CROWS LANDING INDUSTRIAL BUSINESS PARK
PHASE 1A INFRASTRUCTURE DESIGN PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

CROWS LANDING
INDUSTRIAL BUSINESS PARK

May 2020

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WOOD RODGERS

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May 2020

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May 18, 2020

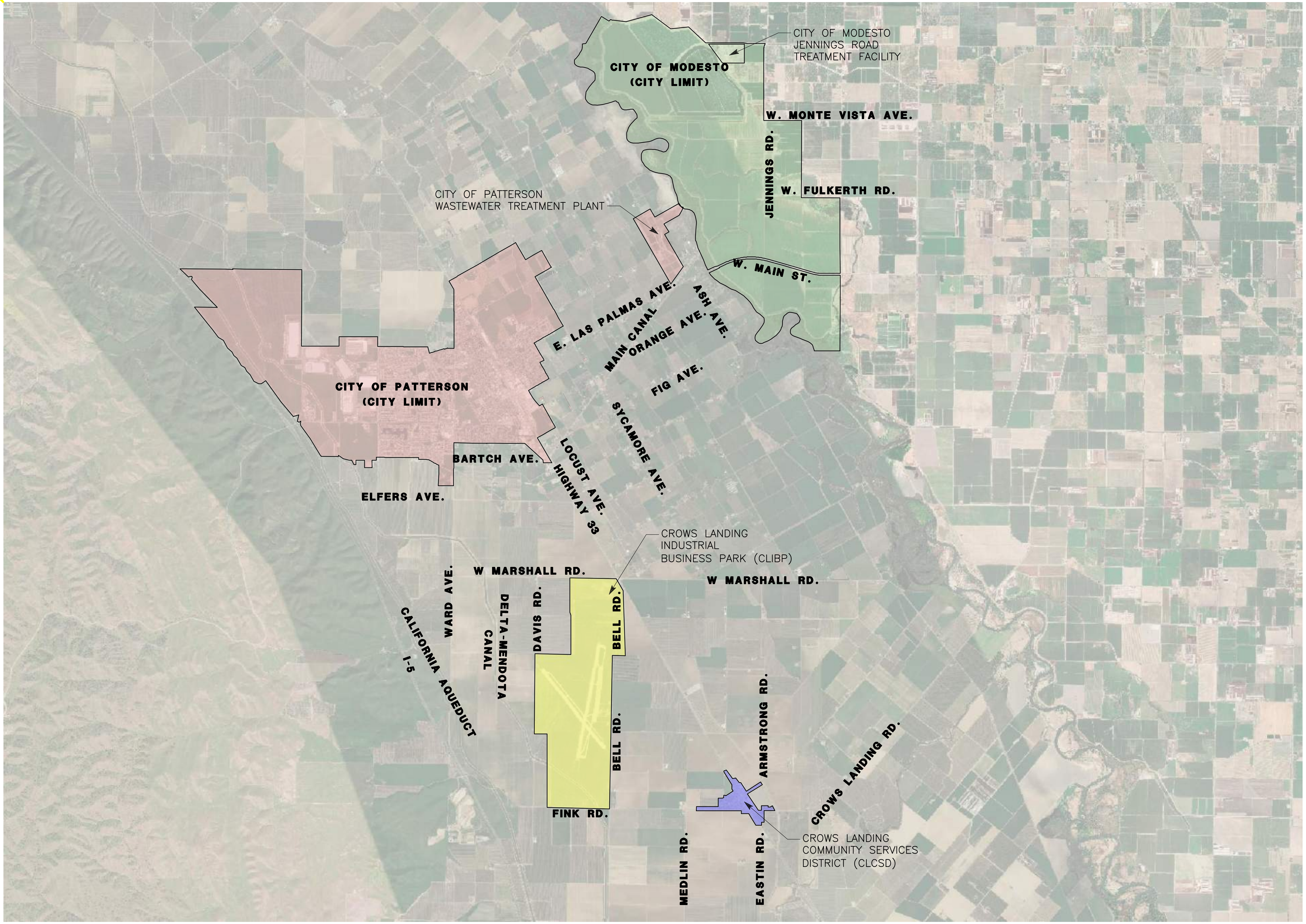
The proposed Crows Landing Industrial Business Park (CLIBP) is located at the former Crows Landing Flight Facility (NASA Ames Research Center). The 1,528 ac site in Western Stanislaus County is approximately 1.5 miles west of the community of Crows Landing and 1.5 miles east of Interstate 5 (I-5). The site is generally bounded by Fink Road to the south, Bell Road to the east, West Marshall Road to the north, and Davis Road to the west (see Figure 1). The Delta Mendota Canal (DMC) crosses the site between Davis Road and Fink Road. Redevelopment of the site by Stanislaus County (County) is anticipated in three phases beginning with Phase 1A along the Fink Road Corridor (see Figure 2). Future land uses include light industrial/manufacturing, logistics/distribution, business park/offices, and aviation-related services. Infrastructure planning is focused initially on the Phase 1 area including water, wastewater, and drainage systems. The Wastewater System Infrastructure Design Study (Wastewater Study) provides a framework for the phased construction of key collection, conveyance, treatment, and disposal elements and is organized as follows: 1) Background; 2) Design Criteria; 3) Projected Wastewater Demands; 4) Analysis of Alternatives; and 5) Recommendations. Each section is presented below.

I. BACKGROUND

Background information presented below includes: a) a summary of land use by development phase; b) an overview of the wastewater management strategy; c) a discussion of the agreement between the County and the City of Patterson (COP) for wastewater service; and d) a discussion of the regulatory setting should the County pursue an onsite wastewater management alternative for Phase 1A.

A. Summary of Land Use by Development Phase

As noted earlier, the CLIBP redevelopment project will be constructed in three phases with the initial phase planned along the Fink Road corridor. Wastewater handling requirements for the project are a function of land use and unit wastewater generation factors (WGFs). The proposed phasing program as outlined in the *Crows Landing Industrial Business Park Specific Plan* [1] is presented in Table 1 below. The development program in Table 1 will be used to determine wastewater handling requirements by phase. These handling requirements will serve as a basis for determining wastewater infrastructure components as detailed in Analysis of Alternatives.



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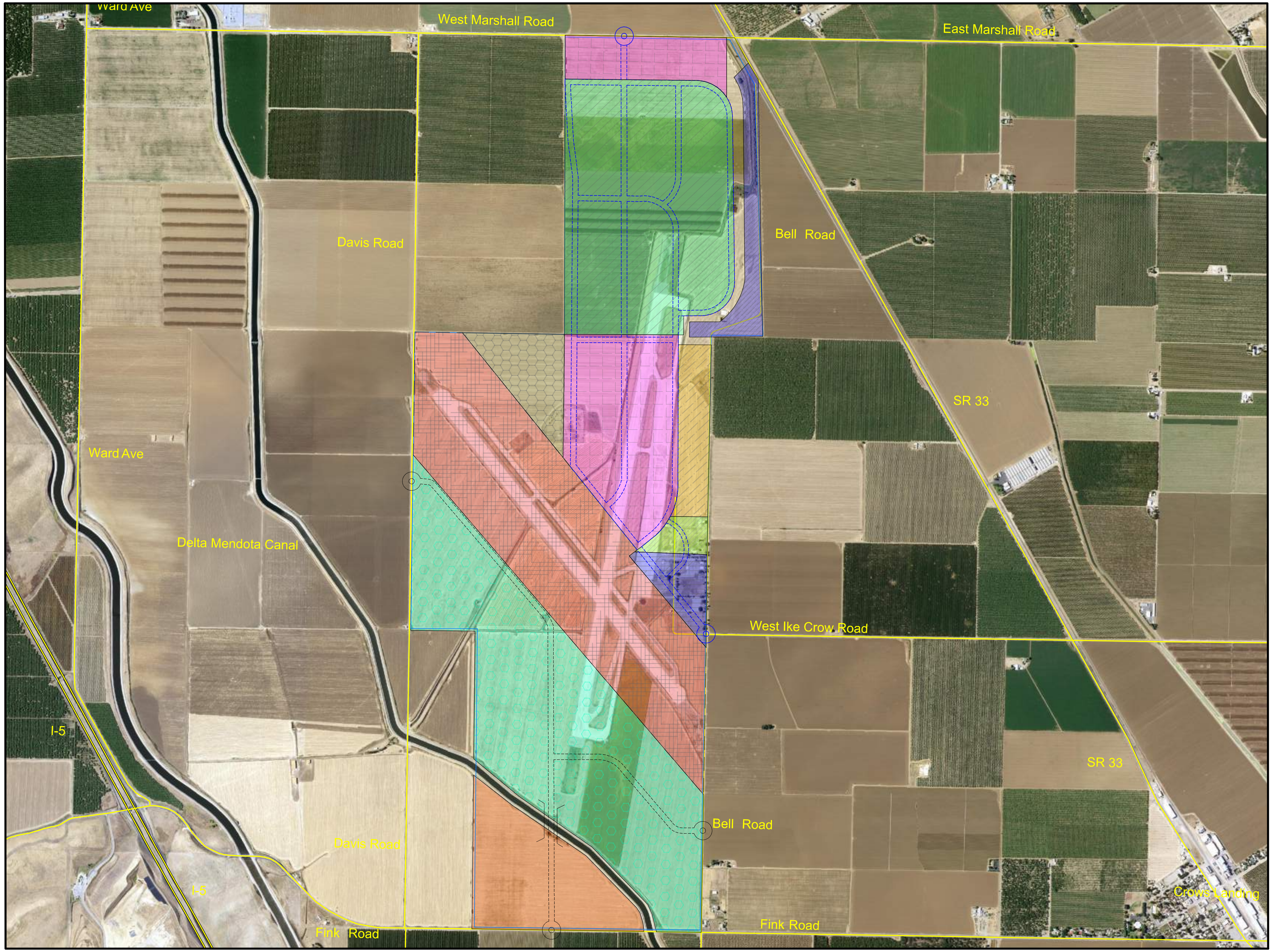
WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 1. LOCATION MAP

5/13/2020

SCALE:NTS



LEGEND

PHASING

- PHASE 1A – FINK ROAD CORRIDOR
- PHASE 1B – BELL ROAD CORRIDOR
- PHASE 1B – AIRPORT
- PHASE 1B – PUBLIC FACILITIES AREA (SOUTH)
- PHASE 2 – AIRPORT RELATED
- PHASE 2 – SR-33 CORRIDOR (SOUTH)
- PHASE 2 – PUBLIC FACILITIES AREA (NORTH)
- PHASE 3 – (REMEDIATION DURING PHASES 1 & 2)
- PHASE 3 – SR CORRIDOR (NORTH)
- STORMWATER POND

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FIGURE 2. DEVELOPMENT PHASES

5/13/2020

SCALE:NTS

I:\19041 - Crows Landing IBP - Wood Rodgers\400 Project Design Files\435 Water\Exhibits\CL-Plan Phases Soils Map (20200512).dwg10

Table 1 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Land Use and Development Phasing

Land Use	Description	Phase 1		Phase 2	Phase 3	Total All Phases
		Phase 1A	Phase 1B			
Logistics/ Distribution	Packaging, warehouse, and distribution, etc.	52	138	57	102	349
Light Industrial	Light industrial manufacturing, machine shops, etc.	41	110	71	128	350
Business Park	Research and development, business support services, etc.	10	28	14	26	78
Public Facilities	Government offices, professional offices, emergency services, etc.	0	15	35	18	68
General Aviation	Airport runways, aprons, hangars, etc.	0	370	0	0	370
Aviation Related	Parcel distribution, aviation classroom training, etc.	0	0	46	0	46
All Uses by Phase		**103**	**661**	**223**	**274**	**1,261**

B. Overview of Wastewater Management Strategy

Wastewater will be collected from new buildings constructed within the CLIBP and conveyed offsite for treatment, disposal, and reuse on a long-term basis. An agreement between the County and the COP defines the conditions for wastewater service and identifies improvements required to the COP system to facilitate the acceptance of wastewater discharges from CLIBP (see Agreement with City of Patterson for Wastewater Service below). The internal wastewater collection system will be designed generally to route flows to a backbone trunk sewer to be built in Bell Road. The referenced trunk sewer will convey wastewater to a regional pump station near the northeast quadrant of the CLIBP site. From the regional pump station, wastewater will be routed to the COP along Marshall Road and Ward Avenue. Although the CLIBP will be developed in phases, the backbone infrastructure (trunk sewer, regional pump station, and force main) would be constructed simultaneously rather than incrementally with multiple, parallel pipelines. Because under this approach, the initial phase of development would be burdened with significant backbone infrastructure costs, the County will consider an onsite wastewater management alternative for Phase 1A and potentially Phase 1B in lieu of discharge to the COP. Later phases of development (Phase 2 and

Phase 3) would be serviced by the ultimate backbone wastewater infrastructure system and the COP.

C. Agreement with City of Patterson for Wastewater Service

The County and COP are executing a Mutual Financing and Infrastructure Agreement (Agreement) for the Crows Landing Specific Plan and the Northwest Patterson Master Plan (see Appendix A). The Agreement includes provisions for the financing and construction of improvements within the COP wastewater collection and treatment system triggered by discharge of wastewater flows from the phased development of the CLIBP [2]. These improvements are summarized in Table 2 and illustrated in Figure 3. The "fair share contribution" of the County to construction of the South Patterson Trunk Sewer (SPTS) and the Phase IV Expansion of the COP Wastewater Treatment Plant are identified as $29,745,000 as of January 2019 in the Agreement. The rationale for the "fair share contribution" is as follows:

1. CLIBP will require 36% of the capacity of the SPTS. Total costs for the construction of the SPTS are projected at $8,379,000. The County's share of the costs would be 36% or $3,015,000.

2. Costs for the Phase IV Expansion of the COP wastewater treatment plant are projected at $30/gpd of capacity. Based on the capacity requirements for the CLIBP, the County's cost will be $26,730,000.

3. Total "fair share contribution" for the County is the sum of the SPTS and wastewater treatment plant expansion costs of $29,745,000 ($3,015,000 plus $26,730,000).

In addition to the "fair share contribution," the County would also be responsible for the following costs:

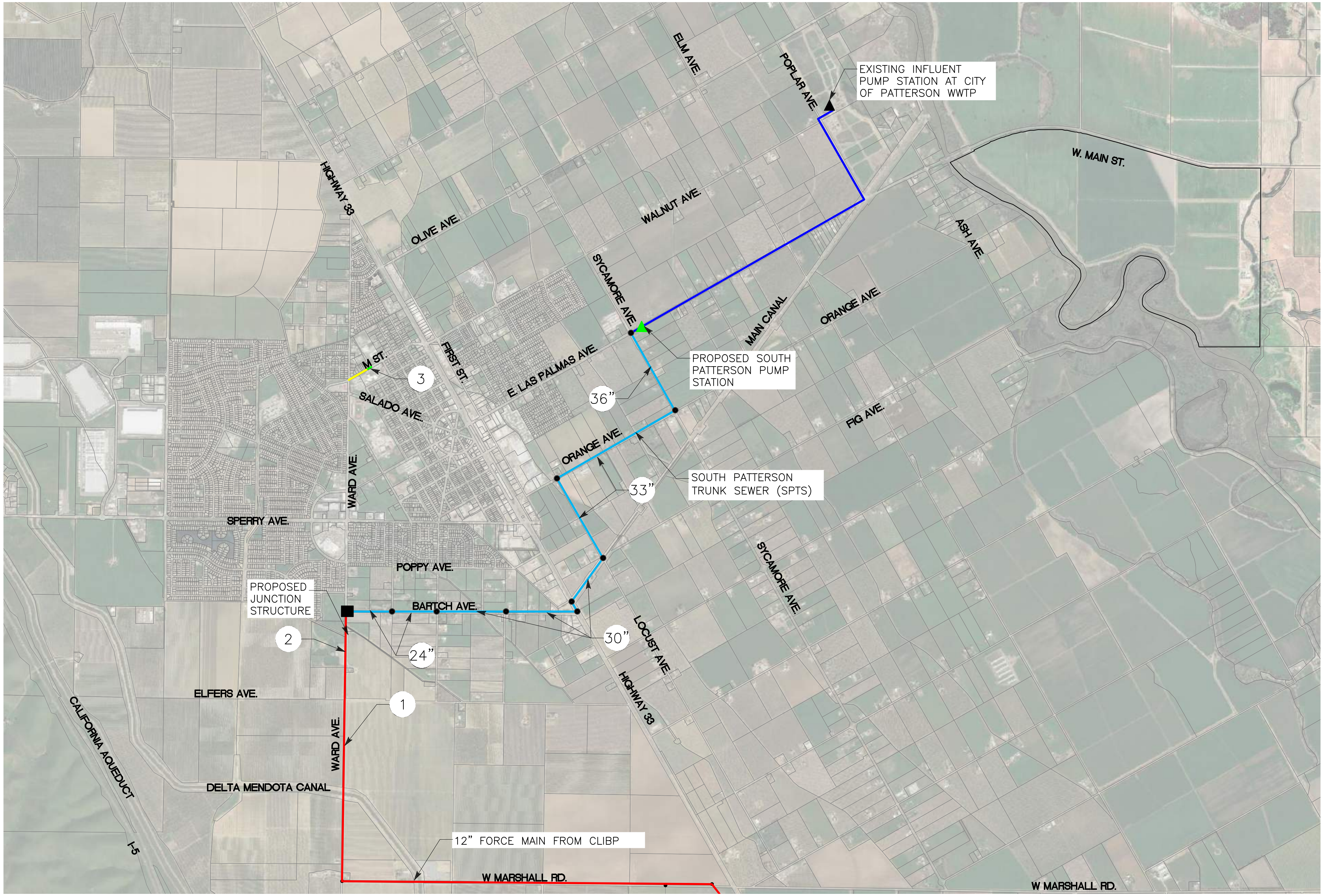
1. Upsizing of 1,300 ft of 21-in trunk sewer to 24-in along Ward Avenue – probable construction cost of $300,000.

2. Replacement of M Street sewer – probable construction cost of $100,000.

3. Installation of 7,850 ft of 12-in force main in Ward Avenue – probable construction cost of $1.0 million.

Table 2 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Summary of City of Patterson Wastewater System Improvements
Triggered by CLIBP Phased Development

CLIBP Development Phase	City of Patterson Wastewater System Improvement
1	• Upsizing of approximately 1,300 ft of 21-in trunk sewer to 24-in along Ward Avenue • Replacement of M Street Sewer • Phase 4 Expansion of Wastewater Treatment Plant • Construction of SPTS
2	• Installation of 7,870 ft of 12-in force main paralleling the existing Western Hills Water District 18-in trunk sewer along Ward Avenue between Marshall Road and Bartch Avenue



LEGEND

- 12" FORCE MAIN
- PROPOSED SPTS GRAVITY TRUNK LINE
- PROPOSED 16" SPTS FORCE MAIN
- SEWER MANHOLE

NOTES:

1. PHASE 1 – UPSIZE TRUNK SEWER TO 24"
2. PHASE 2 – CONSTRUCT 7,900 FT OF 12" FORCE MAIN PARALLEL TO TRUNK SEWER CONNECT TO SPTS
3. CORRECT REVERSE SLOPE IN SEGMENT E5-6:E5-5

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WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 3. PATTERSON WASTEWATER IMPROVEMENTS TRIGGERED BY CLIBP WASTEWATER FLOW

5/14/2020

SCALE: 1" = 3000'

D. Regulatory Setting

For the onsite wastewater management alternative for Phase 1A, the governing criteria are established through the County Primary and Secondary Sewage Treatment Initiative Measure X Implementation Guidelines (Measure X). Measure X requires sewage be treated with a primary and secondary wastewater treatment system prior to disposal [3]. Attachment A of the *Stanislaus County Local Agency Management Program* (LAMP) [4] provides the specific guidelines to be followed for wastewater disposal and defines the County Department of Environmental Resources (DER) as the agency responsible for regulating onsite wastewater treatment system (OWTS) throughout unincorporated areas of the County as well as peripheral portions of various cities in the County. Key provisions of the LAMP that will impact wastewater dispersal area sizing and design include the policies in Table 3.

Table 3 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Summary of City of Patterson Wastewater System Improvements
Key Provisions of the Stanislaus County LAMP [4]

Policy/Section	Provision
Policy #23a	• Requirement for a preliminary hydrogeologic study, and a groundwater monitoring program, for subsurface disposal of treated effluent from package treatment plants.
Policy #35	• Formal adoption by DER of the Percolation Test protocol and wastewater application rates described in the EPA design manual, On-site Wastewater Treatment and Disposal Systems, 1980 [5].
Tier 2 Guidance, Section 7.4	• Percolation test results – Under previous practices acceptable limits of percolation for drainfield suitability range between 1 and 120 minutes per inch (MPI) [5]. Under new Tier 2 standards allowable application rates are set by a 3-step procedure. Standard design is only approved for percolation field testing rates between 1 and 120 MPI. Percolation test results in the effluent disposal area that are faster than 1 MPI, or slower than 120 MPI indicate the soils are not suitable for standard septic tank design, and DER should be consulted for acceptable alternate designs.
Tier 2 Guidance, Section 8.1.3	• Design of new and replacement OWTS shall be made based on Tier 1 language, but allowing up to 10,000 gal/day of flow. New projects that plan to exceed 10,000 gal/day flow must have waste discharge requirements (WDRs) and monitoring and reporting plans (MRPs) approved by the Regional Water Quality Control Board (Regional Board).
Tier 2 Guidance, Section 8.1.4	• Soil cover thickness over dispersal systems must be at least 12 inches, but pressure distribution systems must have at least 6 inches.
Tier 2 Guidance	• Minimum depth to the water table measured from the bottom of the dispersal system is 5 ft minimum depth to groundwater • Dispersal systems replacement area – 100% replacement area that is equivalent and separate, and available for future use.
Appendix 1	• Proposed Tier 2 Guidance, Section 8, Minimum OWTS Design and Construction Standards, 8.1.9 - No new dispersal systems or replacement areas shall be covered by an impermeable surface, such as paving, building foundation slabs, plastic sheeting, or any other material that prevents oxygen transfer to the soil. Gravel or paving stones interspersed with grass are allowed as cover. • Proposed Tier 2 Guidance, Section 9.1.3 - OWTS that use any form of effluent disposal that discharges on or above the post-installation ground surface such as sprinklers, exposed drip lines, free-surface wetlands, or a pond are prohibited.

Because wastewater flows for Phase 1A will likely exceed 10,000 gals/day (gpd), WDRs and a MRP will be issued by the Regional Board. Key considerations in permit development by the Regional Board are as follows:

1. The guiding document is the June 19, 2012, OWTS Policy – Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems [6].

2. Understanding Tier 2 Guidance in accordance with OWTS Policy.

3. Review of the percolation test protocol and wastewater application rates described in the EPA Onsite Wastewater Treatment System Manual [4, 7].

II. DESIGN CRITERIA

Design criteria include WGFs for planned land uses at the CLIBP and level of service standards for wastewater conveyance systems.

A. Wastewater Generation Factors

Typical WGFs for industrial land use are presented in Table 4 for multiple agencies in San Joaquin and Stanislaus Counties. As shown in the referenced table, WGFs vary from 490 to 1100 gal/day-ac (gpd/ac). Historical dry weather peaking factors vary from 2 to 3. For planning purposes, based on a review of the data, the following factors will be used to estimate average and peak wet weather flows (PWWF) for the CLIBP:

1. Industrial land use – 1,000 gpd/ac (average)

2. Business park – 500 gpd/ac (average)

3. Aviation related land use – 4 gpd/person

4. Peak dry weather flow (PDWF) – 2 times average dry weather flow (ADWF)

5. Infiltration/inflow (I/I) allowance – 100 gpd/ac

6. PWWF – PDWF flow plus I/I allowance

Table 4 – CLIBP Phase 1A Infrastructure Project Wastewater System Infrastructure Design Study Wastewater Generation Factors for Industrial Land Use

Source	Wastewater Generation Factor – Industrial
City of Modesto [8]	950 gpd/ac (existing) 1,000 gpd/ac (future)
City of Patterson [9]	490 gpd/ac
City of Manteca [10]	566 gpd/ac[a]
CLIBP Specific Plan [1]	1,100 gpd/ac[b,c]

[a] WGF for business industrial park – 302 gpd/ac

[b] WGF is composed of the following: 1,100 gpd/ac (dry weather) and 100 gpd/ac (wet weather)

[c] WGF for airport uses – 4 gpd/person

B. Level of Service Considerations

Design criteria for the proposed wastewater collection and conveyance system are summarized in Table 5. Design criteria are consistent with level of service standards for the Cities of Patterson and Modesto and will be used for infrastructure sizing and analyses of operational characteristics.

Table 5 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Design Criteria for Wastewater Conveyance System

Parameter	Value
Gravity sewer:	
Minimum size, in	8
Minimum slope, ft/ft	
8-in	0.0035
10-in	0.0025
12-in	0.0020
15-in	0.0017
18-in	0.0010
Minimum velocity, ft/sec	2
Maximum capacity, d/D	0.70
Maximum manhole spacing, ft	400
Pump station:	
Capacity	Convey peak wet weather flow with largest pump out of service
Type	Submersible
Maximum pump starts/hour	12
Force main:	
Minimum velocity, ft/sec	2
Maximum velocity, ft/sec	5

III. PROJECTED WASTEWATER DEMANDS

Using the proposed land use summaries (Table 1) and wastewater generation factors (Table 4), wastewater demands (flows) can be determined by development phase. As shown in Table 6, wastewater demands for Phase 1A are approximately 98,000 gal/day (average dry weather demand) with total buildout demands at 773,000 gal/day. For conveyance planning and design purposes, PWWF for Phase 1A and buildout of CLIBP are 143 gal/min and 1136 gal/min, respectively. These values will be used in the development and analysis of alternatives detailed in the following section.

Table 6 – CLIBP Phase 1A Infrastructure Project Wastewater System Infrastructure Design Study Wastewater Demands for Phase 1A						
Phase	**Land Use**	**Area, ac**	**ADWF, gpd**	**PDWF, gpd**	**I/I, gpd**	**PWWF, gpm**
1A	Logistics/Distribution	52	52,000	104,000	5,200	75.8
1A	Light Industrial	41	41,000	82,000	4,100	59.8
1A	Business Park	10	5,000	10,000	1,000	7.6
	Phase 1A Total		**98,000**			**143.2**
1B	Logistics/Distribution	138	138,000	276,000	13,800	201.3
1B	Light Industrial	110	110,000	220,000	11,000	160.4
1B	Business Park	28	14,000	28,000	2,800	21.4
1B	Public Facilities	15	7,500	15,000	1,500	11.5
1B	General Aviation	370	400	800	1,150	1.4
	Phase 1B Total		**269,900**			**396.0**
	Phase 1 Total		**367,900**			**539.2**
2	Logistics/Distribution	57	57,000	114,000	5,700	83.1
2	Light Industrial	71	71,000	142,000	7,100	103.5
2	Business Park	14	7,000	14,000	1,400	10.7
2	Public Facilities	35	17,500	35,000	3,500	26.7
2	Aviation Related	46	400	800	4,600	3.8
	Phase 2 Total		**152,900**			**227.8**
3	Logistics/Distribution	102	102,000	204,000	10,200	148.8
3	Light Industrial	128	128,000	256,000	12,800	186.7
3	Business Park	26	13,000	26,000	2,600	19.9
3	Public Facilities	18	9,000	18,000	1,800	13.8
	Phase 3 Total		**252,000**			**369.2**
	Grand Total		**772,800**			**1,136.2**

IV. ANALYSIS OF ALTERNATIVES

Based on the projected wastewater flows for CLIBP and the desired level of service standards, a series of alternatives were developed for wastewater collection, conveyance, treatment, and disposal considering initial (Phase 1A) and buildout (through completion of Phase 3) development conditions.

A. Discussion of Methodology

Alternatives were analyzed considering capital costs, phasing, and ease of implementation. For wastewater collection and conveyance for CLIBP, the initial alternative reflected recommendations detailed in the wastewater technical study [10] supporting the *Crows Landing Industrial Business Park Specific Plan*. Alternatives then considered limited downsizing of wastewater pipelines consistent with design criteria or the impact of Phase 1A and Phase 1A/1B relying on an onsite wastewater management option. Offsite conveyance focused on routing wastewater to the COP in alignment with the agreement between the County and the COP. Two "fallback" options were included for the County involving offsite wastewater conveyance to the City of Modesto (COM) Jennings Road Wastewater Treatment Facility (JRWWTF).

For the onsite wastewater management alternative for Phase 1A, alternatives were developed for treatment and disposal through subsurface dispersal. Three treatment systems in compliance with Measure X were identified and detailed. Similarly, three dispersal options are illustrated for Phase 1A including incremental construction of dispersal areas in alignment with possible development of the business park on a "pad by pad" basis.

B. Hydraulic Model

A hydraulic model was prepared to analyze wastewater conveyance alternatives. The software used to model the existing collection system is Bentley Haestad, SewerCAD. SewerCAD can analyze the performance of a collection system under various flow conditions such as dry weather, wet weather, steady-state, or unsteady-state. For the hydraulic evaluation of the proposed CLIBP collection/ conveyance system, a steady-state model using calculated PWWF was conducted.

Information on pipes, manholes, force mains, and pump stations were input into the program. Once the system information was input, information regarding wastewater flow was added. Using the physical information for the collection/ conveyance system, model scenarios were executed for ADWF and PWWF conditions.

The sewer model uses the Manning equation to calculate gravity sewer flow capacities. The Manning's "n" value (coefficient of friction) can be varied based on pipe material and age. The Manning equation to calculate velocity is presented below for reference.

Manning Equation: $V = \frac{1.486\ x\ R^{2/3}\ x\ S^{1/2}}{n}$

Where: V = velocity, fps
n = Manning's coefficient of friction (assumed, n = 0.013)
R = hydraulic radius, ft
S = slope of pipe, ft/ft

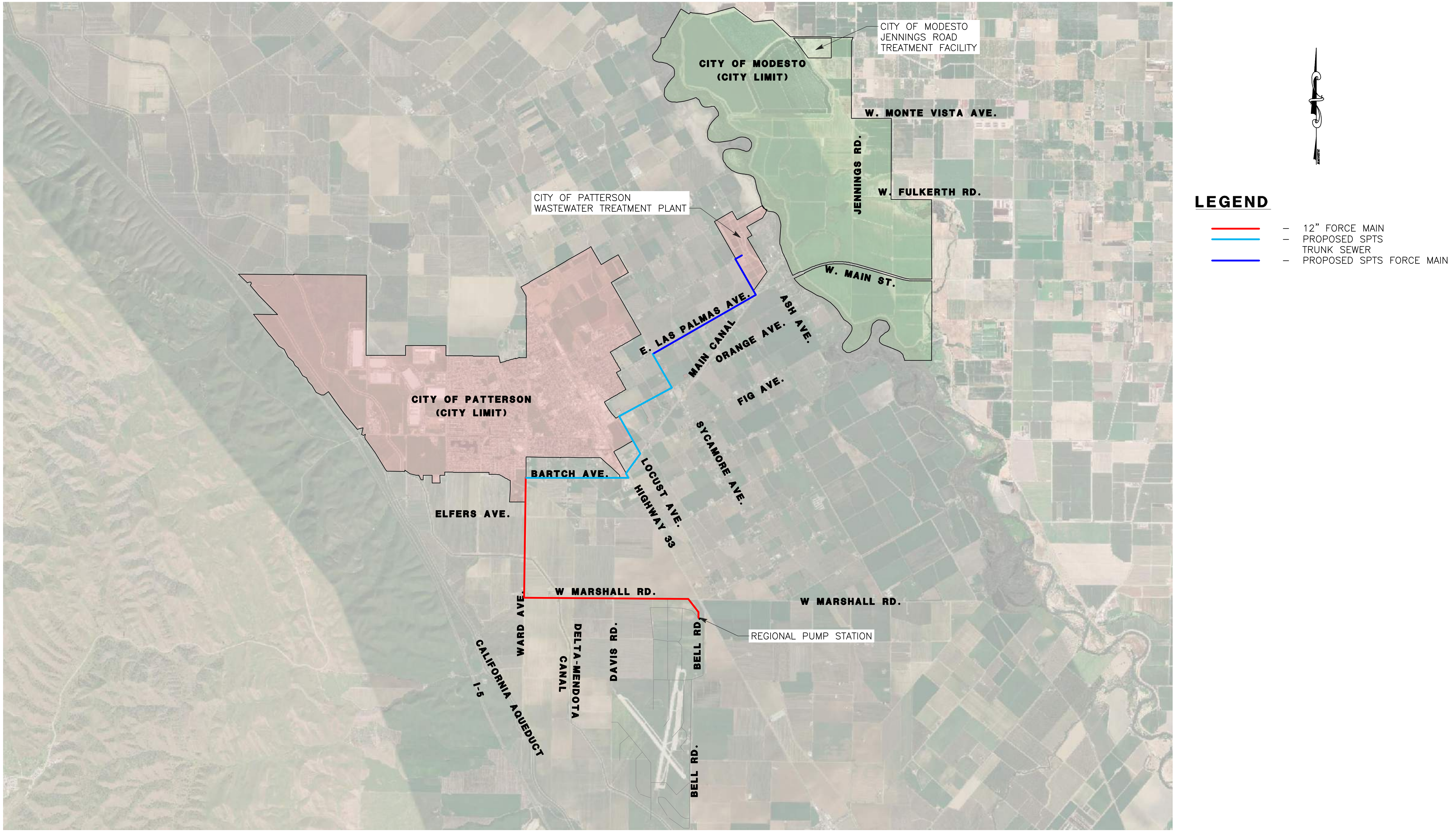
Hydraulic model results are presented in Appendix B.

