Appendix PU-1

Sewer Study

SACRAMENTO AREA
SEWER DISTRICT
SERVING YOU 24/7

December 2, 2013

Tom Balbierz
Wood Rodgers
3301 C Street, Bldg. 100-B
Sacramento, CA 95816

Subject: **South Mather Development & Zinfandel Drive Extension Master Sewer Study Amendment #1 : Approved**

Dear Mr. Balbierz:

Sacramento Area Sewer District staff reviewed the subject submittal and finds it sufficiently addresses District requirements and is considered approved. Any significant change in the proposed and/or assumed land use presented in this document, which impacts the sewer design, may require a revision to this study.

Improvement plans associated with this project may be submitted for review.

If you have any questions regarding these comments, please call me at 916-876-6296.

Sincerely,

Amandeep Singh, P.E.
Development Services

Board of Directors
Representing:

County of Sacramento
City of Citrus Heights
City of Elk Grove
City of Folsom
City of Rancho Cordova
City of Sacramento

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10060 Goethe Road
Sacramento, CA 95827-3553
Tel 916.876.6000
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www.sacsewer.com

TECHNICAL MEMORANDUM

WOOD RODGERS
DEVELOPING INN

SACRAMENTO AREA SEWER DISTRICT

APPROVED

DATE: 12/2/13

To: Amandeep Singh, Sacramento Area Sewer District

From: Tom Balbierz, PE
Mike Motroni, PE

Date: 25 September 2013

Subject: **South Mather Development & Zinfandel Drive Extension Master Sewer Study Amendment #1**

Introduction

The purpose of this technical memorandum is to provide an amendment to the approved Master Sewer Study for South Mater Development & Zinfandel Drive Extension, dated February 2010 and prepared by Wood Rodgers (study). The study analyzed areas north of Douglas Road at a level 3 level while areas south of Douglas Road and west of Mather Boulevard were analyzed at a level 2 level. The study also included large areas of land to the west of Zinfandel Drive.

This amendment is to provide level 3 detail for the extension of trunk sewer within Zinfandel Drive. Additionally, since the February 2010 study, large portions of land to the west of Zinfandel Drive will no longer be included as contributory area as this area is now designated as open space preserve. The remaining undeveloped areas to the east of Zinfandel Drive will continue to be shown in level 2 detail until such time those parcels develop. Street patterns shown with this amendment are preliminary.

Study Updates

As a result of this exercise, a number of revisions were incorporated into the revised calculations and shown on revised **Figure 3** and **Figure 4**. The revised figures are included as part of this amendment.

- Flows originally assigned to the preserve to the east of Zinfandel Drive have been excluded.
- Proposed land use for the University and single-family components, as currently proposed, were incorporated into the sewer analysis. Schematic sewer lines are shown through these areas, at a level 2 detail.
- Pipe slopes in Zinfandel Drive south of Douglas Road were increased allowing pipe downsizing and resulting in overall depth reduction.
- Updated shed areas to reflect more accurate mapping data.
- Updated alignment of the Zinfandel Drive extension.
- Updated with design level detail for the Phase 1 Zinfandel Drive sewer extension.
- Updated vertical datum references from NGVD29 to NAVD88.

The flows identified in the February 2010 study, primarily for areas west of the Zinfandel Drive Extension were removed with the recording of the preserve open space designation. There were also some variances in flows when the shed areas were revaluated with the updated base map data.

Latent capacity resulting from the removal of preserve areas from the system was added to the system near Kiefer Boulevard to equate for a total flow of 10 million gallons per day for peak wet weather flow at North Mather Road as indicated by the original study.

Results & Conclusion

The assumptions and criteria as outlined in the February 2010 study have been carried forth in this technical memorandum. The pipes sizes shown on the attached exhibit are designed per Sacramento Area Sewer District standards. This memorandum and accompanying attachments provide sufficient detail for the approval of improvement plans to extend trunk sewer in Zinfandel Drive.

References

Master Sewer Study, South Mather Development & Zinfandel Drive Extension, Wood Rodgers, February 2010.

