# City of Santee
# Master Drainage Study Update

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***Presented to:***
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# Executive Summary

This City of Santee Master Drainage Study (MDS) Update significantly advances the City's storm water goals by updating the existing February 1990 MDS with comprehensive GIS updates and modern hydrologic and hydraulic (H&H) analysis. The objective of the study is to provide updated H&H analysis of the City's storm water system, identify existing deficiencies, and provide Capital Improvement Program (CIP) projects that will significantly enhance the City's storm water Level of Service (LOS) and aid in future development. This MDS update accomplishes these objectives by:

- Refining the City's GIS storm drain inventory with a comprehensive horizontally and vertically connected system,
- Updating the hydrologic and hydraulic assessment of the City's backbone storm drain infrastructure,
- Identifying the existing storm water system deficiencies,
- Providing seven (7) multi-phased high priority Capital Improvement Program (CIP) projects summarized into user friendly fact sheets,
- Integrating the results into the GIS inventory, and
- Delivering the results in an interactive GIS-based web application making the results readily available to City staff and providing the data necessary to assist in the evaluation of development activity and future CIP projects.

A list of deficiencies within the City and recommended improvements is also provided which includes opinions of probable construction costs associated with the improvements. This study also identifies recommended CIP drainage infrastructure projects, and it presents an estimated cost associated with the CIP drainage improvements. Project fact sheets were generated for the recommended CIP drainage improvements by evaluating the existing backbone storm drain infrastructure's level of service, anticipating drainage infrastructure needs to accommodate future growth, and coordination with City staff.

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## Acronyms/Abbreviations

| Acronym/Abbreviation | Definition |
|---|---|
| BMP | best management practice |
| cfs | cubic feet per second |
| DEM | digital elevation model |
| ft | foot, feet |
| GIS | geographic information system |
| H&H | hydrology and hydraulics |
| LF | linear foot, linear feet |
| LiDAR | Light Detection and Ranging |
| LOS | level of service |
| MDS | Master drainage study |
| NOAA | National Oceanic and Atmospheric Administration |
| NWP | nationwide permits |
| RCB | reinforced concrete box |
| RCP | reinforced concrete pipe |
| ROW | right-of-way |
| SANDAG | San Diego Association of Governments |
| SanGIS | San Diego Geographic Information Source |
| sq. mi. | square miles |
| SSURGO | Soil Survey Geographic Database |
| SWMM | Storm Water Management Model |
| TMDL | total maximum daily load |

## Limitations

The City of Santee Master Drainage Study update has been prepared for drainage master planning purposes only, as a guide for engineers, planners, developers, and City staff. Detailed engineering calculations and investigations should be prepared for the implementation of any of the facilities outlined in this study. In addition, coordination with adjacent municipalities and/or state agencies may be required to coordinate drainage improvement efforts that cross jurisdictional boundaries.

# 1.0 Introduction

The original, City of Santee (City) Citywide Drainage Study (prepared by BSI), was created in February 1990 with the goals of assessing the performance of existing storm drain infrastructure and to identify anticipated drainage facilities to accommodate future development. A supplemental study, Supplemental Storm Drain System, was created in August 1992 and specific to Mission Gorge Road drainage. The original and supplemental studies together are considered the City's Master Drainage Study (MDS).

The original study identified 26 drainage basins within the City; of which three are significantly deficient (Basins O, P and Q). Along with these three basins, the drainage within and along Mission Gorge Road is of significant concern. This study updates the original study to reflect changes in city growth, general plan, and latest adopted drainage standards.

## 1.1 Regulatory Framework

### 1.1.1 Drainage Infrastructure Requirements

One of the objectives was to assess the existing drainage infrastructure to determine the current Level of Service (LOS) relative to the City's policies for drainage design. Based on the County of San Diego's Hydraulic Design Manual (September 2014), underground conduits operate in conjunction with surface drainage to maintain public safety and manage flooding during storm events, and public drainage facilities must be able to carry the 100-year frequency storm without damage to or flooding of adjacent existing buildings or potential building sites. This MDS update will model the 2- and 10-year storm events to assess the minor system (underground storm drain) LOS, and the 100-year storm to assess the major system (street and open channels) LOS. To maintain a balanced approach to the drainage portion of the infrastructure improvements, a combination of upsizing storm drains while allowing flows which exceed the storm drain conveyance capacity to flow on the surface within the City right-of-way (ROW) will be used to identify deficient systems during a 100-year storm.

### 1.1.2 Environmental Permit Requirements

Multiple federal and state agencies as well as the City have jurisdictional authority over areas studied within the MDS. A variety of federal, state, and local regulations, including but not limited to, the Federal endangered Species Act, Clean Water Act, and California Fish and Wildlife may apply to the recommended projects identified within this MDS. All applicable agency permits will need to be acquired as projects are pursued further.

# 2.0 Inventory of Existing Facilities

A high-resolution geospatial dataset is essential to perform detailed hydrologic and hydraulic analyses. Geospatial data necessary for these modeling efforts include: an accurate topographic representation of the study area, ground cover/land use information, and existing storm drain inventory. Additional information regarding other existing utility infrastructure in the area (underground gas, electric, fiber optic, water, and sewer lines) is also desirable for evaluating potential conflicts when recommending infrastructure improvements. During this MDS process, Geographic Information System (GIS) data has been compiled from various sources to develop a comprehensive data set to be used in the modeling process.

While evaluating the data initially collected, it was determined that certain data components (such as the storm drain inventory junction points and linework) did not consistently reflect certain field conditions, elevations, and/or did not align spatially when compared against the aerial imagery of the study area. It was critical to obtain a fully connected link-node network to model the drainage network. An effort to correct and compile the data from various sources into one comprehensive dataset for the City's continued use was undertaken. Of particular focus during this effort was to ensure a correct spatial representation of the storm drain infrastructure by collecting and compiling any missing information. A revised comprehensive dataset will also be a useful reference for any future projects that the City or other consultants undertake within the study area.

Note: The City defines "Master Drainage Facilities" as 36 inch in diameter, or equivalent conveyance capacity and larger. The update to the existing public storm drain system includes public storm drain pipes and conveyances that are 18 inches in diameter and greater. Recommendations for drainage improvements to conveyances with equivalent capacity of an 18-inch diameter pipe and larger, but smaller than 36 inches or equivalent are included in the MDS. Public drainage pipes refer to pipes that are 18 inch in diameter, or the equivalent conveyance and larger, located within the City's right of way, on City owned property, pipes located within drainage easements dedicated to the public regardless of acceptance status, and when located within dedication which are irrevocable regardless of acceptance.

## 2.1 Raw Geospatial Data

The Project Team collected datasets from various sources for this MDS. The relevant datasets are summarized with their associated version dates in Table 2-1 below.

**Table 2-1: Geospatial Data Inventory**

| Data File Name | File Description | Version Date | Source (Agency) |
|---|---|---|---|
| LiDAR | Light Detection and Ranging (Used for Topography) | 2014 | SanGIS, SANDAG, NGA, LECC, Regional Public Safety GIS, 18 Incorporated Cities |
| GRID_2019_AERIAL_9INCHTILE.shp | Current Aerial Imagery Shapefile | November 13, 2020 | SanGIS, SANDAG |
| MUNICIPAL_BOUNDARIES.shp | Municipal Boundaries | June 4, 2022 | SanGIS, SANDAG |
| Zoning.shp | City's General Plan | April 14, 2022 | City of Santee |
| LANDUSE_CURRENT.shp | Current Land Use Shapefile | April 8, 2022 | SanGIS, SANDAG |
| ZoneDistrictsPending.shp | Planned Land Use Shapefile | November 23, 2022 | City of Santee |
| LANDCOVER_SD | High Resolution LiDAR land cover and tree canopy assessment. | February 2, 2017 | SanGIS, SANDAG |
| soilmu_a_aoi.shp | Soil Survey Geographic (SSURGO) database for San Diego County, California (Hydrologic Soils Group Reference) | September 16, 2019 | United States Department of Agriculture, Natural Resources Conservation Service |
| PARCELS.shp | San Diego County Parcels | October 7, 2022 | SanGIS, SANDAG, Assessor/Recorder/County Clerk |
| BUILDING_OUTLINES.shp | Building outline polygons of San Diego County | August 1, 2018 | SanGIS, SANDAG |
| S_FLD_HAZ_LN.shp | Federal Emergency Management Agency – National Flood Hazard Layer | March 3, 2022 | Federal Emergency Management Agency |
| FLOWLINES.shp | National Hydrography Dataset | September, 2022 | United Stated Geological Survey |
| WATER_HYDRANTS_SD.shp | Water Hydrant Layer | September 5, 2022 | SanGIS, SANDAG |
| WATER_MAIN_SD.shp | Water Mainline Layer | September 5, 2022 | SanGIS, SANDAG |
| SEWER_MANHOLE_SD.shp | Sewer Manhole Layer | September 5, 2022 | SanGIS, SANDAG |
| SEWER_MAIN_SD.shp | Sewer Manhole Layer | September 5, 2022 | SanGIS, SANDAG |
| SWChannels.shp | Storm water conveyance infrastructure | April 14, 2022 | City of Santee |
| SWStructure.shp | Storm water structures infrastructure | April 14, 2022 | City of Santee |

## 2.2 Storm Drain Infrastructure

### 2.2.1 Base Information

The most recently available version of the existing GIS storm drain inventory was provided by the City. It consists of storm drain structures and storm drain conveyance systems represented as points and lines, respectively. Storm drain structures were classified as inlets, cleanouts, junctions, discharge points and detention basins. Storm drain conveyance systems were classified as gravity mains and open drains.

### 2.2.2 Revisions to GIS Inventory

Revisions to the GIS storm drain inventory features contained in the GIS files were required for hydrologic and hydraulic modeling. The inventory was used to represent the existing drainage infrastructure conditions within the study area. The completeness of storm drain inventory data is critical in ensuring the effectiveness and practicality of drainage modeling. The updates to the GIS inventory consisted of editing the horizontal layout of the storm drain system, size and material of conduits, and flowline elevations (where feasible).

### 2.2.3 Desktop Analyses

Desktop analyses involved updating the storm drain structures and conveyance information in the City's existing GIS dataset based on previous record survey data, as-built drawings, aerial imagery, and Google Earth observations. The desktop analysis portion consisted of a three-step process.

The first step consisted of developing a horizontally accurate and fully connected storm water conveyance link-node network dataset. It involved adding missing connections in the form of storm drain, street flow, channel flow linework and their associated structure feature points. The horizontal location of drainage structures in the inventory were based on as-built drawings, as well as topographic and aerial imagery observations.

The second step aimed at vertically correcting the elevation information in the storm drain inventory dataset. It involved assigning elevation values to describe flowline directions for storm drains as well as invert elevations for drainage structures (such as inlets and manholes) with missing or conflicting values in the existing dataset. Existing information was populated between connected features using GIS tools and processes as feasible.

Due to the scale of the dataset, certain scenarios with incomplete or missing storm drain elevation data required application of engineering judgment while assigning values to storm drain features to produce a complete dataset. The engineering assumptions used in the refinement of storm drain elevation data during the development of this MDS are documented below:

1. A minimum cover of 2 feet above the storm drain soffit was applied at storm drain structures wherever feasible, for missing data. Alternative minimum cover values were used to ensure positive drainage when vertical constraints were encountered.
2. Linear interpolation was used to assign storm drain upstream and downstream flowline elevations using the connected upstream and downstream structures' invert elevations.
3. A Digital Elevation Model (DEM) – Synthesized from high-resolution LiDAR data – was utilized to assign missing rim/surface elevations to storm drain features.

The third desktop analysis step consisted of reviewing and revising the existing data to identify conveyance features with negative longitudinal slopes, zero slopes ("flat" networks), and other invalid slopes (including review of extremely high and low values). The connecting storm drain structure features were also revised to reflect any revisions made to the connecting conveyance line features.

In addition to adding missing features to the dataset using GIS tools and engineering assumptions, an effort was made to revise the inventory data in, and around local areas of concern (drainage hot spots) identified by City staff using as-built drawings when available. The updates made to the City's existing GIS dataset are summarized in Table 2-2.

**Table 2-2: Summary of Revisions from Existing Condition Review**

| Asset Type | Original Data Set Provided | Revised Existing Condition Data Set | Features Added to Inventory | % Features Added to Inventory | % Features Revised/Edited |
|---|---|---|---|---|---|
| **Structure** | | | | | |
| Inlet | 2,110 | 2,208 | 98 | 5% | 18% |
| Cleanout | 1,016 | 1,119 | 103 | 10% | 15% |
| Discharge Point | 102 | 157 | 55 | 54% | 41% |
| Detention Basin Point | 11 | 54 | 43 | 391% | 80% |
| Junction[1] | 2 | 696 | 694 | 344700% | 100% |
| Headwall | 588 | 647 | 59 | 10% | 11% |
| **Conveyance** | | | | | |
| Open Drain[2] (Feet) | 47 | 48 | 70 | 2% | 5% |
| Gravity Main[3] (Feet) | 82 | 87 | 4 | 184% | 29% |
| Open Drain[2] (Count) | 342 | 614 | 232 | 80% | 47% |
| Gravity Main[3] (Count) | 3,428 | 3,914 | 499 | 14% | 33% |

[1]Junctions classified as Stormwater treatment device per City inventory, node breaks or connectors added by Rick for modeling compatibility.
[2]Open Drain includes brow ditches and channels.
[3]Gravity Main includes pipes and culverts.

# 3.0 Hydrologic Methodology and Criteria

## 3.1 Software Selection

To model a complex drainage network and address both water quality and flood control objectives, a single software is preferred to integrate water quality and flood control solutions. Based on conversations with the City, the software selected for modeling is PCSWMM. PCSWMM is proprietary software which uses the Environmental Protection Agency (EPA) Storm Water Management Model (SWMM) as a computational tool. It can perform both rainfall-runoff modeling, as well as water quality modeling. This user-friendly software contains a graphical user interface (GUI) with GIS integration for running EPA SWMM (all versions) and fully supports all modules, including the Rain, Temperature, Runoff, Transport, Extran, Storage/Treatment, Combine, and Statistics modules. It has the capability of modeling a 1D, 2D and integrated 1D-2D model. It also has the capability of providing hydro/pollutographs and animated hydraulic grade lines as part of the output. It is suitable for projects ranging from small Best Management Practices (BMP) installations to major/minor drainage systems and provides GIS links to the EPA's SWMM core processes. PCSWMM also provides optional support for OpenSWMM engines which incorporate additional features developed by the OpenSWMM community, many of which eventually become officially adopted by the EPA SWMM platform. The proposed hydraulic model setup is a coupled 1-D model utilizing the PCSWMM modeling platform. The model is used to represent sub-surface conveyance (i.e., storm drains). PCSWMM was selected as the modeling program for this integrated drainage plan for its ability to model storm water flow rates and volumes in watersheds with complex drainage networks, such as those with multiple laterals and split flow conditions. PCSWMM also provides the opportunity of expanding the models to include integrated water quality modeling for both single-storm and continuous events. The SWMM version used for the project is 5.1.015.

## 3.2 Rainfall Hyetograph Development

A key component of the hydrologic methodology will be the precipitation data source. The currently available sources are the precipitation depths as specified in the County of San Diego Hydrology Manual and point precipitation data from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14. The City is located within the County of San Diego; therefore, the hydrologic design criteria is specified in the June 2003 San Diego County Hydrology Manual (SDCHM). Based on discussions with the City, it was decided that it would be appropriate to use more current point precipitation data from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for this drainage plan. It should be noted that the County of San Diego is anticipated to adopt the precipitation data from NOAA Atlas 14 into the upcoming update of the Hydrology Manual. NOAA Atlas 14 precipitation depths for the 2-year, 10-year, and 100-year storm events at the project centroid have been provided in Table 3-1.

After reviewing the point precipitation data from all four gages surrounding the City, it appeared that the data was in general agreement and there did not appear to be any outliers in the data. This comparison was important because data extracted at a precise latitude/longitude from NOAA Atlas 14 is interpolated from adjacent rain gages.

Additionally, after comparing the point precipitation data extracted from the centroids of the four major drainage basins used for modeling purposes, it was determined that the NOAA Atlas 14 precipitation depths at the centroid of each of the four major drainage basins would be appropriate for this project due to significant differences in precipitation depths at these different basins. NOAA Atlas 14 precipitation depths for the 2-, 10-, and 100-year storm events at the centroid of the four major drainage basins have been provided in Table 3-2.

**Table 3-1: San Diego County Local 24-Hour NOAA Atlas 14 Precipitation Depths**

| Rain Gage/Location | Latitude | Longitude | 2-year, 24-hour Precipitation (inches) | 10-year, 24-hour Precipitation (inches) | 100-year, 24-hour Precipitation (inches) |
|---|---|---|---|---|---|
| *Project Centroid* | *32.855* | *-116.985* | *1.91* | *2.94* | *4.53* |
| El Cajon | 32.814 | -116.975 | 1.83 | 2.85 | 4.43 |
| El Cajon 2 | 32.783 | -116.917 | 2.00 | 3.1 | 4.88 |
| Lakeside | 32.850 | -116.883 | 2.15 | 3.25 | 5.08 |
| San Vincente | 32.915 | -116.926 | 2.27 | 3.47 | 5.35 |

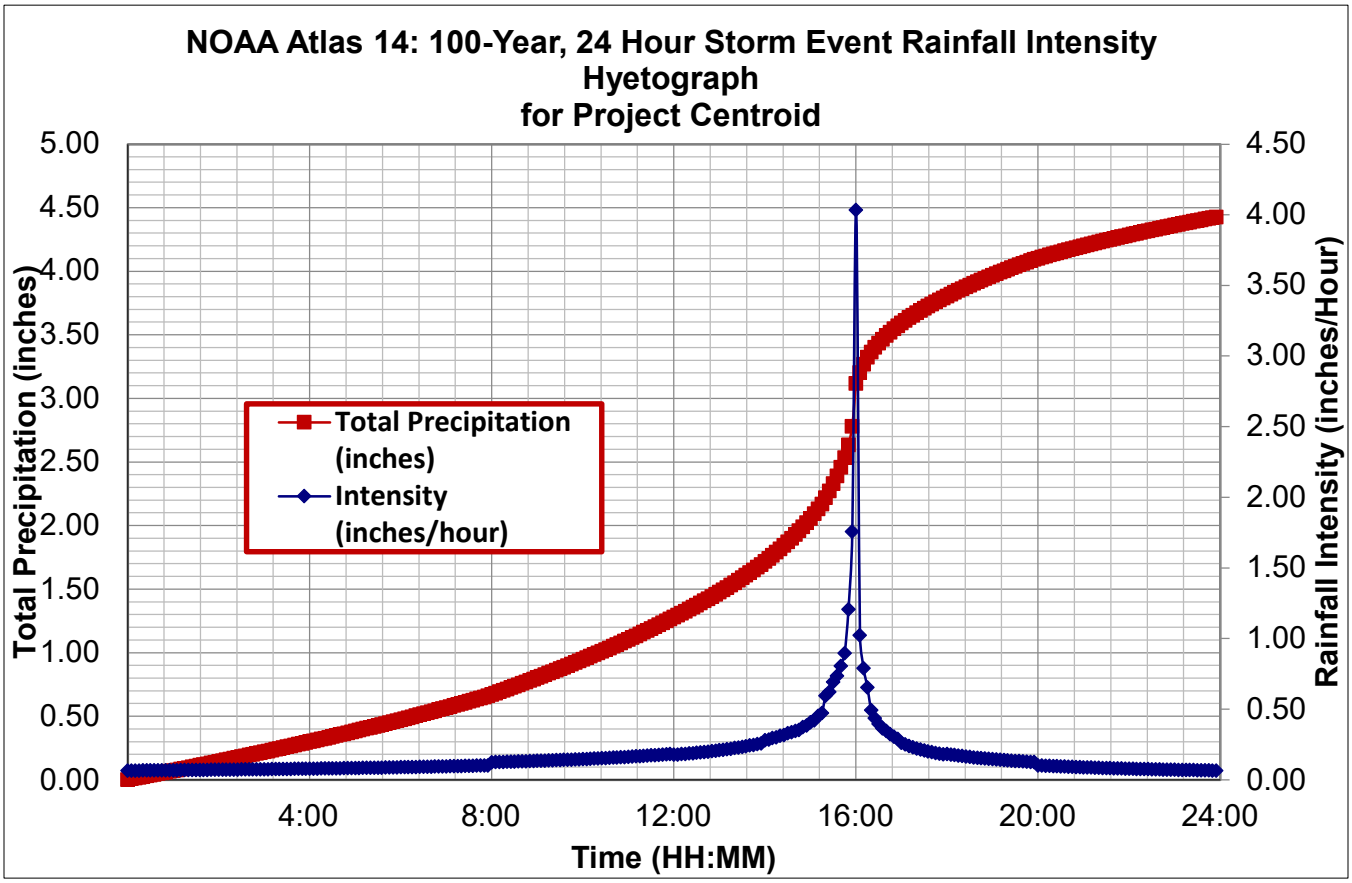
**Table 3-2: 24-Hour NOAA Atlas 14 Precipitation Depths for the Major Drainage Basins in Santee**

| Rain Gage/Location | Latitude | Longitude | 2-year, 24-hour Precipitation (inches) | 10-year, 24-hour Precipitation (inches) | 100-year, 24-hour Precipitation (inches) |
|---|---|---|---|---|---|
| Group 1 | 32.8986 | -117.0002 | 2.11 | 3.23 | 4.96 |
| Group 2 | 32.862 | -116.9775 | *1.92* | 2.94 | 4.54 |
| Group 3 | 32.8357 | -116.9565 | 1.86 | 2.88 | 4.47 |
| Group 4 | 32.8352 | -116.9926 | 1.85 | 2.87 | 4.44 |

### 3.2.1 Rainfall Pattern

In order to set up a storm simulation, the model requires a hyetograph to distribute rainfall across the subcatchments over the storm duration. The hyetographs were developed for the 2-, 10- , and 100-year, 24-hour storm events using 5-minute time intervals. A two-thirds centered distributed hyetograph was created consistent with the NOAA Atlas 14 standards as seen in Figure 3-1.

**Figure 3-1: NOAA Atlas 14: Project Study Area Centroid 100-year, 24-hour Intensity Hyetograph**




## 3.3 Hydrologic Soil Group

The hydrologic soil data utilized was compiled from the 2019 Soil Survey Geographic (SSURGO) database managed by the United States Department of Agriculture - National Resources Conservation Service (USDA-NRCS). This database includes hydrologic soil group classifications assigned by the USDA-NRCS. Hydrologic soil data was necessary to establish general soil infiltration parameters used to estimate drainage area runoff potential.

Hydrologic soils are classified by the Natural Resources Conservation Service into four (4) groups based on the soil's physical characteristics which affect runoff potential. The four (4) Hydrologic Soils Groups are: type A, B, C, and D, where type A has the lowest runoff potential and D has the greatest.

Within the City municipal boundaries, hydrologic soil groups A, B, C, and D are present. About 1.4% of the soil in the City is currently classified as "Unknown" and was grouped in with soil group D. The following Table 3-2 summarizes the distribution of hydrologic soil groups within the study area.

**Table 3-2: Hydrologic Soil Group Summary**

| Soil Type | Runoff Potential | Area (acres) | Percent Area (%) |
|---|---|---|---|
| Type A | Low | 998 | 9.3 |
| Type B | Moderate | 931 | 8.7 |
| Type C | High | 2062 | 19.3 |
| Type D | Highest | 6705 | 62.7 |
| | **Sum** | **10696** | **100** |

## 3.4 Land Use Data

Land use assumptions are based on the final buildout condition of the City per the City's general plan. Additionally, land use data available from the City, and from the San Diego Geographic Information Source (SanGIS) were referenced in the MDS efforts. Land use categories generally correlate to impervious area cover across natural and developed areas and is a necessary dataset to help establish a rainfall/runoff relationship for tributary drainage areas. The volume and velocity of rainfall runoff is generally anticipated to increase in direct relation to the amount of impervious cover within a drainage area. Using GIS tools and processes, land use data can be overlaid with drainage area delineations to perform an area-weighted analysis of impervious and pervious areas.

The City's General Plan Land Use data was used to establish impervious cover within the municipal boundaries by grouping the large number of land use descriptions into categories similar to those outlined in the San Diego County Hydrology Manual (2003). The General Plan Land Use data was incorporated into the H&H models used to size the drainage infrastructure included in the recommended project list.

The following Table 3-3 presents a summary of the planned land use categories, the breakdown and distribution within the study area, and the percent impervious cover assigned to those land uses present in the drainage areas during the hydrologic analyses.

**Table 3-3: Land Use Planning Summary**

| Land Use (Zoning) | Land Use (Zoning) Planned | % Impervious | Area (Ac) | % of City |
|---|---|---|---|---|
| HL | Hillside/ Limited Residential (0-1 DU/A) | 10 | 388 | 3.6 |
| R1 | Low Density Residential (1-2 DU/A) | 20 | 549 | 5.1 |
| R1-A | Low Density Residential (2-4 DU/A) | 25 | 133 | 1.2 |
| R2 | Low-Medium Density Residential (2-5 DU/A) | 30 | 3112 | 29.1 |
| R7 | Medium Density Residential (7-14 DU/A) | 45 | 419 | 3.9 |
| R14 | Medium-High Density Residential (14-22 DU/A) | 65 | 131 | 1.2 |
| R22 | High Density Residential (22-30 DU/A) | 80 | 54 | 0.5 |
| R-B | Residential Business | 80 | 6 | 0.1 |
| OP | Office Professional | 90 | 23 | 0.2 |
| NC | Neighborhood Commercial | 80 | 49 | 0.5 |
| GC | General Commercial | 85 | 327 | 3.1 |
| IL | Light Industrial | 90 | 289 | 2.7 |
| IG | General Industrial | 95 | 113 | 1.1 |
| TC | Town Center | 85 | 452 | 4.2 |
| PD | Planned Development* | 36 | 2856 | 26.7 |
| P/OS | Park/ Open Space | 5 | 1274 | 11.9 |
| Right of Way | Right of Way | 95 | 522 | 4.9 |
| | | **Sum** | **10696** | **100** |

*Planned Development impervious value is based on City provided percentage.

# 4.0 Watershed Characteristics

The City of Santee lies entirely within the San Diego Watershed Hydrologic Unit (907) and is located within the Lower San Diego River Hydrologic Area (907.1). All of the drainage basins within the City discharge both directly and indirectly to the San Diego River (which flows from east to west across the City) through the various creeks and channels such as Sycamore Creek and Forester Creek. Please refer to Appendix 1 for a visual representation of the major drainage basins as well as the previous MDS Basins.

The individual characteristics for each major drainage basin are summarized in the sections below.

## 4.1 Group 1

Group 1 is a major drainage basin which covers the northwest portion of the City. A portion of Group 1 is encompassed in the City of San Diego. Group 1 enters the City from the north and flows south. Group 1 drains both through Sycamore Creek and directly through the San Diego River. The sub-basins which are encompassed in this drainage basin merge with the San Diego River west of Santee Recreation Lakes (Santee Lakes) and eventually discharge to the Pacific Ocean. Group 1 has a total contributing drainage area of approximately 1,383 acres (2.2 sq. mi). Of this, approximately 522 acres (0.8 sq. mi) are located within the City's municipal boundary.

## 4.2 Group 2

The drainage basin, Group 2, covers the northeast portion of the City. The area within the City which is considered to be Group 2 has a total contributing drainage area of approximately 4,335 acres (6.8 sq. mi) and drains through Sycamore Creek, Wood Glen Vista Channel, and directly through the San Diego River.

## 4.3 Group 3

The Group 3 drainage basin represents the southeast areas of the City which drains both through Forester Creek and directly to the San Diego River. The area within the City which is considered to be Group 3 is approximately 2,349 acres (3.7 sq. mi).

### 4.3.1 Basins O, P, and Q

One of the focus areas in drainage Group 3 includes the sub-basins O, P, and Q which were specified to be significantly deficient in the original BSI City of Santee Citywide Drainage Study (BSI).

### 4.3.2 Mission Gorge Road

Mission Gorge Road is located along the southernmost portion of the City below the San Diego River. The southwest parts of Mission Gorge Road drain directly to the San Diego River and the southeast parts drain to Forester Creek which then discharges to the San Diego River. It is a major area of focus, as it was part of the BSI Supplemental Storm Drain System, which was created in August 1992 and specific to the drainage along Mission Gorge Road. The area along Mission Gorge Road is of significant concern in terms of flooding.

## 4.4 Group 4

Group 4 is the most southwest drainage basin in the City. Group 4 enters the City of Santee from the southeast from the City of El Cajon. This basin drains both through Forester Creek and directly through the San Diego River. Eventually Group 4 merges with the San Diego River, west of Carlton Hills Boulevard. Group 4 has a total contributing area of approximately 3,539 acres (5.5 sq. mi), of which approximately 1,616 acres (2.5 sq. mi) is within the City.

# 5.0 Drainage Assessment

The drainage assessment was accomplished by primarily implementing a 1-D dual-drainage hydrologic and hydraulic (H&H) model to represent the minor and major system flows. This approach allows a model to quantify storm water flows that exceed the minor system capacities during the design storm events, which is helpful for identifying deficient drainage infrastructure using the modeling software. This approach is also useful to help conserve the volume of runoff as it is routed through the hydraulic network during the model runtime.

An existing condition model was prepared, which presented a high-resolution visual rendering of the combined surface and sub-surface drainage patterns within the study area. Results from the "existing condition" model were used as the basis for informing proposed drainage infrastructure recommendations to be analyzed in individual "proposed condition" models. For the purposes of this study, the 100-year storm event was used to evaluate the capacity of underground storm drain infrastructure and to inform recommended infrastructure improvements. Appendix 2 shows the existing condition storm drain infrastructure used for modeling.

## 5.1 Subcatchment Delineations

A semi-automated process using GIS and PCSWMM program tools was used to establish drainage area delineations (subcatchments) and flow paths for City-owned drainage infrastructure using topographic data from a high-resolution Digital Elevation Model (DEM). Due to the high resolution of the topographic data, the computer program tools were able to identify flow paths along curbed roadways, through backyards, and across driveways, establishing an effective baseline for subcatchment delineations used in the modeling efforts. Approximately 2,560 subcatchment boundaries were generated and reviewed for accuracy and to make any necessary adjustments.

The individual subcatchment delineations were then used to refine boundaries for the larger hydrologic basins corresponding to the major water body they discharge to. The City has been split into four major drainage basins, all of which discharge both directly and indirectly to the San Diego River.

## 5.2 Model Methodology

The updated GIS storm drain inventory discussed in section 2.0 was imported into the PCSWMM modeling software and formed the basis of the 1-D conveyance elements within the study area. The revised GIS storm drain data was visually inspected horizontally with reference to aerial imagery, and vertically by generating storm drain profiles within the PCSWMM program for quality control.

The hydraulic assessment of storm drain conveyance inventory was primarily focused on the drainage infrastructure owned and operated by the City. Additional connections from private developments were included as needed if they provide a hydraulically significant connection to the public storm drain system. In order to reduce the volume of water that would otherwise be surface ponding or surface flow, an undersized facility is allowed to surcharge through the use of a dual drainage system. The dual drainage system was implemented to redirect flows back to the storm drain system and minimize flooding loss; however, it does not model surface conveyance within the City.

## 5.3 Results

Model results were obtained for the 24-hour storms at the 2-, 10-, and 100-year return period from the precipitation data obtained from NOAA Atlas 14 Precipitation Frequency Data Server (PFDS). The 24-hour design storms were judged to be the most pertinent storm events due to the volume of runoff generated and the peak flows generated at the main outfall of each storm drain system. The flowrates for the 100-year event were calculated for each group and compared to those obtained by the previous MDS as seen in the table in Appendix 1. In general, the higher flowrates correlate with an increase in the runoff coefficients for each group.

Results from the existing condition drainage assessment can be viewed on the web application developed as part of this MDS effort. This web application displays available GIS drainage infrastructure within the City, with attribute fields that show the hydrologic and hydraulic model results generated by the modeling efforts in this MDS, in addition to the record-keeping attributes maintained by the City.

The web application can be accessed online at the following address:
https://maps.rickengineering.com/santeemds/

# 6.0 Deficiencies and Recommended Improvements

The dual drainage system was used to identify deficiencies within the City. According to the City's Public Works Standards (1982), "public drainage facilities shall be designed to carry a ten-year storm underground, and the 100-year storm to the right-of-way".

Based on the Public Works Standards, the 2- and 10-year deficiencies were identified within the City where the dual drainage system experienced flows greater than 0.5 cfs. Deficiencies for the 100-year event were identified where the dual drainage system contained greater than 12.5 cfs. This cutoff was determined using the Gutter and Roadway Discharge - Velocity Chart in the SDCHM (see Appendix 3) based on the assumption of a one percent slope and 0.5 feet depth. The 12.5 cfs cutoff allows the 100-year storm to be contained within the right-of-way.

Appendix 4 index sheets show the deficiencies identified within the City during the 2-, 10, and 100-year storm events. Additionally, the backwater effects of the existing drainage outlets to the San Diego River were analyzed within the 100-year floodplain using the FEMA National Flood Hazard Level (NFHL). The deficiencies with the backwater effects are shown in Appendix 5.

Table 6-1 is a summary of deficient Master Drainage Facilities in linear feet, summarized based on recommended pipe size for circular pipes and by conduit type for RCB, arch and elliptical pipes, and channels.

**Table 6-1: Summary of Deficient Conduits in Linear Feet**

| Recommended Pipe Size (inches) | Group 1 (LF) | Group 2 (LF) | Group 3 (LF) | Group 4 (LF) | Total (LF) |
|---|---|---|---|---|---|
| 36 | 2,249 | 5,853 | 3,054 | 976 | **12,132** |
| 42 | 1,549 | 5,713 | 4,517 | 2,039 | **13,818** |
| 48 | 326 | 4,758 | 2,755 | 2,430 | **10,269** |
| 54 | 30 | 2,460 | 3,158 | 2,907 | **8,555** |
| 60 | 137 | 5,611 | 2,638 | 1,799 | **10,185** |
| 66 | - | - | - | - | **-** |
| 72 | - | 3,377 | 2,471 | 1,978 | **7,826** |
| Other | 1,581 | 6,692 | 2,710 | 399 | **11,382** |
| RCB | - | 1,237 | 773 | 2,914 | **4,924** |
| Arch/Elliptical | - | 1,180 | 2,570 | 657 | **4,407** |
| Channels | - | 2,185 | 2,687 | 681 | **5,553** |
| **Total (LF)** | **5,872** | **39,066** | **27,333** | **16,780** | **89,051** |

Normal depth calculations were used to make recommendations for improved conditions based on the flowrates for the 100-year event. Appendix 6 includes a table with the preliminary storm drain size and estimated cost for deficiencies identified within the City. The preliminary calculated cost is reflective of a $/LF cost and is not inclusive of any design or other contingencies. It includes the original and recommended conduit sizes as well as the

associated cost for each of the recommendations, broken down into the four drainage groups. Included within this Appendix are the deficiencies and recommendations for facilities which are not considered Master Drainage Facilities. Table 6-2 below is a cost summary for updating the deficient Master Drainage Facilities within the City.

**Table 6-2: Cost Summary for Updating Deficient Master Drainage Facilities within the City**

| Group | Cost |
|---|---|
| Group 1 | $ 3,200,000 |
| Group 2 | $ 31,200,000 |
| Group 3 | $ 16,500,000 |
| Group 4 | $ 25,900,000 |
| **Total Cost** | **$ 76,800,000** |

As a goal of this study, the results from the existing drainage infrastructure assessment have been leveraged to identify and prioritize drainage infrastructure CIP projects for the City. This was accomplished via a series of steps:

1. Hydrologic and hydraulic analysis of the existing storm drain infrastructure throughout the City.
2. Storm drain pipe size recommendations for backbone infrastructure which was determined to have deficient conveyance capacity per City standards.
3. Review of CIP project recommendations previously identified as part of the original MDS (prepared by BSI) to highlight any overlapping areas with drainage deficiencies observed in the current Master Drainage assessment.
4. Coordination with City staff to verify and determine additional infrastructure improvements based on knowledge of known problem areas, and locations currently lacking drainage infrastructure.
5. Grouping individual infrastructure improvements into CIP project bundles.

By working closely with City staff, the project team was able to identify and refine a list of seven (7) multi-phased CIP projects deemed the most critical to address current storm drain conveyance deficiencies, while considering effects of future development activity in the City (based on General Plan Land Use data). Appendix 7 includes individual project fact sheets.

## 6.1 Group 1 Project Summaries

Approximately 5,872 linear feet of Master Drainage Facilities are deficient within Group 1. The breakdown of deficiencies and recommendations is within Appendix 6. There are no CIP projects within Group 1.

## 6.2 Group 2 Project Summaries

Approximately 39,066 linear feet of Master Drainage Facilities are deficient within Group 2. The breakdown of deficiencies and recommendations is within Appendix 6. There are no CIP projects within Group 2.

## 6.3 Group 3 Project Summaries

Approximately 27,333 linear feet of Master Drainage Facilities are deficient within Group 3. The breakdown of deficiencies and recommendations is within Appendix 6. There are six CIP projects within Group 3.

### 6.3.1 Project 1A: Las Colinas Channel Culvert and Upsizing

#### Existing Facility and Location:

The potential project is located south to north along the Las Colinas Channel between Mission Gorge Rd and the San Diego River.

#### Need and Purpose:

The upstream storm drain system and the Las Colinas Channel are undersized for a 2- and 10-year event, respectively. This project suggests replacing the existing storm drain infrastructure leading to Las Colinas Channel. Additionally, this project will include regrading of the earthen channel and upsizing the remaining downstream portion of the Las Colinas Channel leading to the San Diego River.

#### Project Type: Upsizing and Replacement

#### Proposed Engineering Features:

The recommended project consists of the following:

- Replace CMP upstream of Las Colinas Channel with 320 LF of 14'x5' RCB.
- Regrade the Las Colinas Channel to add approximately 340 LF of 14'x5' RCB.
- Upsize approximately 1,460 LF of earthen Las Colinas Channel to 8'x4'.
- Add 40 LF of 14'x5' RCB downstream of Las Colinas Channel, crossing Riverview Pkwy. A total of 700 LF of 14'x5' RCB is expected for this project.
- The addition and/or replacement of nine (9) headwalls is anticipated.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

#### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$4,270,000** and is broken down into further detail in Appendix 8 of this report.

### 6.3.2 Project 1B: Cottonwood Ave to Mission Gorge Rd Storm Drain Upsize

#### Existing Facility and Location:

The potential project is located at the corner of Cottonwood Ave and Mission Gorge Rd.

### Need and Purpose:

The storm drain system is undersized for a 100-year event and ties into the 2-year deficient system leading to Las Colinas Channel. The planned project proposes the replacement and upgrade of the CMP pipes on the corner of Cottonwood Ave and east to west along Mission Gorge Rd.

### Project Type: Replacement

### Proposed Engineering Features:

The recommended project consists of the following:

- Remove and replace CMP along east side of Mission Gorge with 580 LF of 48-inch RCP.
- The addition and/or replacement of two (2) cleanouts is anticipated.

Note: Actual alignment and POC may vary for interim condition (i.e., if this segment is constructed prior to Project 1C - Mission Gorge Culvert Project).

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$790,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.3 Project 1C: Mission Gorge Culvert Project

### Existing Facility and Location:

The potential project is located downstream of the Buena Vista Channel and upstream of the Las Colinas Channel.

### Need and Purpose:

The storm drain system is undersized for a 2-year event. The planned project proposes the replacement and upgrade of the storm drain system located downstream of the Buena Vista Channel and the Las Colinas Channel.

### Project Type: Replacement

### Proposed Engineering Features:

The recommended project consists of the following:

- Replace CMP downstream of Buena Vista Channel, running across Mission Gorge Rd with 260 LF of 14’x5’ RCB.
- The addition and/or replacement of two (2) cleanouts and one (1) inlet is anticipated.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$1,540,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.4 Project 2: Buena Vista Channel Upsizing

### Existing Facility and Location:

The potential project is located south to north between Buena Vista Ave and Mission Gorge Rd.

### Need and Purpose:

This portion of the Buena Vista Channel is undersized for a 10-year event. The planned project proposes the upsizing of the most downstream portion of the Buena Vista Channel which will tie into Project 1C.

### Project Type: Upsizing and Replacement

### Proposed Engineering Features:

- Replace the most downstream portion of the Buena Vista Channel with 610 LF 14'x5' RCB.
- Remove and replace 20 LF of CMP downstream of Buena Vista Channel with 14'x5' RCB.
- The addition and/or replacement of two (2) headwalls is anticipated.

Note: Upstream deficiencies between Hwy 52 and Buena Vista Ave are unable to be improved at this time due to easement constraints in the area. The system was recently upsized to the maximum allowable size within the available ROW.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$3,420,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.5 Project 3.1A: Cottonwood Ave - Las Brisas Dr and Mission Gorge Rd Storm Drain Upsize

### Existing Facility and Location:

The potential project is located south to north along Cottonwood Ave from Buena Vista Ave to Mission Gorge Rd.

### Need and Purpose:

This area of Cottonwood Ave is a flat area with sumps in the road and undersized storm drain infrastructure. The planned project will include replacement and upgrade of conduits along Cottonwood Ave between Las Brisas Dr and Mission Gorge Rd which will tie into Project 1C.

### Project Type: New Infrastructure and Replacement

### Proposed Engineering Features:

The recommended project consists of the following:

- Remove and replace 18-inch CSP with 470 LF of 36-inch RCP.
- Remove and replace 28x20-inch CMP at Mission Gorge intersection with 40 LF of 48-inch RCP.
- The addition and/or replacement of two (2) cleanouts and one (1) inlet is anticipated.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$630,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.6 Project 3.1B: Cottonwood Ave - Happy Ln and Mission Gorge Rd Storm Drain Improvements

### Existing Facility and Location:

The potential project is located south to north along Cottonwood Ave from Buena Vista Ave to Mission Gorge Rd.

### Need and Purpose:

This area of Cottonwood Ave is a flat area with sumps in the road and does not have enough inlets. This system currently leads to the 100-year deficient storm drain system along Mission Gorge Rd which is part of Project 1B. The planned project will include new inlets as well as lateral pipes to connect the proposed system to Project 3.1B. Additionally, the project suggests the addition of new curb and gutter along Cottonwood where there currently is none.

### Project Type: New Infrastructure and Replacement

### Proposed Engineering Features:

The recommended project consists of the following:

- Add 40 LF of new 36-inch RCP, lateral to existing pipe.
- Remove and replace lateral 28x20-inch CMP at Mission Gorge intersection with 50 LF of 42-inch RCP.
- The addition and/or replacement of two (2) inlets is anticipated.
- Add approximately 500 LF of new curb and gutter along Cottonwood where there is none.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$270,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.7 Project 3.2: Cottonwood Ave - El Toro Ln and Buena Vista Ave Storm Drain

### Existing Facility and Location:

The potential project is located south to north along Cottonwood Ave between Hwy 52 and Buena Vista Ave.

### Need and Purpose:

This area of Cottonwood is a flat area with sumps in the road and currently does not have any storm drain infrastructure. The planned project will include additional inlets along Cottonwood between Hwy 52 and Buena Vista Ave. This project proposes to add new conduits along Cottonwood which will tie into the non-deficient system running along Buena Vista. Additionally, the project suggests the addition of new curb and gutter along Cottonwood where there currently is none.

### Project Type: New Infrastructure

### Proposed Engineering Features:

The recommended project consists of the following:

- Add 300 LF of 18-inch RCP as a backbone storm drain down Cottonwood, connecting to existing 42-inch RCP running west along Buena Vista.
- The addition and/or replacement of two (2) cleanouts and two (2) inlets is anticipated.
- Add approximately 400 LF of new curb and gutter along Cottonwood where there is none.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$410,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.8 Project 3.3: Cottonwood Ave - Prospect Ave and Hwy 52 Storm Drain

### Existing Facility and Location:

The potential project is located south to north along Cottonwood Ave between Prospect Ave and Hwy 52.

### Need and Purpose:

This area of Cottonwood is a flat area with sumps in the road and currently does not have any storm drain infrastructure. The planned project will include additional inlets along Cottonwood between Prospect and Hwy

52. This project proposes to tie into the inlet on the northwest side of the Hwy 52 underpass. Additionally, the project suggests the addition of new curb and gutter along Cottonwood where there currently is none.

### Project Type: New Infrastructure

### Proposed Engineering Features:

The recommended project consists of the following:

- Add 360 LF of new 30-inch RCP as a backbone storm drain down Cottonwood Ave, connecting to 30-inch system running parallel to Hwy 52.
- Add 40 LF of new 30-inch RCP lateral to new backbone across Cottonwood.
- The addition and/or replacement of one (1) cleanout and three (3) inlets is anticipated.
- Add approximately 200 LF of new curb and gutter along Cottonwood where there is none.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$520,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.9 Project 4.1: South Mission Gorge Rd - Olive Ln and Forester Creek Storm Drain Upsize and Extension

### Existing Facility and Location:

The potential project is located east to west along Mission Gorge Rd between Olive Ln and Forester Creek.

### Need and Purpose:

This area experiences surface flooding due to it being a relatively flat area with undersized CMP pipes. The planned project will include upgrades to the storm drain system along the south side of Mission Gorge which includes 2-, 10-, and 100-year deficiencies. The project suggests additional storm drain infrastructure at the intersection of Olive Ln and along the south side of Mission Gorge where it will tie into current infrastructure along Mission Gorge and connect to the upgrades suggested along the south side of Mission Gorge where there are currently deficiencies.

