THE UNIVERSITY OF IOWA
College of Engineering

INNOVATIVE INFRASTRUCTURE

CITY OF BELLEVUE, IA
EXPANSION PROJECT

DECEMBER 9TH, 2019

MEET THE LAND DEVELOPMENT TEAM

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Technology Support

PRESENTATION OUTLINE

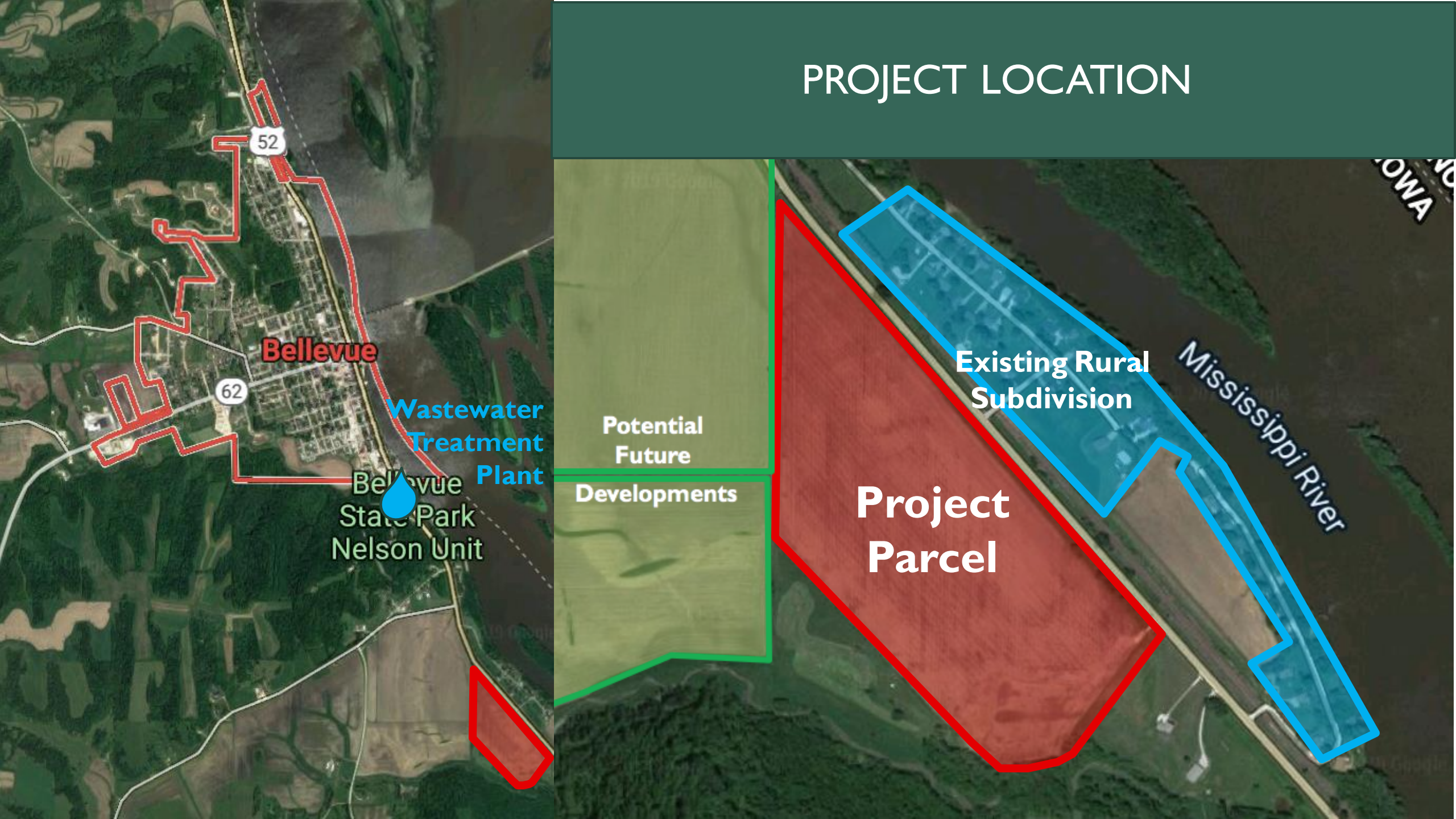
Project Details
- Background
- Scope

Land Development
- Design Alternatives & Final Design
- Offsite Improvements
- Cost Estimate

Stormwater Management
- Existing Drainage
- Design Alternatives & Final Design
- Additional Recommendations
- Cost Estimate

Total Cost and Housing Layout

PROJECT LOCATION




SOUTH
52

PROJECT SCOPE

- Develop Multiple Site Plans
- Complete Design of Selected Alternative – Land Development
- Existing and Future Onsite Utilities
- Offsite Utilities Design
- Develop Drainage Alternatives
- Complete Design of Selected Alternative – Stormwater Management
- Generate Grading Plan via Base Map
- Sizing of Inlet and Outlet Structures
- Vegetation and Monitoring Plan
- Operations and Maintenance Plan

