

Hydrology Study Grantville Focused Plan Amendment EIR

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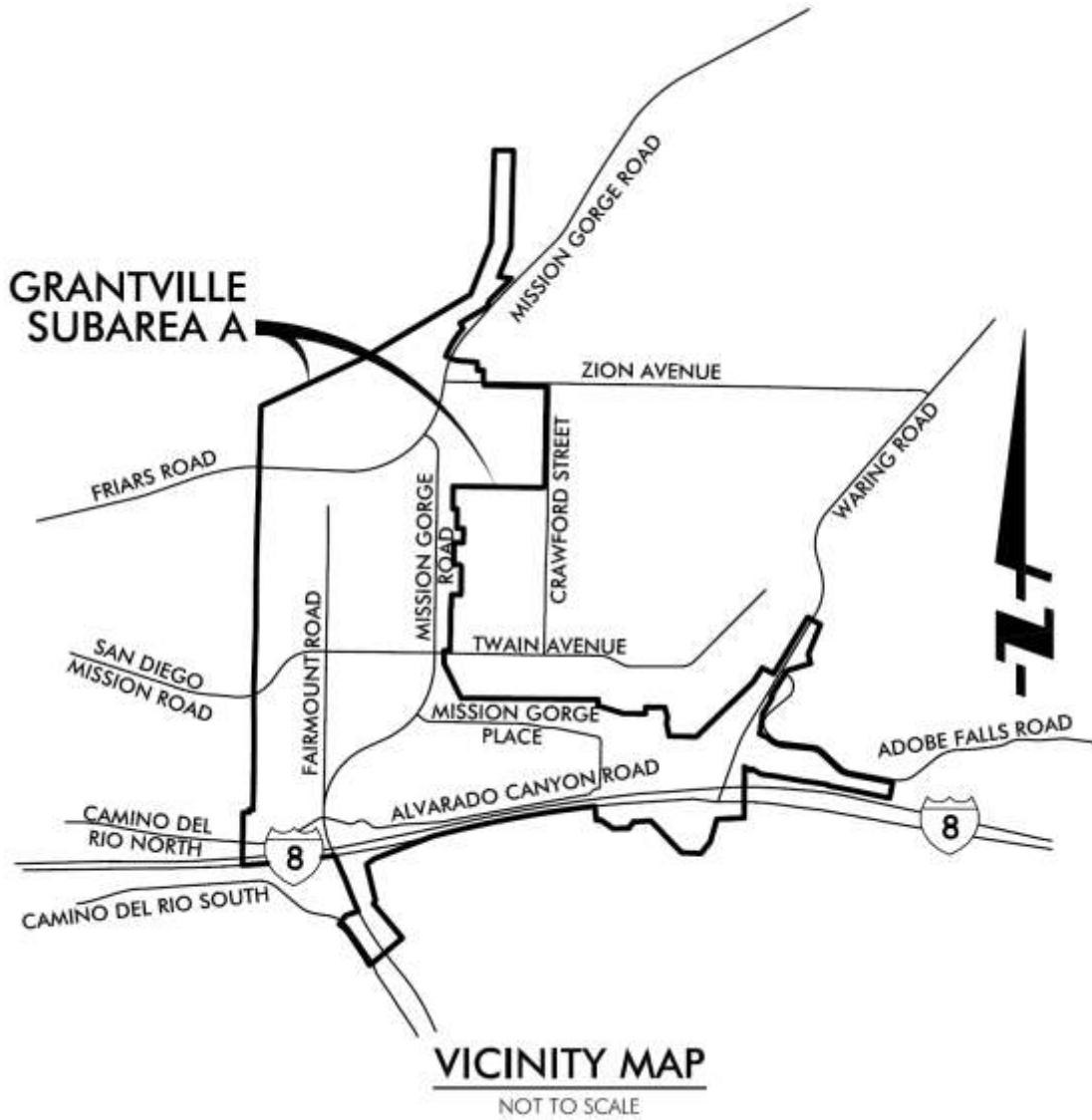
INTRODUCTION

PURPOSE

This Hydrology Study pertains to the Grantville Subarea A Focused Plan Amendment in San Diego, CA. Its purpose is to analyze the hydrologic impacts of the proposed redevelopment with respect to CEQA guidelines and the City of San Diego Drainage Design Manual. This study will be performed at an appropriate level of detail for the redevelopment Focused Plan Amendment, which is a land use planning document.

