

TRAFFIC STATEMENT

Bella Vista Storage

Southeast Corner of Skyline Drive and Sierra Vista Drive
San Tan Valley, Arizona

PREPARED FOR
Civil & Environmental Consultants, Inc.
11811 North Tatum Boulevard, Suite 3057
Phoenix, Arizona 85028

PREPARED BY



APPROVED BY:

PINAL COUNTY ENGINEER
PINAL COUNTY DEPARTMENT OF PUBLIC WORKS

DATE

County Case Number: S-XXX-21

TRAFFIC STATEMENT

Bella Vista Storage

Southeast Corner of Skyline Drive and Sierra Vista Drive
San Tan Valley, Arizona

November 8, 2021

UCG Project Number: TR21130

PREPARED FOR

Civil & Environmental Consultants, Inc.
11811 North Tatum Boulevard, Suite 3057
Phoenix, Arizona 85028

PREPARED BY



United Civil Group

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Phoenix, Arizona 85007
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CONDUCTED BY

Sarah Simpson, PhD, PE
President

INTRODUCTION

United Civil Group was retained by Civil & Environmental Consultants, Inc. to perform this Traffic Statement (TS) for the proposed Bella Vista Storage located on Skyline Drive east of Sierra Vista Drive in San Tan Valley, Arizona. The site is planned as a total of 245 storage units and will be developed in one phase by 2023.

One access is proposed for the site and will provide ingress and egress to Skyline Drive. This access is proposed as full turning movements and will align with Sierra Vista Drive to the north.

This TS has been performed per the Pinal County Traffic Impact Assessment Guidelines and Procedures dated January 2007, locally accepted standards, and industry practice. The purpose of this TS is to forecast the trip generation of the proposed Bella Vista Storage, evaluate potential impacts the proposed development has on the surrounding roadway network, and evaluate the proposed site access driveway of the development.

SITE DESCRIPTION

The proposed Bella Vista Storage is planned for a 3.6-acre parcel of land located on the southeast corner of Skyline Drive and Sierra Vista Drive in Pinal County, Arizona. To the north of the site is Skyline Drive followed by vacant land and single-family residential homes; to the south is farmland and an RV Park; to the east is the RV Park; to the west is Sierra Vista Drive followed by farmland. A vicinity map showing the aerial view and site plan are attached and shown in **Figures 1 and 2.**

ROADWAY CONDITIONS

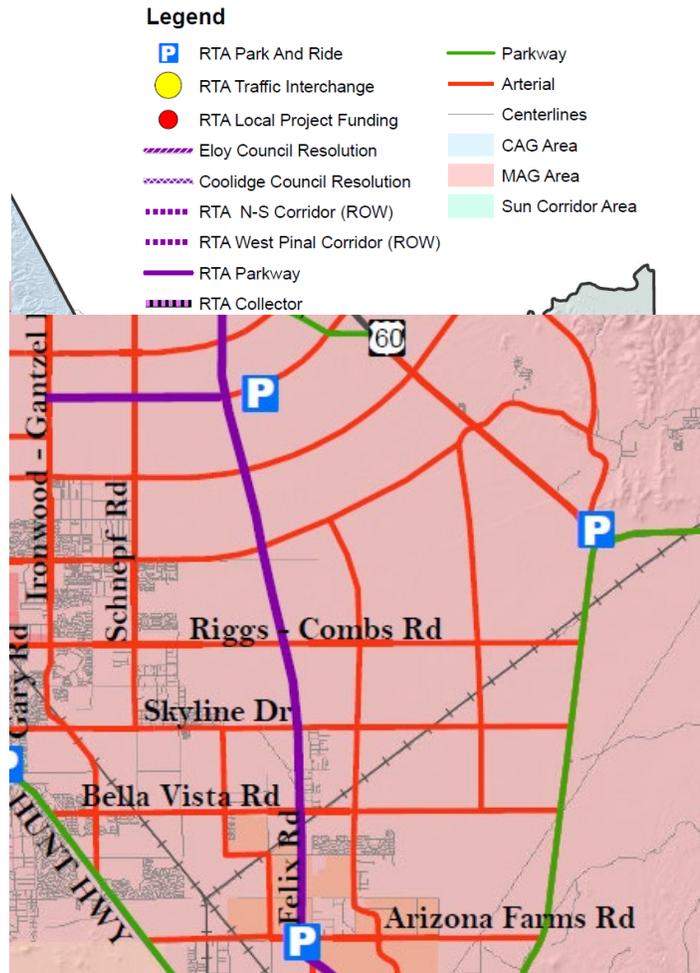
Skyline Drive, located on the 2-mile section, is classified as an east-west major arterial in the Regionally Significant Routes Report for Safety and Mobility 2017 Update. Adjacent to the subject site, Skyline Drive is constructed as a two-lane section with one lane in the westbound direction and one lane in the eastbound direction. The posted speed limit on Skyline Drive is 50 mph. According to ADOT’s HPMS website, the annual average daily traffic (AADT) on Skyline Drive is 2,350 vehicles collected in 2020. The AADTs are shown for Schnepf Road and Quail Run Lane in the figure below.

In the future, Skyline Drive is proposed to be constructed as a six-lane section with three lanes in each direction separated by a raised median. Skyline Drive will function as a major arterial roadway and will have the ability to carry a capacity of approximately 65,000 vehicles per day. Because Skyline Drive is shown to have development considerations along its frontage, per the Regionally Significant Routes Report, this roadway is shown as a medium priority roadway. As such, 75 feet of right of way should be reserved on Skyline Drive measured from centerline to right of way line.

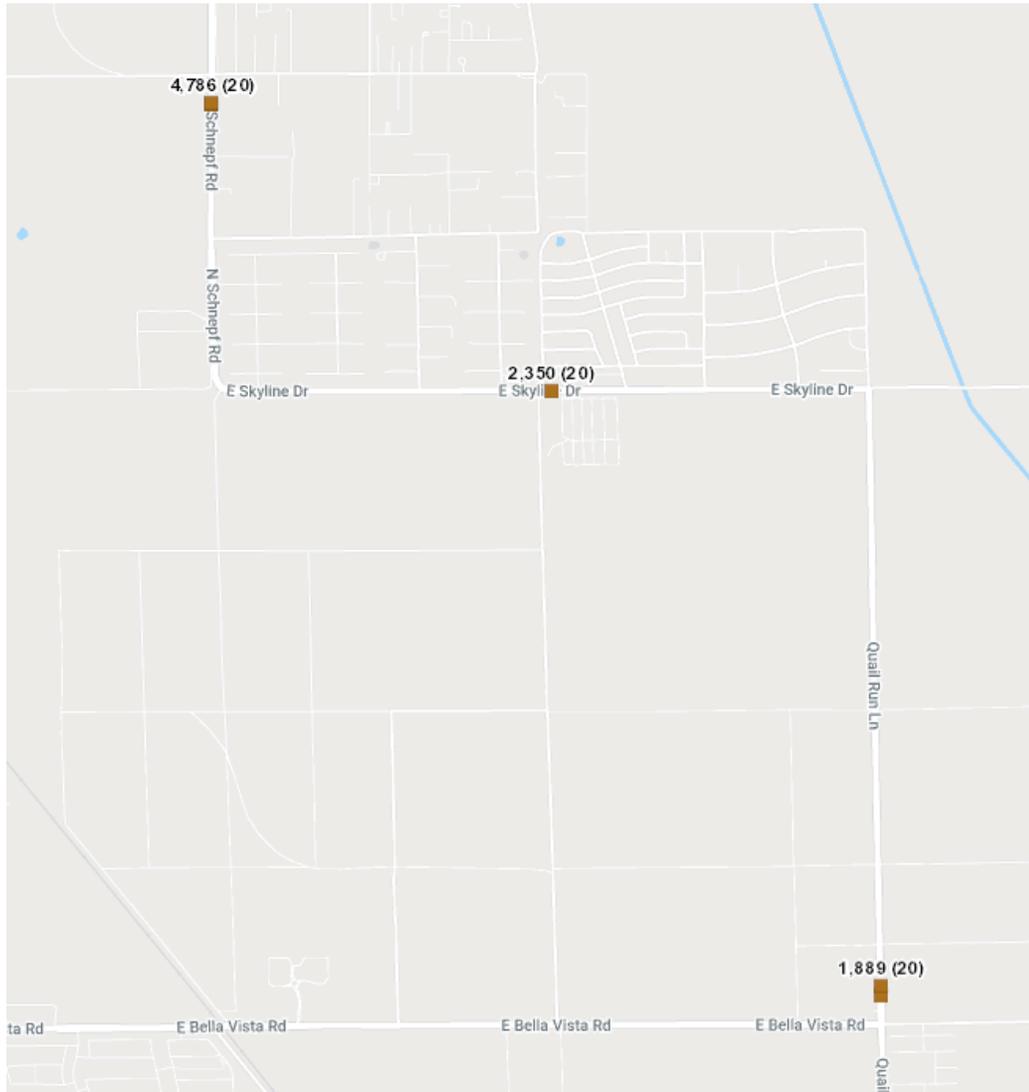
Sierra Vista Drive, located on the mile section, is classified as a north-south minor arterial per the Pinal County Subdivision and Infrastructure Design Manual. Adjacent to the subject site, Sierra Vista Drive is unpaved as a two-lane section with one lane in the northbound direction and one lane in the southbound direction. North of Skyline Drive, Sierra Vista Drive acts as a collector roadway and terminates at Rolling Ridge Road.

