

DRAINAGE STUDY
FOR
VILLA DE VILLAGIO SUBDIVISION

FEBRUARY 10, 2003

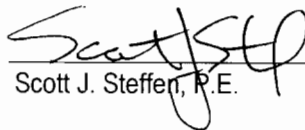
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TABLE OF CONTENTS

	page
I. INTRODUCTION	1
II. METHODOLOGY	1
III. EXISTING CONDITIONS	2
A. Topography	2
B. Existing Drainage Patterns	2
IV. PROPOSED CONDITIONS.....	3
A. Offsite Flows.....	3
B. Onsite Flows.....	3
C. FEMA Floodplain	4
V. CONCLUSION	4

APPENDICES

APPENDIX A - AHYMO INPUT, SUMMARY FILES

APPENDIX B - STREET CAPACITY ANALYSIS

APPENDIX C - STORM DRAIN AND INLET ANALYSIS

APPENDIX D - INFRASTRUCTURE LIST

PLATES

PLATE 1 - PRELIMINARY PLAT

PLATE 2 - GRADING PLAN

PLATE 3 - DEVELOPED CONDITIONS BASIN MAP

PLATE 4 - DEVELOPED CONDITIONS BASIN MAP FOR RIDGEVIEW, MONTEREY PARK,
AND THE UNSER/MCMAHON MASTER DRAINAGE STUDY

I. INTRODUCTION

This drainage study establishes a drainage management plan for the proposed development of the property legally described as Tract 'G', Village Center North. Villa de Villagio is approximately 13 acres of residential (R-2) land to be re-subdivided as the "Villa de Villagio Subdivision". The subject property is located on Albuquerque's northwest mesa, east of Unser Boulevard and north of McMahon Boulevard. (See vicinity map on the *Preliminary Plat* for location, **Plate 1**). Villa de Villagio is planned to consist of 95 single-family, residential dwellings.

This study provides hydrologic and hydraulic analysis and provides a drainage management plan as necessary to support the planned 95-unit development. More specifically, this report is submitted in conjunction with the preliminary plat application. Preliminary plat approval and grading plan approval is requested. Prior to final plat and building permit approvals of this project, the City of Albuquerque (COA) must approve final grading plans and work order construction plans.

II. METHODOLOGY

Existing and proposed site hydrological conditions were analyzed for the 100-year, 6-hour storm in accordance with the revised Section 22.2, Hydrology, of the Development Process Manual (DPM) for the City of Albuquerque, dated January 1993. Street capacities were analyzed using Manning's equation, consistent with the revised DPM Section 22.2. All data and calculations supporting this study are located in *Appendix B*. The AHYMO computer program was utilized to determine peak flow rates for design of the storm drainage improvements within the project. The 100-year, 6-hour storm is used as the design event. The results are included in *Appendix A*.

III. EXISTING CONDITIONS

A. Topography

Villa de Villagio is currently undeveloped land, sloping from south to north with grades ranging from approximately 3% to 5%. Soils consist of deep, well-drained loamy fine sands typical of the West Mesa. Vegetation is light and consists mostly of native grasses and sand sagebrush.

B. Existing Drainage Patterns

Villa de Villagio is located within the Black Arroyo Drainage Basin and will indirectly discharge into the Black Arroyo. Adjacent properties and public roadways have been constructed which intercept much of the potential off-site runoff. Flows south of McMahon Boulevard will be conveyed through McMahon into the Unser Boulevard storm drain. The Ridgeview Subdivision to the north drains north into the Black Arroyo Boulevard storm drain. The Monterey Park Subdivision to the south is proposed to discharge east through the Stonebridge Subdivision (See *Developed Conditions Basin Map, Plate IV*). The Stonebridge Subdivision, to the east of Villa de Villagio, slopes in an easterly direction away from the proposed site. The remaining commercial and residential property to south and west of Villa de Villagio between Unser Boulevard and McMahon Boulevard currently drain undeveloped runoff through the property.

IV. PROPOSED CONDITIONS

Villa de Villagio Subdivision is a proposed single-family, detached-unit residential development with 95 lots on 13 acres, producing a density of approximately 7.3 dwelling units per acre. Proposed street configurations are shown on **Plate 1**, the *Preliminary Plat*. The drainage concepts for this property were presented in the "Master Drainage Study for the Unser/McMahon Area". This drainage report follows the approved concepts.

