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SEWER STUDY
FOR THE
COLLECTION AT CACTUS PROJECT
IN THE CITY OF SAN DIEGO

July 23, 2025

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SEWER STUDY
FOR THE
COLLECTION AT CACTUS PROJECT
IN THE CITY OF SAN DIEGO

July 23, 2025



7-23-2025

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Job No. 537-025

TABLE OF CONTENTS

PAGE NO.

Introduction. 1
Purpose of Study 3
Study Area 3
City of San Diego Sewer Design Criteria 5
Collection at Cactus Project Sewer Generation 6
Collection at Cactus Offsite Sewer System Analysis 8
Existing Sewage Flow Plus Proposed Project Flow 8
Collection at Cactus Onsite Private Sewer System Analysis 9
Pump Station 23T Capacity and Proposed Improvements 9
Conclusions and Recommendations 11

APPENDICES

APPENDIX A PRELIMINARY SITE PLAN

APPENDIX B CITY OF SAN DIEGO SEWER DESIGN CRITERIA

APPENDIX C OFFSITE SEWER ANALYSIS

APPENDIX D ONSITE SEWER ANALYSIS

APPENDIX E PUMP STATION 23T JUNE 2023 MASTER PLAN EXCERPTS AND PEAK WET WEATHER FLOW DATA

APPENDIX F RESPONSES TO CITY COMMENTS

LIST OF TABLES

PAGE NO.

TABLE 1 CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT SEWER SYSTEM DESIGN CRITERIA 5

TABLE 2 COLLECTION AT CACTUS SEWER GENERATION 6

LIST OF FIGURES

PAGE NO.

FIGURE 1 VICINITY MAP 2

FIGURE 2 EXISTING OTAY MESA SEWER FACILITIES 4

FIGURE 3 PROPOSED ONSITE SEWER FACILITIES 7

EXHIBITS

EXHIBIT A OFFSITE MANHOLE DIAGRAM

EXHIBIT B ONSITE MANHOLE DIAGRAM

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537-025

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Attention: Raul Rodriguez, Senior Project Manager, Civil

Subject: Sewer Study for the Collection at Cactus Project in the City of San Diego

Introduction

This report provides a sewer study for the Collection at Cactus project in the City of San Diego. The project site is located in the Otay Mesa area within the Central Village Specific Plan area on the northeast corner of Cactus Road and Airway Road. Figure 1 provides a vicinity map for the project and Appendix A includes a preliminary site plan.

The project encompasses a total of approximately 33 gross acres and the existing property is currently vacant. The project is planned to include 985 multi-family residential units, 20,949 square feet of residential amenities, and 3.5 acres of park sites. Ground elevations on the project range from approximately 495 feet to 510 feet.

This report is an update of the previous "Sewer Study for the Collection at Cactus Project" dated November 1, 2024 and incorporates City comments that were previously issued. The specific City comments and responses (if any) are included in Appendix F of this report.

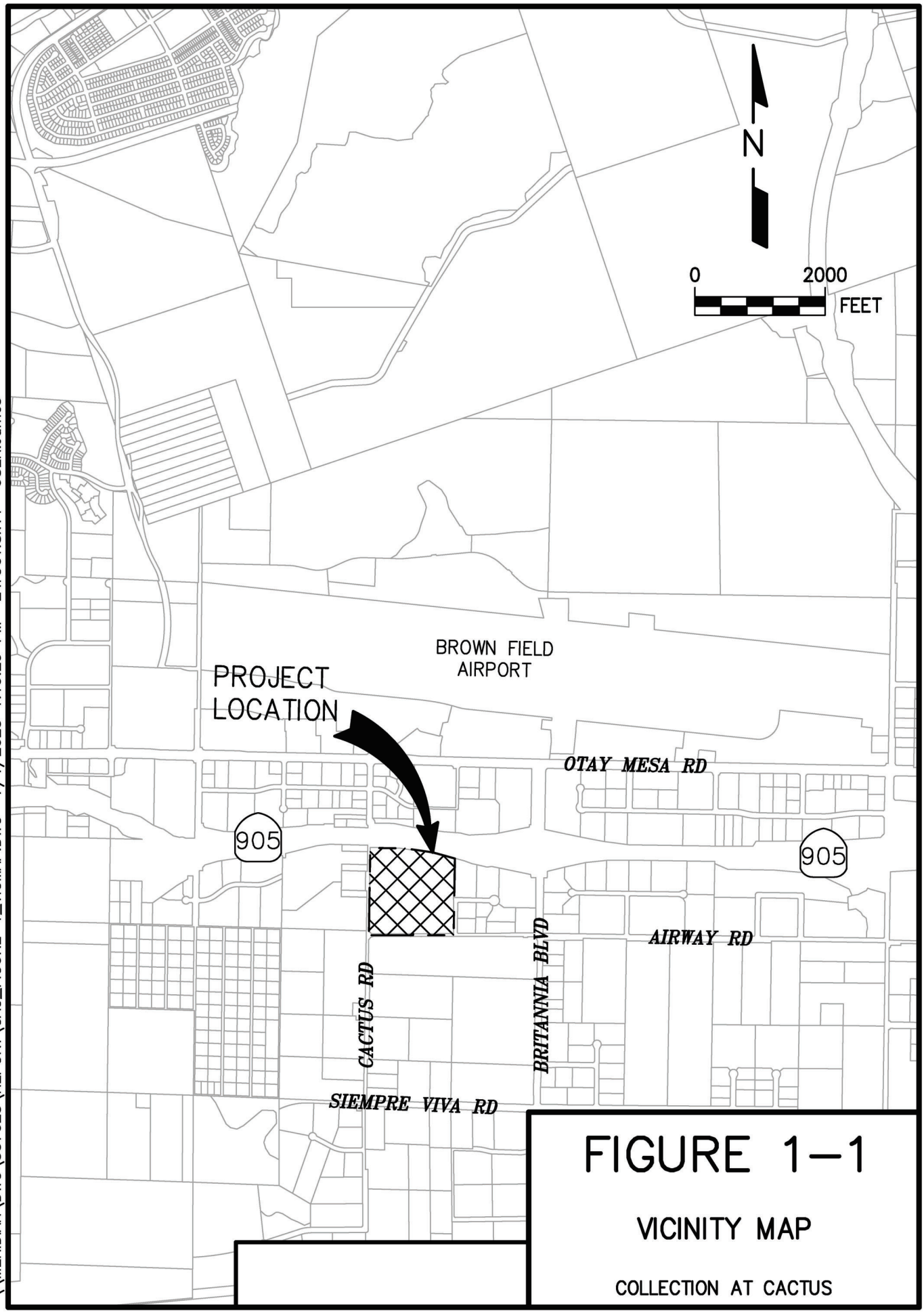

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FIGURE 1-1

VICINITY MAP

COLLECTION AT CACTUS

Purpose of Study

The purpose of this study is to determine if the existing public gravity sewer system and other ancillary public sewer facilities are able to provide adequate capacity for the project. This report will address if any offsite (public) sewer system improvements are needed for the development of the project so that the offsite sewer system will be in conformance with the City of San Diego sewer system design standards.

The onsite sewer facilities for the project are proposed to be private. These facilities will be designed in accordance with the California Plumbing Code and City's sewer system design standards.

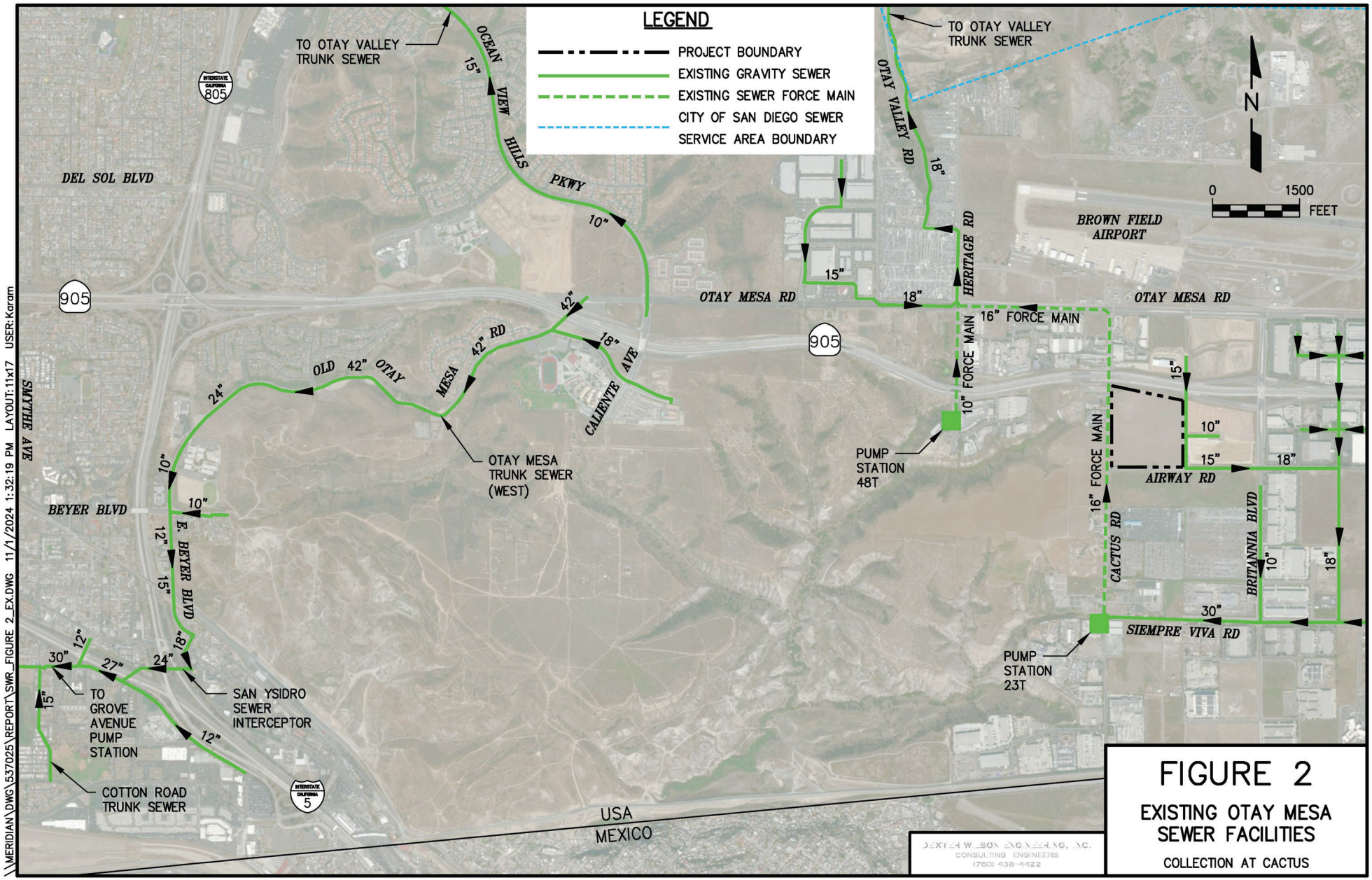
Study Area

In general, the study area for this sewer study encompasses the sewer lines in the vicinity of the project that are ultimately tributary to Pump Station 23T.

