

TERRA ASSOCIATES, Inc.

Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

December 22, 2022
Project No. T-8719

Mr. Terry Grooms
Stack Design and Construction, Inc.
8825 – 34th Avenue Northeast
Marysville, Washington 98271

Subject: Geotechnical Engineering Addendum
Stack Short Plat
3807 – 122nd Street Northeast
Marysville, Washington

Reference: Geotechnical Report, Stack Short Plat, 3807 – 122nd Street Northeast, Marysville, Washington,
Project No. T-8719, prepared by Terra Associates, Inc., dated August 31, 2022

Dear Mr. Grooms:

As requested, we have completed a mounding analysis for the subject project. The project consists of developing the approximately one-acre parcel with five single family residential lots, two stormwater infiltration galleries, and associated access. Based on our review of the “Stack Short Plat Preliminary Plans” prepared by LDC dated September 21, 2022, there are two infiltration galleries planned for the site. The infiltration galleries are labeled as Gallery 1 in the southern portion of the site and Gallery 2 in the northeastern portion of the site.

The mounding analysis was completed using the MODRET 7 computer program. Gallery 1 has an area of approximately 4,085 square feet. The bottom of the gallery was modeled at elevation 73 feet, the seasonal high groundwater level was modeled at elevation 71 feet, and the top of the infiltration facility was modeled at elevation 76 feet. Gallery 2 has an area of approximately 630 square feet. The bottom of the gallery was modeled at elevation 75 feet, the seasonal high groundwater level was modeled at elevation 73 feet, and the top of the infiltration facility was modeled at elevation 77.5 feet. Stormwater runoff rates routed to the infiltration facilities were provided by LDC for the period from November 19, 2007 through December 18, 2007. This timeline included the 100-year event.

The results of our mounding analysis showed that both galleries function without overflow. The results are attached for official review.

Mr. Terry Grooms
December 22, 2022

Based on the results of the modeling, it is our opinion that the galleries can function as designed.

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.



Carolyn S. Decker 12-22-2022

Encl: MODRET Results

MODRET RESULTS

MODRET 7.0

SUMMARY OF MODRET INPUT PARAMETERS

PROJECT NAME : Gallery 1
UNSATURATED ANALYSIS EXCLUDED

Average Pond Area	4,094.64 ft ²
Pond Volume between Bottom & DHWL	12,283.92 ft ³
Pond Length to Width Ratio (L/W)	2.58
Elevation of Effective Aquifer Base	65.00 ft
Elevation of Seasonal High Groundwater Table	71.00 ft
Elevation of Starting Water Level	73.00 ft
Elevation of Pond Bottom	73.00 ft
Design High Water Level Elevation	76.00 ft
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.11
Unsaturated Vertical Hydraulic Conductivity	2.00 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	4.00 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.21
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control Features - Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

MODRET 7.0

ROUTING MODULE

PROJECT NAME : Gallery 1
STAGE-STORAGE INPUT DATA

ELEVATION (ft)	AREA (Ac)	POND VOLUME (ft³)
73.00	0.094	0.0
76.00	0.094	12,283.9

Zero-Infiltration option is OFF

MODRET 7.0

HYDROGRAPH DATA INPUT - MANUAL HYDROGRAPH METHOD

PROJECT NAME :Gallery 1

Index	Time Increment	Volume
0	24.0 hrs	196.0 ft ³
1	24.0 hrs	61.0 ft ³
2	24.0 hrs	7.0 ft ³
3	24.0 hrs	3.0 ft ³
4	24.0 hrs	2.0 ft ³
5	24.0 hrs	1.0 ft ³
6	24.0 hrs	0.0 ft ³
7	24.0 hrs	284.0 ft ³
8	24.0 hrs	29.0 ft ³
9	24.0 hrs	257.0 ft ³
10	24.0 hrs	16.0 ft ³
11	24.0 hrs	5.0 ft ³
12	24.0 hrs	2.0 ft ³
13	24.0 hrs	1,847.0 ft ³
14	24.0 hrs	4,545.0 ft ³
15	24.0 hrs	382.0 ft ³
16	24.0 hrs	80.0 ft ³
17	24.0 hrs	40.0 ft ³
18	24.0 hrs	20.0 ft ³
19	24.0 hrs	10.0 ft ³

