

APPENDIX C

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STORM DRAINAGE PIPE CALCULATIONS



NORTH VINEYARD STATION SPECIFIC PLAN

DRAINAGE MASTER PLAN  
UPDATE AND PHASING

TRUNK DRAINAGE PIPE CALCULATIONS

From Node	To Node	Land Use										Total						Cumulative Total								
		Residential					Multi-Family Residential					Other	Residential Area (acres)	Multi-Family Residential Area * 1 (acres)	Other Area (acres)	Cum. Area (acres)	Residential Area (acres)	Multi-Family Residential Area (acres)	Other Area (acres)	Multi-Family Residential Area * 1 (acres)	Other Area (acres)	Multi-Family Residential Average 1 (cfs)	Cr (cfs)	Cc (cfs)	Cm (cfs)	Note Zone 3 Qdesign (cfs)
		Area (acres)	Area * 1 (acres)	Area * 1 (acres)	Area * 1 (acres)	Area * 1 (acres)	Area (acres)	Area * 1 (acres)	Area * 1 (acres)	Area * 1 (acres)	Area * 1 (acres)															
G4	G2	AFR-2, RD-5, PARK, O.S. RD-7 & SCHOOL I= 60 MFR 14-22 I= 80 COM. BP, TRANSIT CENTER, RXR, MAJOR ROADS, PUBLIC SERVICES	16.8	4.8	288	2.0	140	0.3	24		21.6	16.8	4.8	288	4.7	21.6	16.8	4.8	288.0	4.8	60	4.1	10.9	5.8	4.5	
G3	G2		29.2								31.5	29.2	2.3	164		53.1	46.0	7.1	452	7.1	64	12.0	26.5	17.0	12.7	
G21	G2		19.2								23.9	19.2		66		23.9	19.2		47		53	4.7	12.0	4.7	6.1	
G2	G1		8.5	1.1			1.5				11.1	3.3	2.6	86		88.1	73.7	9.7	518	9.7	53	25.0	40.0	26.3	25.9	
TOTALS			73.7	5.9		2.0		1.8		88.1	73.7	9.7		4.7	88.1	73.7	9.7	4.7		9.7						

1. Based on Sacramento County Improvement Standards Dated June 1, 1989



**NORTH VINEYARD STATION SPECIFIC PLAN**

**DRAINAGE MASTER PLAN  
UPDATE AND PHASING**

**TRUNK DRAINAGE PIPE CALCULATIONS**

From Node	To Node	Land Use						Total						Cumulative Total										
		Residential Area (acres)	RD-7 & SCHOOL Area (acres)	MDR 7-14 Area (acres)	MFR 14-22 Area (acres)	Other Area (acres)	Multi-Family Residential Area (acres)	Residential Area (acres)	Multi-Family Residential Area (acres)	Other Area (acres)	Multi-Family Residential Area (acres)	Residential Area (acres)	Cum. Area (acres)	Other Area (acres)	Multi-Family Residential Area (acres)	Residential Area (acres)	Multi-Family Residential Area (acres)	Other Area (acres)	Multi-Family Residential Area (acres)	Residential Area (acres)	Cum. Qm (cfs)	Note Zone 3 Qdesign' (cfs)		
HL4	HL3	24.7						24.7	24.7							24.7	24.7				24.7	24.7	4.8	4.8
HL3	HL2	16.5						18.8	16.5						16.5	43.5	2.3				16.5	43.5	9.2	9.2
HL2	HL1	13.5						13.5	13.5						57.0	57.0	2.3				57.0	57.0	12.5	13.1
TOTALS		54.7						57.0	54.7						57.0	57.0	2.3				54.7	57.0	27.0	12.5