*Regionally Significant Routes
 for Safety & Mobility - 2017 UPDATE*

PINAL REGION



In the future, Sierra Vista Drive is proposed to be constructed as a four-lane section with two lanes north- and southbound separated by a two way left turn lane. Sierra Vista Drive will function as a minor arterial and will have the ability to carry a capacity of approximately 40,000 vehicles per day. As such, 55 feet of right of way should be reserved on Sierra Vista Drive measured from centerline to right of way line.



The intersection of **Skyline Drive/Sierra Vista Drive** is offset by approximately 80 feet. The intersection is controlled a stop condition on the north and south legs of the intersection. Each approach to the intersection consists of a left through right lane.

SITE GENERATED TRAFFIC

Estimates of the traffic volumes that will be generated by the proposed Bella Vista Storage were determined from transportation planning data taken from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition, 2021*. Per ITE Trip Generation the following land use was chosen for this development:

Mini-Warehouse (LUC 151) - A mini-warehouse is a building in which a number of storage units or vaults are rented for the storage of goods. They are typically referred to as “self-storage” facilities. Each unit is physically separated from other units, and access is usually provided through an overhead door or other common access point.

Mini-Warehouse – ITE LUC 151

| | | |
|--------------|-------------------------|---------------------------|
| Daily | T = 19.19 x (100 units) | 50% entering, 50% exiting |
| AM Peak Hour | T = 1.34 x (100 units) | 56% entering, 44% exiting |
| PM Peak Hour | T = 1.54 x (100 units) | 50% entering, 50% exiting |

Table 1 presents the estimated trip generation for the Bella Vista Storage at full buildout

TABLE 1: TRIP GENERATION

| Land Use | Units | Size | Daily | AM Peak | | | PM Peak | | |
|----------------|-----------|------|-------|---------|----|-----|---------|----|-----|
| | | | | total | in | out | total | in | out |
| Mini-warehouse | 100 Units | 2.45 | 47 | 3 | 2 | 1 | 4 | 2 | 2 |

The storage facility is forecasted to generate 47 daily trips with 3 trips occurring in the morning peak hour and 4 trip occurring in the evening peak hour, per the ITE *Trip Generation Manual*.

DRIVEWAYS

As depicted in the site plan, one access is planned for the site on Skyline Drive. The access should align with Sierra Vista Drive to the north and is approximately 80 feet east of Sierra Vista Drive south of Skyline Drive. In the existing conditions, the access should provide full access into and out of the site. However, in the future when Skyline Drive is widened to its ultimate configuration, a raised median is proposed within its cross section that will limit the driveway to right in/right out only.

ACCESSIBILITY

When Bella Vista Storage opens, the volumes on Skyline Drive are low and will allow vehicles to adequately make left and right turning movements from the site. However, as the surrounding area grows and develops, it is anticipated that Skyline Drive will be widened in front of the site to its ultimate configuration.

Per the Pinal County Access Management Manual, Table 1, corner clearance and the driveway spacing should be 360 feet on major arterial roadways, measured intersection centerline to intersection centerline. Based on the location of the access, this criterion for Pinal County's driveway spacing is not met.

However, due to the use of the facility (low trip generator) and the available frontage of 260 feet on Skyline Drive plus the location of the existing drive into the adjoining property on the eastern boundary of the site, the driveway location in alignment with Sierra Vista Drive to the north will accommodate the site.

Figure 3 shows the spacing between driveways and

SIGHT TRIANGLES

Sight triangles shall be maintained or provided at all driveways to give drivers exiting and entering a clear view of conflicting traffic. The landscape and hardscape within the sight triangles must not obstruct the driver's view. The site designers shall follow most current edition of the American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets and the Pinal County TIA Guidelines.

The sight triangles shall be included on the developer's paving plans at the site driveway.

ROADWAY IMPROVEMENTS

For Skyline Drive, classified as a major arterial, 75 feet of right of way should be reserved for future use.

For Sierra Vista Drive, classified as a minor arterial, 55 feet of right of way should be reserved for future use.

CONCLUSIONS

The proposed Bella Vista Storage, located on Skyline Drive east of Sierra Vista Drive is forecasted to generate 47 daily trips with 3 trips occurring in the morning peak hour and 4 trips occurring in the evening peak hour at site buildout.

One access is proposed for the site and will provide full ingress and egress to Skyline Drive. Because Skyline Drive is a major arterial roadway, in the future, the driveway could be limited to right in/right out due to the installation of a raised median.

Proper intersection sight distance and sight triangles shall be provided and maintained at the site accesses of the proposed development. To ensure adequate sight distances and sight distance triangles, AASHTO's *A Policy on Geometric*

Design of Highways and Streets 7th Edition and the Pinal County TIA Guidelines should be followed when designing the accesses and landscaping.

This TS is based on a variety of assumptions related to the site plan and land use of the proposed development. If a larger building or alternate land use is ultimately proposed, these trip generation calculations and criteria evaluation may not remain valid.

Based on the findings within this TS, when fully constructed, Bella Vista Storage is not anticipated to negatively affect traffic conditions within the vicinity of the site.

LIMITATIONS

Our professional services have been performed using that degree of skill ordinarily exercised, under similar circumstances, by reputable transportation engineering firms practicing in this locality. No other warranty, expressed or implied, is made.

The contents of this report are intended for the sole use of the addressee and his/her designees. In completing this report, data was obtained from a variety of sources which were assumed reliable and accurate (i.e., City, County, State and Federal sources). Should deviations from this report be noted, this firm shall be contacted for review of the area of concern.

A reasonable attempt was made to acquire recent traffic impact studies, traffic projections and/or data that may be helpful in more accurately projecting traffic volumes. United Civil Group is not responsible for incorporating data made available after this document has been finalized.

This report is issued with the understanding that it is the responsibility of the owner to see that its findings are carried out or brought to the attention of those concerned. If any changes to the proposed project are made, the findings of this report shall be subject to review and may require modification or addendum.



