

**GATEWAY LANDING APARTMENTS
DOWNSTREAM STORMWATER IMPACT
STUDY**

Olathe, KS

Prepared:
April 22, 2026

prepared by

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26-013

prepared for

CRG RESIDENTIAL



EXECUTIVE SUMMARY

April 22, 2026

Charlie Love, P.E.
Chief Development Engineer
City of Olathe
100 E. Santa Fe Street
Olathe, KS 66062

RE: Downstream Stormwater Impact Study for Gateway Landing Apartments and the Potential Effects on the Downstream Stream Corridor and Adjacent Properties within Boulder Hills 2nd Plat and Boulder Hills 3rd Plat.

Dear Mr. Love,

As requested, Schlagel & Associates has prepared this Downstream Stormwater Impact Study in support of the proposed Gateway Landing Apartments development in Olathe, Kansas. The purpose of this report is to evaluate the impact of the proposed development on the downstream stream corridor and to analyze the existing and proposed conditions, including water surface elevations, relative to the downstream Boulder Hills 2nd Plat and Boulder Hills 3rd Plat subdivisions.

A hydrologic and hydraulic evaluation was completed to compare existing and proposed runoff conditions and to review the resulting flow characteristics within the analyzed stream reach. Based on the HydroCAD analysis, the peak discharge at Release Point #1 increases from 181.30 cfs to 191.35 cfs for the 1-year storm event, from 201.08 cfs to 215.97 cfs for the 10-year storm event, and from 228.76 cfs to 249.33 cfs for the 100-year storm event.

The analysis also indicates that the proposed development results in only minor increases in peak flow through the studied reach. The hydraulic routing exhibits for the analyzed reaches show only slight increases in average flow depth and similar routing characteristics between existing and proposed conditions with a maximum increase of 0.12 ft. in the 100-year rainfall event.

This report has been prepared to document the downstream impact evaluation for the proposed development and to support the current development review process. Should you have any questions or need any additional information, please do not hesitate to contact our office.

Sincerely,
SCHLAGEL & ASSOCIATES, P.A.

Ryan P. McGinnis, P.E.
Senior Project Engineer

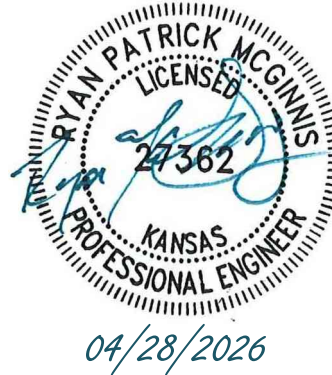


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1.0 GENERAL INFORMATION

The proposed Gateway Landing Apartments development is located in the southeast quarter of Section 20, Township 14 South, Range 24 East, generally situated on the northwest corner of W. 175th Street and S. Allman Road in the City of Olathe, Johnson County, Kansas. A site location map of this area can be found in Appendix A. The proposed development consists of a multi-family residential community on approximately 26.50 acres, planned for 318 dwelling units with associated parking, internal drives, sidewalk, open spaces, and various site amenities located throughout the site.

1.1 OBJECTIVE

The objective of this report is to evaluate the impact of the proposed Gateway Landing Apartments development on the downstream stream corridor and to analyze the existing and proposed conditions, including water surface elevations, relative to the downstream Boulder Hills 2nd Plat and Boulder Hills 3rd Plat subdivisions.

1.2 HYDROLOGIC METHODOLOGY

The following were utilized in the assessment, preparation, and analysis of watersheds in this design plan for the **Gateway Landing Apartments: Section 5600, Storm Drainage Systems & Facilities** of the Standard Specifications & Design Criteria of the Kansas City Metropolitan Chapter of the American Public Works Association; *Manual of Best Management Practices for Stormwater Quality*, published by the Mid-America Regional Council and the American Public Works Association; *Design Criteria for Public Improvement Projects* of the Olathe Technical Specifications and Standard Details; *Title 17 of the Olathe Municipal Code*. Watersheds for the site were defined according to soil cover and type, tributary area, and runoff times of concentration. Soil cover was determined from inspection of the site and aerial photography. A soil survey for the project area was obtained from the NRCS website and was utilized in determining soil type, and can be found in Appendix A. Watershed size was determined from both aerial topography and topographical survey, and by the

proposed grading plan. Times of concentration were compiled according to *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)* methodology for sheet flow, shallow concentrated flow, and channel flow. Travel times for the proposed development channel flows were determined using the length and velocity of the open channel. The watershed characteristics were then entered into *HydroCAD version 10.2* to model the runoff.

