

## ANTELOPE CREEK BASIN

### 11.1 ANTELOPE CREEK TRUNK SEWER SYSTEM

The Antelope Creek Trunk Sewer conveys wastewater from its 29 sub-basins. The existing Antelope sewer system layout is shown in Figure 11.1. Shown in Table 11.1 below, is the area that was used to determine the flows for the different modeling efforts. The following project that is currently being constructed has been included in the model of the existing system.

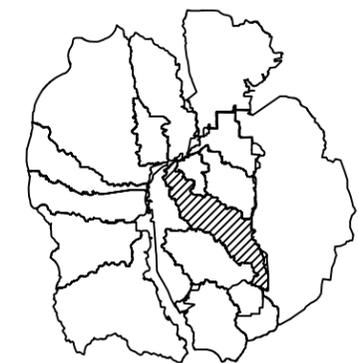
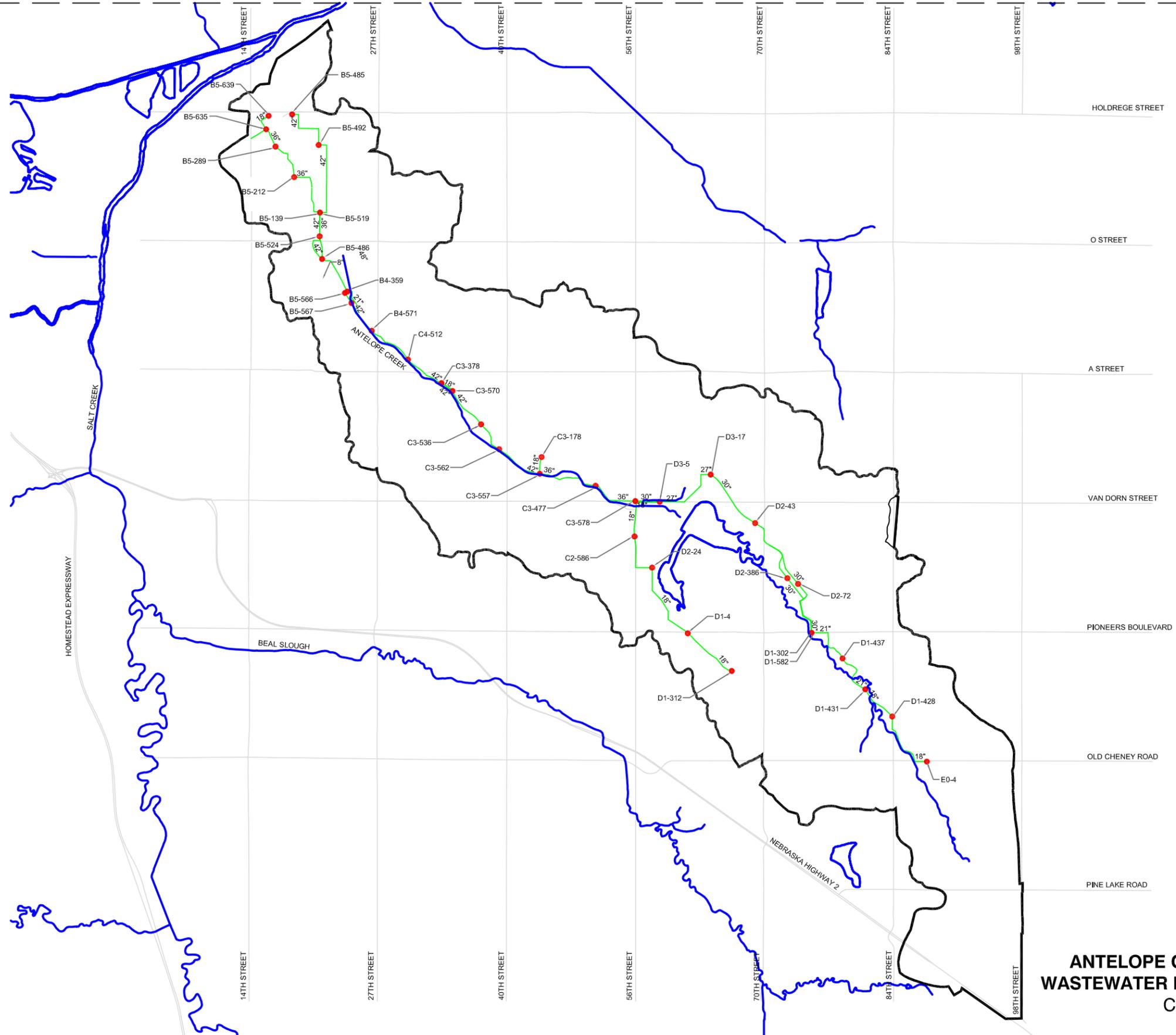
- The revised siphon under Antelope Creek near 21<sup>st</sup> and R Street.

