5 Water Quality Program

5.1 Previous Studies

The Water Quality Program for PA-3 and PA-4 follows the Ranch Plan ROMP (PACE, 2013) and The Conceptual Master Area Plan Water Quality Management Plan for PA-3&4 dated March 5, 2015, prepared by Michael Baker International (formerly RBF Consulting) (PA-3&4 Conceptual WQMP). The Ranch Plan ROMP provided a foundation to achieve the mitigation measures identified in the FEIR for water quality management. This report provides more refined modeling and studies for PA-3 and PA-4 than those provided in the Ranch Plan ROMP, and follows the conceptual strategy studied in the PA-3&4 Conceptual WQMP to understand the effects of urbanization on the existing hydrologic conditions of the watershed. The PA-3&4 Conceptual WQMP detailed the planned best management practices (BMPs) to meet the source control, site design, LID / water quality and hydromodification requirements. The technical memorandum for the RMV Stormwater Harvesting Planning Level Assessment for Trampas Reservoir has also identified the potential for stormwater capture and use in this project area (PACE, 2014). This ROMP summarizes calculations for LID/ water quality BMPs and hydromodification management measures for this study.

This ROMP focuses on the water quality and hydromodification management for discharges to Gobernadora Canyon and water quality calculations for discharges to San Juan Creek.

5.2 Requirements and Standards

The analyses, studies, and plan provided in this PA-3&4 ROMP for water quality management comply with San Diego Regional Water Quality Control Board Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) dated November 18, 2015. In addition to conforming to the MS4 permit, the Orange County Technical Guidance Document (TGD) (OC Public Works, 2017) was used as a basis for the water quality facilities proposed in this PA-3&4 ROMP to mitigate the effects of the development within PA-3 and PA-4.

5.3 Water Quality Best Management Practices

Since the approval of the Ranch Plan ROMP, more detailed infiltration tests have been performed at several proposed water quality/hydromodification basin locations. The tests show a high variability in infiltration rates throughout proposed locations within PA-3. Infiltration BMPs will be placed where the underlying soils allow, while capture and use BMPs or biofiltration BMPs will be placed where infiltration is infeasible. These facilities (referred to as LID BMPs) will be used to meet the LID/ water quality requirements. Local detention basins (referred to as “hydromodification” BMPs) are placed where hydromodification mitigation is needed.

5.3.1 Gobernadora Canyon Water Quality Plan

The Gobernadora Canyon water quality plan analyzes the areas of PA-3 that discharge to Gobernadora Canyon. This primarily includes subwatershed A and a small portion of subwatershed B where low flows will be diverted into basins along Gobernadora Canyon.

Subwatershed A incudes about 452 acres that drains toward outfall 9, which discharges westward to Gobernadora Canyon. This area includes approximately 4 acres of the bridge over Gobernadora Canyon in the ultimate buildout condition that connects PA-2 to PA-3 as it drains toward PA-3. This

area drains to Gobernadora Canyon and is subject to the South Orange County Hydromodification Management Plan (HMP; see Section 5.5.2) requirements. Subwatershed A consists of four water quality systems that work together: three LID and one full hydromodification system. Each of the LID systems will incorporate extra detention storage above the water quality volume to help mitigate the hydromodification impacts. See Figure 5-2 for the layouts of the systems.

It is possible that LID systems, such as LID site design BMPs, smaller bioretention or biofiltration areas, and capture and use BMPs, may be integrated into the future land plan for PA-3 in a more distributed approach to meet the LID/ water quality and hydromodification requirements. The approach taken in this ROMP submittal is the integration of regional and subregional basins (infiltration, biofiltration, detention) to meet the LID/ water quality and hydromodification requirements.

The first system along subwatershed A consists of biofiltration basin 3A-1. This area is located in the north-west portion of PA-3 and includes 32.57 acres of development. Up to 110 percent of the water quality flow from this area is directed to and treated by basin 3A-1. The additional 10 percent increase was added as an effort to take advantage of the treatment capacity at this location in order to buffer downstream facilities and assist with meeting hydromodification standards. For the water quality analysis, up to 110 percent of the calculated water quality flow will be defined as “low flows”. Flows higher than 110 percent of the water quality flow will be diverted into the hydromodification system.

The next water quality system consists of basins 3A-2, 3A-3, and 3A-4. This system treats flows from 194.31 acres of the development. Basin 3A-2 is a pretreatment forebay located at grade within the developable pad. This basin will attenuate flows as a hydromodification basin as well as control the hydraulic pressure on the diversion structure that directs flow to the downstream basins. Basin 3A-2 also collects up to 110 percent of the water quality flow from 194.31 acres of the development. The additional 10 percent increase was again included for partial hydromodification mitigation. The outlet of basin 3A-2 will split the flow between the two downstream infiltration basins: 3A-3 and 3A-4. These two basins have been designed to maximize infiltration based on grading constraints and the infiltration rate of the native soil. It was determined that the optimal design uses a greater depth and longer drawdown time (72 hours) to provide a greater fraction of the design capture storm depth equivalent to 1.08 inches. Flows higher than 110 percent of the water quality flow, similar to the first system, will bypass this system and continue downstream to the hydromodification system.

The third LID system consists of biofiltration basins 3A-5, 3A-6, and 3A-7. Similarly, this system will treat up to 110 percent of the water quality flow of the remaining 225.14 acres of the development. Flows will be distributed amongst the three basins to provide treatment. Flows higher than that will bypass the biofiltration basins and be diverted into the hydromodification system.

The hydromodification system consists of three detention basins in series: 3A-9, 3A-10, and 3A-11. This system will mitigate flows from the 452.02 acres of subwatershed A.

