Drainage Reports

Abbreviated Water and Sewer Needs

Water Study

Wastewater Study

Stormwater Waiver Application
PRELIMINARY DRAINAGE REPORT

Alexan Scottsdale
Scottsdale, Arizona

Plan #
Case # 21-ZN-2018
Q-S #

x Accepted

Corrections

DG 10/16/2018
Reviewed By
Date

Prepared For:
Trammell Crow Residential
3889 Maple Avenue, Suite 200
Dallas, Texas 75219

Kimley-Horn

096253013
September 2018
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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

Trammell Crow Residential is proposing to construct a multi-family development at the northeast corner of Scottsdale Road and Palm Lane in Scottsdale, Arizona. The project is anticipated to consist of multiple four-story apartment buildings with associated parking and infrastructure improvements.

1.2 SITE LOCATION

The proposed development encompasses approximately 7.6 net acres in a portion of the Southwest Quarter of Section 35, Township 2 North, Range 4 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. The proposed development consists of four previously developed parcels. Three of the parcels are commercial developments located adjacent to Scottsdale Road and zoned C-3. The fourth parcel is located east of the commercial parcels and consists of a single-family home and vacant land. This parcel is zoned R1-7. More specifically, the site is bounded on the west by Scottsdale Road and various commercial properties, on the south by Palm Lane and residential single-family homes, on the east by residential senior-living apartments, and on the north by an alley and residential single-family homes. The site slopes from the northwest to the southeast at approximately 0.5%. See Appendix A for the Site Location Map and Legal Descriptions. See Figure 1 in Appendix D for a Context Aerial Map.

1.3 PURPOSE

This Preliminary Drainage Report is intended to satisfy City of Scottsdale requirements. This report provides a description of the current stormwater drainage patterns and a description of the required and proposed drainage improvements.

1.4 OBJECTIVES

This report provides a drainage plan for the site that is intended to meet the drainage standards and guidelines of the City of Scottsdale and the Flood Control District of Maricopa County (FCDMC). In particular, this report will demonstrate the following:

1. Any existing off-site flows from the adjacent properties will handled and conveyed in a way consistent with the current drainage patterns.

2. The proposed site drainage patterns will remain consistent with the current drainage patterns.

3. Permanent drainage facilities will have a positive outfall and any detained stormwater will be disposed of within 36 hours via dual-chamber drywells.

4. Drainage facilities will be designed such that the 100-year post-development flows are collected and conveyed in such a manner so as to not cause damage to buildings and property.

5. Stormwater retention is provided for the difference between the pre-development and post-development stormwater volume.
6. Building finish floor elevations will be determined in accordance with City of Scottsdale and FEMA Flood Zone requirements.

2.0 DESCRIPTION OF EXISTING DRAINAGE CONDITIONS AND CHARACTERISTICS

2.1 EXISTING ON-SITE DRAINAGE CONDITIONS

The site currently consists of previously developed commercial and residential parcels. The three commercial parcels consist of asphalt pavement and existing buildings with limited landscaping. The residential parcel consists of a single-family home and bare land. The site is bounded on the west by Scottsdale Road and various commercial properties, on the south by Palm Lane and residential single-family homes, on the east by residential senior-living apartments, and on the north by an alley and residential single-family homes. The site slopes from the northwest to the southeast at approximately 0.5%.

Stormwater from the site currently flows to the southeast corner as sheet flow where it overtops the adjacent sidewalk and roll curb and flows east along Palm Lane toward 74th Street. No drainage features currently exist on the site. Site-generated stormwater ultimately reaches the City of Scottsdale storm drain system through a curb catch basin at the northwest corner of 74th Street and McDowell Road.

Refer to Figure 2 in Appendix D for the Existing Conditions Exhibit.

2.2 EXISTING OFF-SITE DRAINAGE CONDITIONS

The proposed site is impacted by off-site stormwater runoff generated by an existing commercial parcel located in the northwest corner of the site. Stormwater from this adjacent commercial parcel currently sheet flows from west to east and enters the proposed site along the shared property line. Ultimately, the off-site stormwater combines with the site-generated stormwater and continues to sheet flow to the southeast across the site.

Stormwater runoff from the adjacent portion of Scottsdale Road is collected in catch basins and conveyed to the south in the City storm drain system. Stormwater runoff from the adjacent portion of Palm Lane is conveyed east to 74th Street via curb and gutter where it eventually enters the City storm drain system. Off-site flows from the existing alley along the north property line flow east and do not affect the site.