PROJECT DESCRIPTION

The Grantville area of San Diego is located at the eastern end of Mission Valley. It is bordered to the south by Interstate 8, to the west and north by the San Diego River, and to the east by the Allied Gardens neighborhood. Subarea A consists of the westerly and southerly portions of Grantville, along the San Diego River and Interstate 8. Major roads within Subarea A include Mission Gorge Road, Fairmount Road, Friars Road, and Waring Road. Surrounding land uses include single family residential, multifamily residential, commercial, industrial, churches, and the Admiral Baker Golf Course.



Existing land uses in the redevelopment area are predominantly high-density commercial and industrial, with smaller amounts of office, multifamily residential, and medical. A narrow strip of open space exists along the San Diego River bed, and a portion of the Admiral Baker Golf Course is included in the Subarea. Proposed land uses will include industrial, office, commercial, residential mixed use, commercial mixed use, multifamily residential, single family residential, and open space.

BASIN DESCRIPTIONS

Both the San Diego River and Alvarado Creek run through the project site. As the scope of this study is limited to runoff generated within the boundaries of Subarea A, the overall watersheds and flow rates of the San Diego River and Alvarado Creek will not be analyzed. Record information was obtained from FEMA to determine the flow rates and floodplain/floodway limits for the San Diego River and Alvarado Creek.

Alvarado Creek runs from east to west within the southerly portion of Subarea A, roughly parallel to Interstate 8, and confluences with the San Diego River near the southwest corner of Subarea A. The effective FEMA Flood Insurance Study lists a 100-year flow rate of 4,300 cfs at Section H, at the easterly end of the project site. At approximately Section B, near the confluence with the San Diego River, the 100-year flow rate is 5,100 cfs. Onsite basins which discharge to Alvarado Creek are designated with the letter "A".

The San Diego River flows from northeast to southwest along the northerly and westerly edges of Subarea A. The San Diego River was studied by the US Army Corp of Engineers in the "San Diego River (Mission Valley) Design Memorandum No. 1 Hydrology". This study lists the 100-year flow rate for the River through Grantville Subarea A as 36,000 cfs. Onsite basins which discharge directly to the River are designated with the letters "SD".

The Grantville Subarea A Focused Plan Amendment is a land use planning document. The Focused Plan Amendment does not propose a design for the grading and drainage of the redevelopment area. Such grading and drainage design will be performed for the individual redevelopment projects within Subarea A when such projects proceed to design. Therefore, this study will assume that the size and drainage patterns of the existing drainage basins remain unchanged since no proposed conditions design is available for analysis. This assumption is in accordance with City of San Diego guidelines that proposed development shall not divert water from existing drainage courses.

Following is a description of the hydrologic basins analyzed. These basins can be seen graphically on the Existing Conditions and Proposed Conditions maps located in the appendix.

BASIN A-1

Basin A-1 consists of 5.23 acres to the south of Alvarado Creek, to the north of Camino Del Rio North, and to the west of Mission Gorge Road. In the existing condition, it is drained by a private storm drain system which outlets to Alvarado Creek. The existing land use is commercial; the proposed land use is Industrial.

BASIN A-2

Basin A-2 consists of 23.82 acres along Mission Gorge Road and Fairmount Road. The storm drain system in Mission Gorge Road and Fairmount Road convey runoff from this basin to Alvarado Creek at a point just west of the bridge on Mission Gorge Road. The existing land use is commercial and industrial; the proposed land use is Residential Mixed Use and Commercial.

BASIN A-3

Basin A-3 consists of 15.55 acres along the southerly banks of Alvarado Creek. The basin drains to Alvarado Creek via surface flow and a storm drain system. The existing land use is commercial and industrial; the proposed land use is Residential Mixed Use.

BASIN A-4

Basin A-4 consists of 20.25 acres and extends from Alvarado Creek north along Mission Gorge Road to Twain Avenue, and east a short distance on Twain Avenue. The runoff from this basin is conveyed to Alvarado Creek by a storm drain system extending to Mission Gorge Road, as well as by surface flow from the properties directly along the Creek. The existing land use is commercial and industrial, along with small amounts of office and multifamily residential; the proposed land use is Multi-Family Residential, Residential Mixed Use and Commercial.