Pump Station 23T and its associated infrastructure is currently planned for a series of improvements to upgrade its status from temporary to permanent. These upgrades include constructing a redundant force main, new pumps with VFDs, new force mains in Otay Mesa Road, and ultimately a completely rebuilt pump station. The goal of these Pump Station 23T improvements is to provide sewer capacity for build-out of the City of San Diego Otay Mesa Sewer Service Area and to switch the destination of the pumped sewage flow to the western Otay Mesa Trunk Sewer instead of the current Otay Valley Trunk Sewer. It is anticipated that the Collection at Cactus project will contribute its fair share of these improvements associated with Pump Station 23T.

The analysis in this sewer study will include the proposed private onsite gravity collection system as well as the existing offsite public gravity sewer system up to the existing 30-inch diameter Otay Mesa trunk gravity sewer line in Siempre Viva Road. A discussion and analysis of the Pump Station 23T improvements is also included.

The existing public sewer facilities in the Otay Mesa area can be seen on Figure 2.



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City of San Diego Sewer Design Criteria

Sewer system analyses criteria are based on the Sewer Design Guide, Revised May 2015, City of San Diego Public Utilities Department. This guideline is used for analysis and sizing of new gravity sewer lines and for analysis of existing gravity sewer lines. A summary of the design criteria from the Sewer Design Guide is presented in Table 1 below.

TABLE 1
CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT
SEWER SYSTEM DESIGN CRITERIA

Criterion	Design Requirement	Design Guide Reference
Sewage Flow Generation	80 gallons per capita	1.3.2.2
Industrial Sewage Flow Generation	5,000 gpd/net-acre	Table 1-1
Dry Weather Peaking Factor	Figure 1-1 based on population	1.3.2.2
Wet Weather Peaking Factor[1]	Basin specific – determined by City (2.3 for this Study)	1.3.2.2
Gravity Flow Hydraulic Formula	Manning's Equation	1.3.3.1
Manning's 'n'	0.013	1.3.3.1
Desirable Gravity Flow Velocity	3 fps to 5 fps	1.3.3.1
Minimum Gravity Flow Velocity	2 fps	1.3.3.1
Where 2 fps is not achievable	Set min. slope at 1%	1.3.3.1
Maximum Gravity Flow Velocity	10 fps	1.3.3.1
Maximum Depth of Flow at Peak Wet Weather		
For 15" Pipe and Smaller	d/D = 0.50	1.3.3.3
For 18" and Larger	d/D = 0.75	1.3.3.3
Net Acreage	= 0.80 x Gross Acres	Table 1-1

Collection at Cactus Project Sewer Generation

The sewer generation for the project was developed in accordance with the City of San Diego Design Guidelines and Standards. Multi-family residential sewer generation is estimated based on dwelling unit density and a sewage generation of 80 gpd/person as presented in Table 1. The project proposes 985 residential units over 33 gross acres (26.4 net-acres). An area of 26.4 net acres results in a net-density for Collection at Cactus of 37 units per acre. Table 1-1 in the City's Sewer Design Guide, attached as Appendix B, indicates that 31 units per net-acre falls in the range of 2.8 persons per dwelling unit (equivalent to RM-2-6 Zoning). A dwelling unit density of 2.8 persons per dwelling unit and a unit sewage generation of 80 gpd/person results in a sewer generation rate of 224 gpd per multi-family dwelling unit for this project.

Table 2 presents the projected sewer generation for the project.

TABLE 2
COLLECTION AT CACTUS SEWER GENERATION

Land Use	Quantity	Generation Factor	Average Sewer Generation
Multi-Family Residential (37 DUs/net acre)	985 Units	224 gpd/unit	220,640 gpd 153 gpm

From the City of San Diego's Sewer Design Guide, Figure 1-1, the peak dry weather flow to average flow ratio is approximately 2.17 based on the formula presented in the figure, resulting in an estimated peak dry weather flow of 479,643 gpd (333 gpm).

Appendix B presents the backup data for determining the peaking factors. For estimating the peak flows, average flow was based on the project's average sewer generation presented in Table 2.

Figure 3 on the next page presents the proposed sewer system for the Collection at Cactus project.

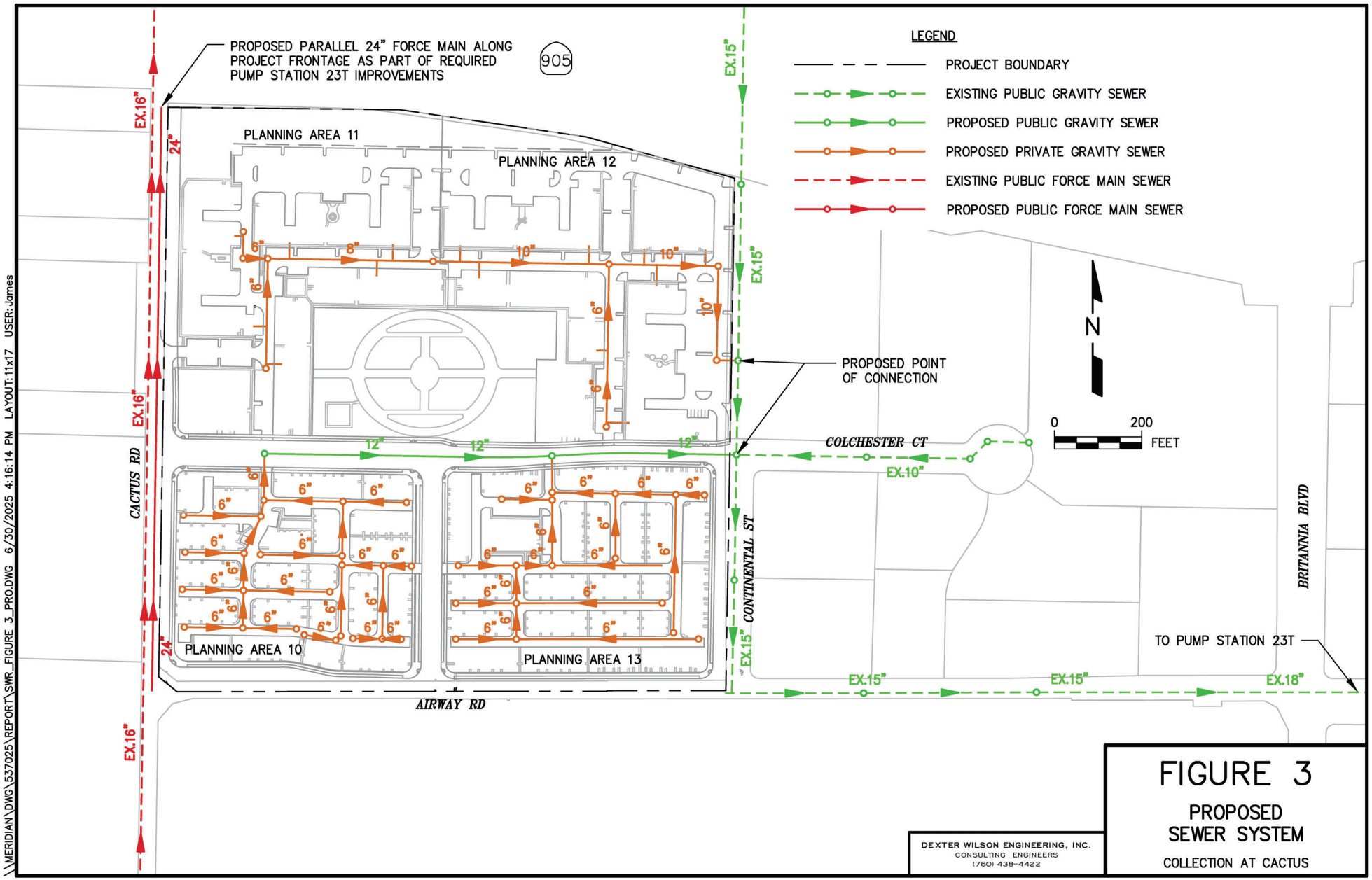

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FIGURE 3

PROPOSED SEWER SYSTEM

COLLECTION AT CACTUS

Collection at Cactus Offsite Sewer System Analysis

The offsite analysis completed for the Collection at Cactus project is to calculate the new flows through the existing 15-inch gravity sewer line in Continental Street and Airway Road from the project connection to the junction with the 30-inch Otay Mesa trunk sewer line at Siempre Via Road. This offsite sewer calculation/analysis is presented in Appendix C for the 15-inch and 18-inch gravity sewer lines.

The sewer system analysis for the Collection at Cactus project will need to take into account sewer flows from existing development that is tributary to the project's point of connection. There are approximately 200 net-acres of existing industrial along the existing 15-inch and 18-inch gravity sewer alignment within the project's tributary area up to the existing 30-inch Otay Mesa trunk sewer at Siempre Viva Road.

Parameters of the existing gravity sewer lines were obtained from the City to accurately model the existing gravity sewer infrastructure (size, invert elevations, location etc. from GIS data). These are included in the Appendix C spreadsheet.

As shown in Model 1 of the spreadsheet calculations in Appendix C, the existing sewer flow within the study area is shown to be below half full in the existing 15-inch diameter gravity sewer lines with a maximum d/D ratio of 0.37 and below three quarters full in the existing 18-inch diameter gravity sewer lines with a maximum d/D ratio of 0.55.

Existing Sewage Flow Plus Proposed Project Flow. Model 2 in the spreadsheet calculations in Appendix C presents the results of the offsite sewer system analyses when including the estimated flows from the project. The project is proposing to sewer all 985 of its multi-family residential units to the existing 15-inch diameter gravity sewer line east of the site in Continental Street.

