

Clients:



Design Team:



**Badger
State
Engineering**

Cassville Airport Residential Redevelopment Project

Badger State Engineering:

Emma Ball, Julian Bendy, Chris Parks, and
Jacob Richardson

Presentation Summary

1. Broad Explanation of Class
2. Location
3. Objectives
4. Constraints
5. Approach
6. Final Design
7. Conclusion
8. Recommendation



What is Senior Design?



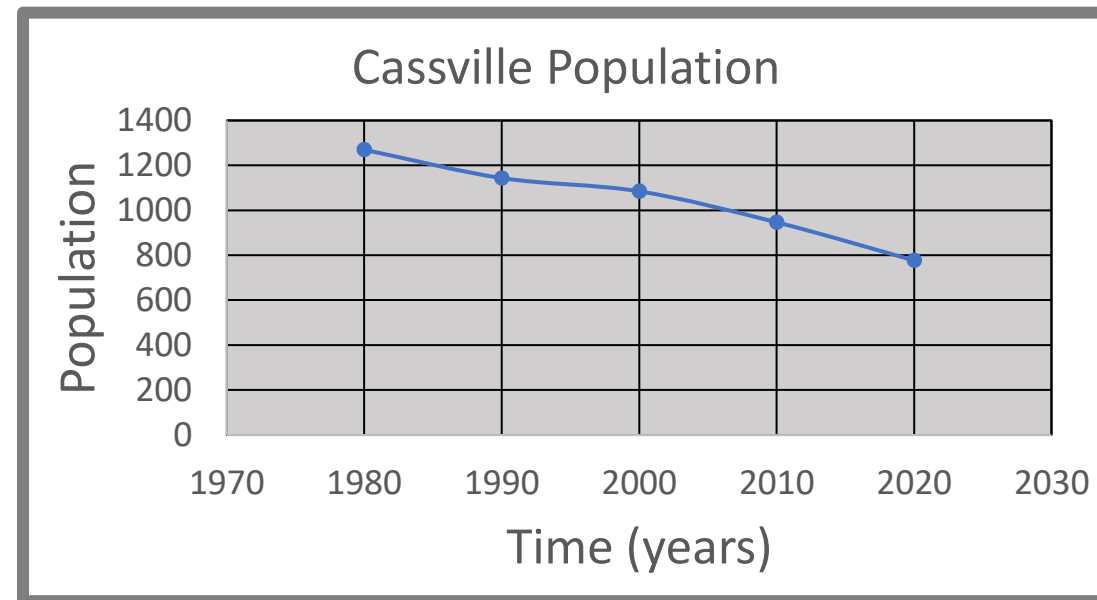
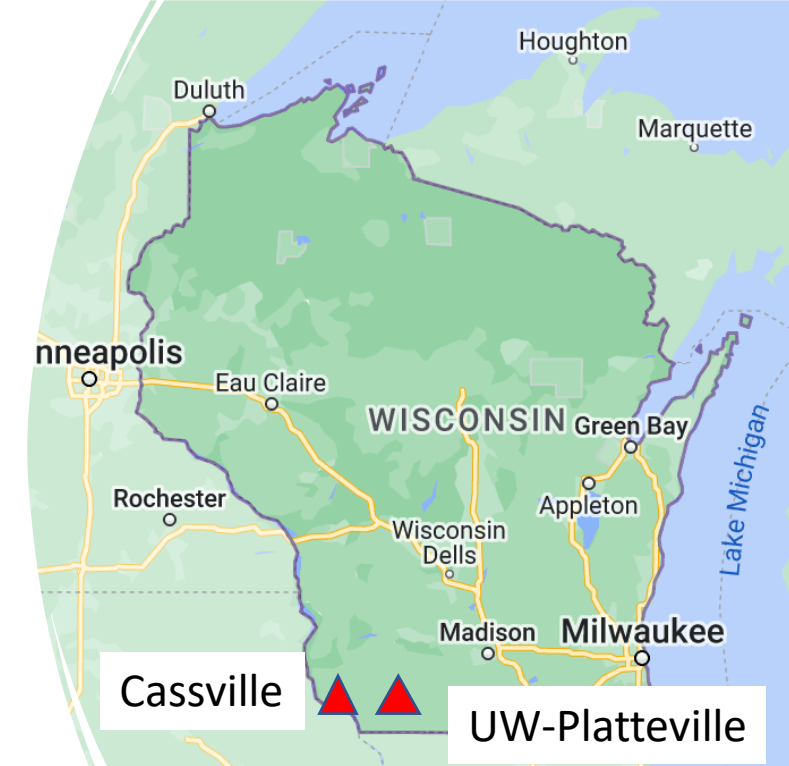
UNIVERSITY OF WISCONSIN
PLATTEVILLE

Course Description:

Open-ended comprehensive design in student's area of specialization. Discussion and experience in project management, work as a team, written reports and presentations, computer aided design and ethics.

Project Location

- Project location: Cassville, WI
- Cassville population: 800
- 40% decline since 1980
- Loss of major industries



Why the Airport?

