KDA-DWR: Hutchinson Technical Assistance

Cow Creek Stormwater Modifications Benefit Cost Analysis

Contract No. 1737 Task Order 46

Project No. 8275000402

September 27, 2022

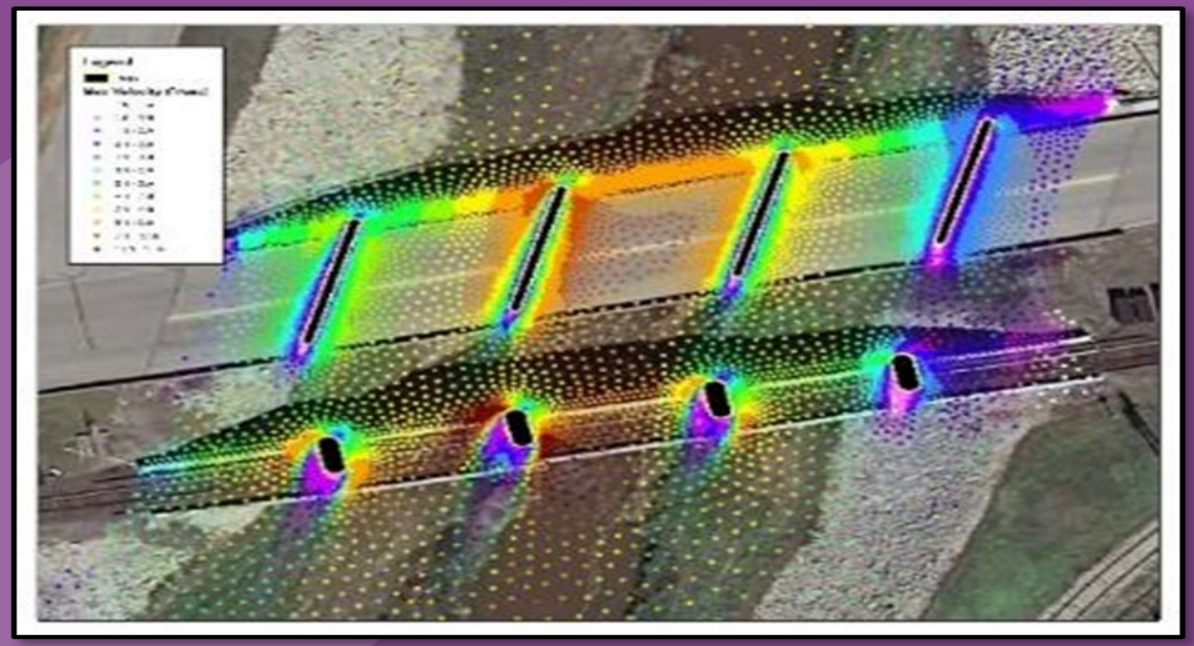
Project Overview

Highlighted Discussion Items

- Where we started and where we are
- Project Verification Phase
- Benefit Cost Analysis
- General Discussion / Questions?

PROJECT BACKGROUND

September 2022



Project Background

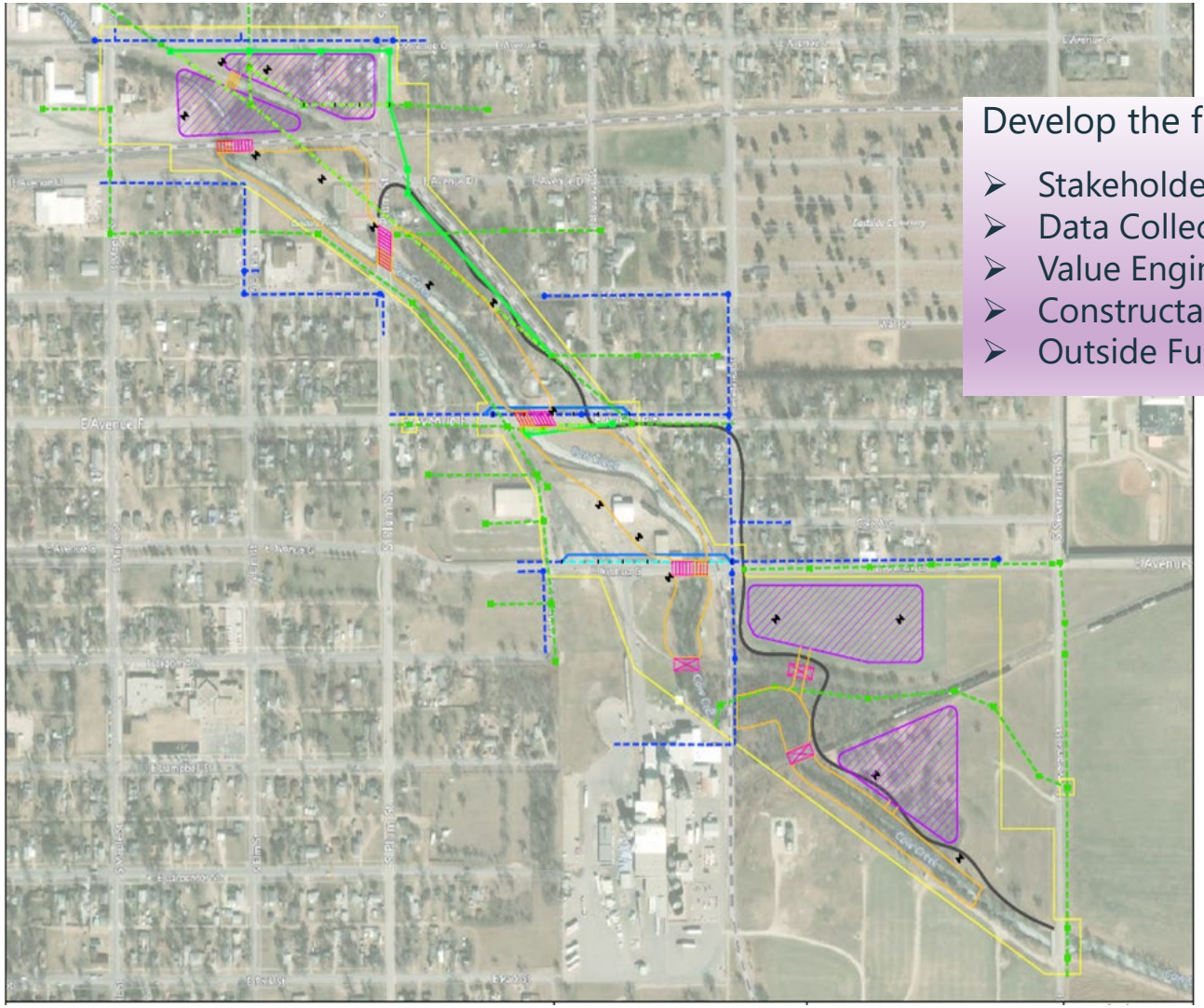
The Cow Creek drainage area encompasses over 4,000 acres of the most highly developed and highly impervious part of the City.

This project for Cow Creek will serve as the foundation block for future stormwater projects:

Future projects may include:

- Elm St.
- Main St.
- E. 2nd Ave.
- Cleveland St.

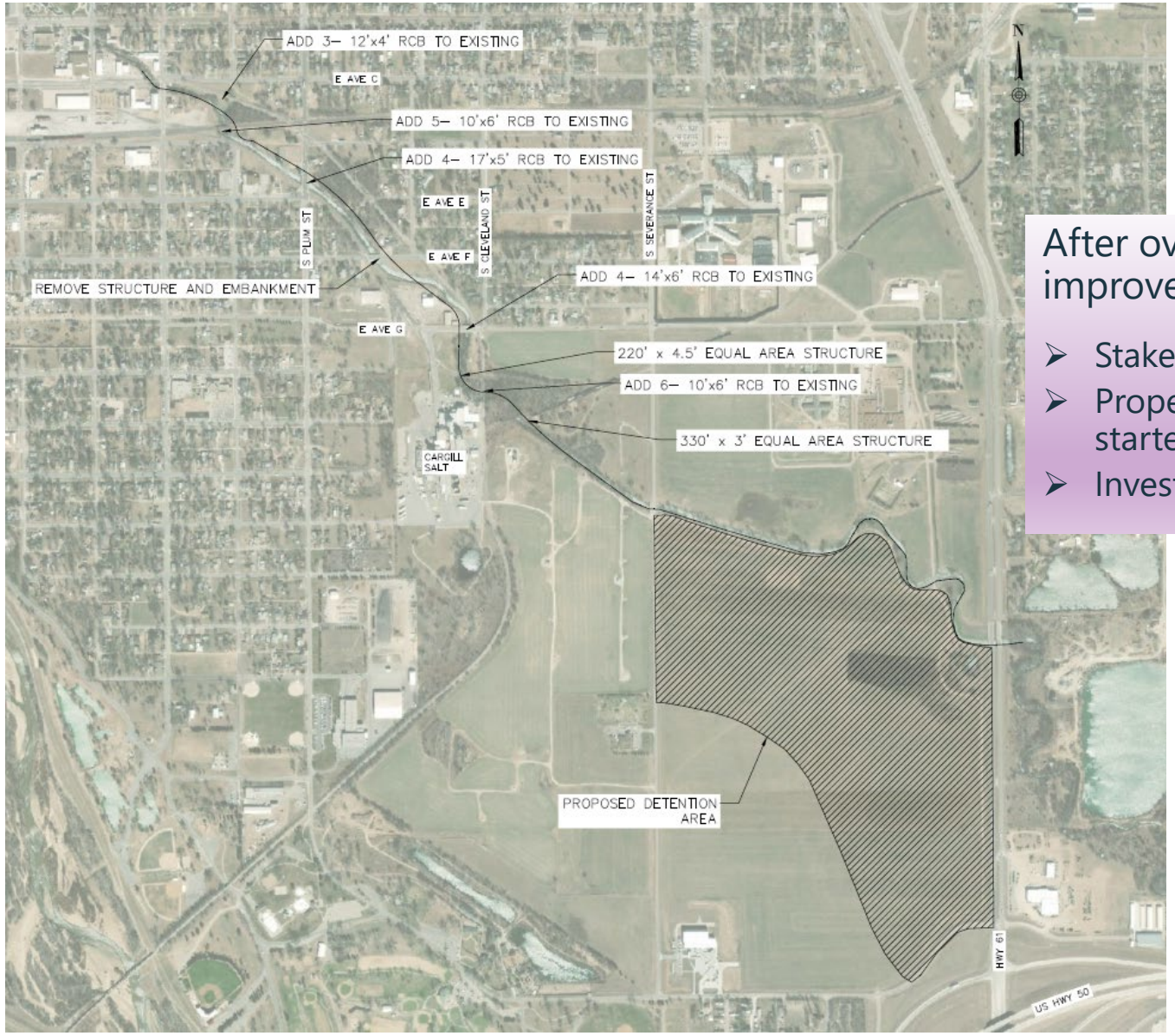
Where we started…..