C. Wastewater Conveyance System

As detailed in the *Crows Landing Industrial Business Park Specific Plan* [1], on a long-term basis, wastewater will be collected within each phase of development and routed to a trunk sewer to be constructed in Bell Road. The trunk sewer will convey wastewater to a regional pump station for discharge to a force main planned in West Marshall Road. The 12-in force main would initially discharge to a trunk sewer in Ward Avenue, combining with flows from the Western Hills Water District. Ultimately, the 12-in force main would be extended along Ward Avenue from West Marshall Road to Bartch Avenue to a future connection to the SPTS. This regional trunk sewer will convey wastewater from multiple developments and the CLIBP to the COP wastewater treatment plant for processing and disposal. An illustration of this overall concept is presented in Figure 4. Various refinements of this conveyance strategy along with routing alternatives are discussed below.

1. Wastewater Conveyance to City of Patterson Including Phase 1 Development

A collection and conveyance system for each phase of development is illustrated in Figure 5. Pipeline sizes reflect information from the Specific Plan technical study and range from 8-in diameter in the upper reaches of the sewer shed to 18-in diameter along Bell Road. Wastewater flow from Phase 1A would be collected and then pumped to Phase 1B infrastructure for conveyance to the trunk sewer in Bell Road. Based on the hydraulic analyses found in Appendix B, some pipelines do not meet the minimum velocity criteria at peak flow of 2 ft/sec. Downsizing of certain pipelines to improve hydraulic performance is presented in Figure 6. Downsizing in the collection/conveyance systems would consist of the downsizing of 500 ft of 15-in sewer to 12-in in Phase 2.



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WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 4. CONVEYANCE STRATEGY FOR DISCHARGE TO CITY OF PATTERSON

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SCALE:NTS

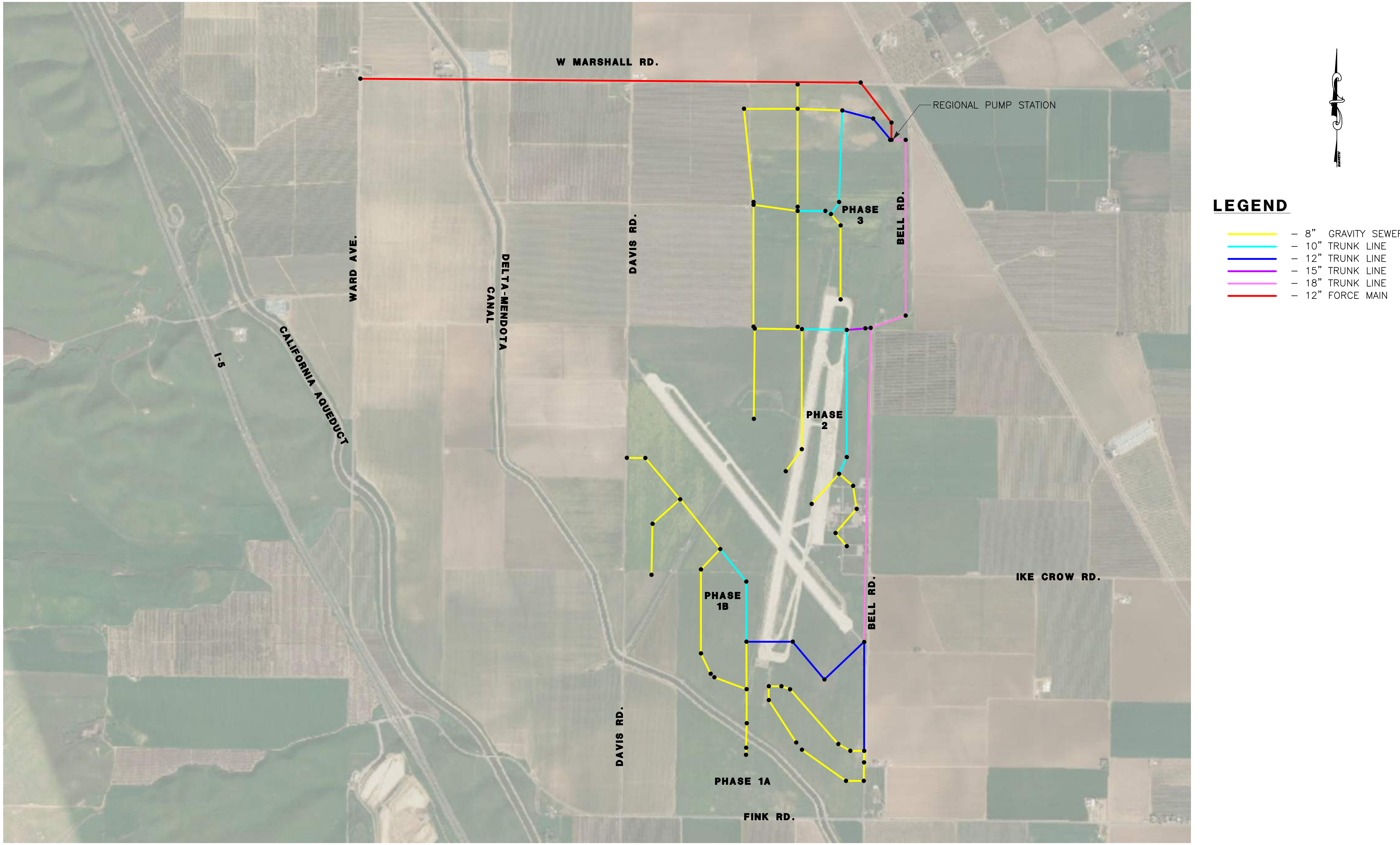

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FIGURE 5. WASTEWATER CONVEYANCE SYSTEM, SPECIFIC PLAN PIPELINE SIZES

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SCALE:NTS

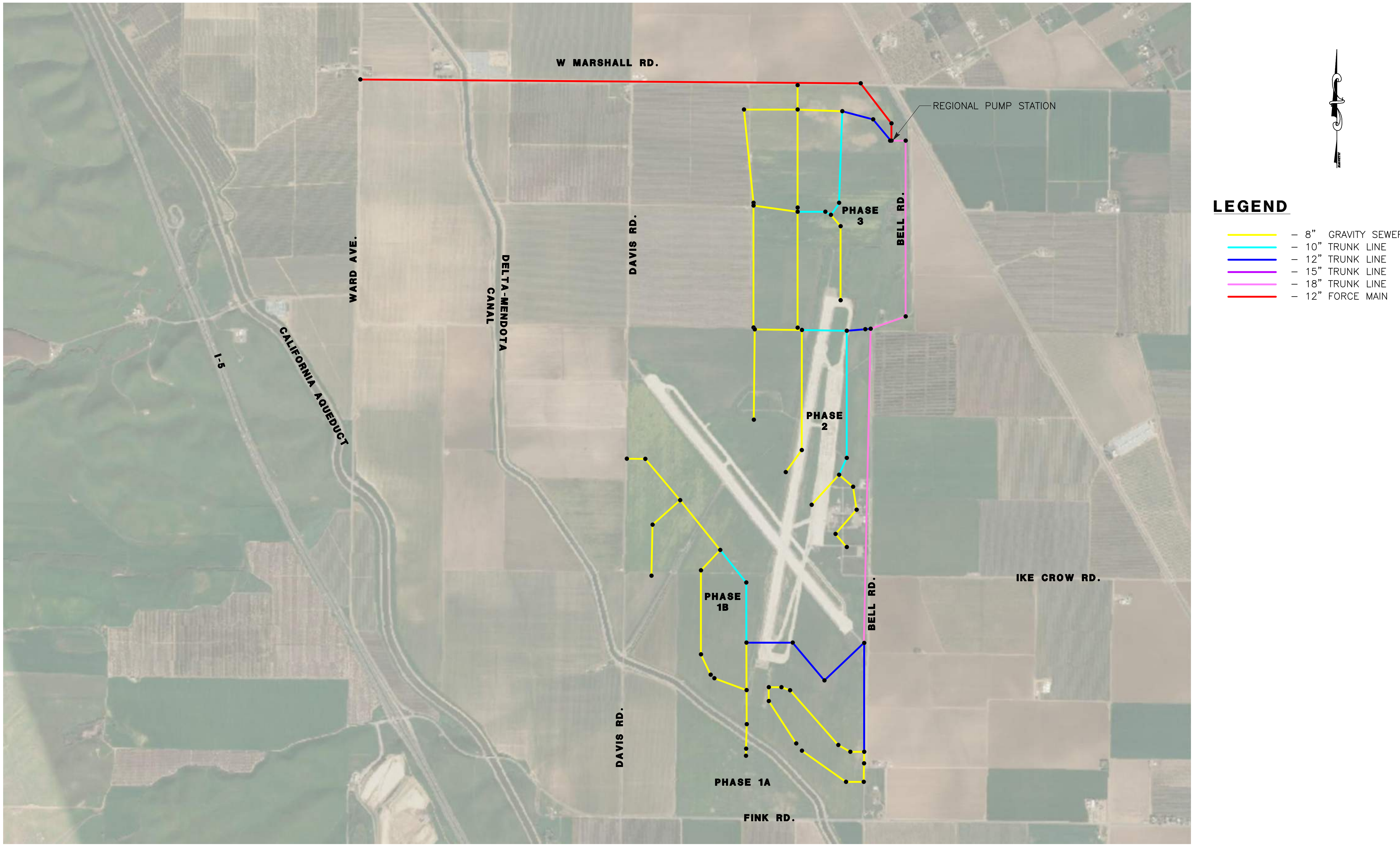

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FIGURE 6. WASTEWATER CONVEYANCE SYSTEM, DOWNSIZING OF PIPELINES

5/15/2020
SCALE:NTS

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As noted earlier, a regional pump station would be constructed near the confluence of West Marshall Road, Bell Road, and State Route (SR) 33 in the northeasterly corner of the site to receive flow from multiple phases of development. The pump station would be a submersible type with one duty and one standby pump. Each pump would be sized individually to convey the PWWF. The station would be furnished with an emergency standby generator, electrical building for housing switchgear and motor control center, odor control unit, metering facilities, and emergency bypass. A preliminary site plan and piping plan for the regional pump station are included as Figures 7 and 8. Preliminary hydraulics for the pump station/12-in force main including a tentative pump selection for buildout conditions are included in Appendix C. Probably construction costs for the regional pump station and 12-in force main are $880,000 and $2.2 million, respectively.

2. **Wastewater Conveyance to City of Patterson Excluding Phase 1 Development**

Should an onsite wastewater system be selected by the County for Phase 1 areas, the wastewater conveyance system to the COP can be reduced. As shown in Figures 9 and 10, reductions in the conveyance system would consist of the following:

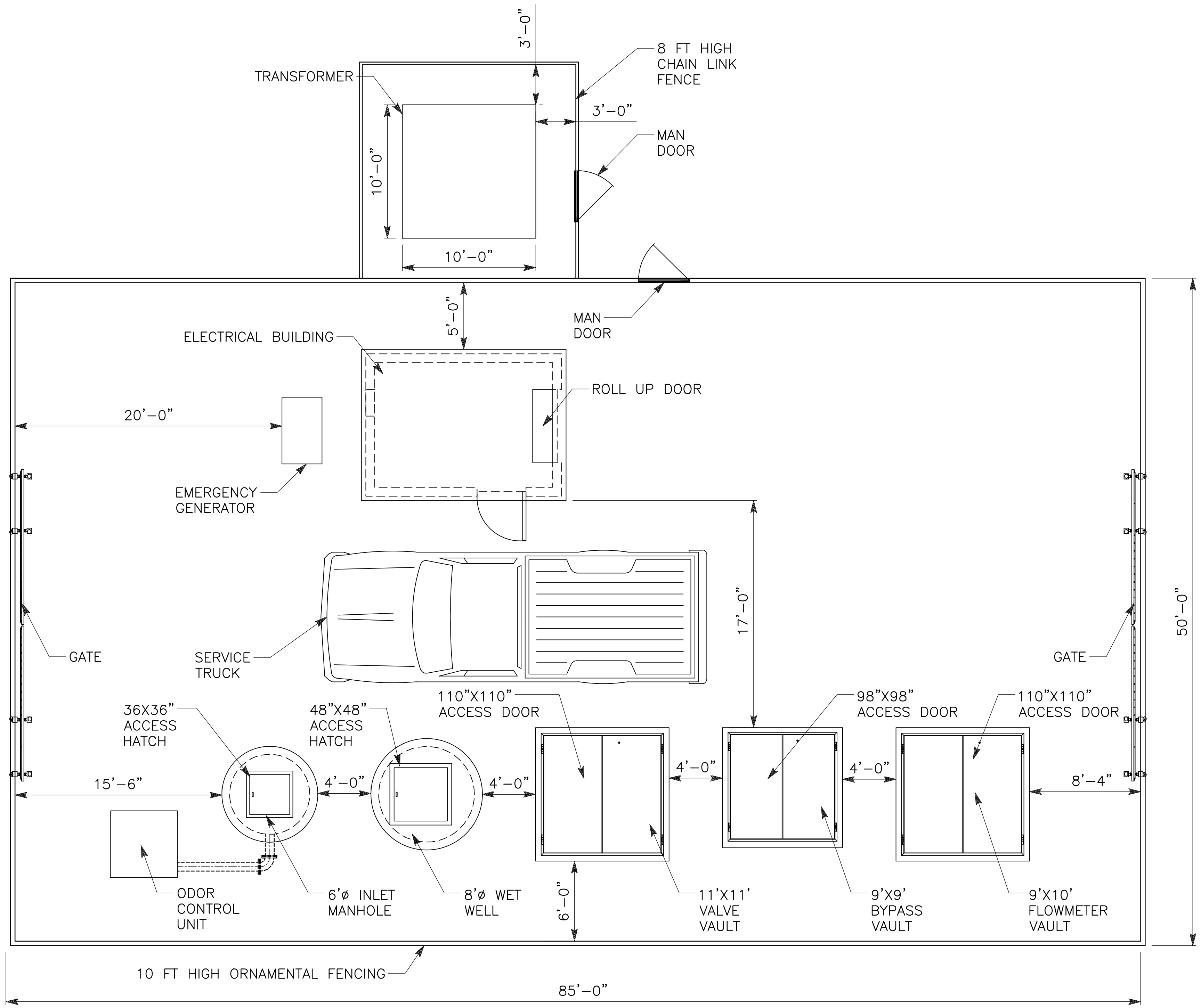
a. If Phase 1A is served by an onsite wastewater management system, reductions in the collection and conveyance system would consist of the downsizing of 3,200 ft of 12-in sewer to 10-in sewer in Phase 1B.

b. If Phases 1A and 1B are served by an onsite wastewater management system, reductions in the collection and conveyance system would consist of the following;

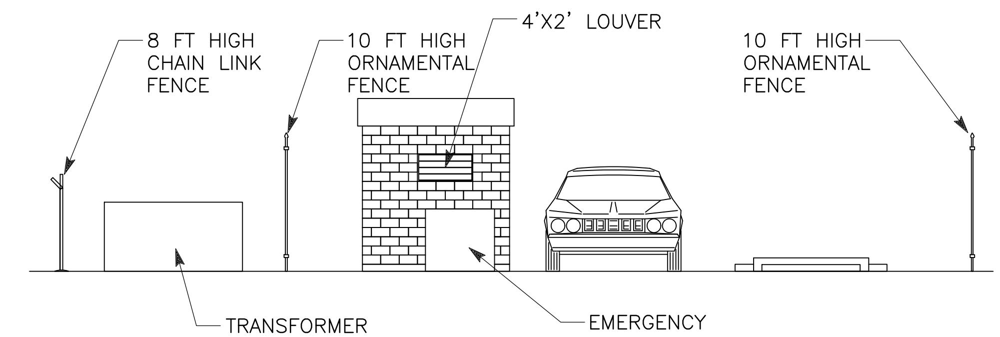
    1) Downsizing of 530 ft of 15-in sewer to 12-in sewer in Phase 2.

    2) Downsizing of 5,000 ft of 18-in sewer to 15-in sewer in Phase 3.

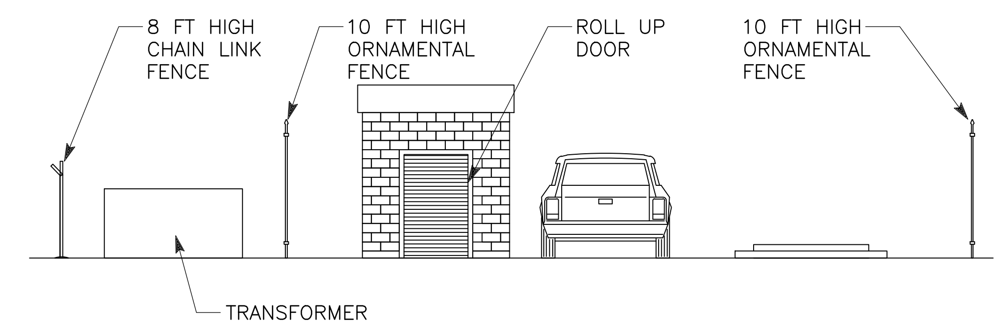
    3) Elimination of 9,800 ft of trunk sewer in Bell Road.



SITE PLAN
SCALE: 1" = 10'



ELEVATION VIEW - BACK OF ELECTRICAL BUILDING
SCALE: NTS



ELEVATION VIEW - FRONT OF ELECTRICAL BUILDING
SCALE: NTS

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WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 7. REGIONAL PUMP STATION - SITE PLAN

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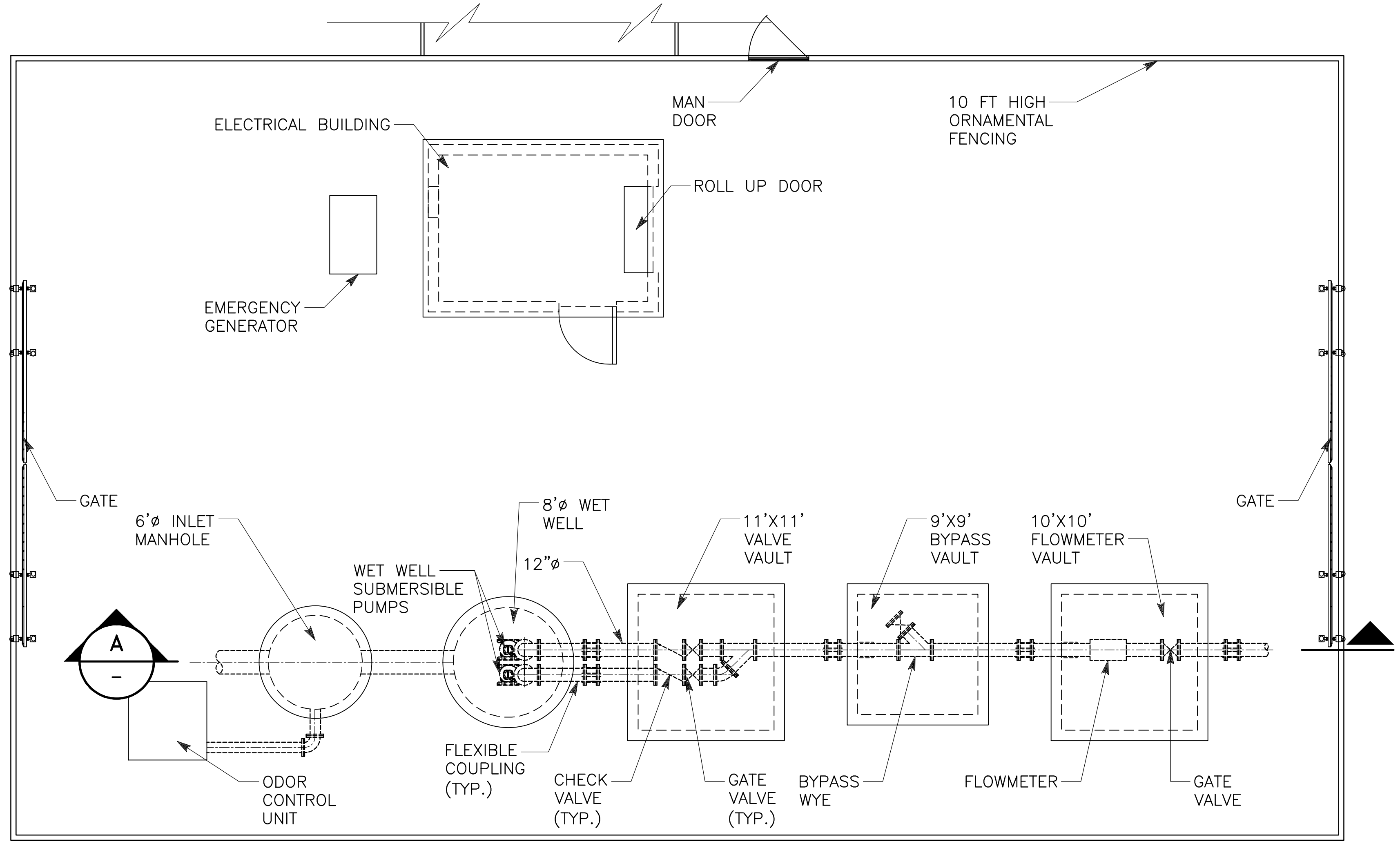
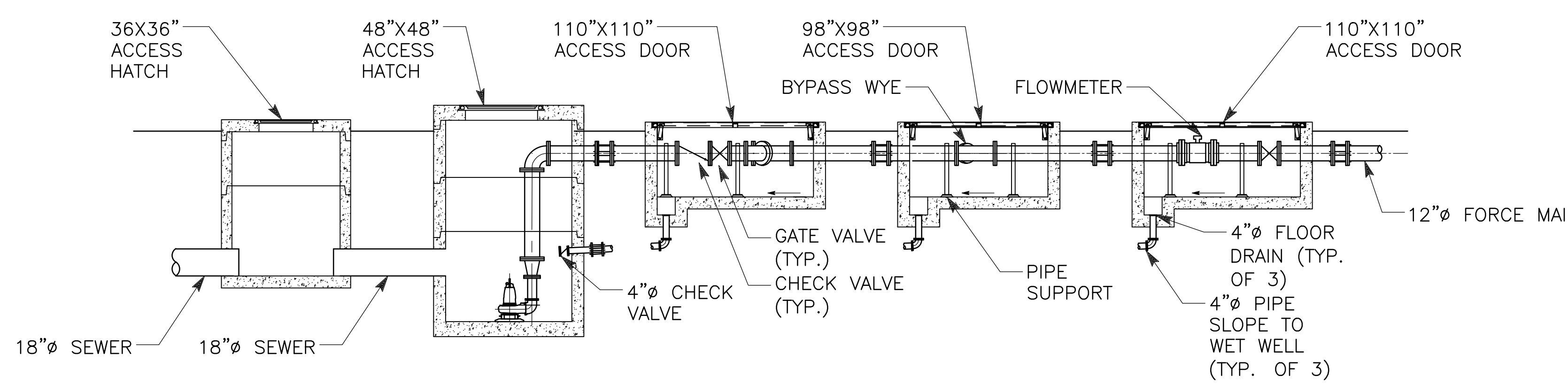
SCALE: VARIES



SITE PLAN
SCALE: 1" = 10'



SECTION A –
SCALE: 1" = 10'

CLIBP - PHASE 1A INFRASTRUCTURE PROJECT

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FIGURE 8. REGIONAL PUMP STATION - PIPING PLAN

5/15/2020
SCALE: 1" = 10'

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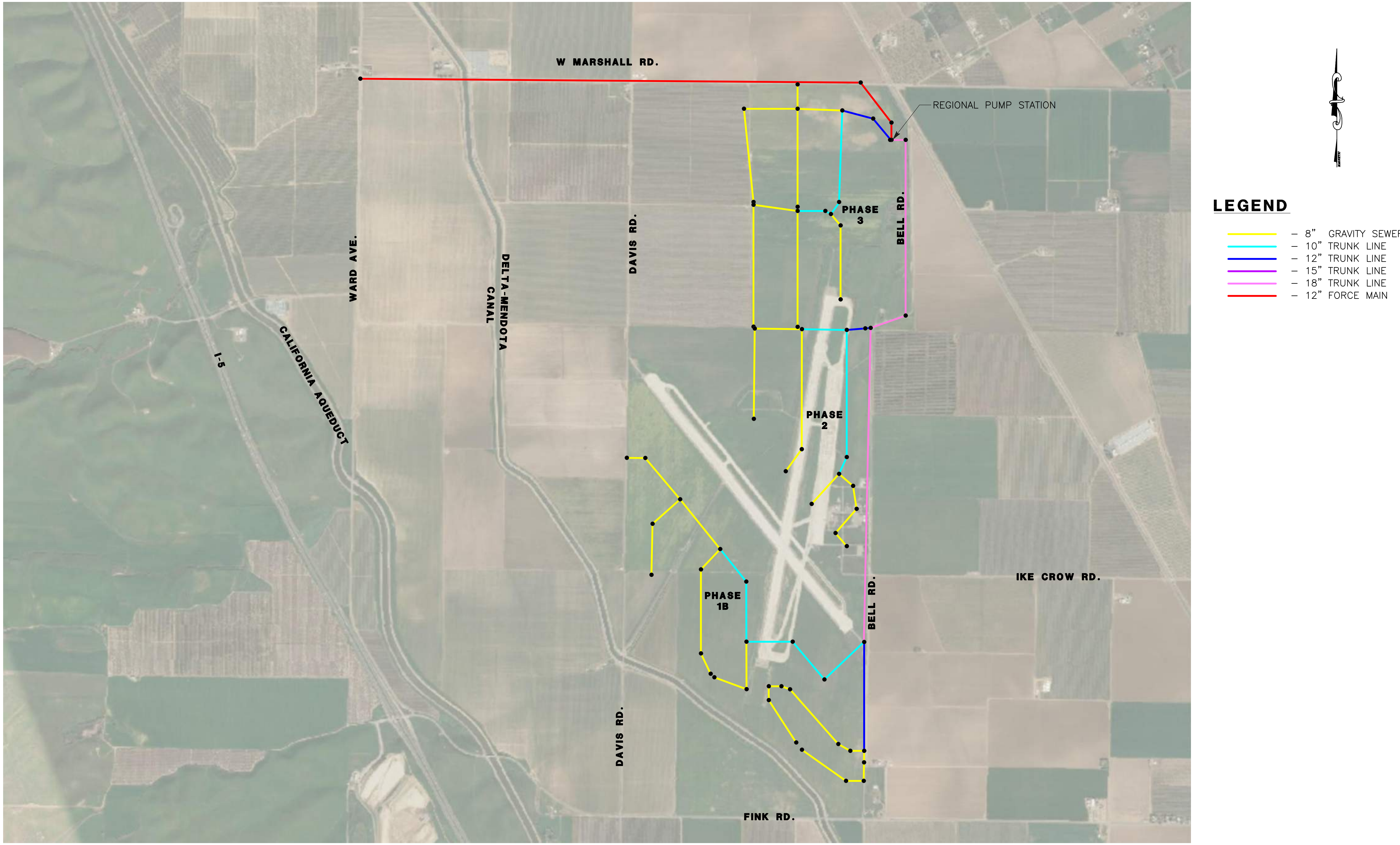

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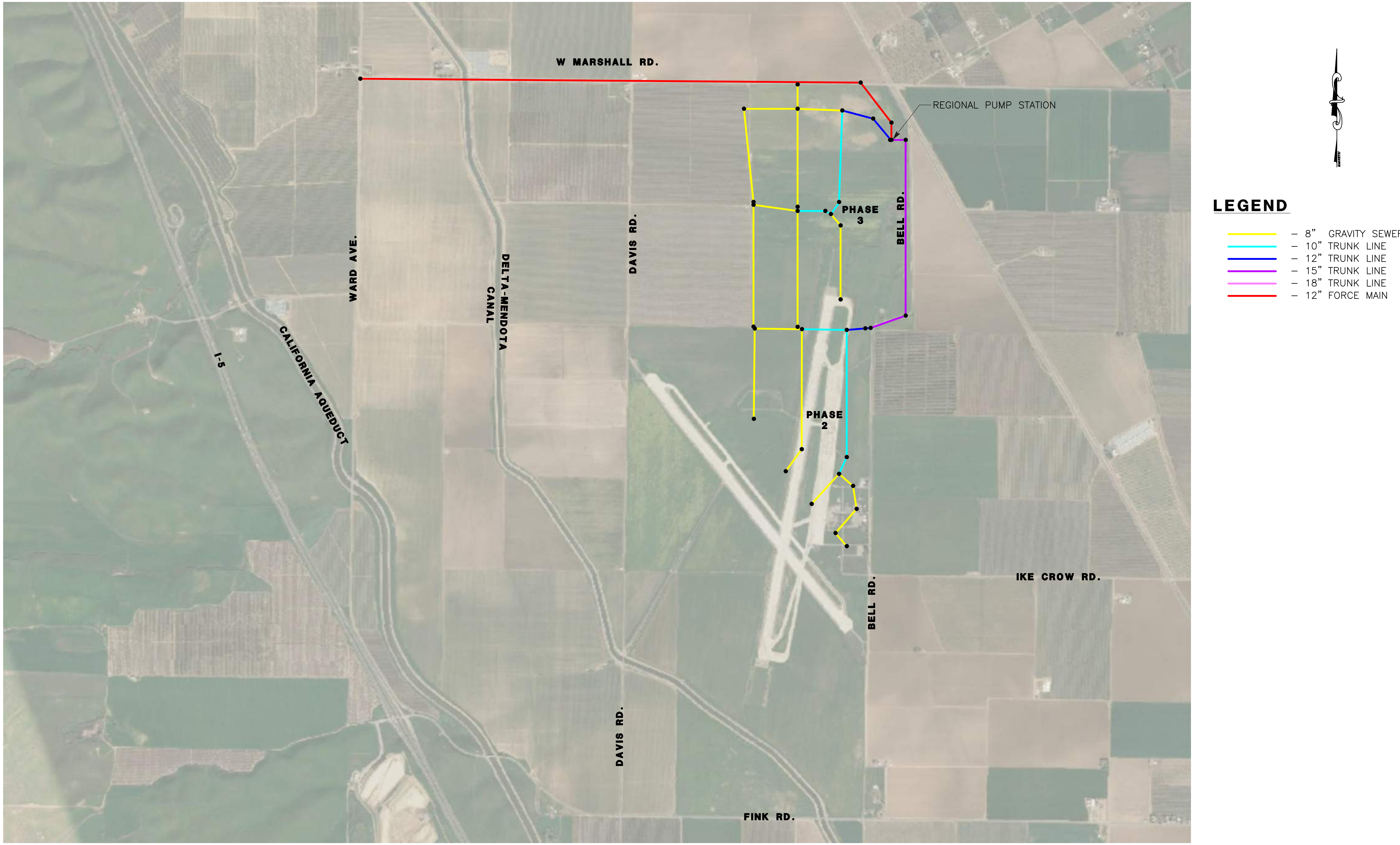
CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 9. WASTEWATER CONVEYANCE SYSTEM, WITHOUT PHASE 1A

