HAINES BRANCH BASIN

15.1 HAINES BRANCH TRUNK SEWER SYSTEM

The Haines Branch basin for the most part is undeveloped, and consists of a small amount of existing area that is currently served, plus Tier I, II, and III growth areas. The basin is located on the west side of Salt Creek, north of the Upper Southwest Salt Creek Basin, and south of Middle Creek Basin as shown in Figure 15.1. Table 15.1 shows the areas and flows that that were used for the modeling efforts.

Table 15.1 Service Areas and Flows - Haines Branch Basin [1, 2]
Wastewater Facilities Master Plan Update - 2007
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Haines Branch Basin	Existing		Existing and Tier I		Existing and Tiers I & II		Existing and Tiers I, II & III	
	Area (ac)	Flow (cfs)	Area (ac)	Flow (cfs)	Area (ac)	Flow (cfs)	Area (ac)	Flow (cfs)
Model Input Values	297	2.53	1,117	8.09	5,095	31.23	6,409	38.39

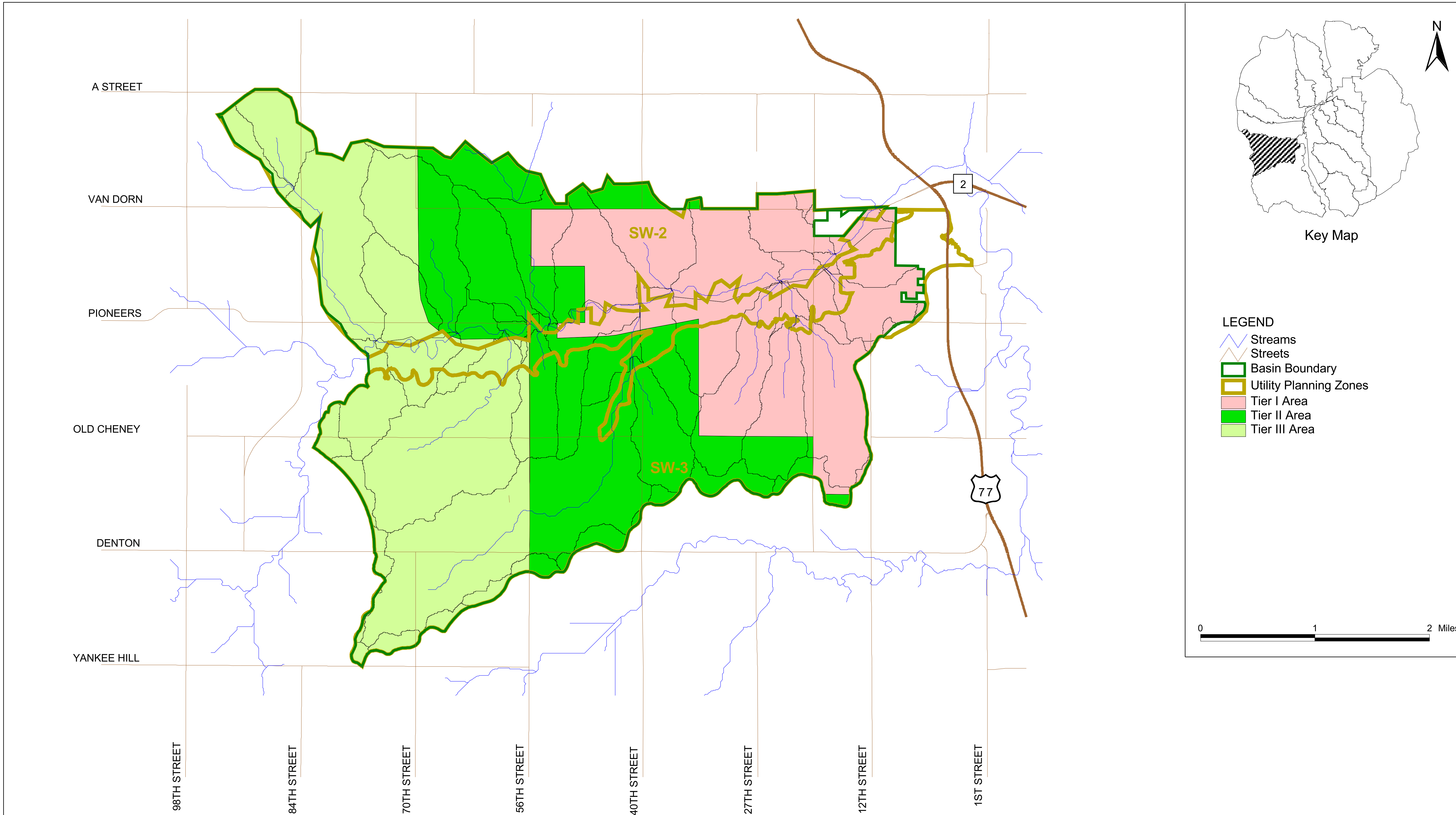
1. Based on Information Provided by LWWS.
2. As of July, 2006.