The maximum d/D ratio increases from 0.37 to 0.50 when the proposed project is added to the existing 15-inch diameter gravity sewer lines and increases from 0.55 to 0.62 d/D when the proposed project is added to the existing 18-inch diameter gravity sewer lines. These depths for the existing 15-inch diameter gravity sewer lines are within the City design criterion of 0.50 d/D and the existing 18-inch diameter gravity sewer lines are below the City design criterion of 0.75 d/D.

Collection at Cactus Onsite Private Sewer System Analysis

In addition to the offsite analysis, an onsite and private sewer analysis was completed utilizing the proposed manhole inverts in the project. The onsite gravity sewer system was designed according to the City's Sewer Design Guide. The sewer modeling results show the depth ratios and velocities in the proposed onsite private gravity sewer lines are in compliance with City design criteria. The onsite analysis results are presented in Appendix D.

For sewer segments where flow velocities of 2 fps could not be achieved, the pipes are designed with a minimum slope of one percent. These segments are primarily located within the most upstream areas of each onsite planning area.

Pump Station 23T Capacity and Proposed Improvements

As mentioned previously in this sewer study, the proposed Collection at Cactus project is tributary to the City's existing Pump Station 23T which is currently undergoing master plan improvements that will take place until build out of its tributary area (approximately 2050). The improvements are categorized in a June 2023 report as current/existing, near/short term, and mid/long term.

Pertinent excerpts from this Pump Station 23T June 2023 report and recent peak wet weather flow data are included in Appendix E.

The June 2023 report established the existing Pump Station 23T design capacity conservatively at approximately 2,100 gpm (3.0 mgd), under peak wet weather flow conditions. This capacity will be increased to 3,000 gpm (4.3 mgd) by the approved 2,100 unit ColRich project. Pump Station 23T will eventually need to be upgraded to a 10 mgd facility at ultimate flows.

Current dry weather flows (average and peak) can easily be accommodated by the 3.0 mgd capacity at the existing Pump Station 23T. Select peak wet weather flow events do occur when influent flows are greater than 3.0 mgd for approximately 1 hour. These infrequent peak wet weather flow events typically occur every one to two years. These have been recently measured as high as 3.2-3.3 mgd and are currently mitigated by utilizing the Siempre Viva Road Interceptor for wet weather equalization.

The Collection at Cactus project will be contributing an additional 0.48 mgd of peak flow. The approved ColRich project will be contributing an additional 1.10 mgd of peak flow (0.574 mgd average x City peaking factor). Both the Collection at Cactus and ColRich projects will be constructing all sewers as PVC material with watertight joints thus peak dry weather flow is expected to equal peak wet weather flow.

These additions by the two projects will result in an increase in peak wet weather flow to Pump Station 23T from 3.2-3.3 mgd up to 4.8-4.9 mgd. The duration of these peak flow events above the 4.3 mgd assumed system baseline is also estimated to increase to approximately 2-3 hours. This results in a total required volume of 160,000-170,000 gallons (with peak project flows included) that would need to be temporarily stored to sufficiently keep Pump Station 23T at a 4.3 mgd total output to Heritage Road and Otay Valley Trunk Sewer downstream facilities. A 4.3 mgd total output is the current constraint to Heritage Road and Otay Valley Trunk Sewer downstream facilities

This temporary wet weather storage is proposed via existing large diameter trunk sewers, as is the case currently, and/or an Emergency Storage tank/basin that can also be utilized during peak wet weather flow events. The Collection at Cactus project is proposed to construct the 250,000 gallon Emergency Storage per City direction and the June 2023 report.

It is proposed that the Collection at Cactus project construct this Emergency Storage as well as a 1,500 LF portion of the redundant 24-inch force main along the project's west frontage in Cactus Road. Constructing the redundant 24-inch force main only along the project's frontage is consistent with previous improvements that were required by the City for other recent residential developments along Cactus Road. The 24-inch force main is not needed from a capacity standpoint until pumped flows from Pump Station 23T exceed 8 mgd (>4 fps velocity in the 24-inch force main).

Additionally, the Collection at Cactus project is proposing to participate in two other Phase 2 engineering and design aspects of the Pump Station 23T master plan (gap piece engineering and diversion structure).

These four projects financially amount to approximately 8 to 9 percent of the total buildout improvements at Pump Station 23T. The Collection at Cactus project itself, at an estimated peak flow rate of 0.48 mgd, also utilizes approximately 8 to 9 percent of the 5.4 mgd peak dry weather buildout flow in the Pump Station 23T service area.

Appendix E provides backup and reference information for Pump Station 23T regarding capacity and these proposed improvements.

Conclusions and Recommendations

The following conclusions and recommendations are summarized based on the sewer system analysis prepared for the proposed Collection at Cactus project.

1. The proposed project consisting of 985 multi-family dwelling units will gravity sewer to the existing 15-inch public gravity sewer line in Continental Street located east of the proposed project.

2. The development of the project is projected to result in average sewage flow of 220,640 gpd.

3. Existing downstream gravity sewer lines are currently calculated to have a d/D of approximately 0.37 in the 15-inch diameter segments under existing peak flow and 0.55 d/D in the 18-inch diameter segments under existing peak flow. The addition of the project's peak sewage flow would increase the d/D to 0.50 in the 15-inch diameter segments and 0.62 d/D in the 18-inch diameter segments. These depths are within the City design criteria of 0.50 d/D for the 15-inch diameter segments and 0.75 d/D for the 18-inch diameter segments. No offsite public gravity sewer line improvements are required for the Collection at Cactus project.

4. Figure 3 presents the proposed private onsite sewer system. Sewer lines that cannot achieve 2 fps velocity are designed with a minimum one percent slope.

5. It is proposed that the Collection at Cactus project construct 250,000 gallons of Emergency Storage as well as a 1,500 LF portion of the redundant 24-inch force main along the project's west frontage in Cactus Road. Additionally, the Collection at Cactus project is proposing to participate in two other Phase 2 engineering and design aspects of the Pump Station 23T master plan (gap piece engineering and diversion structure). These four projects financially amount to approximately 8-9 percent of the total buildout improvements at Pump Station 23T. The Collection at Cactus project itself, at an estimated peak flow rate of 0.48 mgd, also utilizes approximately 8-9 percent of the 5.4 mgd peak dry weather buildout flow in the Pump Station 23T service area.

6. Pertinent excerpts from the Pump Station 23T June 2023 report and recent peak wet weather flow data are included in Appendix E. Appendix E also provides backup and reference information for Pump Station 23T regarding capacity and these proposed improvements.

7. The proposed private onsite gravity sewer system will be designed according to City of San Diego Sewer Design Guide to comply with all design criteria (depth, velocity, minimum slope, etc.). For gravity sewer mains with depths not exceeding 15 feet, the project will use SDR-35 PVC sewer pipe.

If you have any questions regarding the information or conclusions and recommendations presented in this report, please do not hesitate to contact the undersigned.

Dexter Wilson Engineering, Inc.

Steven Henderson, P.E.

