CITY OF BOULDER
CITY COUNCIL AGENDA ITEM

MEETING DATE:

AGENDA TITLE

Consideration of a motion to accept the Area III-Planning Reserve Urban Services Study dated November 7, 2024.

PRESENTER(S)

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EXECUTIVE SUMMARY

The purpose of this item is to share the Area III-Planning Reserve Urban Services Study (USS), and key insights related to the urban service demand scenario evaluations with the City Council for review and acceptance. These insights focus on the potential urban service impacts related to each of the four service demand scenarios, and the economic and fiscal impacts on urban services infrastructure and capacity related to each scenario. In response to feedback received in June, the USS now includes a section on innovation strategies that could be considered in the future if staff is directed to continue to explore potential Service Area expansion into the Area III-Planning Reserve.

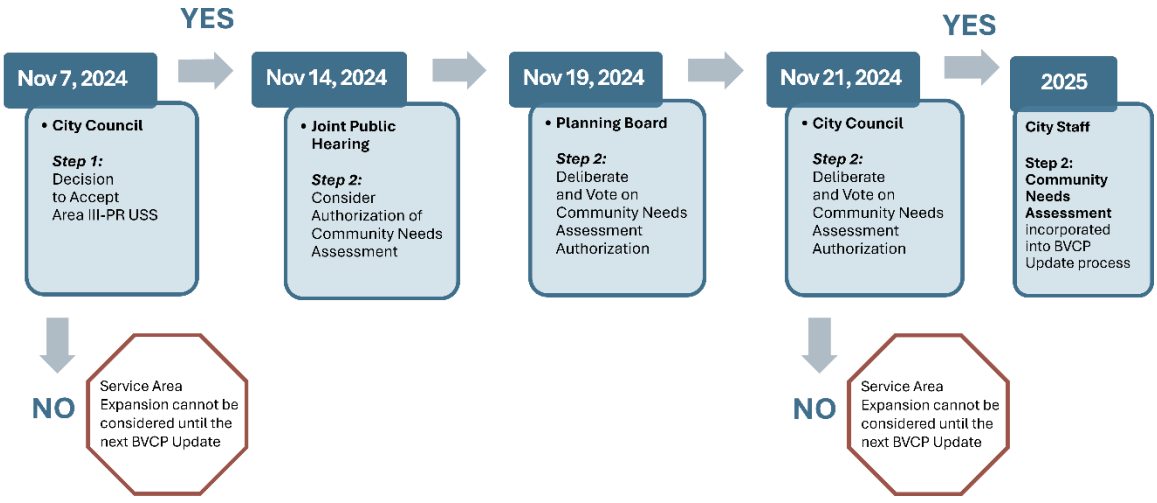
Process

The Boulder Valley Comprehensive Plan (BVCP) requires a USS to be completed before a Service Area expansion can be considered. Staff, with the assistance of a consultant, have completed the USS and are presenting it for City Council acceptance at the November 7, 2024, meeting. Council can make one of two decisions:

1) Accept the study and proceed with a public hearing with the Planning Board to determine if there is interest in considering a Service Area expansion as part of the BVCP major update. If there is such interest, staff will incorporate a planning effort into the BVCP process to solicit and identify priority community needs (Step 2 of the Service Area expansion process).

2) Not accept the study as completed and not proceed to a public hearing to determine if there is interest in considering a Service Area expansion as part of the BVCP major update. Note, the USS is required to be complete prior to considering a Service Area expansion.

If City Council accepts the USS, Step 1 of the Service Area expansion process will be complete.



The Next Steps section of this memo provides more information related to subsequent steps in the Service Area expansion process.

USS Key Insights
The Area III-Planning Reserve is not currently served by the City of Boulder. Any type or size of urban development would result in a need for new service infrastructure and capacity implications for the city. The USS analyzed four urban service scenarios to establish a range of outcomes and analyze possible cost impacts to the city. Scenario D was developed after the project team received City Council and Planning Board feedback to re-purpose a portion of city-owned land set aside for a regional park in Scenarios A, B, and C for housing, and to reduce the overall amount of non-residential/commercial space.

Onsite infrastructure costs could range from approximately $135-160 million. These costs would likely be borne primarily by future development interests and rate payers through property taxes, rates, and other mechanisms. The range of onsite costs is relatively narrow because each scenario would require a similar amount of improvements, with slight variations in size or scale. Offsite infrastructure costs could range from $210-980 million. The offsite costs vary to a greater degree because of the possible need for significant enhancements to existing systems to accommodate the level of potential urban development analyzed in this study. If urban development were to be established in the Area III-Planning Reserve over a 20-year horizon, initial conceptual calculations estimate on-going operations and maintenance costs borne by the city could potentially be covered by municipal revenues. However, these estimates are based on highly generalized assumptions regarding phasing of future development within the Planning Reserve, societal shifts affecting the local capture of sales taxes, and future policy decisions related to off-site infrastructure.

While the significance of the impacts on urban service infrastructure and capacity varies per scenario, one area that was consistently identified for offsite improvements is infrastructure related to water and wastewater. The existing water transmission and distribution system was not designed to supply water to the Planning Reserve. Offsite facilities would need to be upgraded as part of any significant extension of new infrastructure into the Planning Reserve. Several offsite improvements to increase distribution pipe sizes, expand water storage, and improve water treatment facilities have already been anticipated as part of the 6-year Capital Improvement Program and beyond to meet current projections in the Boulder Valley Comprehensive Plan and associated subcommunity/area plans. Future urban development in the Planning Reserve would likely increase or accelerate the need for some of these improvements. Several improvements to the City's existing wastewater infrastructure would also be needed to serve the Planning Reserve, including trunk sewer system modifications and wastewater treatment modifications.

STAFF RECOMMENDATION

Suggested Motion Language:

Staff requests council consideration of this matter and action in the form of the following motion:

Motion to accept the Nov 7, 2024, Area III-Planning Reserve Urban Services Study, dated November 7, 2024.

PLANNING BOARD FEEDBACK

Planning Board comments highlighted continued interest in affordable housing, park land, infrastructure and report methodologies.

Balancing Parks and Housing Needs: Feedback emphasized the need for data-driven conversations to determine the appropriate amount of land potentially dedicated to parks and affordable housing, particularly in light of limited opportunities for acquiring new park land and the need for equitable access to both parks and affordable housing.

Park Space Benchmarking: Comments reflected the idea that it is difficult to benchmark Boulder park space with other cities, as there are unique assets here, like Open Space and Mountain Parks, which already serve many recreational needs.

Park Land Usage and Scale: There was a request for clarity on the specific amenities that could fit into the 91-acre vs. 189-acre scenarios for parkland. A Planning Board member would like specifics on how much affordable housing could be developed on the remaining 98 acres if a smaller park area (91 acres) is chosen.

Infrastructure Assessment: A request for a reassessment of street and infrastructure standards to promote affordability, sustainability, and livability, and emphasize the need for a transit plan was made.

Water and Stormwater Management: Questions were raised about assumptions for water use and irrigation, whether all stormwater can be managed onsite, and if park land can contribute to stormwater management.

Sustainability Goals: There was a call for a proactive approach where ambitious goals for sustainability, traffic, and financial viability are set first, followed by creative solutions to meet these targets.

Accuracy and Methodology: More clarity on cost estimates, particularly around error margins, and a consideration of factors beyond per capita for park levels of service was requested.

