

APPENDIX K
Sewer Study

SUD-B Northeast Quadrant Specific Plan Sewer System Report



DRAFT REPORT

December 5, 2016



**SUD-B Northeast Quadrant
Specific Plan Sewer
System Report**

DRAFT REPORT

for

Peery-Arrilliga and Chris Property Development

Prepared by

Frayji Design Group, Inc.



December 5, 2016

City of Lincoln, California

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1. Introduction

This report provides an analysis of the wastewater needs associated with Special Use District B (SUD-B) Northeast Quadrant (NEQ) Specific Plan Area located west of present City of Lincoln. This report examines the existing conditions, conformance to the goals of the Lincoln Wastewater Master Plan and the general service requirements of the proposed development. This report further describes and analyzes the proposed solution to wastewater needs of this Specific Plan area.

1.1 SUD-B Northeast Quadrant

The SUD-B NEQ Specific Plan is within the City of Lincoln’s General Plan boundary and Sphere of Influence with the exception of a one acre parcel, Assessor’s Parcel Number: 009-031-028, which is within the city limits. As shown on Exhibit 1, this Specific Plan boundary contains four parcels consisting of two property owners. Also, City of Lincoln right-of-way exists within this Specific Plan boundary which fronts the site on Nelson Lane and Nicolaus Road.

SUD-B NEQ Specific Plan Area (SPA) is situated south of Nicolaus Road, east of Nelson Lane and north of the Highway 65 Bypass. The property is bordered by rural residential land uses to the west and agricultural uses being planned for mixed development to the south. To the east are a current residential neighborhood and the planned residential project, referred to as Independence, both within the City of Lincoln limits. The proposed Village 5 Specific Plan area is located to the west and the south of this SPA.

Regional access to the site is provided from Highway 65 by Nelson Lane. Local access is provided in several locations around SUD-B NEQ utilizing Nelson Lane, Nicolaus Road, First Street, Third Street, and Singer Place. A Vicinity Map showing the Specific Plan Area is provided as Exhibit 2.

This Specific Plan is designed to respond to the anticipated long-term demand for housing and services within the City of Lincoln’s Sphere of Influence over the next 10-15 years and is in conformance with the City’s 2050 General Plan. This Specific Plan seeks to ensure that adequate backbone infrastructure, public facilities and essential services needed to support the proposed development will be available and in place to serve project residents.

The SUD-B NEQ Specific Plan Area is approximately 200 acres in size and is proposed as a mixture of Residential and Commercial development. Current use of the site is primarily agricultural. SUD-B NEQ Specific Plan will allow for commercial and residential neighborhoods that are anticipated to be single family homes and will include parks, open space and public streets. Residential densities will be compliant with airport compatibility zones of the Placer County Airport



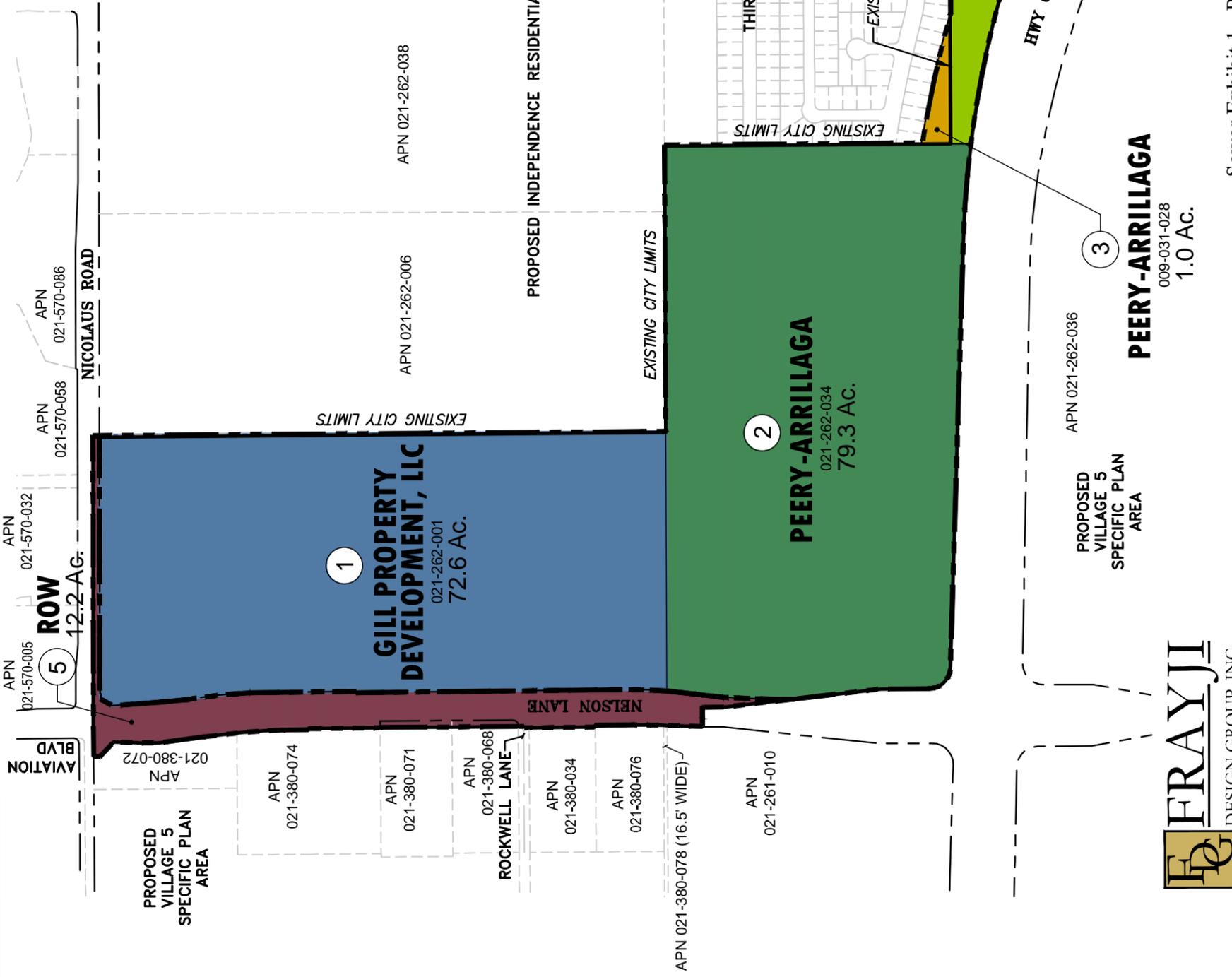
Land Use Compatibility Plan. The project will be oriented around the Markham Ravine open space preserve, a major amenity that traverses the site from east to west. The land uses and street system shown in the proposed Land Use and Circulation plan are similar to the City of Lincoln’s General Plan. The land uses and the street system are shown in Exhibit 3.

As shown on Exhibit 3 and Table 1, the SUD-B NEQ Specific Plan proposes a development of approximately 430 residential dwelling units across 84.8 acres with 69.7 acres of commercial space within the 198.4 acre Specific Plan Area. The Specific Plan also proposes 4.0 acres of parks, 22.6 acres of open space, and 5.0 acres of onsite and 12.2 acres of offsite major roads.

Table 1: SUD-B NEQ Specific Plan – Proposed Land Use			
Land Use Designation	Allowed Density	Estimated Dwelling Units (du)	Acres
Residential			
Low Density Residential (LDR)	3-5.9 DU /acre	430	84.8
Residential Subtotal		430	84.8
Commercial			
Commercial (C)			69.7
Commercial Subtotal			69.7
Parks / Open Space			
Parks (P)			4.0
Open Space/Landscape Corridors (OS)			22.6
Parks /Open Space/Landscape Subtotal			26.6
Major Roadways			
Major Onsite Roadways			5.0
Existing ROW Annexation			12.3
Major Roadways Subtotal			17.3
Total		430	198.4

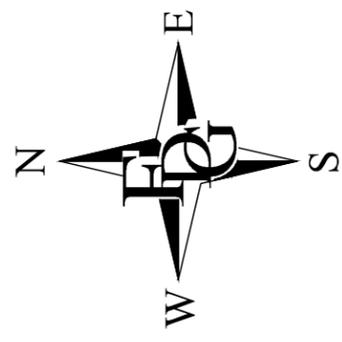
All acreages shown are approximate and subject to change. Estimated Dwelling Units are based upon the current lot layout for LDR PA-5 (105 lots) and LDR PA-6 (325 lots). Refer to the Land Use Plan, Exhibit 2.