1. Based on Sacramento County Improvement Standards Dated June 1, 1999



**NORTH VINEYARD STATION SPECIFIC PLAN**

**DRAINAGE MASTER PLAN  
UPDATE AND PHASING**

**TRUNK DRAINAGE PIPE CALCULATIONS**

From Node	To Node	Land Use										Cumulative Total											
		Residential					Other					Multi-Family Residential Area *1 (acres)	Other Residential Area *1 (acres)	Multi-Family Residential Area (acres)	Other Residential Area (acres)	Cum. Area (acres)	Multi-Family Residential Area *1 (cfs)	Other Residential Area *1 (cfs)	Multi-Family Residential Average *1 (cfs)	Total (cfs)			
		Area (acres)	Area *1 (acres)	Area *1 (cfs)	Area (acres)	Area *1 (cfs)	Area (acres)	Area *1 (cfs)	Area (acres)	Area *1 (cfs)	Area (acres)										Area *1 (cfs)		
NA	AF-2, RD-5, PARK, O.S.	30.5					30.5									30.5						6.0	6.0
A10		26.1					26.1									56.6						13.0	13.0
A9		22.1					22.1									78.7						20.0	20.0
A8		27.2					27.2									105.9						32.0	32.0
A7		27.7					27.7									133.6						48.0	48.0
A6		17.9					17.9									151.5						60.0	60.0
A5		15.8					15.8									167.1						75.0	75.0
A4		14.9					14.9									182.0						80.0	80.0
A3		8.0					8.0									190.0						88	88
TOTALS		190.0					190.0									190.0						95	95

1. Based on Sacramento County Improvement Standards Dated June 1, 1999

NORTH VINEYARD STATION SPECIFIC PLAN

DRAINAGE MASTER PLAN  
UPDATE AND PHASING

TRUNK DRAINAGE PIPE CALCULATIONS

From Node	To Node	Land Use				Cumulative Total																	
		Multi-Family Residential			Other	Total					Cumulative Total												
		Residential Area (acres)	RD-7 & SCHOOL Area (acres)	MDR 7-14 Area (acres)	MFR 14-22 Area (acres)	Area (acres)	Residential Area (acres)	Multi-Family Residential Area (acres)	Multi-Family Residential Area (acres)	Other Area (acres)	Cum. Area (acres)	Residential Area (acres)	Multi-Family Residential Area (acres)	Multi-Family Residential Area (acres)	Other Area (acres)	Multi-Family Residential Area (acres)	Multi-Family Residential Area (acres)	Other Area (acres)	Cum. (cfs)	Co (cfs)	Cr (cfs)	Zone 3 Qdesign' (cfs)	
NA	AR-2, RD-5, PARK, C.S.	37.3				37.3					37.3								37.3				7.8
C8		24.5				24.5					61.8								61.8				14.5
C7		7.4				7.4					69.2								69.2				20.4
C6		62.1				62.1					131.3								131.3				52.2
C5		62.1	8.6			70.7					139.9								139.9				52.2
C5		62.1				62.1	516				578.1								578.1				52.2
C5		23.0	2.0	120		125.0					154.9								154.9				14.5
C4		29.0	6.8	408		443.8					163.3								163.3				65.2
C4		19.8	6.3	378		245.9					183.3								183.3				83.1
C3					272						203.1								203.1				95.9
TOTALS		203.1	23.7	1.7	3.4	231.9					203.1	28.8							231.9				

