INITIAL OPTIMIZATION RESULTS
BEND OPTIMIZED COLLECTION SYSTEM PLAN

Presenters:

Tom Hickmann
David Stangel
Joel Wilson

DRAFT RESULTS – SUBJECT TO CHANGE

MSA Murray, Smith & Associates, Inc.
Engineers/Planners

AGENDA

- Welcome/Introduction
- Initial Optimization Results – Overview (40 min)
- Roundtable Discussion/Dinner Break (60 min)
- Report Back to Group (30 min)
- Discussion Summary (10 min)
- Next Steps (10 min)
- Public Comment (5 min)

PRESENTATION CONTENTS

- Headlines!
- 2033 Deficiencies
- Alternatives
- Summary of Results
- Initial Optimization Solutions
- High Level Takeaways
- Next Steps

THE HEADLINES

1. Good news about initial capital costs—more about this later…
2. The SE Interceptor is selected in every optimization run—it's the right solution
3. The Colorado Lift Station is selected every time—it's the right solution
4. North area results: options for consideration
5. But there is more work to be done…

LOOKING BACK—SIAG DECISIONS

- Land use inputs:
  - Base assumptions (development densities on individual parcels, rights-of-way, parks & schools, people per household, density by General Plan designation)
  - Special areas (OSU-Cascade Campus, Central Area, and Medical District)
- Solution types: pipes, pumps, storage, satellite treatment

LOOKING BACK—SIAG DECISIONS

- Life Cycle Costs: 40-year analysis period
- Sensitivity analysis completed to date:
  - Wet weather (High R and Mid R)
  - Upgrade of existing infrastructure only
  - Storage vs no storage
- Potential sensitivity analysis:
  - Continued wet weather refinement
  - Loading and growth rates (growth nodes, OSU, etc)
  - Indoor Water Conservation

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City of Bend
Collection System Master Plan

2033 Mid R Deficiency

October 2013

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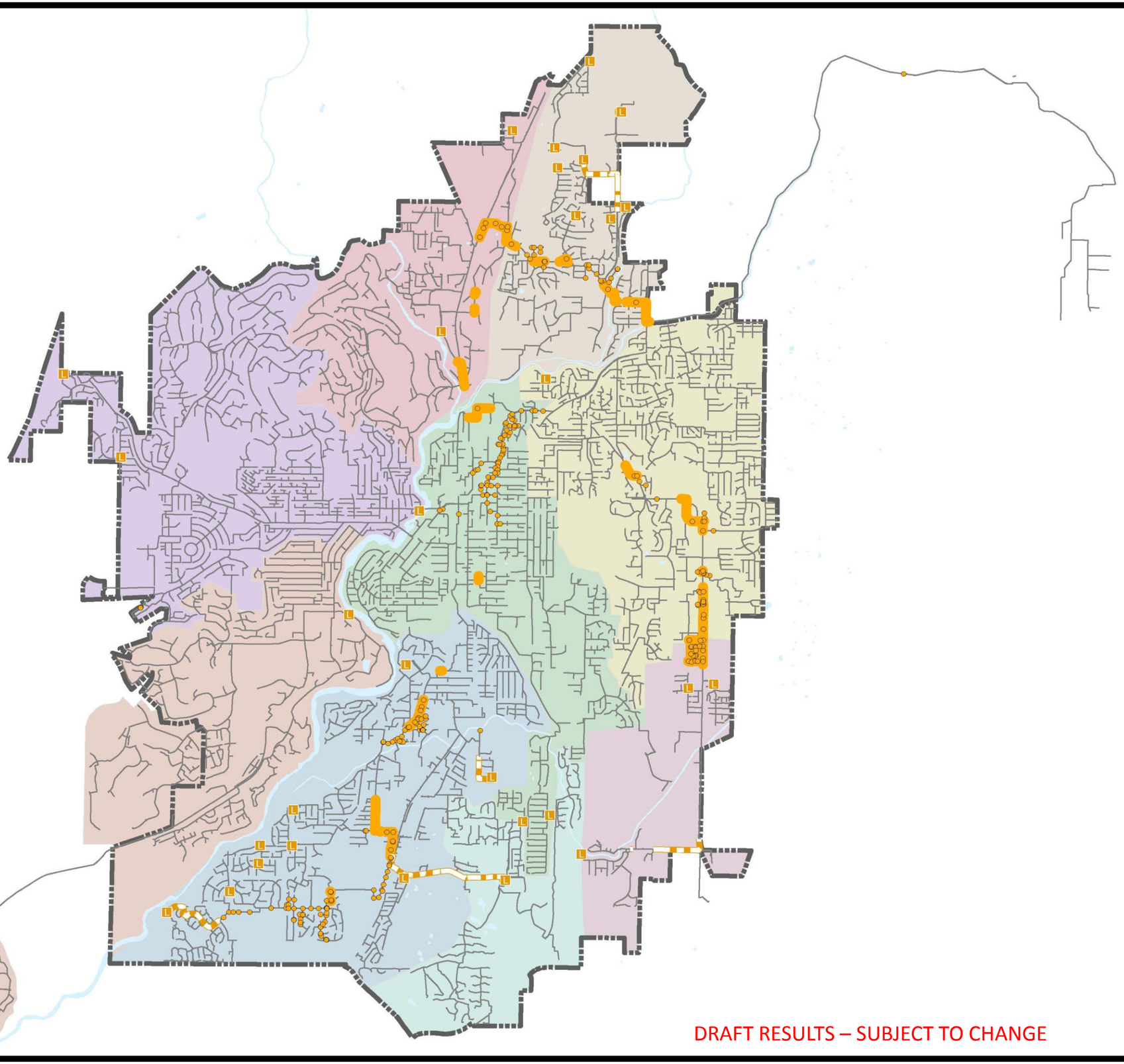