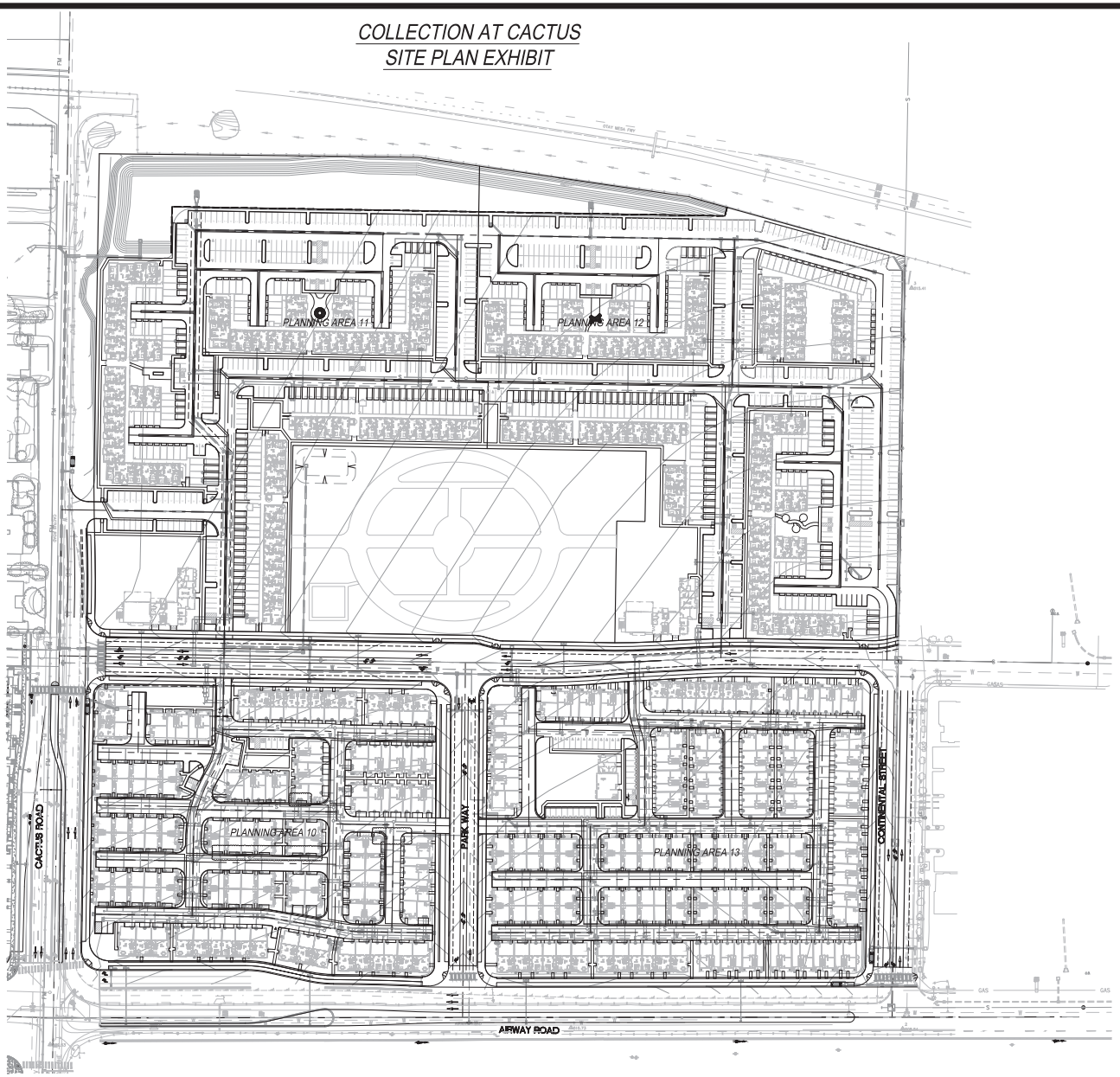
AO:SH:cf

Attachments

APPENDIX A

PRELIMINARY SITE PLAN

COLLECTION AT CACTUS
SITE PLAN EXHIBIT



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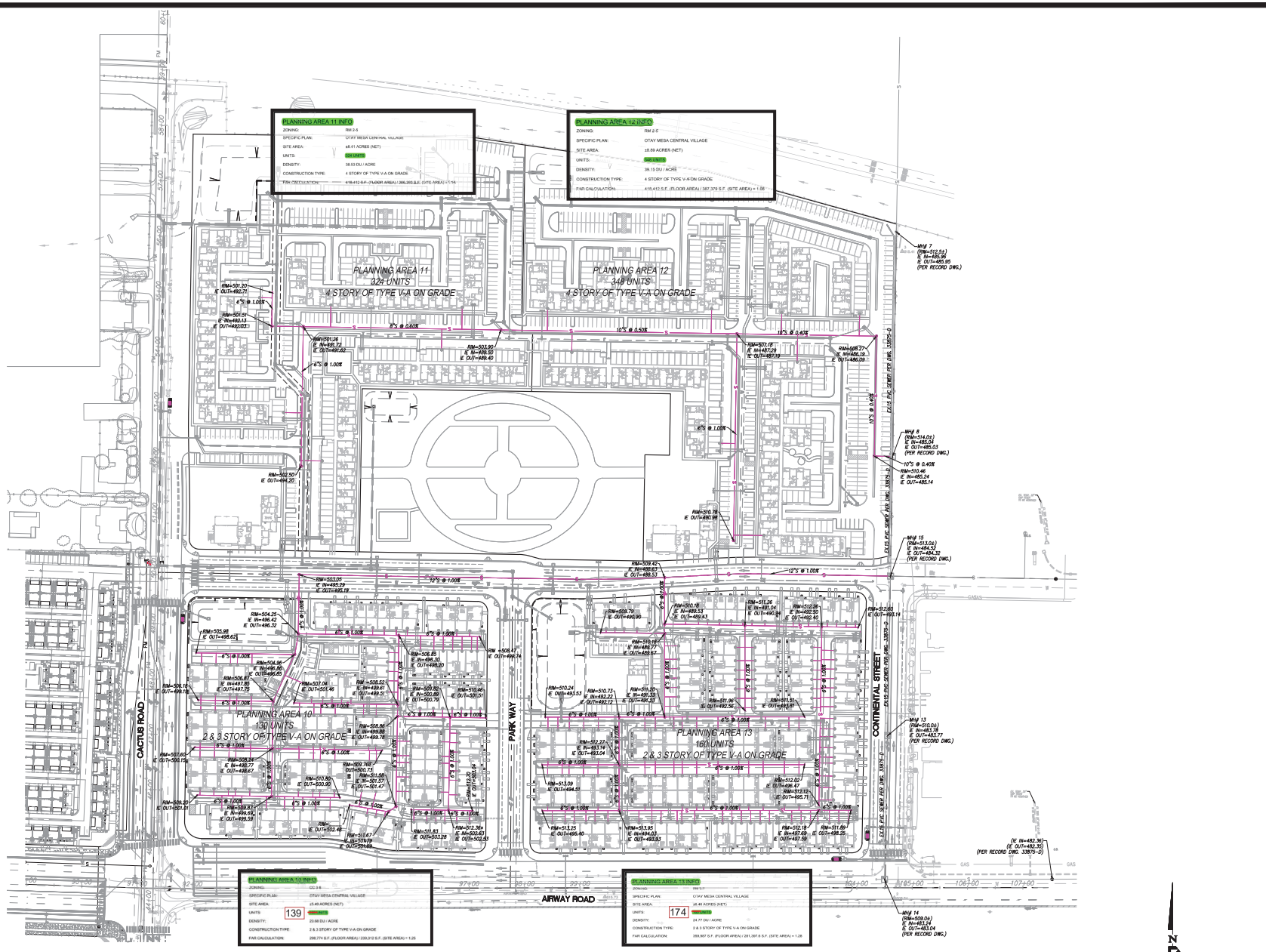

CACTUS ROAD SEWER EXHIBIT - PRELIMINARY

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APPENDIX B

CITY OF SAN DIEGO SEWER DESIGN CRITERIA

street alignments) and all potential points of entry of sewage from surrounding lands.

1.3.1.3 Depth of Mains

The planning study shall clearly identify all existing and/or proposed facilities which will exceed standard depths for sewer mains as defined in Subsection 2.2.1.5. In cases where proposed sewers will exceed 15 feet in depth, a request for design deviation (ATTACHMENT 2) must be submitted to the Water and Sewer Development Review Senior Civil Engineer with the Sewer Planning Study. A design deviation will only be approved in exceptional cases and when adequate justification is provided. Mains more than 20 feet deep shall also require approval from the Wastewater Collection Division Senior Civil Engineer.

1.3.1.4 Existing Studies

The City of San Diego maintains an extensive library of sewer planning studies which were prepared for lands throughout the City. These studies are available for review at the Water and Sewer Development Section, Public Utilities Department. All studies are catalogued by subdivision or trunk sewer name. Logs of sewer flow study analyses for recently monitored trunk sewers and a map of sewers which meet the Regional Water Quality Control Board (RWQCB) criteria for being critical or sub-critical may also be viewed. In addition, information regarding proposed CIP projects within the vicinity of a given project may be requested. In many cases, an addendum or reference to one of the existing planning studies may be acceptable in lieu of an independent study. Concurrent with the preparation of planning studies for sewers proposed to connect to existing canyon sewer mains, a study of flow redirection per Council Policy 400-13 and a cost-benefit analysis per Council Policy 400-14 shall be prepared (Refer to ATTACHMENT 1). An existing analysis of redirection of flows and a cost-benefit analysis, as required by Council Policies 400-13 and 400-14 respectively, may be available for reference for various existing canyon sewers.

1.3.2 Flow Estimation

1.3.2.1 Land Use

Present or future allowable land use, whichever results in higher equivalent population, shall be used to generate potential sewage flows.

1.3.2.2 Flow Determination

Flow definitions and calculation procedures are listed below. All calculations shall be tabulated for each sewer main section (manhole to manhole) in the

format shown on Figure 1-2.

Equivalent Population: The equivalent population shall be calculated from zoning information (Ref. Section 1.6). For major new facilities such as high rise apartment buildings, flow rates (assuming one lateral) shall be checked based on the most current, adopted edition of the Uniform Plumbing Code. The most conservative flow rate shall govern.

Daily Per Capita Sewer Flow: The sewer flow for the equivalent population shall be 80 gallons per capita per day (gpcd).

Average Dry Weather Flow (ADWF): Equivalent populations shall be used to calculate the average dry weather flow. The average dry weather flow for each sewer main reach (manhole to manhole) shall be determined by multiplying the total accumulated equivalent population contributing to that reach by 80 gallons per capita per day:

Average Dry Weather Flow = (80 gpcpd) x (Equivalent Population)

Peaking Factor for Dry Weather Flow (PFDWF): The peaking factor is the ratio of peak dry weather flow to average dry weather flow. It is dependent upon the equivalent population within a tributary area. The tributary area is the area upstream of, and including, the current reach for the total flow in each reach of pipe. Figure 1-1, consisting of the table prepared by Holmes and Narver in 1960, shall be used to determine peaking factors for each tributary area. In no instance shall the dry weather flow peaking factor be less than 1.5.

Peak Dry Weather Flow (PDWF): The peak dry weather flow for each sewer main reach shall be determined by multiplying the average dry weather flow by the appropriate peaking factor (Note that peak dry weather flows are not algebraically cumulative as routed through the sewer system, i.e. the peak dry weather flow at any point shall be based on the equivalent population in the basin to that point (Ref. Figure 1-2).

Peak Dry Weather Flow = (Average Dry Weather Flow) x (Dry Weather Flow Peaking Factor)

Peaking Factor for Wet Weather Flow (PFWWF): The peaking factor for wet weather flow is the ratio of peak wet weather flow to peak dry weather flow. It is basin-specific and shall be based on essential information available at the time of the planning study. Information such as historical rainfall/sewage flow data, land use, soil data, pipe/manhole age, materials and conditions, groundwater elevations (post development), inflow and infiltration (I/I) studies, size, slope and densities of the drainage basin, etc., should be utilized in the wet weather analysis to estimate the peaking factor for wet weather. Upward adjustments shall be made in areas with expected high inflow and

infiltration (i.e. high ground water or in areas with lush landscaping schemes). Flow meters are installed throughout the City's sewer system. Flow data collected from these meters are available upon request. The objective of this analysis is to quantify the magnitude of peak wet weather flow with a 10-year return period on a statistical basis.

The Senior Civil Engineer overseeing the preparation of the planning study shall coordinate with the City Sewer Modeling Group for approval of the peaking factors to be used for design.

Peak Wet Weather Flow (PWWF): The peak wet weather flow (or design flow) for a gravity sewer main reach shall be determined by multiplying the peak dry weather flow (ref. Figure 1-2) by the appropriate wet weather peaking factor. The peak wet weather flow is the design flow for a gravity sewer main. It is determined at any point in the system based on the associated upstream average dry weather flow in the basis to that point times the peaking factor for wet weather.