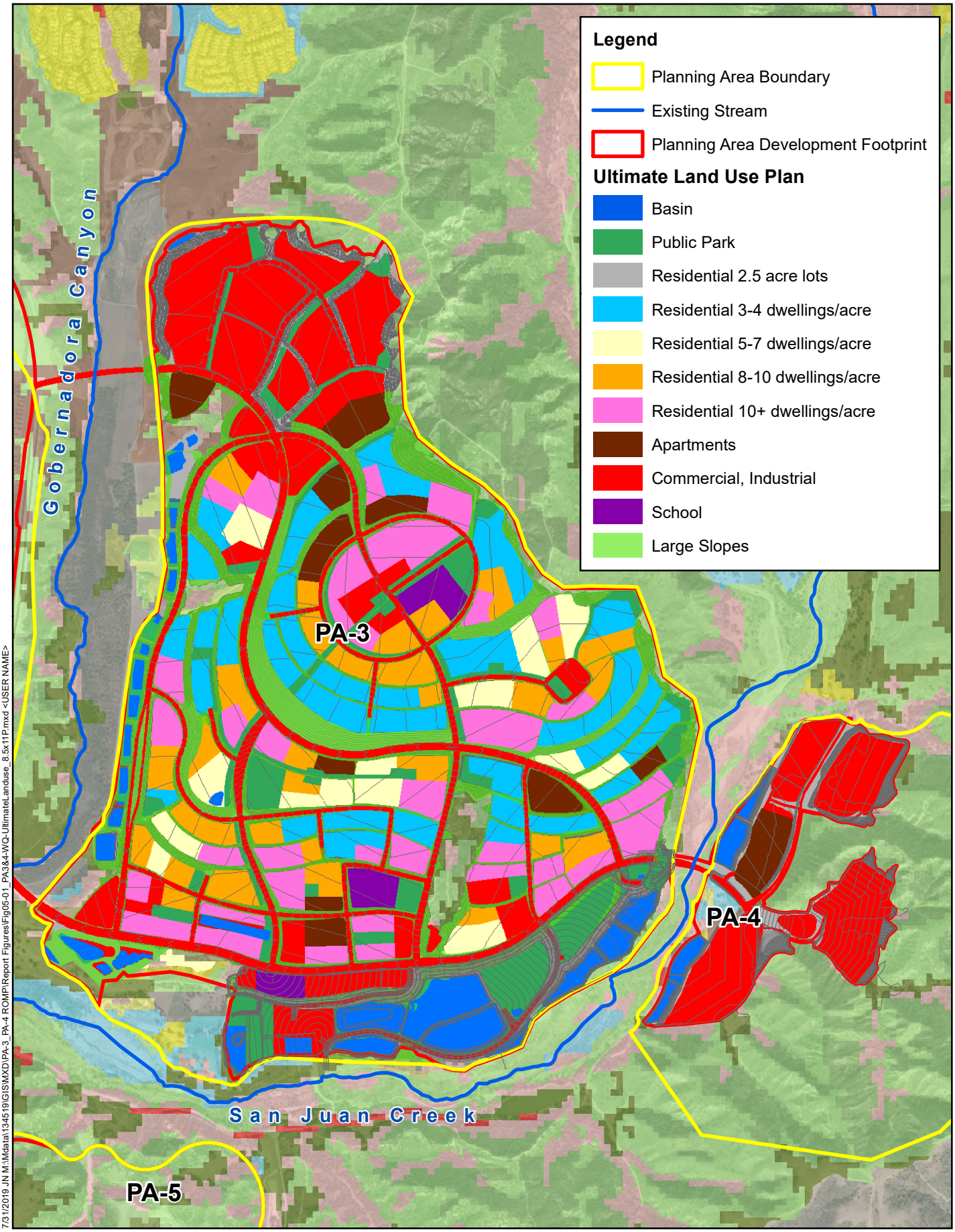
Runoff from 51.22 acres of offsite area is collected through a separate pipe which will discharge directly to Gobernadora Canyon. Since development does not occur in this area, treatment is not provided for the offsite areas.

Low flows from 35.72 acres of subwatershed B will be diverted into two basins along Gobernadora Canyon: 3A-8 and 3A-12. These basins are sized to treat only the water quality flow of the drainage area and have been incorporated into the hydromodification analysis. Flows greater than that will drain to San Juan Creek and will discharge within the 10-year floodplain resulting in exemption from

hydromodification requirements. Properly sized energy dissipation will be implemented during the design phase at the outfall location per Section 15.2.3 of the 2013 Ranch Plan ROMP.

Table 5-1 summarizes the proposed LID basins per this ROMP and provides hydrologic information about the area tributary to each basin based on the current land use plan as shown in Figure 5-1. Appendix K contains the SOHM report and model.

Figure 5-2 shows the tributary area for each of the LID basins.



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RANCHO MISSION VIEJO - PA3&4 ROMP

Michael Baker INTERNATIONAL

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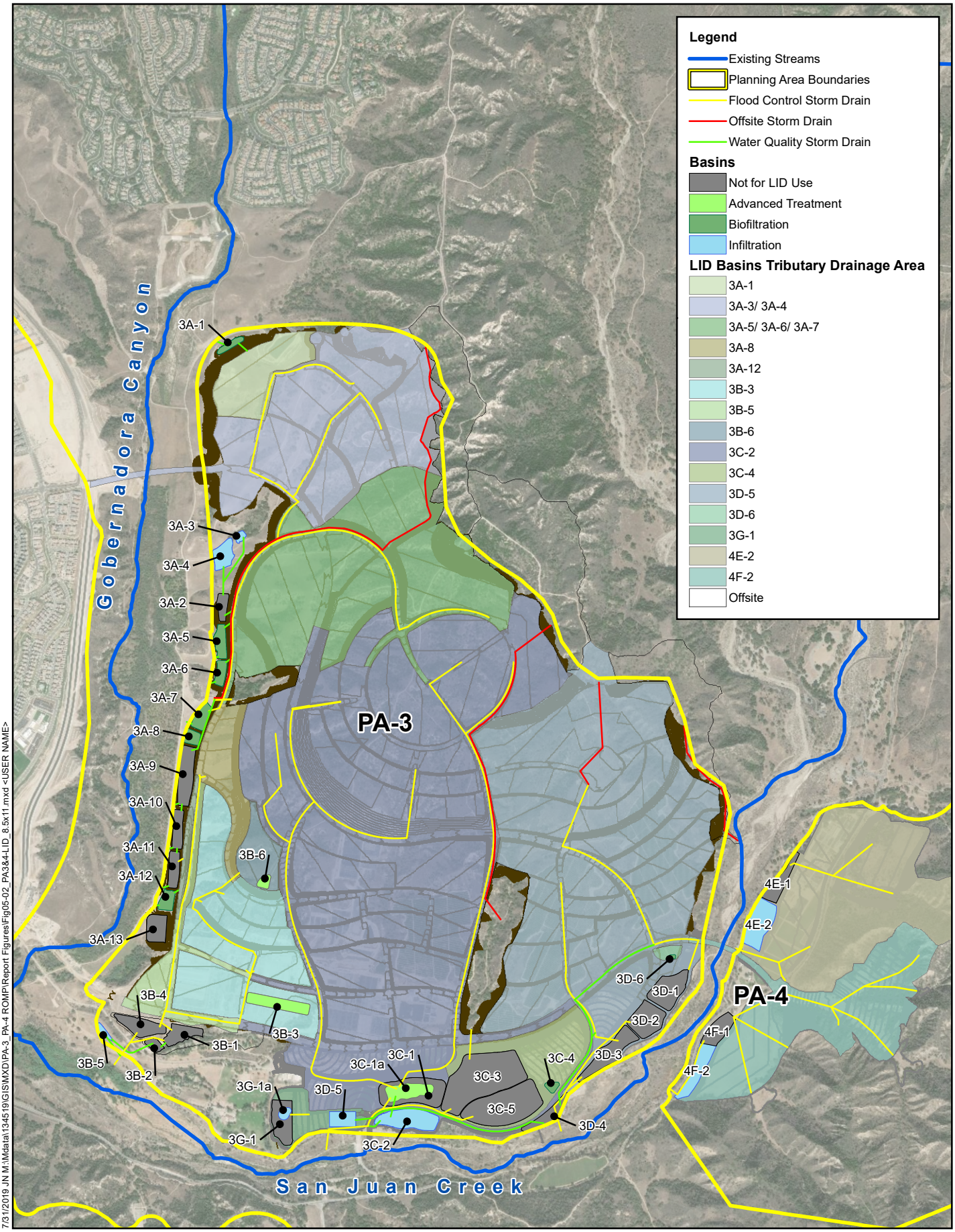
Source:

PA-3 and PA- 4 Water Quality Land Use

Figure 5-1



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Source:

RANCHO MISSION VIEJO - PA3&4 ROMP

PA-3 and PA-4 LID Tributary Areas

Figure 5-2

5.3.2 San Juan Creek Water Quality Plan

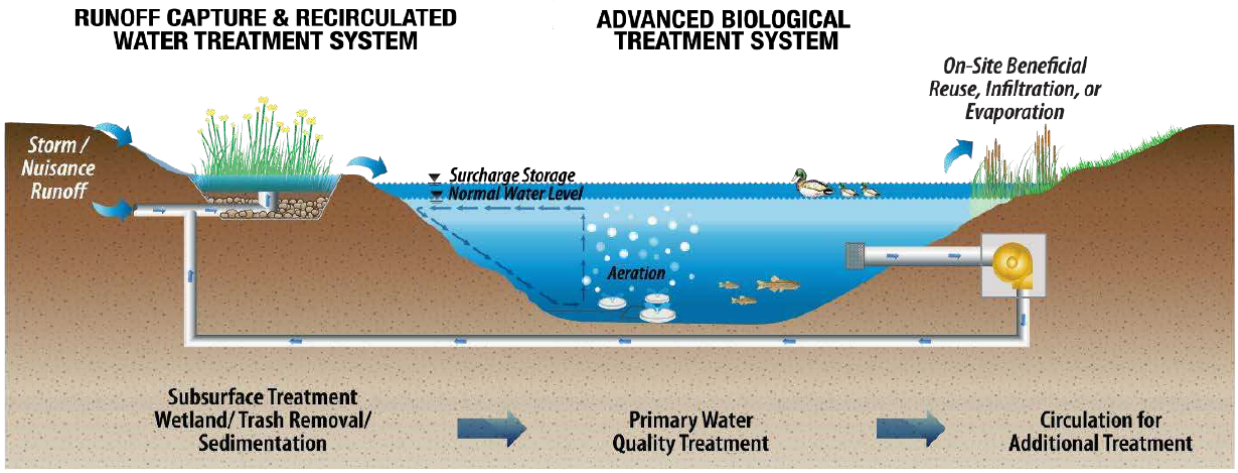
The remaining areas of PA-3 that discharges to San Juan Creek within the 10-year floodplain will be exempt from hydromodification requirements as part of the South Orange County Watershed Management Area Water Quality Improvement Plan (The Orange County Copermittees, 2018) that includes the large river exemption for hydromodification management. This allowance exempts discharges to San Juan Creek that occur within the 10-year floodplain from hydromodification mitigation. San Juan Creek is considered as part of the large river exemption due to its documented intrinsic resilience as explained by the Ranch Plan ROMP (PACE, 2013). This reference is directly applicable as the majority of the remaining urban development planned in the San Juan Creek watershed is associated with the RMV projects.

About 1,373 acres of PA-3 drains to outfalls along San Juan Creek. A series of basins will be included along San Juan Creek to meet LID/ water quality and flood control requirements.

All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies. Water quality management for San Juan Creek is proposed at the southern-most portions of PA-3 along San Juan Creek, and within the development. Water quality management for this area will include the use of biofiltration basins, infiltration basins, and advanced treatment systems.

Based on the preliminary geotechnical studies prepared by GMU Geotechnical, dated August 6, 2014, September 14, 2017, September 18, 2018, and November 16, 2018, (Appendix N), the areas where the PA-3 basins are being proposed have infiltration rates that make it feasible to provide water quality management through infiltration. The infiltration basins are designed to capture and retain the full Design Capture Volume (DCV) for the tributary area. A design storm depth of 0.9 inches will be used as the 85th percentile, 24-hour storm depth. Some areas were determined to be more optimal if a longer drawdown time of 72 hours was used. A greater fraction of the design capture storm depth equivalent to 1.08 inches was used for those areas as a result. Pretreatment devices such as a settling forebays (with capacity of 10 to 20% of the DCV), advanced treatment systems or vegetated channels will be provided for the infiltration basins to minimize sediment and debris loading to maximize the effectiveness of the infiltration basins.

PA-3 will include two advanced treatment systems 3B-6 and 3B-3 within Area B. These advanced treatment systems will serve as a critical component of the stormwater management system for subwatershed B as they provide elements to aid in meeting LID compliance. There is also an advanced treatment system planned in subwatershed C (3C-1a), which will serve as a pretreatment for the infiltration basin (3C-2) and can be used as irrigation for the surrounding fields. Figure 5-3 shows a sample section of the system and Figures 5-4 and 5-5 show examples of possible configurations. Figure 5-4 shows an advanced treatment system with a 2-foot ponding buffer and adjacent residential development. Figure 5-5 shows an advanced treatment system with a 5-foot ponding buffer. These examples are provided to show possible configurations. More details will be provided in the final design.



Source: PACE

Figure 5-3: Advanced Treatment System Cross-Section Schematic

Source: PACE – Bridgeport Lake

Figure 5-4: Advanced Treatment System Example 1

Source: PACE – Dos Lagos

Figure 5-5: Advanced Treatment System Example 2

Several possible configurations of the advanced treatment system are under consideration. In every alternative, they serve as detention and pretreatment forebays for a later step in the stormwater treatment process. These systems will not be built during the earlier phases of construction of Subarea 3.1, allowing more time for RMV to come to a final agreement. If during project level design, it is determined that the advanced treatment systems are no longer feasible, an alternative BMP will be designed to meet water quality requirements. Two (2) alternatives are being considered for this project which include:

- Alternative 1: Advanced treatment system detains the DCV and releases stormwater to infiltration basin and/or irrigation need
- Alternative 2: Advanced treatment system detains DCV and releases stormwater to infiltration basin in cooperation with SMWD

5.3.2.1 Alternative 1

Stormwater runoff from subwatershed B discharges through a storm drain system to the advanced treatment systems. Runoff is detained in the advanced treatment systems then slowly released to the proposed infiltration basin in subwatershed C or removed from the system for site irrigation. The advanced treatment systems provide detention of the stormwater and remove a large percentage of the suspended solids conveyed with the stormwater. The release of stormwater for infiltration or use in site irrigation are both approved LID BMPs, and thus this alternative would be sized to detain the DCV. For

this alternative, the advanced treatment system will be filled and maintained using water from the Metropolitan Water District (MWD).

Key Infrastructure Elements:

- Advanced treatment systems sized to detain the DCV, and constructed with water quality maintenance system including forebays, aeration, circulation.
- Discharge pipeline from the advanced treatment system to the infiltration basin. A preliminary examination of the land plan suggests that the systems can discharge via gravity flow using a proposed storm drain to convey discharge to the infiltration basin in subwatershed C.
- Flow Control System to regulate discharge from the advanced treatment system to the infiltration basin or irrigation system. The simplest system could consist of an orifice or weir sized to release water at a designed discharge rate. A more elaborate system might be designed to detain water in the system until capacity for the stormwater is available in the infiltration basin or needed for site irrigation.
- A line to refill the advanced treatment systems with recycled water or other water supply.
- The advanced treatment system could be attached to the site irrigation system in addition to or in place of discharge to infiltration. One option would be to connect the system to the irrigation system via a pump station and use the water for landscape irrigation. The water used for irrigation would be replaced with water from the irrigation water supply.

For the advanced treatment systems to serve as detention and pretreatment forebays for the infiltration basin, the minimum size is controlled by the required detention volume and desired surcharge depth. For planning, a surcharge depth of 1 foot for the DCV is desirable. This leads to required area of 4.84 acres for 3B-3, and 0.57 acres for 3B-6. At typical depth for advanced treatment systems, the volume is more than enough to provide adequate settling time for sediment removal.

5.3.2.2 Alternative 2

Stormwater runoff from the site will discharge to the advanced treatment systems for detention and water quality improvement. Stormwater will be released to the infiltration basin at a rate suitable for the infiltration basin. The system would be filled with recycled water from SMWD. During dry weather the system could serve as a reservoir to detain and treat water delivered by SMWD before transfer to the infiltration basin, thus the system would become an integral part of the SMWD groundwater recharge system.