5/15/2020

SCALE:NTS



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CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

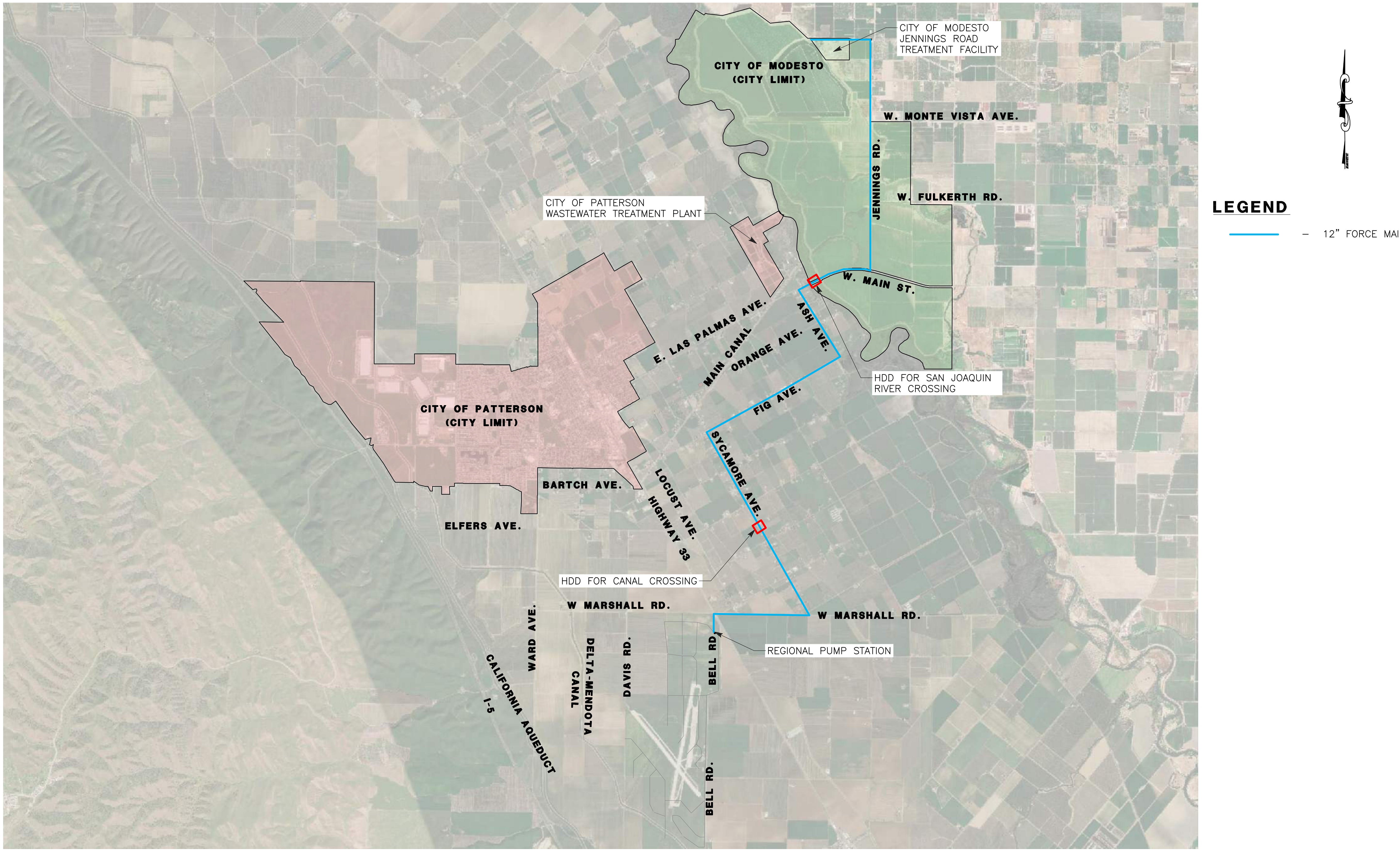
FIGURE 10. WASTEWATER CONVEYANCE SYSTEM, WITHOUT PHASE 1

5/15/2020

SCALE:NTS

3. Wastewater Conveyance to City of Modesto

Although not envisioned by the County, as an alternative to pumping wastewater to the COP, routing of wastewater to the COM JRWWTF could be considered as a "fall-back" option. Two potential pipeline routes from the proposed regional pump station to the JRWWTF are presented in Figures 11 and 12. Each of the routes are 10-11 miles in length and involve crossing of the San Joaquin River by horizontal directional drilling (HDD). Probably construction costs for the two alternatives range from \$6.8 to \$7.4 million exclusive of right-of-way acquisition costs. These construction costs are approximately 10% higher than overall conveyance costs the County would incur for discharge to the COP when the County costs associated with upgrades to the COP wastewater conveyance system (see Table 2) are added to the cost of the proposed 12-in force main along West Marshall Road.



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CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 11. DISCHARGE TO CITY OF MODESTO OPTION - ALTERNATIVE 1

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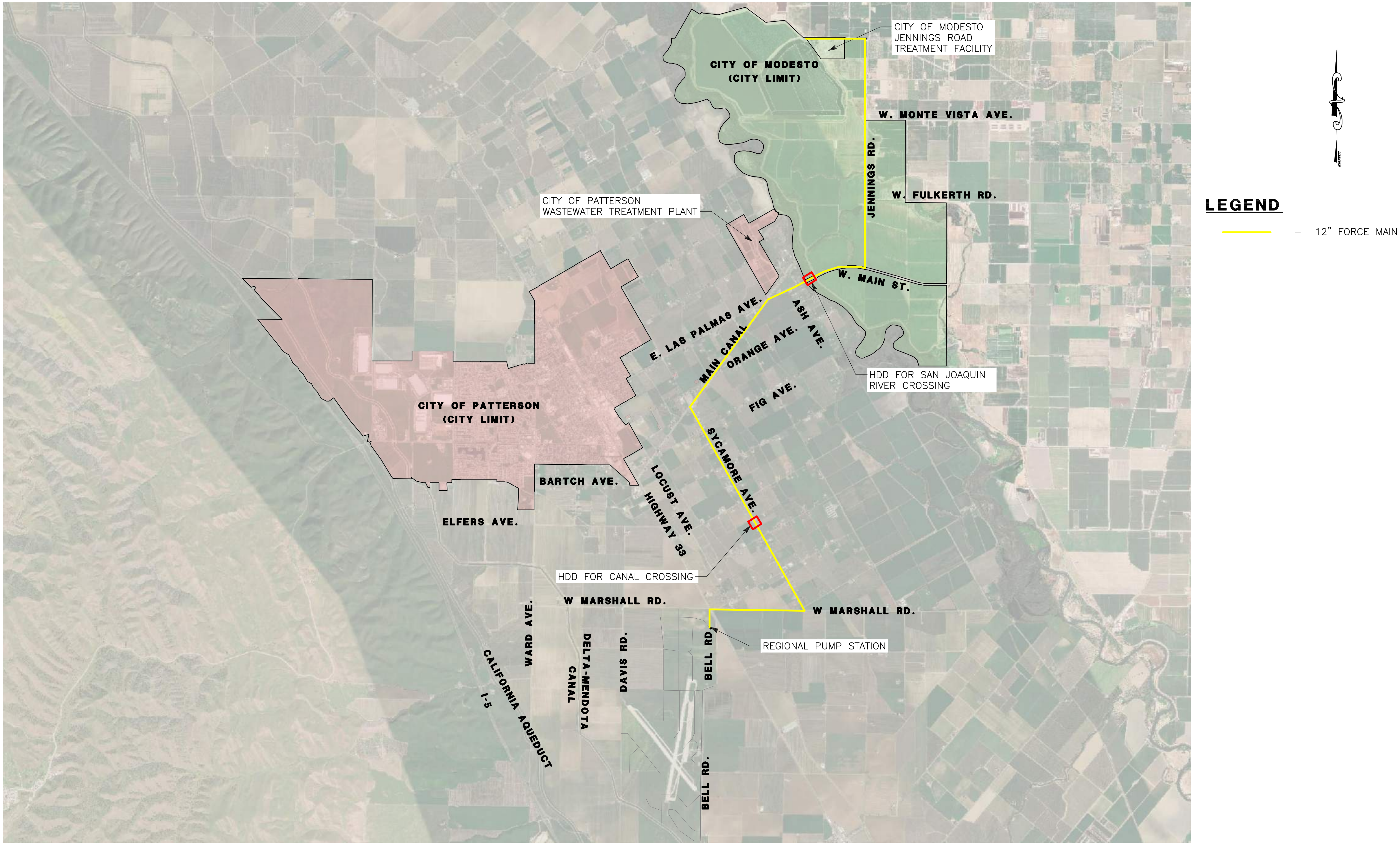

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CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 12. DISCHARGE TO CITY OF MODESTO OPTION - ALTERNATIVE 2

5/15/2020

SCALE:NTS

D. Onsite System for Phase 1A

As an alternative to collection and conveyance of wastewater to the COP for treatment and disposal, an onsite wastewater treatment system (OWTS) and subsurface dispersal network could be considered for the initial development of the CLIBP, specifically, Phase 1A. A discussion of OWTS alternatives and subsurface dispersal options is presented below.

1. Wastewater Treatment Options

Likely characteristics of raw wastewater generated at the CLIBP are presented in Table 7 [11] based on wastewater characterization studies for similar facilities. Typical secondary treatment standards as mandated by Measure X are also included in Table 7. Some level of required TKN reduction is anticipated considering the predicted TKN levels in the raw wastewater and the effluent objective not to compromise existing groundwater quality. Water quality information presented in Table 7 will serve as design criteria for the alternative OWTS.

Table 7 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Anticipated Raw Wastewater Quality – Target Effluent Quality

Parameter	Value
Raw wastewater quality:	
Biochemical oxygen demand (BOD_5), mg/L	300
Total suspended solids (TSS), mg/l	300
Total Kjeldsen nitrogen TKN), mg/L	50
Target effluent quality:	
BOD_5, mg/L	30
TSS, mg/L	30

A list of alternative OWTS certified by the National Sanitation Foundation (NSF) as complying with EPA Standard 4 – Class 1 (secondary treatment) and consistent with Measure X was issued by the County in 2020. Three OWTS alternatives were selected from this list for further evaluation considering system capacity, number of units in operation, similar applications, and positive feedback. A brief overview of the candidate OWTS is summarized as follows. Photographs of operating systems are included as Figure 13.

EXTENDED AERATION
(DELTA TREATMENT SYSTEMS)

PACKED BED FILTERS
(ORENCO)

PRETREATMENT/AERATION/CLARIFICATION
(JET WASTEWATER TREATMENT SYSTEM)

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CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 13. ONSITE TREATMENT ALTERNATIVES

5/15/2020
SCALE:NTS

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a. Jet Wastewater Treatment Solutions (Jet)

Jet is a package secondary treatment plant with capacities ranging from 1,500 to 300,000 gal/day. The compartmentalized system includes a pretreatment process (screening), aeration chamber for high-rate activated sludge treatment, and integral secondary clarifier. Flow equalization is also furnished typically to reduce peak loading to the plant resulting in improved performance. Waste solids produced in the treatment process are stored prior to hauling offsite. Nationally, there are thirty Jet plants with capacities in excess of 20,000 gal/day with successful operating histories in excess of 10 years.

b. Delta Treatment Systems (Delta)

Delta is an extended aeration package treatment plant with capacities ranging from 500 to 250,000 gal/day. The system includes multiple reactors for influent screening, flow equalization, extended aeration, secondary clarification, and sludge holding. The extended aeration process within Delta can provide for nitrification and a high-quality secondary effluent. Waste solids produced in the treatment process are stored prior to hauling offsite. In terms of the number of installations in the United States, there are 600 Delta systems dating back to 1968 including thirty facilities with capacities in excess of 15,000 gal/day. The number of installations in California are limited, however.

c. Orenco Systems (Orenco)

The AdvanTex treatment system manufactured by Orenco utilizes a packed bed filter process for secondary treatment. The system configuration includes a recirculation blend chamber, a recirculation/filtrate chamber, and a textile media filter. The system is usually proceeded by primary treatment and an anoxic tank, depending on the requirements for nutrient removal. Orenco has supplied over 40,000 units globally including 350 systems with capacities in excess of 20,000 gal/day.

To assess the suitability of each of the OWTS alternatives, outreach was undertaken to multiple operating facilities including sites in Angels Camp, Yermo, Portola, Paradise, Seattle (Washington), and Ocean Park (Washington). Feedback in general was positive as documented in Appendix D. This feedback was incorporated into a comparison of alternatives presented below.

Each of the OWTS alternatives was evaluated considering economic and non-economic factors using an evaluation matrix and weighted ratings. These factors are summarized in Table 8.

Table 8 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Summary of Evaluation Criteria/Importance Factor for Evaluation of Onsite Wastewater Treatment System Alternatives

Evaluation Criteria	Description	Importance Factor
First cost	Relative magnitude of capital investment	1.0
Annual operation and maintenance costs	Relative magnitude of long-term recurring costs	1.0
Reliability	Likelihood of operational issues, downtime due to maintenance/repair	0.7
Number of operating units and years in operation	Similar applications with successful long-term operating history	0.5
Complexity of operation	Ease of operation	0.5
Experience with manufacturer's service	Ease of communication with the manufacturer and timeliness of reponses	0.3
Performance	Consistently meets discharge limits	1.0
Operations/maintenance requirements	Ease of maintenance	0.7

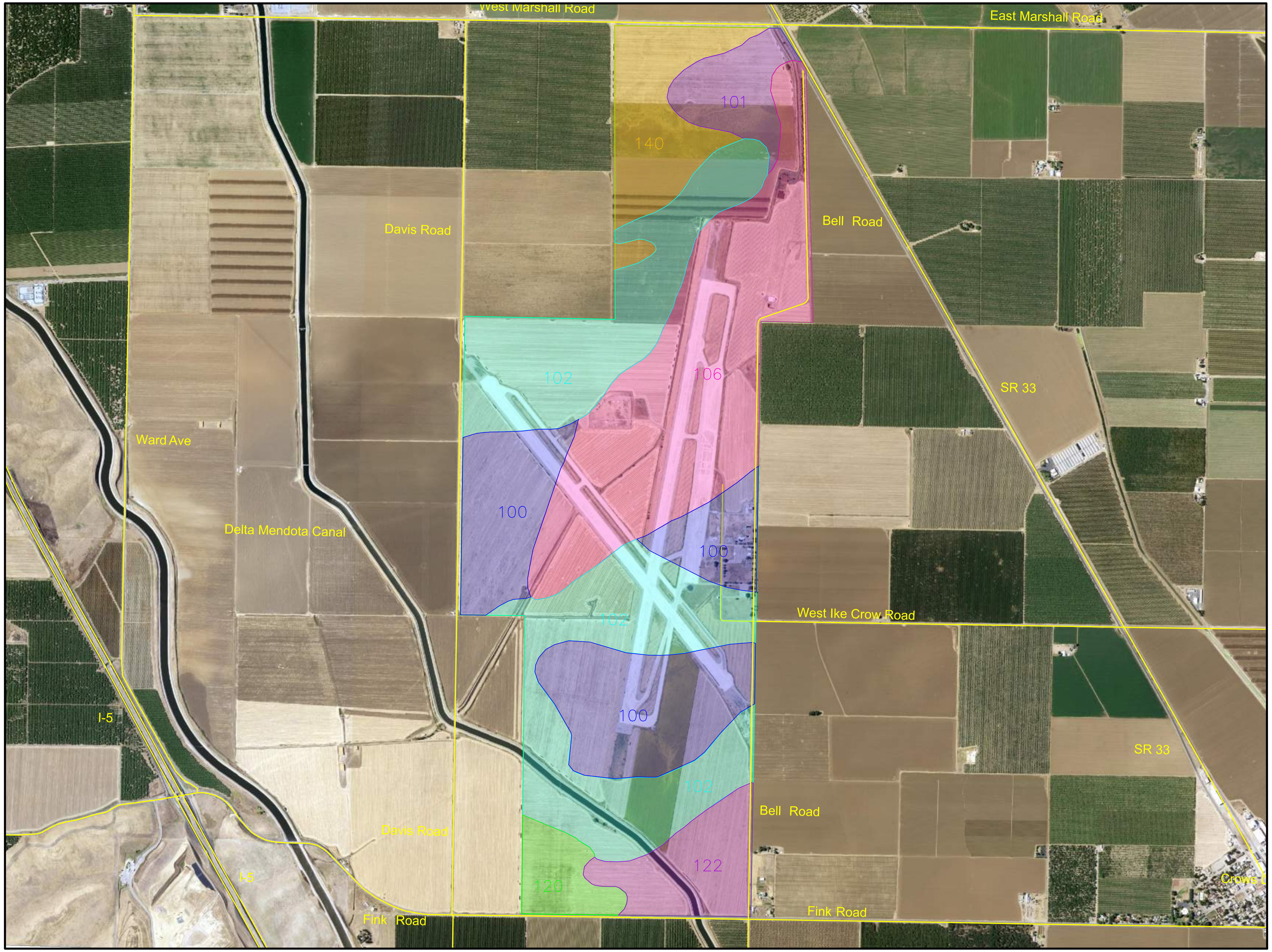
In evaluating an alternative, a score of 1-5 was selected for each criterion. Low scores reflect an inferior alternative while a score of 5 signifies a superior option when considering a specific evaluation criterion. As an example, for the criterion "Operations/maintenance requirements," if the alternative required significant inspection and periodic rehabilitation, the alternative would be assigned a low score. In contrast, alternatives that require little or no periodic inspections/maintenance would receive a higher score. By then applying the importance factor to each criterion score, a weighted score could be calculated and aggregated to identify a preferred alternative. This process is summarized in Table 9. As shown in the referenced table, Orenco has the highest score in the evaluation. Orenco represents the preferred OWTS with Delta as a second option.

Table 9 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Evaluation Matrix for Onsite Wastewater Treatment System Alternatives

Evaluation Criteria	Importance Factor	Jet, Inc.		Delta Systems		Orenco Systems		Comments
		Value	Weighted	Value	Weighted	Value	Weighted	
First cost	1.0	3	3.0	5	5.0	2	2.0	Delta has lowest first costs while Orenco has highest first costs.
Annual operation and maintenance costs	1.0	2	2.0	3	3.0	4	4.0	Orenco has lowest projected annual cost with minimal power requirements.
Reliability	0.7	3	2.1	3	2.1	5	3.5	Orenco has minimal mechanical components that require regular service.
Number of operating units and years in operation	0.5	3	1.5	3	1.5	5	2.5	Orenco has greatest number of units in service.
Complexity of operation	0.5	3	1.5	3	1.5	4	2.0	PFB system is relatively simple.
Experience with manufacturer's service	0.3	5	1.5	5	1.5	5	1.5	Owners all had similar positive experiences.
Performance	1.0	4	4.0	3	3.0	4	4.0	Delta had mixed operational history.
Operations/maintenance requirements	0.7	3	2.1	3	2.1	4	2.8	Easy access to Orenco units.
TOTAL			**17.7**		**19.7**		**22.3**	

2. Wastewater Dispersal Options

Wastewater dispersal area requirements are dependent on local soil characteristics. Absent field testing (to be conducted later in support of project design and permitting), soils maps can be used to identify preferred areas for wastewater applications and to develop conceptual design criteria. For the CLIBP site, soils information prepared by the Natural Resources Conservation Service (formerly the Soil Conservation Service) [12] is presented in Figure 14. Characteristics of site-specific soils are summarized in Table 10. Based on a review of the referenced table, Soil Types 120 and 122 appear to preferable for wastewater dispersal areas.



LEGEND

SOILS MAP

- 100 – CAPAY CLAY
- 101 – CAPAY CLAY, WET
- 102 – CAPAY CLAY, LOAMY SUBSTRATUM
- 106 – CAPAY CLAY, RARELY FLOODED
- 120 – VERNALIS–ZACHARIAS COMPLEX
- 122 – VERNALIS LOAM
- 140 – ZACHARIAS CLAY LOAM

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CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 14. SOILS MAP

5/13/2020
SCALE:NTS

Table 10 – CLIBP Phase 1A Infrastructure Project
Wastewater System Infrastructure Design Study
Summary of Soil Characteristics Phases 1A and 1B [1, 12]

Soil Type	Composition	Description	Most Restrictive Permeability	Permeability		
				Depth, in	Minimum, in/hr	Maximum, in/hr
100	• Capay clay: 85% • Dissimilar includes: 15% • 0-1% slopes	Very deep, moderately well-drained soils formed in alluvium derived mostly from sandstone and shale	Slow	0-20	0.06	0.2
				20-60	0.06	0.2
102	• Capay clay, loamy substratum: 85% • Dissimilar inclusions: 15% • 0 to 2% percent slopes	Very deep, moderately well-drained soils formed in alluvium derived mostly from sandstone and shale	Slow over moderate in the loamy substratum	0-20	0.06	0.2
				20-35	0.06	0.2
				35-45	0.06	0.2
				45-60	0.6	2.0
106	• Capay clay: 90% • Dissimilar inclusions: 10% • 0 to 2% slopes, rarely flooded	Very deep, moderately well-drained soils formed in alluvium derived mostly from sandstone and shale	Slow	0-20	0.06	0.2
				20-60	0.06	0.2
120 - V 120 - Z	• Vernalis clay loam: 45% • Zacharias clay loam: 40% • Dissimilar inclusions: 15% • 0 to 2% slopes	Very deep, well-drained soils on alluvial fans and floodplains. Formed in alluvium from mixed rock sources.	Moderately slow surface over moderate subsoil	0-20	0.2	0.6
				20-62	0.6	2.0
			Moderately slow	0-14	0.2	0.6
				14-66	0.2	0.6
122	• Vernalis loam: 85% • Dissimilar inclusions: 15% • 0 to 2% slopes	Very deep, well-drained soils on alluvial fans and floodplains. Formed in alluvium from mixed rock sources.	Moderate	0-20	0.6	2.0
				20-62	0.6	2.0

Guidelines from the LAMP are used for dispersal area sizing. Soil permeability data from Table 10 will be considered comparable to percolation or infiltration rates for the respective soils.

The following equations are used to determine the size of the dispersal area:

a. $\text{Application Rate (y), gal/day} \cdot \text{ft}^2 = \frac{5}{\sqrt{\text{Infiltration Rate, min/in}}}$

b. $\text{Dispersal Area, ft}^2 = \frac{\text{Projected Flow, gal/day}}{\text{Application Rate, gal/day} \cdot \text{ft}^2}$

Key parameters used in dispersal area sizing include the following:

a. Soil characteristics - moderately slow to moderate permeability (Soil Types 120 and 122) are as follows:

   1) Soil type 120-V percolation rate = 44 – 142 MPI
   2) Soil type 120-Z percolation rate = 100 – 300 MPI
   3) Soil type 122 percolation rate = 30 – 100 MPI

b. A second dispersal field equal to 100% of the area for the primary dispersal field will be identified.

c. Only 10% of the published percolation rate will be used for the dispersal area sizing

Dispersal area application rates for various soil types are summarized in Table 11.

Table 11 – CLIBP Phase 1A Infrastructure Project Wastewater System Infrastructure Design Study Summary of Dispersal Area Application Rates – Soil Types 120 and 122

Soil Type	Percolation Rate, MPI	Published Application Rate, gal/day * ft²	Design Application Rate, gal/day * ft² [a]
120-V	44	0.75	0.24
120-Z	100	0.50	0.16
122	30	0.91	0.29

[a] 10% of published application rate.

Design application rates, 0.16 to 0.29 gal/day-ft^2 are consistent with the published values for local soils in the EPA Onsite Wastewater Treatment and Disposal Systems Manual [7].

Using the conceptual application rates in Table 11 and the soil type locations, three options for dispersal areas to serve Phase 1A are presented in Figures 15-18. Options are presented for centralized locations as well as individual areas associated with specific building pads.

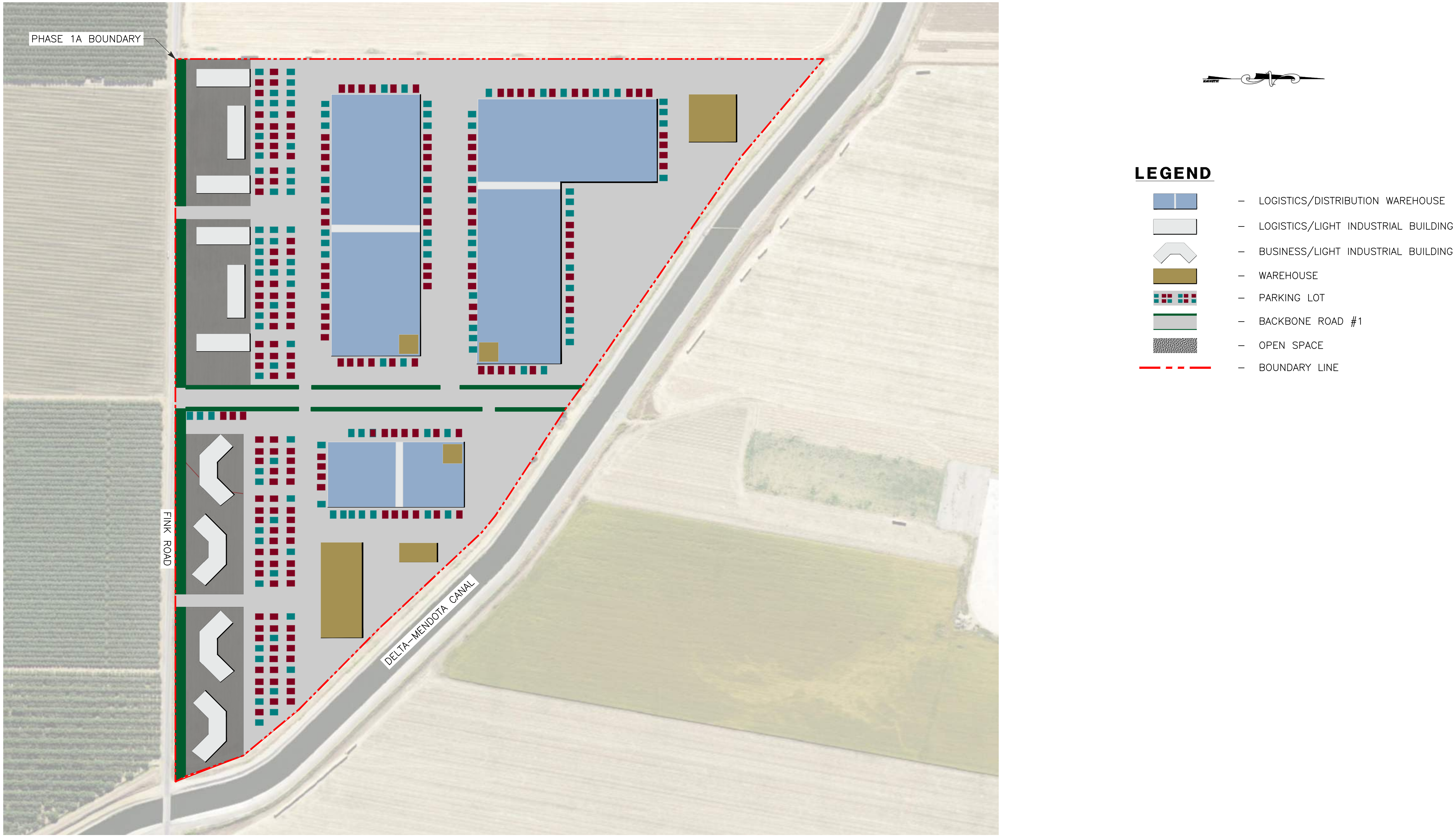

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FIGURE 15. PHASE 1A DEVELOPMENT PLAN

5/11/2020

SCALE:NTS

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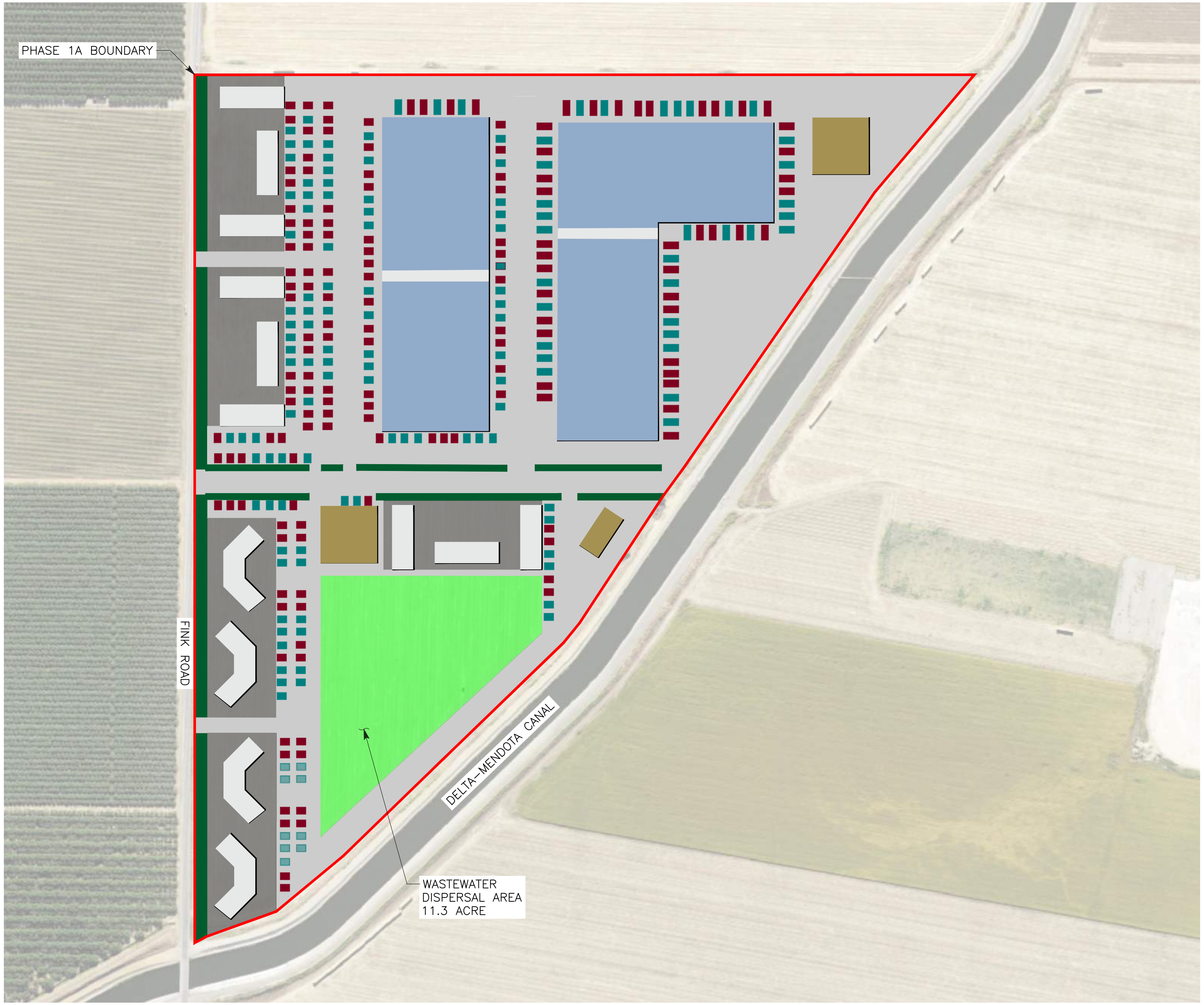

