PRELIMINARY DRAINAGE REPORT

Arabella Spa

Prepared for:

Erwin Architecture & Development, LLC
2236 E Sunland
Sedona, AZ 86336

Prepared by:

Kimley-Horn
201 N. Montezuma Street
Suite 206
Prescott, Arizona 86501

2916459000
March 2022

Kimley»Horn

Section **Page No.**

List of Appendices

Kimley»Horn

1.0 BACKGROUND

This Preliminary Drainage Design Report for the Arabella Spa (USPG) has been prepared to address the drainage requirements outlined in the City of Sedona – Design Review Engineering and Administrative Manual (DREAM) and Coconino County – Drainage Manual (CCDM). The main purposes of this report are the following:

- Illustrate compliance with the DREAM and CCDM by controlling post-project runoff to a level similar to pre-project conditions.
- Establish drainage parameters and criteria for design.

The project site (Site) is located east of AZ State Highway 179 on Sombart Lane. The Site is bounded by Arabella Hotel Sedona directly to the west, single family residential to the north and south. The Site is located within the City of Sedona, Section 18, Township 17 North, Range 06 East. The Site consists of parcel 40122036B with a combined area of approximately 5.42 acres. See **Appendix A** for a Vicinity Map.

This project will consist of the construction of a new spa site containing 4 new buildings, outdoor recreation amenities, new paved parking, and infrastructure that includes water, sewer, and drainage to service the site. The project will also include improvements to existing Sombart Lane.

Off-site runoff currently drains across the site. The majority of runoff will be collected in a series of catch basins, culverts and storm drain networks and directed to the north side of the site where it will be collected in an underground detention system underneath the parking lot adjacent to the northernmost building. A second detention system will collect runoff from the upper parking lot and offsite runoff flowing onto the parking lot. The two systems will outlet onto Sombart Lane, which is the ultimate concentration point.

2.0 METHODOLOGY

The rational method was used to determine the 2-, 10-, 25-, and 100-year peak discharges for pre- and post- project conditions. The CCDDM specifies using a 10-minute minimum time of concentration when determining rainfall intensities. However, under certain circumstances, the DDM allows for thew use of the 5-minute minimum time-of-concentration. Given the steep, rugged terrain of the site, a minimum 5-minute time-of-concentration was used, and as a result, the calculated times of concentration were less than 10 minutes. Results of this analysis can be found in **Appendix E**.

Rainfall depths and intensities were taken from the National Oceanic and Atmospheric Administration Atlas 14 (NOAA 14) for the Site. Existing and proposed subbasins were delineated based on the topographic survey and anticipated grading of the Site.

3.0 EXISTING CONDITIONS ANALYSIS

The existing site is an undeveloped parcel. The property slopes toward the existing Sombart Lane. Runoff drains to Sombart Lane to the south curb line. It then drains west in the curb line toward State Highway 179. Primarily one soil type is prevalent on the Site, summarized in **Table 1** below. Refer to **Appendix B** for the Soils Map.

Table 1. Soil Data

Soil Code	NRCS Soil Survey	Soil Type	Hydrologic Soil Group
406	AZ639	Sedona Soils, Turist soils, 3-15% slopes	D

There are no irrigation facilities near the Site. The site is covered with native trees and brush.

There is a large amount of offsite runoff flowing north onto the site in existing Drainage Basin DA-1. This runoff could greatly impact the proposed site. Therefore, a drainage channel on the south side of the project site is proposed that will convey drainage around the site and and will outlet onto Sombart Lane on large riprap energy dissipation apron. The runoff will then continue to flow west within Sombart Lane as it has historically.

3.1 FEMA FLOODPLAIN CLASSIFICATION

The Site falls within the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel Number 04005C7657G, effective date September 03, 2010. The entire site is defined as Zone X. The FEMA FIRMette is included as **Appendix C**.

4.0 PROPOSED CONDITIONS ANALYSIS

The developed site is divided into six (4) subbasins (1B-1E). Calculations comparing the pre-development and post-development flows are shown in **Appendix E**. The runoff from the spa site and main parking lot (Subbasins 1B-1D) will be directed into Detention System A. Prior to entering the detention system this runoff will pass through a series of stormdrain catch basins, pipes and culverts that will drain to the system. Onsite and offsite runoff (Basin 1E) draining to and from the upper parking area will drain to Detention System B through catch basins and stormdrain pipes. The remaining runoff from areas undeveloped, will drain as it has historically.

4.1 PROPOSED STORMWATER DETENTION

As previously stated, runoff from the spa site and parking areas will be directed to underground Detention Systems A and B. The basins will consist of a series of underground 48" diameter HDPE pipes. The systems will attenuate the 2-, 10-, 25- and 100-year peak runoff per the DREAM. Both systems use a weir structure inside a manhole with 2 orifices set at different elevations and an outlet pipe to allow outflow. One orifice is set at the invert of the outlet pipe and the other is set above. For system A the manhole and weir will be designed so that the 100-year water surface elevation is below the top of the weir. System B allows a small amount of flow to pass through a notch in the weir structure during the 100-year event. The top of the weir for both systems will be set at least 1' above the 100-year water surface elevation. The overtopping of the weir will provide the emergency overflow for the detention facility. Refer to **Table 2** and **Table 3** for the detention system summaries. The invert of the detentions systems of the pipes was set at 9.8 and 9.7 for basis of design, to account for a shallow slope to allow the pipes to drain at the outlet end. 10.0 was used as the invert elevation at for the inlet end. As a result the top of the pipes were set at 14.00. The stage elevations are based on these datums.

Table 2. Detention Basin A Summary

Storm Event	Peak Inflow (ft^3/s)	Stage (ft)	Storage (ft^3)
2-Yr	3.65	11.38	1,388
10-Yr	5.96	11.96	2,050
100-Yr	10.05	13.02	3,164

Table 3. Detention Basin B Summary

Storm Event	Peak Inflow (ft^3/s)	Stage (ft)	Storage (ft^3)
2-Yr	3.8	12.49	544
10-Yr	7.4	13.71	769
100-Yr	10.8	14.00	779

4.2 FIRST FLUSH TREATMENT

The first flush volume for the site will be treated and stored in the detention systems. First flush runoff (0.5 inches) from the impervious areas of each sub-basin will be stored at the lowest stage of the detention system. A summary of the first flush retention is shown below in **Table 3**.