### Project Type: New Infrastructure and Replacement

### Proposed Engineering Features:

The recommended project consists of the following:

- Add 530 LF of new 18-inch RCP connecting to the existing infrastructure.

- Add 10 LF of 24" RCP to replace CMP pipe going south to north along Mission Gorge.
- Add 810 LF and 800 LF of 42" and 48" RCP, respectively, to replace CMP and CSP pipe in place along Mission Gorge.
- The addition and/or replacement of nine (9) cleanouts, five (5) inlets, and one (1) headwall is anticipated.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$2,520,000** and is broken down into further detail in Appendix 8 of this report.

## 6.3.10 Project 4.2: North Mission Gorge Rd - Town Center Pkwy and Carlton Hills Storm Drain Extension

### Existing Facility and Location:

The potential project is located east to west along Mission Gorge Rd between Town Center Pkwy and Carlton Hills.

### Need and Purpose:

This area experiences surface flooding due to it being a relatively flat area with a lack of storm drain infrastructure. The project suggests an extension of the storm drain along the north side of Mission Gorge Rd to capture more of the flow before it enters Forester Creek.

### Project Type: New Infrastructure

### Proposed Engineering Features:

The recommended project consists of the following:

- Add 420 LF of new 18-inch RCP connecting to the existing infrastructure on north side of Mission Gorge.
- The addition and/or replacement of two (2) cleanouts and one (1) inlet are anticipated.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$370,000** and is broken down into further detail in Appendix 8 of this report.

### 6.3.11 Project 5.1: Shadow Hill Rd and Woodside Ave Drainage Improvements

## Existing Facility and Location:

The potential project is located along Shadow Hill Rd and includes a portion along the southwest portion of Meadow Terrace where there is currently no storm drain infrastructure. This proposed infrastructure will connect to the system that goes along Woodside Ave and then attaches laterally to headwalls connecting to Hwy 67 which is currently 2-year deficient.

## Need and Purpose:

The planned project proposes to add storm drain infrastructure along Shadow Hill Rd and Meadow Terrace. Currently, this large, steep area is draining straight to Woodside Ave and causing ponding due to a lack of infrastructure and undersized pipes leading across Hwy 67. Additionally, inlets and storm drain infrastructure are recommended along the most northwest portion of Bird St to connect with the proposed infrastructure along Meadow Terrace.

## Project Type: New Infrastructure and Replacement

## Proposed Engineering Features:

The recommended project consists of the following:

- Add 40 LF of new 18-inch RCP across the most eastern portion of Shadow Hill Rd.
- Add 275 LF and 1,030 LF of new 24-inch and 30-inch RCP, respectively, running along Shadow Hill Rd.
- Add 95 LF of new 24-inch RCP running along Bird St and connect to 160 LF of new 48-inch RCP along the southwest portion of Meadow Terrace.
- Add 485 LF of new 54-inch RCP to connect along Woodside Ave and remove and replace existing 18" pipe with 105 LF of 54-inch RCP.
- The addition and/or replacement of three (3) cleanouts, nine (9) inlets, and five (5) headwalls is anticipated.
- Add approximately 200 LF of new curb and gutter along Woodside where there is none.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

## Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$2,640,000** and is broken down into further detail in Appendix 8 of this report.

### 6.3.12 Project 5.2: Northcote Rd and Woodside Ave Drainage Improvements

#### Existing Facility and Location:

The potential project is located along the northwest side of Northcote Rd, and along Woodside Ave toward the eastern city limits. The lateral infrastructure running across Woodside will be included in the project area as well.

#### Need and Purpose:

The planned project proposes to upsize storm drain infrastructure along Northcote Rd which is currently a 2-year deficient area. Additionally, the project proposes to upsize and extend the storm drain infrastructure along Woodside Ave to the eastern City limit.

#### Project Type: New Infrastructure and Replacement

#### Proposed Engineering Features:

The recommended project consists of the following:

- Remove and replace existing storm drain on west side of Northcote Rd with 320 LF 60-inch RCP.
- Remove and replace existing storm drain along west side of Woodside Ave with 170 LF of 72”x44” RCP to match downstream geometry.
- Add 1,370 LF of new 60-inch RCP beginning at existing outlet between Woodside Terrance and Security Wy.
- Remove and replace 450 LF of 30-inch storm drain east of Woodside Ave with 60-inch RCP.
- Remove and replace 70 LF of 30-inch storm drain running perpendicular to Woodside Ave with 72”x44” RCP.
- The addition and/or replacement of five (5) cleanouts, six (6) inlets, and two (2) headwalls is anticipated.
- Add approximately 1,650 LF of new curb and gutter along Woodside where there is none.

Note: The suggested improvements will tie into the 10-year deficient Caltrans system.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

#### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$4,410,000** and is broken down into further detail in Appendix 8 of this report.

### 6.3.13 Project 6: Pepper Dr and Graves Ave Drainage Improvements

#### Existing Facility and Location:

The potential project is located west of Pepper Dr to Graves Ave where it connects to Hwy 67.

### Need and Purpose:

This area experiences surface flooding along Pepper Dr and Graves Ave. This project suggests new storm drain infrastructure in order to relieve some of the surface flooding from the 511-acre drainage area.

### Project Type: New Infrastructure

### Proposed Engineering Features:

The recommended project consists of the following:

- Add 790 LF of 48-inch RCP to replace the existing ditch along Pepper Drive and Graves Avenue.
- The addition and/or replacement of two (2) inlets is anticipated.

Note: Of the 511-acre watershed, approximately 262 acres (~51%) is within County of San Diego jurisdiction. Additionally, the proposed 48" pipe will relieve approximately 220 out of 858 cfs off the street along Graves Ave. The proposed 48" pipe will connect to the 10- and 2-year deficient Caltrans system crossing Hwy 67.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$970,000** and is broken down into further detail in Appendix 8 of this report.

## 6.4 Group 4 Project Summaries

Approximately 16,780 linear feet of Master Drainage Facilities are deficient within Group 4. The breakdown of deficiencies and recommendations is within Appendix 6. There is one CIP project within Group 4.

### 6.4.1 Project 7: Prospect Ave to San Diego River Storm Drain

### Existing Facility and Location:

The potential project is located along Prospect Ave and south to north along Marrokal Ln between Prospect Ave and the San Diego River.

### Need and Purpose:

This area experiences shoulder ponding due to limited inlets to catch flow from the upstream neighborhoods. Additionally, the system along Marrokal Ln is 10- and 100-year deficient. The planned project will include new storm drain infrastructure and additional inlets on both sides of Prospect Ave and tie into proposed upgrades. The project suggests a parallel system to existing storm drain infrastructure along Marrokal Ln between Prospect Ave and the San Diego River. The addition of new curb and gutter along the northeast side of Prospect Ave where there currently is none is suggested to help with drainage.

### Project Type: New Infrastructure and Replacement

### Proposed Engineering Features:

The recommended project consists of the following:

- Add 630 LF of new 24-inch RCP along Prospect and connect to existing infrastructure.
- Add 1,820 LF of 36-inch RCP parallel to existing RCP pipe going south to north along Marrokal Ln, emptying at the San Diego River.
- The addition and/or replacement of five (5) cleanouts, five (5) inlets, and one (1) headwall is anticipated.
- Add approximately 660 LF of new curb and gutter along Prospect Ave where there is none.

The Appendix 7 project fact sheets show the general location where this project is anticipated.

### Opinion of Probable Cost:

The opinion of probable construction cost for this project is approximately **$2,590,000** and is broken down into further detail in Appendix 8 of this report.

## 6.5 Opinion of Probable Cost

The following Table 6-3 presents a summary overview for the opinion of probable cost associated with the individual recommended projects. The total costs for the seven multi-phased CIP projects proposed is $25,350,000. These are broken down in further detail in Appendix 8. The recommended CIP projects are preliminary and do not include a full account of utility conflicts or easements. A further analysis must be made of these conflicts during final design.

**Table 6-3 Summary of Project Costs**

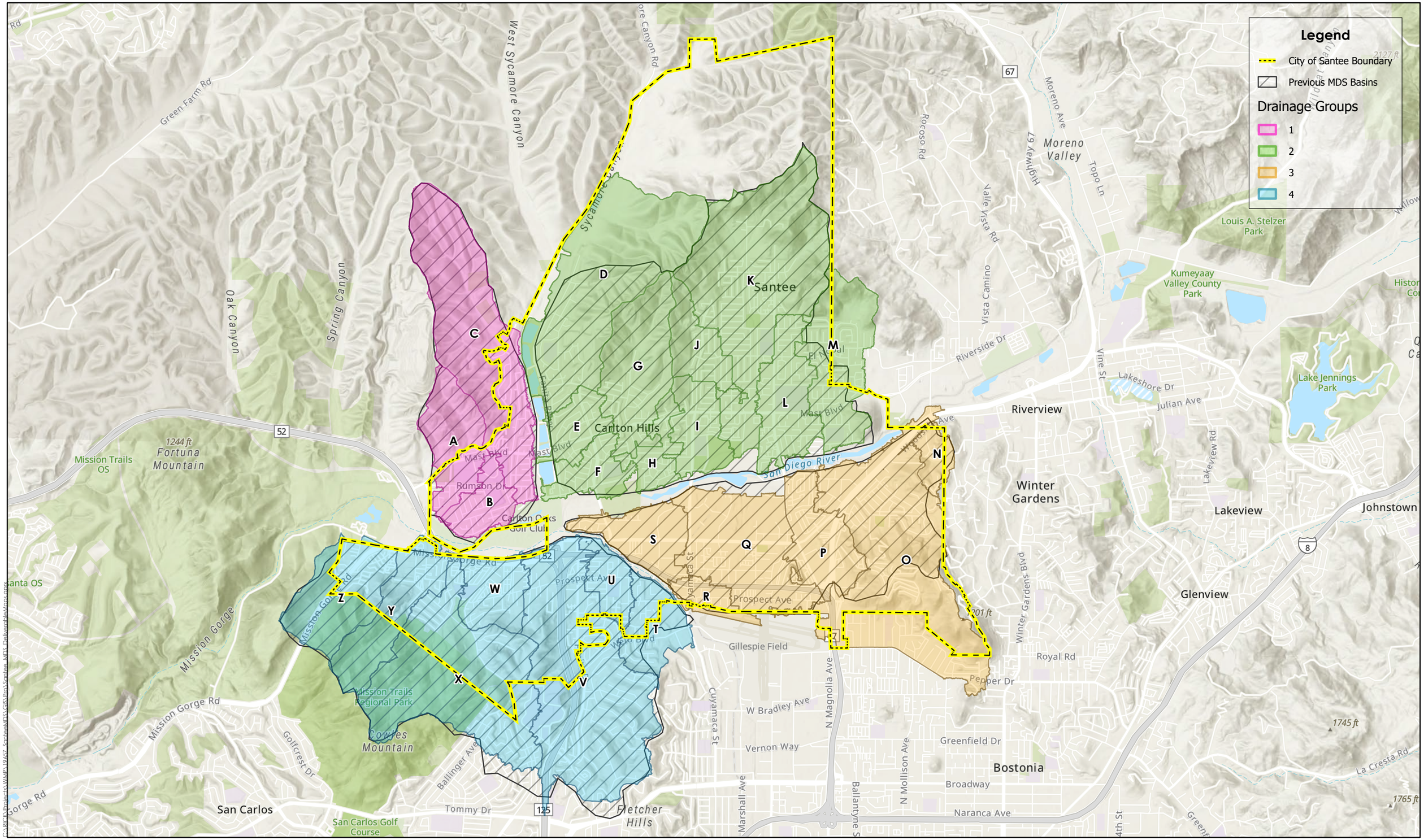
| Project ID | Construction Cost Subtotal | Construction Contingency | Construction Total | Design/Permitting | Project Total |
|---|---|---|---|---|---|
| **Project 1A** | $2,340,000 | $710,000 | $3,050,000 | $1,220,000 | $4,270,000 |
| **Project 1B** | $430,000 | $130,000 | $560,000 | $230,000 | $790,000 |
| **Project 1C** | $840,000 | $260,000 | $1,100,000 | $440,000 | $1,540,000 |
| **Project 2** | $1,870,000 | $570,000 | $2,440,000 | $980,000 | $3,420,000 |
| **Project 3.1A** | $340,000 | $110,000 | $450,000 | $180,000 | $630,000 |
| **Project 3.1B** | $140,000 | $50,000 | $190,000 | $80,000 | $270,000 |
| **Project 3.2** | $220,000 | $70,000 | $290,000 | $120,000 | $410,000 |
| **Project 3.3** | $280,000 | $90,000 | $370,000 | $150,000 | $520,000 |
| **Project 4.1** | $1,380,000 | $420,000 | $1,800,000 | $720,000 | $2,520,000 |
| **Project 4.2** | $200,000 | $60,000 | $260,000 | $110,000 | $370,000 |
| **Project 5.1** | $1,440,000 | $440,000 | $1,880,000 | $760,000 | $2,640,000 |
| **Project 5.2** | $2,420,000 | $730,000 | $3,150,000 | $1,260,000 | $4,410,000 |
| **Project 6** | $530,000 | $160,000 | $690,000 | $280,000 | $970,000 |
| **Project 7** | $1,420,000 | $430,000 | $1,850,000 | $740,000 | $2,590,000 |
| | | **Totals:** | **$18,080,000** | **$7,270,000** | **$25,350,000** |

# 7.0 Summary of Findings

Through the use of drainage modeling, deficient areas were identified within the City. A list of deficiencies and proposed improvements has been made, along with seven (7) multi-phased CIP projects deemed the most critical to address current storm drain conveyance deficiencies. Approximately 89,051 linear feet of Master Drainage Facilities have been identified as deficiencies within the City.

**Appendix 1**

**Comparison of Current and Previous MDS Drainage Basins**




Scale in Feet

0 4,000 8,000

North

Date of Exhibit: 6/27/2023
SANGIS/ SANDAG Aerial Image: 2017

# SANTEE DRAINAGE BASINS

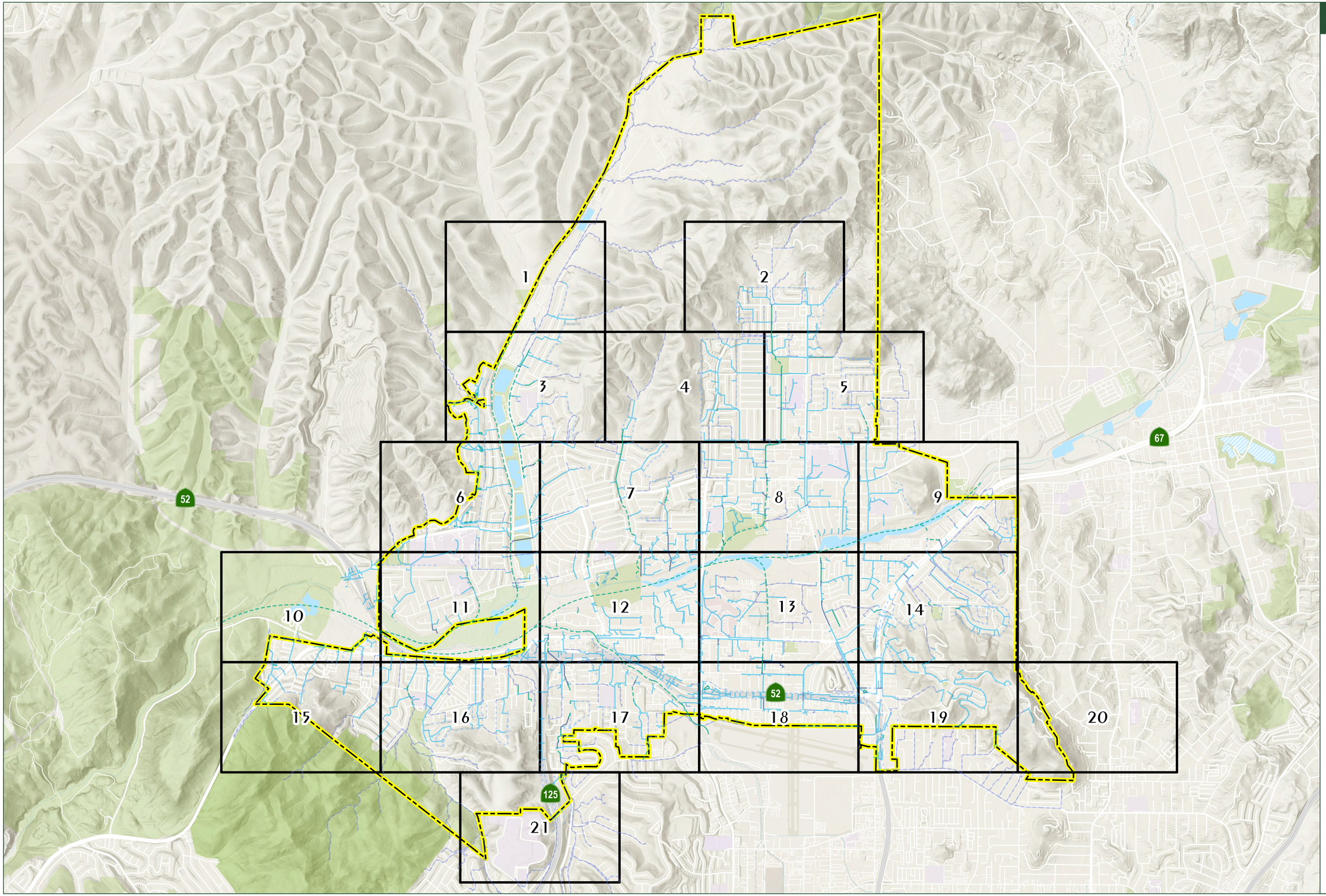
SANTEE MASTER DRAINAGE STUDY

**Table 1: Hydrology Summary Comparison**

| Zone | New Outfalls Total Q (CFS) | Planned Runoff Coefficient | New Total Area (AC) | Old Outfalls Total Q (CFS) | Prev. Runoff Coefficient | Old Total Area (AC) | New to Old Flowrate Ratio | New to Old C Ratio | Area Ratio |
|---|---|---|---|---|---|---|---|---|---|
| **Group 1** | **2872** | **0.62** | **1382** | **1627** | **0.48** | **1333** | **1.77** | **1.29** | **1.04** |
| AB | 1131 | 0.63 | 475 | 604 | 0.47 | 472 | 1.87 | 1.33 | 1.01 |
| C | 1740 | 0.62 | 907 | 1022 | 0.48 | 861 | 1.70 | 1.27 | 1.05 |
| **Group 2** | **8548** | **0.64** | **4335** | **4720** | **0.52** | **3071** | **1.81** | **1.22** | **1.41** |
| DE | 1773 | 0.66 | 1187 | 1032 | 0.52 | 566 | 1.72 | 1.27 | 2.10 |
| F | 397 | 0.63 | 169 | 84 | 0.55 | 67 | 4.70 | 1.15 | 2.50 |
| GH | 1350 | 0.66 | 608 | 929 | 0.51 | 596 | 1.45 | 1.28 | 1.02 |
| IJKL | 4161 | 0.63 | 1907 | 2398 | 0.53 | 1673 | 1.74 | 1.20 | 1.14 |
| M | 867 | 0.56 | 464 | 278 | 0.53 | 170 | 3.12 | 1.05 | 2.74 |
| **Group 3** | **4862** | **0.71** | **2583** | **2881** | **0.69** | **1501** | **1.69** | **1.03** | **1.72** |
| ON | 2302 | 0.60 | 1323 | 1097 | 0.60 | 610 | 2.10 | 1.00 | 2.17 |
| P | 512 | 0.71 | 310 | 524 | 0.62 | 337 | 0.98 | 1.15 | 0.92 |
| QR | 1358 | 0.89 | 697 | 783 | 0.84 | 276 | 1.73 | 1.06 | 2.53 |
| S | 690 | 0.84 | 252 | 478 | 0.85 | 279 | 1.45 | 0.99 | 0.90 |
| **Group 4** | **7422** | **0.63** | **3539** | **4089** | **0.50** | **3073** | **1.82** | **1.25** | **1.15** |
| T | 708 | 0.80 | 237 | 211 | 0.52 | 153 | 3.36 | 1.53 | 1.54 |
| UVW | 3523 | 0.75 | 1552 | 1840 | 0.54 | 1128 | 1.91 | 1.38 | 1.38 |
| X | 1623 | 0.50 | 993 | 1048 | 0.46 | 1084 | 1.55 | 1.09 | 0.92 |
| Y | 616 | 0.50 | 346 | 407 | 0.49 | 310 | 1.52 | 1.02 | 1.12 |
| Z | 952 | 0.49 | 411 | 583 | 0.51 | 398 | 1.63 | 0.97 | 1.03 |
| **Total** | **23703** | **0.65** | **11838** | **13317** | **0.54** | **8978** | **1.78** | **1.21** | **1.32** |

**Appendix 2**

**Storm Drain Infrastructure – Existing Condition Index Maps**




## LEGEND

- City of Santee
- Map Index (200 scale)

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Flowline
- Ditch
- Concrete Channel
- Earthen Channel

Scale in Feet

0 1,600 3,200 4,800

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

## INDEX MAP

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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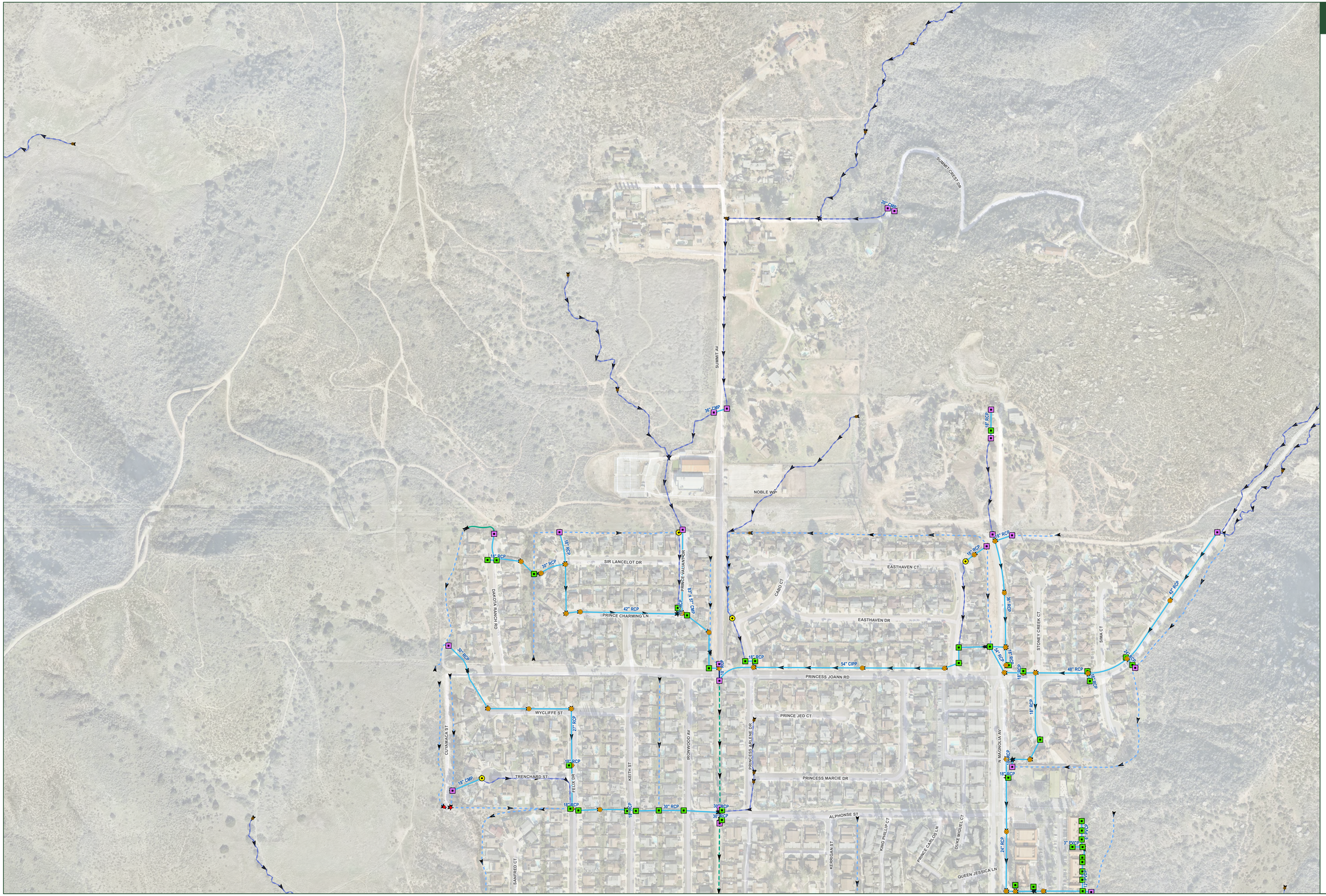
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 1 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
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- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

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Data Source:
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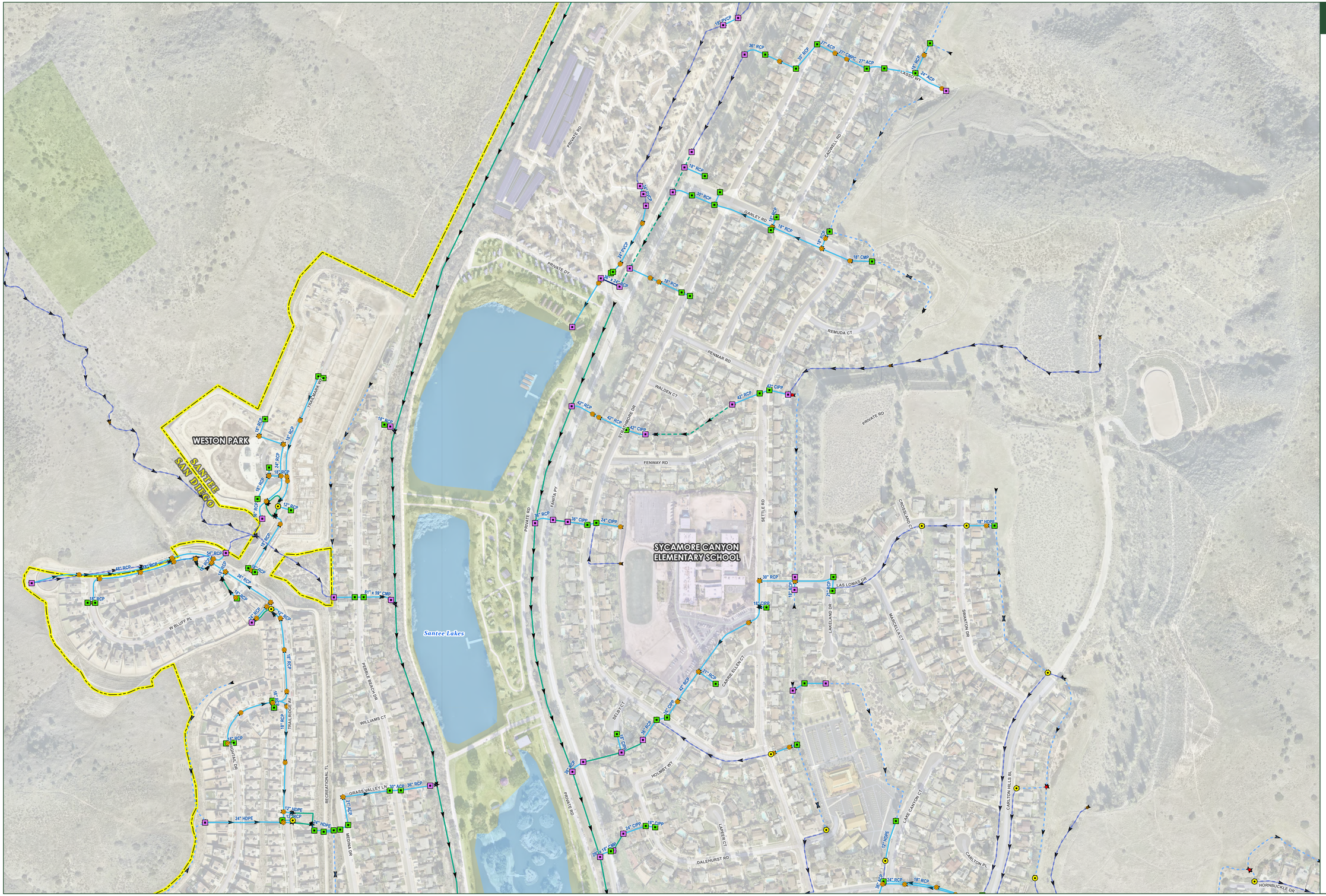
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 2 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

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Data Source:
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 3 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline

- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
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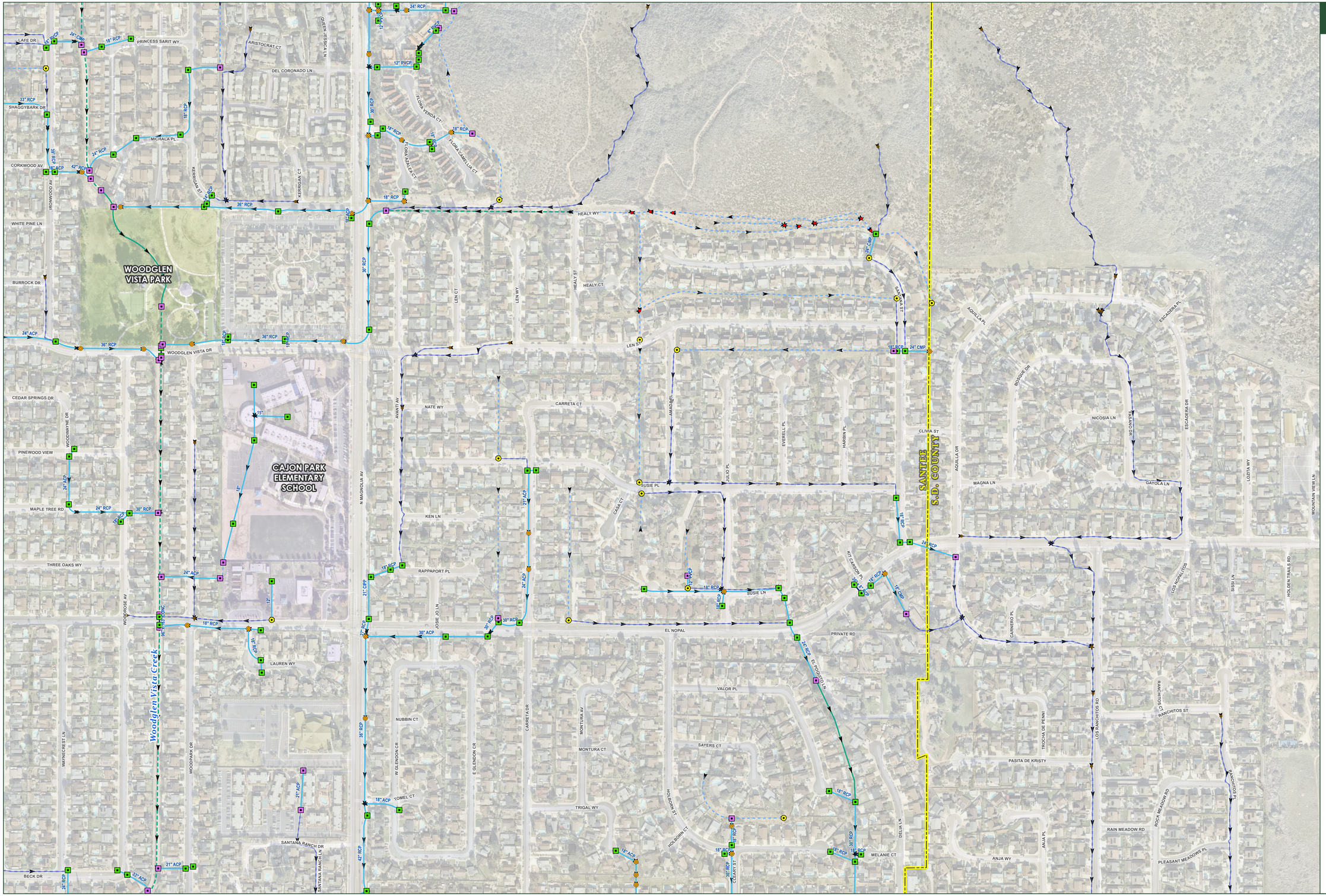
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 4 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline

- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
Data Sources:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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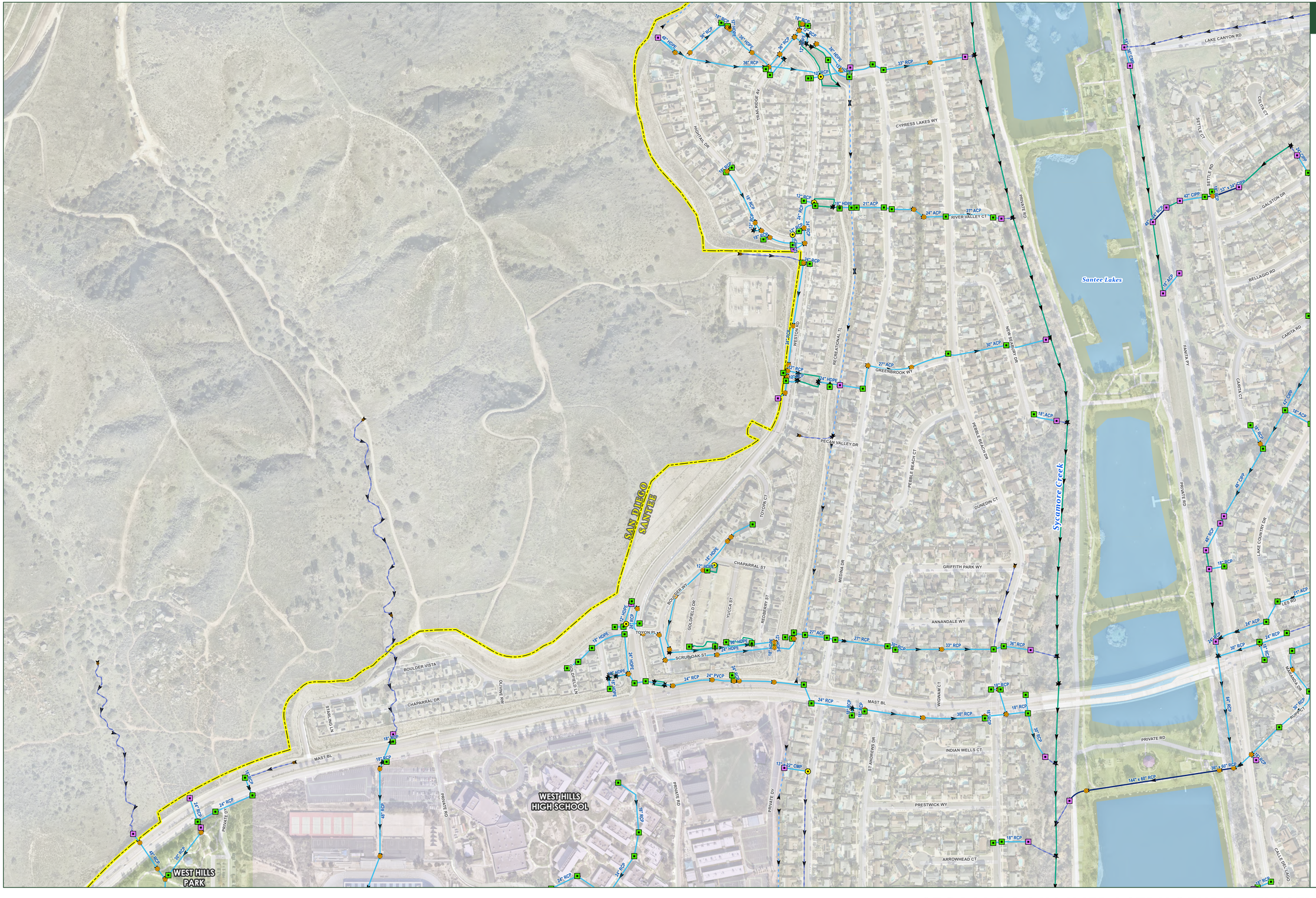
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 5 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

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Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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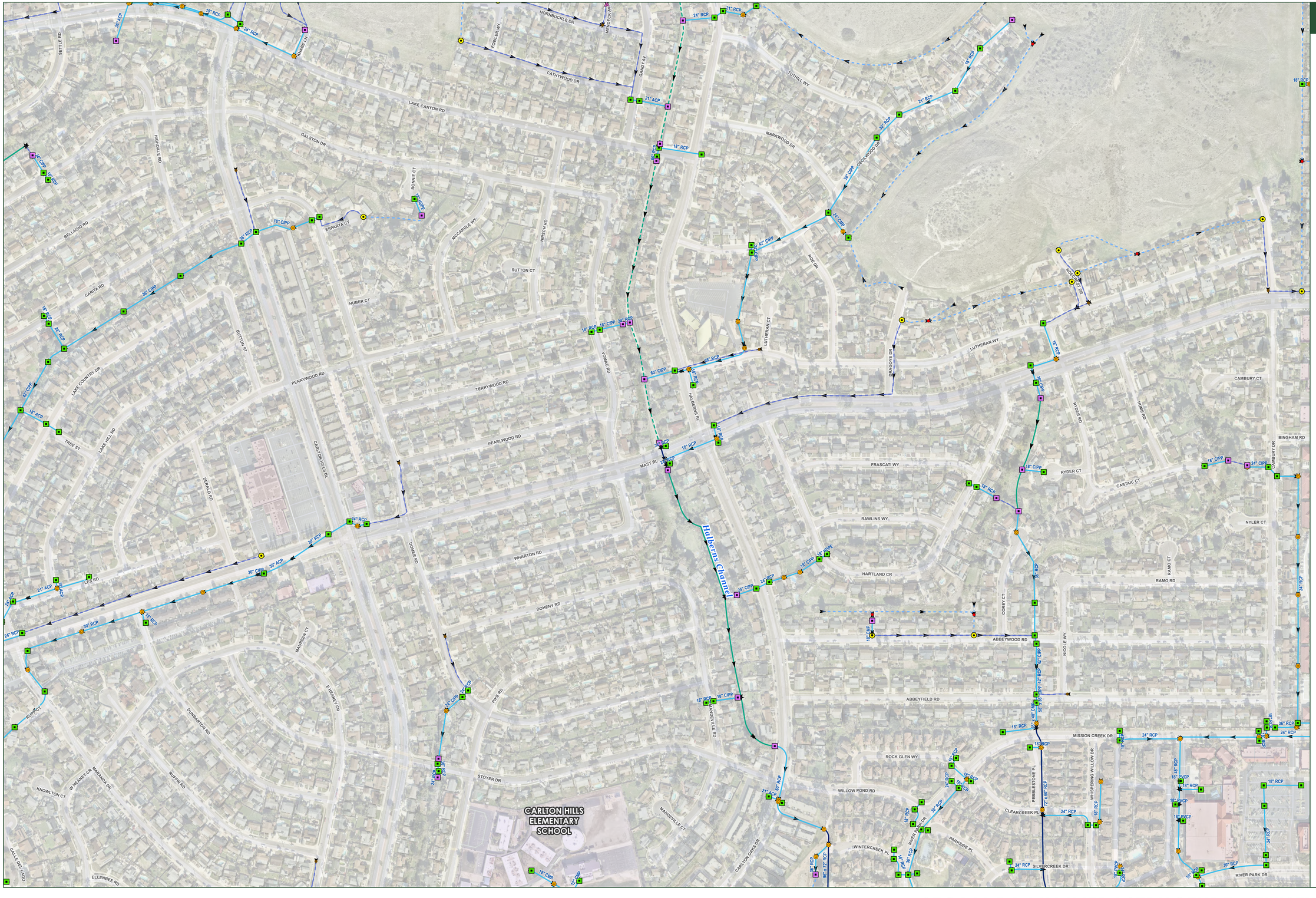
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 6 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
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- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline

- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

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Data Source:
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ESRI World Topographic Basemap
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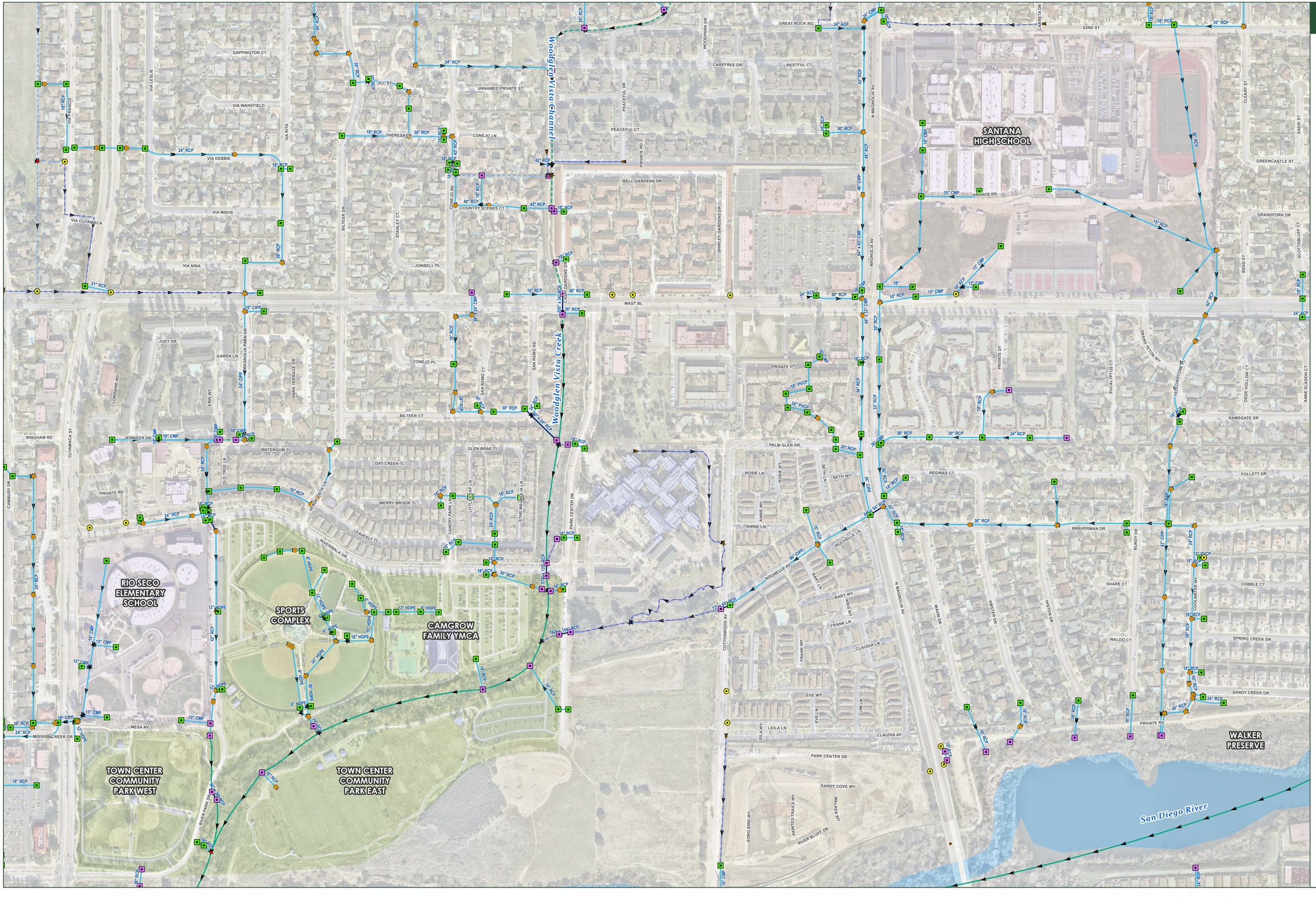
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 7 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
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Existing Storm Drain