Attachments

Exhibit 3: Level 2 / Level 3 Sewer Study Exhibit for South Mather Development & Zinfandel Drive Extension, dated July 2010 and revised September 6, 2013.

Exhibit 4: Level 3 Sewer Study Exhibit for South Mather Development & Zinfandel Drive Extension, dated July 2010 and revised September 6, 2013.

Attachment A: Hydraulic Calculations

South Mather Development & Zinfandel Dr. Extention
Master Sewer Study Amendment #1

Sewer Study (Note: Node Data Applies to Pipes Downstream of Subject Node)

Node	Land Use and Associated ESD's [AC] [EA]										Offsite	Total	Total	Cumulative		Qavg	Q I/I	Peaking	Q Peak	Q Peak	Required Pipe		
#	RD4-6	ESD's	SCHOOL	ESD's	COMM.	ESD's	PARK	ESD's	INDUST.	ESD's	ESD's	Area	ESD	Area	ESD	[MGD]	[MGD]	Factor	DWF [MGD]	PWWF[MGD]	Dia [in]	Slope [ft/ft]	Vel[ft/s]PWWF
13B									27.1	162.6		27.1	162.6	27.1	162.6	0.050	0.038	1.950	0.098	0.136	8	0.0035	1.8
13											5847.7	0.0	5847.7	27.1	6010.3	1.863	0.038	1.643	3.061	3.099	21	0.0011	2.5
12B					6.9	41.4						6.9	41.4	6.9	41.4	0.013	0.010	2.052	0.026	0.036	8	0.0035	1.2
12												0.0	0.0	34.0	6051.7	1.876	0.048	1.642	3.081	3.129	21	0.0011	2.5
11B			185.9	1115.4								185.9	1115.4	185.9	1115.4	0.346	0.260	1.793	0.620	0.880	12	0.0020	2.3
11												0.0	0.0	219.9	7167.1	2.222	0.308	1.627	3.614	3.922	24	0.0011	2.7
10B	51.3	307.8							149.9	899.4		201.2	1207.2	201.2	1207.2	0.374	0.282	1.786	0.668	0.950	12	0.0020	2.3
10												0.0	0.0	421.1	8374.3	2.596	0.590	1.612	4.185	4.775	24	0.0014	3.0
9B	93.6	561.6										93.6	561.6	93.6	561.6	0.174	0.131	1.851	0.322	0.453	10	0.0025	2.1
9												0.0	0.0	514.7	8935.9	2.770	0.721	1.606	4.449	5.169	24	0.0014	3.1
8B	357.5	2145.0										357.5	2145.0	357.5	2145.0	0.665	0.501	1.736	1.155	1.655	18	0.0012	2.2
8												0.0	0.0	872.2	11080.9	3.435	1.221	1.585	5.446	6.667	27	0.0020	3.8
6B							168.2	1009.2				168.2	1009.2	168.2	1009.2	0.313	0.235	1.802	0.564	0.799	12	0.0020	2.2
6												0.0	0.0	1040.4	12090.1	3.748	1.457	1.577	5.911	7.367	27	0.0020	3.9
5							10.4	62.4				10.4	62.4	1050.8	12152.5	3.767	1.471	1.577	5.939	7.411	27	0.0020	3.9
4							41.7	250.2				41.7	250.2	1092.5	12402.7	3.845	1.530	1.575	6.054	7.584	27	0.0020	3.9
3A-3.2					106.4	638.4	39.8	373.9				146.2	1012.3	146.2	1012.3	0.314	0.205	1.801	0.565	0.770	12	0.0020	2.2
3A-3.1							56.7	340.2				56.7	340.2	56.7	340.2	0.105	0.079	1.891	0.199	0.279	8	0.0035	2.1
3A-3												0.0	0.0	202.9	1352.5	0.419	0.284	1.777	0.745	1.029	12	0.0020	2.3
3A-2							35.1	210.6				35.1	210.6	238.0	1563.1	0.485	0.333	1.764	0.855	1.188	15	0.0015	2.2
3A-1					7.6	45.6						7.6	45.6	245.6	1608.7	0.499	0.344	1.762	0.878	1.222	15	0.0015	2.2
3B					28.8	172.8						28.8	172.8	28.8	172.8	0.054	0.040	1.945	0.104	0.145	8	0.0035	1.8
3												0.0	0.0	1366.9	14184.2	4.397	1.914	1.562	6.867	8.780	30	0.0015	3.6
2A					9.7	58.2						9.7	58.2	9.7	58.2	0.018	0.014	2.027	0.037	0.050	8	0.0035	1.3
2B					9.6	57.6						9.6	57.6	9.6	57.6	0.018	0.013	2.028	0.036	0.050	8	0.0035	1.3
2												0.0	0.0	1386.2	14300.0	4.433	1.941	1.561	6.919	8.860	30	0.0015	3.7
1A-4					187.6	1125.6						187.6	1125.6	187.6	1125.6	0.349	0.263	1.792	0.625	0.888	15	0.0015	2.1
1A-3					8.7	52.2						8.7	52.2	196.3	1177.8	0.365	0.275	1.788	0.653	0.928	15	0.0015	2.1
1A-2					8.4	50.4						8.4	50.4	204.7	1228.2	0.381	0.287	1.785	0.680	0.966	15	0.0015	2.1
1A-1					21.6	129.6						21.6	129.6	226.3	1357.8	0.421	0.317	1.776	0.748	1.064	15	0.0015	2.2
1B					50.7	304.2						50.7	304.2	50.7	304.2	0.094	0.071	1.900	0.179	0.250	8	0.0035	2.1
1												0.0	0.0	1663.2	15962.0	4.948	2.328	1.550	7.671	9.999	30	0.0015	3.7
1-ZIN												0.0	0.0	1663.2	15962.0	4.948	2.328	1.550	7.671	9.999	21	0.0125	8.3
∑Ac	502.4		185.9		446.0		351.9		149.9			1636.1											
∑ESD		3014.4		1115.4		2676.0		2246.5		899.4	5847.7		15799.4										