Peak Wet Weather Flow = (Peak Dry Weather Flow) x (Wet Weather Peaking Factor)

1.3.3 Pipe Sizing Criteria

1.3.3.1 Hydraulic Requirements

Manning's formula for open-channel flows shall be used to calculate flows in gravity sewer mains. Manning's coefficient of roughness "n" shall be assumed to be 0.013 for all types of sewer pipe. Sewer grades shall be designed for velocities of 3 to 5 feet per second (fps) where possible. This is extremely important in areas where peak flow will not be achieved for many years. The minimum allowable velocity is 2 fps at calculated peak dry weather flow, excluding infiltration. Sewer mains that do not sustain 2 fps at peak flows shall be designed to have a minimum slope of 1 percent. Additional slope may be required by the Senior Civil Engineer where fill of varied depth is placed below the pipe in order to provide adequate slope after expected settlement occurs. The maximum allowable velocity shall be 10 fps and shall be avoided by adjusting slopes, by increasing the pipe diameter, or by utilizing a vertical curve transition to lower velocities per subsections 2.2.4 and 2.2.9.4. If the Senior Civil Engineer approves a velocity greater than 10 fps, the pipe shall be upgraded to SDR 18 PVC (standard dimension ratio polyvinyl chloride), concrete-encased VC (vitrified clay), or PVC sheet-lined reinforced concrete pipe.

TABLE 1-1
CITY OF SAN DIEGO SEWER DESIGN GUIDE
DENSITY CONVERSIONS

Zone	Maximum Density (DU/Net Ac)	Population per DU	Equivalent Population (Pop/Net Ac)
AR-1-1, RE-1-1	0.1	3.5	0.4
RE-1-2	0.2	3.5	0.7
AR-1-2, RE-1-3	1	3.5	3.5
RS-1-1, RS-1-8	1	3.5	3.5
RS-1-2, RS-1-9	2	3.5	7.0
RS-1-3, RS-1-10	3	3.5	10.5
RS-1-4, RS-1-11	4	3.5	14.0
RS-1-5, RS-1-12	5	3.5	17.5
RS-1-6, RS-1-13	7	3.5	24.5
RS-1-7, RS-1-14	9	3.5	31.5
RX-1-1	11	3.4	37.4
RT-1-1	12	3.3	39.6
RX-1-2, RT-1-2, RU-1-1	14	3.2	44.8
RT-1-3, RM-1-2	17	3.1	52.7
RT-1-4	20	3.0	60.0
RM-1-3	22	3.0	66.0
RM-2-4	25	3.0	75.0
RM-2-5	29	3.0	87.0
RM-2-6	35	2.8	98.0
RM-3-7, RM-5-12	43	2.6	111.8
RM-3-8	54	2.4	129.6
RM-3-9	73	2.2	160.6
RM-4-10	109	1.8	196.2
RM-4-11	218	1.5	327.0

TABLE 1-1
CITY OF SAN DIEGO SEWER DESIGN GUIDE
DENSITY CONVERSIONS (Continued)

Zone	Maximum Density (DU / Net Ac)	Population Per DU	Equivalent Population (Pop/Net Ac)
Schools/Public	8.9	3.5	31.2
Offices	10.9	3.5	38.2*
Commercial/Hotels	12.5	3.5	43.7*
Industrial	17.9	3.5	62.5*
Hospital	42.9	3.5	150.0*

Figures with asterisk (*) represent equivalent population per floor of the building.

Definitions:
DU = Dwelling Units
Ac = Acreage
Pop = Population

Net Acreage is the developable lot area excluding areas that are dedicated as public streets in acres. Gross Area is the entire area in acres of the drainage basin, including lots, streets, etc.

For undeveloped areas, assume Net Acreage = 0.8 x Gross Area in Acres

For developed areas, calculate actual Net Acreage.

Tabulated figures are for general case. The tabulated figures shall not be used if more accurate figures are available.

Population is based on actual equivalent dwelling units (EDU) or the maximum estimate obtained from zoning.

Conversion of Fixture Units to Equivalent Dwelling Units (EDU): The Water Meter Data Card, maintained by the Development Services Department, contains a table of plumbing fixtures that should be used for determining the equivalent dwelling units (EDU's) for the purpose of estimating the rate of wastewater generation in residential, commercial, or industrial areas. Currently, the basis for conversion is: 20 fixtures = 1 EDU and 1 EDU = 280 gallons of wastewater per day.

In high rise building areas, flow rates shall be based on the most current, adopted edition of the applicable Plumbing Code, assuming one lateral per area. The most conservative flow rate shall govern.

PUBLIC UTILITIES DEPARTMENT

PEAKING FACTOR FOR SEWER FLOWS
(Dry Weather)

Ratio of Peak to Average Flow*
Versus Tributary Population

Population	Ratio of Peak to Average Flow	Population	Ratio of Peak to Average Flow
200	4.00	4,800	2.01
500	3.00	5,000	2.00
800	2.75	5,200	1.99
900	2.60	5,500	1.97
1,000	2.50	6,000	1.95
1,100	2.47	6,200	1.94
1,200	2.45	6,400	1.93
1,300	2.43	6,900	1.91
1,400	2.40	7,300	1.90
1,500	2.38	7,500	1.89
1,600	2.36	8,100	1.87
1,700	2.34	8,400	1.86
1,750	2.33	9,100	1.84
1,800	2.32	9,600	1.83
1,850	2.31	10,000	1.82
1,900	2.30	11,500	1.80
2,000	2.29	13,000	1.78
2,150	2.27	14,500	1.76
2,225	2.25	15,000	1.75
2,300	2.24	16,000	1.74
2,375	2.23	16,700	1.73
2,425	2.22	17,400	1.72
2,500	2.21	18,000	1.71
2,600	2.20	18,900	1.70
2,625	2.19	19,800	1.69
2,675	2.18	21,500	1.68
2,775	2.17	22,600	1.67
2,850	2.16	25,000	1.65
3,000	2.14	26,500	1.64
3,100	2.13	28,000	1.63
3,200	2.12	32,000	1.61
3,500	2.10	36,000	1.59
3,600	2.09	38,000	1.58
3,700	2.08	42,000	1.57
3,800	2.07	49,000	1.55
3,900	2.06	54,000	1.54
4,000	2.05	60,000	1.53
4,200	2.04	70,000	1.52
4,400	2.03	90,000	1.51
4,600	2.02	100,000+	1.50

*Based on formula: Peak Factor = $6.2945 \times (pop)^{-0.1342}$
(Holmes & Narver, 1960)

FIGURE 1-1

APPENDIX C

OFFSITE SEWER ANALYSIS

1. Existing Flows – Existing Public Sewer
2. Existing Flow plus Project Flow – Existing Public Sewer

- Reference Exhibit A for Offsite Manhole Diagram

SEWER STUDY SUMMARY

DATE: 10/30/2024

JOB NUMBER: 648-032

FOR: Collection at Cactus City of San Diego; Existing Flows in Offsite Public Continental Street and Airway Road — MODEL 1 OF 2

BY: Dexter Wilson Engineering — REFER TO PLAN SHEET: EXHIBIT A

FROM	I.E.	TO	I.E.	LENGTH	IN-LINE FLOW (gpd)	AVG. DRY WEATHER FLOW (gpd)	PDWF PEAKING FACTOR	PDWF (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	AS-BUILT SLOPE (%)	DEPTH K' [1]	dn (feet)	dn/D[2]	C_a for Velocity[3]	VELOCITY (f.p.s.)	NOTES
									M.G.D.	C.F.S.								
9033 (8)	485.03	9031 (15)	484.52	216	125,000	125,000	2.35	293,265	0.293	0.454	15	0.24	0.066958	0.32500	0.26	0.1623	1.79	25 net-acres Industrial
9031 (15)	484.52	9018 (13)	483.78	278	125,000	250,000	2.14	534,432	0.534	0.827	15	0.27	0.114921	0.42500	0.34	0.2355	2.25	25 net-acres Industrial
9018 (13)	483.78	9019 (14)	483.24	270	0	250,000	2.14	534,432	0.534	0.827	15	0.20	0.132580	0.46250	0.37	0.2642	2.00	
9019 (14)	483.24	9021	482.36	302	0	250,000	2.14	534,432	0.534	0.827	15	0.29	0.109839	0.41250	0.33	0.2260	2.34	Continental St./Airway Rd. Intersection
9021	482.36	9025	481.45	395	0	250,000	2.14	534,432	0.534	0.827	15	0.23	0.123530	0.43750	0.35	0.2450	2.16	
9025	481.45	9026	480.48	390	0	250,000	2.14	534,432	0.534	0.827	15	0.25	0.118889	0.43750	0.35	0.2450	2.16	Connection to 18" at Britannia Blvd.
9026	480.48	9027	479.59	380	750,000	1,000,000	1.77	1,774,827	1.775	2.746	18	0.23	0.250210	0.78000	0.52	0.4130	2.96	150 net-acres Industrial
9027	479.55	9028	478.19	700	0	1,000,000	1.77	1,774,827	1.775	2.746	18	0.19	0.274718	0.82500	0.55	0.4430	2.76	
9028	478.19	9029	477.58	300	0	1,000,000	1.77	1,774,827	1.775	2.746	18	0.20	0.268536	0.82500	0.55	0.4430	2.76	
9029	477.58	9030/132895	466.90	202	0	1,000,000	1.77	1,774,827	1.775	2.746	18	5.29	0.052662	0.34500	0.23	0.1365	8.94	
9030/132895	466.48	132890	462.07	641	0	1,000,000	1.77	1,774,827	1.775	2.746	18	0.69	0.145988	0.58500	0.39	0.2836	4.30	
132890	462.07	132889	459.29	654	0	1,000,000	1.77	1,774,827	1.775	2.746	18	0.43	0.185726	0.66000	0.44	0.3328	3.67	
132889	459.29	132891	456.28	638	0	1,000,000	1.77	1,774,827	1.775	2.746	18	0.47	0.176293	0.64500	0.43	0.3229	3.78	
132891	456.28	132908	453.00	674	0	1,000,000	1.77	1,774,827	1.775	2.746	18	0.49	0.173580	0.63000	0.42	0.3130	3.90	Siempre Viva Rd. Intersection 30" OMTS