Note that many of these comments reflect opportunities for strategies to be explored during future planning processes related to Service Area expansion. The purpose of the USS is to establish a baseline of possible costs and impacts and the decision before Council is to determine if the study has been completed and therefore accepted. If Planning Board and City Council decide to move forward with this process,

conversations around the issues above and other policy decisions will be taken up in the next phase.

BACKGROUND

The process for Service Area expansion (i.e., changing of the Area III-Planning Reserve designation to Area II which allows for annexation) was set in place in 1995 and is defined in the BVCP to ensure a methodical approach to potential expansion of the city into the Planning Reserve. In 2015, the process was revised to incorporate the Urban Services Study as the first step in the expansion process. Per the BVCP, "the purpose of the study is to learn more about the feasibility and requirements to provide urban services to the area, and to understand potential phasing and logical areas of planning and potential expansion."

The USS provides an objective technical analysis of the feasibility, phasing, and potential costs of extending urban services into the Area III-Planning Reserve (Step 1). The outcomes of the study will help inform whether Planning Board and City Council wish to proceed with an evaluation of unmet community needs (Step 2) and then decide whether to initiate a Service Area expansion planning process (Step 3). Directed by the 2022 City Council, staff have prepared the USS over the last year.

The Area III-Planning Reserve (Planning Reserve) is approximately 500 acres in size and was identified through the 1993 Area III Planning Project as the portion of Area III where the city maintains the option of expansion for future urban development in response to priority community needs that cannot be met within the existing Service Area (Areas I and II). Nearly 200 acres of the 500 acres was acquired by the city and is designated for parks and related uses. Most of the remaining acreage is held in private ownership.

The BVCP states that "adequate urban facilities and services" are a prerequisite for new urban development. Urban services as defined by the BVCP specifically include:

- Public water
- Public sewer
- Stormwater and flood mitigation
- Urban fire protection and emergency medical care
- Urban police protection
- Multimodal transportation
- Developed urban parks

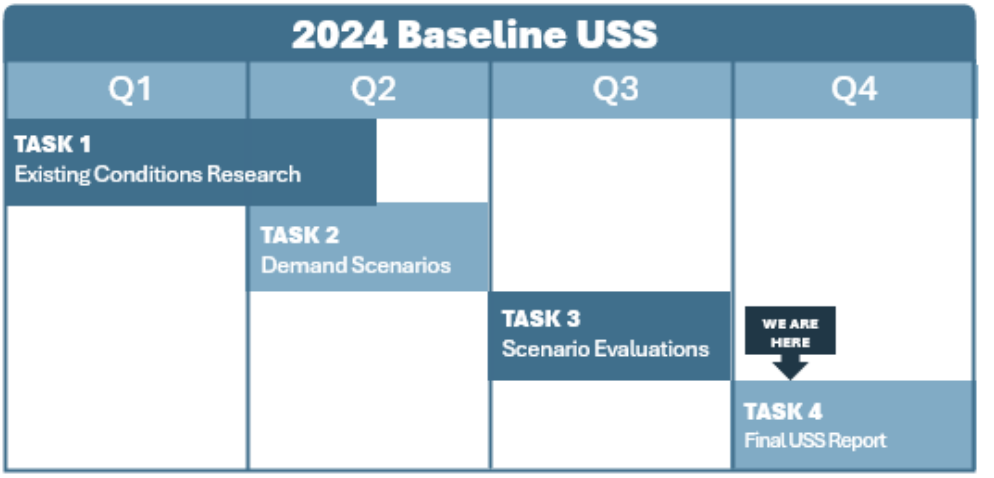
The USS project was led by the Planning & Development Services Comprehensive Planning team in collaboration with a consultant, AECOM, and various city departments directly responsible for providing urban services. The study will be reviewed by Planning Board and can be accepted by City Council as complete. The study provides an analysis of baseline data to help the Boulder community and decision-makers understand the potential scope, extent and feasibility of expanding city services to the area.

Project Timeline

Staff developed a 12-month timeline to complete the project and align it with the BVCP update. AECOM was hired to prepare the report in late 2023 and work officially began in

January 2024. Over the last ten months, comprehensive planning staff have been working with AECOM, other city departments providing urban services, the Finance Department and City Attorney's Office to complete the report. The project has proceeded as planned, apart from adding a fourth scenario to the originally planned three scenarios. This addition was in response to feedback from Planning Board and City Council to evaluate an option where a portion of the city-owned property was repurposed for housing uses rather than regional park uses.

Additionally, the team has prepared an Innovative Strategies section in the USS that identifies possible methods of mitigating the impacts of new urban development that can be further evaluated in future planning efforts, if the Service Area expansion process moves forward with acceptance of the USS by City Council. The final report is still on track to be completed by November 7, 2024.



ANALYSIS

The USS analyzed service demand scenarios to test potential infrastructure capacity and cost implications of Service Area expansion into the Area III-Planning Reserve. To assess cost implications across a realistic, yet hypothetical development timeframe, AECOM assessed the economic and fiscal impacts of each of the four scenarios across a 20-year conceptual development period, following an estimated 8-year period for planning and initial required infrastructure improvements. Based on Planning Board and City Council direction, the project team also developed a summary of innovation strategies that could be considered in the future to possibly mitigate some of the impacts of new urban development. Along with this analysis, and feedback from both Planning Board and City Council, the project team considered input from department staff responsible for providing the city's urban services. Their participation in this project was critical to its success.

Preliminary Service Demand Scenario Feedback (June 2024)
Key feedback from discussions with Planning Board & City Council is summarized below:

Non-Residential Square Footage

- **Discussion:** Staff were directed to explore scenarios where the Planning Reserve only provides neighborhood-serving commercial and services, rather than as a city or regional employment center.
- **Staff Response:** Staff revised the scenarios to reduce the amount of non-residential square footage to be more reflective of assuming only neighborhood-serving commercial and services.

Parks and Use of City-owned Land

- **Discussion:** Staff were asked to explore a fourth scenario option that would consider using a portion of the ~190 acres of land identified for a future regional park to increase the available city-owned land for residential development.
- **Staff Response:** Staff incorporated a fourth scenario in the USS that assumes a portion of the regional park land as additional residential area.

Assessing Water Resources and Infrastructure

- **Discussion:** Staff were asked to further assess water supply capacity and infrastructure capabilities to meet future demands, particularly under varying climate scenarios.
- **Staff Response:** The draft USS clearly describes potential impacts of the Area III-Planning Reserve demand scenarios on water resources and threshold limits identified through the analysis.

Engagement with Landowners and Community Members

- **Discussion:** A request was made for inclusive decision-making processes that incorporate diverse community voices and innovative approaches.
- **Staff Response:** As the USS was a technical study, community engagement was held at the Inform level. Staff are committed to robust and inclusive engagement strategies as part of future steps if the process continues after the USS.

Transportation and Infrastructure Planning

- **Discussion:** Concerns were raised about possible roadway expansion as a response to increased vehicle trips caused by additional development in the area.
- **Staff Response:** It is understood that additional trips along US-36 will need to be accommodated regardless of scenario. Partnerships with CDOT and RTD will be needed to support transportation demand management strategies and options to accommodate additional trips in alignment with the city's transportation policies and goals.

