 to 325 days

Map Unit Composition

Cherioni and similar soils: 50 percent
Rock outcrop: 20 percent

Description of Cherioni

Setting

Landform: Hills, mountain slopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium derived from andesite and/or colluvium derived from andesite

Typical profile

A - 0 to 1 inches: very gravelly loam
B - 1 to 6 inches: very gravelly loam
Bkqm - 6 to 12 inches: cemented material
R - 12 to 16 inches: bedrock

Properties and qualities

Slope: 3 to 25 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: 5 to 18 inches to duripan; 6 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Very low (about 0.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Limy Upland 7-10" p.z. (R040XB210AZ)

CV—Coolidge-Laveen association

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Laveen and similar soils: 40 percent
Coolidge and similar soils: 40 percent

Description of Coolidge

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 13 inches: sandy loam
B - 13 to 24 inches: sandy loam
Bk - 24 to 63 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Description of Laveen

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 15 inches: sandy loam
Bk1 - 15 to 50 inches: loam
Bk2 - 50 to 72 inches: gravelly loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

EPD—Ebon-Pinamt complex, 0 to 10 percent slopes

Map Unit Setting

Elevation: 900 to 1,800 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Ebon and similar soils: 40 percent
Pinamt and similar soils: 25 percent

Description of Ebon

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gravelly alluvium derived from granite and/or gravelly alluvium derived from gneiss

Typical profile

A - 0 to 2 inches: gravelly loam
Bw - 2 to 13 inches: very cobbly clay loam
Btk - 13 to 38 inches: very cobbly clay
Bk - 38 to 60 inches: very cobbly sandy clay loam

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Clay Loam Upland 7-10" p.z. (R040XB205AZ)

Description of Pinamt

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stratified very gravelly mixed alluvium

Typical profile

A - 0 to 2 inches: gravelly sandy loam
B - 2 to 6 inches: very gravelly sandy loam
Btk - 6 to 22 inches: very gravelly sandy clay loam
Bk - 22 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 1 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

GA—Gachado-Rock outcrop complex

Map Unit Setting

Elevation: 800 to 1,500 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 310 days

Map Unit Composition

Rock outcrop: 40 percent
Gachado and similar soils: 40 percent

Description of Gachado

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed colluvium and/or mixed residuum

Typical profile

A - 0 to 1 inches: very gravelly clay loam
Bw - 1 to 4 inches: very gravelly loam
Btk - 4 to 14 inches: very gravelly sandy clay loam
R - 14 to 23 inches: bedrock

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: 7 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Granitic Upland 7-10" p.z. (R040XB220AZ)

Ge—Gilman fine sandy loam

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 60 to 73 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Gilman and similar soils: 100 percent

Description of Gilman

Setting

Landform: Terraces, alluvial fans, flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent mixed alluvium

Typical profile

Ap - 0 to 18 inches: fine sandy loam
C1 - 18 to 37 inches: loam
C2 - 37 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: Loamy Swale 7-10" p.z. (R040XB211AZ)

Gf—Gilman fine sandy loam, saline-alkali

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 60 to 73 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Gilman and similar soils: 100 percent

Description of Gilman

Setting

Landform: Stream terraces, alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

A - 0 to 18 inches: fine sandy loam
C1 - 18 to 37 inches: loam
C2 - 37 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to strongly saline (4.0 to 40.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Farmland classification: Farmland of unique importance
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Saline Bottom 7-10" p.z. (R040XB227AZ)

GgA—Gilman loam, 0 to 1 percent slopes

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 60 to 73 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Gilman and similar soils: 100 percent

Description of Gilman

Setting

Landform: Alluvial fans, stream terraces, plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Recent mixed alluvium

Typical profile

Ap - 0 to 18 inches: loam
C1 - 18 to 37 inches: loam
C2 - 37 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Gh—Gilman loam, saline-alkali

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 60 to 73 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Gilman and similar soils: 100 percent

Description of Gilman

Setting

Landform: Flood plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent mixed alluvium

Typical profile

A - 0 to 18 inches: loam
C1 - 18 to 37 inches: loam
C2 - 37 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to strongly saline (4.0 to 40.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Farmland classification: Farmland of unique importance
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Saline Bottom 7-10" p.z. (R040XB227AZ)

GPI—Gravel pit

Map Unit Composition

Gravel pit: 100 percent

Gt—Glenbar clay loam

Map Unit Setting

Elevation: 700 to 1,250 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 68 to 71 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Glenbar and similar soils: 100 percent

Description of Glenbar

Setting

Landform: Plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

Ap - 0 to 15 inches: clay loam
C - 15 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 7c

Hydrologic Soil Group: B
Ecological site: Clay Loam Upland 7-10" p.z. (R040XB205AZ)

GWD—Gunsight-Pinal complex, 1 to 10 percent slopes

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 68 to 74 degrees F
Frost-free period: 250 to 320 days

Map Unit Composition

Gunsight and similar soils: 40 percent
Pinal and similar soils: 30 percent

Description of Gunsight

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 3 inches: cobbly loam
Bk - 3 to 46 inches: very gravelly loam
2Bb - 46 to 67 inches: very gravelly sandy clay loam

Properties and qualities

Slope: 1 to 10 percent
Percent of area covered with surface fragments: 2.5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

Description of Pinal

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Old gravelly and cobbly mixed valley fill alluvium

Typical profile

A - 0 to 12 inches: gravelly loam
Bkqm - 12 to 60 inches: cemented material

Properties and qualities

Slope: 1 to 3 percent
Percent of area covered with surface fragments: 2.5 percent
Depth to restrictive feature: 8 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Limy Upland 7-10" p.z. (R040XB210AZ)

GxB—Gunsight-Rillito complex, 1 to 3 percent

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 68 to 72 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Gunsight and similar soils: 45 percent
Rillito and similar soils: 45 percent

Description of Rillito

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 10 inches: gravelly loam
Bk - 10 to 75 inches: gravelly loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Description of Gunsight

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 3 inches: gravelly loam
Bk - 3 to 46 inches: very gravelly loam
2Bb - 46 to 67 inches: very gravelly sandy clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

GYD—Gunsight-Rillito complex, 0 to 10 percent slopes

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 68 to 72 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Rillito and similar soils: 40 percent
Gunsight and similar soils: 40 percent

Description of Gunsight

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 3 inches: gravelly loam
Bk - 3 to 46 inches: very gravelly loam
2Bb - 46 to 67 inches: very gravelly sandy clay loam

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

Description of Rillito

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 10 inches: gravelly loam
Bk - 10 to 75 inches: gravelly loam

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

LcA—Laveen loam, 0 to 1 percent slopes

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 69 to 73 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition
Laveen and similar soils: 100 percent

Description of Laveen

Setting
Landform: Alluvial fans, plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile
Ap - 0 to 15 inches: loam
Bk1 - 15 to 50 inches: loam
Bk2 - 50 to 72 inches: gravelly loam

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups
Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Ma—Maripo sandy loam

Map Unit Setting
Elevation: 800 to 1,450 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition
Maripo and similar soils: 100 percent

Description of Maripo

Setting

Landform: Alluvial fans, flood plains, stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent mixed alluvium

Typical profile

Ap - 0 to 13 inches: sandy loam
C1 - 13 to 34 inches: sandy loam
2C2 - 34 to 60 inches: gravelly sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

PRB—Perryville-Rillito complex, 0 to 3 percent slopes

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 68 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Perryville and similar soils: 35 percent
Rillito and similar soils: 30 percent
Perryville and similar soils: 10 percent

Description of Perryville

Setting

Landform: Plains, alluvial fans

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 9 inches: loam
Ck1 - 9 to 38 inches: gravelly loam
Ck2 - 38 to 65 inches: sandy loam
2C - 65 to 72 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Description of Rillito

Setting

Landform: Alluvial fans, plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 10 inches: gravelly loam
Bk - 10 to 75 inches: gravelly loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Description of Perryville

Setting

Landform: Plains, alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 9 inches: sandy loam
Ck1 - 9 to 38 inches: gravelly loam
Ck2 - 38 to 65 inches: sandy loam
2C - 65 to 72 inches: very gravelly loamy sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

PT—Pinal gravelly loam

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 70 to 74 degrees F
Frost-free period: 270 to 320 days

Map Unit Composition

Pinal and similar soils: 100 percent

Description of Pinal

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Old gravelly and cobbly mixed valley fill alluvium

Typical profile

A - 0 to 12 inches: gravelly loam
Bkqm - 12 to 60 inches: cemented material

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 8 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Limy Upland 7-10" p.z. (R040XB210AZ)

PYD—Pinamt-Tremant complex, 1 to 10 percent slopes

Map Unit Setting

Elevation: 800 to 1,800 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 320 days

Map Unit Composition

Pinamt and similar soils: 40 percent
Tremant and similar soils: 30 percent

Description of Pinamt

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stratified very gravelly mixed alluvium

Typical profile

A - 0 to 2 inches: very cobbly loam
B - 2 to 6 inches: very gravelly sandy loam
Btk - 6 to 22 inches: very gravelly sandy clay loam
Bk - 22 to 60 inches: very cobbly sandy loam

Properties and qualities

Slope: 1 to 10 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Upland 7-10" p.z. Deep (R040XB208AZ)

Description of Tremant

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gravelly mixed alluvium

Typical profile

A - 0 to 1 inches: gravelly loam
Bt - 1 to 8 inches: clay loam
Btk - 8 to 23 inches: gravelly clay loam
Bk - 23 to 60 inches: gravelly loam

Properties and qualities

Slope: 1 to 10 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Loamy Upland 7-10" p.z. (R040XB213AZ)

RbA—Rillito loam, 0 to 1 percent slopes

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 68 to 71 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Rillito and similar soils: 100 percent

Description of Rillito

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 10 inches: loam
Bk - 10 to 75 inches: gravelly loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

RS—Rock outcrop-Cherioni complex

Map Unit Setting

Elevation: 800 to 1,800 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 72 degrees F
Frost-free period: 270 to 325 days

Map Unit Composition

Rock outcrop: 65 percent
Cherioni and similar soils: 20 percent

Description of Cherioni

Setting

Landform: Hills, mountain slopes
Landform position (two-dimensional): Summit

Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium derived from andesite and/or colluvium derived from andesite

Typical profile

A - 0 to 1 inches: very gravelly loam
B - 1 to 6 inches: very gravelly loam
Bkqm - 6 to 12 inches: cemented material
R - 12 to 16 inches: bedrock

Properties and qualities

Slope: 5 to 70 percent
Depth to restrictive feature: 5 to 18 inches to duripan; 6 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Very low (about 0.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Basalt Hills 7-10" p.z. (R040XB201AZ)

TB—Torrifluvents

Map Unit Setting

Elevation: 800 to 1,400 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Torrifluvents and similar soils: 0 percent

Description of Torrifluvents

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Young unconsolidated alluvium

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

TrB—Tremant-Rillito complex, 1 to 3 percent slopes

Map Unit Setting

Elevation: 800 to 1,800 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 68 to 74 degrees F
Frost-free period: 250 to 320 days

Map Unit Composition

Tremant and similar soils: 35 percent
Rillito and similar soils: 30 percent

Description of Tremant

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gravelly mixed alluvium

Typical profile

A - 0 to 1 inches: gravelly clay loam
Bt - 1 to 8 inches: clay loam
Btk - 8 to 23 inches: gravelly clay loam
Bk - 23 to 60 inches: gravelly loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Clay Loam Upland 7-10" p.z. (R040XB205AZ)

Description of Rillito

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile
A - 0 to 10 inches: gravelly loam
Bk - 10 to 75 inches: gravelly loam

Properties and qualities
Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

TSC—Tremant-Rillito complex, 0 to 5 percent slopes

Map Unit Setting
Elevation: 800 to 1,800 feet
Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 68 to 74 degrees F
Frost-free period: 250 to 320 days

Map Unit Composition

Tremant and similar soils: 35 percent
Rillito and similar soils: 30 percent

Description of Tremant

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Gravelly mixed alluvium

Typical profile

A - 0 to 1 inches: gravelly clay loam
Bt - 1 to 8 inches: clay loam
Btk - 8 to 23 inches: gravelly clay loam
Bk - 23 to 60 inches: gravelly loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Clay Loam Upland 7-10" p.z. (R040XB205AZ)

Description of Rillito

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

A - 0 to 10 inches: gravelly loam
Bk - 10 to 75 inches: gravelly loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Limy Fan 7-10" p.z. (R040XB207AZ)

Vg—Vint loamy fine sand

Map Unit Setting

Elevation: 750 to 1,300 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 290 days

Map Unit Composition

Vint and similar soils: 100 percent

Description of Vint

Setting

Landform: Flood plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent mixed alluvium

Typical profile

A - 0 to 2 inches: loamy fine sand
C - 2 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups
Farmland classification: Farmland of unique importance
Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

Vh—Vint fine sandy loam

Map Unit Setting
Elevation: 750 to 1,300 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 69 to 74 degrees F
Frost-free period: 250 to 290 days

Map Unit Composition
Vint and similar soils: 100 percent

Description of Vint

Setting
Landform: Terraces, flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent mixed alluvium

Typical profile
Ap - 0 to 2 inches: fine sandy loam
C - 2 to 60 inches: loamy fine sand

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0

Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Farmland classification: Farmland of unique importance
Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: Sandy Wash 7-10" p.z. (R040XB216AZ)

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook."

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change

in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age,

the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of

streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth’s surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown.

The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they

form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which "severely eroded," "very severely eroded," or "gullied" is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds

and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1

Moderate: 13-30:1

Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0
Coarse sand: 1.0 to 0.5
Medium sand: 0.5 to 0.25
Fine sand: 0.25 to 0.10
Very fine sand: 0.10 to 0.05
Silt: 0.05 to 0.002
Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents

the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated

Prismatic: Vertically elongated and having flat tops

Columnar: Vertically elongated and having rounded tops

Angular blocky: Having faces that intersect at sharp angles (planes)

Subangular blocky: Having subrounded and planar faces (no sharp angles)

Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand

Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth’s surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

Appendix E – Biological Resources

(Insert all materials behind this cover page)

Element Status Designations by County, Taxon, Scientific Name
Arizona Game and Fish Department, Heritage Data management System
Updated: July 01, 2014

COUNTY	TAXON	SCIENTIFIC NAME	COMMON NAME	ESA	BLM	CRIT HAB	USFS	NESL	MEXFED	STATE	SGCN	ELCODE	S RANK	G RANK
Maricopa	AMPHIBIAN	Anaxyrus microscaphus	Arizona Toad	SC							1B	AAABB01110	S3S4	G4
Maricopa	AMPHIBIAN	Anaxyrus retiformis	Sonoran Green Toad		S				PR		1B	AAABB01140	S3	G4
Maricopa	AMPHIBIAN	Gastrophryne olivacea	Western Narrow-mouthed Toad		S				PR	WSC	1C	AAABE01020	S3	G5
Maricopa	AMPHIBIAN	Lithobates chiricahuensis	Chiricahua Leopard Frog	LT		Y			A	WSC	1A	AAABH01080	S2	G2G3
Maricopa	AMPHIBIAN	Lithobates yavapaiensis	Lowland Leopard Frog	SC	S		S		PR	WSC	1A	AAABH01250	S3	G4
Maricopa	AMPHIBIAN	Smilisca fodiens	Lowland Burrowing Treefrog		S					WSC	1B	AAABC06010	S2	G4
Maricopa	BIRD	Aquila chrysaetos	Golden Eagle		S			3	A		1B	ABNKC22010	S4	G5
Maricopa	BIRD	Ardea alba	Great Egret							WSC	1C	ABNGA04040	S1B,S4N	G5
Maricopa	BIRD	Ardea herodias	Great Blue Heron						|			ABNGA04010	S5	G5
Maricopa	BIRD	Asio otus	Long-eared Owl								1C	ABNSB13010	S2B,S3S4N	G5
Maricopa	BIRD	Athene cunicularia hypugaea	Western Burrowing Owl	SC	S		S	4	PR		1B	ABNSB10012	S3	G4T4
Maricopa	BIRD	Bubulcus ibis	Cattle Egret									ABNGA07010	S1B,S4N	G5
Maricopa	BIRD	Buteo albonotatus	Zone-tailed Hawk						PR			ABNKC19090	S4	G4
Maricopa	BIRD	Buteo swainsoni	Swainson's Hawk						PR		1C	ABNKC19070	S3	G5
Maricopa	BIRD	Buteogallus anthracinus	Common Black-Hawk						PR	WSC	1C	ABNKC15010	S3	G4G5
Maricopa	BIRD	Cathartes aura	Turkey Vulture									ABNKA02010	S5	G5
Maricopa	BIRD	Catharus ustulatus	Swainson's Thrush								1B	ABPBJ18100	S1	G5
Maricopa	BIRD	Charadrius nivosus nivosus	Western Snowy Plover	No Status					A	WSC	1B	ABNNB03031	S1	G3T3
Maricopa	BIRD	Coccyzus americanus	Yellow-billed Cuckoo (Western U.S. DPS)	PT			S	2		WSC	1A	ABNRB02020	S3	G5
Maricopa	BIRD	Dendrocygna autumnalis	Black-bellied Whistling-Duck							WSC	1C	ABNJB01040	S3	G5
Maricopa	BIRD	Egretta thula	Snowy Egret							WSC	1C	ABNGA06030	S1B,S4N	G5
Maricopa	BIRD	Empidonax traillii extimus	Southwestern Willow Flycatcher	LE		Y		2	E	WSC	1A	ABPAE33043	S1	G5T2
Maricopa	BIRD	Falco peregrinus anatum	American Peregrine Falcon	SC	S		S	4	PR	WSC	1A	ABNKD06071	S4	G4T4
Maricopa	BIRD	Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy-owl	SC	S		S			WSC	1B	ABNSB08041	S1	G5T3
Maricopa	BIRD	Haliaeetus leucocephalus (wintering pop.)	Bald Eagle - Winter Population	SC	S		S	2	P	WSC	1A	ABNKC10015	S4N	G5TNR
Maricopa	BIRD	Haliaeetus leucocephalus pop. 3	Bald Eagle - Sonoran Desert Population	SC	S		S	2	P	WSC	1A	ABNKC10014	S2S3	G5TNR
Maricopa	BIRD	Himantopus mexicanus	Black-necked Stilt									ABNND01010	S2	G5
Maricopa	BIRD	Icterus bullockii	Bullock's Oriole								1C	ABPBXB9220	S4BS1N	G5
Maricopa	BIRD	Ictinia mississippiensis	Mississippi Kite						PR	WSC	1B	ABNKC09010	S3	G5
Maricopa	BIRD	Ixobrychus exilis	Least Bittern						PR	WSC	1C	ABNGA02010	S3	G5
Maricopa	BIRD	Larus fuscus	Lesser Black-backed Gull									ABNNM03150	SA	G5
Maricopa	BIRD	Megaceryle alcyon	Belted Kingfisher					4		WSC		ABNXD01020	S2B,S5N	G5
Maricopa	BIRD	Mniotilta varia	Black-and-white Warbler									ABPBX05010	S1B,S1N	G5
Maricopa	BIRD	Pandion haliaetus	Osprey							WSC		ABNKC01010	S2B,S4N	G5
Maricopa	BIRD	Parabuteo unicinctus	Harris's Hawk						PR		1C	ABNKC16010	S5	G5
Maricopa	BIRD	Rallus longirostris yumanensis	Yuma Clapper Rail	LE					A	WSC	1A	ABNME0501A	S3	G5T3
Maricopa	BIRD	Strix occidentalis lucida	Mexican Spotted Owl	LT		Y		3	A	WSC	1A	ABNSB12012	S3S4	G3T3
Maricopa	BIRD	Toxostoma lecontei	Le Conte's Thrasher								1B	ABPBK06100	S3	G4
Maricopa	BIRD	Tyrannus forficatus	Scissor-tailed Flycatcher									ABPAE52100	SAB	G5
Maricopa	FISH	Agosia chrysogaster chrysogaster	Gila Longfin Dace	SC	S				A		1B	AFCJB37151	S3S4	G4T3T4
Maricopa	FISH	Catostomus clarkii	Desert Sucker	SC	S		S				1B	AFCJC02040	S3S4	G3G4
Maricopa	FISH	Catostomus insignis	Sonora Sucker	SC	S		S		P		1B	AFCJC02100	S3	G3G4
Maricopa	FISH	Cyprinodon macularius	Desert Pupfish	LE		Y			P	WSC	1A	AFCNB02060	S1	G1
Maricopa	FISH	Gila elegans	Bonytail	LE		Y		1	E	WSC	1A	AFCJB13100	S1	G1
Maricopa	FISH	Gila robusta	Roundtail Chub	C*			S	2	A	WSC	1A	AFCJB13150	S2	G3
Maricopa	FISH	Poeciliopsis occidentalis occidentalis	Gila Topminnow	LE					A	WSC	1A	AFCNC05021	S1S2	G3
Maricopa	FISH	Ptychocheilus lucius	Colorado Pikeminnow	LE,XN				2	E	WSC	1A	AFCJB35020	S1	G1
Maricopa	FISH	Rhinichthys osculus	Speckled Dace	SC	S				E		1B	AFCJB37050	S3S4	G5
Maricopa	FISH	Xyrauchen texanus	Razorback Sucker	LE		Y		2	P	WSC	1A	AFCJC11010	S1	G1
Maricopa	INVERTEBRATE	Cicindela oregona maricopa	Maricopa Tiger Beetle	SC								IICOL02362	S3	G5T3

Maricopa	INVERTEBRATE	Limenitis archippus obsoleta	Obsolete Viceroy Butterfly									IILEPL3024	S4	G5T3T4
Maricopa	INVERTEBRATE	Maricopella allynsmithi	Squaw Park Talussnail	SC							1B	IMGASC9010	S1	G1
Maricopa	MAMMAL	Antilocapra americana sonoriensis	Sonoran Pronghorn	LE					P	WSC	1A	AMALD01012	S1	G5T1
Maricopa	MAMMAL	Antrozous pallidus	Pallid Bat									AMACC10010	S4	G5
Maricopa	MAMMAL	Bat Colony										OBATCOLONY	SU	GNR
Maricopa	MAMMAL	Bat Foraging Area	High Netting Concentration									OBATFORAG1	SU	GNR
Maricopa	MAMMAL	Chaetodipus spinatus	Spiny Pocket Mouse						|			AMAFD05090	SR	G5
Maricopa	MAMMAL	Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S		S	4			1B	AMACC08014	S3S4	G3G4T3T4
Maricopa	MAMMAL	Eumops perotis californicus	Greater Western Bonneted Bat	SC	S						1B	AMACD02011	S3	G5T4
Maricopa	MAMMAL	Lasiurus blossevillii	Western Red Bat				S			WSC	1B	AMACC05060	S3	G5
Maricopa	MAMMAL	Lasiurus cinereus	Hoary Bat	No Status								AMACC05030	S4	G5
Maricopa	MAMMAL	Lasiurus xanthinus	Western Yellow Bat				S			WSC	1B	AMACC05070	S2S3	G5
Maricopa	MAMMAL	Leptonycteris curasoae yerbabuenae	Lesser Long-nosed Bat	LE					A	WSC	1A	AMACB03030	S2S3	G4
Maricopa	MAMMAL	Lepus alleni	Antelope Jackrabbit						|		1B	AMAEB03070	S3	G5
Maricopa	MAMMAL	Macrotus californicus	California Leaf-nosed Bat	SC	S					WSC	1B	AMACB01010	S3	G4
Maricopa	MAMMAL	Myotis auriculus	Southwestern Myotis								1C	AMACC01080	S3	G5
Maricopa	MAMMAL	Myotis californicus	California Myotis									AMACC01120	S4	G5
Maricopa	MAMMAL	Myotis velifer	Cave Myotis	SC	S						1B	AMACC01050	S3S4	G5
Maricopa	MAMMAL	Myotis yumanensis	Yuma Myotis	SC							1B	AMACC01020	S3S4	G5
Maricopa	MAMMAL	Nyctinomops femorosaccus	Pocketed Free-tailed Bat								1B	AMACD04010	S3	G4
Maricopa	MAMMAL	Parastrellus hesperus	Canyon Bat									AMACC03010	S5	G5
Maricopa	MAMMAL	Tadarida brasiliensis	Brazilian Free-tailed Bat								1B	AMACD01010	S3S4	G5
Maricopa	PLANT	Abutilon parishii	Pima Indian Mallow	SC	S		S			SR		PDMAL020E0	S3	G2
Maricopa	PLANT	Acacia farnesiana	Sweet Acacia									PDFAB020D0	S1S2	G5
Maricopa	PLANT	Agave delamateri	Tonto Basin Agave	SC			S			HS		PMAGA010W0	S2	G2
Maricopa	PLANT	Agave murpheyi	Hohokam Agave	SC	S		S			HS		PMAGA010F0	S2?	G2
Maricopa	PLANT	Agave toumeyana var. bella	Toumey Agave							SR		PMAGA010R1	S3	G3T3
Maricopa	PLANT	Agave x arizonica	Arizona agave	No status						HS		PMAGA01030	SHYB	G1Q
Maricopa	PLANT	Allium bigelovii	Bigelow Onion							SR		PMLIL02070	S2S3	G3
Maricopa	PLANT	Berberis harrisoniana	Kofa Mt Barberry		S							PDBER02030	S1	G1G2
Maricopa	PLANT	Camissonia micrantha	Miniature Suncup									PDONA03100	S3	G3?
Maricopa	PLANT	Camissonia pusilla	Washoe Suncup									PDONA031C0	S1	G3G4
Maricopa	PLANT	Colubrina californica	California Snakewood									PDRHA05030	S2S3	G4
Maricopa	PLANT	Echinocereus yavapaiensis	Yavapai Hedgehog Cactus									PDCAC060T0	S2S3	GNR
Maricopa	PLANT	Echinomastus erectocentrus var. acunensis	Acuna Cactus	LE		P			P	HS		PDCAC0J0E1	S1	G3T1T2Q
Maricopa	PLANT	Ericameria brachylepis	Rayless Turpentine Bush									PDAST3L030	S4	G4
Maricopa	PLANT	Erigeron lobatus	Lobed Fleabane									PDAST3M2C0	S4	G4
Maricopa	PLANT	Erigeron piscaticus	Fish Creek Fleabane	SC	S		S			SR		PDAST3M4X0	S1	G1
Maricopa	PLANT	Eriogonum ripleyi	Ripley Wild-buckwheat	SC			S			SR		PDPGN08520	S2	G2
Maricopa	PLANT	Euphorbia trachysperma	Roughseed Spurge									PDEUP0D2E0	S4	G4
Maricopa	PLANT	Ferocactus cylindraceus	Desert Barrel Cactus						PR	SR		PDCAC08080	S4	G5
Maricopa	PLANT	Ferocactus emoryi	Emory's Barrel-cactus							SR		PDCAC08090	S1S2	G4
Maricopa	PLANT	Fremontodendron californicum	Flannel Bush		S					SR		PDSTE03010	S2S3	G4
Maricopa	PLANT	Heuchera eastwoodiae	Eastwood Alum Root				S					PDSAX0E0B0	S3	G3
Maricopa	PLANT	Hymenoxys ambigens var. ambigens	Pinaleno Mountain Rubberweed									PDAST530T1	S1?	G3?T1?
Maricopa	PLANT	Justicia candicans	Hierba Azul									PDACA0E0L0	S2	G4
Maricopa	PLANT	Lotus alamosanus	Alamos Deer Vetch				S					PDFAB2A020	S1	G3G4
Maricopa	PLANT	Lotus mearnsii var. equisolensis	Horseshoe Deer Vetch				S					PDFAB2A0Q1	S1	G3T1
Maricopa	PLANT	Ludwigia palustris	Marsh Purslane									PDONA0B0H0	S1	G5
Maricopa	PLANT	Lupinus huachucanus	Huachuca Mountain Lupine				S					PDFAB2B210	S2	G2
Maricopa	PLANT	Lupinus lemmonii	Lemmon's Lupine				S					PDFAB2B2A0	S1Q	G1Q
Maricopa	PLANT	Mabrya acerifolia	Mapleleaf False Snapdragon				S					PDSCR2L010	S2	G2
Maricopa	PLANT	Machaeranthera arida	Arid Tansy-aster									PDAST64040	S1	G3G4
Maricopa	PLANT	Mammillaria viridiflora	Varied Fishhook Cactus							SR		PDCAC0A0D0	S4	G4
Maricopa	PLANT	Mentzelia longiloba var. longiloba	Panamint Blazingstar									PDLOA030W1	S2	G5TNR