PARCEL	APN	OWNER	ACRES
1	021-262-001	Gill Property Development, LLC	72.6
2	021-262-034	John Arrillaga Survivor's Trust & Richard T. Peery Separate Property Trust (Peery-Arrillaga)	79.3
3	009-031-028	John Arrillaga Survivor's Trust & Richard T. Peery Separate Property Trust (Peery-Arrillaga)	1.0
4	021-262-035	John Arrillaga Survivor's Trust & Richard T. Peery Separate Property Trust (Peery-Arrillaga)	33.3
5		Existing Placer County Right of Way & City of Lincoln Right of Way	12.2

TOTAL: 198.4



NOT TO SCALE



1540 Eureka Road Ste. 100
Roseville, CA 95661
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Sewer Exhibit 1 - Property Ownership Map
SUD-B Northeast Quadrant Specific Plan

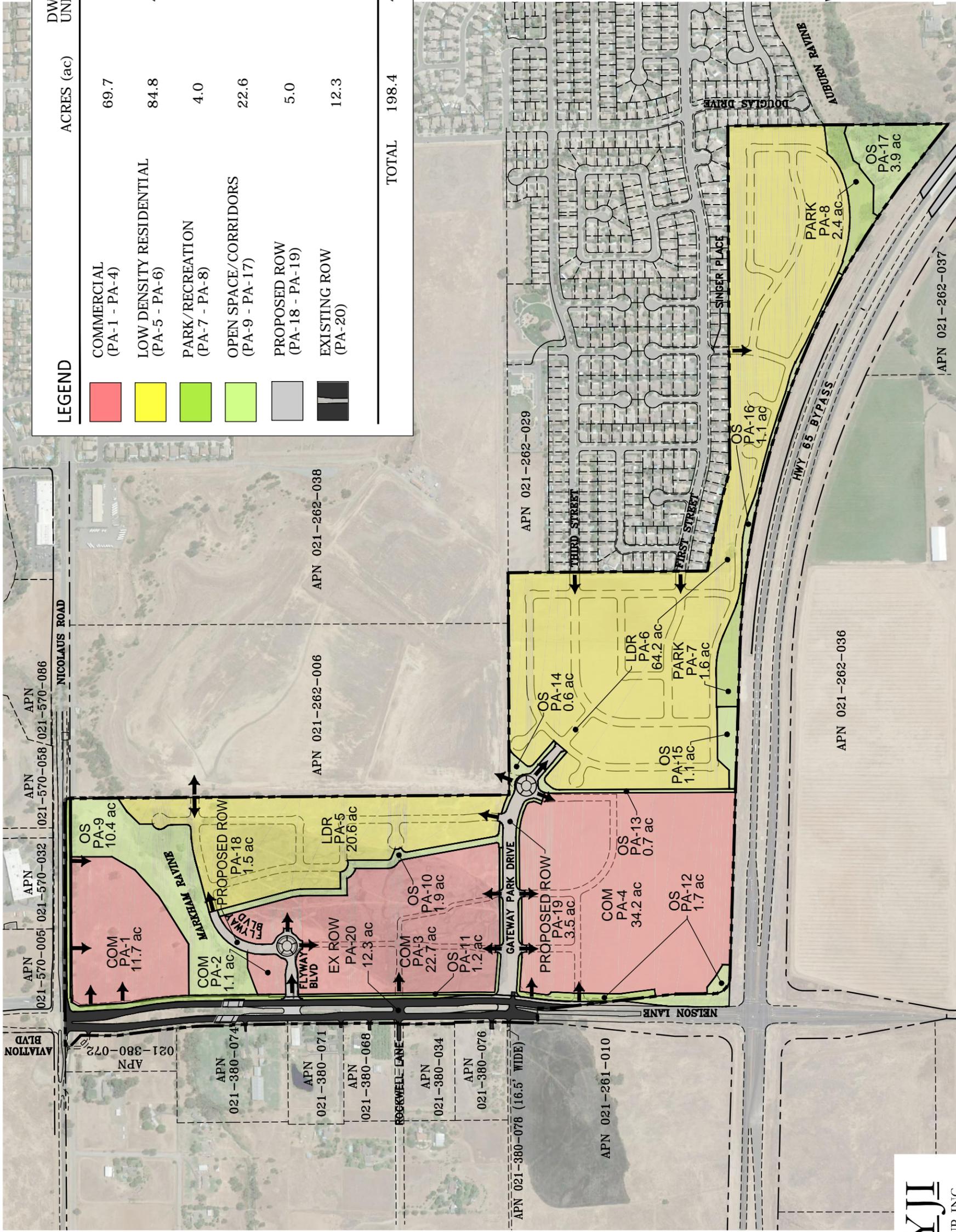
City of Lincoln, California December 5, 2016



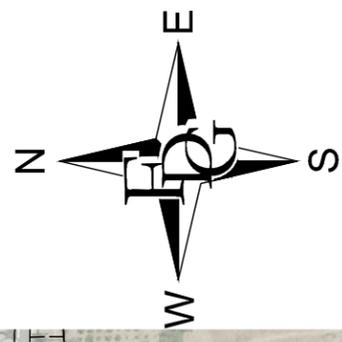
1540 Eureka Road Ste. 100 (916) 782-3000 Phone
 Roseville, CA 95661 (916) 782-3955 Fax
 CIVIL ENGINEERING • PLANNING • SURVEYING

Sewer Exhibit 3 - Land Use Plan & Street Layout Plan
SUD-B Northeast Quadrant Specific Plan

City of Lincoln, California December 5, 2016



LEGEND		ACRES (ac)	DWELLING UNITS
	COMMERCIAL (PA-1 - PA-4)	69.7	-
	LOW DENSITY RESIDENTIAL (PA-5 - PA-6)	84.8	430
	PARK/RECREATION (PA-7 - PA-8)	4.0	-
	OPEN SPACE/CORRIDORS (PA-9 - PA-17)	22.6	-
	PROPOSED ROW (PA-18 - PA-19)	5.0	-
	EXISTING ROW (PA-20)	12.3	-
TOTAL		198.4	430



NOT TO SCALE

2. Wastewater Collection System and Existing Regional Treatment Plant and Reclamation Facility

The City of Lincoln Wastewater Division provides municipal wastewater collection and treatment to all homes and businesses within the City of Lincoln, including treatment of regional sewer for portions of Placer County. The existing City sewer network consists of approximately 220 miles of collection and trunk pipes and 17,000 service connections across the incorporated area. Upon annexation into the City of Lincoln, areas within the SUD-B Northeast Quadrant will be expected to connect to the municipal system for all sewerage needs.

The Lincoln Wastewater Treatment and Reclamation Facility (WWTRF) provides treatment of municipal wastewater from throughout the City. It is located southwest of the City on both sides of Fiddymont Road between Athens Avenue and Moore Road. The state-of-the art treatment facility is capable of expanding to 34.4 million gallons per day (MGD) average flow, thus allowing it to act as a regional facility to serve the entirety of the City of Lincoln Sphere of Influence in addition to portions of South Placer County, including the City of Auburn. The Lincoln WWTRF is a model facility, repeatedly winning the Sacramento Section Small Wastewater Treatment Plant of the Year from the California Water Environment Association.

The plant consists of a multi-stage process capable of achieving secondary and tertiary treatment to meet water quality standards. Treatment facilities at the WWTRF include an influent pump station, head works screening and flow measurement, oxidation ditches, secondary clarifiers, maturation ponds, filtration facilities, dissolved air flotation separators, ultraviolet (UV) light disinfection facilities, solids handling facilities, effluent re-aeration and pumping, a pipeline to an outfall in Auburn Ravine, effluent and emergency storage, and several land disposal fields. Water can be treated to exacting standards not only to permit acceptable discharge into the natural environment, but beneficial reuse through an expanding reclaimed water network.

The existing National Pollution Discharge Elimination System (NPDES) permit for the WWTRF limits average wastewater flow to 3.3-MGD, given the amount of backup reclamation capability available to the facility when the permit was issued. However, the WWTRF process components offer a minimum dry weather hydraulic capacity of 4.2-MGD. With some facility components constructed with a dry weather structural capacity of up to 12-MGD to take advantage of economies of scale during construction. Dry weather flows at the facility are estimated to be 2.4-MGD, or approximately 60 percent of the current dry weather hydraulic capacity of the facility. Based upon these values, the WWTRF has sufficient capacity to accommodate the SUD-B NEQ.





Figure 2: Lincoln Regional Wastewater Treatment and Reclamation Facility

2.1 Lincoln Sewer System

The City currently maintains a network of gravity sewer lines, lift stations and force mains to feed wastewater flow into the wastewater treatment plant. The existing wastewater collection system includes the older downtown area surrounded by newly developed areas. Several wastewater pumping stations are situated at points of low hydraulic grade in the collection system. Most of the pump stations discharge to force main pipelines that convey flow under pressure to a downstream gravity sewer.