Develop the final project scope through collaboration and…

- Stakeholder Engagement
- Data Collection, Investigation and Modeling
- Value Engineering Analysis
- Constructability and Risk Management
- Outside Funding Opportunities

Where we are…..



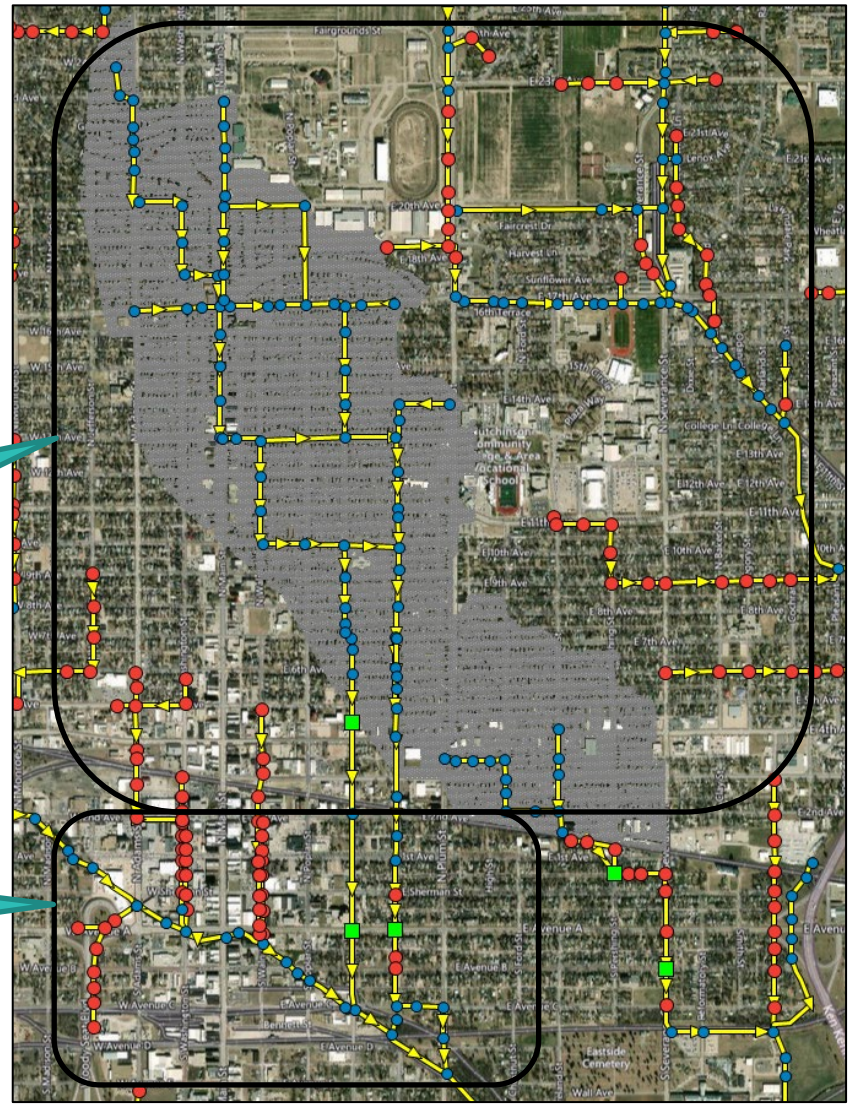
After over 30 project alternatives modelled, conceptual improvements have been identified

- Stakeholder Engagement Continues
- Property acquisitions completed north of G Ave. and demo started
- Investigating Grant Funding Opportunities

PROJECT VERIFICATION PHASE

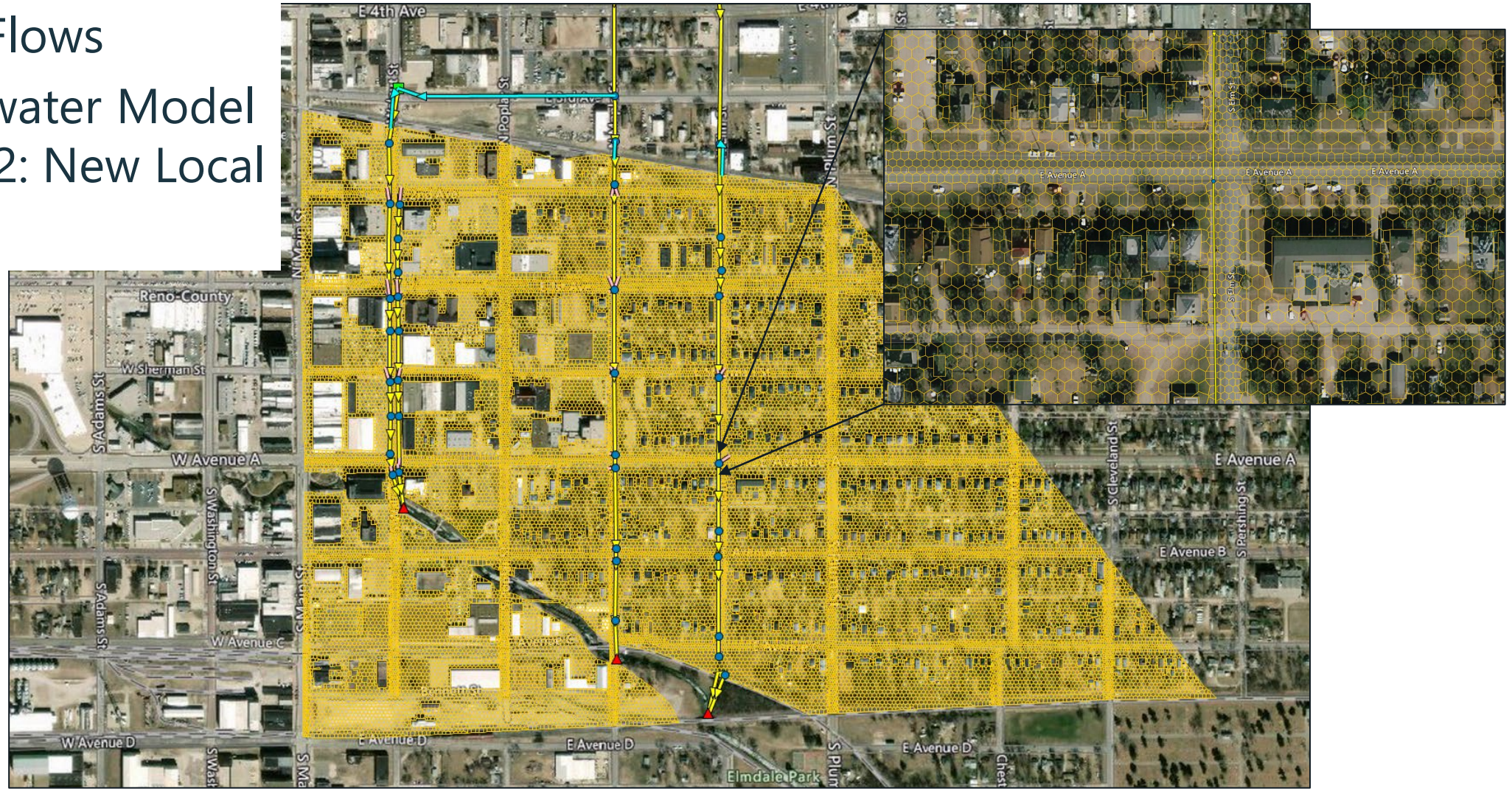
Modeling & Project Verification

- Review Master Plan Data
- Establish Flows (Existing & Future Conditions)
  - Update/Redevelop CIP Stormwater Model
    - Part 1: Upstream Flows