<b>Table 11.1 Antelope Creek Trunk Sewer System Modeling Areas (ac) <sup>(1,2)</sup></b> <b>Wastewater Facilities Master Plan Update - 2007</b> <b>City of Lincoln, Nebraska</b>			
<b>Basin</b>	<b>Existing Area</b>	<b>Tier I Area</b>	<b>Existing + Tier I Areas</b>
Total Antelope Valley	7,866	470	8,336
Area that Flows to SVT <sup>(3)</sup>	510	5	515
Remaining Area	7,376	105	7,821
Notes:			
1. Areas as of July 1, 2006			
2. Based on information provided by LWWS.			
3. The flow from this area is accounted for in the Salt Valley Trunk (SVT) as discussed in Chapter 10			

### 11.2 EXISTING CONDITIONS

#### 11.2.1 Model Results

The existing system was modeled using a total tributary area to the system of 7,866 acres. Of this, the flow from 510 acres with a peak flow of approximately 4 cfs flows directly into the Salt Valley Trunk Sewer at Manhole B6-371 through a 36-inch sewer. The remaining 7,367 acres with an associate peak flow of 44 cfs flows directly to the Theresa Street WWTF. The model was examined during a weekday at diurnal wet weather flow to assess capacity, surcharging, SSO's, and velocity related issues.



**KEY MAP**

**NOTES:**  
1. ONLY 18" AND LARGER PIPES INCLUDED IN MODEL.

**Figure No. 11.1**  
**ANTELOPE CREEK BASIN TRUNK SEWER SYSTEM**  
**WASTEWATER FACILITIES MASTER PLAN UPDATE - 2007**  
**CITY OF LINCOLN, NEBRASKA**



Model simulations of the existing conditions indicated that SSOs did not occur during the wet weather flows. The simulated d/D ratio varied between 0.13 and 1.32. With the exception of pipe segments shown in Table 11.2, all pipes were running below maximum capacity. Most of the pipes listed in Table 11.2 have adequate capacity to convey the design flow. The simulated surcharging is mainly is due to the limited capacity of the system where the two 30-inch pipes join at manhole D2-392 (southeast of 70th St and Van Dorn St) and continue north (downhill) through a single 30-inch sewer. The locations of the surcharged pipes are shown in Figure 11.2, and hydraulic profile of these pipes is shown in Figure 11.3. The model results are located in Appendix D.

<b>Pipe ID</b>	<b>US Manhole</b>	<b>DS Manhole</b>	<b>Diameter (ft)</b>	<b>Length (ft)</b>	<b>Flow (cfs)</b>	<b>d/D</b>
L794	D1-582	D2-179	2.5	501.00	9.60	1.16
PP584	D2-384	D2-385	2.5	485.00	9.63	1.08
PP585	D2-385	D2-386	2.5	600.00	9.63	1.13
PP586	D2-386	D2-387	2.5	543.00	9.64	1.18
PP587	D2-387	D2-388	2.5	211.00	9.72	1.20
PP588	D2-388	D2-389	2.5	291.00	9.81	1.24
PP589	D2-389	D2-390	2.5	308.00	10.06	1.30
PP590	D2-390	D2-391	2.5	431.00	9.92	1.30
PP591	D2-391	D2-392	2.5	7.33	9.84	1.29
PP543	D2-179	D2-178	2.5	365.00	9.59	1.16
PP544	D2-178	D2-177	2.5	623.00	9.58	1.18
PP545	D2-177	D2-73	2.5	401.19	9.58	1.16
PP546	D2-73	D2-72	2.5	583.16	9.59	1.22
PP547	D2-72	D2-71	2.5	600.00	9.62	1.25
PP548	D2-71	D2-161	2.5	260.34	10.17	1.32
PP549	D2-161	D2-70	2.5	239.66	10.36	1.32
PP550	D2-70	D2-69	2.5	544.40	9.85	1.27
PP551	D2-69	D2-68	2.5	355.60	9.77	1.31
PP552	D2-68	D2-392	2.5	83.20	9.68	1.31
PP592	D2-392	D2-67	2.5	369.46	19.27	1.29
PP593	D2-67	D2-42	2.5	488.00	19.20	1.10