Min Slope	Max dn/D
0.19	0.55

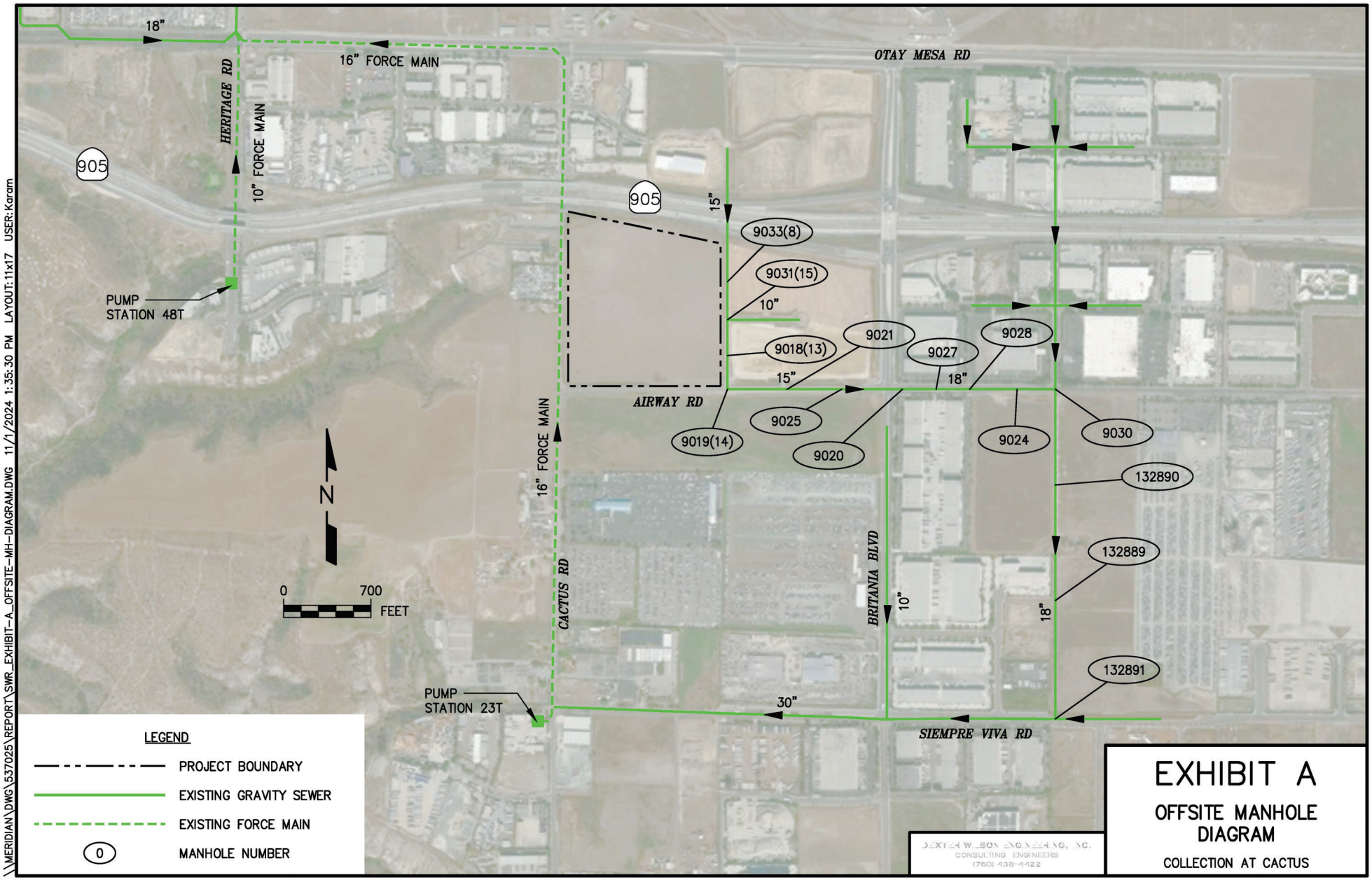
FOR: Collection at Cactus City of San Diego; Existing plus Proposed Flows in Offsite Public Continental Street and Airway Road — MODEL 2 OF 2

BY: Dexter Wilson Engineering — REFER TO PLAN SHEET: EXHIBIT A

FROM	I.E.	TO	I.E.	LENGTH	IN-LINE FLOW (gpd)	AVG. DRY WEATHER FLOW (gpd)	PDWF PEAKING FACTOR	PDWF (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	AS-BUILT SLOPE (%)	DEPTH K' [1]	dn (feet)	dn/D[2]	C_a for Velocity[3]	VELOCITY (f.p.s.)	NOTES
									M.G.D.	C.F.S.								
9033 (8)	485.03	9031 (15)	484.52	216	275,528	275,528	2.11	581,368	0.581	0.900	15	0.24	0.132738	0.46250	0.37	0.2642	2.18	25 net-acres Industrial (partial project P.O.C.)
9031 (15)	484.52	9018 (13)	483.78	278	195,112	470,640	1.96	924,208	0.924	1.430	15	0.27	0.198737	0.57500	0.46	0.3527	2.59	25 net-acres Industrial (partial project P.O.C.)
9018 (13)	483.78	9019 (14)	483.24	270	0	470,640	1.96	924,208	0.924	1.430	15	0.20	0.229275	0.62500	0.50	0.3930	2.33	
9019 (14)	483.24	9021	482.36	302	0	470,640	1.96	924,208	0.924	1.430	15	0.29	0.189947	0.56250	0.45	0.3428	2.67	Continental St./Airway Rd. Intersection
9021	482.36	9025	481.45	395	0	470,640	1.96	924,208	0.924	1.430	15	0.23	0.213624	0.60000	0.48	0.3727	2.46	
9025	481.45	9026	480.48	390	0	470,640	1.96	924,208	0.924	1.430	15	0.25	0.205597	0.58750	0.47	0.3627	2.52	Connection to 18" at Britannia Blvd.
9026	480.48	9027	479.59	380	750,000	1,220,640	1.73	2,109,228	2.109	3.264	18	0.23	0.297352	0.87000	0.58	0.4720	3.07	150 net-acres Industrial
9027	479.55	9028	478.19	700	0	1,220,640	1.73	2,109,228	2.109	3.264	18	0.19	0.326478	0.93000	0.62	0.5120	2.83	
9028	478.19	9029	477.58	300	0	1,220,640	1.73	2,109,228	2.109	3.264	18	0.20	0.319132	0.91500	0.61	0.5020	2.89	
9029	477.58	9030/132895	466.90	202	0	1,220,640	1.73	2,109,228	2.109	3.264	18	5.29	0.062584	0.37500	0.25	0.1535	9.45	
9030/132895	466.48	132890	462.07	641	0	1,220,640	1.73	2,109,228	2.109	3.264	18	0.69	0.173494	0.63000	0.42	0.3130	4.63	
132890	462.07	132889	459.29	654	0	1,220,640	1.73	2,109,228	2.109	3.264	18	0.43	0.220720	0.73500	0.49	0.3827	3.79	
132889	459.29	132891	456.28	638	0	1,220,640	1.73	2,109,228	2.109	3.264	18	0.47	0.209509	0.70500	0.47	0.3627	4.00	
132891	456.28	132908	453.00	674	0	1,220,640	1.73	2,109,228	2.109	3.264	18	0.49	0.206285	0.70500	0.47	0.3627	4.00	Siempre Viva Rd. Intersection 30" OMTS

Min Slope	Max dn/D
0.19	0.62

1 K' based on n = 0.013
2 dn/D using K' in Brater King Table 7-14
3 From Brater King Table 7-4 based on dn/D



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APPENDIX D

ONSITE SEWER ANALYSIS

1. Proposed Flows – Proposed Private Sewer

- Reference Exhibit B for Onsite Manhole Diagram

SEWER STUDY SUMMARY

DATE: 6/30/2025 FOR: Collection at Cactus Sewer Study (Proposed Flows; Private/Onsite) SHT 1 OF 1

JOB NUMBER: 537-025 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET: Exhibit A

FROM	TO	IN-LINE UNITS	AVG. DRY WEATHER FLOW (gpd)	PDWF PEAKING FACTOR	PDWF (gpd)	PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	AS-BUILT/ DESIGN SLOPE (%)	DEPTH K' (1)	dn (feet)	dn/D(2)	C_a for Velocity(3)	VELOCITY (f.p.s.)	NOTES
						M.G.D.	C.F.S.								
PA 10 IN	PA 10 OUT	139	31,136	2.83	88,028	0.088	0.136	6	1.00	0.112434	0.16776	0.34	0.2312	2.36	139 PA 10 Units
PA 13 IN	PA 13 OUT	174	38,976	2.74	106,922	0.107	0.165	6	1.00	0.136566	0.18600	0.37	0.2661	2.49	174 PA 13 Units
106	105	162	36,288	2.77	100,508	0.101	0.156	6	1.00	0.128373	0.17998	0.36	0.2546	2.44	1/2 of PA 11 Units
105	104	162	72,576	2.52	183,160	0.183	0.283	8	0.60	0.140236	0.25160	0.38	0.2714	2.35	1/2 of PA 11 Units
104	103	174	111,552	2.38	265,743	0.266	0.411	10	0.50	0.122929	0.29309	0.35	0.2466	2.40	1/2 of PA 12 Units
103	102	174	150,528	2.29	344,459	0.344	0.533	10	0.40	0.178150	0.35861	0.43	0.3232	2.37	1/2 of PA 12 Units
102	101	0	150,528	2.29	344,459	0.344	0.533	10	0.40	0.178150	0.35861	0.43	0.3232	2.37	
101	8	0	150,528	2.29	344,459	0.344	0.533	10	0.40	0.178150	0.35861	0.43	0.3232	2.37	
PA 10 OUT	PA 13 OUT	139	31,136	2.83	88,028	0.088	0.136	12	1.00	0.017707	0.13360	0.13	0.0624	2.18	Public St. D PA 10 P.O.C.
PA 13 OUT	15	174	70,112	2.54	177,764	0.178	0.275	12	1.00	0.035758	0.18784	0.19	0.1022	2.69	Public St. D PA 13 P.O.C.