15.2 MODELING RESULTS

For the purpose of modeling, it was assumed that Tiers I, II, and III flows would be introduced into the Salt Valley Trunk Sewer System at Manhole B2-403 (east of Van Dorn and 1st St). This assumption will need to be verified as part of the detailed design for improvements in this basin. The existing flows will continue to enter the Salt Valley Trunk Sewer System at Manhole B3-472 (east of Van Dorn and 1st St). The modeling results for the scenarios discussed in this Chapter are located in Appendix D.

15.2.1 Existing Conditions

As shown in Table 15.1, the Haines Branch basin currently contributes about 2.53 cfs of sanitary flow to Salt Valley system. This corresponds to a developed service area of approximately 297 acres. The existing sanitary flow is conveyed through sewers less than 18 inches in diameter and therefore was not modeled. Since sewers less than 18 inches are not represented in the hydraulic model, the sanitary flow from Haines Branch basin under existing conditions was directly introduced into the Salt Valley System Model at manhole B3-472.



CITY OF LINCOLN
NEBRASKA

Figure 15.1 Basin Map
Haines Creek Basin
Wastewater Facilities Master Plan Update - 2007
City of Lincoln, Nebraska

carollo engineers

It has been reported that the existing collection system is currently operating satisfactorily. Therefore, no immediate improvements are recommended for the existing conditions.

15.2.2 Tier I Conditions

The Tier I model results show the Haines Branch basin is anticipated to contribute about 8.09 cfs of sanitary flow to the Salt Valley Trunk Sewer system. This corresponds to a developed service area of approximately 1,117 acres.

15.2.3 Tier II Conditions

The Haines Branch basin is anticipated to contribute about 31.23 cfs of sanitary flow to the Salt Valley system under Tier II conditions. This corresponds to a projected developed service area of approximately 5,095 acres. Additional sewers were designed and added to the Tier I model to convey sanitary flow from the upper reaches of the basin

15.2.4 Tier III Conditions

The Tier III system was modeled using a total area of 6,409 acres, which resulted in a peak flow of 38.39 cfs. Additional sewers were designed and added to the Tier II system to convey sanitary flow from the upper reaches of the basin. The alignments of the new sewers follow the natural drainage network as shown in Figure 15.2. Model results for each sewer segment are presented in Table 15.3.

15.3 IMPROVEMENTS

The improvements for the Haines Branch systems are shown graphically in Figure 15.2 and summarized in Tables 15.2 and 15.3.

15.3.1 Tier I Improvements

The modeled sewer system layout for the Haines Branch basin is presented in Figure 15.2. This map shows the main sanitary sewer sub-basins, natural drainage system, and existing Salt Valley Trunk Sewer. Tier I growth areas are also shown on the map. The sub-basin boundaries and stream network were derived from the City contour data. The results of the modeling are outlined in Table 15.3, with a d/D that varied from 0.16 to 0.60. For the purpose of this report, it is envisioned that a siphon will convey the flows across the Salt Creek. The use of a siphon or lift station will need to be verified during the detailed design phase.