INNOVATIVE INFRASTRUCTURE

LAND DEVELOPMENT BELLEVUE, IOWA

KEYA XU
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LAND DEVELOPMENT

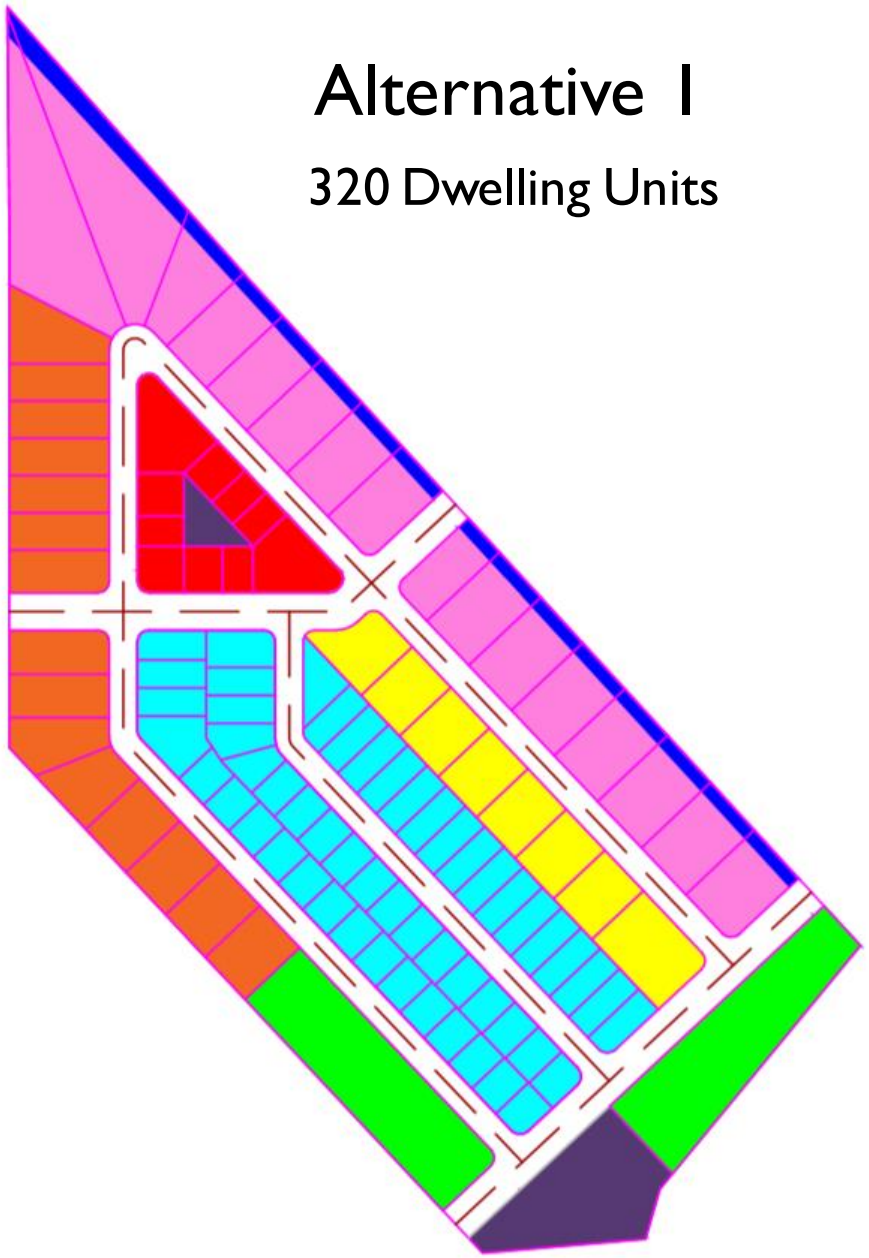
DESIGN ALTERNATIVES & FINAL DESIGN

OFFSITE IMPROVEMENTS

COST ESTIMATE

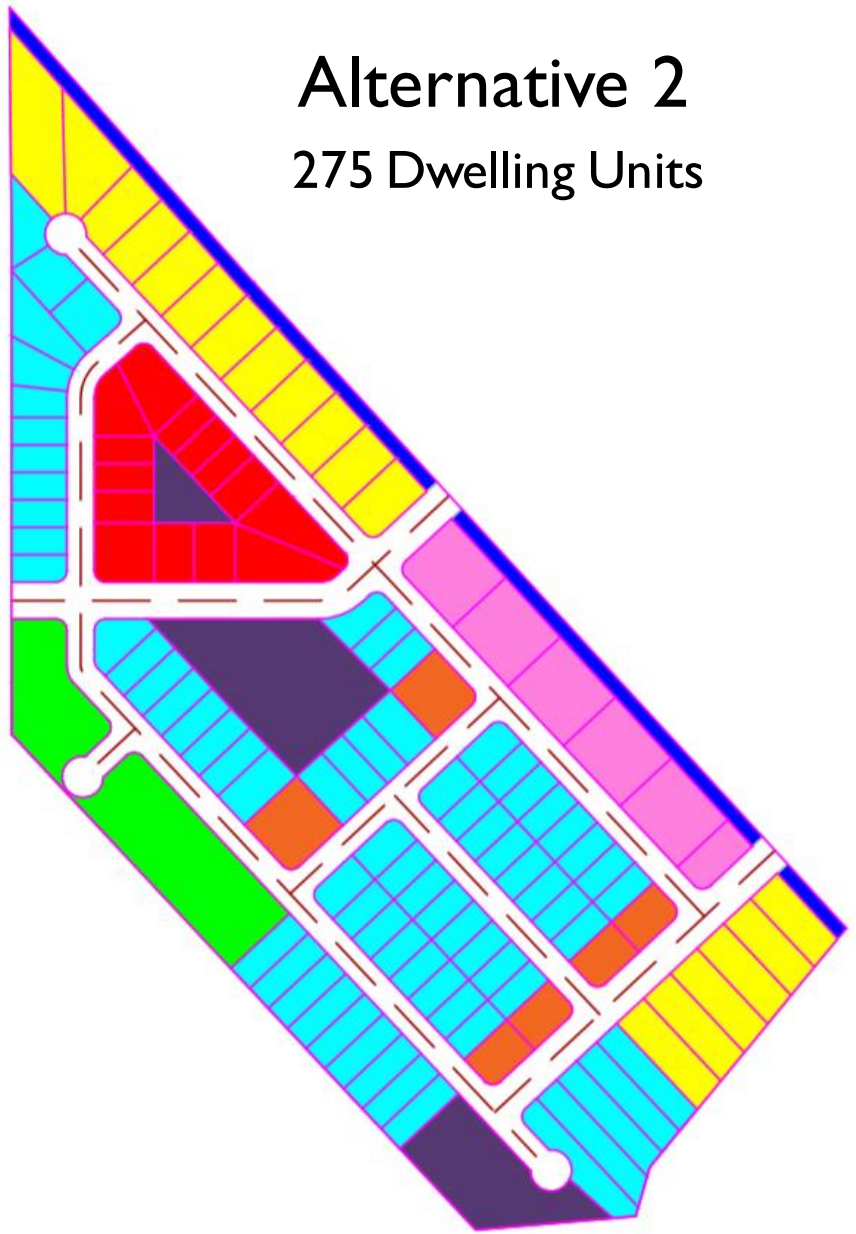
Alternative 1

320 Dwelling Units

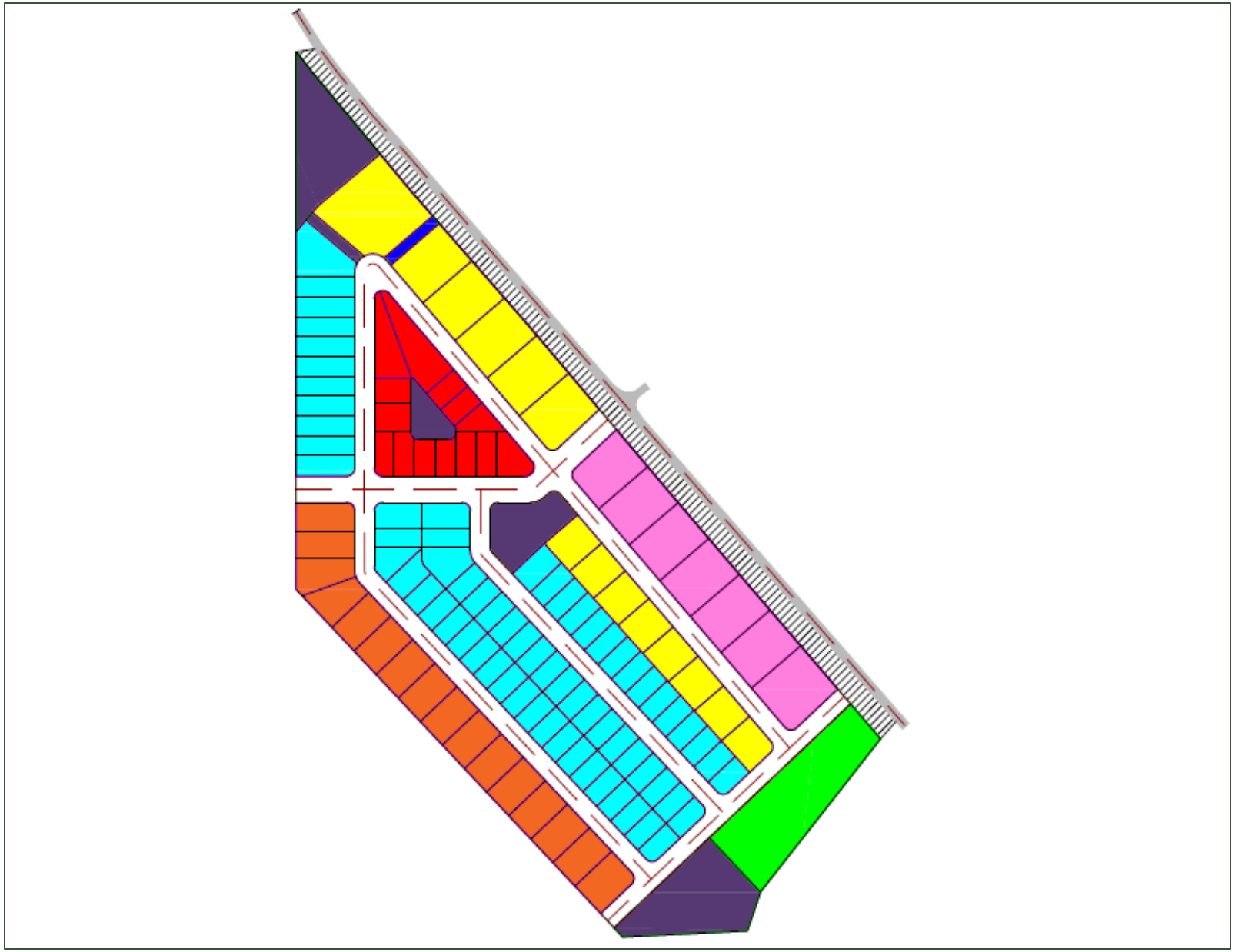


Alternative 2

275 Dwelling Units



- SINGLE FAMILY HOUSING LOTS
- APARTMENT AND POSSIBLE COMMERCIAL LOTS
- TOWNHOUSE LOTS
- RETIREMENT HOUSING LOTS
- FUTURE RESIDENTIAL SIZED FOR MARKET DEMAND
- LARGE LOT SINGLE FAMILY
- PARK/OPEN SPACE/POSSIBLE DRAINAGE LOCATIONS
- BUFFER STRIP
- ROADWAY
- PARCEL BOUNDRY



FINAL DESIGN

- 250 Dwelling Units
- 51 Total Acres
- 7 Acres Open Space
- 10 Acres Road Right-of-Way
- 34 Acres Developed Land