The City of Lincoln desires to eventually provide sewer service by gravity and avoid pumping to the degree possible. Due to the topography of the City Sphere of Influence, the future sewer system will necessarily include few pump stations. However, planned new gravity sewer pipelines will enable abandonment of several existing pump stations if so desired. Improvements have been proposed and are currently in progress that will further expand capacity to serve future uses as the City continues to grow beyond its current limits. The long-range planning for the future of the City of Lincoln wastewater system is outlined in the 2008 General Plan adopted by the City. As the area associated with the SUD-B NEQ is within the Lincoln Sphere of Influence, the needs associated with the Specific Plan Area were considered with the General Plan. The Northeast Quadrant Master Wastewater plan seeks to provide seamless integration into the long term planned system for the City of Lincoln while allowing for services utilizing existing

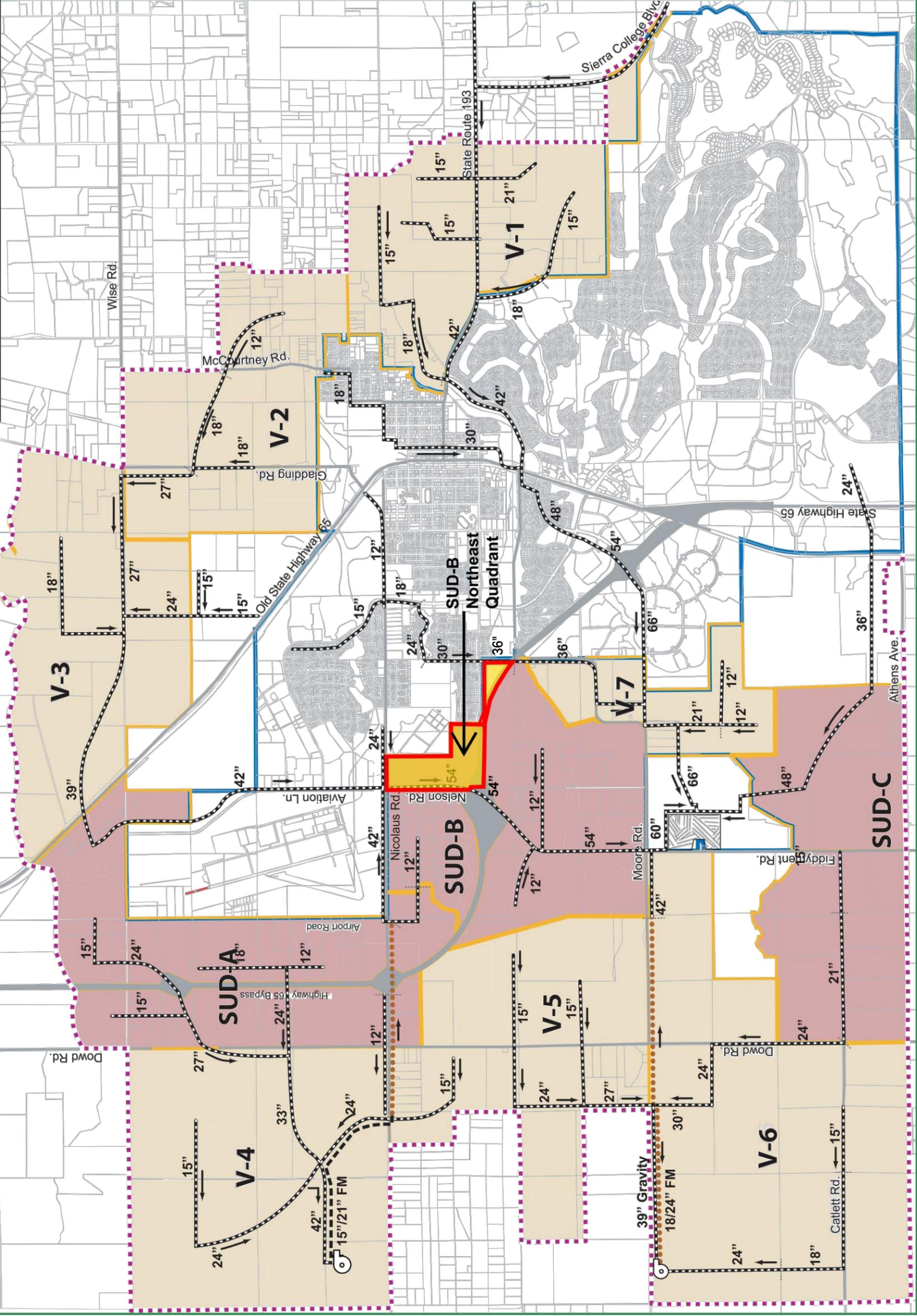


infrastructure in the interim period. The General Plan Wastewater Network is provided as Exhibit 4 which includes the future 54-inch trunk sewer line, as depicted in the Village 5 Specific Plan, in Nelson Lane fronting this Specific Plan area.

SUD-B NEQ will be served by two sewer lines, a 10-inch sewer line in Nicolaus Road and a 36-inch trunk sewer south of Douglas Drive. The existing 10-inch sewer line flows east into the existing Nicolaus Road Lift Station approximately 1/2 mile east of the Nelson Lane/Nicolaus Road intersection. This existing 10-inch sewer connects to a manhole upstream of the lift station and then flows to the lift station via an existing 18-inch sewer. From the lift station, a series of force mains, pump stations, and gravity lines lead to the existing 36-inch trunk line in Douglas Drive, which is this Plan's other sewer connection point. South of this sewer connection point, the existing 36-inch trunk line flows under Auburn Ravine, and ultimately to the WWTRF Treatment Plant. The existing wastewater network in the vicinity of the SUD-B Northeast Quadrant is provided as Exhibit 5.



Sewer Exhibit 4
City of Lincoln
2050 General Plan: Wastewater Network



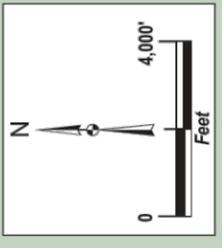
Legend

Boundaries

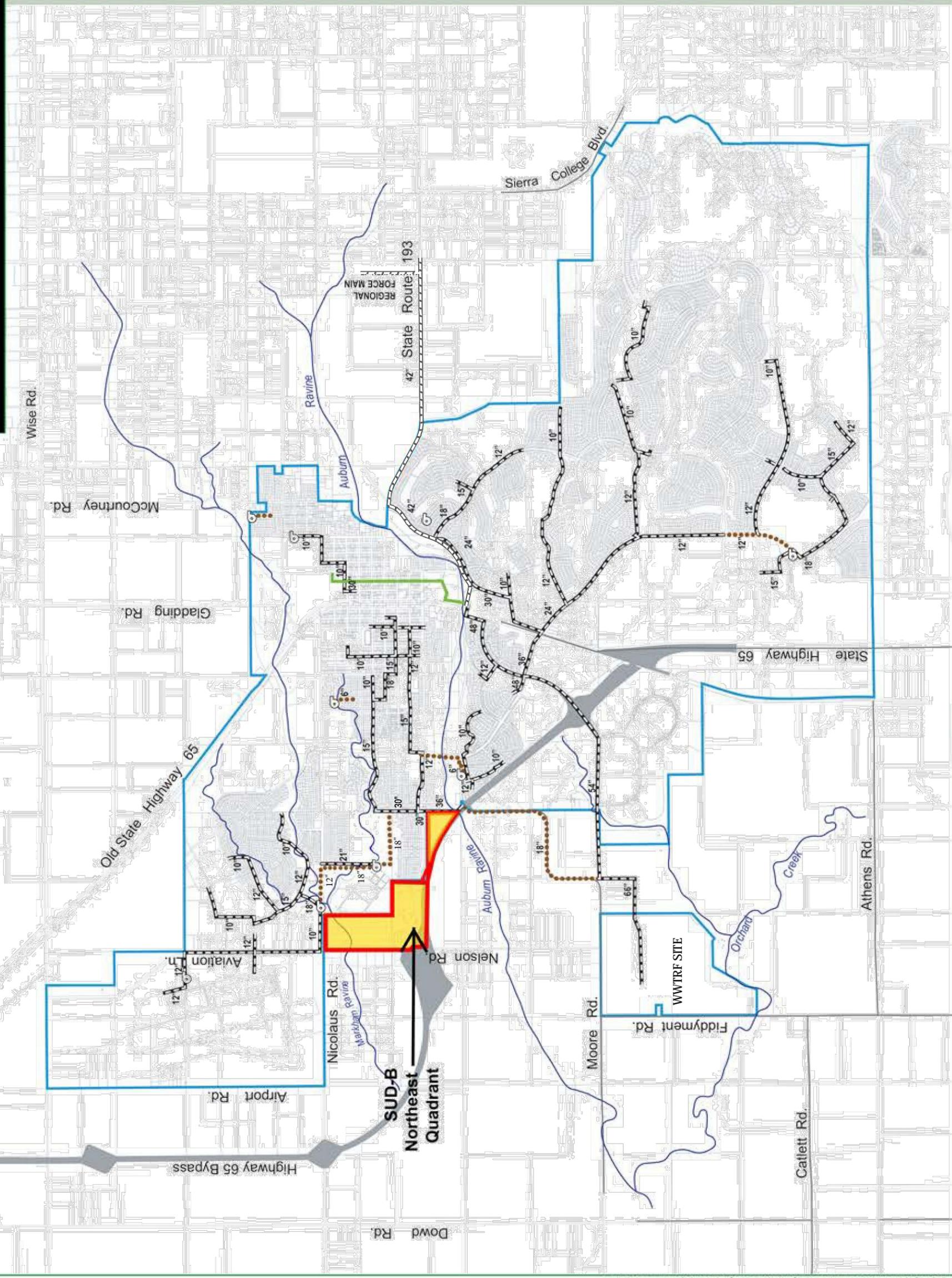
- ▬ City Limits
- ▬ SUD-B NEQ SP Boundary
- - - Proposed Sphere of Influence
- ▬ Airport Runway Expansion
- ▬ Village (V)
- ▬ Special Use District (SUD)

