

4.0 DRAINAGE

4.1 INTRODUCTION

The watershed tributary to the Colonies at San Antonio Specific Plan area totals 2,563 acres. The majority of this watershed is located outside of the Specific Plan area; however, the Specific Plan area is required by the San Bernardino County Flood Control District to receive, detain, and outlet these local and regional flows. Within the Specific Plan area, I-210 intercepts runoff from 73.5 acres located at the northern boundary of the site. To the south, the remaining on-site watershed covers a total of 391.5 acres.

This chapter illustrates the backbone facilities and improvements, based on preliminary design flow calculations, that are necessary to provide drainage and flood protection to the Colonies at San Antonio Specific Plan area. The conceptual master plan and local facilities identified in this chapter will drain the project site to Cucamonga Creek Channel, a regional facility located along the eastern boundary of the Specific Plan. Detailed information on the hydrologic conditions affecting the Colonies at San Antonio Specific Plan and the Specific Plan's storm drain plan are included in the Storm Drain Master Plan prepared for the Colonies at San Antonio Specific Plan. This Master Plan is available under separate cover.

4.2 STORM DRAIN SYSTEM CONCEPT

Using circulation and grading plan information, a storm drain layout for required local, regional, and I-210 flows was developed by the project engineer. The proposed backbone storm drain system for the Colonies at San Antonio Specific Plan is shown in Figure 4.1. Considered in this layout are the design parameters of the San Bernardino County Flood Control District, as well as drainage infrastructure constructed as part of the I-210 project. Flows from the 19th Street Storm Drain and the 20th Street Storm Drain discharge into Basin A within the Specific Plan's central open space. The Campus Avenue Storm Drain will connect to the 20th Street Storm Drain, and then flow in the central open space area. Flows from the I-210 culvert located at the east boundary of the project are conveyed to the storm drain in Colonies Parkway that discharges directly to Basin B.

Also considered was collection and/or safe direction overland of 100 year storm surface flows. Drainage systems in or crossing 19th Street, 20th Street, and Campus Avenue must be sized to collect and convey 100 year storm flows. The proposed storm drain along the southern boundary of the Specific Plan area will also need to be sized for 100 year storm flows from the adjacent tracts. All Planning Areas on the north side of Basin A will discharge to Basin A. Low points must also be similarly designed to dewater 100-year storm surface flows.

The central open space area of Planning Area 16 is designed to accommodate stormwater flows that currently run through the site, ensuring that the capacity of the adjacent Cucamonga Creek Channel will not be exceeded by on-site *or* upstream development. A controlled outlet at the downstream end of the basin, consisting of a gated valve, will detain and discharge flows up to a 100-year storm level into Planning Area 16B.

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Flows from storms greater than a 100-year level will exit Basin A over a different controlled outlet, discharging into Planning Area 16A. The main feature of Planning Area 16A is the rock outlet facility that originates in the adjacent Planning Area 16. The floodway directs water south under Colonies Parkway to Detention Basin B in Planning Area 16C, where flood waters are outlet at a controlled rate of flow into the Cucamonga Creek Channel located to the east just outside the Specific Plan boundary.

The central open space area is composed of three sub-basins designed to maintain historic levels of groundwater recharge and help sustain wetland/riparian plant habitat. Modifications to the central basin area have been necessitated by the settlement agreement entered into by the City, the San Antonio Water Company, the Cucamonga County Water District, a citizens group, and the property owner in a CEQA challenge against the Colonies at San Antonio EIR. As required by the conditions of approval for master tentative tract 16198, a Flood Emergency Action Plan was prepared. The Flood Emergency Action Plan required an interim basin with a detention capacity of 582 acre-feet and ultimate improvements which will raise the spillway and increase detention capacity to 799 acre-feet. The design of the recharge facilities will maintain historic rates of groundwater recharge in both the interim and ultimate conditions, as defined in the settlement agreement.¹ Interim and ultimate basin conditions are described in Table 4.A. Four sources of water flow to the basins: (1) flow from the 19th and 20th Street storm drains; (2) flow from the San Antonio Water Company; (3) nuisance flow, and (4) drainage from lands within the Colonies at San Antonio Specific Plan. The water entering the basin will have the following uses: (1) evapo-transpiration, which is the water used by plants; (2) percolation within the three sub-basins within the open space basin; and (3) outflow, in which periodic rainfall events generate a surplus of water that will leave the open space detention basin, and flow into the Cucamonga Creek channel.