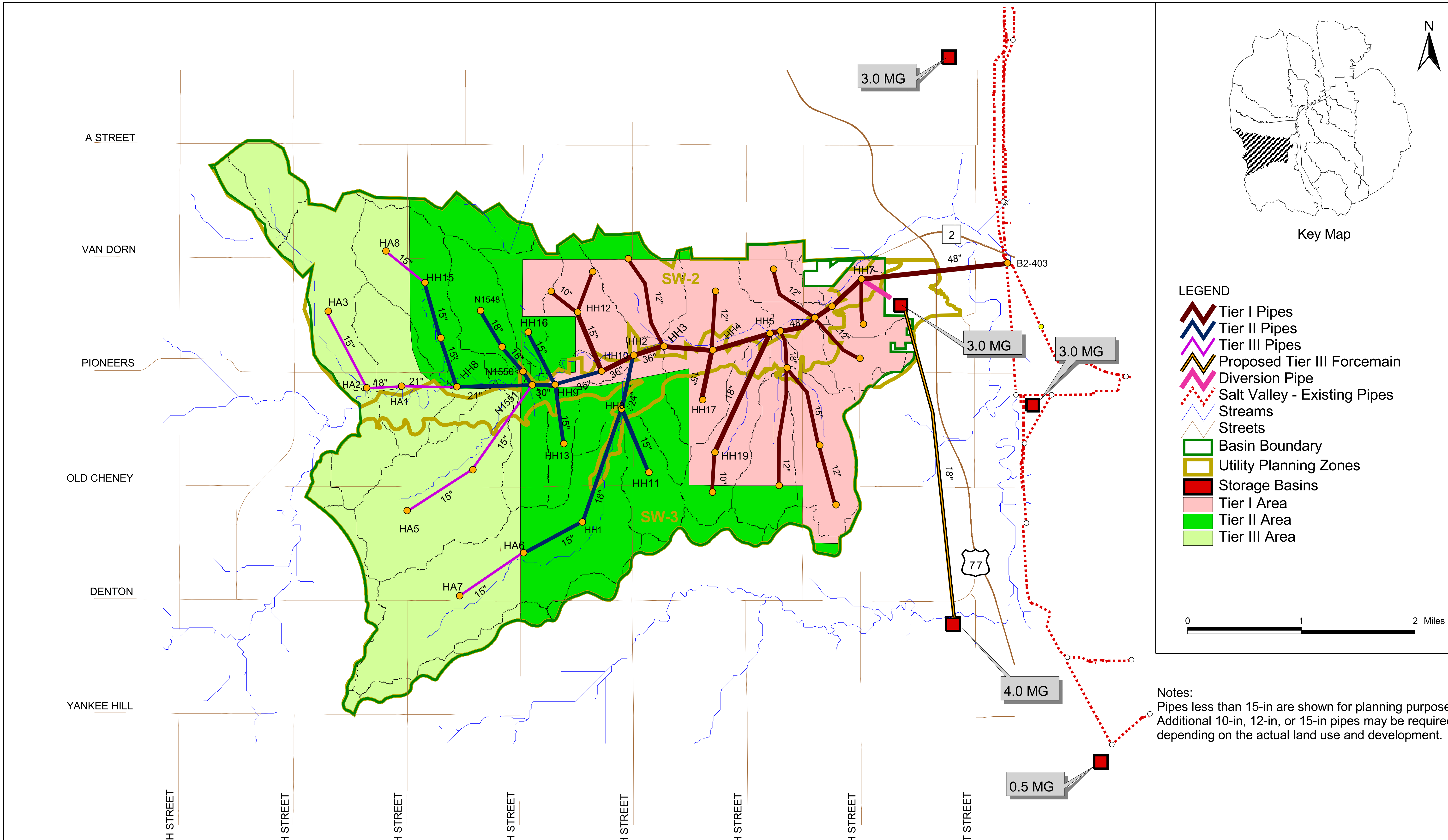


Figure 15.2 Proposed Sewer Improvements
Haines Creek Basin
Wastewater Facilities Master Plan Update - 2007
City of Lincoln, Nebraska