LEGEND

- LOGISTICS/DISTRIBUTION WAREHOUSE
- LOGISTICS/LIGHT INDUSTRIAL BUILDING
- BUSINESS/LIGHT INDUSTRIAL BUILDING
- WAREHOUSE
- PARKING LOT
- DISPERSAL AREA
- BACKBONE ROAD #1
- OPEN SPACE
- BOUNDARY LINE

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CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 16. PHASE 1A ONSITE DISPERSAL AREA (OPTION 1)

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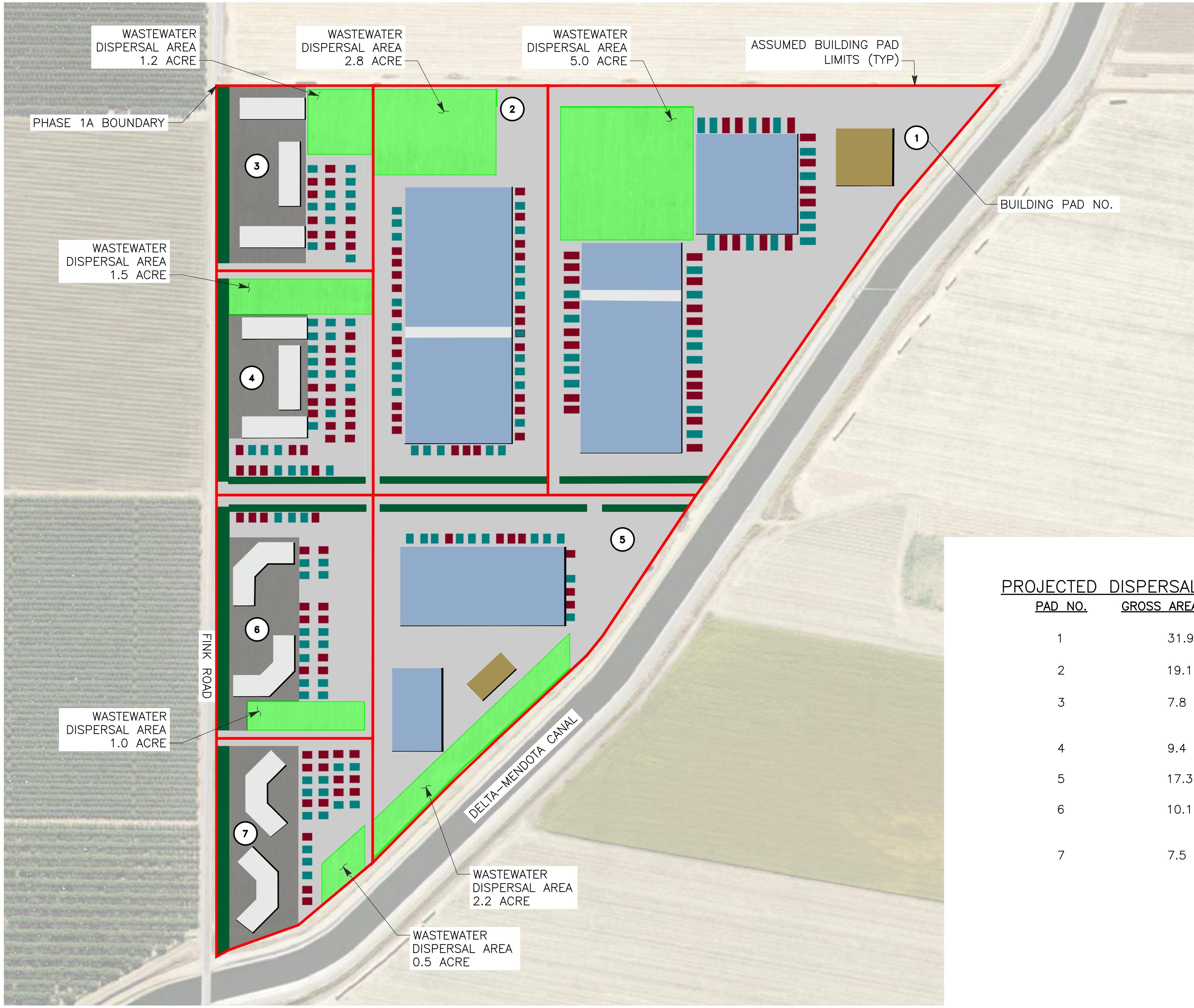
SCALE:NTS



LEGEND

- LOGISTICS/DISTRIBUTION WAREHOUSE
- LOGISTICS/LIGHT INDUSTRIAL BUILDING
- BUSINESS/LIGHT INDUSTRIAL BUILDING
- WAREHOUSE
- PARKING LOT
- DISPERSAL AREA
- BACKBONE ROAD #1
- OPEN SPACE
- BOUNDARY LINE

PROJECTED DISPERSAL AREA BY BUILDING PAD

PAD NO.	GROSS AREA (ACRE)	LAND USE	DESIGN FLOW (GPD)	DISPERSAL AREA (ACRE)
1	31.9	LOGISTICS/DISTRIBUTION	32,937	5.0
2	19.1	LOGISTICS/DISTRIBUTION	19,063	2.8
3	7.8	LOGISTICS/DISTRIBUTION AND LIGHT INDUSTRIAL	7,719	1.2
4	9.4	LIGHT INDUSTRIAL	9,350	1.5
5	17.3	LIGHT INDUSTRIAL	17.300	2.2
6	10.1	BUSINESS PARK AND LIGHT INDUSTRIAL	7,630	1.0
7	7.5	BUSINESS PARK AND LIGHT INDUSTRIAL	5,000	0.5

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WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 17. PHASE 1A ONSITE DISPERSAL AREA BY BUILDING PAD (OPTION 2)

5/11/2020
SCALE:NTS

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CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 18. DISPERSAL AREA FOR PHASE 1A LOCATED IN PHASE 1B (OPTION 3)

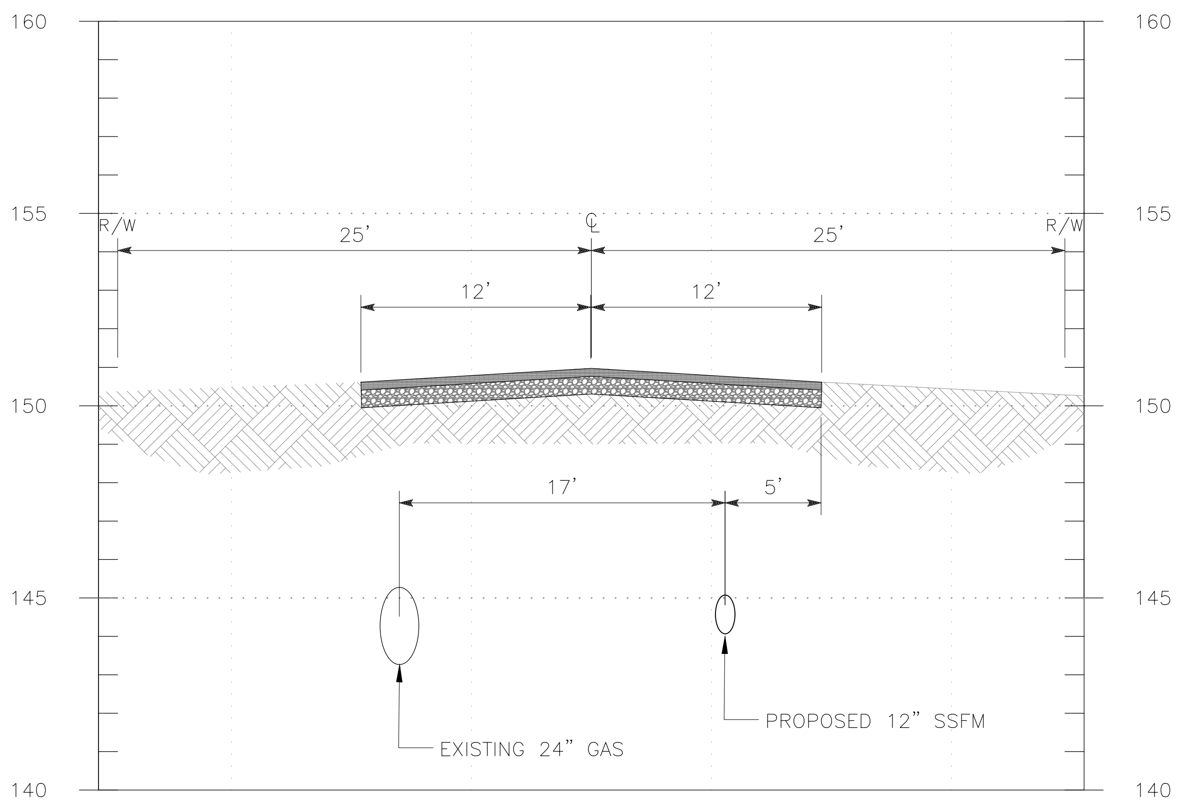
5/11/2020

SCALE:NTS

V. RECOMMENDATIONS

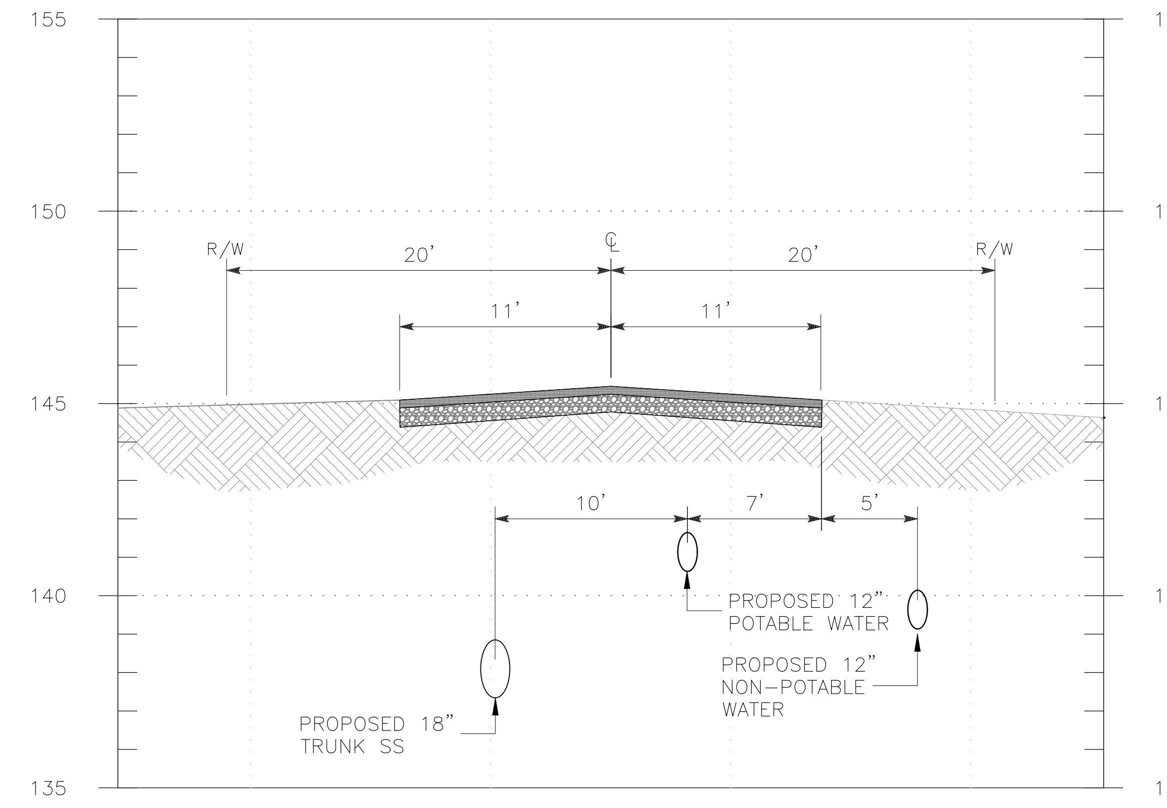
Implementation of an onsite wastewater management system for Phase 1A is recommended to defer significant backbone infrastructure costs and impacts to the COP wastewater system to later phases of development. Deferred infrastructure costs would include construction of: a) trunk sewer in Bell Road; b) regional pump station; c) 12-in force main in West Marshall Road; and d) COP wastewater system improvements (trunk sewer upsize in Ward Avenue, 12-in force main extension in Ward Avenue, replacement of M Street sewer, construction of SPTS, and Phase IV expansion of wastewater treatment plant). For development beyond Phase 1A, backbone infrastructure would be constructed in Bell Road and West Marshall Road consistent with the utility corridors identified in Figure 19. The overall recommended wastewater infrastructure system for Phases 1B, 2, and 3 is illustrated in Figure 20 reflecting the earlier analysis of wastewater pipeline phasing (see Figure 9).

Three options were presented for siting of the wastewater dispersal area(s) for Phase 1A (see Figures 16-18). Two options involved a central site, either within the Phase 1A or Phase 1B boundaries, while the remaining option depended upon the construction of dispersal areas contiguous with the development of individual building pads. While the construction of individual dispersal areas including treatment systems may have advantages in terms of minimizing initial development costs, long-term operation and maintenance of multiple sites may become problematic and is not recommended. A central location with phased construction allows for the selection of a preferred site with superior soils for dispersal and may streamline permitting with regulatory agencies. This approach is recommended for further study including field confirmation of design criteria. A decision regarding locating a central site within either Phase 1A or Phase 1B should be deferred pending detailed field testing of sustained percolation rates at the candidate sites along with consideration of likely development opportunities in Phase 1A if wastewater dispersal is sited in Phase 1B. By confirming wastewater dispersal requirements for each site, combined with an analysis of infrastructure cost and development benefits to the County, a preferred cost-effective option can best be determined.



SECTION A - MARSHALL ROAD (VIEW LOOKING WEST)

SCALE: 1"=10'H
1"=5'V



SECTION B - BELL ROAD (VIEW LOOKING NORTH)

SCALE: 1"=10'H
1"=5'V

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WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 19. PROPOSED UTILITY CORRIDORS

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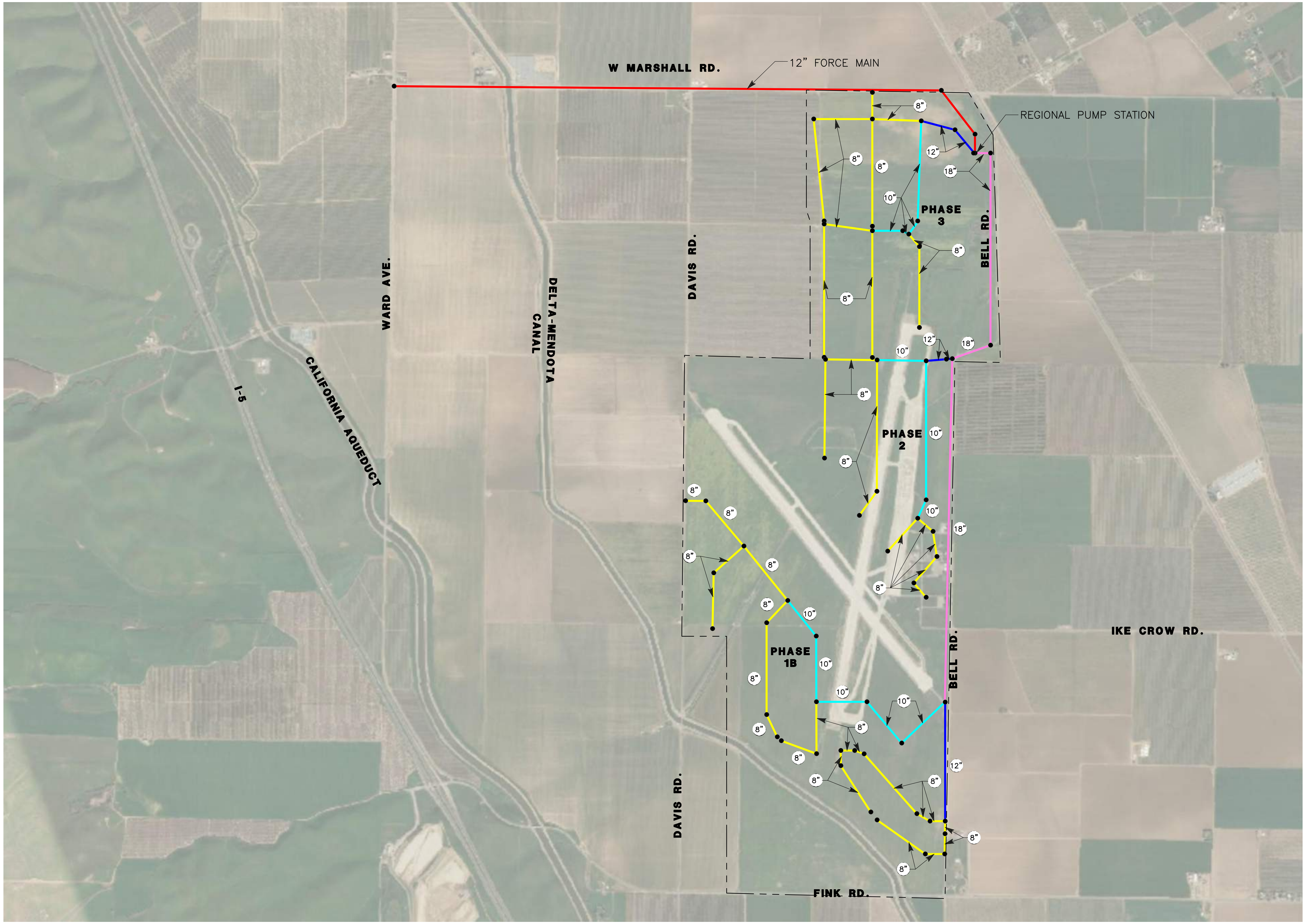

CLIBP-PHASE 1A INFRASTRUCTURE PROJECT

WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

FIGURE 20. RECOMMENDED WASTEWATER CONVEYANCE SYSTEM

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5/18/2020
SCALE:NTS

VI. REFERENCES

[1] *Crows Landing Industrial Business Park Specific Plan*, prepared by AECOM, October 2018.

[2] Mutual Financing and Infrastructure Agreement, City of Patterson – County of Stanislaus, 2019 (Draft).

[3] Stanislaus County Primary and Secondary Sewage Treatment Initiative Measure X Implementation Guidelines, http://www.stancounty.com/er/environmentalhealth/lw-20-measure-x.shtm

[4] *Local Agency Management Program for Onsite Wastewater Treatment Systems*, prepared by Stanislaus County Department of Environmental Resources, October 2016.

[5] *Design Manual Onsite Wastewater Treatment and Disposal Systems*, prepared by United States Environmental Protection Agency, October 1980.

[6] *Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy)*, California Water Resources Control Board, https://www.waterboards.ca.gov/water_issues/programs/owts/

[7] *Onsite Wastewater Treatment Systems Manual*, prepared by U.S. Environmental Protection Agency, February 2002.

[8] *City of Modesto Wastewater Collection System Master Plan*, prepared by Carollo, March 2000.

[9] *City of Patterson Wastewater Master Plan*, prepared by Blackwater Consulting Engineers, Inc., April 2016.

[10] *City of Manteca 2019 Public Facilities Implementation Plan Update Technical Memorandum 5.0 Evaluation of Demand Factors*, prepared by Drake Haglan and Associates, November 2019.

[11] *Crows Landing Industrial Business Park, Sanitary Sewer Infrastructure and Facilities Study*, prepared by AECOM, 30 November 2017.

[12] Natural Resources Conservation Service, Soil Survey - Stanislaus County, California.

Appendix A

Mutual Financing and Infrastructure Agreement

MUTUAL FINANCING AND INFRASTRUCTURE AGREEMENT

This **MUTUAL FINANCING AND INFRASTRUCTURE AGREEMENT** ("Agreement") shall be deemed effective as of ______________, 2019 (the "Effective Date"), by and between the City of Patterson, a California municipal corporation ("City") and the County of Stanislaus, a political subdivision of the State of California ("County"). City and County may herein be referred to individually as a "Party" and collectively as the "Parties." There are no other parties to this Agreement.

RECITALS

A. County has fee title to property in unincorporated Stanislaus County, **Assessors' Parcel Numbers 027-001-057 to 059; 027-003-074 to 080**, an area proposed to be the Crows Landing Industrial Business Park, as shown in more detail on **Exhibit A** attached hereto and incorporated herein by this reference (the "Crows Landing Property").

B. County desires to develop the Crows Landing Property for business park, aviation and other employment-generating uses, in accordance with the proposed Crows Landing Industrial Business Park Specific Plan (the "Crows Landing Specific Plan"). In developing the Crows Landing Specific Plan, County seeks to increase the economic vitality of the region by promoting economic development through the reuse of the Crows Landing Naval Air Facility to create a regional employment center that will bring jobs closer to County residents, providing sustainable-wage employment opportunities that will reduce commute distances for County residents.

C. The Crows Landing Specific Plan contemplates that City will provide sewer service to the Crows Landing Property. Potential impacts related to City's provision of sewer service are analyzed in the Crows Landing Specific Plan Final Environmental Impact Report, SCN 2014102035 (the "Crows Landing FEIR"). Through this Agreement, City and County desire to establish a framework for providing sewer service to the Crows Landing Property. Section 1 of this Agreement thus constitutes implementation of Mitigation Measure No. 3.15-4 – Demonstrate Adequate Wastewater Capacity, as adopted by the Board of Supervisors on October 30, 2018, pursuant to the California Environmental Quality Act (Pub. Res. Code § 21000 *et seq.*) ("CEQA"), to set forth options for financing upgrades to City's sewer system and wastewater treatment plant ("WWTP") in a manner that will allow City to provide sewer service to the Crows Landing project.

D. City is preparing a master plan, general plan amendment and rezoning, and application to Stanislaus Local Agency Formation Commission ("LAFCO") for sphere of influence modification and annexation of approximately 1,200 acres of land located north of existing City limits, and approximately 68 acres of land south of existing City limits, as shown in **Exhibit B** attached and incorporated hereto, to accommodate a variety of low, medium and high-density residential uses, along with light industrial, business park and commercial uses (the Northwest Patterson Master Plan "NWP Master Plan").

E. The NWP Master Plan, if approved, would facilitate development of additional housing in close proximity to the Crows Landing Specific Plan area. Such development may further reduce vehicle miles traveled, greenhouse gas and vehicle emissions, traffic congestion and other environmental impacts associated with buildout of the Crows Landing Specific Plan.

F. The Crows Landing Specific Plan includes a Sanitary Sewer Infrastructure and Facilities Study (Crows Landing Specific Plan, Appendix C) (the "Crows Landing Sewer Plan"), which incorporates a technical memorandum by City's wastewater consultants, Black Water Consulting Engineers, dated August 25, 2017 (the "Black Water TM"). The Crows Landing Sewer Plan notes that completion of both the Phase III and Phase IV expansion projects described in City's Wastewater Master Plan (April 2016), are needed to accept full buildout flows from the Crows Landing Specific Plan. The Blackwater TM notes that the Crows Landing Specific Plan will utilize approximately 51% of the treatment capacity of the Phase IV expansion of City's WWTP, and approximately 36% of the collection system improvements required to convey wastewater flows from the Crows Landing Specific Plan, factoring the anticipated flows from the buildout assumptions for the City, Diablo Grande and the Crows Landing Specific Plan.

G. Development of the NWP Master Plan will likewise utilize a significant portion of City's WWTP capacity from the Phase IV expansion. As such, concurrent development of the NWP Master Plan and Crows Landing Specific Plan, would provide financing for the City's WWTP Phase IV expansion.

H. The Cortese-Knox Hertzberg Local Government Reorganization Act of 2000 (Gov. Code § 56000 *et seq.*) (the "CKH Act") encourages City and County to enter into an agreement regarding proposed development standards, and planning and zoning considerations, prior to LAFCO consideration of a sphere of influence modification for the NWP Master Plan. In accordance with the CKH Act, this Agreement serves as a pre-annexation agreement for the NWP Master Plan. (CKH Act, § 56425.)

I. The housing and light industrial uses to be proposed by the NWP Master Plan, and the objectives of the Crows Landing Specific Plan to create an employment center that will bring jobs benefiting the residents of Stanislaus County, each promise to provide important regional benefits. In entering into this Agreement, County and City seek to express their mutual support for each Party's respective projects and long-term goals as presently known by the Parties.

J. County and City have entered into an agreement for sharing property tax revenues, effective as of May 7, 1996, which includes a provision in Section 12 of that agreement that the County shall not, during the term of that agreement, object to a jurisdictional change as a result of an annexation on the grounds of fiscal impacts. In entering into this Agreement, City and County seek to preserve that existing obligation under Section 12, while working cooperatively to seek regional solutions supporting the development of both the NWP Master Plan and the Crows Landing Specific Plan.

NOW THEREFORE, in exchange for the mutual promises, covenants, and other valuable consideration provided herein, the Parties agree as follows:

AGREEMENT

Section 1. **Financing and Infrastructure Agreement**.

1.1. Obligations of County. County, and any and all grantees, assignees, heirs or other successors-in-interest to any portion of the Crows Landing Property ("Successors") agree that the following obligations, if County chooses to rely on City sewer service, shall be implemented to fulfill the requirements under Mitigation Measure 3.15-4 of the Crows Landing Specific Plan Mitigation Monitoring and Reporting Plan, which County and any Successors shall incorporate as needed into all subsequent approvals related to the Crows Landing Specific Plan.

(a) ***Phased Improvements***. The following off-site improvements must be installed prior to the use of any City sewer facilities by projects within the Crows Landing Specific Plan:

(i) Phase 1 (A&B) Flows. Prior to delivery of any Phase 1 flows to the City's sewer system and WWTP, the Phase 1A improvements identified in the Crows Landing Sewer Plan (or acceptable substitutions, upon City and County concurrence), which are necessary for connection to the City's sewer system, must first be installed, to provide a gravity trunk main system with (1) approximately 10,506 lineal feet of 18-inch-diameter pipe, (2) 2,992 lineal feet of 12-inch-diameter pipe; (3) 2,146 lineal feet of 8-inch-diameter pipe; (4) approximately 56 manholes; (5) construction of a 2.66-MGD lift station, (6) construction of a 0.32 MGD lift station, (7) construction of approximately 12,400 lineal feet of 12-inch sanitary sewer force main; (8) a temporary connection to the existing Western Hills Water District 18-inch sanitary sewer trunk line; and (9) a crossing under the Delta Mendota Canal; and for Phase 1B: (1) construction of 518 lineal feet of 15-inch-diameter pipe; (2) 3,028 lineal feet of 12-inch-diameter pipe; (3) 5,367 lineal feet of 10-inch-diameter pipe; (4) 17,228 lineal feet of 8-inch-diameter pipe; and (5) approximately 28 manholes.

(ii) Phase 2 Flows. Prior to delivery of any Phase 2 flows to the City's sewer system and WWTP, the Phase 2 improvements identified in the Crows Landing Sewer Plan (or acceptable substitutions, upon City and County concurrence), which are necessary for connection to the City's sewer system, must be installed, to provide a gravity trunk main system with (1) approximately 1,318 lineal feet of 12-inch-diameter pipe; (2) 971 lineal feet of 10-inch-diameter pipe; (3) 7,661 lineal feet of 8-inch-diameter pipe, (4) 20 manholes, (5) removal of the temporary connection to the Western Hills Water District sewer trunk line; and (6) installation of approximately 7,870 LF of 12-inch-diameter force main paralleling the existing Western Hills Water District sewer trunk line along Ward Avenue between Marshall Road and Bartch Avenue.

(iii) Phase 3 Flows. Prior to delivery of any Phase 3 flows to the City's sewer system and WWTP, the Phase 3 improvements identified in the Crows Landing Sewer Plan (or acceptable substitutions, upon City and County concurrence), which are necessary for connection to the City's sewer system, must be installed, to ensure the construction of backbone infrastructure to provide sanitary sewer service to the Phase 3 areas south of Marshall Road, through construction of a gravity trunk main system, with approximately (1) 3,037 lineal feet of 10-inch-diameter pipe; (2) 13,326 lineal feet of 8-inch diameter pipe; and (3) 33 manholes.

(iv) City Sewer Line Improvements. Prior to delivery of any Phase 1 flows, approximately 1,300 feet of trunk sewer line along Ward Avenue must be upsized from 21 to 24 inches, and the portion of the M Street sewer that has a reverse slope (pipe segment E5-6:E5:5) must be replaced.

(v) City WWTP Phase 4 Expansion. Prior to delivery of flows from any phase of the Crows Landing Specific Plan, the City's WWTP Phase 4 expansion must be complete or, in the alternative, City may confirm that sufficient WWTP capacity exists to serve each project.

(b) ***Installation and Financing of County Sewer Line Improvements***. County shall finance, or cause to be financed, the design and installation of all sewer line improvements located outside of City limits, as needed to build out Phases 1A&B through Phase 3 of the Crows Landing Specific Plan. County shall be responsible for designing and installing all sewer improvements outside of City limits, as necessary to tie into City's sewer collection system. Prior to proceeding with any improvement plans, County shall first consult with City by providing City at least thirty (30) days to review and comment on such plans prior to commencing any work.

(c) ***Financing of City Sewer Line Improvements and WWTP Expansion***.

(i) Fair Share Contribution. Prior to the delivery of flows from any phase of the Crows Landing Specific Plan, City will require the financing, and complete installation of, sewer improvements needed to serve such phase, namely, expansion of City's WWTP (Phase 4 or, potentially, Phase 5) and installation of the South Patterson Trunk Sewer Components, as identified in City's Wastewater Master Plan. The financial obligation of the Crows Landing Specific Plan shall be in accordance with the percentage fair share contribution calculated in the Black Water TM, as updated due to inflation and changes in construction costs. Specifically, the Crows Landing Specific Plan is currently estimated to utilize approximately 51% of City's WWTP Phase 4 expansion (which, with estimated construction costs in January 2019 of $52,190,000 would result in a fair share attributable to the Crows Landing Specific Plan of $26,730,000, based upon $30/gpd ADWF per Blackwater Technical Memorandum Tables 11 and 12, dated August 25, 2017), and approximately 36% of the capacity of City's South Patterson Trunk Sewer Components (which, with estimated construction costs in January 2019 of $8,379,000 would result in a fair share attributable to the Crows Landing Specific Plan of $3,015,000, per Blackwater Technical Memorandum Table 10, dated August 25, 2017). As a result, the estimated total fair share contribution of the Crows Landing Specific Plan to City sewer improvements, as of January 2019, is $29,745,000 ("Total Fair Share Contribution").

(1) Sewer Impact Fees. The County may adopt and administer a fee program to collect the Total Fair Share Contribution, or portions thereof applicable to each project within the Crows Landing Specific Plan (the "CLIBP Sewer Fee"). If the County plans to adopt a CLIBP Sewer Fee, County shall provide City with at least thirty (30) days to review and comment on the draft CLIBP Sewer Fee study before it is noticed for adoption. Once fees are adopted, the County and City will meet and confer regarding future amendments to the adopted Fee. County shall provide the City with correspondence describing the current status of the Crows Landing Specific Plan build-out relevant to the City's Phase 4 WWTP expansion on or about January 30th of every even-numbered year.

(ii) Direct Payment. In lieu of a project developer paying the CLIBP Sewer Fee to County, City may agree, on a project-by-project basis, to allow such project developer to pay their fair share directly towards City's wastewater collection and WWTP improvements required to serve such project, as determined and calculated by City using accepted engineering standards, and provided that sufficient capacity exists at the time such request for WWTP capacity is made.