LEVEL 2 / LEVEL 3 SEWER STUDY EXHIBT FOR

SOUTH MATHER DEVELOPMENT & ZINFANDEL DR EXTENSION

MATHER KIEFER TRUNK SHED

COUNTY OF SACRAMENTO **CALIFORNIA**

JULY 2010
(REVISED SEPTEMBER 9, 2013)

400' 200' 0 400' 800'

SCALE: 1" = 400'

LEGEND

- 278' @ 8"S, S=0.0018 — PIPE LENGTH / PROPOSED SEWER PIPE (INCHES) / PIPE SLOPE
- INV=154.59, RIM=61.5, D=13.1 — PIPE INVERT / MANHOLE RIM ELEV. / DEPTH (*BASE ON NAVO 88 DATUM)
- PROPOSED SEWER MANHOLE
- MINOR SHED BOUNDARY
- MAJOR SHED BOUNDARY (MAE)
- AREA POTENTIALLY REQUIRING PUMP STATION
- EXISTING SEWER LIFT STATION
- POTENTIAL FUTURE SEWER LIFT STATION
- CREEK CROSSING LOCATION
- 1 / A =0.00 ac. / ΣA =19.9 ac. / ESD=0 / ΣESD =108 / Q =0.09 mgd PWWF — NODE NUMBER / POINT ACREAGE / CUMULATIVE ACREAGE / POINT ESD / CUMULATIVE ESD / PEAK WET WEATHER FLOW (MGD)

FIGURE 3

\\SACFILE01\Jobs\Jobs\8424.001_Zinfandel-Dr-Extension\Zinfandel-Dr-Extension-OA\Civil\Exhibits\C-EXH-ZNF-SWR-STDY.dwg 9/27/2013 8:11 AM Kyle Fredrich

LEVEL 3 SEWER STUDY EXHIBT FOR

SOUTH MATHER DEVELOPMENT & ZINFANDEL DR EXTENSION

MATHER KIEFER TRUNK SHED

COUNTY OF SACRAMENTO CALIFORNIA

JULY 2010
(REVISED SEPTEMBER 9, 2013)