Legend

- Existing Sewer Pipe
- 2033 Wet Deficient Manhole
- 2033 Deficient Modeled Lift Station
- 2033 Force Main Velocity (10 ft/s)
- 2033 Force Main Velocity (Dry 6 ft/s)
- 2033 Gravity Dry Deficiency (0.8 d/D)
- Planning Boundary

Sewer Basin

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

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City of Bend
Collection System Master Plan

2033 High R Deficiency

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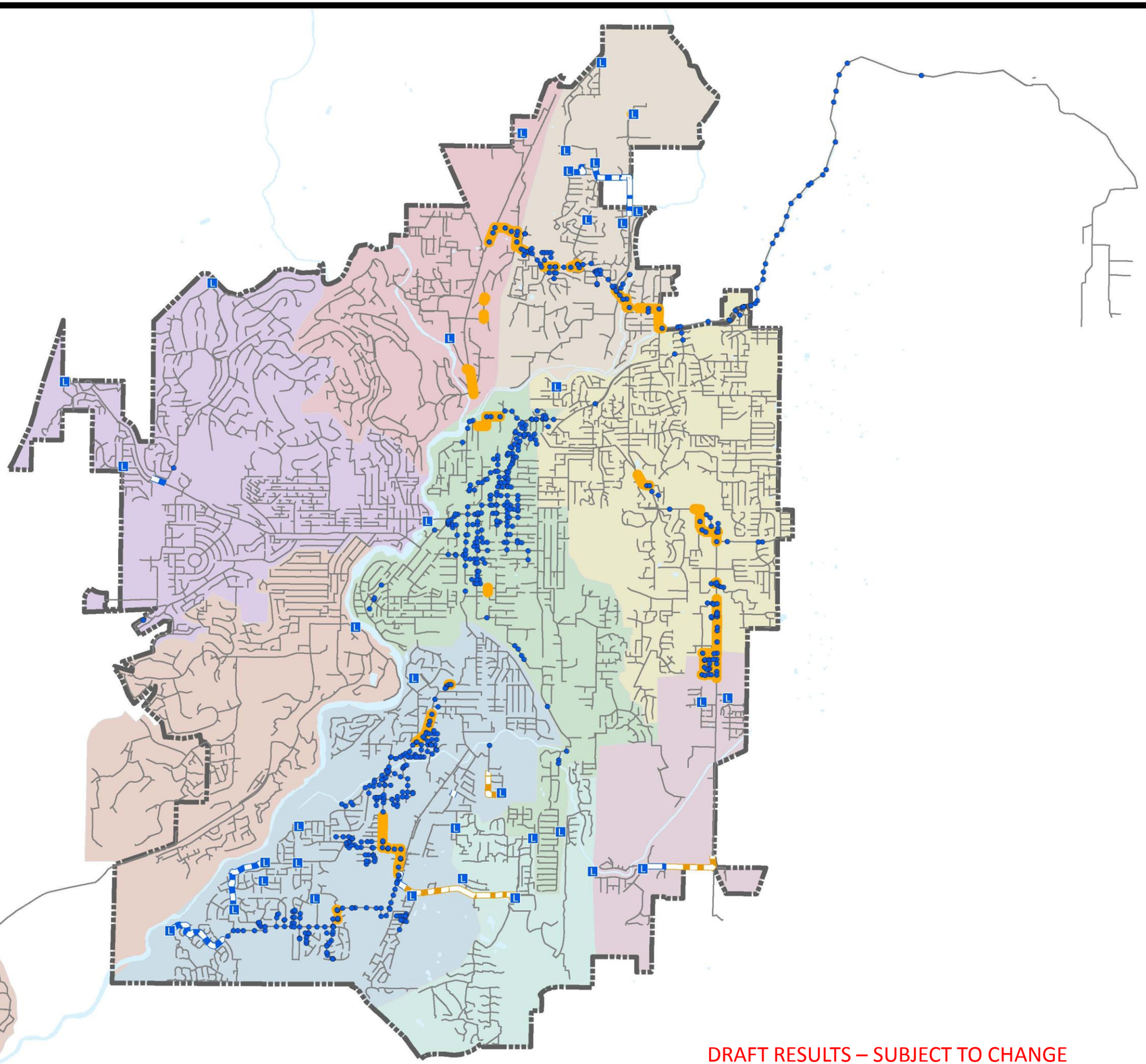

Legend

- Existing Sewer Pipe
- 2033 Wet Deficient Manhole High R
- 2033 Deficient Modeled Lift Station High R
- 2033 Force Main Velocity (Dry 6 ft/s)
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Sewer Basin

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City of Bend
Collection System Master Plan

Overall 2033
Optimization Alternatives

November 2013

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Legend

- New Lift Station
- Decommissioned Lift Station
- Lift Station Upgrade
- WWTP Satellite Treatment
- Offline Storage
- Existing Sewer Pipe

Alternatives

- Gravity Upgrade Along Existing Alignment
- Gravity Diversion
- Force Main Upgrade Along Existing Alignment
- Force Main Diversion
- New Pump Station Force Main
- Gravity or Force Main
- In-Line Linear Storage
- Flow Control Piping
- Planning Boundary