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See Section 3 (Settlement and Amendment of the 1966 Spreading Easement) of the Settlement Agreement in the matters of *The Colonies Partners L.P. v. San Bernardino County Flood Control District and San Antonio Water Company* (San Bernardino County Superior Court RCV061971) and *Cucamonga County Water District v. City of Upland* (San Bernardino County Superior Court RCV067462). The settlement agreement in these matters was reached between the Colonies Partners LP (developer of the Colonies project), the City of Upland, San Antonio Water Company (SAWCO), and the Cucamonga County Water District (CCWD).

In the settlement agreement, the parties agreed on a definition of “historic recharge” (2,233 acre feet of water imported by SAWCO on an average annual basis and an annual average of 1,232 acre feet of stormwater from Upland. The settlement agreement sets forth the rights and responsibilities of parties to implement the “Basin Plan,” which revised the configuration of sub-basins “A-2” and “A-3.” This resulted in the design for Planning Area 16 set forth in the Colonies at San Antonio Specific Plan.

Information on the hydrology of the central open space basin is presented in *Hydrologic Summary of Basin Conditions at The Colonies at San Antonio*, prepared November 2003 by Associated Engineers, Inc. Information on groundwater recharge rates within Planning Area 16 is presented in the November 3, 2003 report of Daniel B. Stephens & Associated, titled *Infiltration Analysis of Proposed Colonies Spreading Grounds.*”

Table 4.A: Comparison of Interim and Ultimate Basin Construction

Feature	Initial Construction/ Interim Condition	Ultimate Condition
Overflow (Breach)	Elevation 1,537' AMSL. The breach will be protected by ungrouted rock (rip rap).	Elevation 1,544' AMSL. The overflow will be protected by a concrete spillway and a State-permitted concrete dam with headwalls.
Dead storage capacity	Approximately 582 acre-feet, an increase from the approximate 345 acre-feet of storage in the existing condition. The 582 acre-feet of storage is approximately the capacity to hold three inches (3") of rain in a 12-day period.	Approximately 799 acre-feet, approximately the capacity to hold four inches (4") of rain in any time period.
Outlet	Storm flows below the 1,537 elevation will only leave the basin to provide additional storage through evaporation, recharge, or pumping.	There will be a controlled (gated valve) outlet at elevation 1,516. This valve may be opened at the discretion of the operator (proposed to be the San Bernardino County Flood Control District) to drain detained stormwater to about 65 acre-feet in storage (remaining volume below elevation 1516). It would take less than 24 hours to drain the basin from full to this level. After draining the basin, the operator may either leave the drain open to allow controlled flow to reach the Cucamonga Creek channel at a maximum flow rate of 658 cfs, or close the gated valve to capture future storm flows.
Landscaping	The basin will be hydroseeded with native vegetation to provide interim groundcover consistent with the ultimate mitigation plan. The hydroseed will be monitored and, if needed supplemented with irrigation to aid in its growth and establishment. The vegetation will act as a filtration system to help cleanse stormwater prior to its reaching the primary recharge basin (A-3).	The basin will be replanted with a mix of native riparian, wetland, and Southern California upland vegetation as mitigation for project impacts on existing riparian habitat. The planting will be monitored and, if needed supplemented with irrigation to aid in its growth and reestablishment. The vegetation will act as a filtration system to help cleanse stormwater from northeast Upland prior to reaching the primary recharge basin (A-3) and the Cucamonga Creek channel. In addition to vegetation acting as a filtration system, a meandering streambed will be constructed of local and artificial rock. The streambed will incorporate drop structures and scouring basins that will reduce velocities and provide for sediment removal.
Grading	The central basin area will be rough graded to its ultimate configuration, with the exception of the spillway.	The spillway will be raised to elevation 1544.