(iii) Other Finance Mechanisms. Options for financing the Crows Landing Specific Plan's fair share contribution towards City's WWTP expansion (Phase 4 or, potentially, Phase 5) and City's South Patterson Trunk Sewer Components, as identified in City's Wastewater Master Plan, may include, but shall not be limited to, payment of the CLIBP Sewer Fee, establishment of financing special district(s), and cash payments.

(2) ***New Capacity Charges***. City reserves the right to impose new connection fees or capacity charges if any new end user in an existing structure within the Crows Landing Specific Plan would result in a significant increase in flows or constituents of concern for processing and treatment at City's WWTP.

(3) ***Ongoing Services Fees and Charges***. County shall pay, or cause to be paid, City ongoing fees and charges related to City's sewer service and wastewater treatment system. Payment of such fees may be memorialized through a separate agreement between City, County and any Successors.

(4) ***Compliance with City Ordinances***. Dischargers into the City's WWTP shall be subject to all applicable discharge regulations of City, as adopted by ordinance, resolution and City policy. This includes compliance with the fats, oils and grease (FOG) program, and any pre-treatment and limitations requirements that arise from any constituents of concern.

(5) ***Western Hills Water District***. County may propose to utilize unused capacity allocated to Western Hills Water District ("WHWD") pursuant to its Memorandum of Understanding with City, dated December 17, 2002. If such unused capacity exists, City shall make a good faith effort to amend its Memorandum of Understanding with WHWD, in a manner reasonably acceptable to City and in accordance with California law, to wheel wastewater flows from the Crows Landing Specific Plan to City's WWTP.

(6) ***County Maintenance***. County shall be responsible for maintaining all sewer facilities serving the Crows Landing Specific Plan area located outside of City limits.

(7) ***Transportation Improvements***. County shall be responsible for ensuring that each project within the Crows Landing Specific Plan contributes on a fair-share basis to the cost of signalizing the intersection at Sperry Avenue and State Route 33, in addition to any other traffic improvements required as mitigation under the Crows Landing Final EIR. Alternatively, County and City may agree to certain offsets of impact fees in exchange for fair share costs for traffic mitigation within City limits attributable to the Crows Landing Specific Plan.

(i) ***South County Corridor***. County supports and agrees to explore the feasibility of Alternative 4D or 7A of the South County Corridor Conceptual Alignment, as the initially preferred alignment alternative, as depicted in the Final South County Corridor Feasibility Study, attached hereto as **Exhibit C** for reference. City and County acknowledge that completion of the South County Corridor will be subject to available funding and environmental review under CEQA and/or NEPA, and that the final design may be subject to minor modifications, as needed in connection with CEQA/NEPA review or in response to subsequent technical analysis regarding environmental concerns or any other limiting factors. In executing this Agreement, County is not pre-committing to select Alternative 4D or 7A, however, County is committing to explore its feasibility as a preferred alternative for consideration.

(j) ***City Consultation***. In a form agreed to by the County and City, the County shall submit to City a project description, and anticipated wastewater volumes, and wastewater information necessary for City compliance with the FOG program, for each development project occurring within the Crows Landing Specific Plan area as it relates to sewer infrastructure connecting to City's WWTP. Such information shall be provided to City within a reasonable time, as needed for City to determine whether sufficient capacity exists within City's sewer system to serve such project. City shall promptly review the information provided by the County and, within twenty (20) days following its receipt from the County, provide any written comments to County for its consideration. County agrees to reasonably consider City's comments and City shall not refuse service if sufficient capacity exists and the project developer has paid its applicable portion of the Total Fair Share Contribution.

1.2. Obligations of City.

(a) ***Sewer Service***. City agrees to provide sewer service to the Crows Landing Property, provided however, that prior to providing such service City shall ensure that (1) such service is in compliance with Section 56133 of the CKH Act; (2) County and any Successors are in compliance with this Agreement; and (3) all applicable impact fees under this Agreement have been paid, or alternative financing has been provided in accordance with Section 1.1 above.

(b) ***City Improvements***. City shall install all improvements to City facilities necessary to accommodate flows from the Crows Landing Specific Plan, provided that adequate financing is provided by County, or caused to be provided, for the City-system improvements listed in Section 1.1 and the Blackwater Technical Memorandum as part of the FEIR.

(c) ***Force Majeure***. City's obligation to provide sewer service and reservation of WWTP capacity to the Crows Landing Specific Plan may be excused due to delay, default, war, insurrection, strikes, walkouts, riots, floods, earthquakes, fires, casualties, acts of God, enactment of conflicting state or federal laws or regulations, litigation brought by any third party (not a Party to this Agreement), or similar bases for excused performance due to causes beyond City's control.

Section 2. Annexation Support.

2.1. Consent to Annexation. By entering into this Agreement, and in exchange for City's commitment to develop a framework for financing and installing sewer system upgrades and increasing City's WWTP capacity to serve the Crows Landing Specific Plan, as set forth in Section 1 above, County supports City's sphere of influence modification and annexation of the NWP Master Plan and agrees to not in any way challenge, delay, or otherwise impede any annexation proceedings at LAFCO concerning the NWP Master Plan, provided that City has adequately addressed the County's comments to the ADEIR and Draft EIR for the Northwest Patterson Specific Plan. County's support is also expressly conditioned upon City's full compliance with all of City's obligations under this Agreement, including but not limited to the following:

(a) ***Administrative Draft EIR***. City anticipates the administrative draft EIR for the NWP Master Plan ("ADEIR") will be completed by September 30, 2019. City will provide the ADEIR to County before September 30, 2019, or, if not completed by then, within three (3) days after the complete ADEIR becomes available. County will have up to forty-five (45) days after receiving the ADEIR to review and provide comments to the ADEIR to City. City and County will treat the ADEIR, and County comments thereto, as though exempt from public disclosure under the preliminary draft and deliberative process exemptions of the California Public Records Act ("PRA"). If the County receives a request under the PRA that includes the ADEIR and/or the County's comments thereto, the County will give City reasonable advanced notice of the request and County's determination of whether the request seeks disclosable documents under the PRA.

(b) ***Draft EIR***. City will incorporate into the draft EIR for the NWP Master Plan ("Draft EIR") a discussion of all County comments to the ADEIR regarding the NWP Master Plan. City will incorporate mitigation measures proposed by County as part of the certified EIR to the extent the City determines such measures are consistent with constitutional nexus requirements and applicable CEQA standards. County expressly reserves the right to provide public comments to the Draft EIR concerning topics raised by the County to City from its review of the ADEIR, after the Draft EIR is published by City in accordance with CEQA. The City agrees to implement all, and to not exclude any, of the County's proposed mitigation measures that have been adopted into the FEIR.

2.2. Property Tax Sharing Agreement. This Agreement shall not preclude City and County from proposing, discussing or negotiating revisions to the property tax sharing agreement in connection with annexation of the NWP Master Plan, or in connection with any other property.

2.3. CKH Act. This Agreement does not affect, nor shall it preclude City from fulfilling all of its obligations under the CKH Act, such as City's obligation to prepare a plan for services, fiscal impact analysis, environmental review under CEQA, and any other legally required reports or studies.

2.4. Crows Landing Specific Plan Litigation. In consideration of the promises contained in this Agreement, City will dismiss with prejudice its current litigation against the County regarding the Crows Landing Specific Plan, within ten (10) days after County enters into this Agreement. City further agrees to not challenge future County approvals required by the Crows Landing Specific Plan, as long as such future approval is not related to a substantial change to the Crows Landing Specific Plan.

Section 3. General Provisions.

3.1. Cooperation and Implementation. City and County agree to cooperate with each other to the fullest extent reasonable and feasible in order to implement this Agreement. City and County agree to reevaluate the terms of this Agreement ten (10) years from the date of its execution for the purpose of determining any modifications to this Agreement based on the status and needs of the Crows Landing Specific Plan and the NWP Master Plan.

3.2. Term. This Agreement shall commence on the Effective Date and shall remain in effect throughout the entire buildout of the Crows Landing Specific Plan. Termination of this Agreement shall occur only upon the executed agreement of both Parties, as duly authorized by the County Board of Supervisors and City Council.

3.3. Amendment. This Agreement may be amended only by written agreement of both Parties, as duly authorized by the County Board of Supervisors and City Council. Such amendment shall not invalidate this Agreement or relieve or release any Party from its obligations under this Agreement unless expressly stated so by such amendment.

3.4. Default.

(a) ***Notice of Default***. In the event of any breach of the provisions of this Agreement, the complaining Party shall give written notice of default to the defaulting Party, specifying the default complained of by the complaining Party. Any delay in giving such notice shall not constitute a waiver of any default nor shall it change the time of default.

(b) ***Right to Cure***. If the notice of default involves actions that are reasonably capable of being cured by the defaulting Party, such Party shall commence to cure such actions within thirty (30) days after receipt of written notice of the default. In no event shall the complaining Party be precluded from exercising any remedies if the default is not cured within one hundred eighty (180) days after the first notice is given.

(c) ***Remedies***. Each Party shall be limited to direct or actual damages only. Each Party shall maintain and possess all rights to enforce this Agreement through specific performance or to invalidate any action taken in breach of this agreement by filing a petition for writ of mandate. The prevailing Party in such litigation, or settlement thereof, shall be entitled to reasonable attorneys' fees.

3.5. Notices. All notices or communications required hereunder between City and County must be in writing, and may be given either personally, by registered or certified mail, or by Federal Express, UPS or other similar couriers providing overnight delivery. If personally delivered, a notice shall be deemed to have been given when delivered to the Party to whom it is addressed. If given by registered or certified mail, such notice or communication shall be deemed to have been received on the first to occur of (a) actual receipt by any of the addressees designated below as the party to whom notices are to be sent, or (b) three (3) days after a registered or certified letter containing such notice, properly addressed, with postage prepaid, is deposited in the United States mail. If given by Federal Express or similar courier, a notice or communication shall be deemed to have been received on the date delivered as shown on a receipt issued by the courier. Any Party hereto may at any time, by giving ten (10) days written notice to the other Party hereto, designate any other address in substitution of the address to which such notice or communication shall be given.

Notices or communications shall be given to the Parties at their addresses set forth below:

If to City:	City of Patterson City Hall P.O. Box 667 Patterson, CA 95363 Attn: City Manager
With copy to	Churchwell White, LLP 1414 K Street, 3rd Floor Sacramento, California 95814 Attn: Douglas L. White, Esq.
If to County:	Stanislaus County Chief Executive Office 1010 10th St., Suite 6800 Modesto, CA 95354 Attn: Chief Executive Officer
With copy to:	County Counsel Stanislaus County 1010 10th St., Suite 6400 Modesto, CA 95354

3.6. Interpretation. City and County acknowledge that this Agreement is the product of a mutual arms-length negotiation and drafting. Accordingly, the rule of construction providing that any ambiguities in a document shall be construed against the drafter of that document shall have no application to the interpretation and enforcement of this Agreement.

3.7. Counterparts. This Agreement may be executed in by the Parties in counterparts, all of which together shall constitute one and the same Agreement.

3.8. Integration. This Agreement constitutes the entire understanding of the Parties with respect to the matters set forth in this Agreement and supersedes any and all prior writings or oral discussions concerning the same. Neither Party shall be liable for any representations made, express or implied, which are not specifically set forth herein.

3.9. Severability. If any provision of this Agreement shall be determined by a court to be invalid and unenforceable, or if any provision of this Agreement is rendered invalid or unenforceable according to the terms of any federal or state statute, which becomes effective after the Effective Date of this Agreement, the remaining provisions shall continue in full force and effect and shall be construed to give effect to the intent of this Agreement, unless enforcement of this Agreement, as so invalidated, would be unreasonable or inequitable under all the circumstances or would frustrate the purposes of this Agreement or the rights and obligations of the Parties as provided herein.

3.10. Successors and Assigns. City and County shall take all reasonable and appropriate actions to ensure that the provisions and the intent of this Agreement are incorporated into and applied to any development approvals for the Crows Landing Specific Plan and NWP Master Plan.

3.11. Other Documents. The Parties agree that they shall cooperate in good faith to accomplish the objectives of this Agreement and to that end, agree to execute and deliver such other instruments or documents as may be necessary and convenient to fulfill the purposes and intentions of this Agreement.

3.12. Authority. City and County warrant and represent that they each have the power and authority to enter into this Agreement in the capacities herein stated, and that all formal requirements necessary or required by law to enter into this Agreement have been fully complied with.

3.13. No Joint Venture. This Agreement in no way constitutes or creates any form of association, joint venture, partnership, or joint powers agreement of any nature whatsoever, for any purpose between City and County.

3.14. Venue; Governing Law. Any legal action or proceeding concerning this Agreement shall be filed and prosecuted in the appropriate court with jurisdiction over the County of Stanislaus, California. This Agreement shall be governed by the laws of the State of California.

[Signatures on following page]

IN WITNESS WHEREOF, the Parties have each executed this Agreement as of the above-referenced Effective Date.

CITY OF PATTERSON, a California municipal corporation

____
Mayor Deborah M. Novelli

Approved as to Form:

____
Tom Hallinan, City Attorney

Attest:

____
Maricela Vela, City Clerk
Agreement adopted pursuant to City Council Resolution 2018-____

COUNTY OF STANISLAUS, a political subdivision of the State of California

____
Terry Withrow, Chairman of the Board

Attest:
Elizabeth King, Clerk of the Board of Supervisors

____
Deputy

Agreement adopted pursuant to Board of Supervisors Resolution ___________

Approved as to Form:

____
Thomas E. Boze, County Counsel

EXHIBIT A

CROWS LANDING PROPERTY

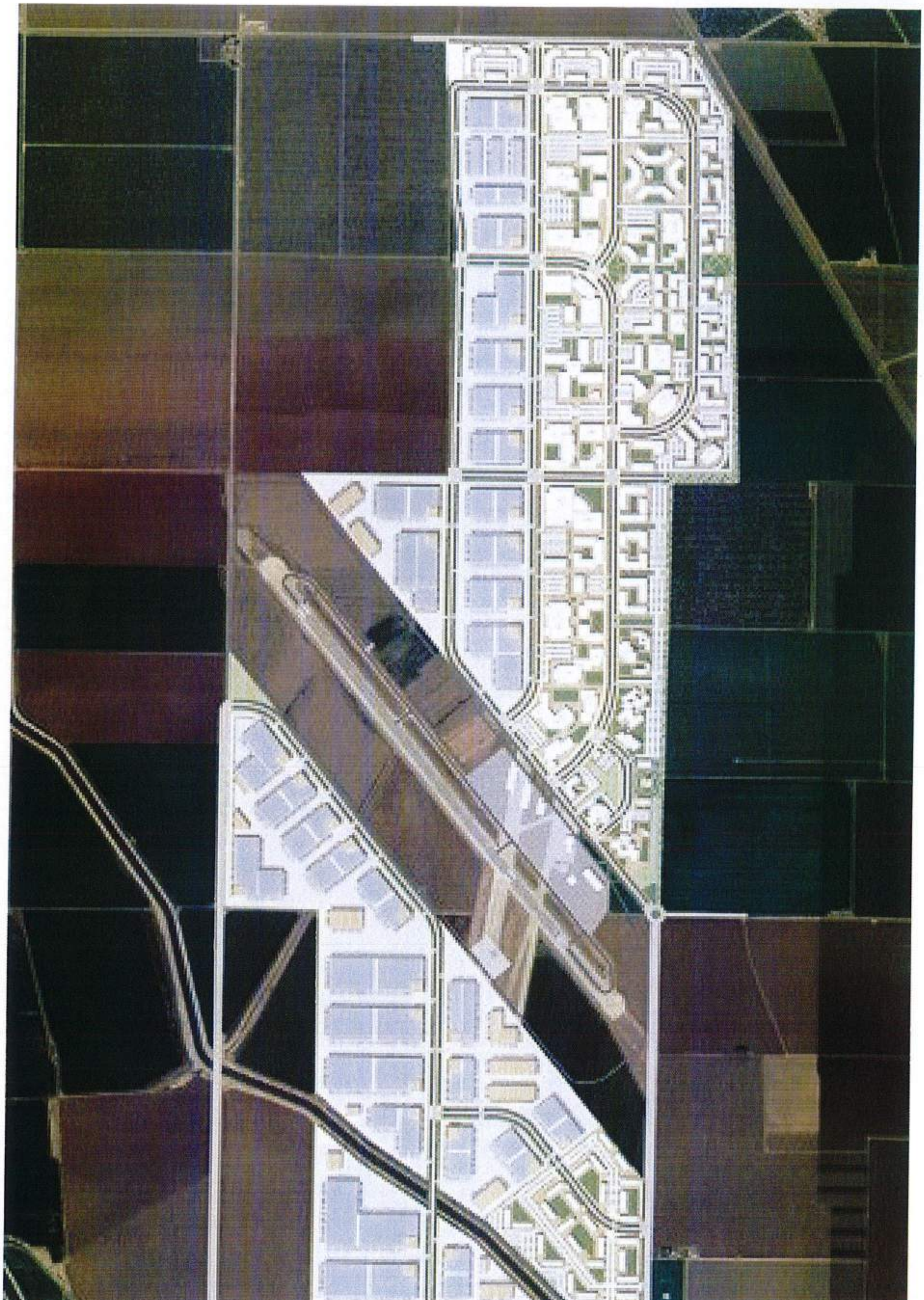
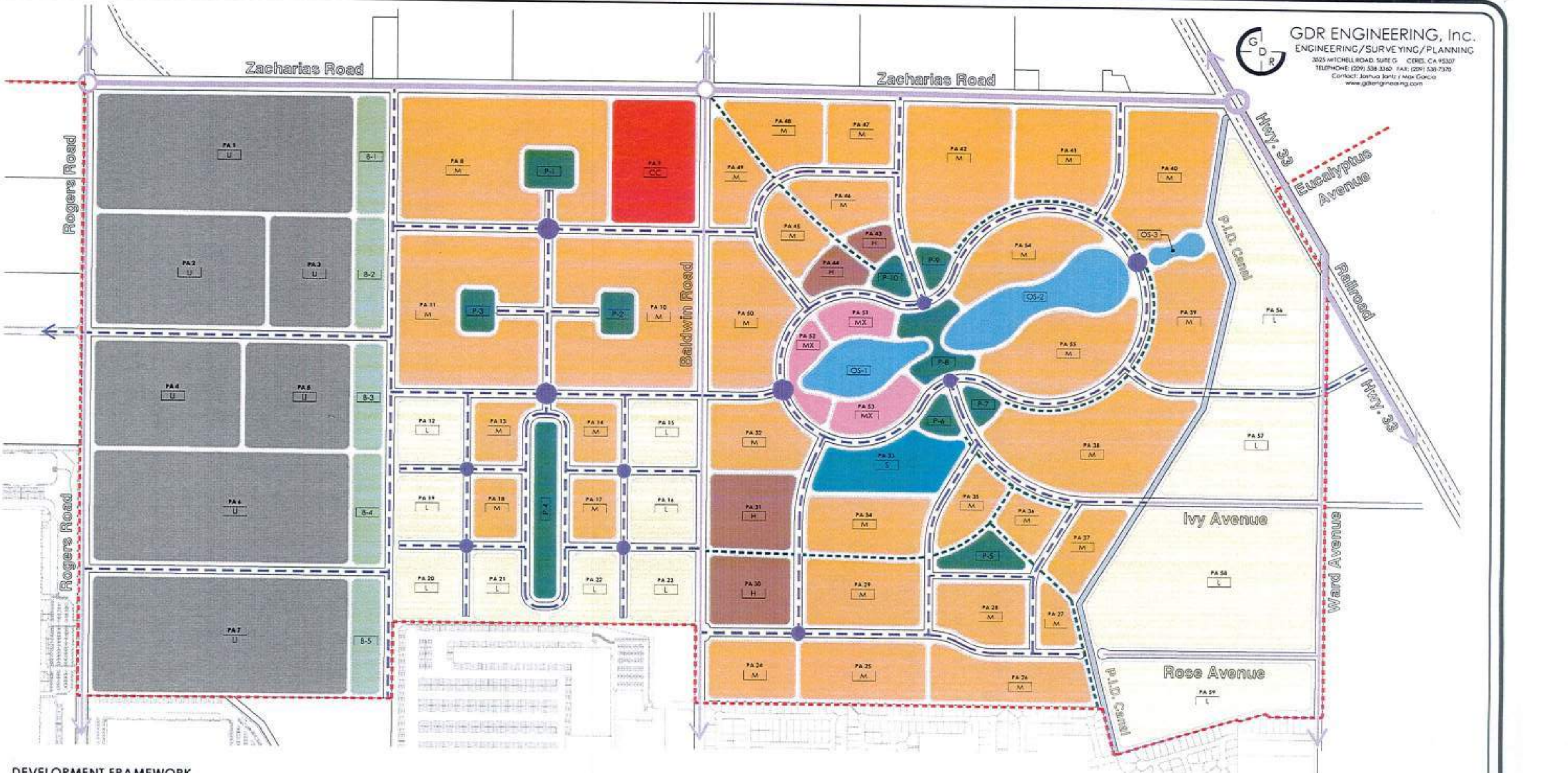


EXHIBIT B

NORTHWEST PATTERSON ANNEXATION AREA



GDR ENGINEERING, Inc.
ENGINEERING/SURVEYING/PLANNING

DEVELOPMENT FRAMEWORK

L	Low Density Residential (1.0 - 5.0 U.P.A.)
M	Medium Density Residential (5.1 - 12.0 U.P.A.)
H	High Density Residential (12.1 - 20.0 U.P.A.)
MX	Mixed Use
S	Future School Site
CC	Community Commercial
LI	Light Industrial
B	Detention Basin
P	Proposed Parks
OS	Open Space / Lake / Flood Control / Park / Recharge Basin

Round-A-Bout
Existing Roads
New Minor Roads
Bike & Pedestrian Paths
City of Patterson Limits

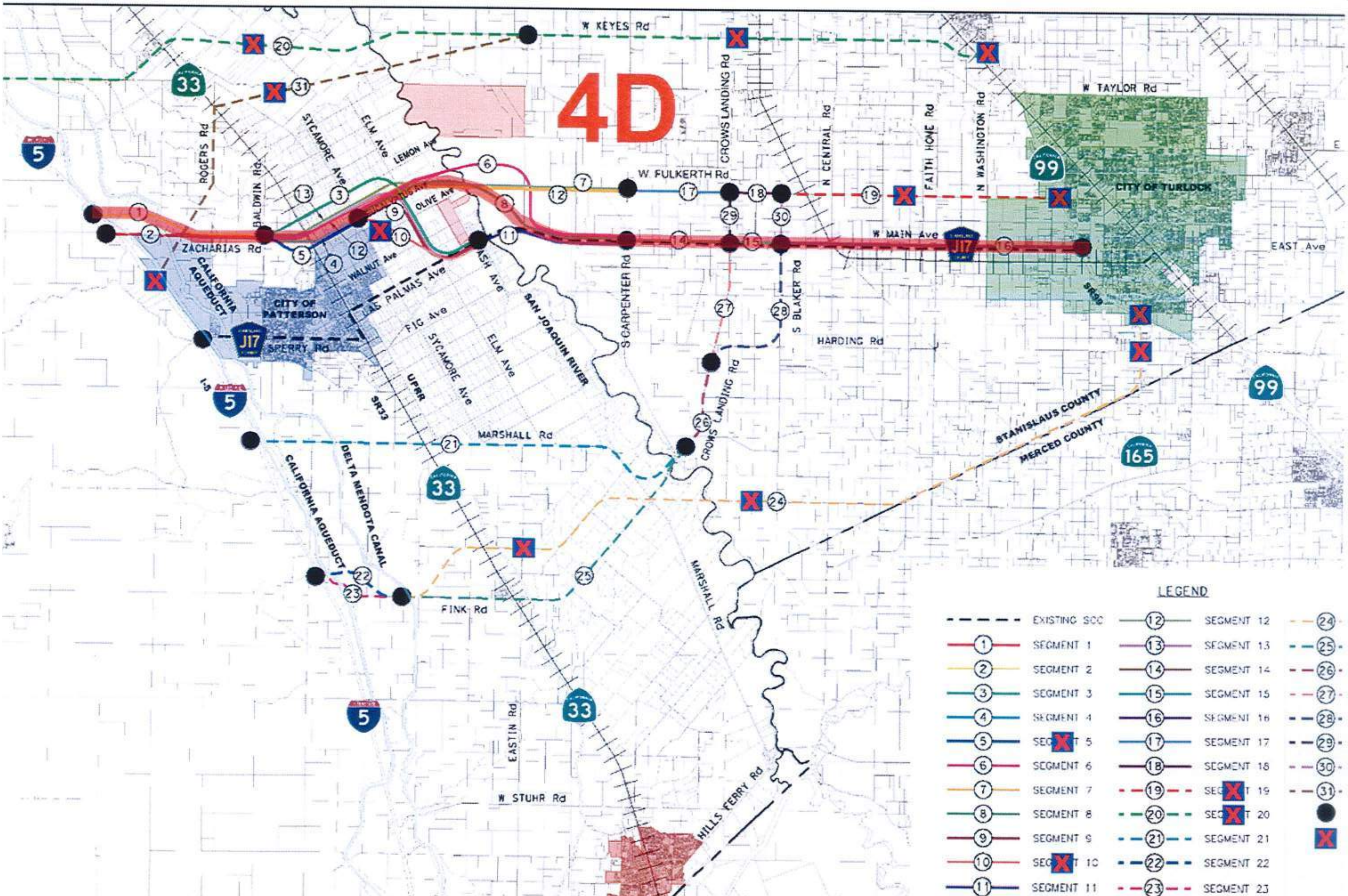
Zacharias Master Planning Area

Conceptual Land Use Plan

City of Patterson, Stanislaus County, California
April 2, 2019

EXHIBIT C

SOUTH COUNTY CORRIDOR ALTERNATIVE

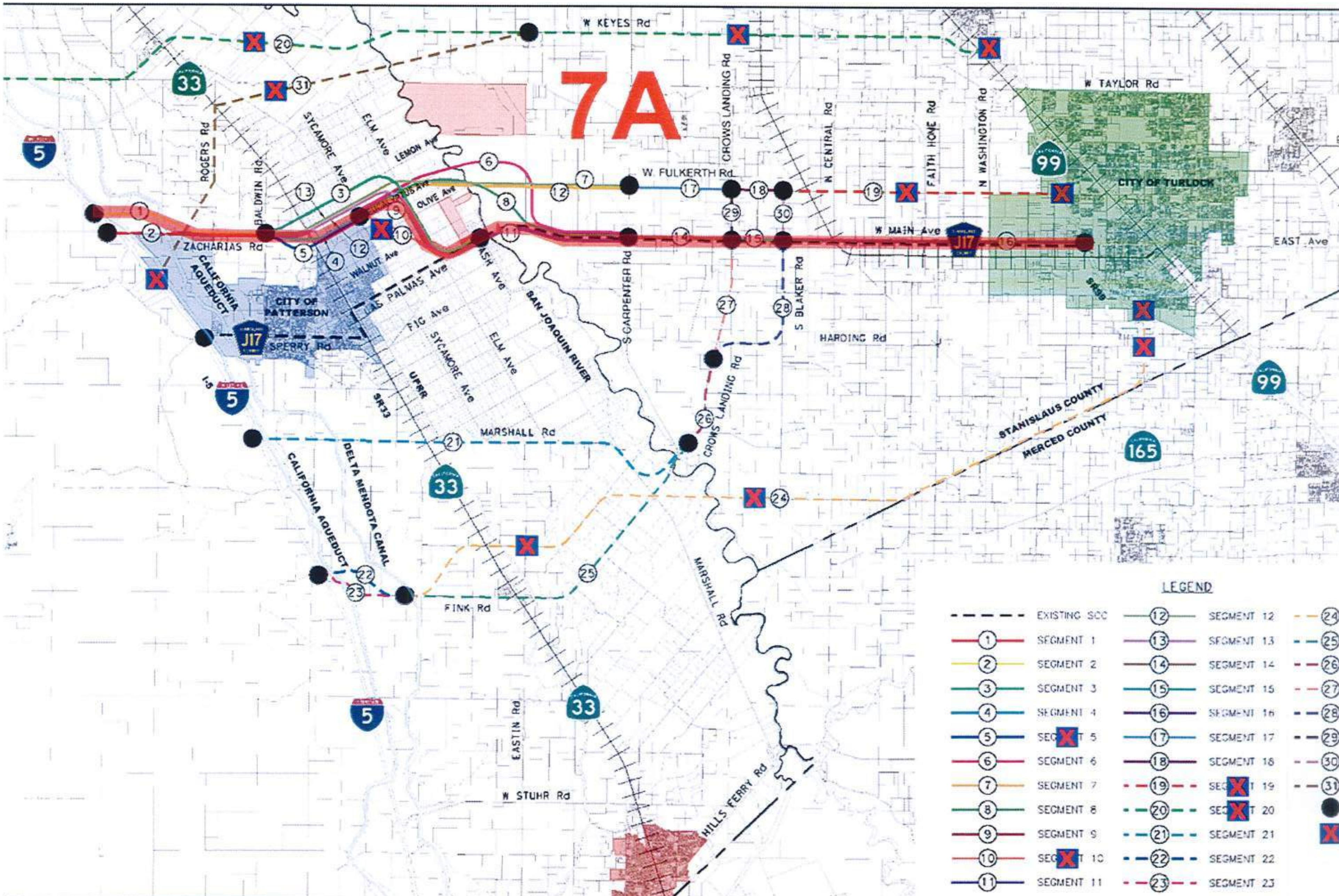


SOUTH COUNTY CORRIDOR CONCEPTUAL ALIGNMENTS

OVERALL PROJECT MAP

INTERNATIONAL

SOUTH COUNTY CORRIDOR



SOUTH COUNTY CORRIDOR CONCEPTUAL ALIGNMENTS

OVERALL PROJECT MAP

INTERNATIONAL

SOUTH COUNTY CORRIDOR

Appendix B

Results of Hydraulic Modeling of Conveyance System

APPENDIX B
TABLE B-1.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, SPECIFIC PLAN PIPELINE SIZES
PIPE TABLE
MAY 15, 2020