- Storm Drain Pipe
- Culvert
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- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
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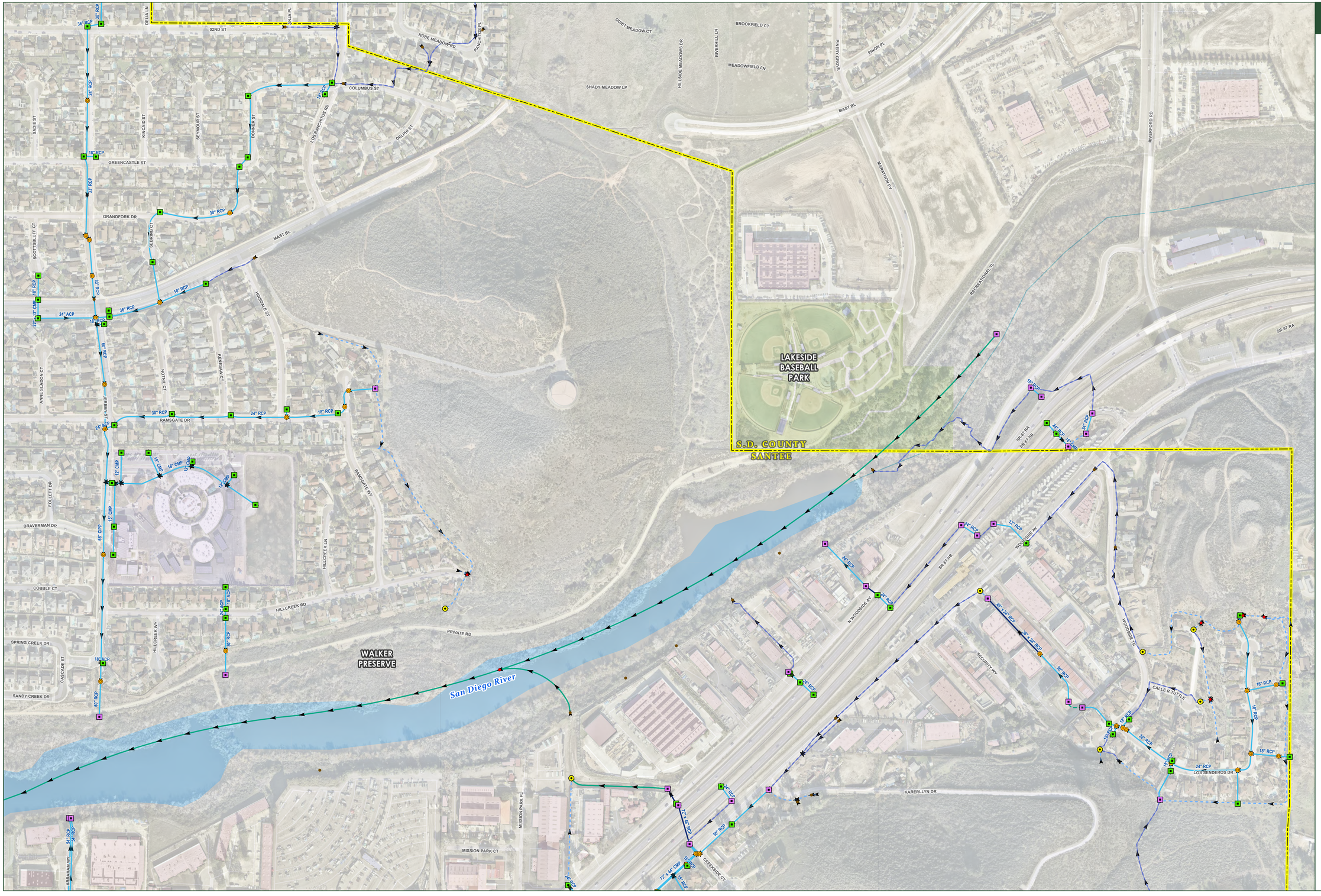
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 8 OF 21**

SANTEE MASTER DRAINAGE STUDY


LAKESIDE BASEBALL PARK
S.D. COUNTY SANTEE
WALKER PRESERVE
San Diego River
SHADY MEADOW LP
QUIET MEADOW CT
ROSE MEADOW RD
RANCHITOS DR
BROOKFIELD CT
MEADOWFIELD LN
RIVERHILL LN
HILLSIDE MEADOWS DR
PINERY GROVE
PINON PL
MAST BL
MARATHON PY
RECREATIONAL CT
RIVERFORD RD
SR-67 RA
SR-67 NB
SR-67 SB
WOODSIDE AV
N WOODSIDE AV
WOODSIDE TR
SECURITY WY
CALLE R. TUTTLE
LOS SENDEROS DR
KARERLLYN DR
DELJA LN
92ND ST
KAJA PL
COLUMBUS ST
LOS RANCHITOS RD
DELPHI ST
SADIE ST
KINCAID ST
SEYMOUR ST
DONNER ST
GREENCASTLE ST
GRANDFORK DR
SEBRING CT
SCOTTSBLUFF CT
ANNE SLADDEN CT
HINSDALE ST
KENNESAW CT
MOTIVE CT
RAMSGATE DR
RAMSGATE WY
FOLLETT DR
BRAVERMAN DR
COBBLE CT
HILLCREEK LN
HILLCREEK RD
PRIVATE RD
HILLCREEK WY
SPRING CREEK DR
CASCADE ST
SANDY CREEK DR
MISSION PARK PL
MISSION PARK CT
CREEKSIDE CT
ABRAHAM WY
36" RCP
24" RCP
18" RCP
30" RCP
33" RCP
24" ACP
18" ACP
60" CIPP
66" CIPP
15" CMP
18" CMP
12" CMP
24" CMP
54" RCP
42" RCP
12" RCP
15" RCP
24" RCP
18" RCP
30" RCP
36" RCP
42" RCP
54" RCP
60" RCP
66" RCP
24" ACP
18" ACP
24" x 38" RCP
30" x 48" RCP
24" x 38" CMP
18" x 29" RCP
24" x 38" RCP
30" x 48" RCP
12" x 24" CMP
18" x 29




## LEGEND

Municipal Boundaries

Storm Drain Junction

- I: Inlet
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Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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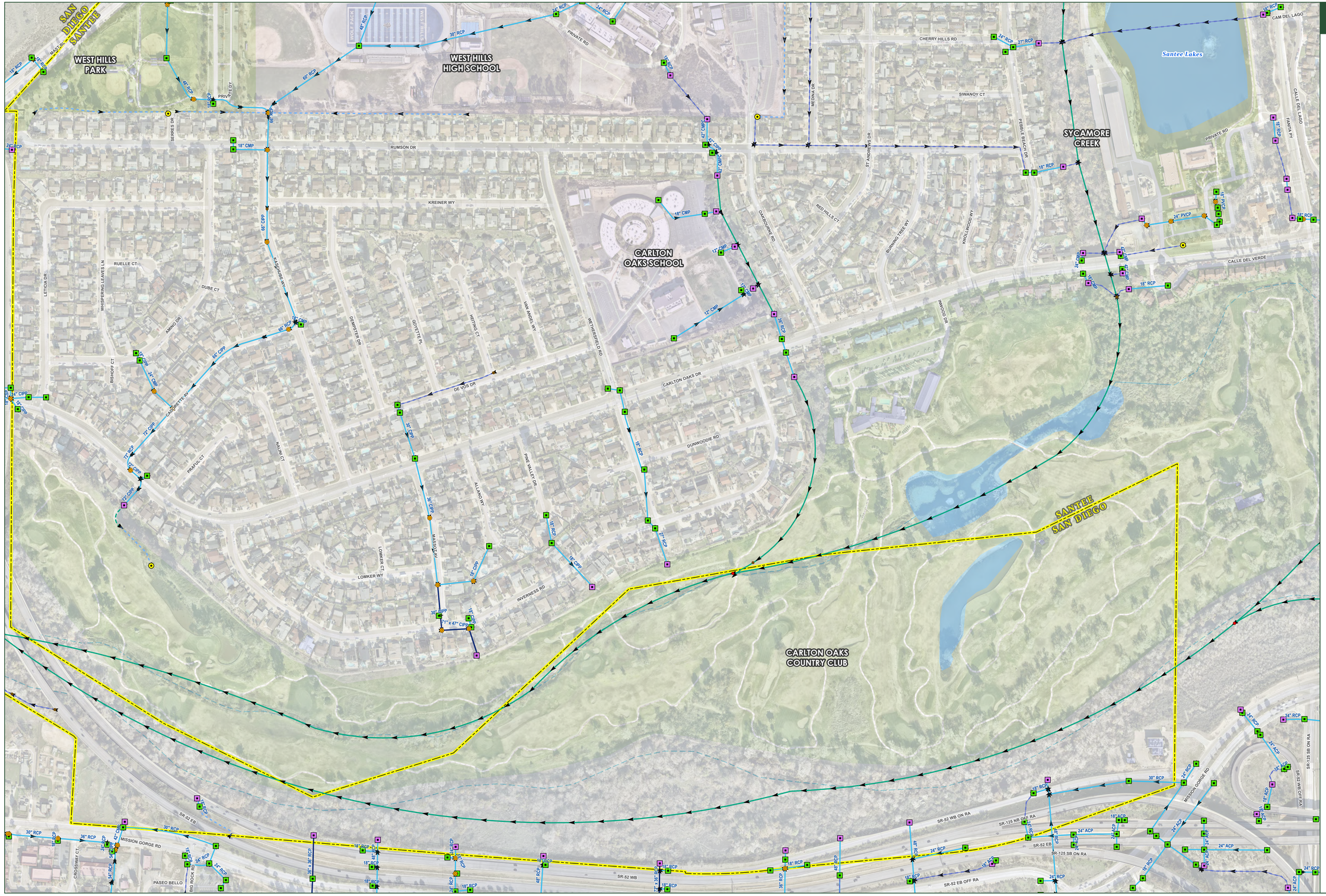
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 10 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

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Existing Storm Drain

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Scale in Feet

0 200 400 600

J-19657
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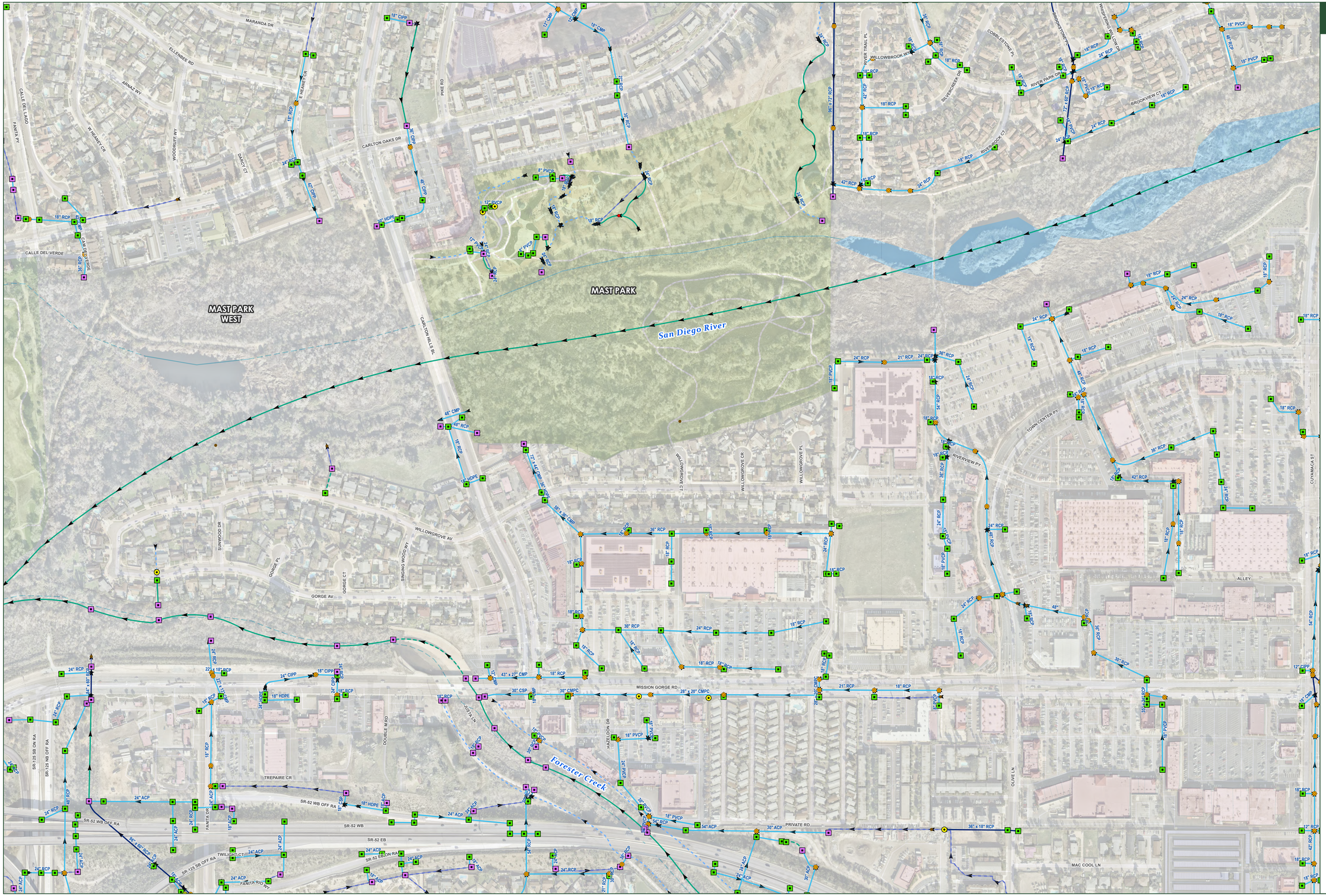
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 11 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

Municipal Boundaries

Storm Drain Junction

- I: Inlet
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Existing Storm Drain

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Scale in Feet

0 200 400 600

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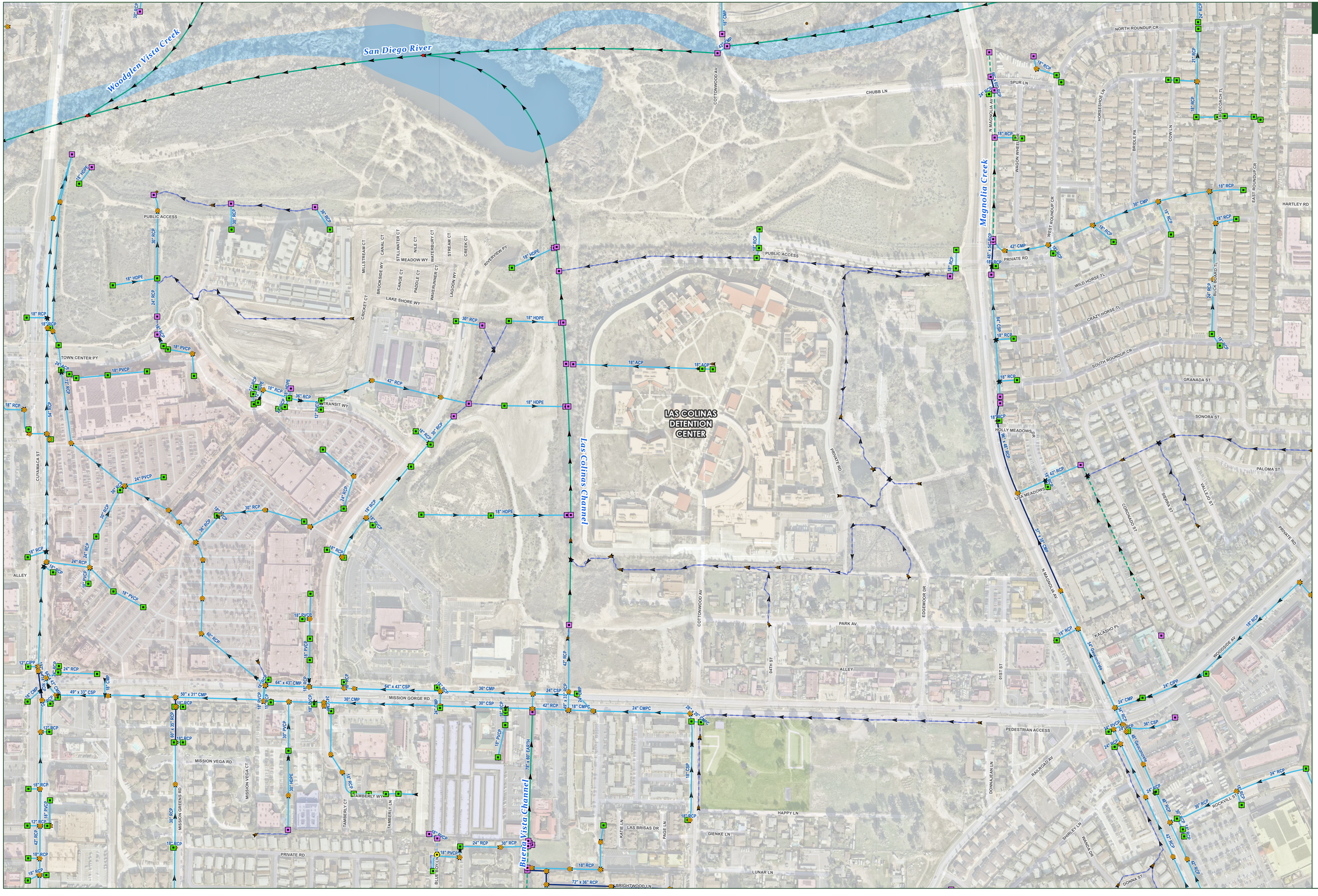
# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 12 OF 21**

SANTEE MASTER DRAINAGE STUDY

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# LEGEND

- Municipal Boundaries

Storm Drain Junction

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Existing Storm Drain

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Scale in Feet

0 200 400 600

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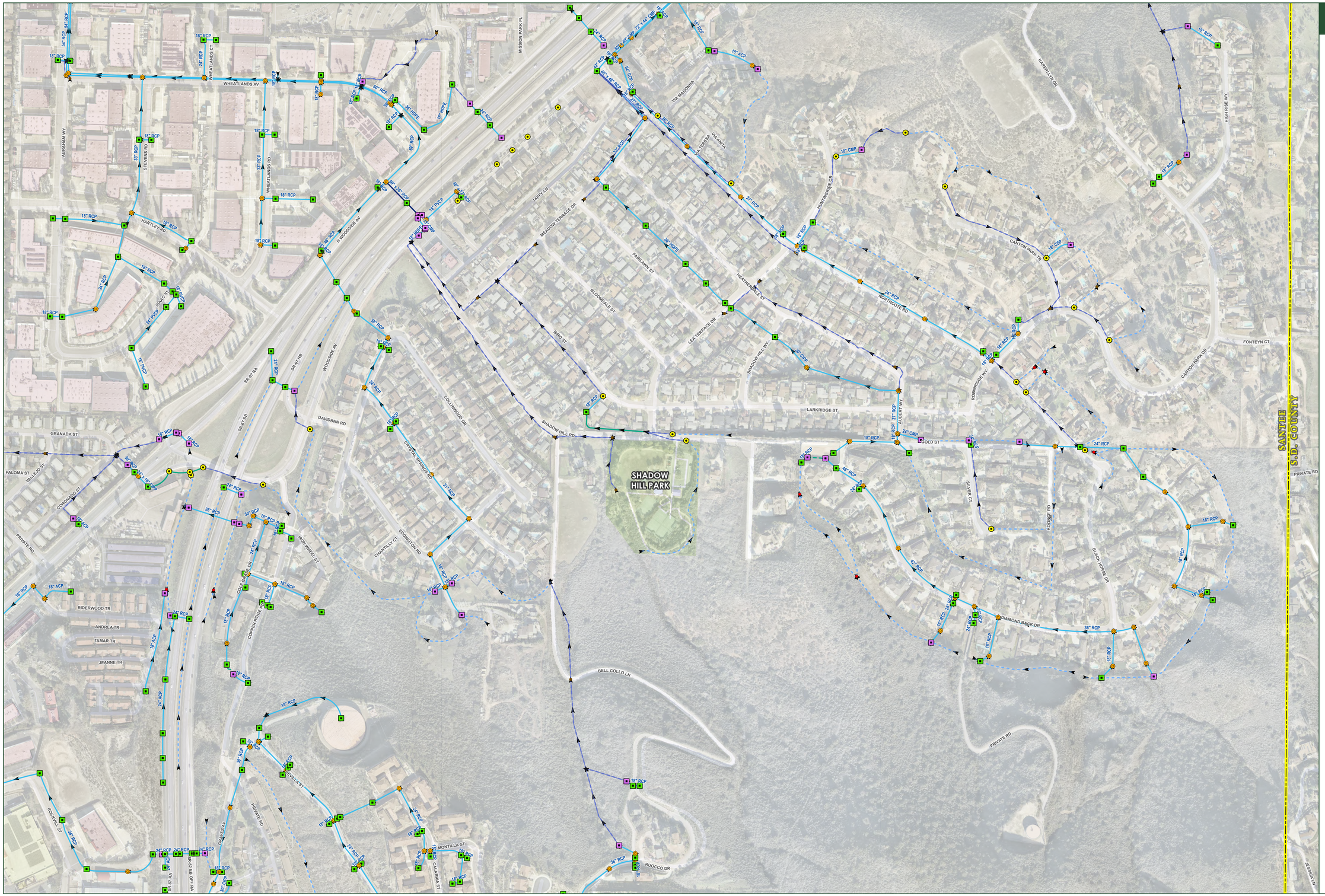
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 13 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 14 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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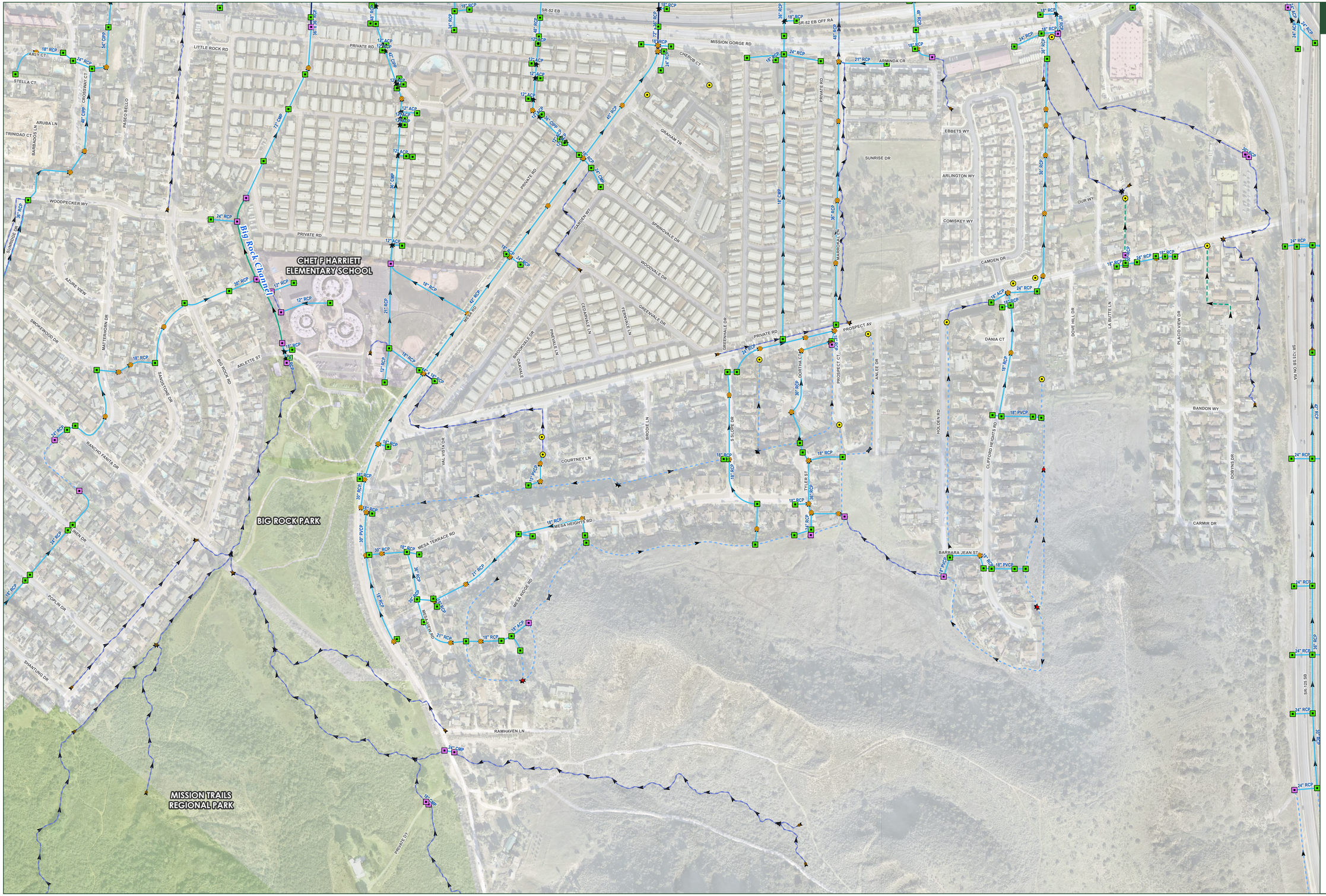
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 15 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657

Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap

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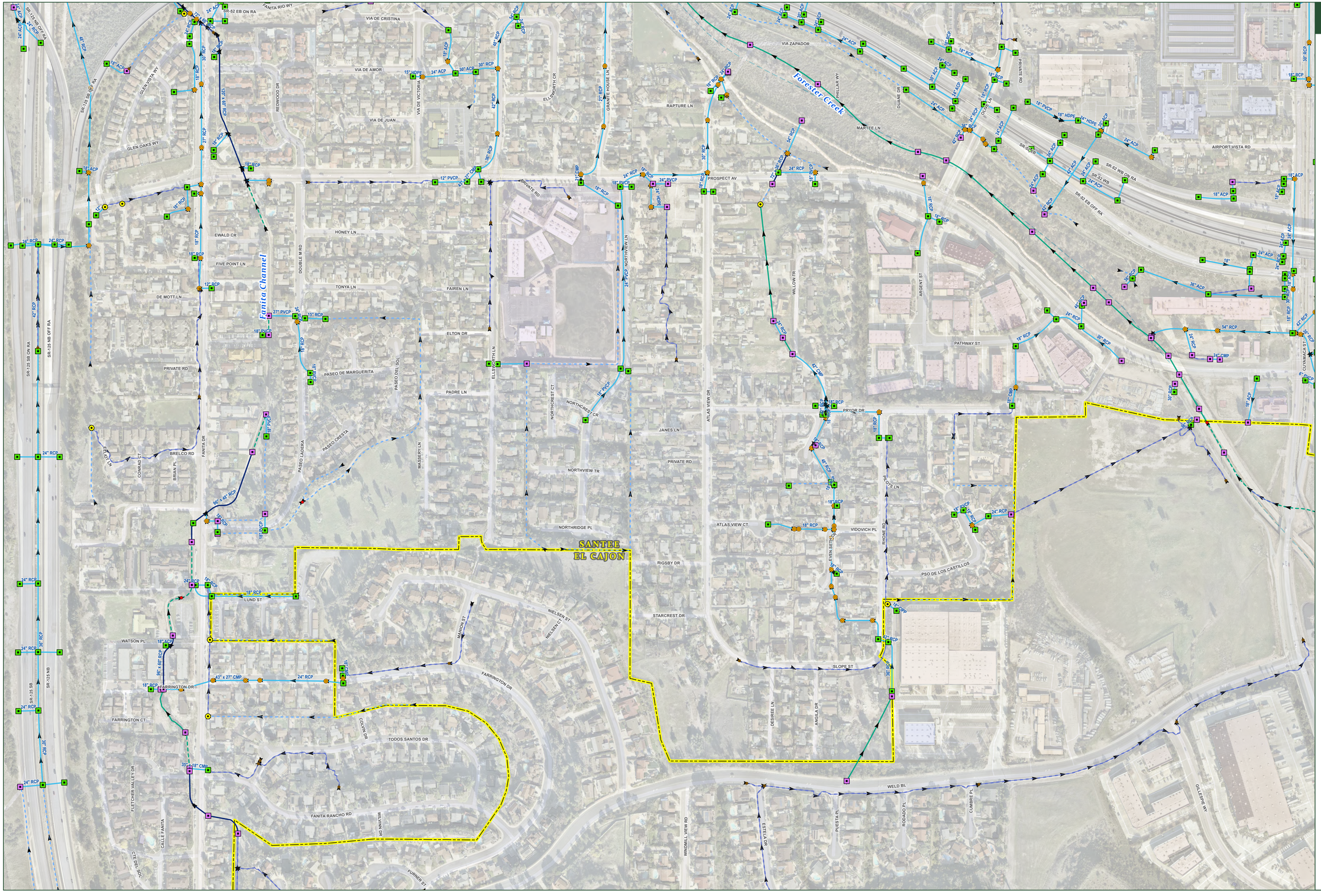
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 16 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

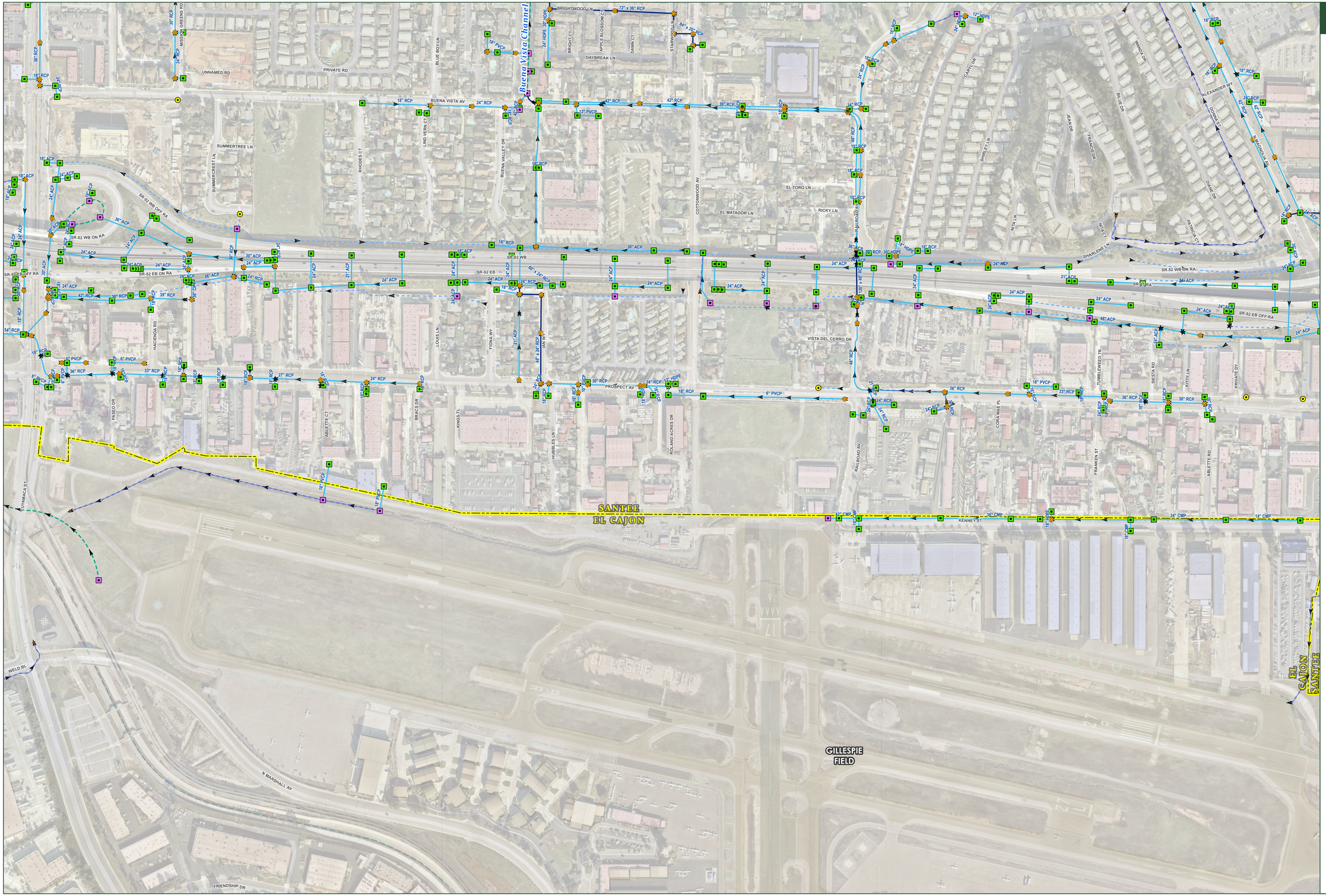
# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 17 OF 21**

SANTEE MASTER DRAINAGE STUDY

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## LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
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- Ditch
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- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

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Data Source:
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WMP19657_SanteeMDSGISProjSanteeMDS_MT_working\SanteeMDS_MT_working.aprx

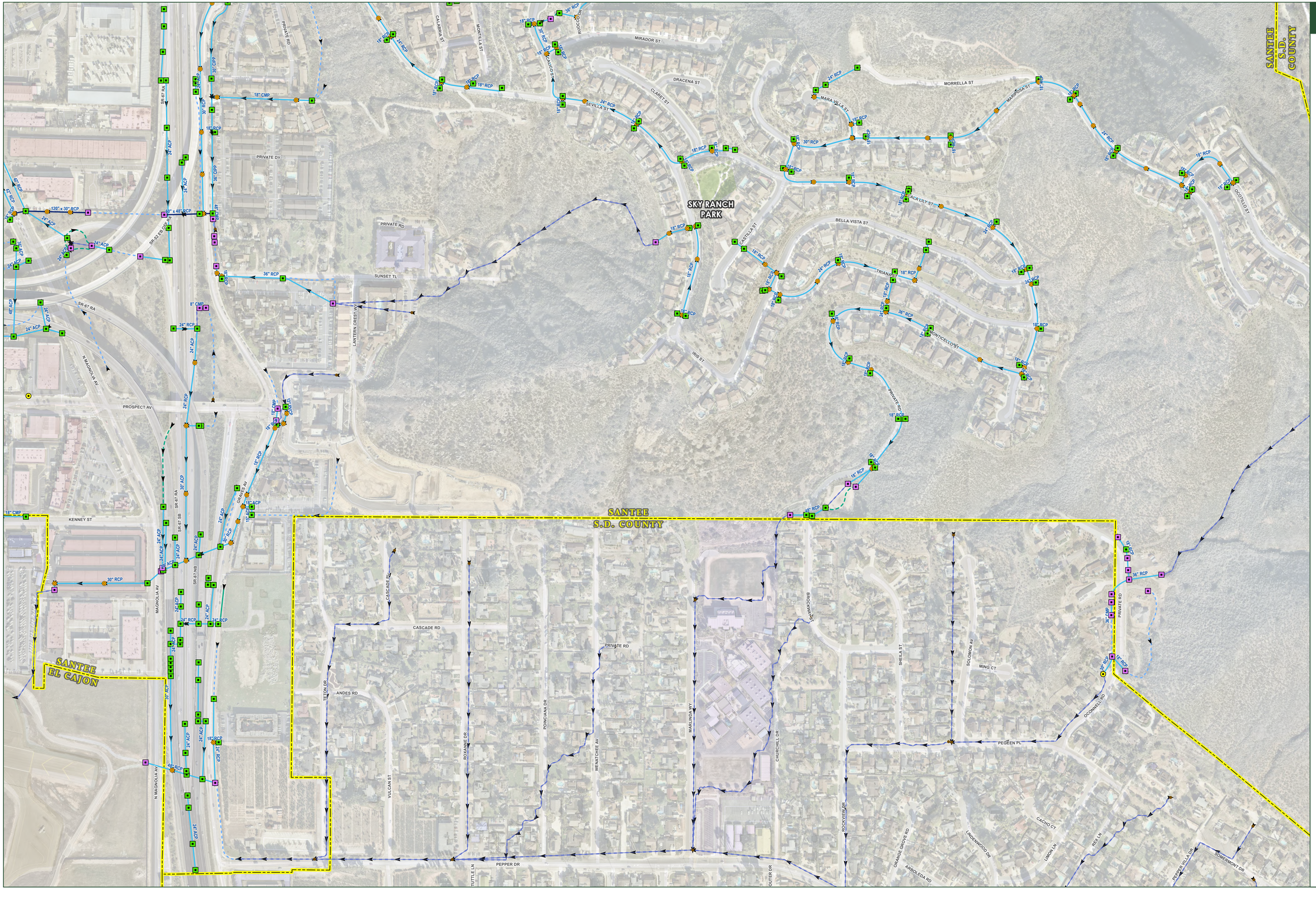
# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 18 OF 21**

SANTEE MASTER DRAINAGE STUDY

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SANTEE
S.D. COUNTY
SKY RANCH PARK
SANTEE
EL CAJON
SANTEE
S.D. COUNTY
MIRADOR ST
DRACENA ST
CLARET ST
SEVILLA ST
CALABRIA ST
MONTILLA ST
MORRELLA ST
MARA-VILLA ST
MARIPOSA ST
ACACIA LILY ST
BELLA VISTA ST
CASTILLA ST
TRIANA ST
MONTICELLO ST
IRIS ST
OCOTILLO ST
PRIVATE RD
SUNSET TL
LANTERN CREST WY
PROSPECT AV
SR-67 RA
SR-67 EB OFF
SR-67 NB
SR-67 SB
N MAGNOLIA AV
MAGNOLIA AV
KENNEY ST
GRANITE AV
CASCADE RD
ANDES RD
TETON DR
VULCAN ST
ROXANNE DR
POINCIANA DR
WENATCHEE AV
MARUNDA WY
CHURCHILL DR
ROCKVISTA DR
SHEILA ST
SOLOMON AV
MING CT
O'CONNELL DR
PEGEEN PL
PEPPER DR
TUTTLE LN
OUTER DR
ORANGE GROVE RD
ARBOLEDA RD
LINDENWOOD DR
CACHO CT
LIMON LN
RED LN
PEPPER VILLA DR
SOMERMONT DR
48" RCP
120" x 30" RCP
60" x 48" RCP
36" CMP
18" CMP
24" ACP
30" ACP
36" CPP
18" RCP
24" RCP
30" RCP
36" RCP
42" RCP
48" RCP
8" CMP
18" ACP
24" ACP
30" ACP
24" AFAP
30" AFAP
24" RCP
30" RCP
36" RCP
42" RCP
48" RCP
18" RCP
24" RCP
30" RCP
36" RCP
18" CMP
36" CMP
24" RCP
30" RCP
36" RCP
42" RCP
18" RCP
24" RCP
30" RCP
36" RCP
18" RCP
24" RCP
30" RCP
36" RCP
18" RCP
24" RCP
30" RCP
36




## LEGEND

- Municipal Boundaries

Storm Drain Junction

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- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline
- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
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City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

**SHEET 20 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

Storm Drain Junction

- I: Inlet
- H: Headwall
- M: Cleanout
- O: Outlet
- A: Spillway
- B: Channel Confluence
- L: Connector
- Q: Snap Point

Existing Storm Drain

- Storm Drain Pipe
- Culvert
- Ditch
- Flowline

- Earthen Channel
- Concrete Channel

Scale in Feet

0 200 400 600

J-19657
Data Sources:
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ESRI World Topographic Basemap
WMP\19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

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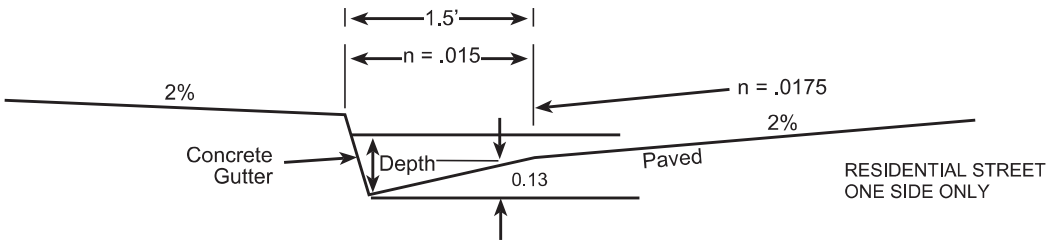
# STORM DRAIN INFRASTRUCTURE - EXISTING CONDITIONS

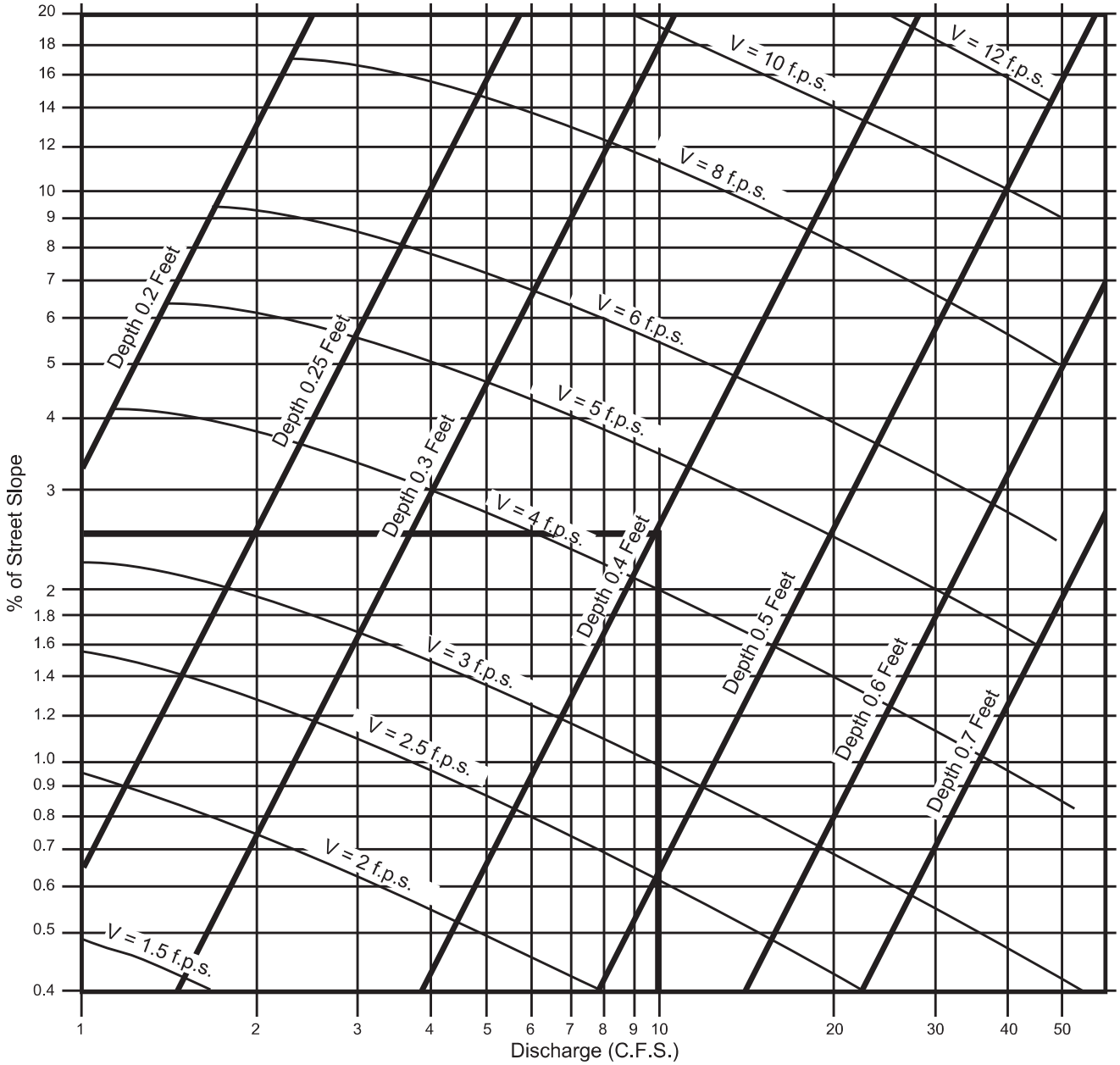
**SHEET 21 OF 21**

SANTEE MASTER DRAINAGE STUDY

**Appendix 3**

**Gutter and Roadway Discharge - Velocity Chart from the San Diego County Hydrology Manual**




**EXAMPLE:**
**Given: Q = 10 S = 2.5%**
**Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.**

SOURCE: San Diego County Department of Special District Services Design Manual

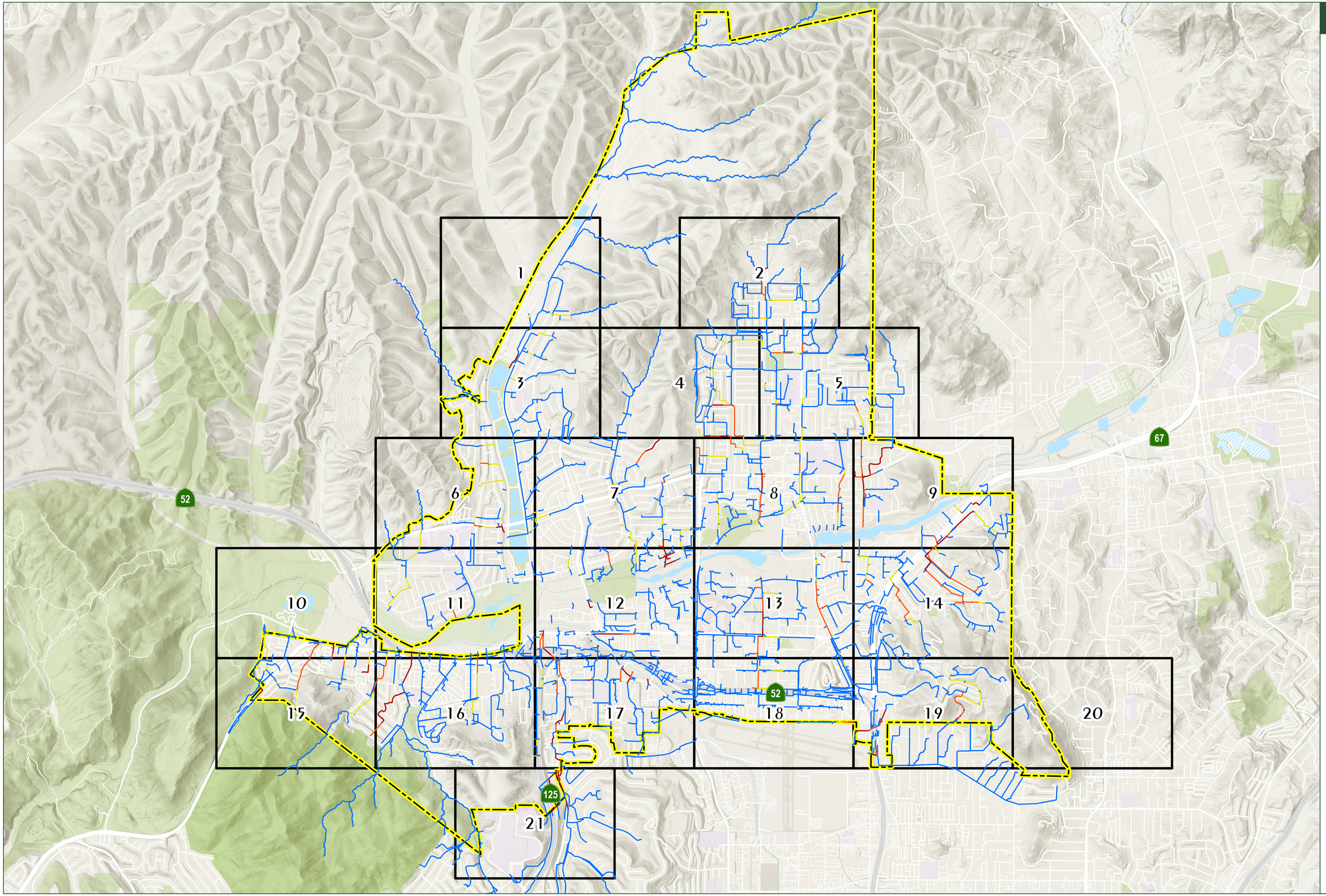
**Gutter and Roadway Discharge - Velocity Chart**