Table 15.2 Design Characteristics of Proposed Sewers - Haines Branch Basin Wastewater Facilities Master Plan Update - 2007 City of Lincoln, Nebraska							
Pipe ID	**US Manhole**	**DS Manhole**	**Diameter (ft)**	**Length (ft)**	**Slope (%)**	**Design Capacity (cfs)**	**Tier**
HL8	HH5	HH6	4.00	2,354	0.25	71.85	I
HL9	HH6	HH18	4.00	957	0.25	71.77	
HL10	HH18	HH7	4.00	1,896	0.25	71.82	
HL11	HH7	B2-403	4.00	7,019	0.25	71.83	
HL4	HH10	HH2	3.00	1,672	0.25	33.35	
HL5	HH2	HH3	3.00	1,424	0.25	33.35	
HL6	HH3	HH4	3.00	2,182	0.25	33.37	
HL7	HH4	HH5	3.00	2,590	0.25	33.34	
HL20	HH17	HH4	1.25	2,432	0.23	3.12	
HL19	HH19	HH5	1.50	6,009	0.24	5.16	
HL15	HH12	HH10	1.25	2,903	0.23	3.12	
HL3	HH9	HH10	3.00	2,215	0.25	33.33	II
HL1	HH16	HH9	1.25	2,869	0.23	3.12	
HL2	HH13	HH9	1.25	2,778	0.23	3.11	
HL12	HH15	HH14	1.25	2,692	0.25	3.23	
HL13	HH14	HH8	1.25	2,294	0.25	3.23	
L1587	HH8	N1551	1.75	3,529	0.25	7.89	
L1589	N1548	N1549	1.50	1,955	0.25	5.25	
L1590	N1549	N1550	1.50	1,467	0.25	5.25	
L1591	N1550	N1551	2.00	773	0.18	9.73	
L1588	N1551	HH9	2.50	1,080	0.25	20.51	
HL16	HH1	HH0	1.50	5,577	0.25	5.25	
HL18	HH11	HH0	1.25	3,053	0.25	3.23	
HL17	HH0	HH2	2.00	2,598	0.23	10.86	
LH8	HA6	HH1	1.25	3,069	0.27	3.35	
LH4	HA8	HH15	1.25	2,282	0.27	3.36	III
LH1	HA3	HA2	1.25	4,003	0.27	3.36	
LH2	HA2	HA1	1.50	1,633	0.27	5.46	
LH3	HA1	HH8	1.75	2,540	0.27	8.23	
LH5	HA5	HA4	1.25	3,581	0.27	3.36	
LH6	HA4	N1551	1.25	4,780	0.26	3.32	
LH7	HA7	HA6	1.25	3,578	0.27	3.36	