SINGLE FAMILY HOUSING LOTS

APARTMENT AND POSSIBLE COMMERCIAL LOTS

TOWNHOUSE LOTS

UNIVERSAL DESIGN LOTS

FUTURE RESIDENTIAL SIZED FOR MARKET DEMAND

LARGE LOT SINGLE FAMILY

PARK/OPEN SPACE/POSSIBLE DRAINAGE LOCATIONS

TRAIL EASEMENT

BUFFER STRIP

ROADWAY RIGHT-OF-WAY

PARCEL BOUNDRY

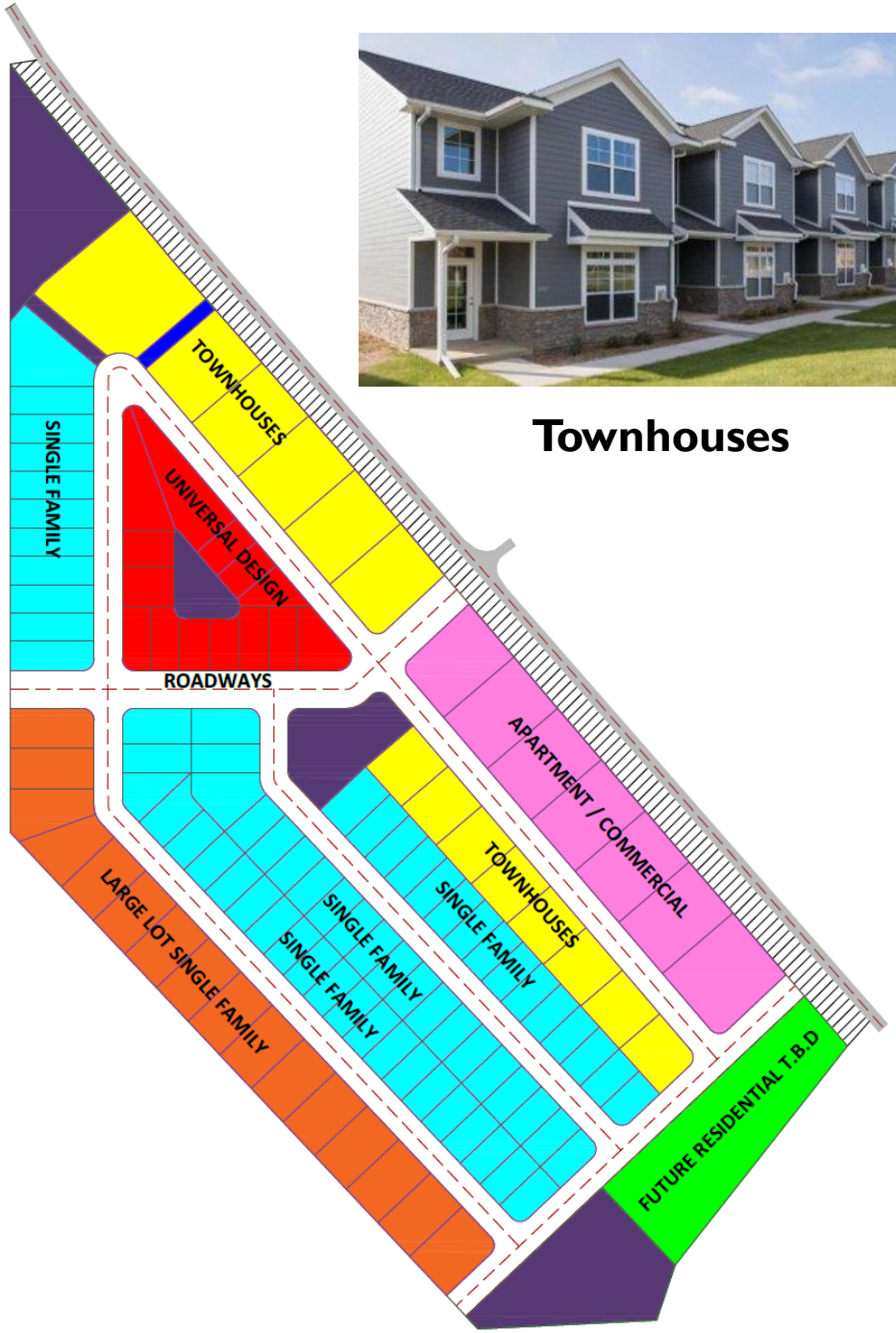
Final Design

250 Dwelling Units

Single Family – 60' Lots

Independent Senior Living

Large Lot Single Family

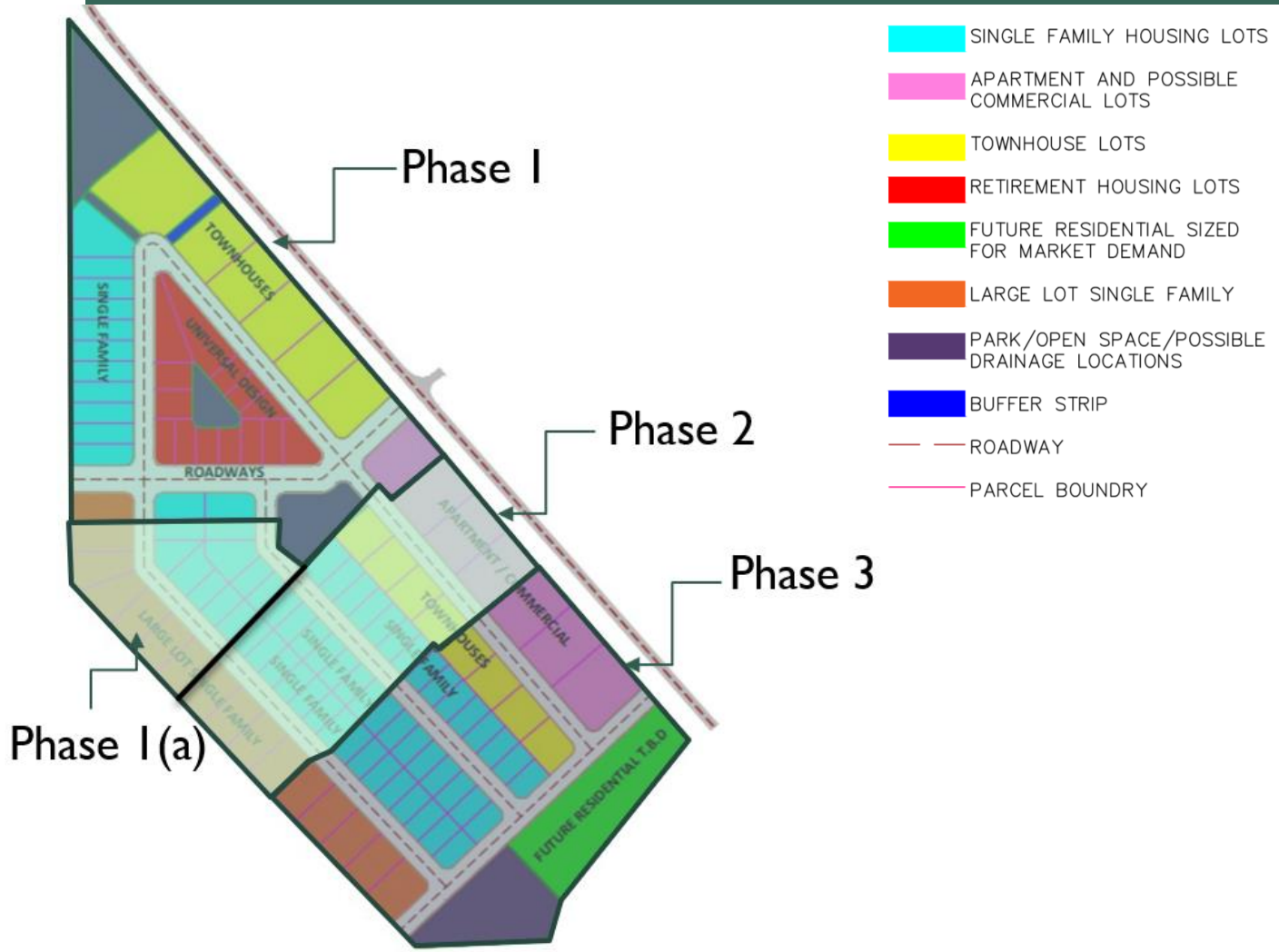


Townhouses

Parks & Open Spaces

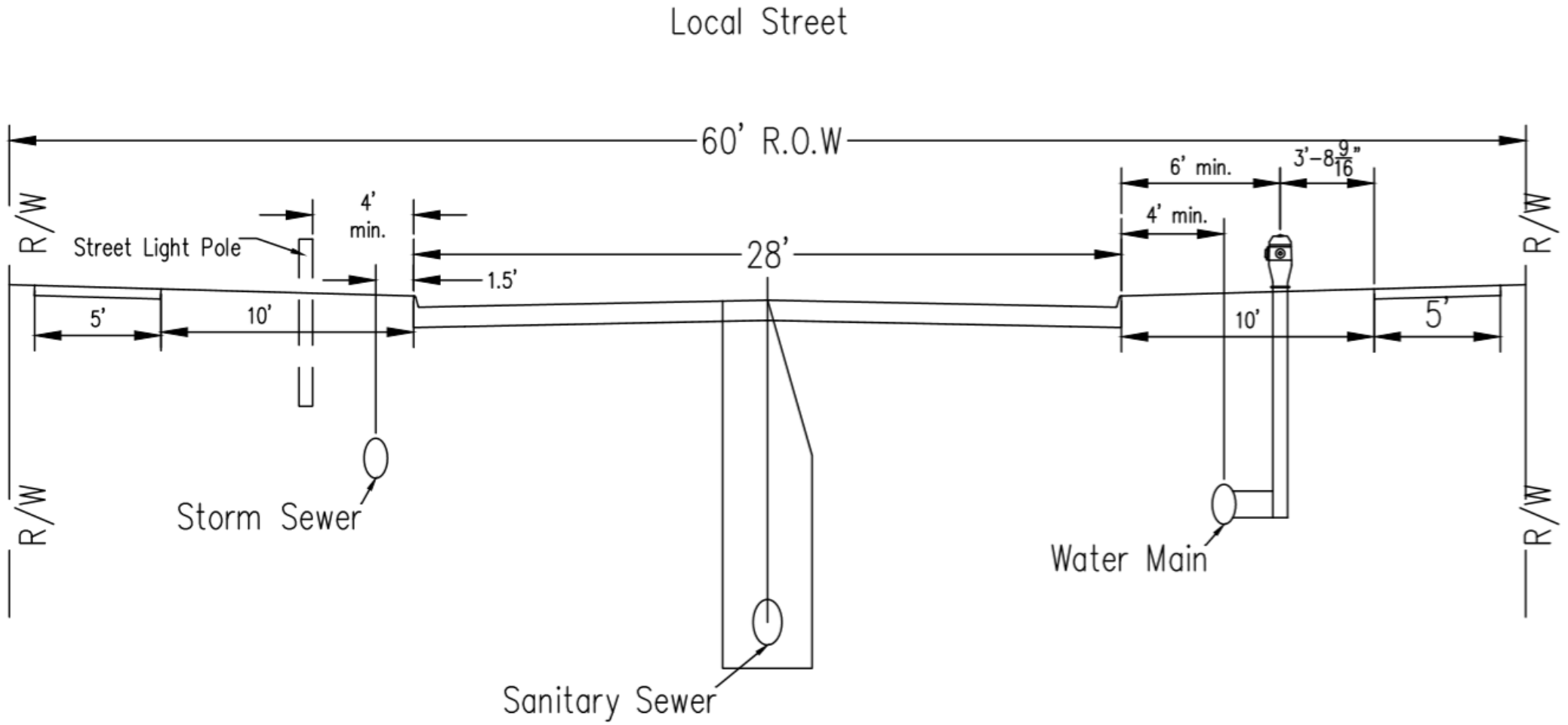
Apartments & Commercial

PHASING



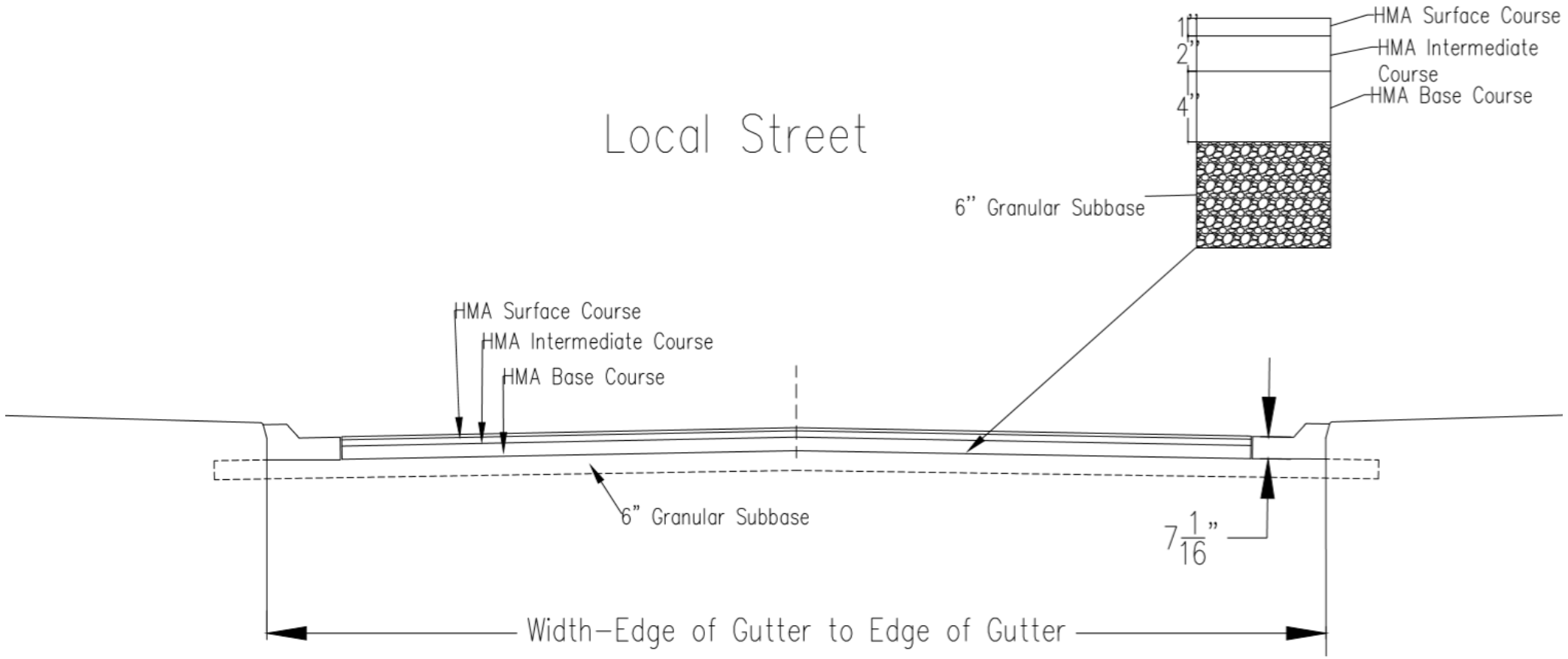
Phases				
Number of Dwelling Units				
Type of Housing	Phase 1	Phase 1 (a)	Phase 2	Phase 3
Apartment Lots	12	--	36	36
Large Lot Single Family	1	6	10	5
Single Family	13	10	21	24
Townhouse	36	--	24	24
Retirement Housing	14	--	0	0
Total Dwelling Units	76	16	91	89

STREET CROSS SECTION: LOCAL STREET



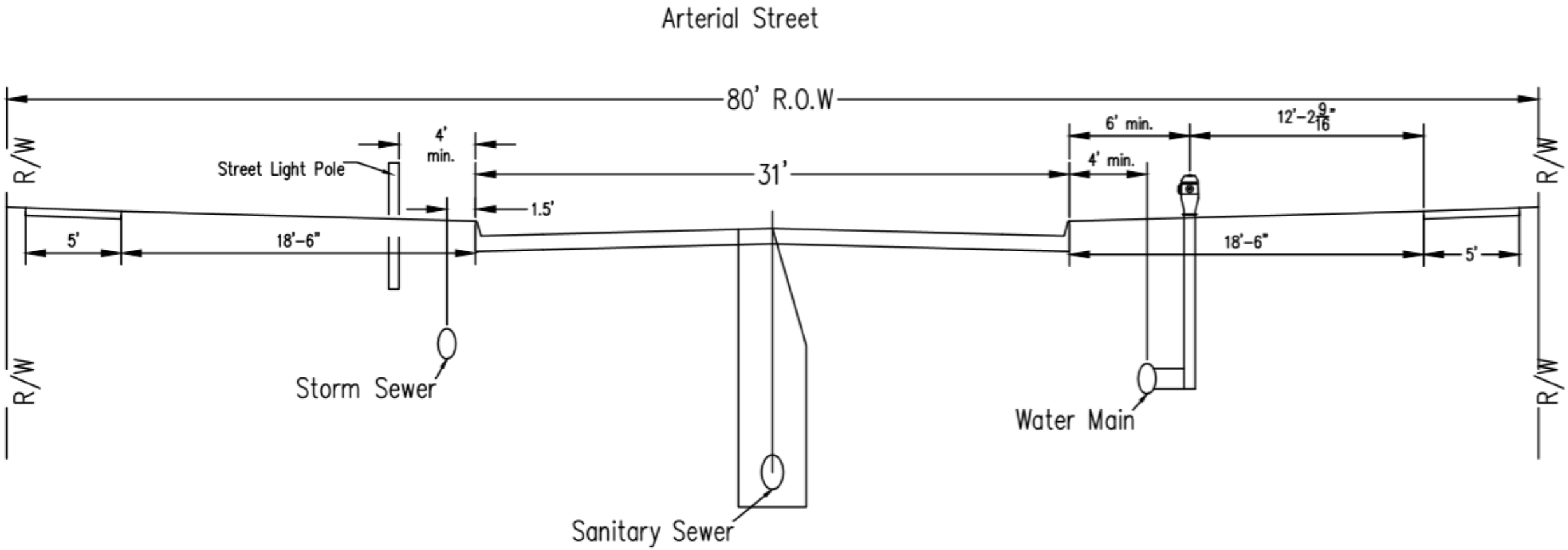
From Iowa SUDAS Chapter 9 Figure 9A–1.01: Typical Urban Utility Locations