Maricopa	PLANT	Opuntia echinocarpa	Straw-top Cholla							SR		PDCAC0D2W0	S5	G5
Maricopa	PLANT	Opuntia engelmannii var. flavispina								SR		PDCAC0D224	S3?	G5T3?
Maricopa	PLANT	Perityle saxicola	Fish Creek Rock Daisy	SC			S					PDAST700P0	S1	G1?
Maricopa	PLANT	Plagiobothrys pringlei	Pringle Popcorn-flower									PDBOR0V0V0	S2	G3G4
Maricopa	PLANT	Purshia subintegra	Arizona Cliff Rose	LE						HS		PDROS1E080	S2	GNA
Maricopa	PLANT	Salvia davidsonii	Davidson Sage									PDLAM1S0E0	S2?	G2?
Maricopa	PLANT	Selaginella eremophila	Desert Spike Moss									PPSEL010G0	S3S4	G4
Maricopa	PLANT	Senecio arizonicus	Arizona Groundsel									PDAST8H070	S4	G4
Maricopa	PLANT	Solanum heterodoxum	Melonleaf Nightshade									PDSOL0Z0X0	S4	G4G5
Maricopa	PLANT	Stenocereus thurberi	Organ Pipe Cactus							SR		PDCAC10020	S4	G5
Maricopa	PLANT	Tetracoccus fasciculatus var. hallii	Hall Shrub Spurge									PDEUP1C021	S3S4	G4T4
Maricopa	PLANT	Tumamoca macdougalii	Tumamoc Globeberry		S		S			SR		PDCUC0S010	S3	G4
Maricopa	PLANT	Vauquelinia californica ssp. sonorensis	Arizona Sonoran Rosewood		S							PDROS1R024	S1S2	G4T1
Maricopa	REPTILE	Aspidoscelis xanthonota	Redback Whiptail	SC			S				1B	ARACJ02012	S2	G2
Maricopa	REPTILE	Chionactis occipitalis	Western Shovel-nosed Snake								1C	ARADB05010	S3S4	G5
Maricopa	REPTILE	Chionactis occipitalis klauberi	Tucson Shovel-nosed Snake	C*		P					1A	ARADB05012	S1	G5T3Q
Maricopa	REPTILE	Crotaphytus bicinctores	Great Basin Collared Lizard									ARACF04010	S4	G5
Maricopa	REPTILE	Crotaphytus nebrius	Sonoran Collared Lizard								1B	ARACF04050	S3S4	G4
Maricopa	REPTILE	Gopherus morafkai	Sonoran Desert Tortoise	C*			S		A	WSC	1A	ARAAF01013	S4	G4
Maricopa	REPTILE	Heloderma suspectum	Gila Monster						A		1A	ARACE01010	S4	G4
Maricopa	REPTILE	Heloderma suspectum cinctum	Banded Gila Monster	SC					A		1A	ARACE01011	S4	G4T4
Maricopa	REPTILE	Heloderma suspectum suspectum	Reticulate Gila Monster						A		1A	ARACE01012	S4	G4T4
Maricopa	REPTILE	Kinosternon arizonense	Arizona Mud Turtle								1B	ARAAE01060	S2	G4
Maricopa	REPTILE	Lichanura trivirgata	Rosy Boa	SC					A		1B	ARADA01020	S1S2	G4G5
Maricopa	REPTILE	Phrynosoma hernandesi	Greater Short-horned Lizard									ARACF12080	S4	G5
Maricopa	REPTILE	Phyllorhynchus browni	Saddled Leaf-nosed Snake						PR		1B	ARADB25010	S5	G5
Maricopa	REPTILE	Plestiodon "gilberti" rubricaudatus	Western Red-tailed Skink						PR		1C	ARACH01065	S3S4	G5T4Q
Maricopa	REPTILE	Sauromalus ater	Common Chuckwalla	SC				4	Pr			ARACF13010	S4	G5
Maricopa	REPTILE	Tantilla hobartsmithi	Smith's Black-headed Snake									ARADB35140	S5	G5
Maricopa	REPTILE	Thamnophis eques megalops	Northern Mexican Gartersnake	PT		P	S		A	WSC	1A	ARADB36061	S1	G4T3
Maricopa	REPTILE	Xantusia bezyi	Bezy's Night Lizard				S				1B	ARACK01060	S2	G2

potential to be
within or near park boundaries

Appendix F – Cultural Resources

(Insert all materials behind this cover page)

Archeological Sites

Sources:

- Maricopa County Regional Park System Plan, Volume 2, Pages 25-28, 1965
- Estrella Mountain Regional Park Long-Range Master Plan, 1988
- An Appraisal of the Archaeological Resources of Five Regional Parks in Maricopa County, Arizona, 1963

Site:	**Arizona T:11:3**
Description:	Arizona T:11:3 is a large village site situates in a stabilized sand dune area in the south side of the Gila River at the northern base of the Sierra Estrella. The important site covers roughly 25 acres, the cultural material extending to a depth of at least 75 cm.
Location:	T1N, R1W, Section 33, N ½, SW ¼
Cultural Affiliation:	Patayan
Pottery:	Red-on-brown, Lower Colorado Buffware
Dates:	The red-on-brown pottery from this site is similar to Papago red-on-brown which was made between 1700 and 1930, indicating the possibility of a date for this site during this time. The Patayan are currently assumed to have been the ancestors, in part, of the present day Maricopa Indians. Historical documents indicate that the section of the Gila River where Arizona T:11:3 is located was controlled by the Maricopa prior to 1800. It is possible, therefore, that Arizona T:11:3 is a Maricopa site occupied before 1800, possibly as early as 1700.
Site:	**Arizona T:11:4**
Description:	This is a rockshelter in a steep-sided wash which drains into the Gila River from the north slope of the Sierra Estrella. The shelter is small, only about 1.0m deep and 2.0m wide at the mouth. It probably represents a temporary campsite as only a few sherds were found scattered about. There is no evidence of long continued occupation.
Location:	T1N, R1W, Section 32, SE ¼ and SW ¼
Cultural Affiliation:	Hohokam
Pottery:	Classic Redware
Dates:	A.D. 1100-1450
Site:	**Arizona T:11:5**
Description:	Arizona T:11:5 is situated on the southwest side of Estrella Park near an arroyo which is a tributary to Corgett Wash, the major drainage in this section of the Park. Sherds are scattered over about 10 acres. An outcrop of quartz rock including some chert, which may have served as a source of tool material, is within the sherd area; perhaps this feature attracted the Indians.
Location:	T1N, R1E, Section 28, E ½ and NE ¼
Cultural Affiliation:	Hohokam
Pottery:	Sacaton Red-on-buff, Classic Redware, Gila Plain
Dates:	A.D. 1000-1450

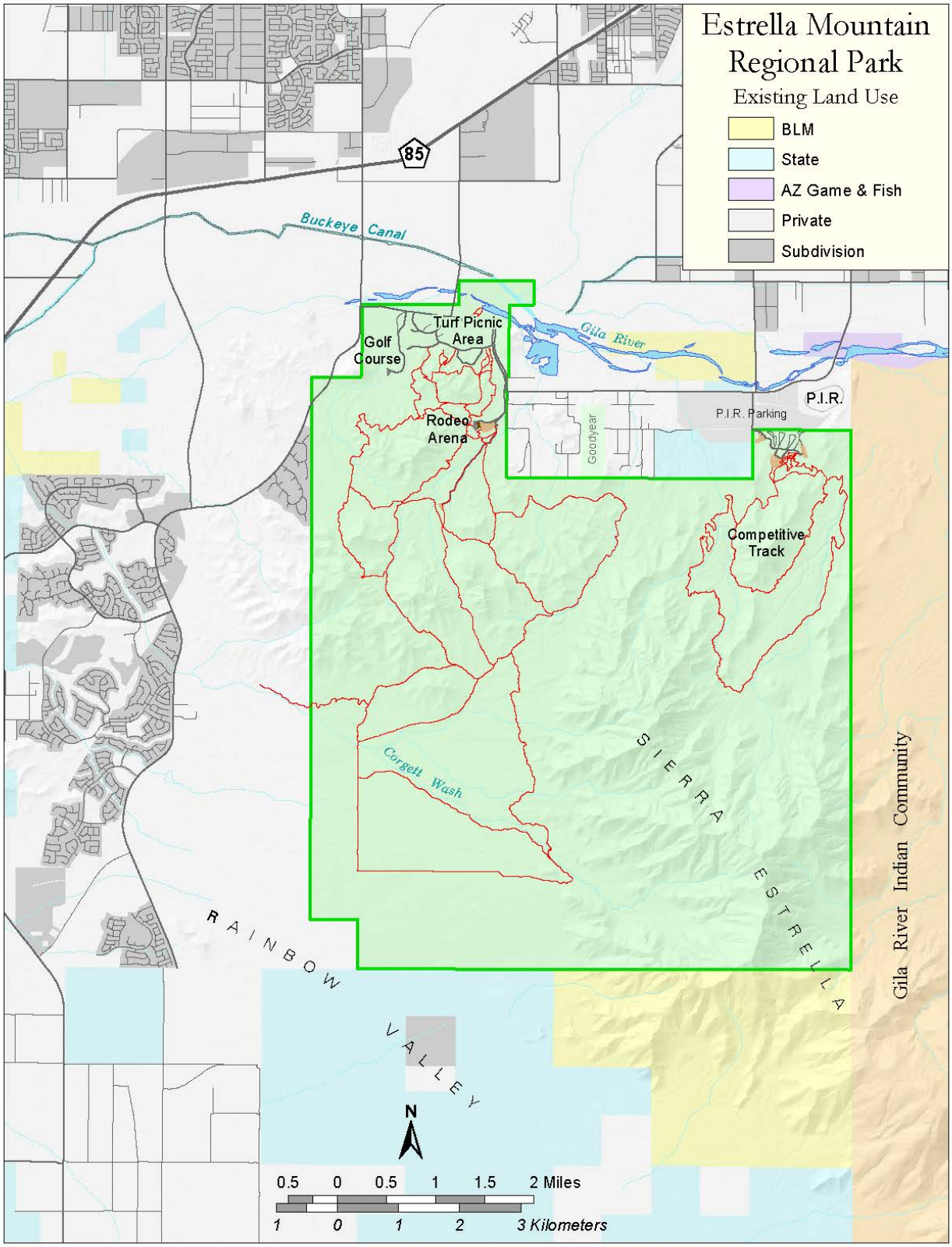
Site:	**Arizona T:11:6**
Description:	This is a rock shelter situated on a steeply sloping hillside near the north end of the Sierra Estrella. The shelter is small, only about 2m deep and 2m wide at the mouth. There is no evidence of any long continued occupation, although traces of burning on the roof of the shelter indicate its probable use as a temporary camping spot.
Location:	T1S R1W, Section 16, NW ¼, NE ¼
Cultural Affiliation:	Unknown
Pottery:	Pottery has been removed from the shelter, but none was found during the course of this survey.
Dates:	Unknown
Site:	**Arizona T:11:7**
Description:	This sherd area, probably representing a temporary camp, is situated on the southwest side of the Sierra Estrella on an arroyo tributary to Corgett Wash. Sherds are scattered over an area of some 10 acres but there is no evidence of any depth to the cultural deposit.
Location:	T1S, R1W, Section 20, SE ¼, NE ¼
Cultural Affiliation:	Hohokam
Pottery:	Gila Plain
Dates:	Unknown
Site:	**Arizona T:11:8**
Description:	This is situated in a pass through the northwest end of Estrella. The site is a small village, covering about an acre. One ling line of boulders which extends for a distance of about 30m may be an architectural feature. Cultural material is present to a depth of about 25cm but has been disturbed by recent relic collectors.
Location:	T1S, R1W, Section 16, SE 1/4 , SW ¼
Cultural Affiliation:	Hohokam
Pottery:	Gila Butte Red-on-Buff, Sacaton Cruz Red-on-buff, Gila Plain
Dates:	A.D. 500-900
Site:	**Arizona T:11:9**
Description:	This site is situated at the top of a small hill near the northwest end of Estrella. It is marked by a single room, of dry-laid masonry, about 1.5m in diameter, which may represent a lookout. The site commands a wide view of the surrounding countryside. There is an indication of temporary occupation in the form of scattered sherds.
Location:	T1S, R1W, Section 6, NW 1/4 , SW ¼
Cultural Affiliation:	Hohokam
Pottery:	Sacaton Red-on-buff, Gila Plain
Dates:	A.D. 900-1100
Site:	**Arizona T:11:10**
Description:	This site is situated on an area of gently sloping ground between two washes

	which drain north into the Gila River. It is a small sherd area with cultural materials scattered over approximately one acre.
Location:	T1S, R1W, Section 8, NW ¼, NW ¼
Cultural Affiliation:	Hohokam
Pottery:	Sacaton Red-on-buff, Classic Redware, Gila Plain
Dates:	A.D. 900-1450
Site:	**Arizona T:11:11**
Description:	A site on the north side of Estrella, it is marked by the presence of sherds scattered over approximately one-half acre and several bedrock mortars in an adjoining outcrop of rock.
Location:	T1N, R1W, Section 32, NE ¼, SE ¼
Cultural Affiliation:	Hohokam
Pottery:	Plainware
Dates:	Unknown
Site:	**Arizona T:11:13**
Description:	This site is situated on a steeply sloping, rocky hillside at the north end of the Park. Sherds are thinly scattered over one-half acre. Several geometric and anthropomorphic petroglyphs have been pecked into boulders on the hillside.
Location:	T1N, R1W, Section 32, NW ¼, SW ¼
Cultural Affiliation:	Hohokam
Pottery:	Sacaton Red-on-buff, Classic Redware, Gila Plain
Dates:	A.D. 700-1450
Site:	**Arizona T:11:14**
Description:	This is a sherd area in a steep sided canyon near the head of Corgett Wash. Sherds, probably all from one vessel, were found thinly scattered over an area about one-half acre.
Location:	T1S, R1W, Section 34, NW ¼, NW ¼
Cultural Affiliation:	Patayan
Pottery:	Lower Colorado Buffware
Dates:	Unknown
Site:	**Arizona T:11:15**
Description:	Arizona T:11:15 is a sherd area, probably representing a temporary camp, situated on the west side of the Park on the bank of Corgett Wash. Sherds are thinly scattered for about 100 yards along the wash.
Location:	T1S, R1W, Section 29, E ½, NE ¼
Cultural Affiliation:	Hohokam
Pottery:	Sacaton Red-on-buff, Gila Plain
Dates:	A.D. 500-900
Site:	**Cashion Site (SHPO site file NA14690)**
Description:	National Register of Historic Places, archaeological district

Location:	n/a
Cultural Affiliation:	n/a
Pottery:	n/a
Dates:	n/a
Site:	**Alkalia Ruin (SHPO site file NA12542)**
Description:	n/a
Location:	n/a
Cultural Affiliation:	n/a
Pottery:	n/a
Dates:	n/a
Site:	**Villa Buena (site file AZ T:12:3 ASU)**
Description:	n/a
Location:	n/a
Cultural Affiliation:	n/a
Pottery:	n/a
Dates:	n/a
Site:	**AZ T:11:29**
Description:	Sherd and lithic scatter
Location:	Within park
Cultural Affiliation:	Hohokam
Pottery:	n/a
Dates:	n/a
Site:	**Pack Saddle Trail (SHPO site file 1197)**
Description:	a historic trail that was used by pioneers traveling from Phoenix to Little Rainbow Valley
Location:	Bisects park northeast to southwest, part of existing trail system
Cultural Affiliation:	Early pioneers
Pottery:	n/a
Dates:	n/a

Appendix G – Land Use

(Insert all materials behind this cover page)


Estrella Mountain Regional Park
Existing Land Use
BLM
State
AZ Game & Fish
Private
Subdivision
85
Buckeye Canal
Gila River
Turf Picnic Area
Golf Course
Rodeo Arena
P.I.R.
P.I.R. Parking
Goodyear
Competitive Track
Corgett Wash
SIERRA ESTRELLA
RAINBOW VALLEY
Gila River Indian Community
N
0.5 0 0.5 1 1.5 2 Miles
1 0 1 2 3 Kilometers

Appendix H – Facilities and Infrastructure

(Insert all materials behind this cover page)

Estrella Mountain Regional Park

* Fixture is a toilet, sink, or urinal

Route	Facility Type/Item	Restrooms		Other	Name/Location/ additional	Comments
		Fixtures	Showers	Filters/valves miles, spaces, etc		
1	Nature/Visitor Center Building	14	0		2 ADA, 8 Ext rest r., 1 critter r., 2 interior rest r., 1 kitchen	3,000 sq. ft. building, masonry and recyled stone walls. Roof metal with solar panels. 8 interior rooms, classroom dividing panels, ext water spigot (1), water fountains (2)
	Parking Lot at Nature Center	51	spaces	33,850 sq. ft.	paved drive, 4 paved ADA, 47 granite	Parking lot 50% paved 50% crushed granite, 1,330 ft. curb
	Exterior space Nature Center			3 valves, 5 drip		3 water valves, 5 drip valve boxes, 1 fire pit, 1 tortoise encl.
	Trailhead at Nature Center				Centennial Trail, Quail Trail	Kiosk, information panel, crushed granite 200 ft. start
2	Maintenance Compound Bld.	7	2	2,000 square ft.	2 ADA toilets, 1 reg toilet, 1 urinal	3 sinks, Metal Building, 2 rest r., 3 offices, 2 garage areas
	Parking Lot at Maintenance Comp			40,722 sq. ft.	2 car ports 12 covered, 5 uncovered	Compound walls, 2 gates, 6 dumpsters
3	Entrance Sites (sites 1,2,3) (Hosts)	3	0	4 valves	3 covered sites, water, sewer, elect.	16' covers, 45' combined vehicle length, Septic Tank
						20, 30, 50 Amp, picnic table, grill, cement pad
4	Entrance Camp sites 4, 5, 6)	3	0	4	Near Golf Course, water,sewer, **elec**	2 covered, 15' covers, 1 uncovered, 50' comb vehicle length
						20, 30, 50 Amp, picnic table, grill, cement pad
5	Contact Station Estrella Main Ent.	2	0	1 A/C, Filter	Vineyard/Casey Abbott Rds	174 sq. ft. block building, annodized metal roof, secure

	Parking Lot at Entry Station	0	0	5 spaces	Paved Parking, flag pole, ext. lights	5 paved spaces (861 sq. ft.), 83 ft curb, 1 kiosk
6	Ball Fields (2)	0	14	10 light structures	Casey Abbott/Diamondback Way	2 Softball Fields, dirt infields, grass outfields, 8 valve boxes, chainlink fence, dugouts, backstops, bleachers, 12 trash cans
	Picnic Restroom at Ball Field	7	0	429 sq. ft.	2 ADA toilets, 1 reg toilet, 1 urinal	Block bld, tar roof, 2 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
	Parking Lot at Ball Fields	0	0	67,336 sq. ft	150 spaces, paved, striped	2,242 feet of curbing, 9 light poles
7	Ramada #1	0	0	6 picnic tables	Casey Abbott Rd North (N. W. Turf)	block posts, cement roof/tables, 4 trash cans, 1 big grill
	Parking Lot at Ramada #1 (paved)	0	0	26,598 sq. ft	60 parking space, 1158 ft of curbing	Groomed tree style in lot and surround (light poles removed)
8	Picnic Restroom #1 on Turf (N. W.)	7	0	300 sq. ft.	2 ADA toilets, 1 reg toilet, 1 urinal	Block bld, tar roof, 3 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
	Parking lot at Restroom #1	0	0		Shared lot from Ramada #1, #2	See lots ramada 1 and 2
9	Playground Turf #1	1		ramada 1, 2 lot	N. Casey Abbot at ramadas 1 and 2	Area signs, cement enclosed sand, see Playground insp. Sheet
						1 trash barrel Playground 1
10	Ramada #2	0	0	10 picnic tables	Casey Abbot Rd N. north turf)	block posts, cement roof/tables, 6 trash cans, 2 big grills
	Parking Lot at Ramada #2 (paved)	0	0	21,393 sq. ft	59 parking spaces, 1,096 ft. curb	Groomed tree style in lot and surround (light poles removed)
11	Picnic Restroom #2 on Turf N.	7	0	339 sq. ft.	2 ADA toilets, 1 reg toilet, 1 urinal	Block bld, tar roof, 2 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
	Parking lot at Restroom #2	0	0		Shared lot from Ramada #2, #3	See lots ramada 2 and 3

12	Ramada #3	7	0	6 picnic tables	Casey Abbot Rd N. north turf)	block posts, cement roof/tables, 4 trash cans, 1 big grill
	Parking lot at Ramada #3 (paved)	0	0	9290 sq. ft	22 parking spaces, 376 ft. curb	Groomed tree style in lot and surround (light poles removed)
13	Ramada #4	0	0	4 picnic tables	Casey Abbot Rd N. north turf)	block posts, cement roof/tables, 2 trash cans, 1 big grill
	Parking lot at Ramada #4 (paved)	0	0	9290 sq. ft	21 parking spaces, 375 ft. curb	Groomed tree style in lot and surround (light poles removed)
14	Primitive Camping Area #1	0	0	434,232 sq ft	Casey Abbot Rd N., NE corner curve	Previously bladed desert used for camping/picnic/event s
						(1 trash can, no grills)
15	Primitive Camping Area #2	0	0	36,186 sq. ft.	Casey Abbot Rd N., NE corner curve	Gravel Parking with 930 ft of curb stones, 82 parking spaces
						(1 trash can, no grills)
16	Picnic Restroom #3 Navy North	7	0	424 sq. ft	2 ADA toilets, 1 reg toilet, 1 urinal	Block bld, tar roof, 3 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
	Parking lot Restroom 3, Navy N.			26838 sq. ft.	53 parking spaces, 1033 ft. curb	Paved parking, stripes, goomed trees, lot supports Navy N.
17	Primitive Camp Area #3 Navy N.	0	0	lot size above	Camping, picnic, tables, grills	under Mesquite tree cover, reserv, 12 trash cans, 11 fam grills
18	Primitive Camp Area #4 Navy S.	0	0	16,626 sq. ft.	50 parking spaces (gravel,dirt)	Camp, picnic under Mesquite, tables, 6 family grills, reserv
						10 trash cans Navy S.
19	Playground Turf #2	1	0	N.W. Navy area	walk to playground only, no parking	Area signs, cement enclosed sand, see Playground insp. Sheet
						1 trash can
20	Picnic Restroom #4 NW of Navy S.	7	0	333 sq. ft.	2 ADA toilets, 1 reg toilet, 1 urinal	Block, metal roof, 3 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
	parking area (none)	0	0		walk to playground only, no parking	

21	Playground #3, Super playgr. Turf	0	0	N.W. Navy area	North of Ramada #5	Area signs, cement enclosed sand, see Playground insp. Sheet
						4 trash cans by Super playground
22	Ramada #5	0	0	8 picnic tables	Casey Abbot Rd. S. central turf	cement posts, metal roof/tables, 5 trash cans, 5 family grills
	Parking lot area #5, #6 paved			27,429 sq. ft	64 parking spaces, 1505 ft. curb	Paved parking, stripes, goomed trees, lot supports area.
23	Picnic Restroom #5, Turf S. central	0	0	326 sq. ft.	2 ADA toilets, 1 reg toilet, 1 urinal	Block, metal roof, 2 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
	Parking lot area see #5, #6 paved	0	0		shared lot with ramada #5, #6	Paved parking, stripes, goomed trees, lot supports area.
24	Primitive Camp Area #5	0	0	next to RR #5	Located E. and W. of Restroom #5	Camp, picnic, Mesquites, tables, 1 big 5 small grills, no reserv
						8 trash cans in primitive area each side of restroom 5
25	Ramada #6	0	0	10 picnic tables	Casey Abbott rd. S, central turf	block posts, cement roof/tables, 5 trash, 1 small grill, 2 big
	Parking lot area #6			13,714 sq. ft	32 parking spaces, 752 ft. curb	Paved parking, stripes, goomed trees, lot supports area.
26	Picnic Restroom #6, SW Turf	7	0	300 sq. ft.	2 ADA toilets, 1 reg toilet, 1 urinal	Block bld, tar roof, 2 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
	Parking lot area #6 paved			31,787 sq. ft.	72 parking spaces, 1393 ft. curb	Paved parking, stripes, goomed trees, lot supports area.
27	Ramada #7, SW Turf	0	0	6 picnic tables	Casey Abbot Rd. SW turf area	block posts, cement roof/tables, 4 trash cans, 2 big grills
	Parking lot area lots #7-#8 paved	0	0	37,118 sq. ft.	62 parking spaces, 1361 ft. curb	Paved parking, stripes, goomed trees, lot supports area.
28	Ramada #8	0	0	16 picnic tables	Casey Abbott Rd. SW turf	block posts, cement roof/tables, 6 trash, 2 big grills

	Parking lot#8 see 7 - 8 above					Paved parking, stripes, goomed trees, lot supports area.
29	Picnic Restroom #7, west turf	7	0	434 sq. ft.	2 ADA toilets, 1 reg toilet, 1 urinal	Block bld, tar roof, 2 trash cans, 2 sinks, 1 wtr fnt, 1 water spg
30	Ramada #9, west turf	0	0	46 picnic tables	Casey Abbott Rd. S. and N. entrance	block posts, cement roof/tables, 13 trash, 1 small grill, 2 big
				60,445 sq. ft.	156 parking spaces, 3514 ft. curb	Paved parking, stripes, goomed trees, lot supports area.
31	Primitive Camp area #6 Cul De Sac	0	0	143,296 sq. ft.	Open parking, dirt, no curbs	under Mesquite tree cover, reserv, 8 trash cans, 5 fam grills
						8 tables, Quail Trail Trailhead
32	Primitive Camp area #7	0	0	picnic/camp	Casey Abbott Rd. S. side sw off turf	under Mesquite tree cover, no reserv, 6 trash cans, 3 fam grills
						4 tables
33	Amphitheater, ramada and area	0	0	250 person seat	Casey Abbott Rd. S. Amphitheater Dr.	Ramada with 4 tables, 2 grills, 4 trash cans, reservation area
34	Amphitheater Camp Sites 1, 2	2	0		2 uncovered sites, water, sewer, elec	25' wide, 35' long, (20, 30, 50 amp) crushed granite, no pad
35	Turf, Turf Pump, Golf Course Pump		0	sprinkler system	Turf=Casey Abbott, Golf=Vineyard	Pump station, housing, valves, relays, keypads, gates, fence
						Turf 37 tables, 22 trash barrels,
36	Trailhead at Gila and Horseshoe	0	0	26,400 sq.ft	Casey Abbott S., S. side near 143 Dr.	Parking lot granite, fits about 30 cars, Kiosk, 2 trash cans
37	Water Tank, Pump for Arena Area		0		143rd Dr. and Arena Dr. intersection	Pump station, housing, valves, relays, gates, fence
38	Trailhead Coldwater, East Parking		0	117,500 sq. ft.	Open parking, 1102 ft. curb	Parking on P-gravel, 2 kiosks, 2 trash cans, horse trough
					143rd Dr. and Arena Dr. intersection	Ramada with 4 tables, 1 grill, 4 trash cans, reservation area

39	Arena Camp Sites 1-7	7	0	water,sewer elec	1 covered site, 6 uncovered	23' wide, 50' long, 20, 30, 50 Amp., table, grill, cement pad
					143rd Dr. and Arena Dr. intersection	
40	Arena Building (Concession Mngm	11	0	2 story offices	Arena Dr.W. end, includes restrooms	2 sinks, 8 toilets, 6 trash cans (4 in, 2 out), 1 water fountain
	Arena Building Parking West Lot			64120 sq. ft.	157 parking spaces, 1800 ft. curb	Parking support Arena, Trailhead for Rainbow, Kiosk, 1 can
41	Arena Camp Sites 8-10 Arena W.	3	0	water,sewer elec	3 uncovered sites, Concession	20' wide, 30' long, 20, 30, 50 Amp., no grill, table, pad
42	Trailhead Rainbow, Arena Dr. W.	0	0	shared lot	See Arena Building Parking sq. ft.	Paved parking, kiosk, 2 trash cans
43	Arena Complex, Concession Mngm	4	0	Shared lot	143rd Dr. and Arena Dr. West end	1 Large Arena, 1 small. Corrals, gates, fences,
	See Maintenance Inventory				**For Details Below See Maint. Plan**	
44	Baseline Trail				2.6 miles multi use	
45	Butterfield Trail				0.8 miles multi use	
46	Coldwater Trail				2.9 miles multi use	
47	Dysart Trail				1.9 miles multi use	
48	Gadsden Trail				6.0 miles multi use	
49	Gila Barrier Free Trail				0.5 miles barrier free, interpretive	
50	Homestead Trail				2.3 miles multi use	
51	Horseshoe Trail				1.0 miles multi use	
52	Pedersen Trail				8.3 mile multi use	
53	Quail Trail				1.0 miles multi use	
54	Rainbow Valley Trail				4.2 miles multi use	
55	Saddle Trail				0.3 miles multi use	
56	Toothaker Trail				3.9 miles multi use	
57	Trailhead Competitive Track				120,500 sq ft gravel parking lot	1 kiosk, 2 port a johns,
58	Competitive Track				13.4 miles, high speed use trails	Running, Mountain Bike races/fast use Track/Trails
59	Trailhead El Rio Test Plot			11,840 sq. ft.	8 parking spaces	Paved, striped spaces, 785 ft. of Curb

60	El-Rio Trail/Path				0.6 mile Path	
61	Tres Rios Golf Course					
62	Septic Tanks					
63	Water Valves					
64	Water Heaters					
65	Roads, Roadsides					
66	Landscaped Areas					
67	Fence, Fenceline Areas					
68	Interior Conserve/Preserve Areas					
69	Neighborhood/Regional Areas					
70	Partnerships for Maintenance					

Appendix I – Roads

(Insert all materials behind this cover page)

Estrella Mountain Regional Park Master Plan
Access Roads

Final Roadway Evaluation

Prepared For:

Prepared By:

September 2015

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Abbreviations

American Association of State Highway and Transportation Officials	AASHTO
Arizona Game and Fish Department	AZGFD
Arizona Public Service	APS
Arizona State Land Department	ASLD
Bureau of Land Management	BLM
Cable TV	CATV
Concrete Box Culvert	CBC
Corrugated Metal Pipe	CMP
Estrella Mountain Regional Park	"Park"
Federal Emergency Management Agency	FEMA
Gila River Indian Community	GRIC
Horizontal Point of Intersection	HPI
Horizontal Sightline Offset	HSO
Maricopa County Department of Transportation	MCDOT
Maricopa County Parks and Recreation Department	MCPRD
Miles Per Hour	MPH
Not Applicable	NA
Off-Highway Vehicle	OHV
Pavement Condition Rating	PCR
Phoenix International Raceway	PIR
Recreational Vehicle	RV
Station	STA
Stopping Sight Distance	SSD
Technical Advisory Committee	TAC
Vertical Point of Intersection	VPI

1.0 Introduction

1.1 Background

Estrella Mountain Regional Park ("Park") became the first regional park in the Maricopa County Park System in 1954 (see **Figure 1** for Regional Vicinity Map). The Maricopa County Parks and Recreation Department (MCPRD) is in the process of updating the Estrella Mountain Regional Park Master Plan that was prepared in 1988. While the majority of the park today remains as pristine desert, the 1988 master plan envisioned multiple youth sports complexes, group and family camping sites, education centers and picnic areas.