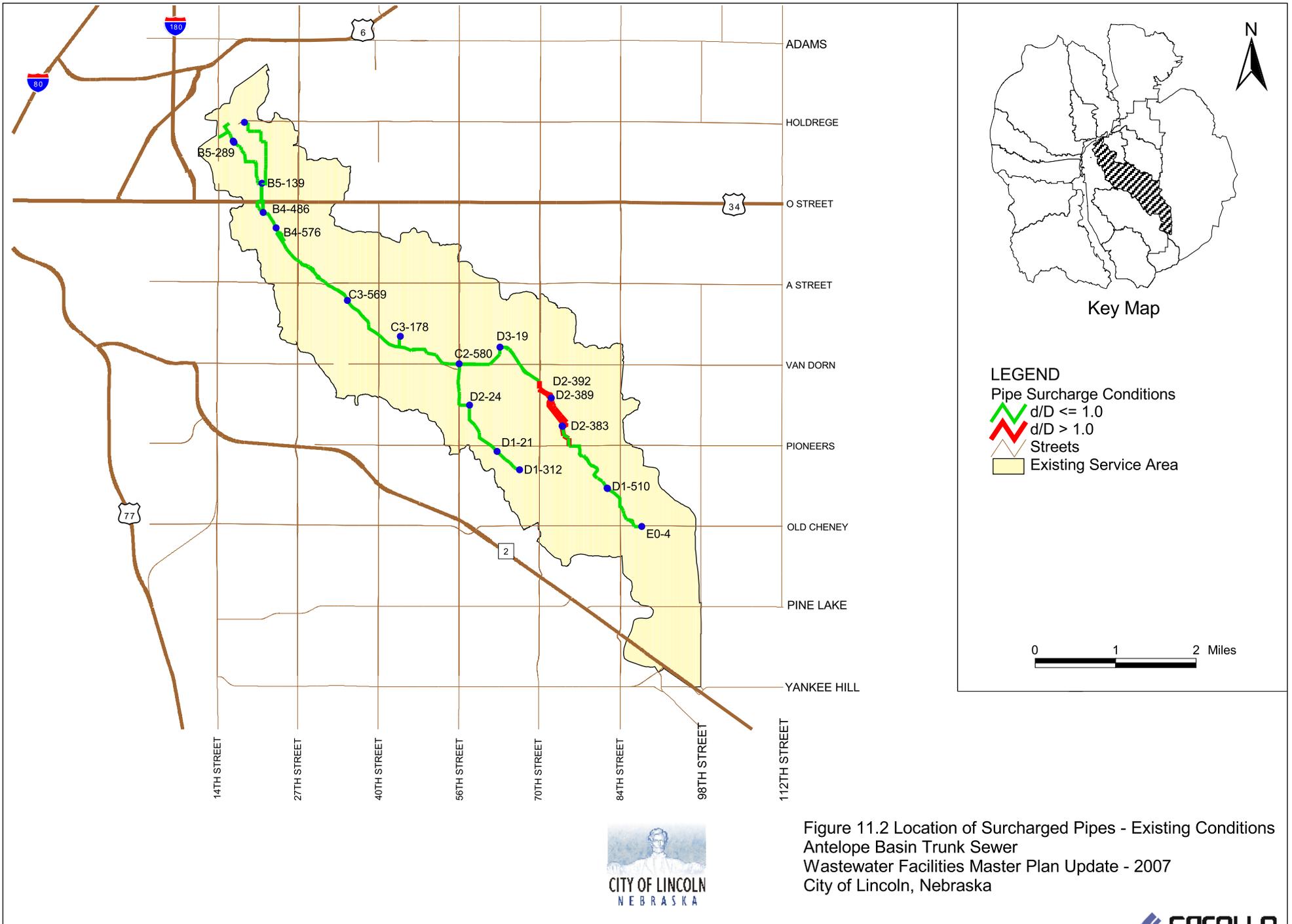