LEGEND

- 278' @ 8"S S=0.0018 — PIPE LENGTH / PROPOSED SEWER PIPE (INCHES) / PIPE SLOPE
- INV=154.59 RIM=161.5 D=13.1 — PIPE INVERT / MANHOLE RIM ELEV. / DEPTH
- PROPOSED SEWER MANHOLE
- MINOR SHED BOUNDARY
- MAJOR SHED BOUNDARY (MAE)
- AREA POTENTIALLY REQUIRING PUMP STATION
- EXISTING SEWER LIFT STATION
- POTENTIAL FUTURE SEWER LIFT STATION
- CREEK CROSSING LOCATION
- NODE NUMBER / POINT ACREAGE / CUMULATIVE ACREAGE / POINT ESD / CUMULATIVE ESD / PEAK WET WEATHER FLOW (MGD)

SCALE: 1" = 100'

EXISTING BRADSHAW INTERCEPTOR

FUTURE MATHER INTERCEPTOR

UPPER MORRISON CREEK

ZINFANDEL DRIVE

MATHER BLVD

EXPIRED LANDFILL SITE

FOLSOM SOUTH CANAL

DOUGLAS ROAD

EAGLES NEST ROAD

MATCH LINE - SEE THIS SHEET

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3301 C St, Bldg. 100-B Tel 916.341.7760
Sacramento, CA 95816 Fax 916.341.7767