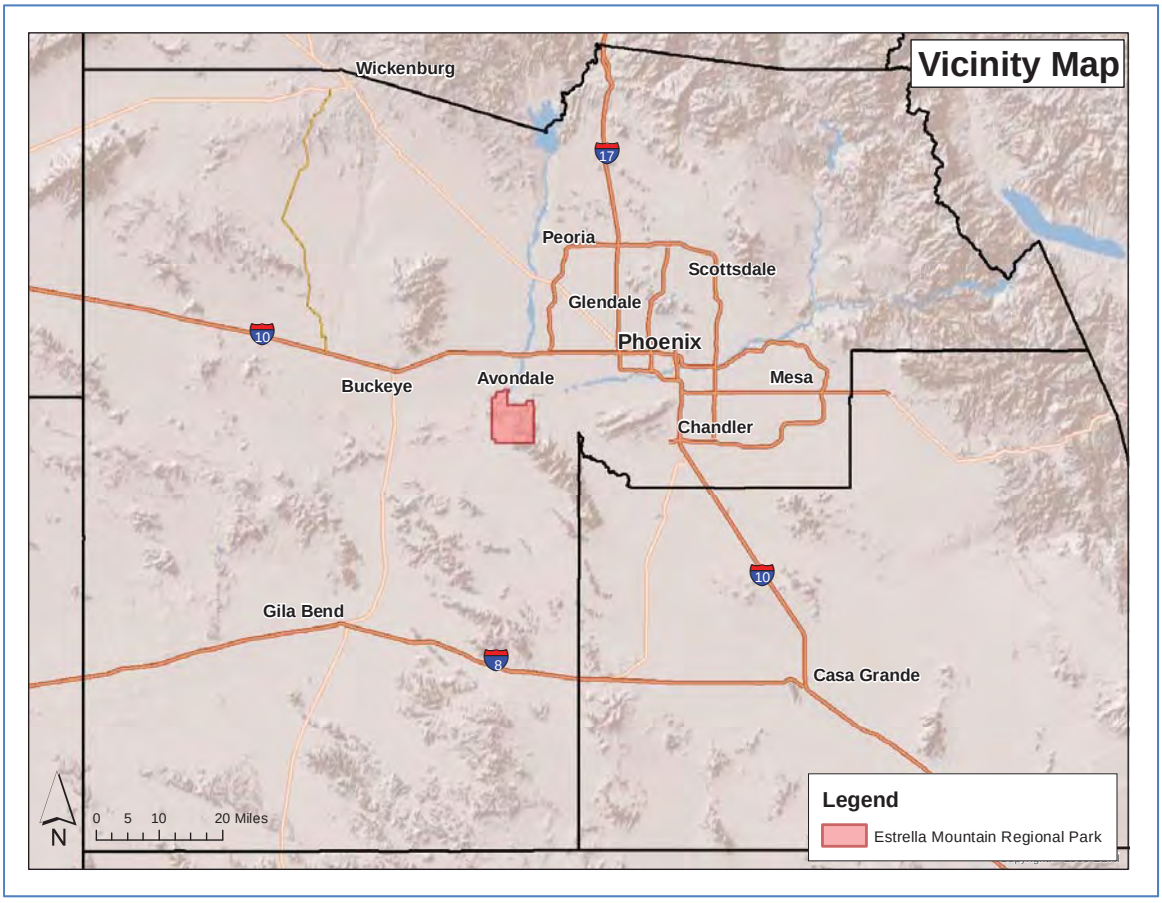


Figure 1 Regional Vicinity Map

1.2 Purpose and Need

The ongoing update to the Park Master Plan does not include a transportation plan to address access to proposed Park facilities. The purpose of this study is to prepare a planning level roadway evaluation to serve as a circulation element for the Park master plan update. This study will focus on the northern 800 acres of the Park where the majority of near term improvements are proposed. This study will also complete a cursory review of additional potential roadways within the southern portion of the Park as they relate to existing topographic constraints.

2.0 Study Area Features

2.1 Study Area

The project study area is located near the confluence of the Gila and Agua Fria Rivers in the southwest Valley. It is bounded by West Vineyard Avenue to the north; Estrella Parkway to the west; Avondale Boulevard (alignment) to the east and Pecos Road (alignment) to the south. The Park is currently accessed from West Vineyard Avenue between Estrella Parkway and Bullard Avenue. This roadway evaluation will focus on the northeast corner of the Park (**Figure 2**).

Figure 2 Main Study Area

2.2 Location Regionally

The Park is located within Sections 1 & 4 – 36 of Township 01 South, Range 01 West and the northwest corner of the Park falls within sections 32 and 33 of Township 01 North, Range 01 West.

Figure 3 illustrates the regional location of the Park along with the jurisdictional boundaries of the adjacent communities. The western half of the Park is located within the jurisdictional limits of the City of Goodyear. The eastern half of the Park is located within the City of Avondale. The Gila River Indian Reservation borders the Park to the east and the Gila & Salt Rivers run parallel to the northern border of the Park.

Other neighboring facilities include the Goodyear airport located two miles north of the northwestern corner of the Park and Phoenix International Raceway (PIR) adjacent to the

northeast corner of the Park. A secondary entrance point into the Park is accessed via the PIR parking area. This access point across PIR is currently the only practical way to reach the Park's Competitive Track Area, which is used for non-motorized racing (i.e. mountain bikers or runners) for formal competitive events as well as casual use.

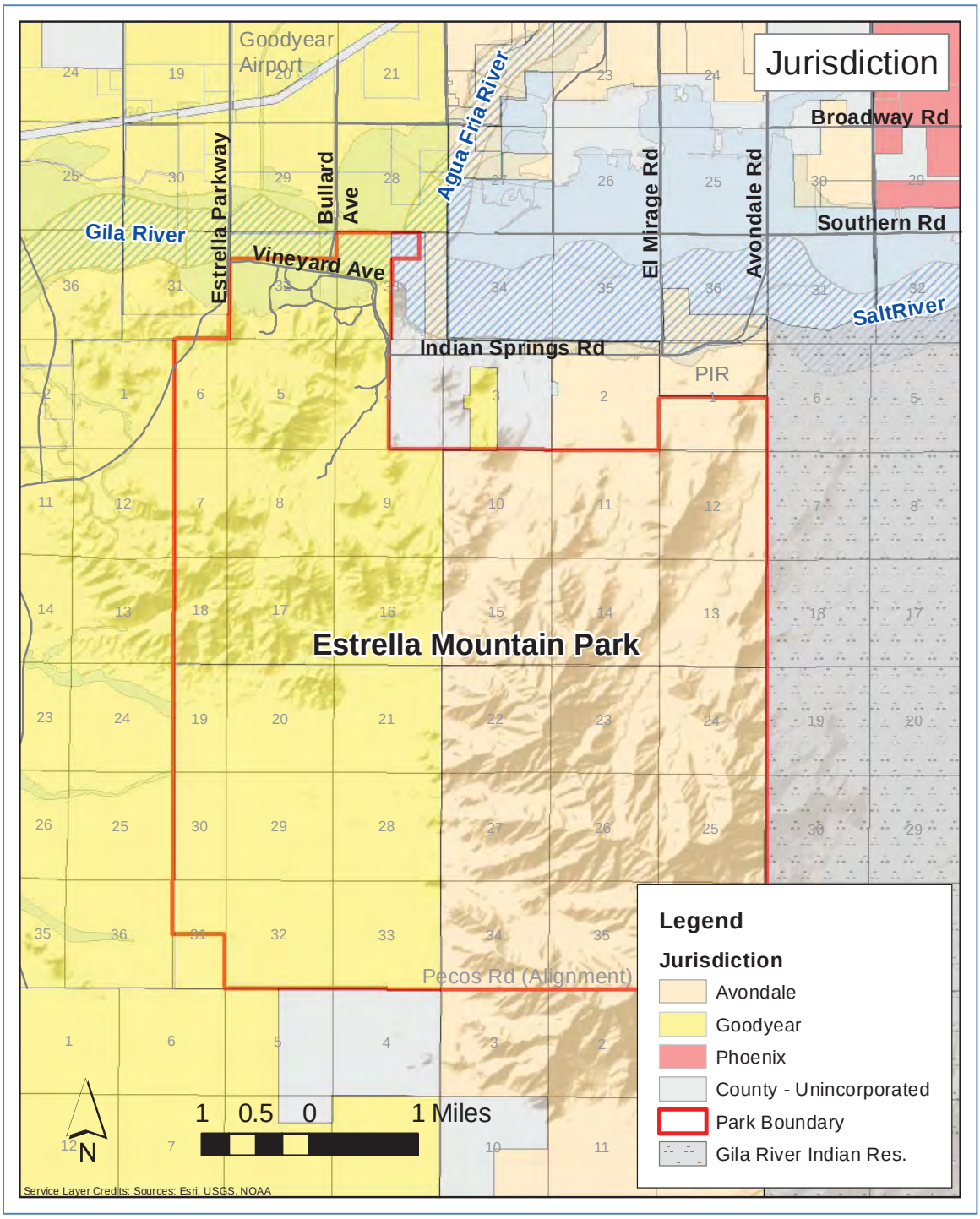


Figure 3 Regional Location and Jurisdictional Boundaries

2.3 Land Ownership

The Park is owned by Maricopa County and is managed by the MCPRD. Adjacent landowners included the Bureau of Land Management (BLM), the Arizona State Land Department (ASLD), the Gila River Indian Community (GRIC) and other private land owners (see **Figure 4)**.

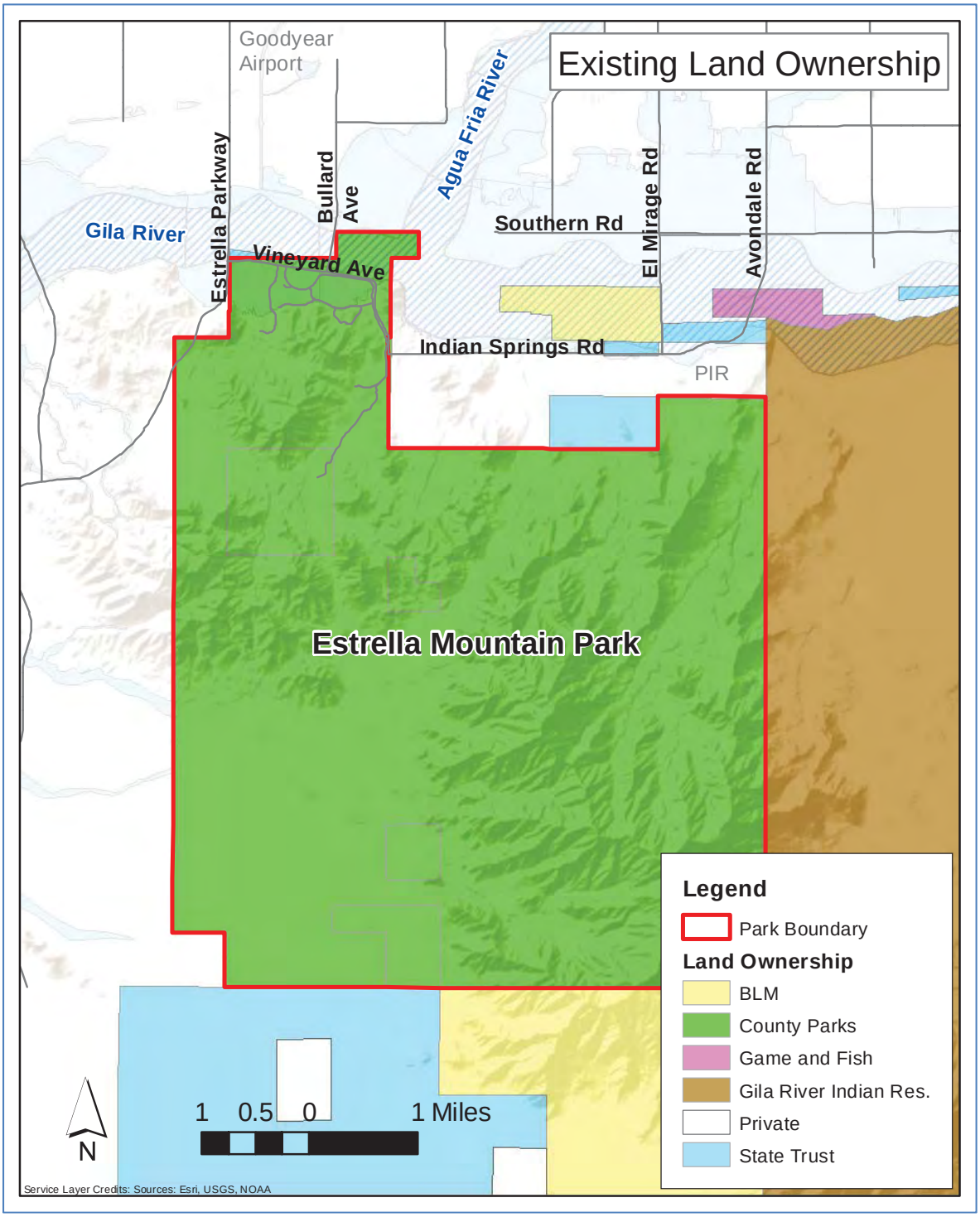


Figure 4 Land Ownership

2.4 Existing Terrain

The study area is located within the Basin and Range physiographic province of Central Arizona, which is characterized by numerous mountain ranges rising abruptly from broad valleys or basins. **Figure 5** depicts the existing topography within the Park study area per the 10-foot contour mapping provided by Maricopa County.

Elevations range from approximately 890 to 4,500 feet above mean sea level within the study area. Land within the study area includes rolling hills to steep mountains. Slopes within the study area range between 0% (near the recreational areas) and 70% (in the Estrella Mountains).

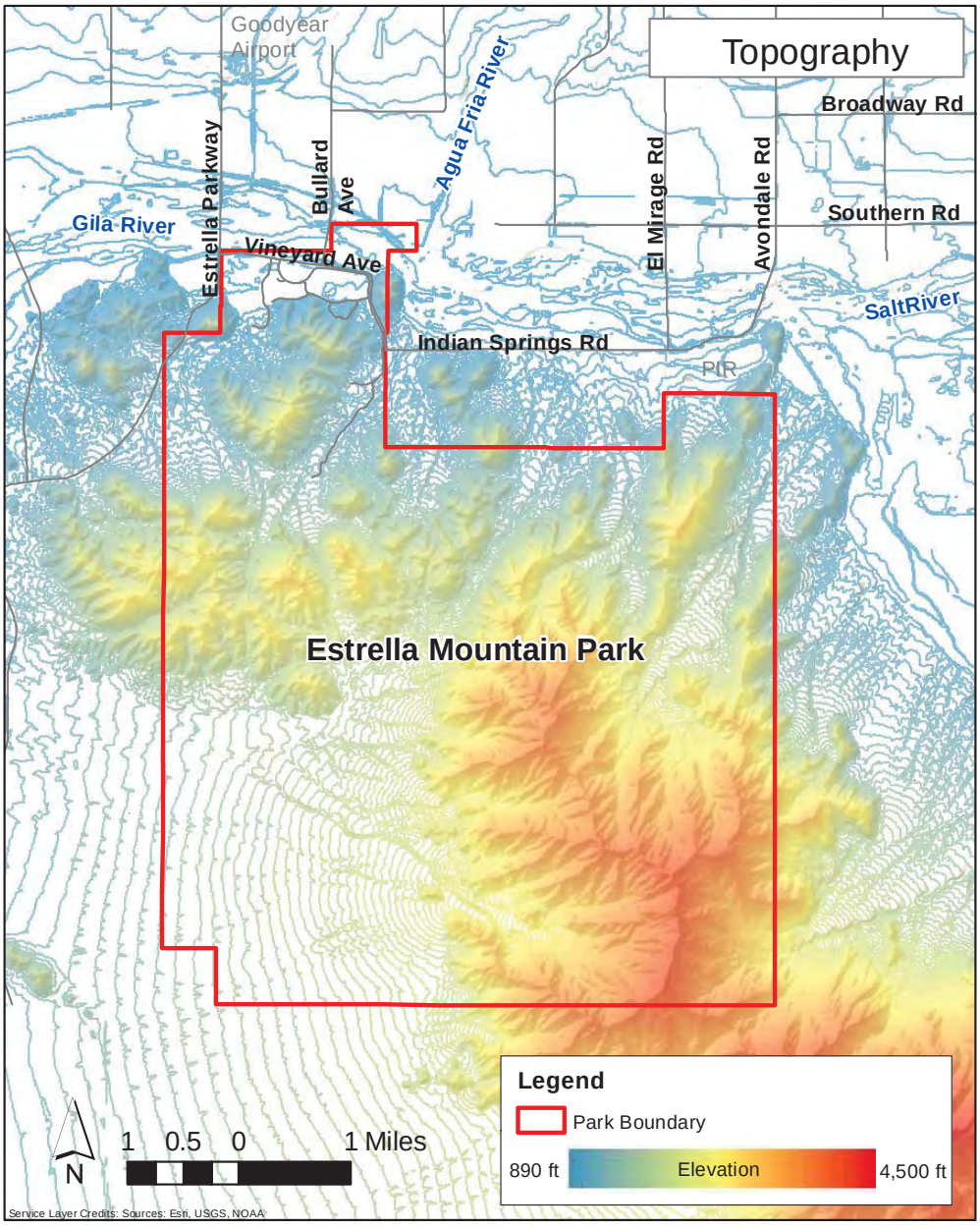


Figure 5 Existing Topography

2.5 Land Use

Existing land use within the study area, “Desert Park and Preserve”, is based upon Maricopa County Assessor’s data and verified via aerial photography. The study area is currently vacant/undeveloped Sonoran Desert land. The Park is currently used for outdoor recreation activities such as golf, hiking, biking, horseback riding and non-motorized off-road racing (mountain bikes/running) and baseball.

Current City of Goodyear Zoning for the Park is Agricultural (AG), which represents an agricultural district that would permit agricultural, ranching and other related uses within the City. The City of Avondale also has the majority of the Park zoned as an agricultural district.

The Maricopa County 2009 Land Use plan designates the Park as “Active Open Space”. This land use category is used for areas that are best precluded from development except as open space and recreational areas.

2.6 Existing Floodplains

Federal Emergency Management Agency (FEMA) has one regulatory floodplain/floodway associated with the Gila River that overlaps the northernmost 600 acres of the Park. The Zone AE floodplain and Zone FW floodway have base flood elevations that extend onto the improved areas of the Park (see **Figure 6**). The Gila River floodplain is based upon a 100-yr discharge of nearly 220,000 cfs.

2.6.1 Local Park Drainage

The Park drains into three major watersheds. The southwestern corner of the Park (~13.5 square miles) drains to the west into the Corgett Wash Watershed. The eastern portions of the Park (~6.0 square miles) drain to the east/northeast into the East Slope Gila River Watershed. The northern portions of the Park (~11.4 square miles) drain north towards the North Slope Gila River Watershed. Stormwater runoff into developed areas of the Park comes from the hills adjacent to the south side of Casey Abbott Drive South.

In order to estimate the stormwater runoff impacting the internal Park roads, the hills adjacent to the south side of Casey Abbott Drive South were subdivided into nine sub-basins (see **Figure 7**). The rational method was used to estimate peak discharges in eight of the nine sub-basins due to the size (less than 160 acres) and uniform nature of the contributing watershed. The modeling parameters and methods were based upon the Drainage Design Manual for Maricopa County.

The hydrology for sub-basin 1 was modeled using HEC 1 because the drainage area was greater than 160 acres. The Green and Ampt procedure was used to estimate runoff losses and sub-basin runoff was estimated using the Clark Unit Hydrograph method. **Table 1** summarizes the modeled discharges that reach the internal Park roadways.

The majority of roadway drainage crossings within the Park are at grade crossings at low points in the roadway.

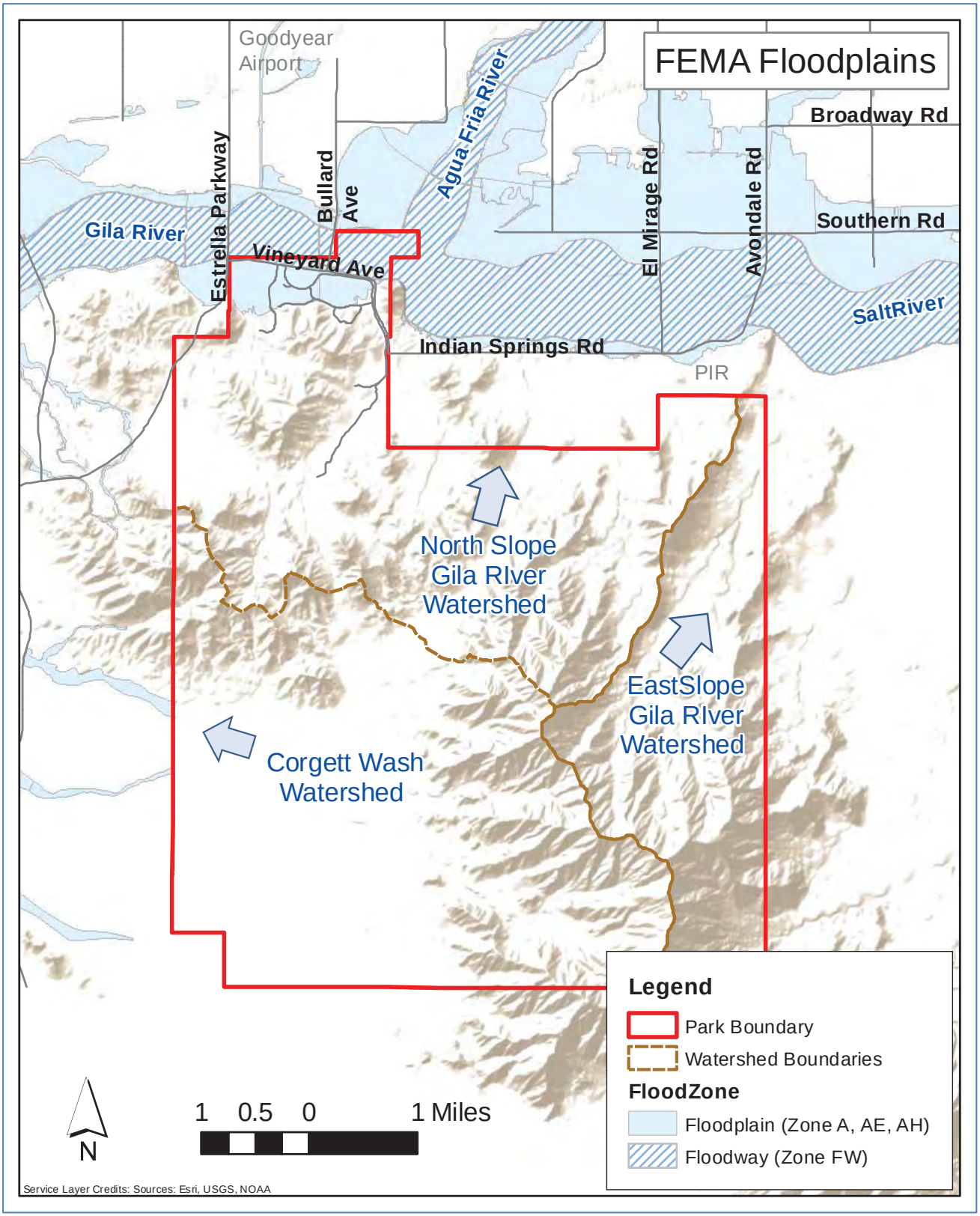


Figure 6 Existing Floodplains

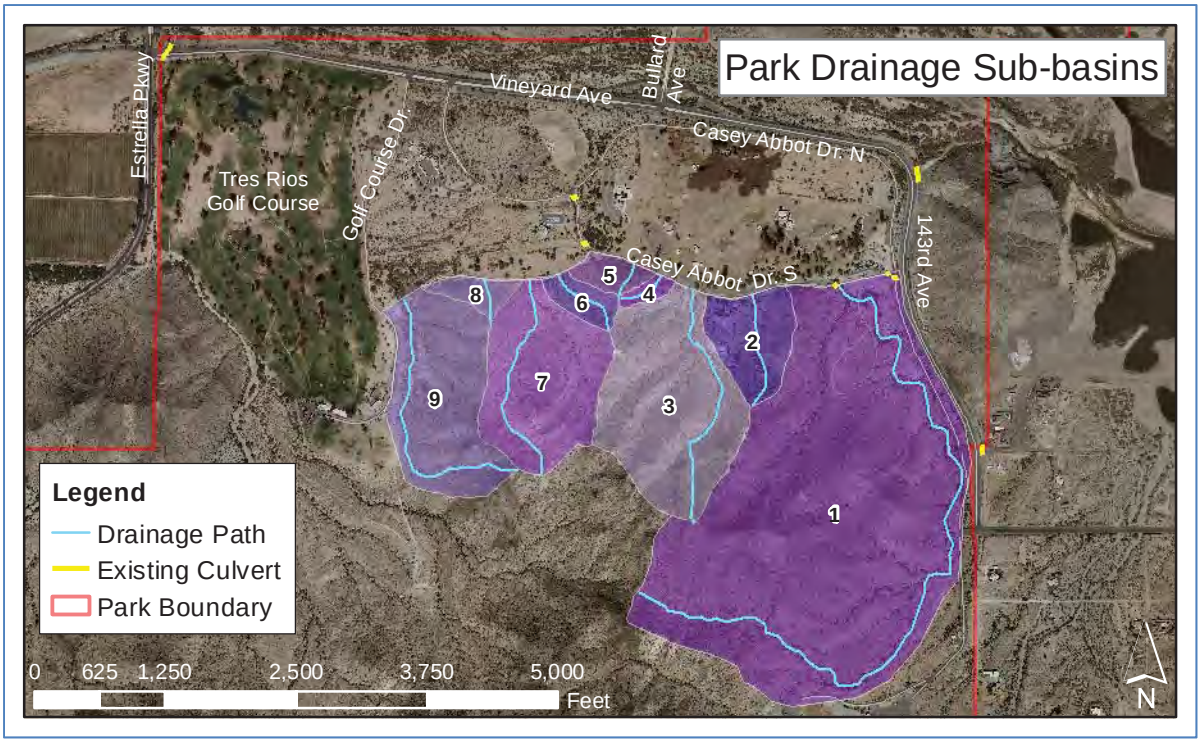


Figure 7 Local Park Drainage sub-basins

Table 1 Estimated Roadway Drainage Crossings

Drainage Sub-basin	Area (Acres)	Peak Discharge 2-yr (cfs)	Peak Discharge 10-yr (cfs)	Peak Discharge 25-yr (cfs)
Sub-basin 1	189.1	101	174	219
Sub-basin 2	15.9	20	36	43
Sub-basin 3	50.7	54	98	114
Sub-basin 4	2.1	3	5	7
Sub-basin 5	4.7	8	12	15
Sub-basin 6	5.3	8	13	16
Sub-basin 7	38.0	62	98	121
Sub-basin 8	4.5	4	8	9
Sub-basin 9	38.9	36	63	74

All weather access could be provided for the majority of these drainage crossings using pipe culverts. Runoff from drainage sub-basin 1 currently crosses Casey Abbott Drive South via a 4 barrel 36"x22" Corrugated Metal Pipe (CMP) arch culvert. This culvert can pass around 160cfs under the road before flows would overtop the roadway.