Sewer Basin

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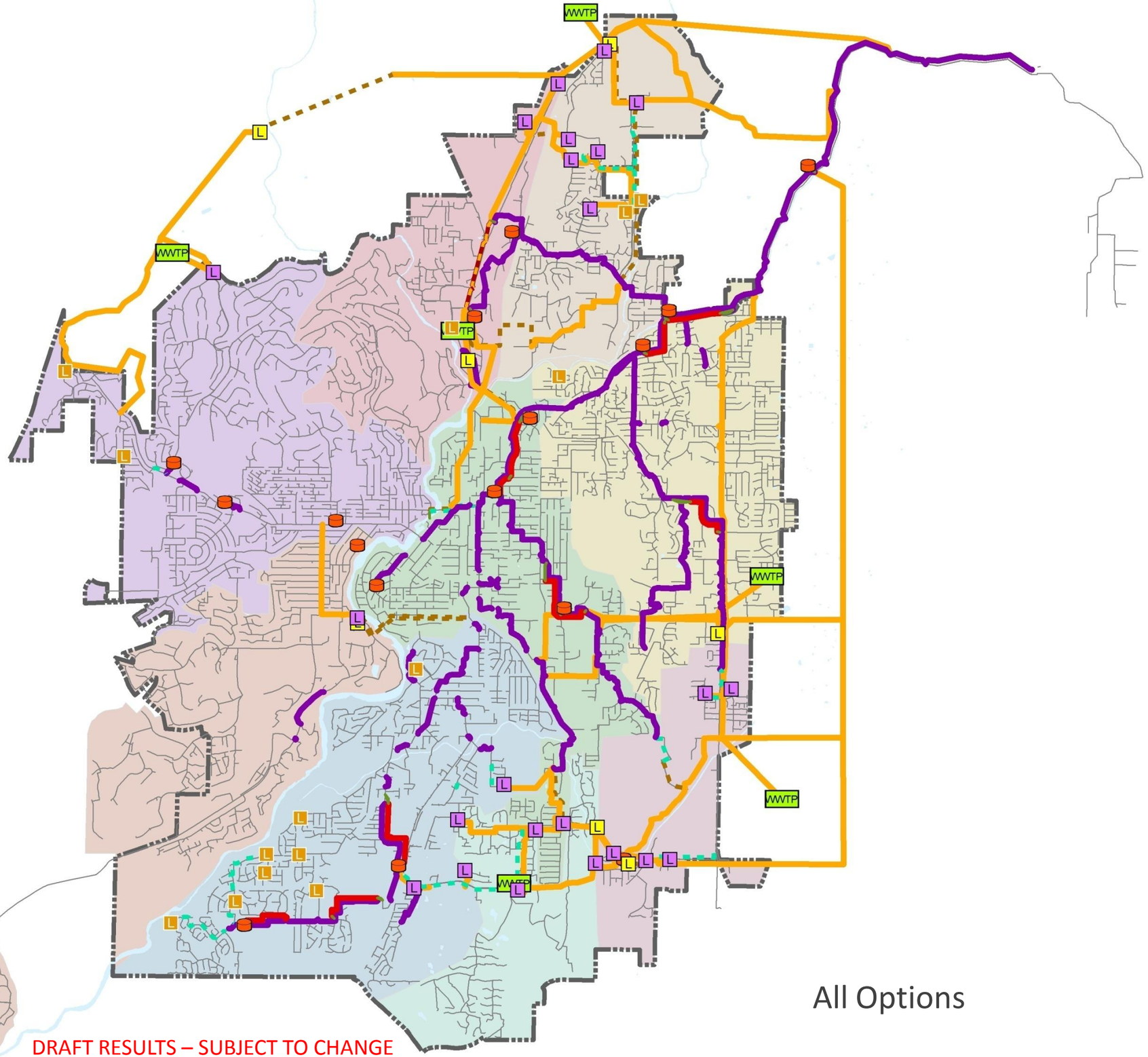

All Options

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Cost Estimate Classification

The accuracy of planning projects is in this range

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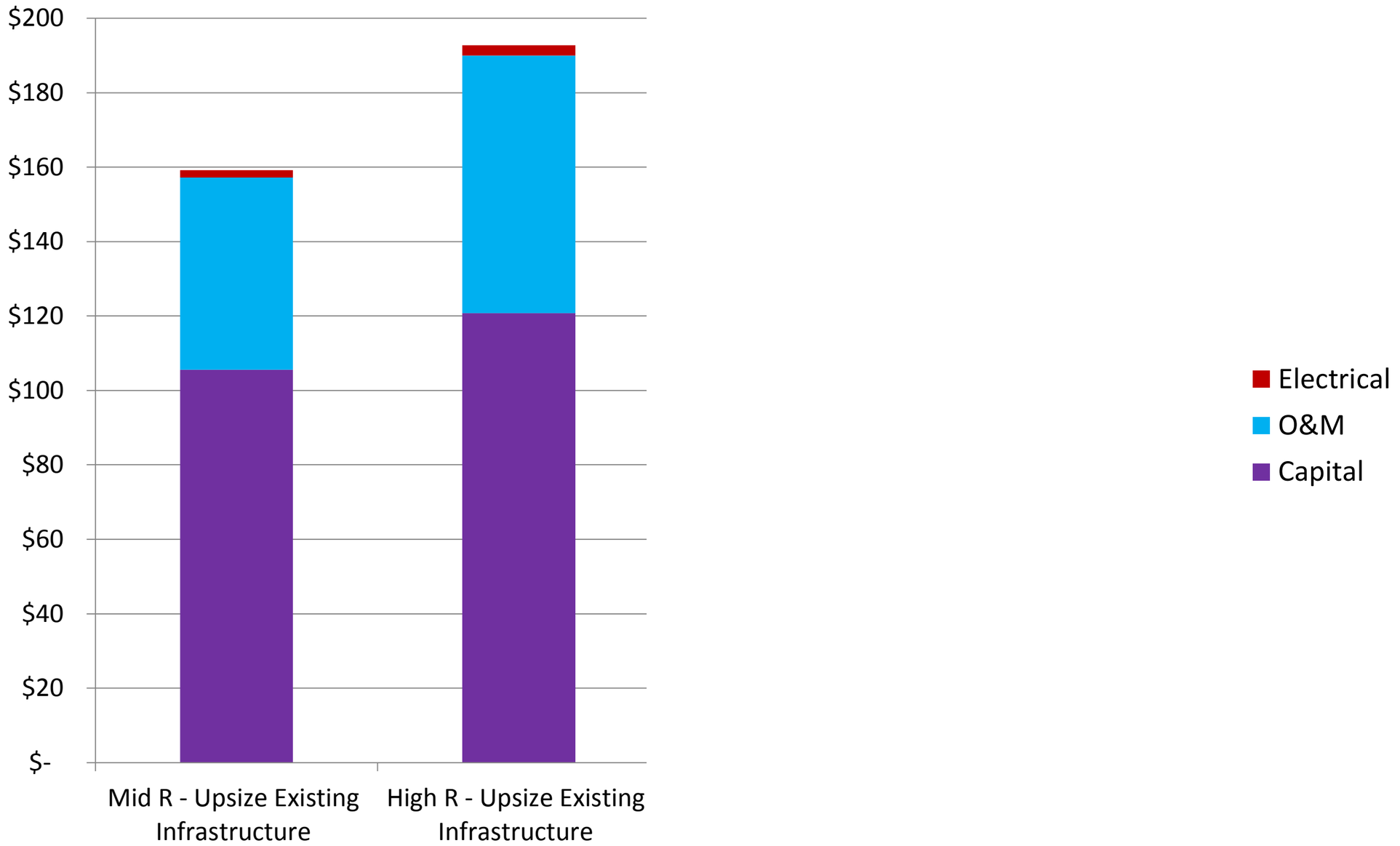
40 YEAR LIFE CYCLE COSTS
(MILLION DOLLARS)