HMA PAVEMENT SECTION: LOCAL STREET



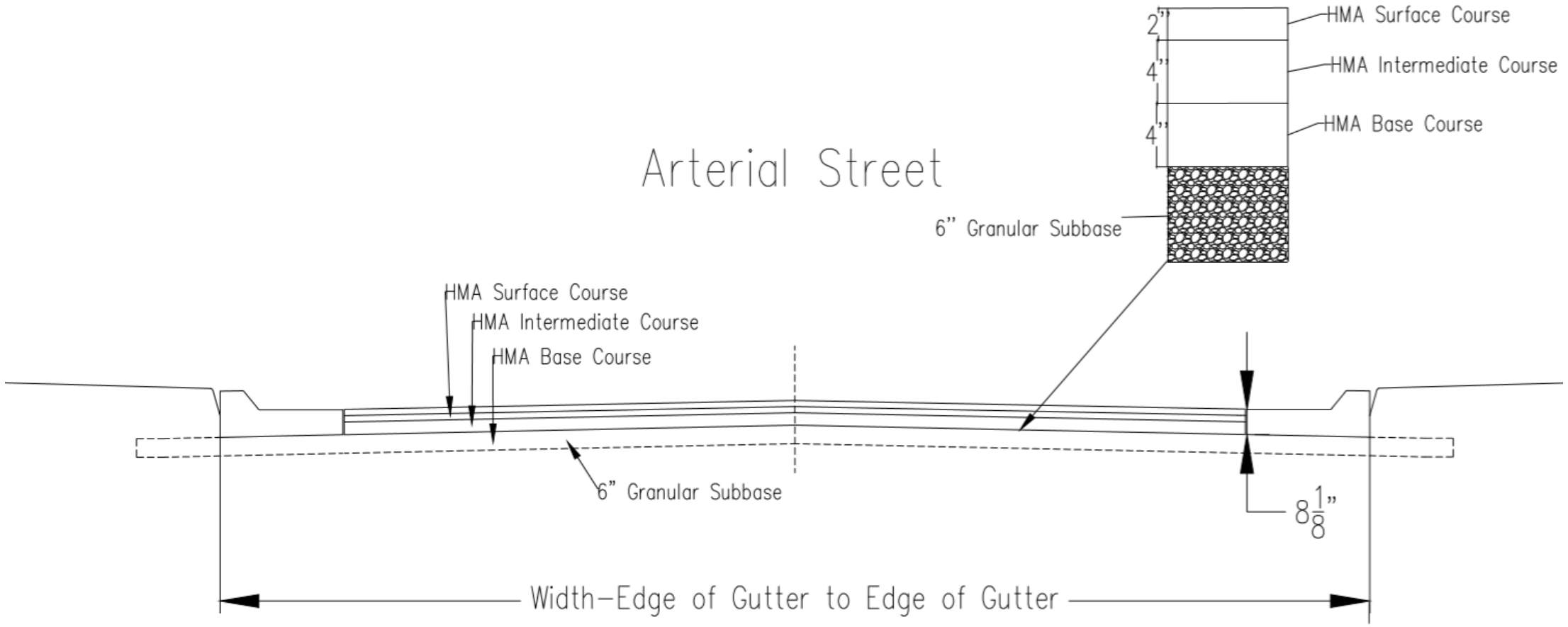
HMA PAVEMENT SECTION

STREET CROSS SECTION: ARTERIAL STREET



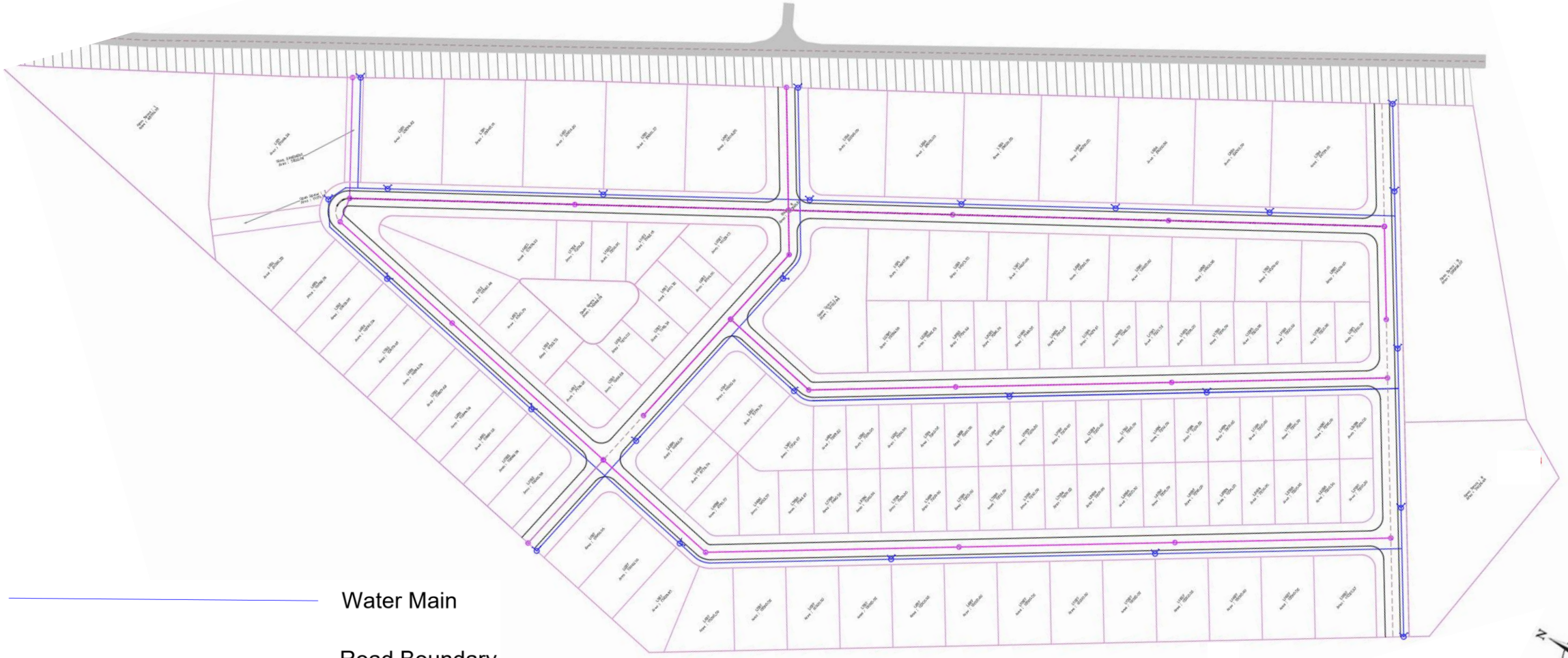
From Iowa SUDAS Chapter 9 Figure 9A-1.01: Typical Urban Utility Locations

