



**m** DEPARTMENT OF  
TRANSPORTATION

# ADA Training Design Case Studies

2018  
MnDOT

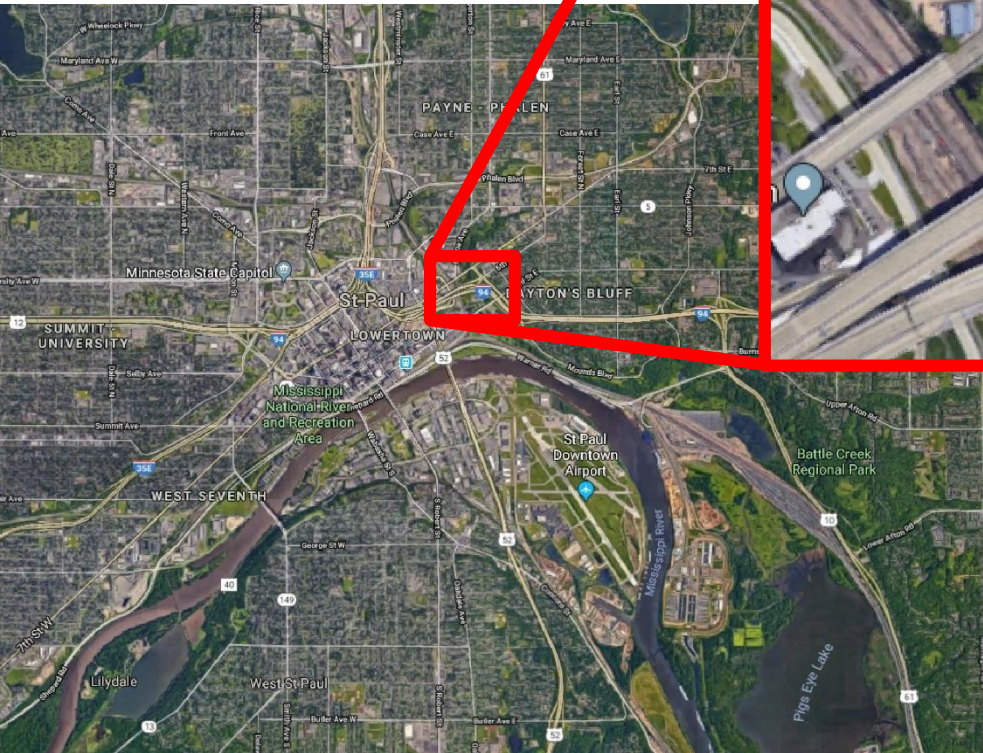
# ADA Design Case Studies

## Overview

- TH 61 (Mounds Blvd) Mill & Overlay
  - Lesson: Steep Slopes and Construction Limits
- Snelling Avenue Mill & Overlay
  - Lesson: Strategies for Commercial Constraints
- TH 43 (Mill St) Reconstruction, Rushford
  - Lesson: Strategies for Rural Retrofit
- TH 23 (Grand Ave) Mill & Overlay
  - Lesson: Strategies for Curb-Attached Sidewalks
- In-Class Design

# TH 61 (Mounds Blvd)

## Mill & Overlay, St. Paul



Mounds Blvd & 6<sup>th</sup> St E  
Mounds Blvd & 7<sup>th</sup> St E



# TH 61 (Mounds Blvd)





# TH 61 (Mounds Blvd)

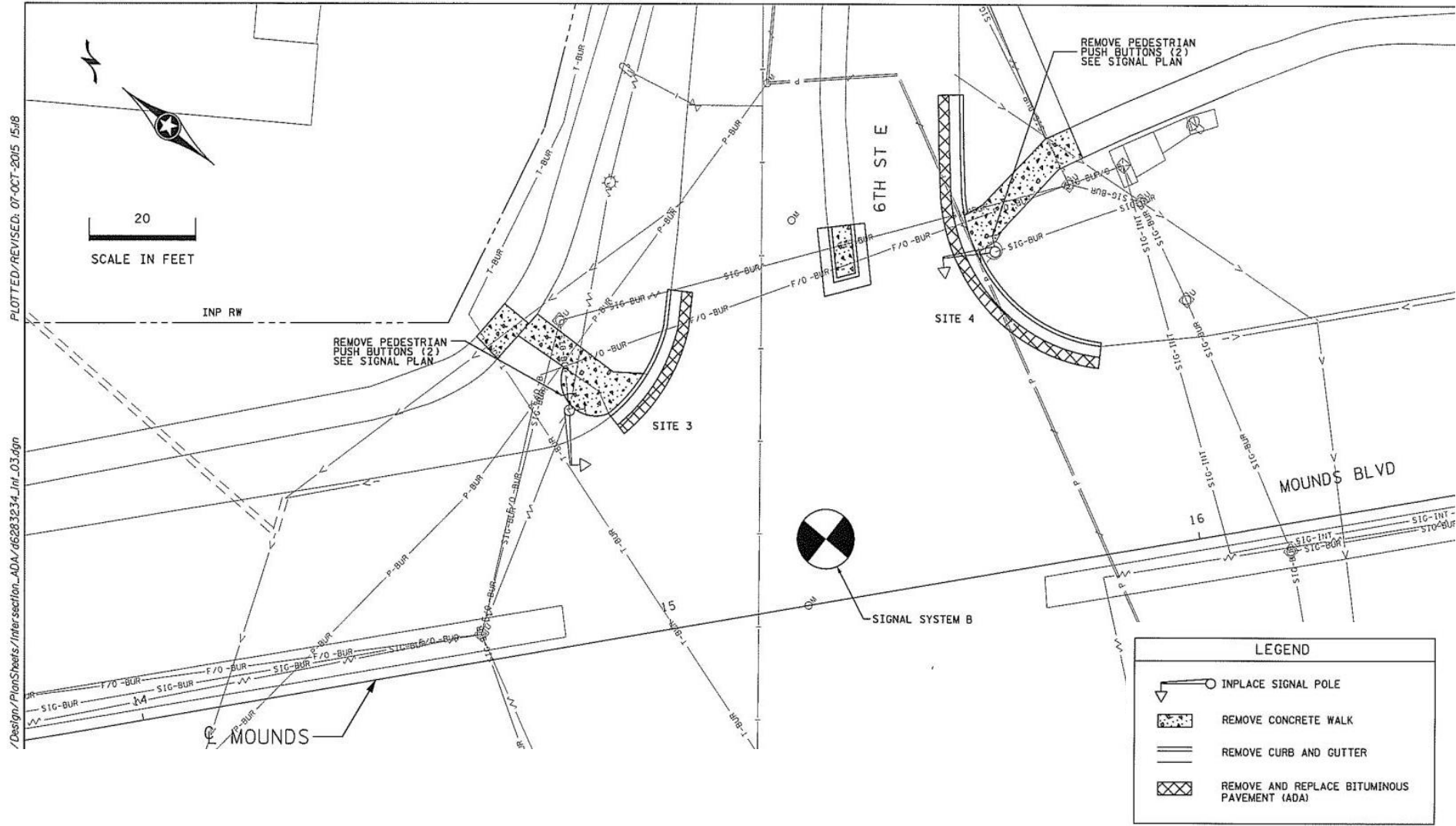




# TH 61 (Mounds Blvd)



# TH 61 (Mounds Blvd)



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/Design/PlanSheets/Intersection\_ADA/66283234\_Int\_03.dgn

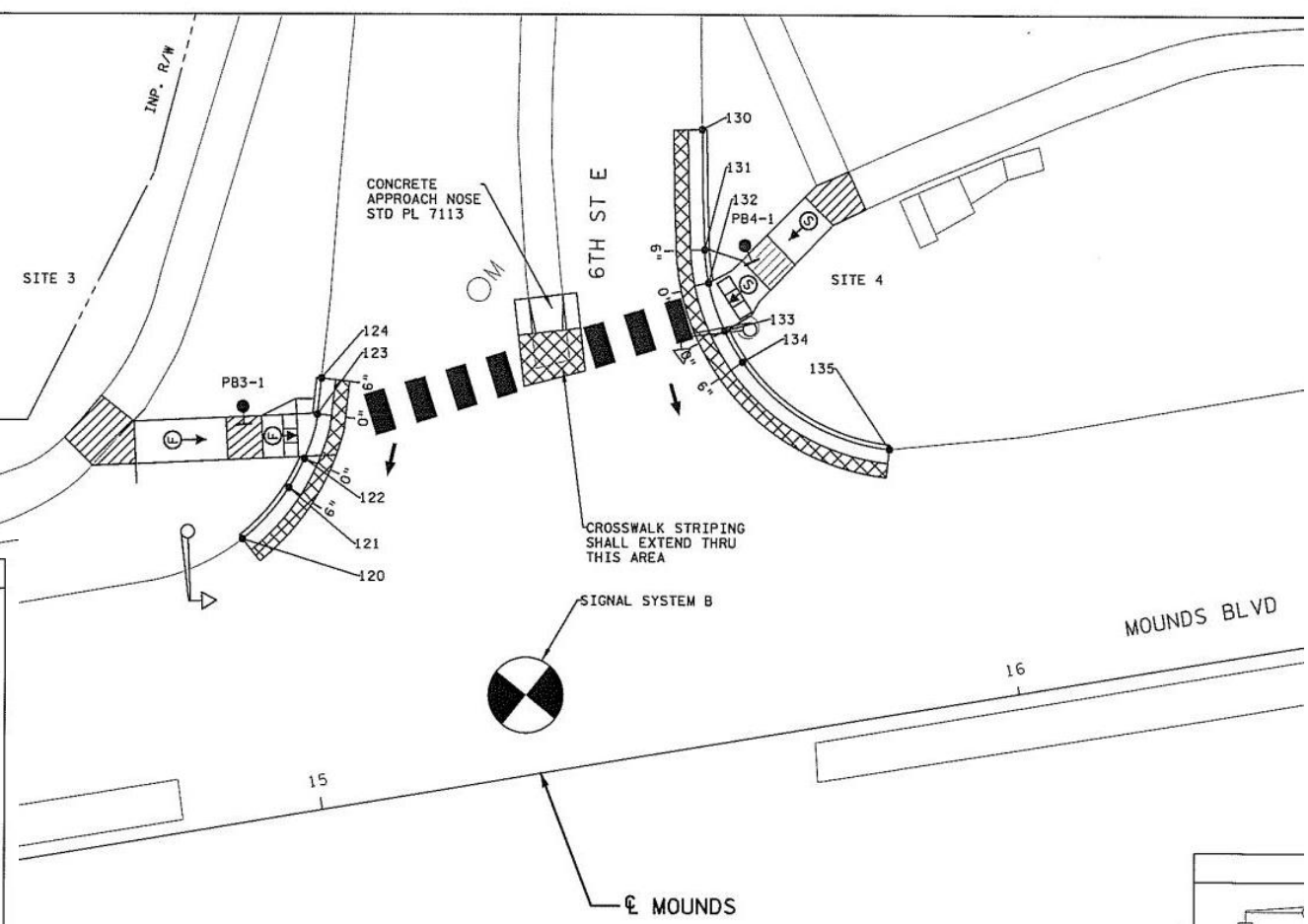


# TH 61 (Mounds Blvd)

GUTTER POINTS				
SITE 3				
POINT NO.	X	Y	Z	SLOPE %
120	579957.14	160332.98	804.25	
121	579966.93	160332.46	804.97	7.34%
122	579971.53	160333.34	805.33	7.69%
123	579977.55	160335.91	805.44	1.68%
124	579981.85	160338.65	805.84	7.84%
SITE 4				
130	580043.06	160319.04	807.60	
131	580030.15	160308.08	806.34	-7.44%
132	580026.89	160304.71	806.00	-7.26%
133	580023.01	160298.69	805.87	-1.81%
134	580021.29	160293.99	805.46	-8.20%
135	580024.92	160270.06	803.2	-9.34%

**LEGEND**

- INPLACE SIGNAL POLE
- PEDESTRIAN PUSH BUTTON STATION
- CONTROL POINTS AT GUTTER FLOW LINE
- TRUNCATED DOMES (SEE STANDARD PLATE 7038)
- CONSTRUCT CONCRETE CURB & GUTTER
- REMOVE AND REPLACE BITUMINOUS PAVEMENT (ADA)
- C<sup>X"</sup> CURB HEIGHT
- LANDING AREA - 4' X 4' MIN. DIMENSIONS AND MAX 2.0% SLOPE IN ALL DIRECTIONS
- INDICATES PEDESTRIAN RAMP - SLOPE SHALL BE BETWEEN 5.0% MINIMUM AND 8.3% MAXIMUM IN THE DIRECTION SHOWN AND CROSS SLOPE SHALL NOT EXCEED 2.0%
- INDICATES PEDESTRIAN RAMP - SLOPE SHALL BE GREATER THAN 2.0% AND LESS THAN 5.0% IN THE DIRECTION SHOWN AND CROSS SLOPE SHALL NOT EXCEED 2.0%
- DRAINAGE FLOW ARROW

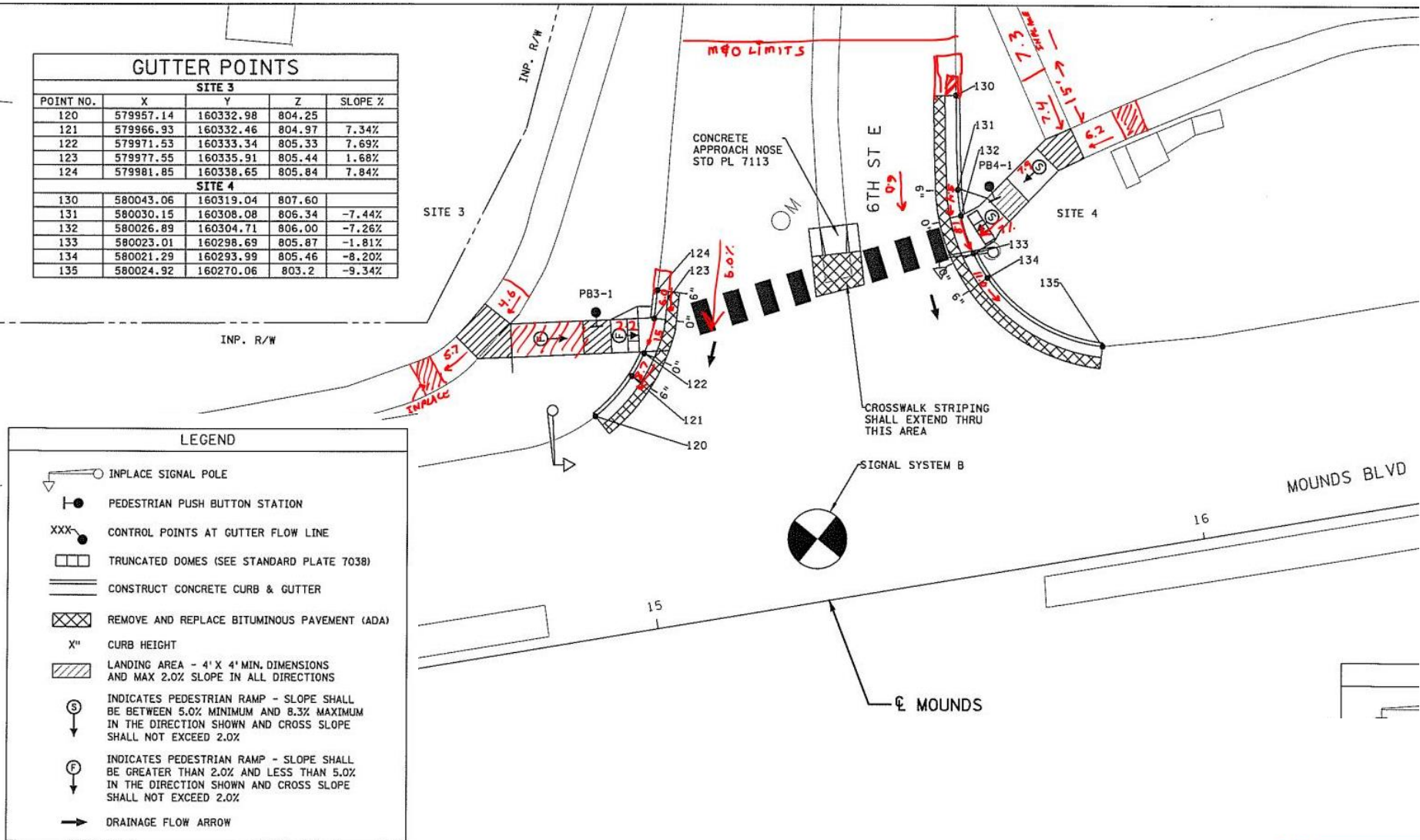


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gm/Plansheets/Intersection\_ADA/d6283234\_Int\_04.dgn