1.3 HYDRAULIC METHODOLOGY

The downstream analysis portion of this report uses the modeled existing 1-year, 10-year, and 100-year and proposed 1-year, 10-year, and 100-year runoff information from HydroCAD to determine the amount of runoff being released from this proposed development. These flows were then used in HECRAS version 5.0 to model the existing and proposed 1-year, 10-year, and 100-year storm events, as shown in the HECRAS profiles and cross-sections provided in Appendix B. The 100-year existing and proposed water surface limits are shown on Sheet 3 in Appendix B.

The upstream and downstream boundary conditions for both the existing and proposed HECRAS models were based on normal depth using the existing channel slope, as no known downstream ponded water surface elevation was available to control the reach. Hydraulic water surface elevation and energy grade line information for the downstream corridor were developed using HECRAS.

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2.0 EXISTING CONDITIONS ANALYSIS

The existing condition of the study area consists of the current upstream drainage basin, the downstream stream corridor, and the downstream subdivisions identified as Boulder Hills 2nd Plat and Boulder Hills 3rd Plat. Under existing conditions, stormwater runoff from the upstream drainage area enters the stream corridor and is conveyed downstream through the existing drainageway.

A hydrologic and hydraulic analysis was completed to establish the existing runoff conditions and corresponding water surface elevations through the analyzed stream reach. The HydroCAD model uses rainfall depths of 3.08 inches, 5.44 inches, and 8.61 inches for the 1-year, 10-year, and 100-year storm events, respectively.

Based on the existing-condition HydroCAD report, the peak from the undeveloped site discharges at OS1: Gateway Landing Apartments is 16.03 cfs for the 1-year storm event, 37.58 cfs for the 10-year storm event, and 67.25 cfs for the 100-year storm event.

The above-mentioned discharge for the 1-year, 10-year, and 100-year existing conditions modeled from HydroCAD was then used to review water surface elevations using HECRAS in relation to Boulder Hills 2nd Plat and Boulder Hills 3rd Plat in order to establish a baseline for comparison to the proposed condition. The Existing Stream Analysis exhibit can be found in Appendix B.

2.1 EXISTING SOIL CONDITIONS

On-site soils data was retrieved via a USDA NRCS Custom Soil Resource Report obtained from the Web Soil Survey online portal. The soils report is presented in Appendix A.

2.2 TRIBUTARY AREAS

For this analysis, the existing upstream tributary area contributing to the modeled stream system is represented in the HydroCAD model as Subcatchment OS1: Gateway Landing Apartments. Under existing conditions, the modeled tributary area is 9.11

acres. The watershed routing diagram and supporting model information are included in Appendix B.

2.3 CURVE NUMBER AND TIME OF CONCENTRATION

The existing curve numbers and time of concentrations for each sub-area have been established based on the procedures outlined in NRCS TR-55 Urban Hydrology for Small Watersheds (1986). Existing curve numbers were based on aerial photography, site inspection, and the soil types present on site. A composite curve number for each sub-area was determined. The predevelopment condition of this site is Pasture/Grassland in Fair condition, woods in fair condition, and right-of-way. These areas can be seen in an aerial AIMS map provided in Appendix A. For the modeled existing upstream tributary area identified in the HydroCAD analysis as Subcatchment OS1: Gateway Landing Apartments, the existing drainage area is 9.11 acres and the composite curve number used in the model is 83.

Time of concentration flow paths were based on sheet flow, shallow concentrated flow, and channel flow conditions. Sheet flow lengths were limited to 100 feet, or where a grade break occurred. Flow was then considered shallow concentrated flow until a channel was visible either from the USGS topographic map or the aerial photograph, and from that point was considered channel flow determined by the length of the channel and estimated flow velocity. The Existing Drainage Area Map presented in Appendix B illustrates the time of concentration flow paths utilized in the analysis. Times of concentration for each sub-area are presented in Table 2.0, and detailed calculations are included with the HydroCAD summary in Appendix B. For Subcatchment OS1, the HydroCAD model uses a total time of concentration of 14.6 minutes.