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SUMMARY COMPARISON OF INITIAL SOLUTIONS

Cost Item	Mid-R Upsize Existing Infrastructure	High-R Upsize Existing Infrastructure
40-Y O&M Life Cycle Cost ($M)	51.60	69.20
40-Y Elect. Life Cycle Cost ($M)	2.00	2.80
40-Y Capital Life Cycle Cost ($M)	105.60	120.80
40-Y Total Life Cycle Cost ($M)	**159.20**	**192.80**

Initial Capital Cost ($M)	**57.23**	**70.24**	**68.46**	**86.14**

Note: Based on Class 5 Cost Estimate

Compared to $120M in prior capital plan

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UPSIZE EXISTING INFRASTRUCTURE (20-Year, High R)

(No change to existing operational strategy)

Cost Item	Cost ($M)
40-Y Life Cycle O&M Cost	69.20
40-Y Life Cycle Elect. Cost	2.80
40-Y Life Cycle Capital Cost	120.80
40-Y Total Life Cycle Cost	**192.80**

Initial Capital Cost	**70.24**

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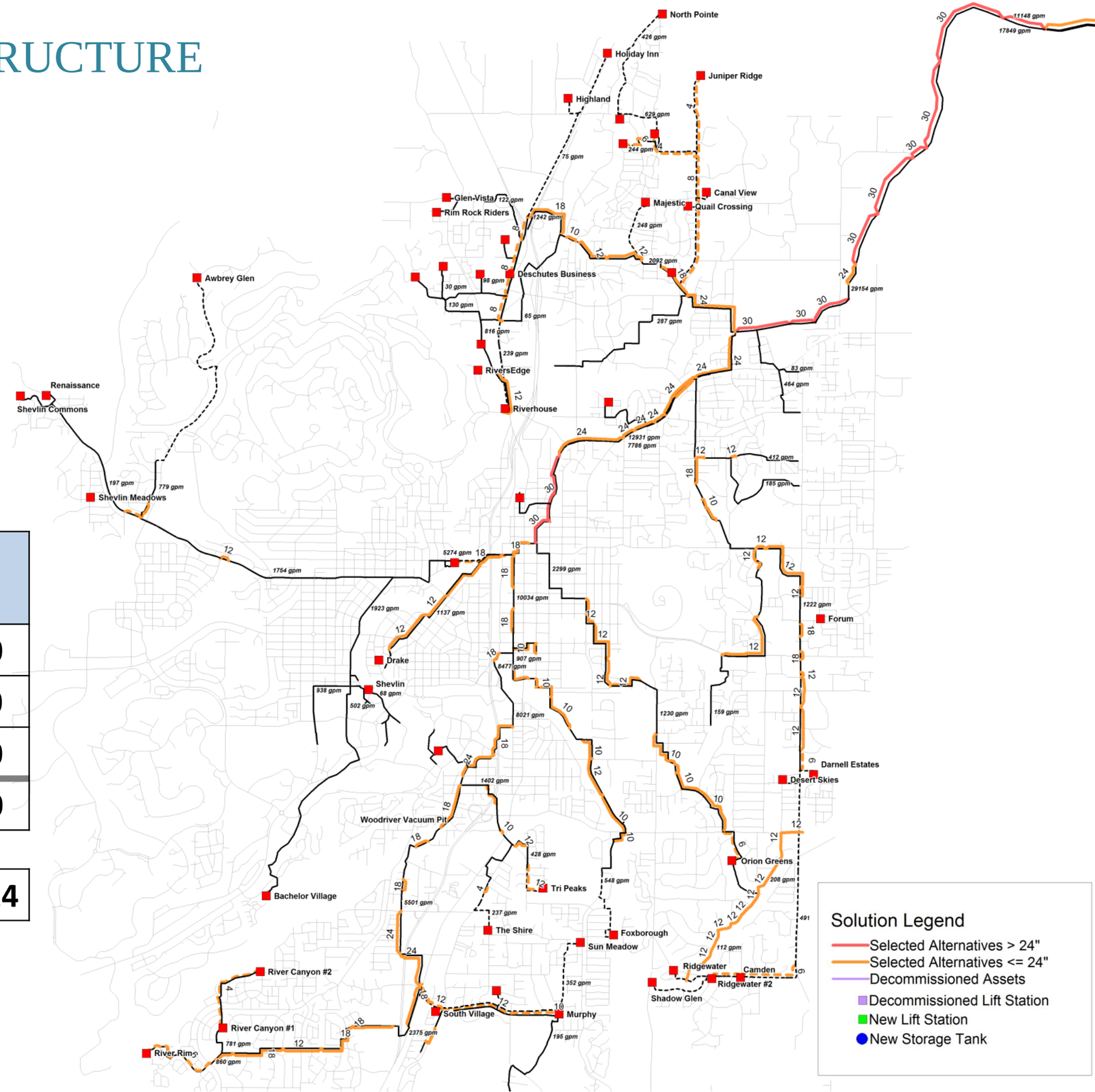

