



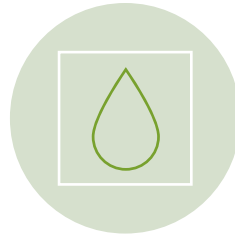
CITY OF NEW RICHLAND FLOOD MITIGATION ALTERNATIVES ANALYSIS

DECEMBER 5, 2024

WHAT WE WILL DISCUSS TODAY



INTRODUCTION



EXISTING
CONDITIONS



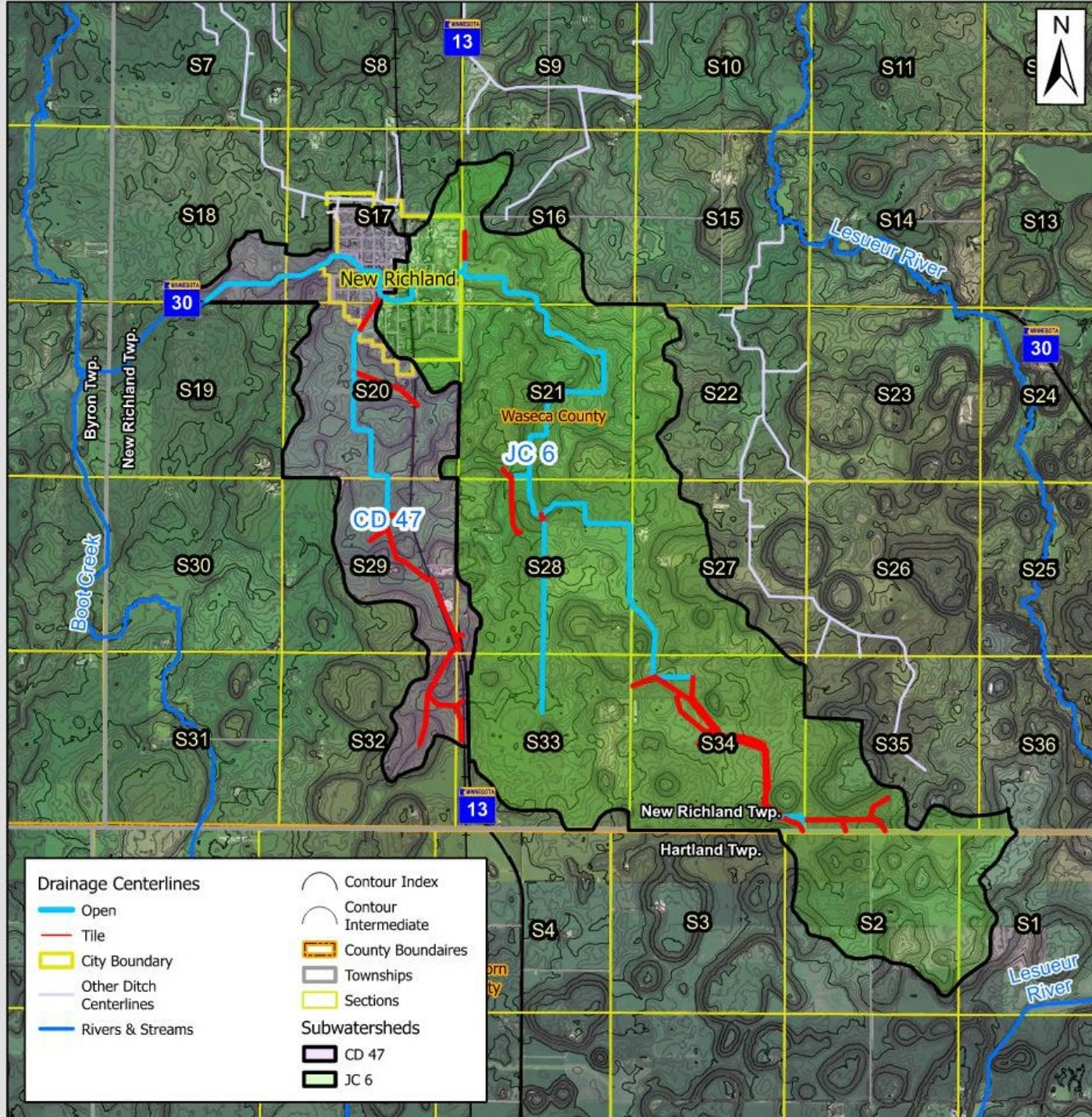
ALTERNATIVES



COSTS AND
FUNDING
OPPORTUNITIES



NEX STEPS



CURRENT CONDITIONS

Channel & Culvert Capacity

- 400 to 600 cubic feet per second
- Adequate to carry 3.5 – 4.5-inches of rainfall over a 24-hour period without overtopping channel banks
- Approximately a 10-year rainfall event



10'W x 6'D RCBC
at Aspen Ave



72" CMP Culverts
at RR Grade



←8-10 feet wide->

5-8 feet deep

PAST FLOOD EVENTS

- 2010 radar estimated precipitation depths
- Majority of project watershed received between 6.9-8 inches