**FIGURE**

**3-6**

## Appendix 4

## Storm Drain Infrastructure Deficiencies - Index Maps




## LEGEND

- City of Santee
- Map Index (200 scale)

No Tailwater - Final Results

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 1,600 3,200 4,800

J-19657
Data Source:
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

## INDEX MAP

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP19657_SanteeMDDGISProjSanteeMDS_MT_workingSanteeMDS_MT_working.aprx

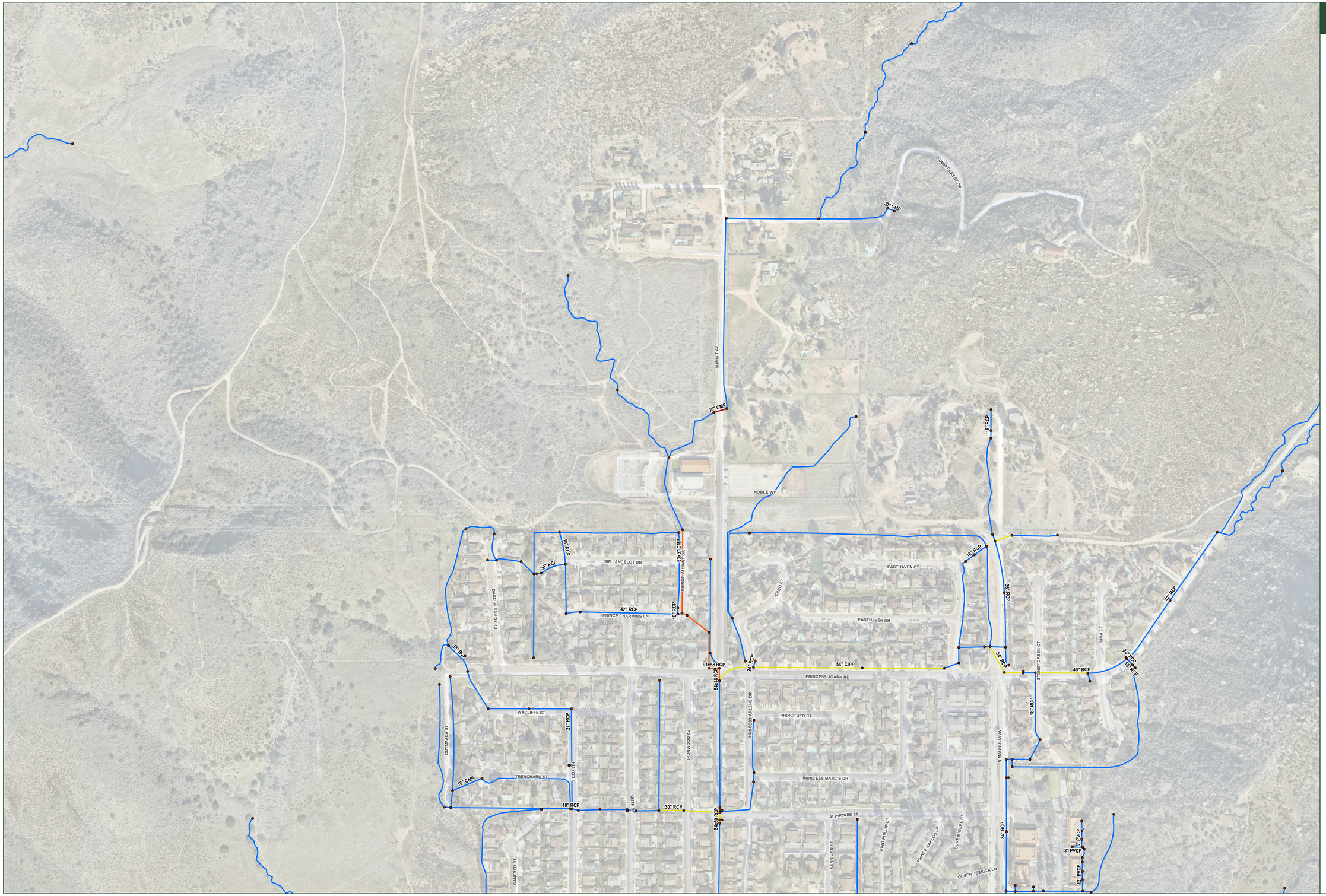
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 1 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_Santee\MDS\GIS\Pro\Santee\MDS_MT_working\Santee\MDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 2 OF 21**

SANTEE MASTER DRAINAGE STUDY

## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP-19657_Santee\MDS\GIS\Pro\Santee\MDS_MT_working\Santee\MDS_MT_working.aprx

# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 3 OF 21**

SANTEE MASTER DRAINAGE STUDY

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## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP19657_SanteeMDSGISProSantee\MDS_MT_working\Santee\MDS_MT_working.aprx

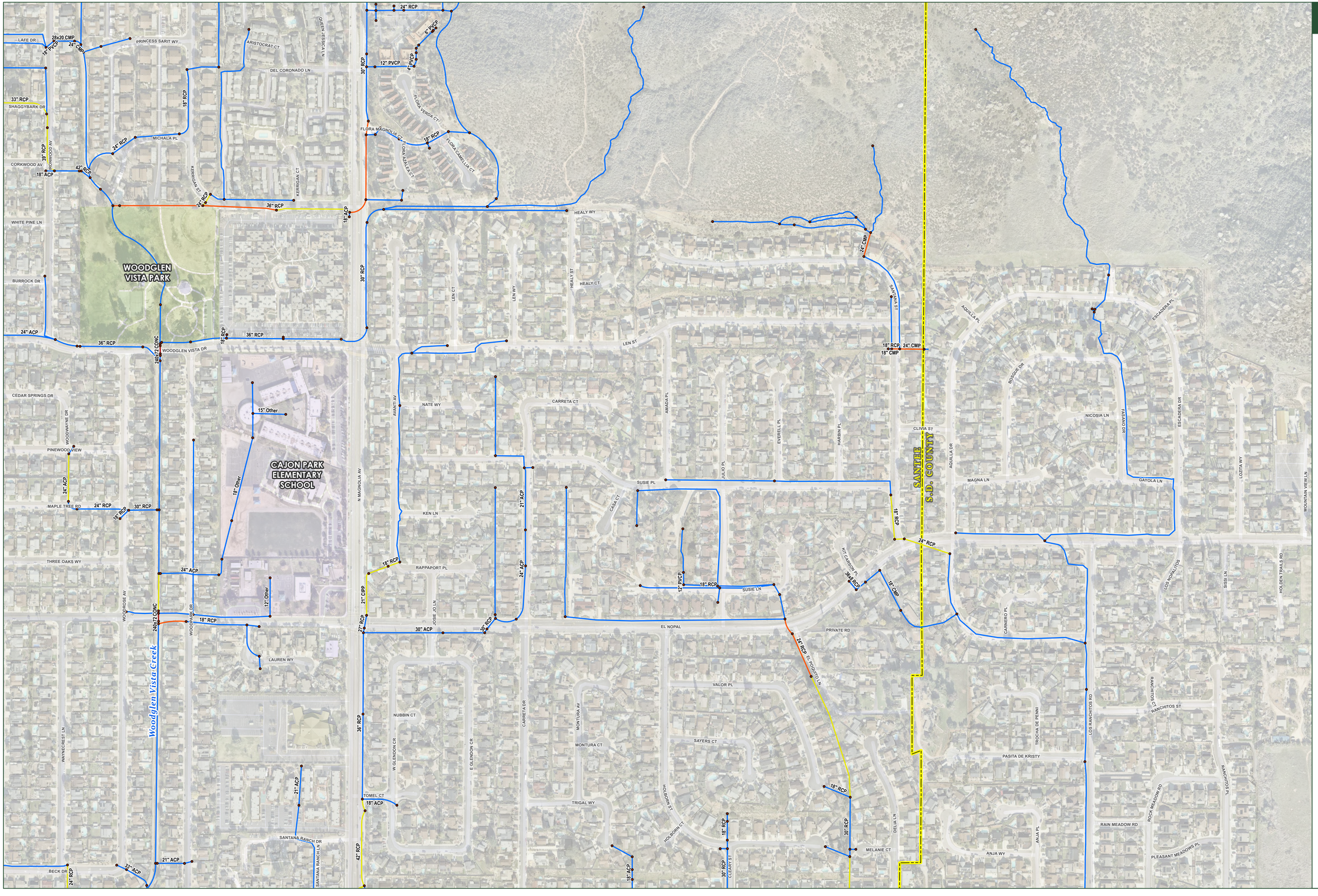
# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 4 OF 21**

SANTEE MASTER DRAINAGE STUDY

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## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 5 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP19657_SanteeMDSGISProjSanteeMDS_MT_workingSanteeMDS_MT_working.aprx

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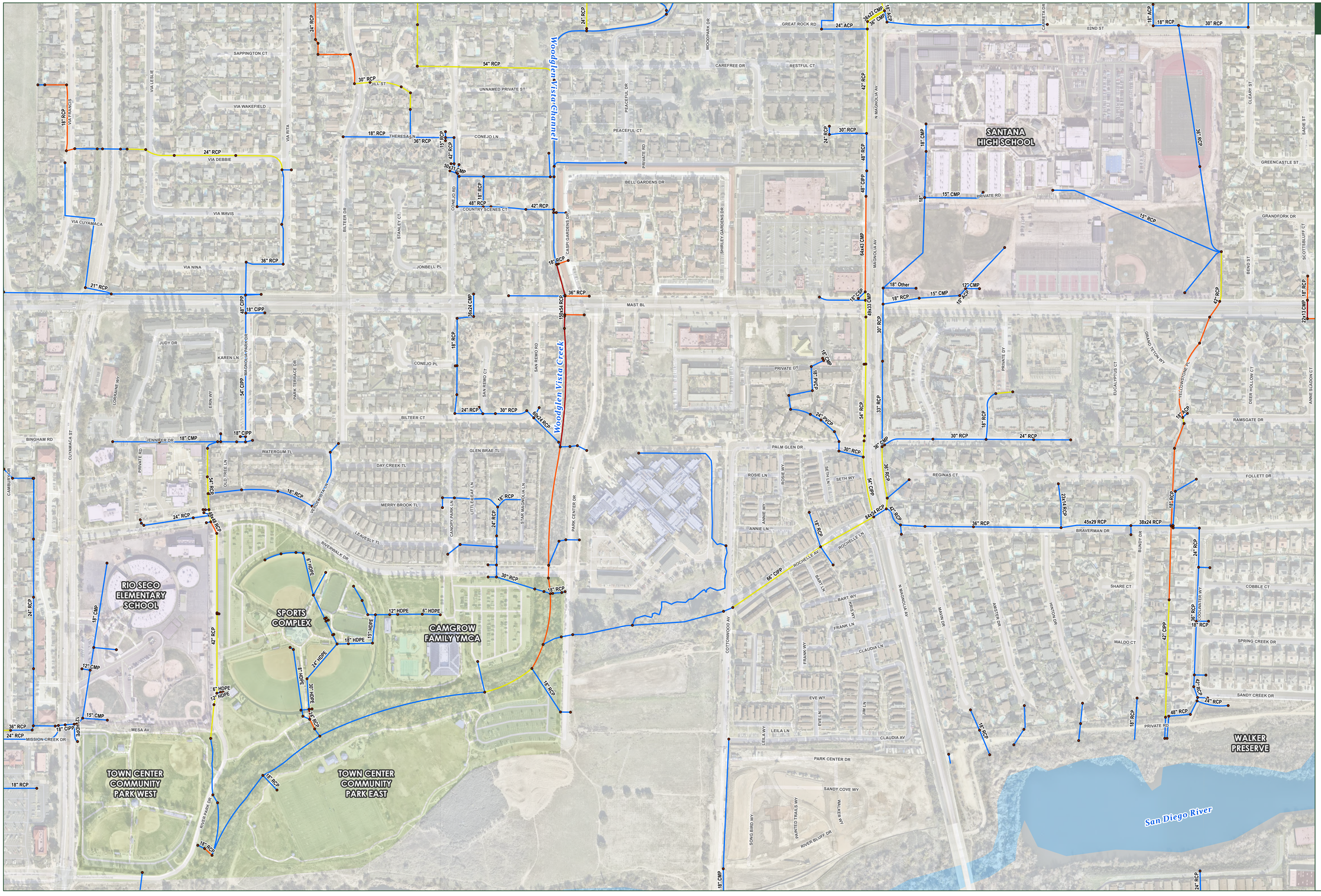
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 6 OF 21**

SANTEE MASTER DRAINAGE STUDY


Halberns Channel
CARLTON HILLS ELEMENTARY SCHOOL
SETTLE RD
HORNBUCKLE DR
FOWLER WY
MERRICK W
CATHYWOOD DR
GANDY AV
TUTHILL WY
LAKE CANYON RD
GALSTON DR
HIGHDALE RD
RONNIE CT
MARKWOOD DR
BELLAGIO RD
ESPARTA CT
MCCARDLE WY
HIRSCH RD
SUTTON CT
CARITA RD
HUBER CT
ROE DR
LUTHERAN CT
ROSECREST DR
LUTHERAN WY
DRAGOTE DR
BUTTON ST
LAKE COUNTRY DR
PENNYWOOD RD
TERRYWOOD RD
YOMAC RD
HALBERNS BL
CAMBURY CT
RYDER RD
HUME RD
BINGHAM RD
TREE ST
LAKEHILL RD
PEARLWOOD RD
CARLTONHILLS BL
MAST BL
FRASCATI WY
RYDER CT
CASTAIC CT
DEFALCO RD
RAWLINS WY
NYLER CT
CAMBURY DR
LES RD
DOMER RD
WHARTON RD
HARTLAND CR
RAMO CT
RAMO RD
DOHENY RD
MAUREEN CT
E HEANEY CIR
ABBEYWOOD RD
COREY CT
NICOLE WY
TRIPP CT
GUNBARTON RD
ABBEYFIELD RD
MISSION CREEK DR
W HEANEY CIR
MARANDA DR
RUFFIN RD
ROCK GLEN WY
KNOWLTON CT
STOYER DR
MANDEVILLE RD
MANDEVILLE CT
WILLOW POND RD
PEBBLESTONE PL
CLEARCREEK PL
WHISPERING WILLOW DR
CARLTON OAKS DR
WINTERCREEK PL
RIVER PARK DR
PARKSIDE PL
SILVERCREEK DR
CALLE DEL LAGO
ELLENBEE RD
RIVER PARK DR
36" ACP
18" RCP
24" RCP
21" RCP
15" RCP
21" ACP
36" RCP
18" CIPP
24" CIPP
18" HDPE
24" CMP
42" CIPP
42" RCP
60" CIPP
36" RCP
18" RCP
24" RCP
18" CIPP
36" CIPP
42" CIPP
42" RCP
54x36 CIPP
63x40 CIPP
72x48 RCP
72x54 RCP
72x96 RCP
18" CMP
18" PVCP
24" RCP
18" CIPP
24" CIPP
18" HDPE
18" RCP
24" RCP
18" CIPP
24" CIPP
24" RCP
18" CMP
36" RCP
24" RCP
18" RCP
24" RCP
18" RCP
24" RCP
18




J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 8 OF 21**

SANTEE MASTER DRAINAGE STUDY

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## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
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WMP\19657_SanteeMDSGIS\ProSantee\MDS_MT_working\SanteeMDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 9 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

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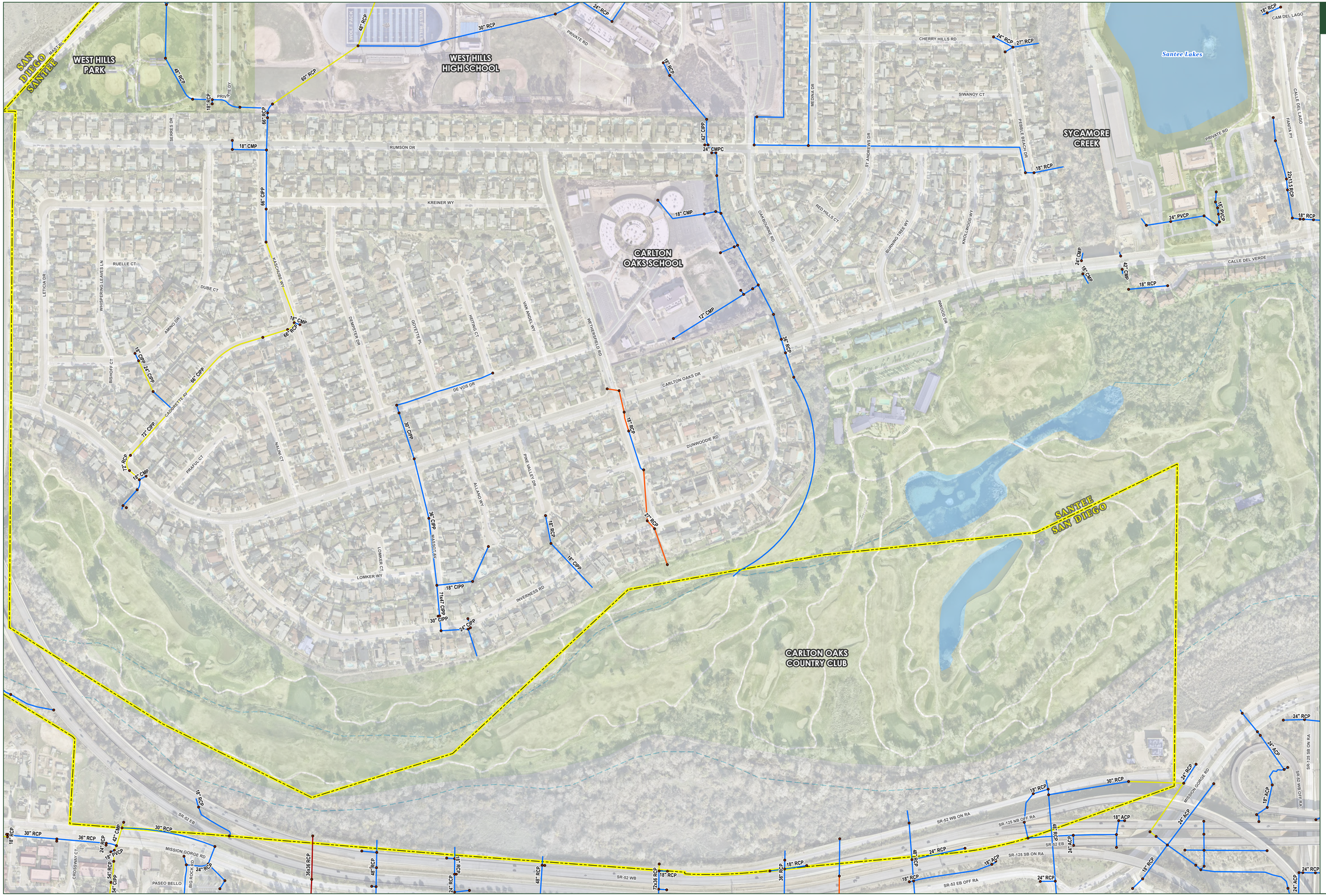
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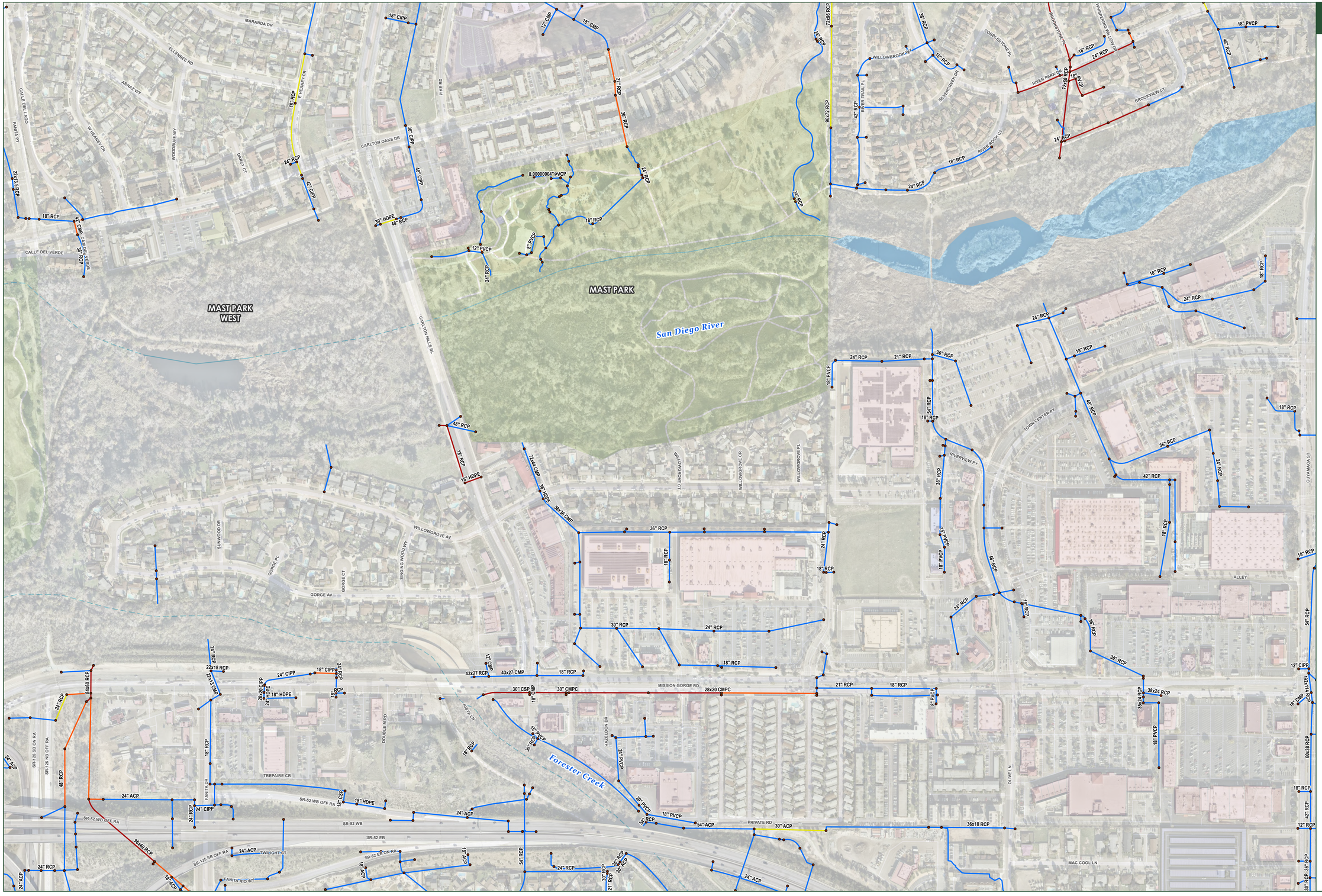
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 10 OF 21**

SANTEE MASTER DRAINAGE STUDY


WEST HILLS PARK
WEST HILLS HIGH SCHOOL
CARLTON OAKS SCHOOL
SYCAMORE CREEK
CARLTON OAKS COUNTRY CLUB
Santee Lakes
SAN DIEGO
SANTEE
SAN DIEGO
MAST BL
PRIVATE RD
SERRES DR
RUMSON DR
KREINER WY
RUELLE CT
DUBE CT
ABINO DR
LETICIA DR
WHISPERING LEAVES LN
BISHOFF CT
KASCHUBE WY
DEMPSTER DR
GOYETTE PL
HEFTING CT
VAN ANDEL WY
INTERSTATE 8
DE VOS DR
CARLTON OAKS DR
DUNWOODIE RD
ALLAN WY
PINE VALLEY DR
INVERNESS RD
LOMKER WY
LOMKER CT
NAUNI CT
PRAFJIL CT
CASSIETTE AV
CROSSWAY CT
PASEO BELLO
BIG ROCK RD
MISSION GORGE RD
SR-52 EB
SR-52 WB
SR-52 WB ON RA
SR-125 NB OFF RA
SR-125 SB ON RA
SR-52 EB OFF RA
CHERRY HILLS RD
SIWANOY CT
MEDINA DR
ST ANDREWS DR
PEBBLE BEACH DR
RED HILLS CT
OAKBOURNE RD
BURNING TREE WY
KNOLLWOOD WY
INWOOD DR
CALLE DEL VERDE
CALLE DEL LAGO
CAM DEL LAGO
FANITA PY
18" RCP
24" RCP
27" RCP
30" RCP
36" RCP
48" RCP
60" RCP
66" RCP
18" CMP
24" CMP
12" CMP
66" CMP
66" CIPP
42" CIPP
24" CMPC
18" CIPP
24" CIPP
72" CIPP
36" CIPP
71x47 CIPP
30" CIPP
66" RCP
72" RCP
36x36 RCP
54" RCP
54" CIPP
42" CMP
18" CMPC
24" PVCP
15" PVCP
22x13.5 RCP
24" PVCP
24" ACP
18" ACP
15" RCP
36x24 RCP
48" RCP
24" RCP
18" CIPP
24" CMP
18" CMP
18" RCP
24" RCP
24" ACP
18" ACP
15" RCP
24" ACP
24" RCP
18" RCP
30" RCP
24" RCP
18" RCP
24" ACP
18" ACP
24" ACP
24" RCP
18" RCP
24" RCP
24" ACP
24" RCP
18" RCP
24" RCP
24" ACP
24" RCP
18" RCP
24" RC




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

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- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
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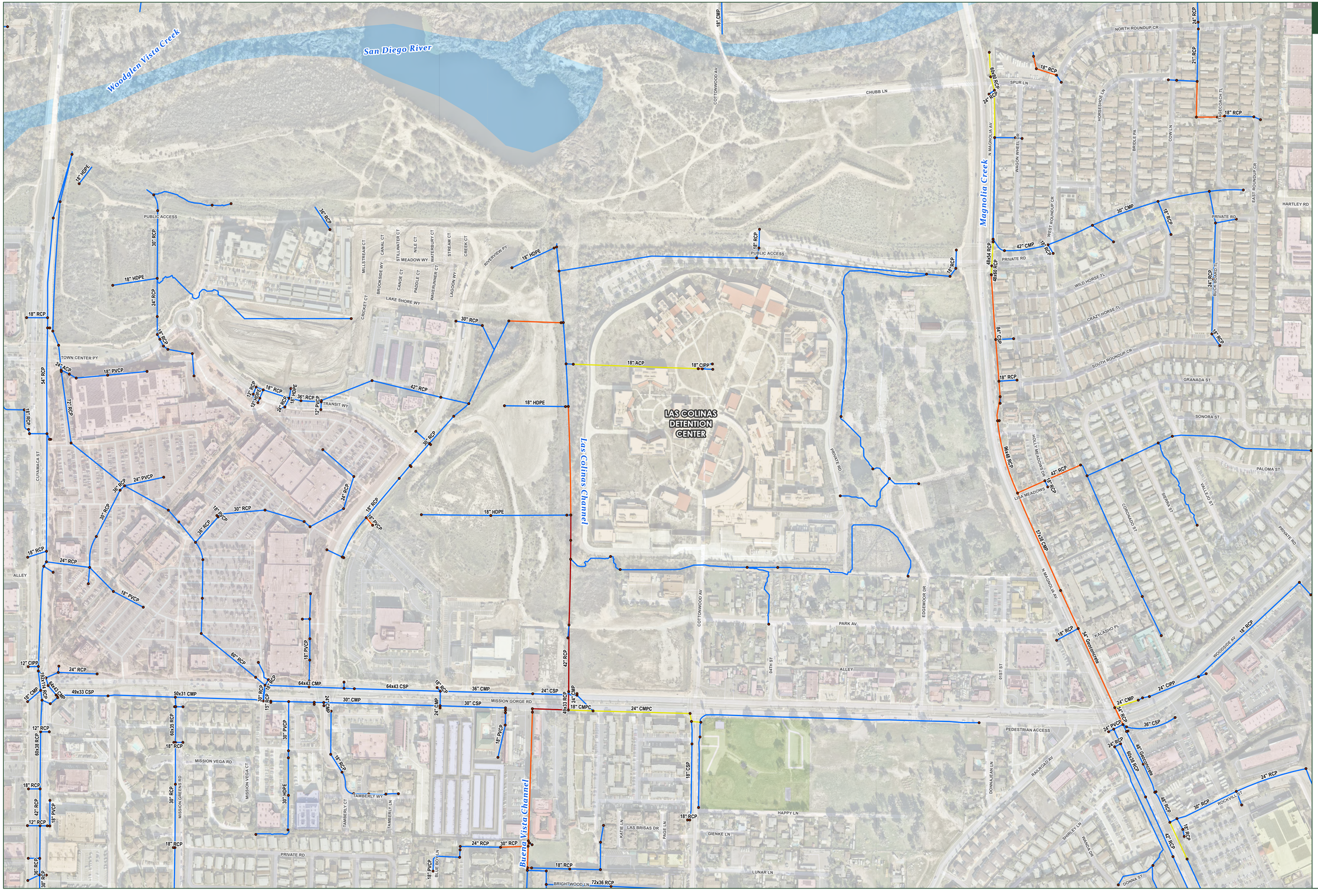
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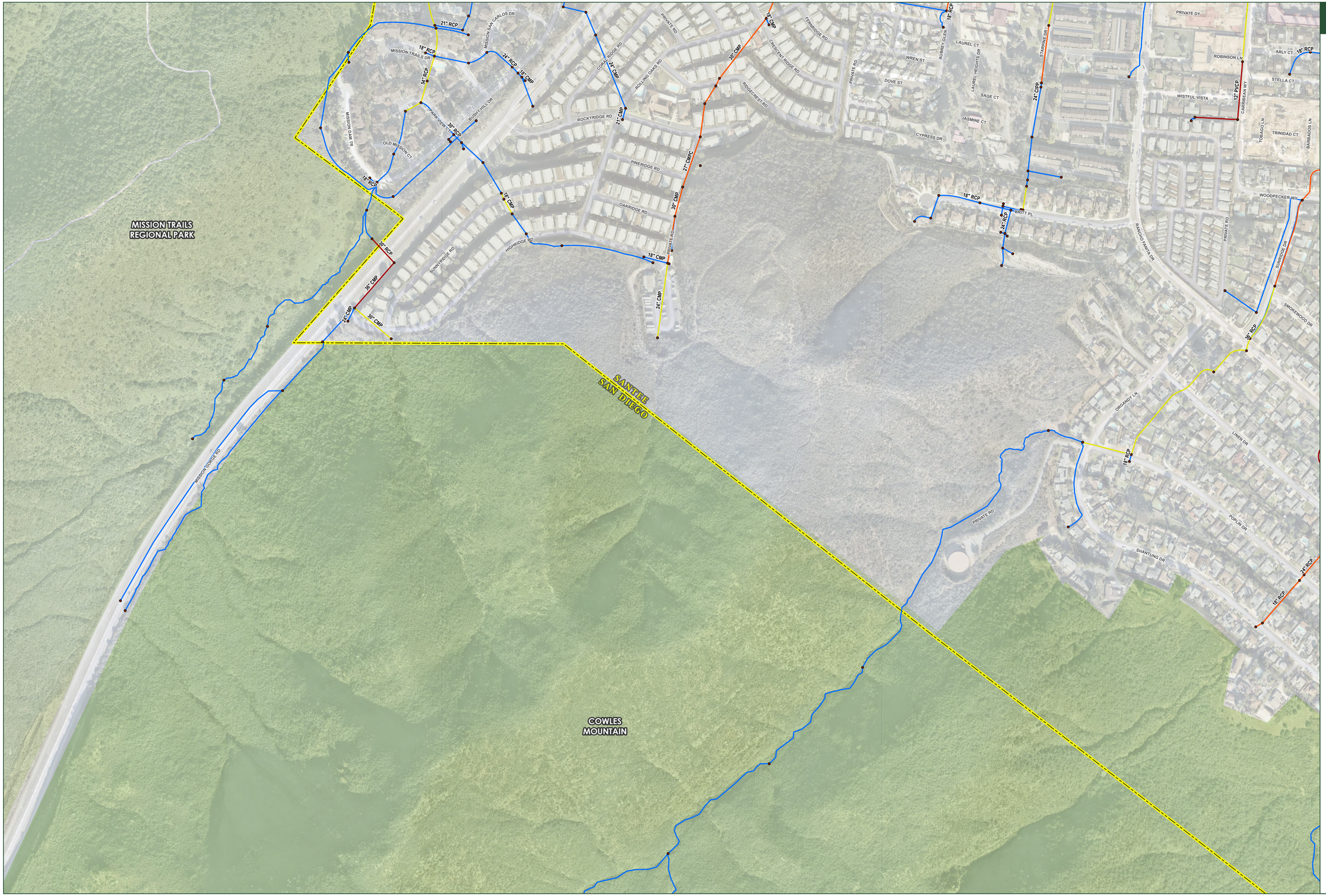
# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 12 OF 21**

SANTEE MASTER DRAINAGE STUDY


Woodglen Vista Creek
San Diego River
Magnolia Creek
Las Colinas Channel
Buena Vista Channel
LAS COLINAS DETENTION CENTER
18" CMP
COTTONWOOD AV
CHUBB LN
NORTH ROUNDUP CR
SPUR LN
WAGON WHEEL DR
HORSESHOE LN
BRIDLE PA
COW LN
STAGECOACH TL
EAST ROUNDUP CR
WEST ROUNDUP CR
HARTLEY RD
PRIVATE RD
WILD HORSE TL
CRAZY HORSE TL
BUCK BOARD TL
SOUTH ROUNDUP CR
GRANADA ST
SONORA ST
PALOMA ST
VALLEJO ST
SIERRA ST
CORONADO ST
HOLLY MEADOWS DR
LISA MEADOWS
N MAGNOLIA AV
K-KLASHO PL
WOODSIDE AV
ROCKVILLE ST
DONNA ST
PUBLIC ACCESS
MILLSTREAM CT
BROOKSIDE WY
CANAL CT
STILLWATER CT
MEADOW WY
NILE CT
WATERBURY CT
STREAM CT
CREEK CT
RIVERVIEW PY
LAKE SHORE WY
CRICKET CT
CANOE CT
PADDLE CT
WAVERUNNER CT
LAGOON WY
TOWN CENTER PY
TRANSIT WY
CUYAMACA ST
ALLEY
MISSION GORGE RD
MISSION VEGA RD
MISSION VEGA CT
MISSION GREENS RD
TAMBERLY WY
TAMBERLY CT
TAMBERLY LN
PRIVATE RD
BLUE BOY LN
KATIE LN
LAS BRISAS DR
PAGE LN
GIENKE LN
HAPPY LN
LUNAR LN
BRIGHTWOOD LN
PARK AV
64TH ST
EDGEMOOR DR
61ST ST
PEDESTRIAN ACCESS
RAILROAD AV
DONNA JEAN LN
SHIRLEY LN
WANDA DR
18" HDPE
30" RCP
18" RCP
24" RCP
18" PVCP
24" ACP
54" RCP
72" RCP
96" RCP
12" CIPP
24" PVCP
12" HDPE
36" RCP
12" PVCP
42" RCP
18" ACP
18" CIPP
36" CMP
24" CSP
18" CMPC
24" CMPC
18" CSP
72x36 RCP
60x38 RCP
60x35 RCP
49x33 RCP
64x43 CMP
64x43 CSP
50x31 CMP
49x33 CSP
30" CMP
30" CSP
15" RCP
24" CMP
18" PVCP
18" HDPE
60" RCP
24" PVCP
24" ACP
18" PVCP
18" RCP
24" RCP
30" RCP
36" RCP
42" RCP
18" HDPE
18" RCP
24" RCP
30" RCP
18" RCP
24" RCP
18" PVCP
18" RCP
24" RCP
18" PVCP
18" RCP
24" RCP
30" R


SHADOW HILL PARK
SANTEE
S.D. COUNTY
WHEATLANDS AV
WHEATLANDS CT
WHEATLANDS RD
ABRAHAM WY
STEVENS RD
HANTLEY RD
GRACE ST
N WOODSIDE AV
WOODSIDE AV
SR-67 NB
SR-67 SB
SR-67 RA
DAVIDANN RD
GRANADA ST
PALOMA ST
VALLEJO ST
CORONADO ST
PRIVATE RD
RIDERWOOD TR
ANDREA TR
TAMAR TR
JEANNE TR
ROCKVILLE ST
COLLINWOOD DR
CRYSTAL SPRINGS RD
IRON WHEEL ST
CHANTILLY CT
EDDINGTON RD
COPPER RIDGE RUN
COLE GRADE DR
GRAVES AV
ST PHILIP ST
CHAMBERLA ST
MONTILLA ST
RUOCCO DR
BELL COLLO LN
SHADOW HILL RD
MISSION PARK PL
TAFFY LN
MEADOW TERRACE DR
BIRD ST
BLOOMDALE ST
FAIRLAWN ST
LEA TERRACE DR
HEATHERDALE ST
SHADOW HILL WY
LARKRIDGE ST
AUBERT WY
GOLD ST
SILVER CT
KOONCE RD
BLACK HORSE DR
DIAMOND BACK DR
PRIVATE RD
JESSICA LN
VIA MADONNA
VIA TERESA
VIA LANTA
HUNTINGRIDGE CR
NORTHGATE RD
ROBINRIDGE WY
CANYON PARK TR
CANYON PARK DR
FONTEYN CT
KAIBERLYN DR
HIGH RISE WY
PRIVATE RD
54" RCP
18" RCP
24" RCP
60" RCP
33" RCP
18" HDPE
18" PVCP
24" PVCP
30" RCP
48" RCP
60" RCP
60x36 RCP
18"x48" RCP
18" PVCP
18" CMP
42" RCP
85x45 CMP
72x44 CMP
18" ACP
48x48 RCP
27" RCP
36" RCP
33" RCP
60x29 RCP
36" HDPE
27" RCP
18" CMP
24" RCP
18" CSP
15" RCP
30" CSP
24" CMP
48" RCP
24" ACP
18" CPP
36" CPP
24x18 CMP
36" RCP
15" RCP
18" RCP
24" ACP
18" ACP
24" RCP
18" RCP
42" RCP
24" RCP
18" RCP
36" RCP
18" RCP
24" RCP
18" RCP
24" RCP
18" RCP
24




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

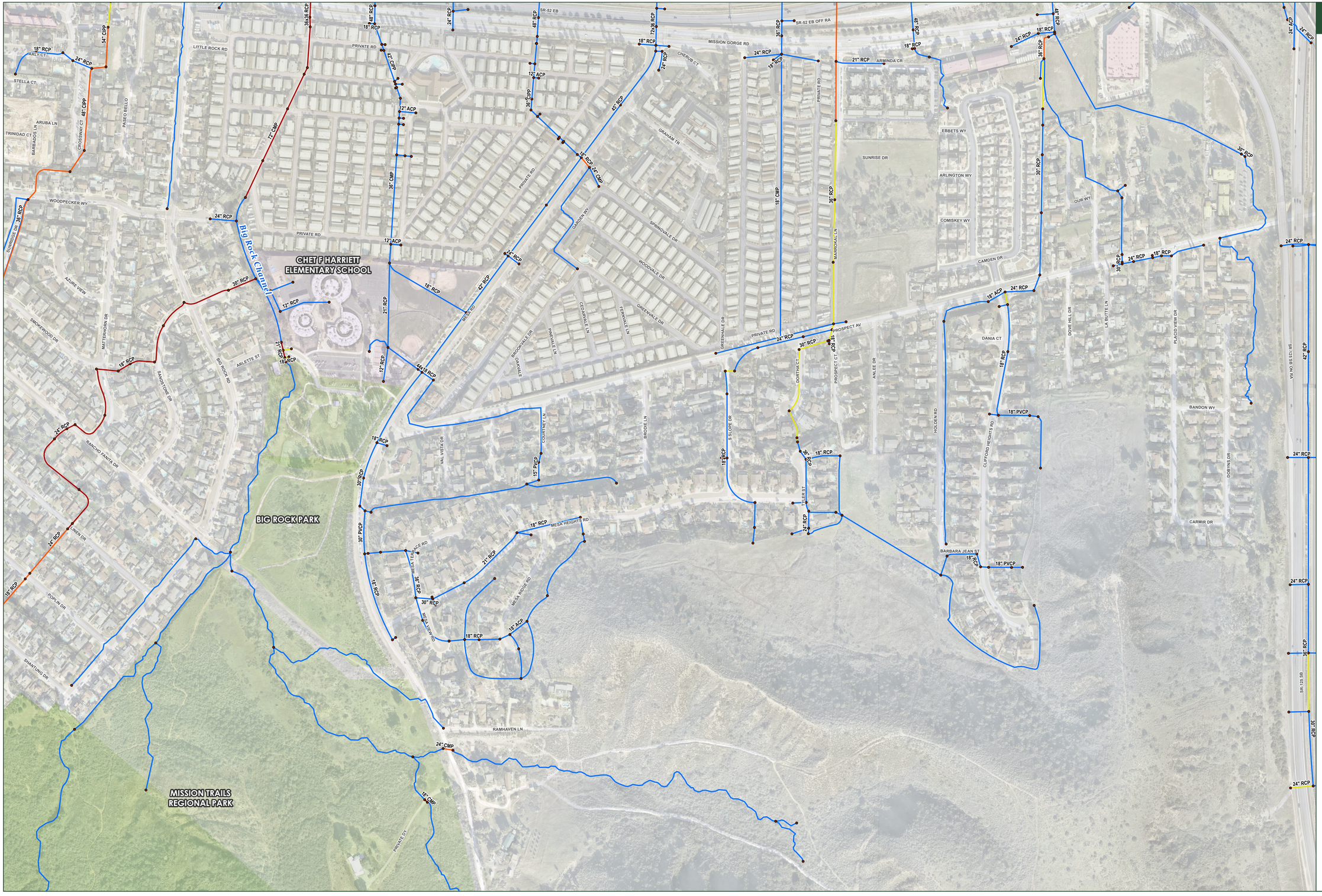
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 15 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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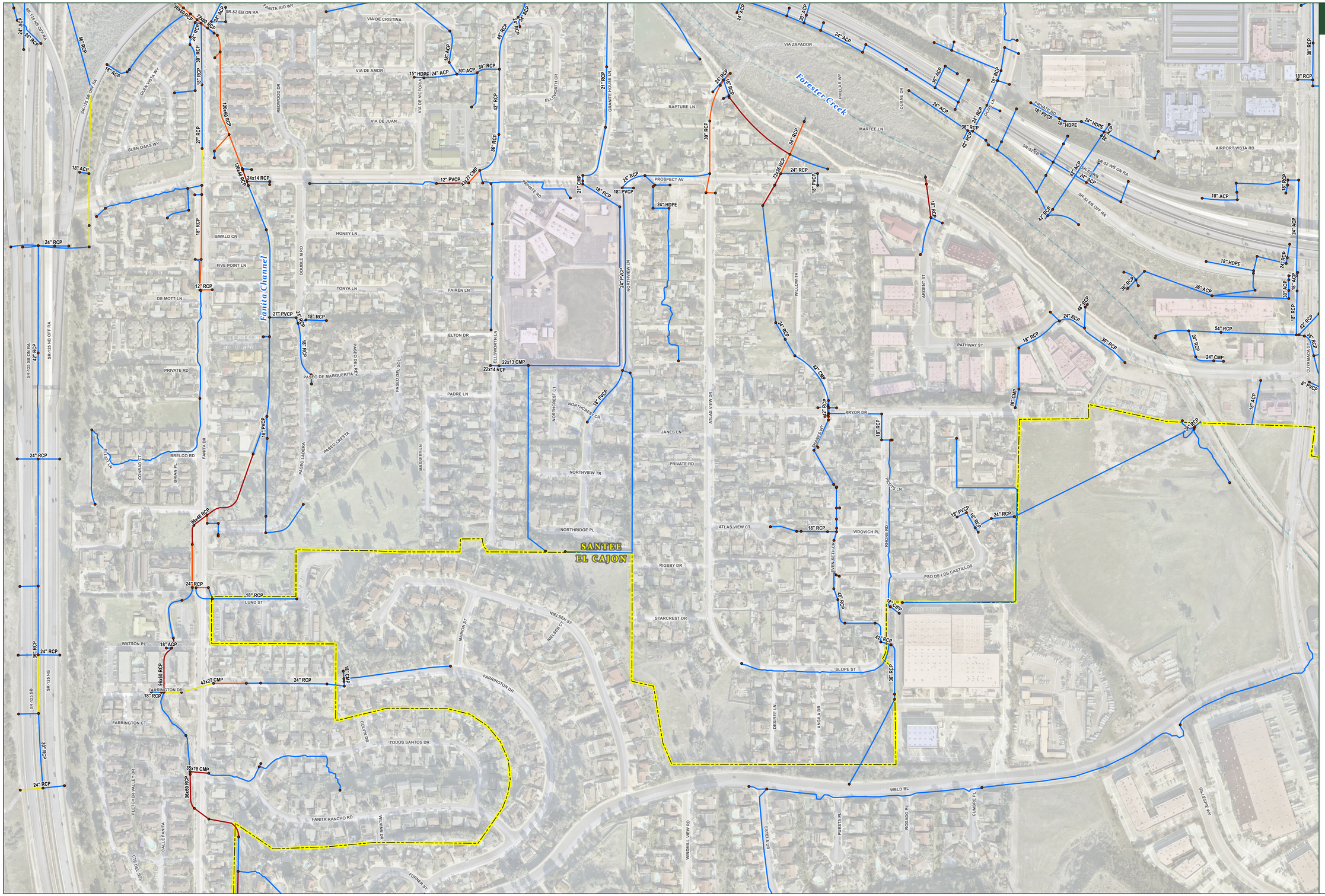
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 16 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP:19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

