PRELIMINARY DRAINAGE REPORT

CITY COPY

Mark-Taylor Silverstone Apartments
Scottsdale, Arizona

Case No. 53-DR-2014

Stormwater Review By:
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Review Cycle _____ Date 5/26/15

Prepared For:

Mark-Taylor Residential

Approved
53-DR-14
BMG

Registered Professional Engineer (Civil)
CERTIFICATE NO.
37059
STEPHEN E.
HANEY
Date Signed 4/27/15
ARIZONA, U.S.A.
Exp 12/31/16

191769002
April 2015

Kimley»Horn

Kimley»Horn

April 29, 2015

Mr. Jesus Murillo
City of Scottsdale
7447 E. Indian School Road, Suite 125
Scottsdale, AZ 85251

Re: Mark Taylor Silverstone – Parcel E of Silverstone, Case No. 53-DR-2014, 04/02/15 Drainage Report 2nd Review Comments

Dear Mr. Murillo:

Regarding the Drainage Report review comments dated April 2, 2015 for the project referenced above, please see our responses listed below.

10. Please submit two (2) copies of the revised Drainage Report with the original red-lined copy of the report to me with the rest of the resubmittal material identified in Attachment A.

    Response: We will submit 2 copies of the revised Drainage Report and Addendum No. 2 to the Master Drainage Report. We did not receive a red-lined copy of the report, only this comment letter.

11. Please submit one (1) copy of the revised Storm Water Waiver with the original red-lined copy of the waiver to me with the rest of the resubmittal material identified in Attachment A.

    Response: We did not receive a red-lined copy of the waiver, only this comment letter; which, did not comment on the waiver.

12. The preliminary drainage report calculates a required detention volume for the development of around 44,200 cubic feet based on reduced rainfall from NOAA 14 hydrology and the City's recent changes in stormwater storage policy relating to previously developed sites. As previously stated, the required detention volume for this parcel was determined to be around 130,000 cubic feet per the approved stormwater master plan for Silverstone. The approved stormwater master plan must be revised to obtain approval for a reduction in the required stormwater storage for this parcel. Additionally, the revision to the stormwater master plan must be approved prior to development review approval of this case since the site design and layout of the development depend on the reduced stormwater storage volume as determined in the preliminary drainage report. The analysis in the revision to the stormwater master plan for the existing condition weighted C coefficient will to include 1) an exhibit based on aerial photographs showing previous development and showing the areas associated with different C coefficients 2) weighted C coefficient calculations for areas and associated C values as determined from the aerial photograph exhibit. The required stormwater storage volume as determined as part of the revised stormwater master plan will be used in the preliminary drainage report.

    As an informational item, case drainage reports submitted in support of preliminary plat and development review applications should include a 90% level of design and analysis to allow an accurate analysis of the viability of the proposed project and an in-depth evaluation of the function and design of the stormwater management system by City staff.

53-DR-2014
5/8/15

Response: An Addendum to the Master Drainage Report, Addendum No. 2, was submitted to the City of Scottsdale One Stop Shop. Addendum No. 2 includes justification and exhibits and other items requested in this comment.

13. The approved stormwater master plan for Silverstone shows the bulk of this site draining to the east into what was supposed to be a stormwater storage basin designed for full storage located in the southeastern portion of the site and then draining into the storm drain outfall located at the southeast corner of the site. The approved stormwater master plan for Silverstone did not include provision for any drainage from this parcel to the parcel to the south in the developed condition. The preliminary drainage report shows almost the entire development draining to the west to proposed stormwater storage basins located along Scottsdale Road. The issue of draining the parcel inconsistent with the approved master plan should be evaluated as part of a revision to the approved stormwater master plan for Silverstone and submitted for City review and approval.

    Response: Per our conversation, the Master Drainage Report shows a drainage corridor through Parcel D. An Addendum to the Master Drainage Report, Addendum No. 2, was submitted to the City of Scottsdale One Stop Shop. Addendum No. 2 includes justification for draining the entire parcel to the west. This preliminary drainage report is consistent with Addendum No. 2.

14. The City still has concerns about proposed improvements and grading located at the south end of the scenic corridor along Scottsdale Road and the ability of the future developer of parcel D to tie-in to these improvements. In short, provisions will need to be included in the design of the project to allow the future developer of parcel D to tie into the proposed storm drain outlet at an elevation that is consistent with the grading design proposed by this project. Additionally, the design of southern end of the southern stormwater storage basin includes a berm or levee that may be subject to failure.

    Response: Please see Section 3.7 (page 11) of the report where we address these comments. The outfall has been elevated, a temporary construction easement is planned, and cut-off walls have been added.

15. Section 5.2 of the report should clarify if proposed storm drains will be designed to convey 100-year flows.

    Response: A bullet point has been added to Section 5.2.

16. Section 3.7 states the outfall elevation of headwalls will be raised one foot above the basin bottom for water quality purposes. The City will allow up to a maximum of up to 6 inches of depth of retention for basins designed as detention basins and 3 inches is preferable due to the potential for standing water.

    Response: Section 3.7 has been update to say "3-6 inches".

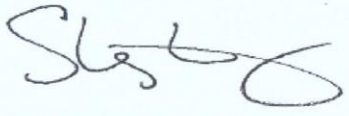
17. Please provide a pdf copy of the preliminary drainage report with the revised drainage report for City records.

    Response: Provided

If you have any further questions, please contact me at 602-906-1121 or by email at steve.haney@kimley-horn.com.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.



Steve Haney, P.E.

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PRELIMINARY DRAINAGE REPORT

Mark-Taylor Silverstone Apartments
Scottsdale, Arizona

Case No. 53-DR-5014

Prepared For:

Mark-Taylor Residential
6623 North Scottsdale Road
Scottsdale, Arizona 85250

Prepared By:

Kimley-Horn and Associates, Inc.
7740 North 16th Street
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191769002
April 2015

List of Appendices

A Site Location Map and Legal Description

B FEMA Federal Insurance Rate Map (FIRM)

C Hydrologic/Hydraulic Calculations

D Master Drainage Report and Amendments to Master Drainage Report

E Letter of Map Revision Technical Data Notebook

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Figure 1: Context Aerial Plan

Figure 2: Preliminary Grading and Drainage Plan

Figure 3: Existing Conditions Topographic Map

Figure 4: Site Basin Delineation

Figure 5: Manufactured Grade Exhibit (by others)

Figure 6: Highest Adjacent Grade (HAG) Exhibit

1.0 Introduction

1.1 Project Description

Mark-Taylor Residential is proposing to construct a multi-family housing development on Parcel E of Silverstone at Pinnacle Peak, which is located at the southeast corner of Scottsdale Road and Silverstone Drive. The project is anticipated to consist of a multi-family housing development and associated site infrastructure, including drive aisles, parking areas, and underground utilities.