Housing and Population Trends

- **Discussion:** Interest was expressed in understanding how housing needs, affordability, demographic trends, and future population growth were factored into planning assumptions and scenario evaluations.
- **Staff Response:** The service demand scenarios used broad assumptions around housing densities to project order-of-magnitude impacts to infrastructure and finances rather than focusing on particular housing types or pricing. The

consultant team has clearly documented assumptions and rationale in the final draft USS.

Flexibility and Creativity in Analysis

- **Discussion:** Staff were asked to explore more creative and innovative approaches to the scenarios.
- **Staff Response:** Staff have clearly documented assumptions and rationale in the USS and the consultant has provided initial information on innovation strategies that can be explored in more detail during future steps to potentially mitigate the impacts of current policy and approaches.

The June 27, 2024 Study Session Summary memo, provides more detail on Council's discussion related to the preliminary service demand scenario development.

Area III-Planning Reserve USS Final Draft

As a technical analysis, the USS does not identify or evaluate policy implications of expansion, which are also important to consider and would be discussed in future steps. The report provides information to help staff and policy makers understand where demand intensities could hit thresholds outside of current capacity and/or the relative costs of extending urban services into the Area-III Planning Reserve. In other words, is there a "tipping point" where the cost and effort associated with potential expansion becomes infeasible, or simply where the possible impacts outweigh the benefits? The USS serves as a baseline for policy makers to decide if moving forward with continued exploration of expansion is appropriate at this time.

While it is a given that urban services and infrastructure would need to be extended to the Area III-Planning Reserve if expansion occurs, the extent of the level of effort and costs to do this is a matter of degrees. The scenarios evaluated in the USS represent points along a service demand scenario spectrum, intended to provide a range of possible outcomes, and to help Planning Board and City Council understand the implications at varying levels of urban development intensity.

AECOM initially framed physical capacity for development within the Planning Reserve across three service demand scenarios (Scenarios A, B, C) which were developed during an in-person workshop with staff from several City departments. Scenario D was developed after the project team received City Council and Planning Board feedback to re-purpose a portion of city-owned land set aside for a regional park in Scenarios A, B, and C for housing, and to reduce the overall amount of non-residential/commercial space.

The four resulting demand scenarios were evaluated by AECOM to frame incremental on- and off-site infrastructure requirements across water, wastewater, stormwater, and transportation systems. The resulting planning-level analyses were used to establish potential magnitudes of residential and commercial development with associated new residents and employees.

Rough order of magnitude construction and operating costs were developed to help frame future policymaking.

The USS includes the following sections:

- **Introduction:** Brief description of purpose and layout of report
- **Key Insights:** Brief overview of key takeaways related to urban services, the economic and fiscal analysis of the four scenarios tested and innovation strategies
- **Service Demand Scenarios:** Detailed description of the four service demand scenarios tested along with assumptions for each scenario
- **Urban Services Evaluations:** The evaluations describe infrastructure capacity and relative costs related to intensity of demand under each scenario
- **Innovation Strategies:** High level overview of strategies that could be considered in the future related to each of the seven urban services evaluated

The report and associated appendix include all assumptions used to both prepare the scenarios and perform the evaluations.

Key Insights

Water

- The maximum day water demands for the four scenarios indicate that the Planning Reserve could add approximately 10% to 16% of additional maximum day water demand to the current citywide build-out projections.
- Under current and mild climate change projections, the city's water supply system should satisfy the city's water supply reliability criteria (Reliability Criteria) under current build-out projections with each different Planning Reserve scenario added. However, under moderate to severe future climate projections, the inclusion of any of the Planning Reserve scenarios results in increased frequency of anticipated water use restrictions further beyond the standard established by the Reliability Criteria, including indoor water use restrictions under Scenario D.
- The water transmission and distribution system was not designed to supply water to the Planning Reserve. Offsite upgrades to increase distribution pipe sizes, expand water storage, and improve water treatment facilities would be required to meet the demands of the Planning Reserve. Some of these upgrades could be incorporated into system improvements that have already been identified to support current growth projections identified in the BVCP. The timing of these upgrades may vary based on the development schedule and scenario.

Wastewater

- Onsite improvements: The Planning Reserve's topography naturally slopes east/southeast, which is favorable for a gravity collection system.
- Wastewater demands under all scenarios would require approximately seven to eight miles of new backbone gravity main to serve the Planning Reserve, with gravity main sizing varying by scenario.
- All scenarios could potentially connect to the existing gravity collection system at one tie-in location near the intersection of Apple Way and 47th Street, which is approximately 1 mile east of the southeastern corner of the Planning Reserve.
- Off-site improvements: Several improvements to the City's existing wastewater infrastructure would be needed to serve the Planning Reserve, which include trunk sewer system modifications and wastewater treatment modifications.

- The addition of the Planning Reserve flows has potential to further stress the capacity of the Fourmile Trunk Sewer and could result in surcharge with a potential for sanitary sewer overflows during design rainfall events. The Fourmile Trunk Sewer would need to be upsized to increase the capacity of the pipeline, or a parallel sewer line would have to be constructed to convey the Planning Reserve flows.

Stormwater

- Existing stormwater collection infrastructure is limited, intermittent, old, and undersized, and all service demand scenarios would require stormwater collection improvements.
- There are no FEMA delineated floodplains in the Planning Reserve. A flood management study for the major storm runoff events for each watershed will need to be conducted to determine the natural flood corridors throughout the Planning Reserve.

Transportation

- It is understood that additional trips along US-36 will need to be accommodated regardless of scenario. The City of Boulder will need to partner with CDOT and RTD to support transportation demand management strategies and options to accommodate additional trips in alignment with the city's transportation policies and goals. As development intensity increases towards Scenario D, the number of trips may lead to capacity limitations where additional right-of-way could be needed. Additional right-of-way may need to be reserved as part of future urban development to provide space for additional bus lanes, bike lanes, multi-use paths and auxiliary lanes.

Developed Urban Parks

- To maintain the current Level of Service (LOS) by 2040, Boulder must utilize all existing undeveloped parkland for park uses, based upon total park land acreage (which includes developed and undeveloped park lands) and population projections. Boulder would maintain developed parkland levels of service for parkland acres per capita under Scenarios A, B, and C. Any reduction of the city's overall park land acres, such as described in Scenario D, which repurposes a portion of city-owned land for housing, is expected to impact Boulder's Level of Service. Beyond reducing the level of park service community members have experienced for decades, there are other considerations to be carefully evaluated, such as (but not limited to): equity and % of park space available in low-income neighborhoods, amenities not possible elsewhere in the system and more feasible at the Area III-Planning Reserve site, and the growing need for and pressure on public green spaces, community facilities and recreation amenities as Boulder densifies.

Capital Improvements Cost Estimates

- Estimated costs for onsite infrastructure, offsite improvements and parks development (conceptual only) within the Planning Reserve by scenario are described in the table below. Offsite improvement costs are expressed as a range and are generally applicable to all scenarios.

PLANNING RESERVE CAPITAL IMPROVEMENT COST ESTIMATES

	Scenario A	Scenario B	Scenario C	Scenario D
On-site Infrastructure	$136,229,000	$138,216,000	$147,287,000	$159,335,000
Off-site Improvements		$210,000,000 - $980,000,000		
Urban Parks Development	$306,893,000	$325,380,000	$325,380,000	$272,500,000

Notes: Figures have been rounded and are expressed in 2024 dollars. Capital Improvements Estimates: AECOM provided analysis and cost estimates for on-site infrastructure. City of Boulder provided rough order of magnitude (Class 5) cost estimates for offsite improvements and urban park development.