A. Offsite Flows

The commercial property directly west of Villa de Villagio has been granted fully developed discharge through the Ridgeview Subdivision by the approved Master Drainage Study. This runoff will be collected by a storm drain system in Pinnacle Peak Drive at Villagio Avenue. Villa de Villagio will accept 28.7 cfs from these commercial properties. The commercial properties to the south are restricted to historic flowrates per the approved Master Drainage Study. When these properties develop, detention ponds must be constructed to restrict the flow to 19.5 cfs. Villa de Villagio will extend a storm drain in Pinnacle Peak Drive to accept the restricted flows from these properties. See the *Developed Conditions Basin Map, Plate III*, for flowrates. A public storm drain system will convey the offsite flows through the Villa de Villagio subdivision, accept on-site flows, and discharge into the existing storm drain in the Ridgeview Subdivision. See the Ridgeview Subdivision, Monterey Park Subdivision and the Unser/McMahon Area master drainage study *Developed Conditions Basin Maps, Plate IV*, for approved drainage concepts of the adjacent offsite properties.

B. Onsite Flows

The internal street system conveys flow north and east to the Ridgeview Subdivision and ultimately to the Black Arroyo Storm Drain. The Ridgeview Subdivision extended a storm drain to its southern boundary to accommodate flow from Villa de Villagio. Analysis point #13 in the Master Drainage Study shows 92.3 cfs will be accepted from offsite basins to the Ridgeview Subdivision. This drainage plan proposes discharging 92.3 cfs (AP3 on the *Developed Conditions Basin Map, Plate III*) through a storm drain to

be built in the internal streets. A more detailed analysis of the storm drain is provided in *Appendix C*.

C. FEMA Floodplain

The property does not lie within a flood hazard zone, as designated on Panel 104 of 825 of the National Flood Insurance Program, Flood Insurance Rate Map published by FEMA for Bernalillo County, New Mexico (September 20, 1996). See the FEMA Floodplain exhibit provided at the end of the report text.

V. CONCLUSION

This report provides a detailed study of the developed runoff and street capacities for the proposed Villa de Villagio Subdivision. Included is the preliminary plat, proposed conditions basin map, grading plan, infrastructure list, and all necessary hydrologic and hydraulic analyses. This drainage plan maintains the overall drainage pattern of the area as proposed in "Unser/McMahon Drainage Master Plan", and allows for safe management of storm runoff in permanent as well as interim conditions.

VILLA DE VILLAGIO SUBDIVISION
Internal Street Capacity Calculations
December 9, 2002

1. Pizzo Drive

Basin 1 (See Basin Map)
 $S = 2.9\%$
 $Q = 3.5 \text{ cfs}$

Total flow from Basin 1 is 3.5 cfs. At 2.9%, a road with mountable curb can handle 10 cfs. Therefore, no inlets are needed. Roll curb will be placed along the entire length of Pizzo Drive. See PC stream output. Water flows into Saturnia Road.

2. Pizzo Drive

Basin 2 (See Basin Map)
 $S = 3.87\%$
 $Q = 2.2 \text{ cfs}$

Total flow from Basin 1 and 2 is 5.7 cfs. At 3.87%, a road with mountable curb can handle 8 cfs. Therefore, no inlets are needed. Roll curb will be placed along the entire length of Pizzo Drive. See PC stream output. Water flows into Saturnia Road.

3. Vicenza Drive

Basin 4 (See Basin Map)
 $S = 4\%$
 $Q = 5.1 \text{ cfs}$

At 4%, a road with mountable curb can handle 8 cfs. Therefore, no inlets are needed. Roll curb will be placed along the entire length of Vicenza Drive. See PC stream output. Water flows into Saturnia Road.

4. Arezzo Drive

Basin 6 (See Basin Map)
 $S = 4.16\%$
 $Q = 4.9 \text{ cfs}$

At 4.16%, a road with mountable curb can handle 8 cfs. Therefore, no inlets are needed. Roll curb will be placed along the entire length of Arezzo Drive. See PC stream output. Water flows into Saturnia Road.