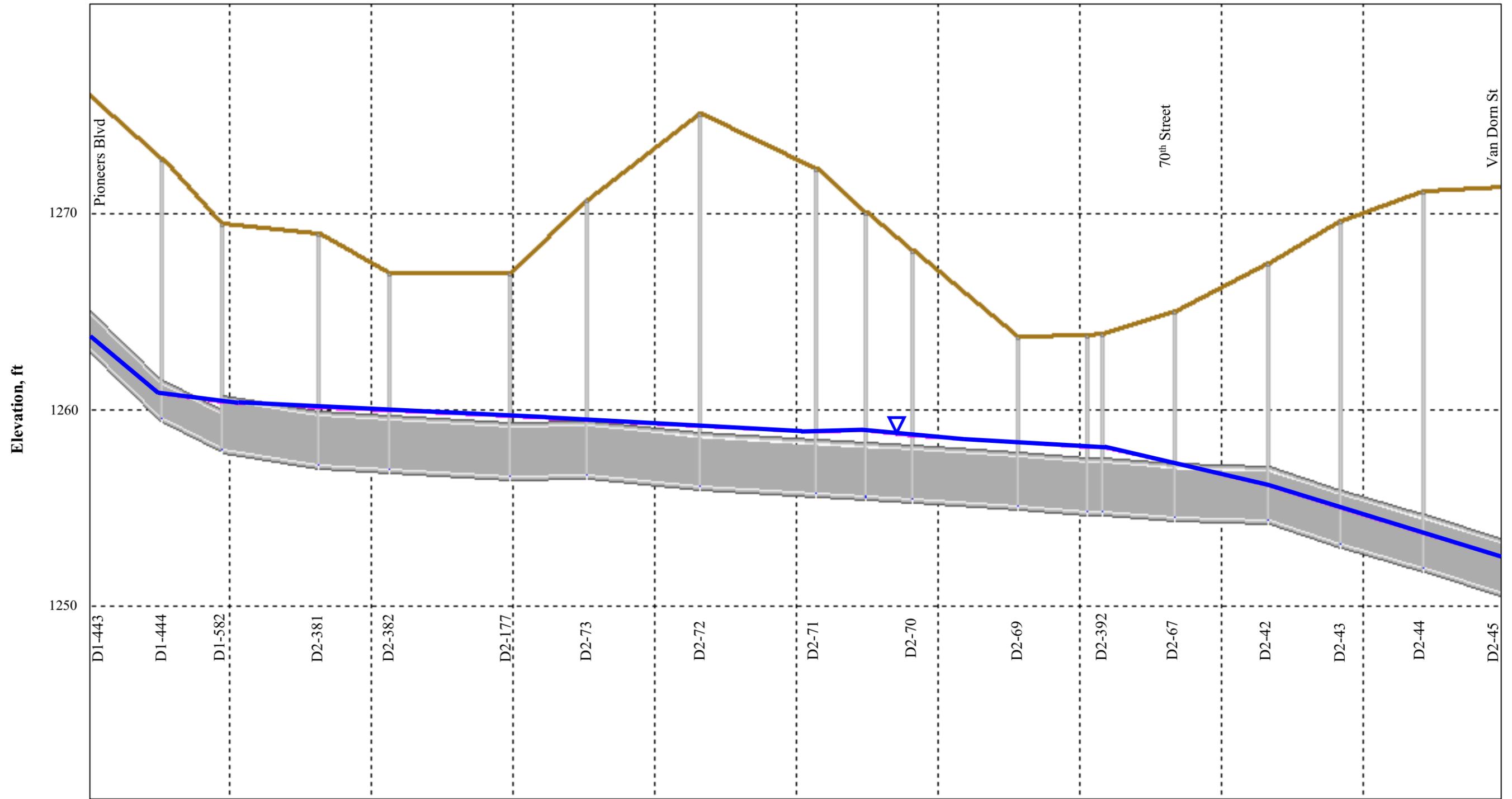