Key Infrastructure Elements:

- Advanced treatment systems sized to detain the DCV, and constructed with a water quality maintenance system, including forebays, aeration, and circulation.
- Discharge pipeline from the advanced treatment systems to the infiltration basin. A preliminary examination of the land plan suggests that the systems can discharge via gravity flow using a proposed storm drain to convey discharge to the infiltration basin in subwatershed C.
- Flow Control System to regulate discharge from the advanced treatment system to the infiltration basin. The simplest system could consist of an orifice or weir sized to release water at a designed discharge rate. A more elaborate system might be designed to detain water in the system until capacity for the stormwater is available in the infiltration basin.
- A line to refill the advanced treatment systems with recycled water or other water supply from SMWD.

For the advanced treatment systems to serve as detention and pretreatment forebays for the infiltration basin, minimum size is controlled by the required detention volume and desired surcharge depth. For planning, a surcharge depth of 1 foot for the DCV is desirable. This leads to required area of 4.84 acres for 3B-3, and 0.57 acres for 3B-6. At typical depth for advanced treatment system, the volume is more than enough to provide adequate settling time for sediment removal.

In addition to the area with treatment provided by these water quality management systems, the San Juan Creek water quality plan includes 86.52 acres of offsite area. Runoff from this area is collected through a separate pipe, which will discharge directly to San Juan Creek. Similar to the Gobernadora Canyon water quality plan, development does not occur in this area, therefore, treatment is not provided for the offsite areas. Additionally, it was determined that 58.17 acres of undeveloped area are not tributary to a LID BMP and were not included in the sizing of the BMPs.

See Tables 5-1 and 5-2, Figure 5-2, and Exhibit 3 for information about these facilities.

5.3.3 PA-4 Water Quality Plan

Geotechnical information is not yet available at the proposed locations of the infiltration basins in PA-4; therefore, the rates are assumed to be the same as those for the opposite side of San Juan Creek (along PA-3). Developed and offsite runoff will be collected through pipes and routed through flood control basins, which will also act as pretreatment for the infiltration basins. The infiltration basins will only be designed to treat flows from the developed portion of PA-4.

In the event that geotechnical information indicates that infiltration basins are not feasible, the next priority level of water quality BMPs will be designed to meet the LID requirements.

Table 5-1: Gobernadora Canyon LID Basin Summary

Basin ID	Tributary Area (ac)	Runoff Coefficient	Rainfall Intensity (in/ hr)	LID Design Storm Depth (in)	Water Quality Flow (cfs)	LID Design Volume (ac-ft)	Design Types	BMP Invert Area Required (ac)	BMP Invert Area Available (ac)	Ponding Depth (ft)	Draw-down time (hrs)	Design Infiltration Rate (in/ hr)
3A-1	32.57	0.73	0.2625	0.90	6.23	1.78	Biofiltration	0.75	0.78	1.5	7.2	N/A
3A-3	27.00	0.64	0.2625	1.08	4.50	1.54	Infiltration	0.36	0.39	4.25	70.1	0.73
3A-4	167.31	0.64	0.2625	1.08	27.89	9.56	Infiltration	2.25	2.33	4.25	70.1	0.73
3A-5	97.53	0.56	0.2625	0.90	14.22	4.06	Biofiltration	1.58	1.71	1.5	7.2	N/A
3A-6	60.73	0.56	0.2625	0.90	8.86	2.53	Biofiltration	0.99	1.18	1.5	7.2	N/A
3A-7	66.88	0.56	0.2625	0.90	9.75	2.79	Biofiltration	1.08	1.57	1.5	7.2	N/A
3A-8	30.19	0.46	0.2625	0.90	3.67	1.05	Biofiltration	0.38	1.01	1.5	7.2	N/A
3A-12	5.53	0.51	0.2625	0.90	0.74	0.21	Biofiltration	0.08	0.13	1.5	7.2	N/A

Note: A factor of safety was applied to the measured infiltration rate to generate the design infiltration rate. The safety factors were determined by Worksheet 3 of the TGD and are included in Appendix M.

Table 5-2: San Juan Creek LID Basin Summary

Basin ID	Tributary Area (ac)	Runoff Coefficient	LID Design Storm Depth (in)	LID Design Volume (ac-ft)	Design Types	BMP Invert Area Required (ac)	BMP Invert Area Available (ac)	Ponding Depth (ft)	Draw-down time (hrs)	Design Infiltration Rate (in/ hr)
3B-6	15.55	0.49	0.90	0.57	Advanced Treatment[1]	0.57	0.89	N/A	N/A	N/A
3B-3	118.61	0.54	0.90	4.84	Advanced Treatment[1]	4.84	4.84	N/A	N/A	N/A
3B-5	30.90	0.62	1.08	1.71	Infiltration[2]	0.54	0.58	3.2	71.3	0.53
3C-2	676.41	0.53	0.90	26.77	Infiltration[3]	4.46	4.56	6.0	18.0	3.99
3C-4	71.79	0.29	0.90	1.56	Biofiltration[4]	0.47	0.50	1.5	7.2	N/A
3D-5	437.31	0.48	0.90	15.88	Underground Storage[5]	3.50	3.60	5.7	39.0	1.75
3D-6	2.16	0.83	0.90	0.13	Biofiltration[4]	0.06	0.06	1.5	7.2	N/A
3G-1	20.24	0.33	0.90	0.50	Infiltration	0.08	0.24	6.0	20.6	3.49
4E-2	171.10	0.47	0.90	5.97	Infiltration	5.97	5.99	1.0	34.7	0.35
4F-2	116.19	0.69	1.08	7.18	Infiltration	3.59	3.63	2.0	69.5	0.35

Note: A factor of safety was applied to the measured infiltration rate to generate the design infiltration rate. The safety factors were determined by Worksheet 3 of the TGD and are included in Appendix M.

[1] If during project level design, it is determined that the advanced treatment systems are no longer feasible, an alternative BMP will be designed to meet water quality requirements.

[2]Infiltration basin has been oversized for the drainage area as shown in this report for anticipation of changes in drainage pattern and land use in the near future.

[3] Current basin grading that the basin has a capacity of approximately 30.1 ac ft. The additional 3.3 ac ft of capacity will allow for changes to the land use and/ or the basin's tributary drainage area.

[4] Current grading and land use plan indicate local biofiltration BMPs are required.

[5] If during project level design, it is determined that an underground storage chamber is determined to be infeasible or impracticable, an alternative BMP will be designed to meet water quality requirements.

5.3.4 Water Balance

According to the FEIR, volumetric mitigation is required for PA-3 and PA-4 to meet the requirements of provision 4.5-1 of the FEIR and should be addressed at appropriate stages of the development. Based on the 2004 PWA report, Hydrologic Comparison of Baseline and Alternative Land Use Conditions for the San Juan and San Mateo Watersheds:

> "The distributed "infiltration" facilities are intended to provide both water quality management and flow management during small to medium rainstorms. In addition to water quality management, they are designed to mimic the annual water balance, maintain groundwater infiltration, and reduce artificial dry season streamflow during smaller more frequent rainstorm events (generally less than 2-year frequency). They will also provide some peak flow rate and flow volume reduction during larger (2- to 100-year) design events. These facilities are described in the Geosyntec report (Geosyntec, 2004).
>
> During more severe flood events (2- to 100-year events), excess runoff will be temporarily stored in larger detention facilities and released at lower flow rates to prevent flow peak increases to local or regional channel systems. These larger basins will also provide water quality benefits by trapping additional sediment and pollutants prior to discharge into the local and regional streams. This is considered an additional benefit, as the existing water quality management facilities have been designed to provide the required level of treatment. While the water quality and flood management elements will be designed to function as an integral system, they will be considered separately for management and maintenance. The flood facilities will be designed and maintained in accordance with the county flood program directions on sizing, design, and maintenance. The water quality facilities will be designed in accordance with RWQCB requirements, and those of the county water quality program.
>
> The primary mitigation approach for sediment transport/channel stability issues is to manage the hydrologic regime. By minimizing the alteration of channel-forming flow events (up to the 2-year event), preventing an increase in peak flows, and reducing volume increases, the channels will not be subject to significantly altered sediment transport characteristics."