Permission for commercial use granted by Google Earth

Figure 1: Vicinity Map & Aerial View



| CLIMATE CONTROLLED | | |
|---------------------------------|-------|-------------|
| 99,600 S.F. TOTAL BUILDING AREA | | |
| 74,700 S.F. LEASABLE AREA | | |
| LINE SIZE | COUNT | S.F. |
| 5X5 | - | - |
| 5X10 | - | - |
| 10X5 | - | - |
| 10X10 | - | - |
| 10X15 | - | - |
| 10X20 | - | - |
| 10X25 | - | - |
| 10X30 | - | - |
| SUB-TOTAL | - | 67,500 |
| NON-CLIMATE CONTROLLED | | |
| 10X30 D.U. | 24 | 7,200 S.F. |
| SUB-TOTAL | 24 | 7,200 S.F. |
| TOTAL | - | 74,700 S.F. |

| DRIVE UP UNIT MATRIX | | |
|----------------------|-------|-------------|
| LINE SIZE | COUNT | S.F. |
| 10X30 | 102 | 30,600 S.F. |
| 10X25 | 41 | 15,250 S.F. |
| 10X20 | 58 | 11,400 S.F. |
| TOTAL | 221 | 57,450 S.F. |

Figure 2: Site Plan

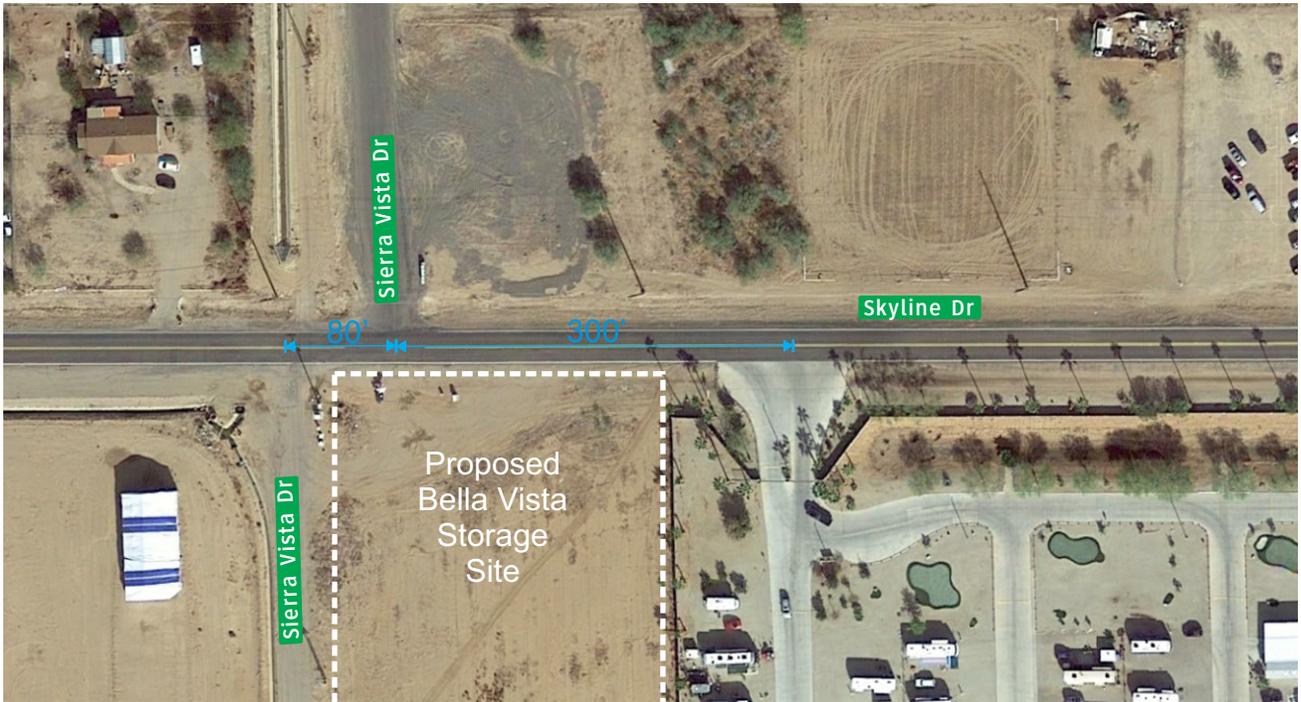


Figure 3: Driveway Spacing

PRELIMINARY DRAINAGE REPORT

BELLA VISTA STORAGE

SEC of E. Skyline Drive & Sierra Vista Drive
San Tan Valley, Arizona

Prepared For:

SPS+ ARCHITECTS

8681 E. Via De Negocio
Scottsdale, AZ 85258

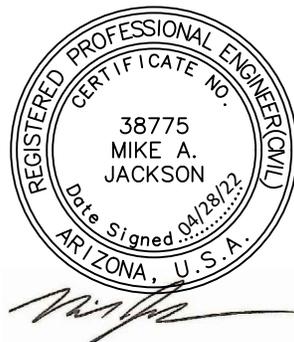
Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

Phoenix, AZ

CEC Project 316-191

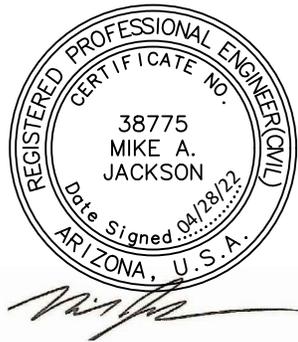
APRIL 2022



Civil & Environmental Consultants, Inc.

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APPENDICES

Appendix A – FEMA Firm Map

Appendix B – Existing & Proposed Drainage Area Maps

Appendix C – Hydrology Calculations

Appendix D – Preliminary Grading and Drainage Plans

1.0 INTRODUCTION

The purpose of this Preliminary Drainage Report is to provide the drainage analysis for the proposed Bella Vista Storage located at the southeast corner of E. Skyline Drive & Sierra Vista Drive. The site is further described as:

- A portion of the northeast quarter of Section 11, Township 3 South, Range 8 East of the Gila and Salt River Meridian, Pinal County, Arizona.
- Assessor's parcel Number: 210-110-0030

Refer to the Vicinity Map on the following page.

The proposed project will be constructed on a vacant parcel of approximately 149,374 sf (3.43 ac) designated as C1. The development will consist of an RV storage center with designated parking area and drainage facilities for the conveyance of onsite and offsite flows. Ingress and egress will be provided by the proposed drive off Skyline Drive.

This preliminary drainage report will provide discussions and calculations defining the onsite and offsite storm water management concepts to comply with the drainage requirements established by Pinal County. The preparation of this report has been done in accordance with Pinal County Drainage Manual Volumes I and II, Design Criteria and Design Methodology and Procedures.

2.0 PROJECT BACKGROUND

2.1 EXISTING CONDITIONS

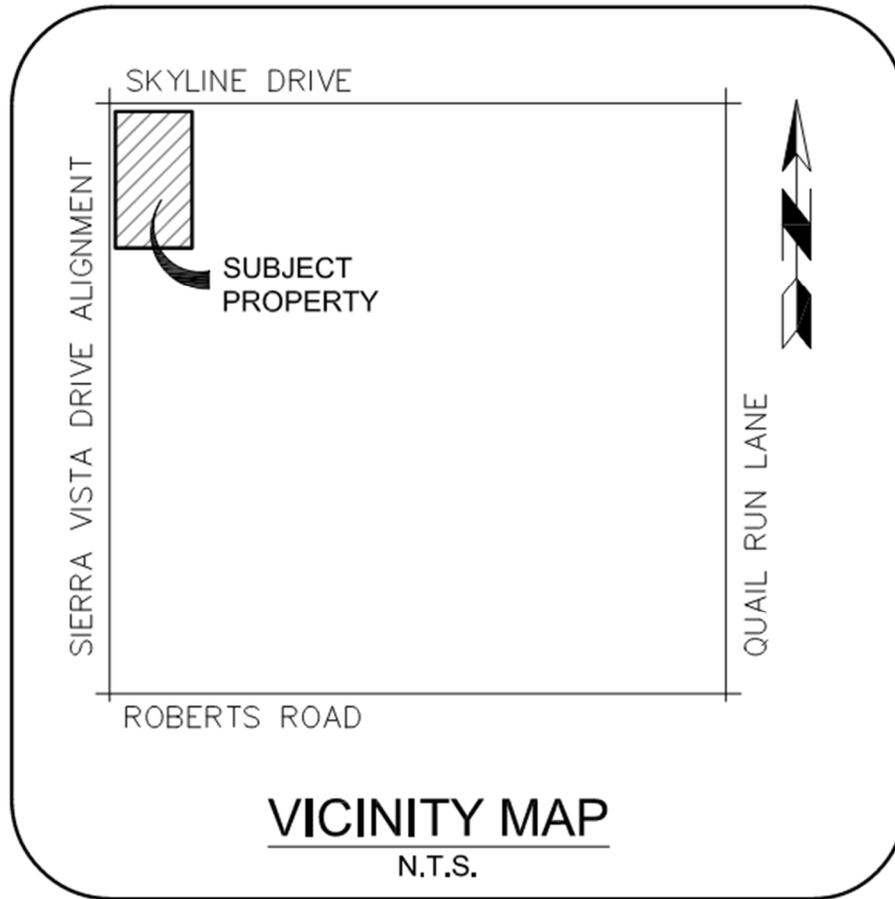
The existing site is mostly undeveloped and relatively flat with average slopes of 0.3%. The site currently drains northeast to southwest to the ultimate outfall located at the southwest corner of the site at an elevation of 1540.90. The site is currently undeveloped and does not contain any drainage infrastructure. There currently is no curb and gutter along adjacent roads; as a result, offsite runoff from the Skyline Dr. R.O.W. could affect the site from the north. Flows along the south side of Skyline Dr. do appear to divert south along the property east of the subject property. The flows conveyed to the project frontage appear to be generated from the half street along the frontage and the property frontage to the east. The site is not affected by any other offsite flows. The adjacent parcels to the east and south have site walls that maintain offsite runoff from respective parcels, 210-11-002A (East) and 210-11-005C (South), from entering the site.