HMA PAVEMENT SECTION: ARTERIAL STREET



HMA PAVEMENT SECTION

WATER MAIN AND SANITARY SEWER LAYOUT

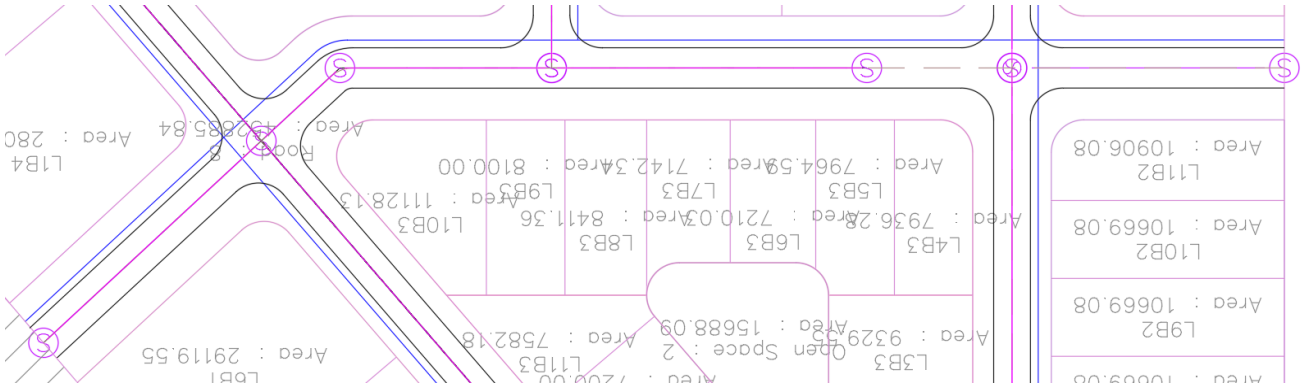


Water Main

Road Boundary

Sanitary Sewer

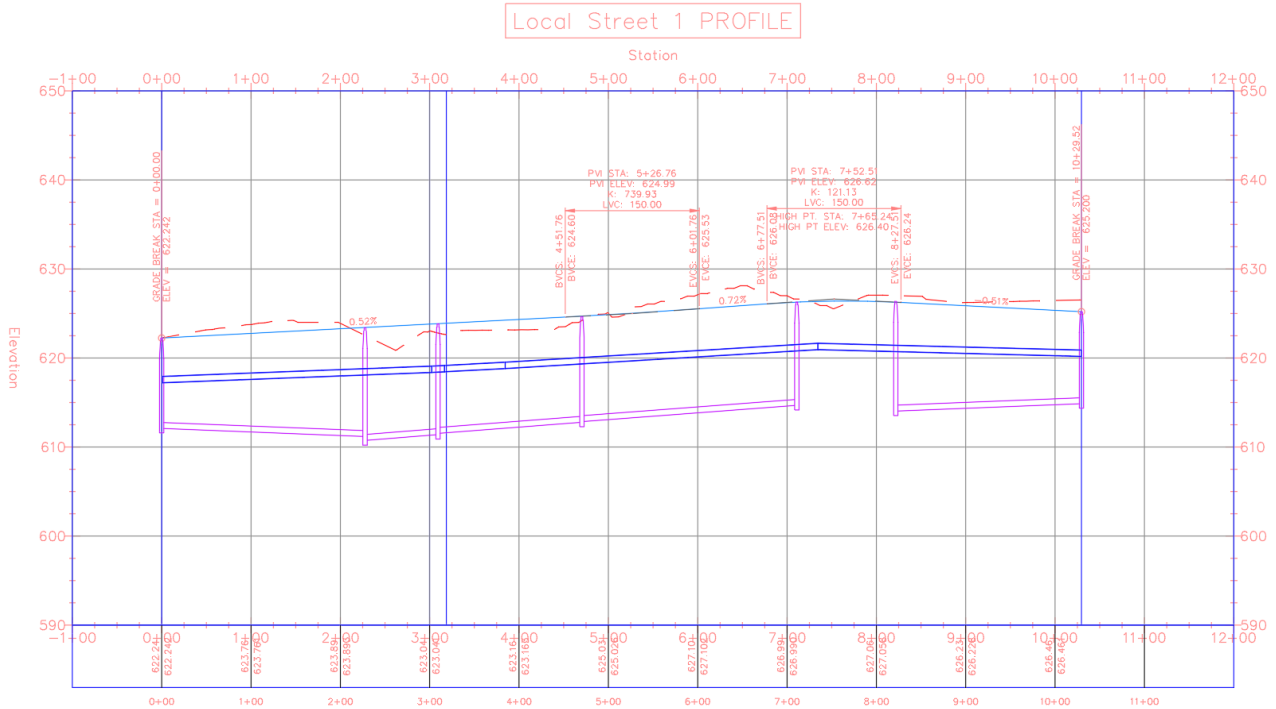
ROAD, WATER MAIN AND SANITARY SEWER PROFILE VIEW



Water Main

Road Boundary

Sanitary Sewer

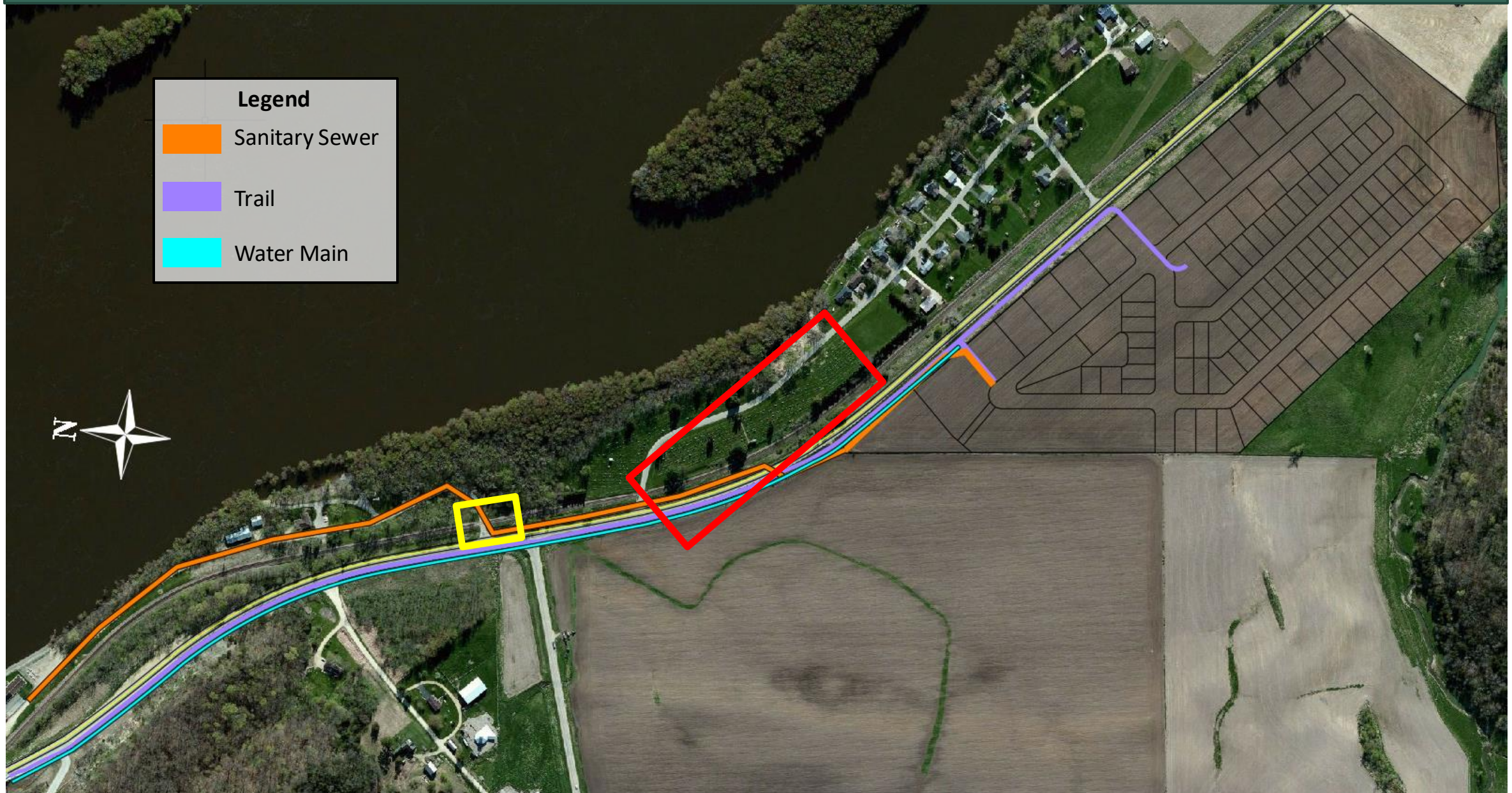


LAND DEVELOPMENT

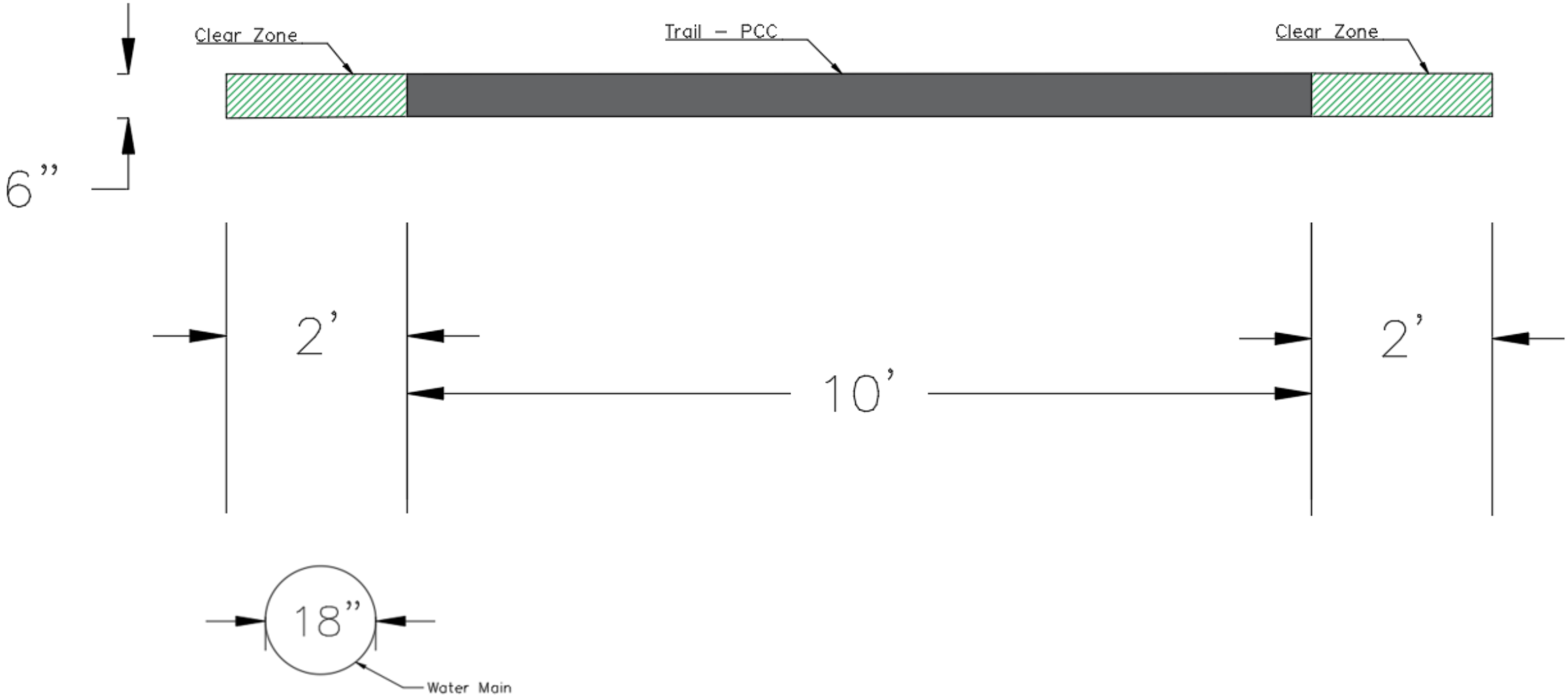
DESIGN ALTERNATIVES &
FINAL DESIGN
OFFSITE IMPROVEMENTS
COST ESTIMATE


52
Bellevue
62
Wastewater
Treatment
Plant
Bellevue
State Park
Nelson Unit

OFFSITE IMPROVEMENTS



OFFSITE IMPROVEMENTS PROFILE



LAND DEVELOPMENT

DESIGN ALTERNATIVES &
FINAL DESIGN
OFFSITE IMPROVEMENTS
COST ESTIMATE

System	Item	Quantity	Unit	Unit Price	Total
Site Grading	Rough Site Grading	80800	C.Y.	$4.20	$339,360
	Grade Subbase - Roadways	21840	S.Y.	$0.55	$12,012
	Grade Subbase - Sidewalks	3900	S.Y.	$1.55	$6,045
	Erosion Control	1	LSUM	$6,000	$6,000
	Seeding	6534	LBS	$6.00	$39,204
	Buffer Strip - Tree Seedlings	~45	Ea.	$0	$0
Land Development	Local Road - 7" HMA	7545	US Ton	$68.50	$516,833
	Arterial Road - 10" HMA	3875	US Ton	$65.50	$253,813
	Curb & Gutter	7445	L.F.	$17	$126,565
Onsite Utilities	Water Main - PVC 8"	7500	L.F.	$18.35	$137,625
	Sanitary Sewer - PVC 8"	6500	L.F.	$48	$312,000
	Manholes	24	Ea.	$2,525	$60,600
	Fire Hydrants	20	Ea.	$967	$19,340
	Valves	27	Ea.	$2,500	$67,500
Offsite Material Estimation	Water Main - 18" Ductile Iron	4300	L.F.	$95	$408,500
	Fire Hydrants	10	Ea.	$967	$9,240
	Valves	5	Ea.	$1,050	$5,644
	Sanitary Sewer - 18" RCP	3715	L.F.	$88	$326,920
	Sanitary Sewer - Bored & Jacked	$100	L.F.	$650	$65,000
	Manholes	10	Ea.	$2,525	$25,250
	Trail - 6" PCC	57570	S.F.	$6.10	$351,177
	Access Road - 6" Chip Seal Gravel	3900	S.Y.	$0.80	$3,120
	Access Road - 8" Gravel Base	1210	US Ton	$17	$20,576
				Total	**$3,112,323**

LAND DEVELOPMENT COST ESTIMATE

Land Development Portion	$3,112,000
Contingency (25%)	$778,000
Engineering & Administration (15%)	$467,000
Total Land Development Project Cost	**$4,357,000**