TOTAL EDUs
985

Min Slope
0.40

Max dn/D
0.43

1 K' based on n = 0.013
2 dn/D using K' in Brater King Table 7-14
3 From Brater King Table 7-4 based on dn/D

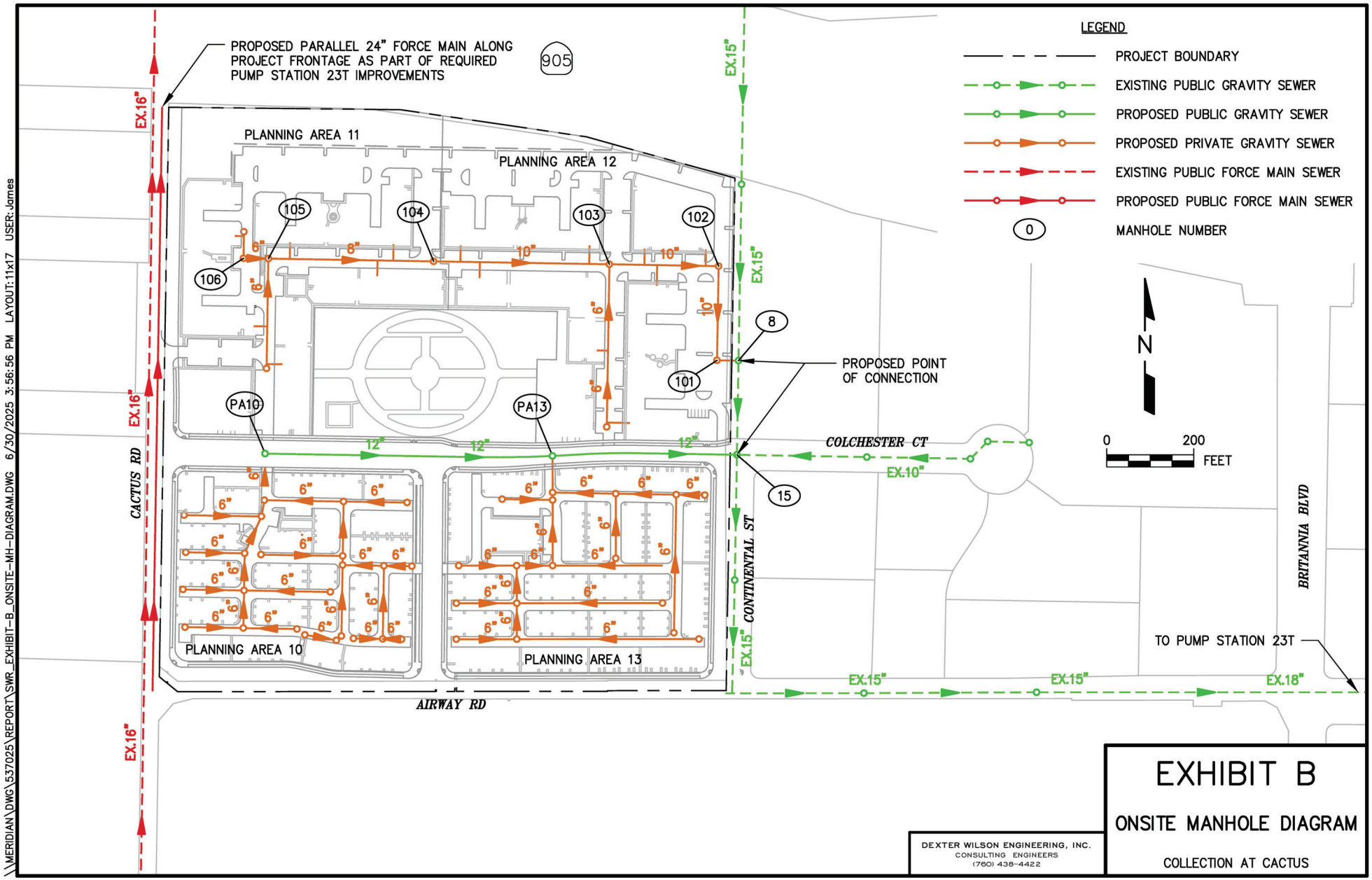

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EXHIBIT B

ONSITE MANHOLE DIAGRAM

COLLECTION AT CACTUS

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

APPENDIX E

PUMP STATION 23T JUNE 2023 MASTER PLAN EXCERPTS AND PEAK WET WEATHER FLOW DATA

Sewer Pump Station 23T Basin Study

(Otay Mesa Trunk Sewer Phasing Plan Report Update)

Prepared for

Colrich

June 20, 2023
(Revised 8.31.23)

ch2m: / Jacobs

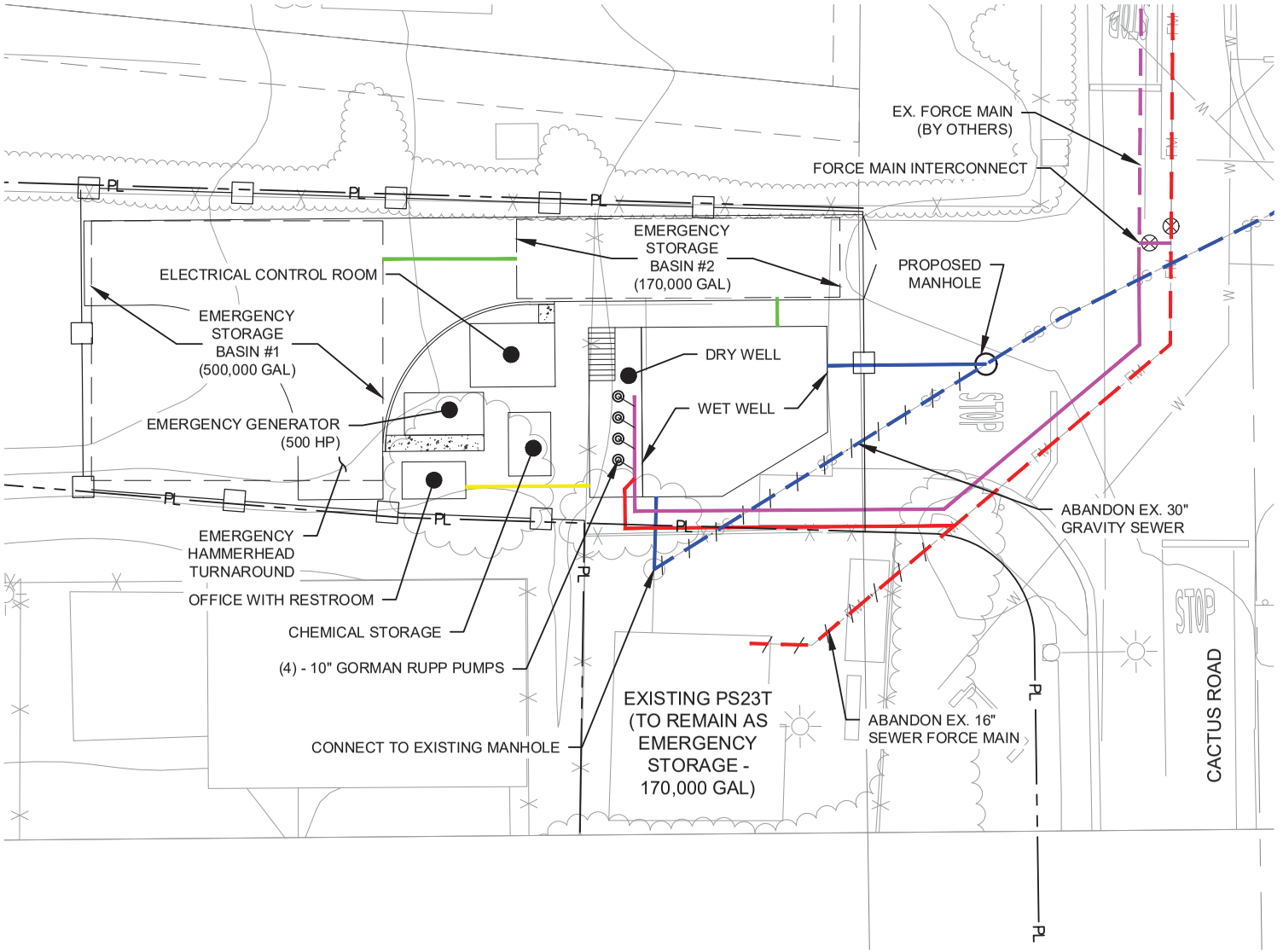


CH2M HILL ENGINEERS, INC/JACOBS
401 B Street, Suite 1550
San Diego, CA 92101

Mark B. Elliott, P.E.
Project Manager

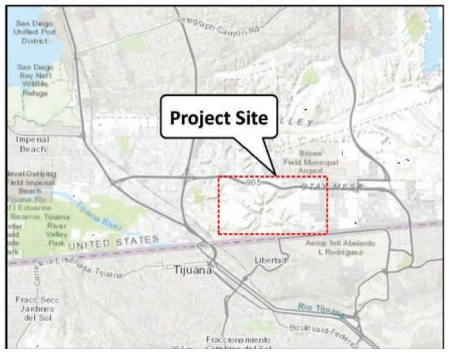
In Association With

WEST COAST CIVIL



LEGEND

- EX. 24" FORCE MAIN
- EX. 16" FORCE MAIN
- EX. 30" GRAVITY SEWER
- PROPOSED 24" FORCE MAIN
- PROPOSED 16" FORCE MAIN
- 30" GRAVITY SEWER
- EMERGENCY STORAGE BASIN CONNECTION
- OFFICE SEWER LATERAL



N
W E
S

0' 20' 40'
SCALE: 1"=20'

OTAY MESA
PS 23 IMPROVEMENT PLAN

FIGURE 6

Table 9. Phasing Plan and Target Capacity

Sewer Capacity (MGD)	Basin Peak Dry Flows (MGD)	Basin Peak Wet Flows (MGD)	Peak Flow Cumulative Increase (MGD)	Target Capacity Units Baseline Flow 3.0 MGD	SPS 23 Basin Scenario Summary and Recommended Improvements
Existing Baseline					
2.9		2.9	To be monitored by the City	To be monitored by the City	• *Lumina (Colrich) completes PS 23 Basin Study.* • City modifies PS 23 T Wet Well Level to reduce pump cycling • **City utilizes Siempre Viva Road Interceptor for wet weather equalization of existing flows.** • *Lumina constructs portion of Cactus Road 24-inch Force Main as part of its fair share contribution.* • *Lumina constructs 2,500 LF of new 18-inch Sewer Interceptor onsite.* • ***Initiate design for adding pump capacity at PS 23 while continuing construction.*** • ***The City maintains the ability to operate the second pump during storm events that may exceed 2.9 mgd and considers other temporarily reliability projects***
Phase 1 Manage Existing Peak Wet Weather					
4.3	2.2	4.3	1.3	Up to 2,100	• ***Colrich adds pumping unit at PS 23 and operates at maximum of 4.3 mgd with construction of 2,100 units.*** • *Developers demonstrate interim emergency storage for new development.* • Minor Surcharging on Heritage Road Sewer • *Prepare pre-design for new SPS 23T.* • *Design of the Gap Piece Sewer and redundant 24-inch Force Main* • ***Optional: City to review, monitor, and approve an interim surcharging plan for Heritage Road or relief sewer, if no other Developers commit to portions of the Gap Piece.***
Phase 2 Connect to Otay Mesa Trunk Sewer					
5.7	3.3	5.5	2.5	Up to 4,400	• Minor Surcharging on two Otay Valley Sewer reaches. • *Developer/City construct the remaining Cactus Road 24-inch Force Main to provide full redundancy.* • *Developer/City construct Otay Mesa Road Gap Piece and Diversion structure as fair share contribution and capital reimbursement project.* • Operate VFD pump during peak wet weather events up to a max of 5.5 mgd. • Assumes downstream Otay Mesa Trunk Sewer reaches constructed by others or City. • *Developer/City constructs 250,000 gallons of Emergency Storage.* • *Final design of PS 23 replacement project.*
Phase 3 Full SPS 23T Capacity					
10.3	5.4	10.3	7.4	Build-out	• *Developer/City constructs new PS 23* • Replacement of the existing 16-inch force main with 24-inch Force Main (if needed)