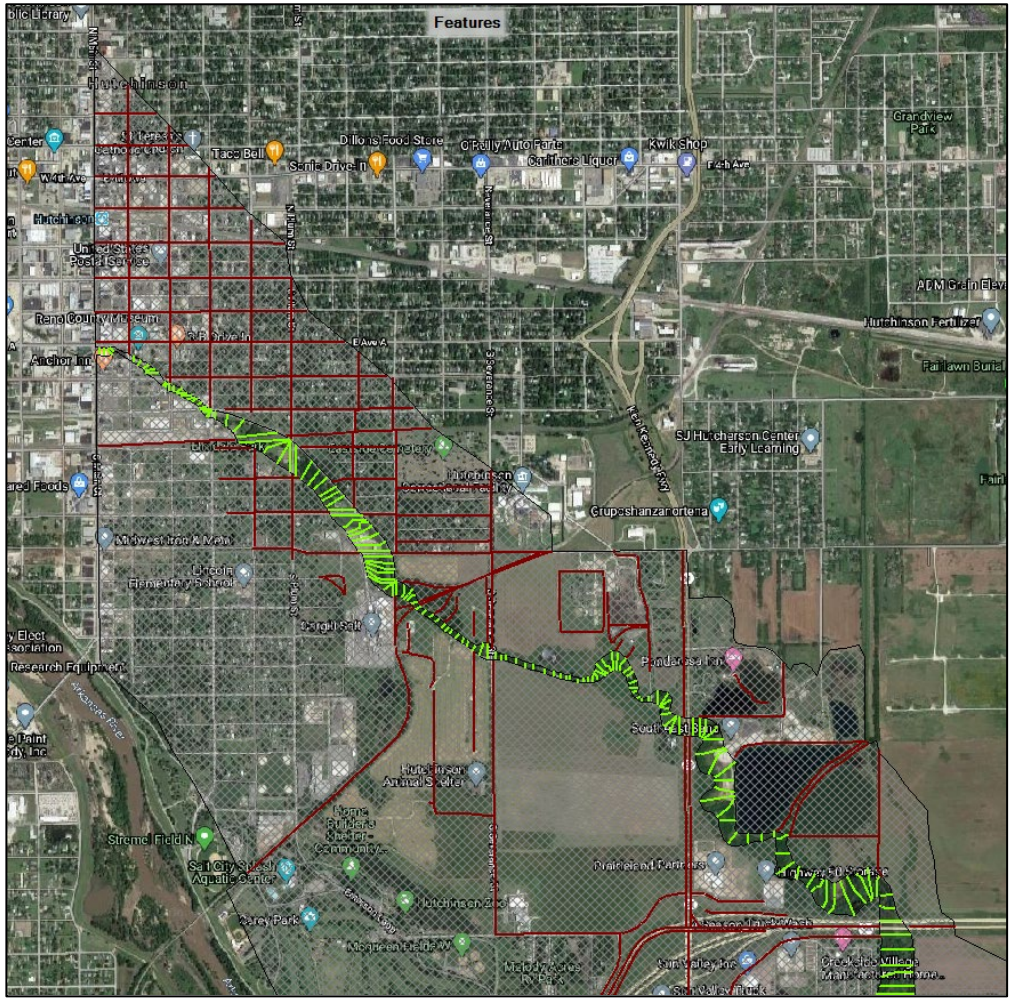
Modeling & Project Verification

- Establish Flows
  - Stormwater Model – Part 2: New Local Flows

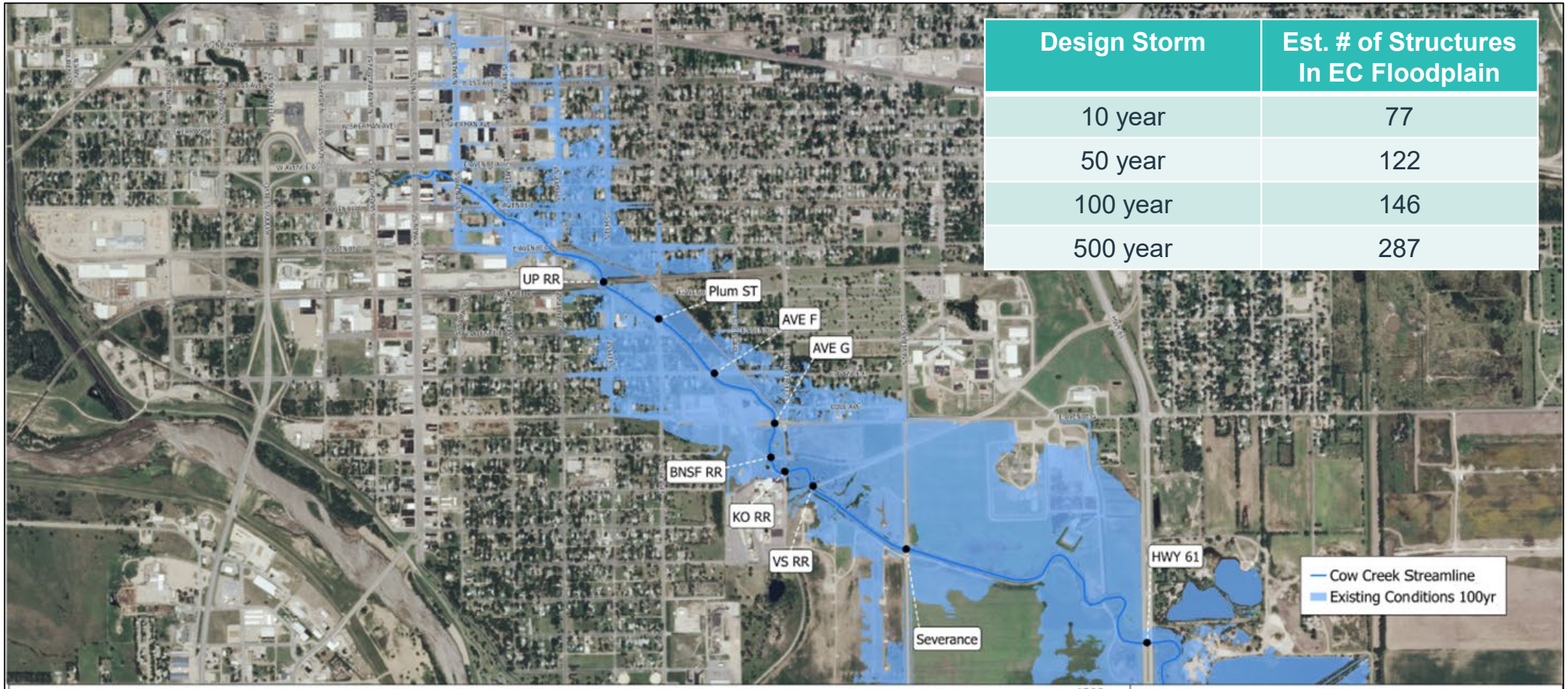


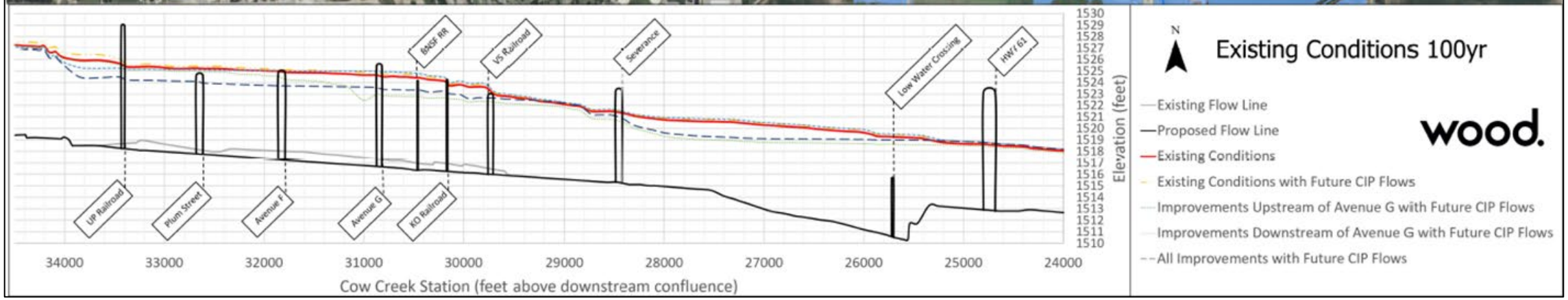
Modeling & Project Verification

- Existing Conditions Hydraulics
  - Update/Enhance FEMA Study Hydrodynamic 1D/2D HECRAS
    - From Main St to Confluence with GVI Drainage Ditch
    - FEMA Compliant