INNOVATIVE INFRASTRUCTURE

STORMWATER MANAGEMENT
BELLEVUE, IA

STORMWATER MANAGEMENT

EXISTING DRAINAGE

DESIGN ALTERNATIVE &
FINAL DESIGN

ADDITIONAL RECOMMENDATIONS

COST ESTIMATE

STORMWATER MANAGEMENT

EXISTING LAYOUT

DESIGN ALTERNATIVE & FINAL DESIGN

ADDITIONAL RECOMMENDATIONS

COST ESTIMATE

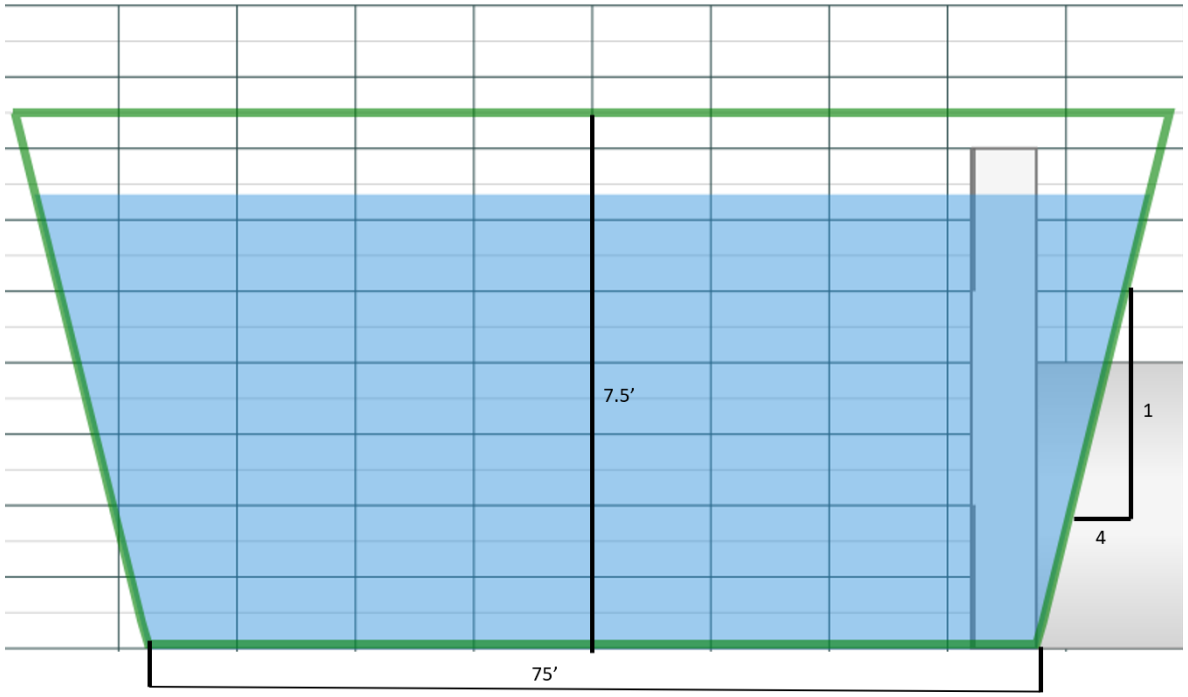
Final Stormwater Strategies

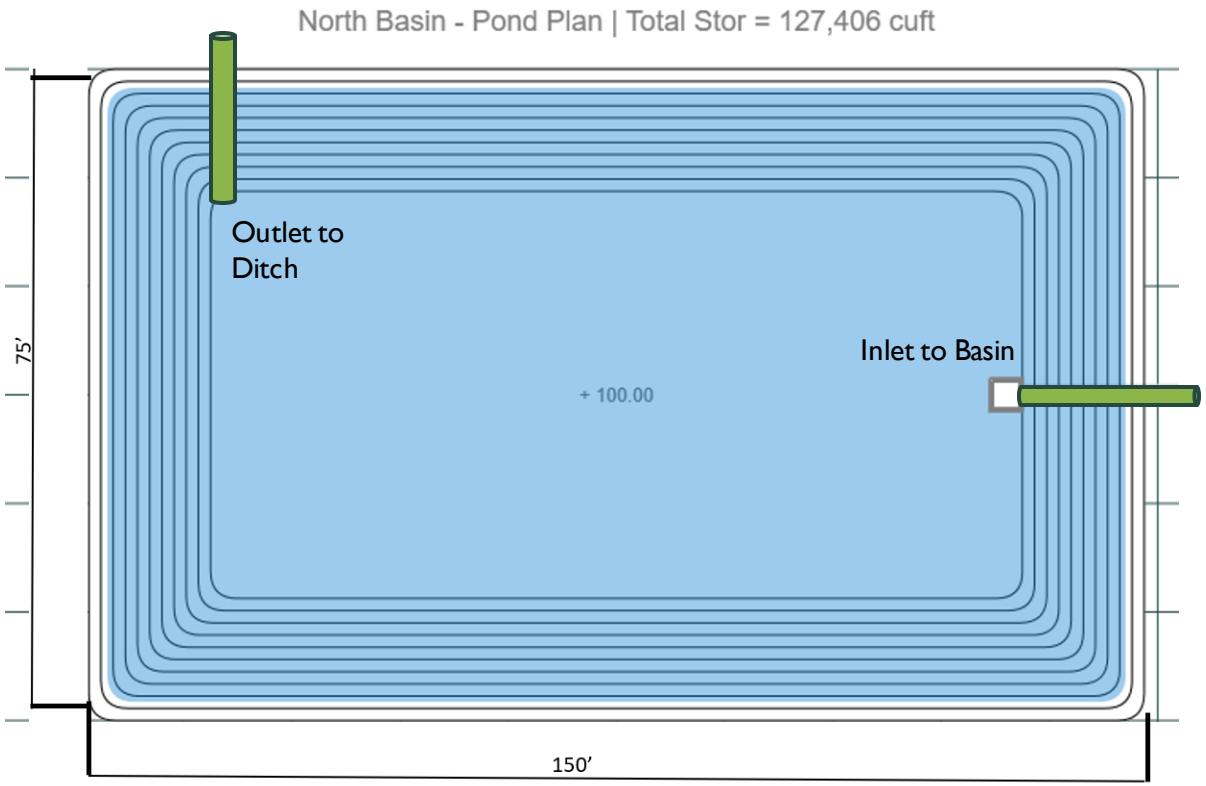
GRADING PLAN

2D AREA (sq. ft.)	CUT (cu. yd.)	FILL (cu. yd.)
2,243,596	80,779	79,081

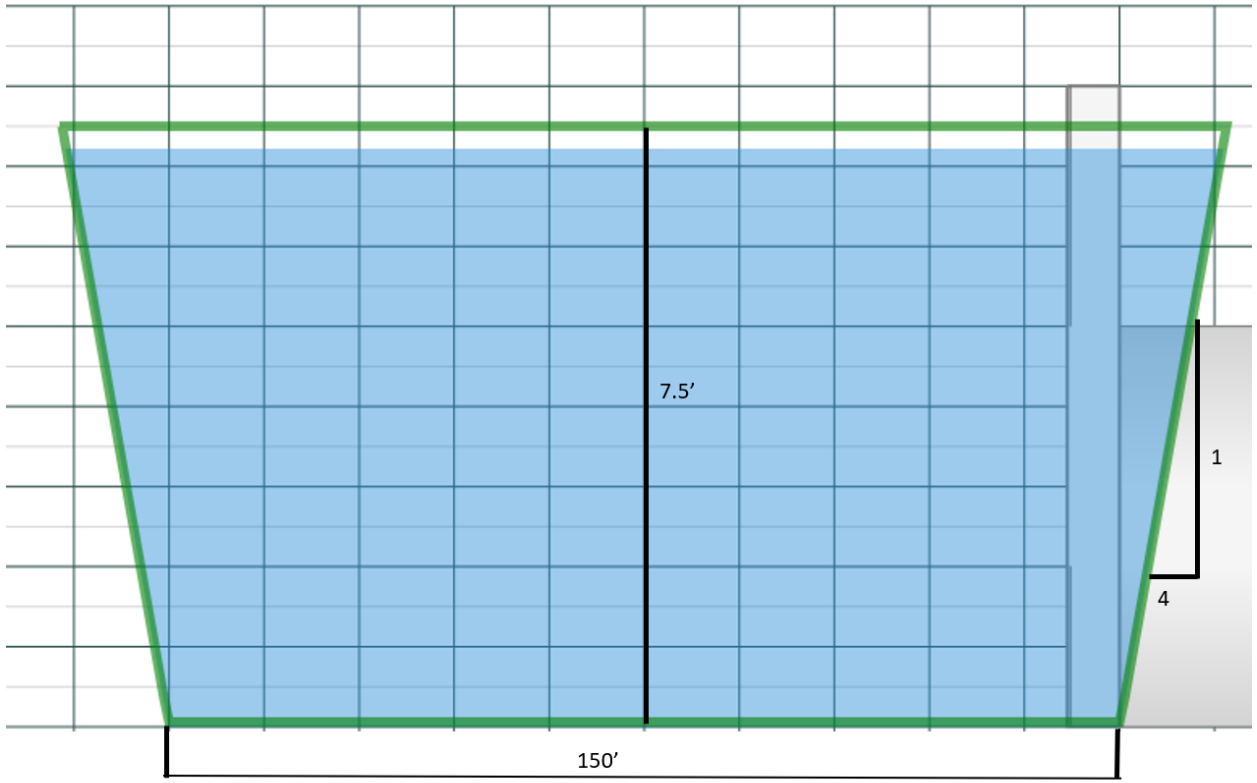

DETENTION
BASIN
150' X 75'
7+00
8+00
DETENTION BASIN
200' X 150'
N

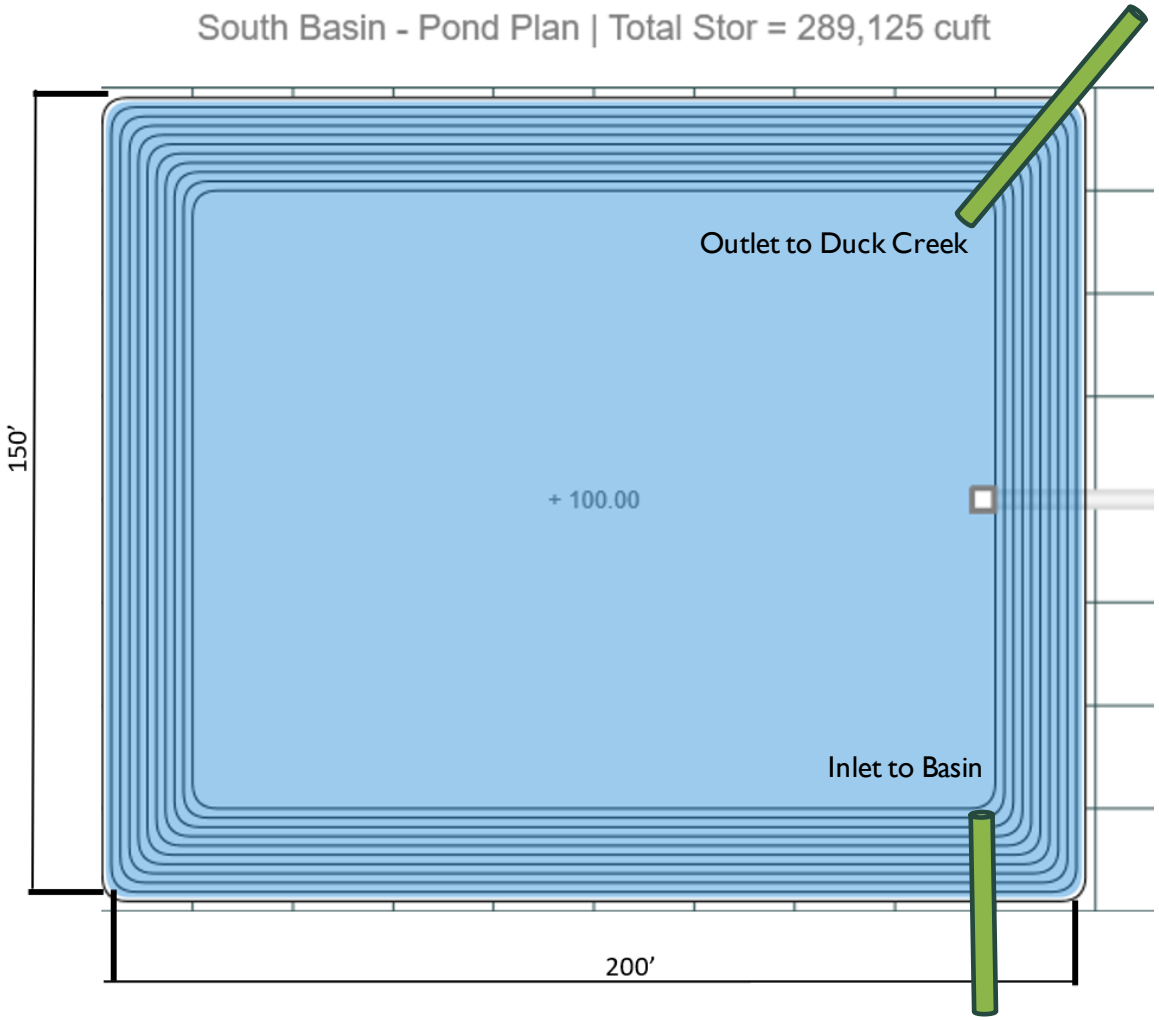
NORTH DETENTION BASIN



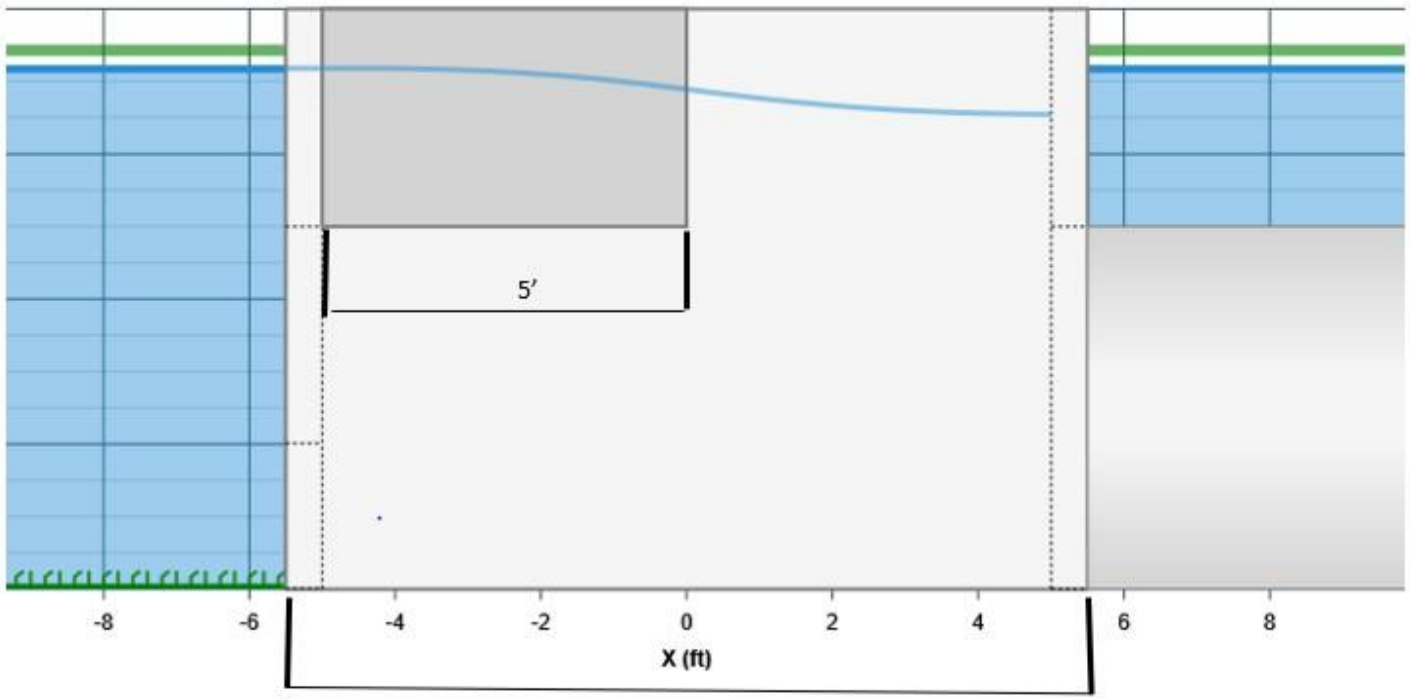


SOUTH DETENTION BASIN

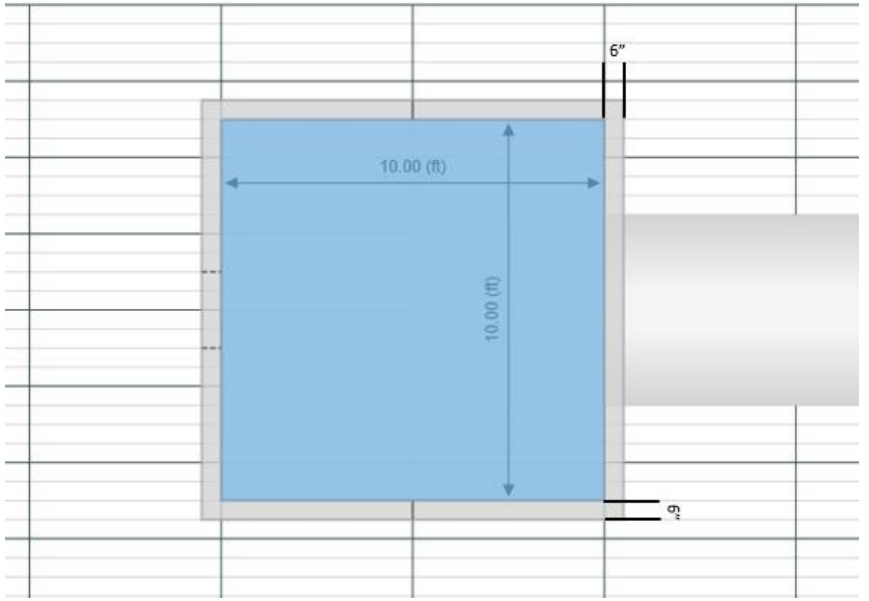




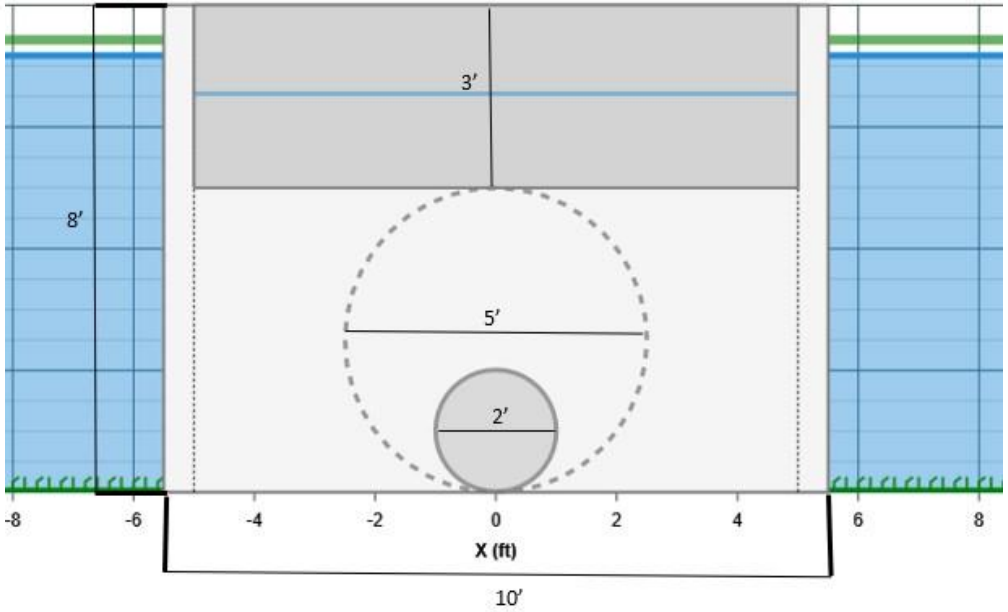
South Basin - Pond Outlet Schematic - 100-yr Water Surface