Table 4. First Flush Retention Summary

Detention Basin	Runoff to Retain/Treat [in]	Impervious Area [ft^2]	Required Volume [ft^3]	Provided Volume [ft^3]
A	**0.5”**	45,009	1,782	0.041
B	**0.5”**	27,500	1,089	0.025

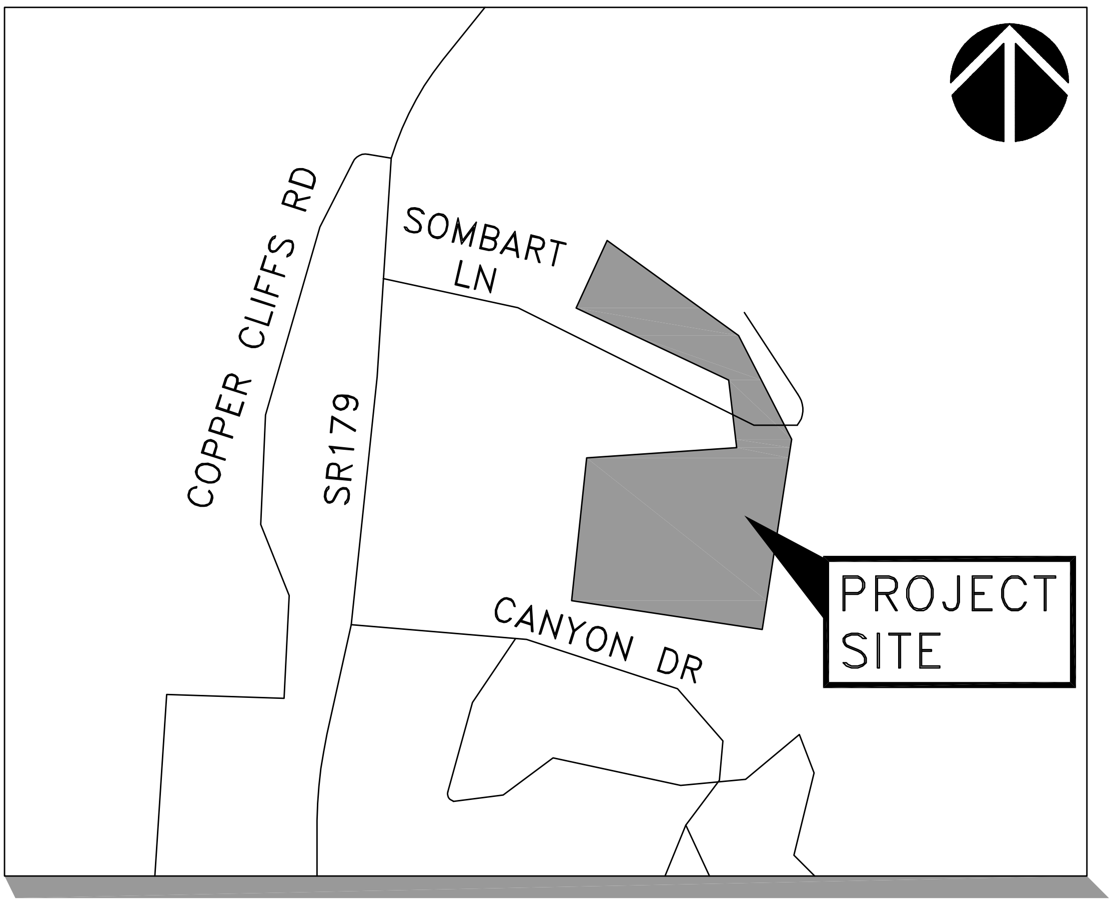
5.0 RESULTS

Stormwater runoff from the site will be attenuated by using the proposed detention system. Remaining runoff will be directed around the site to the historic concentration points and will not impact the detention systems. Most of the onsite runoff will be routed to the detention system and released at or below existing flows. No adjacent properties will be adversely impacted by the development of the site.

Kimley»Horn

Appendix A

Vicinity Map



VICINITY MAP

CITY OF SEDONA
N.T.S.

Kimley»Horn

Appendix B

USDA Soils Survey - Soils Map

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Black Hills-Sedona Area, Arizona, Parts of Coconino and Yavapai Counties

Arabella Spa Site

November 29, 2021

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,690 if printed on A landscape (11" x 8.5") sheet.

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Black Hills-Sedona Area, Arizona, Parts of Coconino and Yavapai Counties
Survey Area Data: Version 11, Sep 16, 2021

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

Date(s) aerial images were photographed: Dec 31, 2009—Oct 12, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
406	Sedona soils, Turist soils and Urban land, 3 to 15 percent slopes	11.4	68.7%
NOTCOM	No Digital Data Available	5.2	31.3%
Totals for Area of Interest		**16.6**	**100.0%**

Map Unit Descriptions

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

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

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

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

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

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

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

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

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

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

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

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

Black Hills-Sedona Area, Arizona, Parts of Coconino and Yavapai Counties

406—Sedona soils, Turist soils and Urban land, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1yld
Elevation: 3,700 to 5,000 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 57 to 62 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Sedona and similar soils: 34 percent
Turist and similar soils: 33 percent
Urban land: 33 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sedona

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium and/or residuum weathered from shale and/or mudstone

Typical profile

A - 0 to 2 inches: extremely channery loam
Btk1 - 2 to 10 inches: extremely channery silty clay loam
Btk2 - 10 to 18 inches: extremely flaggy silt loam
Cr - 18 to 60 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 12 to 18 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R038XB218AZ - Sandstone Hills 16-20

Hydric soil rating: No

Description of Turist

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

A - 0 to 1 inches: very channery sandy loam
Bw - 1 to 5 inches: channery clay loam
Bk1 - 5 to 10 inches: extremely channery loam
Bk2 - 10 to 16 inches: extremely channery loam
2R - 16 to 60 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 12 to 18 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R038XB218AZ - Sandstone Hills 16-20
Hydric soil rating: No

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

NOTCOM—No Digital Data Available

Map Unit Composition

Notcom: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Notcom

Properties and qualities

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Kimley»Horn

Appendix C

FEMA - FIRMette

National Flood Hazard Layer FIRMette

FEMA

111°46'5"W 34°51'38"N

111°45'28"W 34°51'8"N

Feet 0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 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*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- (B) 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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 1/20/2022 at 5:18 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.