Wastewater

- ▬ Sewer Trunks
- ▬ Force Mains
- ▬ Size Change
- Pump Station



Sewer Exhibit 5
City of Lincoln
Existing Wastewater Collection System



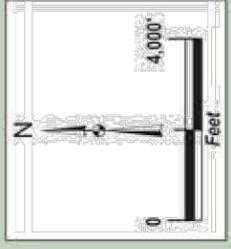
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Boundaries

- City Limits
- SUD-B NEQ SP Boundary

Wastewater

- Existing Sewer Trunks
- Existing Force Mains
- E Street Sewer Pipeline
- Pump Station



3. Design Criteria and Sewer Model Assumptions

This sewer report is utilizes the City of Lincoln’s Pipe Design Criteria; Table 2 below shows the capacity of varying pipe size for both 70% capacity and full flow capacity. The table below is based on minimum slopes with a self-cleaning velocity of 2 ft/sec. The invert elevations contained in the manhole depths of this report have been based upon maintaining the minimum slope.

Table 2: Pipe Design Criteria

PIPE SIZE (IN.)	MIN. SLOPE (ft/ft)	CAPACITY AT 70% DEPTH (MGD)	CAPACITY FLOWING FULL (MGD)
6	0.0050	0.22	
8	0.0035	0.38	
10	0.0025	0.58	0.72
12	0.0020	0.85	1.00
15	0.0015	1.32	1.60
18	0.0012	1.95	2.35

Velocity= 2 feet per second (fps) min for 70% and/or full pipe condition and 10 feet per second (fps) max.
 Size = 6-inch min for public main and 4-inch min for residential laterals; commercial sites shall be served by 8-inch min pipe.
 Manning formula with -inchn-inch value of min 0.013 was used to determine flow and velocity.
 See City of Lincoln Design Standards for full constraints.

3.1 *Pipe Material Requirements**

- Vitrified Clay Pipe – Extra Strength or as approved by City Engineer sizes 6-inch up to 36-inch.
- Ductile Iron Pipe – with polyethylene lining and encasement where applicable.
- Reinforced Concrete Pipe - with T-Lock (36-inch and or larger) as dictated by the site conditions and/or as required by City Engineer.

*unless otherwise approved by the City Engineer

4. Specific Plan Area Development Demand

Development within the approximately 200-acre SUD-B NEQ Specific Plan Area (SPA) is currently planned with approximately 85-acres designated as Low Density Residential and approximately 70-acres as commercial development. The residential development is anticipated to be on the eastern portions of the property roughly corresponding to the C-2 Airport Zone, and will consist of single family homes. Commercial development will site on the western portions of the Specific Plan area, roughly corresponding with the C-1 Airport Zone and fronting Nelson Lane. Table 3 provides a summary of the wastewater generation and Exhibit 6 provides the sewer manhole designators used in Table 3.



Table 3: SUD-B NEQ Specific Plan – Wastewater Generation			
Land Use Category	Acres or Dwelling Units (DU)	Demand Coefficient	Average Dry Daily Flow (MGD)
Residential			
Low Density Residential (LDR)	84.8 acres 430 DUs	250 gpd / DU	0.108
Residential Subtotal	84.8		0.108
Commercial			
Commercial north (MH#1)	11.7 acres	8,600 gal/ac	0.103
Commercial mid (MH#3)	23.8 acres	6,800 gal/ac	0.162
Commercial south (MH#4)	34.2 acres	5,500 gal/ac	0.188
Commercial Subtotal	69.7		0.453
Miscellaneous			
Park, Open Space, Right of Way, Landscaping	43.9 acres	0	0
Misc. Subtotal	43.9		0
Total Specific Plan Buildout			
	198.4		0.561

All acreages shown are approximate and subject to change. Estimated Dwelling Units are based upon the allowable density range of 3-5.9 DU/Acre. Refer to Exhibit 2 for Land Use Plan, and Exhibit 5 for MH numbers (MH#).

4.1 Unit Demand

Average Day Demand = 250 gpd for residential units.
= 8,600 gal/acre for northern commercial site.
= 6,800 gal/acre for mid commercial site.
= 5,500 gal/acre for southern commercial site.

Peak Factor = Per City of Lincoln standards, based on total flow at each tie-in SSMH.

4.2 Demand Calculations

Demand calculations are based on proposed land use density per SUD-B NEQ Specific Plan as listed in Table 1, Page 2. Approximately 430 homes are proposed to be constructed in the approximate 85-acres of residential development in this SPA. The City of Lincoln design standards require that the flow in residential zones be determined based upon an average flow of 250-gpd per dwelling unit in low density residential areas. Within the SUD-B NEQ, the average residential flow is estimated to be 0.108 MGD.



The commercial areas within this Specific Plan do not yet have specific uses assigned, so City of Lincoln design standards estimate sewage based upon the associated contributing area. Planned commercial land uses are located in both the area north and south of Markham Ravine. The commercial site to the north of this Specific Plan Area (PA-1, per Exhibit 3), is 11.7-acres in size which, according to the City of Lincoln Contributing Area: Figure SS-1 included in this report as Figure 2, equates to a sewage rate of approximately 8,600-gpd per acre. The mid commercial site (PA-2 & PA-3), located south of Markham Ravine, yields a total area of 23.8-acres and will utilize a sewage rate of approximately 6,800-gpd per acre while the southern commercial site (PA-4) is 34.2-acres with a sewage rate of approximately 5,500-gpd per acre.

As a result, the average sewage flow for the northern, mid and southern commercial sites will be roughly 0.103-MGD, 0.162-MGD and 0.188-MGD, respectively. See Exhibit 6 - Sewer Demand and Manhole Depth Map (see Appendix A for full size version) for detail information regarding flow for each manhole, the peak flow at the tie-in locations to existing systems, and approximate rim and invert elevations at each major manhole. The manhole rim elevations were based on the SUB-D NEQ SP Master Grading and the manhole invert elevations were calculated using minimum pipe slopes as listed on Table 2, Page 11.

It should be noted that this Specific Plan and this sewer study excludes Assessor's Parcel Number: 021-262-006, which is part of the proposed Independence project, and not within this Specific Plan Area. Furthermore, SUD-B NEQ will not be accepting any wastewater flow from the Independence project.