2.7 Existing Roads

The Maricopa County Department of Transportation (MCDOT) provided information regarding the pavement condition rating of the existing Park roads as shown in **Table 2**.

Table 2 Existing Roadway Pavement Summary

Roadway	Construction Date	Pavement Type	PCR	Most Recent Work
Casey Abbott Drive North	1993	Asphalt	91	Preservative Seal (2014)
Casey Abbott Drive South	1993	Asphalt	91	Preservative Seal (2014)
143rd Drive	1993	Asphalt	92	Preservative Seal (2014)
Golf Course Road	1993	Asphalt	91	Preservative Seal (2014)
Trailhead Drive	1993	Asphalt	91	Preservative Seal (2014)
Amphitheatre Drive	NR	NR	NR	Preservative Seal (2014)

NR = Not Reported

Most of the existing developed roadways within the study area are located near the northern boundary of the study area. The Park's main access road is Casey Abbott Drive North which provides direct access from West Vineyard Avenue. Casey Abbott Drive North follows a curvilinear path near the northern boundary of the Park, providing access to sports facilities, a nature center, a maintenance yard and various picnic areas. Near the eastern edge of the Park, the road curves to the south and becomes 143rd Drive. It eventually provides access to a rodeo arena. Despite serving as the main access road into the Park, Casey Abbott Drive North more accurately fits the description of a circulatory road as defined by the Maricopa County Park Road System Guidelines (MCDOT, 2014).

Casey Abbott Drive South connects to Casey Abbott Drive North on both ends, creating a loop and providing access to trailheads, restroom facilities, and picnic areas. It is best classified as a circulatory road according to the Maricopa County Park Road System Guidelines.

Trailhead Drive is accessed from Casey Abbott Drive South and extends westward, ending in a cul-de-sac. It provides access to a trailhead. The County Park Road System Guidelines would define Trailhead Drive as an area road.

Amphitheatre Drive is also most accurately defined as an area road. It is a looped road, accessed from Casey Abbott Drive South. It provides access to a small parking area and an amphitheater.

2.7.1 Geometric Review

A review of the existing Park roads with respect to horizontal and vertical geometry was conducted. According to the Maricopa County Park Road System Guidelines, the recommended design speed for circulatory roads is 30 mph and the recommended posted speed limit for circulatory roads is 25 mph. To be conservative, all roadways within the Park were analyzed assuming a 25 mph posted speed limit since the roads of concern are either circulatory roads or area roads.

The horizontal and vertical geometric features of the roadways were analyzed against American Association of State Highway and Transportation Officials (AASHTO) criteria for superelevation, degree of curvature and vertical curvature to determine a safe operating speed. The results indicated that all horizontal and vertical curves can accommodate the posted speed limit of 25 mph. Four roadway segments failed to meet AASHTO requires for a desired design speed of 30 mph. A summary of the geometric analysis can be found in **Appendix A**.

The following vertical curves have a stopping sight distance (SSD) less than what is recommend for a 30mph design speed:

- Casey Abbott Drive North STA 202+56.13 (SSD 11 feet less than recommended)
- Golf Course Road STA 113+20.00 (SSD 24 feet less than recommended)

The following horizontal curves have a superelevation rates or degrees of curvature that do not meet recommended AASHTO criteria for a 30mph design speed:

- Casey Abbott Drive South STA 330+37.12 (requires 0.1% superelevation instead of a normal crown)
- Golf Course Road STA 107+00.99 (exceed maximum degree of curvature by 2°)

2.7.2 Trip Generation Analysis

MCPRD have been in discussions with a concessionaire regarding plans to construct new youth sports fields to the northwestern portion of the Park (see **Figure 8**). A trip generation analysis was completed to estimate the volume of anticipated traffic if the sports fields were developed and to determine if the existing internal 2-lane roadways have sufficient capacity to handle that traffic.

Figure 8 Potential Youth Sports Complex

The trip generation analysis was completed using the 9th edition of the *Trip Generation Manual*, published by the Institute of Transportation Engineers (2012). Weekday and weekend peak traffic volumes were estimated for a County Park (land use 412), Regional Park (land use 417) and Soccer Complex (land use 488). The Park acreage was assumed to be 167 acres for the County Park and Regional Park analysis. Multiple youth soccer games are often played on the same field. For this reason, a total of 21 sports fields were assumed for the Soccer Complex trip analysis.

> Land Use 417: Regional Park
> "Regional parks are owned and operated by a regional park authority. The regional parks surveyed vary widely as to location type and number of facilities, including hiking trails, lakes, pools, ball fields, soccer fields, camp sites, picnic facilities, and general office space…" (from Trip Generation Manual, 9th Ed.)

The Regional Park land use resulted in the highest estimated volume of traffic for weekends and weekdays. Refer to Table 3 for a summary of the trip generation results and **Appendix B** for a complete summary of the trip generation analysis.)

Table 3 Results of Trip Generation Analysis

Weekday

Time Period	Entering	Exiting	Total
Day	607	606	1,213
AM Peak	62	25	87
PM Peak	135	166	301

Weekend

Day	1,810	1,996	3,806
PM Peak	282	319	601
PM Peak (max)	372	420	792

However, the largest hourly traffic volume was estimated at approximately 800 total vehicles (400 inbound and 400 outbound) occurring during the weekend PM peak hour. The capacity of a single travel lane is around 700-800 vehicles per hour. Therefore the existing 2-lane roadway should have sufficient capacity to handle the peak hour traffic volume.

The primary concern was not the capacity of the roadway but the time it would take Park patrons to clear the entry fee station. If it were assumed that it takes 30-60 seconds to collect a fee from a single vehicle, the Park would need somewhere between 3 and 6 fee collection stations to pass 400 vehicles into the Park during the peak hour. Traffic may also be asymmetrically distributed during peak hours due to simultaneous game start times. For this reason, it was recommended the entry be widened to add a second entrance lane from Vineyard Avenue. The inbound lanes could be further widened to three lanes near the fee collection station. Additional fee collection capacity could be achieved by utilizing multiple cashiers in each lane. Other ideas suggested discussed include: 1) issuing prepaid entry cards to sports participants to streamline the entry process and 2) having game start times staggered at ½ hour increments (instead of hour increments) to better distribute the peak entry traffic.

2.8 Existing Utilities

Arizona Blue Stake was contacted to identify the utility stakeholders within the study area. **Table 4** lists the identified providers.

Table 4 Existing Utilities

Utility Owner	Utility Type
APS	Electric
Buckeye Water Conservation & Drainage District	Electric, Irrigation
City of Goodyear	Effluent, Fiber, Reclaimed Water, Sewer, Traffic Signals, Water
Cox Communications	CATV, Fiber
CenturyLink	Coaxial, Fiber
Maricopa County Parks & Recreation Department	Electric, Irrigation, Sewer, Water

CenturyLink has indicated that they do not anticipate conflict with their facilities within the study area. Additional coordination with existing utility providers is required prior to any formal design/construction activities to better identify potential conflicts.

2.9 Environmental Features

The majority of the Park supports vegetation typical of the Lower Colorado River Valley subdivision of the Sonoran Desertscrub biotic community (Turner and Brown 1994), which is characterized by high temperatures and generally low precipitation. A small area in the southeastern corner of the Park supports vegetation that is typical of the Arizona Upland subdivision of the Sonoran Desertscrub biotic community (Turner and Brown 1994).

The 1988 Estrella Mountain Regional Park Master Plan identified potential habitiat for the Sonoran Desert Tortise (Gopherus Agassizii) and Gila Monster (Hecodera Suspectum), both of which are considered threatened or endangered species by the Arizona Game and Fish Department (AZGFD).

The Park has never had a formal systematic archaeological reconnaissance survey performed. Regardless of this fact, several historic and prehistoric cultural resources were identified within the Park boundaries (See **Figure 9**) in the previous long-range master plan.

There are no environmental justice concerns within the study area as it is currently unpopulated.

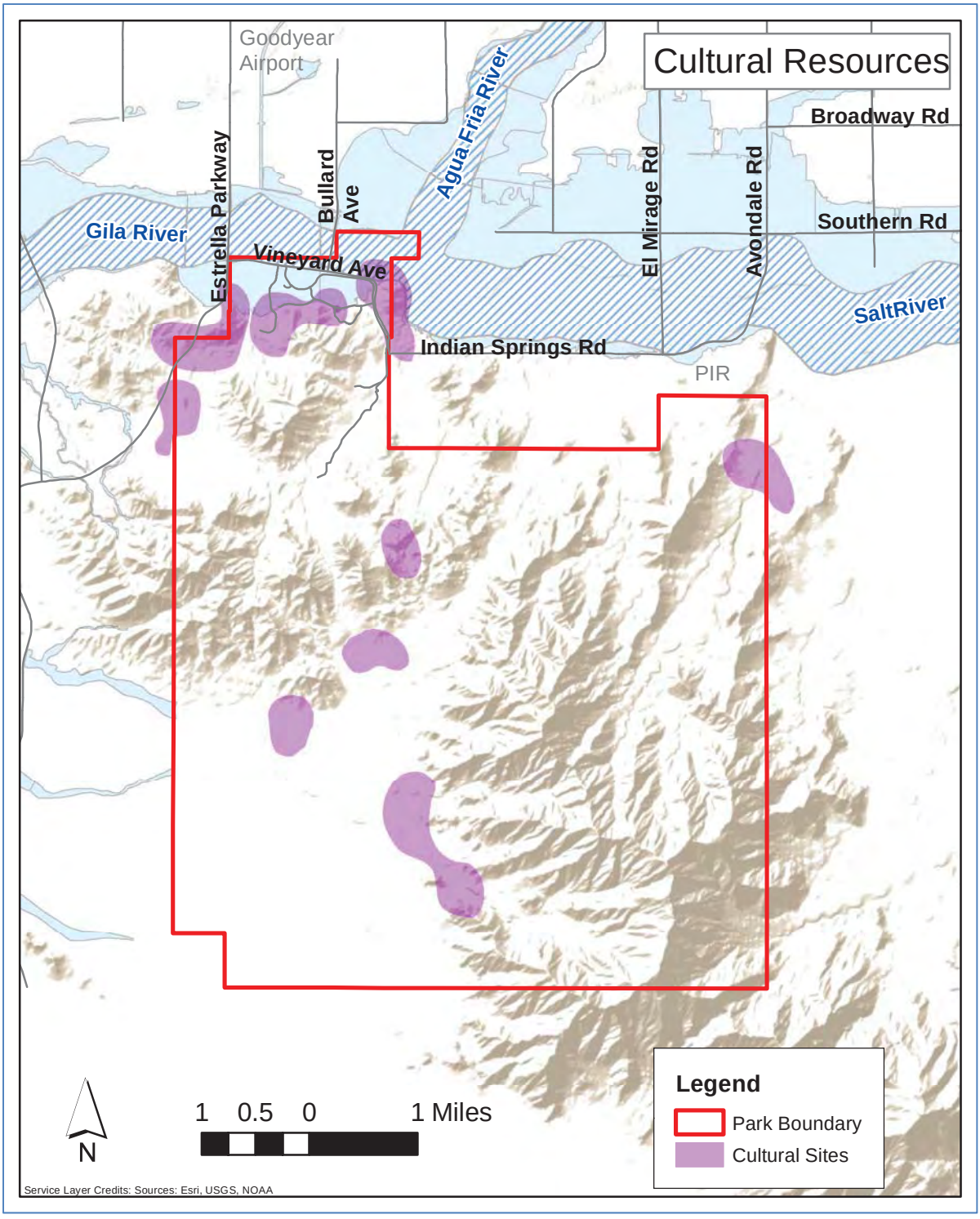


Figure 9 Cultural Resources

3.0 Design Criteria

The following section outlines the design criteria that were developed for the proposed roadways.

3.1 Typical Section

The design criteria for the proposed roadways is based upon the recently completed Maricopa County Park Road System Guidelines and the MCDOT Roadway Design Manual.

Roadways internal to the Park were designed as Circulatory Roads per the Maricopa County Park Road System Guidelines. These roadways have a design speed of 30 MPH, and include a 12' wide travel lane and 4' wide paved shoulder/bike lane in each direction. A 7' wide earthen shoulder is recommended for clear zone requirements and cut and fill transition slopes are limited to 4:1 maximum. **Figure 10** depicts the desired typical section for a circulatory within the Park.

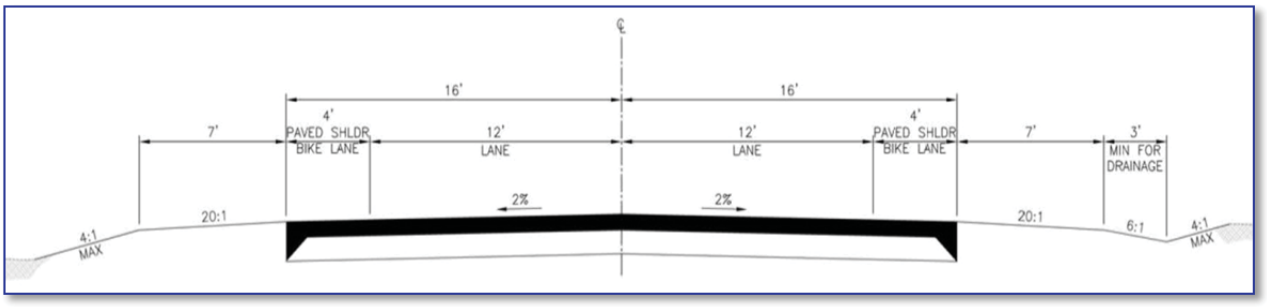


Figure 10 Circulatory Roadway within Estrella Park

Vineyard Avenue and Estrella Parkway were designed as modified Urban Minor Arterials with a Design Speed of 50 MPH. Both are considered modified as Vineyard Avenue has no center turn lane as it nears Estrella Parkway, and Estrella Parkway has only one travel lane in each direction as it intersects with Vineyard Avenue and crosses the Gila River.

3.2 Other Design Criteria

A maximum superelevation of 4.0% was assumed for all roadways. Minimum recommended curve radii are 730' along Vineyard Avenue and 300' along internal Park roads.

Potential right-of-way impacts to the golf course for any realignment of Vineyard Avenue assume a 65' right-of-way half-street width from centerline to match the existing condition.

Per the Maricopa County Park Road System Guidelines, the design vehicle for Park roadways is a Motorhome with a Boat Trailer (MH/B) per AASHTO Figure 2-23.

4.0 Proposed Alternatives and Improvements

This section describes the process that was used to develop and evaluate conceptual alternatives for the improvements to Estrella Mountain Park.

4.1 Stakeholder Feedback

The design team met with key stakeholders to identify study area opportunities and constraints that would need to be addressed when developing conceptual alignment alternatives. Key issues that were identified include:

- Identify appropriate typical section
- Minimize new roadway footprint to mitigate impacts to existing facilities
- Identify alignments that accommodate drainage needs
- Anticipate a secondary point of entry for the campground/rodeo area along the eastern portion of the Park
- Identify potential secondary egress points used during peak activity
- Identify alternative entry points along the western side of the Park
- Identify solutions that account for future use demands
- Calculate planning level project cost

4.2 Evaluation Criteria

A qualitative set of evaluation criteria were developed based upon feedback received from stakeholders and the opportunities and constraints identified for the study area. The conceptual alignment alternatives were evaluated using the following set of qualitative evaluation criteria:

- Vehicle Access
- Stakeholder Feedback
- Right of Way Requirements
- Drainage Impacts
- Environmental Impacts

The conceptual alignments were assigned one of five qualitative rankings for each evaluation criteria. Alignments with the most favorable qualitative ratings were selected as the recommended alignment alternative.

Strong Disadvantage	Disadvantage	Neutral	Advantage	Strong Advantage
●	◒	○	◓	◉

Planning level construction cost estimates for each alignment alternative are included in Appendix C.

4.3 Park Entry Improvements

There are currently two main points of entry into Park off of Vineyard Avenue. Golf Course Drive is used to access the Tres Rios Golf Course in the northwest corner of the Park, and Casey Abbott Drive North leads to the main Park area. In the past, Park visitors have experienced confusion about which entry to use due to the proximity of the two roadways (approximately 400ft of separation) and the poor visibility of the main Park entrance. **Figure 11** illustrates the golf course and Park entries.

Figure 11 Golf Course and Park Entries

A secondary challenge related to the entrance into the Park is related to the fee collection process. During periods of heavy traffic (i.e. holiday weekends or special events) a bottleneck can occur at the fee collection booth that results in traffic queuing back onto Vineyard Avenue. Potential increases in traffic related to the proposed youth sports field improvements will only make the existing fee collection bottleneck occur more frequently.

The design team evaluated potential improvements to the golf course and Park entries intended to reduce confusion and mitigate potential bottlenecks at the fee collection booth. The general concepts explored included:

- Combining the two points of entry into the Park off of Vineyard Avenue into a single roadway.
- Adding additional ingress (or entrance) lanes into the Park to increase the fee collection and vehicle storage capacities.
- Enhancing the visibility of the Park and golf course entrances by clearing away existing vegetation adjacent to Vineyard Avenue and adding new signage/ monumentation.

4.3.1 Park Entrance Option 1A

The first Park entrance Option 1A consolidates both Park entrances off of Vineyard Avenue by closing the Golf Course Road entrance and adding a second ingress lane (or entrance lane) to Casey Abbott Drive North. The Golf Course Road is realigned and connected to the widened Casey Abbott Drive North approximately 300 feet south of Vineyard Avenue. The portion of Golf Course Road between Vineyard Avenue and the realignment will be removed. A third ingress lane is added to Casey Abbott Drive North between the new Golf Course Road intersection and the fee collection booth to further increase the fee collection and vehicle storage capacity of the roadway (see **Figure 12**). The existing vegetation along Vineyard Avenue would have to be modified to enhance the visibility of the new entrance.

Figure 12 Option 1A

The qualitative rankings for Option 1A are as follows:

Vehicle Access: Vehicle access was viewed as a disadvantage for Option 1A. While consolidating the two entry points into the Park eliminates the decision drivers will have to make, the entrance to the golf course is less direct. Access to Golf Course Road may be impeded by vehicles waiting to clear the fee collection booth into the main Park.

Stakeholder Feedback: Members of the Technical Advisory Committee (TAC) did not express a strong opinion for or against Option 1A [neutral rating].

Right of Way Requirements: A positive rating was assigned as no new right-of-way is required for the Park entry modifications. [Advantage]

Drainage Impacts: A neutral rating was assigned as Option 1A, while located in a local low spot, does not impact any existing drainages.

Environmental Impacts: A neutral rating was assigned as the proposed improvements minimally impact existing vegetation. They do not impact any other environmental resources.

Planning Level Cost Estimate: $106,000

4.3.2 Park Entrance Option 1B

Option 1B locates the combined point of entry off of Vineyard Avenue to the Golf Course Road alignment and removes the Casey Abbott Drive North access point (see **Figure 13**). Golf Course Road ties into the consolidated entrance roadway approximately 400 feet south of Vineyard Avenue. The realigned Casey Abbott Drive North is widened to two ingress lanes between Vineyard Avenue and the new Golf Course Road intersection and to three ingress lanes between the new intersection and the fee collection booth. Casey Abbott Drive North retains a single egress (or exit) lane. The portion of Casey Abbott Drive North between Vineyard Avenue and the realignment will be removed.

The qualitative rankings for Option 1B are as follows:

Vehicle Access: A neutral rating was assigned to Option 1B. Consolidating the two points of entry at Golf Course Road alignment will reduce driver confusion. However, the potential for conflicts between golf course traffic and vehicles waiting to clear the fee booth still exists.

Stakeholder Feedback: A positive rating was assigned to Option 1B as this alternative received favorable feedback from members of the TAC including MCPRD staff. [Advantage]

Right of Way Requirements: A positive rating was assigned as no new right-of-way is required for the Park entry modifications. [Advantage]

Drainage Impacts: A neutral rating was assigned for this category as Option 1B, while located in a local low spot, does not impact any existing drainages.

Environmental Impacts: A neutral rating was assigned as the proposed improvements minimally impact existing vegetation. They do not impact any other environmental resources.

Planning Level Cost Estimate: $251,000 – Park Entrance Option 1B was the most costly of the potential improvements considered at this location.

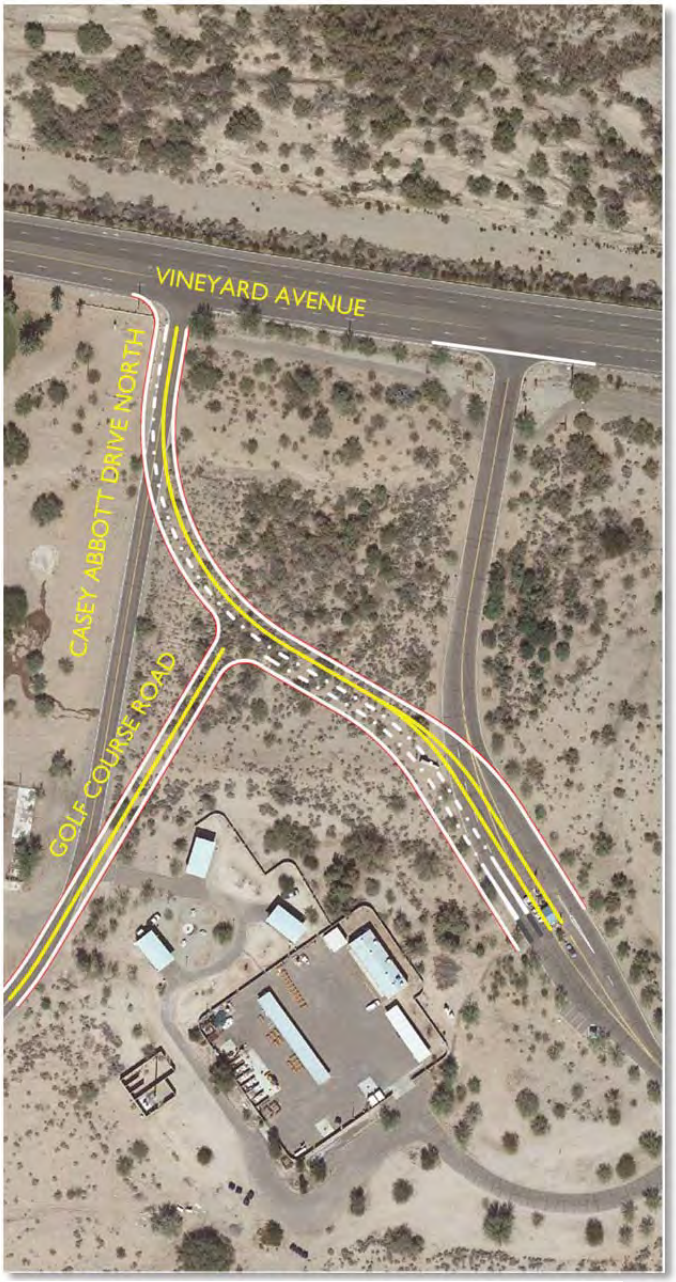


Figure 13 Option 1B

4.3.3 Park Entrance Option 1C

Option 1C keeps the Golf Course Road and Casey Abbott Drive North separated. Existing vegetation along the south side of Vineyard Avenue will be removed to and new signage/monumentation will be added to enhance the visibility of both Park entrances and reduce driver confusion. A second ingress lane is added to Casey Abbott Drive North at Vineyard Avenue. A third ingress lane is added to Casey Abbott Drive North approximately 400 fee north of the fee collection booth to increase the fee collection and vehicle storage capacity of the roadway (see **Figure 14**).

Vehicle Access: Option 1C increases the capacity of the main Park entrance and avoids conflicts between golf course and main Park traffic by keeping the two roadways separated. Driver confusion is reduced with landscaping and signage to showcase both points of entry [advantage].

Stakeholder Feedback: Members of the TAC did not express a strong opinion for or against Option 1C [Neutral].

Right of Way Requirements: A positive rating was assigned as no new right-of-way is required for the Park entry modifications. [Advantage]

Drainage Impacts: Option 1C locates the proposed improvements on or adjacent to existing roadways. It avoids the local low spot between Golf Course Road and Casey Abbott Drive North . For this reason, it was rated slightly higher than the other two Park entry alternatives [Advantage].

Environmental Impacts: A neutral rating was assigned as the proposed improvements minimally impact existing vegetation. They do not impact any other environmental resources.

Planning Level Cost Estimate: $69,000 – Park Entrance Option 1C was the least expensive of the potential improvements considered at this location.

Figure 14 Option 1C

4.3.4 Park Entrance Recommendation

Table 5 provides a summary of the qualitative evaluation of the three Park entrance options. While all three were considered viable, Option 1C was recommended because it enhanced access to the Park without creating conflicts with golf course traffic, minimized drainage impacts and was the most cost effective alternative.