Figure 11.2 Location of Surcharged Pipes - Existing Conditions  
 Antelope Basin Trunk Sewer  
 Wastewater Facilities Master Plan Update - 2007  
 City of Lincoln, Nebraska



**Manholes**

- Modeled water surface
- Ground surface
- Sanitary sewer pipe



**Figure 11.3** Hydraulic Profile of Existing System – Existing Conditions  
 Antelope Basin Trunk Sewer  
 Wastewater Facilities Master Plan Update - 2007  
 City of Lincoln, Nebraska

When using a peak dry weather flow of approximately 20 percent of the peak wet weather flow resulted in several reaches of the modeled trunk sewer system with velocities less than 2 ft/sec. Locations of pipes with flow velocities less than 2 ft/s are shown in Figure 11.4. These areas should be periodically monitored and cleaned if solids deposition is noticed.

## **11.2.2 Improvement Alternatives**

### ***11.2.2.1 Relief Sewer***

The duration and depth of the surcharging is minor in nature and only occurs periodically during peak flows. Due to the minor nature of the surcharging no improvements to the existing system are recommended at this time.

### ***11.2.2.2 I/I Flow Reduction***

The results of the five simulation runs indicate that I/I flow reduction target of approximately 15 percent will eliminate the surcharged conditions identified in the modeling. The results of the five simulation runs are presented in Appendix D.

## **11.3 TIER I CONDITIONS**

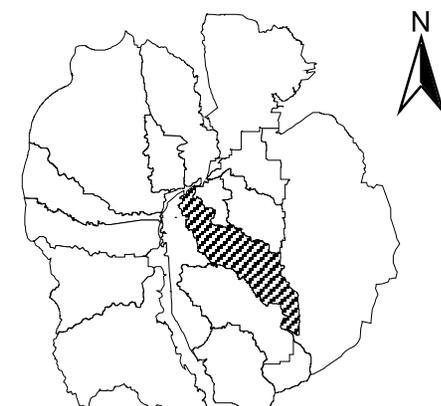
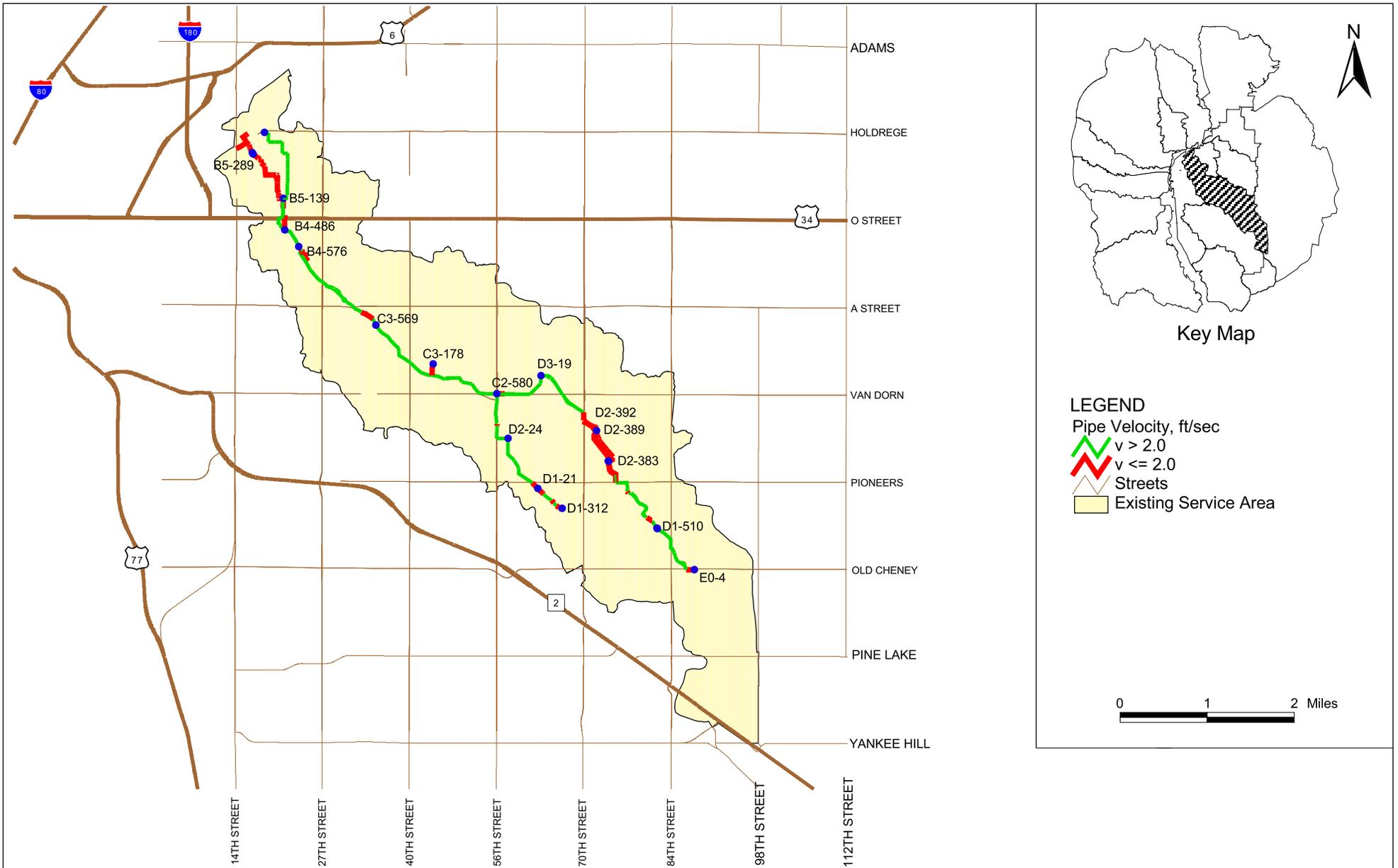
### **11.3.1 Model Results**