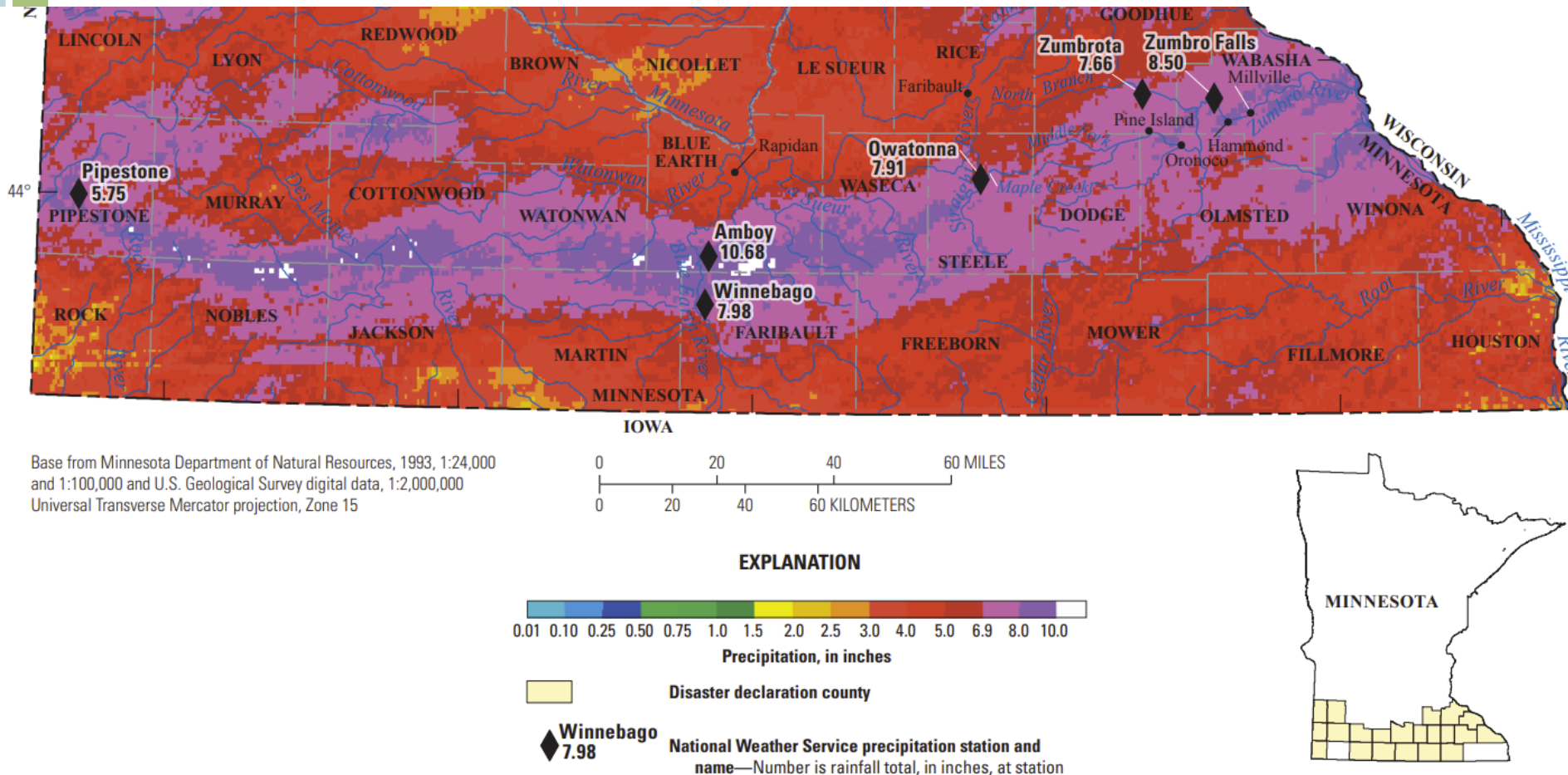


Figure 2. Distribution of rainfall totals September 22–24, 2010, and rainfall totals for the National Weather Service stations.

PAST FLOOD EVENTS

- Radar estimate is 6-7"
- NWS report is 7.7"