- Village owned property
- Closest undeveloped land
- Declining number of users
 - University of Dubuque Flight School
 - Few recreational pilots



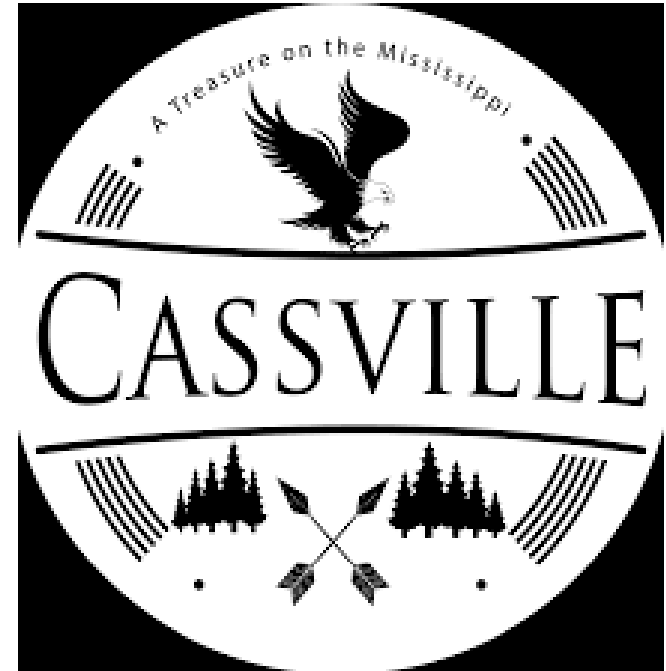
Project Objectives

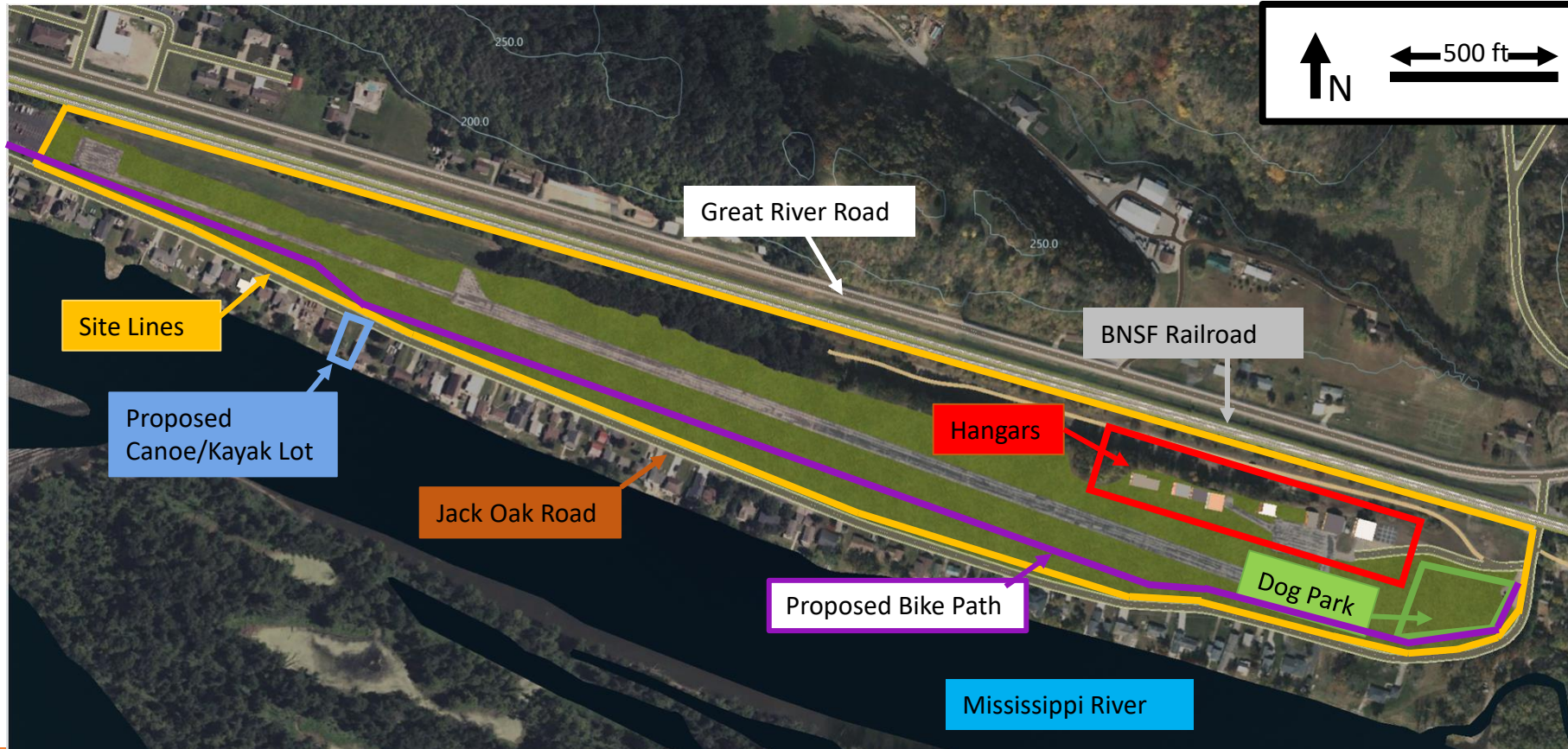
Design:

- Create a neighborhood that will attract new residents
- Bring in a future revenue for the Village and school system

Additional recommendations:

- Increase the public interest in Cassville
- Tailor to younger families
- Provide an affordable and sustainable design
- Analyze Cassville's Return on Investment (ROI)