Economic & Fiscal Analysis

- Initial estimates of citywide sources and uses (excluding utilities) impacts are presented in the table below. These estimates are based on highly generalized assumptions regarding phasing of future development within the Planning Reserve.
- Revenues and net impacts are expressed as ranges and reflect the challenges of near-term forecasting of sales tax dollars in relation to broad changes, which have been in play since 2015, whereby sales tax dollars increasingly flow to where residents live and where stores are located. Given the conceptual nature of these assumptions, relationships between citywide sources and uses (excluding utilities) will evolve as off-site infrastructure decisions are made in the coming years.

FISCAL ANALYSIS SUMMARY (ROUNDED)
OPERATIONS & MAINTENANCE CITYWIDE (EXCLUDING UTILITIES)

	Scenario A	Scenario B	Scenario C	Scenario D
Citywide Sources (Excluding Utilities)	$305,800,000 - $547,000,000	$375,600,000 – 676,000,000	$459,000,000 - $835,000,000	$557,800,000 – $1,030,900,000
Citywide Uses (Excluding Utilities)	($501,000,000)	($629,800,000)	($784,900,000)	($923,500,000)
Citywide Net Impact	($195,200,000) - $46,000,000	($254,200,000) - $46,200,000	($325,900,000) - $50,100,000	($365,700,000) - $107,500,000

Note: Figures have been rounded. Estimates do not include capital costs. Citywide Sources (Excluding Utilities) include ad valorem taxes levied on the new assessed value of Area III-Planning Reserve improvements, estimated sales and use taxes, and planning and permitting fees related to improvements. Each revenue stream captured within identified Citywide Sources (Excluding Utilities) may flow to one or more City of Boulder funds. Citywide Uses (Excluding Utilities) include an estimated total for all City of Boulder budgetary departments, excluding utilities, combining multiple sources and funds.

Innovation Strategies

- Additional strategies and goals centered on sustainability and innovation could be considered for the Planning Reserve in future policymaking and planning stages of the Service Area Expansion process.
- Incorporating innovative strategies and advancements into a strategic planning process require regular planning updates and baseline evaluations to inform improvement modeling and develop comprehensive cost/benefit analyses. Monitoring performance over time is key to implementation efforts and allows for adaptations to emerging challenges or opportunities.

The full USS final draft report provides more detail on all four scenario evaluations, methodologies and assumptions used, and innovation strategies that could be considered for future Service Area expansion (Attachment A).

NEXT STEPS

If Council accepts the USS, a joint public hearing with Planning Board will be held on November 14, 2024.

This hearing is required to determine if there is interest in considering a Service Area expansion as part of the BVCP update. It will offer community members the opportunity to share their thoughts on whether to continue exploring expansion of the city into the Planning Reserve.

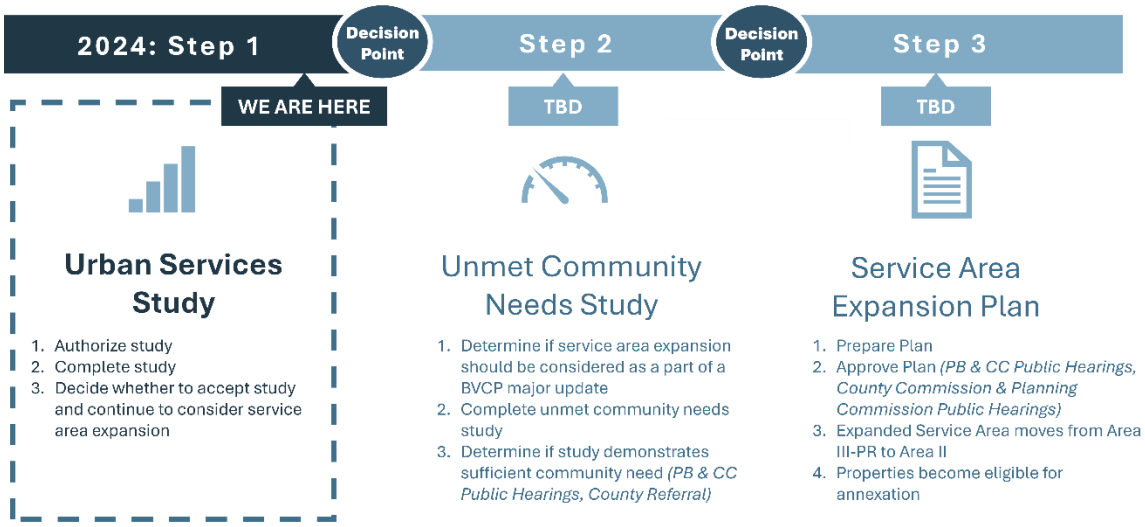
After the joint public hearing:

- November 19, 2024: Planning Board will deliberate and vote on authorizing Step 2 of the Service Area expansion process - a Community Needs Study
- November 21, 2024: City Council will deliberate and vote on authorizing Step 2 of the Service Area expansion process – a Community Needs Study.

If there is such interest from both bodies, a planning effort to solicit and identify priority community needs will be incorporated into the BVCP Major Update process (Step 2 of the Service Area expansion process). If both bodies do not authorize a community needs study, Service Area expansion cannot be considered until the next BVCP update.

If the community needs study is authorized and completed, public hearings with City Council and Planning Board will be held to determine if the community needs are of sufficient priority to warrant preparation of a Service Area Expansion Plan. Prior to the public hearings, the identified needs will be referred to the county. If it is determined that there is sufficient need, the final step (Step 3) of the Service Area Expansion process, a Service Area Expansion Plan, would be initiated. Staff would then prepare the plan, and it would be considered for approval through public hearings with Planning Board and City Council, along with Boulder County Planning Commission and Board of County Commissioners. If approved, all or portions of the Area III-Planning Reserve will move from Area III-Planning Reserve to Area II and properties within Area II will become eligible for annexation.

The entire Service Area Expansion process is outlined in Appendix B of the Boulder Valley Comprehensive Plan (BVCP).



ATTACHMENT(S)

Attachment A – Area III-Planning Reserve Urban Services Study Final Draft
Attachment B – Area III-Planning Reserve Urban Services Study Appendix

Area III-Planning Reserve Urban Services Study

Evaluation Report - Final Draft

Prepared for: City of Boulder

November 7, 2024

Quality information

Prepared by	Checked by	Verified by	Approved by
Sarah Murphy	Chris Brewer		

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Prepared for:

Prepared for: City of Boulder

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Tables

1. Introduction

The City of Boulder (City) engaged AECOM Technical Services, Inc. (AECOM) to support the Area III-Planning Reserve Urban Services Study (USS). This study is a preliminary step to help decisionmakers and the broader Boulder community understand the conceptual feasibility, scope, and cost implications associated with the future provision of city services to this area, and to weigh the potential benefits and risks in enabling the future annexation and development in this area. The 493-acre Area III-Planning Reserve (Planning Reserve) is situated on the north side of Boulder. The City of Boulder maintains the option to expand future urban development in the Planning Reserve in response to priority community needs that cannot be met within the existing Service Area (Areas I and II as defined in the Boulder Valley Comprehensive Plan).