Table 5 Qualitative Evaluation Summary for Park Entrance Options

Evaluation Criteria	Alt 1A	Alt 1B	Alt 1C
Vehicle Access	◒	○	◓
Stakeholder Feedback	○	◓	○
Right-of-way	◓	◓	◓
Drainage Impacts	○	○	◓
Environmental Impacts	○	○	○
Cost	$106k	$251k	$69k
Recommended	No	No	**Yes**

4.4 Additional Bullard Exit – Option 2

An additional connection between Casey Abbott Drive North and Vineyard Avenue was evaluated at the Bullard Avenue alignment. The distance between these two roadways (~110 ft) is too narrow to accommodate a fee collection station. For this reason it was only evaluated as an alternate exit for the Park (see **Figure 15**).

The proposed roadway connection would have two lanes, a thru/right-turn lane (aligned with the northbound Bullard Avenue lane) and a left-turn lane (aligned with the southbound Bullard Avenue Lane). There is approximately 3 ft of elevation change between Bullard Avenue and Casey Abbott Drive North resulting in a proposed roadway grade near 3%. A gate would be required at this location to provide access control. This gate would only be opened during special events that would benefit from a second exit to help distribute the traffic. A Park staff member would need to be stationed at the exit to ensure the roadway is used for egress only. Realigning the existing parking lot entrance to more geometrically align with the Bullard Avenue exit would also be recommended. The

Figure 15 Option 2 - Bullard Avenue Exit

qualitative rankings for Option 2 are as follows:

Vehicle Access: A neutral rating was assigned to Option 2 as it has the potential to improve traffic flow by spreading out the vehicles exiting the Park during periods of peak usage. However, there is some concern that the length of the proposed Bullard Avenue exit will not provide enough room for vehicle storage as exiting drivers wait for traffic to clear on Vineyard Avenue, potentially blocking traffic on Casey Abbott Drive North. Additional traffic analysis is needed to better assess the benefits/risks associated with this proposed improvement.

Stakeholder Feedback: Maricopa County MCPRD staff members were concerned about the safety of improvement Option 2. Vehicles have previously failed to stop at the Bullard Avenue/Vineyard Avenue intersection and driven directly into Park. Their fear was that a new roadway into the Park at the Bullard Avenue alignment might increase the risk of vehicles accidently crashing through the gate into the Park. [Disadvantage]

Right of Way Requirements: A positive rating was assigned as no new right-of-way is required for the Park entry modifications. [Advantage]

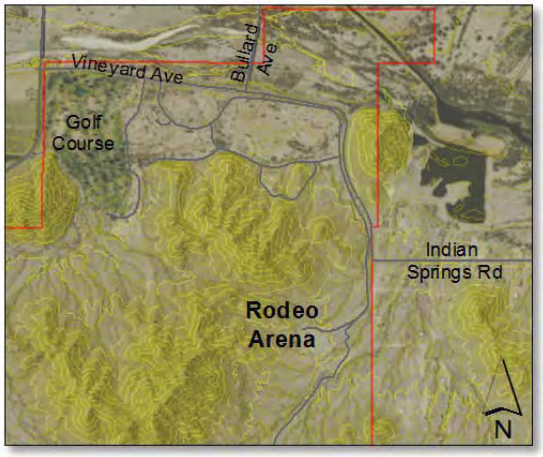
Drainage Impacts: A neutral rating was assigned as the additional exit requires only minimal drainage improvements. It is anticipated a 24" storm drain will be constructed to preserve existing drainage patterns along the south side of Vineyard Avenue.

Environmental Impacts: A neutral rating was assigned as there are no known impacts to existing environmental resources.

Planning Level Cost Estimate: $40,000

Recommendation: Additional traffic analysis is needed to thoroughly evaluate the benefits of a second exit onto Vineyard Avenue and there are concerns about vehicles mistakenly using the roadway when the gates are closed. Regardless, the design team felt that there was enough potential benefit of this design option to carry it forward into conceptual plans (see **Section 5.0**).

4.5 Alternate RV Entrance at Baseline & Indian Springs – Option 3



During the scoping process, MCPRD staff expressed a desire for a secondary entrance into the Park to cater to recreational vehicles (RVs). RV camping is currently allowed near the rodeo arena. The design team evaluated a secondary entrance aligned with Indian Springs Road.

The primary challenge facing this improvement option is fee collection. The potential RV entrance ties into an internal Park roadway, 143rd Drive, which provides access to the main Park and camping area. There is not enough room between the external Park roadway, 143rd Avenue, and the internal roadway to construct a fee collection booth. The internal Park roadway is also constrained to the west by an existing wash of moderate size. For this reason, the alternate RV entrance would require two new fee collection stations. A new fee booth is shown north of

the Baseline Road alignment. Improvement Option 3 would also convert the gates at Baseline Road into an alternate exit. A secondary fee booth would also be required at the entrance to the campground. The qualitative rankings for Option 3 are as follows:

Figure 16 Option 3 - RV Entrance

Vehicle Access: A positive rating was assigned to this option as it will alleviate traffic congestion at the existing Park entrance and exit. [Advantage]

Stakeholder Feedback: A negative rating was assigned to the proposed RV connection for several reasons. Fee collection booths are costly to construct and to operate for MCPRD staff. Improvement Option 3 will require a fee booth on either side of the entrance, or to have the RV campground operate on an "honor system" for fee collection. Neither of these two scenarios were desired by Park staff. In addition, Park staff would prefer not to use the gates at the Baseline Road alignment as an additional public exit. [Strong Disadvantage]

Right of Way Requirements: A positive rating was assigned as no new right-of-way is required for the Park entry modifications. [Advantage]

Drainage Impacts: A neutral rating was assigned as the additional pavement widening for fee booth construction has minimal impacts to existing washes.

Environmental Impacts: A neutral rating was assigned as there are no known impacts to existing environmental features.

Planning Level Cost Estimate: $112,000 (note: cost assumes two prefabricated fee booths at $30,000 each)

Recommendation: The design team did not carry improvement Option 3 forward for further analysis based upon unfavorable stakeholder feedback related to fee collection logistics at this location.

4.6 Estrella Parkway & Vineyard Avenue Intersection

The majority of traffic headed towards Park from the north takes Estrella Parkway south to Vineyard Avenue and then turns east to the main Park entrance. Estrella Parkway at the Vineyard Avenue tee-intersection has single northbound and southbound thru-lanes. There is no southbound-to-eastbound left turn lane on Estrella Parkway due to the proximity of the intersection to the two-lane bridge over the Gila River. Vehicles desiring to turn left onto Vineyard Avenue currently block the southbound traffic on Estrella Parkway when they wait for breaks in the northbound traffic. Estrella Parkway is also a popular route for recreational cycling in the area. The design team looked in to options to accommodate a southbound-to-eastbound turning movement at this intersection while preserving paved shoulders for bicycle traffic. Potential improvements to the Estrella Parkway/Vineyard Avenue intersection fall within the City of Goodyear's jurisdictional control and must be approved by City staff.

4.6.1 Estrella Parkway Improvements - Option 4A

The first option evaluated adds a southbound-to-eastbound left-turn lane symmetrically about the centerline of Estrella Parkway beginning approximately 200 feet north of the southern edge of the bridge. The existing 6 foot bridge shoulders are reduced to 2 foot shoulders as the center turn lane is added. The southernmost 225 feet of the pedestrian barrier must be removed to allow bicycle and pedestrian traffic to share the eastern 5 feet of the structure (see **Figure 17**). It should be noted that pedestrian access to the eastern edge of the bridge is currently encumbered by guardrail, local vegetation and drainage facilities (rip-rap/scuppers). Combining the bike path with the pedestrian pathway would make the eastern edge of the bridge more accessible to pedestrians, though still not ADA compliant. A small amount of pavement would be required on the east side of the roadway to accommodate the additional width and maintain a 5 foot wide bike lane. This improvement option also requires the relocation of existing guardrail. Improvement Option 4A creates an 80 foot southbound-to-eastbound left-turn lane (see **Figure 18**), which is approximately half of the preferred minimum 150 foot turn lane length per the City of Goodyear Engineering Design Standards and Policies Manual.

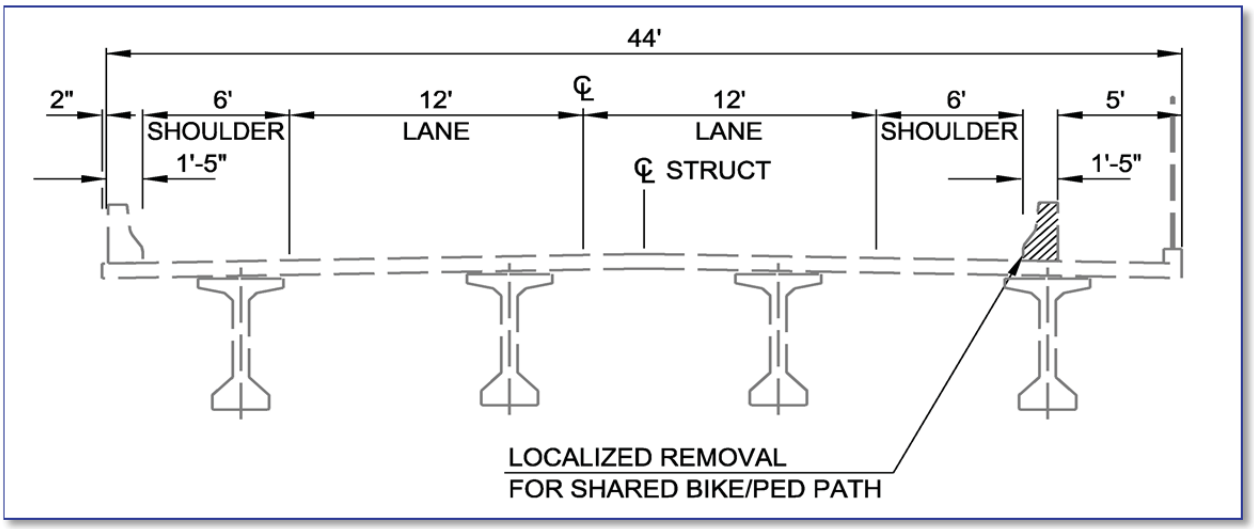


Figure 17 Potential Modifications to the Estrella Parkway Bridge Barrier

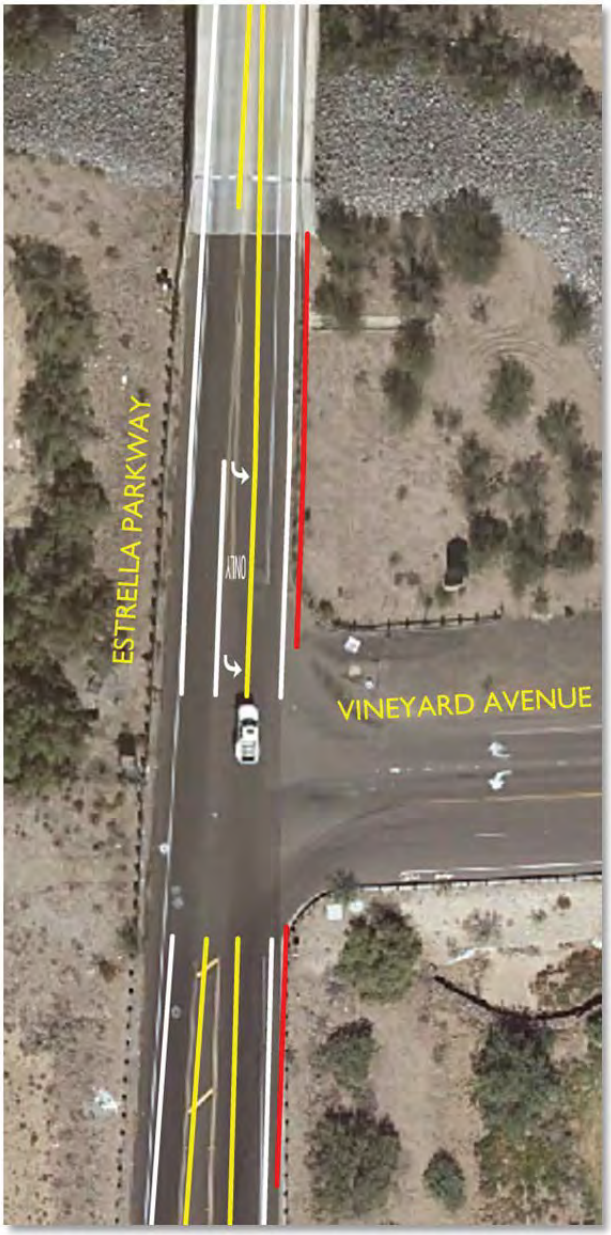


Figure 18 Estrella Parkway - Option 4A

The qualitative rankings for Option 4A are as follows:

Vehicle Access: A positive rating was assigned to this option as an 80 foot left-turn lane is provided. [Advantage]

Stakeholder Feedback: A neutral rating was assigned to improvement option 4A. MCPRD staff were in favor of the alternative because it provides some left-turn storage capacity for the least amount of effort. City staff were intrigued by the low-cost approach to creating a southbound-to-eastbound turn-lane at this intersection, however they did not consider Option 4A to be a long-term solution. The City anticipated that the additional trips generated by the sports fields would be enough to warrant installation of a traffic signal at this intersection. The City would not want to install a traffic signal at this location.

Right of Way Requirements: A positive rating was assigned as no new right-of-way is required along Estrella Boulevard. [Advantage]

Drainage Impacts: A positive rating (relative to the other Estrella Parkway improvements) was assigned as the proposed improvement has no impact on the existing drainages. [Advantage]

Environmental Impacts: A neutral rating was assigned as there are no known impacts to existing features.

Planning Level Cost Estimate: $25,000 – Estrella Parkway Option 4A was the least expensive of the potential improvements considered at this location.

4.6.2 Estrella Parkway Improvements - Option 4B

The second improvement option for the Estrella Parkway intersection realigns Vineyard Avenue approximately 140 feet south of the existing intersection to create room for a new southbound-to-eastbound left-turn lane. The southerly shift of Vineyard Avenue was kept to a minimum to mitigate impacts to fairway #3 of the Tres Rios Golf Course. The realigned Vineyard Avenue crosses a major wash upstream of an existing 4-cell 10ft x 10ft concrete box culvert (CBC). Improvement Option 4B will require a new drainage structure similar to the existing CBC. Improvement Option 4B creates a 100 foot southbound-to-eastbound left-turn lane (see **Figure 19**), which is below the preferred minimum 150 foot turn lane length per the City of Goodyear Engineering Design Standards and Policies Manual.

Figure 19 Estrella Parkway - Option 4B

The qualitative ratings of Estrella Parkway Option 4B are as follows:

Vehicle Access: A positive rating was assigned as the 100 foot left-turn lane is an improvement upon current conditions. [Advantage]

Stakeholder Feedback: A neutral rating was assigned to improvement Option 4B. City staff felt that the proposed sport facility improvements may generate enough traffic to warrant a traffic signal at the Estrella Parkway/Vineyard Avenue intersection. This design option represents a better long-term solution for a signalized intersection. It is assumed that the operators of the Tres Rios Golf Course would have reservations about design Option 4B.

Right of Way Requirements: Improvement Option 4B will require approximately one acre of new right-of-way from MCPRD with consent from the Tres Rios Golf Course to accommodate the realignment of Vineyard Avenue. [Disadvantage]

Drainage Impacts: A negative rating was assigned as the proposed improvement will require construction of a new and/or relocation of the existing concrete box culvert. [Disadvantage]

Environmental Impacts: A neutral rating was assigned as there are no known impacts to existing features.

Planning Level Cost Estimate: $852,000 – Estrella Parkway Option 4B was by far the most expensive of the potential improvements considered at this location.

4.6.3 Estrella Parkway Improvements - Option 4C

The third design option to accommodate southbound-to-eastbound turning movement utilizes an indirect left-turn concept for Estrella Parkway. Option 4C removes the direct left-turn movements from the Estrella Parkway/Vineyard Avenue intersection by relocating the turning movement to a break in the median approximately 600 feet south of the intersection. Southbound drivers desiring to head east on Vineyard Avenue would pass the intersection and drive to the opening in the median, make a U-turn onto northbound Estrella Parkway and then make an northbound-to-eastbound right-turn at Vineyard Avenue. This design option includes a widened paved area along the east side of Estrella Parkway opposite the median break to facilitate the southbound-to-northbound U-turn movements (see **Figure 20**). The widened paved area will slightly encroach upon the existing wash east of Estrella Parkway. This embankment will need to be armored to protect against scouring. Qualitative ratings for Estrella Parkway improvement Option 4C are described below.

Figure 20 Estrella Parkway - Option 4C

Vehicle Access: Option 4C is the only design alternative that allows for a standard turn lane length. However, the indirect left-turn is less common in Arizona and requires out-of-direction travel. [Neutral]

Stakeholder Feedback: A negative rating was assigned to improvement Option 4C based upon feedback received from the City of Goodyear. City staff felt that the indirect-left concept would not be well received by residents unaccustomed to the concept. The City was also concerned that enforcement of the indirect left might be challenging because there is no median through the intersection to prohibit the movement. [Disadvantage]

Right of Way Requirements: Improvement Option 4C will require approximately 0.2 acres of new right-of-way from the Tres Rios Golf Course to accommodate the realignment of Vineyard Avenue. [Disadvantage]

Drainage Impacts: A neutral rating was assigned as the proposed improvement has a minimal impact to the existing wash.

Environmental Impacts: A neutral rating was assigned as there are no known impacts to existing features.

Planning Level Cost Estimate: $148,000

4.6.4 Estrella Parkway Improvement Recommendation

Table 6 provides a summary of the qualitative evaluation of the three potential improvement options for the Estrella Parkway/Vineyard Avenue intersection. Improvement Option 4A was recommended because it provides a moderate improvement to the existing conditions with minimal to no impact to existing right-of-way, drainage or environmental features. It is also the most cost effective alternative considered at this location,

It was noted that improvement Option 4A was not viewed as the preferred long-term solution for this intersection by City of Goodyear staff. The ultimate solution at this location involves widening of the Estrella Parkway Bridge. Improvement Option 4A could however represent a low-cost interim improvement that may be combined with other phased improvements (i.e. a signalized intersection similar to Option 4B) to create a hybrid solution that adapts to growing traffic needs.

Table 6 Qualitative Evaluation Summary for Estrella Parkway Improvement Options

Evaluation Criteria	Alt 4A	Alt 4B	Alt 4C
Vehicle Access	◓	◓	○
Stakeholder Feedback	○	○	◒
Right-of-way	◓	◒	◒
Drainage Impacts	◓	◒	○
Environmental Impacts	○	○	○
Cost	$25k	$865k	$148k
Recommended	**Yes**	No	No

4.6.5 Other Estrella Parkway Improvements Considered

Additional improvement options were considered to address the Estrella Parkway/ Vineyard Avenue intersection, but were ultimately rejected for having a qualitative rating that was viewed to be a strong disadvantage.

A roundabout was considered but rejected for the Estrella Parkway/Vineyard Avenue intersection based upon feedback that the Goodyear City Council would not support it.

Alternate entrances into Park were considered off of Estrella Parkway south of the Tres Rios Golf Course (see **Figure 21**). These were rejected due to extensive environmental and drainage impacts, high costs, and potential conflicts with golf course operations.

Figure 21 Alternate Points of Entry

4.7 Enhancements to the Park Circulation Roadways

Figure 10 illustrates the desired typical section for the internal circulation roads within the Estrella Mountain Park. This typical section includes a single 12 foot travel lane in each direction with 4 foot shoulders for bicycle and pedestrian traffic. The existing internal circulation roadways only have 1 foot wide shoulders. It is proposed that 4 foot shoulders be added to the existing Park roadways (see **Figure 22**) at the locations indicated in **Figure 23**. The planning level cost estimate for the widening improvements is $402,000.

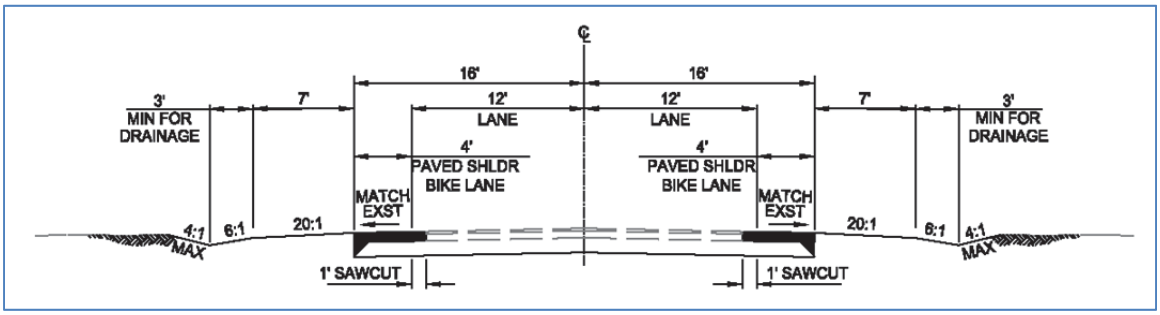


Figure 22 Proposed Circulation Road Widening Typical Section

Figure 23 Locations of Internal Road Widening

4.8 Potential Internal Park Roadways

The design team was asked to evaluate potential internal Park roadways to 1) connect the main Park area to the Competitive Track area located near the northeast corner of the Park and to 2) identify a potential roadway that extends further into the Estrella Mountains for a future trailhead. Two potential roadway alignments were identified to traverse the numerous

washes and mountainous terrain. The first potential roadway alignment is four miles long, begins at the rodeo arena and runs along the northern boundary of the Park to the Competitive Track area. A roadway easement will be required from ASLD as a portion of the potential roadway crosses state trust land near the PIR.

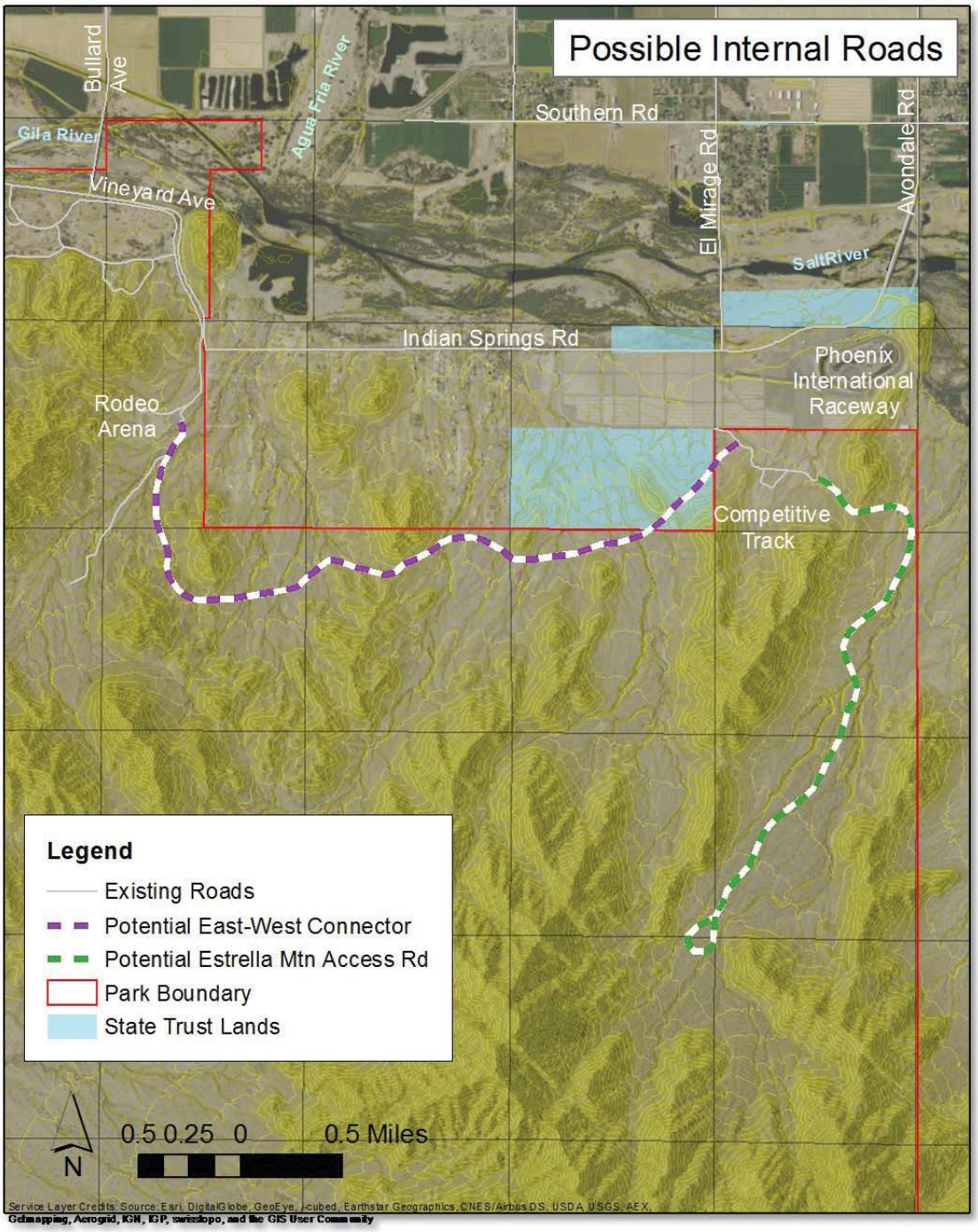


Figure 24 Potential Internal Park Roadways

The second potential internal roadway begins at the Competitive Track area, passes through a saddle point of existing hills and then turns southwest up a small valley into the Estrella Mountains. This second roadway is approximately 3.3 miles long and is intended to service a new trailhead that would make hiking in the Estrella Mountains more accessible to the general public.

Additional circulation roads were proposed as part of the 1988 Estrella Mountain Regional Park Master Plan. The approximate locations of these roads are depicted in **Figure 25**.