Refer to Figure 2 in Appendix D for the Existing Conditions Exhibit.

2.3 FEMA FLOOD HAZARD AREAS

The site is located in Flood Zone “X” according to the Flood Insurance Rate Map 04013C2235L, dated October 16, 2013. Zone “X” is designated by FEMA as “areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than one foot or within drainage areas less than one square mile; and areas protected by levees from 1% annual chance flood.” Refer to Appendix B for the FEMA FIRMette map for the site.
3.0 PROPOSED DRAINAGE PLAN

3.1 GENERAL DESCRIPTION

In the analysis of the proposed drainage conditions the following items are considered:

- Area Types (concrete pavement, building, and desert landscaping)
- Magnitude of areas
- Slopes
- Storm Drain

3.2 PROPOSED SITE CONDITIONS

According to the City of Scottsdale’s Design Standards & Policies Manual (DS&PM), sites that have been previously developed are required to detain/retain the difference between the pre-development and post-development stormwater run-off volume generated by the 100-year, 2-hour storm event. The City of Scottsdale defines “previously developed sites” as those “sites where the city has issued a permit for grading of the site or the site was graded or developed prior to 1987 regardless of issuance of a city permit.” Historical aerial imagery shows that the parcels were developed and improved before 1969 and therefore qualify as “previously developed” according to the City’s definition. The proposed site will be required to detain/retain the pre-development vs post-development (pre- vs post-) or first flush stormwater run-off volume, whichever is greater.

Stormwater generated on the proposed site will be conveyed via sheet flow to a system of catch basins and underground storm drains. Stormwater storage will be provided by 10-foot diameter CMP underground retention tanks near the south of the site. The underground retention tanks will drain in 36 hours or less via dual chamber drywells. The proposed storm drain system will be designed in such a way that stormwater in excess of the pre- vs. post- or first flush run-off volume will be conveyed through the system, bubble up through a catch basin near the existing ultimate site outfall, and exit the site into Palm Lane, consistent with the existing drainage pattern.

Refer to Figure 5 in Appendix D for the Preliminary Grading and Drainage Plan.

3.3 PROPOSED OFF-SITE CONDITIONS

As previously noted, the proposed site is impacted by off-site stormwater runoff generated by the commercial parcel located in the northwest corner of the site. A dedicated area catch basin and storm drain pipe will collect and convey any off-site flows south through the site toward Palm Lane. A bubble-up structure will be installed adjacent to the Palm Lane right-of-way where the off-site flows will exit the site, consistent with the existing drainage pattern. In the event that this parcel is developed in the future, it is anticipated that the parcel will be required to treat and retain/detain the site generated pre- vs. post- or first flush stormwater runoff, whichever is greater. A storm drain stub will be provided at the property line to facilitate future disposal of any detained stormwater.
To protect the on-site storm drain system and retention tanks of the proposed site, the storm drain line used to convey the off-site flows will be kept independent from the on-site storm drain system.

### 3.4 STORMWATER STORAGE REQUIREMENTS

As previously noted, the proposed development will be required to retain the greater of the pre- vs post- or first flush stormwater runoff volume. The proposed site’s pre- vs post- volume required is greater than the first flush required. Refer to Table 1 for a comparison of the two scenarios.

#### Table 1  Pre vs Post Volume and First Flush Retention Comparison

<table>
<thead>
<tr>
<th>C&lt;sub&gt;post-C&lt;sub&gt;pre&lt;/sub&gt; [AC]</th>
<th>Precipitation Depth [P] (in)</th>
<th>Area [A] (sf)</th>
<th>Required Volume ( \left[ \frac{(AC \cdot P \cdot A)}{12} \right] ) (ft&lt;sup&gt;3&lt;/sup&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.855-0.594=0.261</td>
<td>2.14</td>
<td>326,906</td>
<td>15,203</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Runoff Coefficient [C]</th>
<th>Precipitation Depth [P] (in)</th>
<th>Area [A] (sf)</th>
<th>Required Volume ( \left[ \frac{CPA}{12} \right] ) (ft&lt;sup&gt;3&lt;/sup&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>0.5</td>
<td>326,906</td>
<td>13,621</td>
</tr>
</tbody>
</table>

Refer to Appendix C for the Hydrologic Calculations. Refer to Figure 3 and Figure 4 in Appendix D for the Pre-Development and Post-Development Area exhibits, respectively.