Refer to the Existing Conditions Drainage Area Map in **Appendix B**.

2.1.1 FEMA Map

The subject property is located within the Flood Insurance Rate Map (FIRM) #04021C0475E, dated December 4, 2007, designated as an "X" flood zone. This area is defined as "Areas of 0.2% annual chance floodplain."

Refer to the **Appendix A** for a copy of the FIRMette map for this area.



3.0 PROPOSED CONDITIONS

3.1 STORMWATER DESIGN

Onsite drainage for the site will be handled within paved areas through riser inlets and underground retention systems. Onsite retention will be provided for the 100-year, 2-hour storm event and will discharge storm water within 36-hours via drywells. The ultimate outfall for the site is located at the southwest corner of the site at an elevation of 1540.90.

Refer to **Appendix B**, Exhibit 2- Proposed Conditions Drainage Area Map for basin and outfall locations.

3.1.1 Stormwater Retention

The computations included in this report are based on the standards and methodologies presented Pinal County Drainage Manual Volume I. The storm water retention required for the 100-year, 2-hour storm event is given by the following equation:

Volume required= $V_R = A \times C \times (P/12)$; Where:

A = drainage area (s.f.)

C = runoff coefficient; 0.95 for Commercial; 0.95 for Pavement

P = 100-year, 2-hour rainfall depth, 2.25 inches

Onsite retention will consist of underground retention pipes within the proposed parking areas that will connect to drywells to ensure draining of the system within 36-hours. The proposed retention volume for the site is calculated below:

10' UG Retention Pipe Calculations: $V = \pi r^2 L$

| U.G. PIPE # | LF | AREA (SF) | VOLUME PROVIDED (CF) |
|--------------|------------|-----------|----------------------|
| Basin A | 180 | 78.54 | 14,137 |
| Basin B | 200 | 78.54 | 15,708 |
| TOTAL | 380 | | 29,845 |

The following table summarizes the retention required and provided for the proposed development:

| DRAINAGE | | | Cwt | VOLUME | | VOLUME PROVIDED (cf) | EXCESS/ SHORT (cf) |
|--------------|----------------|-------------|------|----------|---------------|----------------------|--------------------|
| AREA | AREA | AREA | | REQUIRED | | | |
| I.D. | (sf) | (Ac) | | (cf) | | | |
| OFF-1 | 10,655 | 0.24 | 0.95 | 1,923 | 13,826 | 14,137 | 311 |
| A1 | 65,943 | 1.51 | 0.95 | 11,903 | | | |
| B1 | 82,382 | 1.90 | 0.95 | 14,870 | 14,870 | 15,708 | 838 |
| TOTAL | 158,980 | 3.65 | | | 28,696 | 29,845 | 1,149 |

3.1.2 Hydrologic Analysis

The rational method was used to compute the onsite peak discharges for the 10-year and 100-year storm event, assuming a 5-minute time of concentration and designated runoff coefficients from the Pinal County Drainage Manual Volumes II, Design Methodology and Procedures.

Refer to **Appendix C** for Peak Runoff Calculations.

3.1.3 Onsite Hydraulics and Drainage Infrastructure

Surface flows will be routed along concrete gutters or on the asphalt pavement. Overland flow will be captured by proposed catch basins and will discharge to the underground retention systems.

Hydraulic analysis for proposed drainage infrastructure will be provided in the final drainage report.

3.1.4 Offsite Hydraulics Drainage Infrastructure

Improvements for offsite drainage include the conveyance of offsite flows along the northern frontage. Culverts will be provided in order to convey the off-site flows on the historic path heading west and eventually southwest.

3.1.5 Discharge Calculations

The calculation is as follows based on a minimum percolation rate of a drywell, 0.1 cfs:

$$\text{Volume to be drained in 36 hours} = 0.1 \text{ cfs} * 36 \text{ hours} * 3600 \text{ sec/hour} = 12,960 \text{ cf}$$

| RETENTION | VOLUME | DRYWELLS |
|------------------|-----------------|-----------------|
| BASIN | PROVIDED | REQUIRED |
| ID | (cf) | (SF) |
| 1 | 14,137 | 2 |
| 2 | 15,708 | 2 |
| TOTAL | 29,845 | 4 |

All drywells will be registered with ADEQ.

3.1.6 Maintenance

The owner will provide required maintenance of the drainage infrastructure, including all structures, underground retention, and drywells. Maintenance should be provided annually at a minimum. Additional maintenance of drywells and underground retention should be provided in accordance with manufacturer’s recommendations.

4.0 CONCLUSION

The Bella Vista Storage project will adhere to Pinal County drainage criteria to retain the 100-year, 2-hour storm event with proposed surface retention system. Offsite flows will be conveyed to the historic flow path. Proposed retentions basins will drain within 36-hours via drywells. The proposed retention systems are adequate to retain onsite and offsite drainage.

In accordance with county requirements, an all-weather access is being provided to the site.

Based upon the proposed drainage design, the proposed development should not create adverse impacts to existing infrastructure and downstream properties.

5.0 REFERENCES

1. *Pinal County Drainage Manual Volume I, Design Criteria; August 2004*
2. *Pinal County Drainage Manual Volume II, Design Methodology and Procedures; August 2004*

APPENDIX A
FEMA FIRM RATE MAP

National Flood Hazard Layer FIRMette

111°30'56"W 33°11'36"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS



0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*



OTHER AREAS OF FLOOD HAZARD

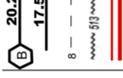
OTHER AREAS



GENERAL STRUCTURES



Cross Sections with 1% Annual Chance Water Surface Elevation



OTHER FEATURES



MAP PANELS



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **11/16/2021 at 4:18 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



APPENDIX B
EXISTING & PROPOSED DRAINAGE AREA MAPS

PROPOSED CONDITIONS
DRAINAGE AREA MAP

DATE: APR 2022
DRAWN BY: MAJ
CHECKED BY: AS NOTED
PROJECT NO: 316-191
APPROVED BY: MAJ

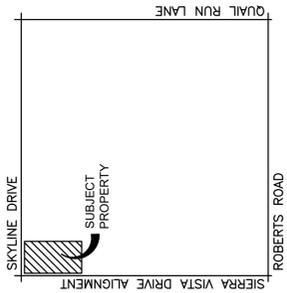
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www.ceinc.com



Civil & Environmental Consultants, Inc.