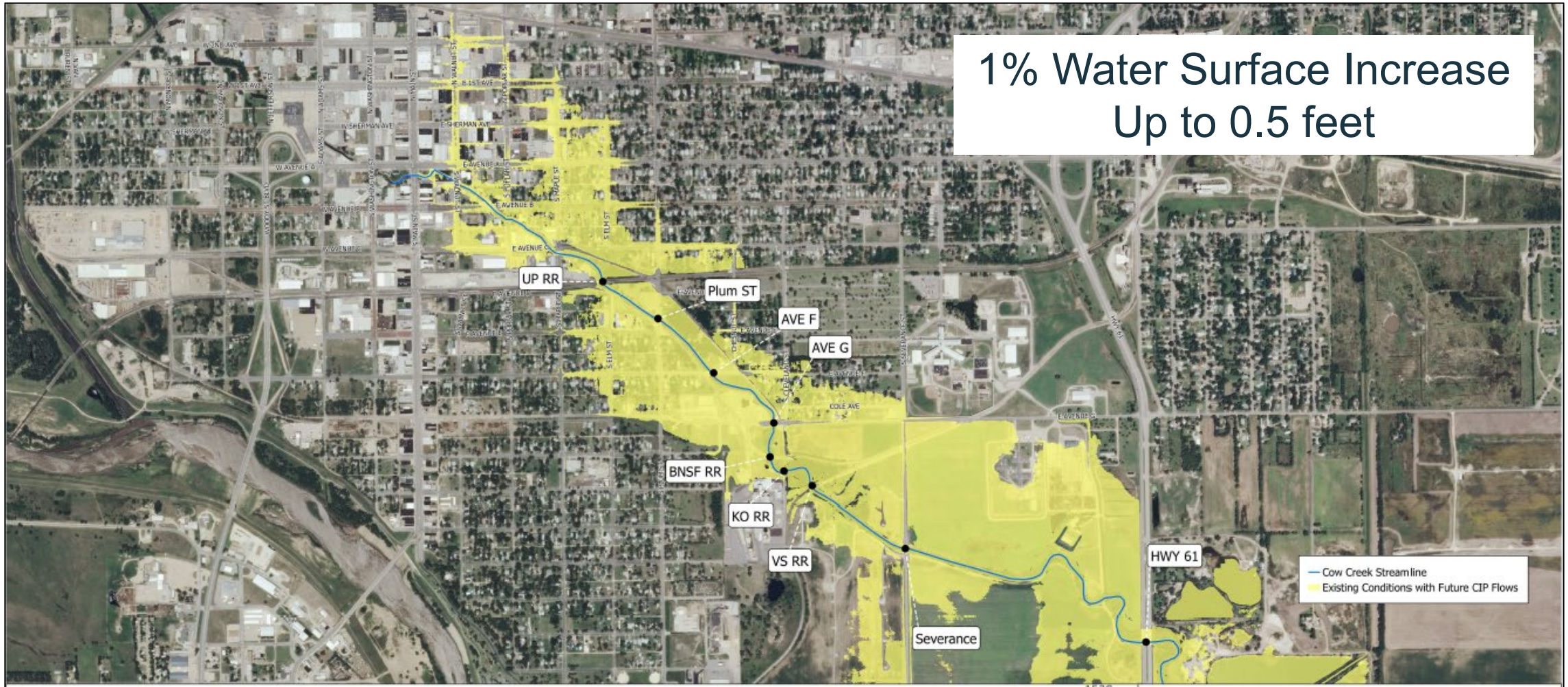


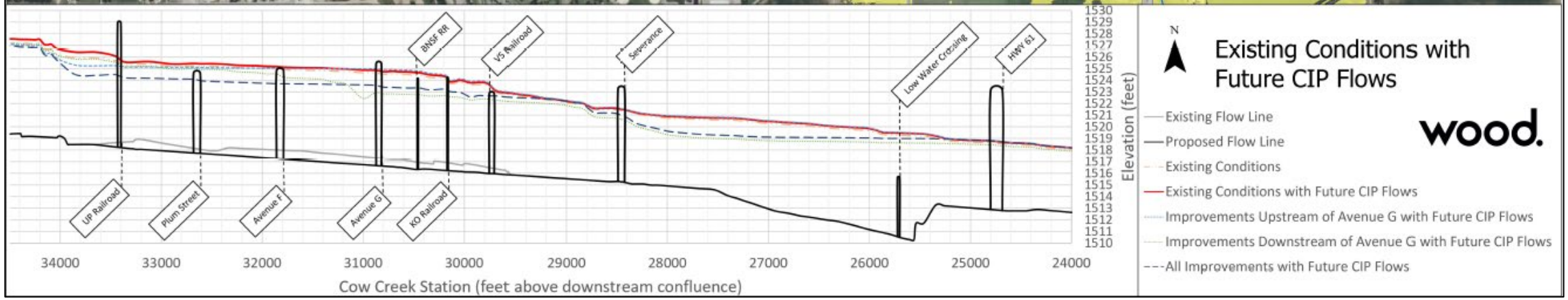
Design Storm	Est. # of Structures In EC Floodplain
10 year	77
50 year	122
100 year	146
500 year	287





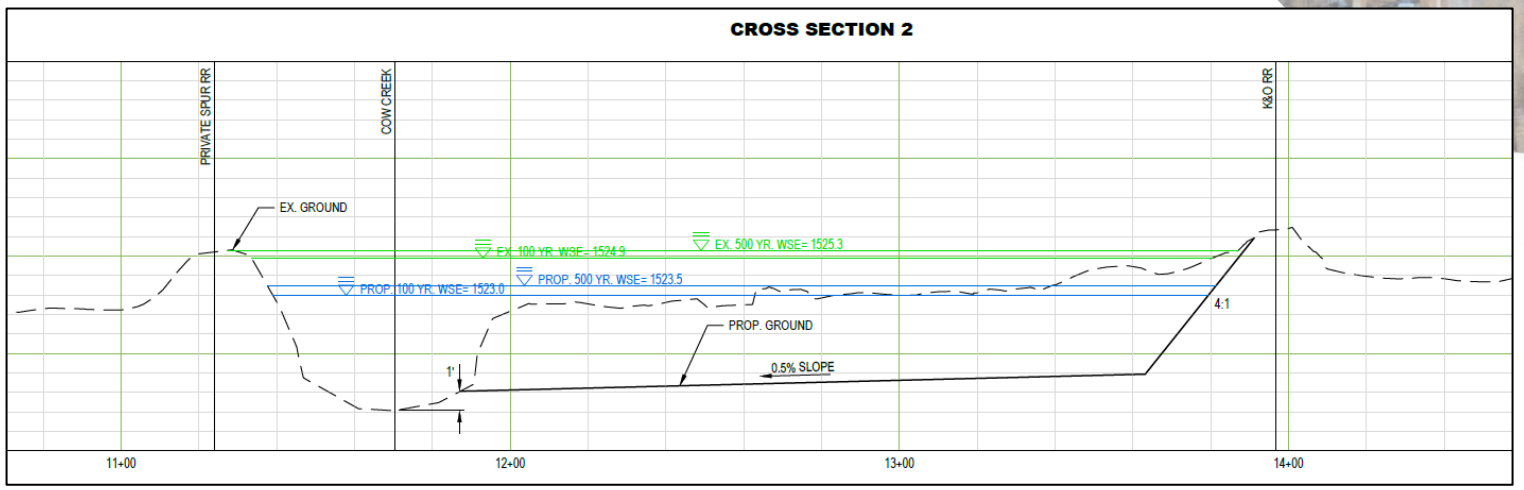
1% Water Surface Increase
Up to 0.5 feet