FIGURE 4

MATHER SOUTH SEWER SUMMARY By Parcel 2/20/2017

PARCEL	LAND USE	UNITS	DENSITY	ACRES	PER PHASE	ESD/Ac	Factor	ESD	PER PHASE
PHASE 1									
PA1	RESIDENTIAL 10 du/ac	94	10.00	9.39		10	100%	93.9	
PA2	RESIDENTIAL 5 du/ac	158	5.30	29.80		5	100%	149	
PA3	RESIDENTIAL 8 du/ac	123	8.00	15.38		8	100%	123.04	
PA4	RESIDENTIAL 7 du/ac	125	7.40	16.95		7	100%	118.65	
PA5	RESIDENTIAL 5 du/ac	127	5.80	21.85		5	100%	109.25	
PA6	RESIDENTIAL 6 du/ac	116	6.60	16.74		6	100%	100.44	
EC	ENVIRONMENTAL CAMPUS	200	0.00	27.90	**943 units**	6	100%	167.4	
					115.11 acres				
SP1	SCHOOL	0	0.00	12.21		6	100%	73.26	
PARK 1	PARK	0	0.00	4.55		6	100%	27.3	
PARK 2	PARK	0	0.00	7.03		6	100%	42.18	
CC	COMMUNITY CENTER	0	0.00	5.80		6	100%	34.8	
B1	BASIN	0	0.00	16.25		6	100%	97.5	
B2	BASIN	0	0.00	8.05		6	100%	48.3	
OST4	OPEN SPACE TRAIL	0	0.00	1.51		6	100%	9.06	
OSMP1	MATHER PRESERVE	0	0.00	23.34		0	100%	0	
OSD2	OPEN SPACE DRAIN	0	0.00	4.16		6	100%	24.96	
OSD6	OPEN SPACE DRAIN	0	0.00	6.87		6	100%	41.22	
OSD7	OPEN SPACE DRAIN	0	0.00	5.21		6	100%	31.26	
OSD8	OPEN SPACE DRAIN	0	0.00	2.66		6	100%	15.96	
	ROAD	0	0.00	15.94		6	100%	95.64	
	ROAD	0	0.00	1.96		**6**	100%	11.76	
ZIN PTN	ROAD	0	0.00	8.91		0	100%	0	
					262.46 acres				**1415 ESD**
PHASE 2									
PA7	RESIDENTIAL 5 du/ac	112	5.80	19.38		5	100%	96.9	
PA8	RESIDENTIAL 10 du/ac	183	10.00	18.31		10	100%	183.1	
PA9	RESIDENTIAL 8 du/ac	121	8.00	15.08		8	100%	120.64	
PA10	RESIDENTIAL 5 du/ac	102	5.30	20.50		5	100%	102.5	
PA11	RESIDENTIAL 6 du/ac	128	6.60	19.37	**853 units**	6	100%	116.22	
PA12	RESIDENTIAL 7 du/ac	207	7.40	28.04	**120.68 acres**	7	100%	196.28	
PARK 3	PARK	0	0.00	4.95		6	100%	29.7	
PUB	PUBLIC	0	0.00	5.27		6	100%	31.62	
OST1	OPEN SPACE TRAIL	0	0.00	6.71		6	100%	40.26	
	ROAD	0	0.00	6.82		6	100%	40.92	
					144.43 acres				**958 ESD**
PHASE 3									
PA13	RESIDENTIAL 20 du/ac	347	20.00	17.36		20	75%	347.2	
PA14	RESIDENTIAL 10 du/ac	104	10.00	10.37		10	100%	103.7	
PA15	RESIDENTIAL 7 du/ac	149	7.40	20.09		7	100%	140.63	
PA16	RESIDENTIAL 6 du/ac	66	6.50	10.15		6	100%	60.9	
