

TALKING ROCK RANCH
Phase 1

SEWER COLLECTION SYSTEM
DESIGN MEMORANDUM

Prepared For:

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Prepared By:

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Introduction

This analysis examines the design of the sewer collection system that will primarily be a low-pressure sewer system for Phase I of the Talking Rock Ranch Subdivision in Williamson Valley, Arizona. The project site is located in portions of Sections 11, 15, 16, 21, 22, 28 and 33, Township 16 North, Range 3 West, Gila and Salt River and Meridian, Yavapai County, Arizona. The project is generally located in the southern portion of Williamson Valley and straddles the Williamson Valley Road. As a result of the large changes in elevation, it is not cost-effective to construct a gravity sewage collection system.

This Design Memorandum will address the low-pressure sewer system design for the portion of the project that is within Phase I and the pumping station located to the South and West of Phase I that will deliver sewage to the Wastewater Treatment Facility. Estimates of the number of expected lots and force mains from portions of the overall project that have yet to be laid out are included in the Phase I design where applicable. These systems also use low-pressure sewer lines that will pump to lift stations) and then force mains to the Wastewater Treatment Facility. The Phase I construction plans will be submitted concurrently with this memorandum.

System Analysis

The system was designed using the map for the project with the objective of providing sewer service to each of the lots in this phase of the project. The analysis was run using the computer design program developed by Environment One Corporation of Niskayuna, New York. It employs their flow velocity and friction head loss versus pumps in simultaneous operation spreadsheet. The design criteria for the software calculation program is based on the *Hazen-Williams* formulas for determining pipe sizes (calculations for Cross Sectional Area, Velocity and Friction Loss) to create minimum flow velocities of ^{2.0} 2.0 feet per second or higher. At these velocities scouring is assured. Pipe sizes are based on the I.D. of the pipe type selected and the "C" factor selected in the design form. This analysis is based on a "C" factor of ¹³⁰ 130 a design flow rate of 235 gallons per day per dwelling and SDR11 Polyethylene pipe.

11/27/02 150 OK

C Factor - 800 OK

The Phase 1 Tail King Rock Ranch project covered by this design includes a total of 199 Environment One GP 2010-60 pump stations spread out over 59 zones (two zones have been replaced by 8" PVC gravity sewers). The highest Total Dynamic Head (TDH) encountered is 132.07 feet in Zone 3, below the recommended continuous operating pressure of 60 psi or 138 feet of TDH. The highest total retention time is 8.11 hours.

This is less than 10 hours when there may be concern for odors at the discharge point. Flushing connections are to be located at the terminal end of each main, at intersections and at any sharp changes in direction. Air release or Air/Vacuum valves will be placed at high points in the system to prevent air buildup or vacuum restrictions. Appendix 11 provides that a low velocity of 3 fps be maintained in force mains, but since this is a low-pressure system, we have held to the manufacturer's recommendation that 2.0 fps be the low end of the velocity range.

SEE PR-9-E301 D4A
3 FPS ≤ V ≤ 7 FPS.

Appendix A includes the spreadsheets that detail the results of the analysis and Appendix B includes the Construction Plan Exhibit map showing the design zones designation, approximate lengths and required pipe size.

Pump Station and Force Mains

A wastewater pumping station will be located at the maintenance area adjacent to Tail King Rock Road and South of the eastern edge of Phase 1. The pumping station consists of dual submersible pumps with an external valve box. The sump is oversized to permit upgrading the station by the addition of a third pump and, subsequently, replacing the pumps with larger capacity units. Two parallel 6" PVC force mains are provided for initial and future flows. Depending on the final road alignment for future phases of the project, this station capacity may be increased up to 680 gpm, fixed capacity.

Wastewater Treatment Facilities

The wastewater treatment and effluent disposal system are being prepared separately by the SANTEC Corporation and will be submitted under separate cover for review and approval.

APPENDIX "A"



Environment One Corporation

Pressure Sewer Preliminary

Cost and Design Analysis

For

Talking Rock Phase 1 Pressure Sewer

Prepared For:

Tel:

Fax:

Prepared By: M

Note: This analysis is valid only with the use of progressive cavity type printer pumps as manufactured by Environment One