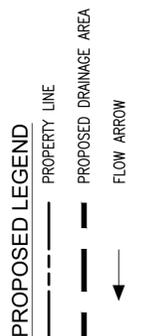
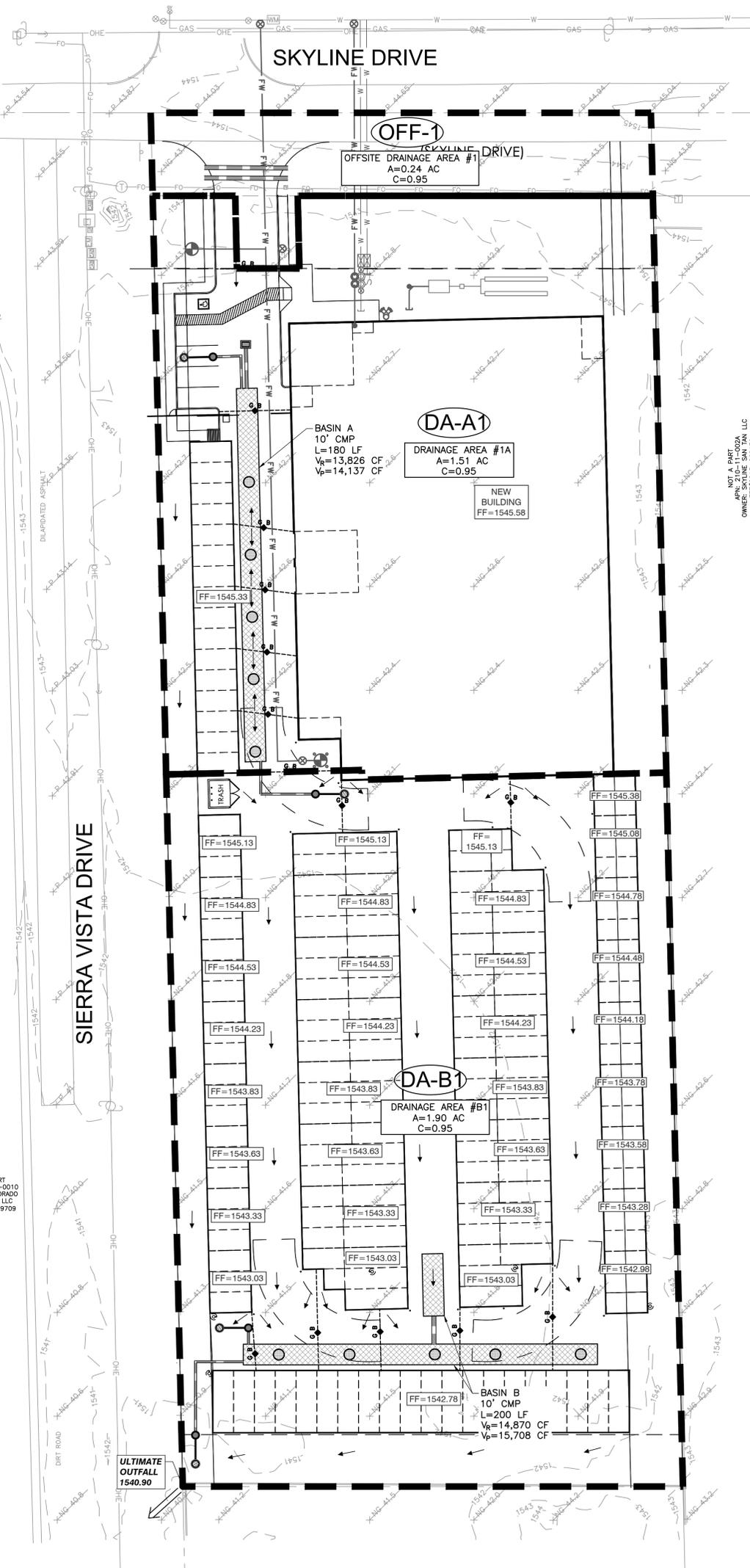


VICINITY MAP
N.T.S.



REVISION RECORD

| NO | DATE | DESCRIPTION |
|----|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |



APPENDIX C
HYDROLOGY CALCULATIONS



NOAA Atlas 14, Volume 1, Version 5
 Location name: San Tan Valley, Arizona, USA*
 Latitude: 33.1901°, Longitude: -111.5103°
 Elevation: 1542.22 ft**