1.2 Site Location

The proposed development encompasses approximately 16.7± net acres in a portion of the Northwest Quarter of Section 14, Township 4 North, Range 4 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. The parcel is bounded by Silverstone Drive and the City of Scottsdale Appaloosa Library to the north, 74th Street to the east, vacant land to the south, and Scottsdale Road to the west. See Appendix A for the site location map and legal description. See Figure 1 in Appendix F for a Context Aerial Map.

The site is located at the former "Rawhide" western theme park area. Based on site observations, the structures associated with the theme park have been demolished, however, grading features including a raised race track, local drainage ditches, and unpaved roadways are present on the site.

1.3 Purpose

This Preliminary Drainage Report is intended to satisfy City of Scottsdale requirements and demonstrate conformance to the overall drainage characteristics of the area. This report provides a description of the current storm water drainage patterns and systems and a description of the required and proposed drainage improvements.

1.4 Objectives

This report provides a drainage plan for the subject 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. Buildings and site amenities will be elevated such that regional storm water flows from Rawhide Wash do not adversely impact the development.
2. Permanent drainage facilities will have a positive outfall, and any detained storm water will be disposed of within 36 hours.
3. 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.

4. Storm water detention is provided for the difference between the pre-development and post-development storm water volume.

5. Building finished floor elevations are in compliance with FEMA and City of Scottsdale requirements.

6. The proposed drainage plan for the site will be in general conformance to the Master Drainage Report for Silverstone, prepared by Wood, Patel & Associates, March 2007 and subsequent revisions by Wood, Patel & Associates and Kimley-Horn and Associates, Inc.

2.0 Description of Existing Drainage Conditions and Characteristics

2.1 Existing Drainage Conditions

The site currently consists of vacant land. The site is a portion of the previously demolished "Rawhide" western theme park. The general topography of the site slopes from the northeast to the southwest at approximately 2%. However, grading features including a raised race track, several small on-site drainage ditches, and unpaved access roads remain from the theme park use. The race track area is elevated approximately 10 feet above the surrounding areas and the largest of the remaining on-site drainage ditches is approximately 16 feet wide and four feet deep. Desert vegetation exists throughout the site. A drainage channel exists along the east side of Scottsdale Road. This drainage channel is approximately 18 feet wide, three feet deep, and flows south at a slope of 1.4%.

The remaining portion of the raised race track acts as a large berm, directing storm water from the western portion of the site to the existing Scottsdale Road drainage channel, while the storm water from the eastern portion of the site exits the site as sheet flow across the southern property line. Shortly after crossing the southern property line, this sheet flow is concentrated along the raised race track. One existing opening is located at the downstream side of the raised race track.

For the 100-year, 2-hour rainfall event, approximately 37 cfs exits the site at the Scottsdale Road drainage channel, and approximately 43 cfs exits the site as sheet flow along the southern property line.

An 18" storm drain stub connecting to the underground storm drain in 74th Street appears to be present at the southeast corner of the site; however, its location and purpose are undocumented in the Master Drainage Report for Silverstone.

Refer to Figure 3 in Appendix F for the Existing Conditions Topographic Map.

2.2 Existing Off-Site Drainage Conditions

The Rawhide Wash regional drainage channel improvements were recently completed approximately 1,000 feet to the north of the project site. These improvements consist of a 300 foot wide, eight foot deep drainage channel that is designed to convey a peak flow of 12,400 cfs from areas north and east of the site. This channel discharges storm water onto open desert on the west side of Scottsdale Road where it continues to overland flow to the southwest.

It is our understanding that a Letter of Map Revision (LOMR) is has been submitted to FEMA in conjunction with the Rawhide Wash regional drainage improvements. This LOMR would remove significant areas surrounding Rawhide Wash from Flood Zone AO. At the time of this report, the LOMR is under review by FEMA and it is not anticipated that this review will be completed prior to the construction of the proposed development.

Based on the Letter of Map Revision Technical Data Notebook, prepared by Wood, Patel & Associates in May 2014, the Rawhide Wash outfall on the west side of Scottsdale Road is currently in an interim condition. This interim condition prevents the 100-year design flow of Rawhide Wash from passing under the Scottsdale Road bridge and onto the open land on the west side of Scottsdale Road. As a result of this restriction, a portion of the design flow overtops Scottsdale Road and Silverstone Drive and enters the project site. Refer to Appendix E for the LOMR Technical Data Notebook.

The adjacent portions of Silverstone Drive and 74th Street consist of paved roadways with curb and gutters and storm drain infrastructure. Storm water from Silverstone Drive is collected in catch basins and conveyed to the Rawhide Wash channel. Storm water from 74th Street is collected in catch basins and conveyed to the south through underground storm drain pipes.

The Appaloosa Library to the north of the project site detains the site-generated storm water runoff in multiple surface basins. These basins bleed off to the underground storm drain system in 74th Street.

The adjacent portion of Scottsdale Road consists of a paved roadway with no curb and gutters. Storm water from the adjacent half-street portion of Scottsdale Road flows to the existing drainage channel along Scottsdale Road and is conveyed to the south. The adjacent portion of the Scottsdale Road drainage channel is approximately 18 feet wide and four feet deep. There are no culverts under Silverstone Drive which convey storm water to this channel; therefore, this channel only conveys storm water from areas to the south of Silverstone Drive. Storm water from this drainage channel overtops Scottsdale Road approximately 500 feet south of the site and continues to flow to the southwest across undeveloped desert land.

The land to the south of the site consists of undeveloped desert land, which was previously used for the theme park. As such, there are portions of the raised race track and other grading features, but no buildings, present on the adjacent site to the south. Storm water from this site appears to flow to the south and west.

Based on the adjacent site conditions and the LOMR Technical Data Notebook, two sources of off-site flows affect the proposed development. The first source is the portion of the 100-year design flow from Rawhide Wash that overtops Scottsdale Road and Silverstone Drive, and the second source is the adjacent half-street portion of Scottsdale Road. Refer to Figure 3 in Appendix F for the Existing Conditions Topographic Map.