Precipitation Total September 20-22, 2016

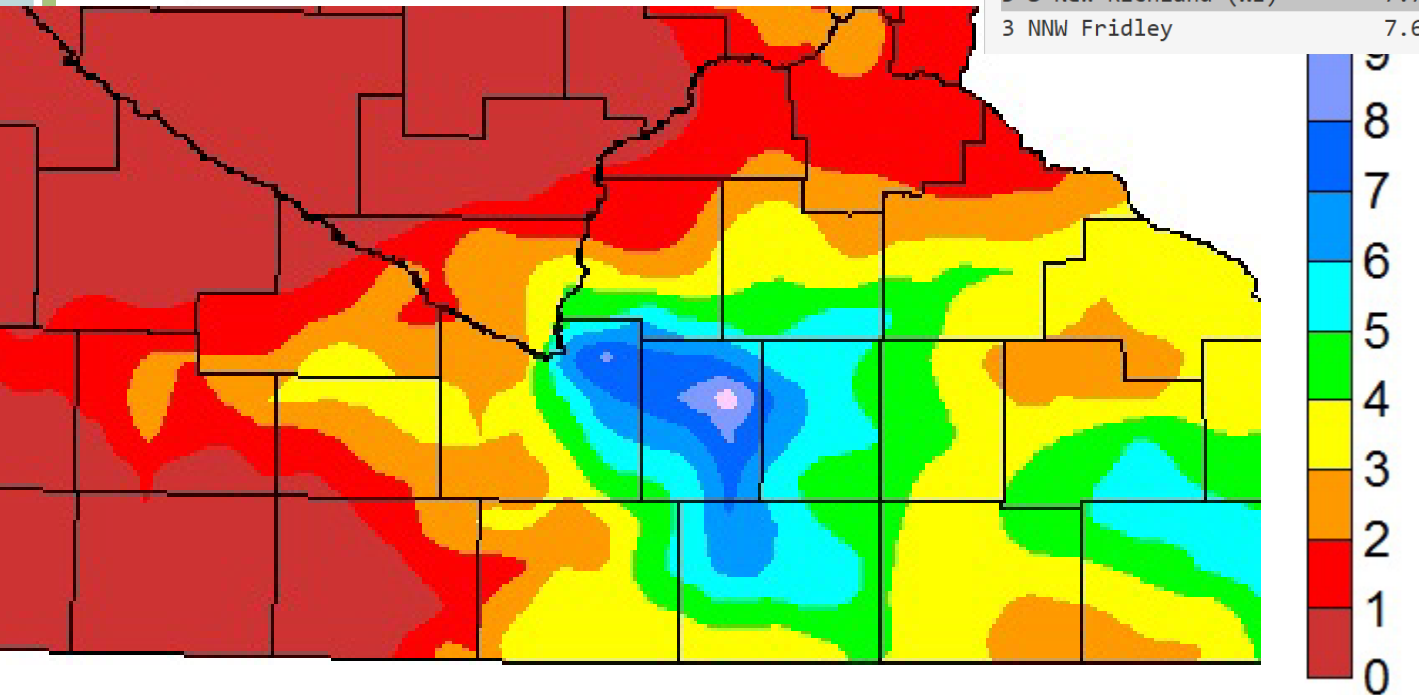
Public Information Statement

National Weather Service Twin Cities/Chanhassen MN

755 PM CDT Thu Sep 22 2016

...Twenty Four Hour Rainfall Reports...

Location	Amount	Time/Date	Lat/Lon
1 NE Lake Wissota (WI)	8.50 in	1058 PM 09/21	44.93N/91.29W
Maple Grove 1SSW	8.11 in	0700 AM 09/22	45.09N/93.47W
Osseo	7.86 in	0610 AM 09/22	45.11N/93.41W
3 S New Richland (WI)	7.70 in	1208 PM 09/22	43.85N/93.49W
3 NNW Fridley	7.65 in	0916 AM 09/22	45.12N/93.27W



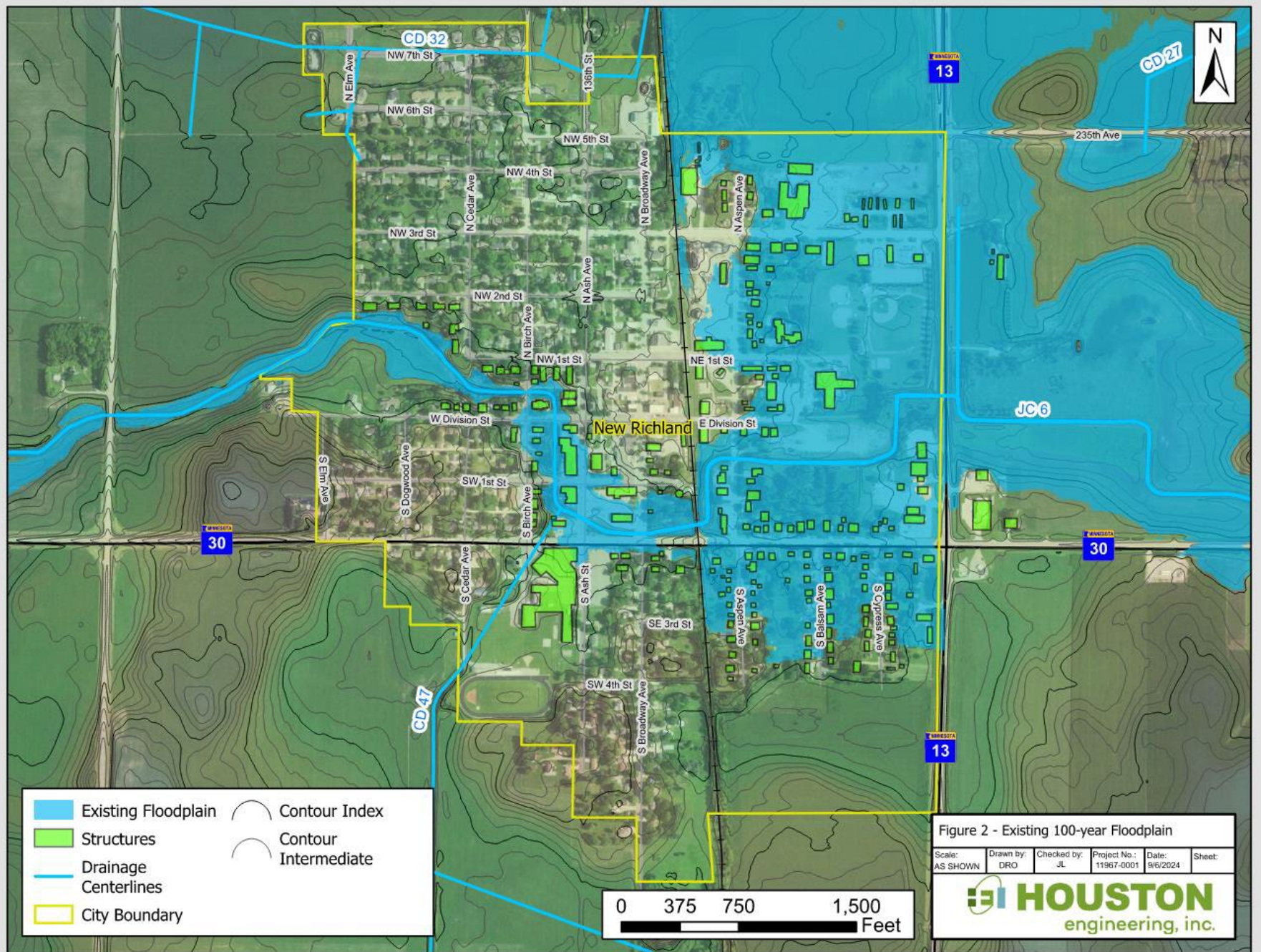


Figure 2 - Existing 100-year Floodplain

Scale: AS SHOWN	Drawn by: DRO	Checked by: JL	Project No.: 11967-0001	Date: 9/6/2024	Sheet:
--------------------	------------------	-------------------	----------------------------	-------------------	--------