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (gpd)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow) (gpd)	Flow / Capacity (Design) (%)
80	P-1	MH-1	170	MH-2	165	154	0.032469	8	0.013	153,818	4.08	0.25	1,425,175	10.8
518	P-2	MH-2	165	MH-3	162.3	529	0.005104	8	0.013	206,182	2.28	0.27	565,049	36.5
423	P-3	MH-3	162.3	MH-4	154.06	738	0.011165	8	0.013	206,182	3.03	0.27	835,730	24.7
424	P-4	MH-4	154.06	MH-5	142.61	1,025.00	0.011171	8	0.013	235,636	3.14	0.39	835,933	28.2
425	P-5	MH-5	142.61	MH-6	140.61	1,000.00	0.002	12	0.013	538,036	2.04	0.52	1,042,855	51.6
426	P-6	MH-6	140.61	MH-7	138.48	1,066.40	0.001997	12	0.013	569,455	2.07	0.57	1,042,167	54.6
427	P-7	MH-7	138.48	MH-8	136.63	1,176.70	0.001572	12	0.013	642,764	1.94	0.54	924,624	69.5
428	P-8	MH-8	136.63	MH-9	118.92	6,795.00	0.002606	18	0.013	757,964	2.42	0.56	3,509,935	21.6
429	P-9	MH-9	118.92	MH-10	117.47	800	0.001813	18	0.013	1,117,964	2.36	0.65	2,927,009	38.2
430	P-10	MH-10	117.47	MH-11	110.1	3,800.00	0.001939	18	0.013	1,173,600	2.45	0.81	3,027,796	38.8
154	P-11	MH-11	110.1	MH-12	110.06	300	0.000133	18	0.013	1,202,400	1.04	0.82	793,879	151.5
216	P-12	MH-14	165.75	MH-15	164.69	303	0.003498	8	0.013	56,945	1.39	0.15	467,804	12.2
217	P-13	MH-15	164.69	MH-16	163.63	270.9	0.003913	8	0.013	56,945	1.44	0.15	494,758	11.5
218	P-14	MH-16	163.63	MH-17	162.86	200	0.00385	8	0.013	56,945	1.43	0.15	490,752	11.6
224	P-15	MH-18	156.54	MH-19	155.49	300	0.0035	8	0.013	56,945	1.39	0.16	467,915	12.2
225	P-16	MH-19	155.49	MH-20	154.44	300	0.0035	8	0.013	56,945	1.39	0.16	467,915	12.2
229	P-17	MH-22	165.01	MH-23	163.68	381	0.003491	8	0.013	30,764	1.16	0.11	467,300	6.6
230	P-18	MH-23	163.68	MH-24	157.99	400	0.014225	8	0.013	30,764	1.9	0.09	943,318	3.3
231	P-19	MH-24	157.99	MH-20	154.44	249.6	0.01422	8	0.013	30,764	1.9	0.13	943,167	3.3
238	P-20	MH-25	157.34	MH-26	155.94	400	0.0035	8	0.013	58,909	1.4	0.16	467,915	12.6
276	P-21	MH-36	131.36	MH-37	130.06	371	0.003504	8	0.013	16,364	0.96	0.09	468,183	3.5
305	P-22	MH-39	124.42	MH-43	123.82	400	0.0015	10	0.013	47,782	0.95	0.21	555,395	8.6
327	P-23	MH-44	119.1	MH-9	118.92	118	0.001525	15	0.013	360,000	1.64	0.57	1,651,313	21.8
328	P-24	MH-40	119.7	MH-44	119.1	400	0.0015	15	0.013	337,745	1.61	0.44	1,637,496	20.6
345	P-25	MH-52	110.1	MH-12	110.06	17.6	0.002272	12	0.013	433,309	2.03	0.66	1,111,484	39
433	P-26	MH-28	165.03	MH-29	156.71	1,102.00	0.00755	8	0.013	31,418	1.52	0.1	687,233	4.6
434	P-27	MH-29	156.71	MH-27	151.85	799	0.006082	8	0.013	31,418	1.41	0.18	616,831	5.1
435	P-28	MH-26	155.94	MH-27	151.85	1,168.30	0.003501	8	0.013	58,909	1.4	0.21	467,967	12.6
436	P-29	MH-27	151.85	MH-30	147.01	1,384.00	0.003497	8	0.013	156,436	1.84	0.31	467,719	33.4
437	P-30	MH-30	147.01	MH-35	145.21	900	0.002	10	0.013	231,055	1.65	0.37	641,317	36
438	P-31	MH-35	145.21	MH-5	142.61	1,301.00	0.001998	10	0.013	302,400	1.77	0.46	641,068	47.2
439	P-32	MH-31	165.83	MH-4	154.06	741.1	0.015882	8	0.013	29,455	1.94	0.19	996,742	3
440	P-33	MH-32	169.48	MH-33	167.69	487.4	0.003672	8	0.013	24,218	1.1	0.09	479,291	5.1
441	P-34	MH-33	167.69	MH-34	151.25	1,816.00	0.009053	8	0.013	24,218	1.51	0.09	752,531	3.2
442	P-35	MH-34	151.25	MH-30	147.01	603.9	0.007021	8	0.013	24,218	1.38	0.22	662,701	3.7
443	P-36	MH-37	130.06	MH-41	127.96	696	0.003017	8	0.013	16,364	0.91	0.08	434,435	3.8
444	P-37	MH-41	127.96	MH-42	125.8	502.4	0.0043	8	0.013	16,364	1.03	0.1	518,629	3.2
445	P-38	MH-42	125.8	MH-39	124.42	400	0.00345	8	0.013	36,000	1.21	0.15	464,557	7.7
446	P-39	MH-38	125.72	MH-39	124.42	879.4	0.001478	8	0.013	1,964	0.37	0.1	304,102	0.6
447	P-40	MH-43	123.82	MH-40	119.7	2,751.00	0.001498	10	0.013	106,036	1.2	0.32	554,963	19.1
449	P-41	MH-13	169.6	MH-14	165.75	1,090.20	0.003531	8	0.013	56,945	1.39	0.16	470,003	12.1
450	P-42	MH-17	162.86	MH-18	156.54	1,577.00	0.004008	8	0.013	56,945	1.45	0.15	500,701	11.4
451	P-43	MH-21	169.21	MH-22	165.01	1,165.70	0.003603	8	0.013	30,764	1.17	0.12	474,742	6.5
452	P-44	MH-20	154.44	MH-8	136.63	2,353.00	0.007569	12	0.013	115,200	2.14	0.32	2,028,751	5.7
455	P-45	MH-50	117.22	MH-51	112.7	965.8	0.00468	8	0.013	145,309	2.01	0.33	541,067	26.9
456	P-46	MH-51	112.7	MH-54	111.23	688.4	0.002134	12	0.013	395,345	1.93	0.44	1,077,120	36.7
457	P-47	MH-54	111.23	MH-52	110.1	599.3	0.001887	12	0.013	433,309	1.89	0.55	1,013,086	42.8
458	P-48	MH-49	121.93	MH-50	117.22	527	0.008937	8	0.013	76,582	2.11	0.2	747,713	10.2
459	P-49	MH-45	140.5	MH-46	131.71	1,953.00	0.004501	8	0.013	31,418	1.27	0.15	530,607	5.9
460	P-50	MH-46	131.71	MH-47	128	1,020.00	0.003637	8	0.013	81,164	1.56	0.21	477,000	17
461	P-60	MH-47	128	MH-40	119.7	971	0.008548	10	0.013	179,345	2.59	0.31	1,325,828	13.5
463	P-61	MH-48	140.7	MH-53	138.71	589	0.003371	8	0.013	54,327	1.35	0.15	459,190	11.8
464	P-62	MH-53	138.71	MH-47	128	2,594.30	0.00413	8	0.013	54,327	1.45	0.19	508,287	10.7
490	P-63	MH-59	131.71	MH-58	121.51	2,626.00	0.003884	8	0.013	18,982	1.04	0.11	492,932	3.9
491	P-64	MH-58	121.51	MH-57	119.15	960	0.002458	8	0.013	46,473	1.1	0.15	392,151	11.9
496	P-65	MH-60	129.8	MH-57	119.15	2,509.00	0.004245	8	0.013	18,327	1.06	0.14	515,297	3.6
499	P-66	MH-62	131.13	MH-63	124.03	2,027.20	0.003502	8	0.013	17,673	0.98	0.1	468,072	3.8
500	P-67	MH-63	124.03	MH-50	117.22	1,161.90	0.005861	8	0.013	35,345	1.45	0.17	605,507	5.8
501	P-68	MH-61	119.15	MH-50	117.22	2,117.00	0.000912	8	0.013	17,673	0.61	0.18	238,811	7.4
504	P-69	MH-56	117.3	MH-64	116.64	296.4	0.002231	10	0.013	204,218	1.66	0.33	677,363	30.1
505	P-70	MH-64	116.64	MH-51	112.7	2,000.00	0.001969	10	0.013	232,364	1.64	0.38	636,388	36.5
508	P-71	MH-57	119.15	MH-65	117.71	600	0.002402	10	0.013	90,327	1.35	0.2	702,772	12.9
509	P-72	MH-65	117.71	MH-56	117.3	139	0.002942	10	0.013	90,327	1.45	0.25	777,868	11.6
512	P-73	MH-55	124.43	MH-66	118.91	1,600.00	0.003451	8	0.013	27,491	1.11	0.14	464,609	5.9
513	P-74	MH-66	118.91	MH-56	117.3	325	0.00495	8	0.013	77,891	1.72	0.24	556,462	14
522	P-75	MH-12	110.06	O-5	109	7.6	0.140014	12	0.013	1,635,709	13.01	0.52	8,725,562	18.7

APPENDIX B
TABLE B-2.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, SPECIFIC PLAN PIPELINE SIZES
MANHOLE TABLE
MAY 15, 2020

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (gpd)	Flow (Total Out) (gpd)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
30	MH-1	183	183	170	0	153,818	0.22	170.22	170.22
31	MH-2	181	181	165	153,818	206,182	0.28	165.28	165.28
519	MH-3	177	177	162.3	206,182	206,182	0.26	162.56	162.56
151	MH-4	172	172	154.06	235,636	235,636	0.28	154.34	154.34
37	MH-5	167	167	142.61	538,036	538,036	0.51	143.12	143.12
40	MH-6	164	164	140.61	538,036	569,455	0.53	141.14	141.14
43	MH-7	163	163	138.48	569,455	642,764	0.61	139.09	139.09
46	MH-8	153	153	136.63	757,964	757,964	0.47	137.1	137.1
63	MH-9	130	130	118.92	1,117,964	1,117,964	0.64	119.56	119.56
65	MH-10	127	127	117.47	1,117,964	1,173,600	0.65	118.12	118.12
75	MH-11	120	120	110.1	1,173,600	1,202,400	0.96	111.06	111.06
520	MH-12	118	118	110.06	1,635,709	1,635,709	0.68	110.74	110.74
156	MH-13	175.5	175.5	169.6	0	56,945	0.16	169.76	169.76
159	MH-14	172	172	165.75	56,945	56,945	0.16	165.91	165.91
160	MH-15	171	171	164.69	56,945	56,945	0.15	164.84	164.84
169	MH-16	169	169	163.63	56,945	56,945	0.15	163.78	163.78
161	MH-17	168	168	162.86	56,945	56,945	0.15	163.01	163.01
166	MH-18	170	170	156.54	56,945	56,945	0.16	156.7	156.7
167	MH-19	169	169	155.49	56,945	56,945	0.16	155.65	155.65
168	MH-20	167	167	154.44	87,709	115,200	0.17	154.61	154.61
170	MH-21	176	176	169.21	0	30,764	0.11	169.32	169.32
173	MH-22	173.5	173.5	165.01	30,764	30,764	0.12	165.13	165.13
174	MH-23	170	170	163.68	30,764	30,764	0.1	163.78	163.78
180	MH-24	168	168	157.99	30,764	30,764	0.1	158.09	158.09
181	MH-25	162.5	162.5	157.34	0	58,909	0.16	157.5	157.5
182	MH-26	159.5	159.5	155.94	58,909	58,909	0.16	156.1	156.1
185	MH-27	158.7	158.7	151.85	90,327	156,436	0.27	152.12	152.12
186	MH-28	170.5	170.5	165.03	0	31,418	0.1	165.13	165.13
189	MH-29	164.8	164.8	156.71	31,418	31,418	0.1	156.81	156.81
194	MH-30	159	159	147.01	180,655	231,055	0.35	147.36	147.36
195	MH-31	175.5	175.5	165.83	0	29,455	0.1	165.93	165.93
197	MH-32	175.5	175.5	169.48	0	24,218	0.1	169.58	169.58
199	MH-33	174	174	167.69	24,218	24,218	0.09	167.78	167.78
205	MH-34	163.5	163.5	151.25	24,218	24,218	0.09	151.34	151.34
209	MH-35	159.4	159.4	145.21	231,055	302,400	0.4	145.61	145.61
271	MH-36	145.32	145.32	131.36	0	16,364	0.09	131.45	131.45
272	MH-37	145.7	145.7	130.06	16,364	16,364	0.09	130.15	130.15
273	MH-38	145.95	145.95	125.72	0	1,964	0.04	125.76	125.76
274	MH-39	140.95	140.95	124.42	37,964	47,782	0.17	124.59	124.59
275	MH-40	131.17	131.17	119.7	285,382	337,745	0.39	120.09	120.09
285	MH-41	141.79	141.79	127.96	16,364	16,364	0.08	128.04	128.04
291	MH-42	140.74	140.74	125.8	16,364	36,000	0.13	125.93	125.93
304	MH-43	139.42	139.42	123.82	47,782	106,036	0.25	124.07	124.07
325	MH-44	129.78	129.78	119.1	337,745	360,000	0.5	119.6	119.6
329	MH-45	145.09	145.09	140.5	0	31,418	0.11	140.61	140.61
330	MH-46	139.12	139.12	131.71	31,418	81,164	0.19	131.9	131.9
331	MH-47	134.92	134.92	128	135,491	179,345	0.23	128.23	128.23
332	MH-48	145.64	145.64	140.7	0	54,327	0.15	140.85	140.85
334	MH-49	126.66	126.66	121.93	0	76,582	0.16	122.09	122.09
335	MH-50	127.74	127.74	117.22	129,600	145,309	0.24	117.46	117.46
336	MH-51	123.15	123.15	112.7	377,673	395,345	0.42	113.12	113.12
337	MH-52	118.19	118.19	110.1	433,309	433,309	0.64	110.74	110.74
371	MH-53	142.3	142.3	138.71	54,327	54,327	0.15	138.86	138.86
410	MH-54	120.35	120.35	111.23	395,345	433,309	0.46	111.69	111.69
466	MH-55	130.03	130.03	124.43	0	27,491	0.11	124.54	124.54
468	MH-56	126.7	126.7	117.3	168,218	204,218	0.31	117.61	117.61
470	MH-57	129.83	129.83	119.15	64,800	90,327	0.2	119.35	119.35
471	MH-58	136.52	136.52	121.51	18,982	46,473	0.14	121.65	121.65
472	MH-59	139.19	139.19	131.71	0	18,982	0.09	131.8	131.8
473	MH-60	135.11	135.11	129.8	0	18,327	0.09	129.89	129.89
475	MH-61	129.71	129.71	119.15	0	17,673	0.12	119.27	119.27
476	MH-62	136.44	136.44	131.13	0	17,673	0.09	131.22	131.22
477	MH-63	135.14	135.14	124.03	17,673	35,345	0.11	124.14	124.14
503	MH-64	125.45	125.45	116.64	204,218	232,364	0.35	116.99	116.99
507	MH-65	127.1	127.1	117.71	90,327	90,327	0.19	117.9	117.9
511	MH-66	126.31	126.31	118.91	27,491	77,891	0.17	119.08	119.08

APPENDIX B
TABLE B-3.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, DOWNSIZING OF PIPELINES
PIPE TABLE
MAY 15, 2020

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (gpd)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow) (gpd)	Flow / Capacity (Design) (%)
80	P-1	MH-1	170	MH-2	165	154	0.032469	8	0.013	153,818	4.08	0.25	1,425,175	10.8
518	P-2	MH-2	165	MH-3	162.3	529	0.005104	8	0.013	206,182	2.28	0.27	565,049	36.5
423	P-3	MH-3	162.3	MH-4	154.06	738	0.011165	8	0.013	206,182	3.03	0.27	835,730	24.7
424	P-4	MH-4	154.06	MH-5	142.61	1,025.00	0.011171	8	0.013	235,636	3.14	0.39	835,933	28.2
425	P-5	MH-5	142.61	MH-6	140.61	1,000.00	0.002	12	0.013	538,036	2.04	0.52	1,042,855	51.6
426	P-6	MH-6	140.61	MH-7	138.48	1,066.40	0.001997	12	0.013	569,455	2.07	0.57	1,042,167	54.6
427	P-7	MH-7	138.48	MH-8	136.63	1,176.70	0.001572	12	0.013	642,764	1.94	0.54	924,624	69.5
428	P-8	MH-8	136.63	MH-9	118.92	6,795.00	0.002606	18	0.013	757,964	2.42	0.56	3,509,935	21.6
429	P-9	MH-9	118.92	MH-10	117.47	800	0.001813	18	0.013	1,117,964	2.36	0.65	2,927,009	38.2
430	P-10	MH-10	117.47	MH-11	110.1	3,800.00	0.001939	18	0.013	1,173,600	2.45	0.81	3,027,796	38.8
154	P-11	MH-11	110.1	MH-12	110.06	300	0.000133	18	0.013	1,202,400	1.04	0.82	793,879	151.5
216	P-12	MH-14	165.75	MH-15	164.69	303	0.003498	8	0.013	56,945	1.39	0.15	467,804	12.2
217	P-13	MH-15	164.69	MH-16	163.63	270.9	0.003913	8	0.013	56,945	1.44	0.15	494,758	11.5
218	P-14	MH-16	163.63	MH-17	162.86	200	0.00385	8	0.013	56,945	1.43	0.15	490,752	11.6
224	P-15	MH-18	156.54	MH-19	155.49	300	0.0035	8	0.013	56,945	1.39	0.16	467,915	12.2
225	P-16	MH-19	155.49	MH-20	154.44	300	0.0035	8	0.013	56,945	1.39	0.16	467,915	12.2
229	P-17	MH-22	165.01	MH-23	163.68	381	0.003491	8	0.013	30,764	1.16	0.11	467,300	6.6
230	P-18	MH-23	163.68	MH-24	157.99	400	0.014225	8	0.013	30,764	1.9	0.09	943,318	3.3
231	P-19	MH-24	157.99	MH-20	154.44	249.6	0.01422	8	0.013	30,764	1.9	0.13	943,167	3.3
238	P-20	MH-25	157.34	MH-26	155.94	400	0.0035	8	0.013	58,909	1.4	0.16	467,915	12.6
276	P-21	MH-36	131.36	MH-37	130.06	371	0.003504	8	0.013	16,364	0.96	0.09	468,183	3.5
305	P-22	MH-39	124.42	MH-43	123.82	400	0.0015	10	0.013	47,782	0.95	0.21	555,395	8.6
327	P-23	MH-44	119.1	MH-9	118.92	118	0.001525	12	0.013	360,000	1.67	0.58	910,761	39.5
328	P-24	MH-40	119.7	MH-44	119.1	400	0.0015	12	0.013	337,745	1.63	0.47	903,135	37.4
345	P-25	MH-52	110.1	MH-12	110.06	17.6	0.002272	12	0.013	433,309	2.03	0.66	1,111,484	39
433	P-26	MH-28	165.03	MH-29	156.71	1,102.00	0.00755	8	0.013	31,418	1.52	0.1	687,233	4.6
434	P-27	MH-29	156.71	MH-27	151.85	799	0.006082	8	0.013	31,418	1.41	0.18	616,831	5.1
435	P-28	MH-26	155.94	MH-27	151.85	1,168.30	0.003501	8	0.013	58,909	1.4	0.21	467,967	12.6
436	P-29	MH-27	151.85	MH-30	147.01	1,384.00	0.003497	8	0.013	156,436	1.84	0.31	467,719	33.4
437	P-30	MH-30	147.01	MH-35	145.21	900	0.002	10	0.013	231,055	1.65	0.37	641,317	36
438	P-31	MH-35	145.21	MH-5	142.61	1,301.00	0.001998	10	0.013	302,400	1.77	0.46	641,068	47.2
439	P-32	MH-31	165.83	MH-4	154.06	741.1	0.015882	8	0.013	29,455	1.94	0.19	996,742	3
440	P-33	MH-32	169.48	MH-33	167.69	487.4	0.003672	8	0.013	24,218	1.1	0.09	479,291	5.1
441	P-34	MH-33	167.69	MH-34	151.25	1,816.00	0.009053	8	0.013	24,218	1.51	0.09	752,531	3.2
442	P-35	MH-34	151.25	MH-30	147.01	603.9	0.007021	8	0.013	24,218	1.38	0.22	662,701	3.7
443	P-36	MH-37	130.06	MH-41	127.96	696	0.003017	8	0.013	16,364	0.91	0.08	434,435	3.8
444	P-37	MH-41	127.96	MH-42	125.8	502.4	0.0043	8	0.013	16,364	1.03	0.1	518,629	3.2
445	P-38	MH-42	125.8	MH-39	124.42	400	0.00345	8	0.013	36,000	1.21	0.15	464,557	7.7
446	P-39	MH-38	125.72	MH-39	124.42	879.4	0.001478	8	0.013	1,964	0.37	0.1	304,102	0.6
447	P-40	MH-43	123.82	MH-40	119.7	2,751.00	0.001498	10	0.013	106,036	1.2	0.34	554,963	19.1
449	P-41	MH-13	169.6	MH-14	165.75	1,090.20	0.003531	8	0.013	56,945	1.39	0.16	470,003	12.1
450	P-42	MH-17	162.86	MH-18	156.54	1,577.00	0.004008	8	0.013	56,945	1.45	0.15	500,701	11.4
451	P-43	MH-21	169.21	MH-22	165.01	1,165.70	0.003603	8	0.013	30,764	1.17	0.12	474,742	6.5
452	P-44	MH-20	154.44	MH-8	136.63	2,353.00	0.007569	12	0.013	115,200	2.14	0.32	2,028,751	5.7
455	P-45	MH-50	117.22	MH-51	112.7	965.8	0.00468	10	0.013	145,309	1.97	0.32	981,013	14.8
456	P-46	MH-51	112.7	MH-54	111.23	688.4	0.002134	12	0.013	395,345	1.93	0.44	1,077,120	36.7
457	P-47	MH-54	111.23	MH-52	110.1	599.3	0.001887	12	0.013	433,309	1.89	0.55	1,013,086	42.8
458	P-48	MH-49	121.93	MH-50	117.22	527	0.008937	8	0.013	76,582	2.11	0.19	747,713	10.2
459	P-49	MH-45	140.5	MH-46	131.71	1,953.00	0.004501	8	0.013	31,418	1.27	0.15	530,607	5.9
460	P-50	MH-46	131.71	MH-47	128	1,020.00	0.003637	8	0.013	81,164	1.56	0.21	477,000	17
461	P-60	MH-47	128	MH-40	119.7	971	0.008548	10	0.013	179,345	2.59	0.33	1,325,828	13.5
463	P-61	MH-48	140.7	MH-53	138.71	589	0.003371	8	0.013	54,327	1.35	0.15	459,190	11.8
464	P-62	MH-53	138.71	MH-47	128	2,594.30	0.00413	8	0.013	54,327	1.45	0.19	508,287	10.7
490	P-63	MH-59	131.71	MH-58	121.51	2,626.00	0.003884	8	0.013	18,982	1.04	0.11	492,932	3.9
491	P-64	MH-58	121.51	MH-57	119.15	960	0.002458	8	0.013	46,473	1.1	0.15	392,151	11.9
496	P-65	MH-60	129.8	MH-57	119.15	2,509.00	0.004245	8	0.013	18,327	1.06	0.14	515,297	3.6
499	P-66	MH-62	131.13	MH-63	124.03	2,027.20	0.003502	8	0.013	17,673	0.98	0.1	468,072	3.8
500	P-67	MH-63	124.03	MH-50	117.22	1,161.90	0.005861	8	0.013	35,345	1.45	0.16	605,507	5.8
501	P-68	MH-61	119.15	MH-50	117.22	2,117.00	0.000912	8	0.013	17,673	0.61	0.17	238,811	7.4
504	P-69	MH-56	117.3	MH-64	116.64	296.4	0.002231	10	0.013	204,218	1.66	0.33	677,363	30.1
505	P-70	MH-64	116.64	MH-51	112.7	2,000.00	0.001969	10	0.013	232,364	1.64	0.38	636,388	36.5
508	P-71	MH-57	119.15	MH-65	117.71	600	0.002402	10	0.013	90,327	1.35	0.2	702,772	12.9
509	P-72	MH-65	117.71	MH-56	117.3	139	0.002942	10	0.013	90,327	1.45	0.25	777,868	11.6
512	P-73	MH-55	124.43	MH-66	118.91	1,600.00	0.003451	8	0.013	27,491	1.11	0.14	464,609	5.9
513	P-74	MH-66	118.91	MH-56	117.3	325	0.00495	8	0.013	77,891	1.72	0.24	556,462	14
522	P-75	MH-12	110.06	O-5	109	7.6	0.140014	12	0.013	1,635,709	13.01	0.52	8,725,562	18.7

APPENDIX B
TABLE B-4.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, DOWNSIZING OF PIPELINES
MANHOLE TABLE
MAY 15, 2020

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (gpd)	Flow (Total Out) (gpd)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
30	MH-1	183	183	170	0	153,818	0.22	170.22	170.22
31	MH-2	181	181	165	153,818	206,182	0.28	165.28	165.28
519	MH-3	177	177	162.3	206,182	206,182	0.26	162.56	162.56
151	MH-4	172	172	154.06	235,636	235,636	0.28	154.34	154.34
37	MH-5	167	167	142.61	538,036	538,036	0.51	143.12	143.12
40	MH-6	164	164	140.61	538,036	569,455	0.53	141.14	141.14
43	MH-7	163	163	138.48	569,455	642,764	0.61	139.09	139.09
46	MH-8	153	153	136.63	757,964	757,964	0.47	137.1	137.1
63	MH-9	130	130	118.92	1,117,964	1,117,964	0.64	119.56	119.56
65	MH-10	127	127	117.47	1,117,964	1,173,600	0.65	118.12	118.12
75	MH-11	120	120	110.1	1,173,600	1,202,400	0.96	111.06	111.06
520	MH-12	118	118	110.06	1,635,709	1,635,709	0.68	110.74	110.74
156	MH-13	175.5	175.5	169.6	0	56,945	0.16	169.76	169.76
159	MH-14	172	172	165.75	56,945	56,945	0.16	165.91	165.91
160	MH-15	171	171	164.69	56,945	56,945	0.15	164.84	164.84
169	MH-16	169	169	163.63	56,945	56,945	0.15	163.78	163.78
161	MH-17	168	168	162.86	56,945	56,945	0.15	163.01	163.01
166	MH-18	170	170	156.54	56,945	56,945	0.16	156.7	156.7
167	MH-19	169	169	155.49	56,945	56,945	0.16	155.65	155.65
168	MH-20	167	167	154.44	87,709	115,200	0.17	154.61	154.61
170	MH-21	176	176	169.21	0	30,764	0.11	169.32	169.32
173	MH-22	173.5	173.5	165.01	30,764	30,764	0.12	165.13	165.13
174	MH-23	170	170	163.68	30,764	30,764	0.1	163.78	163.78
180	MH-24	168	168	157.99	30,764	30,764	0.1	158.09	158.09
181	MH-25	162.5	162.5	157.34	0	58,909	0.16	157.5	157.5
182	MH-26	159.5	159.5	155.94	58,909	58,909	0.16	156.1	156.1
185	MH-27	158.7	158.7	151.85	90,327	156,436	0.27	152.12	152.12
186	MH-28	170.5	170.5	165.03	0	31,418	0.1	165.13	165.13
189	MH-29	164.8	164.8	156.71	31,418	31,418	0.1	156.81	156.81
194	MH-30	159	159	147.01	180,655	231,055	0.35	147.36	147.36
195	MH-31	175.5	175.5	165.83	0	29,455	0.1	165.93	165.93
197	MH-32	175.5	175.5	169.48	0	24,218	0.1	169.58	169.58
199	MH-33	174	174	167.69	24,218	24,218	0.09	167.78	167.78
205	MH-34	163.5	163.5	151.25	24,218	24,218	0.09	151.34	151.34
209	MH-35	159.4	159.4	145.21	231,055	302,400	0.4	145.61	145.61
271	MH-36	145.32	145.32	131.36	0	16,364	0.09	131.45	131.45
272	MH-37	145.7	145.7	130.06	16,364	16,364	0.09	130.15	130.15
273	MH-38	145.95	145.95	125.72	0	1,964	0.04	125.76	125.76
274	MH-39	140.95	140.95	124.42	37,964	47,782	0.17	124.59	124.59
275	MH-40	131.17	131.17	119.7	285,382	337,745	0.42	120.12	120.12
285	MH-41	141.79	141.79	127.96	16,364	16,364	0.08	128.04	128.04
291	MH-42	140.74	140.74	125.8	16,364	36,000	0.13	125.93	125.93
304	MH-43	139.42	139.42	123.82	47,782	106,036	0.25	124.07	124.07
325	MH-44	129.78	129.78	119.1	337,745	360,000	0.52	119.62	119.62
329	MH-45	145.09	145.09	140.5	0	31,418	0.11	140.61	140.61
330	MH-46	139.12	139.12	131.71	31,418	81,164	0.19	131.9	131.9
331	MH-47	134.92	134.92	128	135,491	179,345	0.23	128.23	128.23
332	MH-48	145.64	145.64	140.7	0	54,327	0.15	140.85	140.85
334	MH-49	126.66	126.66	121.93	0	76,582	0.16	122.09	122.09
335	MH-50	127.74	127.74	117.22	129,600	145,309	0.22	117.44	117.44
336	MH-51	123.15	123.15	112.7	377,673	395,345	0.42	113.12	113.12
337	MH-52	118.19	118.19	110.1	433,309	433,309	0.64	110.74	110.74
371	MH-53	142.3	142.3	138.71	54,327	54,327	0.15	138.86	138.86
410	MH-54	120.35	120.35	111.23	395,345	433,309	0.46	111.69	111.69
466	MH-55	130.03	130.03	124.43	0	27,491	0.11	124.54	124.54
468	MH-56	126.7	126.7	117.3	168,218	204,218	0.31	117.61	117.61
470	MH-57	129.83	129.83	119.15	64,800	90,327	0.2	119.35	119.35
471	MH-58	136.52	136.52	121.51	18,982	46,473	0.14	121.65	121.65
472	MH-59	139.19	139.19	131.71	0	18,982	0.09	131.8	131.8
473	MH-60	135.11	135.11	129.8	0	18,327	0.09	129.89	129.89
475	MH-61	129.71	129.71	119.15	0	17,673	0.12	119.27	119.27
476	MH-62	136.44	136.44	131.13	0	17,673	0.09	131.22	131.22
477	MH-63	135.14	135.14	124.03	17,673	35,345	0.11	124.14	124.14
503	MH-64	125.45	125.45	116.64	204,218	232,364	0.35	116.99	116.99
507	MH-65	127.1	127.1	117.71	90,327	90,327	0.19	117.9	117.9
511	MH-66	126.31	126.31	118.91	27,491	77,891	0.17	119.08	119.08