Current Site

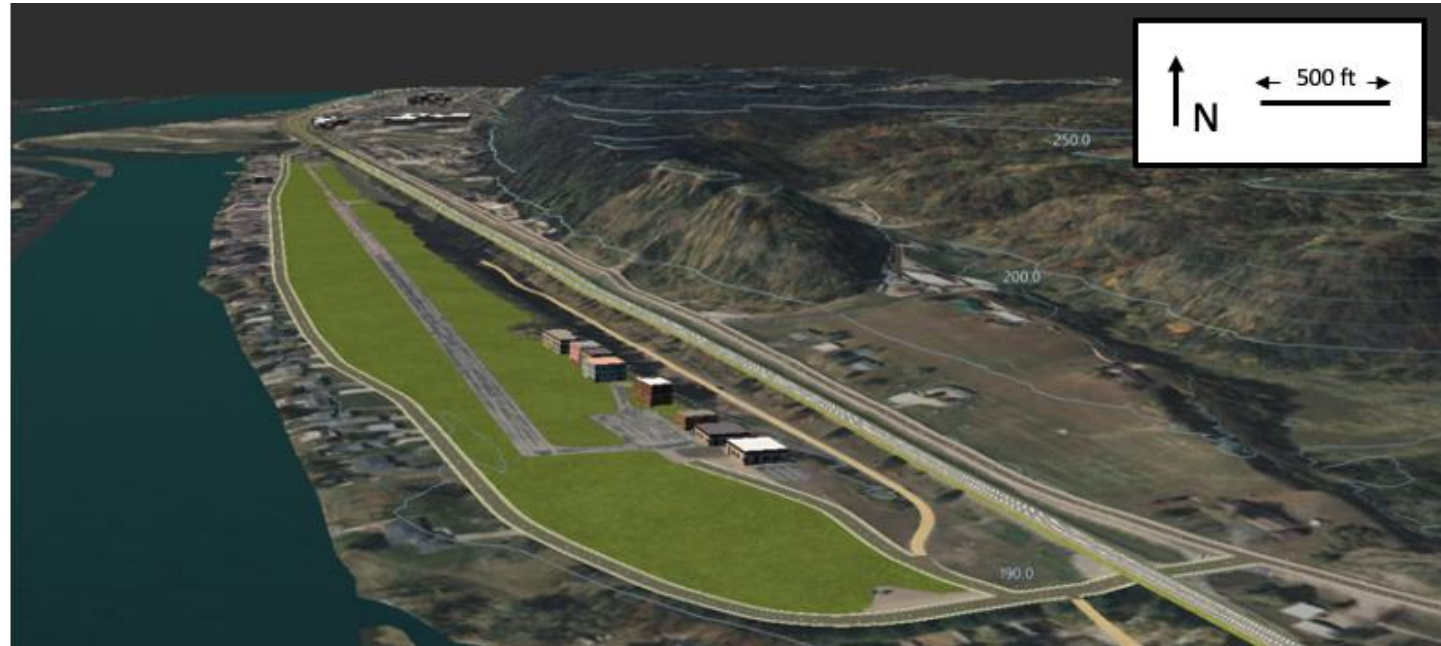
- Runway
- Aircraft Hangars
- Dog park
- Railroad
- Tree Cover
- Lift Station
- Canoe Access Area
- Proposed Walking Path Layout

Design Constraints

- 1. BNSF Railroad**
- 2. Proposed Path Layout**
- 3. Existing Hangars**
- 4. Utility Location**
- 5. Village Ordinances**
- 6. Restrictions for Tax Incremental Finance (TIF) District**

Site Summary

- Soil
 - Silty Loam Soil
 - High Infiltration Rates
- Topography
 - Relatively Flat (1-4% Slope)
 - 500-year Flood Plain