2.3 Context Relative to Adjacent Projects and Improvements

The improvements to the Rawhide Wash channel, Scottsdale Road, and Silverstone Drive have recently been completed. See Figure 1 in Appendix F for the Context Aerial Plan.

2.4 FEMA Flood Hazard Areas

The site is located in Flood Zone "AO" according to the Flood Insurance Rate Map 04013C1310L, dated October 16, 2013. Zone "AO" is designated by FEMA as "areas of flood depths of 1 foot (usually sheet flow on sloping terrain) average depths determined for areas of alluvial fan flooding, velocities also determined." Refer to Appendix B for the FEMA FIRMette map for the site. An elevation certificate will be required for each building constructed in this flood hazard designation.

3.0 Proposed Drainage Plan

3.1 General Description

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

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

3.2 Proposed Site Conditions

Site-generated storm water will be collected in multiple catch basins and conveyed to surface detention basins through underground storm drain pipes and overland flow.

This development will utilize surface detention basins located along Scottsdale Road in place of the existing Scottsdale Road channel, which is no longer necessary following the construction of the Rawhide Wash channel and Silverstone Drive. These two features effectively cut off any off-site flows from the north. The surface detention basins will bleed off to the existing Scottsdale Road channel to the south of the site. The basin outflow will be restricted to less than the existing flow of 80 cfs (combined previous discharge to the south of 37cfs +43 cfs) via pipe sizing/orifice plate/weir outfall.

As previously noted, the existing Scottsdale Road channel consists of an 18 foot wide and four foot deep channel. The proposed surface detention basins which will replace the adjacent portion of the Scottsdale Road channel will consist of three-foot deep undulating basins with native vegetation landscaping for a natural and aesthetic appearance. The proposed surface basins will be generally located in the same area as the existing channel, and will maintain a natural and undulating configuration.

Future developments to the south of the project site will be responsible for providing storm water detention for their sites.

3.3 Proposed Off-Site Conditions

No changes to the off-site conditions are proposed with these improvements. Storm water from adjacent portions of Silverstone Drive and 74th Street will continue to be collected in catch basins and conveyed to regional drainage facilities. Storm water from adjacent portions of Scottsdale Road will continue to flow to the Scottsdale Road channel.

A new sidewalk and a multi-use trail along Scottsdale Road will be installed as part of the site improvements. Drainage considerations will be outlined with the final drainage report to convey the storm water from Scottsdale Road across the sidewalk and trail without significant disturbance to these features.

As previously discussed, a portion of the storm water from the Rawhide Wash overtops Scottsdale Road and Silverstone Drive in the 100-year event and flows onto the project site. The extents of this flow are delineated in the LOMR Technical Data Notebook in Appendix E. As part of this analysis, the authors of the LOMR Technical Data Notebook performed a HEC-RAS analysis of the channel to determine the water surface elevations at various cross sections.

Two of these cross sections encompass a portion of the proposed site. The northern cross section, which is labeled RS 1889, is located near the northwest corner of the site and indicates a water surface elevation of 1814.2 for the design flow. The southern cross section, which is labeled RS 1709, is located near the southwest corner of the site and indicates a water surface elevation of 1810.2. The proposed building finished floor elevations adjacent to these cross sections are 1818.0 for the northern cross section (3.8 feet above adjacent water surface elevation) and 1815.8 for the southern cross section (5.6 feet above adjacent water surface elevation). Based on the finished floor elevations being several feet above the adjacent water surface elevations, off-site flows are not anticipated to affect the proposed buildings.

As part of the Final Drainage Report, the HEC-RAS cross sections adjacent to the proposed development will be updated to reflect the proposed grading. The updated water surface elevations and limits of inundation will be included with the Final Drainage Report. Based on the results of this analysis, appropriate design measures will be taken to ensure that the flows can safely pass through the site without significant impact to site walls, utilities, and amenities.

3.4 Future Conditions

The roadways to the north and east of the site are in their built-out conditions; therefore, these areas are not anticipated to have any future impacts to the project site. The area to the south is undeveloped, and any future developments in this area will be responsible for on-site management of storm water runoff.

Based on conversations with City of Scottsdale staff, improvements to Scottsdale Road adjacent to the site will be completed by the City in the next five to seven years. At this time, Scottsdale Road will be widened and a raised median will be constructed. The sidewalk and multi-use trail that are to be installed by the developer as part of these improvements will be located to coincide with the anticipated future improvements to Scottsdale Road.

It is also anticipated that at some point in the future the Rawhide Wash outfall will be completed to its final condition. At this point, off-site flows would no longer be anticipated to affect the site. The completion of this outfall would involve coordination

between the City of Scottsdale, the City of Phoenix, the Arizona State Land Department, and FEMA. At the time of this report it is not clear when the final outfall conditions will be constructed.

3.5 Storm Water Storage Requirements

According to the Master Drainage Report for Silverstone, prepared by Wood, Patel & Associates, Inc. in March 2007 (Master Drainage Report), the required detention volume for the parcel is approximately 130,000 cubic feet. This volume contemplates detention for the 100-year, 2-hour rainfall event associated with the NOAA Atlas 14 rainfall depths. Due to the site's previous development, storm water storage will be provided for the difference between the pre-development and post-development storm water runoff volume. A revision to the Master Drainage Report that reflects this change will be submitted along with this Preliminary Drainage Report for the proposed development.

Storm water storage will not be provided for Silverstone Drive or 74th Street due to the presence of existing storm drain infrastructure. Storm water in excess of the pre-development vs. post-development volume will flow to the surface detention basins and will continue to the remaining portion of the Scottsdale Road drainage channel to the south, in accordance with the pre-development conditions.

Table 1 below summarizes the contributing area, runoff coefficient for the contributing area, and the required and provided retention volumes.