2.4 EXISTING FLOW RATES

Existing flow rates were determined for the 1-year, 10-year, and 100-year design storms using the HydroCAD model. At Release Point #1, the existing peak discharge is 181.30 cfs for the 1-year storm, 201.08 cfs for the 10-year storm, and 228.76 cfs for the 100-year storm. Detailed routing calculations are included in Appendix B.

2.5 FEMA REQUIREMENTS

There is no FEMA identified floodplain located on the proposed property per Flood Insurance Rate Map Panel No. 20091C110G and 20091C0125G. Therefore, no FEMA requirements associated with this project are anticipated. The FEMA Firmette for this project area can be found in Appendix A of this report.

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3.0 PROPOSED CONDITIONS ANALYSIS

Under proposed conditions, the Gateway Landing Apartments development increases the modeled tributary area and imperviousness associated with the upstream basin while maintaining discharge to the same downstream stream corridor analyzed under existing conditions. The proposed HydroCAD model routes runoff from the developed site through the same downstream reaches to Release Point #1.

The proposed-condition analysis was completed to compare runoff and routing characteristics with the existing-condition model and to evaluate whether the development creates adverse impacts to the downstream stream corridor and adjacent downstream subdivisions.

3.1 TRIBUTARY AREAS

For the proposed condition, the HydroCAD model identifies Subcatchment OS1: Gateway Landing Apartments as 10.860 acres. The proposed condition includes 60.04 percent impervious area and 39.96 percent pervious area within the modeled upstream drainage area. Supporting watershed mapping and HydroCAD model output are included in Appendix B.

3.2 CURVE NUMBER AND TIME OF CONCENTRATION

For the Gateway Landing Apartments, the proposed curve numbers and time of concentrations for the sub-area have been established based on the procedures outlined in NRCS TR-55 Urban Hydrology for Small Watersheds (1986). The proposed curve numbers were based upon aerial photography, site inspection, and the soil types present on site. A composite curve number for the sub-area was determined. Cover types for the proposed condition were taken as commercial/apartments, right-of-way, and wood in fair condition. In addition, the offsite areas to the north commercial site were also utilized within the calculations for the site. A composite curve number was developed for the tributaries and HSG ratings were increased to one level therefore HSG D was used throughout the site in the proposed condition. The proposed cover conditions are shown in Appendix B. For the modeled proposed upstream tributary area

identified in the HydroCAD analysis as Subcatchment OS1: Gateway Landing Apartments, the proposed drainage area is 10.860 acres, consisting of 6.520 acres of impervious area and 4.340 acres of pervious area, and the composite curve number used in the model is 91.

Times of concentration were established in a similar manner to the existing conditions. Shallow concentrated flow lengths were shortened and considered paved. Detailed calculations of the composite curve numbers and times of concentration can be found in Appendix B. Sheet 2 "Proposed Drainage Map" shows the proposed flow paths utilized in the time of concentration calculations. For Subcatchment OS1, the HydroCAD model uses a total time of concentration of 14.0 minutes.

3.3 RAINFALL AMOUNTS

The rainfall amounts used in the study are based on 24-hour storm durations. The total rainfall depths modeled are 3.08 inches for the 1-year storm event, 5.44 inches for the 10-year storm event, and 8.61 inches for the 100-year storm event.

3.4 HYDROLOGIC MODEL RESULTS

The routed reach comparison for the modeled stream system is summarized in Table 3.2 below for the 1-year, 10-year, and 100-year storm events. The same routing sequence of Reach 14+07, Reach 12+51, Reach 10+43, Reach 8+38, Reach 6+23, and Reach 4+09, was used for the 1-year, 10-year, and 100-year storm events in both the existing and proposed HydroCAD models.

Table 3.2
Routed Reach Peak Outflow Comparison (HydroCAD Data)