DESIGN CRITERIA

- 100-year flood event (aka 1% chance annual exceedance) used for preliminary evaluations
 - Consistent with 44 CFR §65.10 which sets minimum design, operation and maintenance standards to be considered as effectively meeting flood hazard and risk mapping efforts within the FEMA National Flood Insurance Program (NFIP)
- Recommendation to consider future climate projections in project design

PROJECT ALTERNATIVES

- Increase capacity of channel and culverts
- Diversion
- Property Buy-outs
- Structural Protection (Levee and/or Floodwalls)

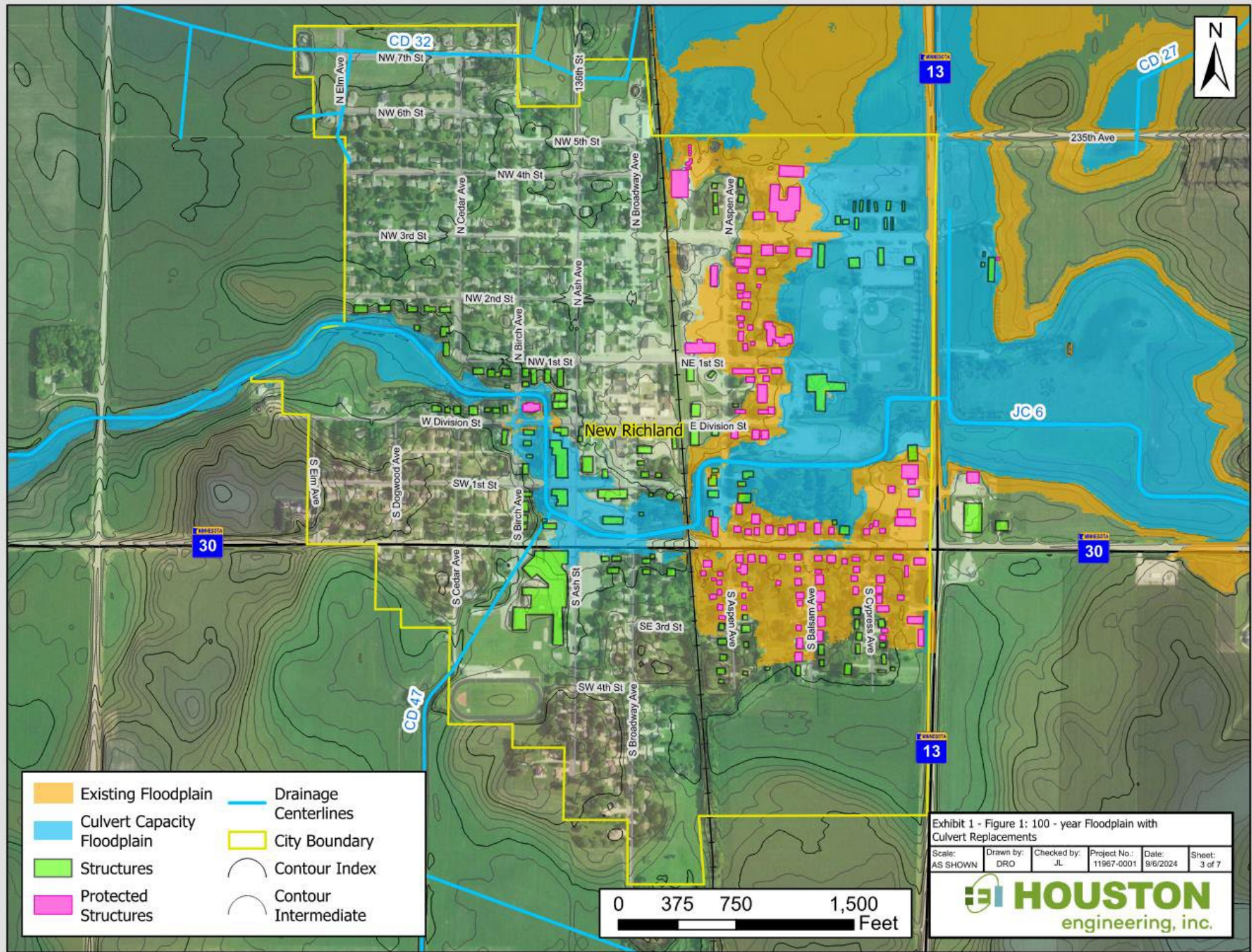


Exhibit 1 - Figure 1: 100 - year Floodplain with Culvert Replacements

Scale: AS SHOWN	Drawn by: DRO	Checked by: JL	Project No.: 11967-0001	Date: 9/6/2024	Sheet: 3 of 7
--------------------	------------------	-------------------	----------------------------	-------------------	------------------

HOUSTON
engineering, inc.