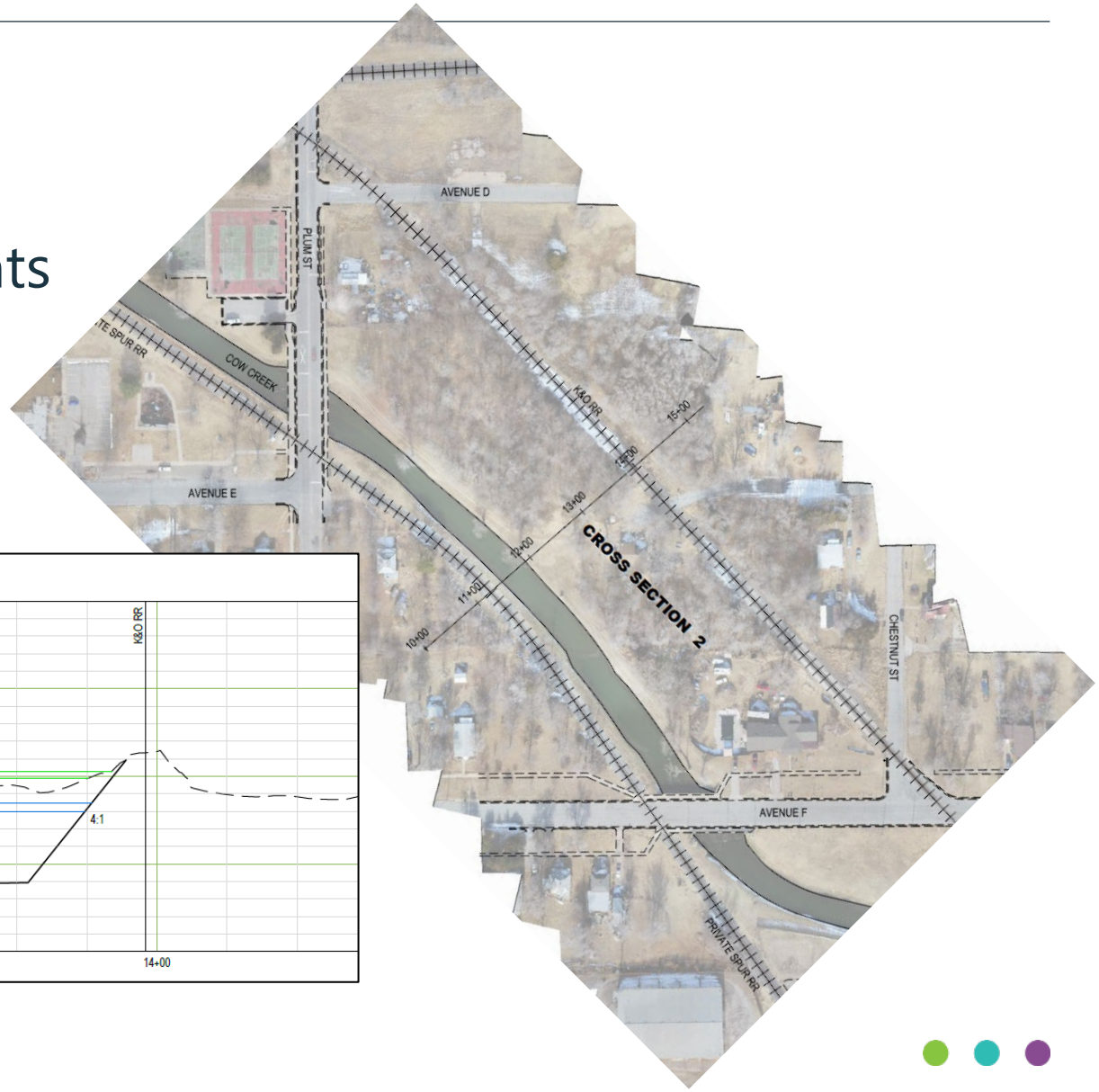




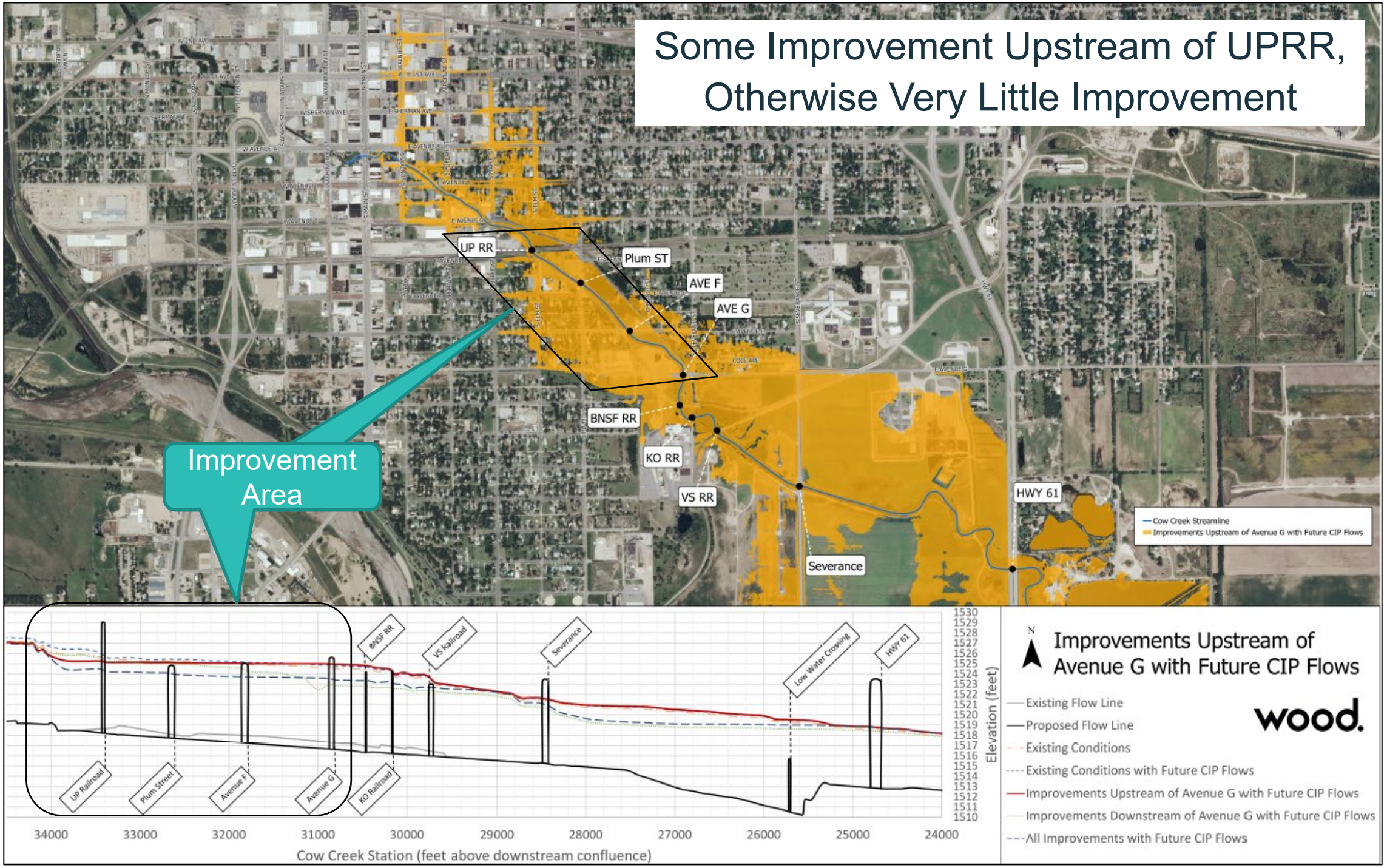
Modeling & Project Verification

- Developed Proposed Conditions
  - >30 Flood Mitigation Scenarios
  - Key to Mitigation is improvements downstream of G Avenue