* source: ESRI Maps
 ** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

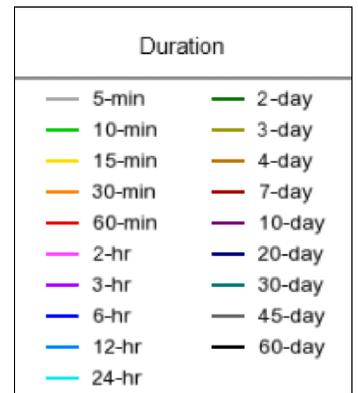
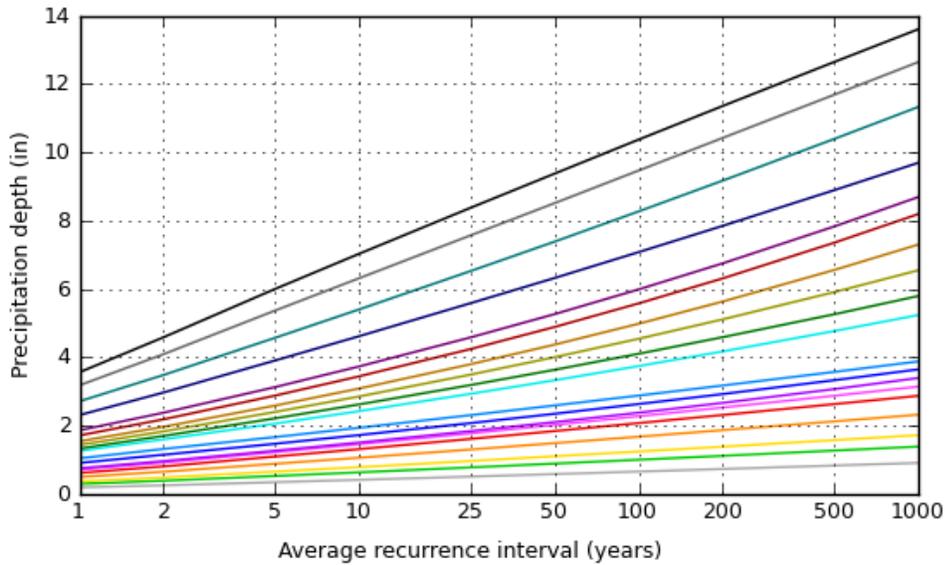
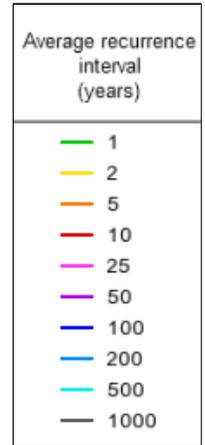
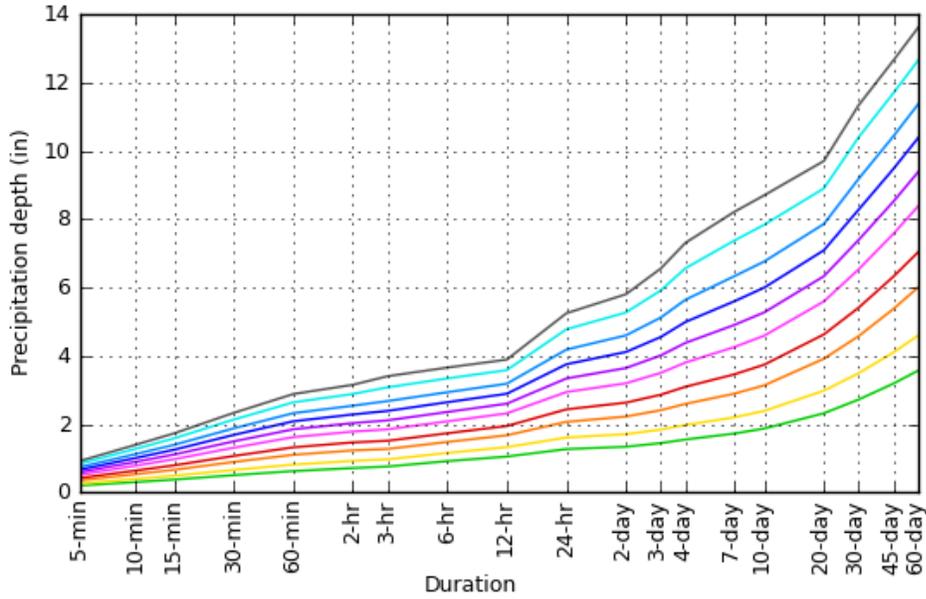
| PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹ | | | | | | | | | | |
|--|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|
| Duration | Average recurrence interval (years) | | | | | | | | | |
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.198 (0.167-0.240) | 0.258 (0.219-0.314) | 0.350 (0.294-0.423) | 0.419 (0.350-0.505) | 0.514 (0.422-0.616) | 0.587 (0.476-0.702) | 0.661 (0.527-0.789) | 0.737 (0.578-0.879) | 0.838 (0.640-1.00) | 0.915 (0.684-1.10) |
| 10-min | 0.301 (0.254-0.365) | 0.393 (0.333-0.478) | 0.532 (0.447-0.643) | 0.638 (0.533-0.769) | 0.782 (0.643-0.938) | 0.894 (0.725-1.07) | 1.01 (0.802-1.20) | 1.12 (0.879-1.34) | 1.27 (0.974-1.52) | 1.39 (1.04-1.67) |
| 15-min | 0.373 (0.314-0.453) | 0.487 (0.413-0.593) | 0.660 (0.554-0.798) | 0.791 (0.661-0.953) | 0.970 (0.797-1.16) | 1.11 (0.899-1.33) | 1.25 (0.994-1.49) | 1.39 (1.09-1.66) | 1.58 (1.21-1.89) | 1.73 (1.29-2.07) |
| 30-min | 0.503 (0.423-0.610) | 0.656 (0.556-0.798) | 0.889 (0.746-1.07) | 1.07 (0.890-1.28) | 1.31 (1.07-1.57) | 1.49 (1.21-1.78) | 1.68 (1.34-2.01) | 1.87 (1.47-2.23) | 2.13 (1.63-2.54) | 2.33 (1.74-2.79) |
| 60-min | 0.622 (0.524-0.755) | 0.812 (0.689-0.987) | 1.10 (0.924-1.33) | 1.32 (1.10-1.59) | 1.62 (1.33-1.94) | 1.85 (1.50-2.21) | 2.08 (1.66-2.48) | 2.32 (1.82-2.76) | 2.64 (2.01-3.15) | 2.88 (2.15-3.45) |
| 2-hr | 0.711 (0.603-0.850) | 0.921 (0.784-1.10) | 1.23 (1.04-1.47) | 1.46 (1.22-1.75) | 1.78 (1.47-2.11) | 2.03 (1.65-2.40) | 2.28 (1.83-2.70) | 2.54 (2.00-3.00) | 2.88 (2.21-3.41) | 3.15 (2.37-3.75) |
| 3-hr | 0.756 (0.641-0.914) | 0.967 (0.822-1.17) | 1.27 (1.08-1.54) | 1.51 (1.27-1.82) | 1.84 (1.52-2.21) | 2.11 (1.71-2.51) | 2.38 (1.91-2.84) | 2.67 (2.10-3.18) | 3.07 (2.34-3.66) | 3.40 (2.52-4.06) |
| 6-hr | 0.913 (0.790-1.08) | 1.15 (0.999-1.36) | 1.47 (1.27-1.74) | 1.73 (1.48-2.03) | 2.08 (1.76-2.42) | 2.35 (1.96-2.74) | 2.64 (2.16-3.07) | 2.93 (2.36-3.41) | 3.33 (2.61-3.88) | 3.65 (2.79-4.26) |
| 12-hr | 1.05 (0.921-1.20) | 1.32 (1.16-1.52) | 1.67 (1.46-1.91) | 1.94 (1.69-2.22) | 2.31 (1.99-2.63) | 2.60 (2.21-2.94) | 2.89 (2.42-3.28) | 3.18 (2.63-3.62) | 3.58 (2.88-4.09) | 3.89 (3.07-4.47) |
| 24-hr | 1.27 (1.14-1.42) | 1.60 (1.44-1.80) | 2.06 (1.85-2.31) | 2.43 (2.17-2.72) | 2.94 (2.60-3.28) | 3.33 (2.93-3.72) | 3.75 (3.26-4.18) | 4.18 (3.60-4.66) | 4.77 (4.03-5.34) | 5.24 (4.37-5.89) |
| 2-day | 1.34 (1.20-1.50) | 1.70 (1.53-1.91) | 2.22 (1.99-2.48) | 2.63 (2.35-2.93) | 3.19 (2.83-3.56) | 3.64 (3.20-4.05) | 4.11 (3.58-4.57) | 4.60 (3.96-5.12) | 5.26 (4.46-5.89) | 5.80 (4.84-6.52) |
| 3-day | 1.44 (1.31-1.60) | 1.84 (1.67-2.04) | 2.40 (2.17-2.67) | 2.86 (2.58-3.16) | 3.50 (3.13-3.86) | 4.01 (3.56-4.42) | 4.55 (4.01-5.02) | 5.12 (4.46-5.66) | 5.91 (5.08-6.56) | 6.55 (5.56-7.31) |
| 4-day | 1.55 (1.41-1.70) | 1.97 (1.80-2.17) | 2.59 (2.36-2.85) | 3.09 (2.81-3.39) | 3.80 (3.43-4.17) | 4.38 (3.93-4.80) | 4.99 (4.44-5.48) | 5.64 (4.97-6.20) | 6.56 (5.70-7.24) | 7.31 (6.28-8.10) |
| 7-day | 1.72 (1.57-1.89) | 2.19 (2.00-2.41) | 2.88 (2.63-3.17) | 3.45 (3.13-3.79) | 4.25 (3.82-4.65) | 4.89 (4.38-5.37) | 5.58 (4.96-6.12) | 6.32 (5.56-6.94) | 7.36 (6.39-8.12) | 8.20 (7.03-9.09) |
| 10-day | 1.87 (1.71-2.05) | 2.38 (2.18-2.62) | 3.13 (2.86-3.44) | 3.74 (3.40-4.10) | 4.59 (4.15-5.03) | 5.27 (4.73-5.78) | 5.99 (5.35-6.58) | 6.76 (5.97-7.43) | 7.83 (6.83-8.65) | 8.70 (7.51-9.63) |
| 20-day | 2.31 (2.11-2.54) | 2.98 (2.71-3.27) | 3.91 (3.56-4.29) | 4.62 (4.20-5.06) | 5.59 (5.05-6.11) | 6.33 (5.69-6.93) | 7.08 (6.35-7.77) | 7.85 (6.99-8.63) | 8.90 (7.84-9.81) | 9.70 (8.48-10.7) |
| 30-day | 2.72 (2.49-2.97) | 3.49 (3.20-3.81) | 4.57 (4.18-4.99) | 5.41 (4.93-5.89) | 6.53 (5.92-7.11) | 7.39 (6.68-8.06) | 8.28 (7.44-9.03) | 9.18 (8.20-10.0) | 10.4 (9.19-11.4) | 11.3 (9.94-12.5) |
| 45-day | 3.19 (2.91-3.49) | 4.10 (3.74-4.48) | 5.37 (4.90-5.87) | 6.32 (5.76-6.91) | 7.57 (6.87-8.27) | 8.52 (7.68-9.31) | 9.47 (8.51-10.4) | 10.4 (9.31-11.4) | 11.7 (10.3-12.9) | 12.6 (11.1-14.0) |
| 60-day | 3.57 (3.26-3.90) | 4.59 (4.20-5.02) | 6.00 (5.49-6.56) | 7.03 (6.42-7.68) | 8.38 (7.61-9.14) | 9.38 (8.48-10.2) | 10.4 (9.35-11.4) | 11.4 (10.2-12.4) | 12.6 (11.2-13.9) | 13.6 (12.0-15.0) |

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves
 Latitude: 33.1901°, Longitude: -111.5103°



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Maps & aerials

Small scale terrain



NOAA Atlas 14, Volume 1, Version 5
 Location name: San Tan Valley, Arizona, USA*
 Latitude: 33.1901°, Longitude: -111.5103°
 Elevation: 1542.22 ft**