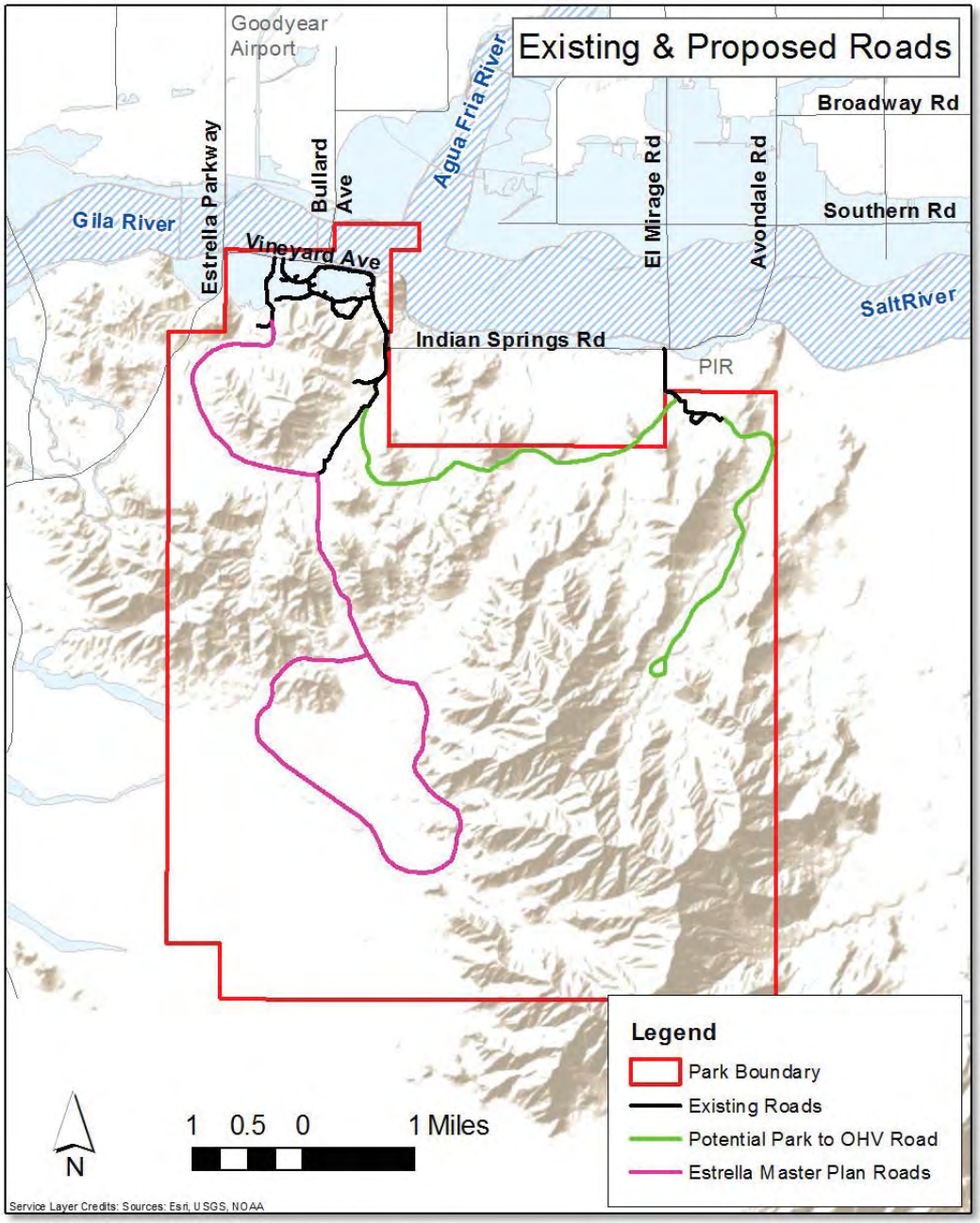
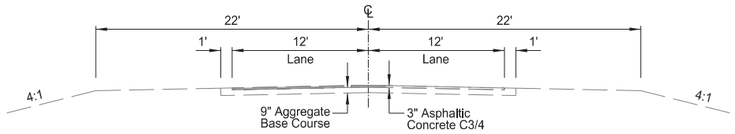


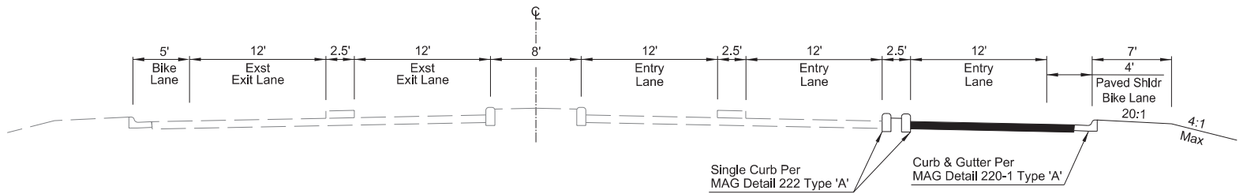
Figure 25 Existing and Proposed Internal Park Roads

5.0 Recommended Improvements

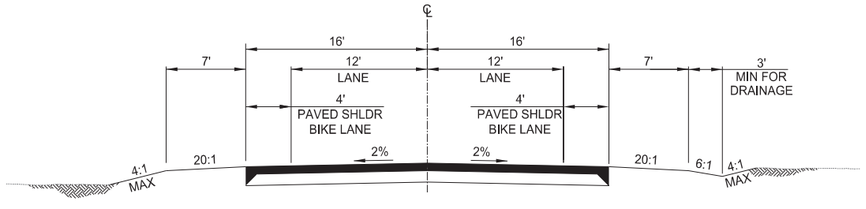
This section presents 200-scale plan-view drawings of the proposed improvement options for Park.



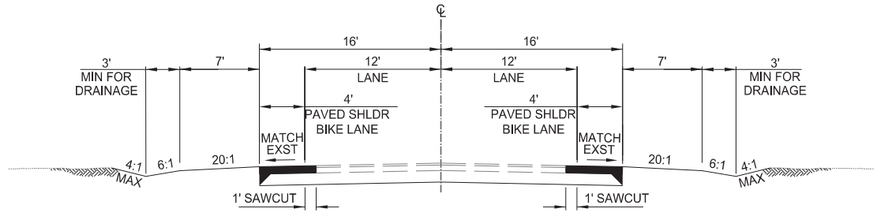
Existing Park Circulation Roads



Proposed Casey Abbott Drive North
at Entry Booth



Proposed Park Circulation Roads



Proposed Circulation Road Widening

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

ESTRELLA MOUNTAIN REGIONAL PARK
ROADWAY EVALUATION

TYPICAL
SECTIONS
Sheet 1 of 5

EPS GROUP
2045 S. Vineyard Ave, Suite 101
Mesa, AZ 85210
T:480.503.2250 | F:480.503.2258
www.epsgroupinc.com

SCALE: Hor: 1"=200'

100 0 100 200

SCALE IN FEET

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION ENGINEERING DIVISION	ESTRELLA MOUNTAIN REGIONAL PARK ROADWAY EVALUATION	PARK ENTRY OPTION 1B Sheet 2 of 5	EPS GROUP 2045 S. Vineyard Ave, Suite 101 Mesa, AZ 85210 T:480.503.2250 | F:480.503.2258 www.epsgroupinc.com

English

SCALE: Hor: 1"=100'

50 0 50 100

SCALE IN FEET

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION ENGINEERING DIVISION	ESTRELLA MOUNTAIN REGIONAL PARK ROADWAY EVALUATION	BULLARD AVE EXIT Sheet 3 of 5	EPS GROUP 2045 S. Vineyard Ave, Suite 101 Mesa, AZ 85210 T:480.503.2250 | F:480.503.2258 www.epsgroupinc.com

English

N

SCALE: Hor: 1"=100'

50 0 50 100

SCALE IN FEET

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

ESTRELLA MOUNTAIN REGIONAL PARK ROADWAY EVALUATION

Vineyard Ave and
Estrella Pkwy
Sheet 4 of 5

EPS GROUP
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English

SCALE: Hor: 1"=400'

400 0 400 800

SCALE IN FEET

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION ENGINEERING DIVISION	ESTRELLA MOUNTAIN REGIONAL PARK ROADWAY EVALUATION	PROPOSED IMPROVEMENTS Sheet 5 of 5	EPS GROUP 2045 S. Vineyard Ave, Suite 101 Mesa, AZ 85210 T:480.503.2250 | F:480.503.2258 www.epsgroupinc.com

English

APPENDIX A

SUMMARY OF EXISTING ROADWAY GEOMETRIC REVIEW

Project Name: Estrella Mountain Park

Roadway: Casey Abbott Drive North – Horizontal Curve Inventory

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	Max	Existing	AASHTO Max	Existing	Posted	(ft)	(%)	Existing	Required
204+93.84			-0.010	-0.132	0.06	13°-28'-53"	39°-53'	34	25	NA			
221+37.60			0.020	-0.178	0.06	7°-09'-43"	39°-53'	45	25	NA			
228+37.23			0.020	-0.125	0.06	14°-19'-26"	39°-53'	35	25	NA			
236+81.64			-0.020	-0.213	0.06	2°-17'-31"	39°-53'	61	25	NA			
247+92.01			-0.020	-0.213	0.06	2°-17'-31"	39°-53'	61	25	NA			
255+09.57			0.020	-0.125	0.06	14°-19'-26"	39°-53'	35	25	NA			
259+62.97			-0.020	-0.187	0.06	5°-51'-29"	39°-53'	44	25	NA			
204+93.84			-0.010	-0.058	0.06	13°-28'-53"	24°-50'	34	30	NA			
221+37.60			0.020	-0.125	0.06	7°-09'-43"	24°-50'	45	30	NA			
228+37.23			0.020	-0.150	0.06	14°-19'-26"	24°-50'	35	30	NA			
236+81.64			-0.020	-0.176	0.06	2°-17'-31"	24°-50'	61	30	NA			
247+92.01			-0.020	-0.176	0.06	2°-17'-31"	24°-50'	61	30	NA			
255+09.57			0.020	-0.050	0.06	14°-19'-26"	24°-50'	35	30	NA			
259+62.97			-0.020	-0.138	0.06	5°-51'-29"	24°-50'	44	30	NA			

Project Name: Estrella Mountain Park

Roadway: Casey Abbott North – Vertical Curve Inventory

Roadway Type: Undivided Roadway (Bi-directional)

VPI Station (ft)	Milepost		Grade (%)		Curve	Curve	Stopping Sight Distance (ft)		Speed (mph)	
	Begin	End	Approach	Departure	Length (ft)	Type	Existing	Required	Existing	Posted
202+56.13			-1.7818	2.7800	150.00	Sag	193	157	29	25
261+80.11			2.7800	0.1365	100.00	Crest	458	157	51	25
202+56.13			-1.7818	2.7800	150.00	Sag	*193	204	29	30
261+80.11			2.7800	0.1365	100.00	Crest	458	204	51	30

= Curve does not meet AASHTO standards for 30mph

Project Name: Estrella Mountain Park

Roadway: Casey Abbott Drive South – Horizontal Curve Inventory

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	Max	Existing	AASHTO Max	Existing	Posted	(ft)	(%)	Existing	Required
301+88.20			0.020	-0.091	0.06	19°-05'-55"	39°-53'	31	25	NA			
306+53.98			0.020	-0.091	0.06	19°-05'-55"	39°-53'	31	25	NA			
309+29.15			0.020	-0.158	0.06	9°-54'-32"	39°-53'	40	25	NA			
313+88.16			-0.020	-0.142	0.06	12°-03'-44"	39°-53'	34	25	NA			
314+94.05			-0.020	-0.154	0.06	10°-25'-03"	39°-53'	36	25	NA			
316+77.53			-0.020	-0.160	0.06	9°-32'-57"	39°-53'	37	25	NA			
321+10.55			-0.020	-0.164	0.06	9°-05'-40"	39°-53'	38	25	NA			
326+64.08			-0.020	-0.184	0.06	6°-21'-58"	39°-53'	43	25	NA			
330+37.12			-0.020	-0.091	0.06	19°-05'-55"	39°-53'	29	25	NA			
333+68.36			-0.020	-0.224	0.06	0°-47'-20"	39°-53'	80	25	NA			
301+88.20			0.020	0.001	0.06	19°-05'-55"	24°-50'	31	30	NA			
306+53.98			0.020	0.001	0.06	19°-05'-55"	24°-50'	31	30	NA			
309+29.15			0.020	-0.096	0.06	9°-54'-32"	24°-50'	40	30	NA			
313+88.16			-0.020	-0.073	0.06	12°-03'-44"	24°-50'	34	30	NA			
314+94.05			-0.020	-0.091	0.06	10°-25'-03"	24°-50'	36	30	NA			
316+77.53			-0.020	-0.100	0.06	9°-32'-57"	24°-50'	37	30	NA			
321+10.55			-0.020	-0.104	0.06	9°-05'-40"	24°-50'	38	30	NA			
326+64.08			-0.020	-0.133	0.06	6°-21'-58"	24°-50'	43	30	NA			
330+37.12			*-0.020	0.001	0.06	19°-05'-55"	24°-50'	29	30	NA			
333+68.36			-0.020	-0.192	0.06	0°-47'-20"	24°-50'	80	30	NA			

= Curve does not meet AASHTO standards for 30mph

Project Name: Estrella Mountain Park

Roadway: Casey Abbottt South – Vertical Curve Inventory

Roadway Type: Undivided Roadway (Bi-directional)

VPI Station (ft)	Milepost		Grade (%)		Curve	Curve	Stopping Sight Distance (ft)		Speed (mph)	
	Begin	End	Approach	Departure	Length (ft)	Type	Existing	Required	Existing	Posted
331+59.00			0.8537	2.6060	100.00	Sag	+9999	157	+100	25
333+95.00			2.6060	-2.0564	100.00	Crest	281	157	37	25
335+42.83			-2.0564	-0.1000	100.00	Sag	1443	156	+100	25
331+59.00			0.8537	2.6060	100.00	Sag	+9999	203	+100	30
333+95.00			2.6060	-2.0564	100.00	Crest	281	203	37	30
335+42.83			-2.0564	-0.1000	100.00	Sag	1443	203	+100	30

Project Name: Estrella Mountain Park

Roadway: Cul-De-Sac Road – Horizontal Curve Inventory

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	Max	Existing	AASHTO Max	Existing	Posted	(ft)	(%)	Existing	Required
404+34.62			0.020	-0.111	0.06	16°-22'-13"	39°-53'	33	25	NA			
407+47.43			-0.020	-0.170	0.06	8°-11'-06"	39°-53'	39	25	NA			
409+74.30			-0.020	-0.184	0.06	6°-21'-58"	39°-53'	43	25	NA			
414+93.27			-0.020	-0.167	0.06	8°-40'-52"	39°-53'	38	25	NA			
418+72.42			0.020	-0.091	0.06	19°-05'-55"	39°-53'	31	25	NA			
404+34.62			0.020	-0.028	0.06	16°-22'-13"	24°-50'	33	30	NA			
407+47.43			-0.020	-0.114	0.06	8°-11'-06"	24°-50'	39	30	NA			
409+74.30			-0.020	-0.133	0.06	6°-21'-58"	24°-50'	43	30	NA			
414+93.27			-0.020	-0.109	0.06	8°-40'-52"	24°-50'	38	30	NA			
418+72.42			0.020	0.001	0.06	19°-05'-55"	24°-50'	31	30	NA			

Project Name: Estrella Mountain Park

Roadway: Golf Course Drive – Horizontal Curve Inventory

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	Max	Existing	AASHTO Max	Existing	Posted	(ft)	(%)	Existing	Required
104+24.10			0.020	-0.111	0.06	16°-22'-13"	39°-53'	33	25	NA			
107+00.99			0.020	-0.034	0.06	26°-54'-43"	39°-53'	27	25	NA			
117+65.61			0.020	-0.132	0.06	13°-28'-53"	39°-53'	36	25	NA			
122+02.42			0.020	-0.132	0.06	13°-28'-53"	39°-53'	36	25	NA			
104+24.10			0.020	-0.028	0.06	16°-22'-13"	24°-50'	33	30	NA			
107+00.99			0.020	***	0.06	*26°-54'-43"	24°-50'	27	30	NA			
117+65.61			0.020	-0.058	0.06	13°-28'-53"	24°-50'	36	30	NA			
122+02.42			0.020	-0.058	0.06	13°-28'-53"	24°-50'	36	30	NA			

= Curve does not meet AASHTO standards for 30mph

Project Name: Estrella Mountain Park

Roadway: Golf Course Drive – Vertical Curve Inventory

Roadway Type: Undivided Roadway (Bi-directional)

VPI Station (ft)	Milepost		Grade (%)		Curve	Curve	Stopping Sight Distance (ft)		Speed (mph)	
	Begin	End	Approach	Departure	Length (ft)	Type	Existing	Required	Existing	Posted
111+65.00			1.3714	-3.2000	140.00	Crest	306	158	39	25
113+20.00			-3.2000	0.7414	100.00	Sag	181	158	28	25
111+65.00			1.3714	-3.2000	140.00	Crest	306	205	39	30
113+20.00			-3.2000	0.7414	100.00	Sag	*181	205	28	30

= Curve does not meet AASHTO standards for 30mph

APPENDIX B

SUMMARY OF TRIP GENERATION ANALYSIS

PROJECT	ESTRELLA PARK			
PARCEL	ENTIRE SITE			
ITE LAND USE CATEGORY AND CODE	COUNTY PARK - 412			
INDEPENDENT VARIABLE	ACRE			
SIZE	167.0			
		TRIPS		
		ENTERING	EXITING	TOTAL
***WEEKDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	22			
AVERAGE SIZE	349			
MINIMUM RATE	0.17	14	14	28
AVERAGE RATE	2.28	191	190	381
MAXIMUM RATE	53.41	4,460	4,459	8,919
STANDARD DEVIATION	7.04			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**191**	**190**	**381**
AM PEAK HOUR ADJACENT STREET		80%	20%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	650			
MINIMUM RATE	0.00	0	0	0
AVERAGE RATE	0.01	2	0	2
MAXIMUM RATE	0.02	2	1	3
STANDARD DEVIATION	0.10			
EQUATION: T = 0.70 * (X) + 9.74	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**2**	**0**	**2**
AM PEAK HOUR GENERATOR		71%	29%	
NUMBER OF STUDIES	7			
AVERAGE SIZE	335			
MINIMUM RATE	0.05	6	2	8
AVERAGE RATE	0.52	62	25	87
MAXIMUM RATE	22.29	2,643	1,079	3,722
STANDARD DEVIATION	1.89			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**62**	**25**	**87**
PM PEAK HOUR ADJACENT STREET		41%	59%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	650			
MINIMUM RATE	0.05	3	5	8
AVERAGE RATE	0.06	4	6	10
MAXIMUM RATE	0.08	5	8	13
STANDARD DEVIATION	0.25			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**4**	**6**	**10**
PM PEAK HOUR GENERATOR		35%	65%	
NUMBER OF STUDIES	6			
AVERAGE SIZE	389			
MINIMUM RATE	0.08	5	8	13
AVERAGE RATE	0.59	35	64	99
MAXIMUM RATE	5.30	310	575	885
STANDARD DEVIATION	1.50			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**35**	**64**	**99**

EPS GROUP

PROJECT	ESTRELLA PARK			
PARCEL	ENTIRE SITE			
ITE LAND USE CATEGORY AND CODE	COUNTY PARK - 412			
INDEPENDENT VARIABLE	ACRE			
SIZE	167.0			
		TRIPS		
	RATE	ENTERING	EXITING	SUM
***SATURDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	6			
AVERAGE SIZE	101			
MINIMUM RATE	4.04	338	337	675
AVERAGE RATE	12.14	1,014	1,013	2,027
MAXIMUM RATE	24.74	2,066	2,066	4,132
STANDARD DEVIATION	9.63			
EQUATION: T = 36.31 * (X) - 2445.12	R^2 = 0.79	1,810	1,809	3,619
LARGEST OF AVERAGE OR EQUATION		**1,810**	**1,809**	**3,619**
PEAK HOUR GENERATOR		59%	41%	
NUMBER OF STUDIES	2			
AVERAGE SIZE	136			
MINIMUM RATE	0.52	51	36	87
AVERAGE RATE	2.24	221	153	374
MAXIMUM RATE	3.20	315	219	534
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**221**	**153**	**374**
***SUNDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	14			
AVERAGE SIZE	339			
MINIMUM RATE	0.32	27	26	53
AVERAGE RATE	4.13	345	345	690
MAXIMUM RATE	38.46	3,212	3,211	6,423
STANDARD DEVIATION	8.07			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**345**	**345**	**690**
PEAK HOUR GENERATOR		47%	53%	
NUMBER OF STUDIES	2			
AVERAGE SIZE	136			
MINIMUM RATE	1.55	122	137	259
AVERAGE RATE	3.60	282	319	601
MAXIMUM RATE	4.74	372	420	792
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**282**	**319**	**601**

EPS GROUP

PROJECT	ESTRELLA PARK			
PARCEL	ENTIRE SITE			
ITE LAND USE CATEGORY AND CODE	REGIONAL PARK - 417			
INDEPENDENT VARIABLE	ACRE			
SIZE	167.0			
		TRIPS		
		ENTERING	EXITING	TOTAL
***WEEKDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	5			
AVERAGE SIZE	310			
MINIMUM RATE	0.92	77	77	154
AVERAGE RATE	4.57	382	381	763
MAXIMUM RATE	39.07	3,263	3,262	6,525
STANDARD DEVIATION	10.03			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**382**	**381**	**763**
AM PEAK HOUR ADJACENT STREET		NA	NA	
NUMBER OF STUDIES	NA			
AVERAGE SIZE	NA			
MINIMUM RATE	NA	NA	NA	NA
AVERAGE RATE	NA	NA	NA	NA
MAXIMUM RATE	NA	NA	NA	NA
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**NA**	**NA**	**NA**
AM PEAK HOUR GENERATOR		57%	43%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	425			
MINIMUM RATE	0.08	7	6	13
AVERAGE RATE	0.15	14	11	25
MAXIMUM RATE	0.60	57	43	100
STANDARD DEVIATION	0.42			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**14**	**11**	**25**
PM PEAK HOUR ADJACENT STREET		45%	55%	
NUMBER OF STUDIES	2			
AVERAGE SIZE	602			
MINIMUM RATE	0.11	8	10	18
AVERAGE RATE	0.20	15	18	33
MAXIMUM RATE	1.10	83	101	184
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**15**	**18**	**33**
PM PEAK HOUR GENERATOR		44%	56%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	425			
MINIMUM RATE	0.11	8	10	18
AVERAGE RATE	0.26	19	24	43
MAXIMUM RATE	1.33	98	124	222
STANDARD DEVIATION	0.63			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**19**	**24**	**43**

EPS GROUP

PROJECT	ESTRELLA PARK			
PARCEL	ENTIRE SITE			
ITE LAND USE CATEGORY AND CODE	REGIONAL PARK - 417			
INDEPENDENT VARIABLE	ACRE			
SIZE	167.0			
		TRIPS		
	RATE	ENTERING	EXITING	SUM
***SATURDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	5			
AVERAGE SIZE	310			
MINIMUM RATE	1.88	157	157	314
AVERAGE RATE	5.65	472	472	944
MAXIMUM RATE	43.04	3,594	3,594	7,188
STANDARD DEVIATION	10.94			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**472**	**472**	**944**
PEAK HOUR GENERATOR		48%	52%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	425			
MINIMUM RATE	0.23	18	20	38
AVERAGE RATE	0.34	27	30	57
MAXIMUM RATE	1.68	135	146	281
STANDARD DEVIATION	0.67			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**27**	**30**	**57**
***SUNDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	5			
AVERAGE SIZE	310			
MINIMUM RATE	2.12	177	177	354
AVERAGE RATE	6.44	538	537	1,075
MAXIMUM RATE	44.11	3,683	3,683	7,366
STANDARD DEVIATION	11.24			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**538**	**537**	**1,075**
PEAK HOUR GENERATOR		34%	66%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	425			
MINIMUM RATE	0.21	12	23	35
AVERAGE RATE	0.42	24	46	70
MAXIMUM RATE	2.32	132	255	387
STANDARD DEVIATION	0.85			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**24**	**46**	**70**

EPS GROUP

PROJECT	**ESTRELLA PARK**			
PARCEL	**ENTIRE SITE**			
ITE LAND USE CATEGORY AND CODE	**SOCCER COMPLEX - 488**			
INDEPENDENT VARIABLE	**FIELDS**			
SIZE	**21.0**			
		TRIPS		
		ENTERING	EXITING	TOTAL
***WEEKDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	10			
MINIMUM RATE	42.86	450	450	900
AVERAGE RATE	71.33	749	749	1,498
MAXIMUM RATE	90.81	954	953	1,907
STANDARD DEVIATION	23.12			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**749**	**749**	**1,498**
AM PEAK HOUR ADJACENT STREET		57%	43%	
NUMBER OF STUDIES	4			
AVERAGE SIZE	13			
MINIMUM RATE	0.29	3	3	6
AVERAGE RATE	1.12	14	10	24
MAXIMUM RATE	1.88	22	17	39
STANDARD DEVIATION	1.19			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**14**	**10**	**24**
AM PEAK HOUR GENERATOR		56%	44%	
NUMBER OF STUDIES	4			
AVERAGE SIZE	13			
MINIMUM RATE	0.29	3	3	6
AVERAGE RATE	2.10	25	19	44
MAXIMUM RATE	3.81	45	35	80
STANDARD DEVIATION	2.06			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**25**	**19**	**44**
PM PEAK HOUR ADJACENT STREET		45%	55%	
NUMBER OF STUDIES	4			
AVERAGE SIZE	13			
MINIMUM RATE	8.71	82	101	183
AVERAGE RATE	17.70	167	205	372
MAXIMUM RATE	24.88	235	287	522
STANDARD DEVIATION	7.55			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**167**	**205**	**372**
PM PEAK HOUR GENERATOR		44%	56%	
NUMBER OF STUDIES	35			
AVERAGE SIZE	58			
MINIMUM RATE	0.94	9	11	20
AVERAGE RATE	3.11	29	36	65
MAXIMUM RATE	6.06	56	71	127
STANDARD DEVIATION	2.17			
EQUATION: LN (T) = 0.89 * LN(X) + 1.50	R^2 = 0.55	12	15	27
LARGEST OF AVERAGE OR EQUATION		**29**	**36**	**65**

EPS GROUP

PROJECT	ESTRELLA PARK			
PARCEL	ENTIRE SITE			
ITE LAND USE CATEGORY AND CODE	SOCCER COMPLEX - 488			
INDEPENDENT VARIABLE	FIELDS			
SIZE	21.0			
		TRIPS		
	RATE	ENTERING	EXITING	SUM
***SATURDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	1			
AVERAGE SIZE	7			
MINIMUM RATE	NA	NA	NA	NA
AVERAGE RATE	117.43	1,233	1,233	2,466
MAXIMUM RATE	NA	NA	NA	NA
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**1,233**	**1,233**	**2,466**
PEAK HOUR GENERATOR		48%	52%	
NUMBER OF STUDIES	6			
AVERAGE SIZE	11			
MINIMUM RATE	17.14	173	187	360
AVERAGE RATE	30.34	306	331	637
MAXIMUM RATE	34.20	345	373	718
STANDARD DEVIATION	7.42			
EQUATION: T = 37.04 * (X) - 75.92	R^2 = 0.97	337	365	702
LARGEST OF AVERAGE OR EQUATION		**337**	**365**	**702**
***SUNDAY* DAILY**		NA	NA	
NUMBER OF STUDIES	NA			
AVERAGE SIZE	NA			
MINIMUM RATE	NA	NA	NA	NA
AVERAGE RATE	NA	NA	NA	NA
MAXIMUM RATE	NA	NA	NA	NA
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**NA**	**NA**	**NA**
PEAK HOUR GENERATOR		41%	59%	
NUMBER OF STUDIES	1			
AVERAGE SIZE	20			
MINIMUM RATE	NA	NA	NA	NA
AVERAGE RATE	28.10	242	348	590
MAXIMUM RATE	NA	NA	NA	NA
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**242**	**348**	**590**

EPS GROUP

APPENDIX C

PLANNING LEVEL COST ESTIMATES

Engineer's Construction Cost Estimate

Estrella Park

Project No. 14-164.3

Estrella Park Entrance - Option 1A

Item	Description	Unit	Quantity	Unit Price	Cost
	Clearing, Grubbing, Monumentation	LS	1	$15,000.00	$15,000
	Prepare Subgrade and Install 3.0" AC Pavement over 9" ABC	SY	2386	$25.00	$59,650
	Sign, Post, and Foundation	EA	2	$250.00	$500
	4" White/Yellow Striping (Equivalent)	LF	3400	$0.60	$2,040
	Remove Existing Pavement Section	SY	1450	$5.00	$7,250
				Total (with 25% Contingency) =	**$106,000**

Estrella Park Entrance - Option 1B

Item	Description	Unit	Quantity	Unit Price	Cost
	Prepare Subgrade and Install 3.0" AC Pavement over 9" ABC	SY	6782	$25.00	$169,550
	Sign, Post, and Foundation	EA	2	$250.00	$500
	4" White/Yellow Striping (Equivalent)	LF	5910	$0.60	$3,546
	Remove Existing Pavement Section	SY	5400	$5.00	$27,000
				Total (with 25% Contingency) =	**$251,000**

Estrella Park Entrance - Option 1C

Item	Description	Unit	Quantity	Unit Price	Cost
	Clearing, Grubbing, Monumentation	LS	1	$20,000.00	$20,000
	Prepare Subgrade and Install 3.0" AC Pavement over 9" ABC	SY	1309	$25.00	$32,725
	Sign, Post, and Foundation	EA	2	$250.00	$500
	4" White/Yellow Striping (Equivalent)	LF	1988	$0.60	$1,193
	Remove Existing Pavement Section	SY	93	$5.00	$465
				Total (with 25% Contingency) =	**$69,000**