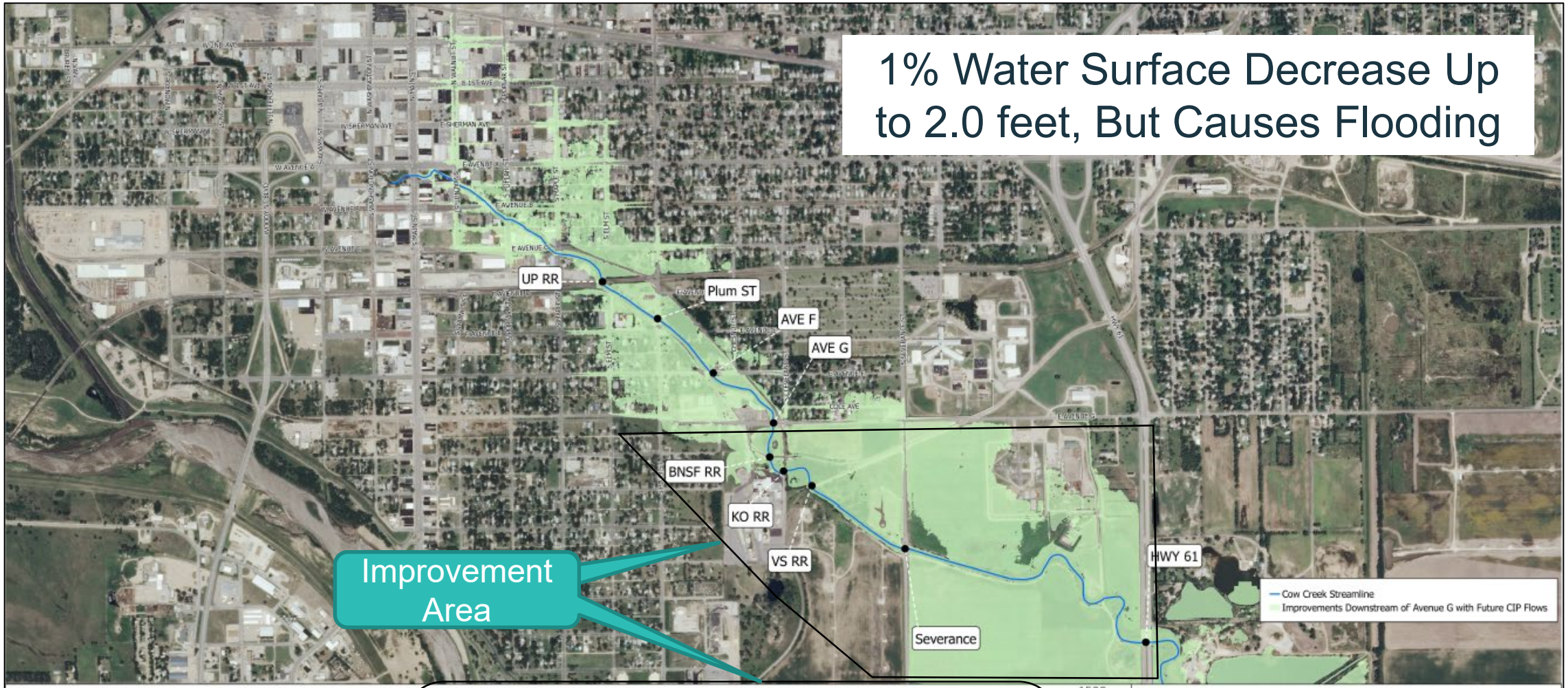


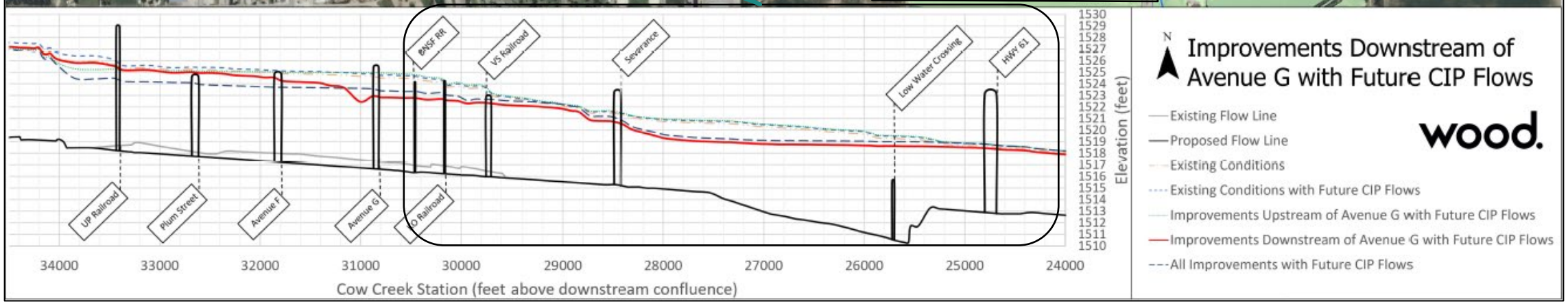


Some Improvement Upstream of UPRR, Otherwise Very Little Improvement

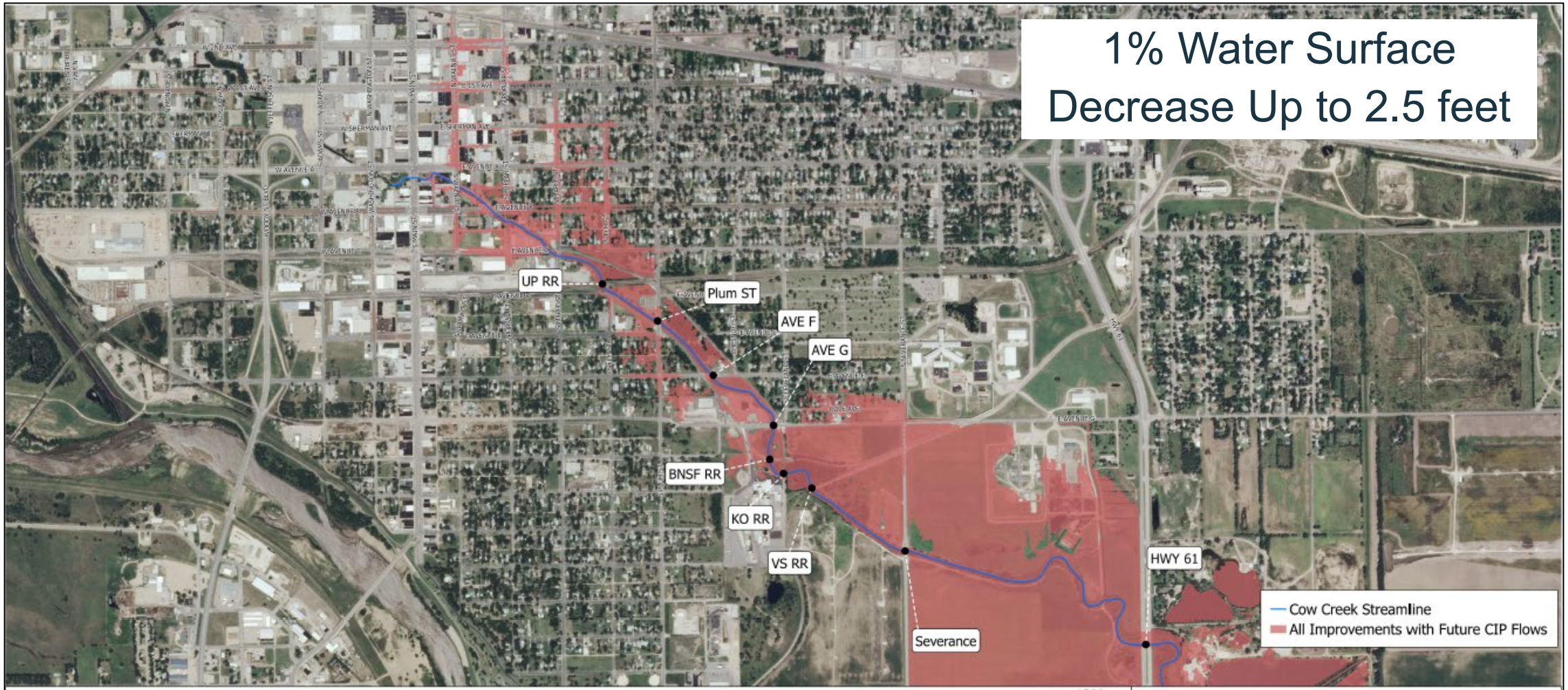


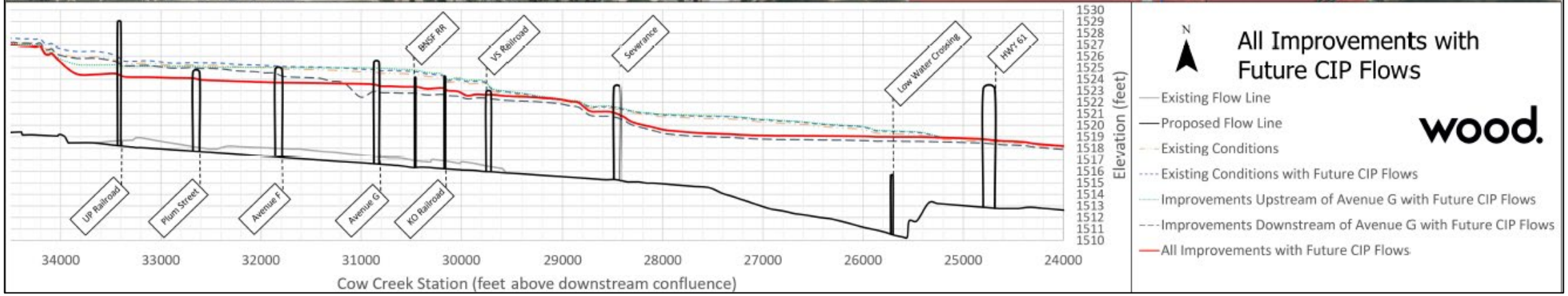
1% Water Surface Decrease Up to 2.0 feet, But Causes Flooding





1% Water Surface Decrease Up to 2.5 feet





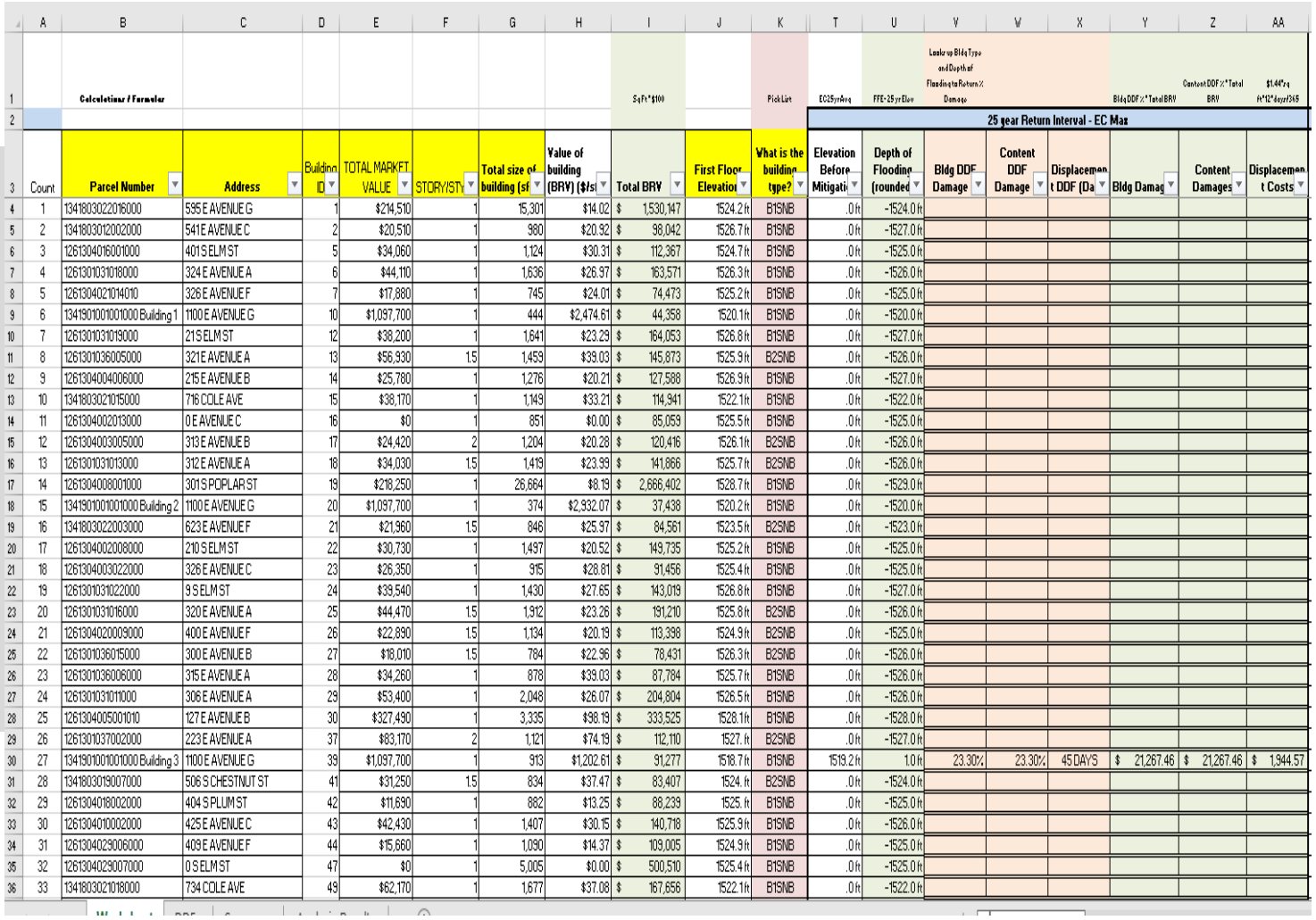
BENEFIT COST ANALYSIS

Benefit Cost Analysis

- Utilized FEMA BCA Tool and FEMA drainage spreadsheet to calculate a project Benefit Cost Ratio (BCR)
- Analyzed existing and proposed conditions
- Benefits analyzed included:
  - Reduced structural damages and displacement costs
  - Social benefits (lost wages)
  - Economic benefits (Cargill plant disruption)
  - Ecosystem services from open space