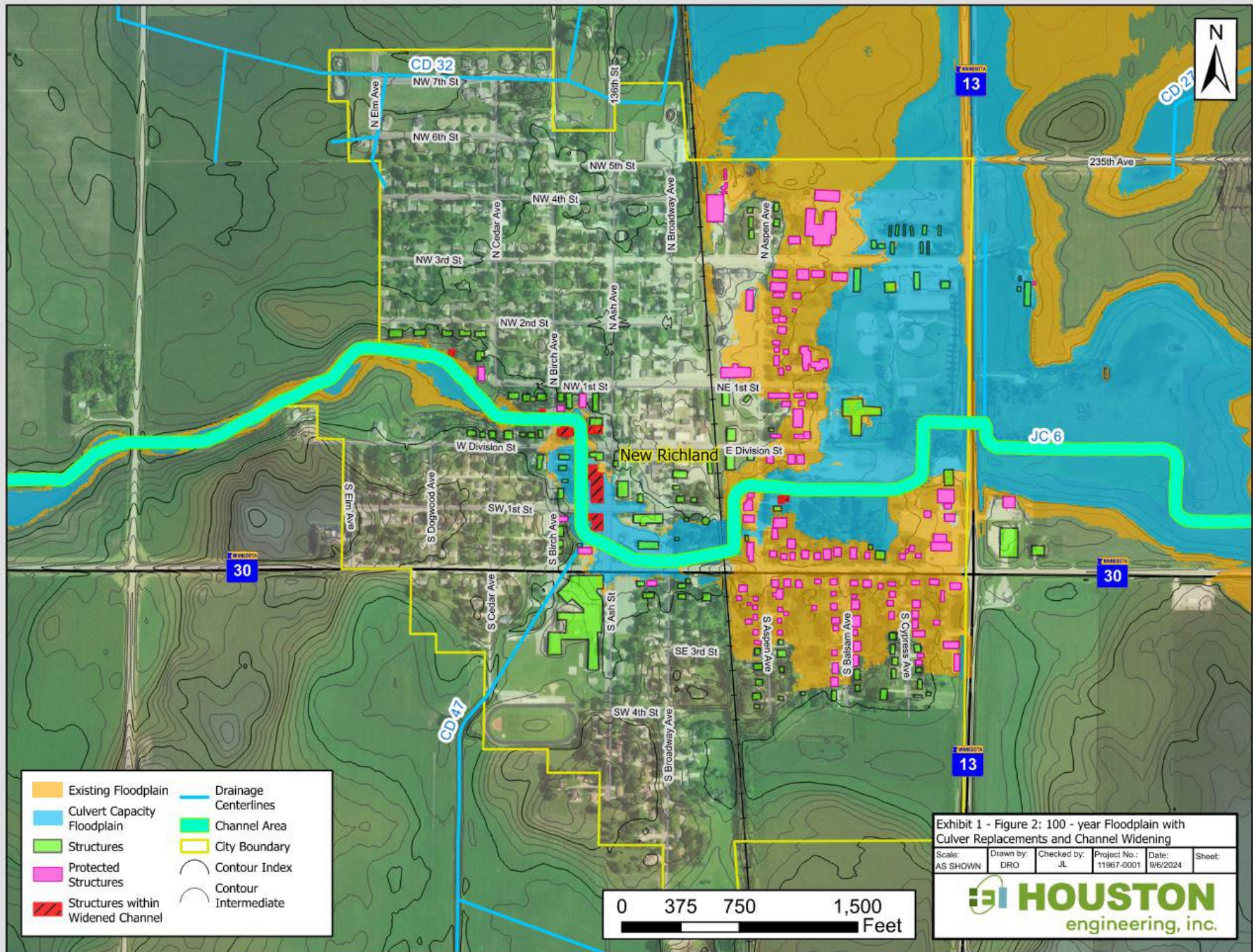


Exhibit 1 - Figure 2: 100 - year Floodplain with Culver Replacements and Channel Widening

Scale:	Drawn by:	Checked by:	Project No.:	Date:	Sheet:
AS SHOWN	DRO	JL	11967-0001	9/6/2024	

HOUSTON
engineering, inc.