5. Como Drive

Basin 8 (See Basin Map)

$S = 4\%$

$Q = 4.9 \text{ cfs}$

At 4%, a road with mountable curb can handle 8 cfs. Therefore, no inlets are needed. Roll curb will be placed along the entire length of Como Drive. See PC stream output. Water flows into Saturnia Road.

6. Saturnia Road

Basin 3 (See Basin Map)

$S = 2.61\%$

$Q = 1.7 \text{ cfs}$

Total flow in this basin is 12.5 cfs. At 2.61%, a road with standard curb can handle 30 cfs. Therefore, no inlets are needed. Standard curb will be placed along the entire length of Saturnia Road. See PC stream output. Water flows east into Firenze Drive.

7. Saturnia Road

Basin 5 (See Basin Map)

$S = 0.65\%$

$Q = 2.3 \text{ cfs}$

Total flow in this basin is 19.7 cfs. At 0.65%, a road with standard curb can handle 40 cfs. Therefore, no inlets are needed. Standard curb will be placed along the entire length of Saturnia Road. See PC stream output. Water flows east into Firenze Drive.

8. Saturnia Road

Basin 9 (See Basin Map)

$S = 1.48\%$

$Q = 2.0 \text{ cfs}$

Total flow in this basin is 28.9 cfs. At 1.48%, a road with standard curb can handle 37 cfs. Standard curb will be placed along the entire length of Saturnia Road. See PC stream output. Inlets will be placed at the east end of Saturnia Road. Water flows east into Firenze Drive.

9. Lito Road

Basin 12 (See Basin Map)

$S = 0.68\%$

$Q = 8.4$ cfs

Total flow in this basin is 8.4 cfs. At 0.68%, a road with mountable curb can handle 5 cfs. Therefore, standard curb will be placed at Lot 40. See PC stream output. Water flows east into Firenze Drive.

10. Lito Road

Basin 12 (See Basin Map)

$S = 0.84\%$

$Q = 8.4$ cfs

Total flow in this basin is 8.4 cfs. At 0.84%, a road with standard curb can handle 40 cfs. Therefore, no inlets are needed. See PC stream output. Water flows east into Firenze Drive.

11. Firenze Drive

Basin 10 (See Basin Map)

$S = 4.37\%$

$Q = 6.3$ cfs

Total flow in this basin is 14.7 cfs. At 4.37%, a road with standard curb can handle 24 cfs. However, inlets will be placed at the north end of Basin 10 to capture some of the flow before it reaches the stub terminus. See PC stream output. Water flows north into storm drain inlets. An analysis of the storm drain is included in the following appendix.

VILLA DE VILLAGIO SUBDIVISION
Storm Drain and Inlet Calculations
December 11, 2002

1. Pinnacle Peak Drive

S = 2.34%

Q = 12.2 cfs

Total flow from Basin 13, I, and J1 is 12.2 cfs. There is a proposed sump inlet to capture this flow and prevent any offsite surface flow from entering the site. During the 100-year storm event, the flow will be contained within the storm drain and will not exceed the top-of-curb height. See attached nomograph. When the property to the west of Villa de Villagio has been fully developed, the discharge from Basins I and J1 will be directly conveyed into the storm drain. The storm drain system for Villa de Villagio has been designed to accept fully developed flows from the properties to the west and flows generated onsite.

2. Saturnia Road

S = 1.48%

Q = 28.9 cfs

At the east end of Saturnia Road, the total flow in the street is 28.9 cfs. From the street hydraulic analysis, the depth of flow will be 0.48'. At this depth, the proposed inlet will accept 5.7 cfs. Therefore, 23.2 cfs will bypass and continue into the north stub terminus of Firenze Drive. See attached nomograph.