# TH 61 (Mounds Blvd)

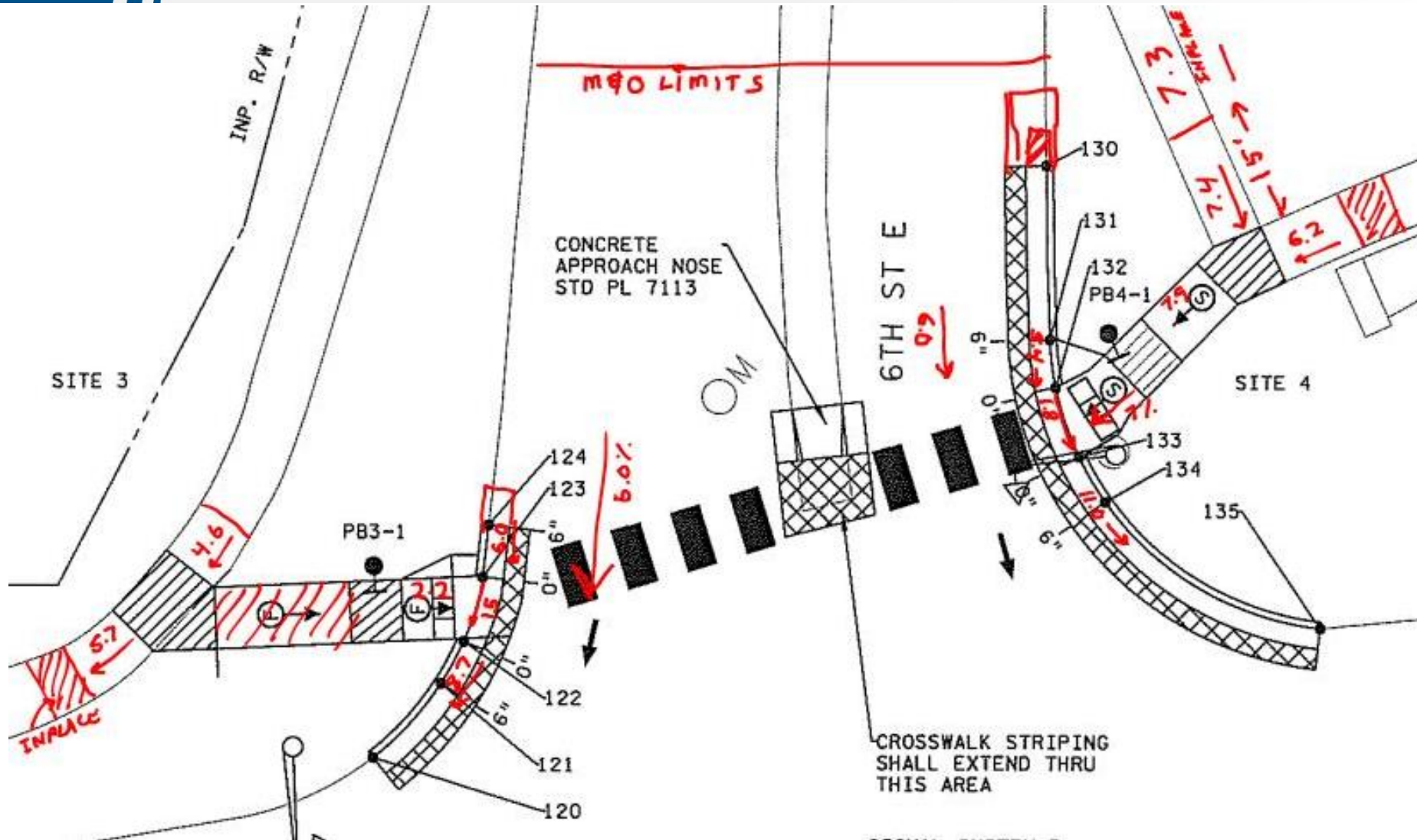
GUTTER POINTS				
SITE 3				
POINT NO.	X	Y	Z	SLOPE %
120	579957.14	160332.98	804.25	
121	579966.93	160332.46	804.97	7.34%
122	579971.53	160333.34	805.33	7.69%
123	579977.55	160335.91	805.44	1.68%
124	579981.85	160338.65	805.84	7.84%
SITE 4				
130	580043.06	160319.04	807.60	
131	580030.15	160308.08	806.34	-7.44%
132	580026.89	160304.71	806.00	-7.26%
133	580023.01	160298.69	805.87	-1.81%
134	580021.29	160293.99	805.46	-8.20%
135	580024.92	160270.06	803.2	-9.34%



PLOTTED/REVISED: 07-OCT-2015 15:20

jnw/PlansSheets/Intersections/ADA/46283234\_Int\_04.dgn

# TH 61 (Mounds Blvd)





# TH 61 (Mounds Blvd)





# TH 61 (Mounds Blvd)





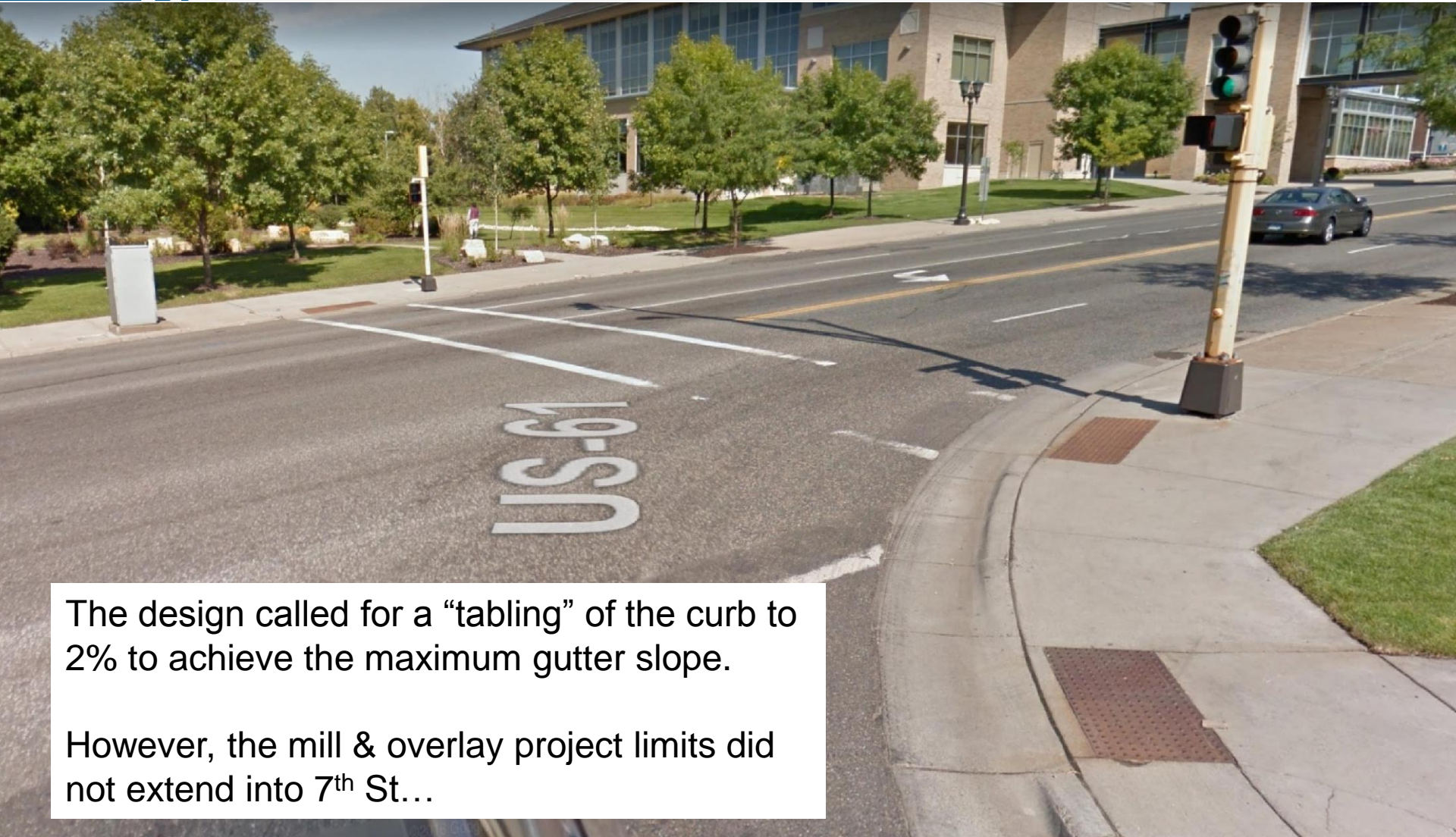
# TH 61 (Mounds Blvd)



Mounds Blvd & 7<sup>th</sup> St E



# TH 61 (Mounds Blvd)



The design called for a “tabling” of the curb to 2% to achieve the maximum gutter slope.

However, the mill & overlay project limits did not extend into 7<sup>th</sup> St...

# TH 61 (Mounds Blvd)

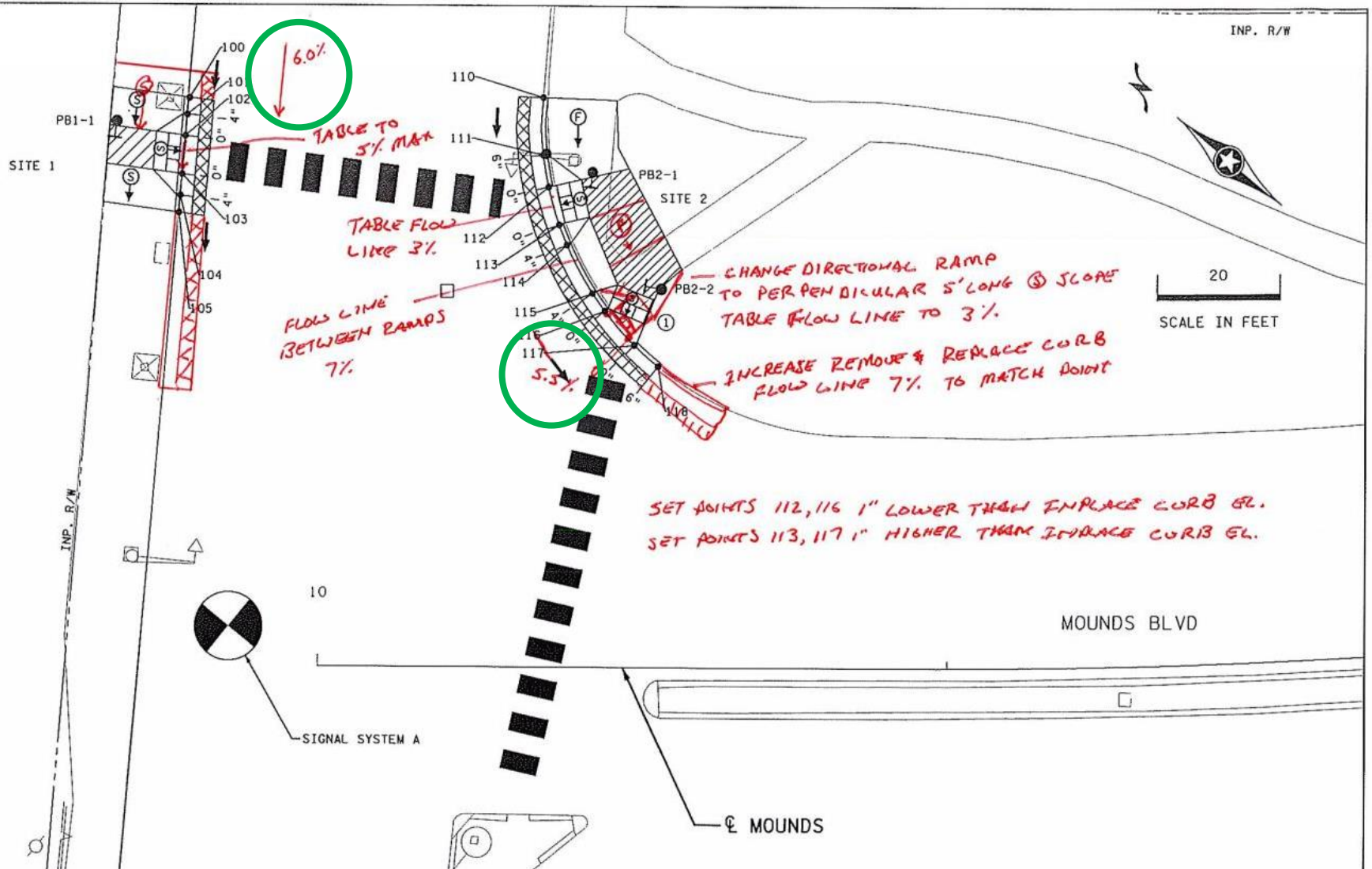




# TH 61 (Mounds Blvd)



# TH 61 (Mounds Blvd)





# TH 61 (Mounds Blvd)





# TH 61 (Mounds Blvd)





# TH 61 (Mounds Blvd)

## Summary

### 6<sup>th</sup> St E

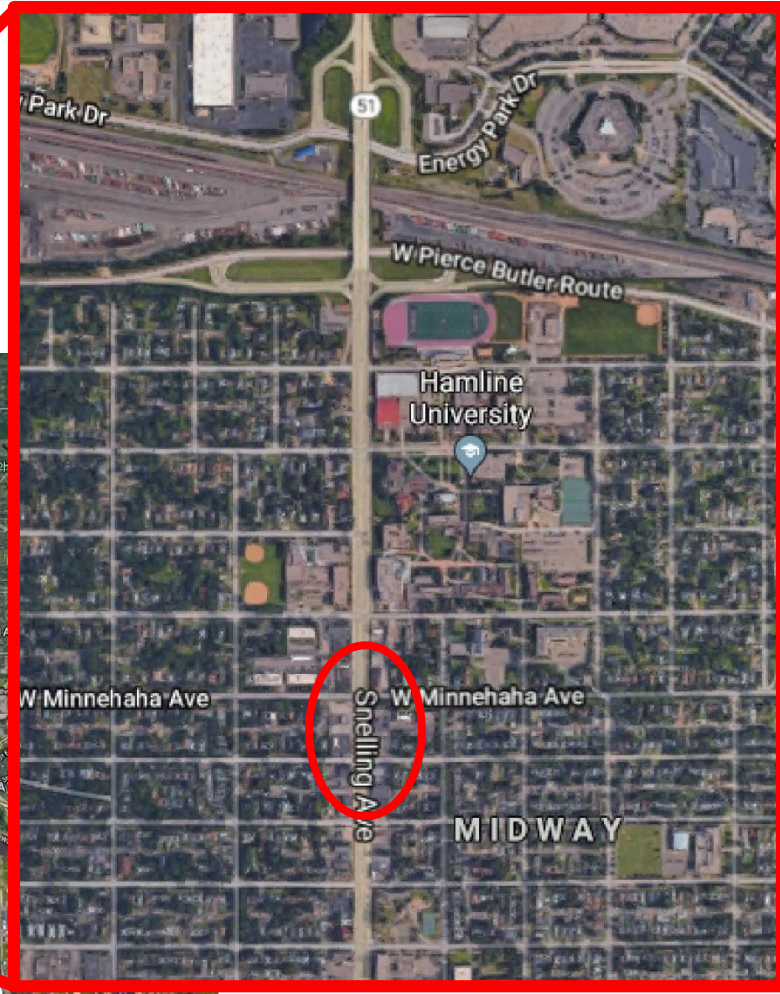
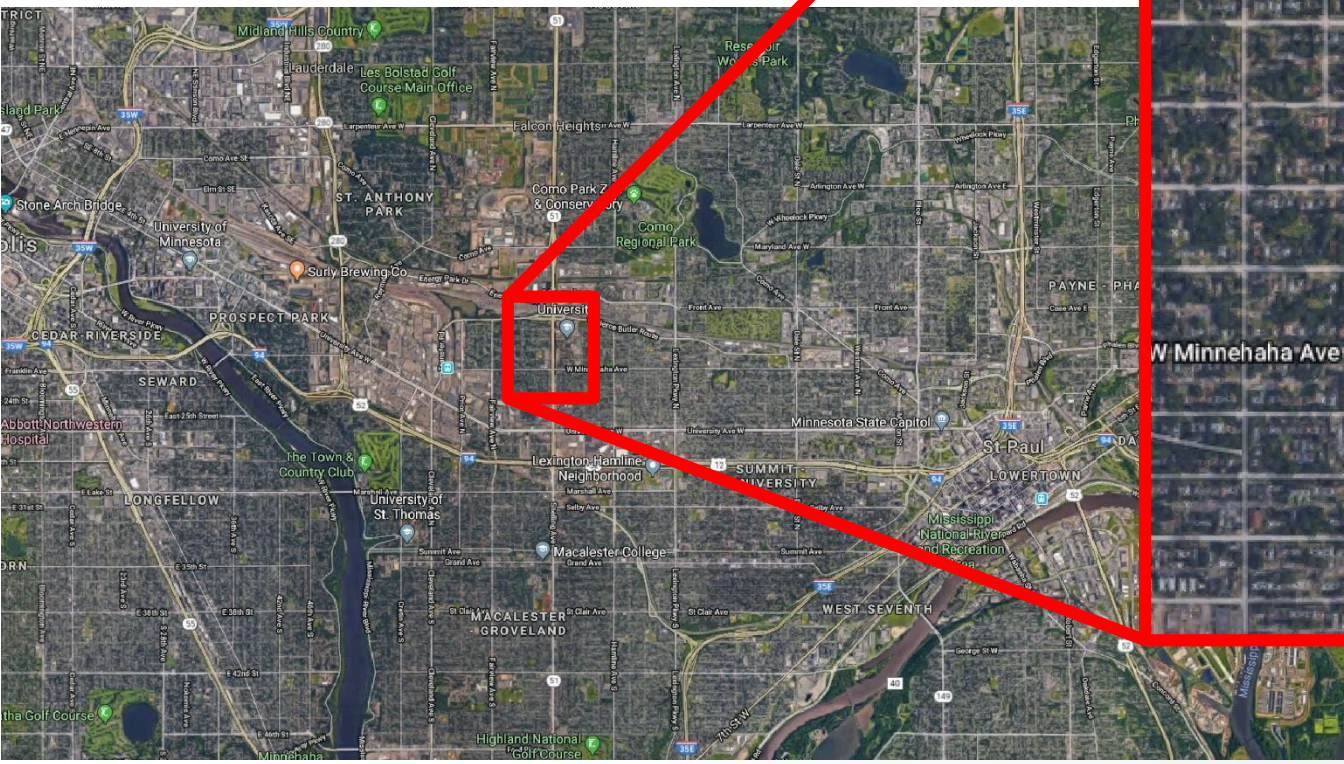
- Curb Ramps installed per plan
- Construction Limits had to be extended beyond design
  - Sidewalks
  - Mill & Overlay

### 7<sup>th</sup> St E

- Curb Ramps originally installed per plan with curb tabled to 2% per plan
- Roadway impacts were too drastic
  - Ramps were removed and replaced at 3% grade