ALL OPTIONS
(20-Year, Mid R)

Cost Item	Cost ($M)
40-Y Life Cycle O&M Cost	32.20
40-Y Life Cycle Elect. Cost	1.20
40-Y Life Cycle Capital Cost	73.10
40-Y Total Life Cycle Cost	**106.50**

Initial Capital Cost	**68.46**

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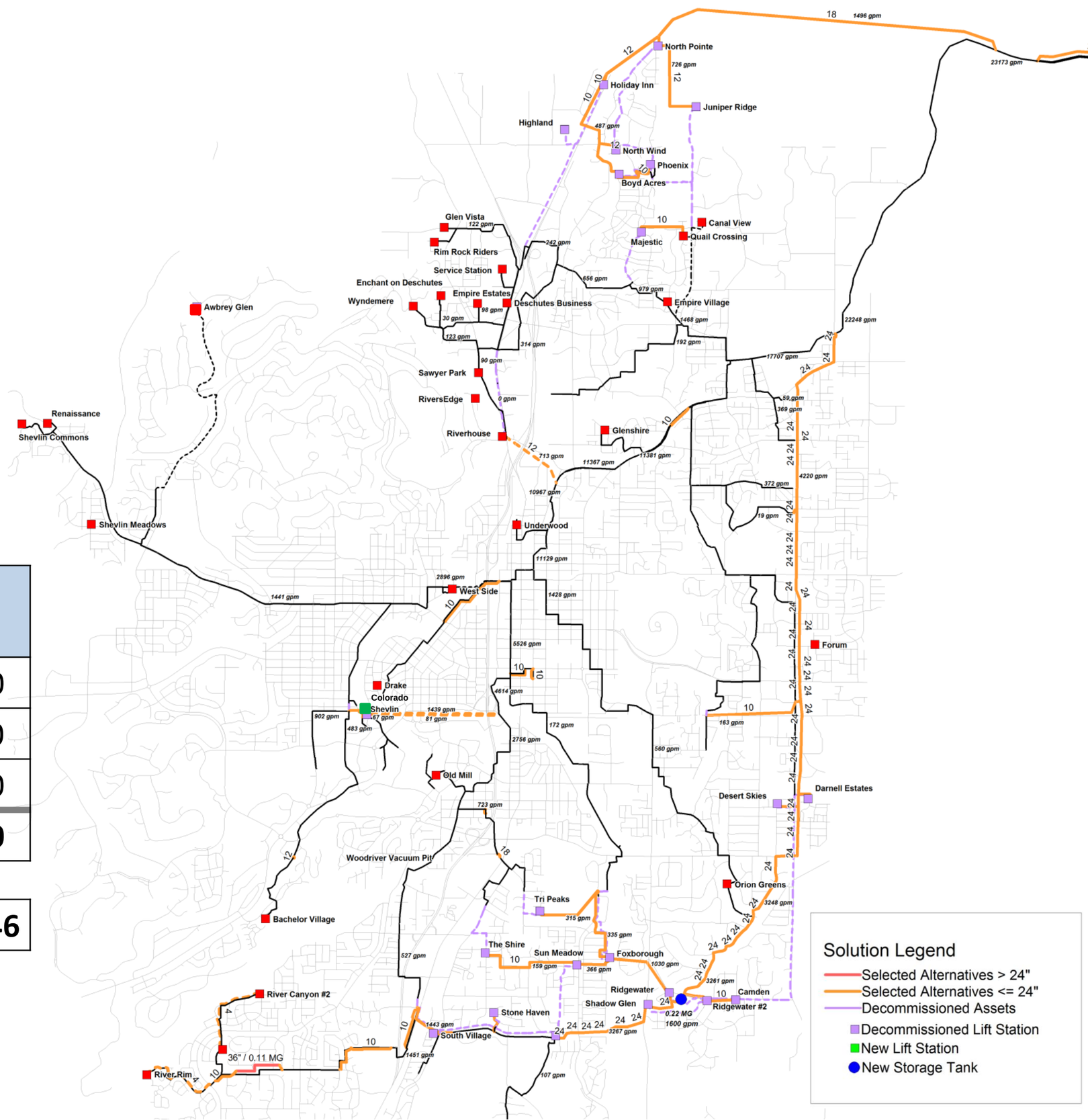

ALL OPTIONS
(20-Year, High R)

Cost Item	Cost ($M)
40-Y Life Cycle O&M Cost	36.10
40-Y Life Cycle Elect. Cost	0.40
40-Y Life Cycle Capital Cost	86.72
40-Y Total Life Cycle Cost	**123.22**