BASIN A-5

Basin A-5 consists of 15.36 acres to the south of Alvarado Creek. It is drained by surface flow and a small storm drain system at the westerly end of the basin. The existing land use is commercial and industrial; the proposed land use is Residential Mixed Use.

BASIN A-6

Basin A-6 consists of 14.09 acres to the north of Alvarado Creek along Mission Gorge Place. Basin A-6 also accepts drainage from adjacent single family residential development via an 18" RCP (OFF-1). The offsite drainage is conveyed to Mission Gorge Place via open concrete channels and swales. On the south side of Mission Gorge Place, an existing headwall and culvert collects the offsite and onsite flows and

conveys them to Alvarado Creek. The existing land use is predominantly industrial, with small amounts of office, commercial, multifamily residential and single family residential along the periphery of the basin; the proposed land use is Residential Mixed Use.

BASIN A-7

Basin A-7 consists of 13.97 acres along Mission Gorge Place to the north of Alvarado Creek. This segment of the Creek flows through an underground culvert. Onsite flows are collected by curb inlets in Mission Gorge Place and conveyed to the westerly end of the culvert by a storm drain. The existing land use is industrial, with a small amount of commercial and single family residential along the slopes at the northerly edge of the basin; the proposed land use is Residential Mixed Use.

BASIN A-8

Basin A-8 consists of 7.58 acres at the east end of Mission Gorge Place. Runoff from both sides of Alvarado Creek is collected by curb inlets in Mission Gorge Place, which connect to the underground culvert housing Alvarado Creek. The existing land use is industrial; the proposed land use is Residential Mixed Use and Multi-Family Residential.

BASIN A-9

Basin A-9 consists of 2.88 acres to the north of Alvarado Creek. A private storm drain system conveys flow from this basin to the underground culvert housing the Creek. The existing land use is industrial; the proposed land use is Multi-Family Residential.

BASIN A-10

Basin A-10 consists of 1.83 acres to the south of Alvarado Creek, including a portion of Adobe Falls Road. Runoff from the roadway is collected by curb inlets and conveyed to the Creek. Onsite flows are also conveyed to the Creek. The existing land use is industrial; the proposed land use is Multi-Family Residential.

BASIN A-11

Basin A-11 consists of 10.65 acres to the north of Alvarado Creek between Mission Gorge Place and Waring Road. This basin accepts offsite flows from two storm drain systems, a storm drain system from Elsa Road (OFF-2) and an 18" RCP from Fenimore Way (OFF-3). The offsite and onsite flows are collected by a storm drain system which outlets to Alvarado Creek. The existing land use is commercial and industrial, with single family residential along the slopes to the north and a small amount of undeveloped area; the proposed land use is Single Family Residential, Multi-Family Residential and Office/Hospital.

BASIN A-12

Basin A-12 consists of 13.17 acres to the west of Waring Road. Basin A-12 accepts flows from two offsite canyon systems. The extensive canyon system to the northeast enters Basin A-12 through two 72" RCP culverts crossing under Waring Road. The canyon to the north enters Basin A-12 through a 30" RCP (OFF-5). These flows, as well as the onsite flows, are conveyed to Alvarado Creek by an open channel. The existing land use is commercial, with single family residential at the top of the slopes, and undeveloped areas along the open channel and steep slopes; the proposed land use is Office/Hospital.

BASIN A-13

Basin A-13 consists of 8.75 acres between Adobe Falls Road and Alvarado Creek to the east of Waring Road. Runoff from the basin is conveyed to the Creek by surface flow and a private storm drain system. The existing land use is multifamily residential and commercial; the proposed land use is Multi-Family Residential and Commercial.

BASIN A-14

Basin A-14 consists of 3.63 acres along Adobe Falls Road. Curb inlets within Adobe Falls Road collect the runoff from this basin and convey it south the Alvarado Creek. Runoff from the northerly side of Adobe Falls Road is offsite of the project, and is conveyed across the street by a 24" RCP (OFF-6). The existing land use is commercial; the proposed land use is Multi-Family Residential and Commercial.

BASIN SD-1

Basin SD-1 consists of 5.91 acres just north of Alvarado Creek and along the San Diego River. Runoff from this basin enters the San Diego River through surface runoff. The existing land use is commercial; the proposed land use is Industrial.

BASIN SD-2

Basin SD-2 consists of 9.80 acres between Fairmount Road and the San Diego River. Record drawings for the onsite drainage facilities were not readily available; however a private storm drain system likely existing within this basin to convey runoff to the San Diego River. The existing land use is commercial and industrial; the proposed land use is Industrial.