Utility Locations

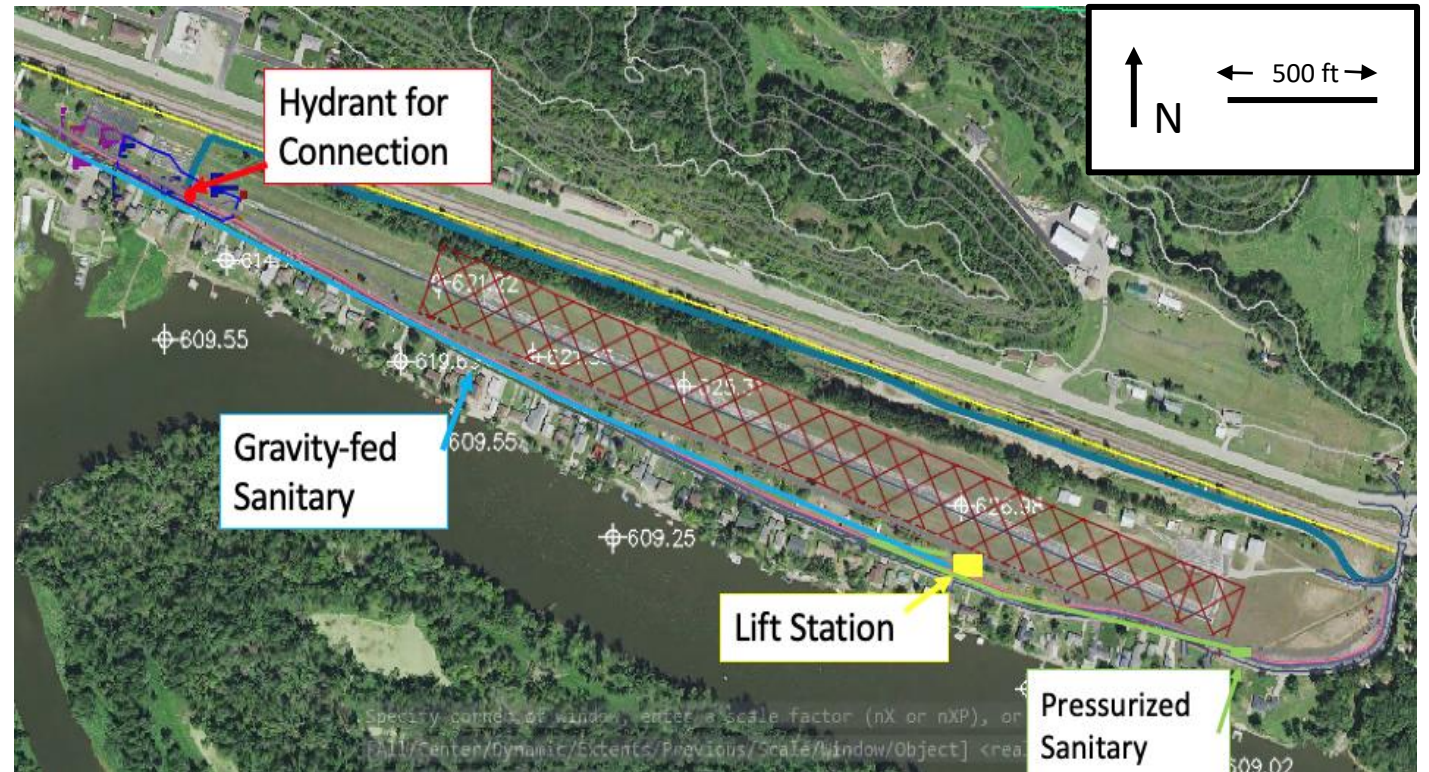
Existing Infrastructure:

Watermain:

- 8" PVC

Sanitary:

- 8" PVC Pressurized
- 8" PVC Gravity-Fed
- Lift Station
 - Designed for Neighborhood Load



Village Ordinances

Ordinance	Constraint
Minimum Street Width	20 ft
Minimum Cul-de-sac Width	50 ft
Minimum Cul-de-sac Radii Street Line	40 ft
Minimum Side Yard	8 ft each side (20 ft total)
Minimum Lot Width	50 ft
Minimum Lot Area	6000 SF

Project Approach

Initial:

- Four alternatives were presented to the Village of Cassville Board
- Each had varying:
 - Number of lots
 - Lot sizes
 - Road layouts
 - Costs to construct

Final:

- One final design proposed
- Site development details
- Cost estimation
- ROI



Initial Alternative Conclusions

- Best Management Practice (BMP)
 - Infiltration Basin
 - Grassed Swale
- Single Road down Middle
- Sporadic Cul-de-sacs
- 1/6-acre to 1/3-acre Lot Sizes
- Park in the Middle of Neighborhood
- Additional Parking for Canoe/Kayak Launch
- Prairie Alternative

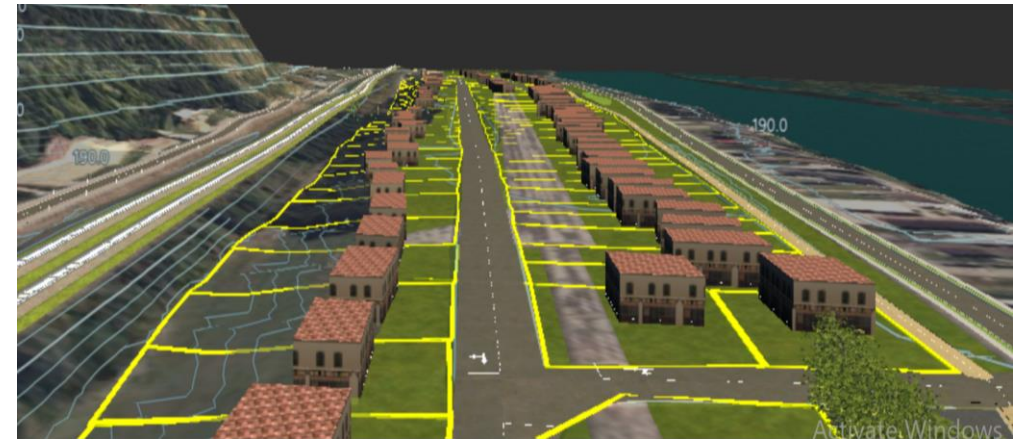


Final Design



Neighborhood Summary

- **Total number of lots – 114**
(104 residential, 10 hangar)
- **Lot size: 1/6 – 1/3-acre**
(1/4-acre average size)
- **Roadway– 6,000 ft; 32 ft wide**
- **Three 50-ft wide cul-de-sacs**