Initial Capital Cost	**86.14**

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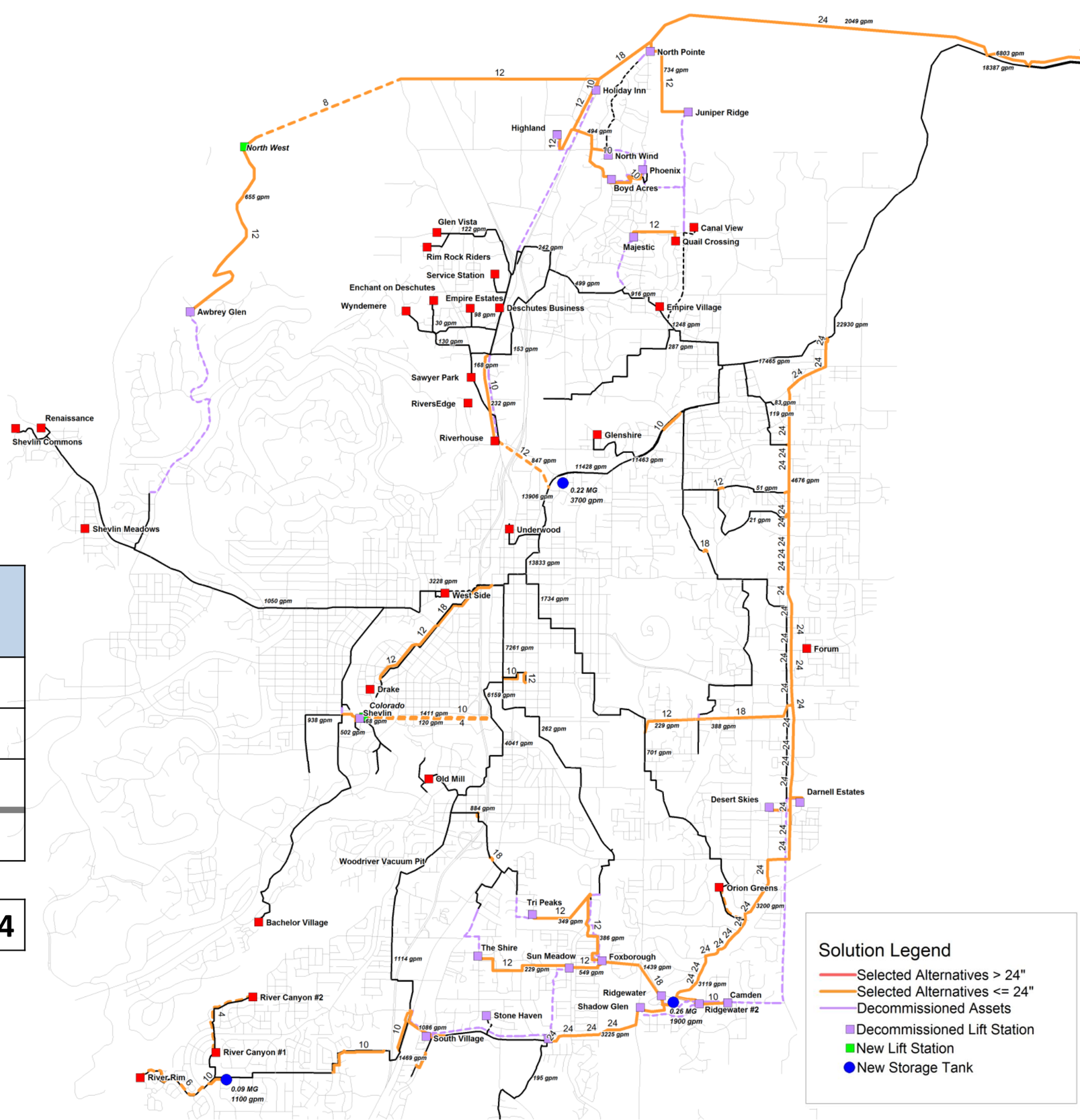

COMPARISON OF ALL OPTIONS AND NO STORAGE SOLUTIONS (20-year High R)

- Projects eliminated by storage shown in red
- Storage not utilized in DWF
- Avoided length of new pipe construction = 31,000 ft.
- Avoided capital cost = $13 M (14%)
- 40-Year O&M Cost Savings = $5 M
- 20-year, High R peak flow to plant reduced from approx. 29,000 to 25,000 gpm