BASIN SD-3

Basin SD-3 consists of 2.78 acres along the San Diego River just south of San Diego Mission Road. Runoff from this basin surface flows into the River.

The existing land use is commercial and industrial; the proposed land use is Industrial.

BASIN SD-4

Basin SD-4 consists of 50.23 acres and stretches from the San Diego River east along Twain Avenue to Mohler Street, including some areas outside of Subarea A. A storm drain system with curb inlets in Twain Avenue, Fairmount Road, and Mission Gorge Road conveys runoff from this basin to the River. The existing land use is commercial, industrial and office, with multifamily residential and single family residential at the easterly end of the basin outside of Subarea A; the proposed land use is Multi-Family Residential, Residential Mixed Use and Commercial.

BASIN SD-5

Basin SD-5 consists of 51.62 acres from the San Diego River east to Crawford Street, and from Vandever Avenue north to Orcutt Avenue. A storm drain system exists with curb inlets in Vandever Avenue, Mission Gorge Road, and Rainier Avenue. The storm drain system extends offsite, with additional flows entering the basin from a 42" RCP in Vandever Avenue (OFF-7) and an 18" RCP in Rainier Avenue (OFF-8). The storm drain system outlets to the San Diego River near the westerly end of Vandever Avenue. The existing land use is commercial, industrial and office, with a small amount of multifamily residential in the offsite areas in the east end of the basin; the proposed land use is Multi-Family Residential, Commercial and Office/Hospital.

BASIN SD-6

Basin SD-6 consists of 3.90 acres adjacent to the San Diego River to the south of Friars Road. Runoff from this basin enters the basin through surface flow. The existing land use is industrial; the proposed land use is Multi-Family Residential.

BASIN SD-7

Basin SD-7 consists of 17.36 acres along Friars Road, extending east past the intersection with Mission Gorge Road and to the existing hospital. The storm drain system in Friars Road, Mission Gorge Road and the hospital parcel conveys the drainage to the San Diego River at the Friars Road crossing. The existing land use is commercial and office; the proposed land use is Commercial and Office/Hospital.

BASIN SD-8

Basin SD-8 consists of 5.48 acres just north of Friars Road. A private storm drain system conveys runoff from this basin to the San Diego River. The existing land use is commercial; the proposed land use is Commercial.

BASIN SD-9

Basin SD-9 consists of 28.00 acres along Zion Avenue from the San Diego River to Crawford Street. A storm drain system within Zion Avenue conveys flows west to the San Diego River. The existing land use is commercial and office, along with an offsite area of multifamily residential; the proposed land use is Commercial and Office/Hospital.

BASIN SD-10

Basin SD-10 consists of 17.51 acres along the San Diego River to the north of Zion Avenue. This basin accepts offsite flow from Mission Gorge Road and the single family residential development to the east through a 24" RCP (OFF-10). The offsite flow, along with the onsite flow, is conveyed to the San Diego River by an open channel. The existing land use is commercial along Mission Gorge Road and open space in the golf course along the River; the proposed land use is Open Space and Commercial.

METHODOLOGY

RUNOFF CALCULATIONS

The design criteria, as found in the City of San Diego Drainage Design Manual, specifies the design runoff conditions as follows:

- 1.) Within floodplain and floodplain fringe areas as defined by the Federal Emergency Management Agency (FEMA), the runoff criteria shall be based upon a 100-year frequency storm.
- 2.) For all drainage channels and storm drain systems, which will convey drainage from a tributary area equal to and greater than 1 square mile, the runoff criteria shall be based upon a 100-year frequency storm.
- 3.) For areas under 1 square mile –
 - a. The storm drain system shall be designed so that the combination of storm drain system capacity and overflow will be able to carry the 100 year frequency storm without damage to or flooding of adjacent existing buildings or potential building sites.
 - b. The runoff criteria for the underground storm drain system shall be based upon a 50-year frequency storm.
- 4.) Type D soils shall be used for all areas.

Note that this study does not establish finish floor elevations for proposed buildings, however, at the time of final design, under City requirements the minimum elevation of the finished, first floor elevation of any building is two (2) feet above the 100-year frequency flood elevation.