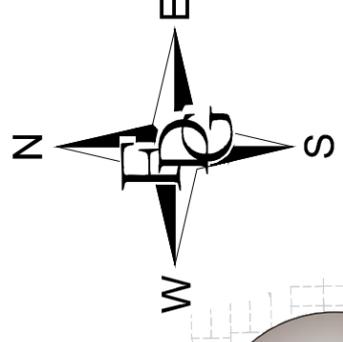


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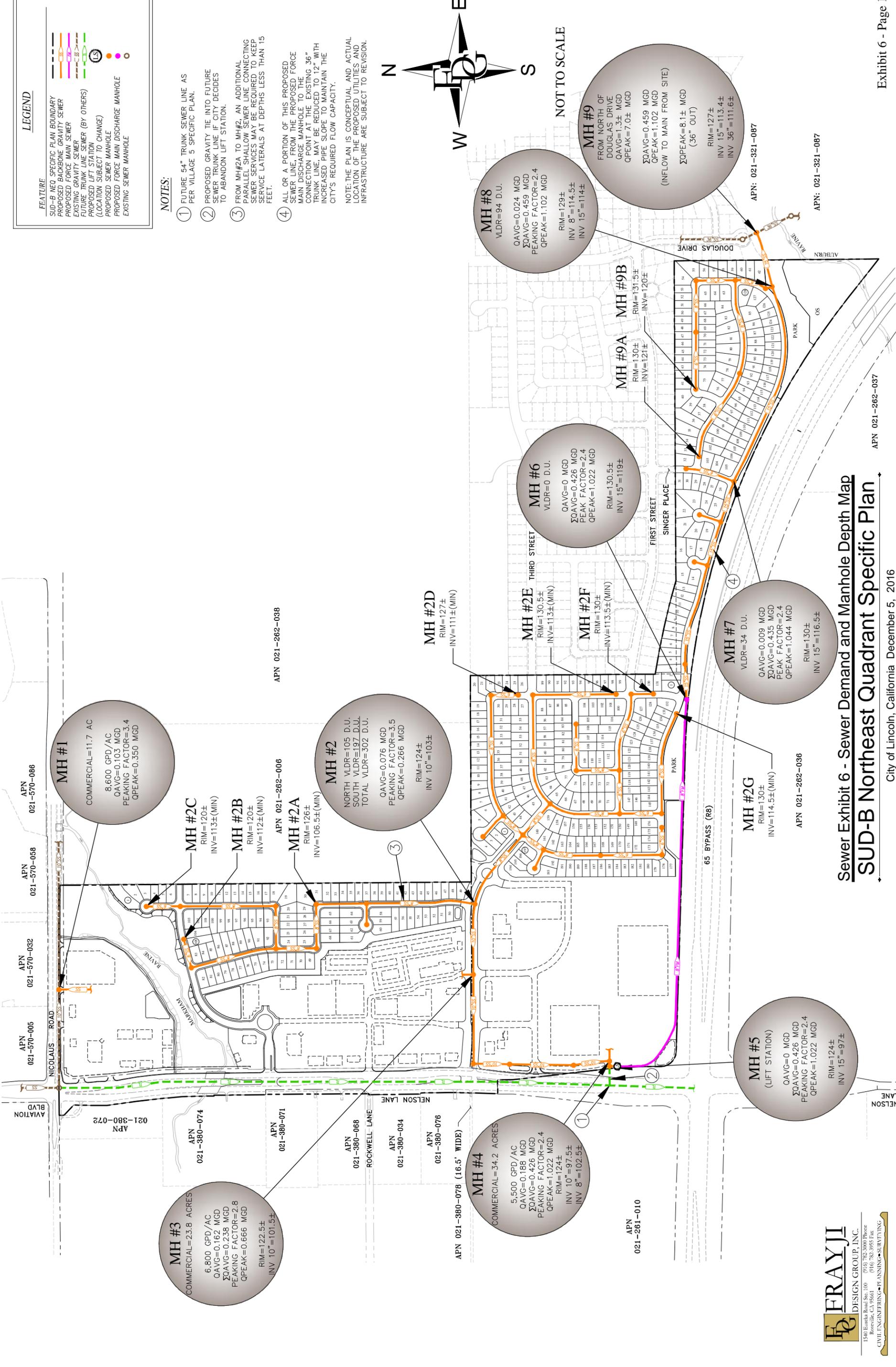
- FEATURE
- SUD-B NEQ SPECIFIC PLAN BOUNDARY
 - PROPOSED BACKSWEPT GRAVITY SEWER
 - PROPOSED FORCE MAIN SEWER
 - EXISTING GRAVITY SEWER
 - FUTURE TRUNK LINE SEWER (BY OTHERS)
 - PROPOSED LIFT STATION (LOCATION SUBJECT TO CHANGE)
 - PROPOSED SEWER MANHOLE
 - PROPOSED FORCE MAIN DISCHARGE MANHOLE
 - EXISTING SEWER MANHOLE

NOTES:

- 1) FUTURE 54" TRUNK SEWER LINE AS PER VILLAGE 5 SPECIFIC PLAN.
 - 2) PROPOSED GRAVITY TIE INTO FUTURE SEWER TRUNK LINE IF CITY DECIDES TO ABANDON LIFT STATION.
 - 3) FROM MH#2A TO MH#2, AN ADDITIONAL PARALLEL SHALLOW SEWER LINE CONNECTING SEWER SERVICES MAY BE REQUIRED TO KEEP SERVICE LATERALS AT DEPTHS LESS THAN 15 FEET.
 - 4) ALL OR A PORTION OF THIS PROPOSED SEWER LINE, FROM THE PROPOSED FORCE MAIN DISCHARGE MANHOLE TO THE CONNECTION POINT AT THE EXISTING 36" TRUNK LINE, MAY BE REDUCED TO 12" WITH INCREASED PIPE SLOPE TO MAINTAIN THE CITY'S REQUIRED FLOW CAPACITY.
- NOTE: THE PLAN IS CONCEPTUAL AND ACTUAL LOCATION OF THE PROPOSED UTILITIES AND INFRASTRUCTURE ARE SUBJECT TO REVISION.



NOT TO SCALE



MH #1
 COMMERCIAL=11.7 AC
 8,600 GPD/AC
 QAVG=0.103 MGD
 PEAKING FACTOR=3.4
 QPEAK=0.350 MGD

MH #2C
 RIM=120±
 INV=113±(MIN)

MH #2B
 RIM=120±
 INV=112±(MIN)

MH #2A
 RIM=126±
 INV=106.5±(MIN)

MH #2
 NORTH VLDR=105 D.U.
 SOUTH VLDR=197 D.U.
 TOTAL VLDR=302 D.U.
 QAVG=0.076 MGD
 PEAKING FACTOR=3.5
 QPEAK=0.266 MGD
 RIM=124±
 INV 10"=103±

MH #2D
 RIM=127±
 INV=111±(MIN)

MH #2E
 RIM=130.5±
 INV=113±(MIN)

MH #2F
 RIM=130±
 INV=113.5±(MIN)

MH #7
 VLDR=34 D.U.
 QAVG=0.009 MGD
 ΣQAVG=0.435 MGD
 PEAK FACTOR=2.4
 QPEAK=1.044 MGD
 RIM=130±
 INV 15"=116.5±

MH #2G
 RIM=130±
 INV=114.5±(MIN)

APN 021-262-036

MH #3
 COMMERCIAL=23.8 ACRES
 6,800 GPD/AC
 QAVG=0.162 MGD
 ΣQAVG=0.238 MGD
 PEAKING FACTOR=2.8
 QPEAK=0.666 MGD
 RIM=122.5±
 INV 10"=101.5±

MH #4
 COMMERCIAL=34.2 ACRES
 5,500 GPD/AC
 QAVG=0.188 MGD
 ΣQAVG=0.426 MGD
 PEAKING FACTOR=2.4
 QPEAK=1.022 MGD
 RIM=124±
 INV 10"=97.5±
 INV 8"=102.5±

APN 021-261-010

MH #5
 (LIFT STATION)
 QAVG=0 MGD
 ΣQAVG=0.426 MGD
 PEAKING FACTOR=2.4
 QPEAK=1.022 MGD
 RIM=124±
 INV 15"=97±

MH #8
 VLDR=94 D.U.
 QAVG=0.024 MGD
 ΣQAVG=0.459 MGD
 PEAKING FACTOR=2.4
 QPEAK=1.102 MGD
 RIM=129±
 INV 8"=114.5±
 INV 15"=114±

MH #9
 FROM NORTH OF DOUGLAS DRIVE
 QAVG=1.3± MGD
 QPEAK=7.0± MGD
 ΣQAVG=0.459 MGD
 QPEAK=1.102 MGD
 ΣQPEAK=8.1± MGD
 (36" OUT)
 RIM=127±
 INV 15"=113.4±
 INV 36"=111.6±
 (INFLOW TO MAIN FROM SITE)

APN: 021-321-087

APN: 021-321-087

Sewer Exhibit 6 - Sewer Demand and Manhole Depth Map
SUD-B Northeast Quadrant Specific Plan

City of Lincoln, California December 5, 2016

APN 021-262-037

FRAYJI
 DESIGN GROUP, INC.
 1540 Eureka Road, Ste. 100
 Roseville, CA 95661
 (916) 782-3000 Phone
 (916) 782-3955 Fax
 CIVIL ENGINEERING • PLANNING • SURVEYING