Table 15.3 Modeling Results of Proposed Sewers - Haines Branch Basin
Wastewater Facilities Master Plan Update - 2007
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Pipe ID	US Manhole	DS Manhole	Capacity cfs	Tier I Conditions		Tier I & II Conditions		Tier I, II, & III Conditions		Tier
				Q, cfs	d/D	Q, cfs	d/D	Q, cfs	d/D	
HL8	HH5	HH6	71.85	5.07	0.36	21.11	0.46	29.08	0.52	I
HL9	HH6	HH18	71.77	19.55	0.36	30.57	0.46	38.53	0.52	
HL10	HH18	HH7	71.82	19.55	0.37	30.57	0.48	38.53	0.55	
HL11	HH7	B2-403	71.83	19.54	0.37	30.56	0.48	38.52	0.55	
HL4	HH10	HH2	33.35	1.80	0.16	11.23	0.52	17.26	0.66	
HL5	HH2	HH3	33.35	1.80	0.16	17.71	0.52	25.68	0.66	
HL6	HH3	HH4	33.37	1.80	0.23	17.71	0.58	25.67	0.74	
HL7	HH4	HH5	33.34	3.77	0.24	19.72	0.58	27.68	0.74	
HL20	HH17	HH4	3.12	1.98	0.57	2.02	0.59	2.02	0.59	
HL19	HH19	HH5	5.16	1.30	0.37	1.40	0.66	1.40	0.85	
HL15	HH12	HH10	3.12	1.80	0.60	1.80	0.56	1.80	0.83	
HL3	HH9	HH10	33.33	NA	NA	9.44	0.40	15.46	0.51	II
HL1	HH16	HH9	3.12			1.68	0.55	1.68	0.75	
HL2	HH13	HH9	3.11			1.16	0.47	1.16	0.75	
HL12	HH15	HH14	3.23			1.52	0.48	2.22	0.61	
HL13	HH14	HH8	3.23			1.52	0.53	2.22	0.91	
L1587	HH8	N1551	5.23			2.13	0.73	5.92	0.81	
L1589	N1548	N1549	5.25			2.35	0.54	2.35	0.54	
L1590	N1549	N1550	5.25			3.01	0.58	3.01	0.55	
L1591	N1550	N1551	9.73			3.42	0.43	3.42	0.46	
L1588	N1551	HH9	11.31			6.60	0.55	12.63	0.57	
HL16	HH1	HH0	5.25			2.69	0.76	4.64	0.88	
HL18	HH11	HH0	3.23			1.68	0.91	1.68	0.82	
HL17	HH0	HH2	10.86			6.47	0.57	8.42	0.74	
LH8	HA6	HH1	3.35	NA	NA	NA	NA	1.96	0.88	III
LH4	HA8	HH15	5.46					0.71	0.51	
LH1	HA3	HA2	3.36					1.43	0.47	
LH2	HA2	HA1	5.46					1.42	0.50	
LH3	HA1	HH8	8.23					3.09	0.65	
LH5	HA5	HA4	3.36					1.79	0.60	
LH6	HA4	N1551	3.32					2.24	0.88	
LH7	HA7	HA6	3.36					1.96	0.55	

15.3.2 Tier II Improvements

15.3.2.1 Pipelines

The proposed Tier II pipe improvements are shown in Figure 15.2. These trunk sewers generally follow the natural drainage of the land to minimize the use of lift stations. The proposed sewer alignment identified in Figure 15.2 were added to the collection system Tier I SWMM model and evaluated to verify the anticipated Tier II flows. The results of the model run are summarized in Table 15.3. As shown in Table 15.3, the proposed sewers have adequate capacity to convey the Tier II flows with d/D ratios ranging from 0.40 to 0.91.

15.3.2.2 Peak Flows

The Salt Valley Trunk Sewer cannot accommodate the entire peak Tier II flows from this basin. Based on the model output, approximately 20 cfs of peak flow will need to be stored or otherwise dealt with. To handle the excess peak flow a storage facility was modeled. Based on the model results, the storage volume required is 3 MG and would store the peak flows for about 6 to 8 hours. The modeled storage location is shown in Figure 15.2 (southwest of Homestead Expressway and Van Dorn St).

15.3.3 Tier III Improvements

15.3.3.1 Pipelines

The proposed sewer alignments shown in Figure 15.2 were added to the Tier II SWMM model and evaluated to verify the anticipated Tier III flows. Model results indicate the proposed sewers have adequate capacity to convey the Tier III flows. The d/D ratio ranges from 0.46 to 0.98.

15.3.3.2 Peak Flows

The Salt Valley trunk Sewer System is inadequate to convey the Tier III flows from this basin. It is recommended that the Tier II storage facility be expanded and improved. During this time the decision to pump the excess peak flows south to the proposed SW WWTF or north toward the Theresa Street WWTF can be finalized. For the purpose of identifying a place holder in the future CIP, it has been assumed that the flows will be pumped to the Southwest WWTF through 11,500 feet of 18-inch force main. See Chapter 24 for alternatives to conveying or otherwise dealing with Tier III flows from this Basin.

15.4 SUMMARY OF RECOMMENDED IMPROVEMENTS

Recommendations for maintenance and improvements of the Haines Branch Basin Sewer System include:

- Tier I Flows:
    - Construct new sewer lines to service the Tier I area.