1. Based on Sacramento County Improvement Standards Dated June 1, 1999







NORTH VINEYARD STATION SPECIFIC PLAN

DRAINAGE MASTER PLAN  
UPDATE AND PHASING

TRUNK DRAINAGE PIPE CALCULATIONS

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft msl)	U/S check1	D/S Flowline (ft msl)	D/S check1	Hydraulic Slope	U/S check2	U/S HGL (ft msl)	D/S HGL (ft msl)
A10	A9	2	13.0	30	0.97	2.19	2.81	700	0.0014	61.2	63.43	60.3	62.45	0.0015	66.11	66.11	65.06
A9	A8	1C	20.0	36	0.92	2.48	3.12	530	0.0014	60.3	62.74	59.5	62.00	0.0015	65.06	65.06	64.29
A8	A7	1C	32.0	48	0.91	3.30	2.86	1,090	0.0008	59.5	62.83	58.7	61.95	0.0008	64.29	64.29	63.39
A7	A6	1C	48.0	48	0.95	3.40	4.20	1,090	0.0017	58.7	62.05	56.8	60.20	0.0018	63.39	63.39	61.43
A6	A5	1C	60.0	54	0.94	3.83	4.12	700	0.0014	56.8	60.63	55.8	59.65	0.0015	61.43	61.43	60.40
A5	A4	1C	75.0	60	0.89	4.00	4.36	670	0.0014	55.8	59.82	54.9	58.88	0.0014	60.40	60.40	59.43
A4	A3	1C	80.0	66	0.91	4.54	3.75	420	0.0009	54.9	59.42	54.5	59.04	0.0009	59.43	59.43	59.04
A3	A1	1C	87.5	66	0.80	4.13	4.50	360	0.0014	54.5	58.63	54.0	58.13	0.0014	58.63	58.63	58.13
Basin G46																	56.4

**NORTH VINEYARD STATION SPECIFIC PLAN**

**DRAINAGE MASTER PLAN  
UPDATE AND PHASING**

**TRUNK DRAINAGE PIPE CALCULATIONS**

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft. msl)	U/S check1	D/S Flowline (ft. msl)	D/S check1	Hydraulic Slope	U/S check2	U/S HGL (ft. msl)	D/S HGL (ft. msl)
B7	B6	IC	10.0	27	0.96	1.97	2.71	550	0.0015	62.3	64.23	61.4	63.41	0.0016	64.73	64.73	63.84
B6	B5	IC	15.0	30	0.99	2.25	3.20	950	0.0018	61.2	63.44	59.5	61.73	0.0020	63.84	63.84	61.98
B5	B4	IC	20.0	36	1.00	3.00	2.84	870	0.0012	59.0	61.98	57.9	60.93	0.0012	61.98	61.98	60.93
B4	B3	IC	27.0	36	0.99	2.70	4.00	670	0.0022	57.9	60.63	56.5	59.16	0.0024	60.80	60.80	59.19
B3	B2	IC	30.0	42	0.99	3.15	3.27	800	0.0012	56.0	59.11	55.0	58.15	0.0013	59.19	59.19	58.15
Basin G46																	56.4

NORTH VINEYARD STATION SPECIFIC PLAN

DRAINAGE MASTER PLAN  
UPDATE AND PHASING

TRUNK DRAINAGE PIPE CALCULATIONS

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft msl)	U/S ccheck1	D/S Flowline (ft msl)	D/S check1	Hydraulic Slope	U/S ccheck2	U/S HGL (ft msl)	D/S HGL (ft msl)
C8	C7	2	14.5	30	0.91	2.06	3.31	800	0.0020	59.5	61.56	57.9	59.96	0.00208	61.63	61.56	59.96
C7	C6	1C	20.4	36	0.91	2.48	3.23	1,005	0.0015	57.4	59.88	55.9	58.37	0.00156	59.94	59.88	58.37
C6	C5	1C	52.2	54	0.97	3.94	3.51	720	0.0010	54.4	58.33	53.7	57.61	0.00107	58.38	58.33	57.61
C51	C5	2	14.5	30	0.96	2.19	3.18	1,650	0.0018	56.6	58.83	53.7	55.86	0.00193	58.83	58.83	57.42
C5	C4	1C	65.2	60	0.83	3.75	3.91	900	0.0012	53.7	57.42	52.6	56.34	0.00116	57.89	57.42	56.84
C4	C3	1C	83.1	60	0.95	4.25	4.58	660	0.0015	52.6	56.84	51.6	55.85	0.00158	56.84	56.84	56.40
C3	C4	1C	95.9	66	0.95	4.68	4.36	920	0.0012	51.1	55.78	50.0	54.68	0.00127	55.78	56.40	56.40
Gerber Creek																	