Kimley»Horn

Appendix D

Drainage Area Map

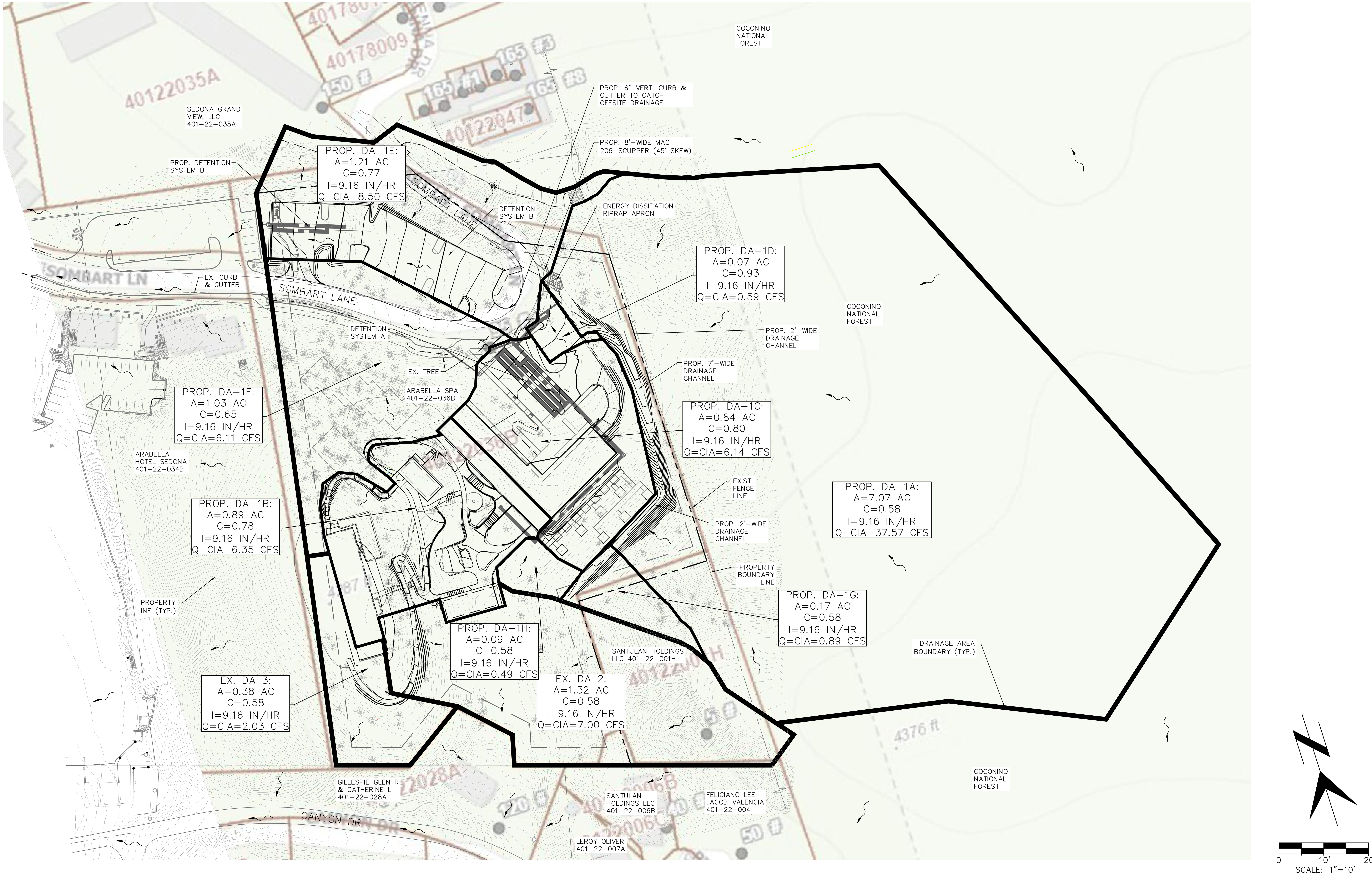
K:\PRS_Roadway\291658000 - Arabella Spa\CAD\Exhibits\DA-PRE.dwg Layout1 Feb 09, 2022 4:14pm by: Jake Levin

ARABELLA SPA - EXISTING DRAINAGE AREA MAP

12/2/2021

Kimley»Horn

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC. COPYRIGHT KIMLEY-HORN AND ASSOCIATES, INC., 2021



10/28/2021

ARABELLA SPA - PROPOSED DRAINAGE AREA MAP

Kimley»Horn

K:\PRS_Roadway\291659000 - Arabella Spa\CAD\Exhibits\DA-POST.dwg Layout1 Feb 09, 2022 4:12pm by: Jake.Levin

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC. COPYRIGHT KIMLEY-HORN AND ASSOCIATES, INC., 2021

Kimley»Horn

Appendix E

Hydrology Calculations

Kimley»Horn

Rainfall Information

General Project Information			
Project	Arabella Spa		
Project #	2916459000		
Designed by	JWL	Date	2/7/2022

NOAA 14 Rainfall Depth Data [in]										
	Storm Event [yr]									
Duration	1	2	5	10	25	50	100	200	500	1000
5-min:	0.215	0.277	0.373	0.453	0.566	0.661	0.763	0.873	1.03	1.17
10-min:	0.327	0.422	0.567	0.689	0.862	1.01	1.16	1.33	1.57	1.78
15-min:	0.405	0.523	0.703	0.854	1.07	1.25	1.44	1.65	1.95	2.2
30-min:	0.546	0.704	0.946	1.15	1.44	1.68	1.94	2.22	2.63	2.97
60-min:	0.676	0.871	1.17	1.42	1.78	2.08	2.4	2.75	3.25	3.67
2-hr:	0.798	1.01	1.33	1.61	2	2.32	2.68	3.07	3.64	4.11
3-hr:	0.858	1.09	1.39	1.65	2.03	2.35	2.71	3.1	3.67	4.14
6-hr:	1.05	1.3	1.61	1.89	2.29	2.61	2.96	3.33	3.88	4.32
12-hr:	1.35	1.67	2.03	2.34	2.76	3.09	3.43	3.77	4.24	4.63
24-hr:	1.7	2.11	2.63	3.05	3.63	4.09	4.55	5.04	5.7	6.22
2-day:	1.99	2.48	3.09	3.58	4.26	4.8	5.36	5.93	6.72	7.34
3-day:	2.15	2.68	3.34	3.88	4.64	5.25	5.87	6.53	7.44	8.15
4-day:	2.3	2.87	3.59	4.19	5.02	5.69	6.39	7.12	8.15	8.96
7-day:	2.7	3.36	4.17	4.84	5.77	6.51	7.29	8.1	9.22	10.1
10-day:	3.08	3.82	4.71	5.42	6.38	7.12	7.87	8.63	9.65	10.4
20-day:	3.99	4.95	6.01	6.81	7.84	8.6	9.35	10.1	11	11.6
30-day:	4.8	5.96	7.19	8.13	9.32	10.2	11	11.8	12.8	13.6
45-day:	5.68	7.05	8.53	9.66	11.1	12.2	13.3	14.3	15.6	16.5
60-day:	6.64	8.23	9.89	11.1	12.7	13.8	14.9	15.9	17.1	18