Mitigation measure 4.5-6 from FEIR No. 489 requires the implementation of combined flow and water quality control systems to achieve flow duration matching, address the water balance, and provide for water quality treatment. Exhibit 4.5-3 of the FEIR identifies the hydrologic components of the water cycle that should be included to show the balance between the "deposits", which include precipitation and irrigation, and "withdrawals", which include (1) infiltration into the soils, (2) evapotranspiration and (3) water which runs off the land.

In addition to providing water balance for the overall project, RMV has developed a plan to conserve and restore the habitat along the Gobernadora Canyon overbank, known as the Gobernadora Ecological Restoration Area (GERA). PA-3's proposed land use plan alters existing drainage patterns, which may potentially reduce dry weather and wet weather flows at certain locations along the Gobernadora Canyon overbank. The proposed basins are being designed to provide treated flow to meet the GERA's water demands. An environmental study was prepared to determine the optimal locations of these basins. The basins will either be infiltration, biofiltration, or detention basins that provide flow continuation along the overbank in an effort to simulate existing condition drainage patterns.

The monthly water balance is based on a continuous simulation model, SOHM. SOHM is an HSPF-based watershed model that has been specifically calibrated to natural and developed condition subwatersheds in southern Orange County and runs more than 48 years of 15-minute precipitation, evapotranspiration, and irrigation data collected at the Trabuco Canyon meteorological station. Using a simulation that includes a long period of time provides a better water balance model because of the variability in the rainfall events and the number of storms each year. This provides an "average" of the potential runoff quantity generated from the tributary areas.

SOHM models were developed for PA-3's existing and proposed conditions. Each tributary drainage area model consisted of identifying land uses, vegetation types, hydrologic soil types, BMPs, and slopes. The SOHM models for the proposed condition also account for the water balance impact due to hydromodification BMPs and LID BMPs. Table 5-3 summarizes the SOHM water balance results at each point of compliance (POC). SOHM guidance manual defines "predeveloped" as the flows for the naturally occurring existing conditions, "inflow to mitigated" as the developed condition flow entering the BMP facility, and "mitigated" as the mitigated flow exiting the BMP facility.

Table 5-3: Gobernadora Canyon Annual Water Balance

Total Average Annual Water Balance Volume (ac-ft)					
POC	**Existing Node**	**Proposed Basin ID**	**Predeveloped**	**Inflow to Mitigated**	**Mitigated**
G1	30311		4.91		
G2	30418	3A-1	37.28	28.86	22.04
G3	30538	3A-3, A-4	112.87	152.46	60.64
G4	30560	3A-2, 3A-5, 3A-6	105.94	121.26	123.03
G5	30608	3A-8	7.53	18.43	14.67
G6	30711, 30809, 30918	3A-9, 3A-10, 3A-11, 3A-12	94.82	130.40	117.82
G7	31010		17.21	3.63	2.92
Total			**380.54**	**455.05**	**341.12**

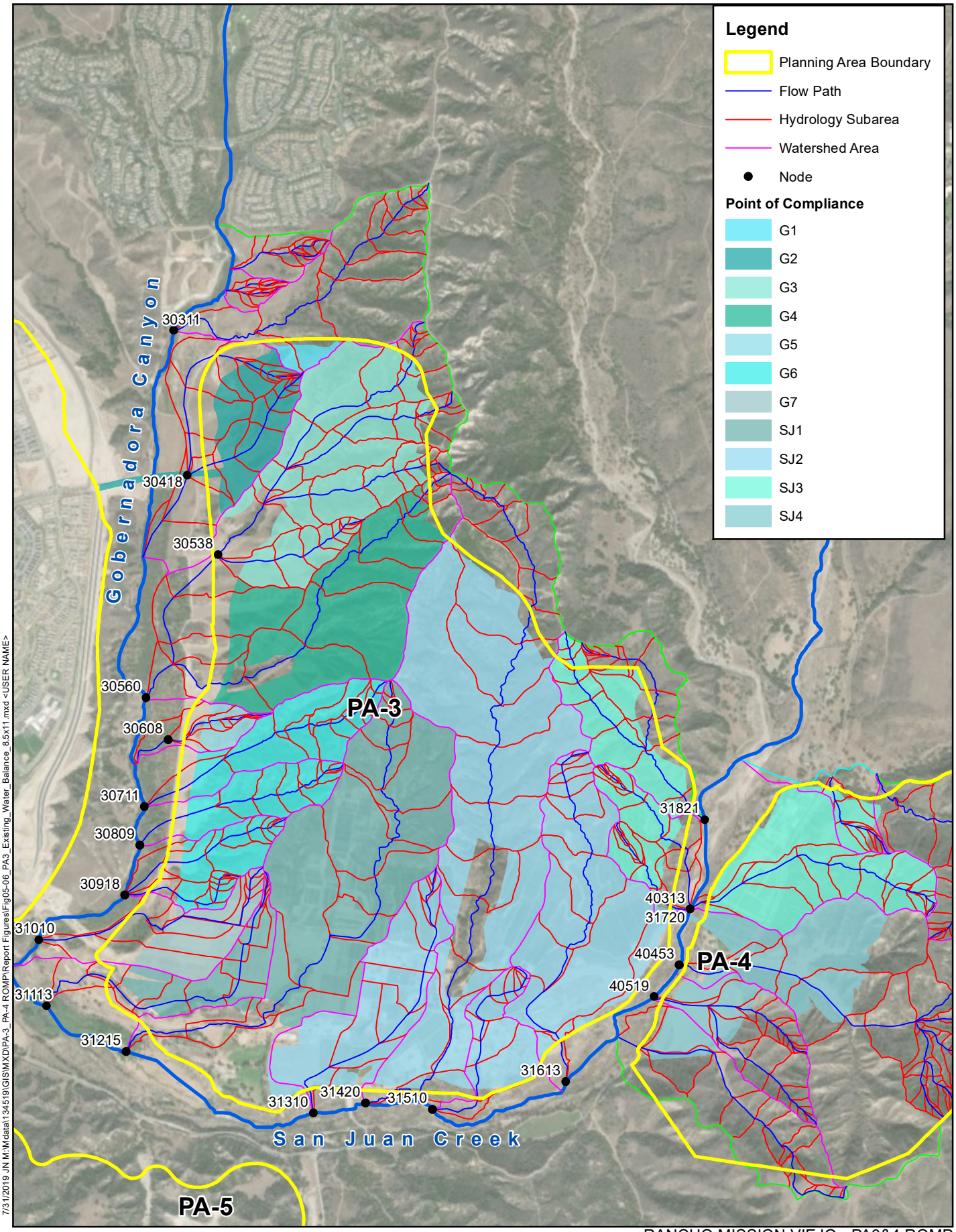
Table 5-4: San Juan Creek Annual Water Balance

Total Average Annual Water Balance Volume (ac-ft)					
POC	**Existing Node**	**Proposed Basin ID**	**Predeveloped**	**Inflow to Mitigated**	**Mitigated**
SJ1	31113, 31215	3D-3, 3D-6, 3D-4, 3B-1, 3B-2, 3B-5	181.50	97.86	43.90
SJ2	31310, 31420, 31510, 31613	3C-1, 3C-2, 3C-3, 3C-5, 3C-4, 3D-1, 3D-2, 3D-3, 3D-4, 3D-5, 3C-1a, 3G-1	314.42	1482.28	340.86
SJ3	31720, 31821, 40313	4E-1, 4E-2	124.66	257.33	58.70
SJ4	40453, 40519	4F-1, 4F-2	59.20	238.26	49.34
Total			**679.79**	**2,075.73**	**492.81**

Figure 5-6 presents the location and tributary area for each existing POC. POCs for the developed condition are located at the discharge point of the listed facility.