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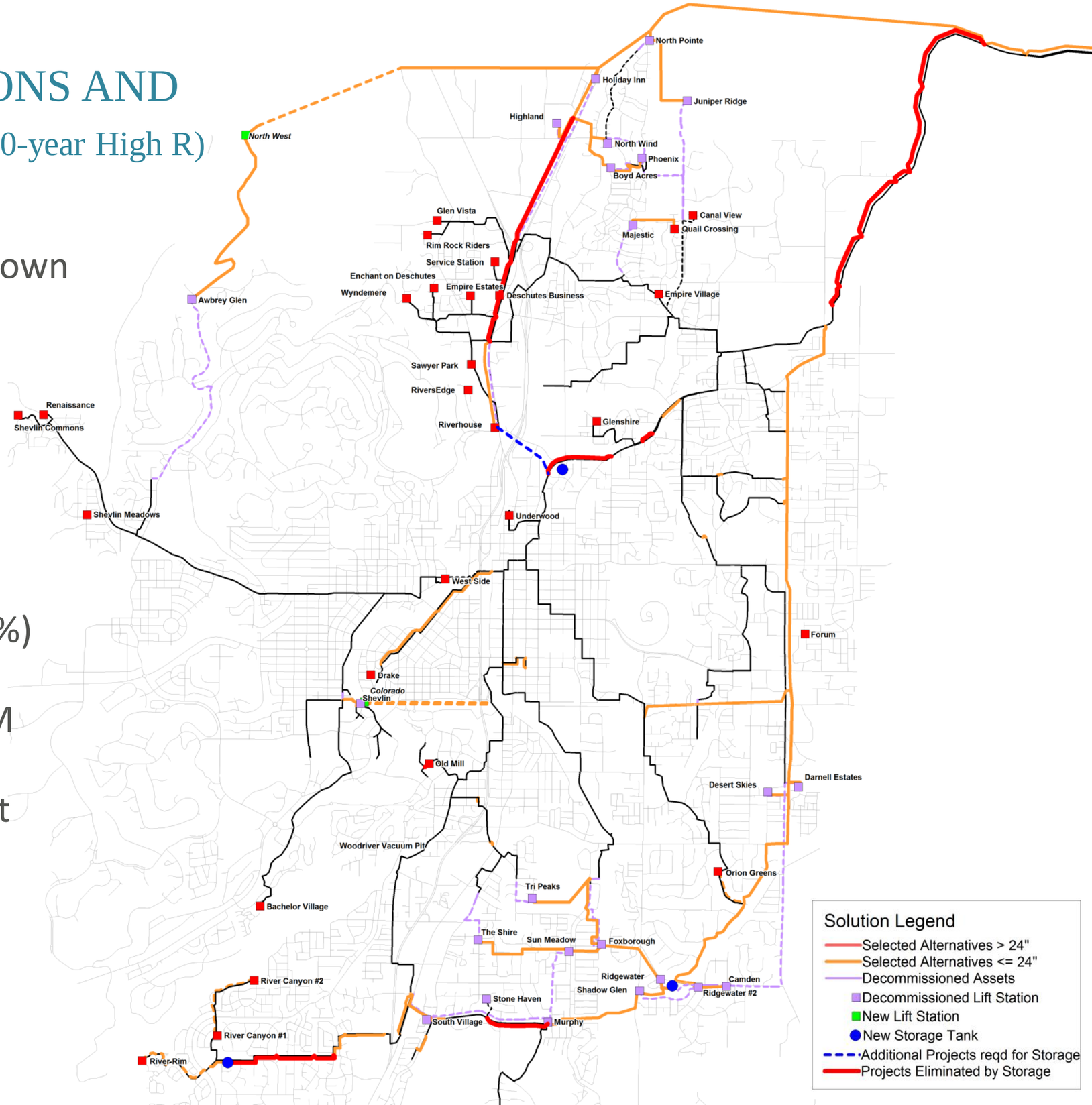

City of Bend
Collection System Master Plan

Overall 2033
Optimization Alternatives

November 2013

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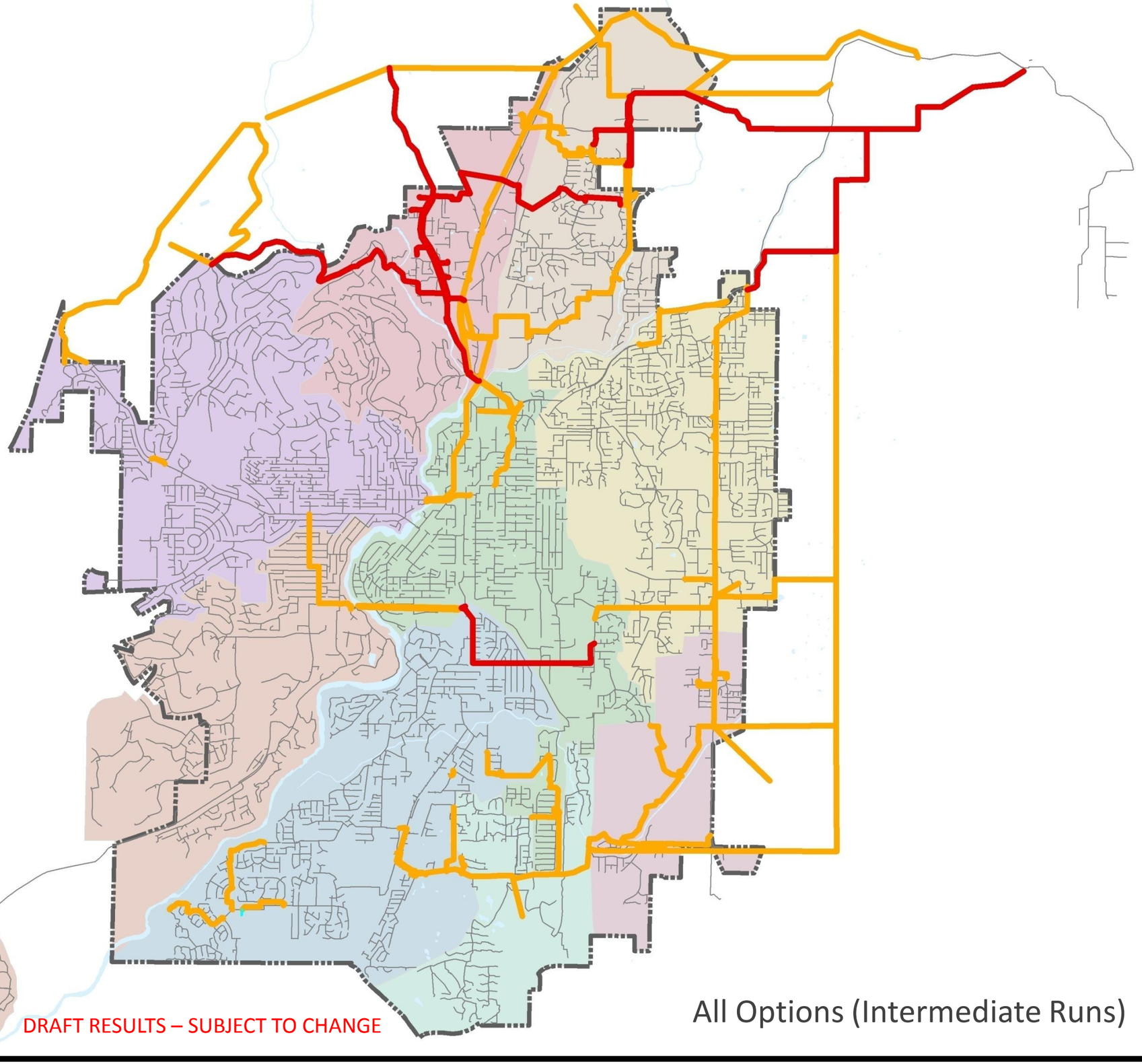
BEND OREGON