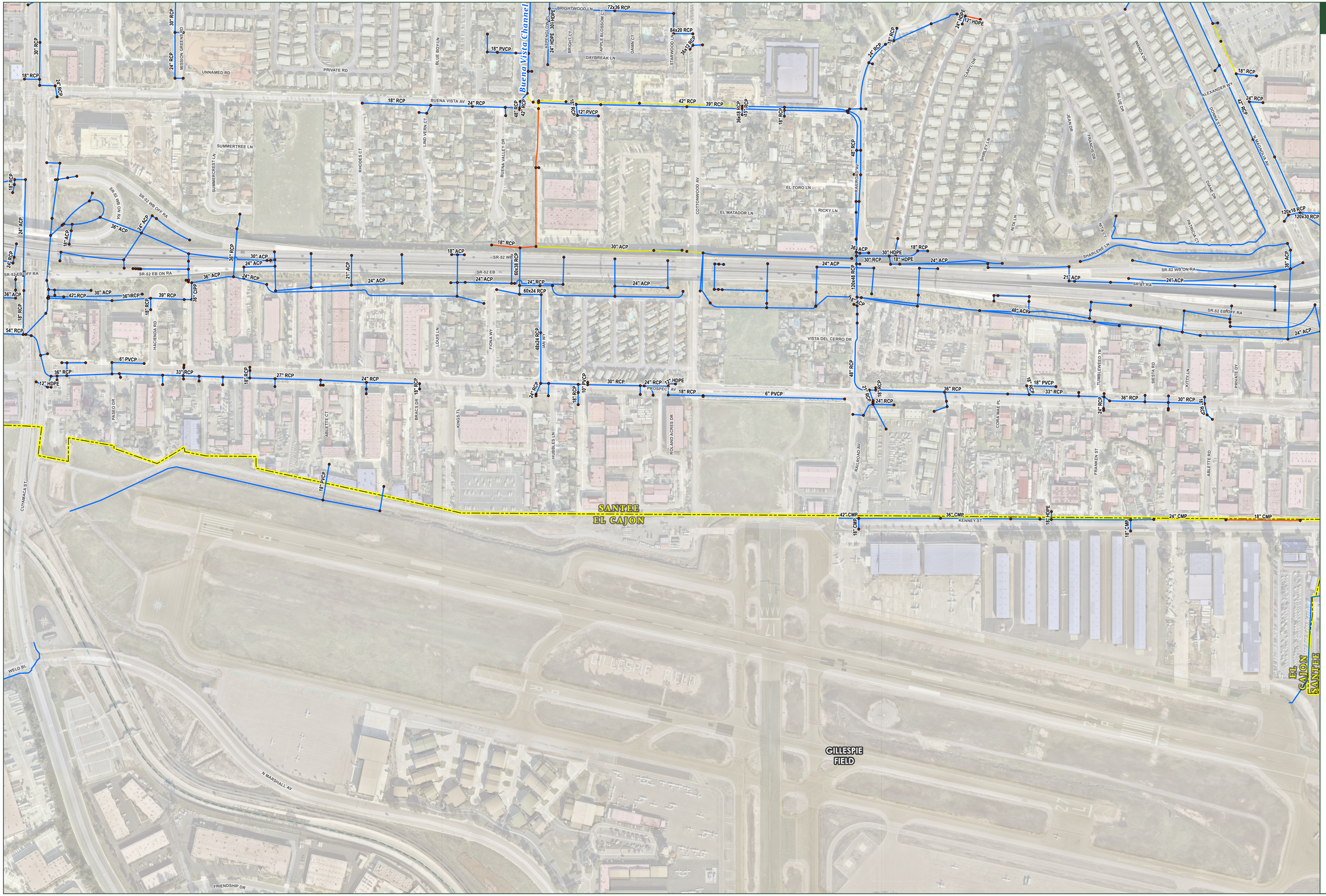
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 17 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 18 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Sources:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 19 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 20 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries
- Junctions

COLOR

- Deficient - 2 Year
- Deficient - 10 Years
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP19657_SanteeMDSGISProjSantee\MDS_MT_working\Santee\MDS_MT_working.aprx

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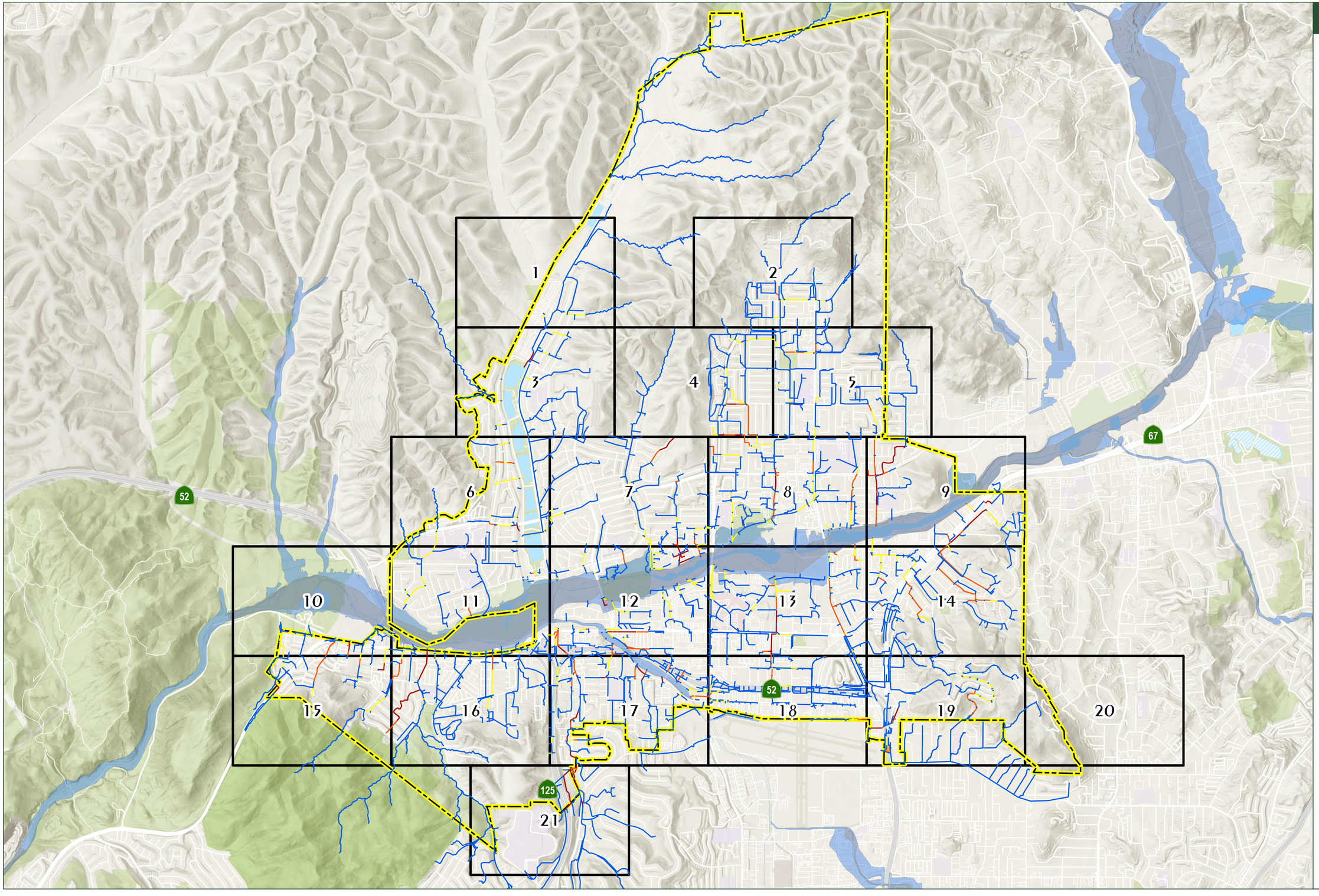
# STORM DRAIN INFRASTRUCTURE - NO TAIL WATER RESULTS

**SHEET 21 OF 21**

SANTEE MASTER DRAINAGE STUDY

**Appendix 5**

**Storm Drain Infrastructure Deficiencies – Tailwater Effects - Index Maps**




## LEGEND

- City of Santee
- Map Index (200 scale)

FEMA NFHL Floodplain
- 100-YR Floodway
- 100-YR Floodplain

Tailwater - Final Results
- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet
0 1,600 3,200 4,800

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## INDEX MAP

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP19657_SanteeMDSGISProjSanteeMDS_MT_workingSanteeMDS_MT_working.aprx

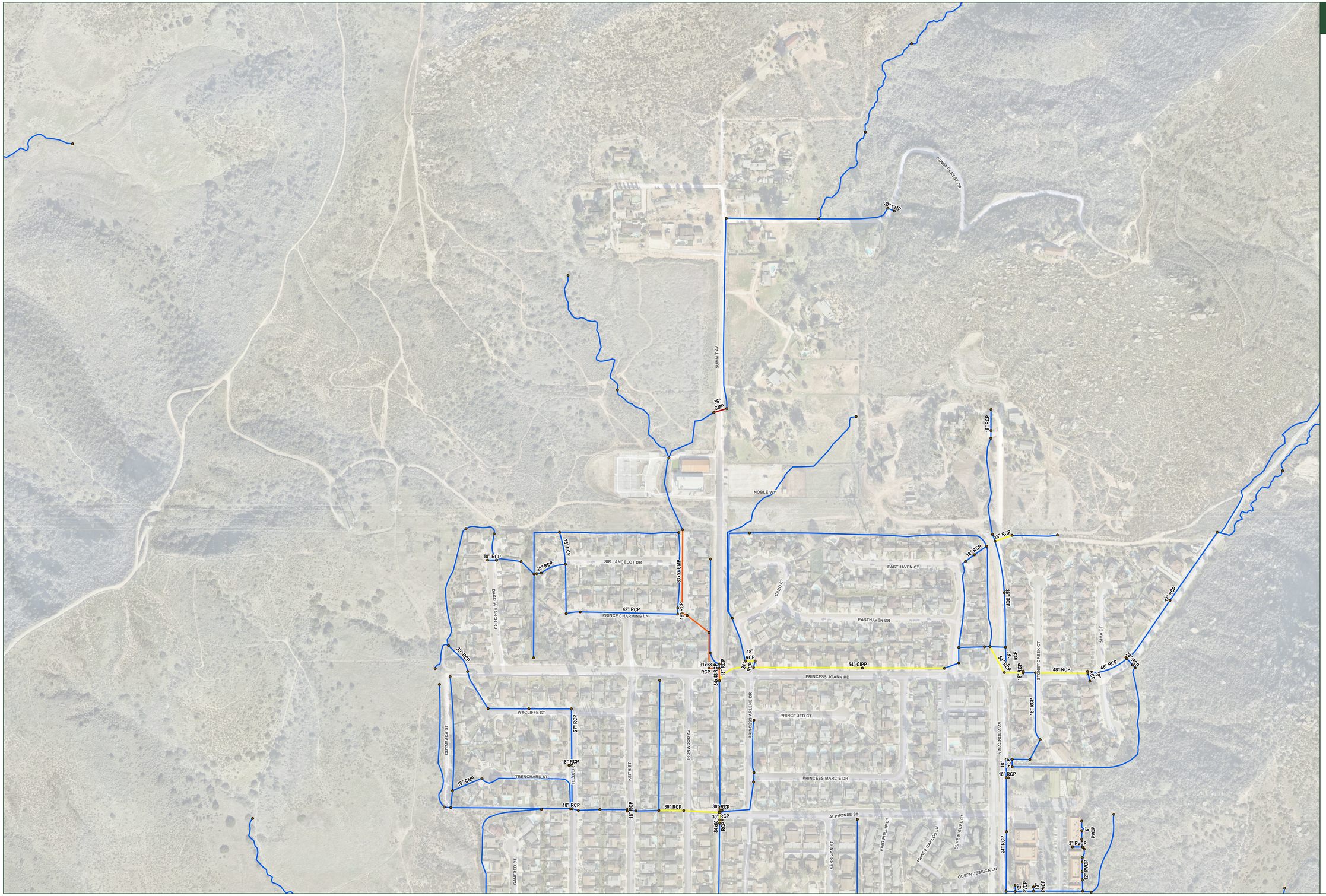
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 1 OF 21

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 2 OF 21

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 3 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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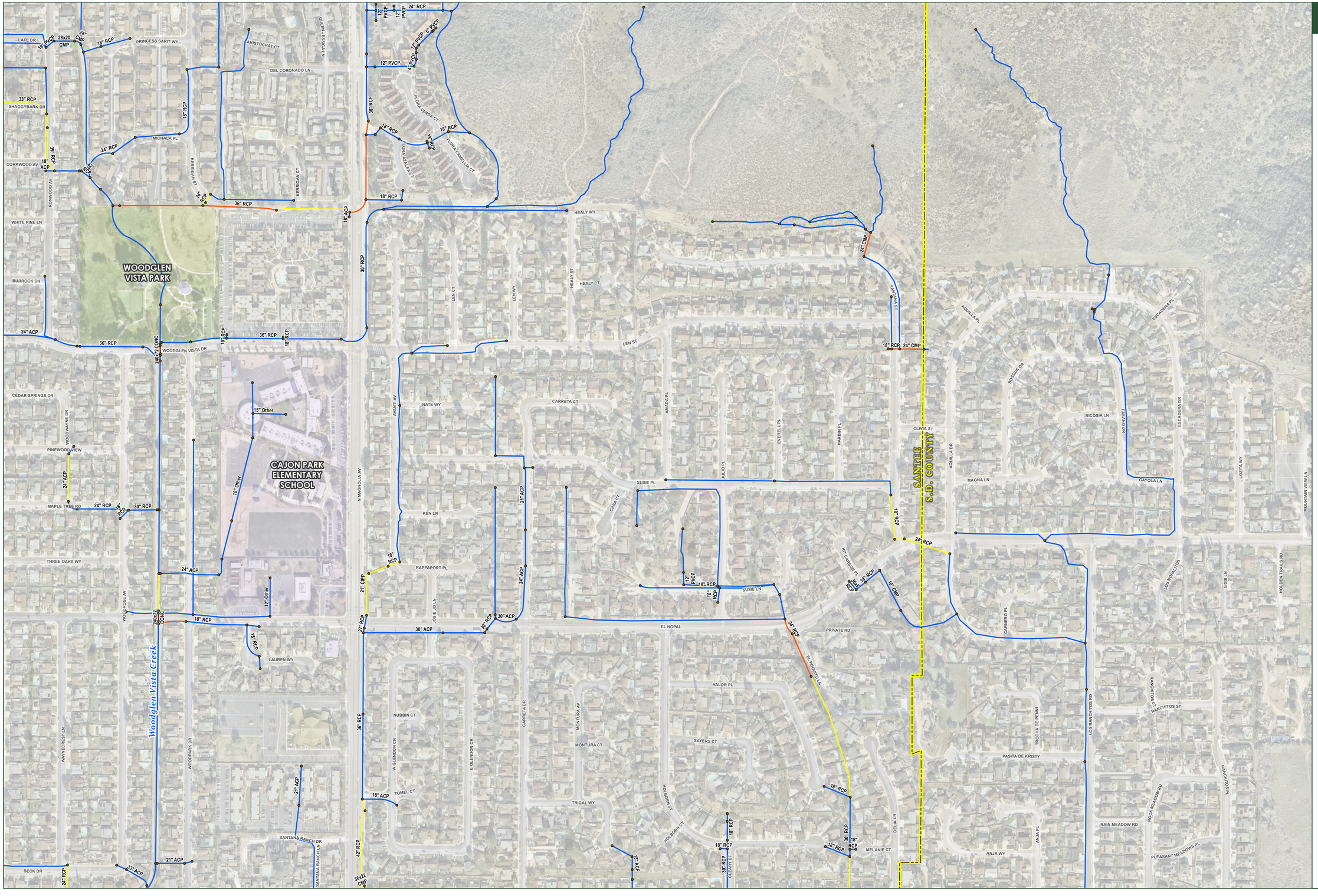
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 4 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 5 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 6 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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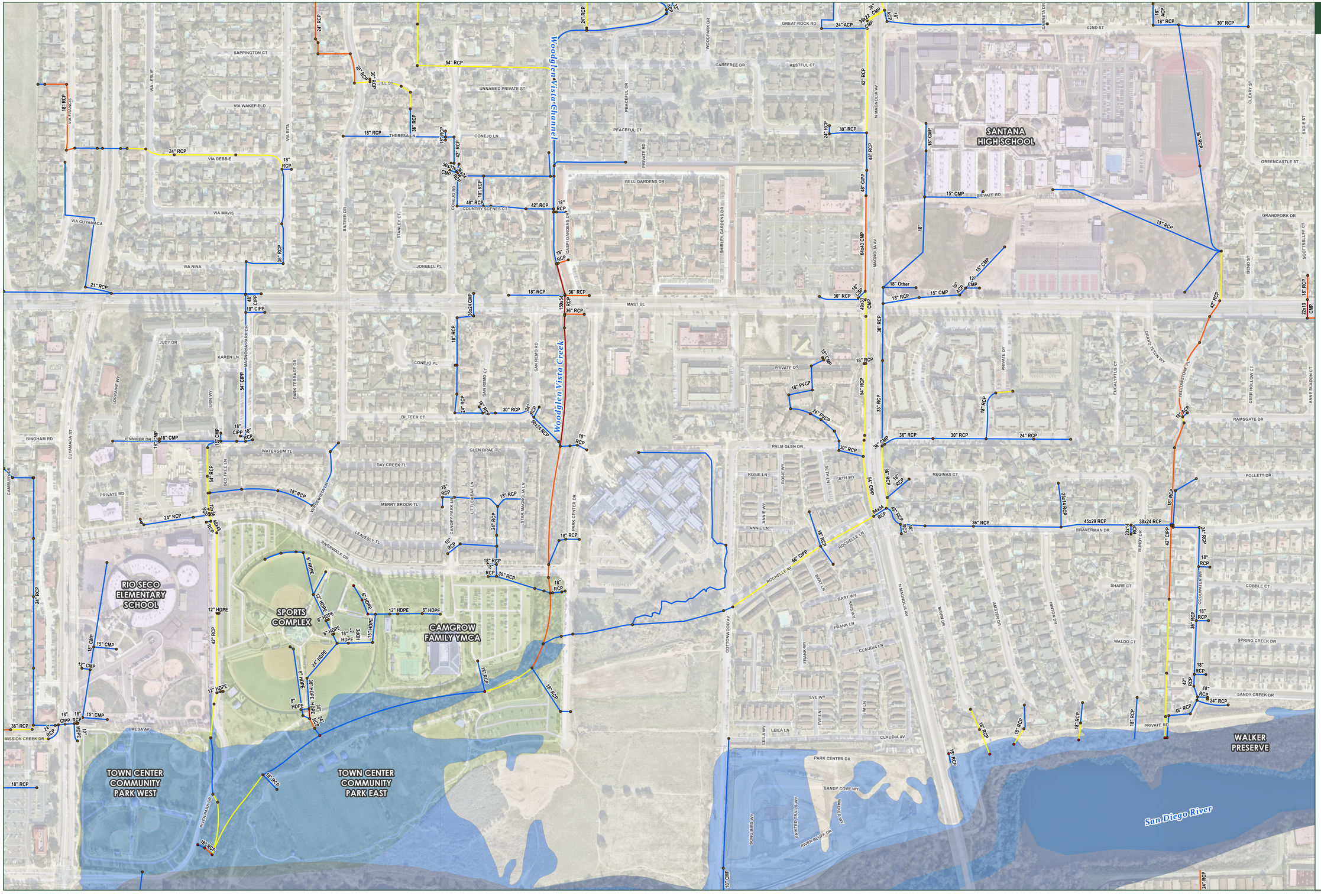
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 7 OF 21**

SANTEE MASTER DRAINAGE STUDY


Woodglen Vista Channel
Woodglen Vista Creek
SANTANA HIGH SCHOOL
RIO SECO ELEMENTARY SCHOOL
SPORTS COMPLEX
CAMGROW FAMILY YMCA
TOWN CENTER COMMUNITY PARK WEST
TOWN CENTER COMMUNITY PARK EAST
WALKER PRESERVE
San Diego River
SAPPINGTON CT
VIA WAKEFIELD
VIA DEBBIE
VIA MAVIS
VIA CUYAMACA
VIA NINA
JUDY DR
KAREN LN
JENNIFER DR
BINGHAM RD
WATERGUM TL
DAY CREEK TL
MERRY BROOK TL
LEAVESLY TL
RIVERWALK DR
PRIVATE RD
MESA AV
MISSION CREEK DR
JILL ST
THERESA LN
CONEJO LN
CONEJO PL
COUNTRY SCENES CT
BELL GARDENS DR
JONBELL PL
MAST BL
BILTEER CT
GLEN BRAE TL
PEACEFUL CT
RESTFUL CT
CAREFREE DR
GREAT ROCK RD
UNNAMED PRIVATE ST
PRIVATE DY
PALM GLEN DR
ROSIE LN
SETH WY
REGINAS CT
ANNIE LN
ROCHELLE LN
ROCHELLE AV
CLAUDIA LN
EVE WY
FRANK LN
FRANK WY
BART LN
BART WY
KRIS WY
LEILA LN
LEILA WY
EVE LN
JIM LN
SANDY COVE WY
PAINTED TRAILS WY
SONG BIRD WY
RIVER BLUFF DR
PARK CENTER DR
MARIN DR
AMSTER DR
HINTON DR
BRAVERMAN DR
BUNDY DR
SHARE CT
WALDO CT
COBBLE CT
COOLWATER WY
SPRING CREEK DR
SANDY CREEK DR
RAMSGATE DR
FOLLETT DR
GREENCASTLE ST
GRANDFORK DR
SCOTTSBLUFF CT
ANNE SLADON CT
DEER HOLLOW CT
YELLOWSTONE PL
GRAND TETON WY
ERIN WY
LORRAINE WY
PARK TERRACE DR
OLD TREE LN
CAMBRIDGE DR
RIVER PARK DR
VERDEMONT PATH
CANOPY PARK LN
LITTLELEAF LN
STAR MAGNOLIA LN
SAN REMO RD
SAN REMO CT
STANLEY CT
BILTEER DR
CONEJO RD
PRIVATE RD
WOODPARK DR
PEACEFUL DR
SHIRLEY GARDENS DR
CASPI GARDENS DR
N MAGNOLIA AV
MAGNOLIA AV
COTTONWOOD AV
CUYAMACA ST
VIA FRANCIS
VIA LESLIE
VIA RITA
MAGNOLIA/PARKROR
CLEARY ST
SADIE ST
BEND ST
02ND ST
CAMETA DR
18" RCP
24" RCP
30" RCP
36" RCP
42" RCP
48" RCP
54" RCP
21" RCP
15" CMP
18" CMP
24" CMP
30" CMP
36" CMP
42" CMP
48" CMP
54" CMP
60" CMP
66" CMP
18" CIPP
24" CIPP
30" CIPP
36" CIPP
42" CIPP
48" CIPP
54" CIPP
12" HDPE
15" HDPE
18" HDPE
24" HDPE
30" HDPE
36" HDPE
6" HDPE
8" HDPE
12" CMP
15" ACP
18" ACP
24" ACP
18" PVCP
24" PVCP
18" Other
12" RCP
15" RCP
18" RCP
24" RCP
30" RCP
36" RCP
42" RCP
45" RCP
48" RCP
54




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap



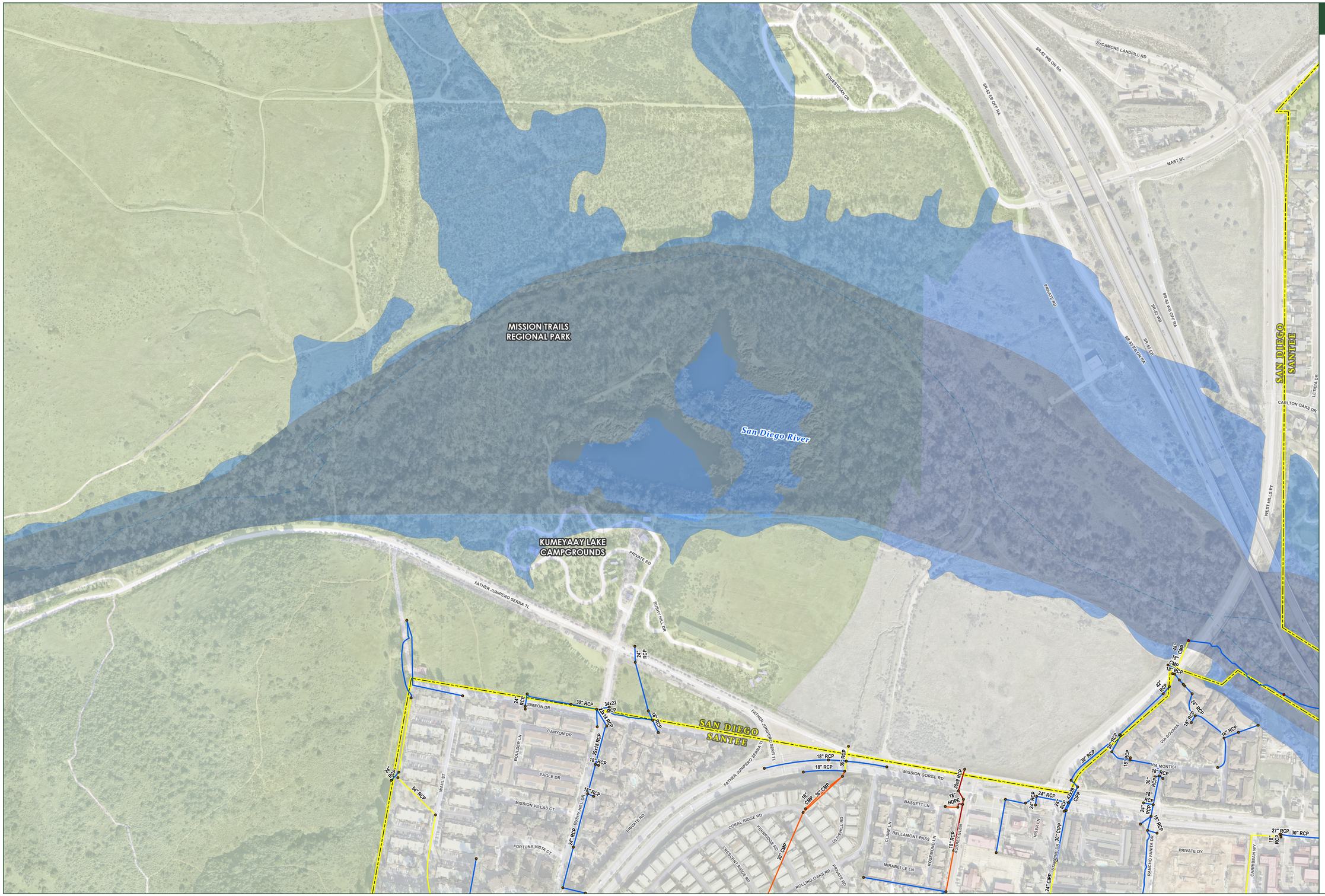
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 9 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 10 OF 21

SANTEE MASTER DRAINAGE STUDY

# LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

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ESRI World Topographic Basemap
WMP19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

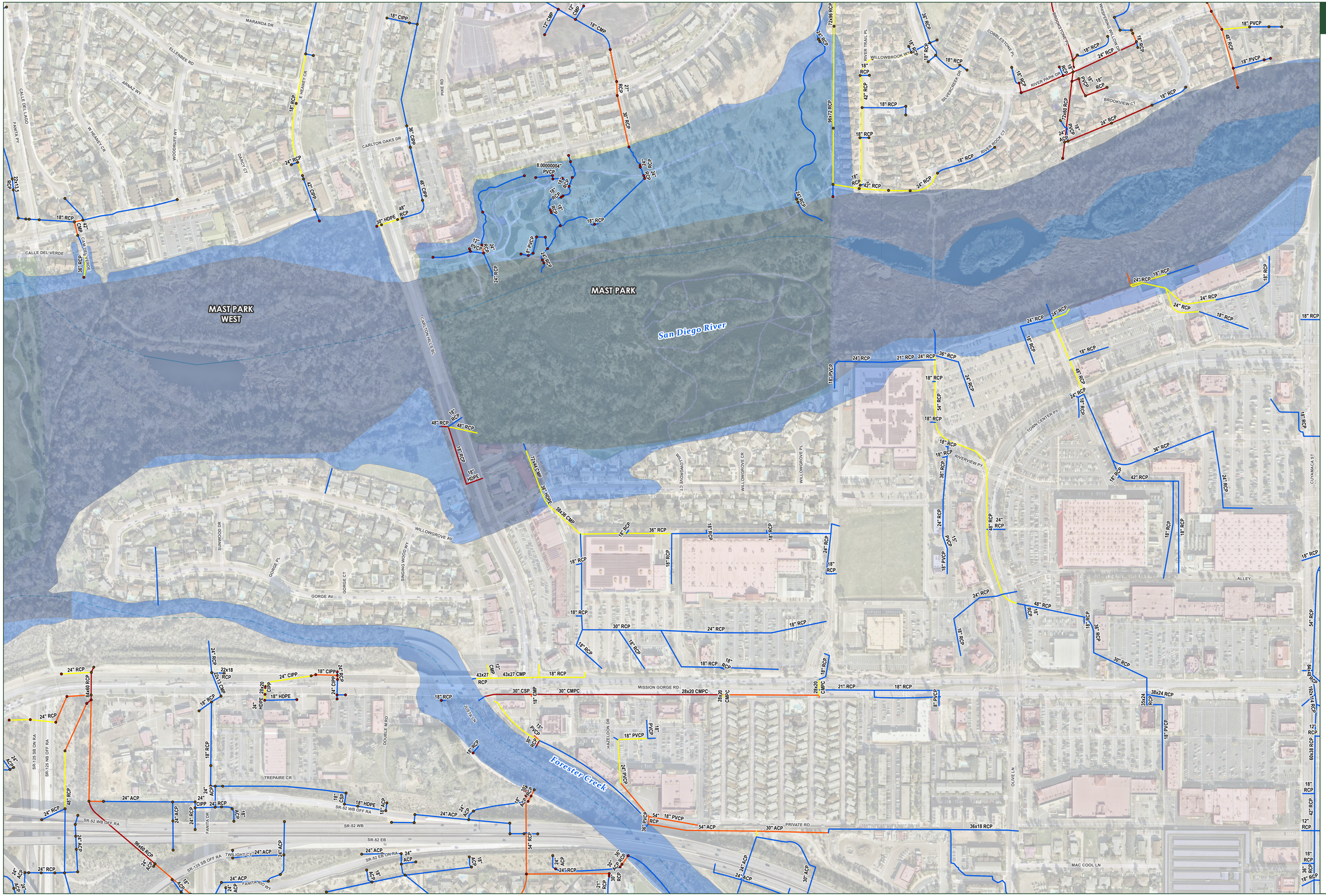
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 11 OF 21

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
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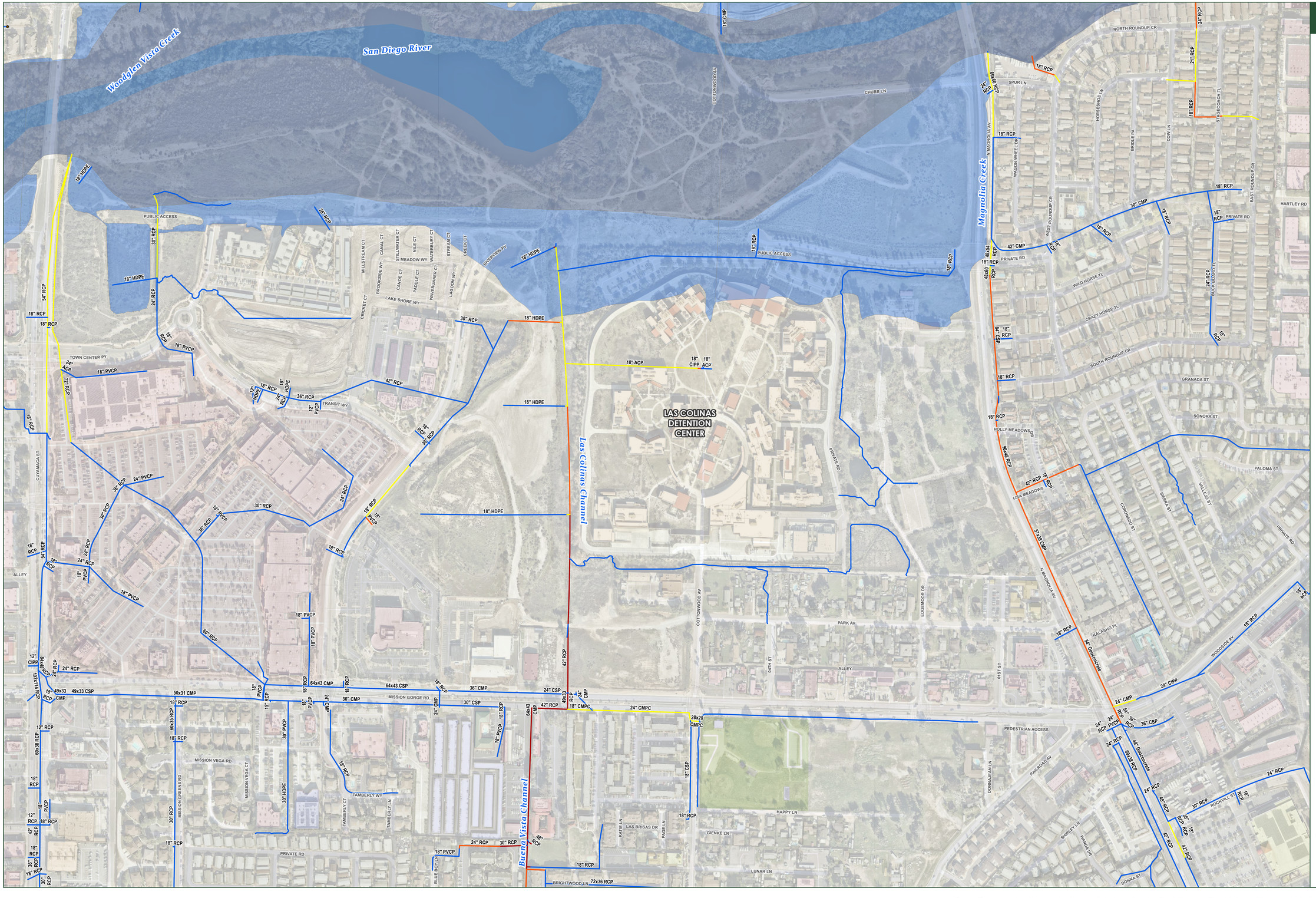
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 12 OF 21

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP:19657_Santee\MDS\GIS\Pro\Santee\MDS_MT_working\Santee\MDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 13 OF 21**

SANTEE MASTER DRAINAGE STUDY




# LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
\\NP\19657_Santee\MDS\GIS\Pro\Santee\MDS_MT_working\Santee\MDS_MT_working.aprx

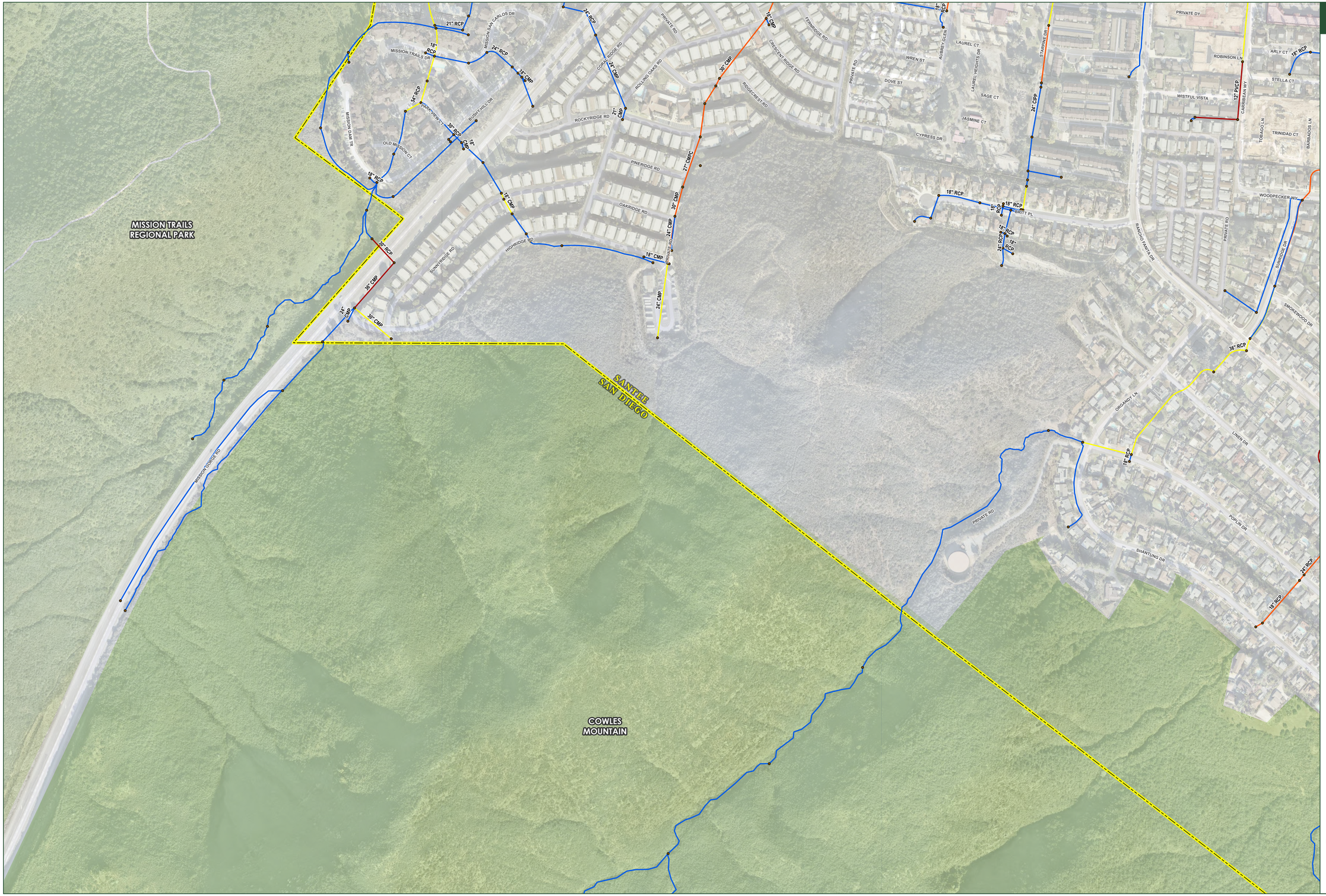
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 14 OF 21

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

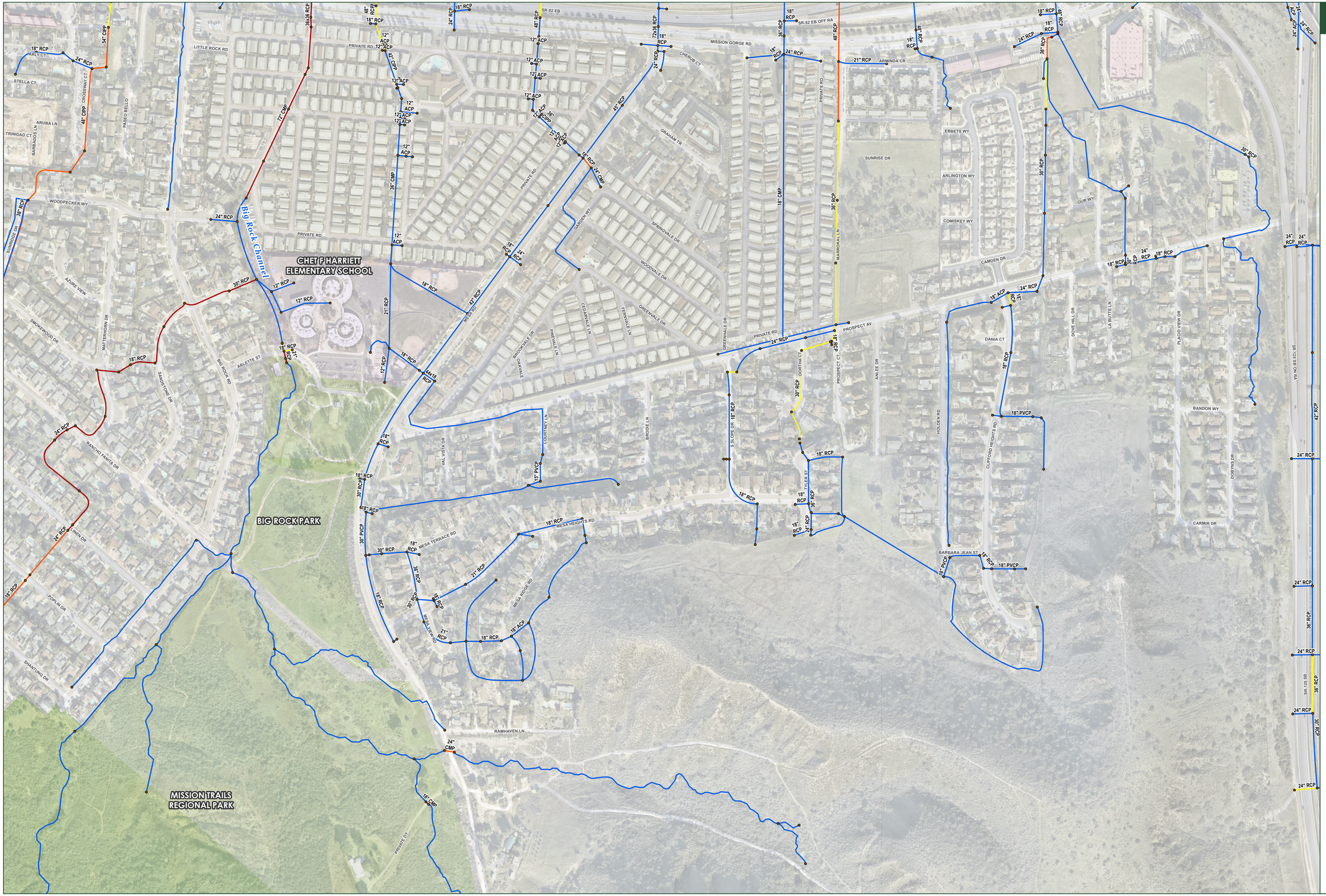
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 15 OF 21**