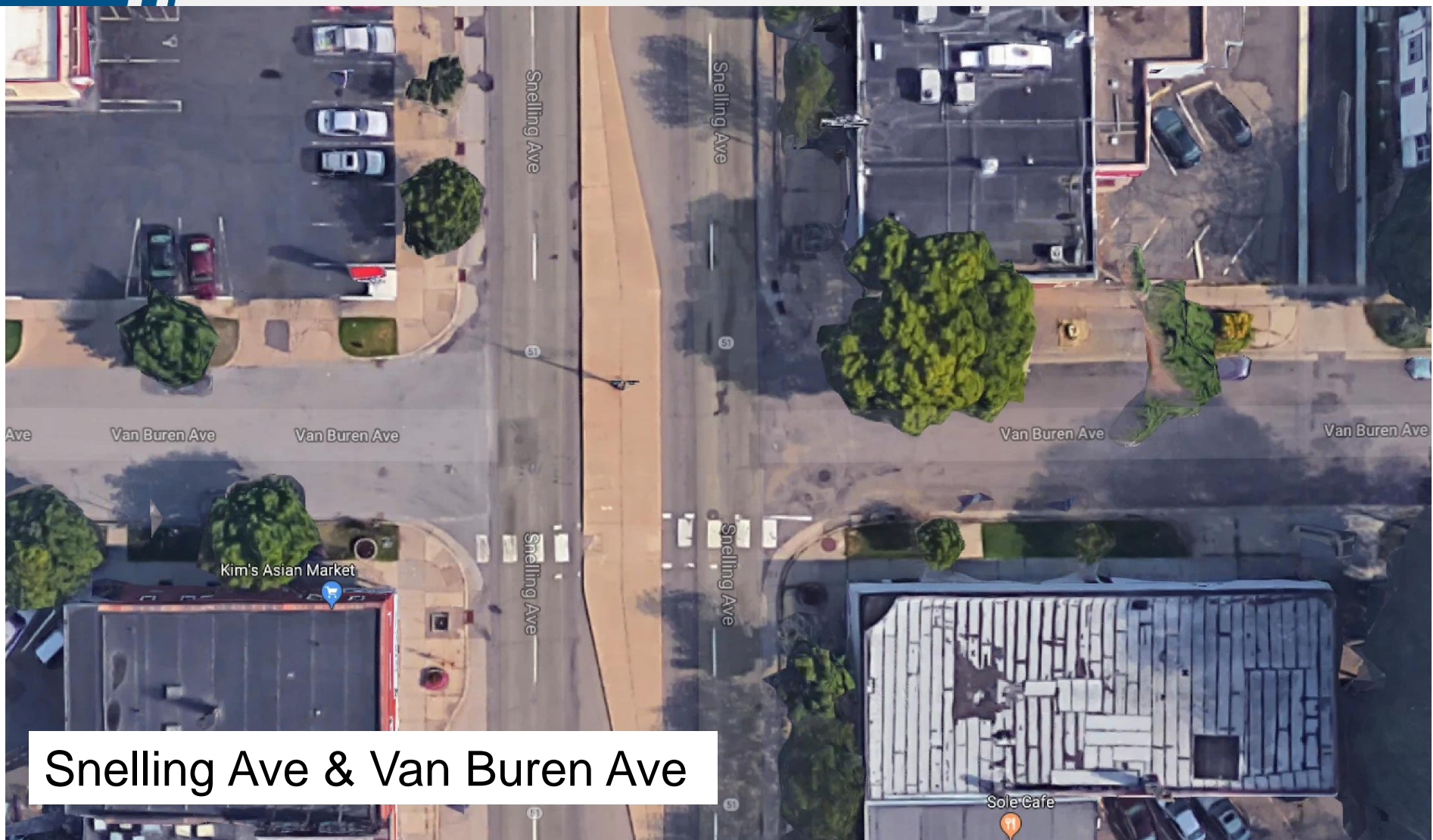
# Snelling Ave Mill & Overlay

Mill & Overlay, St. Paul  
Snelling Ave & Van Buren Ave  
Snelling Ave & Minnehaha Ave





# Snelling Ave Mill & Overlay



Snelling Ave & Van Buren Ave

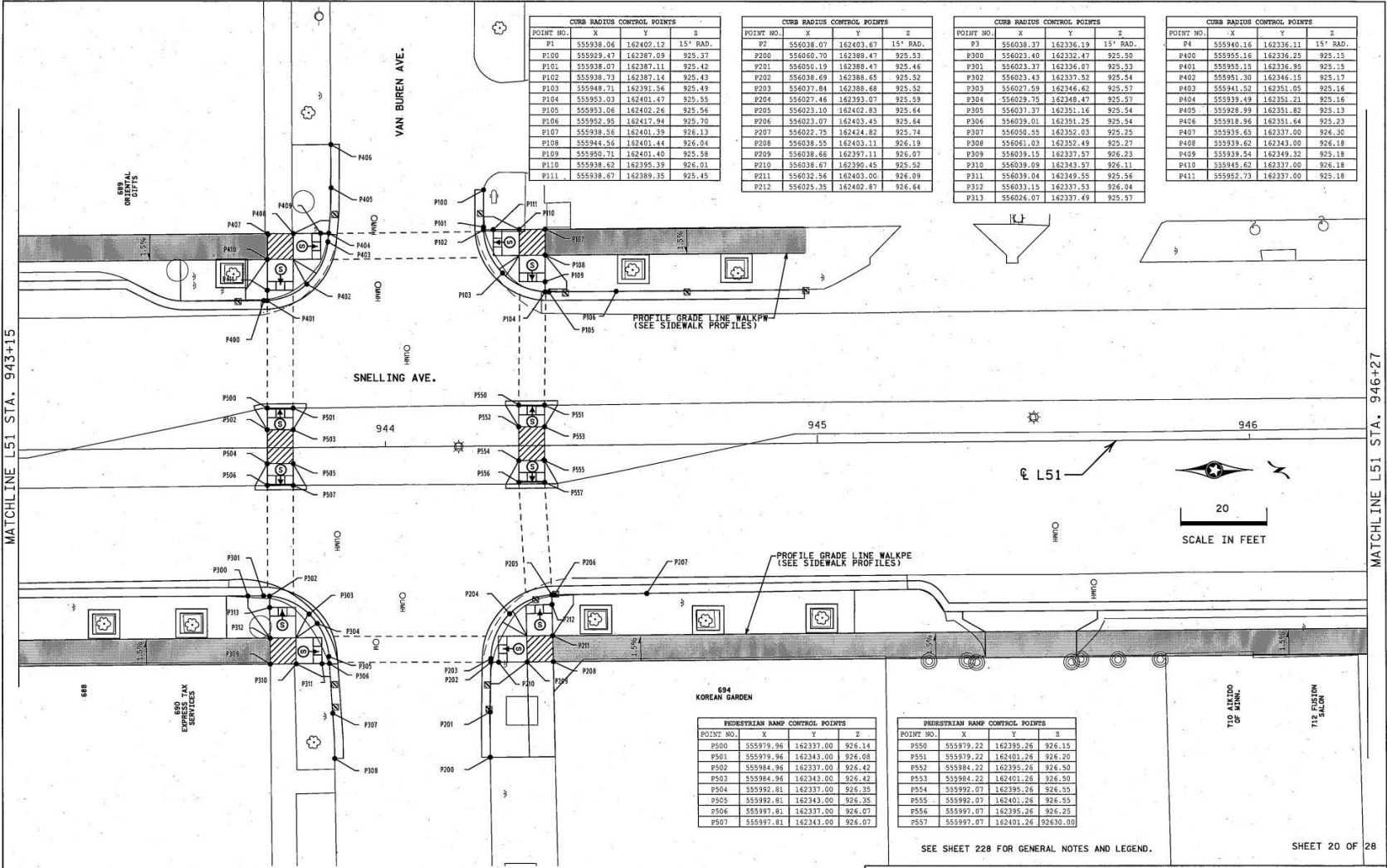
# Snelling Ave Mill & Overlay

PLOTTED/REVISED: 12-FEB-2015 09:46

MATCHLINE L51 STA. 943+15

DISTRICT #: METRO  
IPLOT NAME: 621599\_1260  
FILENAME: Proj\621599\_1260\Design\PlanSheets\Intersections\621599\_1260.dgn

MATCHLINE L51 STA. 946+27



CURB RADIUS CONTROL POINTS			
POINT NO.	X	Y	Z
P1	555938.06	162402.12	15° RAD.
P100	555929.47	162387.09	925.37
P101	555938.07	162387.11	925.42
P102	555939.73	162387.14	925.43
P103	555948.71	162391.56	925.49
P104	555953.03	162401.47	925.55
P105	555953.06	162402.24	925.56
P106	555952.95	162417.94	925.70
P107	555938.56	162401.39	926.13
P108	552944.58	162401.44	926.04
P109	555950.71	162401.40	925.59
P110	555938.62	162395.39	926.01
P111	555938.67	162389.35	925.45

CURB RADIUS CONTROL POINTS			
POINT NO.	X	Y	Z
P2	556038.07	162403.67	15° RAD.
P200	556060.70	162388.47	925.53
P201	556050.19	162388.47	925.46
P202	556039.69	162388.65	925.52
P203	556037.81	162388.48	925.52
P204	556027.48	162393.07	925.59
P205	556023.10	162402.83	925.64
P206	556023.07	162403.45	925.64
P207	556022.75	162424.82	925.74
P208	556039.55	162403.11	926.19
P209	556039.66	162397.11	926.07
P210	556038.67	162390.45	925.52
P211	556032.56	162403.00	926.09
P212	556025.35	162402.87	926.64

CURB RADIUS CONTROL POINTS			
POINT NO.	X	Y	Z
P3	556038.37	162336.19	15° RAD.
P300	556023.40	162332.47	925.50
P301	556023.37	162336.07	925.53
P302	556023.43	162337.52	925.54
P303	556027.59	162346.42	925.57
P304	556029.75	162348.47	925.57
P305	556037.37	162351.16	925.54
P306	556039.01	162351.25	925.54
P307	556050.55	162352.03	925.25
P308	556051.03	162352.49	925.27
P309	556039.15	162337.57	925.23
P310	556039.09	162343.57	926.11
P311	556039.04	162349.55	925.56
P312	556033.15	162337.53	926.04
P313	556026.07	162337.49	925.57

CURB RADIUS CONTROL POINTS			
POINT NO.	X	Y	Z
P4	555940.16	162336.11	15° RAD.
P400	555955.16	162336.25	925.15
P401	555955.15	162336.95	925.15
P402	555951.30	162346.15	925.17
P403	555941.52	162351.05	925.16
P404	555939.49	162351.21	925.16
P405	555928.99	162351.82	925.13
P406	555918.96	162351.64	925.23
P407	555939.65	162337.00	926.30
P408	555939.62	162343.00	926.18
P409	555939.54	162349.32	925.19
P410	555945.62	162337.00	926.18
P411	555952.73	162337.00	925.18

PEDESTRIAN RAMP CONTROL POINTS			
POINT NO.	X	Y	Z
P500	555919.96	162337.00	926.14
P501	555979.96	162343.00	926.08
P502	555984.96	162337.00	926.42
P503	555984.96	162343.00	926.42
P504	555992.81	162337.00	926.35
P505	555992.81	162343.00	926.35
P506	555997.81	162337.00	926.07
P507	555997.81	162343.00	926.07

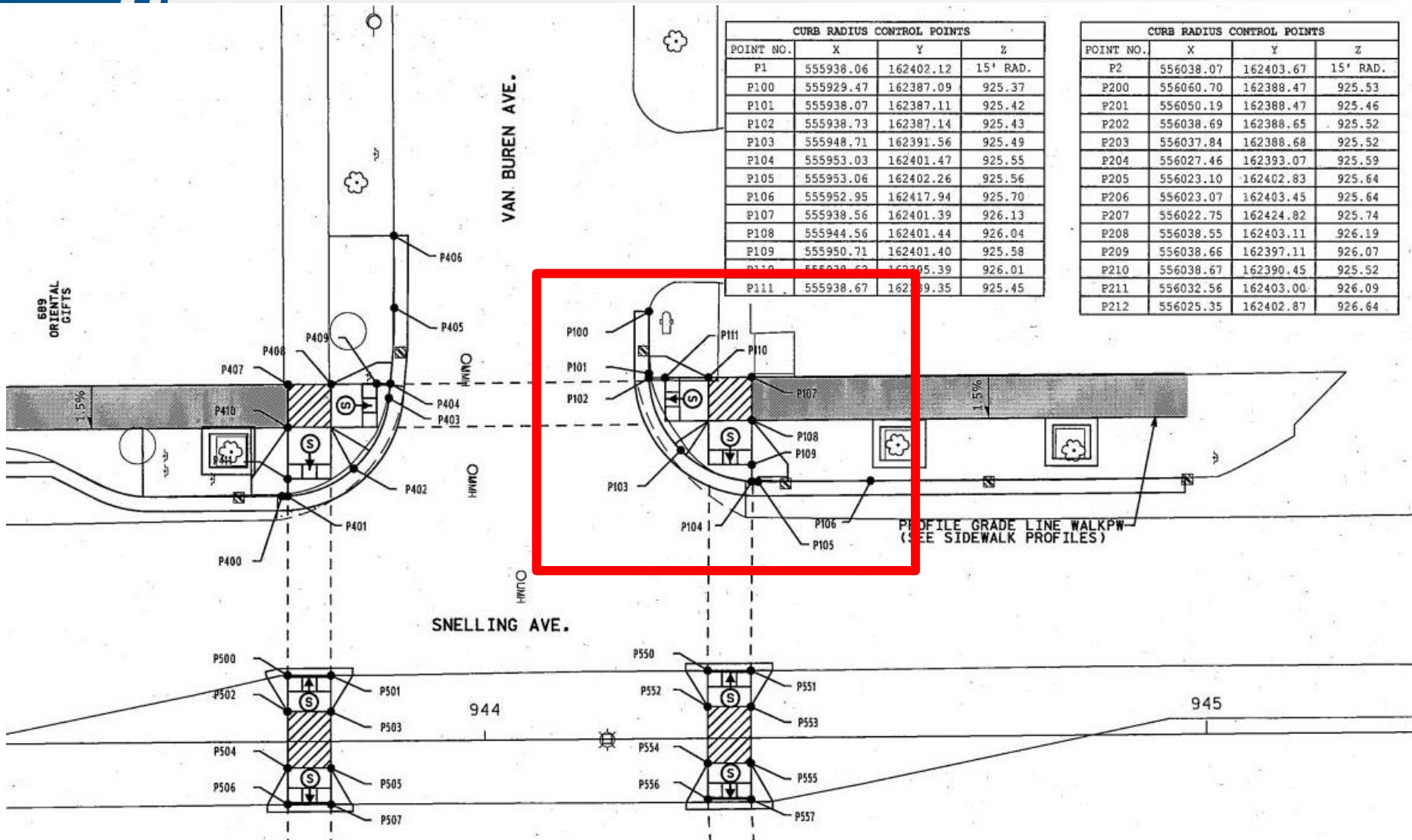
PEDESTRIAN RAMP CONTROL POINTS			
POINT NO.	X	Y	Z
P550	555979.22	162395.26	926.15
P551	555979.22	162401.26	926.20
P552	555984.22	162395.26	926.50
P553	555984.22	162401.26	926.50
P554	555992.07	162395.26	926.55
P555	555992.07	162401.26	926.55
P556	555997.07	162395.26	926.23
P557	555997.07	162401.26	926.30

SEE SHEET 228 FOR GENERAL NOTES AND LEGEND.