For the Tier I conditions the system was modeled using existing plus the Tier I areas as outlined in Table 11.1 above. This resulted in a peak in the Antelope Trunk Sewer System of approximately 47 cfs. As anticipated the same reach of pipe identified in 11.2.1 above, exhibited surcharged conditions using the Tier I flows. The location and hydraulic profile of these areas is shown in Figures 11.5 and 11.6 respectively. The surcharged pipes are summarized in Table 11.3.

### **11.3.2 Identified Alternatives**

#### ***11.3.2.1 Relief Sewer***

To eliminate the surcharging identified in the model, a parallel relief sewer near 70th and Holmes Lake, downstream from manhole D2-392 would be required. The actual size and length of this sewer should be finalized based on a detailed design study based on actual existing sewer inverts and other physical parameters.



Key Map

- LEGEND**
- Pipe Velocity, ft/sec
    - ▲ v > 2.0
    - ▲ v <= 2.0
  - Streets
  - Existing Service Area



Figure 11.4 Location of Pipes With Velocities  $\leq 2.0$  ft/sec Existing Conditions  
 Antelope Basin Trunk Sewer  
 Wastewater Facilities Master Plan Update  
 City of Lincoln, Nebraska



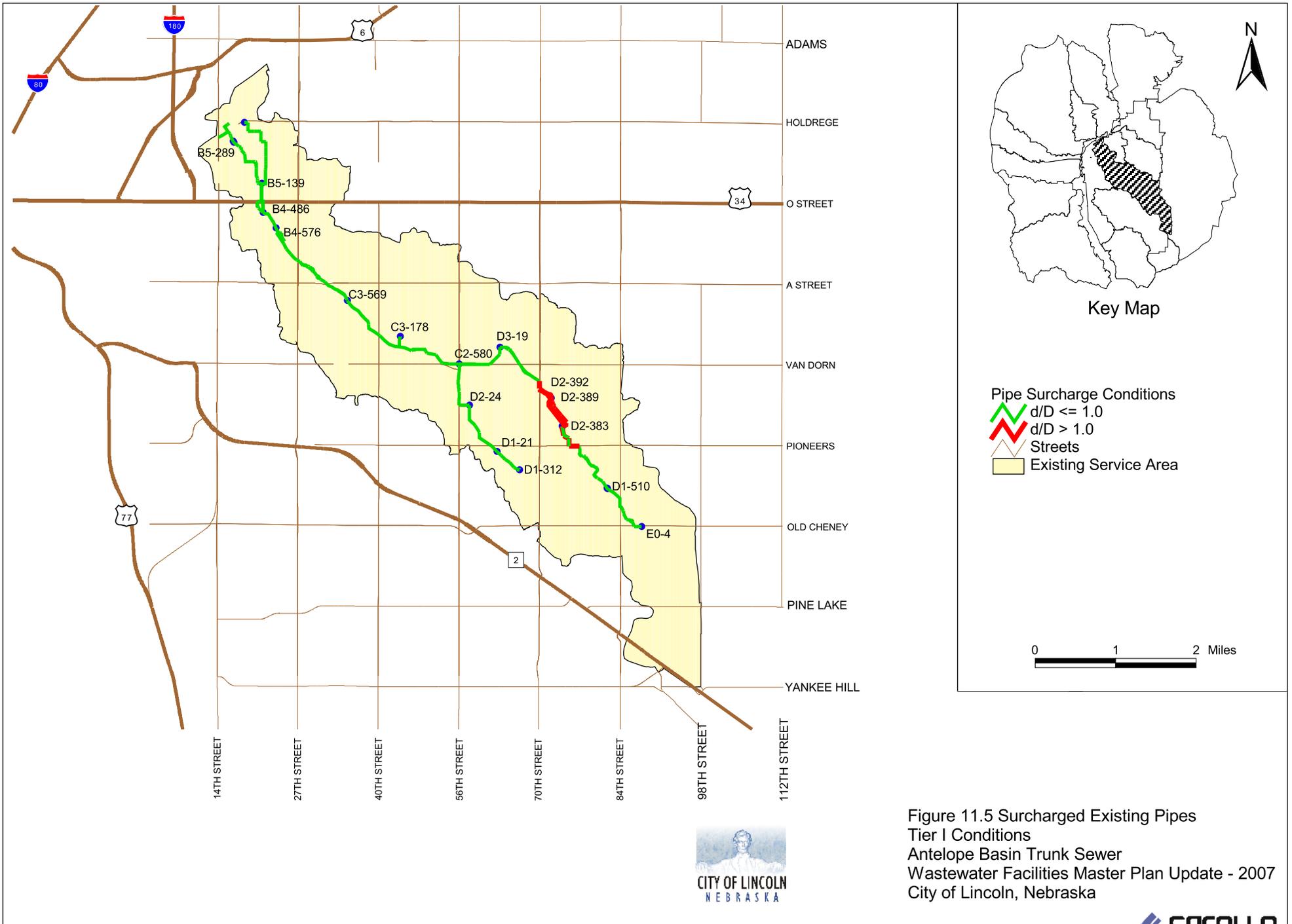
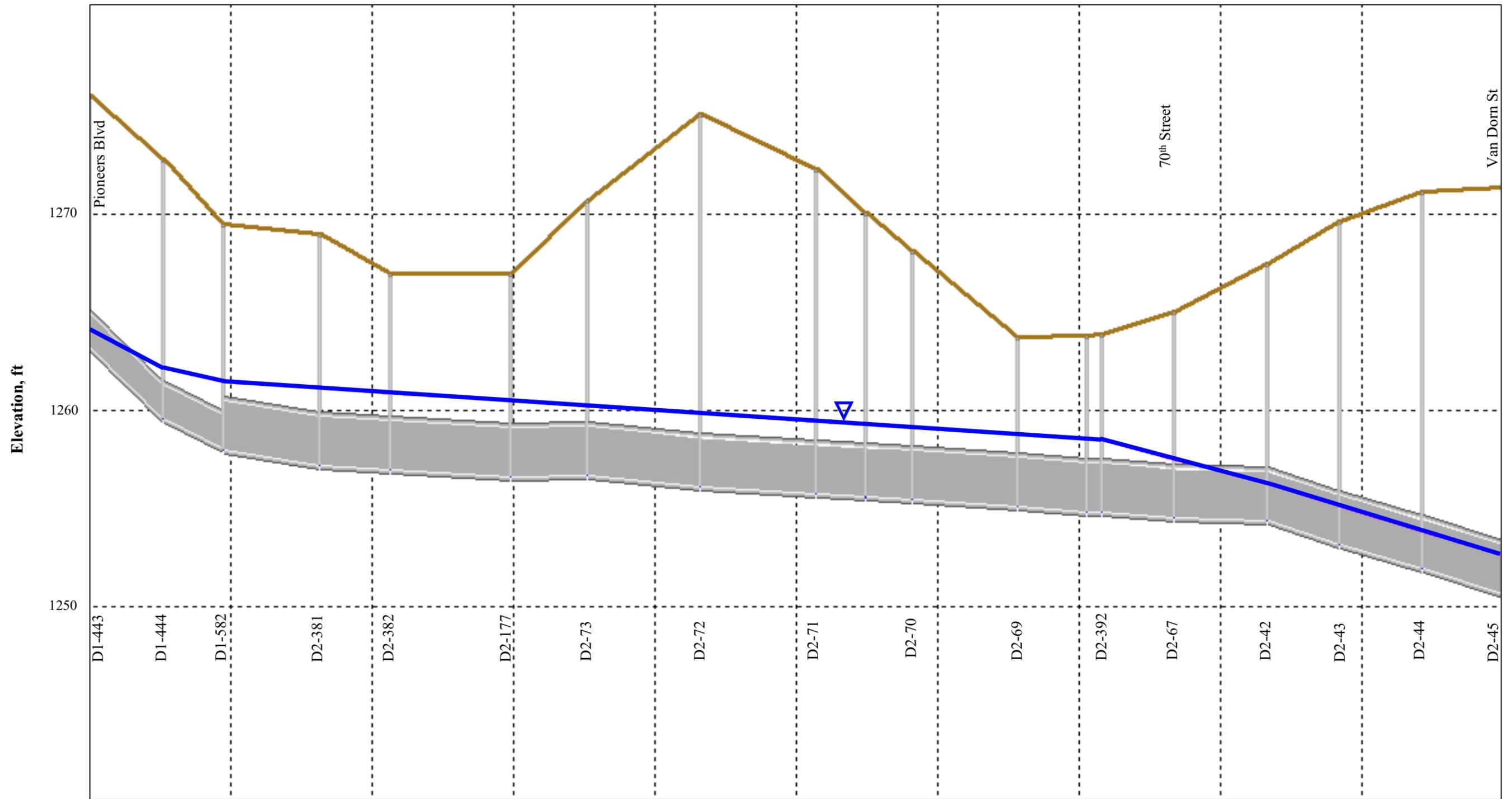