3. Firenze Drive

S = 4.37%

Q = 14.7 cfs

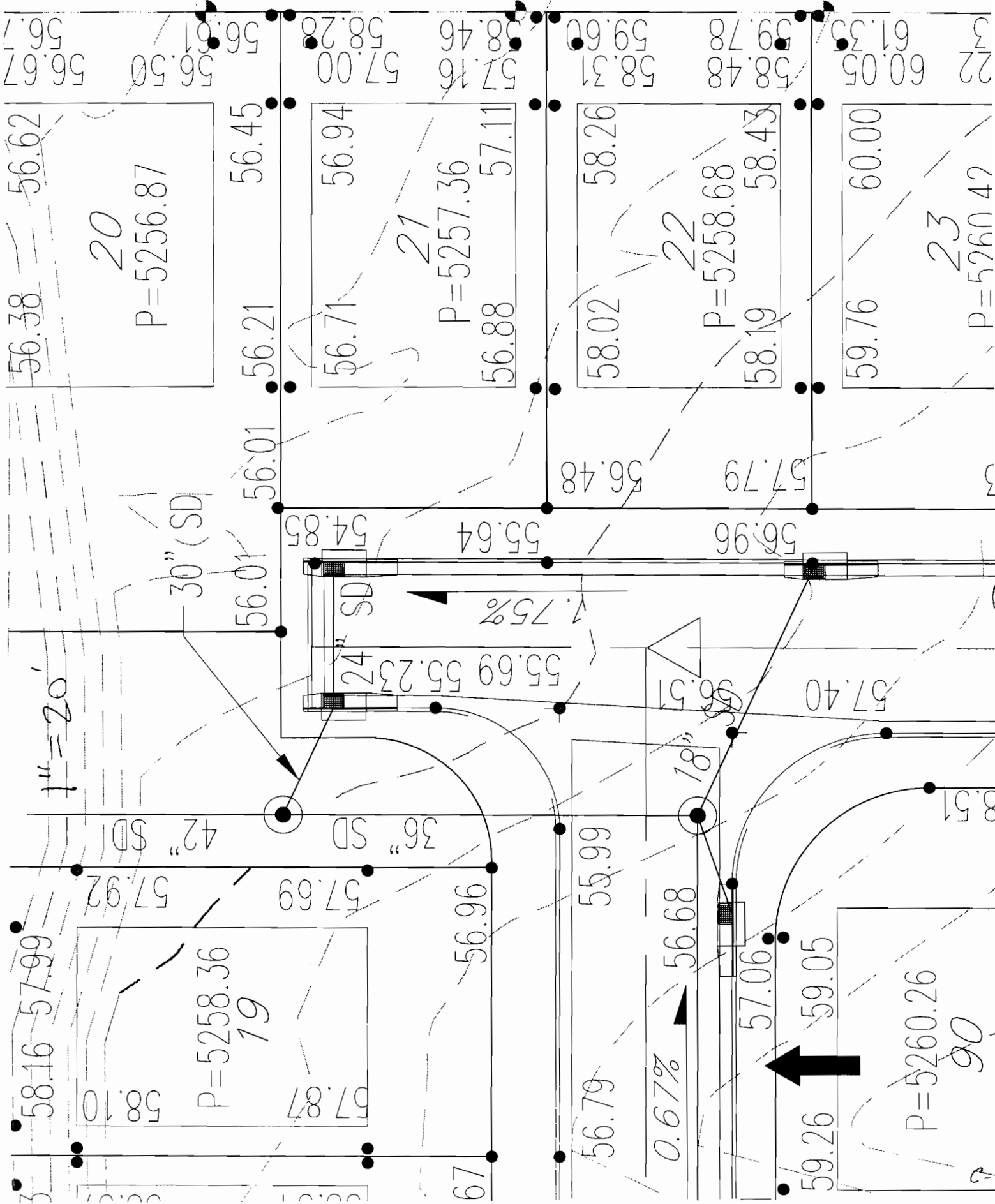
Before the intersection of Saturnia Road, there is an inlet proposed for Firenze Drive. At the flow depth of 0.34', the inlet will accept 5 cfs. Therefore, 9.7 cfs will bypass and continue north into the stub terminus. See attached nomograph.

4. Firenze Drive-North Stub Terminus

S = 1.75%

Q = 34 cfs

There are two sump inlets proposed for the north stub terminus of Firenze Drive. They are currently designated as Type A single inlet and Type C double inlet. During the 100-year storm event, the depth of flow at the two inlets is less than top-of-curb height. (See attached nomograph.) Should a storm event greater than the 100-year design storm occur or one of the sump inlets becomes clogged, the depth of flow will still be less than the right-of-way elevations in the area. In addition, two inlets are available upstream less than 80' away. To summarize, the four inlets are available to safely contain storm runoff generated within the subdivision without surpassing the pad elevations in the area. (See enlarged view of area grades.)