On-site storage will be provided in a 10-foot diameter CMP underground storage tank. The underground storage tank will be drained in 36 hours or less via dual-chamber drywells. Stormwater runoff in excess of the pre-vs-post storage volume will be collected by the on-site storm drain system and will overtop the rim of the lowest catch basin, located near the southeast corner of the site.

### 3.5 PRE- AND POST-DEVELOPMENT RUNOFF CHARACTERISTICS AT CONCENTRATION POINTS

The existing site consists of a combination of commercial use, residential use, and bare land. Current topography indicates the site drains from the northwest to the southwest. The concentration point for the existing runoff is at the southeast corner of the site, near Palm Lane.

The pre- vs post-development stormwater runoff will be retained in an underground retention tank. Stormwater runoff in excess of the pre- vs post- volume will overtop a proposed catch basin near the southeast corner of the site. Similar to the existing condition, the stormwater runoff concentration point for the proposed development will be located at the southeast corner of the site.

Refer to Figure 2 in Appendix D for the Existing Conditions Exhibit.
3.6 ADEQ AZPDES REQUIREMENTS

Prior to construction an executed Notice of Intent (NOI) shall be submitted to Arizona Department of Environmental Quality (ADEQ) in conformance with the Arizona Pollution Discharge Elimination System Permit (AZPDES) permit. The NOI and associated stormwater management best management practices will remain active on the site until construction is complete and a Notice of Termination is filed with ADEQ in conformance with AZPDES permit.

3.7 PROJECT PHASING

This project will be constructed in a single phase.
4.0 SPECIAL CONDITIONS

4.1 404 DISCUSSION

Do to the previous development of the project site, no 404 washes are anticipated.
5.0 DATA ANALYSIS METHODS

5.1 HYDROLOGIC PROCEDURES, PARAMETER SELECTION, AND ASSUMPTIONS

Hydrologic calculations for the site will be performed using the rational equation in the FCDMC Drainage Design Manual Volume I, which is limited to drainage areas of up to 160 acres. A weighted runoff coefficient was used for the site based upon the large amount of landscaping located adjacent to perimeters of the site.

For analysis of the development, the site will be sub-divided into sub-basins consisting of pavement, landscaping, and building areas.

5.2 HYDRAULIC PROCEDURES, METHODS, PARAMETER SELECTION, AND ASSUMPTIONS

All flows for proposed conditions will be determined using the rational method as outlined by the Drainage Design Manual by Maricopa County Flood Control District. Due to the small nature of the watersheds for the individual sub-basins, a minimum time of concentration of five minutes will be assumed. All drainage basins will assume a runoff coefficient of 0.95 with the exception of the landscape sub-basins, which will utilize a runoff coefficient of 0.45 per the DS&PM. The peak flows at the sub-basin concentration points will be calculated and provided with the Final Drainage Report.

The following criteria will be used to size the proposed pipes for on-site stormwater conveyance:

- A maximum allowable 100-year ponding depth of six inches above the catch basin grate.
- A minimum of 12 inches of freeboard between the 100-year ponding depth and the building finish floor elevation.
- The tailwater condition for the 100-year event will be assumed to be the hydraulic grade line at the pipe connection location.
- The 10-year tailwater condition will be assumed to be free outfall.

StormCAD analysis for the 10-year and 100-year events will be provided with the final drainage report.

Storm drain catch basins will be sized using Figure 3.29 from the FHWA HEC-12 dated 1984. A 50% clogging factor will be applied in the analysis. Catch basin analysis will be provided with the final drainage report.

5.3 STORMWATER STORAGE CALCULATION METHODS AND ASSUMPTIONS

As previously noted, the proposed site will be required to retain the pre- vs- post stormwater runoff volume. An underground 10-foot diameter retention tank will be used to store the site-generated stormwater. The
required pre- vs post- volume is calculated based on Section 4-1.201.C.1.b of the City of Scottsdale 2018 Design Standards & Policies Manual (DS&PM):

\[ V = \frac{\Delta C \cdot P \cdot A}{12} \]

Where: \( V \) = Required first flush volume (cubic feet)

\[ \Delta C = \text{Weighted runoff coefficient for the proposed development} - \text{weighted runoff coefficient for the existing development} \]

\[ P = \text{Precipitation depth of 2.14 inches} \]

\[ A = \text{Contributing area (square feet)} \]
6.0 CONCLUSION

6.1 OVERALL PROJECT

Based on the results of this Preliminary Drainage Report, the following can be concluded:

- Off-site stormwater that impacts the proposed site from the adjacent commercial parcel to the northwest will be collected and conveyed to the ultimate outfall.
- An underground retention system will be provided to retain the pre- vs post- development 100-year, 2-hour storm event.
- Underground retention tanks will drain within 36 hours via dual-chamber drywells.
- An on-site storm drain system consisting of catch basins and pipes will be designed and detailed calculations will be provided with the Final Drainage Report.
- Based on the current Flood Insurance Rate Map (FIRM), the site is located in the Zone “X”.
- The building finish floor elevations will be designed to be at least fourteen inches above the ultimate site outfall elevation.