The USS provides an understanding of how existing infrastructure and city services could extend into the Planning Reserve; describes the type and extent of city services needed in the Planning Reserve under a range of service demand scenarios; develops an initial understanding of potential impacts, costs, and policy considerations of providing city services under each scenario; and gives decision-makers information to help them determine if the City should continue to explore expanding into the Planning Reserve. Urban services that are defined in the Boulder Valley Comprehensive Plan and will be analyzed through the USS include public water, public sewer, stormwater and flood management, urban fire protection and emergency medical care, urban police protection, multimodal transportation and developed urban parks.

2. Key Insights

AECOM initially framed physical capacity for development within the Planning Reserve across three Service Demand Scenarios (Scenarios A, B, C) which were developed during an in-person workshop with staff from several City departments. Scenario D was developed after the project team received City Council and Planning Board feedback which highlighted an opportunity to re-purpose a portion of city-owned land set aside for a regional park in Scenarios A, B, and C for housing, and to reduce the overall amount of non-residential/commercial space.

The four resulting demand scenarios were evaluated by AECOM to frame incremental on- and off-site horizontal infrastructure requirements across water, wastewater, stormwater, and transportation systems, such that rough order of magnitude construction and operating costs can be framed to help City officials begin to understand the policy implications of future development of the Planning Reserve. Resulting planning-level analyses were used to frame potential magnitudes of residential and commercial development with associated new residents and jobs. These estimates were then leveraged to frame potential impacts on city infrastructure and services. Key caveats include:

1. The analysis presumes that actual future residential and commercial development of the Planning Reserve is at least 10-15 years in the future.
2. Only basic assumptions have been made regarding how the Planning Reserve will actually develop from a policy or development standpoint, and potential roles to be played by property owners, future developers, regional utilities, or the City of Boulder remain uncertain.
3. While AECOM has identified rough order of magnitude costs associated with potential on-site horizontal infrastructure, it is premature to assume that the City of Boulder would alone bear 100% of these potential costs.
4. All estimates (construction costs, revenues, and operating expenses) are considered planning level, conceptual in nature and subject to change.

The following key insights have been identified:

2.1 Water

- Estimated maximum day water demands for the four scenarios suggest that the Planning Reserve could add approximately 10% to 16% of additional maximum day water demand to current citywide build-out projections.
- Under projected build-out demands that include all Planning Reserve Scenarios (A-D) and climate conditions that range from current climate up to mild climate change, the City’s water supply system should satisfy the City’s water supply reliability criteria (Reliability Criteria). However, under moderate to severe future climate scenarios, the inclusion of any of the Planning Reserve scenarios results in increased frequency of anticipated water use restrictions further beyond the standard established by the Reliability Criteria, including indoor water use restrictions under Scenario D.
- The City of Boulder water transmission and distribution system was not designed to supply water to the Planning Reserve, and as a result, additional offsite upgrades to increase distribution pipe sizes, expand treated water storage, and improve water treatment facilities would be required to meet future demand. Some upgrades can be incorporated into system improvements that have already been identified. The timing of these upgrades will vary based on how future development of the Planning Reserve unfolds in the future.

2.2 Wastewater

- Several improvements to the City's existing wastewater infrastructure would be needed to serve the Planning Reserve, which include trunk sewer system modifications and wastewater treatment modifications.

- The addition of the Planning Reserve flows has potential to further stress the capacity of the Fourmile Trunk Sewer and could result in surcharge with a potential for sanitary sewer overflows during design rainfall events. The Fourmile Trunk Sewer would need to be upsized to increase the capacity of the pipeline, or a parallel sewer line would have to be constructed to convey Planning Reserve flows.
- The Planning Reserve's topography naturally slopes east/southeast, which is favorable for a gravity collection system. Under all scenarios approximately seven to eight miles of new backbone gravity main would be required to serve the Planning Reserve, with gravity main sizing varying by scenario.
- All scenarios could potentially connect to the Fourmile Trunk Sewer (or a parallel relief sewer) at one tie-in location approximately one mile east of the southeastern corner of the Planning Reserve.

2.3 Stormwater & Flood Management

- Existing stormwater collection infrastructure is limited, intermittent, old, and undersize; all Service Demand Scenarios would require stormwater collection improvements.
- There are no FEMA delineated floodplains in the Planning Reserve. A flood management study for the major storm runoff events for each watershed will need to be conducted to determine the natural flood corridors throughout the Planning Reserve.

2.4 Transportation

- A conventional traffic analysis indicates that across all four scenarios, US-36 will need to accommodate additional trips regardless of scenario. As development intensity increases towards Scenario D, the number of trips may lead to capacity limitations where additional right-of-way may be needed to accommodate various multimodal facilities. The City of Boulder will need to partner with CDOT and RTD to support transportation demand management strategies and options to accommodate additional trips in alignment with the city's transportation policies and goals. Additional right-of-way may need to be reserved as part of future planning efforts for the Planning Reserve to ensure that future bus lanes, bike lanes, multi-use paths and auxiliary lanes are available based on demand.

2.5 Developed Urban Parks

- To maintain the current Level of Service (LOS) by 2040, Boulder will need to utilize all existing undeveloped parkland for park uses, based upon total park land acreage (which includes developed and undeveloped park lands) and population projections. Boulder would maintain developed parkland levels of service for parkland acres per capita under Scenarios A, B, and C.
- Any reduction of the city's overall park land acres, such as described in Scenario D which repurposes a portion of city-owned land for housing, is expected to impact Boulder's Level of Service.
- Beyond reducing the level of park service community members have experienced for decades, there are other considerations to be carefully evaluated, such as (but not limited to): equity and percent of park space available in low-income neighborhoods, amenities not possible elsewhere in the system and more feasible within the Area III-Planning Reserve, and the growing need for and pressure on public green spaces, community facilities and recreation amenities as Boulder densifies.

2.6 Police Protection

- Police response services in the Planning Reserve are currently managed by the Boulder County Sheriff's Office. Should the land be annexed into the City of Boulder, police response services

would shift to the Boulder Police Department. The Planning Reserve is assigned to District 1 and can be served by the North Foothills Police Annex.

- Anticipated increases in population associated with increased calls for service in the Planning Reserve are likely to necessitate a reassessment of district operations and current district boundaries. The resulting reassessment may identify the need for additional staff (inclusive of patrol office and detective) and equipment. There are no immediate Police real estate impacts in North Boulder resulting from the service demand scenario-defined population and employee growth within the Planning Reserve.

2.7 Urban Fire Protection & Emergency Medical Care

- Boulder Fire Station 5, at the corner of 19th Street and Violet Avenue, is the closest station to the Planning Reserve. Station 5 houses a three-person engine company and responds to approximately 1,100 emergency calls per year.
- It is not anticipated that an additional fire station or staff would be required under the assumptions of the four service demand scenarios, and current equipment inventories are also considered appropriate for the level of fire risk within the Planning Reserve. Based on service trends, approximately 80% of call volume is medical, and additional population density within the Planning Reserve may require adding ambulance capacity.
- Within the Planning Reserve, wildfire risk has been identified as a primary concern. The City of Boulder's 2024 update to the Community Wildfire Protection Plan (CWPP) recommends strategies to enhance wildfire safety and reduce risk, such as clearing vegetation and flammable materials to increase defensible space around a structure, requiring adherence to ignition-resistant construction standards for new construction, and routine vegetation management. Future strategies for wildfire risk management may influence how the Planning Reserve develops, in terms of allowed construction materials, setbacks between buildings, and related regulatory elements.