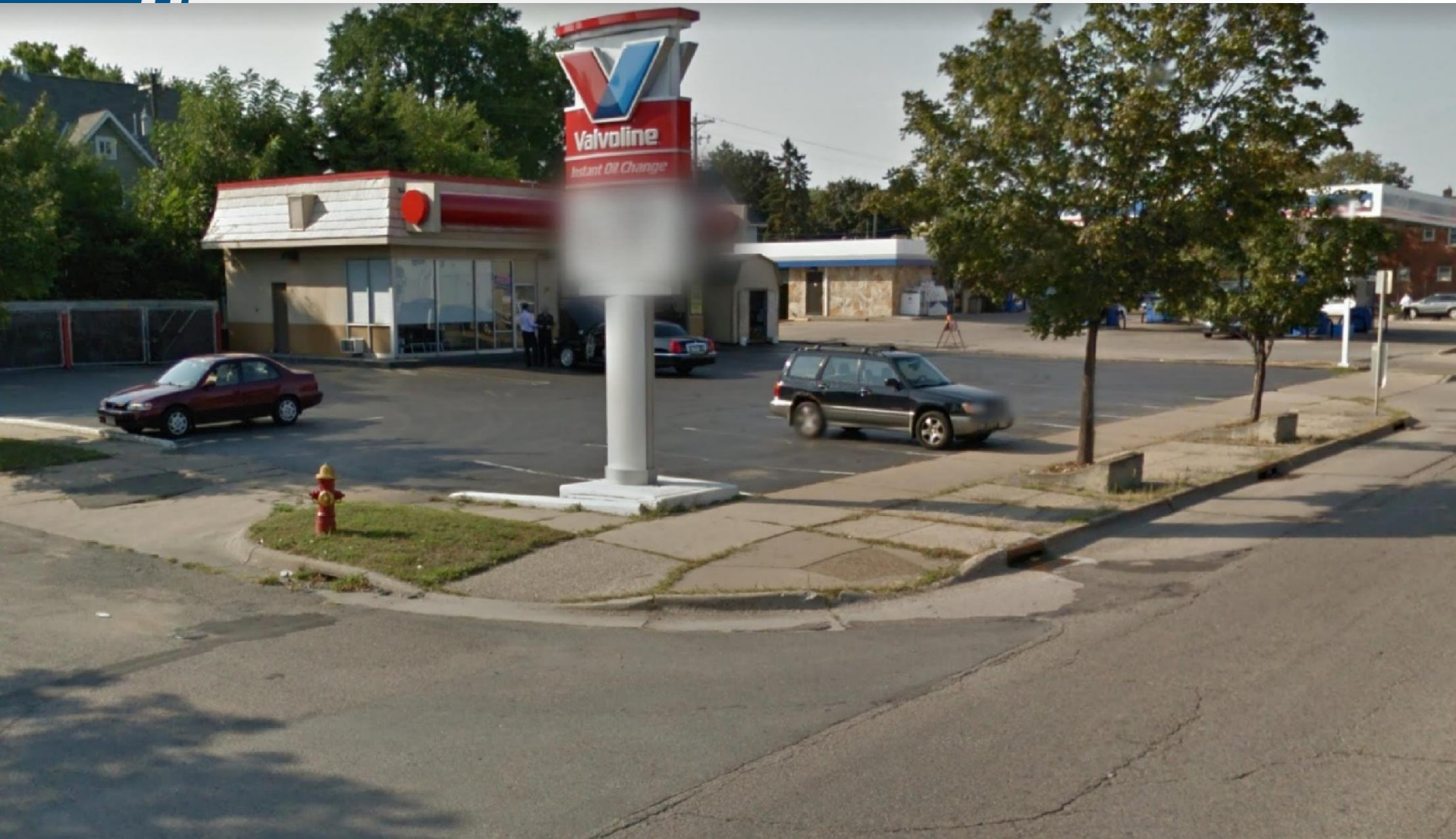
SHEET 20 OF 28



# Snelling Ave Mill & Overlay



# Snelling Ave Mill & Overlay

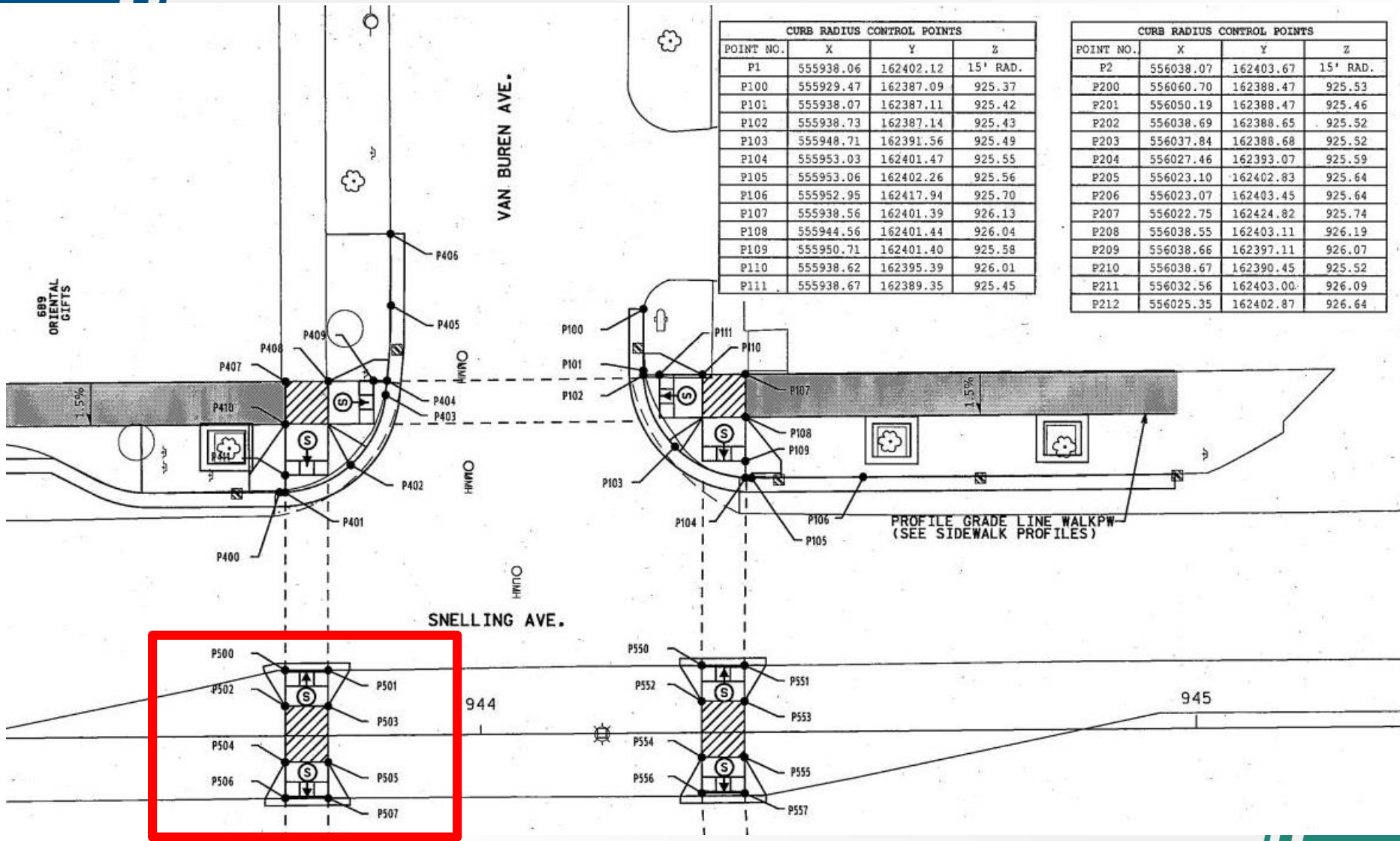




# Snelling Ave Mill & Overlay

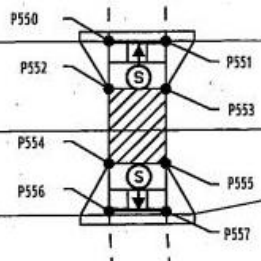
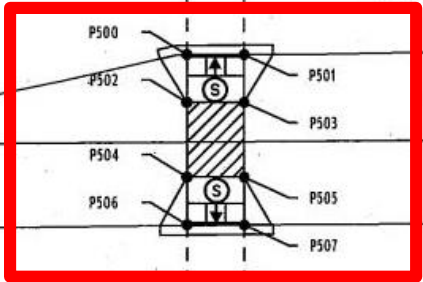


# Snelling Ave Mill & Overlay



CURB RADIUS CONTROL POINTS			
POINT NO.	X	Y	Z
P1	555938.06	162402.12	15' RAD.
P100	555929.47	162387.09	925.37
P101	555938.07	162387.11	925.42
P102	555938.73	162387.14	925.43
P103	555948.71	162391.56	925.49
P104	555953.03	162401.47	925.55
P105	555953.06	162402.26	925.56
P106	555952.95	162417.94	925.70
P107	555938.56	162401.39	926.13
P108	555944.56	162401.44	926.04
P109	555950.71	162401.40	925.58
P110	555938.62	162395.39	926.01
P111	555938.67	162389.35	925.45

CURB RADIUS CONTROL POINTS			
POINT NO.	X	Y	Z
P2	556038.07	162403.67	15' RAD.
P200	556060.70	162388.47	925.53
P201	556050.19	162388.47	925.46
P202	556038.69	162388.65	925.52
P203	556037.84	162388.68	925.52
P204	556027.46	162393.07	925.59
P205	556023.10	162402.83	925.64
P206	556023.07	162403.45	925.64
P207	556022.75	162424.82	925.74
P208	556038.55	162403.11	926.19
P209	556038.66	162397.11	926.07
P210	556038.67	162390.45	925.52
P211	556032.56	162403.00	926.09
P212	556025.35	162402.87	926.64





# Snelling Ave Mill & Overlay



# Snelling Ave Mill & Overlay





# Snelling Ave Mill & Overlay



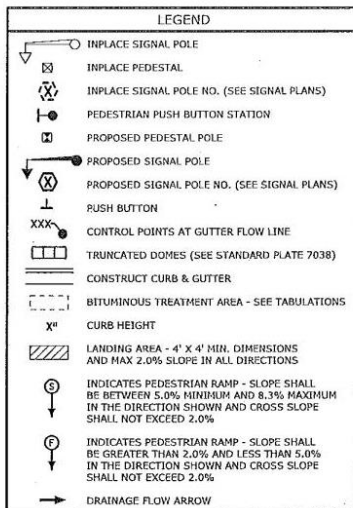
Snelling Ave & Minnehaha Ave

# Snelling Ave Mill & Overlay

# 90%

### NOTES

- 1 BUILD 5% GUTTER OUT.
- 2 LANDING SLOPE SHALL NOT EXCEED 6%.
- 3 RAMP SLOPE SHALL NOT EXCEED 12%.
- 4 LANDING SLOPE SHALL NOT EXCEED 8%.
- 5 LANDING SLOPE SHALL NOT EXCEED 4%.
- 6 RAMP SLOPE SHALL NOT EXCEED 10%.



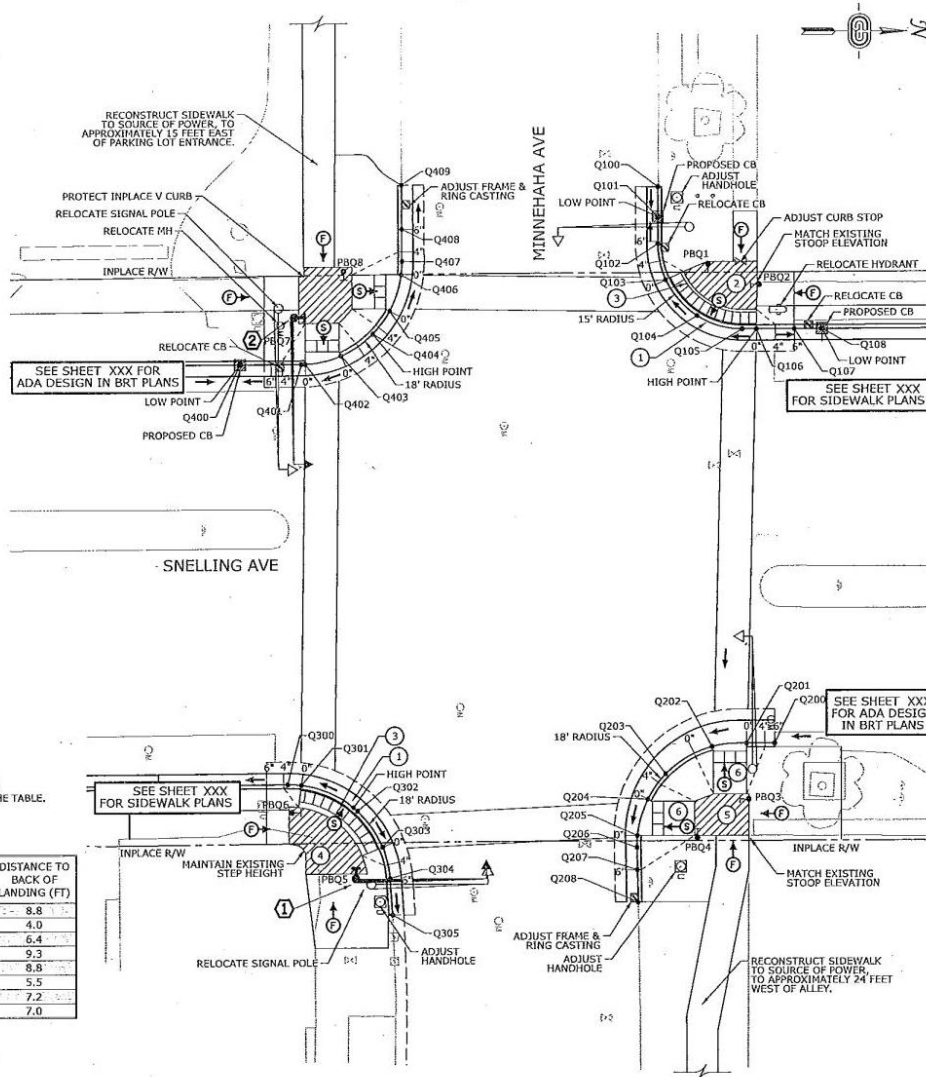
GUTTER CONTROL POINTS			
POINT	X	Y	ELEVATION
<b>NW CORNER</b>			
Q100	559920.73	162728.91	926.50
Q101	559926.01	162728.90	926.40
Q102	559930.75	162728.88	926.80
Q103	559937.12	162730.28	927.18
Q104	559943.45	162735.83	927.35
Q105	559945.80	162743.91	927.50
Q106	559945.79	162746.49	927.56
Q107	559945.78	162753.15	927.50
Q108	559945.77	162757.99	927.42
<b>NE CORNER</b>			
Q200	556018.64	162749.48	927.35
Q201	556018.65	162744.48	927.31
Q202	556019.24	162738.27	927.27
Q203	556024.05	162729.97	927.22
Q204	556028.52	162726.77	927.20
Q205	556034.92	162724.91	927.16
Q206	556036.99	162724.83	927.06
Q207	556040.92	162724.91	926.95
Q208	556046.58	162725.02	926.84
<b>SE CORNER</b>			
Q300	556025.74	162662.85	926.82
Q301	556025.88	162665.24	926.84
Q302	556030.47	162675.15	926.89
Q303	556036.84	162679.61	926.83
Q304	556042.32	162680.93	926.75
Q305	556048.77	162681.41	926.65
<b>SW CORNER</b>			
Q400	559951.82	162654.59	926.50
Q401	559951.79	162665.42	926.75
Q402	559951.78	162666.09	926.80
Q403	559950.35	162672.43	926.90
Q404	559946.47	162678.14	927.10
Q405	559942.44	162681.15	927.00
Q406	559936.05	162683.23	926.90
Q407	559933.72	162683.37	926.80
Q408	559928.05	162683.35	926.70
Q409	559920.29	162683.31	926.65

### GENERAL NOTES

SEE SIGNAL PLAN SHEETS xxx-xxx FOR DETAILS OF PROPOSED SIGNAL WORK.

SIGNAL CONTROL POINT LOCATIONS REPRESENT THE CENTER OF THE PROPOSED PUSH BUTTON STATIONS AND PROPOSED SIGNAL POLES AND PEDESTALS. PUSH BUTTONS TO BE LOCATED ON SIGNAL PEDESTAL POLES OR SIGNAL POLES ARE NOTED IN THE TABLE.

SIGNAL CONTROL POINTS				DISTANCE TO FRONT OF LANDING (FT)	DISTANCE TO BACK OF LANDING (FT)
PBQ1	555934.34	162737.82	4.6	- 8.8	
PBQ2	555937.96	162746.98	4.4	4.0	
PBQ3	556028.51	162744.87	0.9	- 6.4	
PBQ4	556035.28	162735.62	0.5	9.3	
PBQ5	ON POLE 1	ON POLE 1	- 2.1	8.8	
PBQ6	556030.70	162663.59	1.0	5.5	
PBQ7	ON POLE 2	ON POLE 2	1.0	7.2	
PBQ8	555935.43	162672.94	1.5	7.0	
POLE 1	556042.39	162674.89			
POLE 2	555943.53	162664.17			







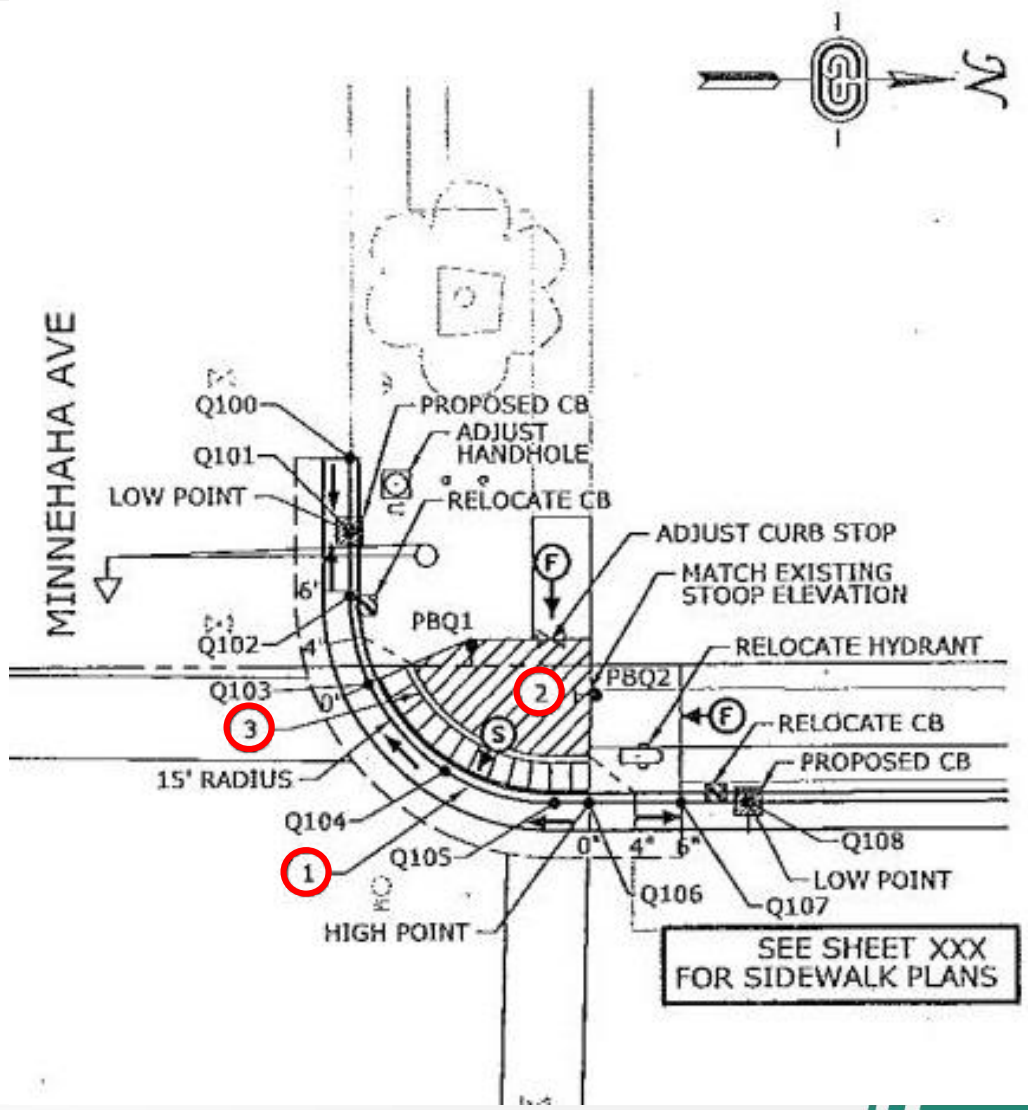
# Snelling Ave Mill & Overlay

## Notes:

- 1) Build 5% gutter out
- 2) Landing shall not exceed 6%
- 3) Ramp slope shall not exceed 12%