Traffic Calming Methods

- Narrowing Roadway
- Bikeway Medians
- Increased Signage



Sanitary Sewer

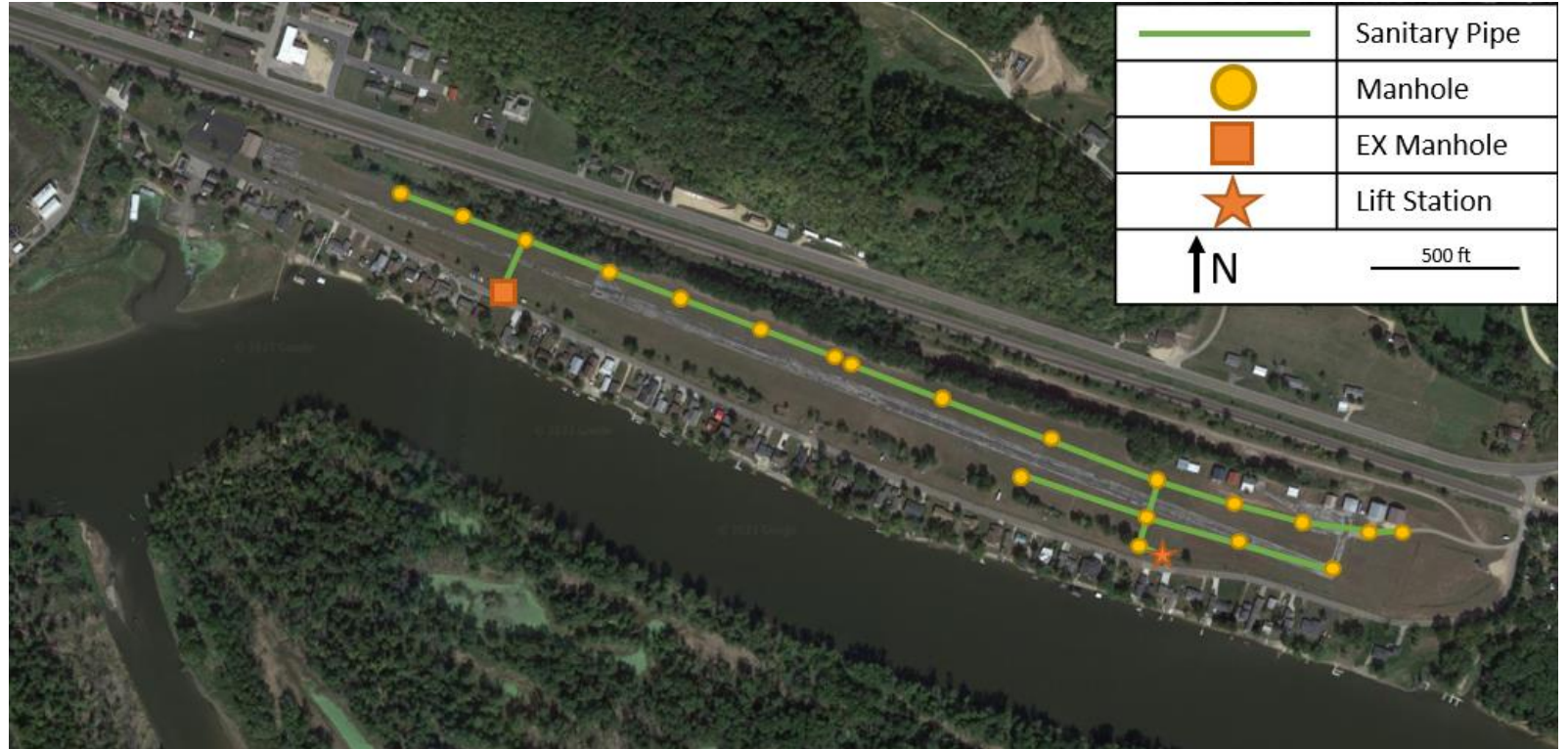
Total Length: 5,900 ft

Manholes: 21 ft

Minimum Depth: 5.5 ft

Maximum Depth: 22.78 ft

Average Slope: 1%



Watermain

Total Length: 10,500 ft

Neighborhood Connections: 110

Jack Oak Connections: ~ 50

Fire Hydrants: 25

Gate Valves: 15

Fittings: 14



Infiltration Basin - Final

Pond sized to 3 acres

- Total suspended solids removal: 99%
- Infiltration: 99%



Prairie Recommendation



Little Bluestem



Purple Prairie-Cover



Hairy Grama



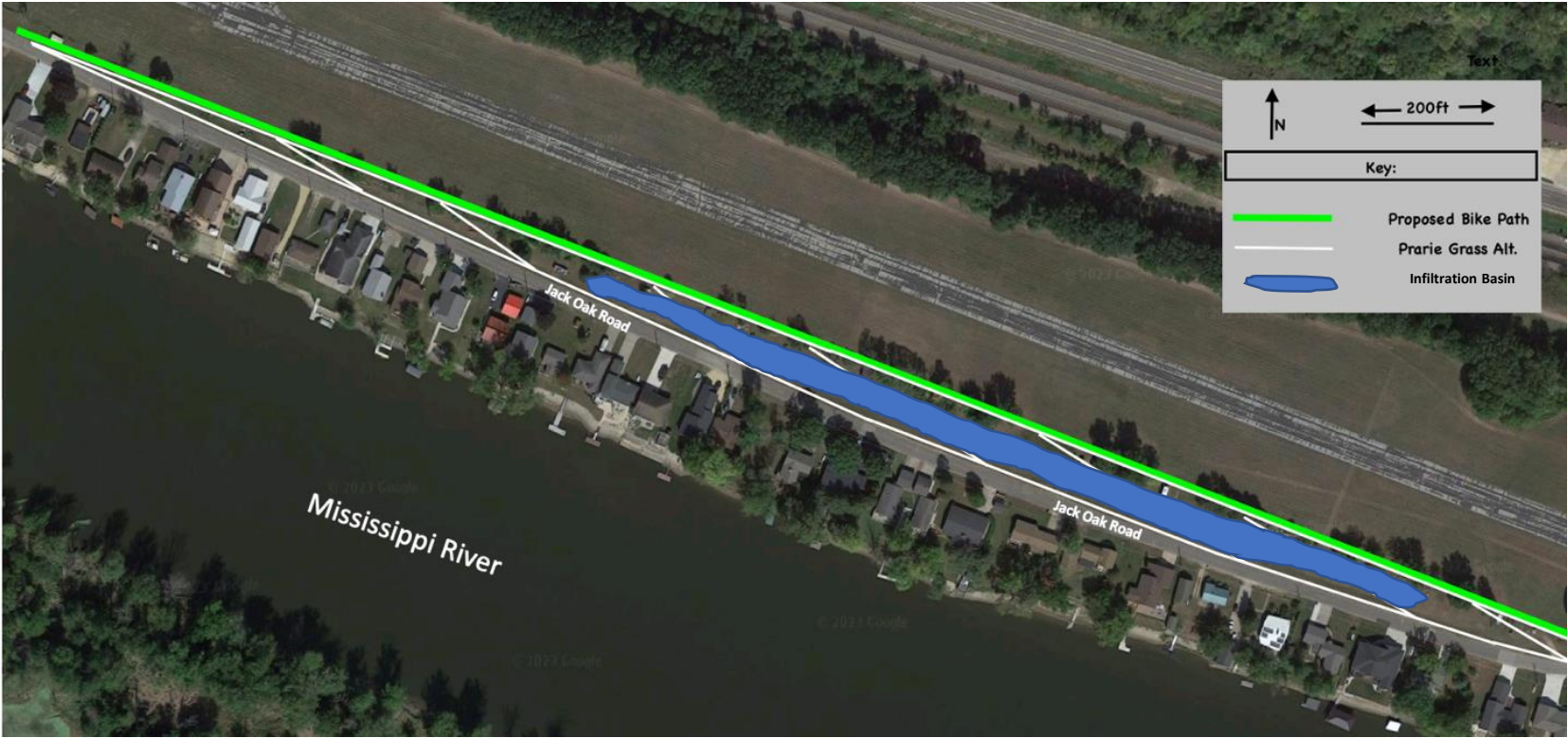
Side-Oats Grama



Gray Goldenrod



Silky Aster



Turtle Habitat Rehabilitation Recommendation



Sound Barrier

- **Sound Reduction**
 - Earth berm 20 decibels
 - Concrete wall 17 decibels
- **Implementation Cost**
 - Earth berm: \$792,000
 - Concrete wall: \$1,480,000
- **Earth Berm Dimensions**