SANTEE MASTER DRAINAGE STUDY



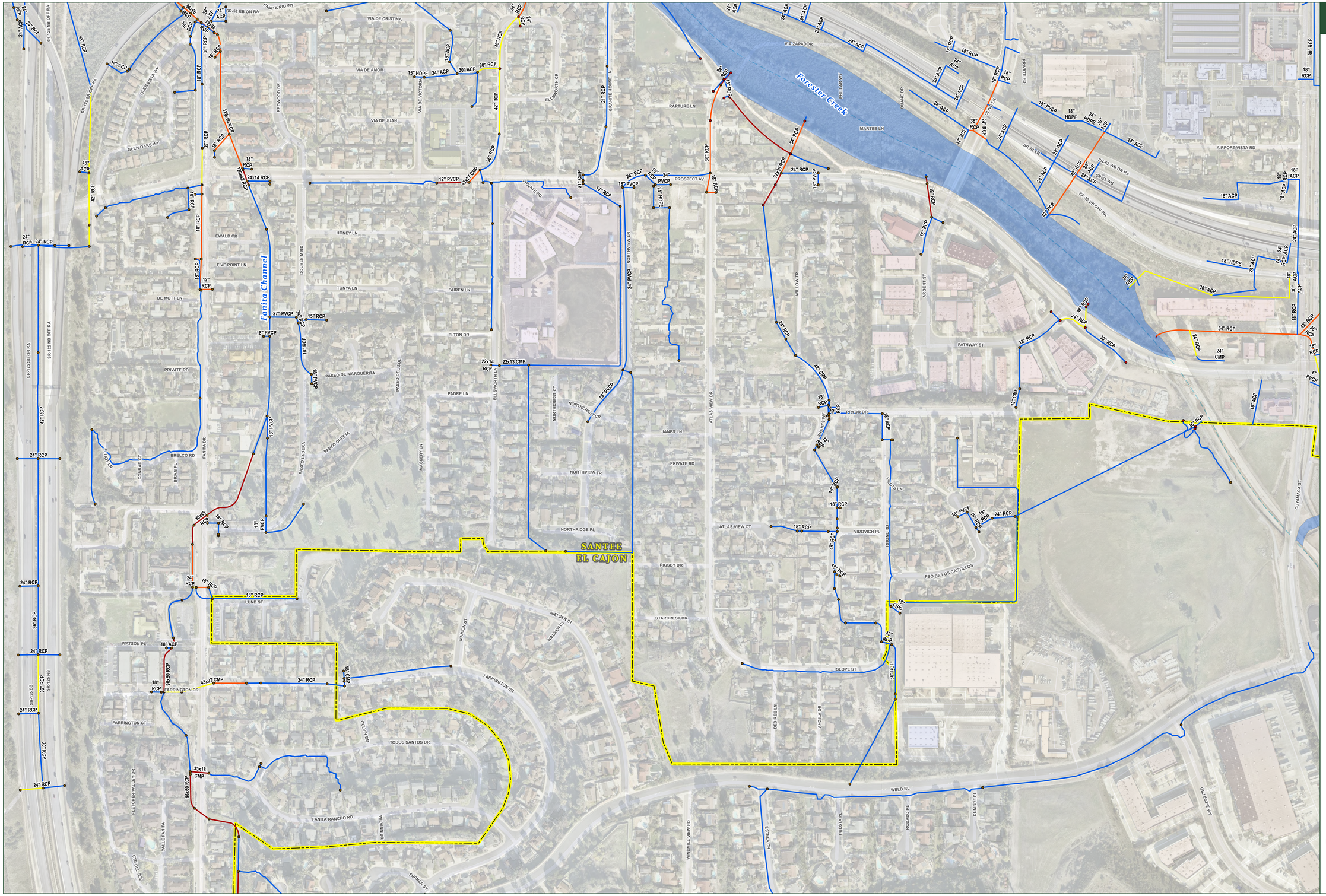

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 16 OF 21

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_SanteeMDDGIS\ProSantee\MDS_MT_working\SanteeMDS_MT_working.aprx

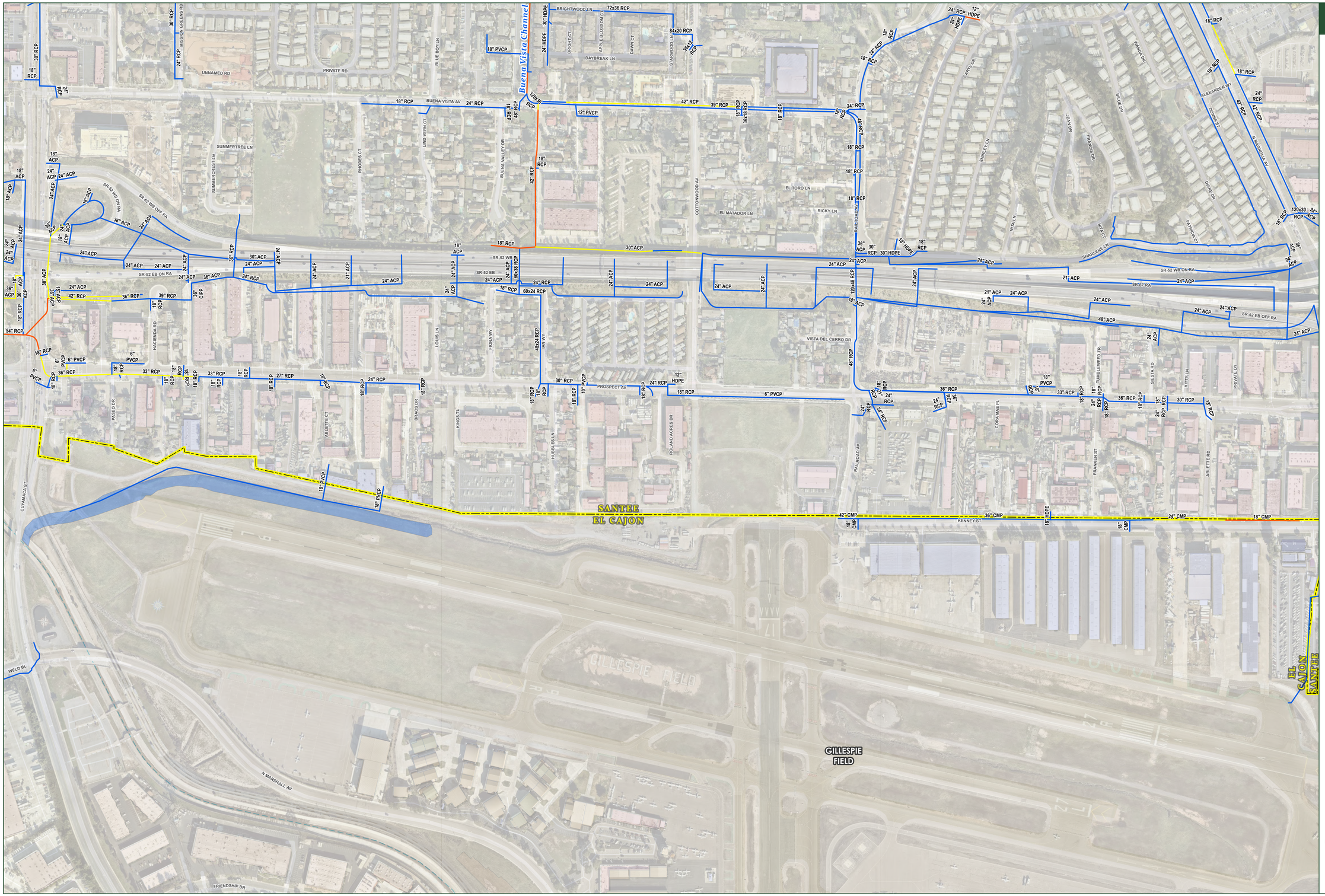
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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 17 OF 21

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_Santee\MDS\GIS\Pro\Santee\MDS_MT_working\Santee\MDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

## SHEET 18 OF 21

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP\19657_SanteeMDS\GIS\Pro\SanteeMDS_MT_working\SanteeMDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 19 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP19657_SanteeMDSGISProjSanteeMDS_MT_workingSanteeMDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 20 OF 21**

SANTEE MASTER DRAINAGE STUDY




## LEGEND

- Municipal Boundaries

FEMA NFHL Floodplain

- 100-YR Floodway
- 100-YR Floodplain

Junctions

- Not Submerged - 100 Year
- Submerged - 100 Year

COLOR

- Deficient - 2 Year
- Deficient - 10 Year
- Deficient - 100 Year
- No Flooding

Scale in Feet

0 200 400 600

FEMA DATA USED TO DETERMINE TAILWATER ELEVATIONS

J-19657
Data Source:
City of Santee Storm Drain, 2022
ESRI World Topographic Basemap
WMP19657_SanteeMDSGISProSanteeMDS_MT_workingSanteeMDS_MT_working.aprx

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# STORM DRAIN INFRASTRUCTURE - TAIL WATER RESULTS

**SHEET 21 OF 21**

SANTEE MASTER DRAINAGE STUDY

**Appendix 6**

**Preliminary Storm Drain Size and Cost for Deficiencies within the City**

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**Santee MDS - Master Drainage Facilities**

| Cost Summary for Updating Deficient Master Drainage Facilities within the City | | |
|---|---|---|
| Group 1 | $ | 3,200,000 |
| Group 2 | $ | 31,200,000 |
| Group 3 | $ | 16,500,000 |
| Group 4 | $ | 25,900,000 |
| **Total Cost** | **$** | **76,800,000** |

**Note: The preliminary calculated cost is reflective of a $/LF cost, and is not inclusive of any design or other contingencies.**

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**Santee MDS - Circular Master Drainage Facilities**

**Preliminary Storm Drain Size and Estimated Cost: Circular MDFs**

| City ID | Length (ft) | Barrels | Slope (%) | $Q_{100}$ (cfs) | Original Pipe Size (in) | Recommended Pipe Size (in) | Estimated Cost ($) |
|---|---|---|---|---|---|---|---|
| **Group 1 MDF** | | | | | | | |
| 402 | 153 | 1 | 2.1% | 70.4 | 24.0 | 36.0 | $ 58,000 |
| 415 | 150 | 1 | 1.4% | 571.0 | 66.0 | 84.0 | $ 135,000 |
| 404 | 294 | 1 | 1.4% | 587.9 | 72.0 | 96.0 | $ 294,000 |
| 406 | 53 | 1 | 1.4% | 585.2 | 72.0 | 96.0 | $ 53,000 |
| 417 | 377 | 1 | 2.1% | 565.5 | 66.0 | 84.0 | $ 340,000 |
| 411 | 567 | 1 | 2.4% | 553.6 | 66.0 | 84.0 | $ 511,000 |
| 2900 | 100 | 1 | 2.5% | 284.7 | 48.0 | 60.0 | $ 66,000 |
| 416 | 70 | 1 | 1.4% | 571.2 | 66.0 | 84.0 | $ 63,000 |
| 2897 | 54 | 1 | 1.0% | 42.3 | 18.0 | 36.0 | $ 21,000 |
| 405 | 71 | 1 | 1.4% | 585.0 | 72.0 | 96.0 | $ 71,000 |
| 2900 | 37 | 1 | 2.2% | 268.0 | 48.0 | 60.0 | $ 24,000 |
| 2900 | 30 | 1 | 3.7% | 286.5 | 48.0 | 54.0 | $ 17,000 |
| 260 | 180 | 1 | 5.2% | 98.4 | 27.0 | 36.0 | $ 68,000 |
| 250 | 102 | 1 | 2.0% | 76.1 | 27.0 | 42.0 | $ 41,000 |
| 261 | 106 | 1 | 5.8% | 103.1 | 27.0 | 36.0 | $ 40,000 |
| 245 | 38 | 1 | 2.0% | 93.1 | 27.0 | 42.0 | $ 16,000 |
| 262 | 103 | 1 | 3.1% | 100.9 | 27.0 | 42.0 | $ 42,000 |
| 239 | 230 | 1 | 2.2% | 85.1 | 27.0 | 42.0 | $ 92,000 |
| 240 | 108 | 1 | 3.2% | 67.1 | 24.0 | 36.0 | $ 41,000 |
| 259 | 210 | 1 | 6.1% | 102.3 | 27.0 | 36.0 | $ 79,000 |
| 248 | 179 | 1 | 3.1% | 113.8 | 30.0 | 42.0 | $ 72,000 |
| 258 | 128 | 1 | 1.9% | 137.6 | 36.0 | 48.0 | $ 58,000 |
| 2908 | 379 | 1 | 3.9% | 80.7 | 24.0 | 36.0 | $ 143,000 |
| 134 | 230 | 1 | 3.5% | 130.3 | 33.0 | 42.0 | $ 93,000 |
| 135 | 167 | 1 | 3.0% | 125.8 | 33.0 | 42.0 | $ 67,000 |
| 131 | 55 | 1 | 3.5% | 126.7 | 33.0 | 42.0 | $ 22,000 |
| 2910 | 295 | 1 | 5.7% | 78.7 | 30.0 | 36.0 | $ 111,000 |
| 247 | 281 | 1 | 3.1% | 112.3 | 30.0 | 42.0 | $ 113,000 |
| 2918 | 220 | 1 | 6.0% | 101.4 | 30.0 | 36.0 | $ 83,000 |
| 2916 | 101 | 1 | 1.4% | 96.3 | 18.0 | 48.0 | $ 46,000 |
| 2912 | 98 | 1 | 1.1% | 88.1 | 30.0 | 48.0 | $ 44,000 |
| 398 | 105 | 1 | 0.8% | 37.1 | 18.0 | 36.0 | $ 40,000 |
| 243 | 35 | 1 | 3.3% | 58.4 | 21.0 | 36.0 | $ 13,000 |
| 242 | 106 | 1 | 4.2% | 67.2 | 21.0 | 36.0 | $ 40,000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2905 | 206 | 1 | 2.8% | 73.1 | 24.0 | 36.0 | $ 78,000 |
| 2901 | 92 | 1 | 2.2% | 57.1 | 24.0 | 36.0 | $ 35,000 |
| 379 | 164 | 1 | 1.1% | 78.7 | 27.0 | 42.0 | $ 66,000 |
| **Group 2 MDF** | | | | | | | |
| 186 | 95 | 1 | 3.5% | 188.7 | 42.0 | 48.0 | $ 43,000 |
| 149 | 465 | 1 | 2.7% | 241.1 | 42.0 | 54.0 | $ 256,000 |
| 189 | 109 | 1 | 2.4% | 197.9 | 42.0 | 54.0 | $ 61,000 |
| 156 | 147 | 1 | 1.5% | 91.5 | 30.0 | 42.0 | $ 59,000 |
| 188 | 142 | 1 | 2.1% | 194.6 | 42.0 | 54.0 | $ 79,000 |
| 146 | 278 | 1 | 7.6% | 248.5 | 42.0 | 48.0 | $ 125,000 |
| 143 | 178 | 1 | 8.2% | 278.6 | 42.0 | 48.0 | $ 81,000 |
| 153 | 99 | 1 | 2.6% | 85.7 | 27.0 | 42.0 | $ 40,000 |
| 155 | 94 | 1 | 3.5% | 85.7 | 27.0 | 36.0 | $ 36,000 |
| 152 | 81 | 1 | 1.5% | 83.5 | 27.0 | 42.0 | $ 33,000 |
| 163 | 144 | 1 | 4.7% | 73.7 | 24.0 | 36.0 | $ 54,000 |
| 467 | 133 | 1 | 2.3% | 80.7 | 30.0 | 42.0 | $ 54,000 |
| 471 | 270 | 1 | 2.0% | 77.8 | 30.0 | 42.0 | $ 109,000 |
| 468 | 77 | 1 | 2.3% | 81.1 | 30.0 | 42.0 | $ 31,000 |
| 470 | 299 | 1 | 2.1% | 82.0 | 30.0 | 42.0 | $ 120,000 |
| 454 | 163 | 1 | 3.0% | 105.5 | 30.0 | 42.0 | $ 66,000 |
| 443 | 84 | 1 | 1.9% | 110.5 | 30.0 | 48.0 | $ 38,000 |
| 296 | 159 | 1 | 2.2% | 54.4 | 21.0 | 36.0 | $ 60,000 |
| 299 | 70 | 1 | 0.6% | 53.5 | 21.0 | 42.0 | $ 28,000 |
| 2829 | 80 | 1 | 2.9% | 115.6 | 30.0 | 42.0 | $ 32,000 |
| 457 | 280 | 1 | 3.2% | 59.4 | 18.0 | 36.0 | $ 105,000 |
| 4540 | 66 | 1 | 5.8% | 451.3 | 36.0 | 60.0 | $ 43,000 |
| 3545 | 295 | 1 | 4.1% | 180.0 | 36.0 | 48.0 | $ 133,000 |
| 344 | 70 | 1 | 0.5% | 182.6 | 36.0 | 72.0 | $ 56,000 |
| 4538 | 17 | 1 | 1.5% | 356.2 | 36.0 | 72.0 | $ 14,000 |
| 3545 | 16 | 1 | 2.7% | 181.2 | 36.0 | 48.0 | $ 8,000 |
| 598 | 17 | 2 | 1.0% | 1328.4 | 60.0 | 108.0 | $ 42,000 |
| 514 | 119 | 1 | 1.8% | 141.7 | 42.0 | 48.0 | $ 54,000 |
| 345 | 145 | 1 | 0.6% | 212.4 | 60.0 | 72.0 | $ 116,000 |
| 499 | 288 | 2 | 1.8% | 1396.3 | 60.0 | 108.0 | $ 692,000 |
| 3545 | 39 | 1 | 2.3% | 184.4 | 36.0 | 54.0 | $ 22,000 |
| 515 | 119 | 1 | 0.5% | 148.2 | 42.0 | 72.0 | $ 96,000 |
| 598 | 263 | 2 | 1.0% | 1352.2 | 60.0 | 108.0 | $ 631,000 |
| 494 | 115 | 1 | 0.6% | 36.7 | 18.0 | 36.0 | $ 44,000 |
| 1317 | 134 | 1 | 1.0% | 266.6 | 54.0 | 72.0 | $ 107,000 |
| 1342 | 375 | 2 | 0.9% | 288.6 | 42.0 | 72.0 | $ 600,000 |
| 546 | 152 | 1 | 3.0% | 77.3 | 24.0 | 36.0 | $ 57,000 |
| 1450 | 367 | 1 | 0.5% | 137.7 | 48.0 | 60.0 | $ 239,000 |
| 1343 | 375 | 2 | 1.1% | 260.8 | 42.0 | 72.0 | $ 601,000 |
| 545 | 290 | 1 | 2.9% | 72.7 | 24.0 | 36.0 | $ 109,000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1469 | 37 | 1 | 0.5% | 70.8 | 36.0 | 48.0 | $ 17,000 |
| 1343 | 5 | 2 | 2.2% | 265.8 | 42.0 | 60.0 | $ 6,000 |
| 1451 | 35 | 1 | 0.5% | 132.6 | 36.0 | 60.0 | $ 23,000 |
| 1468 | 48 | 1 | 0.5% | 102.7 | 36.0 | 54.0 | $ 27,000 |
| 1318 | 76 | 1 | 1.0% | 247.2 | 54.0 | 72.0 | $ 61,000 |
| 1454 | 4 | 1 | 0.5% | 124.7 | 48.0 | 60.0 | $ 3,000 |
| 1455 | 44 | 1 | 0.5% | 130.6 | 48.0 | 60.0 | $ 29,000 |
| 1321 | 17 | 1 | 1.0% | 251.5 | 54.0 | 72.0 | $ 14,000 |
| 547 | 88 | 1 | 3.0% | 67.3 | 24.0 | 36.0 | $ 33,000 |
| 1345 | 160 | 2 | 0.5% | 258.5 | 42.0 | 84.0 | $ 289,000 |
| 544 | 260 | 1 | 3.7% | 65.0 | 24.0 | 36.0 | $ 98,000 |
| 1344 | 55 | 2 | 0.5% | 263.4 | 42.0 | 84.0 | $ 99,000 |
| 1456 | 151 | 1 | 0.5% | 121.9 | 48.0 | 60.0 | $ 98,000 |
| 1320 | 72 | 1 | 1.0% | 252.7 | 54.0 | 72.0 | $ 58,000 |
| 577 | 391 | 1 | 4.4% | 198.5 | 36.0 | 48.0 | $ 177,000 |
| 947 | 649 | 1 | 1.9% | 325.4 | 54.0 | 72.0 | $ 520,000 |
| 576 | 243 | 1 | 4.8% | 209.0 | 36.0 | 48.0 | $ 110,000 |
| 575 | 206 | 1 | 6.1% | 213.9 | 36.0 | 48.0 | $ 93,000 |
| 578 | 176 | 1 | 3.9% | 207.6 | 36.0 | 48.0 | $ 79,000 |
| 920 | 150 | 1 | 2.0% | 112.0 | 30.0 | 48.0 | $ 68,000 |
| 922 | 52 | 1 | 1.6% | 116.6 | 30.0 | 48.0 | $ 24,000 |
| 920 | 74 | 1 | 0.5% | 120.1 | 30.0 | 60.0 | $ 49,000 |
| 946 | 196 | 1 | 1.5% | 361.2 | 54.0 | 72.0 | $ 158,000 |
| 1069 | 362 | 1 | 1.2% | 197.2 | 48.0 | 60.0 | $ 236,000 |
| 589 | 122 | 1 | 0.9% | 334.8 | 54.0 | 84.0 | $ 110,000 |
| 901 | 46 | 1 | 0.9% | 58.3 | 24.0 | 42.0 | $ 19,000 |
| 718 | 387 | 1 | 1.0% | 343.6 | 54.0 | 84.0 | $ 349,000 |
| 619 | 216 | 1 | 1.9% | 150.6 | 39.0 | 48.0 | $ 98,000 |
| 895 | 352 | 1 | 1.7% | 126.5 | 36.0 | 48.0 | $ 159,000 |
| 749 | 247 | 1 | 3.3% | 301.5 | 48.0 | 60.0 | $ 161,000 |
| 752 | 89 | 1 | 0.5% | 274.5 | 54.0 | 84.0 | $ 81,000 |
| 717 | 513 | 1 | 3.9% | 341.3 | 54.0 | 60.0 | $ 334,000 |
| 627 | 145 | 1 | 3.7% | 156.1 | 30.0 | 48.0 | $ 66,000 |
| 722 | 185 | 1 | 0.8% | 392.1 | 54.0 | 84.0 | $ 167,000 |
| 1106 | 217 | 1 | 5.3% | 129.2 | 30.0 | 42.0 | $ 87,000 |
| 622 | 232 | 1 | 4.6% | 146.5 | 33.0 | 42.0 | $ 93,000 |
| 1105 | 53 | 1 | 5.1% | 116.8 | 30.0 | 42.0 | $ 22,000 |
| 626 | 270 | 1 | 3.9% | 150.3 | 30.0 | 42.0 | $ 109,000 |
| 652 | 183 | 1 | 2.0% | 53.9 | 24.0 | 36.0 | $ 69,000 |
| 620 | 66 | 1 | 1.9% | 158.3 | 39.0 | 54.0 | $ 37,000 |
| 756 | 140 | 1 | 0.5% | 275.7 | 54.0 | 84.0 | $ 126,000 |
| 902 | 19 | 1 | 1.3% | 59.4 | 24.0 | 42.0 | $ 8,000 |
| 623 | 229 | 1 | 4.6% | 149.2 | 33.0 | 42.0 | $ 92,000 |
| 889 | 117 | 1 | 2.0% | 97.5 | 30.0 | 42.0 | $ 47,000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1071 | 90 | 1 | 3.3% | 138.2 | 36.0 | 42.0 | $ 36,000 |
| 639 | 225 | 1 | 1.6% | 51.4 | 24.0 | 36.0 | $ 85,000 |
| 888 | 166 | 1 | 1.9% | 104.2 | 30.0 | 42.0 | $ 67,000 |
| 1109 | 91 | 1 | 3.8% | 130.0 | 30.0 | 42.0 | $ 37,000 |
| 923 | 79 | 1 | 1.8% | 104.0 | 30.0 | 48.0 | $ 36,000 |
| 1104 | 129 | 1 | 3.1% | 107.8 | 30.0 | 42.0 | $ 52,000 |
| 621 | 289 | 1 | 4.3% | 144.0 | 33.0 | 42.0 | $ 116,000 |
| 843 | 83 | 1 | 1.9% | 83.2 | 36.0 | 42.0 | $ 34,000 |
| 2648 | 25 | 1 | 0.5% | 188.0 | 54.0 | 72.0 | $ 20,000 |
| 992 | 205 | 1 | 0.5% | 118.0 | 42.0 | 60.0 | $ 134,000 |
| 1195 | 279 | 2 | 0.5% | 319.0 | 66.0 | 84.0 | $ 503,000 |
| 1198 | 496 | 2 | 0.5% | 308.7 | 66.0 | 84.0 | $ 893,000 |
| 805 | 210 | 1 | 2.4% | 62.4 | 21.0 | 36.0 | $ 79,000 |
| 1192 | 277 | 1 | 0.7% | 207.8 | 54.0 | 72.0 | $ 222,000 |
| 991 | 350 | 1 | 0.5% | 128.8 | 42.0 | 60.0 | $ 228,000 |
| 813 | 100 | 1 | 2.4% | 63.2 | 21.0 | 36.0 | $ 38,000 |
| 1194 | 78 | 1 | 0.5% | 192.9 | 54.0 | 72.0 | $ 63,000 |
| 1029 | 45 | 1 | 0.5% | 101.5 | 36.0 | 54.0 | $ 25,000 |
| 914 | 502 | 1 | 1.4% | 158.4 | 42.0 | 54.0 | $ 276,000 |
| 844 | 347 | 1 | 1.0% | 148.5 | 42.0 | 54.0 | $ 192,000 |
| 987 | 89 | 1 | 0.5% | 75.9 | 42.0 | 48.0 | $ 40,000 |
| 812 | 57 | 1 | 3.2% | 60.8 | 18.0 | 36.0 | $ 22,000 |
| 2825 | 32 | 1 | 2.3% | 147.6 | 42.0 | 48.0 | $ 15,000 |
| 845 | 56 | 1 | 1.5% | 119.1 | 36.0 | 48.0 | $ 26,000 |
| 1031 | 255 | 1 | 0.8% | 95.4 | 36.0 | 48.0 | $ 115,000 |
| 1182 | 239 | 1 | 0.5% | 191.9 | 54.0 | 72.0 | $ 191,000 |
| 2649 | 335 | 1 | 0.9% | 183.2 | 54.0 | 60.0 | $ 218,000 |
| 821 | 46 | 1 | 1.7% | 60.7 | 24.0 | 36.0 | $ 18,000 |
| 868 | 203 | 1 | 1.5% | 69.1 | 30.0 | 42.0 | $ 82,000 |
| 869 | 66 | 1 | 1.0% | 69.2 | 36.0 | 42.0 | $ 27,000 |
| 823 | 227 | 1 | 2.9% | 60.3 | 24.0 | 36.0 | $ 86,000 |
| 291 | 224 | 1 | 6.7% | 120.1 | 18.0 | 36.0 | $ 84,000 |
| 323 | 288 | 1 | 6.6% | 122.8 | 21.0 | 36.0 | $ 108,000 |
| 290 | 200 | 1 | 6.8% | 117.6 | 18.0 | 36.0 | $ 75,000 |
| 1360 | 50 | 1 | 1.4% | 44.7 | 30.0 | 36.0 | $ 19,000 |
| 565 | 260 | 1 | 3.7% | 84.9 | 18.0 | 36.0 | $ 98,000 |
| 1055 | 58 | 1 | 0.5% | 97.1 | 30.0 | 54.0 | $ 32,000 |
| 573 | 72 | 1 | 0.8% | 111.4 | 18.0 | 54.0 | $ 40,000 |
| 572 | 301 | 1 | 7.0% | 97.7 | 18.0 | 36.0 | $ 113,000 |
| 981 | 342 | 1 | 0.5% | 806.9 | 66.0 | 108.0 | $ 411,000 |
| 981 | 256 | 1 | 0.5% | 787.5 | 66.0 | 108.0 | $ 308,000 |
| 979 | 211 | 1 | 0.5% | 739.8 | 66.0 | 108.0 | $ 254,000 |
| 876 | 155 | 1 | 0.6% | 519.9 | 30.0 | 96.0 | $ 156,000 |
| 953 | 88 | 1 | 0.5% | 144.8 | 33.0 | 72.0 | $ 71,000 |

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|---|---|---|---|---|---|---|---|
| 878 | 59 | 1 | 0.6% | 536.3 | 30.0 | 108.0 | $ 71,000 |
| 978 | 284 | 1 | 0.5% | 736.1 | 60.0 | 108.0 | $ 341,000 |
| 879 | 117 | 1 | 0.6% | 530.8 | 30.0 | 96.0 | $ 117,000 |
| 978 | 33 | 1 | 0.5% | 729.9 | 60.0 | 108.0 | $ 40,000 |
| 976 | 248 | 1 | 0.5% | 606.4 | 36.0 | 108.0 | $ 298,000 |
| 955 | 335 | 1 | 2.1% | 530.3 | 30.0 | 84.0 | $ 302,000 |
| 4272 | 65 | 1 | 0.5% | 626.3 | 36.0 | 108.0 | $ 79,000 |
| 954 | 117 | 1 | 2.3% | 530.7 | 30.0 | 84.0 | $ 106,000 |
| 880 | 63 | 1 | 1.1% | 55.4 | 18.0 | 42.0 | $ 26,000 |
| 957 | 193 | 1 | 0.5% | 565.8 | 30.0 | 108.0 | $ 233,000 |
| 877 | 296 | 1 | 0.6% | 536.4 | 30.0 | 108.0 | $ 356,000 |
| 956 | 260 | 1 | 0.5% | 549.1 | 30.0 | 108.0 | $ 313,000 |
| 881 | 253 | 1 | 0.6% | 518.9 | 30.0 | 96.0 | $ 253,000 |
| 592 | 152 | 1 | 0.5% | 28.0 | 18.0 | 36.0 | $ 57,000 |
| 450 | 41 | 1 | 1.0% | 65.8 | 18.0 | 42.0 | $ 17,000 |
| 449 | 65 | 1 | 1.1% | 95.9 | 42.0 | 48.0 | $ 30,000 |
| 593 | 67 | 1 | 0.7% | 43.6 | 27.0 | 36.0 | $ 26,000 |
| 595 | 250 | 1 | 0.7% | 38.2 | 30.0 | 36.0 | $ 94,000 |
| 325 | 425 | 1 | 5.9% | 131.3 | 36.0 | 42.0 | $ 170,000 |
| 350 | 110 | 1 | 1.4% | 42.7 | 18.0 | 36.0 | $ 42,000 |
| 493 | 32 | 1 | 0.8% | 31.2 | 18.0 | 36.0 | $ 13,000 |
| 4539 | 28 | 1 | 0.5% | 418.9 | 36.0 | 96.0 | $ 28,000 |
| 351 | 37 | 1 | 2.0% | 57.0 | 30.0 | 36.0 | $ 14,000 |
| 324 | 148 | 1 | 2.7% | 124.0 | 30.0 | 42.0 | $ 60,000 |
| 552 | 40 | 1 | 2.0% | 56.5 | 24.0 | 36.0 | $ 15,000 |
| 1357 | 70 | 1 | 0.7% | 42.8 | 24.0 | 36.0 | $ 27,000 |
| 917 | 153 | 1 | 2.0% | 101.6 | 30.0 | 42.0 | $ 62,000 |
| 586 | 399 | 1 | 3.4% | 351.1 | 42.0 | 60.0 | $ 260,000 |
| 584 | 153 | 1 | 3.4% | 357.9 | 42.0 | 60.0 | $ 100,000 |
| 558 | 128 | 1 | 5.2% | 74.4 | 18.0 | 36.0 | $ 48,000 |
| 919 | 22 | 1 | 6.7% | 98.7 | 24.0 | 36.0 | $ 9,000 |
| 587 | 407 | 1 | 3.0% | 342.6 | 42.0 | 60.0 | $ 265,000 |
| 566 | 108 | 1 | 3.4% | 101.6 | 24.0 | 42.0 | $ 44,000 |
| 590 | 347 | 1 | 0.7% | 343.8 | 54.0 | 84.0 | $ 313,000 |
| 585 | 232 | 1 | 3.4% | 358.7 | 42.0 | 60.0 | $ 151,000 |
| 582 | 20 | 1 | 3.1% | 227.5 | 42.0 | 54.0 | $ 11,000 |
| 571 | 211 | 1 | 5.3% | 102.4 | 18.0 | 36.0 | $ 79,000 |
| 581 | 142 | 1 | 2.6% | 105.7 | 21.0 | 42.0 | $ 57,000 |
| 916 | 141 | 1 | 1.2% | 108.9 | 30.0 | 48.0 | $ 64,000 |
| 568 | 216 | 1 | 1.9% | 99.8 | 24.0 | 42.0 | $ 87,000 |
| 899 | 32 | 1 | 0.5% | 177.6 | 36.0 | 72.0 | $ 26,000 |
| 784 | 66 | 1 | 1.9% | 119.1 | 30.0 | 48.0 | $ 30,000 |
| 896 | 350 | 1 | 0.5% | 137.4 | 36.0 | 60.0 | $ 228,000 |
| 948 | 115 | 1 | 0.6% | 256.6 | 36.0 | 84.0 | $ 104,000 |

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|---|---|---|---|---|---|---|---|
| 787 | 108 | 1 | 2.2% | 133.0 | 36.0 | 48.0 | $ 49,000 |
| 897 | 394 | 1 | 0.5% | 178.1 | 36.0 | 72.0 | $ 316,000 |
| 907 | 132 | 1 | 0.5% | 56.2 | 18.0 | 48.0 | $ 60,000 |
| 783 | 307 | 1 | 2.7% | 134.4 | 30.0 | 48.0 | $ 139,000 |
| 1293 | 93 | 1 | 0.9% | 78.6 | 36.0 | 48.0 | $ 42,000 |
| 985 | 350 | 1 | 0.5% | 131.3 | 42.0 | 60.0 | $ 228,000 |
| 984 | 127 | 1 | 0.5% | 131.8 | 42.0 | 60.0 | $ 83,000 |
| 982 | 377 | 1 | 0.5% | 106.8 | 42.0 | 54.0 | $ 208,000 |
| 990 | 350 | 1 | 0.5% | 130.9 | 42.0 | 60.0 | $ 228,000 |
| 986 | 123 | 1 | 0.5% | 112.7 | 42.0 | 60.0 | $ 80,000 |
| 987 | 89 | 1 | 0.5% | 111.6 | 42.0 | 60.0 | $ 58,000 |
| 827 | 116 | 1 | 4.2% | 96.5 | 24.0 | 36.0 | $ 44,000 |
| 994 | 87 | 1 | 0.5% | 839.6 | 66.0 | 108.0 | $ 104,000 |
| 994 | 512 | 1 | 0.5% | 812.2 | 66.0 | 108.0 | $ 615,000 |
| 953 | 88 | 1 | 0.5% | 121.1 | 33.0 | 60.0 | $ 57,000 |
| 950 | 191 | 1 | 3.6% | 121.5 | 33.0 | 42.0 | $ 77,000 |
| 839 | 221 | 1 | 0.5% | 62.1 | 24.0 | 48.0 | $ 100,000 |
| 875 | 187 | 1 | 0.6% | 122.0 | 33.0 | 60.0 | $ 122,000 |
| 872 | 269 | 1 | 4.2% | 82.1 | 24.0 | 36.0 | $ 101,000 |
| 838 | 80 | 1 | 0.5% | 56.2 | 24.0 | 48.0 | $ 37,000 |
| 873 | 351 | 1 | 3.4% | 83.4 | 24.0 | 36.0 | $ 132,000 |
| 952 | 171 | 1 | 0.7% | 121.0 | 33.0 | 54.0 | $ 95,000 |
| 977 | 235 | 1 | 0.5% | 40.3 | 18.0 | 42.0 | $ 94,000 |
| 995 | 168 | 1 | 0.5% | 802.8 | 60.0 | 108.0 | $ 202,000 |
| 972 | 273 | 1 | 0.5% | 39.1 | 24.0 | 42.0 | $ 110,000 |
| 980 | 48 | 1 | 1.0% | 51.8 | 24.0 | 36.0 | $ 19,000 |
| **Group 3 MDF** | | | | | | | |
| 2399 | 13 | 1 | 1.0% | 85.1 | 24.0 | 48.0 | $ 6,000 |
| 2527 | 68 | 1 | 6.4% | 90.1 | 30.0 | 36.0 | $ 26,000 |
| 2527 | 53 | 1 | 2.0% | 56.2 | 30.0 | 36.0 | $ 20,000 |
| 2836 | 224 | 1 | 1.1% | 113.7 | 30.0 | 48.0 | $ 101,000 |
| 2820 | 204 | 1 | 1.1% | 114.9 | 30.0 | 48.0 | $ 92,000 |
| 1214 | 72 | 1 | 1.0% | 902.7 | 48.0 | 108.0 | $ 87,000 |
| 1214 | 78 | 1 | 1.8% | 883.6 | 48.0 | 96.0 | $ 79,000 |
| 3939 | 42 | 1 | 0.5% | 201.9 | 18.0 | 72.0 | $ 34,000 |
| 3940 | 58 | 1 | 2.2% | 205.8 | 18.0 | 54.0 | $ 32,000 |
| 2495 | 206 | 1 | 0.5% | 204.1 | 30.0 | 72.0 | $ 165,000 |
| 2473 | 90 | 1 | 0.5% | 333.1 | 42.0 | 84.0 | $ 82,000 |
| 2513 | 366 | 1 | 0.9% | 332.7 | 33.0 | 84.0 | $ 330,000 |
| 2514 | 163 | 2 | 0.8% | 334.5 | 27.0 | 84.0 | $ 294,000 |
| 2494 | 65 | 1 | 0.5% | 203.2 | 30.0 | 72.0 | $ 53,000 |
| 2473 | 79 | 1 | 0.5% | 334.4 | 42.0 | 84.0 | $ 71,000 |
| 2496 | 240 | 1 | 0.5% | 198.4 | 30.0 | 72.0 | $ 192,000 |
| 2269 | 325 | 1 | 0.5% | 434.9 | 42.0 | 96.0 | $ 325,000 |

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|---|---|---|---|---|---|---|---|
| 2772 | 11 | 1 | 0.5% | 84.6 | 30.0 | 54.0 | $ 7,000 |
| 2271 | 170 | 1 | 0.5% | 399.7 | 42.0 | 96.0 | $ 170,000 |
| 3149 | 164 | 1 | 0.5% | 62.1 | 30.0 | 48.0 | $ 74,000 |
| 3151 | 218 | 1 | 0.5% | 59.4 | 30.0 | 48.0 | $ 99,000 |
| 3149 | 12 | 1 | 0.5% | 51.0 | 30.0 | 42.0 | $ 5,000 |
| 3087 | 285 | 1 | 1.1% | 62.3 | 18.0 | 42.0 | $ 114,000 |
| 2831 | 82 | 1 | 1.0% | 40.4 | 18.0 | 36.0 | $ 31,000 |
| 2837 | 28 | 1 | 1.1% | 112.9 | 30.0 | 48.0 | $ 13,000 |
| 2843 | 45 | 1 | 0.8% | 35.5 | 18.0 | 36.0 | $ 17,000 |
| 2526 | 107 | 1 | 0.6% | 89.6 | 30.0 | 54.0 | $ 59,000 |
| 2421 | 61 | 1 | 1.7% | 121.8 | 30.0 | 48.0 | $ 28,000 |
| 2421 | 2 | 1 | 1.7% | 105.5 | 30.0 | 48.0 | $ 2,000 |
| 2420 | 83 | 1 | 1.8% | 113.5 | 30.0 | 48.0 | $ 38,000 |
| 2400 | 86 | 1 | 1.0% | 113.8 | 24.0 | 54.0 | $ 48,000 |
| 2394 | 250 | 1 | 0.5% | 23.4 | 24.0 | 36.0 | $ 94,000 |
| 1221 | 10 | 1 | 6.0% | 96.1 | 30.0 | 36.0 | $ 4,000 |
| 1221 | 56 | 1 | 0.8% | 111.6 | 30.0 | 54.0 | $ 31,000 |
| 1221 | 66 | 1 | 0.8% | 105.8 | 30.0 | 54.0 | $ 37,000 |
| 1220 | 55 | 1 | 4.3% | 89.3 | 30.0 | 36.0 | $ 21,000 |
| 1214 | 63 | 1 | 10.9% | 861.4 | 48.0 | 72.0 | $ 51,000 |
| 2453 | 41 | 1 | 7.7% | 200.5 | 18.0 | 42.0 | $ 17,000 |
| 2465 | 163 | 1 | 0.5% | 144.4 | 54.0 | 72.0 | $ 131,000 |
| 2448 | 250 | 1 | 2.2% | 292.3 | 30.0 | 60.0 | $ 163,000 |
| 2365 | 203 | 1 | 0.6% | 218.6 | 60.0 | 72.0 | $ 163,000 |
| 3499 | 128 | 1 | 1.1% | 71.8 | 30.0 | 42.0 | $ 52,000 |
| 2942 | 170 | 1 | 3.4% | 61.7 | 24.0 | 36.0 | $ 64,000 |
| 2449 | 36 | 1 | 33.1% | 334.4 | 36.0 | 42.0 | $ 15,000 |
| 2546 | 248 | 1 | 1.6% | 78.5 | 21.0 | 42.0 | $ 100,000 |
| 3489 | 170 | 1 | 3.3% | 94.7 | 30.0 | 42.0 | $ 68,000 |
| 2502 | 316 | 1 | 2.5% | 90.0 | 24.0 | 42.0 | $ 127,000 |
| 2979 | 224 | 1 | 7.9% | 193.7 | 18.0 | 42.0 | $ 90,000 |
| 2501 | 353 | 1 | 2.9% | 87.5 | 24.0 | 36.0 | $ 133,000 |
| 1268 | 90 | 1 | 1.6% | 151.8 | 48.0 | 54.0 | $ 50,000 |
| 2363 | 60 | 1 | 0.5% | 254.1 | 60.0 | 84.0 | $ 55,000 |
| 3474 | 277 | 1 | 6.1% | 141.1 | 36.0 | 42.0 | $ 111,000 |
| 3475 | 211 | 1 | 2.8% | 142.9 | 36.0 | 48.0 | $ 95,000 |
| 4276 | 260 | 1 | 4.9% | 332.4 | 36.0 | 54.0 | $ 144,000 |
| 2818 | 278 | 1 | 4.1% | 164.1 | 30.0 | 48.0 | $ 126,000 |
| 2796 | 159 | 1 | 8.2% | 173.6 | 30.0 | 42.0 | $ 64,000 |
| 2799 | 264 | 1 | 5.9% | 143.0 | 30.0 | 42.0 | $ 106,000 |
| 3472 | 273 | 1 | 3.8% | 175.2 | 36.0 | 48.0 | $ 123,000 |
| 2549 | 35 | 1 | 0.6% | 73.4 | 18.0 | 48.0 | $ 16,000 |
| 3496 | 181 | 1 | 2.5% | 92.6 | 30.0 | 42.0 | $ 73,000 |
| 2352 | 350 | 1 | 0.5% | 53.8 | 33.0 | 42.0 | $ 140,000 |

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|---|---|---|---|---|---|---|---|---|
| 2554 | 186 | 1 | 1.1% | 123.8 | 30.0 | 54.0 | $ | 103,000 |
| 2555 | 69 | 1 | 0.8% | 240.1 | 54.0 | 72.0 | $ | 56,000 |
| 2491 | 34 | 1 | 8.4% | 96.5 | 24.0 | 36.0 | $ | 13,000 |
| 2541 | 220 | 1 | 6.9% | 97.3 | 24.0 | 36.0 | $ | 83,000 |
| 2487 | 266 | 1 | 8.3% | 133.0 | 27.0 | 36.0 | $ | 100,000 |
| 2486 | 347 | 1 | 9.4% | 130.6 | 27.0 | 36.0 | $ | 131,000 |
| 2555 | 566 | 1 | 0.9% | 253.9 | 54.0 | 72.0 | $ | 453,000 |
| 2801 | 38 | 1 | 0.5% | 81.4 | 30.0 | 54.0 | $ | 21,000 |
| 4277 | 133 | 1 | 0.8% | 354.4 | 36.0 | 84.0 | $ | 120,000 |
| 1268 | 150 | 1 | 1.6% | 155.7 | 48.0 | 54.0 | $ | 83,000 |
| 2794 | 32 | 1 | 13.0% | 155.5 | 30.0 | 36.0 | $ | 13,000 |
| 4275 | 259 | 1 | 3.0% | 331.3 | 36.0 | 60.0 | $ | 169,000 |
| 2884 | 251 | 1 | 0.6% | 33.0 | 18.0 | 36.0 | $ | 95,000 |
| 2940 | 119 | 1 | 2.4% | 62.2 | 24.0 | 36.0 | $ | 45,000 |
| 2794 | 36 | 1 | 3.5% | 161.7 | 30.0 | 48.0 | $ | 17,000 |
| 2462 | 66 | 1 | 3.9% | 67.7 | 15.0 | 36.0 | $ | 25,000 |
| 3473 | 225 | 1 | 3.3% | 132.3 | 36.0 | 42.0 | $ | 91,000 |
| 3493 | 285 | 1 | 2.4% | 92.1 | 30.0 | 42.0 | $ | 115,000 |
| 2978 | 94 | 1 | 9.1% | 196.8 | 18.0 | 42.0 | $ | 38,000 |
| 2447 | 208 | 1 | 5.5% | 287.8 | 30.0 | 54.0 | $ | 115,000 |
| 3488 | 265 | 1 | 1.3% | 92.6 | 30.0 | 48.0 | $ | 120,000 |
| 2794 | 17 | 1 | 15.0% | 141.6 | 30.0 | 36.0 | $ | 7,000 |
| 3486 | 260 | 1 | 2.1% | 108.4 | 36.0 | 42.0 | $ | 105,000 |
| 2377 | 398 | 1 | 0.5% | 150.8 | 48.0 | 72.0 | $ | 319,000 |
| 2553 | 50 | 1 | 0.5% | 123.8 | 30.0 | 60.0 | $ | 33,000 |
| 2485 | 362 | 1 | 1.0% | 129.2 | 36.0 | 54.0 | $ | 200,000 |
| 2348 | 55 | 1 | 0.5% | 51.7 | 33.0 | 42.0 | $ | 22,000 |
| 3446 | 105 | 1 | 1.3% | 51.9 | 18.0 | 36.0 | $ | 40,000 |
| 2451 | 202 | 1 | 5.3% | 291.7 | 27.0 | 54.0 | $ | 112,000 |
| 2461 | 177 | 1 | 3.9% | 69.1 | 18.0 | 36.0 | $ | 67,000 |
| 2490 | 87 | 1 | 4.2% | 129.2 | 27.0 | 42.0 | $ | 35,000 |
| 3495 | 168 | 1 | 0.6% | 91.4 | 30.0 | 54.0 | $ | 93,000 |
| 2446 | 449 | 1 | 3.7% | 289.1 | 30.0 | 54.0 | $ | 248,000 |
| 3470 | 237 | 1 | 10.7% | 176.5 | 36.0 | 42.0 | $ | 95,000 |
| 2500 | 305 | 1 | 4.1% | 88.0 | 24.0 | 36.0 | $ | 115,000 |
| 2450 | 130 | 1 | 3.9% | 334.7 | 36.0 | 60.0 | $ | 85,000 |
| 2377 | 19 | 1 | 0.5% | 152.7 | 48.0 | 72.0 | $ | 16,000 |
| 2354 | 295 | 1 | 0.5% | 78.1 | 33.0 | 48.0 | $ | 133,000 |
| 3477 | 34 | 1 | 6.4% | 138.1 | 36.0 | 42.0 | $ | 14,000 |
| 2538 | 210 | 1 | 0.5% | 96.9 | 24.0 | 54.0 | $ | 116,000 |
| 2560 | 299 | 1 | 1.1% | 240.6 | 60.0 | 72.0 | $ | 240,000 |
| 3180 | 89 | 1 | 1.0% | 183.7 | 54.0 | 60.0 | $ | 58,000 |
| 1148 | 71 | 1 | 0.5% | 530.4 | 84.0 | 108.0 | $ | 86,000 |
| 1148 | 192 | 1 | 0.5% | 530.1 | 84.0 | 108.0 | $ | 231,000 |