NOAA 14 Rainfall Intensity [in/hr]										
	Storm Event									
Duration	1	2	5	10	25	50	100	200	500	1000
5-min:	2.58	3.32	4.48	5.44	6.79	7.93	9.16	10.48	12.36	14.04
10-min:	1.96	2.53	3.40	4.13	5.17	6.06	6.96	7.98	9.42	10.68
15-min:	1.62	2.09	2.81	3.42	4.28	5.00	5.76	6.60	7.80	8.80
30-min:	1.09	1.41	1.89	2.30	2.88	3.36	3.88	4.44	5.26	5.94
60-min:	0.68	0.87	1.17	1.42	1.78	2.08	2.40	2.75	3.25	3.67
2-hr:	0.40	0.51	0.67	0.81	1.00	1.16	1.34	1.54	1.82	2.06
3-hr:	0.29	0.36	0.46	0.55	0.68	0.78	0.90	1.03	1.22	1.38
6-hr:	0.18	0.22	0.27	0.32	0.38	0.44	0.49	0.56	0.65	0.72
12-hr:	0.113	0.139	0.169	0.195	0.230	0.258	0.286	0.314	0.353	0.386
24-hr:	0.071	0.088	0.110	0.127	0.151	0.170	0.190	0.210	0.238	0.259
2-day:	0.041	0.052	0.064	0.075	0.089	0.100	0.112	0.124	0.140	0.153
3-day:	0.030	0.037	0.046	0.054	0.064	0.073	0.082	0.091	0.103	0.113
4-day:	0.024	0.030	0.038	0.044	0.053	0.060	0.067	0.075	0.086	0.094
7-day:	0.016	0.020	0.025	0.029	0.034	0.039	0.043	0.048	0.055	0.060
10-day:	0.013	0.016	0.020	0.023	0.027	0.030	0.033	0.036	0.040	0.043
20-day:	0.008	0.010	0.013	0.014	0.016	0.018	0.019	0.021	0.023	0.024
30-day:	0.007	0.008	0.010	0.011	0.013	0.014	0.015	0.016	0.018	0.019
45-day:	0.005	0.007	0.008	0.009	0.010	0.011	0.012	0.013	0.014	0.015
60-day:	0.005	0.006	0.007	0.008	0.009	0.010	0.010	0.011	0.012	0.013

Kimley»Horn

Rational Method Calculations

General Project Information			
Project #	Arabella Spa		
Designed by	JWL	Date	11/15/21
Design Storm Event	2		
Minimum T_c [min]	10		

Drainage Area Information					Hydrology				
Drainage Area	Longitudinal Slope, S_l [ft/ft]	Rational Coefficient	Flowpath Length [ft]	Area [ac]	FCDMC Resistance Coefficient Type	Kb	I [in/hr]	T_c [min]	Q [cfs]
EX. DA-1	0.108	0.29	*1,116*	*11.15*	*C*	*0.124*	*2.53*	*10.4*	*8.19*
EX. DA-2	0.247	0.27	*360*	*1.49*	*C*	*0.146*	*2.53*	*10.0*	*1.02*
EX. DA-3	0.110	0.27	*182*	*0.43*	*C*	*0.159*	*2.53*	*10.0*	*0.29*
DA-1A	0.170	0.27	*811*	*7.36*	*C*	*0.128*	*2.53*	*10.0*	*5.03*
DA-1B	0.138	0.63	*253*	*0.89*	*A*	*0.040*	*2.53*	*10.0*	*1.42*
DA-1C	0.073	0.71	*384*	*0.77*	*A*	*0.041*	*2.53*	*10.0*	*1.38*
DA-1D	0.115	0.72	*87*	*0.10*	*A*	*0.046*	*2.53*	*10.0*	*0.18*
DA-1E	0.130	0.62	*453*	*1.21*	*A*	*0.039*	*2.53*	*10.0*	*1.89*
DA-1F	0.154	0.39	*376*	*1.03*	*A*	*0.040*	*2.53*	*10.0*	*1.01*
DA-2	0.249	0.28	*374*	*1.32*	*C*	*0.147*	*2.53*	*10.0*	*0.93*
DA-3	0.123	0.29	*179*	*0.38*	*C*	*0.161*	*2.53*	*10.0*	*0.28*

Kimley»Horn

Rational Method Calculations

General Project Information			
Project #	Arabella Spa		
Designed by	JWL	Date	11/15/21
Design Storm Event	10		
Minimum T_c [min]	10		

Drainage Area Information					Hydrology				
Drainage Area	Longitudinal Slope, S_l [ft/ft]	Rational Coefficient	Flowpath Length [ft]	Area [ac]	FCDMC Resistance Coefficient Type	Kb	I [in/hr]	T_c [min]	Q [cfs]
EX. DA-1	0.108	0.43	*1,116*	*11.15*	*C*	*0.124*	*4.13*	*10.0*	*19.82*
EX. DA-2	0.247	0.41	*360*	*1.49*	*C*	*0.146*	*4.13*	*10.0*	*2.53*
EX. DA-3	0.110	0.41	*182*	*0.43*	*C*	*0.159*	*4.13*	*10.0*	*0.73*
DA-1A	0.170	0.41	*811*	*7.36*	*C*	*0.128*	*4.13*	*10.0*	*12.48*
DA-1B	0.138	0.70	*253*	*0.89*	*A*	*0.040*	*4.13*	*10.0*	*2.57*
DA-1C	0.073	0.77	*384*	*0.77*	*A*	*0.041*	*4.13*	*10.0*	*2.45*
DA-1D	0.115	0.78	*87*	*0.10*	*A*	*0.046*	*4.13*	*10.0*	*0.32*
DA-1E	0.130	0.69	*453*	*1.21*	*A*	*0.039*	*4.13*	*10.0*	*3.44*
DA-1F	0.154	0.51	*376*	*1.03*	*A*	*0.040*	*4.13*	*10.0*	*2.17*
DA-2	0.249	0.41	*374*	*1.32*	*C*	*0.147*	*4.13*	*10.0*	*2.23*
DA-3	0.123	0.42	*179*	*0.38*	*C*	*0.161*	*4.13*	*10.0*	*0.65*