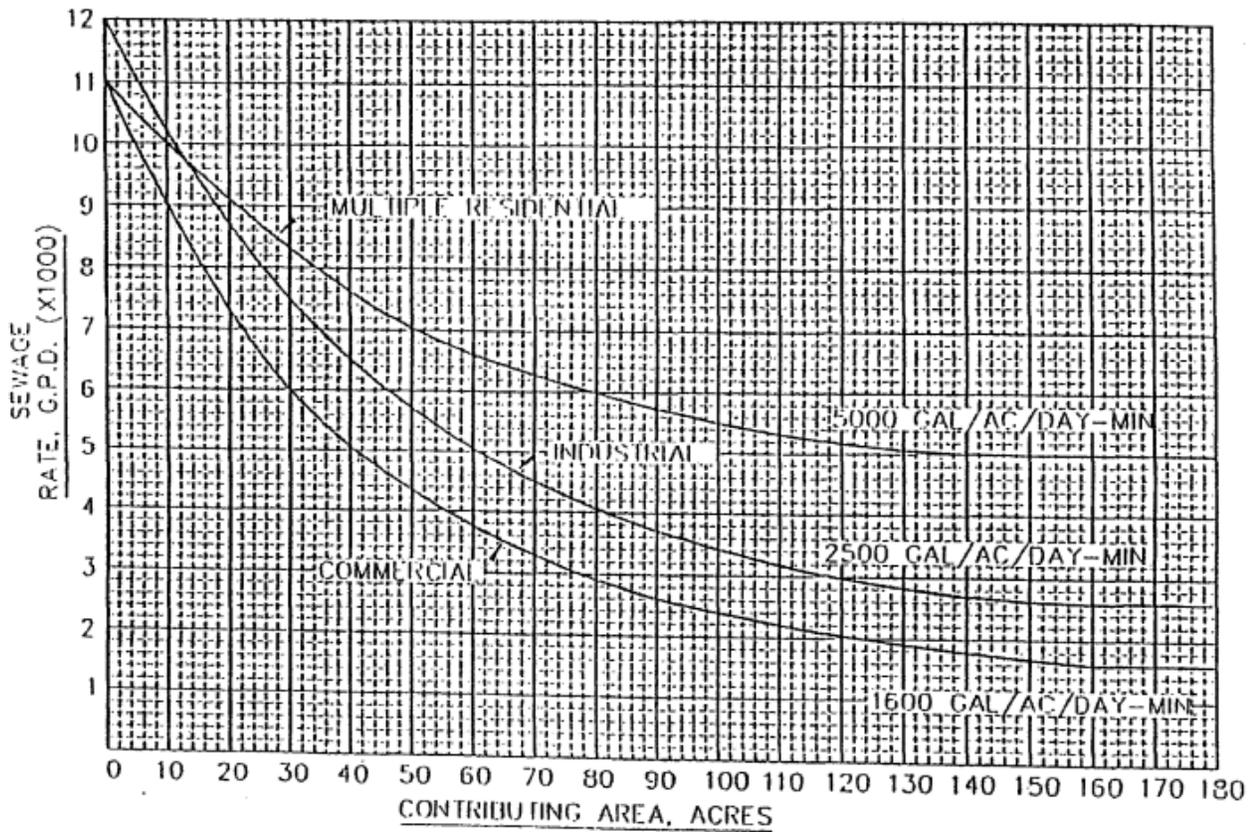


Figure - 3: City of Lincoln Contributing Area

(Figure SS-1, City of Lincoln Design Criteria)



Table 4: SUD-B NEQ Specific Plan – Flow Calculation Table						
MH #	VLDR units	Commercial Area (acres)	Average Dry Daily Flow (MGD)	Cumulative Average Dry Daily Flow (MGD)	Peaking Factor	Peak Flow (MGD)
1	0	11.7	0.103	0.103	3.4	0.350
Total	0	11.7	0.103	0.103	-	0.350
2	302	-	0.076	0.076	3.5	0.266
3	-	23.8	0.162	0.238	2.8	0.666
4	-	34.2	0.188	0.426	2.4	1.022
5	-	-	-	0.426	2.4	1.022
6	-	-	-	0.426	2.4	1.022
7	34	-	0.009	0.435	2.4	1.044
8	94	-	0.024	0.459	2.4	1.102
9	-	-	-	-	-	1.102
Total	430	60.5	0.462	-	-	1.102

The areas contributing to each proposed SSMH were calculated and divided to sub areas with the corresponding land uses. Table 4 above shows the calculated average flow of each identified manhole. Total EDU's of the residential units and commercial areas contributing to each manhole was used in the demand calculations for each SSMH.

The Average Dry Daily Flow (ADF), Cumulative Average Daily Flow and resulting Peak Flow (PF) for each calculated SSMH are shown on Table 4 and Exhibit 6. The City of Lincoln design criteria provides a peaking factor to allow conversion of ADF to peak values. The peak factor is based on City of Lincoln Figure SS-2, included in this report as Figure 4 shown on the next page. The ADF and PF exiting the site are 0.103 MGD and 0.350 MGD at MH #1 (Nicolaus Road) and 0.459 MGD and 1.102 MGD at MH #9 (Douglas Drive), respectively.



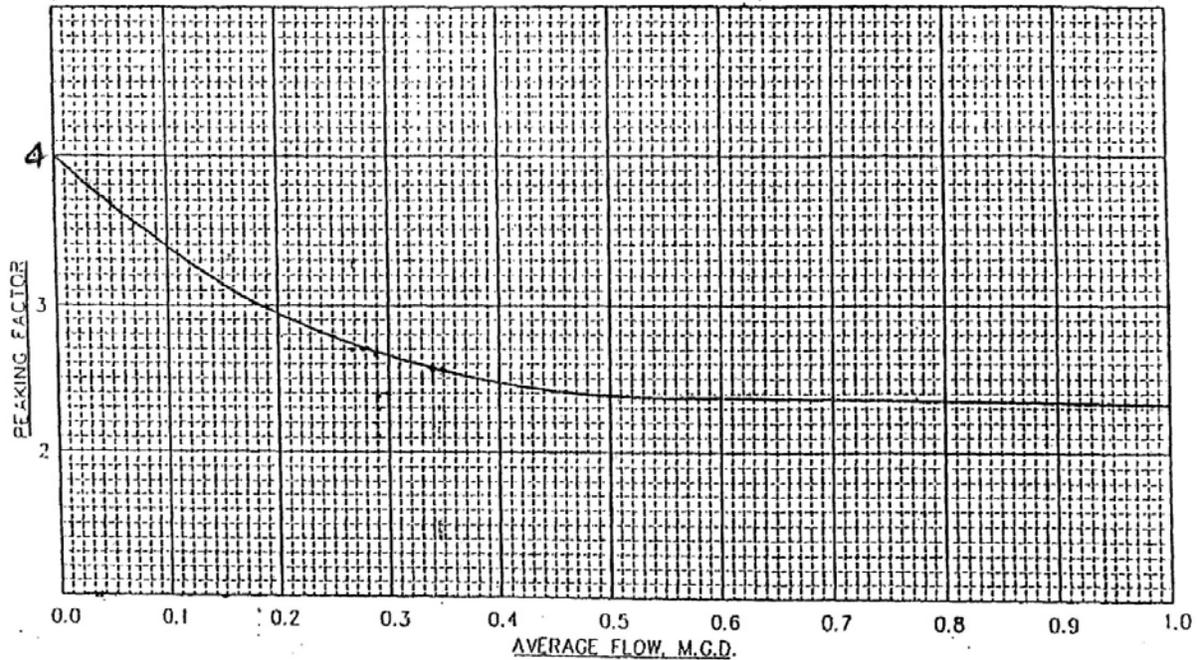


Figure - 4: City of Lincoln Peaking Factor Diagram

(Figure SS-2, City of Lincoln Design Criteria)

5. SUD-B NEQ Proposed Collection System

5.1 Capacity within the Existing Sewer System

The existing City of Lincoln sewer system in the vicinity of the SUD-B Northeast Quadrant Specific Plan area is composed of a combination of original sewers, temporary sewers resulting from the closure of the former wastewater treatment plant, and master plan replacement sewers. There are two existing sewer lines adjacent to the Specific Plan area; a 10-inch sewer on Nicolaus Road flowing east and a 36-inch line on Douglas Drive flowing south.

A lift station exists downstream of the 10-inch sewer on Nicolaus Road. Based on information from City of Lincoln staff, the flows of the Nicolaus Road lift station with both pumps operating is 0.864 MGD average daily flow and 2.12 MGD peak daily flow. The existing capacity of the Nicolaus Road Sewer Lift Station is 0.97 MGD average daily flow and 2.57 MGD peak daily flow. Therefore, the existing lift station will have capacity to accept the additional 0.103 MGD of average daily flow and 0.350 peak daily flow from the proposed commercial site, north of Markham Ravine. Flow capacities of the existing 10-inch sewer branch have been limited by the flow capacities at the Nicolaus Road Lift Station. However, this lift station has recently been



upgraded to be able to provide the needed capacity for build-out of future upstream projects.