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**TRUNK DRAINAGE PIPE CALCULATIONS**

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft. msl)	U/S check1	D/S Flowline (ft. msl)	D/S check1	Hydraulic Slope	U/S check2	U/S HGL (ft. msl)	D/S HGL (ft. msl)
D10	D9	IB	11.4	30	0.97	2.19	2.49	180	0.0011	50.2	52.35	50.0	52.15	0.00118	55.25	55.04	55.04
D9	D8	IB	24.0	42	0.97	3.06	2.65	525	0.0008	49.0	52.03	48.5	51.61	0.00086	55.04	55.04	54.59
D8	D7	IB	30.8	48	0.87	3.20	2.84	900	0.0008	48.0	51.25	47.3	50.53	0.00082	54.59	54.59	53.85
D7	D6	IB	45.0	48	0.93	3.40	3.94	490	0.0015	47.3	50.73	46.6	49.99	0.00158	53.85	53.85	53.07
D6	D5	IB	53.8	54	1.00	4.50	3.40	1,250	0.0010	46.1	50.59	44.8	49.34	0.00100	53.07	53.07	51.82
D5	D4	IA	59.8	60	0.84	3.88	3.63	580	0.0010	44.3	48.22	43.8	47.64	0.00099	51.82	51.82	51.24
D4	D3	IA	70.7	60	0.90	4.13	4.06	1,000	0.0012	43.8	47.89	42.6	46.69	0.00125	51.24	51.24	49.99
D3	D1	IA	80.9	60	0.99	4.50	4.32	1,200	0.0013	42.6	47.06	41.0	45.50	0.00141	49.99	49.99	48.30
Detention Pond E26																	

**NORTH VINEYARD STATION SPECIFIC PLAN**

**DRAINAGE MASTER PLAN  
UPDATE AND PHASING**

**TRUNK DRAINAGE PIPE CALCULATIONS**

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft msl)	U/S check1	D/S Flowline (ft msl)	D/S check1	Hydraulic Slope	U/S check2	U/S HGL (ft msl)	D/S HGL (ft msl)
E5	E4	2	8.8	27	0.99	2.03	2.34	800	0.0011	41.6	43.60	40.7	42.72	0.00120	44.52	44.52	43.57
E4	E3	2	15.1	30	0.95	2.13	3.33	800	0.0020	40.4	42.57	38.8	40.97	0.00211	43.57	43.57	41.88
E3	E2	2	22.0	42	0.80	2.63	2.82	1,000	0.0010	37.8	40.47	36.8	39.47	0.00096	41.88	41.88	40.91
E2	E1	2	30.0	42	0.99	3.15	3.27	700	0.0012	36.8	39.99	36.0	39.15	0.00130	40.91	40.91	40.00
TO E24A																	

NORTH VINEYARD STATION SPECIFIC PLAN

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TRUNK DRAINAGE PIPE CALCULATIONS

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft. msl)	U/S check1 (ft. msl)	D/S Flowline (ft. msl)	D/S check1 (ft. msl)	Hydraulic Slope	U/S check2 (ft. msl)	U/S HGL (ft. msl)	D/S HGL (ft. msl)
F8	F7		16.8	36	0.91	2.48	2.64	780	0.0010	48.8	51.28	48.0	50.50	0.00104	51.66	51.66	50.85
F7	F6		22.8	36	0.98	2.63	3.39	510	0.0016	48.0	50.65	47.2	49.83	0.00171	50.85	50.85	49.98
F6	F5		28.2	42	0.97	3.06	3.11	1,050	0.0011	46.7	49.77	45.6	48.61	0.00118	49.98	49.98	48.74
F4	F5		7.0	24	0.80	1.50	2.74	535	0.0020	48.1	49.62	47.1	48.55	0.00193	49.77	49.77	48.74
F5	F3		48.0	48	0.99	3.60	4.00	700	0.0015	45.1	48.65	44.0	47.60	0.00163	48.74	48.74	47.60
G41	F21		16.9	36	0.92	2.48	2.64	940	0.0010	45.9	48.42	45.0	47.48	0.00104	48.45	48.45	47.48
F22	G41																47