Table 1: Storm Water Volume Required

Basin	Land Use	Pre-Exist. Runoff Coefficient, [C_{PRE}]	Post-Dev. Runoff Coefficient, [C_{POST}]	Runoff Coefficient [$C=C_{POST}-C_{PRE}$]	Drainage Area (ft^2)	Required Volume (ft^3)	Provided Volume (ft^3)	Surplus (ft^3)
A	Landscaping	0.45	0.45	0.00	143,569	0		
	Building	0.45	0.95	0.50	103,977	10,441		
	Pavement	0.45	0.95	0.50	134,591	12,072		
					382,137	22,513	22,954	441

Basin	Land Use	Pre-Exist. Runoff Coefficient, [C_{PRE}]	Post-Dev. Runoff Coefficient, [C_{POST}]	Runoff Coefficient [$C=C_{POST}-C_{PRE}$]	Drainage Area (ft^2)	Required Volume (ft^3)	Provided Volume (ft^3)	Surplus (ft^3)
B	Landscaping	0.45	0.45	0.00	153,306	0		
	Building	0.45	0.95	0.50	93,281	9,367		
	Pavement	0.45	0.95	0.50	128,931	11,654		
					375,518	21,021	21,545	524

Refer to Figures 2 and 4 in Appendix F for the Preliminary Grading and Drainage Plan and the Site Basin Delineation, respectively. Refer to Appendix C for the Hydrologic/Hydraulic Calculations.

3.6 Pre- and Post-Development Runoff Characteristics at Concentration Points

The existing site consists of approximately 16.7 acres of vacant land that drains from the northeast to the southwest. Due to the current topography, there is no single concentration point for the storm water flows generated by the project site. As previously discussed, in the pre-developed condition approximately 37 cfs exits the site at the existing Scottsdale Road channel and approximately 43 cfs exits the site as sheet flow along the southern property line.

The post-development flow at the Scottsdale Road channel will be maintained at a rate less than 80 cfs (combined total of 37 cfs and 43cfs). For events where the storage capacity of the surface basins along Scottsdale Road is not exceeded, storm water will be discharged from these basins to the Scottsdale Road channel at a rate of approximately 10 cfs. For events up to the 100-year, 2-hour design storm event, storm water will overtop the surface basins and flow to the remaining portion of the Scottsdale Road channel at a rate that will be controlled by a weir condition at the southern (downstream) end of the surface basin. This weir will be sized such that the combined weir flow and pipe flow does not exceed the pre-development flow of 80 cfs at this location consistent with the Master Drainage Report Addendum No.2. Supporting calculations will be provided with the Final Drainage Report.

The proposed outfall elevation of the surface detention basins will be set above existing grade, which will allow the future development on the south parcel the option of continuing this storm drain pipe, or providing a channel within the Scottsdale Road scenic corridor setback. As previously mentioned, post-development flows will be not exceed pre-development flows, which will benefit the downstream development by decreasing the size of pipe or channel required to convey this flow.

3.7 Proposed Drainage Structures or Special Drainage Facilities

Storm water quality will be maintained by elevating the outfall headwalls 3-6 inches above the basin bottom. This will allow the first flush of storm water to remain in the basin, where it will be disposed of via natural percolation. Orifice plates or pipe sizing will be used to meter the storm water outflow; sizing will be included with the Final Drainage Report. A temporary construction easement will be provided at the basin outfall to the property to the south. The easement will allow future development of that parcel to tie-in or modify the outfall to accommodate its design.

Detention basins that involve berms/levees will incorporate cut off walls to reduce the potential for basin failure due to piping and erosion. Cutoff wall design will be provided with the final design.

The building finished floor elevations have been set at a minimum of two feet above natural grade to satisfy construction requirements within the floodplain area of Zone AO. Per the FEMA map, this area is subject to 1' depth of sheet flow.. FEMA requires that buildings placed within Zone AO have finished floor elevations placed above the depth of sheet flow and the City of Scottsdale requires that buildings in Zone AO have one

additional foot of freeboard above the depth of sheet flow. Therefore, the building finished floor elevation needs to be at least two feet above the highest adjacent natural grade.

Many of the apartment buildings have attached garages that are at a lower elevation than the livable areas. Typically the lowest point of the garage is at the garage door entry, which is eight inches below the livable area floor elevation. For these cases, the lowest point of the garage is set at a minimum of two feet above the natural grade, thereby setting the livable area elevation two feet, eight inches above the natural grade.

Due to the previous grading of the site, it was necessary to determine the natural grade of the area prior to the theme park use. A Manufactured Grade Exhibit was reviewed and approved as part of the Preliminary Drainage Report for The Collection at Silverstone, prepared by Terrascape Consulting (June 2011). This exhibit was used to develop the natural grade contours for the site. The building finish floor elevations were set a minimum of two feet above these grades. Refer to Figure 5 in Appendix D for the Manufactured Grade Exhibit (prepared by Terrascape Consulting, June 2011).

For the proposed buildings, the highest adjacent natural grade (HAG), proposed lowest finished floor elevation (LF), and elevation difference are provided in Table 2 below. The lowest finished floors of the proposed buildings are two feet or more above the highest adjacent natural grade, and are therefore in compliance with FEMA and City of Scottsdale requirements. See Figure 6 in Appendix F for natural grade contours compared to proposed grade contours.

Table 2: Building Highest Adjacent Natural Grade (HAG) and Lowest Finish Floor Elevations (LF)

Building	HAG Elevation	LF Elevation	Difference
Building A	14.3	20.1	5.8
Building B	21.5	23.6	2.1
Building C	18.1	20.5	2.4
Building D	14.4	19.4	5.0
Building E	18.5	20.6	2.1
Building F	21.8	23.9	2.1
Building G	15.6	17.7	2.1
Building H	13.1	15.2	2.1
Building I	10.0	13.1	3.1
Building J	7.7	10.8	3.1
Building K	9.5	14.1	4.6
Building L	9.3	15.8	6.5
Building M	11.6	16.7	5.1
Building N	13.1	16.6	3.5
Building O	15.9	18.0	2.1
North Guard Shack	15.6	20.6	5.0
South Guard Shack	15.9	17.9	2.0
Garage 1	20.6	22.7	2.1
Garage 2	4.6	13.7	9.1
Cabana	10.5	18.6	8.1
Maintenance	5.5	14.5	9.0

3.8 ADEQ AZPDES requirements

An executed Notice of Intent (NOI) will 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 storm water 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.

3.9 Project Phasing

This project will be constructed in a single phase.

4.0 Special Conditions

4.1 404 Discussion

Due 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 proposed site.

For analysis of the proposed improvements, the site was sub-divided into 90 sub-basins consisting of paved areas, building areas, or landscaped areas. For each sub-basin, the Rational equation will be used to calculate the peak flow at each concentration point for each basin. The results of the Rational equation are located in Appendix C. Figure 4, which identifies the drainage sub-basin and concentration points, is located in Appendix F.