Design Log

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InRoads Storm & Sanitary Design Log

Drainage File: P:\030030\cdp\control\data\utility\030030SD.sdb

Design File: P:\030030\CDP\DESIGN\030030_UTIL JUNK.DWG

Display Log: P:\030030\CDP\DESIGN\design.log

Date: Tuesday, December 10, 2002 02:17:54 PM

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HGL/EGL Computations:

Table A:

Struct ID	D (in)	Q (cfs)	L (ft)	V (ft/s)	d (ft)	dc (ft)	V ² /2g (ft)	Sf (ft/ft)	Dnstrm Soffit (ft)	EGLdn (ft)	HGLdn (ft)	Tot Loss (ft)	EGLup (ft)	HGLup (ft)	Rim Elev. (ft)
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDP1	42	95.83	41.38	9.96	-	-	1.54	0.0091	5245.29	5251.54	5250.00	0.38	5251.92	5250.38	-
SDMH1	-	-	-	-	-	-	-	-	-	5251.92	5250.38	0.32	5252.24	5250.70	5256.86
SDP2	36	62.63	67.10	8.86	-	-	1.22	0.0088	5248.58	5252.24	5250.70	0.59	5252.83	5251.61	-
SDMH2	-	-	-	-	-	-	-	-	-	5252.83	5251.61	0.86	5253.69	5252.47	5256.60
SDP4	36	51.10	344.23	7.23	-	-	0.81	0.0059	5250.30	5253.69	5252.47	2.02	5255.71	5254.90	-
SDMH3	-	-	-	-	-	-	-	-	-	5255.71	5254.90	0.08	5255.79	5254.98	5261.25
SDP5	30	51.10	378.70	10.41	-	-	1.68	0.0155	5254.86	5255.79	5254.98	5.88	5261.67	5259.98	-
SDMH4	-	-	-	-	-	-	-	-	-	5261.67	5259.98	1.50	5263.17	5261.49	5266.36
SDP6	30	51.10	87.22	10.41	-	-	1.68	0.0155	5259.96	5263.17	5261.49	1.35	5264.53	5262.84	-
SDMH5	-	-	-	-	-	-	-	-	-	5264.53	5262.84	1.69	5266.21	5264.53	5268.09
SDP7	30	51.10	133.52	10.41	-	-	1.68	0.0155	5261.79	5266.21	5264.53	2.07	5268.29	5266.60	-
SDMH6	-	-	-	-	-	-	-	-	-	5268.29	5266.60	0.63	5268.92	5267.23	5271.81
SDP9	24	19.50	352.26	12.17	-	-	2.30	0.0074	5264.00	-	5267.23	-	-	5272.80	-
SDMH7	-	-	-	-	-	-	-	-	-	-	5272.80	-	-	5272.80	5280.03
SDP13	24	19.50	10.00	10.68	1.13	1.58	1.77	-	5273.88	-	5273.01	-	-	5273.15	-
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	5251.92	5250.38	-
SDMH1	-	-	-	-	-	-	-	-	-	5251.92	5250.38	0.73	5252.64	5251.10	5256.86
SDP11	30	33.20	20.71	6.76	-	-	0.71	0.0066	5248.08	5252.64	5251.10	0.14	5252.78	5252.07	-
IN1	-	-	-	-	-	-	-	-	-	5252.78	5252.07	0.29	5253.07	5252.36	5254.91
SDP12	24	16.60	23.29	5.28	-	-	0.43	0.0054	5251.71	5253.07	5252.36	0.13	5253.19	5252.76	-
IN2	-	-	-	-	-	-	-	-	-	5253.19	5252.76	-	5253.19	5252.76	5254.91
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	5252.83	5251.61	-
SDMH2	-	-	-	-	-	-	-	-	-	5252.83	5251.61	0.22	5253.05	5251.83	5256.60
(Alternate HGL and EGL Used)	-	-	-	-	-	-	-	-	-	-	-	-	5253.40	5252.18	-
SDP3	18	6.58	15.83	14.61	0.45	0.99	3.32	-	5252.44	-	5252.18	-	-	5253.46	-
IN3	-	-	-	-	-	-	-	-	-	-	5253.46	-	-	5253.46	5256.71
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	5252.83	5251.61	-
SDMH2	-	-	-	-	-	-	-	-	-	5252.83	5251.61	0.61	5253.44	5252.22	5256.60