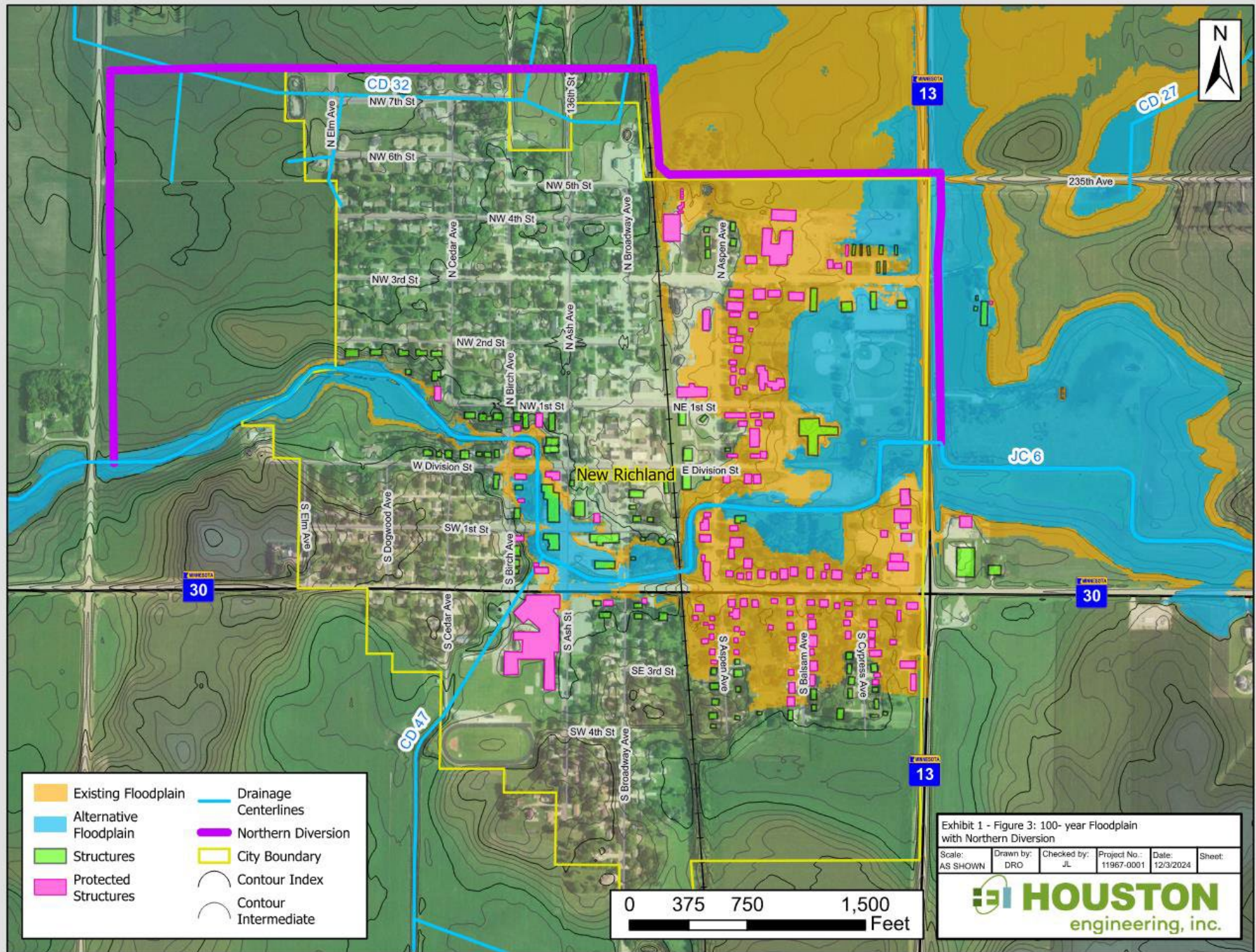


Exhibit 1 - Figure 3: 100- year Floodplain with Northern Diversion

Scale: AS SHOWN	Drawn by: DRO	Checked by: JL	Project No.: 11967-001	Date: 12/3/2024	Sheet:
--------------------	------------------	-------------------	---------------------------	--------------------	--------

HOUSTON
engineering, inc.

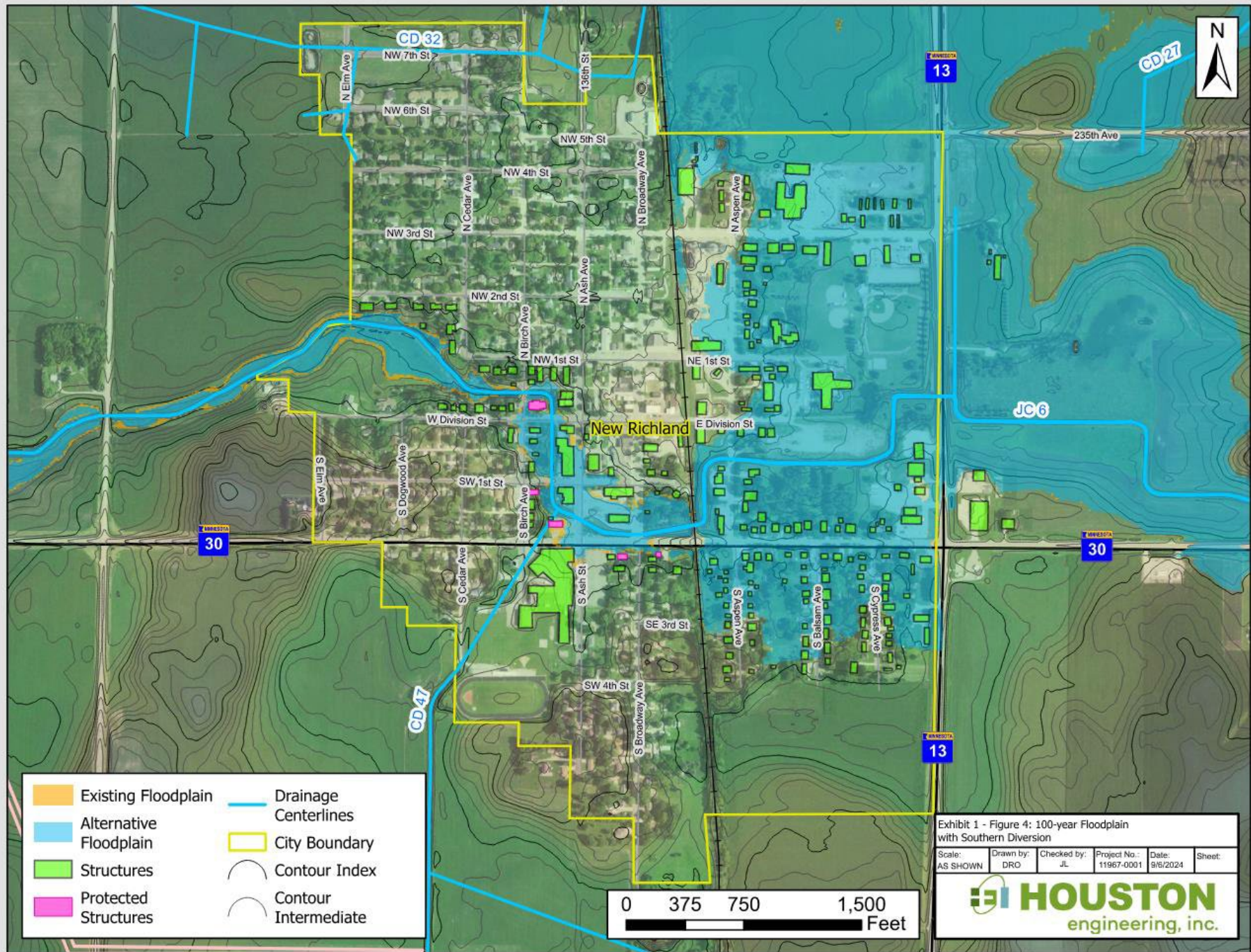


Exhibit 1 - Figure 4: 100-year Floodplain with Southern Diversion

Scale: AS SHOWN	Drawn by: DRO	Checked by: JL	Project No.: 11967-0001	Date: 9/6/2024	Sheet:
-----------------	---------------	----------------	-------------------------	----------------	--------

HOUSTON engineering, inc.