South Basin - Pond Outlet Schematic



South Basin - Pond Outlet Schematic - 100-yr Water Surface



STORMWATER SEWER SYSTEM

Road Boundary

Stormwater Sewer

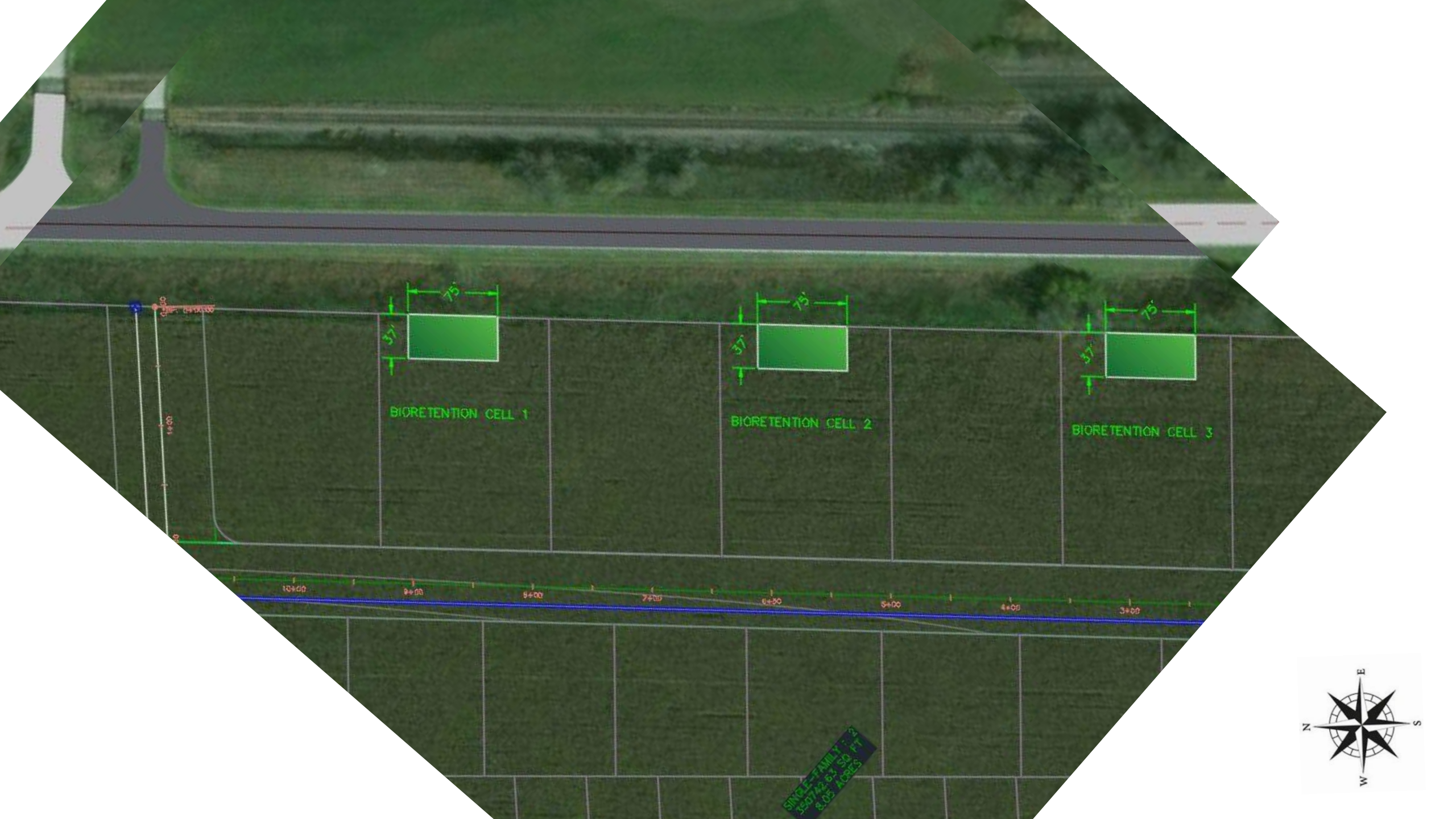
STORMWATER SEWER SYSTEM

Road Boundary

Stormwater Sewer


Bioretention
Cell

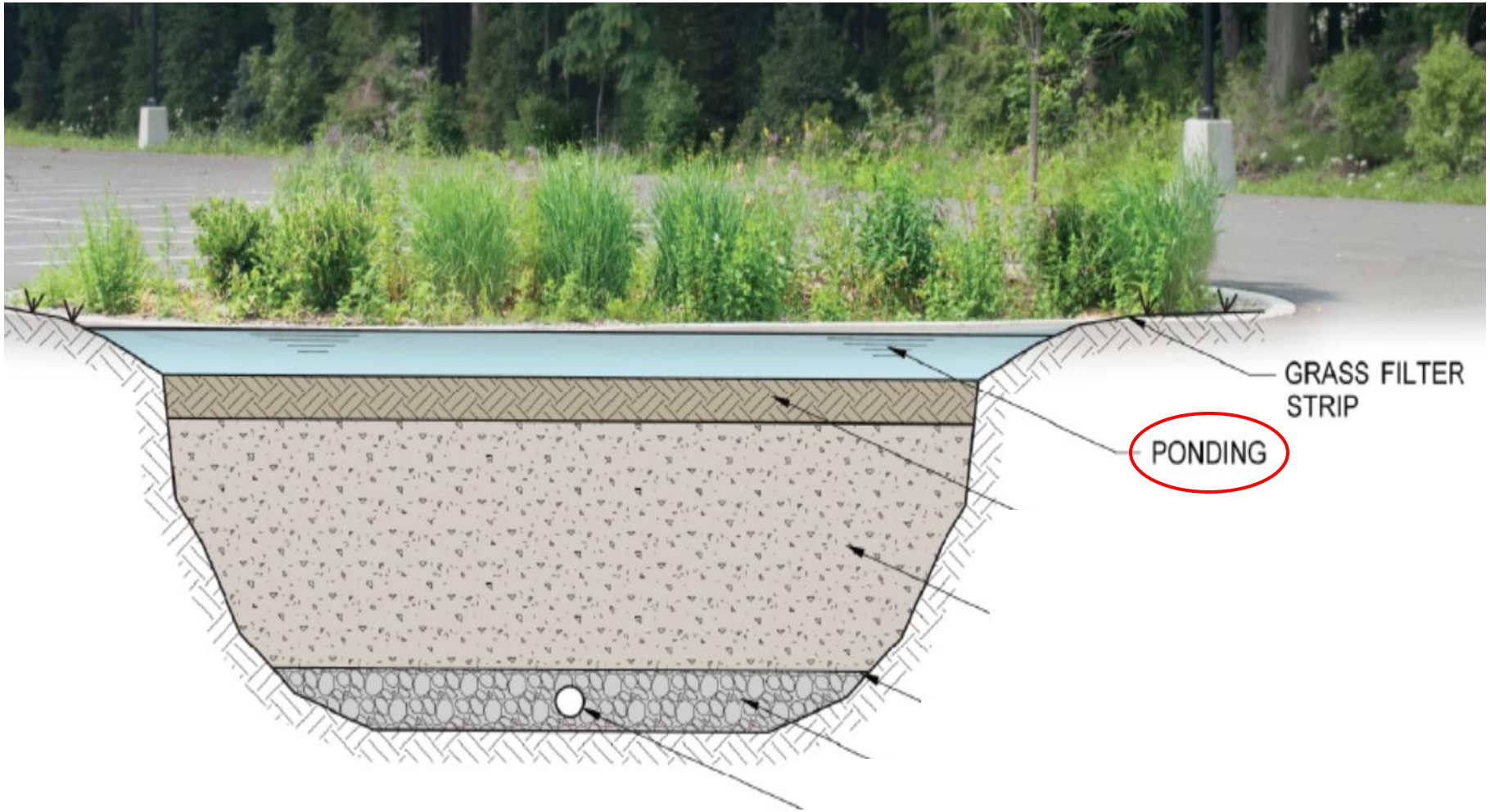
- Shallow landscaped level depression that temporarily stores and infiltrates runoff
- Stormwater runoff collected in the upper layer of the system, filtered through the surface vegetation, and then stored temporarily in a stone aggregate base layer
- Flexible design options
- Flexible landscaping options can provide an aesthetic feature


75'
37'
BIORETENTION CELL 1
75'
37'
BIORETENTION CELL 2
75'
37'
BIORETENTION CELL 3
10+00
9+00
8+00
7+00
6+00
5+00
4+00
3+00
N
E
S
W

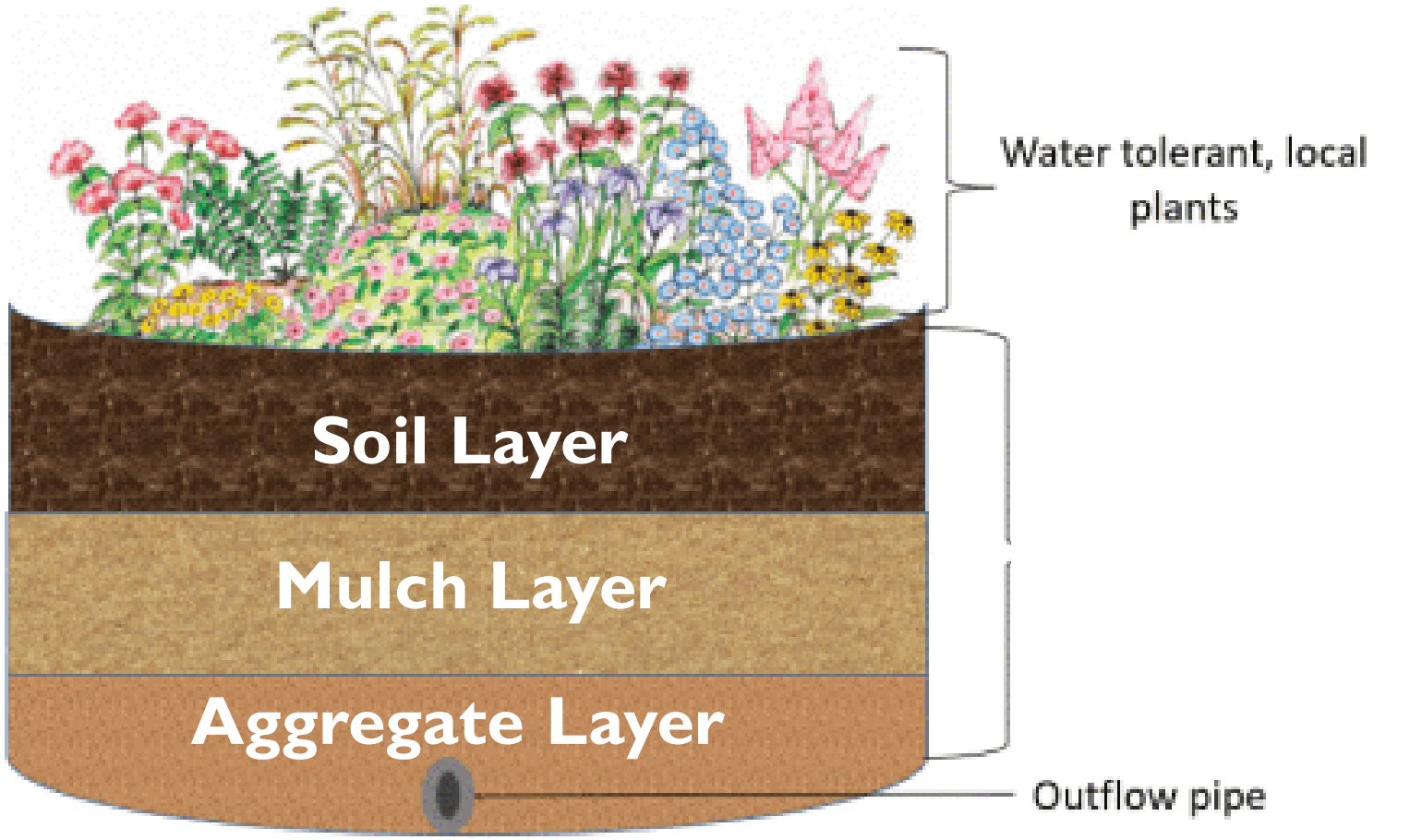

PRETREATMENT

Temporary Ponding Area

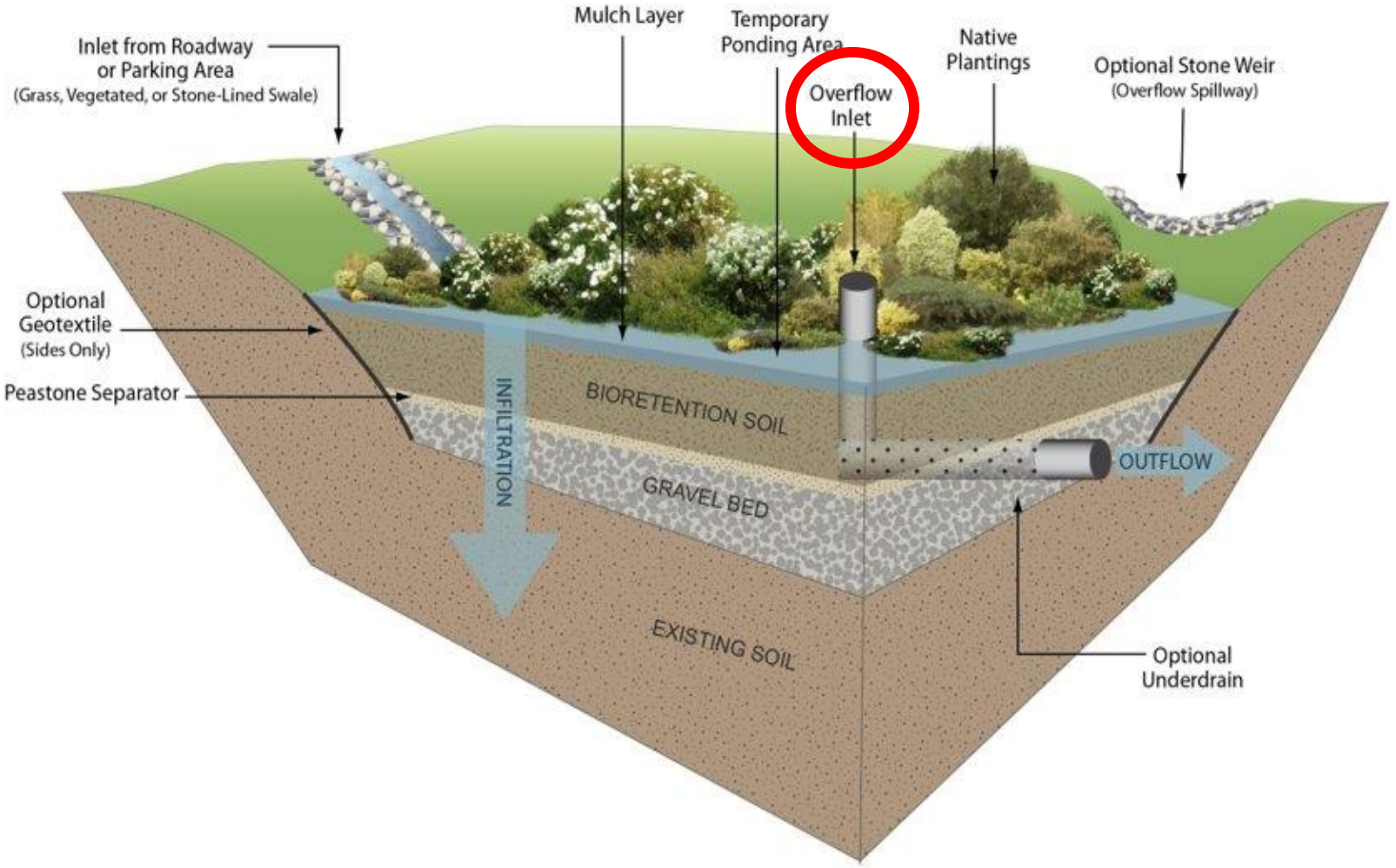
Provides for temporary surface storage of the runoff before it infiltrates into the soil bed