Feature	Initial Construction/ Interim Condition	Ultimate Condition
Hardscape Improvements	No hardscape improvements will be provided. Access roads (20' wide) and trails (10' wide) will be graded in their ultimate location, but will not be paved.	Access roads and trails graded in the interim condition will be improved. The trails and roads will provide access for maintenance, as well as hiking/jogging and passive recreation.
Fencing and Access Restrictions	Because trails are not provided in the interim condition, and there is no need for public access, the basin itself will be fenced along the perimeter to prevent unauthorized access.	A wrought iron fence will be placed along the perimeter, generally at the basin's high water mark. The fence will be provided with vehicular and pedestrian gates that will remain open in the dry season and closed (locked) in times of large storms.
Standing Water	There may be standing water in Basin A-3 through the winter and spring rainy season.	There may be standing water in Basin A-3 through the winter and spring rainy season.
Flood Control Design	Storm flows exceeding the magnitude of a 10-year event will flow over the spillway at elevation 1,537 in a controlled manner through Planning Area 16A. Water will flow along the surface adjacent to Tanglewood Avenue in a rock-lined channel through Planning Area 16B, and enter the existing triple box structure, flowing into the basin within Planning Area 16C. Storm flows will reach the Cucamonga Channel at a rate of 1,804 cfs, in excess of the approved rate of 658 cfs, but below the existing rate of 3,400 cfs, consistent with the Flood emergency Action Plan.	During the design storm (back-to-back 100-year storms over a 5-day period), the valved outlet at elevation 1,516 will be opened, and storm flows will reach the Cucamonga Channel at a rate of 625 cfs, below the approved rate of 658 cfs.

4.3 STORMWATER TREATMENT

California's Nonpoint Source Management Plan was approved by the State Water Resources Control Board (SWRCB) in 1988. In 1993 the United States Environmental Protection Agency (USEPA) published guidance for specifying management of nonpoint sources of pollution which was incorporated into the California Nonpoint Source/Coastal Zone Act Reauthorization Amendments (NPS/CZARA) Program. The new federal regulations for nonpoint source pollution are expected to require the State of California to issue Phase II National Pollutant Discharge Elimination System (NPDES) permits as of May 31, 2002. The permit program adopted by the State of California will require permits for stormwater discharges for:

- All municipalities within urbanized areas
- Small municipalities outside of urbanized areas of at least 10,000 and/or a population density of at least 1,000 persons/square mile
- Construction sites that disturb between 1 and 5 acres.

Under California's NPS management plan, six management measures are specified which include Wetlands, Riparian Areas and Vegetated Treatment Systems. Management Measure 6C (MM6C) "promotes the installation of vegetated treatment systems (e.g., artificial or constructed wetlands) in areas where these systems will serve a polluted run-off abatement function. Vegetated filter strips and engineered wetlands (also known as bio-filters) remove sediment and other pollutants from runoff and wastewater, and prevent pollutants from entering adjacent water bodies. Removal typically occurs through filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization."

The open space basin proposed in Planning Area 16 is designed to provide treatment for low flow runoff and nuisance water conditions. Normal rainfall and nuisance water discharging into Planning Area 16 will receive treatment via the treatment processes specified above in MM6C. Major storm events will not receive the same level of treatment because the volume of stormwater exceeds the system's capacity for treatment. However, major storm events do not have the same pollutant concentrations as low flow events. Stormwater pollutant loads are highest at the beginning of the rainy season, after light rains, and during dry weather when nuisance water is discharging into the basin. The objective of the stormwater treatment concept for the Colonies at San Antonio is that the water quality of stormwater leaving the site be equal to that of stormwater entering the basin in Planning Area 16 from outside sources such as the 19th Street and 20th Street storm drains. Thus, mitigation will be provided for the water quality effects of drainage generated *within* the Specific Plan area.

The desire of the San Antonio Water Company (SAWCO) and Cucamonga County Water District (CCWD) to maintain historic levels of groundwater recharge has been provided for in a manner consistent with the Federal requirement to treat stormwater. In order to provide groundwater recharge to the quantities identified in the settlement agreement with SAWCO and CCWD, Basin A-3, a 4.11-acre sub-basin, will be provided, free of all vegetation. The design described for the open space basin (Planning Area 16) balances the Federal requirements for stormwater treatment with historic groundwater recharge in Planning Area 16's sub-basins.