Bullard Egress - Option B

Item Number	Description	Unit	Quantity	Unit Price	Cost
	Prepare Subgrade and Install 3.0" AC Pavement over 9" ABC	SY	640	$25.00	$16,000
	6" Curb and Gutter / Single Curb	LF	530	$12.00	$6,360
	24" Storm Drain Pipe	LF	60	$90.00	$5,400
	Sign, Post, and Foundation	EA	4	$250.00	$1,000
	4" White/Yellow Striping (Equivalent)	LF	80	$0.60	$48
	Arrow Symbol	EA	4	$200.00	$800
	"ONLY" Symbol	EA	2	$200.00	$400
	Remove Existing Pavement Section	SY	260	$5.00	$1,300
	Remove Concrete Curb and Gutter	LF	200	$3.00	$600
				Total (with 25% Contingency) =	**$40,000**

Option C - Baseline Fee Booth and Egress

Item Number	Description	Unit	Quantity	Unit Price	Cost
	Prepare Subgrade and Install 3.0" AC Pavement over 9" ABC	SY	250	$25.00	$6,250
	6" Curb and Gutter / Single Curb	LF	118	$12.00	$1,416
	Sign, Post, and Foundation	EA	3	$250.00	$750
	4" White/Yellow Striping (Equivalent)	LF	565	$0.60	$339
	Arrow Symbol	EA	2	$200.00	$400
	"ONLY" Symbol	EA	1	$200.00	$200
	Remove Existing Pavement Section	SY	80	$5.00	$400
	Fee Booth	LSUM	2	$30,000.00	$60,000

Indian Springs Entrance and Egress

	Prepare Subgrade and Install 3.0" AC Pavement over 9" ABC	SY	645	$25.00	$16,125
	Sign, Post, and Foundation	EA	3	$250.00	$750
	4" White/Yellow Striping (Equivalent)	LF	130	$0.60	$78
	Remove Existing Pavement Section	SY	600	$5.00	$3,000
				Total (with 25% Contingency) =	**$112,000**

Circulation Road Widening

Item Number	Description	Unit	Quantity	Unit Price	Cost
	Prepare Subgrade and Install 3.0" AC Pavement over 9" ABC	SY	11889	$25.00	$297,222
	4" White/Yellow Striping (Equivalent)	LF	21400	$0.60	$12,840
	Remove Existing Pavement Section	SY	2378	$5.00	$11,889
				Total (with 25% Contingency) =	**$402,000**

Estrella & Vineyard Intersection - Option 4A

Item Number	Description	Unit	Quantity	Unit Price	Cost
	Prepare Subgrade and Install 7.0" AC Pavement over Subgrade	SY	120	$40.00	$4,800
	Steel Gaurdrail	LF	230	$25.00	$5,750
	Sign, Post, and Foundation	EA	2	$250.00	$500
	4" White/Yellow Striping (Equivalent)	LF	5100	$0.60	$3,060
	Arrow Symbol	EA	2	$200.00	$400
	"ONLY" Symbol	EA	1	$200.00	$200
	Remove Gaurdrail	LF	230	$4.00	$920
	Remove Concrete Barrier	LF	225	$20.00	$4,500
				Total (with 25% Contingency) =	**$25,000**

Estrella & Vineyard Intersection - Option 4B

Item Number	Description	Unit	Quantity	Unit Price	Cost
	Prepare Subgrade and Install 7.0" AC Pavement over Subgrade	SY	4914	$40.00	$196,560
	6" Curb and Gutter / Single Curb	LF	1100	$12.00	$13,200
	Concrete Box Culvert	LF	80	$2,000.00	$160,000
	Box Culvert Headwall	EA	2	$5,000.00	$10,000
	Steel Gaurdrail	LF	175	$25.00	$4,375
	Sign, Post, and Foundation	EA	4	$250.00	$1,000
	4" White/Yellow Striping (Equivalent)	LF	6735	$0.60	$4,041
	Arrow Symbol	EA	10	$200.00	$2,000
	"ONLY" Symbol	EA	2	$200.00	$400
	Remove Existing Pavement Section	SY	4100	$5.00	$20,500
	Remove Concrete Curb and Gutter	LF	715	$3.00	$2,145
	Remove Gaurdrail	LF	625	$4.00	$2,500
	New Right of Way	SF	52900	$5.00	$264,500
				Total (with 25% Contingency) =	**$852,000**

Estrella & Vineyard Intersection - Option 4C

Item Number	Description	Unit	Quantity	Unit Price	Cost
	Prepare Subgrade and Install 7.0" AC Pavement over Subgrade	SY	1151	$40.00	$ 46,040
	6" Curb and Gutter / Single Curb	LF	680	$12.00	$ 8,160
	Steel Gaurdrail	LF	460	$25.00	$ 11,500
	Sign, Post, and Foundation	EA	6	$ 250.00	$ 1,500
	4" White/Yellow Striping (Equivalent)	LF	745	$ 0.60	$ 447
	Arrow Symbol	EA	4	$ 200.00	$ 800
	"ONLY" Symbol	EA	2	$ 200.00	$ 400
	Remove Existing Pavement Section	SY	150	$5.00	$ 750
	Remove Concrete Curb and Gutter	LF	730	$3.00	$ 2,190
	Remove Gaurdrail	LF	460	$4.00	$ 1,840
	New Right of Way	SF	9000	$5.00	$ 45,000
				Total (with 25% Contingency) =	**$ 148,000**

Appendix J – Trail System Plan

(Insert all materials behind this cover page)

Estrella Mountain Regional Park Trail System Plan

Table of Contents

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Introduction

The purpose of the Estrella Mountain Regional Park (EMRP) Trail Plan is to determine the desired future condition of the trail system, including trailheads, service roads access and competitive tracks.

This plan is tiered to the EMRP Master Plan and will guide the management of trails tracks and access within the park by developing specific management actions for the EMRP trail system. This plan is consistent with federal, state and county laws and Maricopa County Parks and Recreation Department (PRD) policies.

This plan was developed with the input of the public and is of particular value to the Park Supervisor and the Trails Planner. It is intended for this plan to provide the needed framework for the management of EMRP's trail system and in the planning of specific trail work projects. This plan will also be used to educate PRD personnel about the overall management of the ERMP trail system.

Public participation

The Scoping Process

People interested in participating in the trail planning process were sought through news releases sent to eight area newspaper community sections. Announcement flyers were placed within EMRP at the trailhead kiosks. Several key contacts were made including SunChase Estrella Limited Partnership Development Company of Estrella Mountain Ranch (SunChase) and Phoenix Speedway Corporation of Phoenix International Raceway (PIR) and The City of Goodyear. In addition, announcement letters were sent to 60 individuals, organizations and government agencies potentially interested in participating in the plan development process.

In response to these announcements, PRD received 44 notices of interest from those who wanted to participate in the planning process. These participants were sent a letter of information which, outlined the planning process and requested scoping comments concerning the current and future trail system of EMRP. To facilitate this initial comment phase, some trail concerns were itemized and a planning map was included for visual reference.

Altogether, PRD received 11 letters and e-mail messages from this scoping process. The individuals and organizations submitted these comments represented hikers, park neighbors, bicyclists and equestrians. During the development of the draft plan, the planning team reviewed every pertinent comment submitted.

The Draft Plan

The draft plan was mailed to 47 citizens and organizations that were interested in reviewing the draft plan. In response to the draft plan, three comment letters were received.

The plan

This Trail Plan was produced by the Estrella trail planning team consisting of: Mark Lansing, EMRP Supervisor; Bob Skaggs, Trails Planner; Dave Konopka, Trails Planner; and Julie Allbrooks, Planning Consultant. This team compiled and analyzed all pertinent information including public comments, recommendations of government agencies, natural and cultural resource protection issues, specifications for county trails, PRD policies and the EMRP master plan.

The development of a specific trail plan is critical to managing EMRP. The 1988 Master Plan for EMRP does not address new trails, trail changes nor provide an action plan for trail development. The Master Plan contains a small section about EMRP trails and discusses two types of trails - formal and informal. Formal trails are referred to as hard surfaced intensive use trails found in the developed areas. “These trails connect major use areas and facilities to parking lots” (EMRP 1988 Master Plan, p.104).

This trail plan addresses the informal trail system. Informal trails are referred to as trails “constructed of dirt, gravel or whatever material is present in the landscape” and lead “through natural areas and away from development” (EMRP 1988 Master Plan, p.104).

The maps included with this trail plan show the planned trail system. If a trail that is currently being used by the public does not appear on the map, it is slated for closure and obliteration. All of the EMRP trails are subject to modifications and improvements as needed to repair hazards to visitors, prevent trail erosion or solve other trail management concerns.

Public and agency comments

Scoping comments directly related to trail planning

Eleven comment letters and e-mail messages were received within the initial scoping period. The comments were sent by organizations and individuals who are trail users at EMRP or otherwise interested in the management of its trails. Analysis revealed that comments addressed six major issues directly related to trail planning.

Trail System

There were many comments that directly addressed the current trail system. The bulk of these comments stated that the trails, as they currently exist, are confusing and need attention and some modifications. The issue of multiple users of the trail system was commented upon in both positive and negative ways.

Trail connection to Estrella Mountain Ranch Development

Representatives of Sunchase, the development builder, specifically requested a private access gate connecting the Estrella Mountain Ranch Development to EMRP’s trail system. The Sunchase representatives suggested three locations best suited for their needs.

One letter from the public specifically addressed the issue of trail connections to private neighborhoods. This letter argued against any connections to private developments unless these connections were available for use by the general public, including parking and fee stations. The “Trail B” spur on the EMRP Visitor Map May 1991, which leads to the west boundary of the park, is cause for concern (difficult to find and no outside access). These same concerns were raised about the “Trail C” spur which leads to the north boundary of the park.

Bicycle Issues

Mountain bike trail use is a topic of great concern. There were positive and negative comments regarding the current situation. There were suggestions promoting the establishment of a separate competitive track and suggestions of banning bicycles from the trails all together. Comments were made, stating that the current situation is confusing and needs attention and modifications.

Trailheads

The trailheads were addressed by a few comments that called for slight modifications in the existing physical layout.

Trail Amenities

Several people commented that there should be a water source provided to the main trailhead areas. A backcountry picnic area with a table and ramada was also suggested.

Signs and Maps

A few comments were directed to the map and consisted of suggestions for making it easier to read. The trail markings received poor reviews and a few suggestions were made on how to improve the effectiveness of the current trail sign system.

Draft Plan Review comments directly related to trail planning

Public Letters

Three comment letters and meetings with two park neighbors, PIR and SunChase resulted from public review of the EMRP draft trail plan.

Trail System

Comments generally favored the draft plan. Support was given for maintaining the trails as multiple-use, improving the trail signage and the rerouting of several established trails.

Competitive Track

The competitive track concept and location were given support.

Alternative Public Access to EMRP

Alternative access to EMRP was supported as long as it was made available to the general public.

SunChase would like to develop a public access trail connecting the Estrella Mountian Ranch community to EMRP. The precise location of the access point and spur trail will be decided at a later

date based on the progression of the community development.

PIR intends to grant an easement to PRD for purposes of access to the Northeast area of the park. PIR will assist with the development of the competitive track parking lot and other facilities.

Government Comments

The PRD received a letter from The City of Goodyear planning department. A Senior Planner wrote that while at this time there is no specific plan to have city trail connections directly with EMRP, they intend to ”establish an open space trail system throughout the City of Goodyear with links to surrounding communities”.

Trail system plan

This section lists policies from the PRD Trails Management and lists the planned trail development actions.

Policies

Multiple uses

PRD policy encourages designating trails for multiple-use whenever possible. This means pedestrian, equestrian and cyclists should be allowed to use all of the designated trails in EMRP. Where essential, for visitor safety or special use conditions, trail use may be restricted (e.g., Interpretive or Barrier-free trails).

Trail Classification

Trails are classified as primary, secondary, barrier-free and/or interpretive as directed in the PRD Trails Manual.

Trail Definitions:

Maximum sustained grade: Maximum inclination allowed for long distances. Grade is a function of rise over run expressed as percent (i.e., rise/run = %).

Tread: Trail surface maintained to bare mineral soil.

Vegetation Clearance: Zone of vegetation cut back from treads edge for ease of passage along the trail corridor.

Primary Trails:

Maximum sustained grade: 10%
Tread: 4 feet (1.2 m) wide
Vegetation Clearance:
Width: 6 feet (2 m) total clearance - 12 in (0.3 m) from tread edge
Height: 10 feet (3 m) from tread surface

Secondary Trails:

Maximum sustained grade: 15%
Tread: 2 feet (0.6 m) width
Vegetation Clearance:
Width: 6 feet (2 m) total clearance; 2 feet (0.6m) from tread edge
Height: 10 feet (3 m) from tread surface

Barrier- Free Trails:

Maximum sustained grade: 5%. Not more than 20% of the total trail length shall exceed the maximum sustained grade. A maximum grade of 8% may be utilized for segments no longer than 90 feet (30 m), access ramps and dips. A 5 foot (1.5 m) long level grade landing shall be constructed on maximum grade segments at intervals not to exceed 30 feet (9 m) in length.
Tread: One-way segments - 5 feet (1.5 m) wide
Two -way segments - 7 feet (2.1 m)
wide
Vegetation Clearance:
Width: 1-foot (0.3 m) from tree edge
Height: 8 feet (2.4 m) from tread surface

Interpretive Trails:

Maximum sustained grade: 10%
Tread: 4 feet (1.2 m) wide
Vegetation Clearance:

Width: 6 feet (2 m) total clearance, 12 in (0.3 m) from tread surface
Height: 8 feet (2.4 m) from tread surface

Complete specifications are found within the PRD Trails Management Manual and are available upon request.

Trail Signs

The signs marking the trail system will be consistent with the PRD Trail Manual guidelines.

Access Gates

One gate may connect the residential area west of the park to the EMRP trail system. According to the current PRD policy, trail gates may be added along park boundaries only if:

1. There is a demonstrated public need and demand.
2. The access is guaranteed, long-term for the overall public.
3. Other adjacent landowners concur with the establishment of access.
4. Access via the main entrance for local residents is demonstrated to be excessively inconvenient.
5. Access connects with another government agency's trail system.
6. Access connects an authorized trail concession facility serving the public.

Actions

The following action items provide direction for the establishment of the EMRP Trail System and access to trails. For reference, each action item's corresponding number is located on maps 'A' and 'B'. Unless it is otherwise indicated, all trails are designated for non-motorized multiple-use by hikers, bikers and equestrians.

Actions Related to the Trail System

1. Southwest Area

Designate, develop and sign a primary trail in the southwest area of the park.

- This trail will be approximately 9 miles long.

1A. West Boundary

Designate, develop and sign a spur trail providing access for residential areas west of the park.

- This action item will be carried out only if the criteria listed under "Policies – Access Gates" is met.
- Precise location will be determined when SunChase continues discussions with PRD and provides specific plans for development an adjacent to EMRP.
- Development at the park boundary will be limited to the trail boundary fence, entry gate, fee collection station, and appropriate signs.
- Access is primarily for local neighborhood residents. No trailhead parking will be developed or allowed.

2. South of Corgett Wash

Designate, develop and sign a primary trail along the south bank of Corgett Wash

- This trail will be approximately 1.5 miles long.

3. West-Central Area

Designate, realign and sign a primary trail from the arena trailhead to the new trail in the Southeast area.

- This trail will be approximately 3.3 miles long.

4. West of new trailhead

Designate, develop and sign a primary trail from the new trailhead to the trail farthest west in that area.

- This trail will be approximately 1 mile long.

5. West and south of arena trailhead

Designate, develop and sign a primary trail in the park's west and central area.

- This trail will be approximately 4.5 miles long.

6. East of new trailhead

Designate, realign and sign a primary trail from the new trailhead through the central park area.

- This trail will be approximately 3 miles long.

7. South of new trailhead

Designate, realign and sign a primary trail south of the new trailhead.

- This trail will be approximately 1.5 miles long.

8. South of Casey Abbot picnic area

Designate, renovate and sign an interpretive trail.

- Renovate to barrier-free specifications.
- Develop and install interpretive displays.
- Designate for pedestrian use only.
- This trail will be approximately 1.8 miles long.

9. Casey Abbot picnic area to arena trailhead

Designate, develop and sign a primary trail along the west side of the existing roadway from the Casey Abbot picnic area to the arena trailhead.

- This trail will be approximately 0.8 miles long.

10. Southeast of Casey Abbot picnic area

Designate, develop and sign an interpretive trail.

- Construct to barrier-free specifications.
- Develop and install interpretive displays.
- Designate for pedestrian use only.
- This trail will be approximately 0.3 miles long.

11. South of PIR

Designate, develop and sign a competitive track in the northeast area of the park.

- Development is pending completion of a cooperative agreement and acquisition of easement for access.
- The track will be a series of interconnecting segments totaling approximately 12 miles.

Actions Related to the Access System

12. Southeast Area

Designate and sign service roads.

- Maintain existing old roads to county transportation specifications.
- Service roads are for administrative and emergency use only.
- Install and maintain a locked gate at the park boundary. Install gates at other locations if necessary.
- Construct end of road turn-around areas to allow for use for helicopter access.

13. South of arena

Designate, develop and sign an improved surfaced road and a new trailhead.

- Renovate existing old road to County transportation specifications. As funding allows, upgrade road from dirt to blacktop.
- Develop parking area adequate for vehicles and trailers.
- Install support facilities as necessary and as funding allows, such as kiosks, hitch rails, water spigot, ramadas, toilets, etc.

14. East of arena

Renovate existing trailhead.

- Install support facilities as necessary and as funding allows, such as kiosks, hitch rails, water spigot, ramadas, toilets, etc.

15. South of Casey Abbott picnic area

Renovate existing trailheads.

- Install support facilities as necessary and as funding allows, such as kiosks, water spigot, paved surface, etc.

16. South of PIR

Designate, develop and sign an improved, dirt surface road and a parking area in the northeast area of the park.

- Development is pending completion of a cooperative agreement and acquisition of easement for access.
- Renovate existing old road to County transportation specifications. As funding allows, upgrade road from dirt to blacktop.
- Develop parking area adequate for vehicles and trailers.
- Install support facilities as necessary and as funding allows, such as kiosks, water spigot, ramadas, toilets, etc.

17. East and west of track

Designate, develop and sign an improved, dirt surface road.

- Renovate existing old road and construct new roadway to County transportation specifications.
- Service roads are for administrative and emergency use only.
- Install and maintain a locked gate at the park boundary. Install gates at other locations if necessary.
- Construct end of road turn-around areas to allow for use for helicopter access.

Other Actions Related to Trails

Trail names

Any new trails will be given new names. Some segments of previously established trails will be renamed to minimize visitor confusion.

Obliteration of paths and roads

The undesignated paths and closed roads not designated for inclusion into the trail and access system will be obliterated and "naturalized" by scarifying the tread, planting native vegetation and/or scattering native debris.

Control of off-trail use

Trail user education and, if necessary, law enforcement will be used to attain compliance with the stay-on-the-trail rule. Signs will be posted at obliterated paths, roads and undesignated washes, if these areas are subject to continued use after closure.

Maintenance of trails

Work on the EMRP trail system focuses on the additions and changes listed above. However, visitor use and environmental factors require that routine trail maintenance remains an

integral part of trail system management. (This includes heavy maintenance such as realigning short segments of trail.) Routine trail maintenance is scheduled on an as needed, on - going basis.

ESTRELLA MOUNTIAN REGIONAL PARK
TRAIL SYSTEM PLAN
AMENDMENT

Recommended: _____ / _____
Don Harris, Park Supervisor — Date

Recommended: Allen Ockenfels 4/23/12
Allen Ockenfels, Trails Supervisor — Date

Recommended: _____ / _____
Jack Stapley, Chair
Maricopa County
Parks & Recreation Commission — Date

Approved: R.J. Cardin / 6/30/12
RJ Cardin, Director — Date

Maricopa County
Parks and Recreation Department

ES 2-1: Connector trail from Baseline trail to #9(to be built at a later date) to accommodate the Horse Stables. Approximately .2 mi. /.3 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-2: Connector trail from Baseline trail to #9(to be built at a later date) to accommodate the Horse Stables. Approximately .25 mi. /.4 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-3: Connector trail from Baseline trail to Rainbow Valley trail. Approximately .14 mi. /.23 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-4: Connector trail from the Nature Center to Rainbow Valley trail for connectivity to the trail system. Approximately 1 mi. /1.6 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-4a: Connector trail from the ES 2-6 to Baseline trail for connectivity to the trail system. Approximately .18 mi. /.3 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-5: Centennial trail. Behind the nature center. Interpretive/ barrier free. Approximately .8 mi. /1.3 km. Use hike only.

ES 2-6: Connector trail from Coldwater trail to Rainbow Valley trail head. Approximately .34 mi. /.54 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-7: Spur trail from south west boundary of park to Pedersen trail. Pending an agreement with the land owner and access matrix. Approximately .5 mi. /.7 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-8: Extension of Pedersen trail to connect to Toothaker trail. Approximately 1.5 mi. /1.8 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-9: Mountain Trail, pending further study of the area for feasibility. Approximately 6 mi. /9.5 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-10: Connector trail from north side of Gadsden trail to south side of Gadsden trail. Approximately 1 mi. /1.3 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-11: Connector trail from Gadsden trail to Competitive Track Parking lot. Approximately 1.8 mi. /2.9 km. Use is multiuse (pedestrians, bicycles, and livestock.)

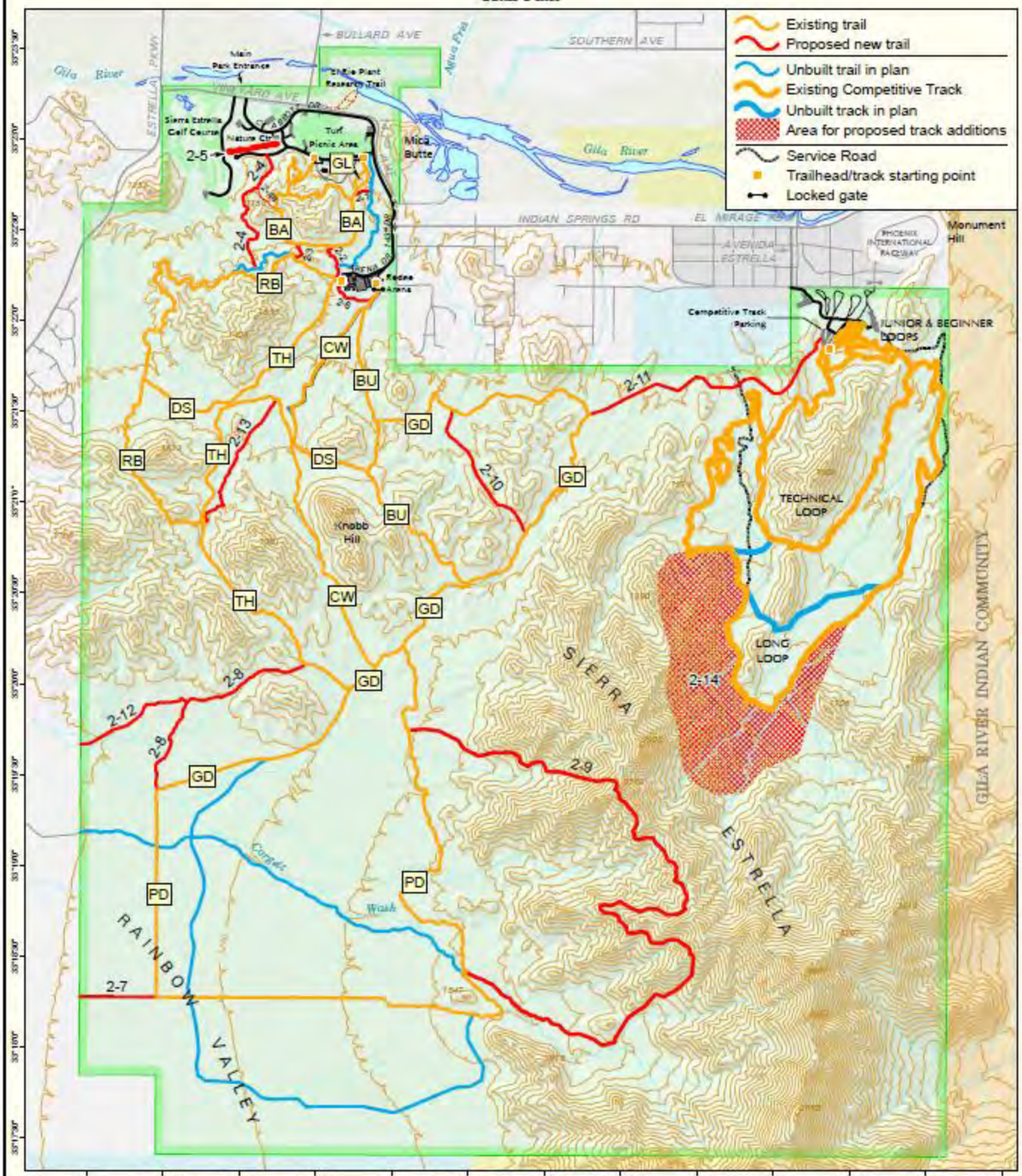
ES 2-12: Spur trail from western boundary of park (by Corgett Wash per land owner) to Pedersen trail. Pending an agreement with the land owner and access matrix. Approximately .8 mi. /1.3 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-13: Connector trail from Toothaker trail to Dysart trail. Approximately 1 mi. /1.3 km. Use is multiuse (pedestrians, bicycles, and livestock.)

ES 2-14: Addition of outer loop and interconnecting segments as needed to the competitive track, pending further study of the area for feasibility. Approximately 6 miles/9.6km.

Estrella Mountain Regional Park

Trail Plan



Maricopa County
Parks and Recreation

Appendix K – Draft Alternatives

(Insert all materials behind this cover page)

Draft Alternative A: Minimal improvement opportunities

This recommendation is responsive to public and stakeholder input that preferred minimal changes to existing park features and recommends maintaining most of the existing 1988 Master Plan with minimal amendments. Alternative A focuses on implementing the remaining 1988 Master Plan improvements opportunities not yet completed and presents a minimal number of new opportunities. The amendment(s) will include adding the wetlands project with the City of Goodyear and BOR and adding "El Rio" project components in cooperation with City of Goodyear and the Flood Control District of Maricopa County and other associated partners. The amendment(s) will include removing the convenience store, ranger station living quarters, model airplane site, shooting range, and swimming pool from further consideration or implementation.

Alternative A also recommends the continuation of previously planned Super Playground updates, screening and shading the pump station, and routine maintenance throughout the park. Additionally, this alternative encourages continued collaboration with its Friends group and park volunteers and exploring other feasible partnerships.