Figure 11.5 Surcharged Existing Pipes  
 Tier I Conditions  
 Antelope Basin Trunk Sewer  
 Wastewater Facilities Master Plan Update - 2007  
 City of Lincoln, Nebraska





**Manholes**

- Modeled water surface
- Ground surface
- Sanitary sewer pipe



**Figure 11.6** Hydraulic Profile of Existing System – Tier I Conditions  
 Antelope Basin Trunk Sewer  
 Wastewater Facilities Master Plan Update - 2007  
 City of Lincoln, Nebraska

<b>Table 11.3 Surcharged Pipes - Tier I Conditions - Antelope Creek Trunk Sewer Wastewater Facilities Master Plan Update - 2007 City of Lincoln, Nebraska</b>						
<b>Pipe ID</b>	<b>US Manhole</b>	<b>DS Manhole</b>	<b>Diameter (ft)</b>	<b>Length (ft)</b>	<b>Flow (cfs)</b>	<b>d/D</b>
PP578	D1-443	D1-444	1.75	379.00	7.31	1.47
PP579	D1-444	D1-582	1.75	316.00	7.32	1.93
L794	D1-582	D2-179	2.50	501.00	10.53	1.57
PP583	D2-383	D2-384	2.50	173.00	10.63	1.39
PP584	D2-384	D2-385	2.50	485.00	10.57	1.40
PP585	D2-385	D2-386	2.50	600.00	10.57	1.41
PP586	D2-386	D2-387	2.50	543.00	10.57	1.43
PP587	D2-387	D2-388	2.50	211.00	10.57	1.44
PP588	D2-388	D2-389	2.50	291.00	10.57	1.44
PP589	D2-389	D2-390	2.50	308.00	10.57	1.45
PP590	D2-390	D2-391	2.50	431.00	10.57	1.46
PP591	D2-391	D2-392	2.50	7.33	10.57	1.46
PP543	D2-179	D2-178	2.50	365.00	10.53	1.56
PP544	D2-178	D2-177	2.50	623.00	10.53	1.55
PP545	D2-177	D2-73	2.50	401.19	10.53	1.51
PP546	D2-73	D2-72	2.50	583.16	10.53	1.50
PP547	D2-72	D2-71	2.50	600.00	10.53	1.50
PP548	D2-71	D2-161	2.50	260.34	10.53	1.49
PP549	D2-161	D2-70	2.50	239.66	10.53	1.47
PP550	D2-70	D2-69	2.50	544.40	10.53	1.46
PP551	D2-69	D2-68	2.50	355.60	10.53	1.48
PP552	D2-68	D2-392	2.50	83.20	10.53	1.48
PP592	D2-392	D2-67	2.50	369.46	21.10	1.46
PP593	D2-67	D2-42	2.50	488.00	21.10	1.20

## **11.4 SUMMARY OF RECOMMENDED IMPROVEMENTS**

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

- Existing Flows:
  - Monitor and provide regular cleaning of existing sewer lines to maintain full pipe capacity.
  - I/I flow reduction of 15-percent to reduce surcharging.

- Tier I Flows:
  - Construct parallel relief sewer near 70th St and Holmes Lake to reduce surcharging.

A summary of the improvement projects identified with planning costs is outlined in Table 11.4.

**Table 11.4 Recommended Improvements - Antelope Creek Trunk Sewer  
Wastewater Facilities Master Plan Update - 2007  
City of Lincoln, Nebraska**

Tier (Timing)	ID	Description	Location	Parameters	Unit Price	Planning Cost <sup>(1)</sup>
I	ANT-1	Trunk Sewer Relief (CIP Project 12.a)	70th and Holmes Lake			\$750,000 <sup>(2)</sup>

Notes:

1. ENR CCI for Kansas City = 8512 (July 2006).
2. Costs are from current City CIP.