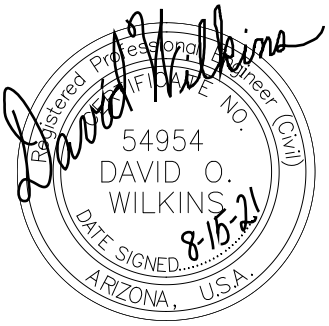
Drainage Memo

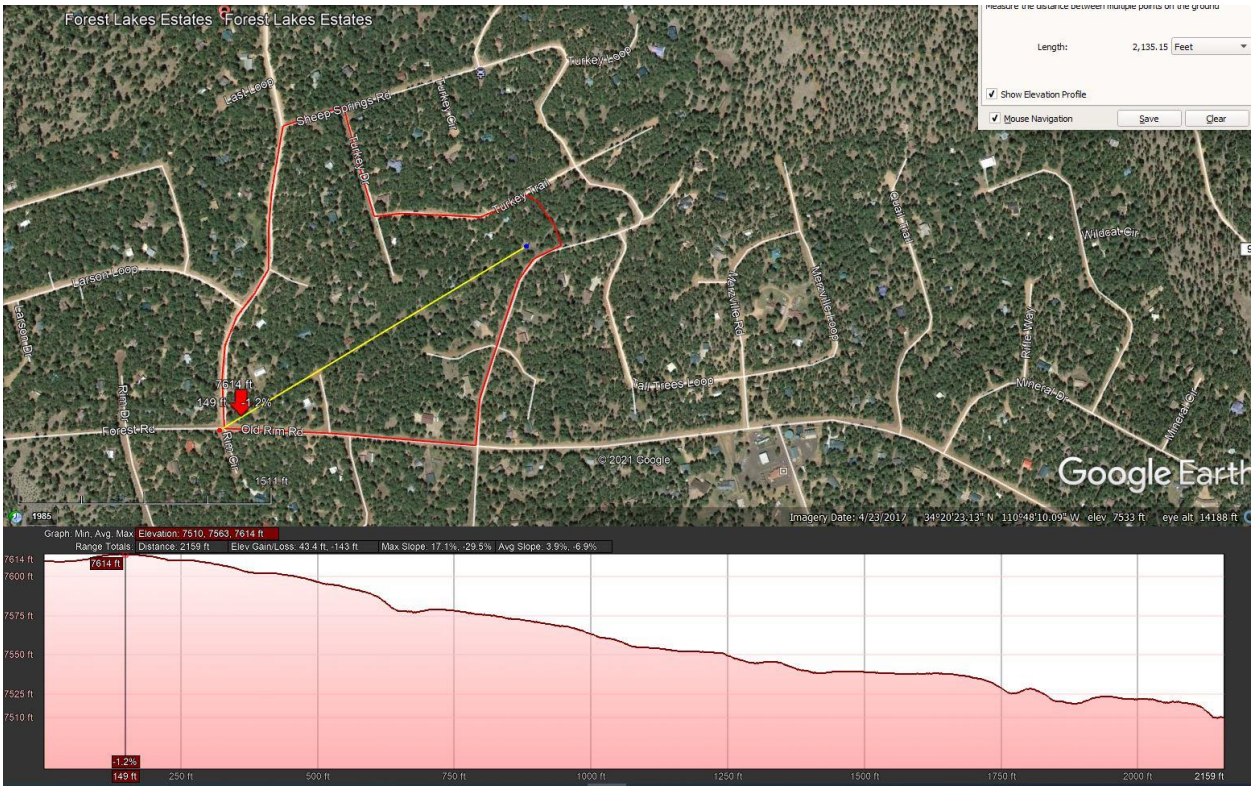
APN: 403-56-004, Coconino County Records



Property Location:
2246 Turkey Trail, Forest Lakes Unit 6, Lot 431, Forest Lakes, AZ 85931

Purpose:
To determine the estimated flow and potential impact to the proposed onsite wastewater system for the subject property.

Analysis:
The subject property is in Forest Lakes Estates along Turkey Trail and is located near the bottom of an estimated 55.7 drainage basin that is defined by the local streets with ditches and the existing grade as shown below. Using Google Earth to determine the areas, slopes, and lengths, the estimated longest flow path is approximately 0.40 miles with an elevation difference of 104 feet.



Using the ADOT Rational program, the estimated 100-year flow at the bottom of the defined basin area, which is adjacent to the proposed septic system disposal area is approximately 94 cfs.

Since the subject property is above 7000 feet, the estimated flow is being doubled to account for

snow or freeze/thaw conditions. Based on 188 cfs, a channel slope of at least 2% or more, and flattest approximate cross slopes of 5%, the drainage swale will carry the flow with an estimated total spread of 49.7 feet with an estimated depth of 1.41 feet. Much of the drainage swale is steeper with cross slopes ranging from 10% - 15%, therefore this is a conservative approach to estimating the drainage spread.

The average width of the channel varies but is estimated to be approximately 12' on average. Since the 25' setback is based on the edge of the channel, the estimated clearance between the 25' setback and channel flow is approximately 8 feet. (25ft – (24.8 ft – 6ft) = 6.2 ft clearance.