 - 10 feet tall
 - 3:1 slope
 - 64 feet wide



Cost Estimation

- RS-Means and Cassville values
- Indexed to Lancaster area
- Standard union wage

Cost Estimation

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- Standard union wage

Necessary Items			
Item	Cost	Contingency %	Total
Runway Removal	\$238,000	20%	\$285,000
Site Grading	\$264,000	10%	\$290,000
Tree removal	\$118,000	20%	\$142,000
Roadway	\$3,076,000	10%	\$3,384,000
Sewer/Main	\$1,631,000	15%	\$1,875,000
Sum			\$5,976,000

Accessory Items			
Item	Cost	Contingency %	Total
Earth berm	\$689,000	15%	\$792,000
Concrete panel	\$1,346,000	10%	\$1,480,000
Comp. panel	\$1,424,000	10%	\$1,567,000
Building demo	\$120,000	30%	\$156,000
Sum			\$792,000

Cost Estimation

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- Standard union wage

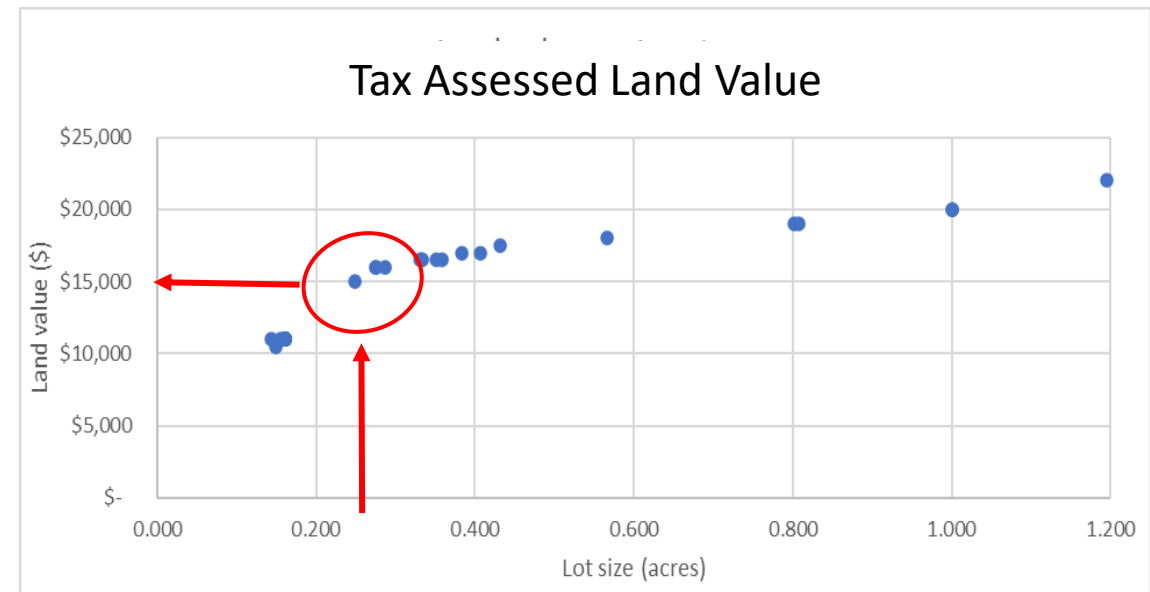
FINAL SUMMARY	
Necessary Items	\$5,976,000
Accessory Items	\$792,000
SUM TOTAL	\$6,768,000