5.2 Hydraulic Procedures, Methods, Parameter Selection, and Assumptions

The site is divided into 90 sub-basins that drain into multiple storm drain systems. See Figure 4 in Appendix F for sub-basin boundaries and concentration points associated with each drainage basin.

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 of the drainage basins will assume a runoff coefficient of 0.95 (100-year) and 0.85 (10-year) with the exception of the landscape sub-basins. Due to the pervious material in these areas, a runoff coefficient of 0.45 was used per the City of Scottsdale Design Standards and Policy Manual.

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

- A maximum allowable 100-year ponding depth of six inches above the catch basin grate.
- The tailwater condition for the 100-year event will be assumed to be the high water elevation of the surface detention basin.
- The 10-year tailwater condition will be assumed to be the pipe crown at the outfall.
- The 10-year storm HGL shall be contained within the storm drain pipe.
- The 100-year storm HGL shall be contained below the ground/rim elevations.

The software program StormCAD, by Bentley Systems, will be used for the hydraulic modeling, and the results will be included 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.

Storm water quality will be maintained by elevating the surface basin outfall above the bottom of the basin, so that the first flush of storm water runoff is retained within the basin.

5.3 Storm Water Storage Calculation Methods and Assumptions

Storm water storage requirements were calculated per City of Scottsdale and Flood Control District of Maricopa County design standards. The standard formula for determining the required storage volumes is as follows:

Equation 2: Standard Formula for On-Site Storage Requirement

$$V_R = CPA/12$$

Where:

V_R = storage volume required (cubic feet)

C = difference between pre-development and post-development runoff coefficients (0.50 for buildings/pavement, 0 for landscape areas)

P = precipitation depth for 100-year, 2-hour event = 2.41 inches

A = contributing drainage area to basin (square feet)

Refer to Appendix C for the Hydrological Calculations.

6.0 Conclusion

6.1 Overall Project

Based on the results of this preliminary drainage report, the following can be concluded:

- Off-site storm water flows from Rawhide Wash are not anticipated to adversely impact the site due the building finished floor elevations which are several feet above the water surface elevation of the off-site flows.
- With the City's approval of Addendum No. 2 to the Master Drainage Report for Silverstone, storm water detention will be provided in surface basins for the difference between the pre-development and post-development storm water volume.
- Storm water will be discharged to the Scottsdale Road channel and the southern property line, in accordance with pre-development conditions.
- Based on the current Flood Insurance Rate Map (FRIM), the site is located in the Zone "AO".
- Drainage easements will be provided for the storm drain infrastructure as required by the City of Scottsdale.

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

7.0 References

1. City of Scottsdale, *Design Standards and Policies Manual, Chapter 4: Grading and Drainage,* January 2010.

2. Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map (FIRM) of Maricopa County, Arizona and Incorporated Areas, Panel 1310 of 4425, Map Number 04013C1310L*, October 16,2013.

3. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Hydrology Volume, February*, 2008.

4. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Hydraulics Volume,* January, 1996.

5. Kimley-Horn and Associates, Inc. *Addendum No. 2 to the Master Drainage Report for Silverstone*, April 2015.

6. Terrascape Consulting, LLC. *Preliminary Drainage Report for Collection at Silverstone*, June 2011.

7. Wood, Patel, & Associates, Inc. *Design Report for Rawhide Wash Channel at Silverstone*, June 2007.

8. Wood, Patel, & Associates, Inc. *Master Drainage Report for Silverstone*, March 2007.

9. Wood, Patel, & Associates, Inc. *Addendum No. 1 to the Master Drainage Report for Silverstone*, February 2014.

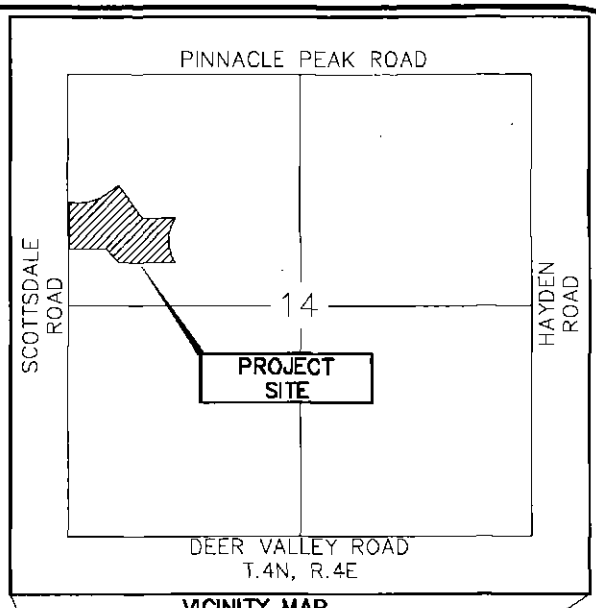
10. Wood, Patel, & Associates, Inc. *Rawhide Wash (at Silverstone) Letter of Map Revision Technical Data Notebook*, May 2014.