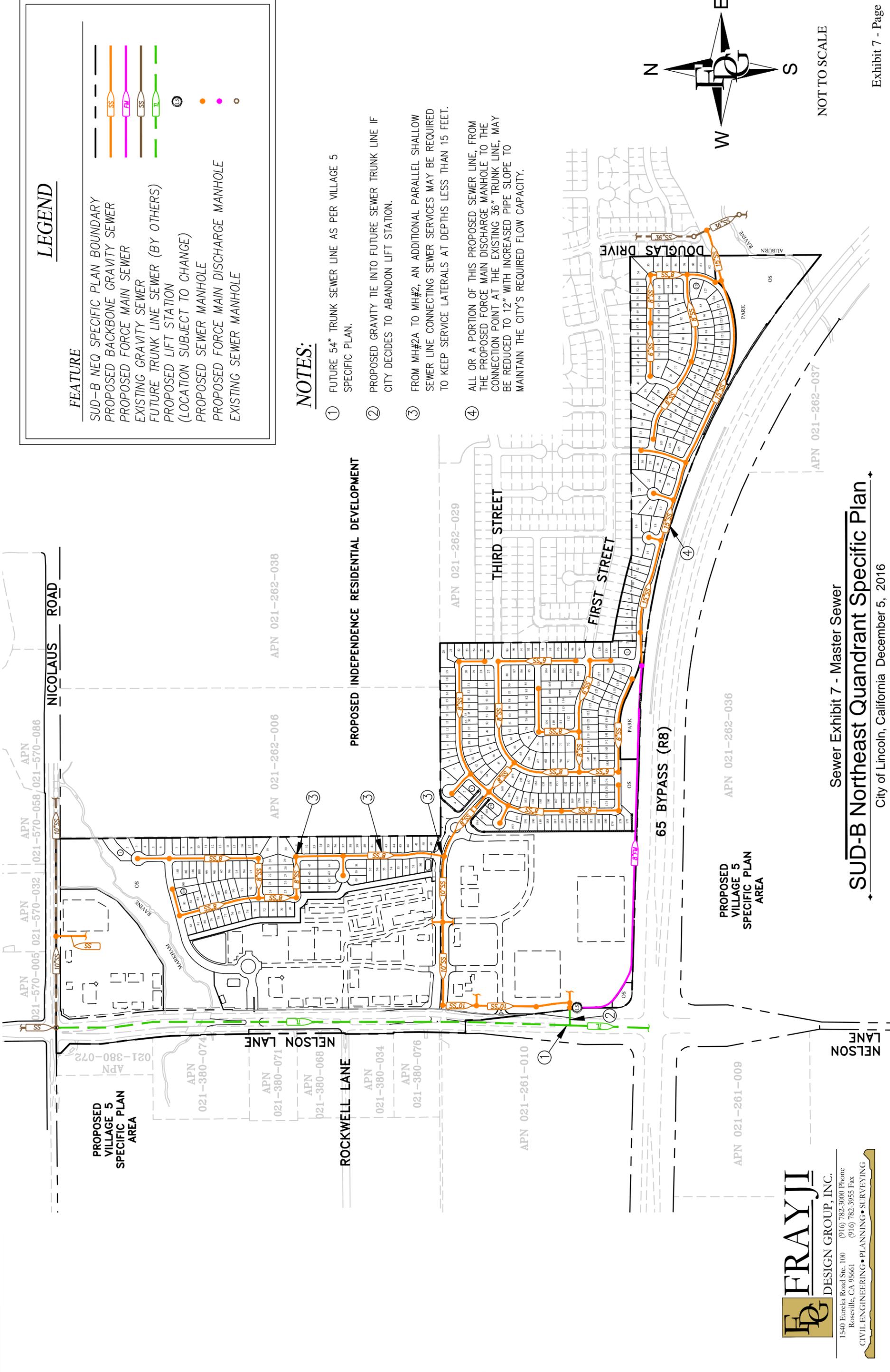
According to information provided by the City of Lincoln, the current flows in the existing 36-inch sanitary sewer east of the project at Douglas Drive are approximately 1.3 MGD average daily flow and 7 MGD peak flow at the critical downstream location. The critical capacity of the existing 36-inch sanitary sewer line in Douglas is about 17 MGD Peak wet flow at that peak location. As such, there is more than sufficient capacity at present to accommodate the entire Specific Plan area south of Markham Ravine flow of 0.459 MGD ADF and 1.102 MGD PF within the Northeast Quadrant into the 36-inch sewer line. Additionally, full build-out of the sewer sheds associated with this 36-inch sewer line would result in a 3 MGD average daily flow and 14 MGD peak flow rate. Therefore, the existing 36-inch line would be able to serve full tributary build-out condition.

Treatment of sanitary sewage generated within the City of Lincoln will be performed by the existing Wastewater Treatment and Reclamation Facility owned and operated by the City of Lincoln. The City of Lincoln is currently expanding the treatment capacity of the wastewater treatment plant. Currently, the existing Lincoln Wastewater Treatment Plant has an Average Dry Daily Flow (ADDF) capacity of 4.2 MGD, with some oversizing capabilities to 12 MGD. As the current flow rate is 2.7 MGD, 1.5 MGD of ADF is available to serve the SUD-B NEQ development at present. Given the estimates of 0.459 MGD average daily flow for the developing portions of this Specific Plan, that 1.5 MGD of ADF of surplus at the treatment plant is presently sufficient.

5.2 Proposed Sewer Trunk System

The Master Sewer Plan is depicted in Exhibit 7 (see Appendix B for full size version) and Exhibit 8 has this Specific Plan broken into 3 areas. Area 1, north of Markham Ravine, will sewer the northwest corner of the Specific Plan and gravity flow to a new manhole, MH # 1 (per Exhibit 6), and utilize the existing 10-inch sanitary sewer line found in Nicolaus Road. The areas south of Markham Ravine, Areas 2 and 3, will provide sanitary sewer service for the remainder of the Specific Plan area. Area 2 will gravity flow to a lift station, MH # 5, located approximately in the southwest quadrant of this Specific Plan area. The lift station location is approximate and the exact location will be determined at final design of the improvement plans. From the lift station, the sewage will be pumped to a receiving manhole, MH # 6. Area 3 will gravity flow into MH #8, joining the Area 2 flow, and ultimately connecting to the existing 36-inch trunk sewer south of Douglas Drive (MH#9).





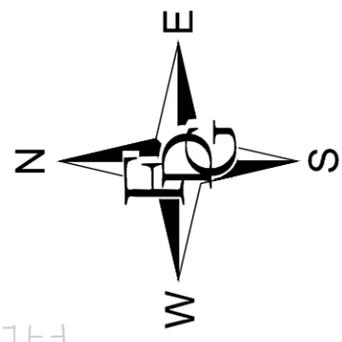
LEGEND

FEATURE

- SUD-B NEQ SPECIFIC PLAN BOUNDARY
- PROPOSED BACKBONE GRAVITY SEWER
- PROPOSED FORCE MAIN SEWER
- EXISTING GRAVITY SEWER
- FUTURE TRUNK LINE SEWER (BY OTHERS)
- PROPOSED LIFT STATION (LOCATION SUBJECT TO CHANGE)
- PROPOSED SEWER MANHOLE
- PROPOSED FORCE MAIN DISCHARGE MANHOLE
- EXISTING SEWER MANHOLE

NOTES:

- ① FUTURE 54" TRUNK SEWER LINE AS PER VILLAGE 5 SPECIFIC PLAN.
- ② PROPOSED GRAVITY TIE INTO FUTURE SEWER TRUNK LINE IF CITY DECIDES TO ABANDON LIFT STATION.
- ③ FROM MH#2A TO MH#2, AN ADDITIONAL PARALLEL SHALLOW SEWER LINE CONNECTING SEWER SERVICES MAY BE REQUIRED TO KEEP SERVICE LATERALS AT DEPTHS LESS THAN 15 FEET.
- ④ ALL OR A PORTION OF THIS PROPOSED SEWER LINE, FROM THE PROPOSED FORCE MAIN DISCHARGE MANHOLE TO THE CONNECTION POINT AT THE EXISTING 36" TRUNK LINE, MAY BE REDUCED TO 12" WITH INCREASED PIPE SLOPE TO MAINTAIN THE CITY'S REQUIRED FLOW CAPACITY.



NOT TO SCALE

Sewer Exhibit 7 - Master Sewer

SUD-B Northeast Quadrant Specific Plan

City of Lincoln, California December 5, 2016

FRAYJI
DESIGN GROUP, INC.