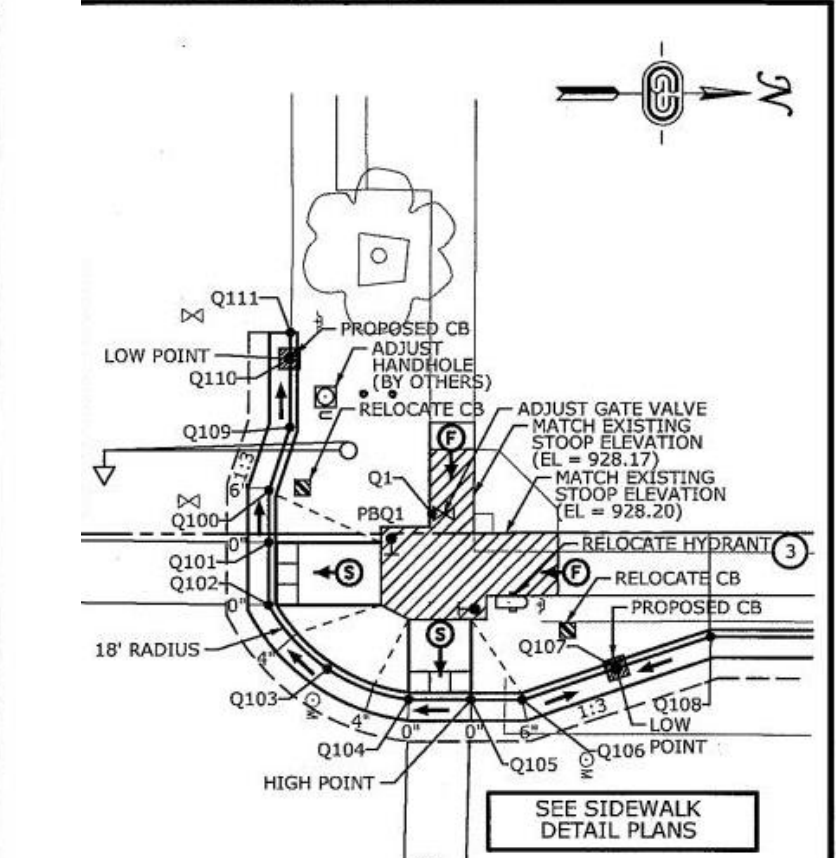
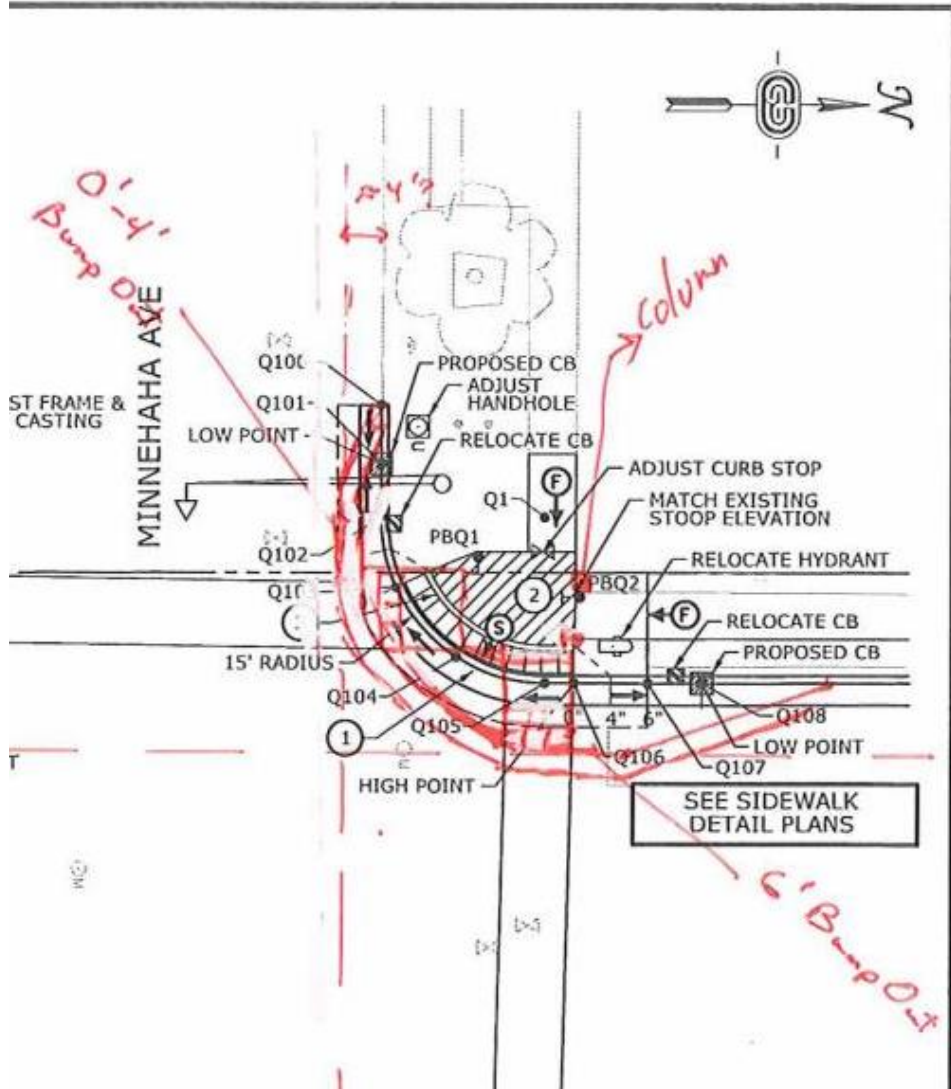
No Maintenance Access Route present

Pedestrian curb ramps will remain on transition plan due to non-compliant features!



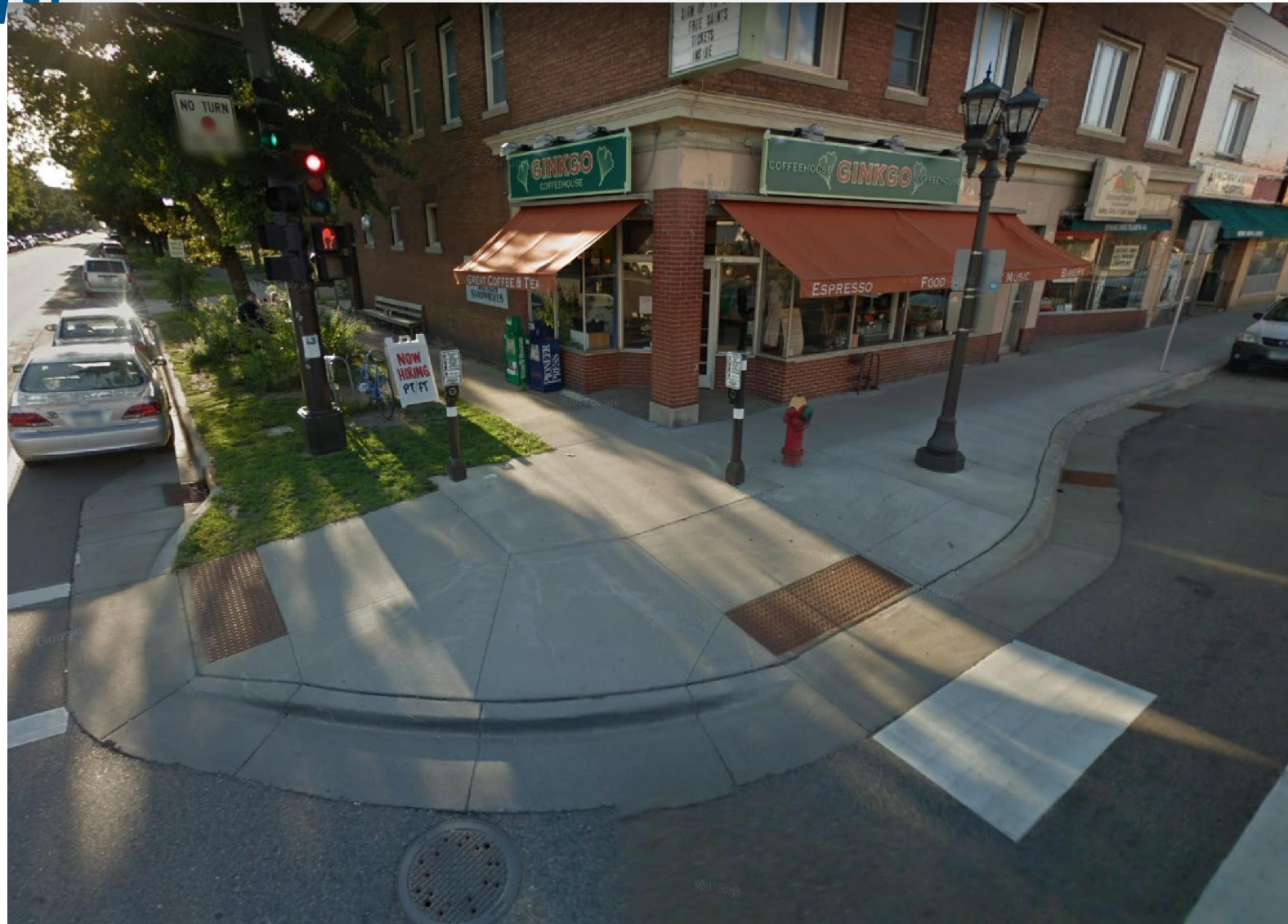


# Snelling Ave Mill & Overlay



GUTTER CONTROL POINTS			
POINT	X	Y	ELEVATION
NW CORNER			
Q1	555933.91	162742.56	18' RAD.
Q100	555931.68	162726.88	926.93
Q101	555936.68	162726.86	927.14
Q102	555942.68	162726.85	927.23
Q103	555948.83	162732.50	927.33

# Snelling Ave Mill & Overlay





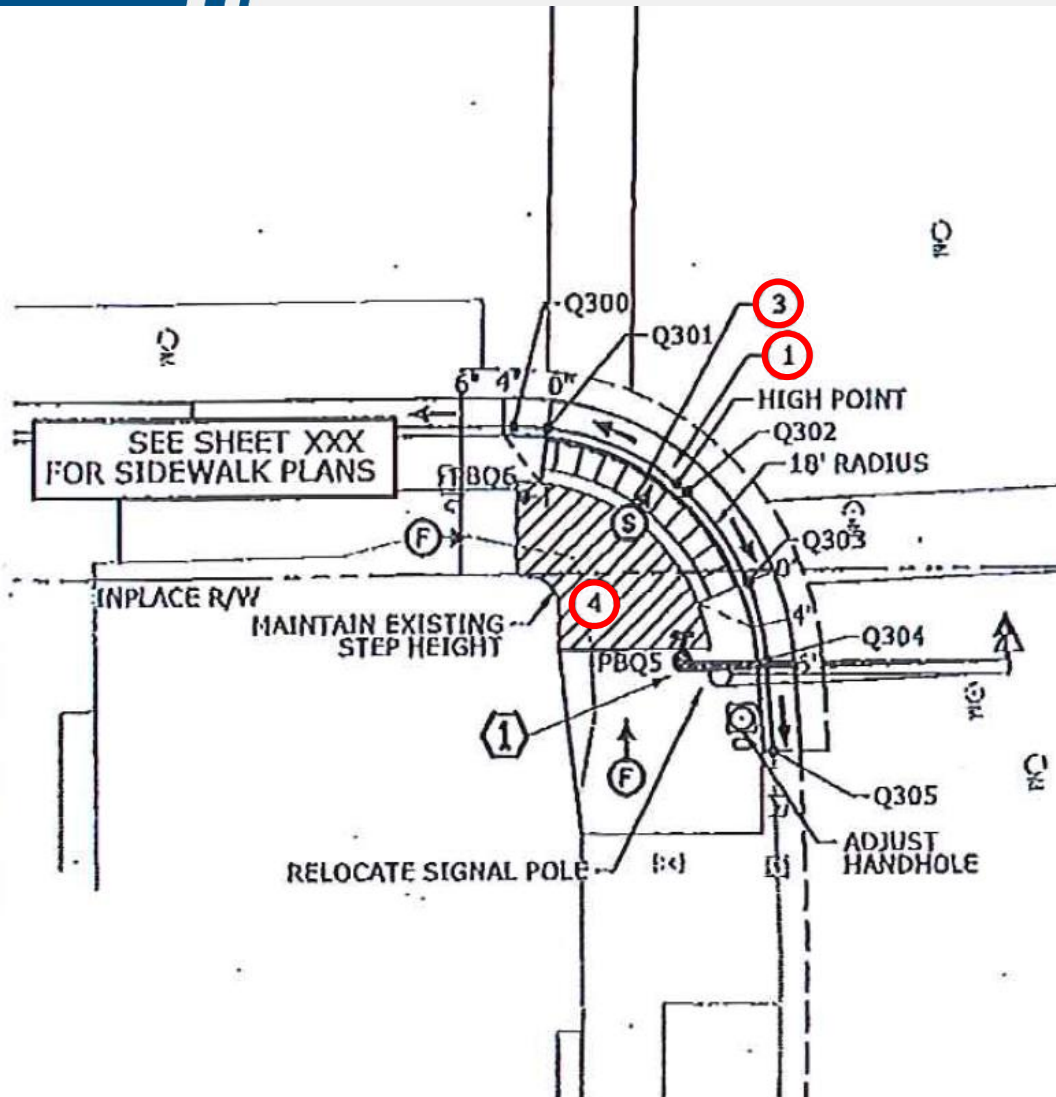
# Snelling Ave Mill & Overlay



Vertically  
Constrained:  
steep ramps  
existing without  
landings

Limited space  
for push buttons

# Snelling Ave Mill & Overlay



## Notes:

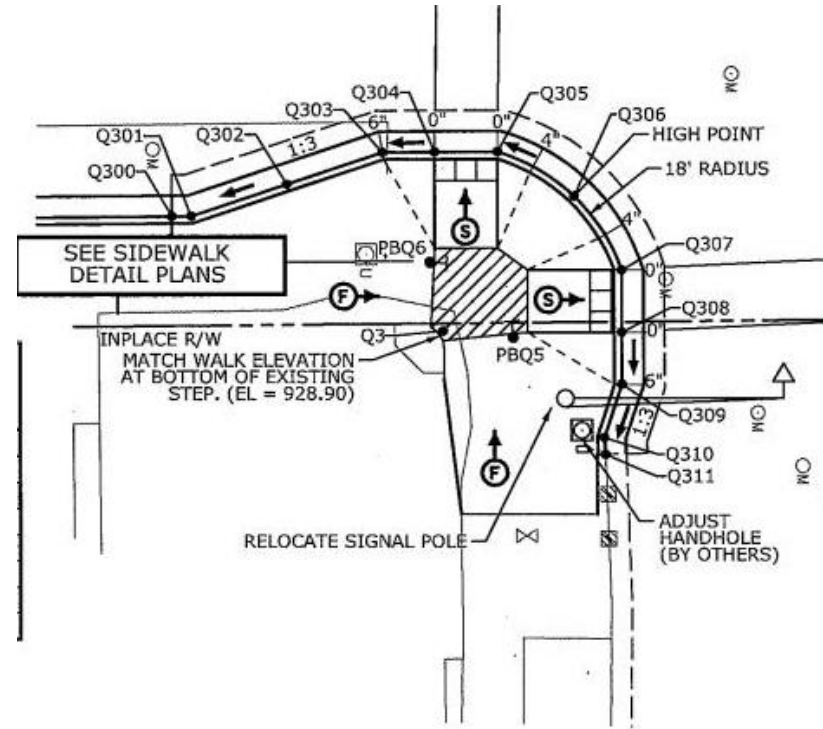
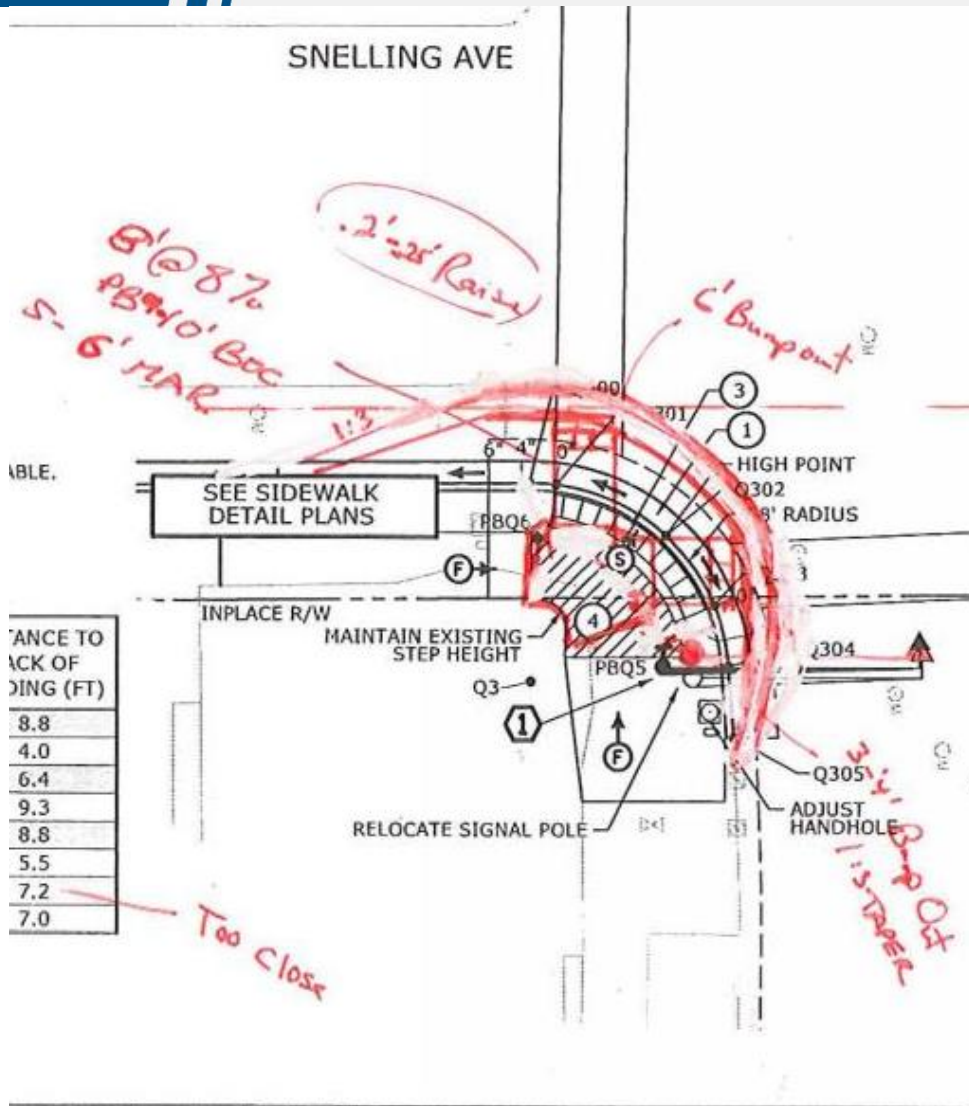
- 1) Build 5% gutter out
- 2) Ramp slope shall not exceed 12%
- 3) Ramp slope shall not exceed 12%
- 4) Landing slope shall not exceed 8%

No Maintenance Access Route present

Pedestrian curb ramps will remain on transition plan due to non-compliant features!