2.8 Capital Improvements Cost Estimates

- Table 1, below, summarizes estimated costs for onsite infrastructure, offsite improvements and parks development within the Planning Reserve, by scenario. The offsite improvements costs are expressed as a range and are generally applicable to all scenarios.
- Identified capital costs for urban parks are conceptual and will change as policy decisions around the role and purpose of park land in City of Boulder ownership evolve in coming years.

Table 1. Planning Reserve Capital Improvement Cost Estimates[1]

	Scenario A	Scenario B	Scenario C	Scenario D
Onsite Infrastructure	$136,229,000	$138,216,000	$147,287,000	$159,335,000
Offsite Improvements	$210,000,000 - $980,000,000			
Urban Parks Development	$306,893,000	$325,380,000	$325,380,000	$272,500,000

Note: Figures have been rounded and are expressed in 2024 dollars.

[1] Capital Improvements Estimates: AECOM provided analysis and cost estimates for horizontal infrastructure (onsite improvements). City of Boulder provided rough order of magnitude (Class 5) cost estimates for offsite improvements and urban park development.

2.9 Economic & Fiscal Analysis

- The table below summarizes initial estimates regarding future Citywide sources and uses across the four scenarios. The fiscal revenue analysis is primarily focused on typical Citywide Sources from property tax, sales and use taxes, and permitting fees.
- Revenues ('sources') and net impacts are expressed as ranges, reflecting the challenges of near-term and long-term forecasting of sales tax dollars in relation to broad changes, which have been in play since 2015, whereby sales tax dollars increasingly flow to where residents live and where stores are located. Given the conceptual nature of these assumptions, relationships between citywide sources and uses (excluding utilities) will evolve as off-site infrastructure decisions are made in the coming years
- The analysis is based on framework assumptions regarding a 20-year buildout of the Planning Reserve, and reflect operating and maintenance costs, not capital costs.
- If urban development were to be established in the Planning Reserve, the initial conceptual calculation estimate of on-going operations and maintenance costs borne by the city could potentially be covered by municipal revenues. However, these estimates are based on highly generalized assumptions regarding phasing of future development within the planning reserve, societal shifts affecting the local capture of sales taxes and future policy decisions related to off-site infrastructure.

Table 2. Fiscal Analysis Summary (Rounded), Operations & Maintenance, Citywide (Excluding Utilities)

	Scenario A	Scenario B	Scenario C	Scenario D
Citywide Sources (Excluding Utilities)	$305,800,000 - $547,000,000	$375,600,000 - $676,000,000	$459,000,000 - $835,000,000	$557,800,000 - $1,030,900,000
Citywide Uses (Excluding Utilities)	($501,000,000)	($629,800,000)	($784,900,000)	($923,500,000)
Citywide Net Impact	($195,200,000) - $46,000,000	($254,200,000) - $46,200,000	($325,900,000) - $50,100,000	($365,700,000) - $107,500,000

Note: Figures have been rounded. Estimates do not include capital costs. Citywide Sources (Excluding Utilities) include ad valorem taxes levied on the new assessed value of Area III-Planning Reserve improvements, estimated sales and use taxes, and planning and permitting fees related to improvements. Each revenue stream captured within identified Citywide Sources (Excluding Utilities) may flow to one or more City of Boulder funds. Citywide Uses (Excluding Utilities) include an estimated total for all City of Boulder budgetary departments, excepting utilities, combining multiple sources and funds.

2.10 Innovation Strategies

- Additional strategies and goals centered on sustainability and innovation could be considered for the Planning Reserve in future policymaking and planning stages of the Service Area Expansion process.
- Incorporating innovative strategies and technology advancements into a strategic planning processes require regular planning updates and baseline evaluations to inform improvement modeling and develop comprehensive cost/benefit analyses. Monitoring performance over time is key to implementation efforts and allows for adaptations to emerging challenges or opportunities.

3. Service Demand Scenarios

AECOM leveraged urban planning tools and a two-hour, in-person workshop with staff from several City departments to frame the physical capacity for development within the Planning Reserve across a range of Service Demand Scenarios considering factors related to slope, topography, property ownership,

transportation networks, and other potential constraints on development to help define developable acreage.

Three Service Demand Scenarios (Scenarios A, B, C) were developed during the workshop to illustrate the feasibility and impacts of providing municipal services to the Planning Reserve. A fourth Service Demand Scenario (Scenario D) was developed in response to feedback received from Boulder City Council and Planning Board members, highlighting an opportunity to re-purpose a portion of city-owned land set aside for a regional park for residential use and to reduce the overall amount of non-residential/commercial space.

The scenarios are points on a spectrum of potential development outcomes, and they are not intended to represent choices, or the only available options. They are intended to capture possible bookends of potential demand to model urban service needs. The purpose of scenario development is to understand the big picture infrastructure and urban service needs for a wide variety of possible outcomes so the city can make informed future decisions, not to decide which scenario is the best fit. Future planning processes will evaluate the policy implications and levels of community support of different outcomes.

The four scenarios identify a variety of land uses within the Planning Reserve, and each scenario estimates an amount of residential units, population, gross floor area of non-residential use (including commercial, industrial, and public/community services), and employees. Each scenario also includes preliminary identification of the network of local and collector streets and multi-use paths needed to connect the Planning Reserve to Boulder west and south of US-36.

3.1.1 Service Demand Scenario Summary

The table below shows a summary comparison of the conceptual development assumptions for four scenarios (A, B, C, and D). The team attempted to frame a range of outcomes on a spectrum of potential development features that would help identify critical infrastructure upgrades and test the feasibility of service area expansion under different conditions.

Table 3. Scenario Summary Comparison, Rounded

Estimated Outcomes	Scenario A	Scenario B	Scenario C	Scenario D
Residential Units	4,300	5,300	6,700	8,700
Population	9,400	11,600	14,500	19,000
Non-Residential Gross Floor Area (GSF)	725,000	972,000	1,004,000	499,000
Employment (Jobs)	1,900	2,700	3,100	1,500
Park – Regional (Acres)	189	189	189	91
Park – Neighborhood (Acres)	16	28	28	30

Note: Figures have been rounded.

AECOM worked with City of Boulder staff to define a set of general assumptions used to inform scenario outcomes. Table 4, below, details the assumptions applied to all scenarios.