Zone	Accumulated Total of Cycles	Running Time (hrs)	Length of Zone (miles per hr)	Capacity of Zone	Average Daily Flow	Average Fluid Change (per Day)	Average Retention Time (hr)	Accumulated Retention Time (hr)
1.00	2.00	2.00	15.40	340.00	52.37	705	13.46	1.78
2.00	7.00	3.00	33.47	1,205.00	403.27	3,290	8.16	2.94
3.00	4.00	2.00	15.40	260.00	40.05	705	17.60	1.56
4.00	6.00	2.00	15.40	100.00	18.06	1,175	65.07	0.37
5.00	6.00	2.00	15.40	100.00	15.40	470	30.51	0.79
6.00	7.00	3.00	33.47	1,020.00	341.35	3,055	8.95	2.68
7.00	10.00	3.00	33.47	290.00	97.05	6,580	67.80	0.35
8.00	9.00	2.00	15.40	100.00	15.40	705	45.77	0.52
9.00	10.00	3.00	33.47	640.00	214.18	2,485	12.07	1.99
10.00	12.00	3.00	33.47	335.00	112.11	9,400	83.85	0.29
11.00	12.00	2.00	15.40	190.00	29.27	705	24.09	1.00
12.00	13.00	4.00	55.31	550.00	184.06	2,350	12.77	1.88
13.00	13.00	4.00	55.31	400.00	144.00	12,690	35.85	0.67
14.00	15.00	2.00	15.40	345.00	53.14	705	13.27	1.81
15.00	91.00	4.00	55.31	880.00	486.75	13,865	28.48	0.84
16.00	90.00	2.00	15.40	260.00	40.05	470	11.74	2.04
17.00	90.00	3.00	33.47	570.00	190.78	8,695	45.58	0.53
18.00	19.00	2.00	15.40	135.00	20.79	705	33.90	0.71
19.00	21.00	2.50	22.57	245.00	54.30	1,645	29.75	0.81
20.00	21.00	2.00	15.40	290.00	44.67	705	15.78	1.52
21.00	24.00	3.00	33.47	325.00	108.76	3,055	28.09	0.85
22.00	24.00	2.00	15.40	200.00	30.81	705	22.89	1.05
23.00	24.00	2.50	22.57	240.00	54.17	940	17.34	1.38
24.00	27.00	3.00	33.47	300.00	100.40	4,465	44.47	0.54
25.00	27.00	2.50	22.57	355.00	80.12	1,645	20.53	1.17
26.00	27.00	3.00	33.47	980.00	327.97	7,420	22.93	1.05
27.00	17.00	2.00	15.40	200.00	30.81	470	15.26	1.57
28.00	17.00	2.00	15.40	200.00	30.81	470	15.26	1.57
29.00	32.00	2.00	15.40	270.00	41.59	705	16.95	1.43
30.00	32.00	2.00	15.40	200.00	30.81	705	22.89	1.05
31.00	32.00	3.00	33.47	870.00	291.16	2,485	8.88	2.70
32.00	35.00	3.00	33.47	270.00	90.36	3,760	41.61	0.58
33.00	34.00	2.00	15.40	150.00	23.10	705	40.51	0.79
34.00	34.00	3.00	33.47	780.00	261.04	2,350	9.00	2.67
35.00	38.00	3.00	33.47	655.00	219.20	7,050	32.16	0.75
36.00	37.00	2.00	15.40	155.00	23.87	705	29.53	0.81
37.00	38.00	3.00	33.47	905.00	302.87	2,820	9.11	2.48

This spreadsheet was calculated using pipe diameters for SDR31 HDPE

Prepared By: PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME (HR) Talking Rock Phase 1 Pressure Sewer

April 12, 2001

Note: This analysis is valid only with the use of progressive cavity type grinder pumps as manufactured by Environment One

Zone Number	Feet to Accumulated Tank	Accumulated Tank Volume (Gals)	Existing Pipe Size	Carbons per (ft)	Length of Zone	Capacity of Zone	Average Daily Flow	Average Influent (Gallons per Day)	Average Detention Time (Hr)	Accumulated Retention Time (Hr)
38.00	38.00	33.47	3.00	33.47	500.00	167.33	10.340	61.79	0.39	0.39
39.00	52.00	15.40	2.00	15.40	150.00	23.10	705	30.51	0.79	4.10
40.00	55.00	22.57	2.50	22.57	250.00	56.43	1.410	24.99	0.94	3.32
41.00	58.00	15.40	2.00	15.40	145.00	22.33	705	31.57	0.76	3.98
42.00	62.00	33.47	3.00	33.47	560.00	187.41	3.055	16.30	1.47	2.06
43.00	65.00	15.40	2.00	15.40	370.00	46.99	705	12.37	1.94	4.49
44.00	68.00	15.40	2.00	15.40	150.00	23.10	705	30.51	0.79	5.48
45.00	72.00	33.47	3.00	33.47	630.00	210.84	2.350	11.15	2.15	4.70
46.00	75.00	22.57	2.50	22.57	425.00	142.23	3.525	24.78	0.97	2.55
47.00	79.00	16.17	2.00	16.17	105.00	16.17	705	43.56	0.55	3.31
48.00	82.00	33.47	3.00	33.47	205.00	46.27	940	20.32	1.18	2.76
49.00	85.00	15.40	2.00	15.40	275.00	92.03	4.700	41.07	0.47	1.58
50.00	88.00	15.40	2.00	15.40	80.00	12.32	705	57.21	0.42	2.60
51.00	91.00	22.57	2.50	22.57	325.00	73.35	1.649	22.43	1.07	2.18
52.00	94.00	33.47	3.00	33.47	175.00	58.57	6.345	108.34	0.22	1.11
53.00	97.00	33.47	3.00	33.47	400.00	133.86	10.105	73.49	0.32	0.89
54.00	100.00	15.40	2.00	15.40	135.00	20.79	705	33.00	0.71	2.06
55.00	103.00	22.57	2.50	22.57	420.00	94.79	1.645	17.35	1.38	1.95
56.00	106.00	33.47	3.00	33.47	830.00	277.77	11.750	42.30	0.57	0.57
57.00	109.00	10.510	3.00	10.510	251.00	251.00	10.510	43.07	0.56	1.79
58.00	112.00	24.675	3.00	24.675	1,272.20	1,272.20	24.675	19.40	1.24	1.24

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME (HR)
Talking Rock Phase I Pressure Sewer

Prepared By: NA

April 12, 2001

APPENDIX "B"