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TRUNK DRAINAGE PIPE CALCULATIONS

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft msl)	U/S check1	D/S Flowline (ft msl)	D/S check1	Hydraulic Slope	U/S check2	U/S HGL (ft msl)	D/S HGL (ft msl)
G6	G5	IB	4.0	24	0.53	1.15	2.09	800	0.0015	49.2	50.38	48.0	49.18	0.00112	51.59	50.70	
G5	G4	IB	6.1	24	0.81	1.50	2.38	900	0.0015	48.0	49.53	46.7	48.18	0.00145	50.87	49.56	
G4	G3	IB	9.0	30	0.63	1.56	2.61	1,370	0.0016	46.2	47.74	44.0	45.55	0.00130	50.70	48.93	
G31	G3*	1A	4.5	24	0.72	1.40	1.88	700	0.0010	45.2	46.59	44.5	45.89	0.00091	49.56	48.93	
G3	G2	1A	21.7	42	0.78	2.54	2.77	670	0.0010	43.0	45.53	42.3	44.86	0.00094	48.93	48.30	
G21	G2	1A	6.1	24	0.99	1.80	2.06	500	0.0010	44.3	46.12	43.8	45.62	0.00109	48.84	48.30	
G2	G1	1A	35.5	54	1.04	4.28	2.21	550	0.0004	41.3	45.60	41.1	45.38	0.00043	48.53	48.30	
Detention Pond E26																	

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**TRUNK DRAINAGE PIPE CALCULATIONS**

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft msl)	U/S check1 (ft msl)	D/S Flowline (ft msl)	D/S check1 (ft msl)	Hydraulic Slope	U/S check2 (ft msl)	U/S HGL (ft msl)	D/S HGL (ft msl)
K2	K3		3.0	18	0.60	0.90	2.49	422	0.0030	44.6	45.48	43.3	44.22	0.00234	45.20	45.48	44.22
K3	K4		10.0	30	0.72	1.75	2.67	292	0.0015	42.3	44.07	41.9	43.63	0.00136	44.10	44.10	43.70
K4	K5		12.0	36	0.85	2.33	2.00	263	0.0006	41.4	43.70	41.2	43.55	0.00060	43.70	43.70	43.55
K5	K6		12.0	36	0.85	2.33	2.00	266	0.0006	41.2	43.55	41.1	43.39	0.00060	43.55	43.55	43.39
K6	K7		12.0	36	0.85	2.33	2.00	433	0.0006	41.1	43.39	40.8	43.13	0.00060	43.39	43.39	43.13
K7	K8		25.5	48	0.83	3.00	2.38	670	0.0006	39.8	42.80	39.4	42.40	0.00058	42.79	42.80	42.40
K7	to E24B																41.6

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**TRUNK DRAINAGE PIPE CALCULATIONS**

From Node	To Node	Phase	Pipe Design Flow (cfs)	Pipe Diam. (in)	Q/Q (full)	depth (ft)	velocity (fps)	Pipe Length (ft)	Pipe Slope	U/S Flowline (ft msl)	U/S check1 (ft msl)	D/S Flowline (ft msl)	D/S check1 (ft msl)	Hydraulic Slope	U/S check2 (ft msl)	U/S HGL (ft msl)	D/S HGL (ft msl)
HL4	HL3		4.8	18	0.96	1.31	2.92	358	0.0030	43.5	44.84	42.5	43.76	0.00322	44.91	44.91	43.76
HL3	HL2		9.9	30	0.87	2.00	2.32	500	0.0010	41.5	43.45	41.0	42.95	0.00103	43.46	43.46	42.95
HL2	HL1		13.1	36	0.71	2.03	2.42	450	0.0010	40.5	42.48	40.0	42.03	0.00087	42.42	42.48	42.03
Basin E24B																	41.6