RUNOFF CALCULATIONS

Runoff produced on the project site will be calculated for the 2-year, 10-year, and 100-year storm events using the methodology outlined in the City of San Diego Drainage Design Manual. Runoff will be calculated using the Rational Method, which is given by the following equation:

$$Q = C \times I \times A$$

Where:

Q = Flow rate in cubic feet per second (cfs)

C = Runoff coefficient

I = Rainfall Intensity in inches per hour (in/hr)

A = Drainage basin area in acres, (ac)

Soil Type – Hydrologic soil groups A and D are present within the project boundary, as shown on the Soil Hydrologic Groups map provided in the appendix. However, per City standards, Type D soils will be assumed for all calculations. Soil maps developed by the Soil Conservation Service were used to provide additional detail in the delineation of the soil groups. The extents of the Group A and D soils can be seen on the Existing Land Use and Proposed Land Use exhibits in the Appendix. Group A soils have rapid infiltration rates, and consist largely of alluvial materials. They are present within the project boundary mainly along the courses of the San Diego River and Alvarado Creek. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials, Group D soils have a very slow rate of water transmission. The Group D soils within the project boundary are present at the higher elevations above the river bed and on the mesas and steep slopes.

Runoff Coefficient – The runoff coefficients used are in accordance with the City of San Diego Drainage Design Manual. Existing and proposed land uses were assigned a runoff coefficient “C” based on Table 2 of the Manual. The table below lists the runoff coefficients used for the various land uses and soil types present within the analysis area. Where multiple land uses and/or soil types were present in an individual basin, a weighted runoff coefficient was calculated based on the respective areas of each “C” value. Existing land uses were determined using Figure 4: Map of

Current Land Uses in Grantville Redevelopment Area (Subarea A) contained in the Grantville Redevelopment Project Subarea A Market Overview prepared by ERA. Proposed land uses were determined based on the Grantville Subarea A Focused Plan Amendment EIR.

Land Use	Runoff Coefficient
	Soil Type D
Open Space	0.35
Single Family Residential	0.55
Multifamily Residential	0.70
Mobile Homes	0.79
Commercial (85% Impervious)	0.85
Industrial (90% Impervious)	0.95

Note: For land use of hospital, a percent imperviousness of 85% is assumed and the associated runoff coefficient used for calculations is 0.85
 Rainfall Intensity – Rainfall intensity was calculated using the Rational Method, which is given by the following equation:

$$I = 7.44 \times P_6 \times (T_c^{-0.645})$$

Where:

- I = Rainfall Intensity in inches per hour (in/hr)
- P₆ = Rainfall in inches for the 6-hour storm event
- T_c = Time of concentration in minutes

The P₆ value was taken from the isopluvial maps given in the San Diego County Hydrology Manual for each of the storm events analyzed, which are listed below. The isopluvial maps are included in the appendix.

- P₆(100-year) = 2.6 inches
- P₆(10-year) = 1.8 inches
- P₆(2-year) = 1.2 inches

Time of Concentration – Detailed time of concentration calculations were not performed, as the Focused Plan Amendment in a planning level document and no proposed conditions grading or drainage design is available or warranted at this time. Therefore, each basin was assigned a time of concentration of 5, 10, or 15 minutes based on the basin’s size and length of flow through the basin.

OFFSITE FLOW CALCULATIONS

Where runoff from offsite areas enters Subarea A through a storm drain pipe, record drawings were consulted to determine the flows entering the

site. In the event that the Q(100) was shown on the record drawings, this was used as the 100-year flow from offsite. If the Q(100) was not shown on the record drawings, the 100-year flow was conservatively assumed to be the maximum capacity of the pipe entering the site. The capacity calculation was performed using the Flowmaster software by Bentley Systems, which is based on the Manning's equation. A Manning's "n" of 0.013 was used for RCP. The pipe sizes and slopes were taken from the record drawings. The 10-year and 2-year flow rates were calculated by multiplying the 100-year flow rate by the ratio of the design storm P₆ to the 100-year P₆. The results of these calculations are shown below, and more detailed information can be found in the appendix.

Offsite Basin	Receiving Basin	Q(100)	Q(10)	Q(2)
		cfs	cfs	cfs
OFF-1	A-6	11	8	5
OFF-2	A-11	58	40	27
OFF-3	A-11	9	6	4
OFF-4	A-12	1015	703	469
OFF-5	A-12	97	67	45
OFF-6	A-14	22	15	10
OFF-7	SD-5	160	110	73
OFF-8	SD-5	20	14	9
OFF-9	SD-10	40	28	19

CALCULATIONS/RESULTS

The results of the existing conditions calculations can be found in the table below. These results can also be found on the Existing Conditions map located in the appendix.