PA17a	RESIDENTIAL 5 du/ac	90	5.80	15.52	**846 units**	5	100%	77.6	
PA17b	RESIDENTIAL 5 du/ac	90	5.30	17.05	**90.54 acres**	5	100%	85.25	
COMM1	COMMERCIAL/RETAIL	0	0.00	17.96		6	100%	107.76	
SP2	SCHOOL	0	0.00	9.98		6	100%	59.88	
PARK 4	PARK	0	0.00	22.48		6	100%	134.88	
B3	BASIN	0	0.00	3.24		6	100%	19.44	
B4	BASIN	0	0.00	3.03		6	100%	18.18	
B5	BASIN	0	0.00	3.29		6	100%	19.74	
B6	BASIN	0	0.00	4.29		6	100%	25.74	
OST2	OPEN SPACE TRAIL	0	0.00	2.92		6	100%	17.52	
OST5	OPEN SPACE TRAIL	0	0.00	1.10		6	100%	6.6	
OSD1	OPEN SPACE DRAIN	0	0.00	8.95		6	100%	53.7	
OSD3	OPEN SPACE DRAIN	0	0.00	2.82		6	100%	16.92	
OSD5	OPEN SPACE DRAIN	0	0.00	4.56		**6**	100%	27.36	
OSMP3	MATHER PRESERVE	0	0.00	53.16		0	100%	0	
	ROAD	0	0.00	5.93		6	100%	35.58	
	ROAD	0	0.00	1.84		6	100%	11.04	
ZIN PTN	ROAD	0	0.00	5.15		0	100%	0	
					241.24 acres				**1370 ESD**
PHASE 4									
PA18a	RESIDENTIAL 5 du/ac	82	5.80	14.20		5	100%	71	
PA18b	RESIDENTIAL 5 du/ac	87	5.30	16.36		5	100%	81.8	
PA19	RESIDENTIAL 7 du/ac	147	7.40	19.81		7	100%	138.67	
PA20	RESIDENTIAL 6 du/ac	166	6.60	25.12		6	100%	150.72	
PA21	RESIDENTIAL 10 du/ac	69	10.00	6.87		10	100%	68.7	
PA22	RESIDENTIAL 8 du/ac	95	8.00	11.84	**879 units**	8	100%	94.72	
PA23	RESIDENTIAL 20 du/ac	234	20.00	11.71	**105.91 acres**	20	75%	234.2	
COMM2	COMMERCIAL/RETAIL	0	0.00	3.10		6	100%	18.6	
U1	RESEARCH AND DEVELOPMENT	0	0.00	21.35		6	100%	128.1	
PARK 5	PARK	0	0.00	5.02		6	100%	30.12	
B7	BASIN	0	0.00	3.07		6	100%	18.42	
B8	BASIN	0	0.00	3.77		6	100%	22.62	
B9	BASIN	0	0.00	5.45		6	100%	32.7	
OST3	OPEN SPACE TRAIL	0	0.00	1.24		6	100%	7.44	
OSD4	OPEN SPACE DRAIN	0	0.00	6.97		6	100%	41.82	
OSD9	OPEN SPACE DRAIN	0	0.00	13.37		6	100%	80.22	
OSMP2	MATHER PRESERVE	0	0.00	9.66		0	100%	0	
L1	LANDSCAPE CORRIDOR	0	0.00	3.06		6	100%	18.36	
L2	LANDSCAPE CORRIDOR	0	0.00	1.07		**6**	100%	6.42	
L3	LANDSCAPE CORRIDOR	0	0.00	0.72		6	100%	4.32	
	ROAD	0	0.00	9.31		6	100%	55.86	
ZIN PTN	ROAD	0	0.00	7.11		0	100%	0	**1305 ESD**
					200.18				
TOTALS		**3,522**	**4.09**	**848.31**		**Total ESD**		**5047**	
	Residential Units/Acres - Net Density	**3,522**	**8.15**	**432.24**					