# Snelling Ave Mill & Overlay



# Snelling Ave Mill & Overlay







# Snelling Ave Mill & Overlay

NW QUAD	Without Bumpout	With Bumpout	Difference in Quantities	Unit Cost	Difference in Cost	Total
Remove C&G (LF)	32 LF	52 LF	20 LF	\$ 5.50	\$ 110.00	<b>\$13,423.00</b>
Remove Pavement (SY)	0 SY	48 SY	48 SY	\$ 8.00	\$ 384.00	
Sawcut Full Depth Pavement (LF)	0 LF	78 LF	78 LF	\$ 4.00	\$ 312.00	
Place C&G (ADA) (LF)	32 LF	74 LF	42 LF	\$ 28.00	\$ 1,176.00	
Mill & Patch Bit. (LF)	32 LF	0 LF	-32 LF	\$ 25.00	\$ (800.00)	
Relocate Drainage Structure (EA)	0 EA	2 EA	2 EA	\$ 5,000.00	\$ 10,000.00	
Truncated Domes (SF)	36 SF	24 SF	-12 SF	\$ 47.00	\$ (564.00)	
6" Concrete Sidewalk (SF)	250 SF	505 SF	255 SF	\$ 11.00	\$ 2,805.00	

SE QUAD	Without Bumpout	With Bumpout	Difference in Quantities	Unit Cost	Difference in Cost	Total
Remove C&G (LF)	38 LF	47 LF	9 LF	\$ 5.50	\$ 49.50	<b>\$ 5,138.50</b>
Remove Pavement (SY)	0 SY	49 SY	49 SY	\$ 8.00	\$ 392.00	
Sawcut Full Depth Pavement (LF)	0 LF	71 LF	71 LF	\$ 4.00	\$ 284.00	
Place C&G (ADA) (LF)	38 LF	67 LF	29 LF	\$ 28.00	\$ 812.00	
Mill & Patch Bit. (LF)	38 LF	0 LF	-38 LF	\$ 25.00	\$ (950.00)	
Relocate Drainage Structure (EA)	0 EA	0 EA	0 EA	\$ 5,000.00	\$ -	
Truncated Domes (SF)	36 SF	24 SF	-12 SF	\$ 47.00	\$ (564.00)	
6" Concrete Sidewalk (SF)	385 SF	850 SF	465 SF	\$ 11.00	\$ 5,115.00	

**Additional cost to remove these ramps from the transition plan**

$$\Delta_{\text{COST}} = \text{\$ 18,561.50}$$

(DRAINAGE = \$10,000.00)

# Snelling Ave Mill & Overlay

## Summary

### Mill & Overlay projects are “alterations”

- Curb Ramps SHALL be installed/upgraded as part of the alteration (if not compliant with the standards in place at time of construction)
- Project Scope should include pay items that are necessary for ADA-compliant curb ramps

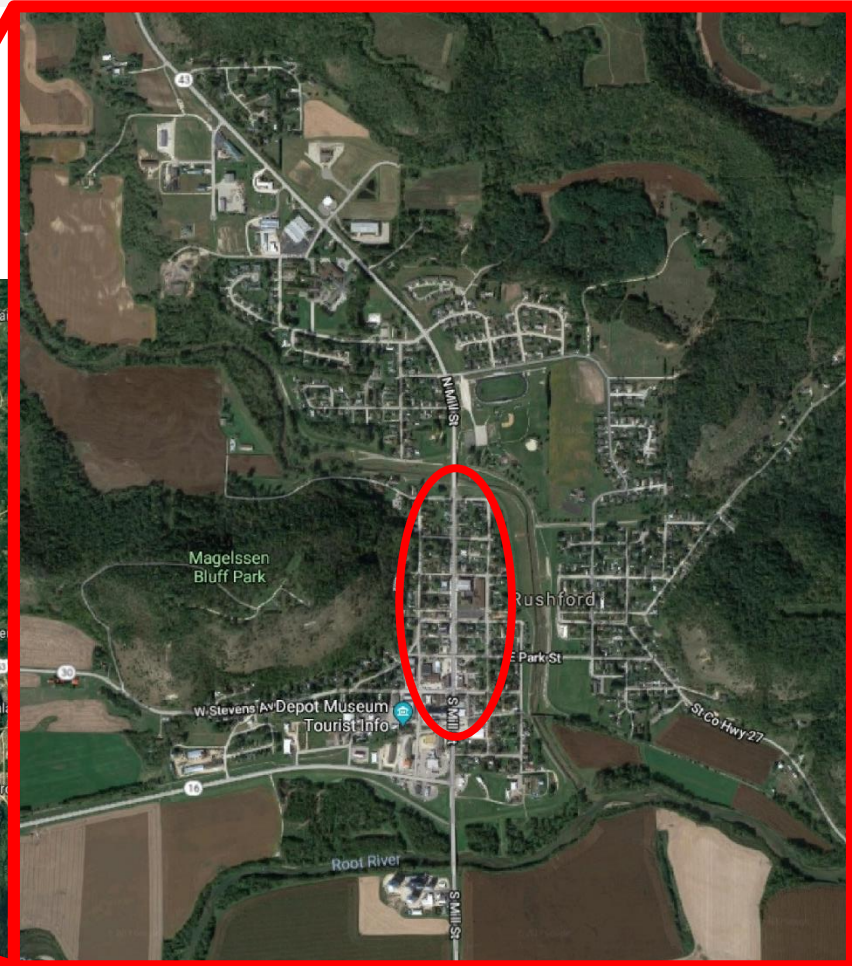
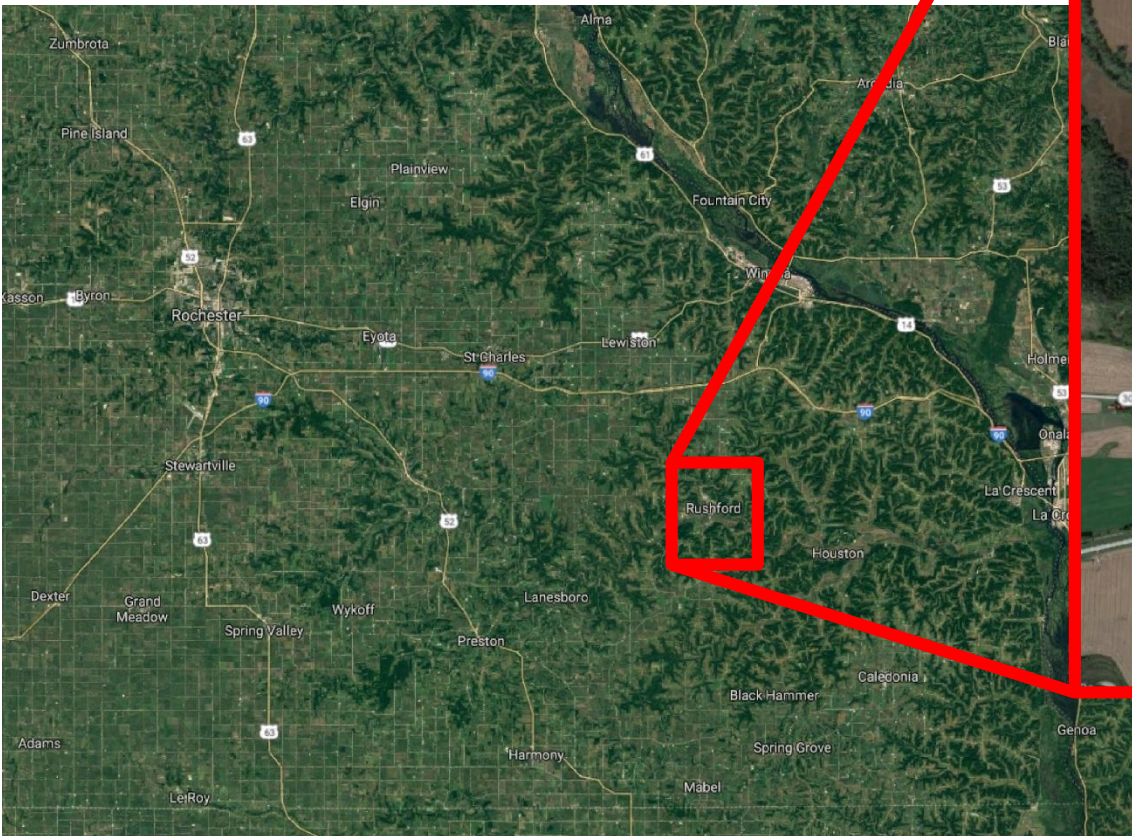
### Commercial/Urban corridors provide unique challenges

- Locate and consolidate street furniture to preserve PAR width and easy navigation for all users
- Designers should consider curb bumpouts or boulevards to create room for pedestrians, APS, and ADA-compliant curb ramps
  - Bumpouts were installed to achieve acceptable curb ramp slopes and combined directional (preferred) ramps



# TH 43 (Mill St) Reconstruction

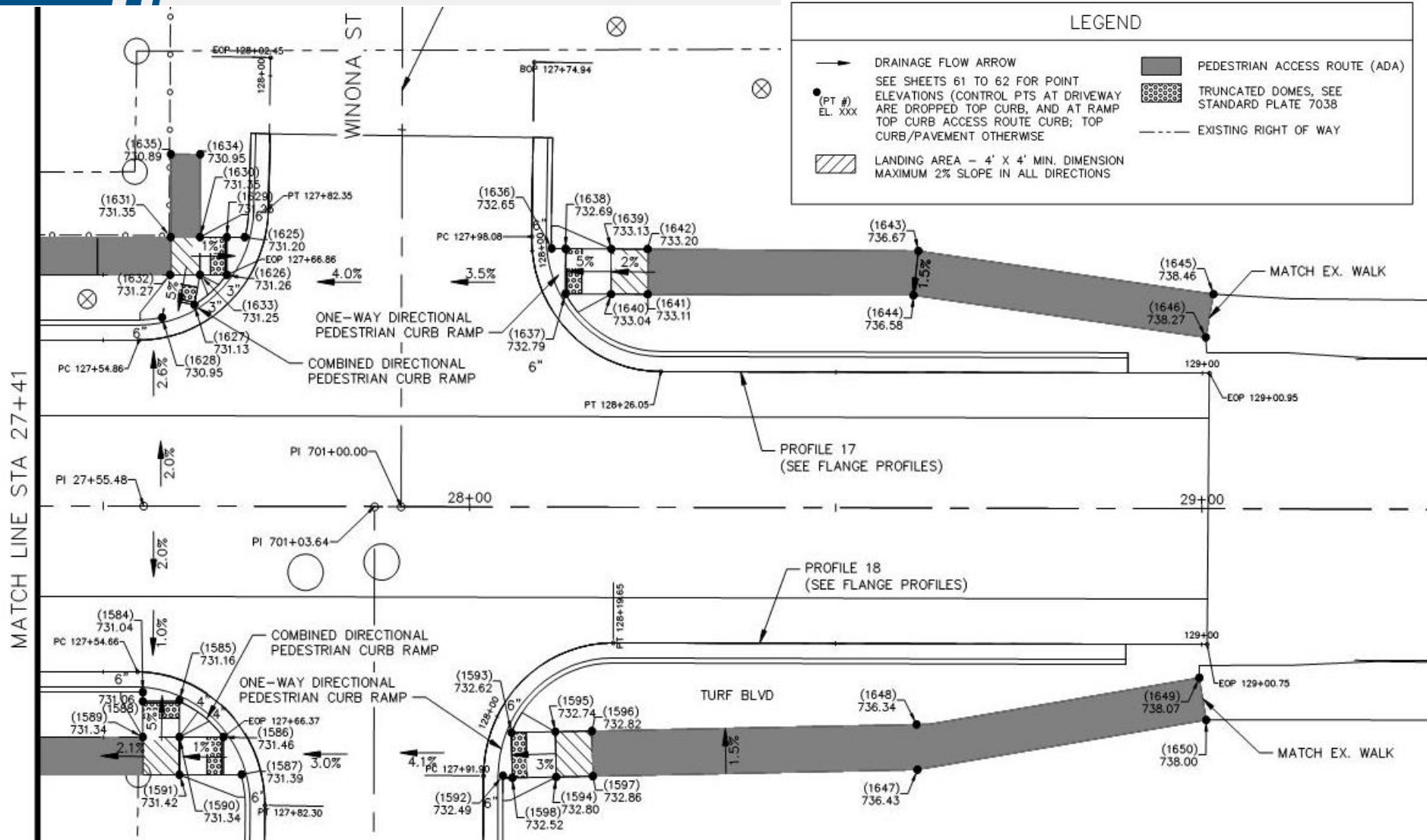
## Reconstruction Mill St Through Rushford







# TH 43 (Mill St) Reconstruction



# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction



# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction



# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction



# TH 43 (Mill St) Reconstruction





# TH 43 (Mill St) Reconstruction



# TH 43 (Mill St) Reconstruction

## Summary

Residential retrofitting of walkways has a variety of challenges

- Residential and commercial areas linked by sidewalks
- When present, boulevards allow for easier retrofitting
- Fences, stairs, vegetation, etc. may be barriers to accessibility
- Reconstruction (vs. mill & overlay) provides flexibility in achieving accessible walkways despite steep slopes

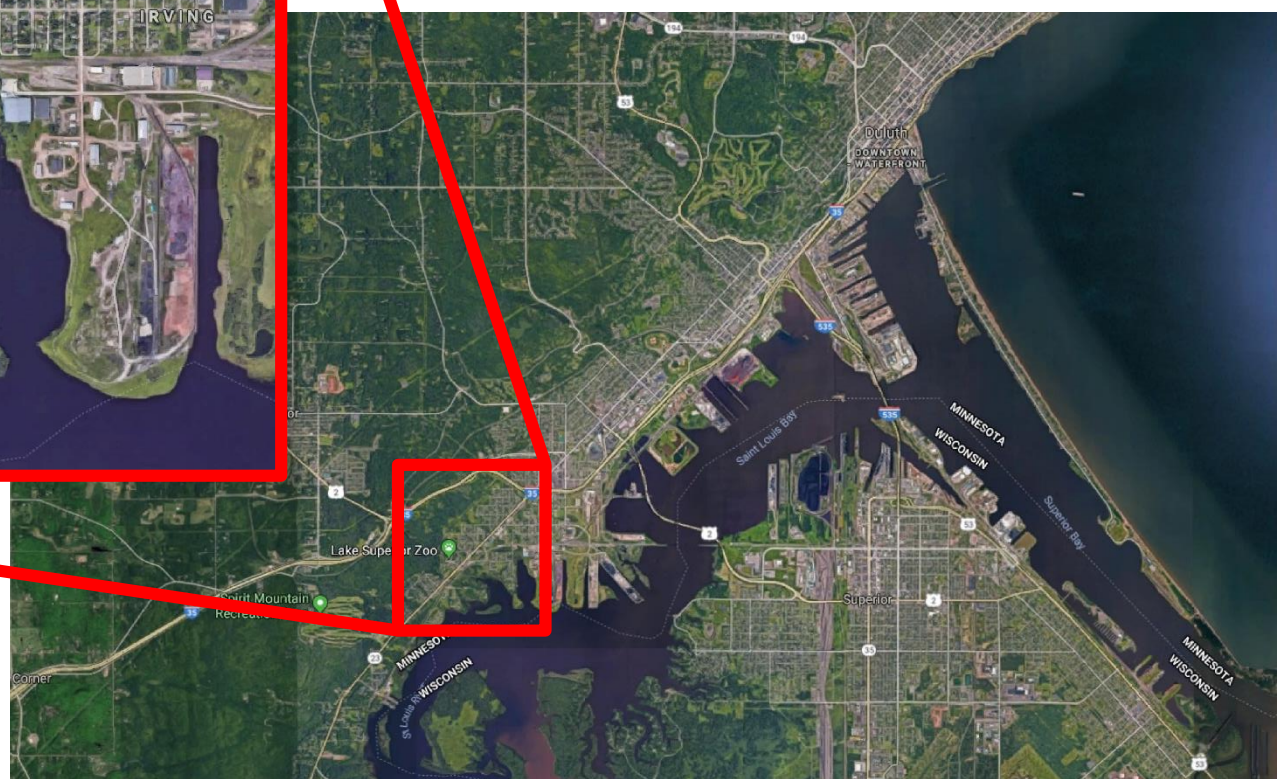
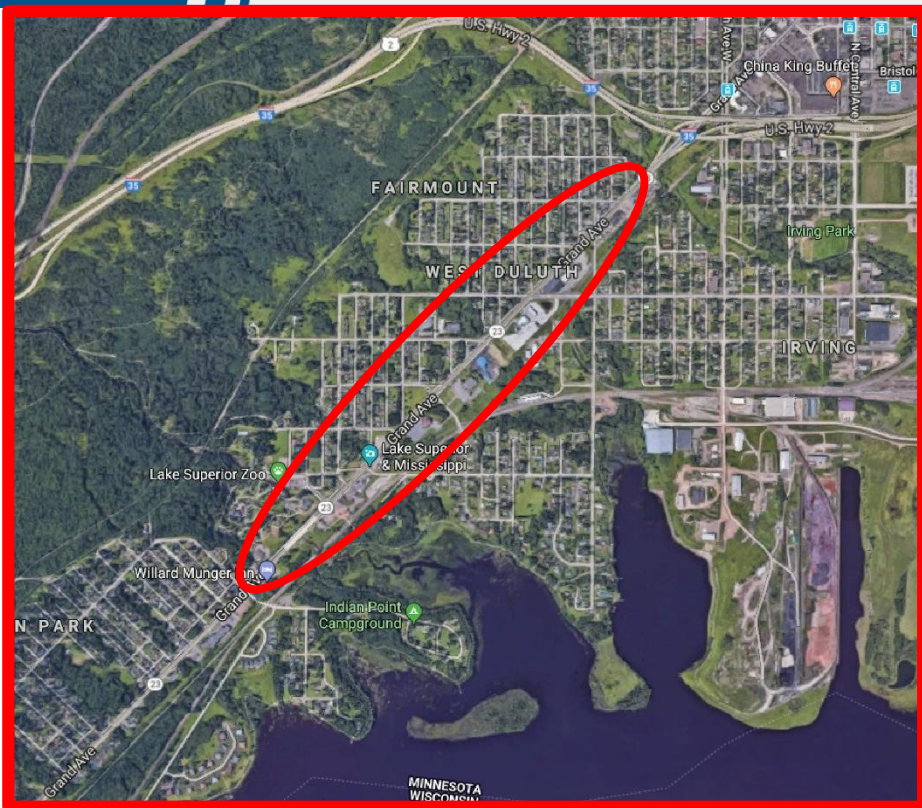
## Mill St. Reconstruction