Benefit Cost Analysis – Structure Analysis

- 206 structures affected up to the 500 year event
- Used GIS methods to assess flood depth at each structure for 25, 50, 100 and 500 year return intervals
- Analyzed existing and proposed conditions
- Results captured in spreadsheet tool that summarizes estimated losses based on USACE depth-damage curves



	A	B	C	D	E	F	G	H	I	J	K	T	U	V	W	X	Y	Z	AA
1		Calculations / Formulas							SqFt*$100		Pick List	EC25yrAvg	FFE-25yrElev	Lookup Bldg Type and Depth of Flooding to Return % Damage			Bldg DDF x * Total BRV	Content DDF x * Total BRV	$1.44*sq ft*12*4syr/365
2												25 year Return Interval - EC Max							
3	Count	Parcel Number	Address	Building ID	TOTAL MARKET VALUE	STORYISTY	Total size of building (sf	Value of building (BRV) ($/sf	Total BRV	First Floor Elevation	What is the building type?	Elevation Before Mitigati	Depth of Flooding (rounded	Bldg DDF Damage	Content DDF Damage	Displacement DDF (Da	Bldg Damag	Content Damages	Displacement Costs
4	1	1341803022016000	595 E AVENUE G	1	$214,510	1	15,301	$14.02	$ 1,530,147	1524.2 ft	B1SNB	.0 ft	-1524.0 ft						
5	2	1341803012002000	541 E AVENUE C	2	$20,510	1	980	$20.92	$ 98,042	1526.7 ft	B1SNB	.0 ft	-1527.0 ft						
6	3	1261304016001000	401 S ELM ST	5	$34,060	1	1,124	$30.31	$ 112,367	1524.7 ft	B1SNB	.0 ft	-1525.0 ft						
7	4	1261301031018000	324 E AVENUE A	6	$44,110	1	1,636	$26.97	$ 163,571	1526.3 ft	B1SNB	.0 ft	-1526.0 ft						
8	5	1261304021014010	326 E AVENUE F	7	$17,880	1	745	$24.01	$ 74,473	1525.2 ft	B1SNB	.0 ft	-1525.0 ft						
9	6	13419010010010 00 Building 1	1100 E AVENUE G	10	$1,097,700	1	444	$2,474.61	$ 44,358	1520.1 ft	B1SNB	.0 ft	-1520.0 ft						
10	7	1261301031019000	21 S ELM ST	12	$38,200	1	1,641	$23.29	$ 164,053	1526.8 ft	B1SNB	.0 ft	-1527.0 ft						
11	8	1261301036005000	321 E AVENUE A	13	$56,930	1.5	1,459	$39.03	$ 145,873	1525.9 ft	B2SNB	.0 ft	-1526.0 ft						
12	9	1261304004006000	215 E AVENUE B	14	$25,780	1	1,276	$20.21	$ 127,588	1526.9 ft	B1SNB	.0 ft	-1527.0 ft						
13	10	1341803021015000	716 COLE AVE	15	$38,170	1	1,149	$33.21	$ 114,941	1522.1 ft	B1SNB	.0 ft	-1522.0 ft						
14	11	1261304002013000	0 E AVENUE C	16	$0	1	851	$0.00	$ 85,059	1525.5 ft	B1SNB	.0 ft	-1525.0 ft						
15	12	1261304003005000	313 E AVENUE B	17	$24,420	2	1,204	$20.28	$ 120,416	1526.1 ft	B2SNB	.0 ft	-1526.0 ft						
16	13	1261301031013000	312 E AVENUE A	18	$34,030	1.5	1,419	$23.99	$ 141,866	1525.7 ft	B2SNB	.0 ft	-1526.0 ft						
17	14	1261304008001000	301 S POPLAR ST	19	$218,250	1	26,664	$8.19	$ 2,666,402	1528.7 ft	B1SNB	.0 ft	-1529.0 ft						
18	15	13419010010010 00 Building 2	1100 E AVENUE G	20	$1,097,700	1	374	$2,932.07	$ 37,438	1520.2 ft	B1SNB	.0 ft	-1520.0 ft						
19	16	1341803022003000	623 E AVENUE F	21	$21,960	1.5	846	$25.97	$ 84,561	1523.5 ft	B2SNB	.0 ft	-1523.0 ft						
20	17	1261304002008000	210 S ELM ST	22	$30,730	1	1,497	$20.52	$ 149,735	1525.2 ft	B1SNB	.0 ft	-1525.0 ft						
21	18	1261304003022000	326 E AVENUE C	23	$26,350	1	915	$28.81	$ 91,456	1525.4 ft	B1SNB	.0 ft	-1525.0 ft						
22	19	1261301031022000	9 S ELM ST	24	$39,540	1	1,430	$27.65	$ 143,019	1526.8 ft	B1SNB	.0 ft	-1527.0 ft						
23	20	1261301031016000	320 E AVENUE A	25	$44,470	1.5	1,912	$23.26	$ 191,210	1525.8 ft	B2SNB	.0 ft	-1526.0 ft						
24	21	1261304020009000	400 E AVENUE F	26	$22,890	1.5	1,134	$20.19	$ 113,398	1524.9 ft	B2SNB	.0 ft	-1525.0 ft						
25	22	1261301036015000	300 E AVENUE B	27	$18,010	1.5	784	$22.96	$ 78,431	1526.3 ft	B2SNB	.0 ft	-1526.0 ft						
26	23	1261301036006000	315 E AVENUE A	28	$34,260	1	878	$39.03	$ 87,784	1525.7 ft	B1SNB	.0 ft	-1526.0 ft						
27	24	1261301031011000	306 E AVENUE A	29	$53,400	1	2,048	$26.07	$ 204,804	1526.5 ft	B1SNB	.0 ft	-1526.0 ft						
28	25	1261304005001010	127 E AVENUE B	30	$327,490	1	3,335	$98.19	$ 333,525	1528.1 ft	B1SNB	.0 ft	-1528.0 ft						
29	26	1261301037002000	223 E AVENUE A	37	$83,170	2	1,121	$74.19	$ 112,110	1527. ft	B2SNB	.0 ft	-1527.0 ft						
30	27	13419010010010 00 Building 3	1100 E AVENUE G	39	$1,097,700	1	913	$1,202.61	$ 91,277	1518.7 ft	B1SNB	1519.2 ft	1.0 ft	23.30%	23.30%	45 DAYS	$ 21,267.46	$ 21,267.46	$ 1,944.57
31	28	1341803019007000	506 S CHESTNUT ST	41	$31,250	1.5	834	$37.47	$ 83,407	1524. ft	B2SNB	.0 ft	-1524.0 ft						
32	29	1261304018002000	404 S PLUM ST	42	$11,690	1	882	$13.25	$ 88,239	1525. ft	B1SNB	.0 ft	-1525.0 ft						
33	30	1261304010002000	425 E AVENUE C	43	$42,430	1	1,407	$30.15	$ 140,718	1525.3 ft	B1SNB	.0 ft	-1526.0 ft						
34	31	1261304029006000	409 E AVENUE F	44	$15,660	1	1,090	$14.37	$ 109,005	1524.9 ft	B1SNB	.0 ft	-1525.0 ft						
35	32	1261304029007000	0 S ELM ST	47	$0	1	5,005	$0.00	$ 500,510	1525.4 ft	B1SNB	.0 ft	-1525.0 ft						
36	33	1341803021018000	734 COLE AVE	49	$62,170	1	1,677	$37.08	$ 167,656	1522.1 ft	B1SNB	.0 ft	-1522.0 ft						

Benefit Cost Analysis

FEMA Benefit-Cost Calculator

V.6.0 (Build 20220831.1934 | Release Notes)

Benefit-Cost Analysis

Project Name: Hutchinson BCA FFE $100 Sq. Ft

Map Marker ▲	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)
1	Drainage Improvement @ 38.0220660; -97.9325110		DFA - Riverine Flood	$ 68,950,734	$ 20,869,652	3.30
TOTAL (SELECTED)				**$ 68,950,734**	**$ 20,869,652**	**3.30**
TOTAL				**$ 68,950,734**	**$ 20,869,652**	**3.30**

Benefit Cost Analysis

Cost Estimation

Drainage Improvement @ 38.0220660; -97.9325110

Project Useful Life (years):	50
Project Cost:	$20,662,641
Number of Maintenance Years:	50 Use Default:Yes
Annual Maintenance Cost:	$15,000

Professional Expected Damages Before Mitigation

Drainage Improvement @ 38.0220660; -97.9325110

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
25	1,494,875	62,000	0	0	0	0	1,556,875
50	2,224,606	62,000	0	0	0	0	2,286,606
100	10,199,320	124,000	0	0	0	0	10,323,320
500	15,173,486	124,000	0	0	0	0	15,297,486

Benefit Cost Analysis

Annualized Damages Before Mitigation

Drainage Improvement @ 38.0220660; -97.9325110

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
25	1,556,875	37,736
50	2,286,606	48,585
100	10,323,320	100,533
500	15,297,486	30,593
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	29,464,287	217,447

Professional Expected Damages After Mitigation

Drainage Improvement @ 38.0220660; -97.9325110

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
25	246,197	0	0	0	0	0	246,197
50	771,908	0	0	0	0	0	771,908
100	8,629,781	0	0	0	0	0	8,629,781
500	10,489,522	0	0	0	0	0	10,489,522