Using the land use, soil type, and basin characteristics of the existing and proposed conditions, hydrographs were created in SOHM to demonstrate the annual water balance. The total amount of volume infiltrated is approximately 136 acre-feet for Gobernadora Canyon and 1,853 acre-feet for San Juan Creek. This value is estimated from the difference between the "inflow to mitigated" and the "mitigated." The majority of the volume is due to infiltration basins while the remaining amount is due to the native infiltration rate of biofiltration basins per the TGD (0.1 in/hr).

The total annual volume discharged to Gobernadora Canyon and San Juan Creek after the mitigated post development condition are expected to be less than the predeveloped condition. See values for the "predeveloped" and "mitigated" conditions in Tables 5-3 and 5-4. The decrease in volume is anticipated to be insignificant in terms of the entire watershed since this development only accounts for a fraction of the entire Gobernadora Canyon and San Juan Creek watersheds (7% and 2% respectively).



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RANCHO MISSION VIEJO - PA3&4 ROMP

Michael Baker INTERNATIONAL

0 5001,000 2,000 Feet

Source:

PA-3 and PA-4 Existing Water Balance Areas

Figure 5-6

5.3.5 Volume Mitigation

For this PA-3&4 ROMP, volumetric mitigation was performed to compare the runoff volume produced by each drainage in their existing and post-development conditions, for the 2-, 5-, 10-, 25-, 50- and 100-year return period/24-hour duration storm events. The volume mitigation adopts a regional approach, consistent with the 2013 Ranch Plan ROMP. Volumetric mitigation is provided by the ultimate stormwater system for PA-3 and PA-4 consistent with the methods in the 2013 Ranch Plan ROMP. Volumes for mitigation comparison were obtained from the local area hydrograph calculations in Appendix B for existing and proposed conditions. Table 5-5 shows the results of the analysis. A detailed spreadsheet is included in Appendix K.

Table 5-5: Volume Mitigation

Stream	100-year Expected Value Storm Event				50-year Expected Value Storm Event				25-year Expected Value Storm Event				10-year Expected Value Storm Event				5-year Expected Value Storm Event				2-year Expected Value Storm Event			
	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)
Gobernadora	93.5	86.2	-	16.4	80.5	77.7	-	16.4	67.3	66.9	-	16.4	48.8	53.4	-	16.4	24.5	32.9	-	16.4	9.7	19.5	-	16.4
San Juan Creek	259.8	362.7	-	139.2	238.8	324.8	-	139.2	191.4	280.3	-	139.2	139.4	215.7	-	106.6	64.9	127.2	-	106.6	26.1	73.1	-	106.6
Total	353.3	448.9	95.6	155.6	319.3	402.5	83.2	155.6	258.7	347.2	88.5	155.6	188.2	269	80.8	122.9	89.4	160.1	70.7	122.9	35.8	92.7	56.9	122.9

6 Drainage Design Guidelines

The PA-3&4 ROMP provides a planning area scale study that will guide the stormwater mitigation measures that addresses flood control, water quality management and stream stability for facility and project scale planning. The 2013 Ranch Plan ROMP in Chapter 4 Regulatory Requirements and Design Criteria identifies criteria that must be addressed in the phasing or project level. As planning areas 3 and 4 are built out, the final engineering plans and grading plans must adhere to those items and the County requirements. Table 19-1 in Appendix A identifies required items that will need to be addressed in final design plans. The checklist is not intended to be all inclusive of all drainage/stormwater management requirements and guidelines but only the criteria specific to the Ranch Plan. Additional items are added as part of the PA-3&4 ROMP as guidelines for the future development of the planning areas. Figure 6-1 is a general summary of potential ownership and is subject to change. Special conditions, design, or use of the facilities may dictate different ownership requirements. Detailed ownership of the facilities is not finalized and is not required at this stage of design. Responsibility of maintenance will be determined prior to the approval of the final plans and designated on the title sheet, plan and profile per Chapter 2 of the Orange County Local Drainage Manual.

6.1 Tributary to Gobernadora Canyon

6.1.1 Subwatershed A

Subwatershed A is the area of PA-3 that is tributary to Gobernadora Canyon at outfall 9. It is planned to be predominately commercial land use and is subject to hydromodification. Hydromodification mitigation will be provided through a series of hydromodification detention basins which will detain the hydromodification volume. The LID basins will also incorporate extra detention storage above the water quality volume to help with hydromodification mitigation. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

6.1.1.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes, further analysis will need to be conducted to prove the changes will not adversely affect Gobernadora Canyon.
3. Coordination with the County may be required.

6.1.1.2 Discharge to Gobernadora

Design guidelines for the Outfall 9 and other flows to Gobernadora Canyon are not defined in the PA-3&4 ROMP. The final planning of the Subwatershed A must show that hydromodification requirements are met and stable conveyance design to the planning area boundary is proposed. Energy dissipators/riprap should be considered to ensure that flows from the outlets for both onsite and offsite flows are nonerosive. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.

- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap.

6.1.1.3 Water Quality Management Plan

Basins are proposed along the development that will discharge to Gobernadora Canyon. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID and hydromodification facilities.

6.1.1.3.1 Hydromodification Basins

To ensure that hydromodification requirements are still met: Compare the land uses and slopes to ensure it does not differ greatly from the ROMP. If the overall breakdown of area based on these categories for a BMP differs significantly from the ROMP values, rerun the hydromodification models.

6.1.1.4 Debris

Debris basin design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable (to address undeveloped areas).
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.1.1.5 Regional Flood Facilities

Regional flood facilities are not required for PA-3 areas draining to Gobernadora Canyon as defined by the 2013 Ranch Plan ROMP.

6.1.1.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration rates due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.1.1.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County.
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2 Tributary to San Juan Creek

6.2.1 Subwatershed B

Subwatershed B is one of the three areas of PA-3 tributary to San Juan Creek. Subwatershed B is in the southwest portion of the PA-3 development and it is tributary to 2019 proposed outfall 11. It is planned to have mixed land use which will be mitigated by two smaller flood control basins south of Cow Camp Road. The basin B system will also consist of water quality treatment basins consisting of an infiltration basin south of Cow Camp Road and two advanced treatment systems within the development north of Cow Camp Road.

6.2.1.1 Land Use and Grading

As final planning for the phase areas continues, the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect Gobernadora Canyon.
3. Coordination with the County may be required.

6.2.1.2 Discharge to San Juan Creek

Design guidelines for the Outfall 11 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should daylight at the 100-year floodplain and outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the outlet.

6.2.1.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.1.4 Debris

Debris basins design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.1.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.1.6 Infiltration Basins

Infiltration basin design will need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.1.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County.
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2.2 Subwatershed C

Subwatershed C is located in the south-center portion of the PA-3 development and is tributary to 2019 outfall 13. This subwatershed is the largest in the development. The land use is mixed, and the runoff is conveyed in two mainline storm drain systems, each of which conveys water to a combination basin prior to treatment in the infiltration basin. The combination basin consists of both water quality treatment and flood control capacity by allowing flood control ponding depth on top of a permanent pool (advanced treatment system). The offsite pipe system outlets to the natural canyon in Subwatershed C, where flows will be treated with a debris basin, and then conveyed via a culvert under Cow Camp Road to the second flood control basin.