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|---|---|---|---|---|---|---|---|---|
| 2858 | 178 | 2 | 0.5% | 134.4 | 42.0 | 60.0 | $ | 232,000 |
| 1148 | 299 | 1 | 0.5% | 528.3 | 84.0 | 108.0 | $ | 359,000 |
| 2608 | 189 | 1 | 1.7% | 159.0 | 42.0 | 54.0 | $ | 104,000 |
| 3180 | 84 | 1 | 1.1% | 189.0 | 54.0 | 60.0 | $ | 55,000 |
| 2858 | 137 | 2 | 0.6% | 176.5 | 42.0 | 72.0 | $ | 220,000 |
| 2610 | 169 | 1 | 1.6% | 157.4 | 42.0 | 54.0 | $ | 93,000 |
| 2609 | 92 | 1 | 1.4% | 153.5 | 42.0 | 54.0 | $ | 51,000 |
| 3182 | 412 | 1 | 1.0% | 400.0 | 54.0 | 84.0 | $ | 371,000 |
| 3182 | 200 | 1 | 1.0% | 404.6 | 54.0 | 84.0 | $ | 180,000 |
| 4185 | 109 | 1 | 0.5% | 117.4 | 42.0 | 60.0 | $ | 71,000 |
| 2626 | 19 | 1 | 0.6% | 31.5 | 18.0 | 36.0 | $ | 8,000 |
| 3842 | 86 | 1 | 0.6% | 58.1 | 30.0 | 42.0 | $ | 35,000 |
| 4186 | 365 | 1 | 0.5% | 115.3 | 42.0 | 60.0 | $ | 237,000 |
| 2278 | 462 | 1 | 0.6% | 49.7 | 24.0 | 42.0 | $ | 185,000 |
| 2575 | 375 | 1 | 0.5% | 141.9 | 42.0 | 60.0 | $ | 244,000 |
| 3919 | 263 | 1 | 0.5% | 56.0 | 18.0 | 48.0 | $ | 119,000 |
| 2771 | 101 | 1 | 0.5% | 62.2 | 30.0 | 48.0 | $ | 46,000 |
| 2576 | 279 | 1 | 0.5% | 134.5 | 42.0 | 60.0 | $ | 182,000 |
| 2652 | 8 | 1 | 0.5% | 32.1 | 18.0 | 36.0 | $ | 3,000 |
| 4187 | 471 | 1 | 0.5% | 119.6 | 42.0 | 60.0 | | |
| **Group 4 MDF** | | | | | | | | |
| 4502 | 238 | 1 | 1.1% | 62.6 | 30.0 | 42.0 | $ | 96,000 |
| 1692 | 279 | 1 | 0.5% | 55.5 | 30.0 | 48.0 | $ | 126,000 |
| 1693 | 36 | 1 | 0.8% | 53.9 | 30.0 | 42.0 | $ | 15,000 |
| 2030 | 291 | 1 | 3.0% | 189.3 | 36.0 | 48.0 | $ | 131,000 |
| 2032 | 373 | 1 | 3.0% | 177.8 | 36.0 | 48.0 | $ | 169,000 |
| 2134 | 174 | 1 | 1.1% | 54.5 | 27.0 | 42.0 | $ | 70,000 |
| 2031 | 295 | 1 | 3.4% | 183.3 | 36.0 | 48.0 | $ | 133,000 |
| 2029 | 52 | 1 | 2.2% | 147.5 | 36.0 | 48.0 | $ | 24,000 |
| 1152 | 17 | 1 | 3.6% | 84.3 | 24.0 | 36.0 | $ | 7,000 |
| 2029 | 29 | 1 | 1.9% | 191.1 | 36.0 | 54.0 | $ | 16,000 |
| 2045 | 20 | 1 | 4.1% | 121.2 | 30.0 | 42.0 | $ | 8,000 |
| 2024 | 135 | 1 | 2.9% | 127.8 | 30.0 | 42.0 | $ | 55,000 |
| 2025 | 304 | 1 | 5.0% | 118.6 | 30.0 | 42.0 | $ | 122,000 |
| 2026 | 148 | 1 | 2.9% | 118.1 | 30.0 | 42.0 | $ | 60,000 |
| 1862 | 113 | 1 | 0.5% | 57.1 | 24.0 | 48.0 | $ | 51,000 |
| 1954 | 120 | 1 | 2.3% | 395.2 | 54.0 | 72.0 | $ | 96,000 |
| 1831 | 587 | 1 | 6.0% | 369.2 | 36.0 | 54.0 | $ | 323,000 |
| 1635 | 94 | 2 | 2.7% | 409.6 | 42.0 | 72.0 | $ | 151,000 |
| 1945 | 55 | 1 | 1.1% | 382.5 | 54.0 | 84.0 | $ | 50,000 |
| 1953 | 100 | 1 | 3.6% | 388.4 | 54.0 | 72.0 | $ | 80,000 |
| 3935 | 20 | 2 | 7.5% | 434.6 | 42.0 | 60.0 | $ | 26,000 |
| 1829 | 236 | 1 | 6.0% | 361.4 | 36.0 | 54.0 | $ | 130,000 |
| 2724 | 200 | 1 | 5.5% | 366.6 | 36.0 | 60.0 | $ | 130,000 |

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|---|---|---|---|---|---|---|---|
| 1938 | 335 | 1 | 7.2% | 362.9 | 36.0 | 54.0 | $ 185,000 |
| 1775 | 46 | 1 | 1.8% | 167.4 | 36.0 | 54.0 | $ 26,000 |
| 1775 | 69 | 1 | 4.2% | 168.9 | 36.0 | 48.0 | $ 31,000 |
| 1837 | 82 | 1 | 3.2% | 472.9 | 54.0 | 72.0 | $ 66,000 |
| 1816 | 352 | 1 | 4.0% | 622.7 | 54.0 | 72.0 | $ 282,000 |
| 1839 | 113 | 1 | 3.6% | 520.9 | 54.0 | 72.0 | $ 91,000 |
| 1814 | 429 | 1 | 3.4% | 584.7 | 54.0 | 72.0 | $ 343,000 |
| 1814 | 14 | 1 | 3.4% | 568.4 | 54.0 | 72.0 | $ 12,000 |
| 1815 | 249 | 1 | 3.2% | 584.6 | 54.0 | 84.0 | $ 225,000 |
| 1840 | 117 | 1 | 6.9% | 521.7 | 54.0 | 60.0 | $ 77,000 |
| 1816 | 26 | 1 | 4.0% | 576.5 | 54.0 | 72.0 | $ 22,000 |
| 2201 | 158 | 1 | 1.0% | 43.5 | 18.0 | 36.0 | $ 60,000 |
| 1936 | 66 | 1 | 3.9% | 164.3 | 18.0 | 48.0 | $ 30,000 |
| 1116 | 36 | 1 | 2.1% | 1520.0 | 21.0 | 108.0 | $ 43,000 |
| 1933 | 200 | 1 | 1.3% | 158.5 | 18.0 | 54.0 | $ 110,000 |
| 1934 | 225 | 1 | 1.5% | 161.2 | 18.0 | 54.0 | $ 124,000 |
| 1925 | 112 | 1 | 5.2% | 162.2 | 18.0 | 42.0 | $ 45,000 |
| 1826 | 34 | 1 | 1.8% | 129.0 | 24.0 | 48.0 | $ 16,000 |
| 1827 | 210 | 1 | 1.1% | 142.8 | 24.0 | 54.0 | $ 116,000 |
| 1970 | 151 | 1 | 5.1% | 167.8 | 18.0 | 42.0 | $ 61,000 |
| 1968 | 137 | 1 | 4.2% | 190.0 | 30.0 | 48.0 | $ 62,000 |
| 1885 | 77 | 1 | 8.1% | 143.7 | 24.0 | 36.0 | $ 29,000 |
| 1935 | 100 | 1 | 4.1% | 163.1 | 18.0 | 48.0 | $ 45,000 |
| 1116 | 39 | 1 | 2.1% | 1500.0 | 21.0 | 108.0 | $ 47,000 |
| 1116 | 21 | 1 | 2.0% | 1517.2 | 21.0 | 108.0 | $ 25,000 |
| 1926 | 180 | 1 | 6.1% | 167.9 | 18.0 | 42.0 | $ 72,000 |
| 1969 | 221 | 1 | 1.0% | 186.4 | 18.0 | 60.0 | $ 144,000 |
| 1937 | 45 | 1 | 2.7% | 150.9 | 24.0 | 48.0 | $ 21,000 |
| 1804 | 155 | 1 | 3.2% | 290.8 | 30.0 | 60.0 | $ 101,000 |
| 1803 | 285 | 1 | 10.2% | 290.4 | 36.0 | 48.0 | $ 129,000 |
| 2743 | 38 | 1 | 0.5% | 43.5 | 18.0 | 42.0 | $ 16,000 |
| 4503 | 119 | 1 | 1.2% | 176.0 | 36.0 | 60.0 | $ 78,000 |
| 2130 | 44 | 1 | 1.3% | 69.7 | 27.0 | 42.0 | $ 18,000 |
| 1698 | 114 | 1 | 0.5% | 65.6 | 24.0 | 48.0 | $ 52,000 |
| 2138 | 28 | 1 | 1.0% | 48.4 | 18.0 | 36.0 | $ 11,000 |
| 3313 | 74 | 1 | 0.5% | 101.1 | 30.0 | 54.0 | $ 41,000 |
| 2167 | 177 | 1 | 1.4% | 103.8 | 30.0 | 48.0 | $ 80,000 |
| 2179 | 92 | 1 | 2.2% | 50.4 | 18.0 | 36.0 | $ 35,000 |
| 2166 | 248 | 1 | 0.6% | 104.4 | 30.0 | 54.0 | $ 137,000 |
| 2137 | 306 | 1 | 1.0% | 65.4 | 18.0 | 42.0 | $ 123,000 |
| 2745 | 105 | 1 | 0.6% | 49.7 | 18.0 | 42.0 | $ 42,000 |
| 2033 | 281 | 1 | 1.9% | 175.2 | 36.0 | 54.0 | $ 155,000 |
| 1984 | 60 | 1 | 1.3% | 56.6 | 18.0 | 36.0 | $ 23,000 |
| 1675 | 313 | 1 | 1.5% | 171.7 | 48.0 | 54.0 | $ 172,000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3619 | 69 | 1 | 0.5% | 119.0 | 24.0 | 60.0 | $ | 45,000 |
| 2188 | 14 | 1 | 4.0% | 108.8 | 18.0 | 42.0 | $ | 6,000 |
| 3317 | 166 | 2 | 0.5% | 159.4 | 54.0 | 72.0 | $ | 266,000 |
| 1824 | 32 | 1 | 0.7% | 135.4 | 24.0 | 60.0 | $ | 22,000 |
| 1825 | 271 | 1 | 8.0% | 120.1 | 24.0 | 36.0 | $ | 102,000 |
| 1821 | 36 | 1 | 1.4% | 88.7 | 18.0 | 42.0 | $ | 15,000 |
| 1942 | 374 | 1 | 3.9% | 371.5 | 48.0 | 60.0 | $ | 244,000 |
| 1939 | 427 | 1 | 4.5% | 361.5 | 36.0 | 60.0 | $ | 278,000 |
| 1941 | 124 | 1 | 6.5% | 371.5 | 48.0 | 54.0 | $ | 69,000 |
| 1943 | 64 | 1 | 4.4% | 381.9 | 48.0 | 60.0 | $ | 42,000 |
| 1940 | 300 | 1 | 2.0% | 371.6 | 36.0 | 72.0 | $ | 240,000 |
| 1921 | 273 | 1 | 1.8% | 63.1 | 24.0 | 36.0 | $ | 103,000 |
| 1944 | 182 | 1 | 2.4% | 391.3 | 54.0 | 72.0 | $ | 146,000 |
| | | | | | | **Sum** | **$** | **46,900,000** |

RICK ENGINEERING COMPANY

**Santee MDS - RCB Master**
**Drainage Facilities**

**Preliminary Storm Drain Size and Estimated Cost: RCB MDFs**

| City ID | Length (ft) | Barrels | Slope (%) | $Q_{100}$ (cfs) | Height (ft) | Width (ft) | Recommended Pipe Width (ft) | Estimated Cost ($) |
|---|---|---|---|---|---|---|---|---|
| **Group 2 MDF** | | | | | | | | |
| 1459 | 265 | 1.0 | 1.7% | 982.1 | 6.00 | 8.0 | 9.0 | $ 800,000 |
| 1458 | 480 | 1.0 | 0.6% | 915.7 | 6.00 | 8.0 | 13.0 | $ 1,700,000 |
| 1322 | 32 | 1.0 | 0.6% | 290.6 | 3.00 | 6.0 | 11.0 | $ 100,000 |
| 726 | 16 | 1.0 | 1.1% | 1306.1 | 5.00 | 7.0 | 16.0 | $ 100,000 |
| 726 | 10 | 1.0 | 1.3% | 1191.3 | 5.00 | 7.0 | 14.0 | $ 100,000 |
| 726 | 36 | 1.0 | 1.3% | 1302.7 | 5.00 | 7.0 | 15.0 | $ 200,000 |
| 726 | 11 | 1.0 | 1.3% | 1182.2 | 5.00 | 7.0 | 14.0 | $ 100,000 |
| 634 | 38 | 1.0 | 0.5% | 2134.0 | 13.58 | 8.0 | 12.0 | $ 200,000 |
| 949 | 4 | 1.0 | 0.5% | 5158.7 | 4.50 | 12.5 | 65.0 | $ 100,000 |
| 634 | 9 | 1.0 | 0.5% | 1799.4 | 13.58 | 8.0 | 10.0 | $ 100,000 |
| 949 | 88 | 1.0 | 0.5% | 4607.6 | 4.50 | 12.5 | 60.0 | $ 1,100,000 |
| 949 | 7 | 1.0 | 0.5% | 4869.7 | 4.50 | 12.5 | 62.0 | $ 100,000 |
| 634 | 8 | 1.0 | 0.5% | 2920.5 | 13.58 | 8.0 | 14.0 | $ 100,000 |
| 330 | 27 | 1.0 | 0.8% | 1608.3 | 4.00 | 8.0 | 26.0 | $ 200,000 |
| 330 | 26 | 1.0 | 0.8% | 1681.5 | 4.00 | 8.0 | 27.0 | $ 200,000 |
| 330 | 58 | 1.0 | 0.9% | 2033.4 | 4.00 | 8.0 | 29.0 | $ 400,000 |
| 1212 | 62 | 1.0 | 0.6% | 297.5 | 4.00 | 4.0 | 9.0 | $ 200,000 |
| 700 | 59 | 1.0 | 1.8% | 788.4 | 4.00 | 7.0 | 11.0 | $ 200,000 |
| **Group 3 MDF** | | | | | | | | |
| 1143 | 35 | 1.0 | 0.5% | 438.1 | 5.00 | 5.0 | 10.0 | $ 100,000 |
| 1147 | 39 | 1.0 | 0.5% | 563.0 | 5.00 | 4.0 | 12.0 | $ 200,000 |
| 1154 | 500 | 1.0 | 0.9% | 405.1 | 3.17 | 4.8 | 11.0 | $ 1,400,000 |
| 1147 | 114 | 1.0 | 0.5% | 506.2 | 4.50 | 4.0 | 12.0 | $ 400,000 |
| 4181 | 57 | 1.0 | 0.9% | 335.9 | 3.00 | 10.0 | 11.0 | $ 200,000 |
| 4182 | 28 | 1.0 | 0.5% | 342.9 | 3.50 | 10.0 | 11.0 | $ 100,000 |
| **Group 4 MDF** | | | | | | | | |
| 3037 | 221 | 1.0 | 1.9% | 2133.5 | 5.00 | 8.0 | 19.0 | $ 1,000,000 |
| 1700 | 27 | 1.0 | 1.0% | 2150.3 | 5.00 | 7.0 | 24.0 | $ 200,000 |
| 2615 | 57 | 1.0 | 0.6% | 2265.1 | 4.00 | 10.0 | 36.0 | $ 500,000 |
| 2615 | 57 | 1.0 | 0.6% | 2240.9 | 4.00 | 10.0 | 36.0 | $ 500,000 |
| 1700 | 106 | 1.0 | 1.0% | 2153.5 | 5.00 | 7.0 | 24.0 | $ 600,000 |
| 2280 | 91 | 1.0 | 0.6% | 2134.2 | 4.00 | 8.0 | 35.0 | $ 700,000 |
| 3615 | 433 | 1.0 | 1.0% | 2154.7 | 5.00 | 8.0 | 24.0 | $ 2,400,000 |
| 1700 | 23 | 1.0 | 1.0% | 2164.6 | 5.00 | 7.0 | 24.0 | $ 200,000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2280 | 78 | 1.0 | 0.6% | 2217.4 | 4.00 | 8.0 | 36.0 | $ 600,000 |
| 3037 | 48 | 1.0 | 1.9% | 2137.0 | 5.00 | 8.0 | 19.0 | $ 300,000 |
| 2280 | 395 | 1.0 | 1.4% | 2134.8 | 4.00 | 8.0 | 26.0 | $ 2,200,000 |
| 1643 | 203 | 1.0 | 0.6% | 1693.7 | 3.00 | 3.0 | 41.0 | $ 1,700,000 |
| 1643 | 45 | 1.0 | 0.6% | 1641.3 | 3.00 | 3.0 | 40.0 | $ 400,000 |
| 1643 | 88 | 1.0 | 0.6% | 1646.8 | 3.00 | 3.0 | 40.0 | $ 800,000 |
| 3608 | 41 | 1.0 | 2.5% | 2157.5 | 5.00 | 6.0 | 17.0 | $ 200,000 |
| 2742 | 172 | 1.0 | 1.1% | 2238.4 | 5.00 | 10.0 | 23.0 | $ 900,000 |
| 2563 | 25 | 1.0 | 1.2% | 2145.9 | 5.00 | 6.0 | 22.0 | $ 200,000 |
| 2563 | 57 | 1.0 | 1.2% | 2102.0 | 5.00 | 6.0 | 22.0 | $ 300,000 |
| 2742 | 7 | 1.0 | 1.1% | 2201.9 | 5.00 | 10.0 | 23.0 | $ 100,000 |
| 2742 | 397 | 1.0 | 0.5% | 2111.6 | 5.00 | 10.0 | 30.0 | $ 2,600,000 |
| 2563 | 38 | 1.0 | 1.2% | 2108.2 | 5.00 | 6.0 | 22.0 | $ 200,000 |
| 3615 | 177 | 1.0 | 1.3% | 2153.0 | 5.00 | 8.0 | 21.0 | $ 900,000 |
| 3615 | 44 | 1.0 | 0.9% | 2153.0 | 5.00 | 8.0 | 25.0 | $ 300,000 |
| 2742 | 81 | 1.0 | 3.6% | 2100.6 | 5.00 | 10.0 | 15.0 | $ 300,000 |
| | | | | | | | **Sum** | **$ 26,500,000** |

RICK ENGINEERING COMPANY

**Santee MDS - Arch/Elliptical**
**Master Drainage Facilities**

**Preliminary Storm Drain Size and Estimated Cost: Arch/Elliptical MDFs**

| City ID | Length (ft) | Barrels | Slope (%) | $Q_{100}$ (cfs) | Height (in) | Width (in) | Recommended Pipe Size (Equ. Diam.) (in) | Estimated Cost ($) |
|---|---|---|---|---|---|---|---|---|
| **Group 2 MDF** | | | | | | | | |
| 1188 | 133 | 2.0 | 0.5% | 197.6 | 33.00 | 49.0 | 72.0 | $ 214,000 |
| 2824 | 100 | 2.0 | 1.6% | 74.8 | 22.00 | 36.0 | 42.0 | $ 80,000 |
| 1188 | 67 | 2.0 | 5.1% | 192.7 | 33.00 | 49.0 | 48.0 | $ 61,000 |
| 973 | 88 | 1.0 | 0.5% | 32.8 | 13.00 | 22.0 | 36.0 | $ 33,000 |
| 705 | 169 | 1.0 | 0.7% | 766.6 | 57.00 | 83.0 | 108.0 | $ 203,000 |
| 707 | 26 | 1.0 | 0.9% | 759.4 | 57.00 | 83.0 | 108.0 | $ 31,000 |
| 704 | 49 | 1.0 | 0.9% | 781.7 | 58.00 | 91.0 | 108.0 | $ 59,000 |
| 693 | 393 | 1.0 | 2.5% | 651.9 | 57.00 | 83.0 | 84.0 | $ 354,000 |
| 706 | 131 | 1.0 | 0.6% | 765.0 | 57.00 | 83.0 | 108.0 | $ 158,000 |
| 951 | 25 | 1.0 | 0.6% | 121.2 | 27.00 | 43.0 | 60.0 | $ 17,000 |
| **Group 3 MDF** | | | | | | | | |
| 2474 | 59 | 1.0 | 0.5% | 334.0 | 44.00 | 72.0 | 84.0 | $ 53,000 |
| 2512 | 60 | 1.0 | 1.3% | 332.8 | 29.00 | 45.0 | 72.0 | $ 48,000 |
| 2270 | 90 | 1.0 | 0.5% | 436.9 | 33.00 | 49.0 | 96.0 | $ 90,000 |
| 2272 | 17 | 1.0 | 0.5% | 400.3 | 43.00 | 64.0 | 96.0 | $ 17,000 |
| 3152 | 375 | 1.0 | 0.5% | 48.8 | 20.00 | 28.0 | 42.0 | $ 150,000 |
| 3155 | 350 | 1.0 | 0.5% | 52.5 | 20.00 | 28.0 | 42.0 | $ 140,000 |
| 2468 | 79 | 1.0 | 0.5% | 156.9 | 44.00 | 72.0 | 72.0 | $ 64,000 |
| 2470 | 59 | 1.0 | 0.5% | 174.0 | 44.00 | 72.0 | 72.0 | $ 48,000 |
| 2466 | 282 | 1.0 | 0.5% | 143.7 | 40.00 | 65.0 | 72.0 | $ 226,000 |
| 2464 | 38 | 1.0 | 0.5% | 142.6 | 40.00 | 65.0 | 72.0 | $ 31,000 |
| 2475 | 427 | 1.0 | 0.5% | 349.5 | 44.00 | 72.0 | 96.0 | $ 427,000 |
| 2476 | 54 | 1.0 | 0.5% | 374.0 | 44.00 | 72.0 | 96.0 | $ 54,000 |
| 2469 | 73 | 1.0 | 0.5% | 171.9 | 44.00 | 72.0 | 72.0 | $ 59,000 |
| 3551 | 70 | 1.0 | 0.5% | 113.7 | 18.00 | 24.0 | 60.0 | $ 46,000 |
| 3175 | 42.0 | 1.0 | 0.7% | 52.4 | 20.00 | 28.0 | 42.0 | $ 17,000 |
| 2279 | 48 | 1.0 | 0.5% | 52.3 | 20.00 | 28.0 | 42.0 | $ 20,000 |
| 3156 | 448 | 1.0 | 0.5% | 37.9 | 20.00 | 28.0 | 42.0 | $ 180,000 |
| **Group 4 MDF** | | | | | | | | |
| 4168 | 83 | 1.0 | 2.5% | 82.5 | 27.00 | 43.0 | 42.0 | $ 34,000 |
| 4169 | 156 | 1.0 | 0.5% | 61.7 | 27.00 | 43.0 | 48.0 | $ 71,000 |
| 2147 | 83 | 2.0 | 7.6% | 440.9 | 31.00 | 50.0 | 60.0 | $ 109,000 |
| 2140 | 88 | 1.0 | 0.6% | 1969.1 | 18.00 | 35.0 | 108.0 | $ 106,000 |
| 1961 | 92 | 2.0 | 0.8% | 77.7 | 9.00 | 30.0 | 48.0 | $ 83,000 |
| 4175 | 155 | 1.0 | 0.5% | 60.1 | 27.00 | 43.0 | 48.0 | $ 70,000 |
| | | | | | | | **Sum** | **$ 3,400,000** |

RICK ENGINEERING COMPANY

**Santee MDS - Circular Drainage Facilities**
**<36"**

**Preliminary Storm Drain Size and Estimated Cost: Circular (<36")**

| City ID | Length (ft) | Barrels | Slope (%) | $Q_{100}$ (cfs) | Original Pipe Size (in) | Recommended Pipe Size (in) | Estimated Cost ($) |
|---|---|---|---|---|---|---|---|
| **Group 1 (<36")** | | | | | | | |
| 397 | 56 | 1 | 0.8% | 15.9 | 18.0 | 24.0 | $ 17,000 |
| 399 | 84 | 1 | 9.0% | 40.7 | 18.0 | 24.0 | $ 26,000 |
| 378 | 48 | 1 | 5.9% | 72.7 | 27.0 | 30.0 | $ 17,000 |
| 377 | 235 | 1 | 5.2% | 50.2 | 18.0 | 30.0 | $ 83,000 |
| 2905 | 61 | 1 | 14.2% | 73.3 | 24.0 | 30.0 | $ 22,000 |
| 241 | 57 | 1 | 27.0% | 67.2 | 21.0 | 24.0 | $ 18,000 |
| 244 | 123 | 1 | 2.5% | 45.1 | 21.0 | 30.0 | $ 43,000 |
| **Group 2 (<36")** | | | | | | | |
| 176 | 289 | 1 | 8.8% | 54.6 | 18.0 | 30.0 | $ 102,000 |
| 458 | 240 | 1 | 4.1% | 60.9 | 18.0 | 30.0 | $ 84,000 |
| 560 | 131 | 1 | 6.9% | 46.2 | 18.0 | 24.0 | $ 40,000 |
| 563 | 344 | 1 | 4.3% | 44.2 | 18.0 | 30.0 | $ 121,000 |
| 715 | 46 | 1 | 2.3% | 48.6 | 18.0 | 30.0 | $ 17,000 |
| 768 | 85 | 1 | 5.8% | 51.9 | 18.0 | 30.0 | $ 30,000 |
| 824 | 211 | 1 | 3.7% | 59.7 | 18.0 | 30.0 | $ 74,000 |
| 4578 | 14 | 1 | 26.4% | 47.3 | 8.0 | 24.0 | $ 5,000 |
| 559 | 195 | 1 | 5.1% | 69.5 | 18.0 | 30.0 | $ 69,000 |
| 1440 | 137 | 1 | 0.6% | 14.4 | 24.0 | 30.0 | $ 48,000 |
| 553 | 104 | 1 | 3.3% | 46.2 | 18.0 | 30.0 | $ 37,000 |
| 557 | 302 | 1 | 3.0% | 54.1 | 18.0 | 30.0 | $ 106,000 |
| 1352 | 47 | 1 | 4.3% | 28.4 | 18.0 | 24.0 | $ 15,000 |
| 564 | 295 | 1 | 5.3% | 72.8 | 18.0 | 30.0 | $ 104,000 |
| 829 | 118 | 1 | 2.8% | 49.7 | 24.0 | 30.0 | $ 42,000 |
| 825 | 38 | 1 | 1.8% | 32.4 | 18.0 | 30.0 | $ 14,000 |
| 958 | 114 | 1 | 0.5% | 7.1 | 18.0 | 24.0 | $ 35,000 |
| **Group 3 (<36")** | | | | | | | |
| 3943 | 363 | 1 | 5.0% | 56.7 | 18.0 | 30.0 | $ 127,000 |
| 2844 | 40 | 1 | 0.5% | 20.2 | 15.0 | 30.0 | $ 14,000 |
| 2547 | 170 | 1 | 9.6% | 79.1 | 18.0 | 30.0 | $ 60,000 |
| 3500 | 21 | 1 | 4.1% | 30.8 | 18.0 | 24.0 | $ 7,000 |
| 2544 | 300 | 1 | 6.8% | 77.9 | 21.0 | 30.0 | $ 106,000 |
| 2800 | 12 | 1 | 4.9% | 47.5 | 18.0 | 30.0 | $ 5,000 |
| 3459 | 135 | 1 | 25.3% | 53.5 | 18.0 | 24.0 | $ 41,000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2543 | 10 | 1 | 0.9% | 29.4 | 18.0 | 30.0 | $ | 4,000 |
| 2472 | 291 | 1 | 3.3% | 33.7 | 18.0 | 30.0 | $ | 102,000 |
| 2545 | 273 | 1 | 6.2% | 78.3 | 21.0 | 30.0 | $ | 96,000 |
| 2883 | 55 | 1 | 1.0% | 25.3 | 18.0 | 30.0 | $ | 20,000 |
| 2452 | 115 | 1 | 18.5% | 94.3 | 24.0 | 30.0 | $ | 41,000 |
| 2503 | 57 | 1 | 5.4% | 71.6 | 18.0 | 30.0 | $ | 20,000 |
| 3474 | 19 | 1 | 2.3% | 25.4 | 18.0 | 24.0 | $ | 6,000 |
| 3181 | 150 | 1 | 1.2% | 31.3 | 24.0 | 30.0 | $ | 53,000 |
| 3288 | 44 | 1 | 0.8% | 26.3 | 18.0 | 30.0 | $ | 16,000 |
| 3206 | 4 | 1 | 4.8% | 39.1 | 15.0 | 30.0 | $ | 2,000 |
| 2277 | 116 | 1 | 2.6% | 39.4 | 18.0 | 30.0 | $ | 41,000 |
| 3564 | 10 | 1 | 1.7% | 25.4 | 18.0 | 30.0 | $ | 4,000 |
| **Group 4 (<36")** | | | | | | | | |
| 2036 | 44 | 1 | 3.0% | 46.1 | 18.0 | 30.0 | $ | 16,000 |
| 2097 | 61 | 1 | 3.7% | 57.2 | 18.0 | 30.0 | $ | 22,000 |
| 1117 | 45 | 1 | 11.3% | 36.1 | 18.0 | 24.0 | $ | 14,000 |
| 1920 | 219 | 1 | 8.6% | 65.4 | 24.0 | 30.0 | $ | 77,000 |
| 3983 | 152 | 1 | 1.7% | 31.2 | 12.0 | 30.0 | $ | 54,000 |
| 3320 | 31 | 1 | 7.6% | 43.4 | 18.0 | 24.0 | $ | 10,000 |
| 2124 | 38 | 1 | 1.5% | 31.2 | 18.0 | 30.0 | $ | 14,000 |
| 2138 | 144 | 1 | 0.5% | 13.4 | 18.0 | 30.0 | $ | 51,000 |
| 1151 | 58 | 1 | 4.0% | 53.1 | 18.0 | 30.0 | $ | 21,000 |
| 4541 | 58 | 1 | 0.8% | 14.9 | 12.0 | 24.0 | $ | 18,000 |
| 2751 | 102 | 1 | 0.5% | 16.2 | 18.0 | 30.0 | $ | 36,000 |
| 2178 | 45 | 1 | 0.9% | 23.5 | 18.0 | 30.0 | $ | 16,000 |
| 1823 | 265 | 1 | 13.0% | 100.7 | 18.0 | 30.0 | $ | 93,000 |
| | | | | | | **Sum** | **$** | **2,400,000** |

RICK ENGINEERING COMPANY

**Santee MDS - RCB Drainage**
**Facilities <36"**

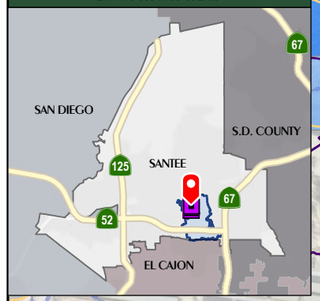
**Preliminary Storm Drain Size and Estimated Cost: RCB (<36")**

| City ID | Length (ft) | Barrels | Slope (%) | $Q_{100}$ (cfs) | Height (ft) | Width (ft) | Recommended Pipe Width (ft) | Estimated Cost ($) |
|---|---|---|---|---|---|---|---|---|
| **Group 2 (<36")** | | | | | | | | |
| 1322 | 6 | 1.0 | 2.4% | 277.9 | 3.00 | 6.0 | 7.0 | $ 100,000 |
| **Group 3(<36")** | | | | | | | | |
| 2515 | 154 | 1.0 | 2.5% | 333.4 | 4.00 | 4.0 | 6.0 | $ 300,000 |
| 2816 | 217 | 1.0 | 1.0% | 162.0 | 2.00 | 4.0 | 9.0 | $ 500,000 |
| 2817 | 142 | 1.0 | 1.5% | 165.4 | 2.00 | 3.0 | 8.0 | $ 300,000 |
| | | | | | | | **Sum** | **$ 1,200,000** |

# Appendix 7

## Project Fact Sheets

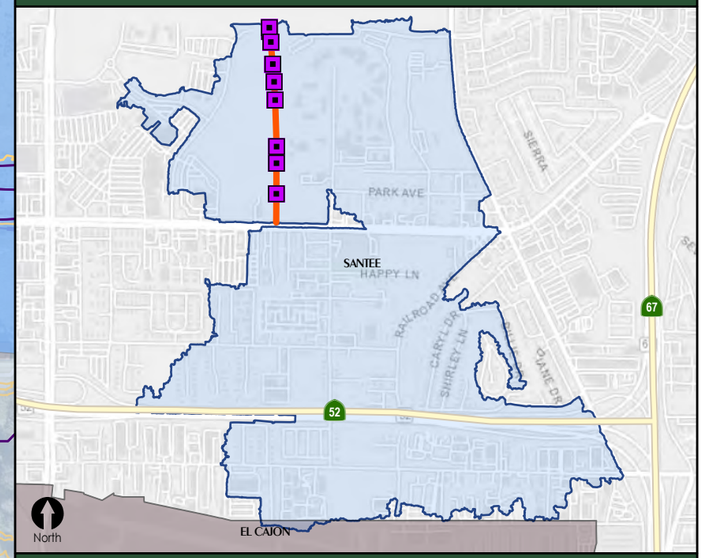
LOCATION MAP







DRAINAGE AREA: 403 AC.




## PROJECT ID: 1A

### PROJECT NAME

Las Colinas Channel Culvert and Upsizing

### LOCATION

Las Colinas Channel from Mission Gorge Rd to San Diego River

### PROJECT DESCRIPTION

- Replace CMP upstream of Las Colinas Channel with 320 LF of 14'x5' RCB.
- Regrade the Las Colinas Channel to add approximately 340 LF of 14'x5' RCB.
- Upsize approximately 1,460 LF of earthen Las Colinas Channel to 8'x4'.
- Add 40 LF of 14'x5' RCB downstream of Las Colinas Channel, crossing Riverview Pkwy. A total of 700 LF of 14'x5' RCB is expected for this project.
- The addition and/or replacement of nine (9) headwalls is anticipated.

### PROJECT HYDROLOGIC SUMMARY

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 403 | 80 | 635 |

### COST SUMMARY

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 3,050,000 | $ 1,220,000 | $ 4,270,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**
- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**
- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**
- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 300 600

Date of Exhibit: 7/19/2023
SANGIS/SANDAG Aerial Imagery, 2020

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RICK ENGINEERING COMPANY

Santee
DO MORE ▸ DUE EAST

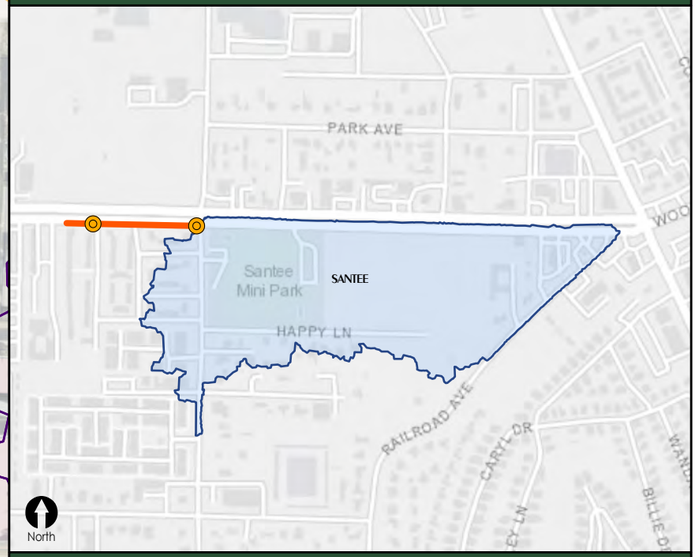
LOCATION MAP







## DRAINAGE AREA: 26 AC.




## PROJECT ID: 1B

**PROJECT NAME**

Cottonwood Ave to Mission Gorge Rd Storm Drain Upsize

**LOCATION**

Corner of Cottonwood Ave and Mission Gorge Rd

**PROJECT DESCRIPTION**

- Remove and replace CMP along east side of Mission Gorge with 580 LF of 48-inch RCP.
- The addition and/or replacement of two (2) cleanouts is anticipated.

Note: Actual alignment and POC may vary for interim condition (i.e., if this segment is constructed prior to Project 1C - Mission Gorge Culvert Project).

**PROJECT HYDROLOGIC SUMMARY**

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 26 | 82 | 39 |

**COST SUMMARY**

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 560,000 | $ 230,000 | $ 790,000 |

**LEGEND**

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 100 200

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Santee DO MORE ▸ DUE EAST

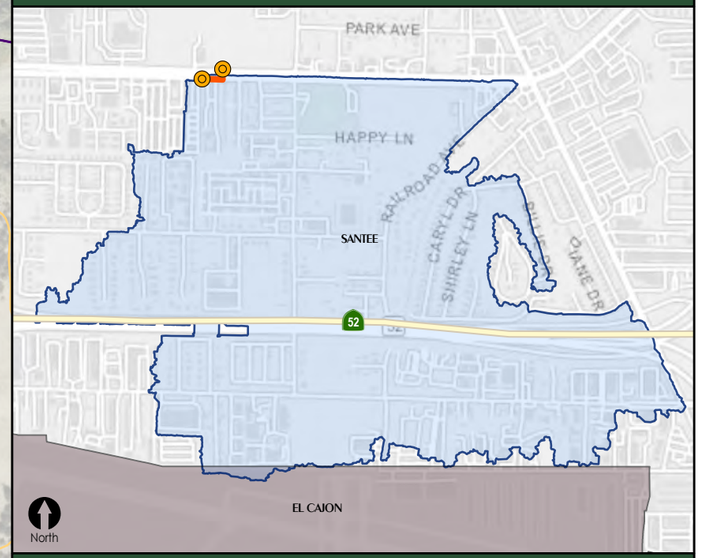
## LOCATION MAP







## DRAINAGE AREA: 250 AC.




## PROJECT ID: 1C

### PROJECT NAME

Mission Gorge Culvert Project

### LOCATION

Downstream Buena Vista Channel to Upstream Las Colinas Channel

### PROJECT DESCRIPTION

- Replace CMP downstream of Buena Vista Channel, running across Mission Gorge Rd with 260 LF of 14'x5' RCB.
- The addition and/or replacement of two (2) cleanouts and one (1) inlet is anticipated.

### PROJECT HYDROLOGIC SUMMARY

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 250 | 81 | 437 |

### COST SUMMARY

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 1,100,000 | $ 440,000 | $ 1,540,000 |

## LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**
- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**
- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**
- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 — 100 — 200

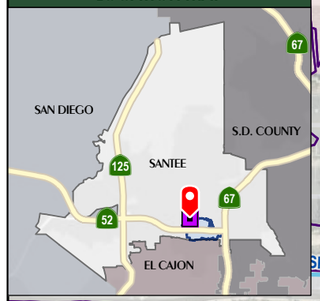
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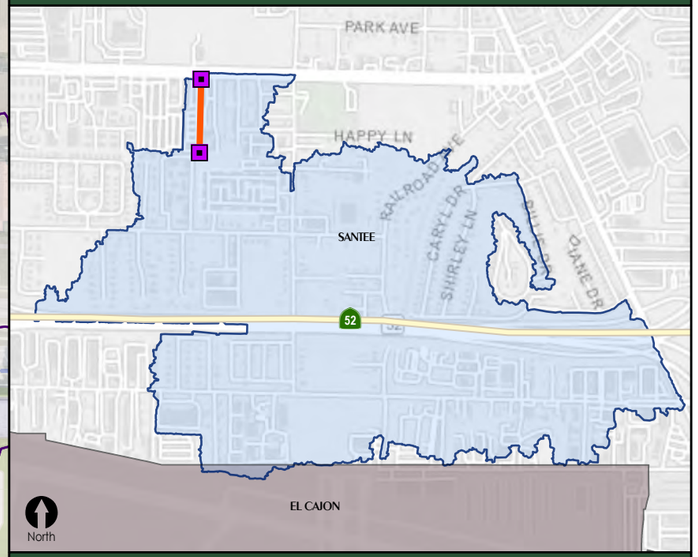
RICK ENGINEERING COMPANY

Santee DO MORE ▸ DUE EAST

## LOCATION MAP




## DRAINAGE AREA: 224 AC.




## PROJECT ID: 2

### PROJECT NAME

Buena Vista Channel Upsizing

### LOCATION

Buena Vista Channel between Buena Vista Ave to Mission Gorge Rd

### PROJECT DESCRIPTION

- Replace the most downstream portion of the Buena Vista Channel with 610 LF 14'x5' RCB.
- Remove and replace 20 LF of CMP downstream of Buena Vista Channel with 14'x5' RCB.
- The addition and/or replacement of two (2) headwalls is anticipated.

Note: Upstream deficiencies between Hwy 52 and Buena Vista Ave are unable to be improved due to easement constraints in the area. The system was recently upsized to maximum allowable size within the available ROW.

### PROJECT HYDROLOGIC SUMMARY

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 224 | 76 | 400 |

### COST SUMMARY

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 2,440,000 | $ 980,000 | $ 3,420,000 |

## LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 — 150 — 300

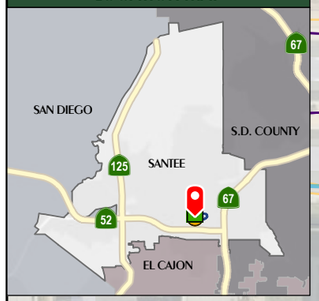
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Santee DO MORE ▸ DUE EAST

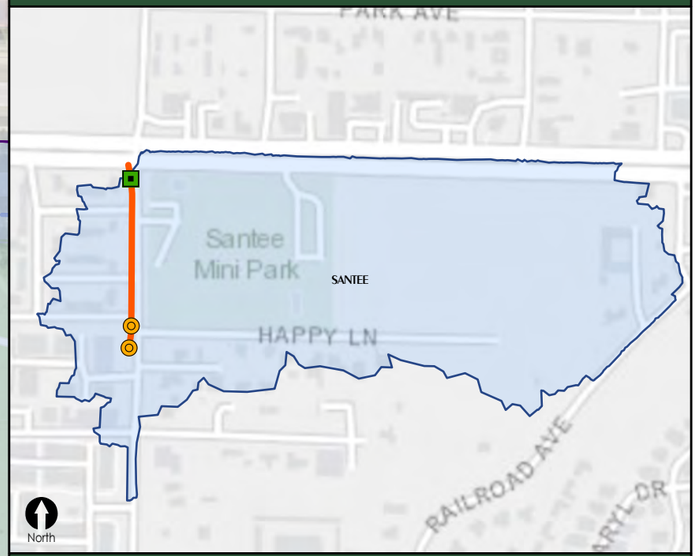
## LOCATION MAP







## DRAINAGE AREA: 24 AC.




## PROJECT ID: 3.1A

### PROJECT NAME

Cottonwood Ave - Las Brisas Dr and Mission Gorge Rd Storm Drain Upsize

### LOCATION

Cottonwood Ave between Las Brisas Dr and Mission Gorge Rd

### PROJECT DESCRIPTION

- Remove and replace 18-inch CSP with 470 LF of 36-inch RCP.
- Remove and replace 28x20-inch CMP at Mission Gorge intersection with 40 LF of 48-inch RCP.
- The addition and/or replacement of two (2) cleanouts and one (1) inlet is anticipated.