* source: ESRI Maps
 ** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

| PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹ | | | | | | | | | | |
|---|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Duration | Average recurrence interval (years) | | | | | | | | | |
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 2.38 (2.00-2.88) | 3.10 (2.63-3.77) | 4.20 (3.53-5.08) | 5.03 (4.20-6.06) | 6.17 (5.06-7.39) | 7.04 (5.71-8.42) | 7.93 (6.32-9.47) | 8.84 (6.94-10.5) | 10.1 (7.68-12.0) | 11.0 (8.21-13.2) |
| 10-min | 1.81 (1.52-2.19) | 2.36 (2.00-2.87) | 3.19 (2.68-3.86) | 3.83 (3.20-4.61) | 4.69 (3.86-5.63) | 5.36 (4.35-6.41) | 6.04 (4.81-7.21) | 6.73 (5.27-8.03) | 7.65 (5.84-9.14) | 8.36 (6.25-10.0) |
| 15-min | 1.49 (1.26-1.81) | 1.95 (1.65-2.37) | 2.64 (2.22-3.19) | 3.16 (2.64-3.81) | 3.88 (3.19-4.65) | 4.43 (3.60-5.30) | 4.99 (3.98-5.96) | 5.56 (4.36-6.63) | 6.32 (4.83-7.55) | 6.91 (5.16-8.28) |
| 30-min | 1.01 (0.846-1.22) | 1.31 (1.11-1.60) | 1.78 (1.49-2.15) | 2.13 (1.78-2.57) | 2.61 (2.15-3.13) | 2.98 (2.42-3.57) | 3.36 (2.68-4.01) | 3.75 (2.94-4.47) | 4.26 (3.25-5.09) | 4.65 (3.48-5.57) |
| 60-min | 0.622 (0.524-0.755) | 0.812 (0.689-0.987) | 1.10 (0.924-1.33) | 1.32 (1.10-1.59) | 1.62 (1.33-1.94) | 1.85 (1.50-2.21) | 2.08 (1.66-2.48) | 2.32 (1.82-2.76) | 2.64 (2.01-3.15) | 2.88 (2.15-3.45) |
| 2-hr | 0.356 (0.302-0.425) | 0.460 (0.392-0.552) | 0.614 (0.519-0.734) | 0.730 (0.612-0.874) | 0.889 (0.736-1.06) | 1.01 (0.826-1.20) | 1.14 (0.916-1.35) | 1.27 (0.999-1.50) | 1.44 (1.11-1.70) | 1.57 (1.18-1.87) |
| 3-hr | 0.252 (0.213-0.304) | 0.322 (0.274-0.390) | 0.423 (0.358-0.512) | 0.503 (0.422-0.606) | 0.614 (0.507-0.734) | 0.702 (0.570-0.836) | 0.794 (0.634-0.945) | 0.890 (0.699-1.06) | 1.02 (0.779-1.22) | 1.13 (0.840-1.35) |
| 6-hr | 0.152 (0.132-0.180) | 0.193 (0.167-0.227) | 0.246 (0.212-0.290) | 0.289 (0.247-0.339) | 0.347 (0.293-0.405) | 0.393 (0.327-0.457) | 0.441 (0.360-0.512) | 0.489 (0.393-0.569) | 0.557 (0.435-0.647) | 0.610 (0.466-0.711) |
| 12-hr | 0.087 (0.076-0.100) | 0.110 (0.096-0.126) | 0.139 (0.121-0.159) | 0.161 (0.140-0.184) | 0.192 (0.165-0.218) | 0.215 (0.183-0.244) | 0.240 (0.201-0.272) | 0.264 (0.218-0.300) | 0.297 (0.239-0.339) | 0.322 (0.255-0.371) |
| 24-hr | 0.053 (0.047-0.059) | 0.067 (0.060-0.075) | 0.086 (0.077-0.096) | 0.101 (0.090-0.113) | 0.122 (0.108-0.136) | 0.139 (0.122-0.155) | 0.156 (0.136-0.174) | 0.174 (0.150-0.194) | 0.199 (0.168-0.223) | 0.218 (0.182-0.246) |
| 2-day | 0.028 (0.025-0.031) | 0.035 (0.032-0.040) | 0.046 (0.041-0.052) | 0.055 (0.049-0.061) | 0.066 (0.059-0.074) | 0.076 (0.067-0.084) | 0.086 (0.075-0.095) | 0.096 (0.082-0.107) | 0.110 (0.093-0.123) | 0.121 (0.101-0.136) |
| 3-day | 0.020 (0.018-0.022) | 0.026 (0.023-0.028) | 0.033 (0.030-0.037) | 0.040 (0.036-0.044) | 0.049 (0.044-0.054) | 0.056 (0.049-0.061) | 0.063 (0.056-0.070) | 0.071 (0.062-0.079) | 0.082 (0.071-0.091) | 0.091 (0.077-0.102) |
| 4-day | 0.016 (0.015-0.018) | 0.021 (0.019-0.023) | 0.027 (0.025-0.030) | 0.032 (0.029-0.035) | 0.040 (0.036-0.043) | 0.046 (0.041-0.050) | 0.052 (0.046-0.057) | 0.059 (0.052-0.065) | 0.068 (0.059-0.075) | 0.076 (0.065-0.084) |
| 7-day | 0.010 (0.009-0.011) | 0.013 (0.012-0.014) | 0.017 (0.016-0.019) | 0.021 (0.019-0.023) | 0.025 (0.023-0.028) | 0.029 (0.026-0.032) | 0.033 (0.030-0.036) | 0.038 (0.033-0.041) | 0.044 (0.038-0.048) | 0.049 (0.042-0.054) |
| 10-day | 0.008 (0.007-0.009) | 0.010 (0.009-0.011) | 0.013 (0.012-0.014) | 0.016 (0.014-0.017) | 0.019 (0.017-0.021) | 0.022 (0.020-0.024) | 0.025 (0.022-0.027) | 0.028 (0.025-0.031) | 0.033 (0.028-0.036) | 0.036 (0.031-0.040) |
| 20-day | 0.005 (0.004-0.005) | 0.006 (0.006-0.007) | 0.008 (0.007-0.009) | 0.010 (0.009-0.011) | 0.012 (0.011-0.013) | 0.013 (0.012-0.014) | 0.015 (0.013-0.016) | 0.016 (0.015-0.018) | 0.019 (0.016-0.020) | 0.020 (0.018-0.022) |
| 30-day | 0.004 (0.003-0.004) | 0.005 (0.004-0.005) | 0.006 (0.006-0.007) | 0.008 (0.007-0.008) | 0.009 (0.008-0.010) | 0.010 (0.009-0.011) | 0.011 (0.010-0.013) | 0.013 (0.011-0.014) | 0.014 (0.013-0.016) | 0.016 (0.014-0.017) |
| 45-day | 0.003 (0.003-0.003) | 0.004 (0.003-0.004) | 0.005 (0.005-0.005) | 0.006 (0.005-0.006) | 0.007 (0.006-0.008) | 0.008 (0.007-0.009) | 0.009 (0.008-0.010) | 0.010 (0.009-0.011) | 0.011 (0.010-0.012) | 0.012 (0.010-0.013) |
| 60-day | 0.002 (0.002-0.003) | 0.003 (0.003-0.003) | 0.004 (0.004-0.005) | 0.005 (0.004-0.005) | 0.006 (0.005-0.006) | 0.007 (0.006-0.007) | 0.007 (0.006-0.008) | 0.008 (0.007-0.009) | 0.009 (0.008-0.010) | 0.009 (0.008-0.010) |