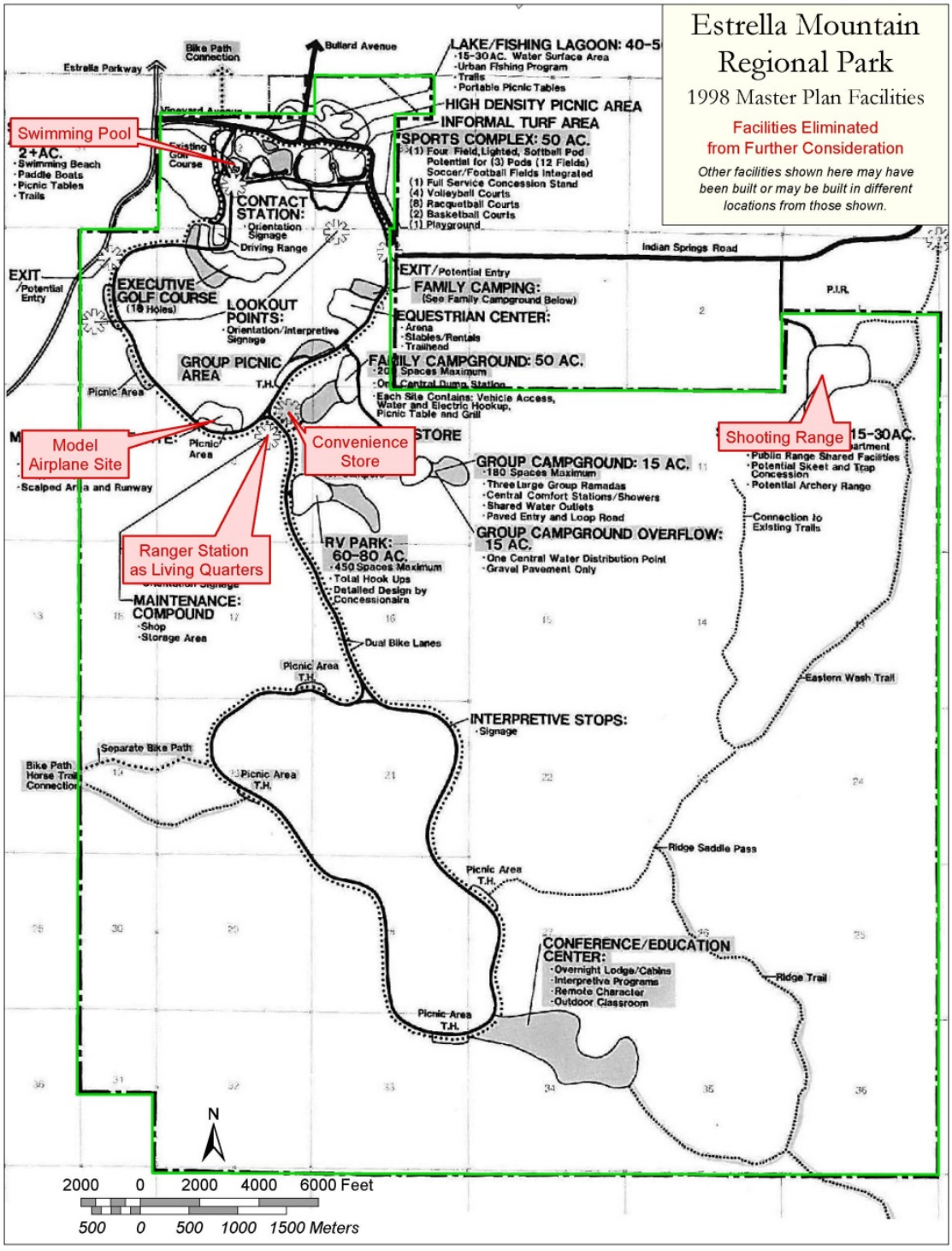


Figure 7-1: Draft Alternative A, facilities eliminated from further consideration

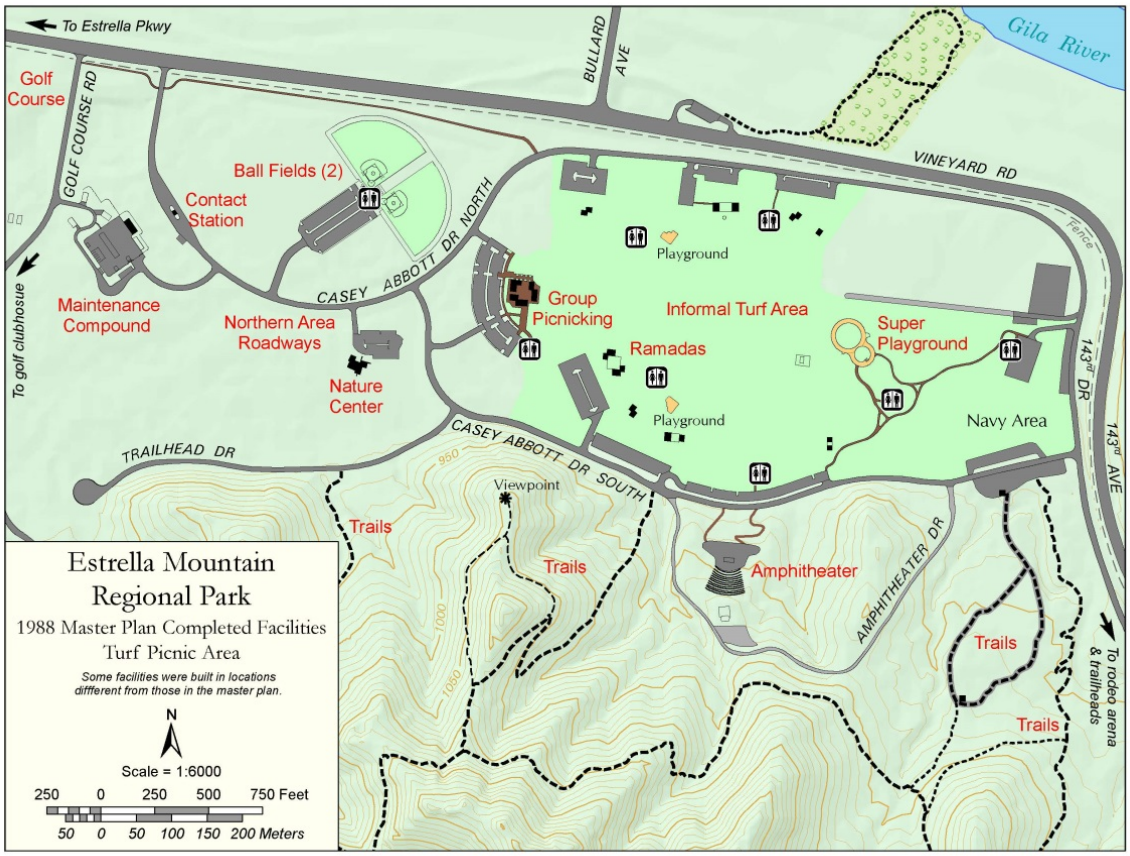


Figure 7-2: Draft Alternative A, facilities completed from 1988 master plan

Table 7-2: Draft Alternative A				
ID#	***Location***	***Description***	***Priority***	***Acres of new ground disturbance (Approx)***
A1		1988 Master Plan includes: *Completed:* • Northern area roadways • Ball fields (2) • Ramadas, group picnicking (some, different locations) • Maintenance compound (different location) • Nature Center (different location) • Amphitheater (different location) • Golf course • Equestrian center • Contact station • Informal turf area • Trails (some) • Land acquisition (some) *Not Yet Completed:* • Lake/Fishing lagoon • Sports complex		

		• Executive golf course • Additional entry/exit (2) • Family campground • Group campground (and overflow area) • RV park • Botanical display • Conference / education center / overnight lodge • Interior roadways with picnic/scenic stops • Trails (some) • Land acquisition (some) *Eliminated from further consideration:* • Convenience store • Ranger station as living quarters • Model airplane site • Shooting range • Swimming pool		
		Develop New Facilities		
A2	North park and Golf Course	Brine wetlands: 30-40 acres as designated via Parks/Goodyear/BOR partnership. May include a 3-5 acre blending pond at east turf area. May include service roads and berms. Additional public meetings or input may be required.	High	*n/a*
A3	Gila River corridor	As a cooperative effort with Flood Control District of Maricopa County, City of Goodyear, City of Avondale, and others, to implement the El Rio Watercourse Master Plan and related documents or projects for riverbed restoration and recreation elements. Additional public meetings or input may be required on a project by project basis.	High	*n/a*
		Maintain/Rehabilitate Existing Facilities		
A4	Super Playground	Continue with planned improvements and equipment upgrades.	High	*n/a*
A5	Park-wide	Annual/routine maintenance	High	*n/a*
A6	Restrooms	Renovate existing restrooms and/or construct new restrooms. Demolish crumbling restrooms (#1 and #6) and replace with new or expanded restrooms in an area with greater need (area of greater need is TBD pending other improvements).	High	*n/a*
A7	Near Super Playground	Shade from sun damage and screen pumping station area from visitors view.	Medium	*n/a*
		Administrative		
A8	Park-wide	The park shall continue to engage with and build upon past success with Citizens for Estrella Mountain Park. The park should also seek out their assistance for minor park improvements, educational events, and park advocacy when appropriate.	High	*n/a*
A9	Park-wide	Develop and improve relationships with volunteer base for trail maintenance and other park projects.	High	*n/a*

7.2.2 Draft Alternative B: Maximum improvement opportunities

Alternative B begins with acknowledging the park's existing facilities and recommends distinctive improvements and effectively eliminates the remainder of the 1988 Master Plan recommendations.

One key focus of this alternative is development of approximately 55 acres of multi-purpose fields/open space area east of the park entrance that will be partner-operated by Estrella Youth Sports (EYS) and open for public use when not reserved for EYS member teams. This alternative is responsive to public and stakeholder input to provide an open grass area; will increase a community need for youth sports fields; and will create a destination point for park visitors. Revenue derived from field reservations will provide a new funding source that will allow the park to complete other facility upgrades, program enhancements, and resource protection efforts described herein.

Alternative B also recommends that the park divest itself of the rodeo arena infrastructure and repurpose the area with another recreational activity (most likely RV camping) that provides self-sustaining revenue that is acceptable under R&PP requirements. Care shall be taken to incorporate horse rental concessionaire needs and facilities into any redevelopment of this area.

Additional recommendations include: additional upgrades at the Super Playground; utility upgrades; a new amphitheater and entry signage; and various trail and trailhead improvements. No parking signs on the Vineyard Avenue and the Vineyard Avenue curve will be recommended to MCDOT and/or City of Goodyear for installation.

This option also focuses on resource protection measures such as returning as much former turf grass not in use for sports fields or near ramadas back to native vegetation to the extent possible. A tree replacement program; additional wildlife studies; and lightscape management are also components of this alternative.

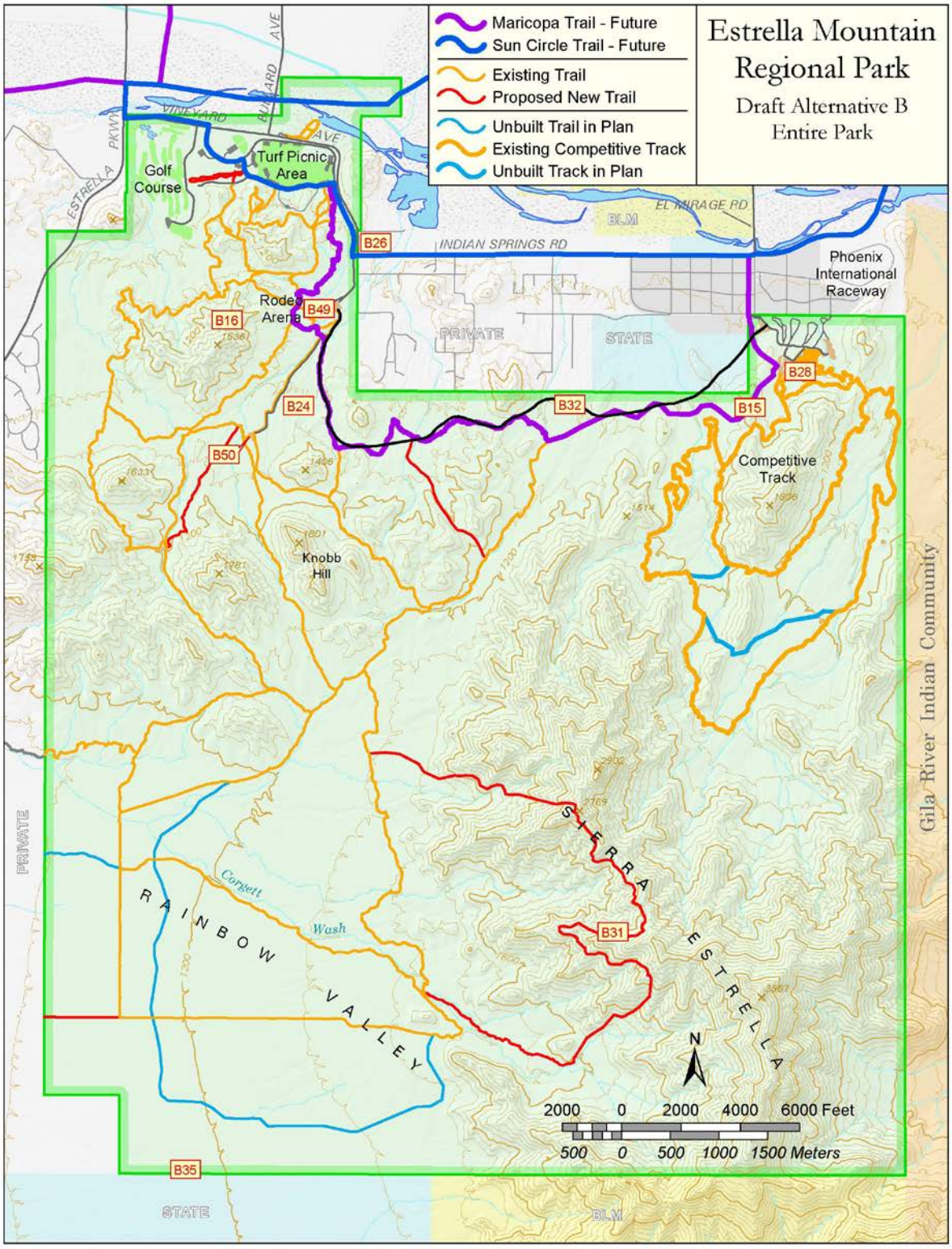


Figure 7-3: Draft Alternative B (entire park)

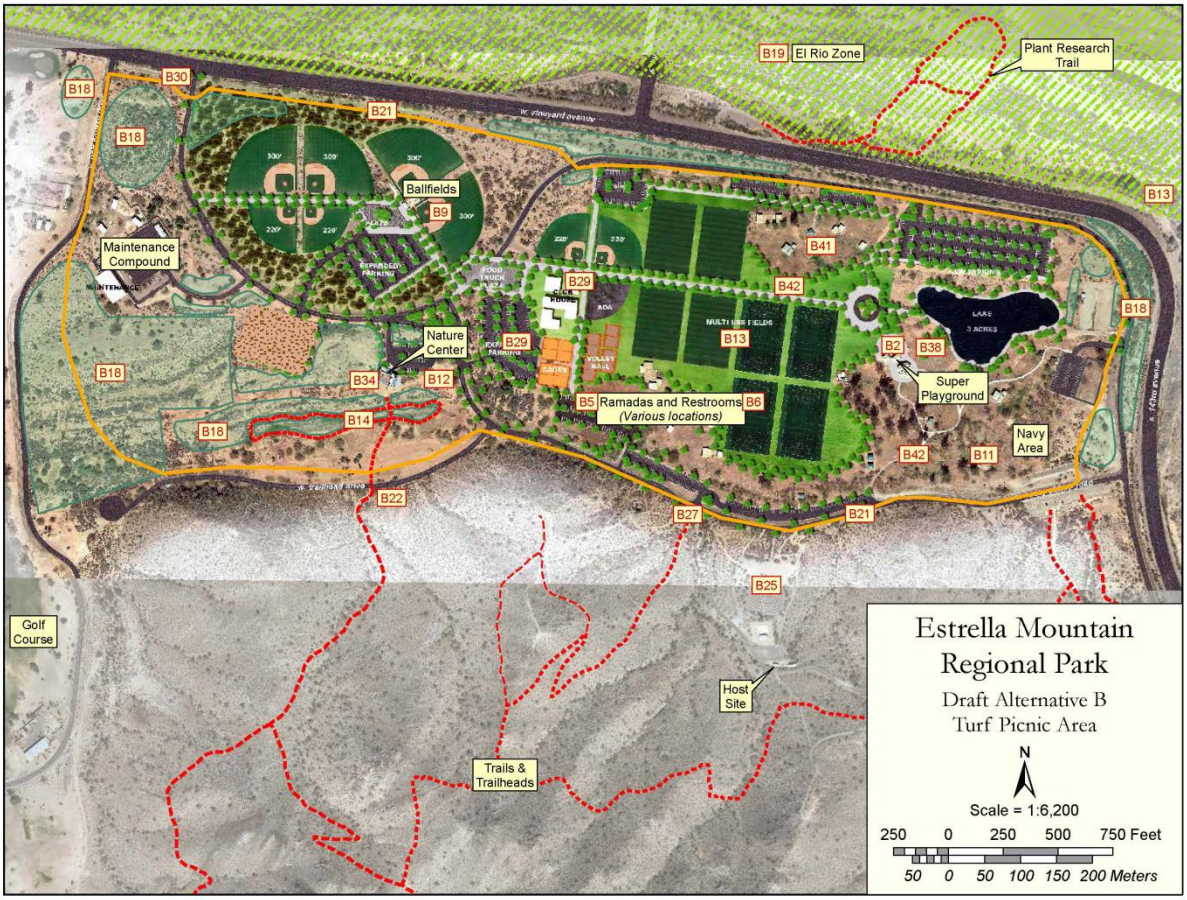


Figure 7-4: Draft Alternative B (north area close-up)

***Table 7-3: Draft Alternative* B**				
ID#	***Location***	***Description***	***Priority***	***Acres of new ground disturbance (Approx)***
B1		Existing park features including: Nature Center Maintenance Compound Host Sites Super Playground Ramadas Restrooms Trails / Trailheads Horse rental area Comp Track Golf course Navy Area Ball fields		
		Maintain/Rehabilitate Existing Facilities		
B2	Super Playground	Continue with planned improvements and equipment upgrades. Install interpretive signage.	High	*n/a*

B3	Gila River corridor	Install “no parking” signage at curve in road and roadsides. (Legal parking is located at Plant Research Trail parking lot.)	High	*n/a*
B4	Park-wide	Domestic water main replacement to stabilize water distribution.	High	*n/a*
B5	Ramadas	Renovate existing or develop new ramadas to include updated electrical and water.	High	*n/a*
B6	Restrooms	Renovate existing restrooms and/or construct new restrooms. Demolish crumbling restrooms (#1 and #6) and replace with new or expanded restrooms in an area with greater need (area of greater need is TBD pending other improvements).	High	*n/a*
B7	Park-wide	Explore costs and feasibility of sewer hookup to City of Goodyear and/or expanding and replacing existing septic systems.	High	*n/a*
B8	Roads	Existing roads: Maintenance is on a routine schedule and should be coordinated with other park upgrades to minimize impacts to park visitors. MCDOT repairs the major roads within the park.	High	*n/a*
B9	Ball Fields	Renovate existing ballfields: includes improvements to turf, restroom, fencing, lighting, existing parking. (Phase 1 of EYS plan)	Medium	*n/a*
B10	Near Super Playground	Screen pumping station area from visitors view. This will also protect the machinery from sun damage.	Medium	*n/a*
B11	Navy Areas	Realign approximately 4 acres of picnic area to include both ramadas and open picnic tables. Use desert landscaping and pathways/roads to define area. Replace worn or broken grills and fire pits. Day uses only; no overnight use.	Medium	*n/a*
		Develop New Facilities		
B12	Near Nature Center	New amphitheater constructed near nature center (approximately 75x75 square feet). To include a trail or pathway from nature center to site; distance of this trail/pathway may vary depending on final location of amphitheater.	Medium	*n/a*
B13	Turf area	Install up to 8 multipurpose sports fields/open space; final number dependent on market demand and needs assessment. (Phase 2 of EYS plan)	Medium	*n/a*
B14	Trails	Centennial Trail – install trail just behind Nature Center; to feature barrier-free and pedestrian only access; may include public art, interpretive panels, or other trail amenities.	Medium	*n/a*
B15	Trails	Install a Maricopa Trail connection near the existing Competitive Track. This trail will be built in cooperation with the Maricopa Trail and MCPRD trails crew.	Medium	*tbd*
B16	Trails	Provide a peak view trail: A trail that spurs off of the Rainbow/Toothaker/Dysart trails will provide a peak view and be located within a distance that most hikers can travel in a couple hours round-trip and remain close to existing facilities.	Medium	*tbd*
B17	Trails	Design, build, and incorporate more challenging trails for both mountain bikers and hikers alike (akin to National and Mormon Trails at South Mountain). *May require Trail Maintenance Manual update prior to instigating design and/or implementation as well as following the trail planning process for new trail development.*	Medium	*tbd*

B18	North park and golf course	Brine wetlands: 30-40 acres as designated via Parks/Goodyear/BOR partnership. May include a 3-5 acre blending pond at east turf area. May include service roads and berms. Additional public meetings or input may be required.	Medium	*n/a*
B19	Gila River corridor	As a cooperative effort with Flood Control District of Maricopa County, City of Goodyear, City of Avondale, and others, to implement the El Rio Watercourse Master Plan and related documents or projects for riverbed restoration and recreation elements. Additional public meetings or input may be required on a project by project basis.	Medium	*tbd*
B20	Roads	New roads and upgrades: Future road improvements may include: expand entrance lane widths; bicycle lane installation; improving dips; etc., scenic loop/pullouts; loops to ramadas, picnic areas, or campgrounds; road to competitive track. Additionally, recommendations from the MCDOT park roadway evaluation (Sept. 2015) regarding the Estrella Parkway and Vineyard Ave intersection will be forwarded to the City of Goodyear for their consideration.	Medium	*tbd*
B21	Trails	Design a looped trail around main, northern area of park; repurpose remnants of old perimeter road to the extent possible with the final alignment to be compatible with the proposed wetlands and sports field layouts.	Medium	*tbd*
B22	Quail Trailhead	Develop trailhead: kiosk map and trail information and educational materials; designated path from nature center, public art, defined parking and crosswalk, trim/landscape vegetation. Define the overlook with kiosk or educational materials and seating. Rename trail to reflect overlook destination.	Medium	0.004
B23	Trails	Install additional signage at trailheads, trail mileage signs, and interpretive signs along trails.	Medium	*n/a*
B24	Primitive Camping Area	A basic, walk-in style camping area. To include defined individual tent pads, grill or fire ring, and a restroom if feasible. The precise location will be determined based on a future engineering analysis and access considerations.	Medium	0.05 (approx. per site)
B25	Amphitheater	Install small, modest cabins at the approximately 5.1 acre site that currently serves as an amphitheater. May include pre-fabricated cabins that provide kitchenette and HVAC. A centralized restroom/shower area may be provided.	Medium	n/a
B26	Access	Secondary entrance point with entry station near existing gate(s) on 143rd Ave. This entrance is associated with campground development or as a relief entrance/exit point to sports field use.	Medium	0.15+
B27	Baseline Trailhead	Develop trailhead, may include: kiosk map and educational materials; public art, trim/landscape vegetation. Consider relocating trailhead (dependent on EYS level of activity) or define parking and crosswalk for trailhead access.	Medium	0.2+
B28	Comp. Track	Upgraded staging area - features may include: technical trail (already in trails plan as comp track expansion), pump track, Maricopa Trail connection, restroom, water, shade, improved entry and kiosk signage. *Note that the consideration of trail reroutes out of sandy wash areas are implemented via the*	Medium	*n/a*

		trails plan process.		
B29	Turf Area	Multipurpose and ballfield expansion and support facilities (to include clubhouse, batting cages, sand volleyball, ADA ballfield, parking etc.). (Phases 2 through 5 of EYS plan.)	Medium	*n/a*
B30	Main Entrance	Create a highly visible park entrance monument.	Medium	0.0014
B31	Trails	Included in 2012 Trails Plan and reiterated by Master Plan Update: backcountry trail at elevation (consult with AZGFD to determine trail alignment).	Low	*tbd*
B32	Trails/ Roads	Included in 2012 Trails Plan and reiterated by this Master Plan Update, provide a connector trail to competitive track. If the need arises, this may be upgraded to an improved road instead of a trail; improved roadways require MCDOT consultation and assistance. (This trail or road may facilitate "B24" by opening certain areas to primitive or basic tent camping.)	Low	*tbd*
B33	Equestrian camping site(s)	Corral or site(s) with space to assemble own corral: Campers who bring horses with them require a corral or corral space to allow horses untethered resting and overnight sleeping space. The park will identify and provide adequate space (16x16 square foot or 0.0118 acre minimum) adjacent to one or two campsites for a camper to assemble their own corral; based on demand, this may include constructing a permanent corral at the same camp site(s) sized 16x16 square foot minimum. This will provide an additional recreational opportunity to those who prefer to camp with horses.	Low	*n/a*
B34	Near Nature Center	Install an approximately 0.021 acre Monarch waystation butterfly garden near nature center. Collaborate with knowledgeable entities regarding plant varieties and garden layout.	Low	*n/a*
B35	Access	Formal entrance at south park boundary to coincide with City of Goodyear's planned arterial roadways. To include entry station, trail connections, ramada area, or other desired amenities.	Low	*tbd*
B36	Access	Additional access points desired by City of Goodyear or other entities will follow the process of the access matrix protocol for final determination and placement. The access matrix protocol may require additional public meetings.	Low	*tbd*
B37	*TBD*	Rope-course adventure area or zipline.	Low	*tbd*
B38	Super Playground	Splash pad. Improved parking.	Low	*tbd*
		Resource Protection		
B39	Park-wide	Mixed-use conflict (*requires study*): Research is needed to determine the level of each type of use, the expectations for that use type, ways the park may lessen potential conflicts in order to improve the visitor's experiences, and impacts of use. These studies may be performed by MCPRD staff or with the assistance of an educational institution or other knowledgeable entities. Research methods may include visitor survey, field monitoring, literature review, aerial photography comparison,	High	*n/a*

		or other methods.		
B40	Park-wide	Capacity - social, physical, environmental (*requires study*): As the most popular places in the park, these areas play host to hikers, bikers, picnickers, and others; differing activities may expect different experiences which may be in conflict with other uses. Likewise, a study is needed to determine how much use or how many people a given area can handle before the experience is degraded or the environment is degraded.	High	*n/a*
B41	Turf Area	Replace remaining turf areas with native desert vegetation, where appropriate.	High	*n/a*
B42	Developed Areas	Create and implement a tree replacement plan and program. Use flood irrigation for trees to the extent possible.	High	*n/a*
B43	Park-wide	Develop a Lightscape Management Plan that will outline the park's commitment to dark skies conservation and its lightscape management practices. The park will develop this plan using "International Dark-Sky Association, Dark Sky Park Program Criteria" as its guideline.	High	*n/a*
B44	Park-wide	Develop a plan for conducting a species inventory/census with the advice and guidance of AZGFD or other knowledgeable entities. Once survey work is complete, this knowledge will assist the park in managing its biodiversity.	High	*n/a*
B45	Park-wide	Protect and/or restore park natural and cultural resources via surveys, inventories, or studies from qualified institutions per Department standards.	High	*n/a*
		Education/Interpretation		
B46	Park-wide	Encourage educational components related to water resources, habitat or other natural systems, and cultural and historic resources into park programs, interpretive signage, or other displays.	High	*n/a*
		Administrative		
B47	Park-wide	Develop and improve relationships with Volunteer base for trail maintenance and other park projects.	High	*n/a*
B48	Park-wide	The park shall continue to engage with and build upon past success with Citizens for Estrella Mountain Park. The park should also seek out their assistance for minor park improvements, educational events, and park advocacy when appropriate.	High	*n/a*
B49	Rodeo Arena	The park will divest itself of the rodeo arena and repurpose the area with another recreational activity that provides self-sustaining revenue. Care shall be taken to incorporate horse rental concessionaire needs and facilities into any redevelopment of this area. This area will most likely include RV camping (approx. 12.5 acres) and provide horse rentals and an equestrian staging area at western-most portion of area (approx. 2.5 acres). Trailhead access near eastern-most portion of area near existing ramada (approx. 0.5 acres). The existing building with restroom will be retained and/or remodeled to the extent feasible. A green space with landscaping and picnic tables will be used a buffer between equestrian area and RV camping	Medium	*n/a*

		area. Entrance from the Indian Springs Road access point.		
B50	Coldwater	Partnered with "B49" above, establish this clearing as a trailhead with restroom if feasible. To enter discussions with MCDOT to improve road access; to also offer roadside pullouts for picnicking and/or tent camping.	Medium	*n/a*
B51	Park-wide	The park shall continue to engage with the Cities of Avondale and Goodyear, Arizona Game and Fish Department (as well as with other appropriate agencies) to develop potential partnerships. As adjacent land use designations change, it's critical to form these partnerships early.	Low	*n/a*
B52	Trails	Install air pump stations for bikes at key trailhead locations	Low	*n/a*

Maricopa County
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