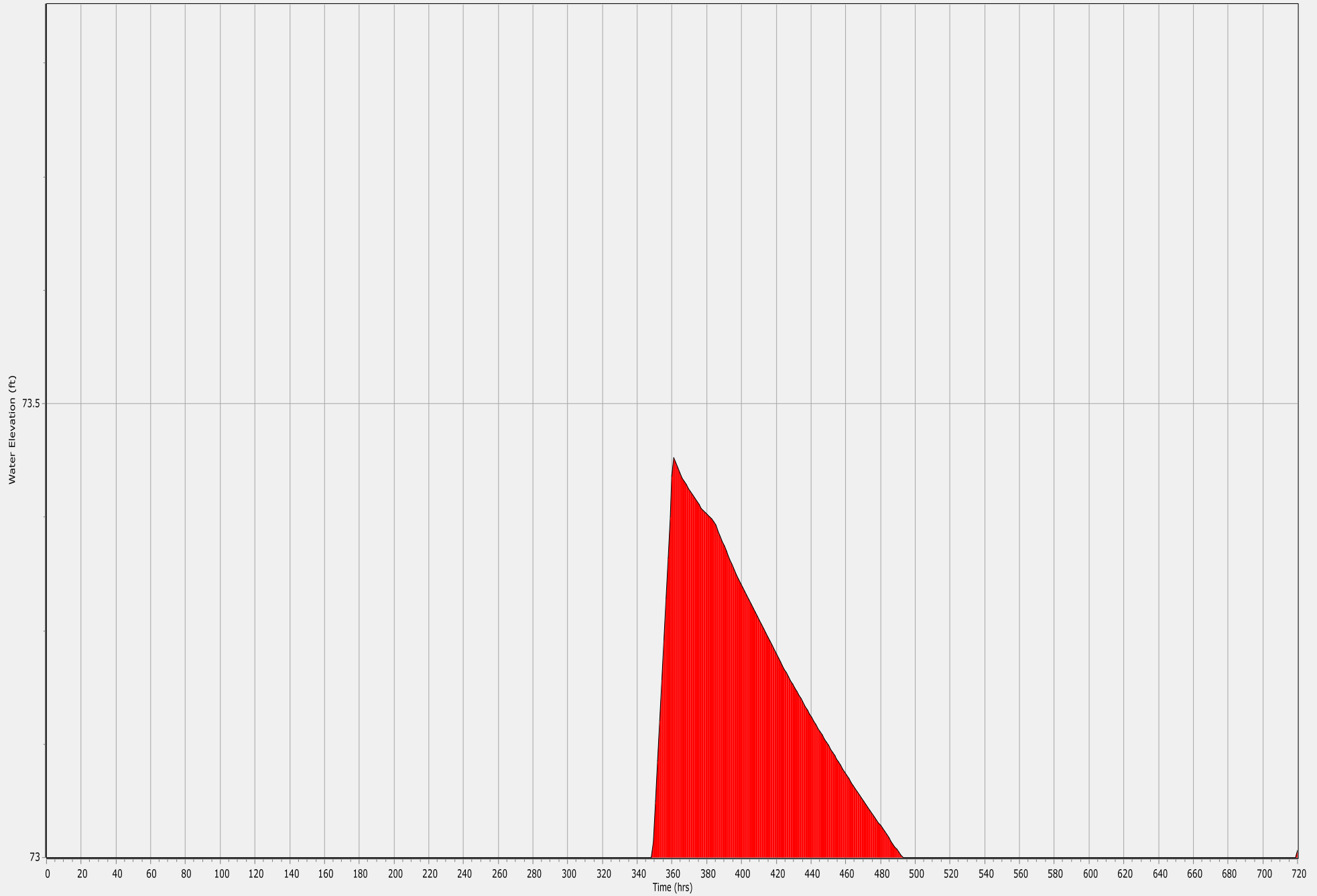
MODRET 7.0

HYDROGRAPH DATA INPUT - MANUAL HYDROGRAPH METHOD

PROJECT NAME :Gallery 1

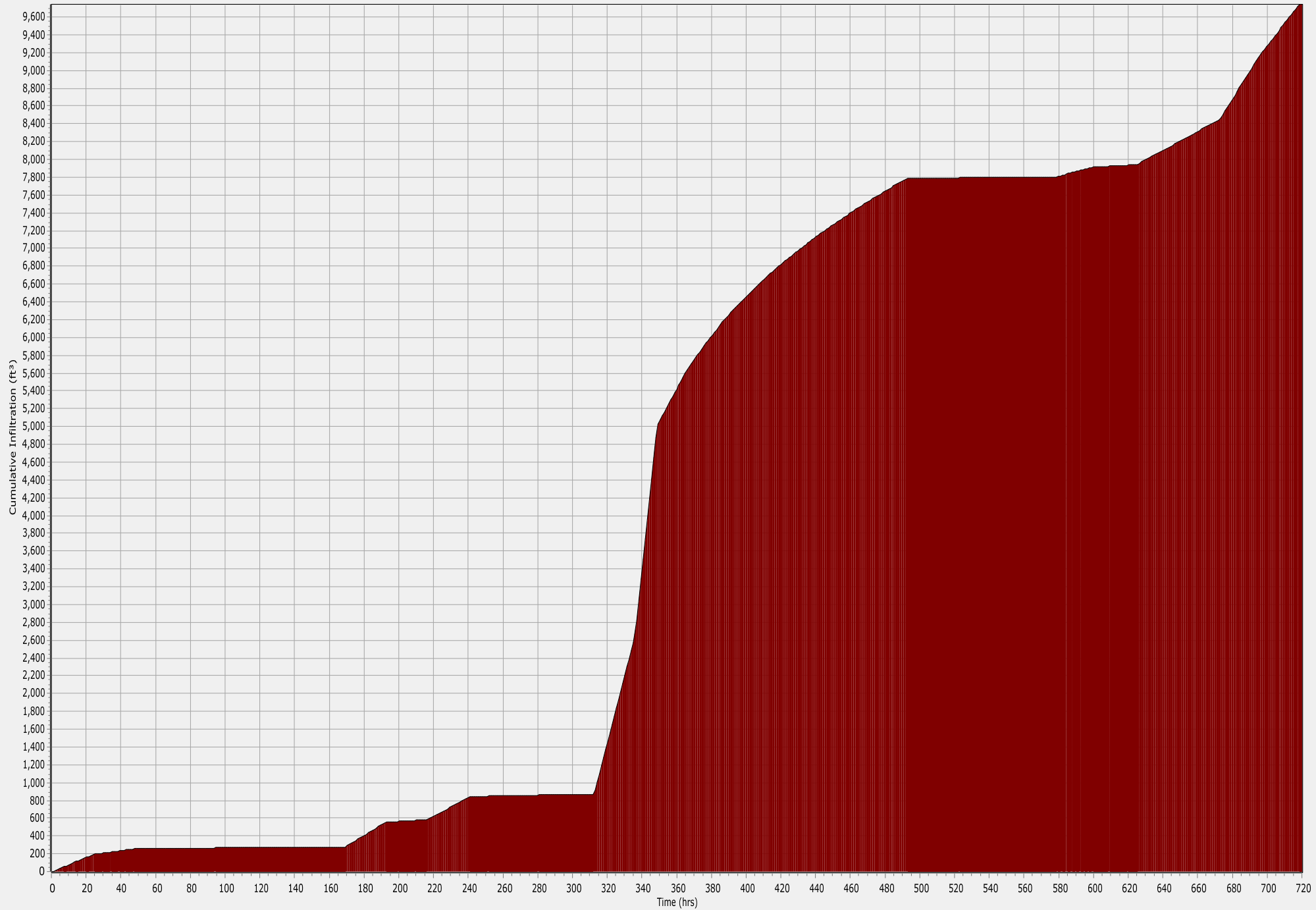
Index	Time Increment	Volume
20	24.0 hrs	5.0 ft ³
21	24.0 hrs	2.0 ft ³
22	24.0 hrs	1.0 ft ³
23	24.0 hrs	1.0 ft ³
24	24.0 hrs	120.0 ft ³
25	24.0 hrs	24.0 ft ³
26	24.0 hrs	252.0 ft ³
27	24.0 hrs	256.0 ft ³
28	24.0 hrs	746.0 ft ³
29	24.0 hrs	596.0 ft ³