HDR to Overall Units Ratio

HDR Units	**781**
Overall Units	**3,522**
Ratio	**22.2%**

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Mather South

TRUNK SANITARY SEWER- EXHIBIT A

Residential & Mixed Use

Sacramento County, CA.

Full Size Scale: 1"= 600'

January, 2017

MACKAY & SOMPS
ENGINEERS PLANNERS SURVEYORS
1552 Eureka Road, Suite 100, Roseville, CA 95661 (916) 773-1189

Douglas Rd.

Legend

- Sanitary Sewer Pipe
- Future Sanitary Sewer Pipe (By Others)
- Basin
- Commercial / Retail
- Community Center
- Environmental Campus
- Landscape Corridor
- Mather Preserve
- Open Space Drain
- Open Space Trail
- Park
- Public
- Research and Development
- Residential 5 du/ac
- Residential 6 du/ac
- Residential 7 du/ac
- Residential 8 du/ac
- Residential 10 du/ac
- Residential 20 du/ac
- Road
- School
- Sports Park

MATHER LAKE

PHASE 2

PHASE 1

PHASE 3

8"SS

10"SS

15"SS

24"SS

27"SS

Folsom South Canal

Sunrise Blvd.

Zinfandel D

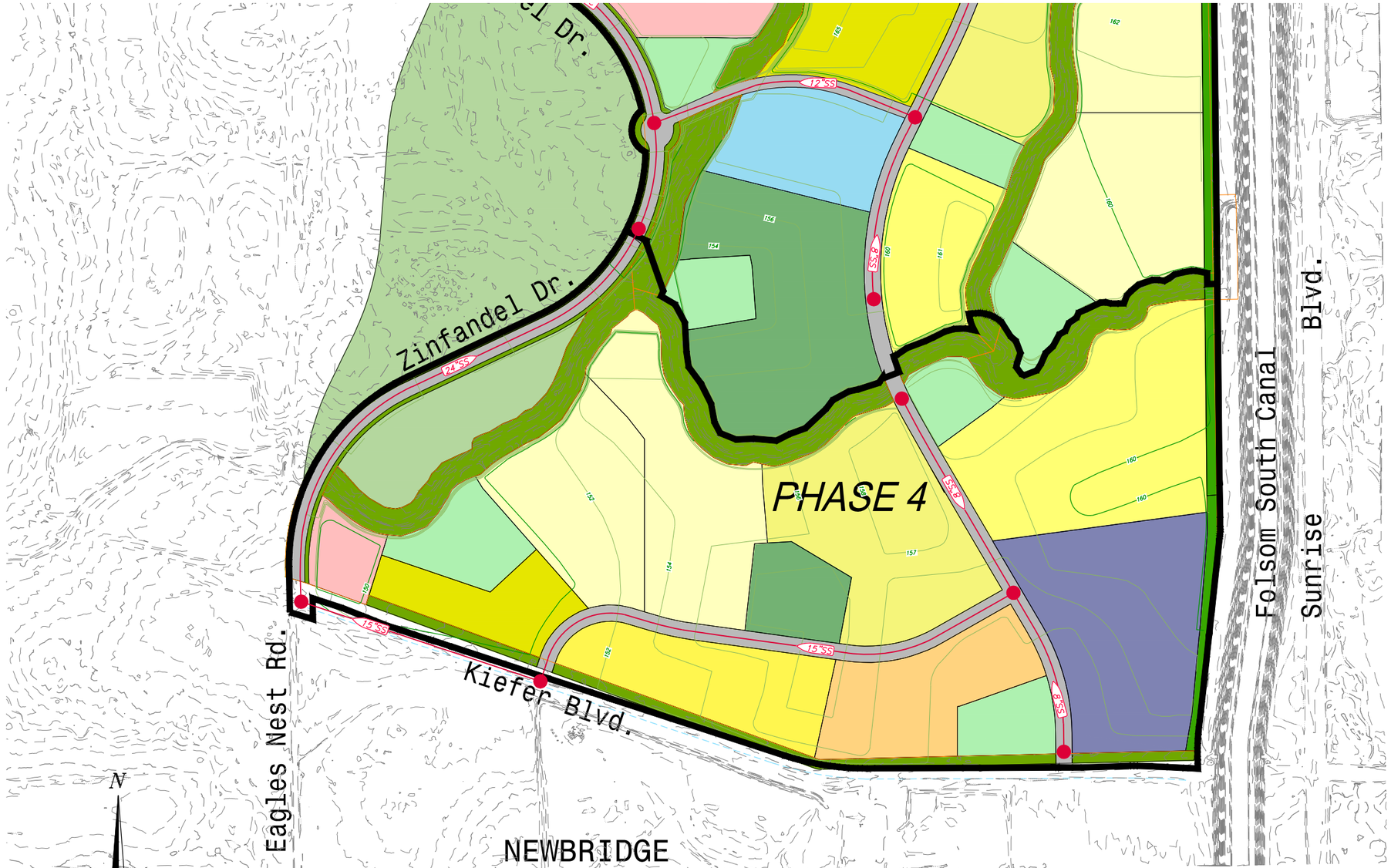
N

0 300 600 1200

SCALE: 1"=600'

PRELIMINARY - Subject to Revision

[1] P:\27082\MstrPln\bases\EX Contours.dwg [2] P:\27082\MstrPln\sd\2016\bases\MthrSth-Contours.dwg [3] P:\27082\Admin\Estimates\Backbone CIP\Exhibits\Sewer.dwg
1-25-2018 07:01:46 jbarnes P:\27082\Admin\Estimates\Backbone CIP\Exhibits\Exhibit Base\Phasing Bndy.dwg [4] P:\27082\MstrPln\sd\2017 Spring\bases\MS - Landplan.dwg



Legend

- Sanitary Sewer Pipe
- Future Sanitary Sewer Pipe (By Others)
- Basin
- Commercial / Retail
- Community Center
- Environmental Campus
- Landscape Corridor
- Mather Preserve
- Open Space Drain
- Open Space Trail
- Park
- Public
- Research and Development
- Residential 5 du/ac
- Residential 6 du/ac
- Residential 7 du/ac
- Residential 8 du/ac
- Residential 10 du/ac
- Residential 20 du/ac
- Road
- School
- Sports Park

Mather South

TRUNK SANITARY SEWER- EXHIBIT B
SPORTS PARK AND UNIVERSITY

Sacramento County, CA.

Full Size Scale: 1"= 600' *January, 2017*

MACKAY & SOMPS
ENGINEERS PLANNERS SURVEYORS
1552 Eureka Road, Suite 100, Roseville, CA 95661 (916) 773-1189

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PRELIMINARY - Subject to Revision