HIGH LEVEL TAKEAWAYS

Solution Component	Trends Observed	Additional Refinement
General	• Similar solutions selected in both Mid R and High R • Cost difference between Mid R and High R • Upsizing existing infrastructure has higher life cycle costs	• Model verification based on add. flow monitoring • Evaluate project phasing
Southeast Interceptor	• Always selected • Size relatively consistent with current design • 27th St alignment selected	• Future growth sensitivity • Test Colorado extension
Colorado LS	• Always selected	• Option to connect to SEI
Storage	• Three locations consistently selected for storage	• Site specific costs
Northern System	• Northern Interceptor consistently selected • Upgrade of existing gravity/force mains not selected • Northwest Interceptor only selected in High R	• OB Riley alignment and several other alignment alternatives to be included
Treatment	• Low treatment cost used to favor treatment • Treatment not selected	• No further evaluation anticipated
Existing Lift Stations	• Decommission the majority of existing lift stations where gravity alternatives existed	• Effect of phasing

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NEXT STEPS / INTERMEDIATE OPTIMIZATION

Input Refinement

- Site specific costs
- Review alignments
- Additional alternatives
- Review storage

Phasing Analyses

- 10-year planning horizon

Sensitivity Analyses

- Wet-weather flow sensitivity analysis
- Loading sensitivity analysis (growth nodes, OSU, etc)
- Indoor water conservation

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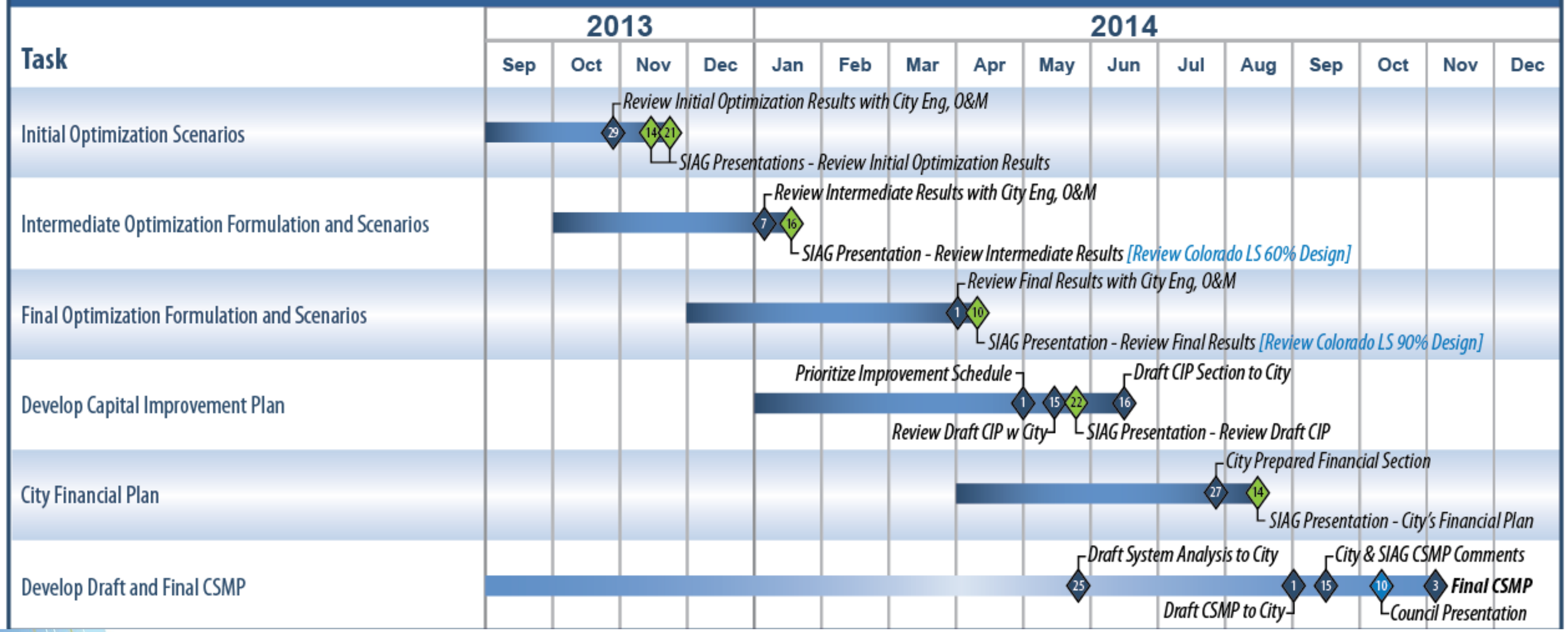
SCHEDULE REVIEW

DRAFT CONDENSED PROJECT SCHEDULE (AS OF NOVEMBER 12, 2013)

CITY OF BEND
OPTIMIZED SEWER COLLECTION SYSTEM MASTER PLAN



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ROUNDTABLE DISCUSSION

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TODAY'S TAKEAWAY

- Cost savings—initial construction and long-term
- Greater certainty of investment
- Potential for more good news when the team looks at project phasing opportunities
- Seeking direction from SIAG related to SE Interceptor on November 21st meeting

QUESTIONS

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