Kimley»Horn

Rational Method Calculations

General Project Information			
Project #	Arabella Spa		
Designed by	JWL	Date	11/15/21
Design Storm Event	25		
Minimum T_c [min]	10		

Drainage Area Information					Hydrology				
Drainage Area	Longitudinal Slope, S_l [ft/ft]	Rational Coefficient	Flowpath Length [ft]	Area [ac]	FCDMC Resistance Coefficient Type	Kb	I [in/hr]	T_c [min]	Q [cfs]
EX. DA-1	0.108	0.50	1,116	11.15	C	0.124	5.17	10.0	28.83
EX. DA-2	0.247	0.48	360	1.49	C	0.146	5.17	10.0	3.71
EX. DA-3	0.110	0.48	182	0.43	C	0.159	5.17	10.0	1.07
DA-1A	0.170	0.48	811	7.36	C	0.128	5.17	10.0	18.28
DA-1B	0.138	0.74	253	0.89	A	0.040	5.17	10.0	3.40
DA-1C	0.073	0.79	384	0.77	A	0.041	5.17	10.0	3.14
DA-1D	0.115	0.80	87	0.10	A	0.046	5.17	10.0	0.40
DA-1E	0.130	0.73	453	1.21	A	0.039	5.17	10.0	4.55
DA-1F	0.154	0.57	376	1.03	A	0.040	5.17	10.0	3.03
DA-2	0.249	0.48	374	1.32	C	0.147	5.17	10.0	3.27
DA-3	0.123	0.49	179	0.38	C	0.161	5.17	10.0	0.95

Kimley»Horn

Rational Method Calculations

General Project Information			
Project #	Arabella Spa		
Designed by	JWL	Date	11/15/21
Design Storm Event		100	
Minimum T_c [min]		10	

Drainage Area Information					Hydrology				
Drainage Area	Longitudinal Slope, S_l [ft/ft]	Rational Coefficient	Flowpath Length [ft]	Area [ac]	FCDMC Resistance Coefficient Type	Kb	I [in/hr]	T_c [min]	Q [cfs]
EX. DA-1	0.108	0.59	1,116	11.15	C	0.124	6.96	10.0	45.78
EX. DA-2	0.247	0.58	360	1.49	C	0.146	6.96	10.0	6.03
EX. DA-3	0.110	0.58	182	0.43	C	0.159	6.96	10.0	1.74
DA-1A	0.170	0.58	811	7.36	C	0.128	6.96	10.0	29.73
DA-1B	0.138	0.78	253	0.89	A	0.040	6.96	10.0	4.82
DA-1C	0.073	0.82	384	0.77	A	0.041	6.96	10.0	4.39
DA-1D	0.115	0.83	87	0.10	A	0.046	6.96	10.0	0.57
DA-1E	0.130	0.77	453	1.21	A	0.039	6.96	10.0	6.46
DA-1F	0.154	0.65	376	1.03	A	0.040	6.96	10.0	4.65
DA-2	0.249	0.58	374	1.32	C	0.147	6.96	10.0	5.32
DA-3	0.123	0.59	179	0.38	C	0.161	6.96	10.0	1.54

First Flush Retention Summary							
Drainage Area	Land Use	Area [A]		Runoff Coefficient [C]	Precipitation Depth [P]	Required Storage (V_{REQ} = CPA/12)	
		sf	ac		in	cf	ac-ft
Basin 1	Land Use	30,147	0.692	0.58	0.50	729	0.017
	Pavement	27,771	0.638	0.95	0.50	1,099	0.025
	Pavement	18,188	0.418	0.95	0.50	720	0.017
TOTAL	**-**	**76,107**	**1.747**	**-**	**-**	**2,548**	**0.058**
Basin 2	Land Use	43,168	0.991	0.58	0.50	1,043	0.024
	Pavement	46,554	1.069	0.95	0.50	1,843	0.042
	Landscaping		0.000	0.58			
TOTAL	**-**	**89,721**	**2.060**	**-**	**-**	**2,886**	**0.066**

Kimley»Horn

Appendix F

Hydraulic Calculations

PondMaker Worksheet Detailed Report: Detention System 1

Element Details

ID	67
Label	Detention System 1
Select Pond to Design	PO-1
Flow Allowed Below Target	50.0
Flow Allowed Above Target	10.0
Flow Allowed Below Target	25.0
Flow Allowed Above Target	0.0
Volume Allowed Below Target	25.0
Volume Allowed Above Target	50.0
Tolerance Display	Display PASS for values within specified tolerance

Notes

Volume

Pond Type	Pipe	Pipe Storage Number of Barrels	3
Pipe Storage Upstream Invert	10.00 ft	Pipe Storage Slice Width	10.00 ft
Pipe Storage Downstream Invert	9.50 ft	Pipe Storage Vertical Increment	0.10 ft
Pipe Storage Length	96.00 ft	Use Void Space?	False
Pipe Storage Diameter	48.0 in		