Basin	Runoff Coefficient	Tc	A	Q(100)	Q(10)	Q(2)
		min.	ac	cfs	cfs	cfs
Alvarado Creek	-	-	-	4,300	2,300	-
A-1	0.85	5	5.23	30	21	14
A-2	0.85	10	23.82	89	61	41
A-3	0.92	10	15.55	63	43	29
A-4	0.88	10	20.25	78	54	36
A-5	0.93	10	15.36	63	43	29
A-6	0.88	10	14.09	65*	45*	30*
A-7	0.92	10	13.97	56	39	26
A-8	0.95	5	7.58	49	34	23
A-9	0.95	5	2.88	19	13	9
A-10	0.95	5	1.83	12	8	5
A-11	0.79	10	10.65	104*	72*	48*
A-12	0.64	10	13.17	1149*	796*	530*
A-13	0.74	10	8.75	28	20	13
A-14	0.83	10	3.63	35*	24*	16*
A Total	-	-	-	1,840	1,274	849
San Diego River	-	-	-	36,000	3,100	-
SD-1	0.85	5	5.91	34	24	16
SD-2	0.90	10	9.80	39	27	18
SD-3	0.94	5	2.78	18	12	8
SD-4	0.83	15	50.23	141	97	65
SD-5	0.88	15	51.62	333*	230*	153*
SD-6	0.95	5	3.90	25	18	12
SD-7	0.85	15	17.36	50	34	23
SD-8	0.85	5	5.48	32	22	15
SD-9	0.83	15	28.00	78	54	36
SD-10	0.61	10	17.51	87*	60*	41*
SD Total	-	-	-	837	579	386

* - includes runoff from offsite basin(s)

The results of the proposed conditions calculations can be found in the table below. These results can also be found on the Proposed Conditions map located in the appendix.

Basin	Runoff Coefficient	Tc	A	Q(100)	Q(10)	Q(2)
		min.	ac	cfs	cfs	cfs
Alvarado Creek	-	-	-	4,300	2,300	-
A-1	0.95	5	5.23	34	24	16
A-2	0.84	10	23.82	88	61	40
A-3	0.70	10	15.55	48	33	22
A-4	0.74	10	20.25	66	45	30
A-5	0.78	10	15.36	52	36	24
A-6	0.70	10	14.09	54*	38*	25*
A-7	0.70	10	13.97	43	30	20
A-8	0.70	5	7.58	36	25	17
A-9	0.70	5	2.88	14	10	6
A-10	0.70	5	1.83	9	6	4
A-11	0.67	10	10.65	98*	68*	46*
A-12	0.85	10	13.17	1161*	804*	536*
A-13	0.72	10	8.75	28	19	13
A-14	0.73	10	3.63	34*	23*	15*
A Total	-	-	-	1759	1217	812
San Diego River	-	-	-	36,000	3,100	-
SD-1	0.95	5	5.91	38	27	18
SD-2	0.95	10	9.80	41	28	19
SD-3	0.95	5	2.78	18	13	8
SD-4	0.74	15	50.23	125	87	58
SD-5	0.81	15	51.62	321*	222*	147*
SD-6	0.70	5	3.90	19	13	9
SD-7	0.85	15	17.36	50	34	23
SD-8	0.85	5	5.48	32	22	15
SD-9	0.85	15	28.00	80	56	37
SD-10	0.61	10	17.51	87*	60*	41*
SD Total	-	-	-	811	561	374

* - includes runoff from offsite basin(s)

For proposed redeveloped basins showing an increase in peak flow rates where the downstream storm drain system is limited in available capacity, mitigation measures shall apply. Mitigation measures might include but shall not be limited to on-site detention. The application of suitable mitigation practices will ensure that the proposed peak flow rates will remain similar or become less than the existing peak flow rates where downstream capacity issues are present. Since there are no proposed design conditions in this Grantville Subarea A Focused Plan Amendment, mitigation measures shall be analyzed according to proposed projects when the project proceeds to final engineering. For information regarding mitigation methods that might be applicable for the redevelopment of Subarea A, refer to the Grantville Subarea A Water Quality Technical Report dated May 2014.