Storm Event	Location	Existing Peak Outflow (cfs)	Proposed Peak Outflow (cfs)	Increase (cfs)
1-Year	Reach 14+07	86.66	97.61	10.95
1-Year	Reach 12+51	86.33	97.07	10.74
1-Year	Reach 10+43	117.81	128.34	10.53
1-Year	Reach 8+38	117.64	128.04	10.40
1-Year	Reach 6+23	149.41	159.59	10.18
1-Year	Reach 4+09	181.30	191.35	10.05
10-Year	Reach 14+07	107.94	123.98	16.04
10-Year	Reach 12+51	107.26	123.05	15.79
10-Year	Reach 10+43	138.38	153.95	15.57
10-Year	Reach 8+38	138.00	153.38	15.38
10-Year	Reach 6+23	169.40	184.47	15.07
10-Year	Reach 4+09	201.08	215.97	14.89
100-Year	Reach 14+07	137.32	158.92	21.60
100-Year	Reach 12+51	136.23	157.46	21.23
100-Year	Reach 10+43	167.02	187.94	20.92
100-Year	Reach 8+38	166.35	187.06	20.71
100-Year	Reach 6+23	197.48	218.11	20.63
100-Year	Reach 4+09	228.76	249.33	20.57

The peak discharge comparison for OS1: Gateway Landing Apartments for the modeled storm events is summarized in Table 3.3 below.

Table 3.3

OS1: Gateway Landing Apartments Peak Discharge Comparison (HydroCAD Data)

Storm Event	Existing Peak Discharge (cfs)	Proposed Peak Discharge (cfs)	Increase (cfs)
1-Year	16.03	27.17	11.14
10-Year	37.58	53.87	16.29
100-Year	67.25	89.16	21.91

As shown in Table 3.4, the proposed development results in only minor increases in average flow depth through the analyzed reaches for the 1-year, 10-year, and 100-year storm events. The largest increase is 0.12 feet at Reach 10+43 and Reach 14+07 during the 100-year storm event, while the 1-year and 10-year events likewise show only slight changes in routed depth through the downstream system.

Table 3.4
Routed Reach Average Flow Depth Comparison (HydroCAD Data)

Storm Event	Location	Existing Avg. Flow Depth (ft)	Proposed Avg. Flow Depth (ft)	Change (ft)
1-Year	Reach 14+07	2.52	2.60	0.08
1-Year	Reach 12+51	1.74	1.81	0.07
1-Year	Reach 10+43	3.02	3.11	0.09
1-Year	Reach 8+38	1.54	1.59	0.05
1-Year	Reach 6+23	1.82	1.86	0.04
1-Year	Reach 4+09	1.30	1.33	0.03
10-Year	Reach 14+07	2.68	2.79	0.11
10-Year	Reach 12+51	1.88	1.97	0.09
10-Year	Reach 10+43	3.19	3.30	0.11
10-Year	Reach 8+38	1.64	1.70	0.06
10-Year	Reach 6+23	1.90	1.96	0.06
10-Year	Reach 4+09	1.35	1.39	0.04
100-Year	Reach 14+07	2.87	2.99	0.12
100-Year	Reach 12+51	2.04	2.15	0.11
100-Year	Reach 10+43	3.38	3.50	0.12
100-Year	Reach 8+38	1.76	1.84	0.08
100-Year	Reach 6+23	2.01	2.07	0.06
100-Year	Reach 4+09	1.42	1.47	0.05

3.5 HECRAS HYDRAULIC MODEL RESULTS

Manning's roughness coefficients used in the HECRAS model were selected based on the surveyed field conditions, topographic data, aerial review, and the channel/overbank descriptions provided within the GeoHECRAS software. The main channel was modeled using an n-value of 0.10, consistent with a very weedy reach condition, and the overbank areas were modeled using an n-value of 0.10, consistent with heavy stand timber conditions.

The lot comparisons presented herein are based on the upstream lot corner callout locations shown on the Detailed Stream Analysis exhibit in Appendix B. These upstream lot corner values were used as a conservative basis for comparison to the minimum low opening elevations of the adjacent structures.

Table 3.5 presents interpolated HECRAS results for the 100-year storm event at the upstream lot corner callout locations shown on the Detailed Stream Analysis exhibit, along with the corresponding minimum low opening elevations for the adjacent structures.

Table 3.5

HECRAS Interpolated Data for the 100-Year Storm Event Per Lot.