Table 4. Service Demand Scenario Assumptions

Scenario Element	Assumption
Residential	Measured in units per acre (Units/Acre)
Low Density	12 Units/Acre
Medium Density	30 Units/Acre
High Density	50 Units/Acre
Mixed Use (Residential)	35 Units/Acre

Scenario Element	Assumption
	3-4 story building, ¼ to commercial, ¾ to residential
People per Dwelling Unit	2.18
Non-Residential	
Mixed Use (Commercial)	3-4 Story building, ¼ to commercial, ¾ to residential
Job Creation	Measured in square feet per employee (SF/Employee)
Mixed Use	303 SF/Employee
Business Use	285 SF/Employee
Public/Community Services	326 SF/Employee
Light Industrial ("Maker Space")	600 SF/Employee

3.1.2 Scenario Details

Each scenario is detailed below, with pie charts demonstrating identified land uses, and tables summarizing estimated outcomes, including high-level onsite capital improvements and urban parks construction cost estimates.[2]

3.1.2.1 Scenario A

Land Use Summary

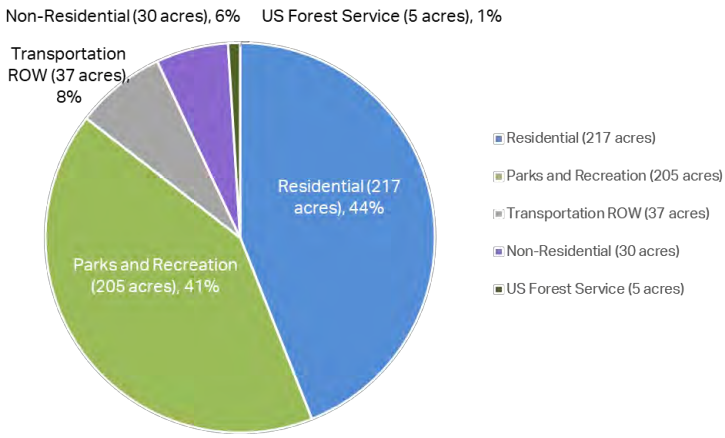

Figure 1. Scenario A Land Use

Scenario Details

Table 5. Scenario A Details

Land Use	Acres	% of Total	GSF	Employees	Units	Population
Residential	**217**	**44%**			**4,300**	**9,400**
Low Density	136	28%			1,600	

[2] AECOM provided analysis and cost estimates for horizontal infrastructure (onsite improvements). City of Boulder provided rough order of magnitude cost estimates for urban park development. Additional detail for urban park development estimates can be found in Section 4.5.1.

Land Use	Acres	% of Total	GSF	Employees	Units	Population
Medium Density	59	12%			1,800	
High Density	7	2%			400	
Mixed Use (Residential)	15	3%			500	
Non-Residential	**30**	**6%**		**1,900**		
Mixed Use (Commercial)	5	1%	129,000	400		
Business/Office	7	2%	113,000	400		
Public/Community	5	1%	215,000	700		
Light Industrial	12	3%	268,000	400		
Parks & Recreation	**205**	**42%**				
Regional Park	189	38%				
Neighborhood Park	16	3%				
Transportation	**37**	**8%**				
Road (Collector)	15	3%				
Road (Local)	17	4%				
Multi-Use Trail	5	1%				
Federal, US Forest Service	5	1%				
TOTAL	**493**		**725,000**	**1,900**	**4,300**	**9,400**

Note: Figures have been rounded. Column and category totals may not sum exactly due to rounding.

Cost Estimates for On-Site Improvements

Table 6. Cost Estimates, Scenario A (Onsite Improvements and Parks)

Infrastructure	Quantity	Unit of Measurement (UoM)	Rate	Estimated Construction Cost
Road – Collector (70’ ROW)	15	Acre	$1,606,000	$23,752,000
Road – Local (50’ ROW)	17	Acre	$1,638,000	$28,270,000
Multi-Use Trail (12’ W)	5	Acre	$543,000	$2,677,000
Water Infrastructure	493	Acre	$83,000	$34,116,000
Wastewater Infrastructure	493	Acre	$57,000	$32,624,000
Stormwater Management	493	Acre	$30,000	$14,791,000
Sub Total – Sitework, Scenario A	*493*	*Acre*	*$276,000*	*$136,229,000*
Parks	205	Acre	$1,500,000	$306,893,000
TOTAL – SCENARIO A				**$443,122,000**

NOTE: Column and category totals may not sum exactly due to rounding. Cost estimates are expressed in Q3 2024 dollars. The Parks cost estimate assumed a per-acre cost of $1,500,000 for both regional and neighborhood park types.

3.1.2.2 Scenario B

Land Use Summary

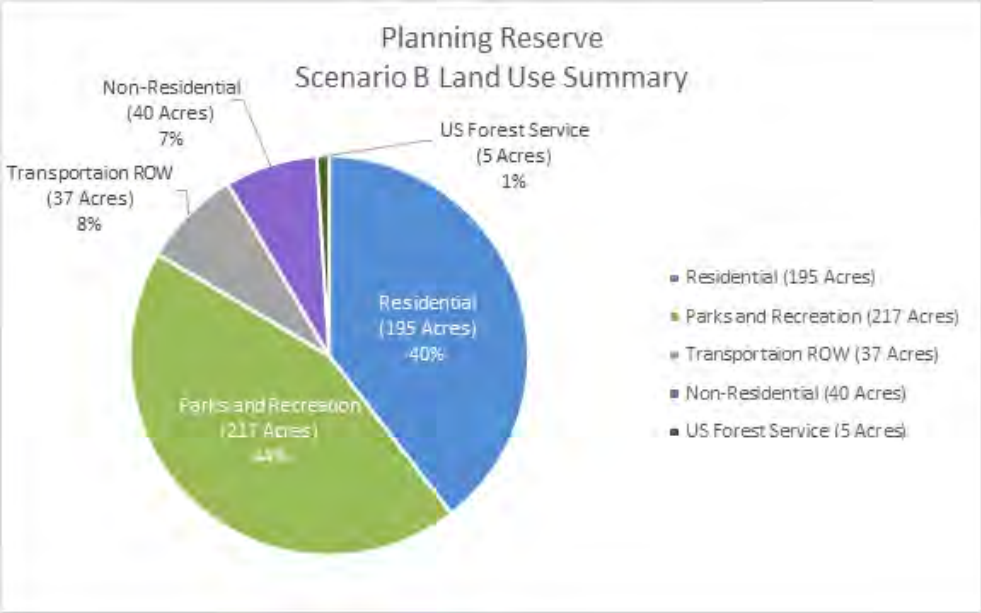

Figure 2. Scenario B Land Use Summary

Scenario Details

Table 7. Scenario B Details

Land Use	Acres	% of Total	GSF	Employees	Units	Population
Residential	**195**	**40%**			**5,300**	**11,600**
Low Density	49	10%			600	
Medium Density	111	23%			3,300	
High Density	12	3%			500	
Mixed Use (Residential)	22	5%			800	
Non-Residential	**40**	**8%**		**2,700**		
Mixed Use (Commercial)	7	2%	193,000	600		
Business/Office	12	3%	188,000	600		
Public/Community	7	2%	322,000	1,000		
Light Industrial	12	3%	268,000	400		
Parks & Recreation	**217**	**44%**				
Regional Park	189	38%				
Neighborhood Park	28	6%				
Transportation	**37**	**8%**				
Road (Collector)	15	3%				
Road (Local)	17	4%				
Multi-Use Trail	5	1%				
Federal, US Forest Service	5	1%				

Land Use	Acres	% of Total	GSF	Employees	Units	Population
Total	**493**		**972,000**	**2,700**	**5,300**	**11,600**

Note: Figures have been rounded. Column and category totals may not sum exactly due to rounding.

Cost Estimates for On-Site Improvements

Table 8. Cost Estimates, Scenario B (Onsite Improvements and Parks)

Infrastructure	Quantity	UoM	Rate	Estimated Construction Cost
Road – Collector (70' ROW)	15	Acre	$1,546,000	$23,752,000
Road – Local (50' ROW)	17	Acre	$1,638,000	$28,270,000
Multi-Use Trail (12' W)	5	Acre	$543,000	$2,677,000
Water Infrastructure	493	Acre	$86,000	$34,659,000
Wastewater Infrastructure	493	Acre	$60,000	$34,067,000
Stormwater Management	493	Acre	$30,000	$14,791,000
Subtotal – Sitework, Scenario B	*493*	*Acre*	*$280,000*	*$138,215,000*
Parks	217	Acre	$1,500,000	$325,380,000
TOTAL – SCENARIO B				**$463,595,000**

Note: Column and category totals may not sum exactly due to rounding. Cost estimates are expressed in Q3 2024 dollars. The Parks cost estimate assumed a per-acre cost of $1,500,000 for both regional and neighborhood park types.