APPENDIX B
TABLE B-5.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, WITHOUT PHASE 1A
PIPE TABLE
MAY 15, 2020

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (gpd)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow) (gpd)	Flow / Capacity (Design) (%)
80	P-1	MH-1	170	MH-2	165	154	0.032469	8	0.013	0	0	0	1,425,175	0
518	P-2	MH-2	165	MH-3	162.3	529	0.005104	8	0.013	0	0	0	565,049	0
423	P-3	MH-3	162.3	MH-4	154.06	738	0.011165	8	0.013	0	0	0.05	835,730	0
424	P-4	MH-4	154.06	MH-5	142.61	1,025.00	0.011171	8	0.013	29,455	1.72	0.24	835,933	3.5
425	P-5	MH-5	142.61	MH-6	140.61	1,000.00	0.002	12	0.013	331,855	1.8	0.4	1,042,855	31.8
426	P-6	MH-6	140.61	MH-7	138.48	1,066.40	0.001997	12	0.013	363,273	1.84	0.45	1,042,167	34.9
427	P-7	MH-7	138.48	MH-8	136.63	1,176.70	0.001572	12	0.013	436,582	1.77	0.44	924,624	47.2
428	P-8	MH-8	136.63	MH-9	118.92	6,795.00	0.002606	18	0.013	551,782	2.21	0.49	3,509,935	15.7
429	P-9	MH-9	118.92	MH-10	117.47	800	0.001813	18	0.013	911,782	2.23	0.58	2,927,009	31.2
430	P-10	MH-10	117.47	MH-11	110.1	3,800.00	0.001939	18	0.013	967,418	2.33	0.73	3,027,796	32
154	P-11	MH-11	110.1	MH-12	110.06	300	0.000133	18	0.013	996,218	0.86	0.76	793,879	125.5
216	P-12	MH-14	165.75	MH-15	164.69	303	0.003498	8	0.013	56,945	1.39	0.15	467,804	12.2
217	P-13	MH-15	164.69	MH-16	163.63	270.9	0.003913	8	0.013	56,945	1.44	0.15	494,758	11.5
218	P-14	MH-16	163.63	MH-17	162.86	200	0.00385	8	0.013	56,945	1.43	0.15	490,752	11.6
224	P-15	MH-18	156.54	MH-19	155.49	300	0.0035	8	0.013	56,945	1.39	0.16	467,915	12.2
225	P-16	MH-19	155.49	MH-20	154.44	300	0.0035	8	0.013	56,945	1.39	0.16	467,915	12.2
229	P-17	MH-22	165.01	MH-23	163.68	381	0.003491	8	0.013	30,764	1.16	0.11	467,300	6.6
230	P-18	MH-23	163.68	MH-24	157.99	400	0.014225	8	0.013	30,764	1.9	0.09	943,318	3.3
231	P-19	MH-24	157.99	MH-20	154.44	249.6	0.01422	8	0.013	30,764	1.9	0.13	943,167	3.3
238	P-20	MH-25	157.34	MH-26	155.94	400	0.0035	8	0.013	58,909	1.4	0.16	467,915	12.6
276	P-21	MH-36	131.36	MH-37	130.06	371	0.003504	8	0.013	16,364	0.96	0.09	468,183	3.5
305	P-22	MH-39	124.42	MH-43	123.82	400	0.0015	10	0.013	47,782	0.95	0.21	555,395	8.6
327	P-23	MH-44	119.1	MH-9	118.92	118	0.001525	12	0.013	360,000	1.67	0.53	910,761	39.5
328	P-24	MH-40	119.7	MH-44	119.1	400	0.0015	12	0.013	337,745	1.63	0.45	903,135	37.4
345	P-25	MH-52	110.1	MH-12	110.06	17.6	0.002272	12	0.013	433,309	2.03	0.62	1,111,484	39
433	P-26	MH-28	165.03	MH-29	156.71	1,102.00	0.00755	8	0.013	31,418	1.52	0.1	687,233	4.6
434	P-27	MH-29	156.71	MH-27	151.85	799	0.006082	8	0.013	31,418	1.41	0.18	616,831	5.1
435	P-28	MH-26	155.94	MH-27	151.85	1,168.30	0.003501	8	0.013	58,909	1.4	0.21	467,967	12.6
436	P-29	MH-27	151.85	MH-30	147.01	1,384.00	0.003497	8	0.013	156,436	1.84	0.31	467,719	33.4
437	P-30	MH-30	147.01	MH-35	145.21	900	0.002	10	0.013	231,055	1.65	0.37	641,317	36
438	P-31	MH-35	145.21	MH-5	142.61	1,301.00	0.001998	10	0.013	302,400	1.77	0.4	641,068	47.2
439	P-32	MH-31	165.83	MH-4	154.06	741.1	0.015882	8	0.013	29,455	1.94	0.09	996,742	3
440	P-33	MH-32	169.48	MH-33	167.69	487.4	0.003672	8	0.013	24,218	1.1	0.09	479,291	5.1
441	P-34	MH-33	167.69	MH-34	151.25	1,816.00	0.009053	8	0.013	24,218	1.51	0.09	752,531	3.2
442	P-35	MH-34	151.25	MH-30	147.01	603.9	0.007021	8	0.013	24,218	1.38	0.22	662,701	3.7
443	P-36	MH-37	130.06	MH-41	127.96	696	0.003017	8	0.013	16,364	0.91	0.08	434,435	3.8
444	P-37	MH-41	127.96	MH-42	125.8	502.4	0.0043	8	0.013	16,364	1.03	0.1	518,629	3.2
445	P-38	MH-42	125.8	MH-39	124.42	400	0.00345	8	0.013	36,000	1.21	0.15	464,557	7.7
446	P-39	MH-38	125.72	MH-39	124.42	879.4	0.001478	8	0.013	1,964	0.37	0.1	304,102	0.6
447	P-40	MH-43	123.82	MH-40	119.7	2,751.00	0.001498	10	0.013	106,036	1.2	0.34	554,963	19.1
449	P-41	MH-13	169.6	MH-14	165.75	1,090.20	0.003531	8	0.013	56,945	1.39	0.16	470,003	12.1
450	P-42	MH-17	162.86	MH-18	156.54	1,577.00	0.004008	8	0.013	56,945	1.45	0.15	500,701	11.4
451	P-43	MH-21	169.21	MH-22	165.01	1,165.70	0.003603	8	0.013	30,764	1.17	0.12	474,742	6.5
452	P-44	MH-20	154.44	MH-8	136.63	2,353.00	0.007569	12	0.013	115,200	2.14	0.29	2,028,751	5.7
455	P-45	MH-50	117.22	MH-51	112.7	965.8	0.00468	10	0.013	145,309	1.97	0.32	981,013	14.8
456	P-46	MH-51	112.7	MH-54	111.23	688.4	0.002134	12	0.013	395,345	1.93	0.44	1,077,120	36.7
457	P-47	MH-54	111.23	MH-52	110.1	599.3	0.001887	12	0.013	433,309	1.89	0.53	1,013,086	42.8
458	P-48	MH-49	121.93	MH-50	117.22	527	0.008937	8	0.013	76,582	2.11	0.19	747,713	10.2
459	P-49	MH-45	140.5	MH-46	131.71	1,953.00	0.004501	8	0.013	31,418	1.27	0.15	530,607	5.9
460	P-50	MH-46	131.71	MH-47	128	1,020.00	0.003637	8	0.013	81,164	1.56	0.21	477,000	17
461	P-60	MH-47	128	MH-40	119.7	971	0.008548	10	0.013	179,345	2.59	0.33	1,325,828	13.5
463	P-61	MH-48	140.7	MH-53	138.71	589	0.003371	8	0.013	54,327	1.35	0.15	459,190	11.8
464	P-62	MH-53	138.71	MH-47	128	2,594.30	0.00413	8	0.013	54,327	1.45	0.19	508,287	10.7
490	P-63	MH-59	131.71	MH-58	121.51	2,626.00	0.003884	8	0.013	18,982	1.04	0.11	492,932	3.9
491	P-64	MH-58	121.51	MH-57	119.15	960	0.002458	8	0.013	46,473	1.1	0.15	392,151	11.9
496	P-65	MH-60	129.8	MH-57	119.15	2,509.00	0.004245	8	0.013	18,327	1.06	0.14	515,297	3.6
499	P-66	MH-62	131.13	MH-63	124.03	2,027.20	0.003502	8	0.013	17,673	0.98	0.1	468,072	3.8
500	P-67	MH-63	124.03	MH-50	117.22	1,161.90	0.005861	8	0.013	35,345	1.45	0.16	605,507	5.8
501	P-68	MH-61	119.15	MH-50	117.22	2,117.00	0.000912	8	0.013	17,673	0.61	0.17	238,811	7.4
504	P-69	MH-56	117.3	MH-64	116.64	296.4	0.002231	10	0.013	204,218	1.66	0.33	677,363	30.1
505	P-70	MH-64	116.64	MH-51	112.7	2,000.00	0.001969	10	0.013	232,364	1.64	0.38	636,388	36.5
508	P-71	MH-57	119.15	MH-65	117.71	600	0.002402	10	0.013	90,327	1.35	0.2	702,772	12.9
509	P-72	MH-65	117.71	MH-56	117.3	139	0.002942	10	0.013	90,327	1.45	0.25	777,868	11.6
512	P-73	MH-55	124.43	MH-66	118.91	1,600.00	0.003451	8	0.013	27,491	1.11	0.14	464,609	5.9
513	P-74	MH-66	118.91	MH-56	117.3	325	0.00495	8	0.013	77,891	1.72	0.24	556,462	14
522	P-75	MH-12	110.06	O-5	109	7.6	0.140014	12	0.013	1,429,527	12.52	0.49	8,725,562	16.4

APPENDIX B
TABLE B-6.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, WITHOUT PHASE 1A
MANHOLE TABLE
MAY 15, 2020

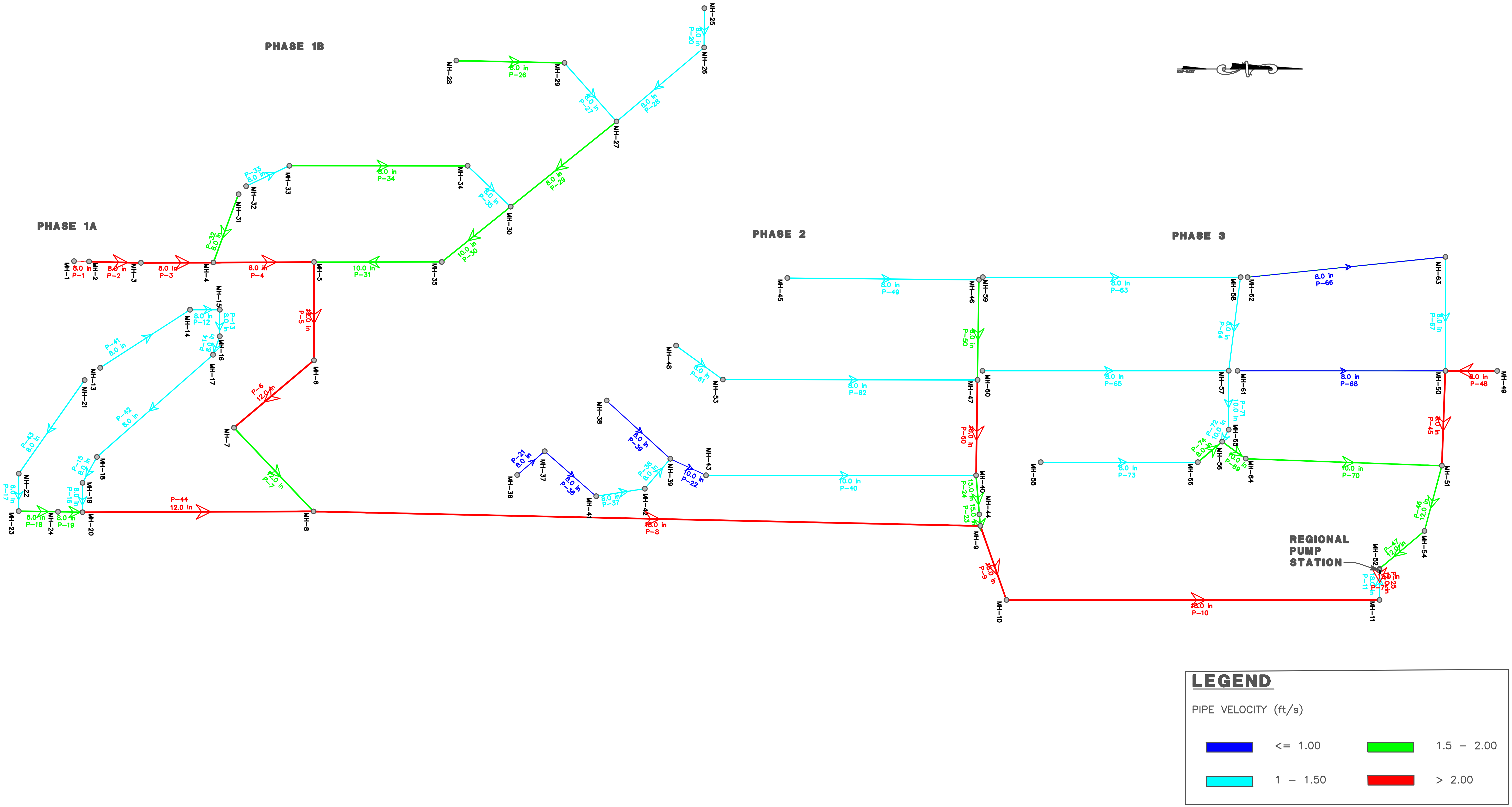
ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (gpd)	Flow (Total Out) (gpd)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
30	MH-1	183	183	170	0	0	0	170	170
31	MH-2	181	181	165	0	0	0	165	165
519	MH-3	177	177	162.3	0	0	0	162.3	162.3
151	MH-4	172	172	154.06	29,455	29,455	0.1	154.16	154.16
37	MH-5	167	167	142.61	331,855	331,855	0.39	143	143
40	MH-6	164	164	140.61	331,855	363,273	0.41	141.02	141.02
43	MH-7	163	163	138.48	363,273	436,582	0.48	138.96	138.96
46	MH-8	153	153	136.63	551,782	551,782	0.4	137.03	137.03
63	MH-9	130	130	118.92	911,782	911,782	0.58	119.5	119.5
65	MH-10	127	127	117.47	911,782	967,418	0.58	118.05	118.05
75	MH-11	120	120	110.1	967,418	996,218	0.88	110.98	110.98
520	MH-12	118	118	110.06	1,429,527	1,429,527	0.63	110.69	110.69
156	MH-13	175.5	175.5	169.6	0	56,945	0.16	169.76	169.76
159	MH-14	172	172	165.75	56,945	56,945	0.16	165.91	165.91
160	MH-15	171	171	164.69	56,945	56,945	0.15	164.84	164.84
169	MH-16	169	169	163.63	56,945	56,945	0.15	163.78	163.78
161	MH-17	168	168	162.86	56,945	56,945	0.15	163.01	163.01
166	MH-18	170	170	156.54	56,945	56,945	0.16	156.7	156.7
167	MH-19	169	169	155.49	56,945	56,945	0.16	155.65	155.65
168	MH-20	167	167	154.44	87,709	115,200	0.17	154.61	154.61
170	MH-21	176	176	169.21	0	30,764	0.11	169.32	169.32
173	MH-22	173.5	173.5	165.01	30,764	30,764	0.12	165.13	165.13
174	MH-23	170	170	163.68	30,764	30,764	0.1	163.78	163.78
180	MH-24	168	168	157.99	30,764	30,764	0.1	158.09	158.09
181	MH-25	162.5	162.5	157.34	0	58,909	0.16	157.5	157.5
182	MH-26	159.5	159.5	155.94	58,909	58,909	0.16	156.1	156.1
185	MH-27	158.7	158.7	151.85	90,327	156,436	0.27	152.12	152.12
186	MH-28	170.5	170.5	165.03	0	31,418	0.1	165.13	165.13
189	MH-29	164.8	164.8	156.71	31,418	31,418	0.1	156.81	156.81
194	MH-30	159	159	147.01	180,655	231,055	0.35	147.36	147.36
195	MH-31	175.5	175.5	165.83	0	29,455	0.1	165.93	165.93
197	MH-32	175.5	175.5	169.48	0	24,218	0.1	169.58	169.58
199	MH-33	174	174	167.69	24,218	24,218	0.09	167.78	167.78
205	MH-34	163.5	163.5	151.25	24,218	24,218	0.09	151.34	151.34
209	MH-35	159.4	159.4	145.21	231,055	302,400	0.4	145.61	145.61
271	MH-36	145.32	145.32	131.36	0	16,364	0.09	131.45	131.45
272	MH-37	145.7	145.7	130.06	16,364	16,364	0.09	130.15	130.15
273	MH-38	145.95	145.95	125.72	0	1,964	0.04	125.76	125.76
274	MH-39	140.95	140.95	124.42	37,964	47,782	0.17	124.59	124.59
275	MH-40	131.17	131.17	119.7	285,382	337,745	0.42	120.12	120.12
285	MH-41	141.79	141.79	127.96	16,364	16,364	0.08	128.04	128.04
291	MH-42	140.74	140.74	125.8	16,364	36,000	0.13	125.93	125.93
304	MH-43	139.42	139.42	123.82	47,782	106,036	0.25	124.07	124.07
325	MH-44	129.78	129.78	119.1	337,745	360,000	0.48	119.58	119.58
329	MH-45	145.09	145.09	140.5	0	31,418	0.11	140.61	140.61
330	MH-46	139.12	139.12	131.71	31,418	81,164	0.19	131.9	131.9
331	MH-47	134.92	134.92	128	135,491	179,345	0.23	128.23	128.23
332	MH-48	145.64	145.64	140.7	0	54,327	0.15	140.85	140.85
334	MH-49	126.66	126.66	121.93	0	76,582	0.16	122.09	122.09
335	MH-50	127.74	127.74	117.22	129,600	145,309	0.22	117.44	117.44
336	MH-51	123.15	123.15	112.7	377,673	395,345	0.42	113.12	113.12
337	MH-52	118.19	118.19	110.1	433,309	433,309	0.6	110.7	110.7
371	MH-53	142.3	142.3	138.71	54,327	54,327	0.15	138.86	138.86
410	MH-54	120.35	120.35	111.23	395,345	433,309	0.46	111.69	111.69
466	MH-55	130.03	130.03	124.43	0	27,491	0.11	124.54	124.54
468	MH-56	126.7	126.7	117.3	168,218	204,218	0.31	117.61	117.61
470	MH-57	129.83	129.83	119.15	64,800	90,327	0.2	119.35	119.35
471	MH-58	136.52	136.52	121.51	18,982	46,473	0.14	121.65	121.65
472	MH-59	139.19	139.19	131.71	0	18,982	0.09	131.8	131.8
473	MH-60	135.11	135.11	129.8	0	18,327	0.09	129.89	129.89
475	MH-61	129.71	129.71	119.15	0	17,673	0.12	119.27	119.27
476	MH-62	136.44	136.44	131.13	0	17,673	0.09	131.22	131.22
477	MH-63	135.14	135.14	124.03	17,673	35,345	0.11	124.14	124.14
503	MH-64	125.45	125.45	116.64	204,218	232,364	0.35	116.99	116.99
507	MH-65	127.1	127.1	117.71	90,327	90,327	0.19	117.9	117.9
511	MH-66	126.31	126.31	118.91	27,491	77,891	0.17	119.08	119.08

APPENDIX B
TABLE B-7.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, WITHOUT PHASE 1
PIPE TABLE
MAY 15, 2020

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (gpd)	Velocity (ft/s)	Depth (Middle) (ft)	Capacity (Full Flow) (gpd)	Flow / Capacity (Design) (%)
80	P-1	MH-1	170	MH-2	165	154	0.032469	8	0.013	0	0	0	1,425,175	0
518	P-2	MH-2	165	MH-3	162.3	529	0.005104	8	0.013	0	0	0	565,049	0
423	P-3	MH-3	162.3	MH-4	154.06	738	0.011165	8	0.013	0	0	0	835,730	0
424	P-4	MH-4	154.06	MH-5	142.61	1,025.00	0.011171	8	0.013	0	0	0	835,933	0
425	P-5	MH-5	142.61	MH-6	140.61	1,000.00	0.002	12	0.013	0	0	0	1,042,855	0
426	P-6	MH-6	140.61	MH-7	138.48	1,066.40	0.001997	12	0.013	0	0	0	1,042,167	0
427	P-7	MH-7	138.48	MH-8	136.63	1,176.70	0.001572	12	0.013	0	0	0	924,624	0
428	P-8	MH-8	136.63	MH-9	118.92	6,795.00	0.002606	18	0.013	0	0	0.17	3,509,935	0
429	P-9	MH-9	118.92	MH-10	117.47	800	0.001813	18	0.013	341,673	1.69	0.36	2,927,009	11.7
430	P-10	MH-10	117.47	MH-11	110.1	3,800.00	0.001939	18	0.013	397,309	1.81	0.48	3,027,796	13.1
154	P-11	MH-11	110.1	MH-12	110.06	300	0.000133	18	0.013	426,109	0.7	0.54	793,879	53.7
216	P-12	MH-14	165.75	MH-15	164.69	303	0.003498	8	0.013	0	0	0	467,804	0
217	P-13	MH-15	164.69	MH-16	163.63	270.9	0.003913	8	0.013	0	0	0	494,758	0
218	P-14	MH-16	163.63	MH-17	162.86	200	0.00385	8	0.013	0	0	0	490,752	0
224	P-15	MH-18	156.54	MH-19	155.49	300	0.0035	8	0.013	0	0	0	467,915	0
225	P-16	MH-19	155.49	MH-20	154.44	300	0.0035	8	0.013	0	0	0	467,915	0
229	P-17	MH-22	165.01	MH-23	163.68	381	0.003491	8	0.013	0	0	0	467,300	0
230	P-18	MH-23	163.68	MH-24	157.99	400	0.014225	8	0.013	0	0	0	943,318	0
231	P-19	MH-24	157.99	MH-20	154.44	249.6	0.01422	8	0.013	0	0	0	943,167	0
238	P-20	MH-25	157.34	MH-26	155.94	400	0.0035	8	0.013	0	0	0	467,915	0
276	P-21	MH-36	131.36	MH-37	130.06	371	0.003504	8	0.013	0	0	0	468,183	0
305	P-22	MH-39	124.42	MH-43	123.82	400	0.0015	10	0.013	29,455	0.82	0.18	555,395	5.3
327	P-23	MH-44	119.1	MH-9	118.92	118	0.001525	12	0.013	341,673	1.65	0.38	910,761	37.5
328	P-24	MH-40	119.7	MH-44	119.1	400	0.0015	12	0.013	319,418	1.6	0.42	903,135	35.4
345	P-25	MH-52	110.1	MH-12	110.06	17.6	0.002272	12	0.013	433,309	2.03	0.48	1,111,484	39
433	P-26	MH-28	165.03	MH-29	156.71	1,102.00	0.00755	8	0.013	0	0	0	687,233	0
434	P-27	MH-29	156.71	MH-27	151.85	799	0.006082	8	0.013	0	0	0	616,831	0
435	P-28	MH-26	155.94	MH-27	151.85	1,168.30	0.003501	8	0.013	0	0	0	467,967	0
436	P-29	MH-27	151.85	MH-30	147.01	1,384.00	0.003497	8	0.013	0	0	0	467,719	0
437	P-30	MH-30	147.01	MH-35	145.21	900	0.002	10	0.013	0	0	0	641,317	0
438	P-31	MH-35	145.21	MH-5	142.61	1,301.00	0.001998	10	0.013	0	0	0	641,068	0
439	P-32	MH-31	165.83	MH-4	154.06	741.1	0.015882	8	0.013	0	0	0	996,742	0
440	P-33	MH-32	169.48	MH-33	167.69	487.4	0.003672	8	0.013	0	0	0	479,291	0
441	P-34	MH-33	167.69	MH-34	151.25	1,816.00	0.009053	8	0.013	0	0	0	752,531	0
442	P-35	MH-34	151.25	MH-30	147.01	603.9	0.007021	8	0.013	0	0	0	662,701	0
443	P-36	MH-37	130.06	MH-41	127.96	696	0.003017	8	0.013	0	0	0	434,435	0
444	P-37	MH-41	127.96	MH-42	125.8	502.4	0.0043	8	0.013	0	0	0.05	518,629	0
445	P-38	MH-42	125.8	MH-39	124.42	400	0.00345	8	0.013	19,636	1.01	0.11	464,557	4.2
446	P-39	MH-38	125.72	MH-39	124.42	879.4	0.001478	8	0.013	0	0	0.07	304,102	0
447	P-40	MH-43	123.82	MH-40	119.7	2,751.00	0.001498	10	0.013	87,709	1.14	0.32	554,963	15.8
449	P-41	MH-13	169.6	MH-14	165.75	1,090.20	0.003531	8	0.013	0	0	0	470,003	0
450	P-42	MH-17	162.86	MH-18	156.54	1,577.00	0.004008	8	0.013	0	0	0	500,701	0
451	P-43	MH-21	169.21	MH-22	165.01	1,165.70	0.003603	8	0.013	0	0	0	474,742	0
452	P-44	MH-20	154.44	MH-8	136.63	2,353.00	0.007569	12	0.013	0	0	0	2,028,751	0
455	P-45	MH-50	117.22	MH-51	112.7	965.8	0.00468	10	0.013	145,309	1.97	0.32	981,013	14.8
456	P-46	MH-51	112.7	MH-54	111.23	688.4	0.002134	12	0.013	395,345	1.93	0.44	1,077,120	36.7
457	P-47	MH-54	111.23	MH-52	110.1	599.3	0.001887	12	0.013	433,309	1.89	0.46	1,013,086	42.8
458	P-48	MH-49	121.93	MH-50	117.22	527	0.008937	8	0.013	76,582	2.11	0.19	747,713	10.2
459	P-49	MH-45	140.5	MH-46	131.71	1,953.00	0.004501	8	0.013	31,418	1.27	0.15	530,607	5.9
460	P-50	MH-46	131.71	MH-47	128	1,020.00	0.003637	8	0.013	81,164	1.56	0.21	477,000	17
461	P-60	MH-47	128	MH-40	119.7	971	0.008548	10	0.013	179,345	2.59	0.32	1,325,828	13.5
463	P-61	MH-48	140.7	MH-53	138.71	589	0.003371	8	0.013	54,327	1.35	0.15	459,190	11.8
464	P-62	MH-53	138.71	MH-47	128	2,594.30	0.00413	8	0.013	54,327	1.45	0.19	508,287	10.7
490	P-63	MH-59	131.71	MH-58	121.51	2,626.00	0.003884	8	0.013	18,982	1.04	0.11	492,932	3.9
491	P-64	MH-58	121.51	MH-57	119.15	960	0.002458	8	0.013	46,473	1.1	0.15	392,151	11.9
496	P-65	MH-60	129.8	MH-57	119.15	2,509.00	0.004245	8	0.013	18,327	1.06	0.14	515,297	3.6
499	P-66	MH-62	131.13	MH-63	124.03	2,027.20	0.003502	8	0.013	17,673	0.98	0.1	468,072	3.8
500	P-67	MH-63	124.03	MH-50	117.22	1,161.90	0.005861	8	0.013	35,345	1.45	0.16	605,507	5.8
501	P-68	MH-61	119.15	MH-50	117.22	2,117.00	0.000912	8	0.013	17,673	0.61	0.17	238,811	7.4
504	P-69	MH-56	117.3	MH-64	116.64	296.4	0.002231	10	0.013	204,218	1.66	0.33	677,363	30.1
505	P-70	MH-64	116.64	MH-51	112.7	2,000.00	0.001969	10	0.013	232,364	1.64	0.38	636,388	36.5
508	P-71	MH-57	119.15	MH-65	117.71	600	0.002402	10	0.013	90,327	1.35	0.2	702,772	12.9
509	P-72	MH-65	117.71	MH-56	117.3	139	0.002942	10	0.013	90,327	1.45	0.25	777,868	11.6
512	P-73	MH-55	124.43	MH-66	118.91	1,600.00	0.003451	8	0.013	27,491	1.11	0.14	464,609	5.9
513	P-74	MH-66	118.91	MH-56	117.3	325	0.00495	8	0.013	77,891	1.72	0.24	556,462	14
522	P-75	MH-12	110.06	O-5	109	7.6	0.140014	12	0.013	859,418	10.8	0.37	8,725,562	9.8

APPENDIX B
TABLE B-8.
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY
SEWERCAD MODEL RESULTS
PWWF BUILD-OUT CONDITION, WITHOUT PHASE 1
MANHOLE TABLE
MAY 15, 2020

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Total In) (gpd)	Flow (Total Out) (gpd)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
30	MH-1	183	183	170	0	0	0	170	170
31	MH-2	181	181	165	0	0	0	165	165
519	MH-3	177	177	162.3	0	0	0	162.3	162.3
151	MH-4	172	172	154.06	0	0	0	154.06	154.06
37	MH-5	167	167	142.61	0	0	0	142.61	142.61
40	MH-6	164	164	140.61	0	0	0	140.61	140.61
43	MH-7	163	163	138.48	0	0	0	138.48	138.48
46	MH-8	153	153	136.63	0	0	0	136.63	136.63
63	MH-9	130	130	118.92	341,673	341,673	0.35	119.27	119.27
65	MH-10	127	127	117.47	341,673	397,309	0.37	117.84	117.84
75	MH-11	120	120	110.1	397,309	426,109	0.6	110.7	110.7
520	MH-12	118	118	110.06	859,418	859,418	0.48	110.54	110.54
156	MH-13	175.5	175.5	169.6	0	0	0	169.6	169.6
159	MH-14	172	172	165.75	0	0	0	165.75	165.75
160	MH-15	171	171	164.69	0	0	0	164.69	164.69
169	MH-16	169	169	163.63	0	0	0	163.63	163.63
161	MH-17	168	168	162.86	0	0	0	162.86	162.86
166	MH-18	170	170	156.54	0	0	0	156.54	156.54
167	MH-19	169	169	155.49	0	0	0	155.49	155.49
168	MH-20	167	167	154.44	0	0	0	154.44	154.44
170	MH-21	176	176	169.21	0	0	0	169.21	169.21
173	MH-22	173.5	173.5	165.01	0	0	0	165.01	165.01
174	MH-23	170	170	163.68	0	0	0	163.68	163.68
180	MH-24	168	168	157.99	0	0	0	157.99	157.99
181	MH-25	162.5	162.5	157.34	0	0	0	157.34	157.34
182	MH-26	159.5	159.5	155.94	0	0	0	155.94	155.94
185	MH-27	158.7	158.7	151.85	0	0	0	151.85	151.85
186	MH-28	170.5	170.5	165.03	0	0	0	165.03	165.03
189	MH-29	164.8	164.8	156.71	0	0	0	156.71	156.71
194	MH-30	159	159	147.01	0	0	0	147.01	147.01
195	MH-31	175.5	175.5	165.83	0	0	0	165.83	165.83
197	MH-32	175.5	175.5	169.48	0	0	0	169.48	169.48
199	MH-33	174	174	167.69	0	0	0	167.69	167.69
205	MH-34	163.5	163.5	151.25	0	0	0	151.25	151.25
209	MH-35	159.4	159.4	145.21	0	0	0	145.21	145.21
271	MH-36	145.32	145.32	131.36	0	0	0	131.36	131.36
272	MH-37	145.7	145.7	130.06	0	0	0	130.06	130.06
273	MH-38	145.95	145.95	125.72	0	0	0	125.72	125.72
274	MH-39	140.95	140.95	124.42	19,636	29,455	0.13	124.55	124.55
275	MH-40	131.17	131.17	119.7	267,055	319,418	0.41	120.11	120.11
285	MH-41	141.79	141.79	127.96	0	0	0	127.96	127.96
291	MH-42	140.74	140.74	125.8	0	19,636	0.09	125.89	125.89
304	MH-43	139.42	139.42	123.82	29,455	87,709	0.22	124.04	124.04
325	MH-44	129.78	129.78	119.1	319,418	341,673	0.42	119.52	119.52
329	MH-45	145.09	145.09	140.5	0	31,418	0.11	140.61	140.61
330	MH-46	139.12	139.12	131.71	31,418	81,164	0.19	131.9	131.9
331	MH-47	134.92	134.92	128	135,491	179,345	0.23	128.23	128.23
332	MH-48	145.64	145.64	140.7	0	54,327	0.15	140.85	140.85
334	MH-49	126.66	126.66	121.93	0	76,582	0.16	122.09	122.09
335	MH-50	127.74	127.74	117.22	129,600	145,309	0.22	117.44	117.44
336	MH-51	123.15	123.15	112.7	377,673	395,345	0.42	113.12	113.12
337	MH-52	118.19	118.19	110.1	433,309	433,309	0.47	110.57	110.57
371	MH-53	142.3	142.3	138.71	54,327	54,327	0.15	138.86	138.86
410	MH-54	120.35	120.35	111.23	395,345	433,309	0.46	111.69	111.69
466	MH-55	130.03	130.03	124.43	0	27,491	0.11	124.54	124.54
468	MH-56	126.7	126.7	117.3	168,218	204,218	0.31	117.61	117.61
470	MH-57	129.83	129.83	119.15	64,800	90,327	0.2	119.35	119.35
471	MH-58	136.52	136.52	121.51	18,982	46,473	0.14	121.65	121.65
472	MH-59	139.19	139.19	131.71	0	18,982	0.09	131.8	131.8
473	MH-60	135.11	135.11	129.8	0	18,327	0.09	129.89	129.89
475	MH-61	129.71	129.71	119.15	0	17,673	0.12	119.27	119.27
476	MH-62	136.44	136.44	131.13	0	17,673	0.09	131.22	131.22
477	MH-63	135.14	135.14	124.03	17,673	35,345	0.11	124.14	124.14
503	MH-64	125.45	125.45	116.64	204,218	232,364	0.35	116.99	116.99
507	MH-65	127.1	127.1	117.71	90,327	90,327	0.19	117.9	117.9
511	MH-66	126.31	126.31	118.91	27,491	77,891	0.17	119.08	119.08