Infiltration

Infiltration Method	No Infiltration

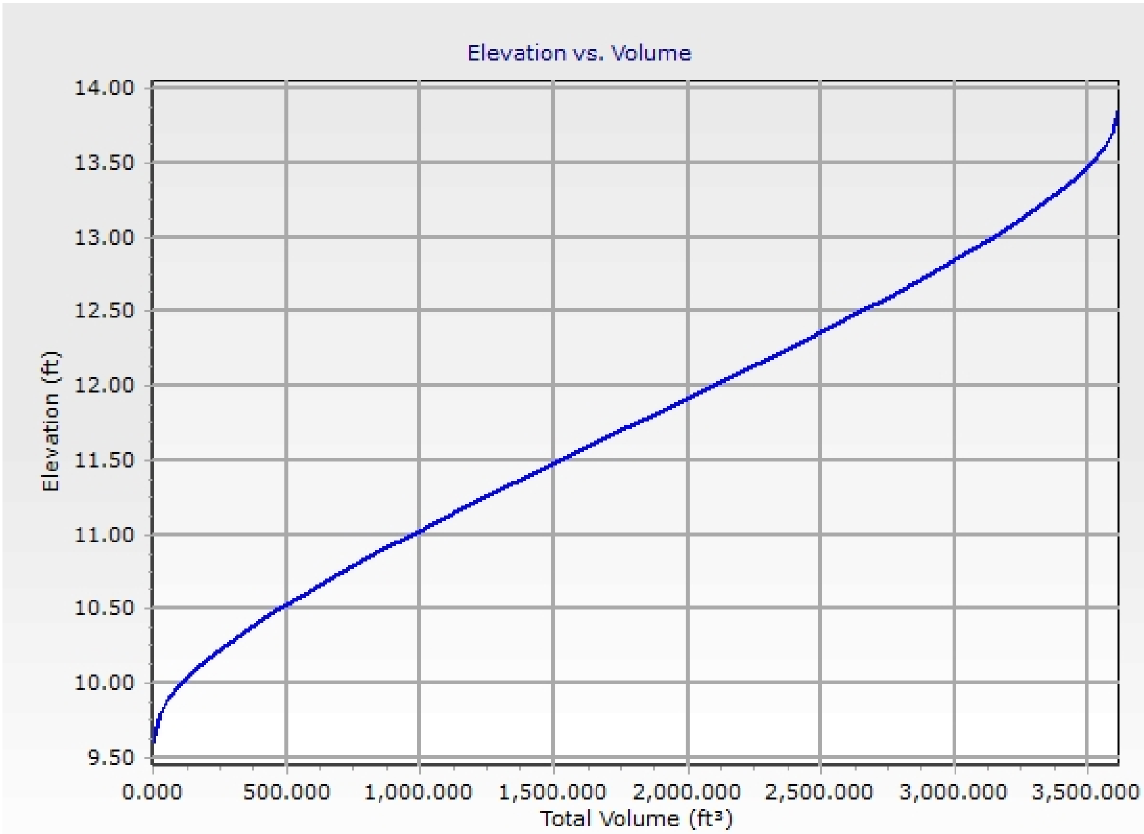
Output

Detention Time	None

Initial Conditions

Is Outflow Averaging On?	False	Define Starting Water Surface Elevation	Pond Invert

PondMaker Worksheet Detailed Report: Detention System 1

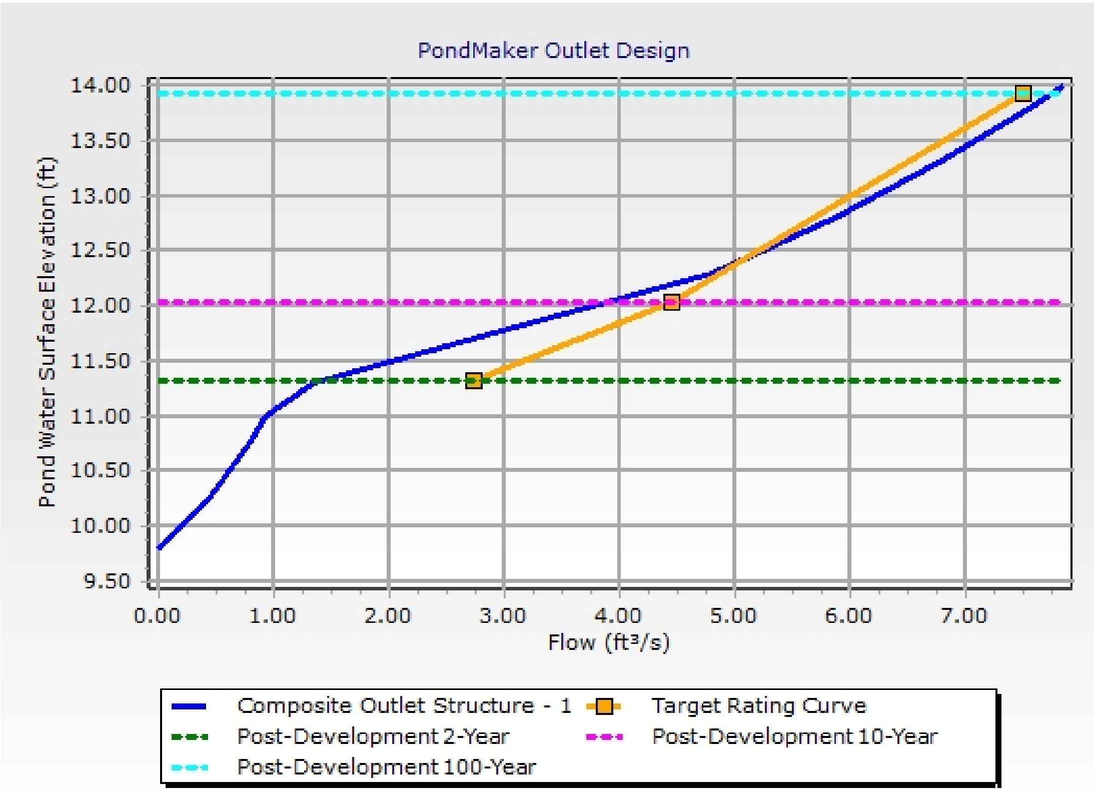


PondMaker Worksheet Detailed Report: Detention System 1

PondMaker Worksheet (Outlet Design)

Design Scenario	Design Return Event	Target Peak Outflow (ft³/s)	Target Outflow Volume (ft³)	Peak Pond Inflow (ft³/s)	Total Inflow Volume (ft³)
Post-Development 2-Year	2	2.73	2,028.000	3.65	2,103.000
Post-Development 10-Year	10	4.46	3,313.000	5.96	3,433.000
Post-Development 100-Year	100	7.51	2,028.000	10.05	5,786.000