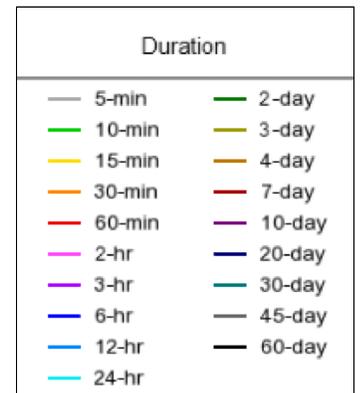
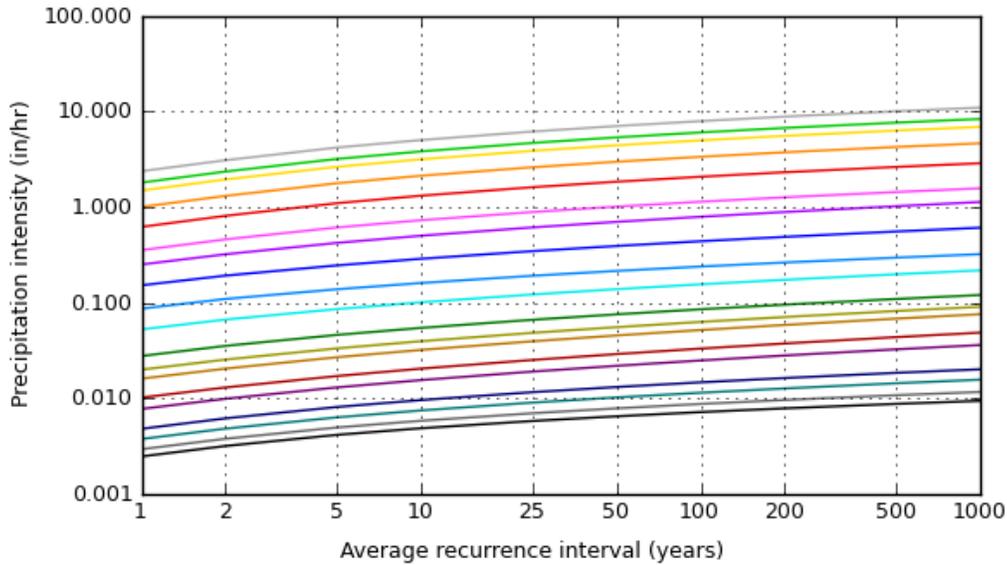
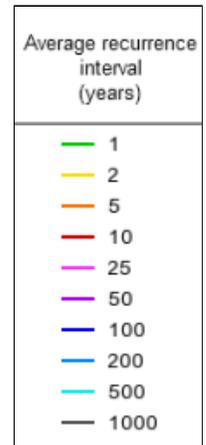
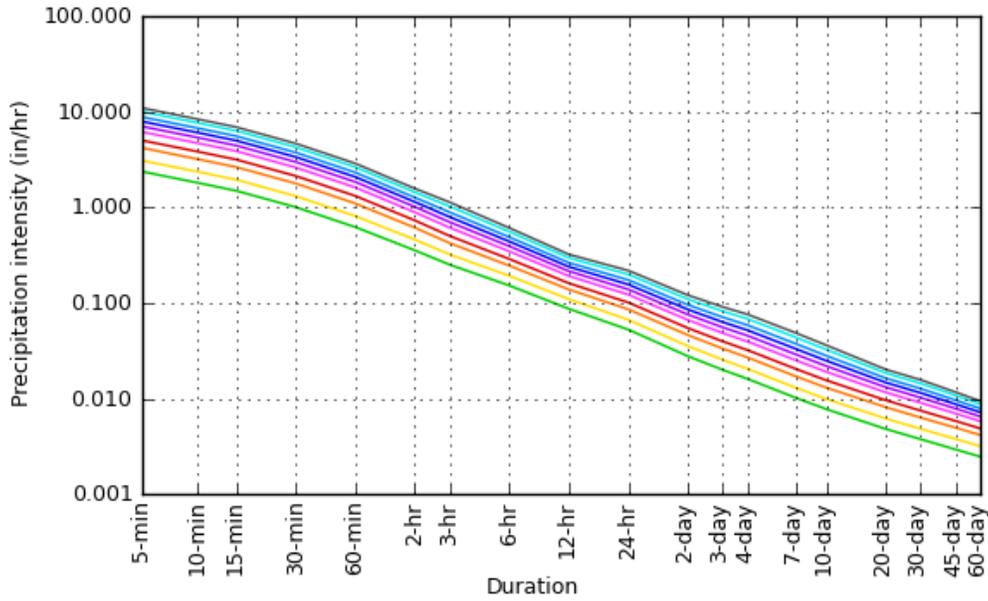
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based intensity-duration-frequency (IDF) curves

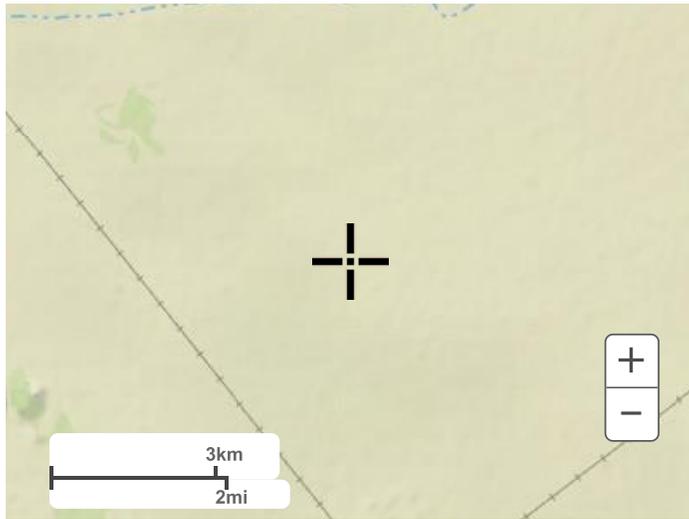
Latitude: 33.1901°, Longitude: -111.5103°



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Maps & aerials

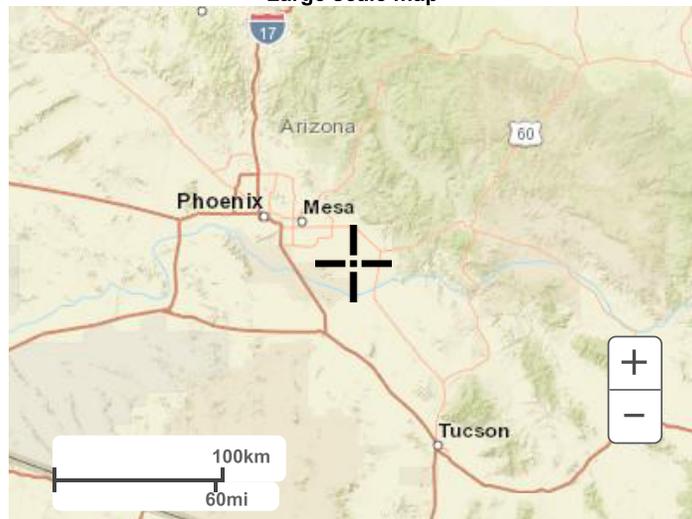
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Project Name: Bella Vista Storage

CEC JOB: 316-191

DATE:04/28/2022

PREPARED BY: LR

CHECKED BY:

RATIONAL METHOD

$$Q = C \cdot I \cdot A$$

C = weighted

A = Area, Acre

| PEAK RUNOFF CALCULATIONS | | | | | | | | |
|---------------------------------|-------------|---------------|-----------------------|------------------------|-------------------------|--------------------------|-----------------------|------------------------|
| AREA | AREA | Tc | I₁₀ | I₁₀₀ | Cwt₁₀ | Cwt₁₀₀ | Q₁₀ | Q₁₀₀ |
| I.D. | (ac) | (min.) | (in/hr) | (in/hr) | | | (cfs) | (cfs) |
| EX1 | 0.22 | 5 | 5.03 | 7.93 | 0.85 | 0.95 | 0.94 | 1.66 |
| EX2 | 3.43 | 5 | 5.03 | 7.93 | 0.40 | 0.50 | 6.90 | 13.60 |
| OFF-1 | 0.24 | 5 | 5.03 | 7.93 | 0.85 | 0.95 | 1.03 | 1.81 |
| A1 | 1.51 | 5 | 5.03 | 7.93 | 0.85 | 0.95 | 6.46 | 11.38 |
| B1 | 1.90 | 5 | 5.03 | 7.93 | 0.85 | 0.95 | 8.12 | 14.31 |

APPENDIX D
PRELIMINARY GRADING AND DRAINAGE PLANS