- Tier II Flows:
  - Construct new sewer lines to service the Tier II area.
  - Construct a new 3.0 MG storage facility near Homestead Expressway and Van Dorn St.
- Tier III Flows
  - Construct new sewer lines to service the Tier III area.
  - Expand storage facility to handle additional Tier III flow.
  - Construct force main and lift station to Upper Southwest Basin or to Theresa Street WWTF.

The proposed alignments of the sanitary sewers are preliminary and developed for planning purposes. It is recommended that a detailed study be performed prior to designing the improvements to make certain conformance with existing and proposed development and to determine project phasing. In most cases, the alignments shown closely follow natural drainage ways. Until full development of the system, some pipes will be oversized with regard to interim flows. These sewers should be periodically inspected to determine if deposition is occurring.

To maximize the use of the recommended storage facilities it is recommended that they also be designed, constructed, and operated to dampen the diurnal peaks throughout the trunk sewer system. Dampening the diurnal peaks will result in maximizing the trunk infrastructure and deliver a more constant flow to the WWTF's.

A summary of the improvement projects identified with planning costs is outlined in Table 15.4.

Table 15.4	Recommended Improvements - Haines Branch Basin Wastewater Facilities Master Plan Update - 2007 City of Lincoln, Nebraska					
Tier	**ID**	**Description**	**Location** [1]	**Parameters**	**Unit Price**	**Planning Cost** [2]
I	HB-1	48-inch	HH5 to HH7, HH7 to B2-403 [3]	12,226 lf	$480.00	$5,868,000
I	HB-2	36-inch	HH10 to HH5	7,868 lf	$360.00	$2,832,000
I	HB-3	18-inch	HH19 to HH5. See Figure 15.2.	7,791 lf	$180.00	$1,402,000
I	HB-4	15-inch	HH12 to HH10. See Figure 15.2.	9,343 lf	$150.00	$1,401,000
I	HB-5	12-inch	See Figure 15.2.	21,490 lf	$120.00	$2,579,000
I	HB-6	10-inch	See Figure 15.2.	7,551 lf	$100.00	$755,000
I	HB-7	Siphon	Under Salt Creek	1	$1,000,000	$1,000,000
II	HB-8	36-inch	HH5 to HH10	2,215 lf	$360.00	$797,000
II	HB-9	30-inch	N1551 to HH9	1,080 lf	$300.00	$324,000
II	HB-10	24-inch	N1550 to N1551, HH0 to HH2	3,371 lf	$240.00	$809,000
II	HB-11	21-inch	HH8 to N1551	3,529 lf	$210.00	$741,000
II	HB-12	18-inch	N1548 to N1550, HH1 to HH0	8,999 lf	$180.00	$1,620,000
II	HB-13	15-inch	HH5 to HH8, H16 to HH9, HH13 to HH9, HH11 to HH0, HA6 to HH1	16,755 lf	$150.00	$2,513,000
II	HB-14	Storage Basin	East of MH HH7	3,000,000 gal	$4.00	$12,000,000

**Table 15.4 Recommended Improvements - Haines Branch Basin
Wastewater Facilities Master Plan Update - 2007
City of Lincoln, Nebraska**

Tier	ID	Description	Location [(1)]	Parameters	Unit Price, $/lf	Planning Cost [(2)]
III	HB-15	21-inch	HA1 to HH8	2,540	$210.00	$533,000
III	HB-16	18-inch	HA2 to HA1	1,633	$180.00	$294,000
III	HB-17	15-inch	HA3 to HA2, HA8 to HH15, HA5 to N1551, HA7 to HA6	18,224	$150.00	$2,734,000
III	HB-18A	18-inch Force Main	From Haines Branch Storage to Upper SW Storage	14,500	$144.00	$2,088,000
III	HB-18B	Lift Station	Pump to Upper Southwest Basin WWTF	3,000,000	$1.00	$3,000,000

Notes:
1. Upstream and downstream nodes for each pipe section.
2. ENR CCI for Kansas City = 8512 (July 2006).
3. This section of pipe diameter may be reduced if storage is implemented.