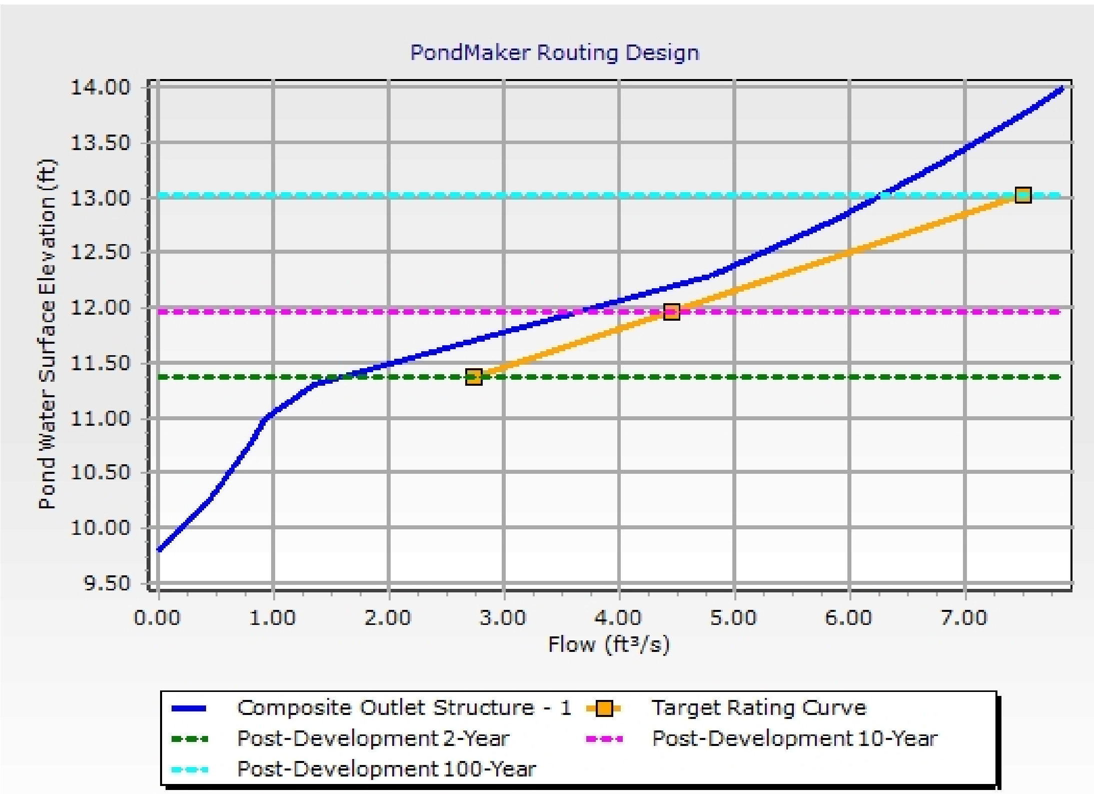
Estimated Storage (ft³)	Estimated Max Water Surface Elevation (ft)	Estimated Freeboard Depth	Design Outlet Structure	Estimated Peak Outflow (ft³/s)	Estimated Peak Outflow vs. Target
1,315.678	11.32	Pass	Composite Outlet Structure - 1	1.40	Pass
2,146.302	12.04	Pass	Composite Outlet Structure - 1	3.89	Pass
3,617.547	13.93	Pass	Composite Outlet Structure - 1	7.75	Pass



PondMaker Worksheet Detailed Report: Detention System 1

PondMaker Worksheet (Routing Design)

Design Scenario	Design Return Event	Target Peak Outflow (ft³/s)	Computed Peak Outflow (ft³/s)	Computed Peak Outflow vs. Target	Target Outflow Volume (ft³)	Computed Volume Outflow (ft³)	Computed Outflow Volume vs. Target	Routing Outlet Structure	Computed Max Water Elevation (ft)	Freeboard Depth	Maximum Storage (ft³)
Post-Development 2-Year	2	2.73	1.62	Fail	2,028.000	2,073.479	Pass	Composite Outlet Structure - 1	11.38	Pass	1,388.000
Post-Development 10-Year	10	4.46	3.59	Pass	3,313.000	3,403.613	Pass	Composite Outlet Structure - 1	11.96	Pass	2,050.000
Post-Development 100-Year	100	7.51	6.28	Pass	2,028.000	5,756.288	Fail	Composite Outlet Structure - 1	13.02	Pass	3,164.000



PondMaker Worksheet Detailed Report: Detention System 2

Element Details

ID	67
Label	Detention System 2
Select Pond to Design	PO-1
Flow Allowed Below Target	50.0
Flow Allowed Above Target	10.0
Flow Allowed Below Target	25.0
Flow Allowed Above Target	0.0
Volume Allowed Below Target	25.0
Volume Allowed Above Target	50.0
Tolerance Display	Display PASS for values within specified tolerance

Notes

Volume

Pond Type	Pipe	Pipe Storage Number of Barrels	1
Pipe Storage Upstream Invert	10.00 ft	Pipe Storage Slice Width	10.00 ft
Pipe Storage Downstream Invert	9.70 ft	Pipe Storage Vertical Increment	0.10 ft
Pipe Storage Length	62.00 ft	Use Void Space?	False
Pipe Storage Diameter	48.0 in		