Benefit Cost Analysis

Annualized Damages After Mitigation

Drainage Improvement @ 38.0220660; -97.9325110

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
25	246,197	8,719
50	771,908	25,810
100	8,629,781	76,115
500	10,489,522	20,978
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	20,137,408	131,622

Benefit Cost Analysis

Standard Benefits - Ecosystem Services

Drainage Improvement @ 38.0220660; -97.9325110

Total Project Area (acres):	1,075
Percentage of Urban Green Open Space:	26.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	1.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	$4,743,599

Additional Benefits - Social

Drainage Improvement @ 38.0220660; -97.9325110

Number of Workers:	170
Expected Annual Social Benefits:	$2,301,082

Benefit Cost Analysis

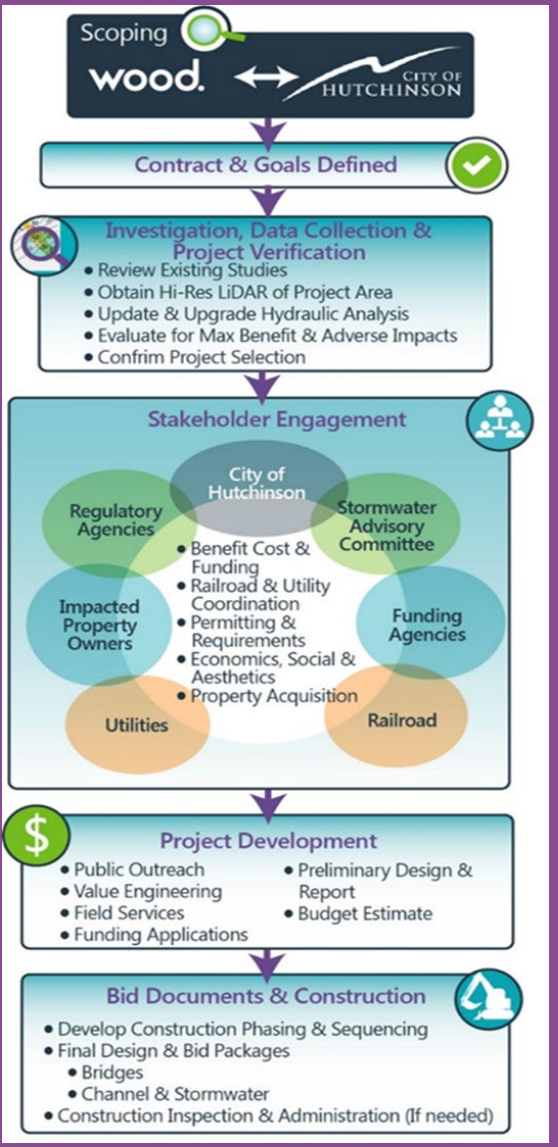
Benefits-Costs Summary

Drainage Improvement @ 38.0220660; -97.9325110

Total Standard Mitigation Benefits:	$66,649,652
Total Social Benefits:	$2,301,082
Total Mitigation Project Benefits:	$68,950,734
Total Mitigation Project Cost:	$20,869,652
Benefit Cost Ratio - Standard:	3.19
Benefit Cost Ratio - Standard + Social:	3.30

General Discussions / Questions

STAKEHOLDER ENGAGEMENT



UP Railroad Structure

N

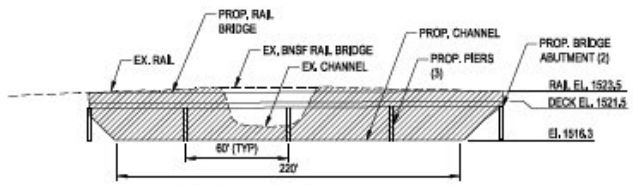
40 0 40 80

SCALE IN FEET

LEGEND

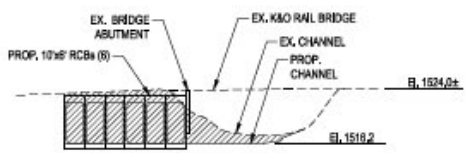
BNSF RAILROAD

K&O RAILROAD



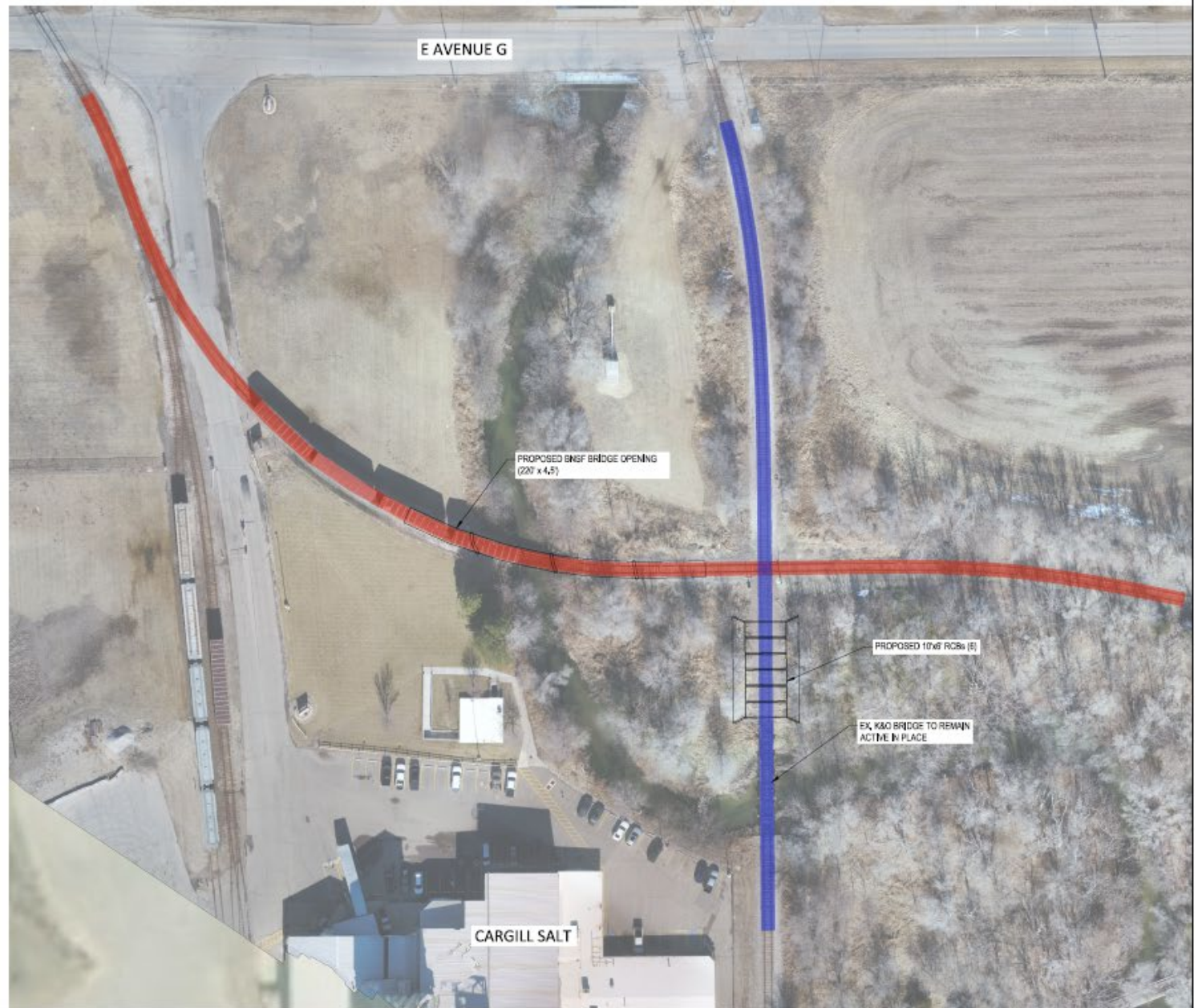
BNSF BRIDGE SECTION VIEW

W/ VERTICAL EXAGURATION



K&O BRIDGE SECTION VIEW

W/ VERTICAL EXAGURATION



Wood Environment & Infrastructure, Inc.
245 N WACO AVE, SUITE 110
WICHITA, KS 67202
T: (316) 448-2711

wood.

CITY OF HUTCHINSON

COW CREEK CHANNEL IMPROVEMENTS
BNSF RAILROAD EXHIBIT

DATE: 1/25/2021

EXHIBIT 1

1 OF 1

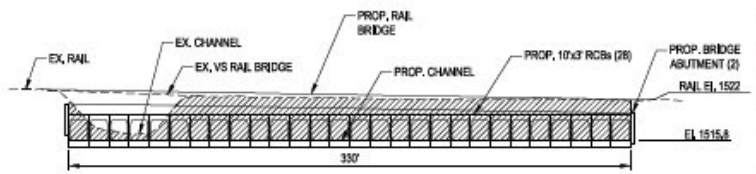
N

40 0 40 80

SCALE IN FEET

LEGEND

- VS RAILROAD
- BNSF RAILROAD
- K&O RAILROAD



VS BRIDGE SECTION VIEW

W/ VERTICAL EXAGURATION

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wood.

CITY OF HUTCHINSON

COW CREEK CHANNEL IMPROVEMENTS
VS RAILROAD EXHIBIT

DATE: 2/01/2021

EXHIBIT 1

1 OF 1

BNSF / K&O / VS Railroad Structures

Next Steps




- Work with City Staff for Project Phasing and Implementation
- Continue engaging with Stakeholders / permitting activities
- Evaluate potential funding opportunities
- Utility Relocations
- Bridge Modifications
- Stormwater Channel Improvements (including public amenities)