6.2.2.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect Gobernadora Canyon.
3. Coordination with the County may be required.

6.2.2.2 Discharge to San Juan Creek

Design guidelines for the Outfall 13 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should daylight at the 100-year floodplain and outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the outlet.

6.2.2.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.2.4 Debris

Debris basins design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.2.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.2.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.2.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2.3 Subwatershed D

Subwatershed D is located on the south-east side of PA-3. This area is planned to have mixed land use predominately residential. The flows produced by this are discharge at outfall 14. A series of three basins will provide flood control mitigation for this subwatershed. Water quality treatment will be provided by a pretreatment forebay (3D-4) south of Cow Camp Road in area D, from which water will be

conveyed by storm drain to an underground infiltration basin under the parking lot in Cow Camp in subwatershed G.

6.2.3.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect Gobernadora Canyon.
3. Coordination with the County may be required.

6.2.3.2 Discharge to San Juan Creek

Design guidelines for the Outfall 14 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should daylight at the 100-year floodplain and outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the outlet.

6.2.3.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.3.4 Debris

Debris basins design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.

- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.3.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.3.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design. Should an atypical infiltration basin like the proposed underground storage chamber be constructed an additional O&M manual should be produced to instruct the party assuming responsibly.

6.2.3.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2.4 Subwatershed O

Subwatershed O is located on the eastern portion of PA-3. The total drainage area is 48.4 acres. It consists of natural areas with small drainages around the development that will not be disturbed by the proposed development. Subwatershed O will be maintained as a separate watershed from the developed areas in order to maintain natural drainage patterns and minimize impacts to the existing regional watershed S26. Some of the flows from this drainage area will be collected through a separate storm drain system and discharged into San Juan Creek at 2018 outfall 17. The natural runoff flows will be routed through an oversized pipe to deliver flow and sediment to San Juan Creek. Other flows will be routed to the same location through ditches that will only receive the undeveloped area runoff flows.

6.2.4.1 Discharge to San Juan Creek

Design guidelines for the Outfall 17 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should daylight at the 100-year floodplain and outlet to San

Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour.

6.2.4.2 Debris

The proposed storm drain that intercepts runoff from natural watershed area shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present. The Local Drainage Manual identifies different types of "debris barriers" which should be considered at the inlet of the storm drain during final design.

6.2.5 Subwatershed E

Subwatershed E is located in the north-western portion of PA-4. The current land use for PA-4 is commercial. This subwatershed will collect off-site runoff through the storm drain system and it will comingle with runoff flows from the developed areas. The off-site runoff originates from natural hills that will not be developed. The two basins in subwatershed E will be located in the most downstream portion of this subwatershed. The flood control basin will provide flood mitigation for the entire watershed, while the infiltration basin directly downstream will treat the water quality volume of only the developed areas. The flows will be discharged to San Juan Creek through storm drain outfall 20.

6.2.5.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect Gobernadora Canyon.
3. Coordination with the County may be required.

6.2.5.2 Discharge to San Juan Creek

Design guidelines for the Outfall 20 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should daylight at the 100-year floodplain and outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the outlet.

6.2.5.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.5.4 Debris

Debris basins design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.5.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.5.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.5.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County

- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2.6 Subwatershed F

Subwatershed F is located in the south-eastern portion of PA-4. Like Subwatershed E the land use is currently planned to be commercial. This subwatershed will collect off-site runoff flow through the storm drain system and it will comingle with runoff flows from the developed areas. The off-site runoff originates from natural hills that will not be developed. A flood control and pretreatment forebay will provide flood mitigation and pretreatment for the infiltration basin. The two basins in subwatershed F will be located in the most downstream portion of this subwatershed. The flood control basin will provide flood mitigation for the entire watershed, while the infiltration basin directly downstream will treat the water quality volume of only the developed areas. The flows will be discharged to San Juan Creek through storm drain outfall 22.

6.2.6.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect Gobernadora Canyon.
3. Coordination with the County may be required.

6.2.6.2 Discharge to San Juan Creek

Design guidelines for the Outfall 22 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should daylight at the 100-year floodplain and outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the creek outlet.

6.2.6.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.6.4 Debris

Debris basins design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.6.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

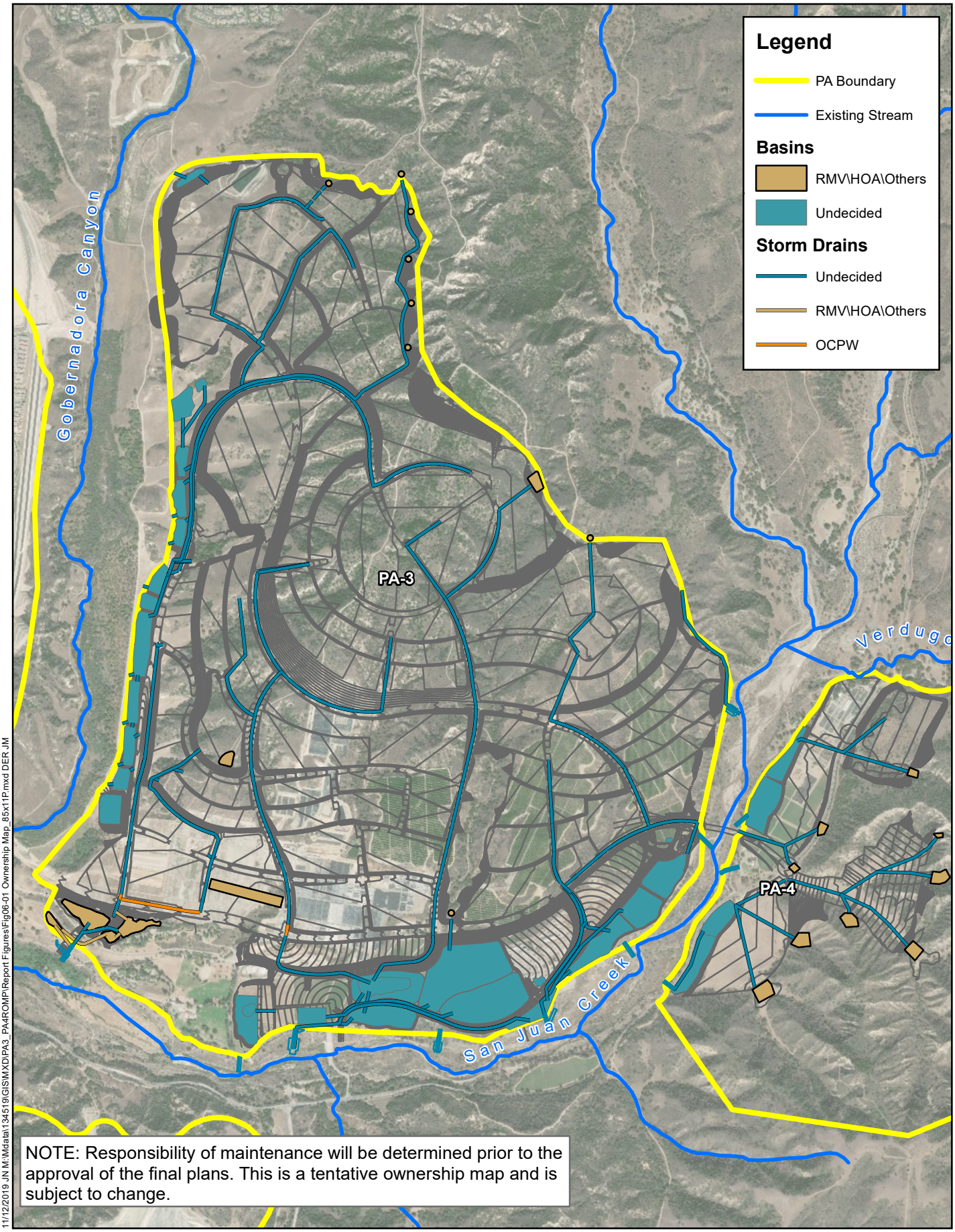
6.2.6.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.6.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.