- Sidewalks widened throughout the corridor
- Curb ramps updated to be ADA-compliant
- Roadway and gutter slopes flattened at pedestrian crossings
- Detailed design (Level 3) necessary for curb ramps

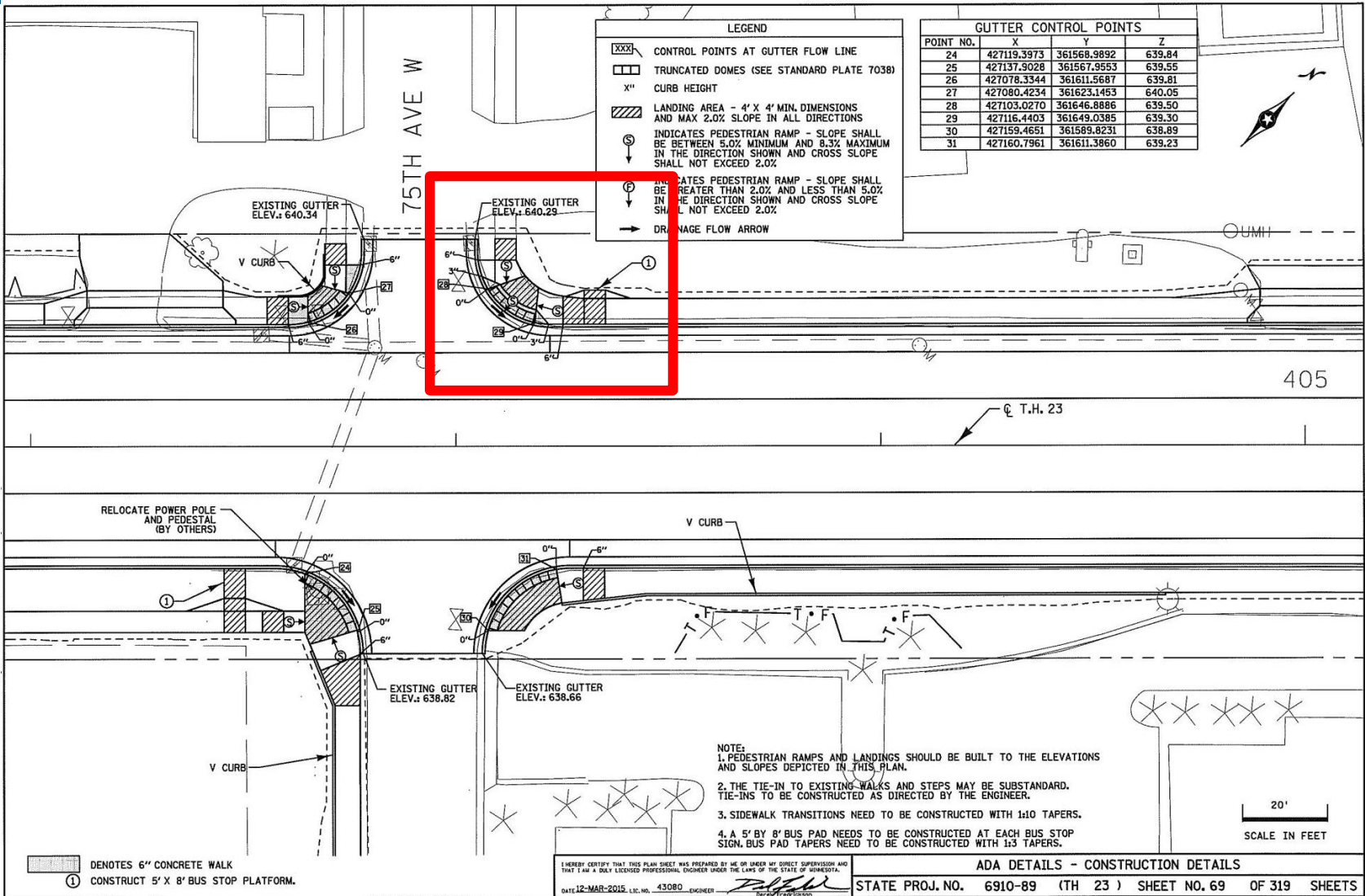


# TH 23 (Grand Ave) Mill & Overlay

Mill & Overlay, Duluth  
Grand Ave, 83<sup>rd</sup> St to I-35



# TH 23 (Grand Ave) Mill & Overlay

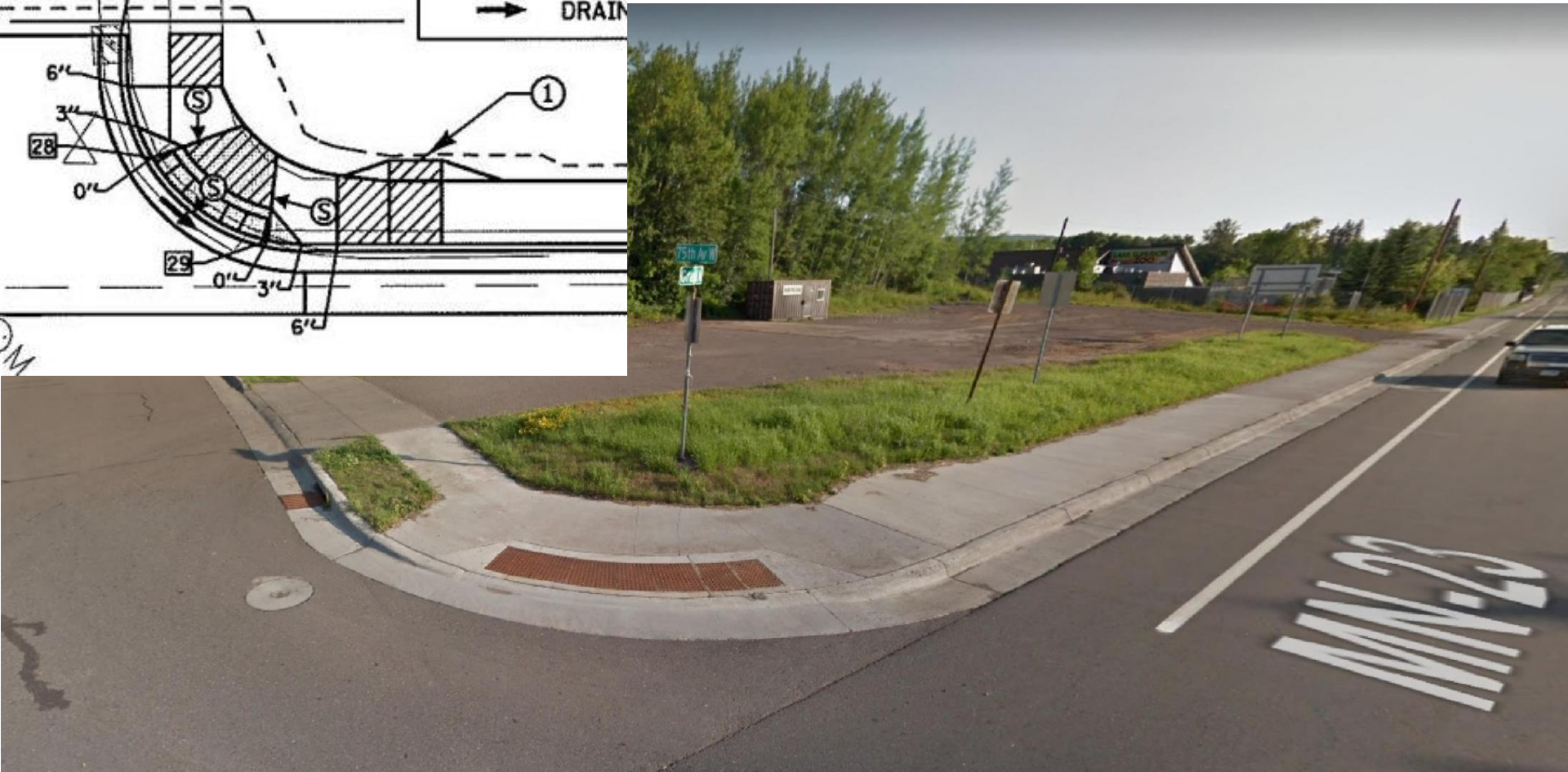
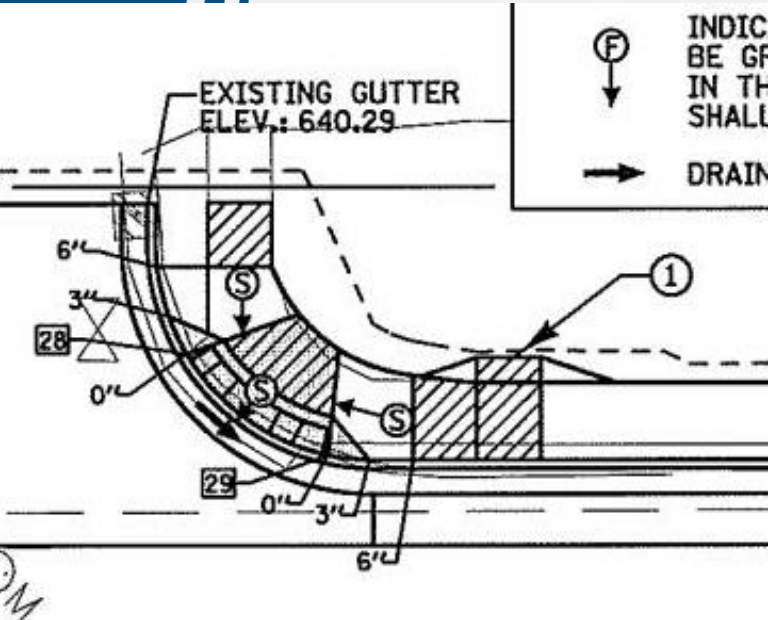