ROUTING : GALLERY 1



Max Water Elevation = 73.44 ft

ROUTING : GALLERY 1



Total Infiltration = 9,744 ft³

MODRET 7.0

SUMMARY OF MODRET INPUT PARAMETERS

PROJECT NAME : Gallery 2
UNSATURATED ANALYSIS EXCLUDED

Average Pond Area	653.40 ft ²
Pond Volume between Bottom & DHWL	1,633.50 ft ³
Pond Length to Width Ratio (L/W)	1.27
Elevation of Effective Aquifer Base	65.00 ft
Elevation of Seasonal High Groundwater Table	73.00 ft
Elevation of Starting Water Level	75.00 ft
Elevation of Pond Bottom	75.00 ft
Design High Water Level Elevation	77.50 ft
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.11
Unsaturated Vertical Hydraulic Conductivity	2.00 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	4.00 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.19
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control Features - Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

MODRET 7.0

ROUTING MODULE

PROJECT NAME : Gallery 2
STAGE-STORAGE INPUT DATA

ELEVATION (ft)	AREA (Ac)	POND VOLUME (ft³)
75.00	0.015	0.0
77.50	0.015	1,633.5

Zero-Infiltration option is OFF

MODRET 7.0

HYDROGRAPH DATA INPUT - MANUAL HYDROGRAPH METHOD

PROJECT NAME :Gallery 2

Index	Time Increment	Volume
0	24.0 hrs	39.0 ft ³
1	24.0 hrs	11.0 ft ³
2	24.0 hrs	0.0 ft ³
3	24.0 hrs	0.0 ft ³
4	24.0 hrs	0.0 ft ³
5	24.0 hrs	0.0 ft ³
6	24.0 hrs	0.0 ft ³
7	24.0 hrs	60.0 ft ³
8	24.0 hrs	4.0 ft ³
9	24.0 hrs	53.0 ft ³
10	24.0 hrs	2.0 ft ³
11	24.0 hrs	0.0 ft ³
12	24.0 hrs	0.0 ft ³
13	24.0 hrs	389.0 ft ³
14	24.0 hrs	925.0 ft ³
15	24.0 hrs	49.0 ft ³
16	24.0 hrs	0.0 ft ³
17	24.0 hrs	0.0 ft ³
18	24.0 hrs	0.0 ft ³
19	24.0 hrs	0.0 ft ³