11/12/2019 JJN M:\Mdata\134519\GIS\MXD\PA3_PA4ROMP\Report Figures\Fig06-01 Ownership Map_85x11P.mxd DER_JM

Michael Baker INTERNATIONAL

0 750 1,500 Feet

Source:

RANCHO MISSION VIEJO - PA3&4 ROMP

Tentative Ownership Map

Figure 6-1

7 Conclusions

This section provides a discussion of the local and regional analysis results and a comparison between the approved Ranch Plan ROMP and the current PA-3&4 ROMP analysis. A regional mitigation summary is shown in Table 7-1.

The increase in tributary areas to the permitted storm drain outfalls in the development condition is caused by the alteration of the land plan. The areas of this PA-3&4 ROMP, tributary to each storm drain outfall compared to the Ranch Plan ROMP drainage areas, have increased in some cases and decreased in other cases. Tributary areas have changed due to modifications to the overall land plan. The effects of the development will be mitigated with basins that provide flood control mitigation and water quality treatment. The areas tributary to outfalls 20 and 22 within PA-4 have decreased significantly from the Ranch Plan ROMP; however, the majority of the tributary area is undeveloped land. The natural runoff flows will comingle with the development runoff flows and will be routed through basins at outfalls 20 and 22 to improve the regional mitigation goals. The undeveloped area will include debris and pretreatment forebays prior to entering the basin systems.

The Ranch Plan used outfalls 10, 12, and 15 within PA-3. These are not used in the current PA-3&4 ROMP. However, this PA-3&4 ROMP will use outfalls 11 and 14 within PA-3, which were not used in the Ranch Plan ROMP, to optimize the basins' use for mitigation. PA-4 has significantly changed per this PA-3&4 ROMP compared to the Ranch Plan ROMP; only outfalls 20 and 22 will be used to discharge to San Juan Creek. In the current plan, Verdugo Canyon will not receive development discharges.

The regional ultimate and phase hydrology meets the EIR flow mitigation requirements by mitigating ultimate condition flows to the Ranch Plan ROMP ultimate condition models or the PA-3&4 existing condition models using onsite mitigation basins. The Ranch Plan ROMP indicated that peak flow mitigation for San Juan Creek is to be provided by detention basins. Full mitigation is required for the 25-, 50-, and 100-year expected value storm events; the target values for the 10-, 5-, and 2-year expected value storm events are the peak discharges from the complex with basin models from the Ranch Plan ROMP.

Volume mitigation is provided through the infiltration basins, flood control basins, and biofiltration and hydromodification basin in the PA-3&4 development. The volume analysis shows no adverse impacts to the storm water runoff volumes on both a regional and local outfall scale. The monthly water balance study completed to address the potential impacts to the biological communities as a result of the phased PA-3 development also showed no significant impact to the development of benthic communities in San Juan Creek and its smaller tributaries.

The sediment transport study was prepared to evaluate the impacts of the PA-3&4 development area on the event-based and long-term response of San Juan Creek and Gobernadora Canyon. The result of the analysis shows no adverse impacts due to the PA-3&4 development. The lateral bank migration analysis was completed to demonstrate that the proposed PA-3&4 development area has sufficient setbacks from the creeks, and that the proposed grading for all permanent engineered structures do not encroach into identified riverine erosion hazard areas. As part of the assessment of the of the project impacts on the receiving waters, a stream monitoring program for the PA-3&4 development area was developed in conformance with MM 4.5-8. The program is an amendment to the "PA-1 Development Area and the Ranch Development Plan San Juan Creek Watershed Stream Monitoring Program" prepared by PACE dated December 2011 and the "PA-2 ROMP Stream Monitoring Program Amendment" prepared by Michael Baker International dated March 2014. The amendment extends the stream walk limits along San Juan Creek to upstream of regional node 119 and includes limits for

Gobernadora Canyon to upstream of the PA-3&4 development area. The program also identifies the additional cross section monitoring locations along the creeks.

The location of the recommended stormwater facilities associated with the PA-3 development are illustrated in Exhibit 3.

Based on the results of the hydrology study, volumetric calculations, hydraulics, and the stream stability analysis, the PA-3&4 project in both the phased and ultimate condition will not create adverse impacts to San Juan Creek or Gobernadora Canyon and is in substantial conformance with the FEIR and Ranch Plan ROMP.

Table 7-1: Regional Discharge Comparison

Node	PA-3&4 Ultimate Area (ac)	100-year Expected Value Storm Event				50-year Expected Value Storm Event				25-year Expected Value Storm Event				10-year Expected Value Storm Event				5-year Expected Value Storm Event				2-year Expected Value Storm Event			
		PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]
		Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model
119	49496	20326	-	20326[2]	20321[2]	17844	-	17837[2]	17850[2]	14939	-	14921[2]	14918[2]	7239	-	7216[2]	7196[2]	2403	-	2409[2]	2407[2]	534	-	524[2]	525[2]
126	50406	20352	-	20303	20204	17828	-	17811	17748	14924	-	14898	14844	7145	-	7178	7144	2380	-	2429	2359	525	-	534	520
127	52660	20460	-	20283	20257	17925	-	17756	17782	14964	-	14875	14851	6990	-	7159	7140	2314	-	2414	2411	514	-	559	560
133t	6640	3986	2800	3085	2985	3500	2514	2761	2683	2942	2179	2371	2347	1875	1480	1649	1654	786	671	836	797	354	275	417	403
133u	54415	20361	20110	20260	20237	17911	17648	17793	17764	14948	14753	15028	14836	6914	6999	7221	7183	2308	2523	2575	2542	515	643	638	619
133c	61056	21828	21110	21162	21486	19143	18541	18610	18855	15972	15477	15566	15717	7172	7152	7374	7254	2458	2568	2758	2670	583	657	733	652
134t	3860	2415	2262	2422	-	2124	1984	2128	-	1792	1666	1790	-	1039	1003	1103	-	329	317	430	-	121	122	191	-
134u	62747	22000	21316	21310	21682	19284	18708	18723	19022	16080	15618	15657	15857	7148	7162	7265	7263	2415	2629	2702	2701	582	651	713	654
134c	66607	22933	22123	22157	22574	20118	19415	19470	19808	16770	16203	16274	16514	7275	7263	7373	7407	2525	2651	2736	2748	610	672	718	687
137	67799	23080	22274	22352	22720	20237	19534	19634	19929	16869	16299	16415	16616	7267	7275	7433	7426	2501	2653	2796	2745	617	682	732	699
138	69103	23249	22443	22504	22882	20380	19666	19761	20055	16983	16400	16513	16709	7270	7276	7412	7424	2510	2667	2791	2751	625	674	737	704
139	69530	23299	22492	22553	22928	20423	19700	19802	20088	17013	16432	16549	16741	7270	7276	7415	7424	2531	2678	2807	2750	640	679	748	710

[1]Ultimate Conditions (with basin model) shows the results of the PA-3&4 ROMP regional complex hydrology analysis.

[2]Discharge is selected from the higher discharge between the Single Area and Free Draining models.

8 References

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