HGL.txt

(Alternate HGL and EGL Used)

SDP10	18	4.95	43.77	5.06	0.81	0.85	0.40	-	5253.71	-	5253.39	-	5254.61	5253.39
IN4	-	-	-	-	-	-	-	-	-	-	5253.66	-	-	5253.66
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDMH6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDP8	18	2.90	87.61	1.64	-	-	0.04	0.0008	5264.51	5268.29	5266.60	0.09	5268.38	5266.69
IN5	-	-	-	-	-	-	-	-	-	5268.44	5268.40	0.07	5268.44	5268.40
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDMH6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDP14	30	28.70	30.00	5.85	-	-	0.53	0.0049	5264.00	5269.13	5267.44	0.15	5269.27	5268.74

Table B:

Str ID	Hf	Hb	Losses			He	Hj	Total	Dstr	Ko	Loss Coefficients				Cb	K
			Hstr	Hc	Hd						CD	Cd	Cq	Cp		
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDP1	0.38	-	-	-	-	-	-	0.38	-	-	-	-	-	-	-	-
SDMH1	-	-	0.32	-	-	-	-	0.32	8.29	0.171	1.000	0.839	1.452	1.000	1.000	0.209
SDP2	0.59	-	-	-	-	-	-	0.59	-	-	-	-	-	-	-	-
SDMH2	-	-	0.86	-	-	-	-	0.86	4.41	1.553	1.000	0.630	0.719	1.000	1.000	0.704
SDP4	2.02	-	-	-	-	-	-	2.02	-	-	-	-	-	-	-	-
SDMH3	-	-	0.08	-	-	-	-	0.08	3.04	0.200	1.000	0.504	1.000	1.000	1.000	0.101
SDP5	5.88	-	-	-	-	-	-	5.88	-	-	-	-	-	-	-	-
SDMH4	-	-	1.50	-	-	-	-	1.50	3.02	1.594	1.000	0.560	1.000	1.000	1.000	0.893
SDP6	1.35	-	-	-	-	-	-	1.35	-	-	-	-	-	-	-	-
SDMH5	-	-	1.69	-	-	-	-	1.69	3.65	1.596	1.000	0.628	1.000	1.000	1.000	1.002
SDP7	2.07	-	-	-	-	-	-	2.07	-	-	-	-	-	-	-	-
SDMH6	-	-	0.63	-	-	-	-	0.63	5.20	1.596	1.000	0.776	0.303	1.000	1.000	0.375
SDP9	2.62	-	-	-	-	-	-	2.62	-	-	-	-	-	-	-	-
SDMH7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDP13	-	-	-	-	-	-	-	SuperCr	-	-	-	-	-	-	-	-
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDMH1	-	-	0.73	-	-	-	-	0.73	8.29	1.399	1.000	0.839	0.402	1.000	1.000	0.471
SDP11	0.14	-	-	-	-	-	-	0.14	-	-	-	-	-	-	-	-
IN1	-	-	0.29	-	-	-	-	0.29	2.46	0.820	1.000	0.495	1.000	1.000	1.000	0.406
SDP12	0.13	-	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-
IN2	-	-	-	-	-	-	-	-	2.85	-	-	-	-	-	-	-
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDMH2	-	-	0.22	-	-	-	-	0.22	4.41	1.471	1.000	0.630	0.192	1.000	1.000	0.178
SDP3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IN3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDMH2	-	-	0.61	-	-	-	-	0.61	-	-	-	-	-	-	-	0.500
SDP10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IN4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Branch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SDMH6	-	-	0.09	-	-	-	-	0.09	5.20	1.596	1.000	0.776	0.044	1.000	1.000	0.054
SDP8	0.07	-	-	-	-	-	-	0.07	-	-	-	-	-	-	-	-