Notes:

1. Developer constructed Projects as part of fair share improvements and subject to cost reimbursement.
2. *Available Units estimate based on 190 gpd/Unit and assuming an average of 3.5 people per multi-family (mf) unit and 55 gpdc.*
3. *Assumes an average peak dry weather factor of 1.70 (Peak Dry to Average Dry) for future flows.*
4. *Assumes an average peak wet weather factor of 3.14 (Peak Wet to Average Day) for future flows.*



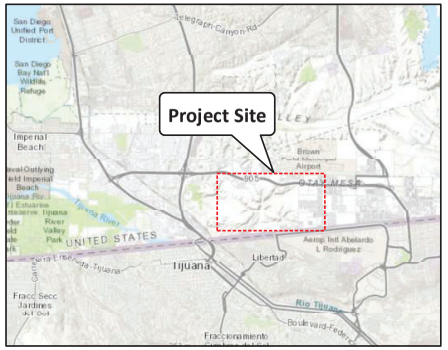
LEGEND

- LS PS 23
- Phase 1 Improvements
- Phase 2 Improvements
- Phase 3 Improvements
- Ex 42in Gravity Sewer OMTS
- Ex 16in Forcemain
- * Baseline

Phase 1

Phase 2

Phase 3



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W E

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Otay Mesa Trunk Sewer Phasing Plan

FIGURE 8

CadopG W:\Projects\127012 - Colrich PS23T Study (CH2M)\GIS\MXD\SPS 23T - Phasing Plan 2022.mxd 9/2/2022

Proposed improvements for Collection at Cactus highlighted in yellow below.

Table 10: Otay Mesa Trunk Sewer System Opinion of Probable Cost

Phase	Cumulative Units	Description	Quantity	Unit Cost	Cost
Betterment and 1	2,100	OM Sewer Update			$150,000
		PS 23 Rehabilitation (By City)	-	-	--
		Redundant 24" Force Main	2,700 LF	$480 LF	$1,296,000
		Construct regional onsite sewer system including 15-inch and 18-inch Interceptors; portions in the interim for use as wet weather storage	--	--	Colrich
		PS 23T design for 1 new 100 HP Pumps			100,000
		PS 23 Pre-Design Report			$175,000
		Upgrade PS 23T 1 new 100 HP Pumps	--	--	$350,000
		Heritage Road – Peak Weather flow Monitoring Program	1		$30,000
		Preliminary Design of Gap Piece			$50,000
2	4,400	Final Engineering Design of Gap Piece			$450,000
		Diversion Structure: Heritage & Otay Mesa	-	-	$500,000
		Dual 24" Otay Mesa Rd Force Main (2 x 4000 ft.) GAP – Force Main	8,000 LF	$480/LF	$3,840,000
		24" Otay Mesa Rd. Gravity Sewer GAP - Gravity	3,000 LF	$600/LF	$1,800,000
		PS23 Interim Emergency Storage	0.25 MG	$4.0/Gal	$1,000,000
		Remaining Redundant 24" Force Main	5,300 LF	$480 LF	$2,544,000-
		Construct 27”/30” OMTS PH2B2	5,750 LF	$600 LF	$3,450,000
		Engineering Final Design of Phase 10 mgd SPS 23	1	-	$1,300,000
3	Build-out	10 mgd New SPS 23	10	$1.25/mgd	$12,500,000
		Replace Ex. 16" Force Main with 24”	8,000 LF	$480/LF	$3,840,000
		Construction Cost Subtotal			$34,093,000
		Subtotal with 10% Admin, Legal, & CM			$3,409,300
		Subtotal with 20% Contingency			$6,818,600
		Project Costs (Rounded)			**$44,500,000**

Colrich = 2,025 Units

TOTAL: $2,151,000

Project Frontage (1,500 LF), identical to Colrich

TOTAL: $13,084,000

Table 11 includes the near term planned absorption schedule for the EPOCA development by Colrich. Based on the current market trends and construction schedule, about 1,100 units are proposed to be constructed over the next five years. These new multi-family units would add 400 gpm of peak wet

Phasing Considerations:

The City's recent investment at PS 23 with new pumps (shown below), structural upgrades and new electrical equipment should improve its service life and allow for continued near term development and provide for sufficient time for the new PS 23 to be planned, designed, and constructed.

The current deficiency related to emergency storage would require the construction of new storage adjacent to the existing PS 23, and likely would be located in the same area planned for the new PS 23. Since the new PS 23 has yet to be designed, there may be few opportunities to locate early construction of storage, it is recommended that interim storage options be explored as described below.



Recently Upgraded PS 23 with spare room for additional pumps.

The City's has experienced two recent major storm events in 2022 and 2023 which have resulted in peak wet weather flows either near or exceeding the PS 23 pump capacity, with the largest peak event just over 3.0 mgd.

During the rehabilitation project, the City actually operated a single Bypass Pumping System between two manholes at Siempre Viva Road and Cactus Road. The City was able to successfully manage these peak wet weather events, with minimal wet well or emergency storage. This is likely an indicator of the ability to utilize the available storage capacity in existing pipes and the attenuation of peak flows in the Siempre Viva Road Interceptor.

The City has confirmed that this managed peaking scenario can be assumed for "existing" peak flows, which is assumed at approximately 2.9 mgd based on the recent storm events in 2022 and 2023. New development needs to demonstrate similar pipe storage can be provided or build dedicated storage as peak flows are increased. This is further discussed in Phase 2.

In reviewing the backbone City gravity system serving Otay Mesa, several large diameters interceptors operate at very low flows and depths and have excess capacity to help the City meet emergency storage needs. Appendix H Hydraulic Calculations include the total storage of three larger interceptors for Siempre Viva Road, Via de la Amistad, and La Media Road. A total of over 800,000 gallons of full pipe storage exists. During peak wet weather flows the existing Siempre Viva Road Interceptor would be used to meet the emergency storage requirement in the interim conditions until such time that temporary or permanent storage is designed and constructed.

New development will construct several interceptor sewers, the largest being an 18-inch diameter within the Lumina development that drains to PS 23, and can provide portions of the emergency storage, while allowing peak wet weather flows to attenuate. It is anticipated that approximately 100,000 gallons of storage would need to be provided to manage the new development increased peak flows, based on City design criteria. One option may include a temporary concrete basin near PS 23 within City public right of way that could serve as an emergency storage basin until the new PS 23 is constructed. This option should be further reviewed with the City. Based on the timing of the new PS 23, and site constraints in and around PS 23, it is recommended that permanent emergency storage be deferred until a detailed pre-design report is prepared and approved by the City, and a plan to phase construct emergency storage is accepted by the City.

Pump Station 23T

Wet Weather Flow in January 2023



Assumed adjusted baseline pumping rate
(Current Pumping Capacity - Additional Peak Flow from Cactus and ColRich + Additional Pumping Capacity)
(3.0 mgd - 1.6 mgd +1.3 mgd)

Wet Weather Flow in October and November 2023



Assumed adjusted baseline pumping rate
(Current Pumping Capacity - Additional Peak Flow from Cactus and ColRich + Additional Pumping Capacity)
(3.0 mgd - 1.6 mgd +1.3 mgd)

Wet Weather Flow in March 2025



Assumed adjusted baseline pumping rate
(Current Pumping Capacity - Additional Peak Flow from Cactus and ColRich + Additional Pumping Capacity)
(3.0 mgd - 1.6 mgd +1.3 mgd)

APPENDIX F

RESPONSES TO CITY COMMENTS

Collection at Cactus PRJ-1111415

Sewer Study Comments and Responses

Comment	Commentor	Comment	Response
1	City of SD PUD	The City concurs with item 3 in the sewer study conclusion that the existing gravity collection system is able to accommodate the Collection at Cactus project.	Noted, sewer study will keep gravity collection system analysis and conclusions as is.
2	City of SD PUD	On item 5 in the sewer study conclusion, the estimated contributing future sewer flow at the Collection at Cactus project should include the future wet weather component. Therefore, the approximate future flow for the project should be 9-10% instead of 6-7% of the build-out flow to Pump Station 23T.	The sewer study has been revised to better clarify between average and peak flow - The proposed project will comprise 6-7% of the buildout average daily flow: (0.22 MGD (project average daily flow per applicant sewer study) / 3.2 MGD (buildout average daily flow per June 2023 Pump Station 23T sewer study)) The proposed project will comprise 8~9% of the buildout peak flow: (0.48 MGD (project peak flow per applicant sewer study) / 5.4 MGD (buildout peak flow per June 2023 Pump Station 23T sewer study))
3	City of SD PUD	Currently, Pump Station 23T does not have capacity to accommodate the Collection at Cactus project. If any developer's project prompt capacity issues to the existing sewer system, it is the obligation of the developer to mitigate potential capacity constraints. The Collection at Cactus project cannot discharge into the City collection system until Pump Station 23T and downstream conveyance system capacity issues are mitigated. Therefore, it is recommended that the developer either take sole responsibility of improving the system or initiate a coalition amongst the major developers in the Otay Mesa Sewer Service area to initiate the improvements including the financial obligations and construction for Pump Station 23T and downstream conveyance system.	Specific proposed improvements for the project regarding Pump Station 23T are now included in the revised sewer study. It is expected that the improvements will be in conjunction with adjacent developments (e.g. ColRich) and will be in line with the overall June 2023 study for Pump Station 23T.