WOOD RODGERS

Dewberry drakehaglan

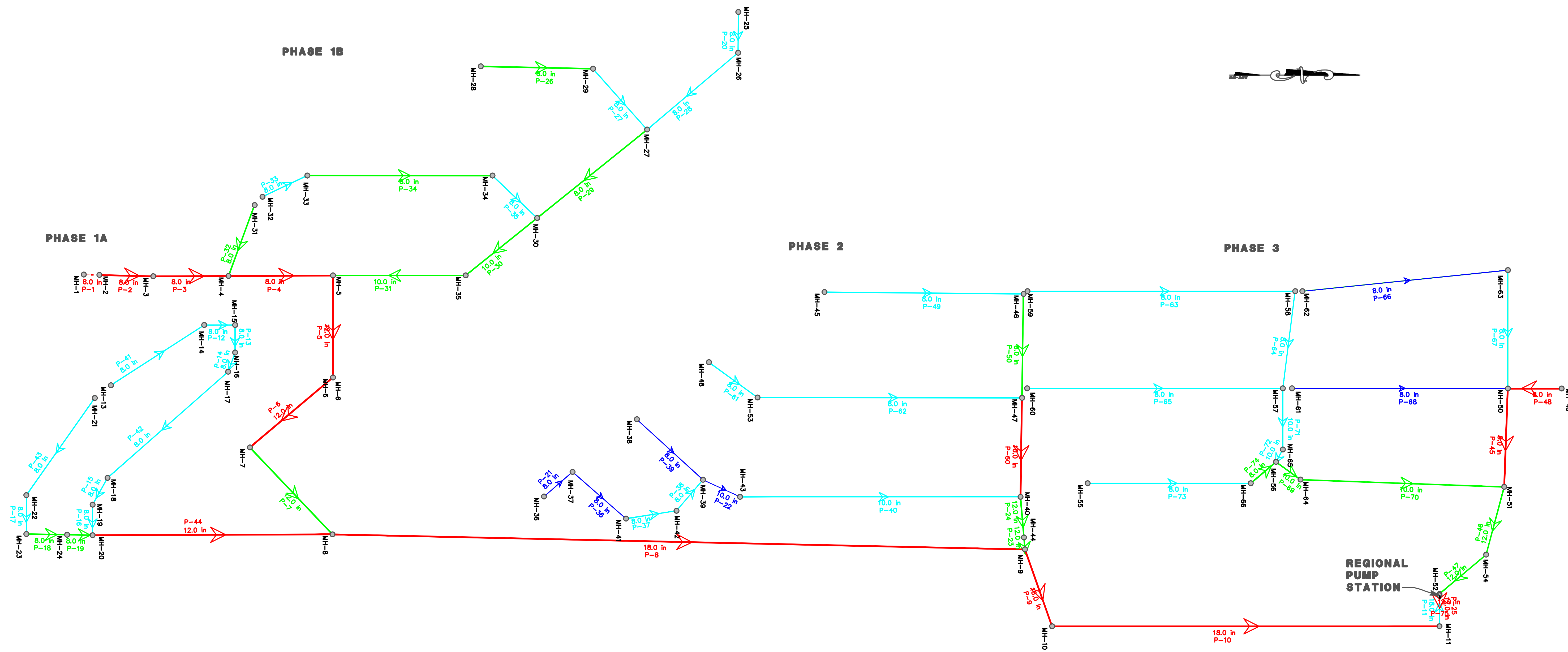
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

SANITARY SEWER SYSTEM SCHEMATIC-SEWERCAD MODEL RESULTS

FIGURE B-1. PWWF BUILD-OUT CONDITION, SPECIFIC PLAN PIPELINE SIZES

5/15/2020

SCALE:NTS



LEGEND

PIPE VELOCITY (ft/s)

<= 1.00	1.5 – 2.00
1 – 1.50	> 2.00

WOOD RODGERS

Dewberry | drake haglan

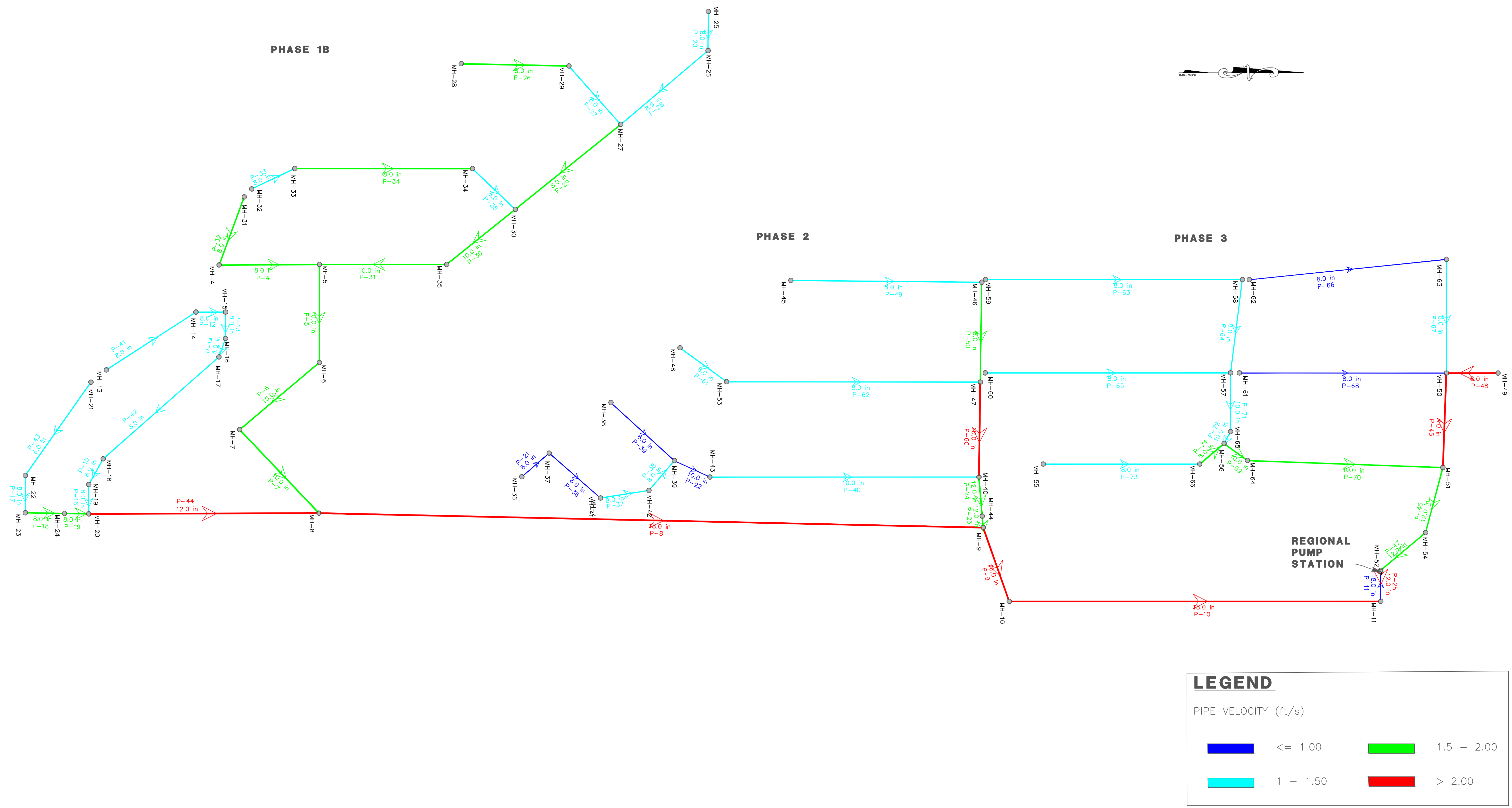
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

SANITARY SEWER SYSTEM SCHEMATIC-SEWERCAD MODEL RESULTS

FIGURE B-2. PWWF BUILD-OUT CONDITION, DOWNSIZING OF PIPELINES

5/15/2020

SCALE:NTS



WOOD RODGERS

Dewberry drakehaglan

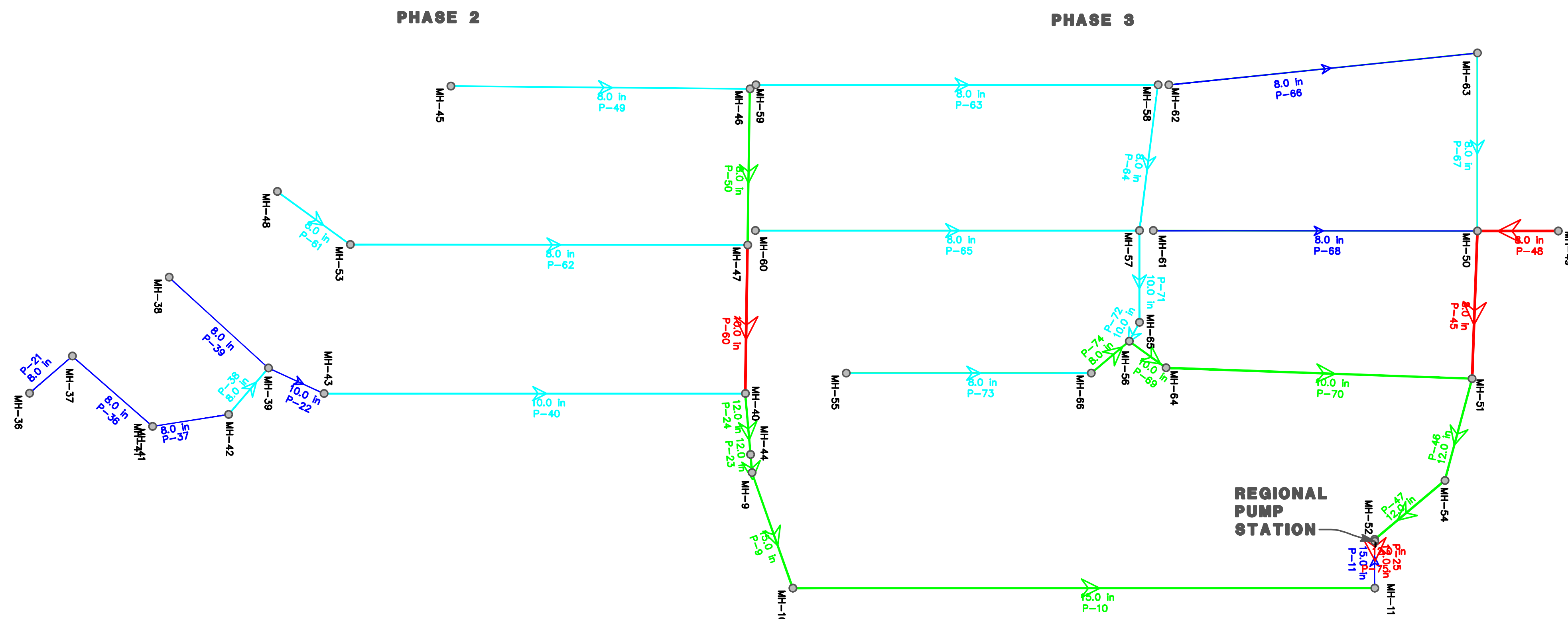
CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

SANITARY SEWER SYSTEM SCHEMATIC-SEWERCAD MODEL RESULTS

FIGURE B-3. PWWF BUILD-OUT CONDITION, WITHOUT PHASE 1A

5/15/2020

SCALE:NTS



LEGEND

PIPE VELOCITY (ft/s)

<= 1.00	1.5 – 2.00
1 – 1.50	> 2.00

WOOD RODGERS

Dewberry | drake haglan

CLIBP-WASTEWATER SYSTEM INFRASTRUCTURE DESIGN STUDY

SANITARY SEWER SYSTEM SCHEMATIC-SEWERCAD MODEL RESULTS

FIGURE B-4. PWWF BUILD-OUT CONDITION, WITHOUT PHASE 1

5/15/2020

SCALE:NTS

Appendix C

Preliminary Hydraulics for Regional Pump Station

DUPLEX PUMP STATION SYSTEM CURVE CALCULATION

GIVEN:

Minimum Static Head	**83.38 ft.**
Pump Selected	**Fairbanks Morse Submersible**
Pump Model	**4" Model D5435MT**
Motor Rated Power	**75 hp**
Impeller Diameter	**13.65 in**

Loss Coefficients (KL)

KL, Bell-mouth entrance	**0.04**	
KL, 90° Elbow (long Rad.)	**0.23**	(x3)
KL, 45° Elbow (long Rad.)	**0.42**	(x2)
KL, 12" Plug Valve, Screwed	**0.77**	(fully open)
KL, 12" Gate Valve	**0.19**	(fully open)
KL, 12" Flap (swing check) valve	**2**	(x2)
KL, Tee	**1.8**	
KL, Increaser	**3.23**	
KL, Total	**11.56**	

Hazen-William Coefficient (C)

C **120**

Pipe's Length **20353.4 ft.**

Pipe's Diameter **12 in.**
1.00 ft.

Pipe's Area **113 sq. in.**
0.79 sq. ft.

Gravity **32.174 ft/s**

Contingency Level **20%**

Unit Conversion
1 gpm = 0.002228 cfs

Hazen-William Formula

$v = 1.318\, C\, R_H^{0.63}\, S^{0.54}$

$S = hL/L$

$R_H = d/4$

Formulas used in Calculation

TDH = Static Head + Velocity Head + Major Head Loss + Minor Head Loss

Velocity Head = $v^2/2g$, in which $v = Q/A$

Major Head Loss (H_L) = $(v / (1.318 \times C \times R_H^{0.63}))^{1.852} \times L$

Minor Head Loss = $\Sigma KL\, v^2/2g$

Note:

1. Minimum Static Head is based off the invert of connecting pipe from upstream manhole at EL. 110.06 and the discharge elevation at 193.44.
2. Maximum TDH is based off the minimum TDH with 20% contingency.

Assumptions:

1. Each pump in a duplex pump station shall meet 100% of design flow.
2. Phase 2 force main extension assumed to be included in the total pipe's length.
3. The discharge elevation assumed to be at Phase 1's temporary connection.

CALCULATION:

Table 1. System Curve Calculation

Flowrate (gpm)	Min. Static Head (ft)	Velocity (ft/s)	$v^2/2g$ (ft)	$\Sigma KL\, v^2/2g$ (ft)	H_L (ft)	TDH_{min} (ft)	TDH_{max} (ft)
0	83.38	0.00	0.00	0.00	0.00	83.38	100.06
45	83.38	0.13	0.00	0.00	0.19	83.57	100.29
90	83.38	0.25	0.00	0.01	0.69	84.08	100.90
135	83.38	0.38	0.00	0.03	1.46	84.87	101.84
180	83.38	0.51	0.00	0.05	2.49	85.92	103.10
228	83.38	0.65	0.01	0.08	3.87	87.33	104.80
269	83.38	0.76	0.01	0.10	5.27	88.77	106.52
369	83.38	1.05	0.02	0.20	9.45	93.04	111.65
400	83.38	1.13	0.02	0.23	10.97	94.60	113.52
449	83.38	1.27	0.03	0.29	13.58	97.28	116.73
494	83.38	1.40	0.03	0.35	16.20	99.96	119.96
539	83.38	1.53	0.04	0.42	19.07	102.91	123.49
583	83.38	1.66	0.04	0.49	22.08	105.99	127.19
628	83.38	1.78	0.05	0.57	25.32	109.32	131.19
673	83.38	1.91	0.06	0.66	28.77	112.87	135.44
718	83.38	2.04	0.06	0.75	32.43	116.62	139.94
767	83.38	2.18	0.07	0.85	36.63	120.93	145.12
808	83.38	2.29	0.08	0.94	40.33	124.74	149.68
993	**83.38**	**2.82**	**0.12**	**1.42**	**59.07**	**144.00**	**172.79**
1136	83.38	3.22	0.16	1.87	75.82	161.22	193.47
1346	83.38	3.82	0.23	2.62	103.87	190.09	228.11
1571	83.38	4.46	0.31	3.57	138.18	225.44	270.53

Table 2. Expected Wastewater Flows

Development Phase	Wastewater Flow ADWF (gpd)	PWWF (gpd)	PWWF (gpm)
1A	98,000	206,300	143
1B	269,900	570,050	396
1	367,900	776,350	539
1B+2	422,800	898,150	624
Buildout (1B+2+3)	**674,800**	**1,429,550**	**993**

RESULT:

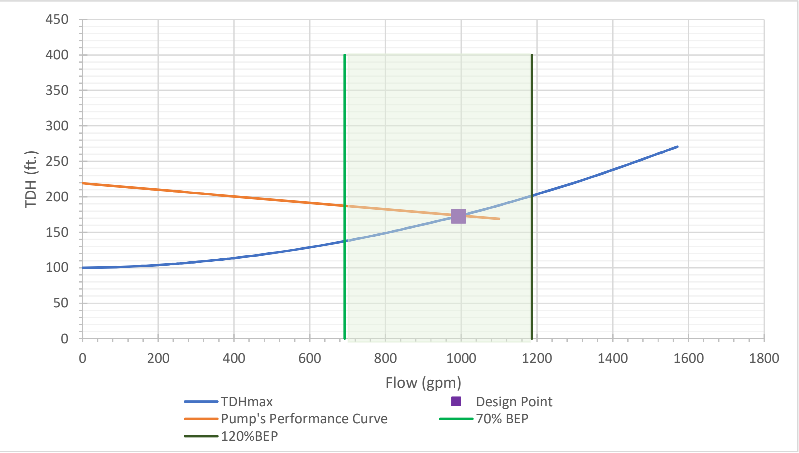


Figure 1. System Head Curve

Initial Design Point	
Flow	993
Head	172.79
Eff.	68.83%
BEP	
Flow	988.8
Head	173.95

Customer : JM Squared
Project name : Dewberry Sewage PS

Pump Performance Datasheet

Encompass 2.0 - 19.5.6 20.1.2

Item number	: 002	Size	: 4" 5435 (W, MT, WD)
Service	: Station 2	Stages	: 1
Quantity	: 1	Based on curve number	: 4-54x5-1800-T4E1E
Quote number	: JMV20-0115-1	Date last saved	: 13 May 2020 10:57 AM

Operating Conditions

Flow, rated	: 995.0 USgpm
Differential head / pressure, rated (requested)	: 175.0 ft
Differential head / pressure, rated (actual)	: 175.4 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Performance

Speed, rated	: 1780 rpm
Impeller diameter, rated	: 13.65 in
Impeller diameter, maximum	: 14.00 in
Impeller diameter, minimum	: 11.00 in
Efficiency	: 68.83 %
NPSH required / margin required	: 17.87 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 22 / 126 Metric units
Minimum Continuous Stable Flow	: 100.0 USgpm
Head, maximum, rated diameter	: 219.1 ft
Head rise to shutoff	: 25.23 %
Flow, best eff. point	: 988.8 USgpm
Flow ratio, rated / BEP	: 100.63 %
Diameter ratio (rated / max)	: 97.50 %
Head ratio (rated dia / max dia)	: 91.61 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 3.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

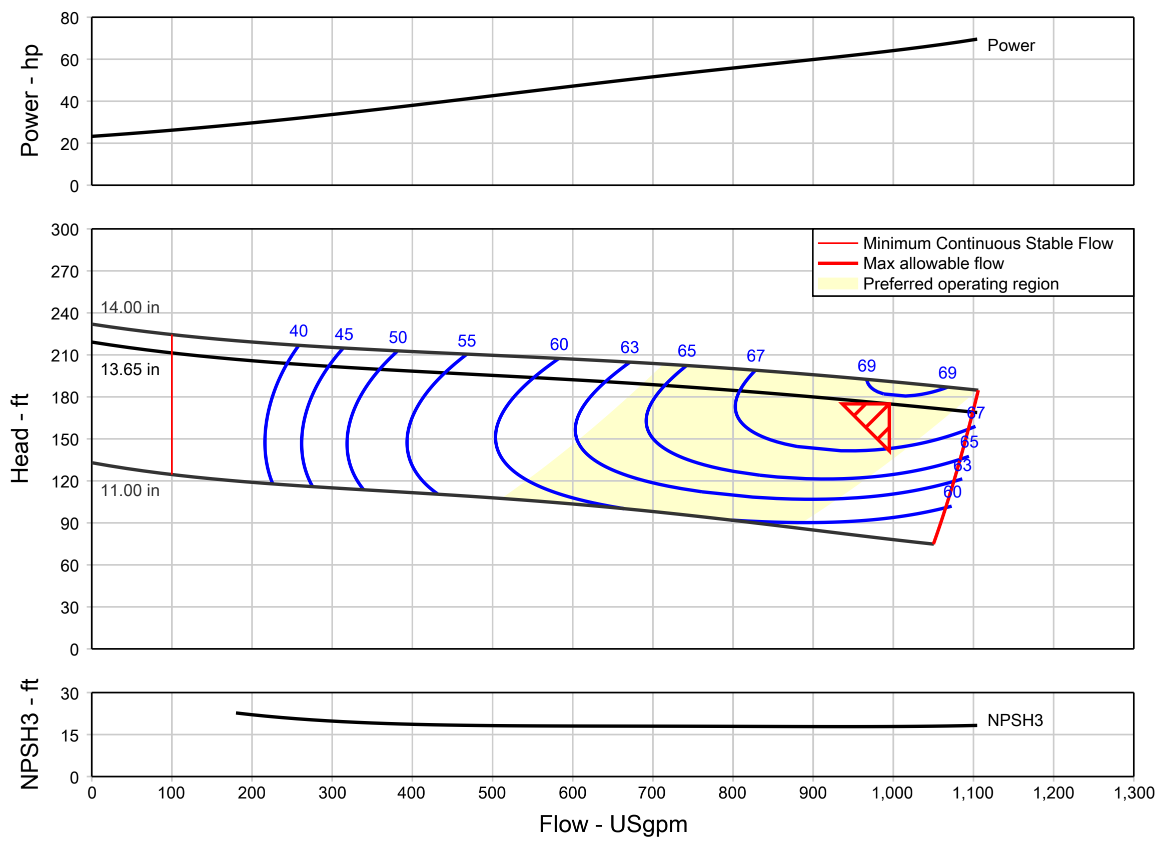
Material selected	: Cast Iron

Pressure Data

Maximum working pressure	: 94.85 psi.g
Maximum allowable working pressure	: 125.0 psi.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: 190.0 psi.g

Driver & Power Data (@Max density)

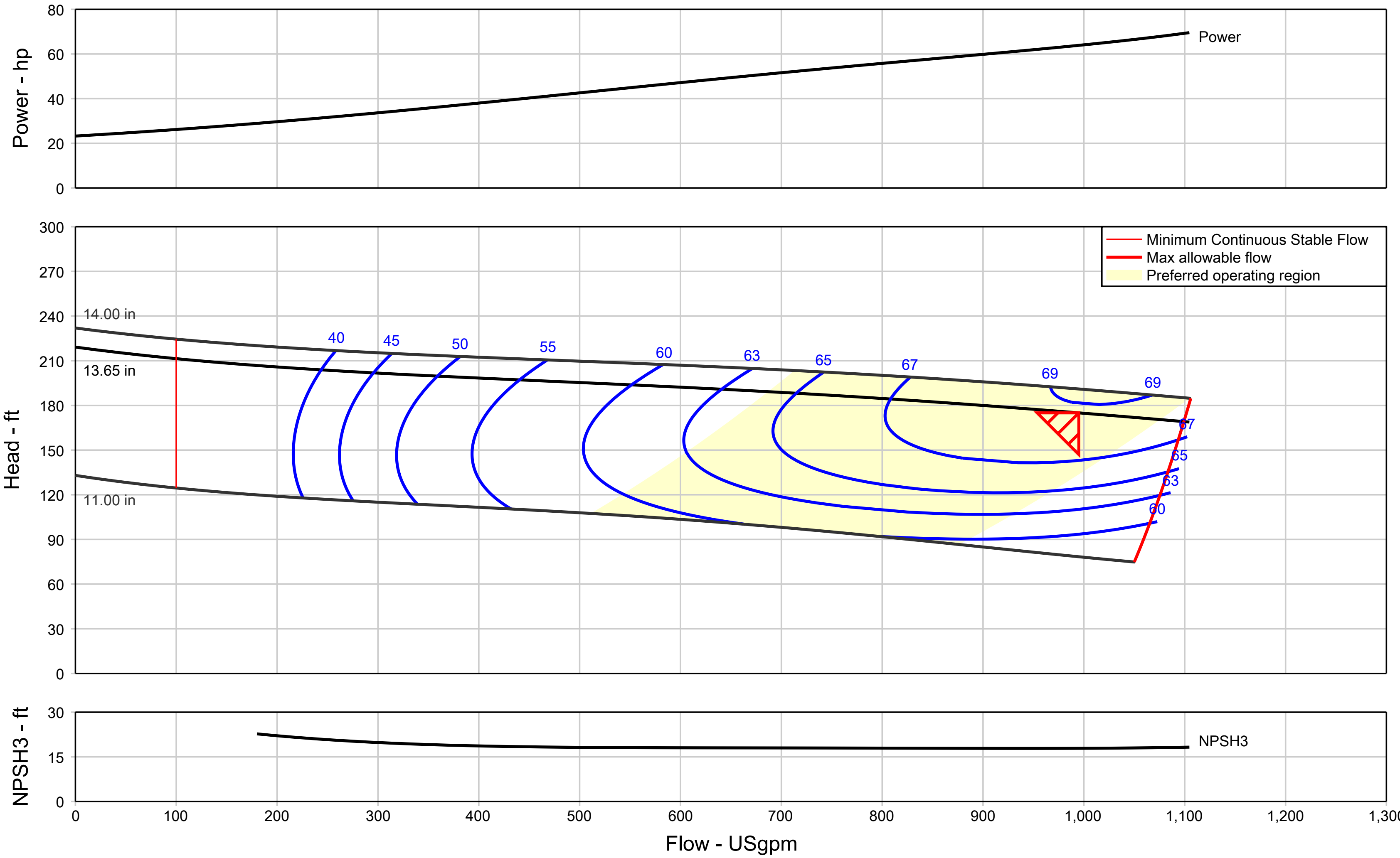
Driver sizing specification	: Max Power
Margin over specification	: 0.00 %
Service factor	: 1.15 (used)
Power, hydraulic	: 43.96 hp
Power, rated	: 63.86 hp
Power, maximum, rated diameter	: 69.55 hp
Minimum recommended motor rating	: 75.00 hp / 55.93 kW



Customer : JM Squared
Project name : Dewberry Sewage PS

Pump Performance Curve

Encompass 2.0 - 19.5.6 20.1.2



Item number	: 002	Size	: 4" 5435 (W, MT, WD)	Flow, rated	: 995.0 USgpm
Service	: Station 2	Stages	: 1	Differential head / pressure, rated	: 175.0 ft
Quantity	: 1	Speed, rated	: 1780 rpm	NPSH required	: 17.87 ft
Quote number	: JMV20-0115-1	Based on curve number	: 4-54x5-1800-T4E1E	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 13 May 2020 10:57 AM	Efficiency	: 68.83 %	Viscosity	: 1.00 cP
		Power, rated	: 63.86 hp	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

Appendix D

Outreach to Onsite Wastewater Treatment Systems

Summary of Outreach to Operational OWTS

Jet Wastewater Treatment Solutions- Location #1
Angels Camp RV Park, Angels Camp, CA

Number and size of units in service	7,500 gpd unit/discharges to evaporation pond
Application	RV park wastewater treatment
Maintenance requirements	Once a week (1 hour), once a month (1.5 hour)
Effectiveness	• Simple system that has been meeting discharge requirements, although effluent testing does not occur on a regular basis • Effluent - Nitrate 0.64 mg/L, Nitrite 0.25 mg/L, TKN 38 mg/L, BOD_5 5.5 mg/L, TDS 137 mg/L, Zinc 57 ug/L, Phenols ND, Formaldehyde 26 ug/L
Any problems encountered	No problem meeting discharge requirements
Experience with service from manufacturer	Responsive and easy to obtain replacement parts
Operational experience	• Skim top of aeration chamber to remove floatables • Had to replace diaphragm once – easily done • Pumps are very good • Easy to maintain

Jet Wastewater Treatment Solutions – Location #2
Eddie World, Yermo, CA

Number and size of units in service	14,000 gpd system
Application	Strip mall including restaurant waste
Maintenance requirements	Weekly (1 hour), monthly (1 hour)
Effectiveness	Restaurant is using too much bleach which has often killed biological processes requiring the facility to add baking soda; otherwise, system has been working well since 2017
Any problems encountered	Excessive bleach usage at a restaurant that discharges to facility
Experience with service from manufacturer	Electrical issue at time of installation; a control wire was partially severed – first time dealing with this issue
Operational experience	Difficult to maintain effective biological processes because the pH is being lowered so much from the bleach

Delta Treatment Systems – Location #1
Seattle City Light, Seattle, WA

Number and size of units in service	Three 2,000-gallon Ecopods/design flow of 6,000 gpd
Application	Residential - 21 home system
Maintenance requirements	Contract operation company performs maintenance
Effectiveness	Not meeting permit 33 mg/L Total Nitrogen (TN) discharge requirement. 65 mg/L. May need to increase alkalinity (120 mg/L as $CaCO_3$)
Any problems encountered	• Baffle was placed at wrong elevation, a manufacturing flaw • Problems achieving reduction of total nitrogen in the effluent
Experience with service from manufacturer	Responsive and easy to work with
Operational experience	Contract operation company working on reducing nitrogen levels by making blower adjustments / considering adding alkalinity

Delta Treatment Systems – Location #2
Surfside Hotel, Ocean Park, WA

Number and size of units in service	Extended aeration package plant with pre- and post- anoxic zones and a tertiary filter, treating about 16,000 gpd
Application	The system treats domestic wastewater from a condominium complex
Maintenance requirements	Daily monitoring and weekly visits from O&M services
Effectiveness	Meeting requirements, on good terms with the state (readings are good)
Any problems encountered	Let the maintenance slip for a while and solids accumulated; bacterial growth issues
Experience with service from manufacturer	Fairly easy to work with and collaborate with
Operational experience	• Some electrical connections needed to be repaired • The OWTS was retrofitted inside a barn which causes the O&M company to provide extra troubleshooting to correct issues

Orenco Systems, Inc. – Location #1
Grizzly Ranch Project, Portola, CA

Number and size of units in service	Two AX-MAX / 25,000 gpd capacity
Application	• 49 residential waste + 10 commercial • Current permit limit-10,000 gpd • Winter flows average 2,000 gpd with 4,000 gpd max and summer flows average 5,000 gpd with 8,000 gpd max
Maintenance requirements	• Periodically flush the recirculation lines and observe sprayer nozzles • The textile media creates habitat, the operator just needs to monitor and mitigate any bridging • The majority of operational time at this site is manual final effluent pumping and chlorination (case to case basis)
Effectiveness	• Installed in October 2019 • The AX-MX Treatment System has been easy to operate using the timed-dose float activation • Easy to access and manually program the system as needed
Any problems encountered	Software programming (data logging); the issue was resolved quickly through remote technical assistance
Experience with service from manufacturer	Very responsive and helpful throughout the process of starting up the OWTS
Operational experience	• Effluent turbidity levels have ranged between 1.0-3.0 NTU • BOD samples have basically been ND as well

Orenco Systems, Inc. – Location #2
Feather River Hospital, Paradise, CA

Number and size of units in service	Nine AX-100, 40,000 gpd
Typical application	Hospital waste
Maintenance requirements	Every other month
Effectiveness	Meet's NPDES discharge requirements. Nitrate levels are close to limits. Installed in ~2007
Any problems encountered	None
Experience with service from manufacturer	One time had to replace pumps and a flow meter Hard to access some of the sprinkler spinners to replace or clean
Experience with maintenance/effluent	• Media sheet hangers occasionally need to be replaced • Ensure there is proper tankage and settling in the pre-treatment or the AdvanTex system will short circuit and the media can clog or present more problems