Appendix A

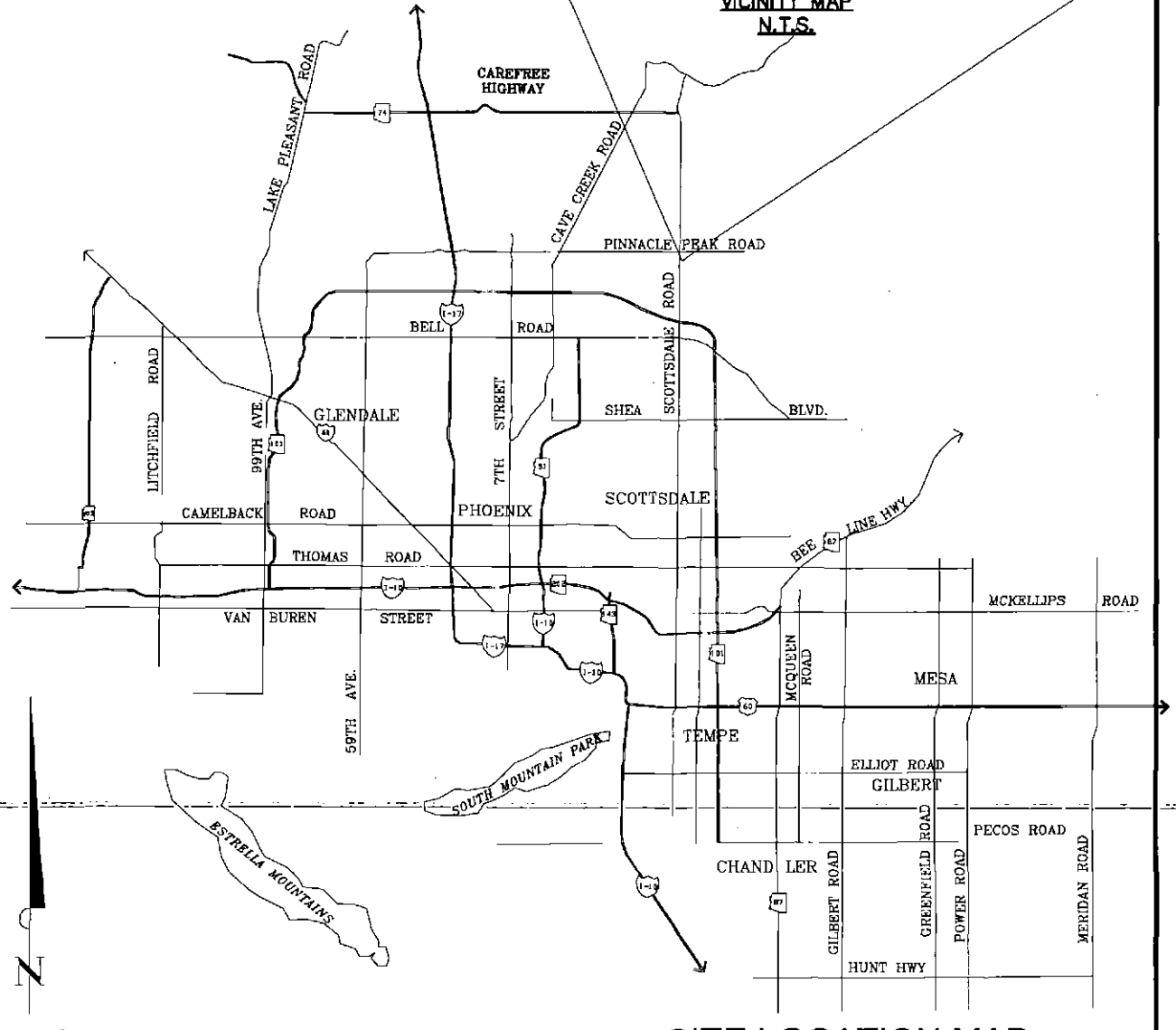
Site Location Map and Legal Descriptions

PROJECT INFORMATION

SITE ADDRESS: SEC OF SCOTTSDALE ROAD AND SILVERSTONE DRIVE



VICINITY MAP
N.T.S.



(N.T.S.)

SITE LOCATION MAP

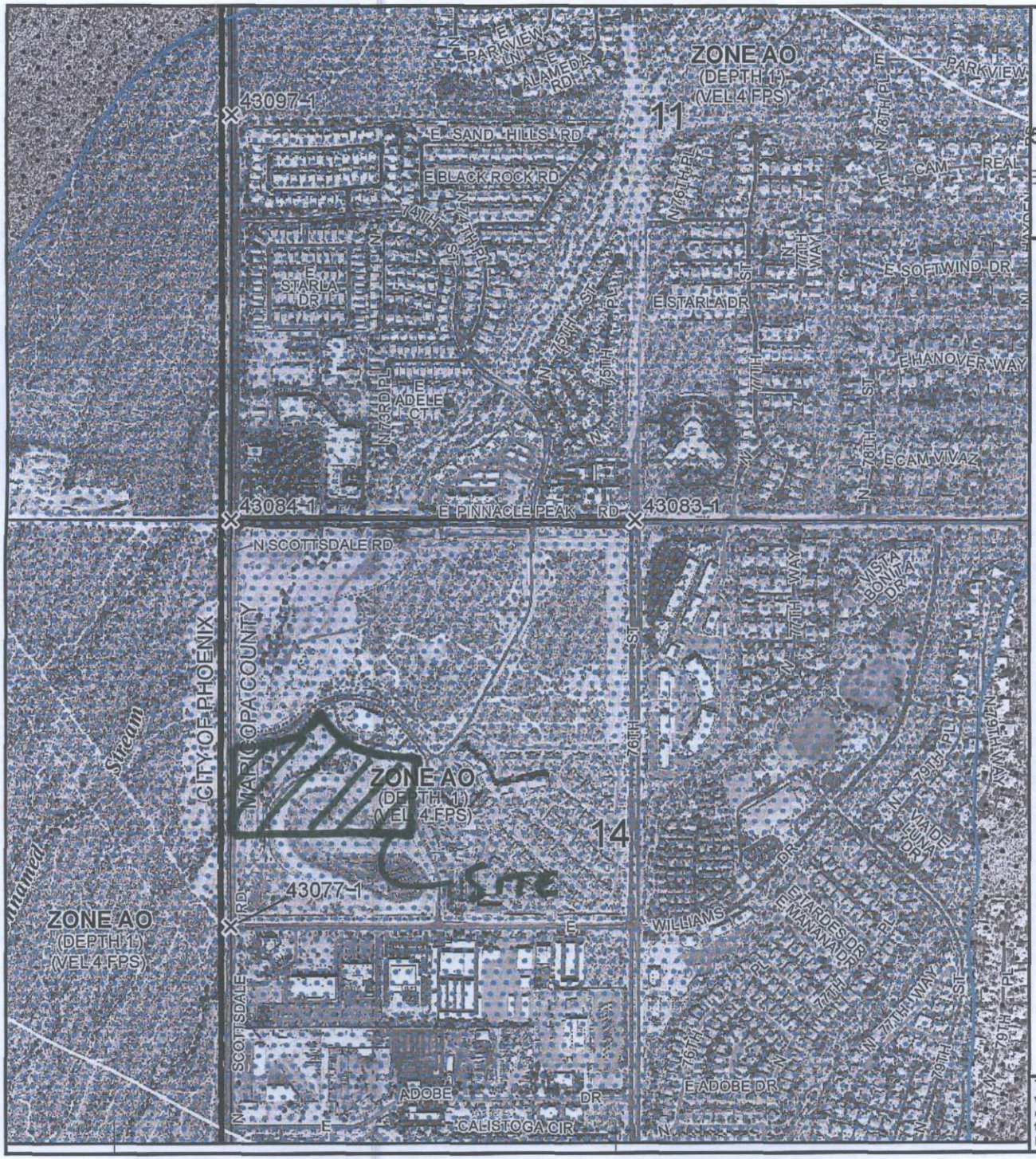
Kimley»Horn

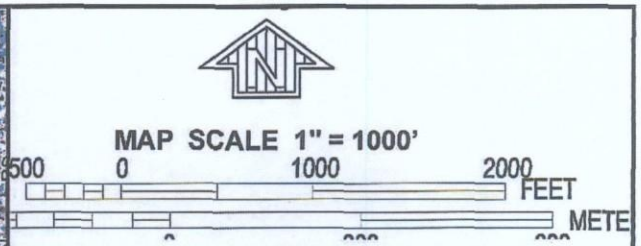
LEGAL DESCRIPTION:

PARCEL E, SILVERSTONE AT PINNACLE PEAK, ACCORDING TO THE PLAT OF RECORD IN THE OFFICE OF THE COUNTY RECORDER OF MARICOPA COUNTY, ARIZONA, RECORDED IN BOOK 883 OF MAPS, PAGE 17.

Appendix B

FEMA Flood Insurance Rate Map (FIRM)





NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1310L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1310 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1310	L
PHOENIX, CITY OF	040051	1310	L
SCOTTSDALE, CITY OF	045012	1310	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
04013C1310L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

Appendix C

Hydrologic/Hydraulic Calculations

Overall Retention Summary - SEC of Scottsdale Road and Silverstone Drive										
Drainage Area	Land Use	Area [A]		Pre-Exist. Runoff Coefficient, [C_{PRE}]	Post-Dev. Runoff Coefficient, [C_{POST}]	Runoff Coefficient [$C=C_{POST}-C_{PRE}$]	Precipitation Depth [P]	Required Storage (V_{REQ} = CPA/12)		Retention Basin
		sf	ac				in	cf	ac-ft	
5	Landscaping	19,696	0.452	0.45	0.45	0.00	2.41	0	0.000	A
10	Pavement	4,291	0.099	0.45	0.95	0.50	2.41	431	0.010	A
15	Pavement	6,063	0.139	0.45	0.95	0.50	2.41	609	0.014	A
20	Pavement	4,293	0.099	0.45	0.95	0.50	2.41	431	0.010	A
25	Landscaping	1,093	0.025	0.45	0.45	0.00	2.41	0	0.000	A
30	Building	7,500	0.172	0.45	0.95	0.50	2.41	753	0.017	A
35	Building	7,920	0.182	0.45	0.95	0.50	2.41	795	0.018	A
40	Landscaping	2,678	0.061	0.45	0.45	0.00	2.41	0	0.000	A
45	Landscaping	4,331	0.099	0.45	0.45	0.00	2.41	0	0.000	A
50	Building	2,232	0.051	0.45	0.95	0.50	2.41	224	0.005	A
55	Pavement	3,622	0.083	0.45	0.95	0.50	2.41	364	0.008	A
60	Pavement	12,086	0.277	0.45	0.95	0.50	2.41	1,214	0.028	A
65	Landscaping	1,057	0.024	0.45	0.45	0.00	2.41	0	0.000	A
70	Building	7,490	0.172	0.45	0.95	0.50	2.41	752	0.017	A
75	Building	7,967	0.183	0.45	0.95	0.50	2.41	800	0.018	A
80	Landscaping	4,323	0.099	0.45	0.45	0.00	2.41	0	0.000	A
85	Pavement	7,377	0.169	0.45	0.95	0.50	2.41	741	0.017	A
90	Landscaping	6,659	0.153	0.45	0.45	0.00	2.41	0	0.000	A
95	Pavement	32,732	0.751	0.45	0.95	0.50	2.41	3,287	0.075	A
100	Building	2,620	0.060	0.45	0.95	0.50	2.41	263	0.006	A
105	Landscaping	3,000	0.069	0.45	0.45	0.00	2.41	0	0.000	A
110	Landscaping	1,465	0.034	0.45	0.45	0.00	2.41	0	0.000	A
115	Building	8,995	0.206	0.45	0.95	0.50	2.41	903	0.021	A
120	Building	9,306	0.214	0.45	0.95	0.50	2.41	934	0.021	A
125	Landscaping	6,410	0.147	0.45	0.45	0.00	2.41	0	0.000	A
130	Landscaping	16,977	0.390	0.45	0.45	0.00	2.41	0	0.000	A
135	Landscaping	1,067	0.024	0.45	0.45	0.00	2.41	0	0.000	A
140	Building	7,426	0.170	0.45	0.95	0.50	2.41	746	0.017	A
145	Building	8,036	0.184	0.45	0.95	0.50	2.41	807	0.019	A
150	Landscaping	21,451	0.492	0.45	0.45	0.00	2.41	0	0.000	A
155	Landscaping	1,101	0.025	0.45	0.45	0.00	2.41	0	0.000	B
160	Pavement	20,699	0.475	0.45	0.95	0.50	2.41	2,079	0.048	B
165	Pavement	12,644	0.290	0.45	0.95	0.50	2.41	1,270	0.029	B
170	Landscaping	1,066	0.024	0.45	0.45	0.00	2.41	0	0.000	B
175	Building	7,453	0.171	0.45	0.95	0.50	2.41	748	0.017	B
180	Building	8,008	0.184	0.45	0.95	0.50	2.41	804	0.018	B
185	Landscaping	21,094	0.484	0.45	0.45	0.00	2.41	0	0.000	B
190	Building	2,620	0.060	0.45	0.95	0.50	2.41	263	0.006	B
195	Landscaping	6,733	0.155	0.45	0.45	0.00	2.41	0	0.000	B
200	Pavement	13,566	0.311	0.45	0.95	0.50	2.41	1,362	0.031	B
205	Pavement	3,961	0.091	0.45	0.95	0.50	2.41	398	0.009	B
210	Landscaping	1,470	0.034	0.45	0.45	0.00	2.41	0	0.000	B
215	Building	9,008	0.207	0.45	0.95	0.50	2.41	905	0.021	B
220	Building	9,294	0.213	0.45	0.95	0.50	2.41	933	0.021	B
225	Landscaping	8,014	0.184	0.45	0.45	0.00	2.41	0	0.000	B
230	Pavement	3,863	0.089	0.45	0.95	0.50	2.41	388	0.009	B
235	Landscaping	6,370	0.146	0.45	0.45	0.00	2.41	0	0.000	B
240	Building	2,608	0.060	0.45	0.95	0.50	2.41	262	0.006	B
245	Landscaping	8,299	0.191	0.45	0.45	0.00	2.41	0	0.000	B
250	Landscaping	1,470	0.034	0.45	0.45	0.00	2.41	0	0.000	B
255	Building	9,020	0.207	0.45	0.95	0.50	2.41	906	0.021	B
260	Building	9,281	0.213	0.45	0.95	0.50	2.41	932	0.021	B
265	Building	2,232	0.051	0.45	0.95	0.50	2.41	224	0.005	B
270	Pavement	10,359	0.238	0.45	0.95	0.50	2.41	1,040	0.024	B
271	Pavement	7,978	0.183	0.45	0.95	0.50	2.41	801	0.018	B
275	Landscaping	12,998	0.298	0.45	0.45	0.00	2.41	0	0.000	B
280	Building	2,673	0.061	0.45	0.95	0.50	2.41	268	0.006	B
285	Pavement	12,053	0.277	0.45	0.95	0.50	2.41	1,210	0.028	B
290	Building	9,934	0.228	0.45	0.95	0.50	2.41	998	0.023	A
295	Landscaping	6,929	0.159	0.45	0.45	0.00	2.41	0	0.000	B
300	Building	9,130	0.210	0.45	0.95	0.50	2.41	917	0.021	A
305	Building	9,137	0.210	0.45	0.95	0.50	2.41	918	0.021	B
310	Landscaping	1,503	0.035	0.45	0.45	0.00	2.41	0	0.000	B
315	Pavement	5,732	0.132	0.45	0.95	0.50	2.41	576	0.013	B
320	Landscaping	4,445	0.102	0.45	0.45	0.00	2.41	0	0.000	B
325	Pavement	8,848	0.203	0.45	0.95	0.50	2.41	888	0.020	B
330	Building	1,083	0.025	0.45	0.95	0.50	2.41	109	0.002	B
335	Landscaping	6,625	0.152	0.45	0.45	0.00	2.41	0	0.000	B
340	Building	9,651	0.222	0.45	0.95	0.50	2.41	969	0.022	B
345	Building	8,592	0.197	0.45	0.95	0.50	2.41	863	0.020	B