The estimated 100-yr flow as defined by the ADOT Rational program should not impact the proposed septic system trenches but may encroach on the proposed side slopes. Rock riprap is being proposed for erosion control measures. The designed rip-rap is D_{50} = 6", at 12" thick. The total estimate area required along the side slopes is approximately 1600 sf.

See the attached supporting calculations for reference.

ADOT RATIONAL METHOD PROGRAM

Compution Date and Time: 08/10/2021 20:09:25

Project Name: APN: 403-56-004
Project Location: Forest Lakes Area
Company: Wilkins Site & Septic Civil Engineering
Project Notes:
Prepared by: David Wilkins Prepared by date: 7-3-21

Summary Table for 2-Year event:

Subbasin ID	Discharge Q (cfs)	Rational Coeff. C	Rainfall Intensity i (inches/hour)	Area A (acres)	Time of Concentration Computed Tc (minutes)	Time of Concentration Applied Tc (minutes)
Area A	31.5	0.20	2.82	55.70	19.4	19.4

Summary Table for 5-Year event:

Subbasin ID	Discharge Q (cfs)	Rational Coeff. C	Rainfall Intensity i (inches/hour)	Area A (acres)	Time of Concentration Computed Tc (minutes)	Time of Concentration Applied Tc (minutes)
Area A	44.3	0.20	3.98	55.70	17.0	17.0

Summary Table for 10-Year event:

Subbasin ID	Discharge Q (cfs)	Rational Coeff. C	Rainfall Intensity i (inches/hour)	Area A (acres)	Time of Concentration Computed Tc (minutes)	Time of Concentration Applied Tc (minutes)
Area A	54.3	0.20	4.88	55.70	15.8	15.8

Summary Table for 25-Year event:

Subbasin ID	Discharge Q (cfs)	Rational Coeff. C	Rainfall Intensity i (inches/hour)	Area A (acres)	Time of Concentration Computed Tc (minutes)	Time of Concentration Applied Tc (minutes)
Area A	68.9	0.20	6.19	55.70	14.4	14.4

Summary Table for 50-Year event:

Subbasin ID	Discharge Q (cfs)	Rational Coeff. C	Rainfall Intensity i (inches/hour)	Area A (acres)	Time of Concentration Computed Tc (minutes)	Time of Concentration Applied Tc (minutes)
Area A	81.4	0.20	7.31	55.70	13.5	13.5

Summary Table for 100-Year event:

Subbasin ID	Discharge Q (cfs)	Rational Coeff. C	Rainfall Intensity i (inches/hour)	Area A (acres)	Time of Concentration Computed Tc (minutes)	Time of Concentration Applied Tc (minutes)
Area A	94.6	0.20	8.49	55.70	12.8	12.8

DETAILED RESULTS

Subbasin: Area A

Description: Area Bounded by local streets
Notes:
Area, A: 55.7 acres
Landform Type: Mountain, with forest & dense ground cover
Flow Type: Defined Drainage Network
Watershed Resistance Coefficient, Kb: 0.15
Longest Flowpath Length, L: 0.4 miles

Slope Method: Method 1
Change in Elevation, H (ft): 104
Computed Subbasin Slope, S:260 ft/mile

Subarea: Subarea 1
==========
Area, A: 55.7 acres
Subbasin Type: Mountain Ponderosa Pine
Hydrologic Soil Group: B
Percent Vegetation Cover: 30%

Subarea C-Factors Table:

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Subarea C-Factor	0.2	0.2	0.2	0.2	0.2	0.2

RESULTS TABLE

Parameters	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Discharge-Q (cfs)	31.5	44.3	54.3	68.9	81.4	94.6
Rational Coefficient-C	0.20	0.20	0.20	0.20	0.20	0.20
Rainfall intensity-i (inches/hour)	2.82	3.98	4.88	6.19	7.31	8.49
Subbasin Total Area-A (acres)	55.70	55.70	55.70	55.70	55.70	55.70
Computed Time of Concentration-Tc (minutes)	19.4	17.0	15.8	14.4	13.5	12.8
Applied Time of Concentration-Tc (minutes)	19.4	17.0	15.8	14.4	13.5	12.8

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Saturday, July 3, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Channel Analysis 3

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 20.0000 ft/ft

Side Slope 2 (Z2): 20.0000 ft/ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0250

Flow: 188.0000 cfs

Result Parameters

Depth: 1.2405 ft

Area of Flow: 30.7763 ft^2

Wetted Perimeter: 49.6816 ft

Hydraulic Radius: 0.6195 ft

Average Velocity: 6.1086 ft/s

Top Width: 49.6196 ft

Froude Number: 1.3669

Critical Depth: 1.4057 ft

Critical Velocity: 4.7572 ft/s

Critical Slope: 0.0103 ft/ft

Critical Top Width: 56.23 ft

Calculated Max Shear Stress: 1.5481 lb/ft^2

Calculated Avg Shear Stress: 0.7731 lb/ft^2