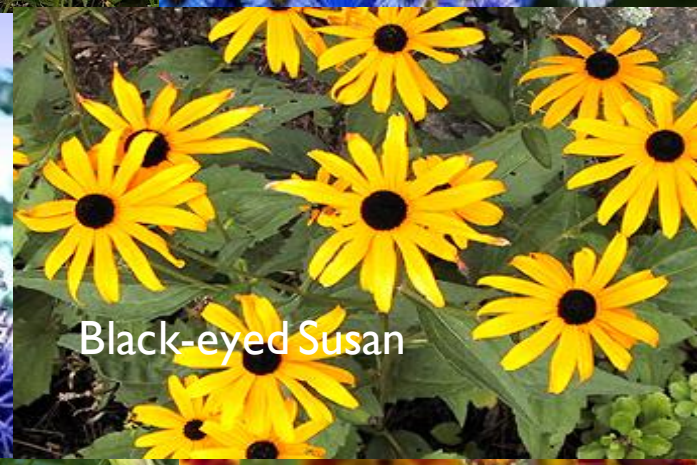
CROSS-SECTIONAL ELEMENTS



OVERFLOW DESIGN



VEGETATION AND MONITORING PLAN



OPERATIONS AND MAINTENANCE PLAN

BIORETENTION CELL

- Removal of weeds
- Remove trash and debris from pretreatment area, bioretention cell, and retention ponds
- Re-seed or sod as needed

DETENTION BASIN

- Inspect inlet and outlet points for clogging
- Remove any sediment

STORMWATER MANAGEMENT

EXISTING LAYOUT
DESIGN ALTERNATIVE &
FINAL DESIGN
ADDITIONAL RECOMMENDATIONS
COST ESTIMATE

CONSTRUCTION PHASE EROSION CONTROL

STORMWATER MANAGEMENT

EXISTING LAYOUT
DESIGN ALTERNATIVE
FINAL DESIGN
ADDITIONAL RECOMMENDATIONS
COST ESTIMATE

System	Item	Quantity	Unit	Unit Price	Total
Stormwater Collection System	Stormwater Collection - RCP	7107	L.F.	$45.00	$319,815
	Inlet Structure	15	Ea.	$2,200.00	$33,000
	Storm Drainage Manholes	11	Ea.	$1,725.00	$18,975
Stormwater Management	Outlet Structure	2	Ea.	$4,500.00	$9,000
	Basin Excavation	11500	C.Y.	$6.25	$71,875
	Bioretention Cell Excavation	1012	C.Y.	$6.25	$6,325
	Bioretention Cell - Soil Media	222.64	C.Y.	$25.00	$5,566
	Bioretention Cell - Gravel	101.2	C.Y.	$30.00	$3,036
	Bioretention Cell - Top Mulch	40.48	C.Y.	$32.00	$1,295
	Erosion Control	1	lsum	$3,000.00	$3,000
Temporary Protection	3' Silt Fence	1500	L.F.	$4.00	$6,000
	5'x5' Silt Bag	10	Ea.	$62.00	$620
Plants	Helenum Autumnale	2730	Ea.	$2.50	$6,825
	Rudbeckia Hirta	2730	Ea.	$2.50	$6,825
	Aromatic Aster	2730	Ea.	$2.50	$6,825
				Total	**$498,982**

Annual Expenses					
Operations and Maintenance	Mowing Maintenance - Park and Basins	4.5	Ac	$78.00	$351
	Lawn Maintenance - Park and Basins	4.5	Ac	$320.00	$1,440
	Vegetation Maintenance	4.1	Ac	$451.00	$1,849
	Weed Planting Bed	1250	S.Y.	$0.62	$775
				Total	**$4,415**

STORMWATER COST ESTIMATE

Stormwater Collection System	$372,000
Stormwater Management	$100,000
Temporary Protection & Plants	$27,000
Operations and Maintenance - Annual	$4,500
Contingency (10%)	$50,000
Engineering & Administration (15%)	$75,000
Total Stormwater Project Cost	**$628,500**

TOTAL COST ESTIMATE

Land Development Portion	$3,112,000
Contingency (25%)	$778,000
Engineering & Administration (15%)	$467,000
Total Land Development Project Cost	**$4,357,000**

Stormwater Portion	$499,000
Contingency (10%)	$50,000
Engineering & Administration (15%)	$75,000
Total Stormwater Project Cost	**$624,000**

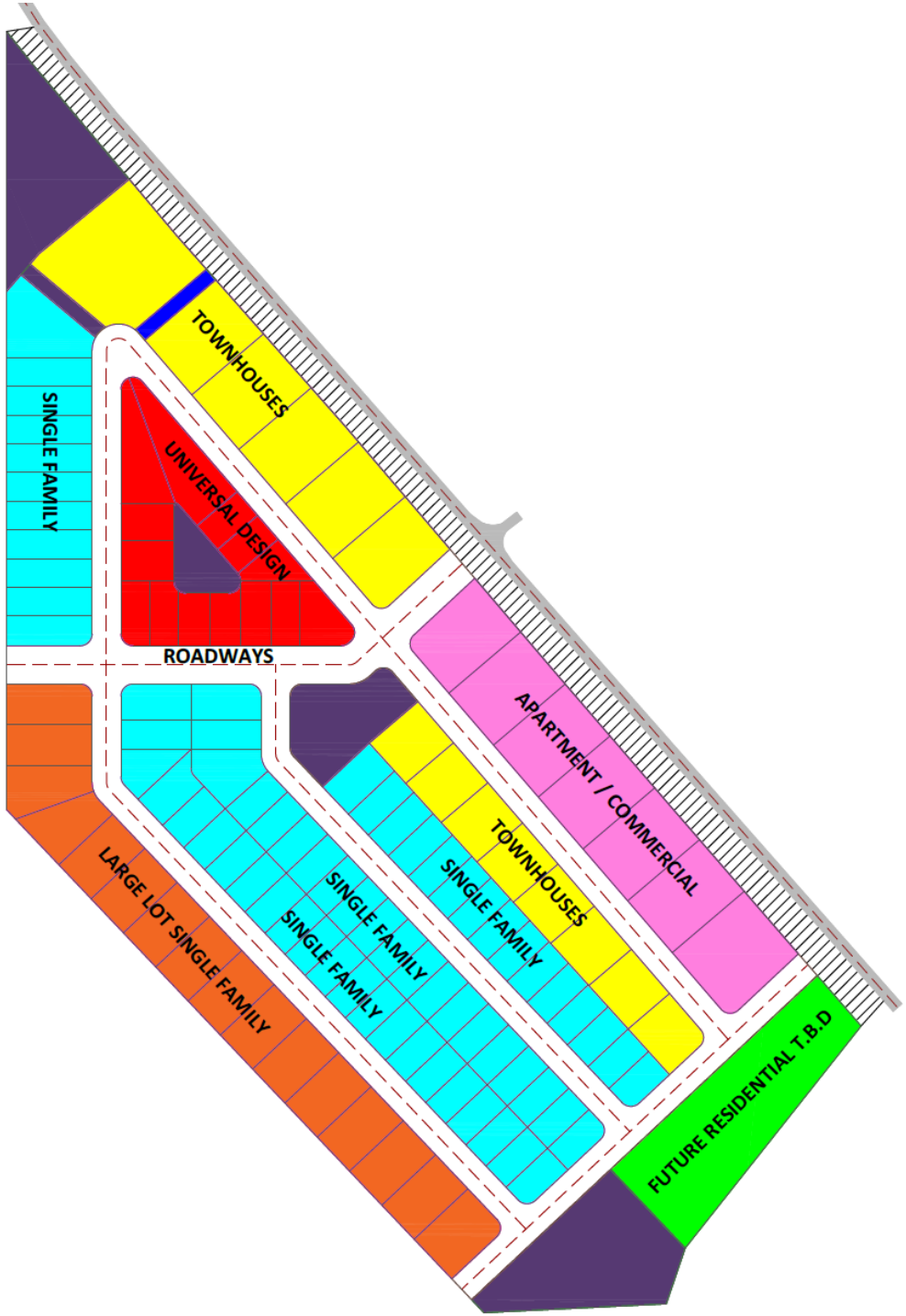
Total City of Bellevue Expansion Cost:
$4,981,000

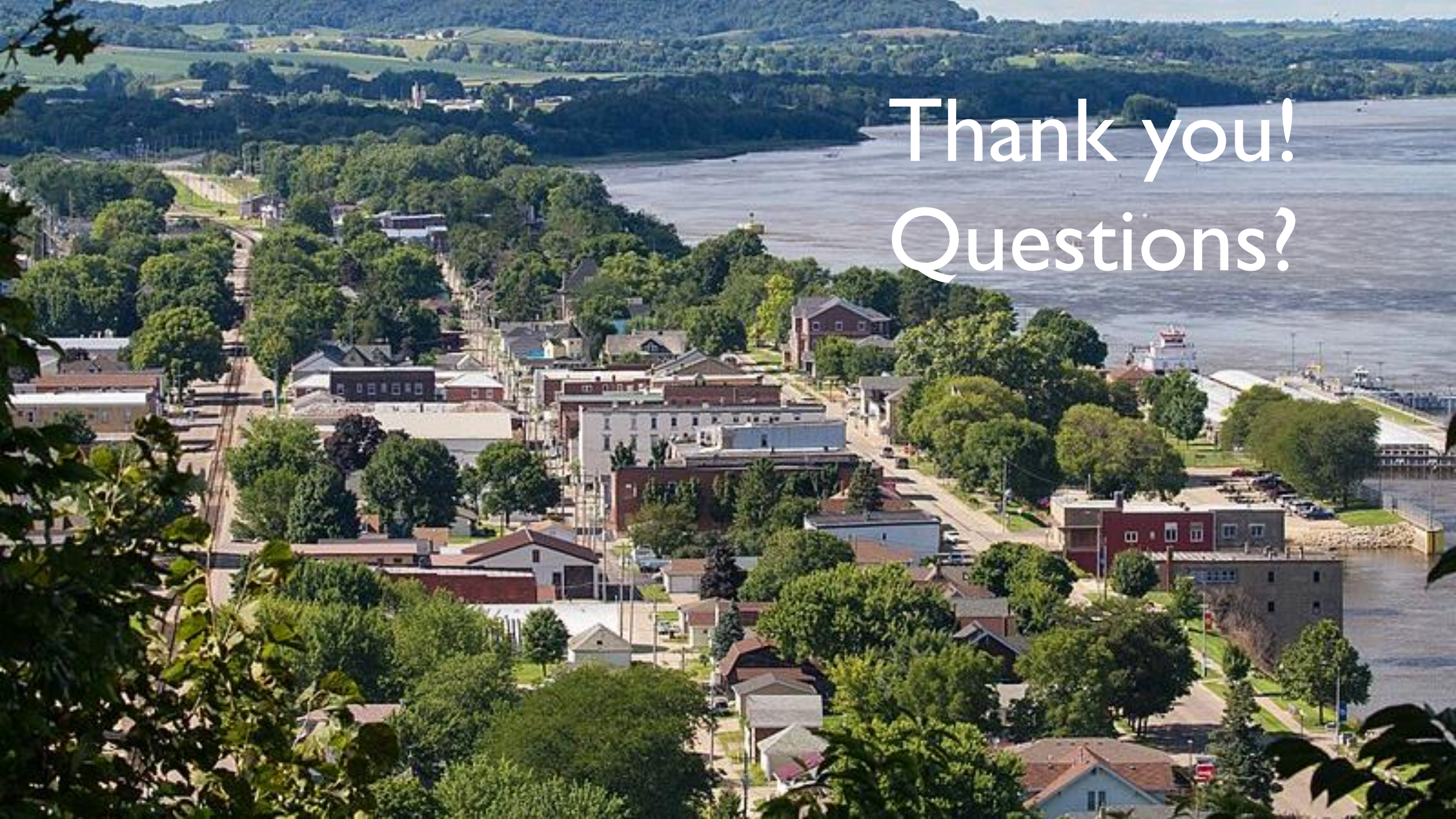
FINAL HOUSING LAYOUT AND TOTAL COST ESTIMATE

City of Bellevue Expansion Project Cost Estimation: **$4,981,000**

Total Land Development Project Cost	**$4,357,000**
Total Stormwater Project Cost	**$624,000**
Total City of Bellevue Expansion Cost	**$4,981,000**

Price per sq. ft. : $3.40
Lot Prices : $24,000 - $101,000




Thank you!
Questions?