This report is intended to provide a level of assurance that the site will adhere to all appropriate reviewing agency guidelines with respect to drainage and flood protection.
7.0 REFERENCES


EXHIBIT "A"

PARCEL NO. 1:


EXCEPT THE WEST 65 FEET THEREOF FOR ROADWAY;

ALSO EXCEPTING THEREFROM ALL COAL, OIL, GAS AND OTHER MINERAL DEPOSITS AS RESERVED IN THE PATENT RECORDED IN DOCKET 547, PAGE 362.

PARCEL NO. 2:


EXCEPT THE WEST 65 FEET THEREOF FOR ROADWAY;

ALSO EXCEPTING THEREFROM ALL COAL, OIL, GAS AND OTHER MINERAL DEPOSITS AS RESERVED IN THE PATENT RECORDED IN DOCKET 547, PAGE 362.

PARCEL NO. 3:


EXCEPT THE WEST 65 FEET THEREOF FOR ROADWAY;

ALSO EXCEPTING THEREFROM ALL COAL, OIL, GAS AND OTHER MINERAL DEPOSITS AS RESERVED IN THE PATENT RECORDED IN DOCKET 547, PAGE 362.

PARCEL NO. 4:


EXCEPT THE SOUTH 100 FEET OF THE WEST 435.6 FEET;

AND EXCEPT THE EAST 579.49 FEET MORE OR LESS;

AND EXCEPT THE NORTH 544.9 FEET OF THE WEST 355 FEET;

AND EXCEPT THE SOUTH 30 FEET FOR ROADWAY;

AND EXCEPT THE WEST 1.00 FOOT OF THE EAST 25.00 FEET OF THE WEST 460.60 FEET OF THE
NORTH 70.00 FEET OF THE SOUTH 100.00 FEET OF THE SOUTH HALF OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 35, TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA;

AND EXCEPT BEGINNING AT A POINT THAT LIES 435.60 FEET EAST OF THE WEST LINE AND 100 FEET NORTH OF THE SOUTH LINE OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 35, TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA; THENCE SOUTH 89°35'24" WEST PARALLEL WITH AND 100.00 FEET NORTH OF SAID SOUTH LINE 60.60 FEET TO A POINT THAT LIES 375.00 FEET EAST OF SAID WEST LINE; THENCE NORTH PARALLEL WITH AND 375.00 FEET EAST OF SAID WEST LINE 0.64 FEET; THENCE SOUTH 89°48'24" EAST 60.60 FEET TO THE POINT OF BEGINNING.


AND EXCEPTING THEREFROM ALL COAL, OIL, GAS AND OTHER MINERAL DEPOSITS AS RESERVED IN THE PATENT RECORDED IN DOCKET 547, PAGE 362.
Appendix B – FEMA Flood Insurance Rate Map (FIRM)
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards. The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/25/2018 at 6:49:14 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: base map 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.

Legend

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

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE)
- With BFE or Depth
- Regulatory Floodway

Zone A, V, A99
Zone AE, AO, AH, VE, AR
Zone X
Zone D

OTHER AREAS OF FLOOD HAZARD

- Area of Minimal Flood Hazard
- Effective LOMRs
- Area of Undetermined Flood Hazard

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall
- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

OTHER FEATURES

- Digital Data Available
- No Digital Data Available
- Unmapped

MAP PANELS

- 8

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
### Pre-Development, Weighted C

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<th>Land Use</th>
<th>Area [A]</th>
<th>Runoff Coefficient [C_{pre}]</th>
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### Pre vs Post Development Retention Summary

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<td>ac</td>
<td>cf</td>
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### Underground Retention Summary

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<td>194</td>
<td>194</td>
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### Drywell Summary

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<th>Retention Basin</th>
<th>Volume</th>
<th>Percolation Rate</th>
<th>Drywells Required</th>
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<td>UG Tank</td>
<td>15,203</td>
<td>0.10</td>
<td>2</td>
<td>22</td>
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Appendix D – Figures