1540 Eureka Road Ste. 104 (916) 782-3000 Phone
 Roseville, CA 95661 (916) 782-3955 Fax
 CIVIL ENGINEERING • PLANNING • SURVEYING



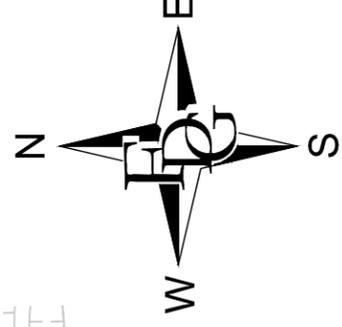
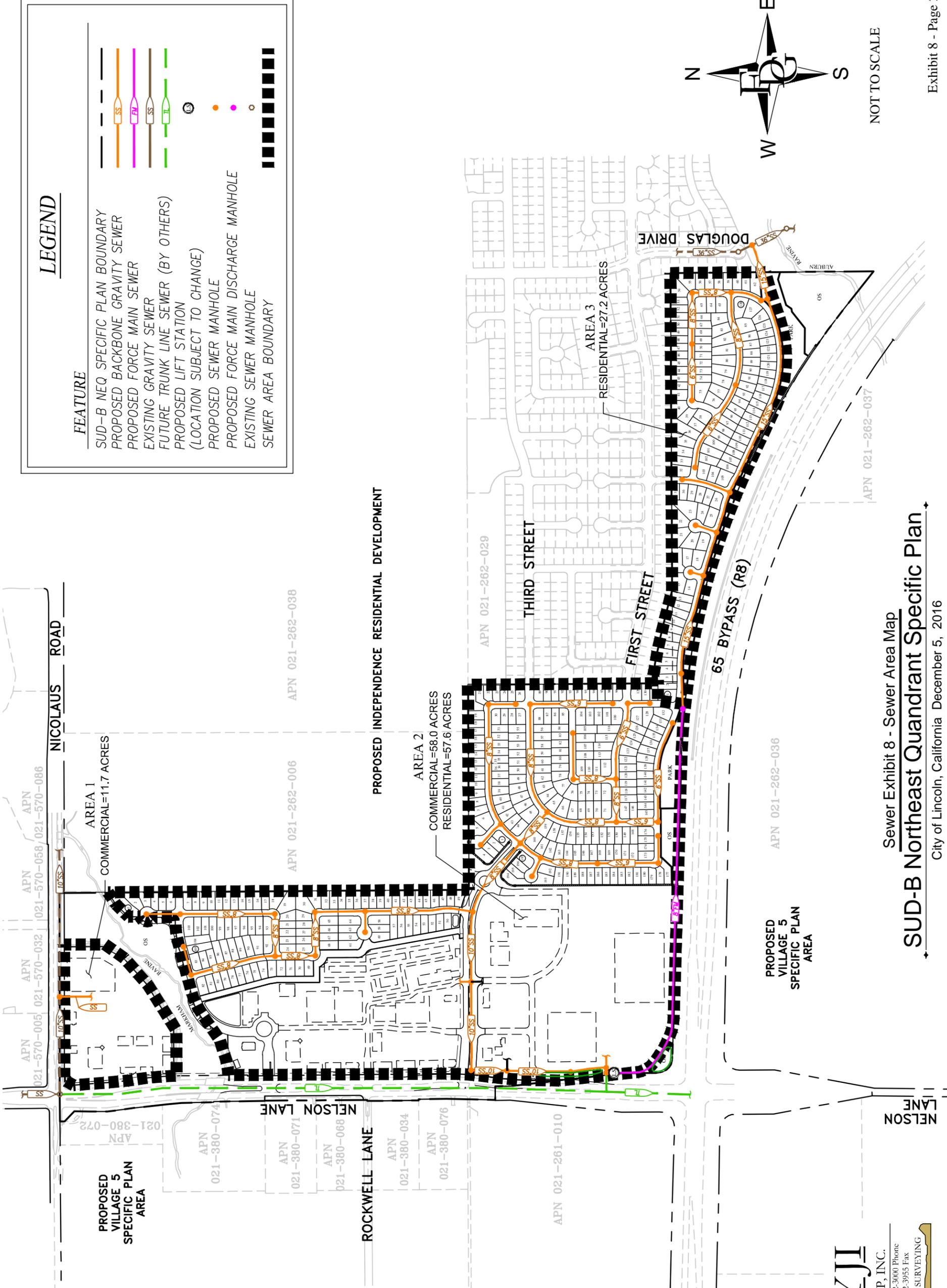
1540 Eureka Road Ste. 104
Roseville, CA 95661
CIVIL ENGINEERING • PLANNING • SURVEYING

(916) 782-3000 Phone
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Sewer Exhibit 8 - Sewer Area Map

SUD-B Northeast Quadrant Specific Plan

City of Lincoln, California December 5, 2016



NOT TO SCALE

LEGEND

FEATURE

- SUD-B NEQ SPECIFIC PLAN BOUNDARY
- PROPOSED BACKBONE GRAVITY SEWER
- PROPOSED FORCE MAIN SEWER
- EXISTING GRAVITY SEWER
- FUTURE TRUNK LINE SEWER (BY OTHERS)
- PROPOSED LIFT STATION (LOCATION SUBJECT TO CHANGE)
- PROPOSED SEWER MANHOLE
- PROPOSED FORCE MAIN DISCHARGE MANHOLE
- EXISTING SEWER MANHOLE
- SEWER AREA BOUNDARY

5.2 Proposed Sewer Trunk System (Continued from page 18)

The backbone sewer system within the planning areas of the SUD-B NEQ Specific has been sized based upon the capacities required for the sewer lines and City of Lincoln Standards. The individual sewer lines that provide 4-inch service connections for individual homes and businesses will primarily be a network of 8-inch pipes, with some 6-inch and 10-inch pipes. In commercial zones, branch lines should be sized based upon the final configuration of the businesses and the type of commercial enterprise present with a minimum pipe size of 6-inch required to meet city standards. Residential neighborhoods should utilize City of Lincoln design criteria to size sanitary sewers.

As part of implementing the 2050 General Plan, the construction of a new 54-inch line in Nelson Lane is planned for the future, as depicted in the Village 5 Specific Plan, and will flow by gravity to the Lincoln WWTRF. The proposed onsite sewer lift station (MH#5) will be designed with the option in the future for disconnecting to gravity serve this Specific Plan and to tie into the 54-inch line. This future deep trunk sewer permits direct gravity flow for all of Area 2. To enable this potential transition, the lift station will be plumbed and be provided with a sealed stub that would be used to connect to the future trunk line. The timing of this potential transition would depend upon when the wastewater trunk line infrastructure to the south is constructed in the future and on the City's desire to abandon the lift station in favor of connecting to the 54-inch trunk line. If the trunk sewer is constructed in the future, the City will have the option to eliminate the lift station. Regardless of the 54-inch trunk line and whether or not it is available for the use of SUD-B NEQ, the proposed sewer plan will work independently and will not rely on the existence of the future trunk line in Nelson Lane.



6. Summary

The wastewater needs for the SUD-B Northeast Quadrant upon build-out can be successfully met utilizing the master plan outlined in this report. The existing pipes appear to have capacity to carry the generated wastewater flows and the backbone sewer system identified in this report should be capable of providing adequate wastewater service throughout the Specific Plan Area. The City of Lincoln Wastewater Treatment and Reclamation Facility is capable of providing treatment without need to add capacity. Internal wastewater improvements within the NEQ Specific Plan area can conform to City of Lincoln Design Standards without issues.

The SUD-B NEQ sewer master plan will provide the ability to utilize the available sewer capacity in existing lines while enabling a potential transition in the future to the anticipated City of Lincoln system, for a portion of the Specific Plan area. This Specific Plan will be served by the two existing sewers lines, a 10-inch sewer in Nicolaus Road and a 36-inch sewer south of Douglas Drive. The sewer for the commercial area north of Markham Ravine (Area 1, Exhibit 8) will gravity flow and connect to the existing 10-inch sanitary sewer line in Nicolaus Road. A sewer lift station located at the south west corner of this Specific Plan will pump approximately 60 acres of commercial and 58 acres of residential sewerage (Area 2, Exhibit 8) to the existing 36-inch sewer line and the residential area at the southeast corner of this Specific Plan area (Area 3, Exhibit 8) will gravity flow into the existing 36-inch sewer south of Douglas Drive.

The sewer lift station will be designed with the option in the future for disconnecting to gravity serve Area 2 and tie directly into the 54-inch line in Nelson Lane which may be built in the future, as depicted in the Village 5 Specific Plan. As noted in this report, the location of the sewage lift station is approximate and the exact location will be determined at the final design of the improvement plans. The actual lift station location would have no significant change to the master plan, although the specific impact to particular pipes may need to be adjusted accordingly to accommodate the ultimate location. If these methods are employed, the backbone sewer system would be substantially compliant with this report.

The future 54-inch trunk line has been preliminarily sized to accommodate the majority of the flow from the Northeast Quadrant, so the future system should be capable of receiving these onsite flows if the City decides to abandon the lift station. In the eventual 2050 General Plan build-out scenario, most of the flow within the Specific Plan Area will have the potential to be transferred to the 54-inch trunk line. The northwest corner of the Specific Plan area would flow to a new 24-inch sewer which connects to the 54-inch trunk line at the intersection of Nicolaus Road and Nelson Lane.



Appendices

- Sewer Exhibit 6 - SUD-B NEQ Specific Plan - Sewer Demand & Manhole Depth Map
- Sewer Exhibit 7 - SUD-B NEQ Specific Plan - Master Sewer
- Disk containing a PDF of this report



SUD-B NEQ SP Sewer System Report