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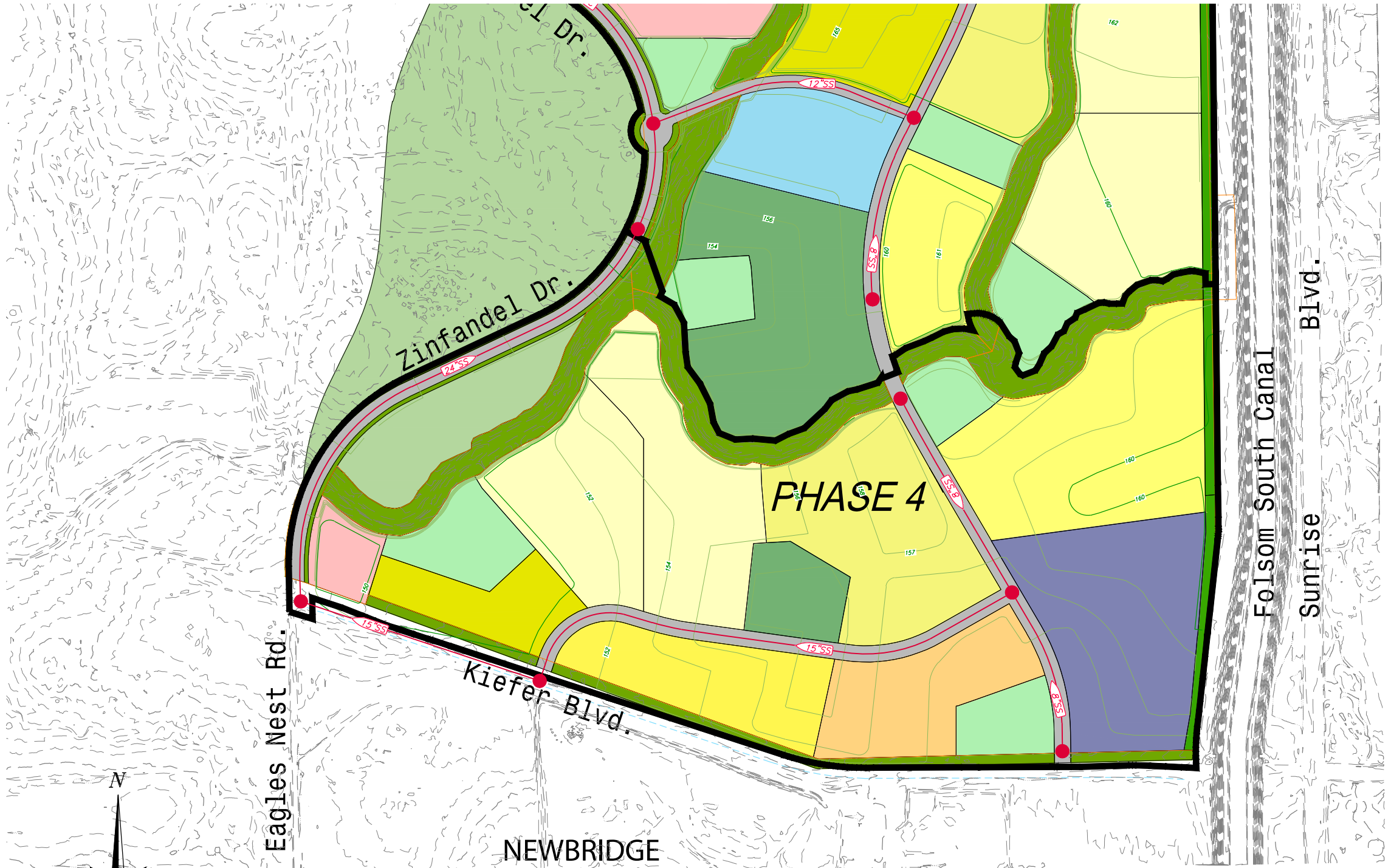

Legend

- Sanitary Sewer Pipe
- Future Sanitary Sewer Pipe (By Others)
- Basin
- Commercial / Retail
- Community Center
- Environmental Campus
- Landscape Corridor
- Mather Preserve
- Open Space Drain
- Open Space Trail
- Park
- Public
- Research and Development
- Residential 5 du/ac
- Residential 6 du/ac
- Residential 7 du/ac
- Residential 8 du/ac
- Residential 10 du/ac
- Residential 20 du/ac
- Road
- School

Mather South

TRUNK SANITARY SEWER- EXHIBIT B

Sacramento County, CA.

Full Size Scale: 1"= 600' *January, 2017*

MACKAY & SOMPS
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PRELIMINARY - Subject to Revision

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