Drainage Area	Land Use	Area [A]		Pre-Exist. Runoff Coefficient, [C_{PRE}]	Post-Dev. Runoff Coefficient, [C_{POST}]	Runoff Coefficient [$C=C_{POST}-C_{PRE}$]	Precipitation Depth [P]	Required Storage (V_{REQ} = CPA/12)		Retention Basin
		sf	ac				in	cf	ac-ft	
350	Landscaping	1,515	0.035	0.45	0.45	0.00	2.41	0	0.000	B
355	Pavement	3,411	0.078	0.45	0.95	0.50	2.41	343	0.008	B
360	Landscaping	903	0.021	0.45	0.45	0.00	2.41	0	0.000	B
365	Pavement	1,633	0.037	0.45	0.95	0.50	2.41	164	0.004	B
370	Pavement	5,702	0.131	0.45	0.95	0.50	2.41	573	0.013	B
375	Landscaping	4,478	0.103	0.45	0.45	0.00	2.41	0	0.000	B
380	Building	2,621	0.060	0.45	0.95	0.50	2.41	263	0.006	B
385	Pavement	5,608	0.129	0.45	0.95	0.50	2.41	563	0.013	B
390	Landscaping	2,235	0.051	0.45	0.45	0.00	2.41	0	0.000	A
395	Pavement	4,186	0.096	0.45	0.95	0.50	2.41	420	0.010	A
400	Landscaping	1,059	0.024	0.45	0.45	0.00	2.41	0	0.000	A
405	Building	7,424	0.170	0.45	0.95	0.50	2.41	745	0.017	A
410	Building	7,997	0.184	0.45	0.95	0.50	2.41	803	0.018	A
415	Landscaping	28,662	0.658	0.45	0.45	0.00	2.41	0	0.000	A
420	Landscaping	1,290	0.030	0.45	0.45	0.00	2.41	0	0.000	A
425	Pavement	11,797	0.271	0.45	0.95	0.50	2.41	1,185	0.027	A
430	Pavement	33,776	0.775	0.45	0.95	0.50	2.41	3,392	0.078	A
435	Landscaping	14,014	0.322	0.45	0.45	0.00	2.41	0	0.000	A
440	Landscaping	6,102	0.140	0.45	0.45	0.00	2.41	0	0.000	A
445	Landscaping	58,293	1.338	0.45	0.45	0.00	2.41	0	0.000	B
OS1	Pavement	14,368	0.330	0.95	0.95	0.00	2.41	0	0.000	A
OS2	Pavement	12,874	0.296	0.95	0.95	0.00	2.41	0	0.000	B
TOTAL	-	730,413	16.768	-	-	-	-	43,534	0.999	-

Basin	Land Use	Pre-Exist. Runoff Coefficient, [C_{PRE}]	Post-Dev. Runoff Coefficient, [C_{POST}]	Runoff Coefficient [$C=C_{POST}-C_{PRE}$]	Drainage Area (ft^2)	Required Volume (ft^3)	Provided Volume (ft^3)	Surplus (ft^3)
A	Landscaping	0.45	0.45	0.00	143,569	0		
	Building	0.45	0.95	0.50	103,977	10,441		
	Pavement	0.45	0.95	0.50	134,591	12,072		
					382,137	22,513	22,954	441

Basin	Land Use	Pre-Exist. Runoff Coefficient, [C_{PRE}]	Post-Dev. Runoff Coefficient, [C_{POST}]	Runoff Coefficient [$C=C_{POST}-C_{PRE}$]	Drainage Area (ft^2)	Required Volume (ft^3)	Provided Volume (ft^3)	Surplus (ft^3)
B	Landscaping	0.45	0.45	0.00	153,306	0		
	Building	0.45	0.95	0.50	93,281	9,367		
	Pavement	0.45	0.95	0.50	128,931	11,654		
					375,518	21,021	21,545	524

Appendix D

Master Drainage Report for Silverstone, Addendums No. 1 & 2 to the Master Drainage Report for Silverstone