# TH 23 (Grand Ave) Mill & Overlay

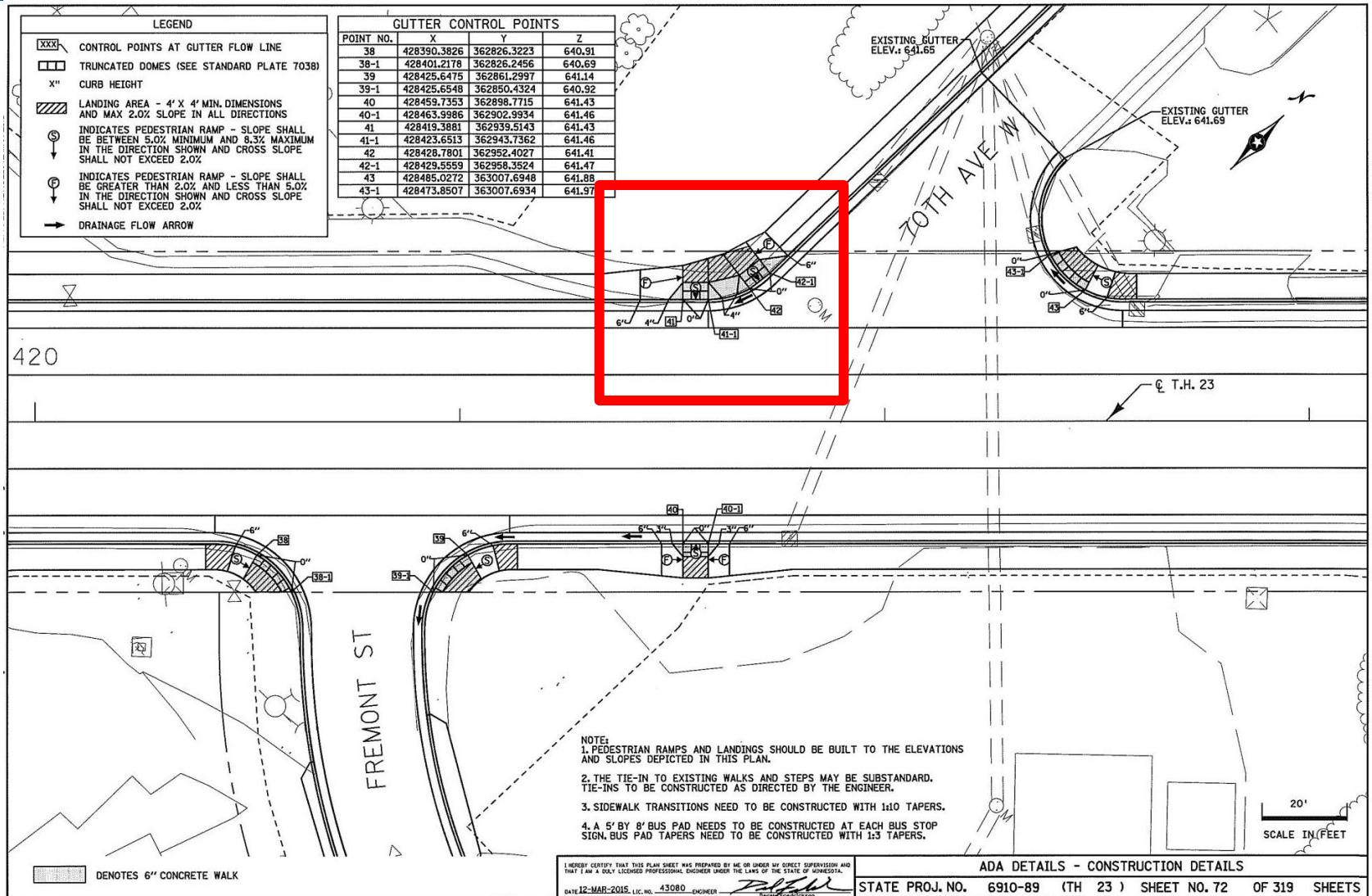


# TH 23 (Grand Ave) Mill & Overlay





# TH 23 (Grand Ave) Mill & Overlay

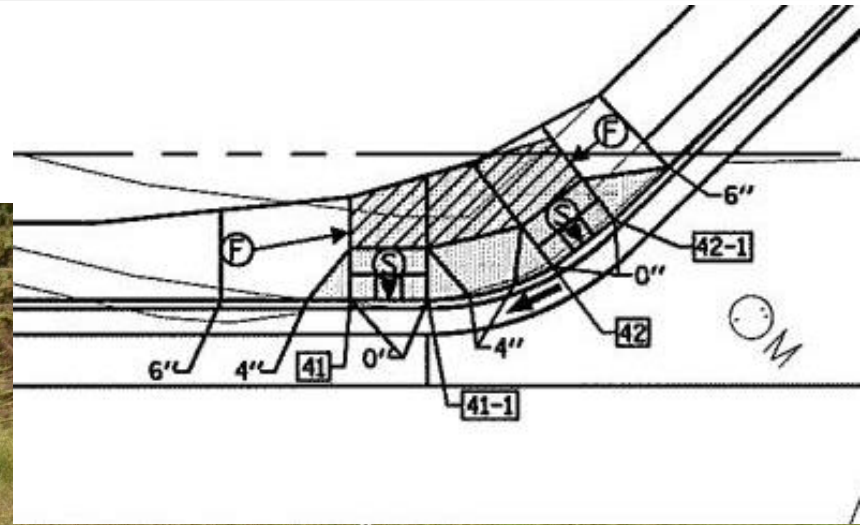


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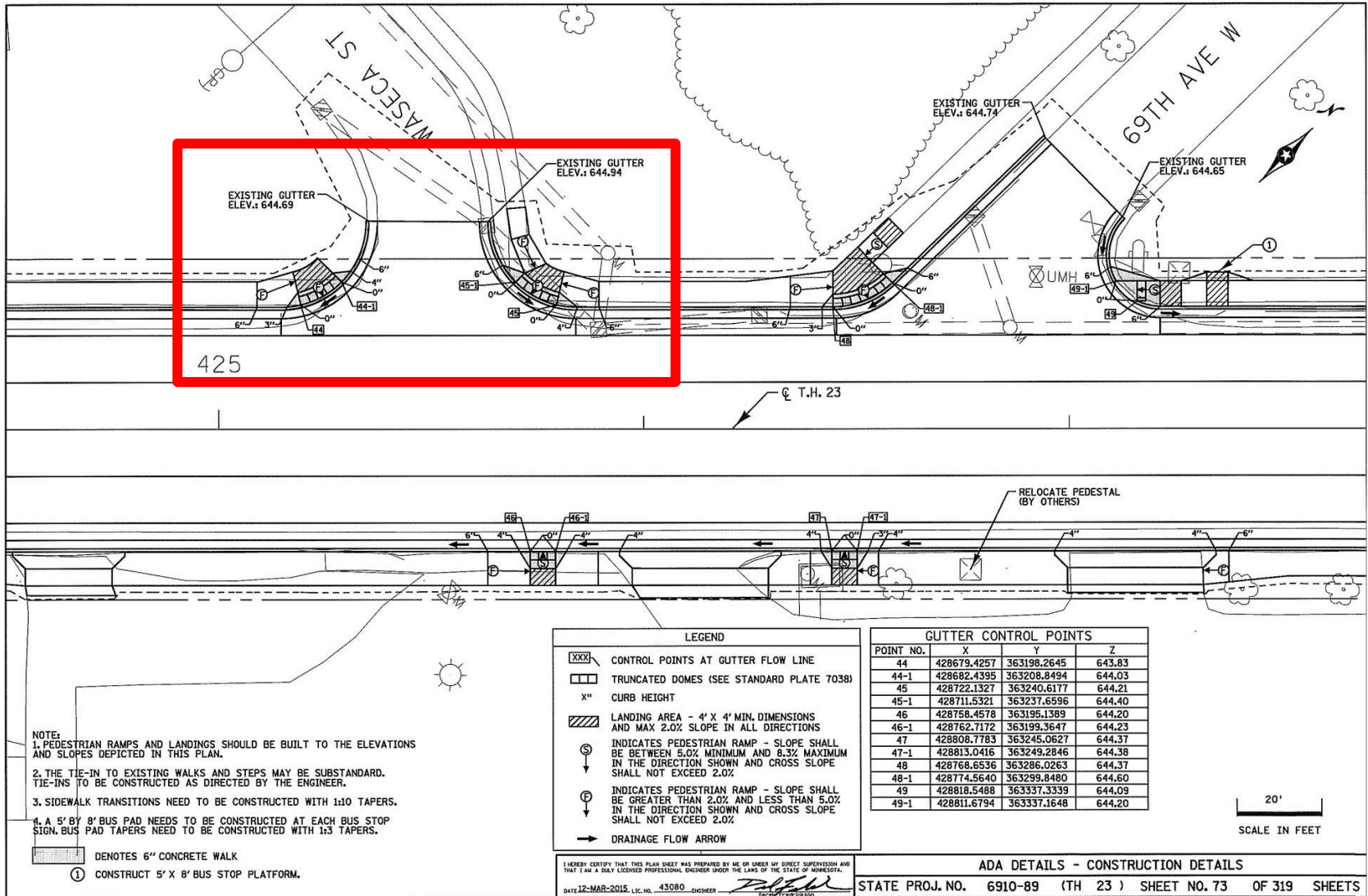




# TH 23 (Grand Ave) Mill & Overlay



# TH 23 (Grand Ave) Mill & Overlay



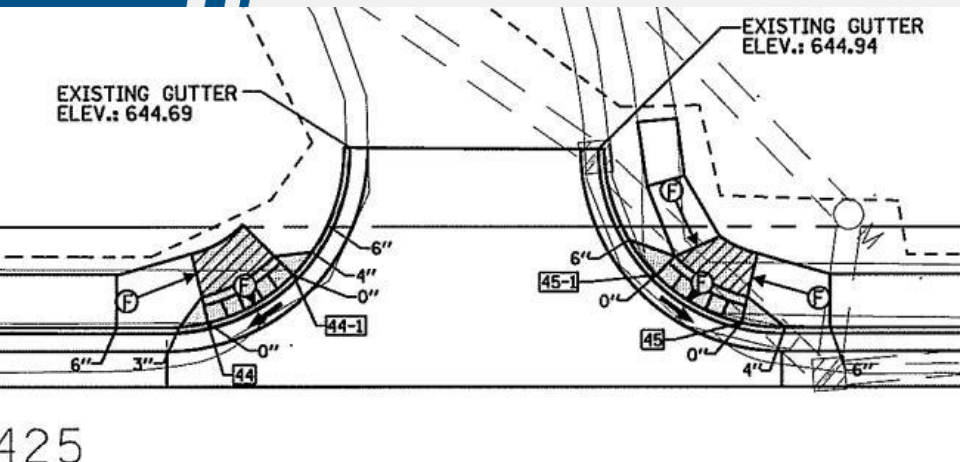


# TH 23 (Grand Ave) Mill & Overlay





# TH 23 (Grand Ave) Mill & Overlay



425





# TH 23 (Grand Ave) Mill & Overlay





# TH 23 (Grand Ave) Mill & Overlay







# TH 23 (Grand Ave) Mill & Overlay

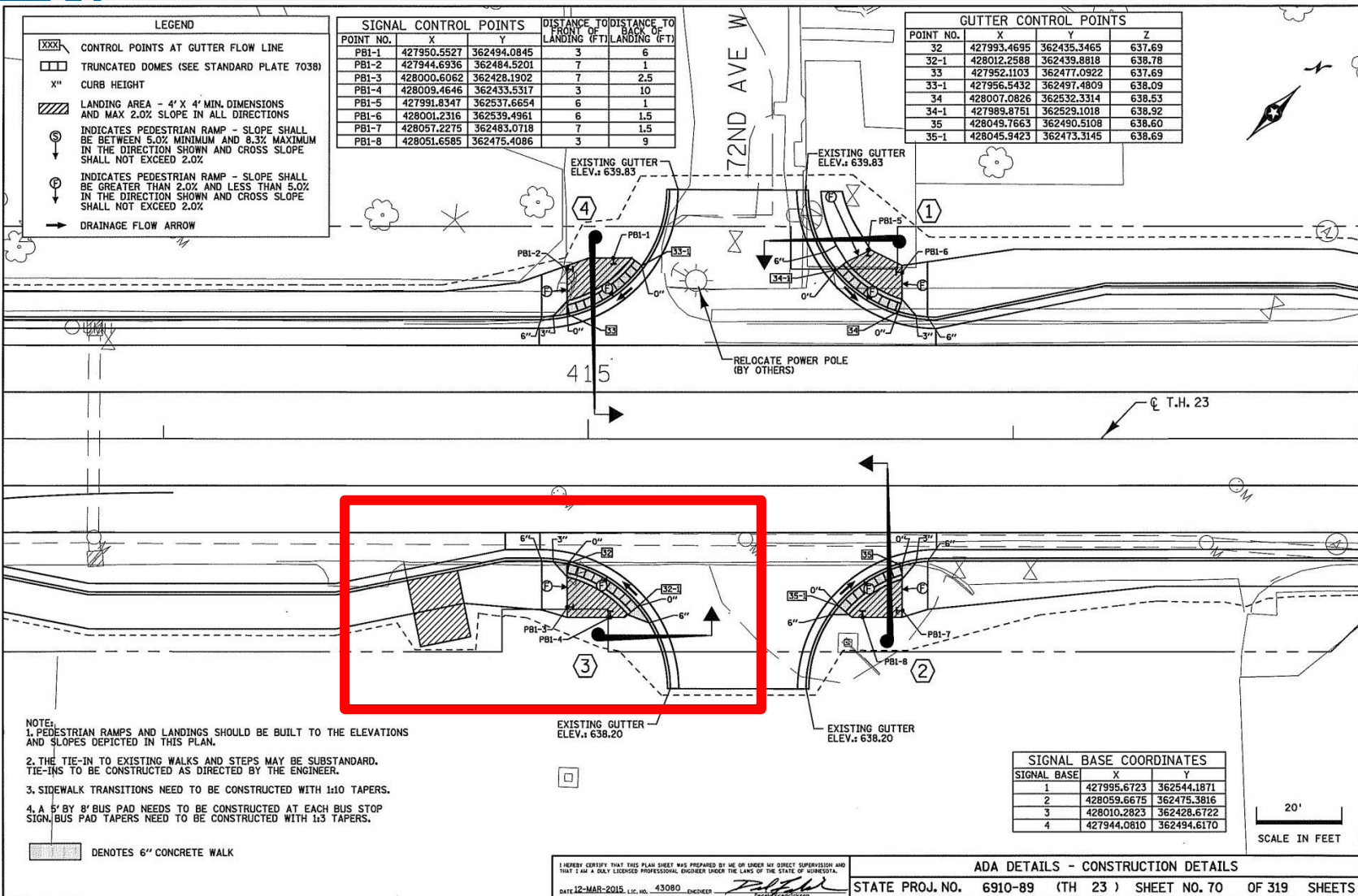


# TH 23 (Grand Ave) Mill & Overlay





# TH 23 (Grand Ave) Mill & Overlay



# TH 23 (Grand Ave) Mill & Overlay

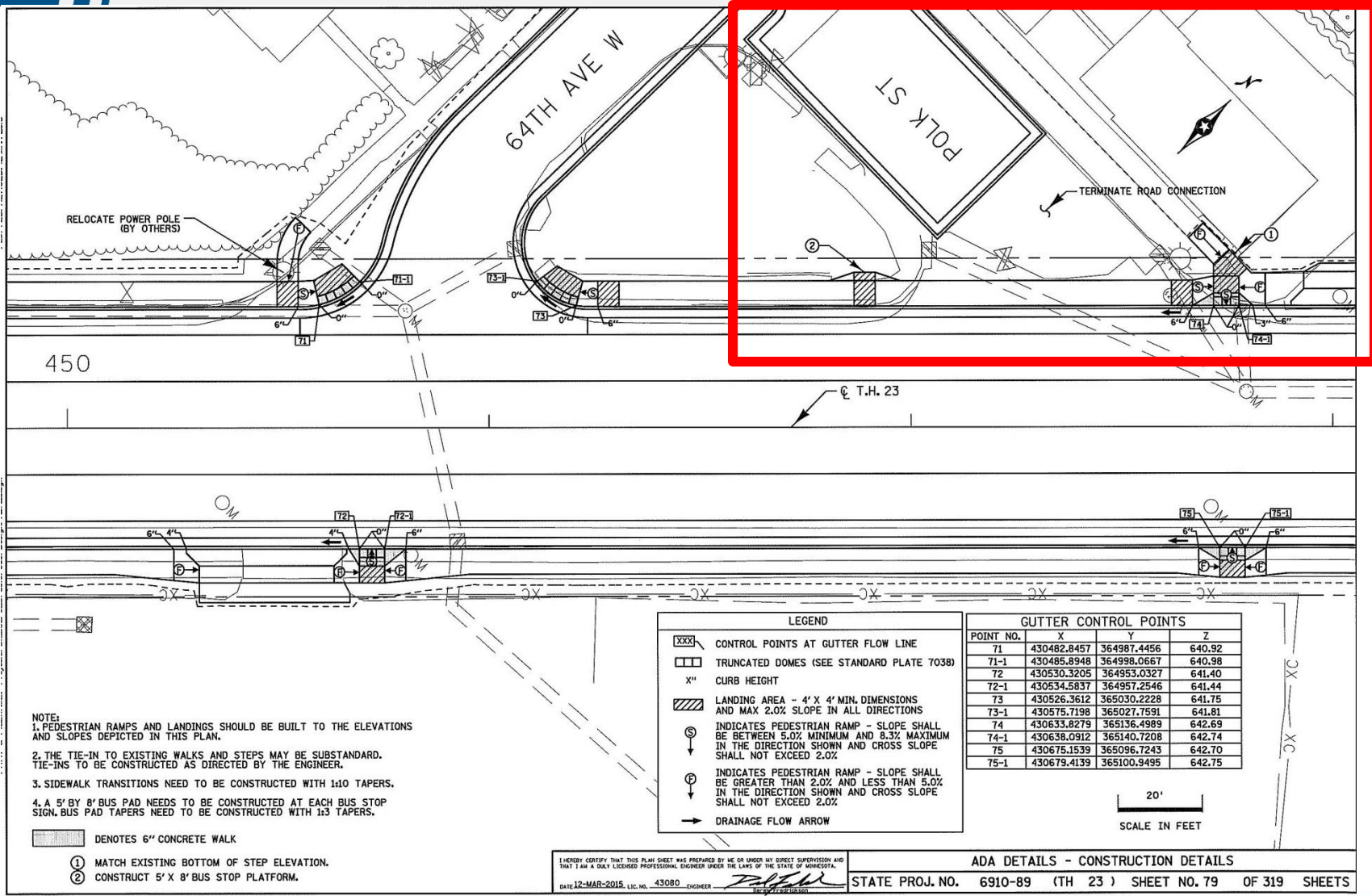




# TH 23 (Grand Ave) Mill & Overlay



# TH 23 (Grand Ave) Mill & Overlay





# TH 23 (Grand Ave) Mill & Overlay



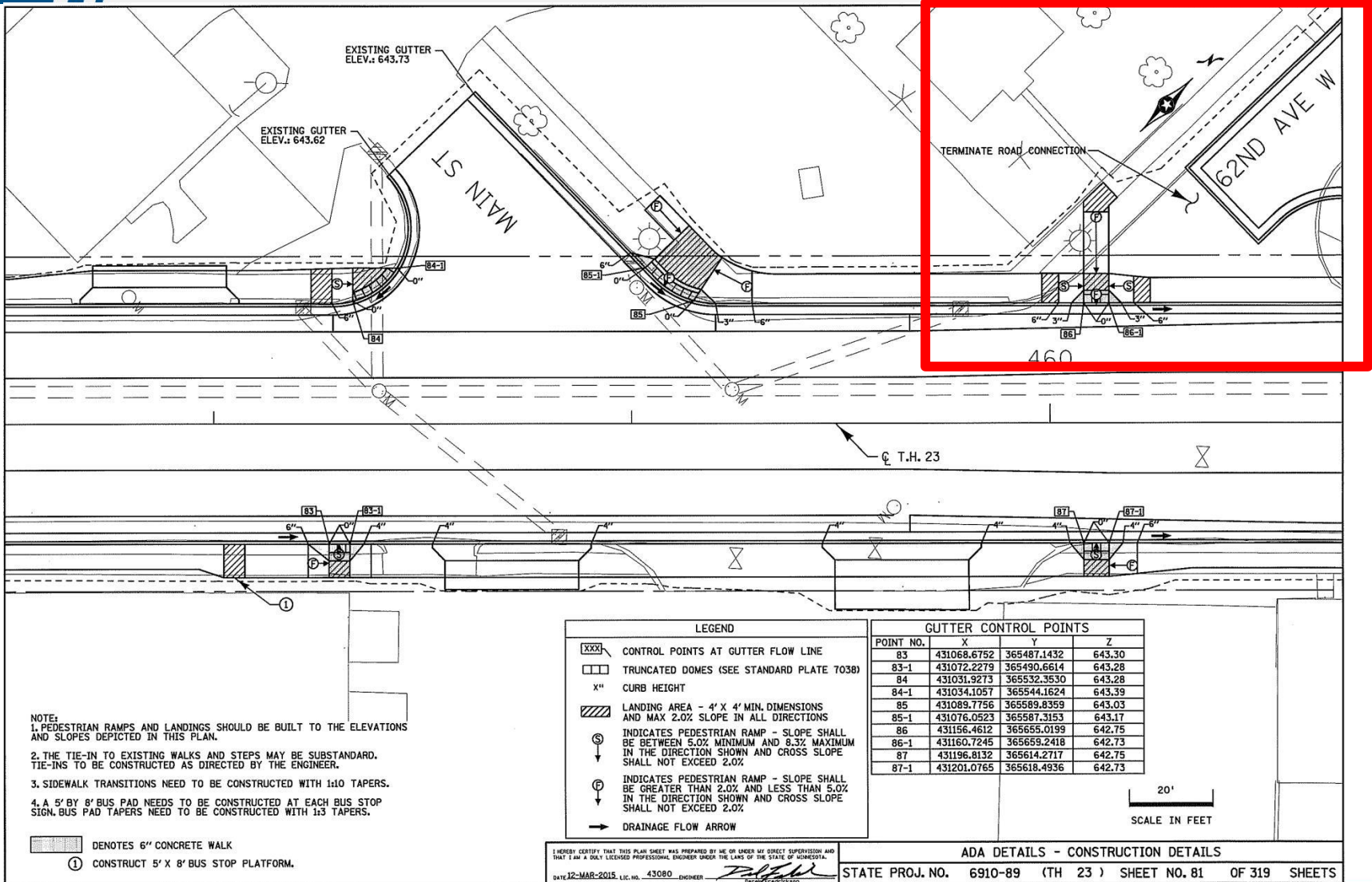


# TH 23 (Grand Ave) Mill & Overlay





# TH 23 (Grand Ave) Mill & Overlay





# TH 23 (Grand Ave) Mill & Overlay







# TH 23 (Grand Ave) Mill & Overlay



# TH 23 (Grand Ave) Mill & Overlay

## Summary

Narrow boulevards (or no boulevards) and large curb radii restrict ADA design options and make design and construction more technical/difficult.

- Curb Ramps at intersections are designed as depressed corners or fan ramps
  - Combined Directional ramps are preferred
- Driveways are designed as either offset or parallel
  - Perpendicular driveways are preferred
  - Pedestrians must navigate many longitudinal slopes
- Pedestrians on sidewalks compete with signs, push buttons, street furniture, etc.
  - Boulevards provide space for obstacles and a buffer from traffic



# TH 23 (Grand Ave) Mill & Overlay

## Summary

### Grand Ave Mill & Overlay ADA improvements

- New segments of sidewalk create connections on both sides of TH 23
- Landings provided at stairs, doorways, etc.
- APS installation and enhancement
- Curb ramps installed at new locations and updated at existing locations to be ADA-compliant
- Existing narrow sidewalks and narrow boulevards replaced with widened sidewalks
- Street access closures reduce crossings
- Bus pullouts and adequate loading space provided at bus stops



# Questions?