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Sum			\$792,000

Return on Investment (ROI)

- **Period of time to recoup all costs accrued from the site development**
 - Runway removal, site grading, tree removal, roadway, sewer and water main, sound barrier, accessories
- **Cassville revenues include:**
 - Info obtained from Wisconsin Department of Revenue
 - Sale of lots (**\$15,000 per lot**)
 - Village tax revenue (**\$1,540 per lot**)



ROI

To calculate ROI period:

- 5% lots sold per year (6 per year)
- 20% lots sold per year (23 per year)
- To allow building of houses a one-year time buffer was added

Village of Cassville				
5% of lots sold per year			20% of lots sold per year	
year	Cumulative lots sold	Cumulative revenue	Cumulative lots sold	Cumulative revenue
0	0	\$ -	0	\$ -
1	6	\$ 85,500	23	\$ 342,000
2	11	\$ 179,717	46	\$ 718,867
3	17	\$ 282,650	68	\$ 1,130,600
4	23	\$ 394,300	91	\$ 1,577,200
5	29	\$ 514,667	114	\$ 2,058,667
10	57	\$ 1,247,250	114	\$ 2,930,334
15	86	\$ 2,197,750	114	\$ 3,802,000
20	114	\$ 3,366,167	114	\$ 4,673,667

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20	114	\$ 3,366,167	114	\$ 4,673,667
25	114	\$ 4,237,834	114	\$ 5,545,334
30	114	\$ 5,109,501	114	\$ 6,417,001
31	114	\$ 5,283,834	114	\$ 6,591,334
32	114	\$ 5,458,167	114	\$ 6,765,667
35	114	\$ 5,981,167	114	\$ 7,288,668
38	114	\$ 6,504,167	114	\$ 7,811,668
39	114	\$ 6,678,501	114	\$ 7,986,001
40	114	\$ 6,852,834	114	\$ 8,160,334
41	114	\$ 7,027,167	114	\$ 8,334,668

ROI

To calculate ROI period:

- 5% lots sold per year (6 per year)
- 20% lots sold per year (23 per year)
- To allow building of houses a one-year time buffer was added

Summary

- Estimated 5–20 years before all lots are sold
- Estimated 31–39-year ROI period

Village of Cassville				
5% of lots sold per year (~6 per year)			20% of lots sold per year (~23 per year)	
year	Cumulative lots sold	Cumulative revenue	Cumulative lots sold	Cumulative revenue
0	0	\$ -	0	\$ -
1	6	\$ 85,500	23	\$ 342,000
2	11	\$ 179,717	46	\$ 718,867
3	17	\$ 282,650	68	\$ 1,130,600
4	23	\$ 394,300	91	\$ 1,577,200
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39	114	\$ 6,678,501	114	\$ 7,986,001
40	114	\$ 6,852,834	114	\$ 8,160,334
41	114	\$ 7,027,167	114	\$ 8,334,668

What Could Be Done To Reduce The Roi Period?

- No change to design
 - All features kept
- Change design
 - Reduce road width to 24'
 - No sound barrier

No Change to Design

Total cost: \$6.76 million

A 10 Year period is reached if:

- **All lots are sold in 5 years**
- **All lots are sold for \$48,500**

Village of Cassville		
20% of lots sold per year (~23 per year)		
year	Cumulative lots sold	Cumulative revenue
0	0	\$ -
1	23	\$ 1,105,800
2	46	\$ 2,246,467
3	68	\$ 3,422,000
4	91	\$ 4,632,400
5	114	\$ 5,877,667
6	114	\$ 6,052,000
7	114	\$ 6,226,333
8	114	\$ 6,400,667
9	114	\$ 6,575,000
10	114	\$ 6,749,334
11	114	\$ 6,923,667
12	114	\$ 7,098,000
13	114	\$ 7,272,334
14	114	\$ 7,446,667

Decrease road width No sound barrier

Total cost: \$5 million

A 10-Year period is reached if:

- **All lots are sold in 5 years**
- **All lots are sold for \$33,500**

Village of Cassville		
20% of lots sold per year (~23 per year)		
year	Cumulative lots sold	Cumulative revenue
0	0	\$ -
1	23	\$ 763,800
2	46	\$ 1,562,467
3	68	\$ 2,396,000
4	91	\$ 3,264,400
5	114	\$ 4,167,667
6	114	\$ 4,342,000
7	114	\$ 4,516,333
8	114	\$ 4,690,667
9	114	\$ 4,865,000
10	114	\$ 5,039,334
11	114	\$ 5,213,667
12	114	\$ 5,388,000

Estimation Accuracy

improves with further design

Estimate Class	Level of Project Definition	Purpose of Estimate	Expected Accuracy
Class 5	0%-2%	Concept screening	50% to 100%
Class 4	1%-5%	Study and feasibility	-30% to +50%
Class 3	10%-50%	Budget, authorization, or control	-20% to +30%
Class 2	30%-70%	Control or bid/tender	-15% to +20%
Class 1	50%-100%	Check estimate or bid/tender	-10% to 15%

Association for the Advancement of Cost Engineering (AACE) International cost estimation classifications

Utilize TIF District on 1/3 of Total Lots

- Taxes
 - County Mill Rate
 - Village Mill Rate
 - Tech College
 - School District
- Lot sale => \$15,000 for 114 lots
 - 37 houses in TIF district
 - 77 houses outside of TIF district
- **Pay-off period drops to ~19 years**



Cassville School District Revenue

- About \$ 230,000 after 5 years
- About \$1 million after 10 years
- About \$2.5 million after 20 years

Cassville School District		
	5% of lots sold per year (~6 per year)	20% of lots sold per year (~23 per year)
year	cumulative	cumulative
0	\$ -	\$ -
1	\$ -	\$ -
2	\$9,500	\$38,001
3	\$28,501	\$114,002
4	\$57,001	\$228,005
5	\$95,002	\$380,008
6	\$142,503	\$570,011
7	\$199,504	\$760,015
8	\$266,005	\$950,019
9	\$342,007	\$1,140,023
10	\$427,509	\$1,330,027
11	\$522,510	\$1,520,030
12	\$627,013	\$1,710,034
13	\$741,015	\$1,900,038
14	\$864,517	\$2,090,042
15	\$997,520	\$2,280,046
16	\$1,140,023	\$2,470,049
17	\$1,292,026	\$2,660,053
18	\$1,453,529	\$2,850,057
19	\$1,624,532	\$3,040,061
20	\$1,805,036	\$3,230,065

Conclusion

- Final Design

- 114 total lots
- 104 residential lots
- 1-acre park
- 10 ft tall earth berm
- 32-foot-wide road
 - 5-ft walking/biking path
 - 8-ft on-street parking lane
 - Length: 6,000 ft
- Sanitary Sewer
 - Length: 5,900 ft
- Watermain
 - Length: 10,500 ft
- 3-acre Infiltration Basin



Total cost: \$6.76 million
ROI period: 31-39 years

Recommendations

Location Confirmations

- Location of bedrock and water table
- Soil testing
- Verify location of path after construction

Closing

Feedback

Final Presentation Feedback



Thank you for coming today!

Are there any questions?

USDA Web Soil Survey



Results:

- Majority of Site: Loamy Fine Sand
- High Infiltration Rate
- Low Runoff Potential
- Low Susceptibility of Frost Action/Frost Heave

Map unit symbol	Map Unit Name	Rating	Acres of AOI	Percent of Area
511F	Plainfield sand, river valley, 15-60 percent slopes	A	16.1	29.3 %
DaA	Dakota fine sandy loam, 0-2 percent slopes	A	0.3	0.5 %
Or	Orion silt loam, 0-3% slopes, occasionally flooded	B/D	0.1	0.2 %
SsA	Sparta Loamy fine sand, 0-3 percent slopes	A	26.9	48.8 %
SsB	Sparta loamy fine sand, 2-6 percent slopes	A	11.7	21.2 %
		SUM	55.1	100.00%

Stormwater Management

- SCS Method

Pre-Construction			
SCS Method			
Land Use	CN Value	Area (acres)	% AOI
Grassland	39	49.2	100%

Post-Construction			
SCS Method			
Land Use	CN Value	Areas (acres)	% AOI
Residential (1/3 acre)	57	22	45%
Residential (1/4 acre)	61	15.3	31%
Bike Path	98	1.15	2%
Prairie	39	4.8	10%

- Using HydroCAD
 - Pre-Construction Runoff Volume
 - No Runoff
 - Post Construction Runoff Volume
 - 0.96 ac-ft
 - ~ 0.55-acre basin with a 2 ft depth

ROI Information from Spreadsheet

Assessed Value (Typ) \$ 200,000.00

	Mill Rate	Taxes
County Mill Rate	\$ 3.4217	\$ 684.34
Village Mill Rate	\$ 7.6962	\$ 1,539.24
Tech College	\$ 1.0438	\$ 208.76
School District	\$ 8.3335	\$ 1,666.70
	\$ 20.50	\$ 4,099.05

	Homes	Taxes	Payoff (Years)	Revenue from land sale
Village value	114	\$ 175,473.14	28.84	\$1,710,000
If TIF is used for 1/3 of the lots	37	\$ 151,664.76		
Non-TIF ROI	77	\$ 118,521.33		
Total ROI if TIF is used on 1/3 lots	114	\$ 270,186.10	18.73	
School Taxes once all lots are built	114	\$ 190,004.34		