Lot #	Upstream Lot Corner Callout #	Existing Grade	Existing 100-Yr. Elevation	Proposed 100-Yr. Elevation	Proposed 100-Yr. EGL Elevation	Existing Minimum Low Opening Elevation (MLOE)	MLOE - EGL (FT)
73	1	1041.93	1039.57	1039.68	1039.80	1044.83	5.03
74	2	1045.11	1041.67	1041.69	1041.76	1046.03	4.27
75	3	1047.28	1042.87	1042.97	1043.04	1050.00	6.96
76	4	1048.24	1044.17	1044.30	1044.37	1049.83	5.46
77	5	1050.92	1046.63	1046.74	1046.83	1052.03	5.20
78	6	1052.12	1048.63	1048.72	1048.81	1053.00	4.19
79	7	1053.00	1050.56	1050.64	1050.97	1054.17	3.20
80	8	1054.00	1052.26	1052.35	1052.68	1055.70	3.02
81	9	1054.69	1054.32	1054.40	1054.73	1057.03	2.30
82	10	1057.21	1056.00	1056.05	1056.10	1059.70	3.60
83	11	1059.38	1057.99	1058.00	1058.05	1060.33	2.28
84	12	1061.98	1059.50	1059.59	1059.78	1062.53	2.75
85	13	1064.13	1059.50	1059.59	1059.78	1067.70	7.92
98	14	1063.01	1059.50	1059.59	1059.78	1066.83	7.05
99	15	1062.72	1059.50	1059.59	1061.35	1062.50	1.15
107	16	1058.88	1054.46	1054.55	1054.74	1059.75	5.01
108	17	1057.18	1056.60	1056.69	1056.74	1058.50	1.76
109	18	1056.00	1055.19	1055.31	1055.36	1056.70	1.34
110	19	1054.42	1053.97	1054.01	1054.34	1057.47	3.13
118	20	1056.02	1052.30	1052.30	1052.63	1056.80	4.17
119	21	1053.00	1050.77	1050.86	1051.19	1054.80	3.61
120	22	1052.00	1049.49	1049.62	1049.71	1053.30	3.59
132	23	1050.15	1047.73	1047.87	1047.96	1051.00	3.04
133	24	1045.65	1045.45	1045.53	1045.62	1047.50	1.88
134	25	1043.01	1043.58	1043.64	1043.71	1048.00	4.29
135	26	1045.91	1041.31	1041.42	1041.54	1045.00	3.46
136	27	1045.32	1039.51	1039.56	1039.68	1049.00	9.32
137	28	1046.98	1038.63	1038.80	1038.92	1051.10	12.18

4.0 CONCLUSIONS AND RECOMMENDATIONS

This Downstream Stormwater Impact Study has been prepared to evaluate the impact of the proposed Gateway Landing Apartments development on the downstream stream corridor located within the existing Boulder Hills 2nd Plat and Boulder Hills 3rd Plat developments in Olathe, Kansas. Existing and proposed conditions for Gateway Landing Apartments were modeled using HydroCAD for the 1-year, 10-year, and 100-year storm events. The existing and proposed 1-year, 10-year, and 100-year storm event flows from HydroCAD were then used in HECRAS to evaluate the downstream hydraulic conditions. The 100-year storm event was further evaluated in detail relative to the adjacent lot grades and minimum low opening elevations. The downstream boundary condition for this model was based on normal depth using the existing channel slope, as no known downstream ponded water surface elevation was available to control the reach. A detailed Stream Analysis exhibit, supporting profiles, and Table 3.5 are included in Appendix B.

At Release Point #1, HydroCAD results indicate the peak discharge increases from 181.30 cfs to 191.35 cfs for the 1-year storm event, from 201.08 cfs to 215.97 cfs for the 10-year storm event, and from 228.76 cfs to 249.33 cfs for the 100-year storm event. These increases are minor within the context of the downstream routed system.

The routed reach summaries shown in Table 3.4 indicate a maximum increase in average flow depth of 0.12 feet or less through the downstream reaches under proposed conditions. HECRAS interpolated results for the 100-year storm event at the upstream lot corner callout locations are presented in Table 3.5. The upstream lot corner values were used as a conservative basis for comparison to the minimum low opening elevations of the adjacent structures. While the modeled 100-year storm event extends onto two adjacent properties, the analysis indicates that the existing homes remain protected. At Lot 133, the lowest opening elevation is 1047.50, which is 1.88 feet above the computed energy grade line elevation of 1045.62. At Lot 134, the lowest opening elevation is 1048.00, which is 4.29 feet above the computed energy grade line elevation of 1043.71.

April 22, 2026

Based on the completed hydrologic and hydraulic evaluation, the proposed Gateway Landing Apartments results in minor increases to the flow depth in the downstream stream corridor adjacent Boulder Hills 2nd Plat and Boulder Hills 3rd Plat subdivisions.

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