INITIAL PLANNING COST RANGES

Alternative	POPC Anticipated Accuracy Range, Low (-10%)	POPC ¹ (Point Estimate)	POPC Anticipated Accuracy Range, High (+20%)
Increase Culvert Capacity	\$1.7 Million	\$1.9 Million	\$2.3 Million
Increase Culvert Capacity and Channel Widening	\$4.2 Million	\$4.6 Million	\$5.6 Million
Northern Diversion	\$2.9 Million	\$3.2 Million	\$3.8 Million
Southern Diversion	\$2.4 Million	\$2.6 Million	\$3.1 Million
Buyouts ²	\$21.0 Million	\$23.3 Million	\$28.0 Million

FUNDING

- Multiple funding opportunities being explored including Flood Hazard Mitigation Program administer by the MN DNR
- \$590 million since 1987
- Applications are prioritized and subject to availability of funding
- Local contribution required

NEXT STEPS

- City and County continue to coordinate administrative process to jointly pursue funding opportunities
- Further evaluation of current conditions to demonstrate severity of existing flood risk
- Refine analysis of alternatives to solidify preferred / most effective alternative

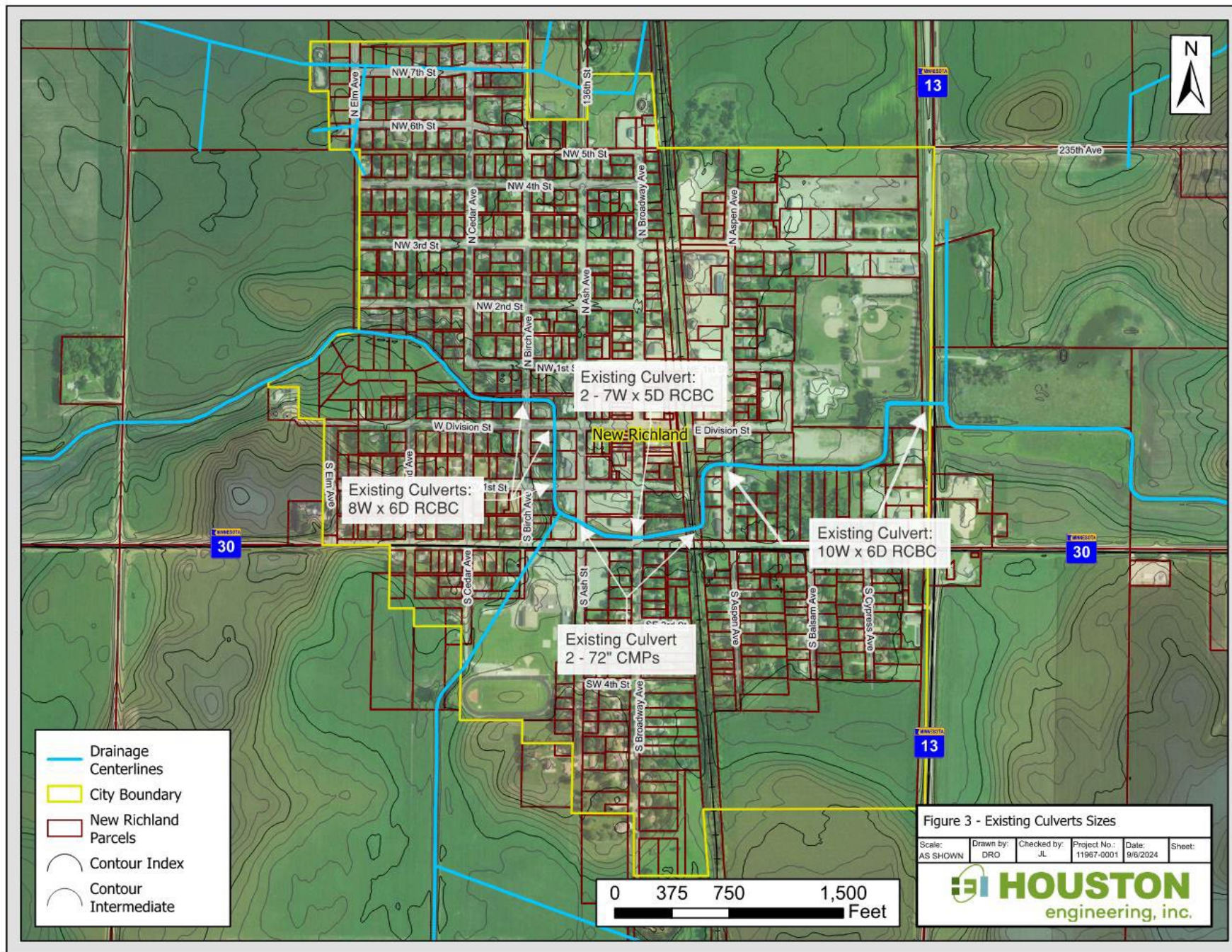


STRUCTURAL – FLOODWALL



STRUCTURAL - LEVEE





HYDROLOGY

Return Frequency	Peak Flow (cfs)	Precipitation Depth (inches)
2-year	178	2.96
5-year	377	3.75
10-year	549	4.49
25-year	805	5.63
50-year	1,030	6.60
100-year	1,270	7.66

**PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)¹**

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.376 (0.290-0.489)	0.448 (0.345-0.583)	0.573 (0.440-0.746)	0.682 (0.521-0.890)	0.840 (0.625-1.13)	0.969 (0.703-1.31)	1.10 (0.775-1.51)	1.25 (0.841-1.74)	1.44 (0.939-2.04)	1.60 (1.01-2.28)
10-min	0.551 (0.425-0.715)	0.656 (0.506-0.854)	0.839 (0.644-1.09)	0.998 (0.762-1.30)	1.23 (0.915-1.65)	1.42 (1.03-1.92)	1.62 (1.14-2.22)	1.82 (1.23-2.54)	2.11 (1.38-3.00)	2.34 (1.48-3.34)
15-min	0.671 (0.518-0.873)	0.801 (0.617-1.04)	1.02 (0.785-1.33)	1.22 (0.930-1.59)	1.50 (1.12-2.02)	1.73 (1.26-2.34)	1.97 (1.38-2.70)	2.22 (1.50-3.10)	2.58 (1.68-3.65)	2.86 (1.81-4.07)
30-min	0.934 (0.720-1.21)	1.12 (0.860-1.45)	1.43 (1.10-1.86)	1.70 (1.30-2.23)	2.11 (1.57-2.83)	2.43 (1.77-3.29)	2.78 (1.95-3.81)	3.14 (2.12-4.38)	3.64 (2.37-5.16)	4.04 (2.56-5.76)
60-min	1.21 (0.934-1.57)	1.45 (1.12-1.88)	1.86 (1.43-2.42)	2.22 (1.70-2.90)	2.76 (2.06-3.72)	3.20 (2.33-4.34)	3.67 (2.58-5.04)	4.17 (2.82-5.82)	4.86 (3.17-6.90)	5.42 (3.43-7.72)
2-hr	1.49 (1.16-1.91)	1.78 (1.38-2.29)	2.29 (1.77-2.95)	2.74 (2.12-3.54)	3.42 (2.57-4.56)	3.98 (2.92-5.33)	4.56 (3.24-6.21)	5.20 (3.55-7.18)	6.09 (4.00-8.55)	6.80 (4.35-9.59)
3-hr	1.66 (1.30-2.12)	1.98 (1.55-2.53)	2.55 (1.99-3.26)	3.07 (2.38-3.93)	3.83 (2.91-5.09)	4.47 (3.31-5.96)	5.15 (3.68-6.97)	5.88 (4.05-8.09)	6.92 (4.58-9.67)	7.75 (4.98-10.9)
6-hr	1.94 (1.54-2.45)	2.32 (1.83-2.93)	2.99 (2.35-3.78)	3.60 (2.82-4.57)	4.52 (3.47-5.95)	5.30 (3.96-7.00)	6.12 (4.43-8.21)	7.02 (4.88-9.56)	8.29 (5.55-11.5)	9.32 (6.06-12.9)
12-hr	2.22 (1.77-2.76)	2.64 (2.10-3.29)	3.39 (2.70-4.24)	4.09 (3.23-5.12)	5.14 (3.98-6.70)	6.03 (4.55-7.88)	6.99 (5.10-9.27)	8.02 (5.64-10.8)	9.50 (6.43-13.0)	10.7 (7.03-14.7)
24-hr	2.53 (2.04-3.11)	2.96 (2.38-3.65)	3.75 (3.01-4.64)	4.49 (3.59-5.57)	5.63 (4.42-7.26)	6.60 (5.04-8.55)	7.66 (5.66-10.1)	8.82 (6.26-11.8)	10.5 (7.17-14.2)	11.8 (7.85-16.1)
2-day	2.93 (2.38-3.56)	3.34 (2.72-4.07)	4.12 (3.34-5.03)	4.86 (3.92-5.96)	6.03 (4.79-7.71)	7.05 (5.45-9.04)	8.16 (6.10-10.6)	9.40 (6.76-12.4)	11.2 (7.74-15.0)	12.7 (8.49-17.0)
3-day	3.22 (2.64-3.89)	3.64 (2.98-4.41)	4.44 (3.62-5.38)	5.19 (4.21-6.31)	6.38 (5.09-8.08)	7.40 (5.75-9.41)	8.52 (6.41-11.0)	9.76 (7.06-12.8)	11.6 (8.05-15.4)	13.0 (8.80-17.4)
4-day	3.45 (2.84-4.15)	3.90 (3.20-4.69)	4.72 (3.87-5.70)	5.50 (4.48-6.65)	6.69 (5.36-8.42)	7.72 (6.02-9.75)	8.84 (6.67-11.3)	10.1 (7.30-13.1)	11.8 (8.27-15.7)	13.3 (9.00-17.7)
7-day	4.02 (3.33-4.79)	4.54 (3.76-5.41)	5.46 (4.51-6.52)	6.29 (5.17-7.53)	7.52 (6.04-9.30)	8.55 (6.70-10.6)	9.64 (7.32-12.2)	10.8 (7.89-13.9)	12.5 (8.77-16.4)	13.8 (9.44-18.2)
10-day	4.56 (3.80-5.40)	5.14 (4.28-6.09)	6.13 (5.09-7.27)	6.99 (5.77-8.32)	8.25 (6.64-10.1)	9.27 (7.29-11.4)	10.3 (7.88-13.0)	11.5 (8.41-14.7)	13.0 (9.21-17.0)	14.3 (9.82-18.7)