Infiltration

Infiltration Method	No Infiltration

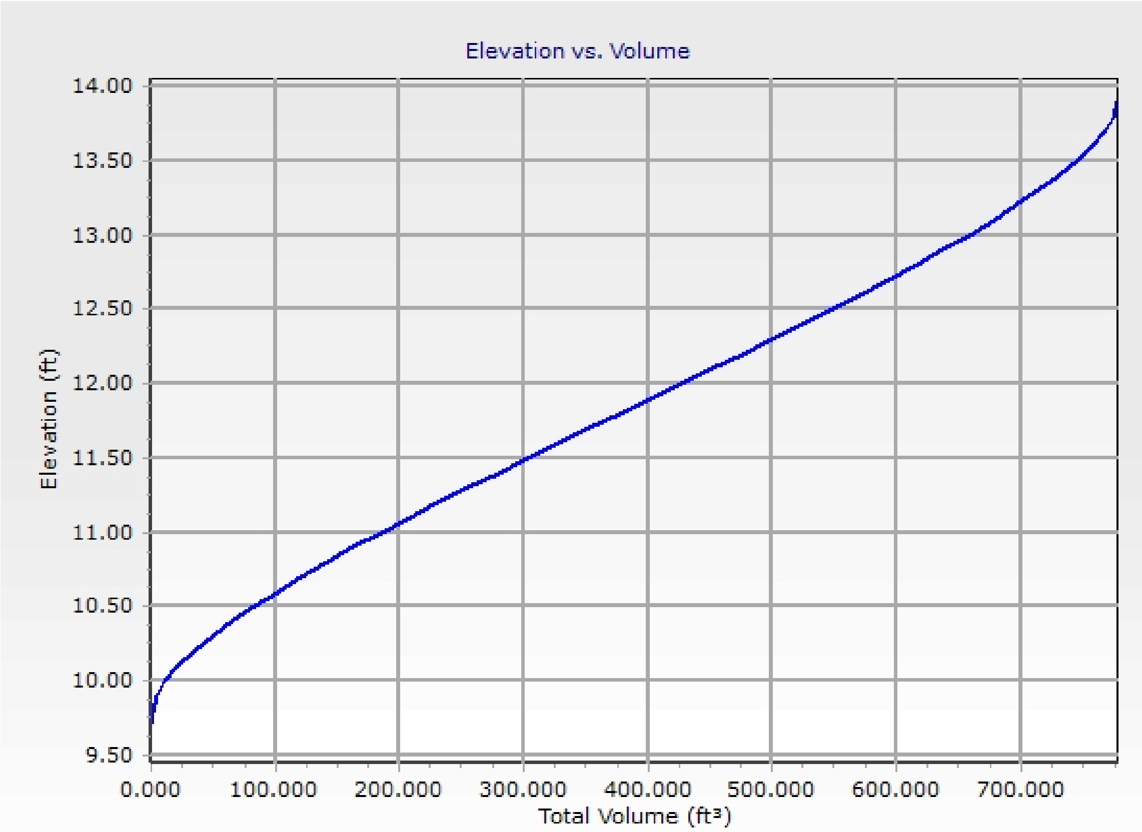
Output

Detention Time	None

Initial Conditions

Is Outflow Averaging On?	False	Define Starting Water Surface Elevation	Pond Invert

PondMaker Worksheet Detailed Report: Detention System 2

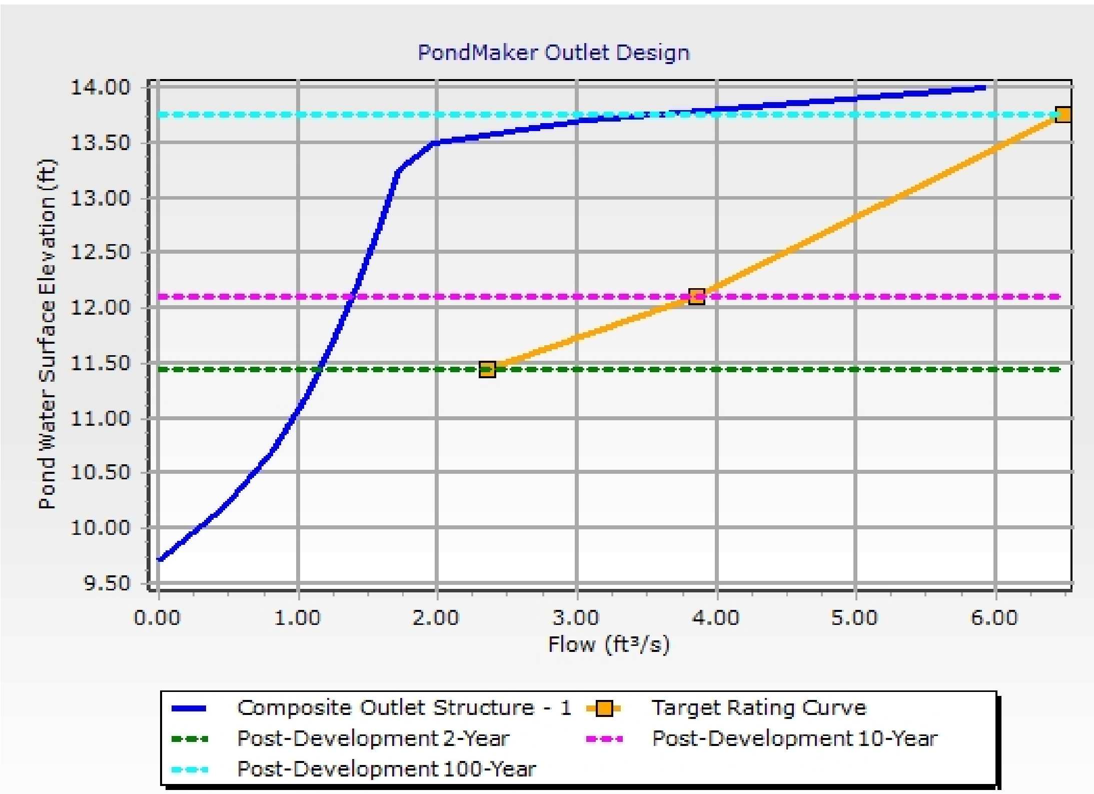


PondMaker Worksheet Detailed Report: Detention System 2

PondMaker Worksheet (Outlet Design)

Design Scenario	Design Return Event	Target Peak Outflow (ft³/s)	Target Outflow Volume (ft³)	Peak Pond Inflow (ft³/s)	Total Inflow Volume (ft³)
Post-Development 2-Year	2	2.35	2,028.000	2.38	1,369.000
Post-Development 10-Year	10	3.85	3,313.000	3.88	2,235.000
Post-Development 100-Year	100	6.48	2,028.000	6.54	3,766.000

Estimated Storage (ft³)	Estimated Max Water Surface Elevation (ft)	Estimated Freeboard Depth	Design Outlet Structure	Estimated Peak Outflow (ft³/s)	Estimated Peak Outflow vs. Target
288.604	11.44	Pass	Composite Outlet Structure - 1	1.15	Fail
454.423	12.11	Pass	Composite Outlet Structure - 1	1.39	Fail
772.081	13.76	Pass	Composite Outlet Structure - 1	3.62	Pass



PondMaker Worksheet Detailed Report: Detention System 2

PondMaker Worksheet (Routing Design)

Design Scenario	Design Return Event	Target Peak Outflow (ft³/s)	Computed Peak Outflow (ft³/s)	Computed Peak Outflow vs. Target	Target Outflow Volume (ft³)
Post-Development 2-Year	2	2.35	1.50	Fail	2,028.000
Post-Development 10-Year	10	3.85	3.20	Pass	3,313.000
Post-Development 100-Year	100	6.48	5.93	Pass	2,028.000

Computed Volume Outflow (ft³)	Computed Outflow Volume vs. Target	Routing Outlet Structure	Computed Max Water Elevation (ft)	Freeboard Depth	Maximum Storage (ft³)
1,369.062	Fail	Composite Outlet Structure - 1	12.49	Pass	544.000
2,234.872	Fail	Composite Outlet Structure - 1	13.71	Pass	769.000
4,707.843	Fail	Composite Outlet Structure - 1	14.00	Pass	779.000