### PROJECT HYDROLOGIC SUMMARY

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 24 | 86 | 53 |

### COST SUMMARY

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 450,000 | $ 180,000 | $ 630,000 |

## LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**
- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**
- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**
- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 — 80 — 160

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Santee
DO MORE ▸ DUE EAST

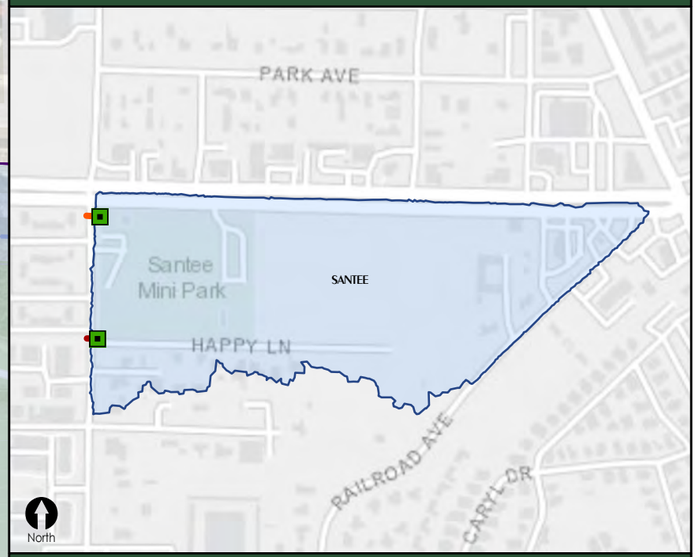
## LOCATION MAP







## DRAINAGE AREA: 22 AC.




## PROJECT ID: 3.1B

**PROJECT NAME**

Cottonwood Ave - Happy Ln and Mission Gorge Rd Storm Drain Improvements

**LOCATION**

Cottonwood Ave between Happy Ln to Mission Gorge Rd

**PROJECT DESCRIPTION**

- Add 40 LF of new 36-inch RCP, lateral to existing pipe.
- Remove and replace lateral 28x20-inch CMP at Mission Gorge intersection with 50 LF of 42-inch RCP.
- The addition and/or replacement of two (2) inlets is anticipated.
- Add approximately 500 LF of curb and gutter along Cottonwood where there is none.

**PROJECT HYDROLOGIC SUMMARY**

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 22 | 88 | 50 |

**COST SUMMARY**

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 190,000 | $ 80,000 | $ 270,000 |

## LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 — 80 — 160

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Santee DO MORE ▶ DUE EAST

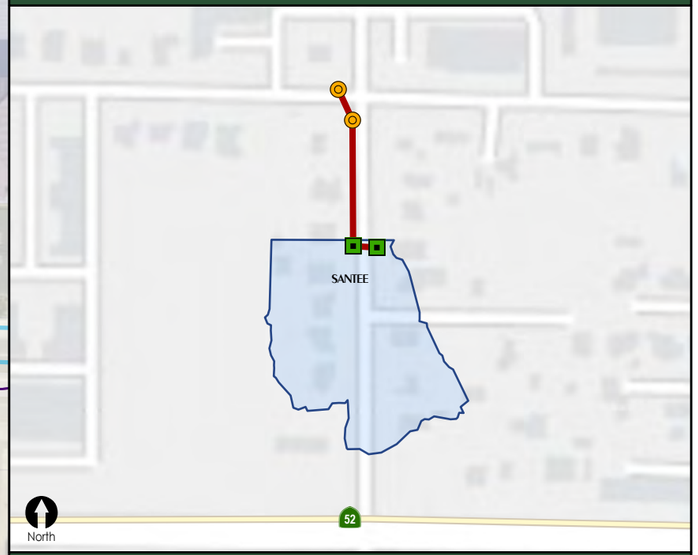
LOCATION MAP







## DRAINAGE AREA: 3 AC.




## PROJECT ID: 3.2

**PROJECT NAME**

Cottonwood Ave - El Toro Ln and Buena Vista Ave

**LOCATION**

Cottonwood Ave between El Toro Ln and Buena Vista Ave

**PROJECT DESCRIPTION**

- Add 300 LF of 18-inch RCP as a backbone storm drain down Cottonwood, connecting to existing 42-inch RCP running west along Buena Vista.
- The addition and/or replacement of two (2) cleanouts and two (2) inlets is anticipated.
- Add approximately 400 LF of curb and gutter along Cottonwood where there is none.

**PROJECT HYDROLOGIC SUMMARY**

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 3 | 92 | 21 |

**COST SUMMARY**

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 290,000 | $ 120,000 | $ 410,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 60 120

Date of Exhibit: 7/19/2023

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Santee DO MORE ▸ DUE EAST

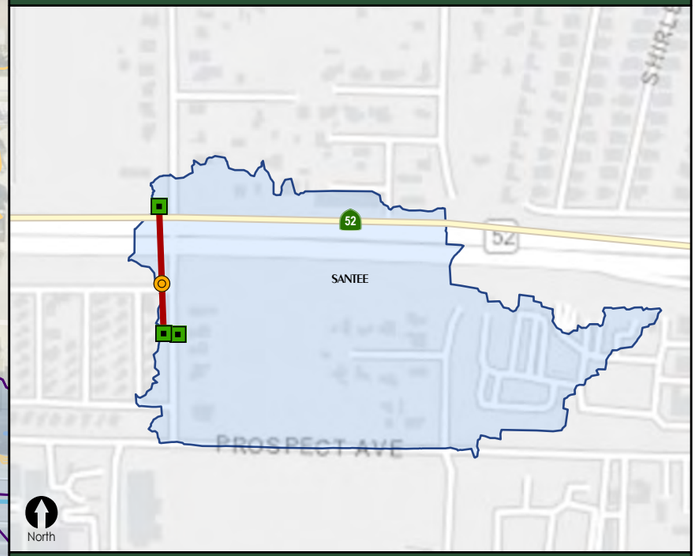
LOCATION MAP







## DRAINAGE AREA: 9 AC.




## PROJECT ID: 3.3

**PROJECT NAME**

Cottonwood Ave - Prospect Ave and Hwy 52

**LOCATION**

Cottonwood Ave between Prospect Ave and Hwy 52

**PROJECT DESCRIPTION**

- Add 360 LF of new 30-inch RCP as a backbone storm drain down Cottonwood Ave, connecting to 30-inch system running parallel to Hwy 52.
- Add 40 LF of new 30-inch RCP lateral to new backbone across Cottonwood.
- The addition and/or replacement of one (1) cleanout and three (3) inlets is anticipated.
- Add approximately 200 LF of new curb and gutter along Cottonwood where there is none.

**PROJECT HYDROLOGIC SUMMARY**

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 9 | 91 | 58 |

**COST SUMMARY**

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 370,000 | $ 150,000 | $ 520,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 — 100 — 200

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Santee DO MORE ▸ DUE EAST

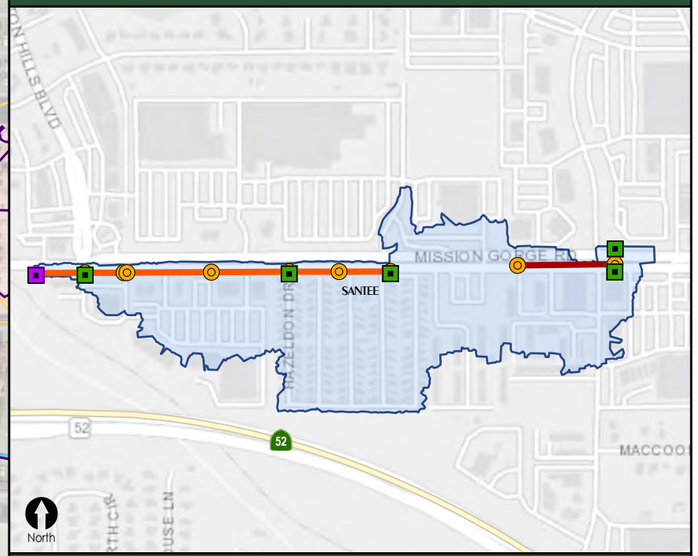
LOCATION MAP







## DRAINAGE AREA: 51 AC.




## PROJECT ID: 4.1

### PROJECT NAME

South Mission Gorge Rd - Olive Ln and Forester Creek Storm Drain Upsize and Extension

### LOCATION

Mission Gorge Rd between Olive Ln and Forester Creek

### PROJECT DESCRIPTION

- Add 530 LF of new 18-inch RCP connecting to the existing infrastructure.
- Add 10 LF of 24" RCP to replace CMP pipe going south to north along Mission Gorge.
- Add 810 LF and 800 LF of 42" and 48" RCP, respectively, to replace CMP and CSP pipe in place along Mission Gorge.
- The addition and/or replacement of nine (9) cleanouts, five (5) inlets, and one (1) headwall is anticipated.

### PROJECT HYDROLOGIC SUMMARY

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 51 | 83 | 60 |

### COST SUMMARY

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 1,800,000 | $ 720,000 | $ 2,520,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**
- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**
- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**
- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 — 250 — 500

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Santee DO MORE ▸ DUE EAST

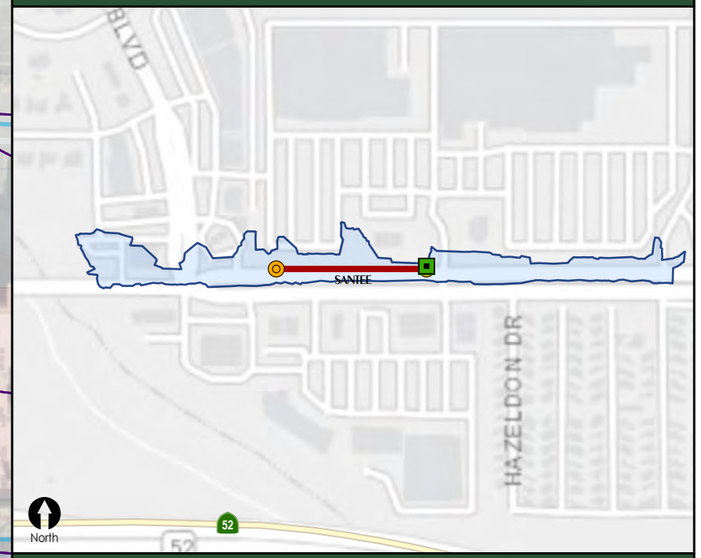
## LOCATION MAP







## DRAINAGE AREA: 3 AC.




## PROJECT ID: 4.2

**PROJECT NAME**

North Mission Gorge Rd - Town Center Pkwy and Carlton Hills Storm Drain Extension

**LOCATION**

Mission Gorge Rd between Town Center Pkwy and Carlton Hills

**PROJECT DESCRIPTION**

- Add 420 LF of new 18-inch RCP connecting to the existing infrastructure on north side of Mission Gorge.
- The addition and/or replacement of two (2) cleanouts and one (1) inlet are anticipated.

**PROJECT HYDROLOGIC SUMMARY**

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 3 | 83 | 9 |

**COST SUMMARY**

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 260,000 | $ 110,000 | $ 370,000 |

## LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 60 120

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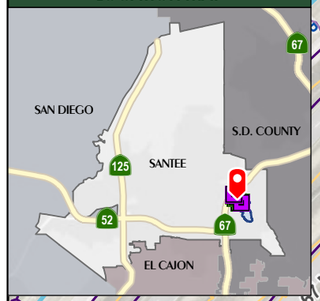
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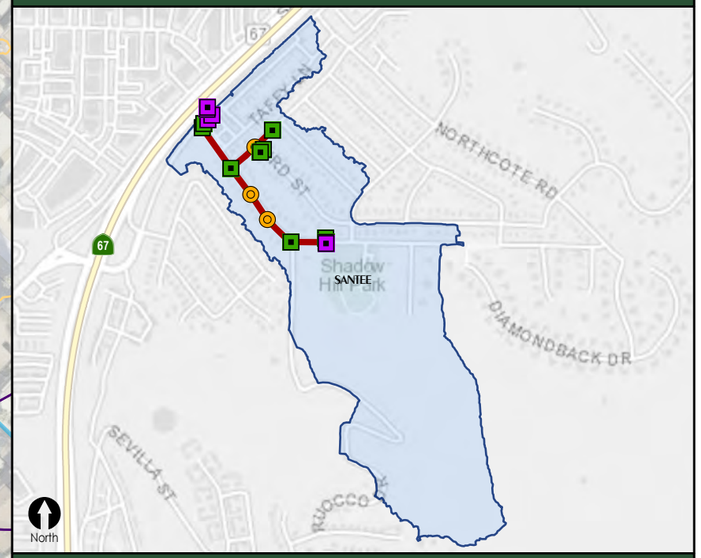
RICK ENGINEERING COMPANY

Santee DO MORE ▶ DUE EAST

## LOCATION MAP




## DRAINAGE AREA: 89 AC.




## PROJECT ID: 5.1

### PROJECT NAME

Shadow Hill Rd and Woodside Ave Drainage Improvements

### LOCATION

Shadow Hill Rd and Woodside Ave where it connects to Hwy 67

### PROJECT DESCRIPTION

- Add 40 LF of new 18-inch RCP across the most eastern portion of Shadow Hill Rd.
- Add 275 LF and 1,030 LF of new 24-inch and 30-inch RCP, respectively, running along Shadow Hill Rd.
- Add 95 LF of new 24-inch RCP running along Bird St and connect to 160 LF of new 48-inch RCP along the southwest portion of Meadow Terrace.
- Add 485 LF of new 54-inch RCP to connect along Woodside Ave and remove and replace existing 18" pipe with 105 LF of 54-inch RCP.
- The addition and/or replacement of three (3) cleanouts, nine (9) inlets, and five (5) headwalls is anticipated.
- Add approximately 200 LF of new curb and gutter along Woodside where there is none.

### PROJECT HYDROLOGIC SUMMARY

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 89 | 20 | 230 |

### COST SUMMARY

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 1,880,000 | $ 760,000 | $ 2,640,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 150 300

Date of Exhibit: 7/19/2023

SANGIS/SANDAG Aerial Imagery, 2020

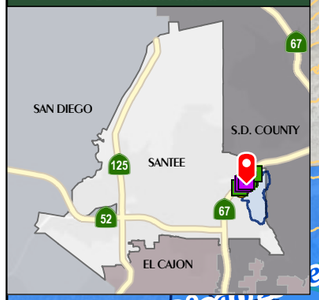
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Santee DO MORE ▸ DUE EAST

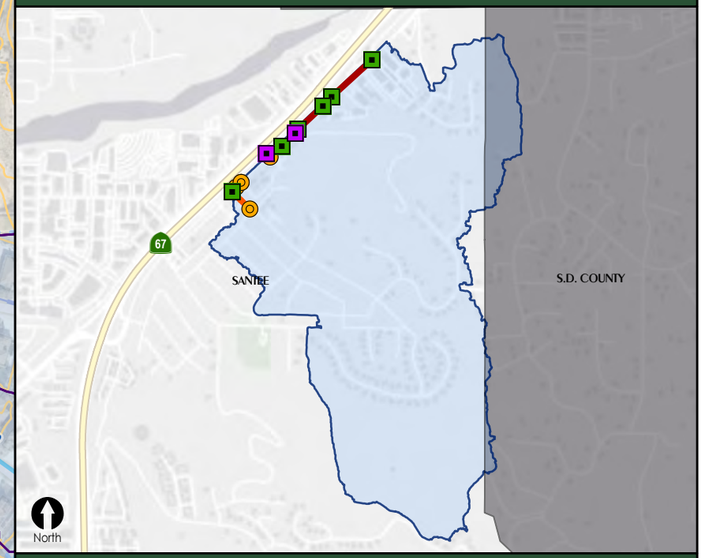
LOCATION MAP







## DRAINAGE AREA: 345 AC.




## PROJECT ID: 5.2

**PROJECT NAME**

Northcote Rd and Woodside Ave Drainage Improvements

**LOCATION**

Northcote Rd and Woodside Ave to Eastern City limit

**PROJECT DESCRIPTION**

- Remove and replace existing storm drain on west side of Northcote Rd with 320 LF 60-inch RCP.
- Remove and replace existing storm drain along west side of Woodside Ave with 170 LF of 72"x44" RCP to match downstream geometry.
- Add 1,370 LF of new 60-inch RCP beginning at existing outlet between Woodside Terrance and Security Wy.
- Remove and replace 450 LF of 30-inch storm drain east of Woodside Ave with 60-inch RCP.
- Remove and replace 70 LF of 30-inch storm drain running perpendicular to Woodside Ave with 72"x44" RCP.
- The addition and/or replacement of five (5) cleanouts, six (6) inlets, and two (2) headwalls is anticipated.
- Add approximately 1,650 LF of new curb and gutter along Woodside where there is none.

Note: The suggested improvements will tie into the 10-year deficient Caltrans system.

**PROJECT HYDROLOGIC SUMMARY**

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 345 | 29 | 619 |

**COST SUMMARY**

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 3,150,000 | $ 1,260,000 | $ 4,410,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 — 300 — 600

**DISCLAIMER**
The City of Santee Master Drainage Study update has been prepared for drainage master planning purposes only, as a guide for engineers, planners, developers, and City staff. Detailed engineering calculations and investigations should be prepared for the implementation of any of the facilities outlined in this study. In addition, coordination with adjacent municipalities and/or state agencies may be required to coordinate drainage improvement efforts that cross jurisdictional boundaries.

Date of Exhibit: 7/20/2023
SANGIS/SANDAG Aerial Imagery, 2020

RICK ENGINEERING COMPANY

Santee DO MORE ▸ DUE EAST

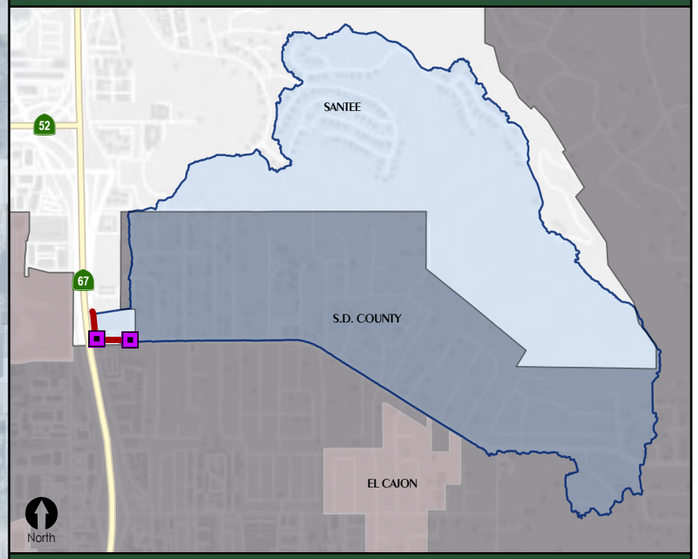
LOCATION MAP







## DRAINAGE AREA: 511 AC.




## PROJECT ID: 6

**PROJECT NAME**

Pepper Dr and Graves Ave Drainage Improvements

**LOCATION**

West of Pepper Dr to Graves Ave where it connects to Hwy 67

**PROJECT DESCRIPTION**

- Add 790 LF of 48-inch RCP to replace the existing ditch along Pepper Drive and Graves Avenue.
- The addition and/or replacement of two (2) inlets is anticipated.

Note: Of the 511-acre watershed, approximately 262 acres (~51%) is within County of San Diego jurisdiction. Additionally, the proposed 48" pipe will relieve approximately 220 out of 858 cfs off the street along Graves Ave. The proposed 48" pipe will connect to the 10- and 2-year deficient Caltrans system crossing Hwy 67.

**PROJECT HYDROLOGIC SUMMARY**

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 511 | 29 | 858 |

**COST SUMMARY**

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 690,000 | $ 280,000 | $ 970,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 80 160

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Date of Exhibit: 7/19/2023
SANGIS/SANDAG Aerial Imagery, 2020

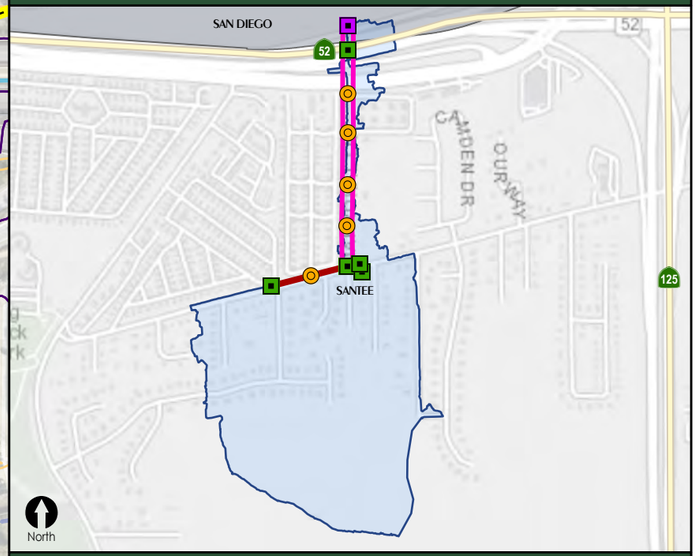
RICK ENGINEERING COMPANY

Santee DO MORE ▶ DUE EAST

## LOCATION MAP




## DRAINAGE AREA: 65 AC.




## PROJECT ID: 7

### PROJECT NAME

Prospect Ave to San Diego River Storm Drain

### LOCATION

Marrokal Ln between Prospect Ave to the San Diego River

### PROJECT DESCRIPTION

- Add 630 LF of new 24-inch RCP along Prospect and connect to existing infrastructure.
- Add 1,820 LF of 36-inch RCP parallel to existing RCP pipe going south to north along Marrokal Ln, emptying at the San Diego River.
- The addition and/or replacement of five (5) cleanouts, five (5) inlets, and one (1) headwall is anticipated.
- Add approximately 660 LF of new curb and gutter along Prospect Ave where there is none.

### PROJECT HYDROLOGIC SUMMARY

| Drainage Area (ac.) | Impervious (%) | 100-Year Peak Flow (cfs) |
|---|---|---|
| 65 | 36 | 178 |

### COST SUMMARY

| Construction Total | Design/Permitting (40%) | Project Total |
|---|---|---|
| $ 185,000 | $ 740,000 | $ 2,590,000 |

LEGEND

- City of Santee
- Watersheds
- Drainage Area
- Storm Drain Junctions

**Existing Storm Drain**

- Storm Drain Pipe
- Channel
- Culvert
- Flowline
- Ditch

**Proposed Storm Drain**

- Cleanout
- Curb inlet
- Headwall
- Add New Conduit
- Add Parallel System
- Improve Existing Conduit

**FEMA NFHL Floodplain**

- 100-YR Floodway
- 100-YR Floodplain

North

Scale in Feet: 0 250 500

Date of Exhibit: 7/19/2023

SANGIS/SANDAG Aerial Imagery, 2020

**DISCLAIMER**
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## Appendix 8

## Opinion of Probable Costs

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**Santee MDS - Drainage Facilities**
**Construction Cost Summary**

| Project ID | Project Name | Construction Cost Subtotal | Construction Contingency | Construction Total | Design/Permitting | Project Total |
|---|---|---|---|---|---|---|
| **Project 1A** | **Las Colinas Channel Culvert and Upsizing** | $2,340,000 | $710,000 | $3,050,000 | $1,220,000 | $4,270,000 |
| **Project 1B** | **Cottonwood Ave to Mission Gorge Storm Drain Upsize** | $430,000 | $130,000 | $560,000 | $230,000 | $790,000 |
| **Project 1C** | **Mission Gorge Culvert Project** | $840,000 | $260,000 | $1,100,000 | $440,000 | $1,540,000 |
| **Project 2** | **Buena Vista Channel Upsizing** | $1,870,000 | $570,000 | $2,440,000 | $980,000 | $3,420,000 |
| **Project 3.1A** | **Cottonwood Ave - Las Brisas Dr to Mission Gorge Rd Storm Drain Upsize** | $340,000 | $110,000 | $450,000 | $180,000 | $630,000 |
| **Project 3.1B** | **Cottonwood Ave - Happy Ln and Mission Gorge Rd Storm Drain Improvements** | $140,000 | $50,000 | $190,000 | $80,000 | $270,000 |
| **Project 3.2** | **Cottonwood Ave - El Toro Ln and Buena Vista Ave Storm Drain** | $220,000 | $70,000 | $290,000 | $120,000 | $410,000 |
| **Project 3.3** | **Cottonwood Ave - Prospect Ave and Hwy 52 Storm Drain** | $280,000 | $90,000 | $370,000 | $150,000 | $520,000 |
| **Project 4.1** | **South Mission Gorge Rd - Olive Ln and Forester Creek Storm Drain Upsize and Extension** | $1,380,000 | $420,000 | $1,800,000 | $720,000 | $2,520,000 |
| **Project 4.2** | **North Mission Gorge Rd - Town Center Pkwy and Carlton Hills Storm Drain Extension** | $200,000 | $60,000 | $260,000 | $110,000 | $370,000 |
| **Project 5.1** | **Shadow Hill Rd and Woodside Ave Drainage Improvements** | $1,440,000 | $440,000 | $1,880,000 | $760,000 | $2,640,000 |
| **Project 5.2** | **Northcote Rd and Woodside Ave Drainage Improvements** | $2,420,000 | $730,000 | $3,150,000 | $1,260,000 | $4,410,000 |
| **Project 6** | **Pepper Dr and Graves Ave Drainage Improvements** | $530,000 | $160,000 | $690,000 | $280,000 | $970,000 |
| **Project 7** | **Prospect Ave to San Diego River Storm Drain** | $1,420,000 | $430,000 | $1,850,000 | $740,000 | $2,590,000 |
| | | | **Totals:** | **$18,080,000** | **$7,270,000** | **$25,350,000** |

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**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone Q |
| Project ID: | 1A - Las Colinas Channel Culvert and Upsizing |

Location: Las Colinas Channel from Mission Gorge Rd to San Diego River

| Item Description | Quantity | Unit | Unit Price | Item Price |
|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $51,000.00 | $51,000.00 |
| Mobilization | 1 | LS | $61,000.00 | $61,000.00 |
| Field Orders | 1 | AL | $31,000.00 | $31,000.00 |
| Traffic Control | 1 | LS | $61,000.00 | $61,000.00 |
| Prepare SWPPP/ESC Plan | 1 | LS | $61,000.00 | $61,000.00 |
| Water Pollution Control Implementation | 1 | LS | $41,000.00 | $41,000.00 |
| Clearing and Grubbing | 1 | LS | $10,000.00 | $10,000.00 |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 |
| Dewatering | 1 | LS | $10,000.00 | $10,000.00 |
| Remove Existing Pipe | 320 | LF | $35.00 | $12,000.00 |
| Wing Type Headwall / Box Culvert Wingwall | 34 | CY | $2,500.00 | $85,000.00 |
| Reinforced Concrete Box Culvert (14' W x 5' H) | 700 | LF | $2,500.00 | $1,800,000 |
| Grading, Excavation (1,000-20,000 C.Y.) | 1410 | CY | $70.00 | $99,000.00 |
| Energy Dissipater (D-40) | 1 | LS | $10,000.00 | $10,000.00 |
| | | | ***Subtotal:*** | $2,340,000.00 |
| | | | ***30% Contingency:*** | $710,000.00 |
| | | | ***Construction Total:*** | $3,050,000.00 |
| | | | ***40% Design/Permitting:*** | $1,220,000.00 |
| | | | ***Total:*** | $4,270,000.00 |

**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone Q |
| Project ID: | 1B - Cottonwood Ave to Mission Gorge Rd Storm Drain Upsize |

Location: Corner of Cotttonwood Ave to Mission Gorge Rd

| Item Description | Quantity | Unit | Unit Price | Item Price |
|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $10,000.00 | $10,000.00 |
| Mobilization | 1 | LS | $12,000.00 | $12,000.00 |
| Field Orders | 1 | AL | $6,000.00 | $6,000.00 |
| Traffic Control | 1 | LS | $12,000.00 | $12,000.00 |
| Prepare SWPPP/ESC Plan | 1 | LS | $12,000.00 | $12,000.00 |
| Water Pollution Control Implementation | 1 | LS | $8,000.00 | $8,000.00 |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 |
| Remove Existing Pipe | 580 | LF | $35.00 | $21,000.00 |
| Cleanout (Type A) | 2 | EA | $10,000.00 | $20,000.00 |
| 48" Reinforced Concrete Pipe | 580 | LF | $450.00 | $270,000.00 |
| Saw Cut (AC/PCC Pvt.) | 1150 | LF | $7.50 | $9,000.00 |
| Paving, AC | 3500 | SF | $12.00 | $42,000.00 |
| | | | ***Subtotal:*** | $430,000.00 |
| | | | ***30% Contingency:*** | $130,000.00 |
| | | | ***Construction Total:*** | $560,000.00 |
| | | | ***40% Design/Permitting:*** | $230,000.00 |
| | | | ***Total:*** | $790,000.00 |

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**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone Q |
| Project ID: | 1C - Mission Gorge Culvert Project |

Location: Downstream Buena Vista Channel to
Upstream Las Colinas Channel

| Item Description | Quantity | Unit | Unit Price | Item Price |
|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $19,000.00 | $19,000.00 |
| Mobilization | 1 | LS | $22,000.00 | $22,000.00 |
| Field Orders | 1 | AL | $11,000.00 | $11,000.00 |
| Traffic Control | 1 | LS | $22,000.00 | $22,000.00 |
| Prepare SWPPP/ESC Plan | 1 | LS | $22,000.00 | $22,000.00 |
| Water Pollution Control Implementation | 1 | LS | $15,000.00 | $15,000.00 |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 |
| Remove Existing Pipe | 260 | LF | $35.00 | $10,000.00 |
| Cleanout (Type A) | 2 | EA | $10,000.00 | $20,000.00 |
| Curb Inlet | 1 | EA | $10,000.00 | $10,000.00 |
| Reinforced Concrete Box Culvert (14' W x 5' H) | 260 | LF | $2,500.00 | $650,000 |
| Grading, Excavation (1,000-20,000 C.Y.) | 370 | CY | $70.00 | $30,000.00 |
| | | | ***Subtotal:*** | $840,000.00 |
| | | | ***30% Contingency:*** | $260,000.00 |
| | | | ***Construction Total:*** | $1,100,000.00 |

| | |
|---|---|
| ***40% Design/Permitting:*** | $440,000.00 |
| ***Total:*** | $1,540,000.00 |

**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin | Group 3 - Zone Q |
| Project ID: | 2 - Buena Vista Channel Upsizing |

Location: Buena Vista Channel Between Buena Vista Ave to Mission Gorge Rd

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $41,000.00 | $41,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $49,000.00 | $49,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $25,000.00 | $25,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $49,000.00 | $49,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $49,000.00 | $49,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $33,000.00 | $33,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Reinforced Concrete Box Culvert (14' W x 5' H) | 630 | LF | $2,500.00 | $1,580,000.00 | |
| Dewatering | 1 | LS | $10,000.00 | $10,000.00 | |
| Remove Existing Pipe | 20 | LF | $35.00 | $700.00 | |
| Wing Type Headwall / Box Culvert Wingwall | 8 | CY | $2,500.00 | $20,000.00 | |
| | | | ***Subtotal:*** | $1,870,000.00 | |
| | | | ***30% Contingency:*** | $570,000.00 | |
| | | | ***Construction Total:*** | $2,440,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $980,000.00 |
| ***Total:*** | $3,420,000.00 |

**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone Q |
| Project ID: | 3.1A - Cottonwood Ave - Las Brisas Dr and Mission Gorge Rd Storm Drain Upsize |

Location: Cottonwood Ave between Las Brisas Drive and Mission Gorge Rd

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $8,000.00 | $8,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $9,000.00 | $9,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $5,000.00 | $5,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $9,000.00 | $9,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $9,000.00 | $9,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $6,000.00 | $6,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Remove Existing Pipe | 510 | LF | $35.00 | $17,900.00 | |
| Cleanout (Type A) | 2 | EA | $10,000.00 | $20,000.00 | |
| Curb Inlet | 1 | EA | $10,000.00 | $10,000.00 | |
| 36" Reinforced Concrete Pipe | 470 | LF | $375.00 | $180,000.00 | |
| 48" Reinforced Concrete Pipe | 40 | LF | $450.00 | $18,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 1010 | LF | $7.50 | $8,000.00 | |
| Paving, AC | 2600 | SF | $12.00 | $32,000.00 | |
| | | | ***Subtotal:*** | $340,000.00 | |
| | | | ***30% Contingency:*** | $110,000.00 | |
| | | | ***Construction Total:*** | $450,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $180,000.00 |
| ***Total:*** | $630,000.00 |

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**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone Q |
| Project ID: | 3.1B - Cottonwood Ave - Happy Ln and Mission Gorge Rd Storm Drain Improvements |

Location: Cottonwood Ave between Happy Ln to Mission Gorge Rd

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $3,000.00 | $3,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $4,000.00 | $4,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $2,000.00 | $2,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $4,000.00 | $4,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $4,000.00 | $4,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $3,000.00 | $3,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Remove Existing Pipe | 40 | LF | $35.00 | $1,400.00 | |
| Curb Inlet | 2 | EA | $10,000.00 | $20,000.00 | |
| 36" Reinforced Concrete Pipe | 40 | LF | $375.00 | $15,000.00 | |
| 42" Reinforced Concrete Pipe | 50 | LF | $400.00 | $20,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 160 | LF | $7.50 | $1,200.00 | |
| Paving, AC | 400 | SF | $12.00 | $4,800.00 | |
| Curb and Gutter (6 inch, Type G) | 500 | LF | $100.00 | $50,000.00 | |
| | | | ***Subtotal:*** | $140,000.00 | |
| | | | ***30% Contingency:*** | $50,000.00 | |
| | | | ***Construction Total:*** | $190,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $80,000.00 |
| ***Total:*** | $270,000.00 |

**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone Q |
| Project ID: | 3.2 - Cottonwood Ave - El Toro Ln and Buena Vista Ave Storm Drain |

Location: Cottonwood Ave between El Toro Ln and Buena Vista Ave

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $5,000.00 | $5,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $6,000.00 | $6,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $3,000.00 | $3,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $6,000.00 | $6,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $6,000.00 | $6,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $4,000.00 | $4,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Cleanout (Type A) | 2 | EA | $10,000.00 | $20,000.00 | |
| Curb Inlet | 2 | EA | $10,000.00 | $20,000.00 | |
| 18" Reinforced Concrete Pipe | 300 | LF | $250.00 | $75,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 610 | LF | $7.50 | $4,600.00 | |
| Paving, AC | 1100 | SF | $12.00 | $13,200.00 | |
| Curb and Gutter (6 inch, Type G) | 400 | LF | $100.00 | $40,000.00 | |
| | | | ***Subtotal:*** | $220,000.00 | |
| | | | ***30% Contingency:*** | $70,000.00 | |
| | | | ***Construction Total:*** | $290,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $120,000.00 |
| ***Total:*** | $410,000.00 |

**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone Q |
| Project ID: | 3.3 - Cottonwood Ave - Prospect Ave and Hwy 52 Storm Drain |

Location: Cottonwood Ave between Prospect Ave and Hwy 52

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $6,000.00 | $6,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $7,000.00 | $7,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $4,000.00 | $4,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $7,000.00 | $7,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $7,000.00 | $7,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $5,000.00 | $5,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Cleanout (Type A) | 1 | EA | $10,000.00 | $10,000.00 | |
| Curb Inlet | 3 | EA | $10,000.00 | $30,000.00 | |
| 30" Reinforced Concrete Pipe | 400 | LF | $350.00 | $140,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 780 | LF | $7.50 | $5,900.00 | |
| Paving, AC | 1800 | SF | $12.00 | $21,600.00 | |
| Curb and Gutter (6 inch, Type G) | 200 | LF | $100.00 | $20,000.00 | |
| | | | ***Subtotal:*** | $280,000.00 | |
| | | | ***30% Contingency:*** | $90,000.00 | |
| | | | ***Construction Total:*** | $370,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $150,000.00 |
| ***Total:*** | $520,000.00 |

**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone S |
| Project ID: | 4.1 South Mission Gorge Rd - Olive Ln and Forester Creek Storm Drain Upsize and Extension |

Location: Mission Gorge Rd between Olive Ln and Forester Creek

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $30,000.00 | $30,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $36,000.00 | $36,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $18,000.00 | $18,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $36,000.00 | $36,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $36,000.00 | $36,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $24,000.00 | $24,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Remove Existing Pipe | 1610 | LF | $35.00 | $57,000.00 | |
| Cleanout (Type A) | 9 | EA | $10,000.00 | $90,000.00 | |
| Wing Type Headwall / Box Culvert Wingwall | 3 | CY | $2,500.00 | $7,500.00 | |
| Curb Inlet | 5 | EA | $10,000.00 | $50,000.00 | |
| 18" Reinforced Concrete Pipe | 530 | LF | $250.00 | $133,000.00 | |
| 24" Reinforced Concrete Pipe | 10 | LF | $300.00 | $3,000.00 | |
| 42" Reinforced Concrete Pipe | 810 | LF | $400.00 | $324,000.00 | |
| 48" Reinforced Concrete Pipe | 800 | LF | $450.00 | $360,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 4280 | LF | $7.50 | $33,000.00 | |
| Paving, AC | 11100 | SF | $12.00 | $134,000.00 | |
| | | | ***Subtotal:*** | $1,380,000.00 | |
| | | | ***30% Contingency:*** | $420,000.00 | |
| | | | ***Construction Total:*** | $1,800,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $720,000.00 |
| ***Total:*** | $2,520,000.00 |

RICK ENGINEERING COMPANY

**Santee MDS - Drainage Facilities**

| | |
|---|---|
| Subbasin: | Group 3 - Zone S |
| Project ID: | 4.2 - North Mission Gorge Rd - Town Center Pkwy and Carlton Hills Storm Drain Extension |

Location: Mission Gorge Rd between Town Center Pkwy and Carlton Hills

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $5,000.00 | $5,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $5,000.00 | $5,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $3,000.00 | $3,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $5,000.00 | $5,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $5,000.00 | $5,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $4,000.00 | $4,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Cleanout (Type A) | 2 | EA | $10,000.00 | $20,000.00 | |
| Curb Inlet | 1 | EA | $10,000.00 | $10,000.00 | |
| 18" Reinforced Concrete Pipe | 420 | LF | $250.00 | $105,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 850 | LF | $7.50 | $7,000.00 | |
| Paving, AC | 1500 | SF | $12.00 | $18,000.00 | |
| | | | ***Subtotal:*** | $200,000.00 | |
| | | | ***30% Contingency:*** | $60,000.00 | |
| | | | ***Construction Total:*** | $260,000.00 | |

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|---|---|
| ***40% Design/Permitting:*** | $110,000.00 |
| ***Total:*** | $370,000.00 |

**Santee MDS - Drainage Facilities**

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|---|---|
| Subbasin: | Group 3 - Zone O |
| Project ID: | 5.1 - Shadow Hill Rd and Woodside Ave Drainage Improvements |

Location: Shadow Hill Rd and Woodside Ave
where it connects to Hwy 67

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $32,000.00 | $32,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $38,000.00 | $38,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $19,000.00 | $19,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $38,000.00 | $38,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $38,000.00 | $38,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $25,000.00 | $25,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Remove Existing Pipe | 110 | LF | $35.00 | $3,850.00 | |
| Cleanout (Type A) | 3 | EA | $10,000.00 | $30,000.00 | |
| Wing Type Headwall / Box Culvert Wingwall | 20 | CY | $2,500.00 | $50,000.00 | |
| Curb Inlet | 9 | EA | $10,000.00 | $90,000.00 | |
| 18" Reinforced Concrete Pipe | 40 | LF | $250.00 | $10,000.00 | |
| 24" Reinforced Concrete Pipe | 370 | LF | $300.00 | $111,000.00 | |
| 30" Reinforced Concrete Pipe | 1030 | LF | $350.00 | $360,500.00 | |
| 48" Reinforced Concrete Pipe | 160 | LF | $450.00 | $72,000.00 | |
| 54" Reinforced Concrete Pipe | 590 | LF | $550.00 | $324,500.00 | |
| Saw Cut (AC/PCC Pvt.) | 4330 | LF | $7.50 | $32,475.00 | |
| Paving, AC | 10900 | SF | $12.00 | $130,800.00 | |
| Curb and Gutter (6 inch, Type G) | 200 | LF | $100.00 | $20,000.00 | |
| | | | ***Subtotal:*** | $1,440,000.00 | |
| | | | ***30% Contingency:*** | $440,000.00 | |
| | | | ***Construction Total:*** | $1,880,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $760,000.00 |
| ***Total:*** | $2,640,000.00 |

**Santee MDS - Drainage Facilities**

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|---|---|
| Subbasin: | Group 3 - Zone O/N |
| Project ID: | 5.2 - Northcote Rd and Woodside Ave Drainage Improvements |

Location: Northcote Rd and Woodside Ave to Eastern City limit

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $53,000.00 | $53,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $63,000.00 | $63,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $32,000.00 | $32,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $63,000.00 | $63,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $63,000.00 | $63,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $42,000.00 | $42,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Remove Existing Pipe | 1000 | LF | $35.00 | $35,000.00 | |
| Cleanout (Type A) | 5 | EA | $10,000.00 | $50,000.00 | |
| Wing Type Headwall / Box Culvert Wingwall | 7.5 | CY | $2,500.00 | $18,750.00 | |
| Curb Inlet | 6 | EA | $10,000.00 | $60,000.00 | |
| 60" Reinforced Concrete Pipe | 2140 | LF | $650.00 | $1,391,000.00 | |
| 72"x44" Reinforced Concrete Pipe | 240 | LF | $650.00 | $156,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 4270 | LF | $7.50 | $32,025.00 | |
| Paving, AC | 15000 | SF | $12.00 | $180,000.00 | |
| Curb and Gutter (6 inch, Type G) | 1650 | LF | $100.00 | $165,000.00 | |
| | | | ***Subtotal:*** | $2,420,000.00 | |
| | | | ***30% Contingency:*** | $730,000.00 | |
| | | | ***Construction Total:*** | $3,150,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $1,260,000.00 |
| ***Total:*** | $4,410,000.00 |

**Santee MDS - Drainage Facilities**

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|---|---|
| Subbasin: | Group 3 - Zone O |
| Project ID: | 6 - Pepper Dr and Graves Ave Drainage Improvements |

Location: West of Pepper Dr to Graves Ave where it connects to Hwy 67

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $12,000.00 | $12,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $14,000.00 | $14,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $7,000.00 | $7,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $14,000.00 | $14,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $14,000.00 | $14,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $9,000.00 | $9,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Curb Inlet | 2 | EA | $10,000.00 | $20,000.00 | |
| 48" Reinforced Concrete Pipe | 790 | LF | $450.00 | $355,500.00 | |
| Saw Cut (AC/PCC Pvt.) | 1570 | LF | $7.50 | $11,775.00 | |
| Paving, AC | 4700 | SF | $12.00 | $56,400.00 | |
| | | | ***Subtotal:*** | $530,000.00 | |
| | | | ***30% Contingency:*** | $160,000.00 | |
| | | | ***Construction Total:*** | $690,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $280,000.00 |
| ***Total:*** | $970,000.00 |

RICK ENGINEERING COMPANY

**Santee MDS - Drainage Facilities**

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|---|---|
| Subbasin: | Group 4 - Zone W |
| Project ID: | 7 - Prospect Ave to San Diego River Storm Drain |

Location: Marrokal Ln between Prospect Dr to the San Diego River

| Item Description | Quantity | Unit | Unit Price | Item Price | Notes |
|---|---|---|---|---|---|
| Bonds (Payment and Performance) | 1 | LS | $31,000.00 | $31,000.00 | 2.5% of subtotal |
| Mobilization | 1 | LS | $37,000.00 | $37,000.00 | 3.0% of subtotal |
| Field Orders | 1 | AL | $19,000.00 | $19,000.00 | 1.5% of subtotal |
| Traffic Control | 1 | LS | $37,000.00 | $37,000.00 | 3.0% of subtotal |
| Prepare SWPPP/ESC Plan | 1 | LS | $37,000.00 | $37,000.00 | 3.0% of subtotal |
| Water Pollution Control Implementation | 1 | LS | $25,000.00 | $25,000.00 | 2.0% of subtotal |
| Project ID Sign | 1 | EA | $2,500.00 | $2,500.00 | |
| Temporary Concrete Washout (Portable) | 1 | LS | $5,000.00 | $5,000.00 | |
| Cleanout (Type A) | 5 | EA | $10,000.00 | $50,000.00 | |
| Wing Type Headwall / Box Culvert Wingwall | 2 | CY | $2,500.00 | $5,000.00 | |
| Curb Inlet | 5 | EA | $10,000.00 | $50,000.00 | |
| 24" Reinforced Concrete Pipe | 630 | LF | $300.00 | $189,000.00 | |
| 36" Reinforced Concrete Pipe | 1820 | LF | $375.00 | $683,000.00 | |
| Saw Cut (AC/PCC Pvt.) | 4890 | LF | $7.50 | $37,000.00 | |
| Paving, AC | 11600 | SF | $12.00 | $140,000.00 | |
| Curb and Gutter (6 inch, Type G) | 660 | LF | $100.00 | $66,000.00 | |
| | | | ***Subtotal:*** | $1,420,000.00 | |
| | | | ***30% Contingency:*** | $430,000.00 | |
| | | | ***Construction Total:*** | $1,850,000.00 | |

| | |
|---|---|
| ***40% Design/Permitting:*** | $740,000.00 |
| ***Total:*** | $2,590,000.00 |