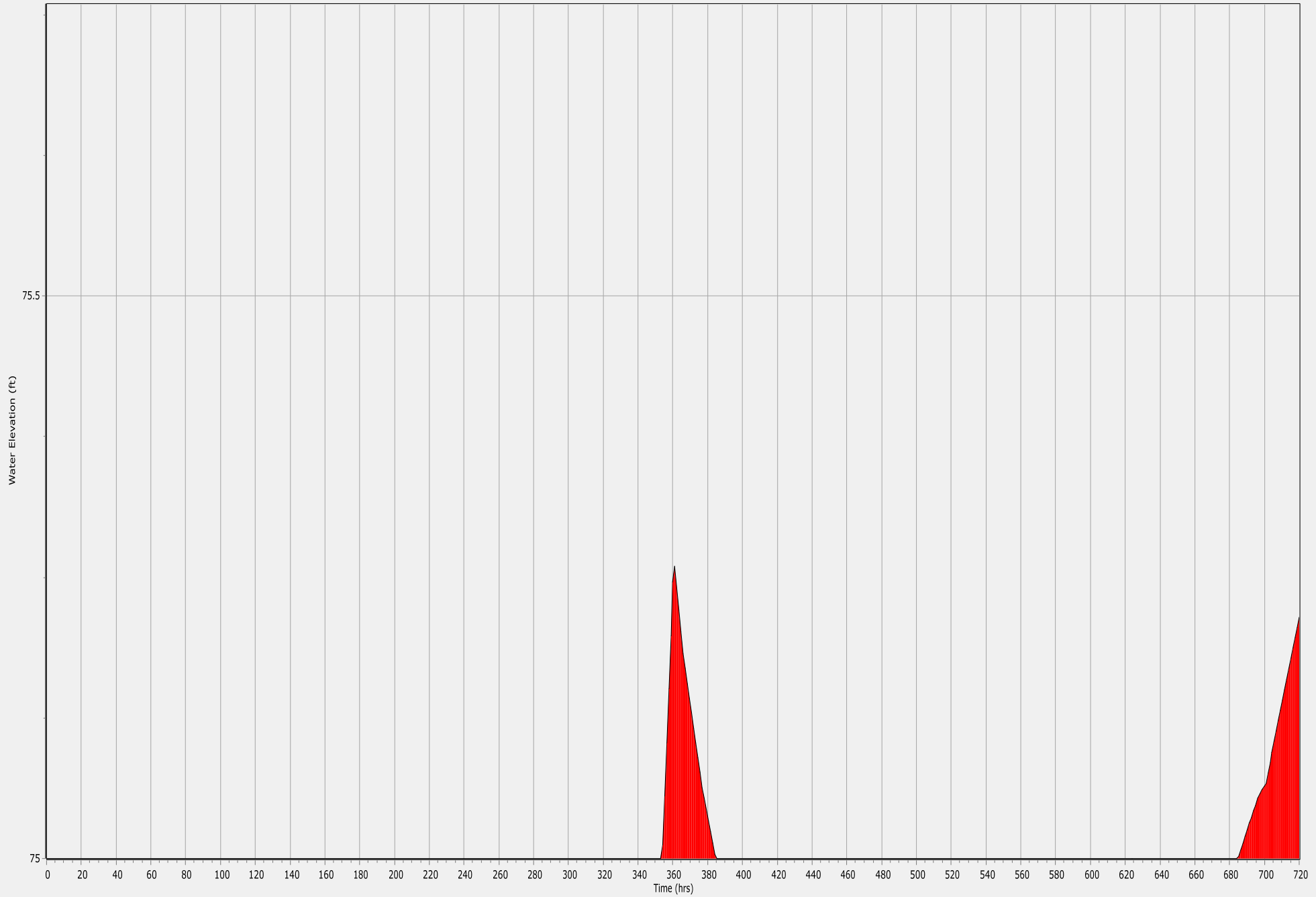
MODRET 7.0

HYDROGRAPH DATA INPUT - MANUAL HYDROGRAPH METHOD

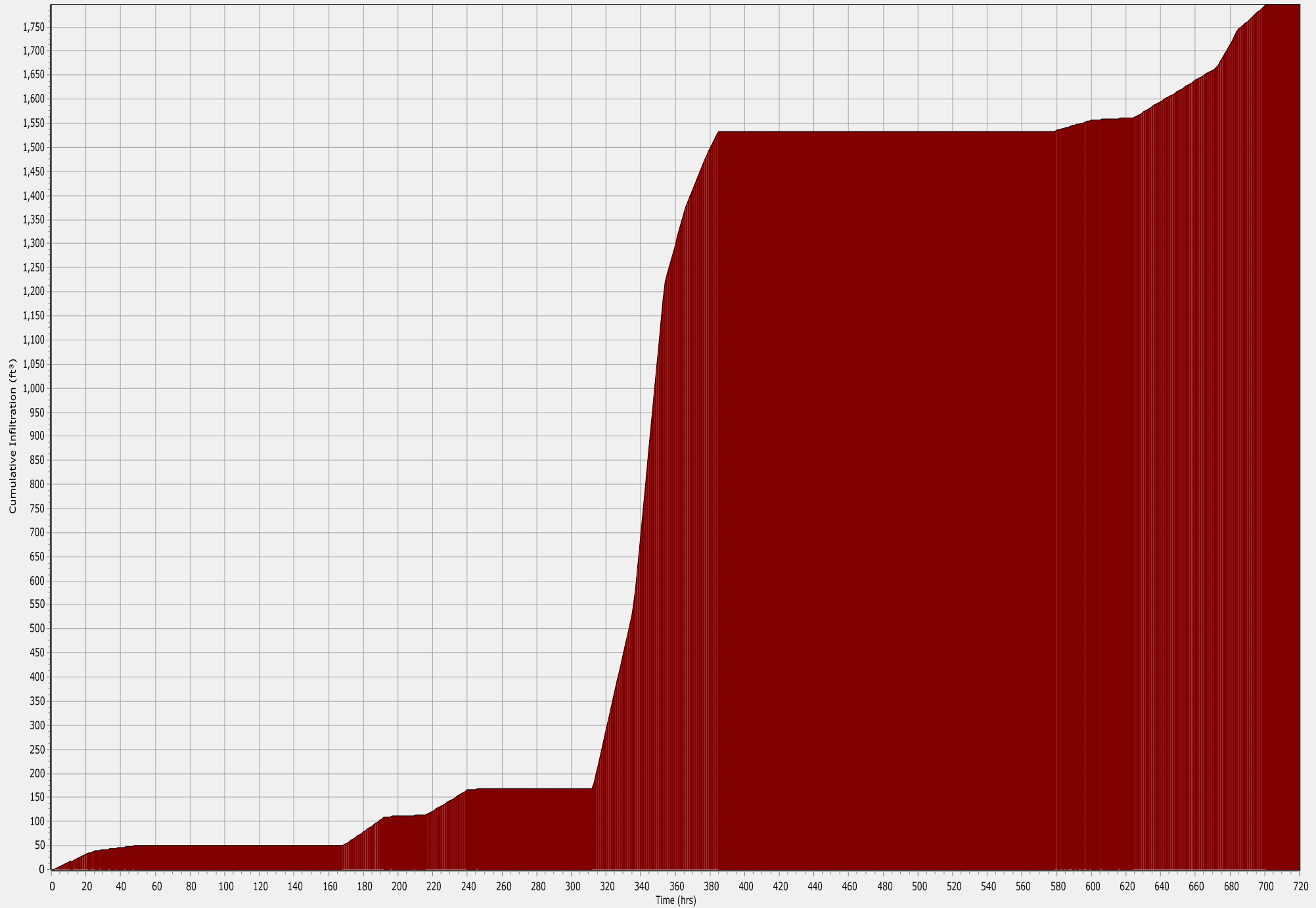
PROJECT NAME :Gallery 2

Index	Time Increment	Volume
20	24.0 hrs	0.0 ft ³
21	24.0 hrs	0.0 ft ³
22	24.0 hrs	0.0 ft ³
23	24.0 hrs	0.0 ft ³
24	24.0 hrs	25.0 ft ³
25	24.0 hrs	5.0 ft ³
26	24.0 hrs	52.0 ft ³
27	24.0 hrs	53.0 ft ³
28	24.0 hrs	153.0 ft ³
29	24.0 hrs	121.0 ft ³

ROUTING : GALLERY 2



Max Water Elevation = 75.26 ft



Total Infiltration = 1,797 ft³