3.1.2.3 Scenario C

Land Use Summary

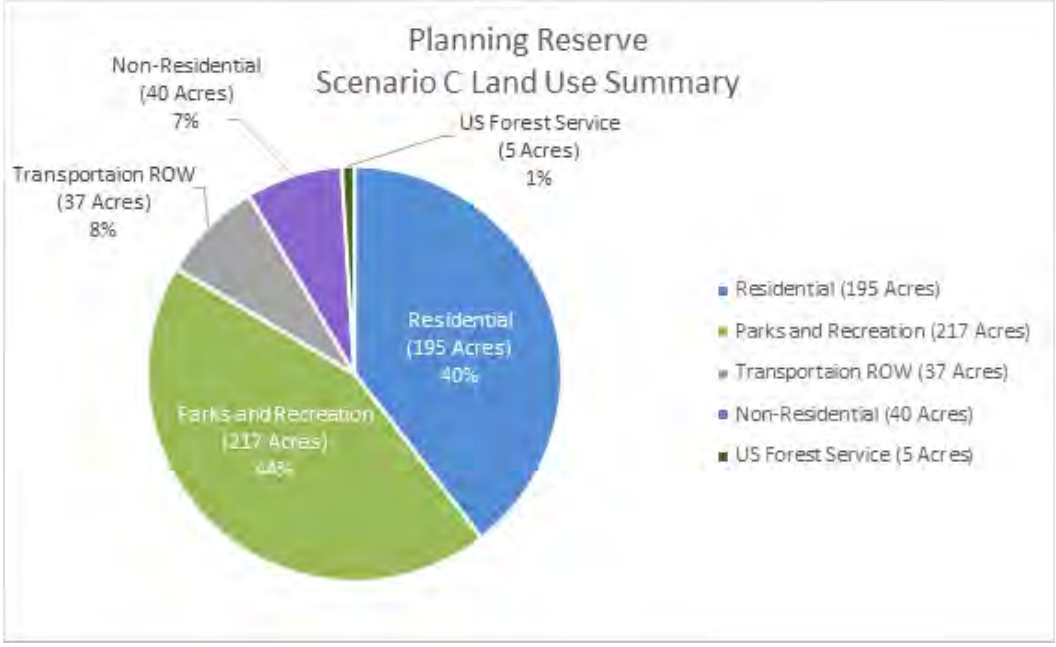

Figure 3. Scenario C Land Use Summary

Scenario C Details

Table 9. Scenario C Details

Land Use	Acres	% of Total	GSF	Employees	Units	Population
Residential	**195**	**40%**			**6,700**	**14,500**
Low Density	25	5%			300	
Medium Density	74	15%			2,200	
High Density	52	11%			2,600	
Mixed Use (Residential)	44	9%			1,600	
Non-Residential	**40**	**8%**		**3,100**		
Mixed Use (Commercial)	15	3%	387,000	1,300		
Business/Office	12	3%	188,000	600		
Public/Community	7	2%	322,000	1,000		
Light Industrial	5	1%	107,000	200		
Parks & Recreation	**217**	**44%**				
Regional Park	189	38%				
Neighborhood Park	28	6%				
Transportation	**37**	**8%**				
Road (Collector)	15	3%				
Road (Local)	17	4%				
Multi-Use Trail	5	1%				
Federal, US Forest Service	5	1%				
TOTAL	**493**		**1,004,000**	**3,100**	**6,700**	**14,500**

Note: Figures have been rounded. Column and category totals may not sum exactly due to rounding.

Cost Estimates

Table 10. Cost Estimates, Scenario C (Onsite Improvements and Parks)

Infrastructure	Quantity	UoM	Rate	Estimated Construction Cost
Road – Collector (70’ ROW)	15	Acre	$1,546,000	$22,870,000
Road – Local (50’ ROW)	17	Acre	$1,638,000	$28,270,000
Multi-Use Trail (12’ W)	5	Acre	$543,000	$2,677,000
Water Infrastructure	493	Acre	$91,000	$36,441,000
Wastewater Infrastructure	493	Acre	$71,000	$41,357,000
Stormwater Management	493	Acre	$30,000	$14,791,000
Subtotal – Sitework, Scenario C	*493*	*Acre*	*$299,000*	*$147,287,000*
Parks	217	Acre	$1,500,000	$325,380,000
TOTAL – SCENARIO C				**$472,667,000**

Note: Column and category totals may not sum exactly due to rounding. Cost estimates are expressed in Q3 2024 dollars. The Parks cost estimate assumed a per-acre cost of $1,500,000 for both regional and neighborhood park types.

3.1.2.4 Scenario D

Land Use Summary

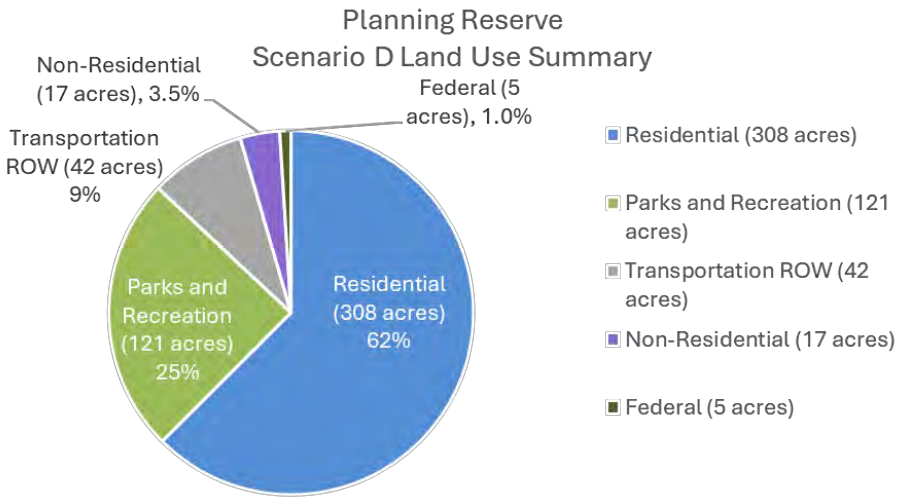

Figure 4. Scenario D Land Use Summary

Scenario D Details

Table 11. Scenario D Details

Land Use	Acres	% of Total	GSF	Employees	Units	Population
Residential	**308**	**63%**			**8,700**	**19,000**
Low Density	64	13%			800	
Medium Density	197	40%			5,900	
High Density	25	5%			1,200	
Mixed Use (Residential)	22	5%			800	
Non-Residential	**17**	**4%**	**499,000**	**1,500**		
Mixed Use (Commercial)	7	2%	193,000	600		
Business/Office	2	1%	38,000	100		
Public/Community	5	1%	215,000	700		
Light Industrial	2	1%	54,000	100		
Parks & Recreation	**121**	**25%**				
Regional Park	91	19%				
Neighborhood Park	30	6%				
Transportation	**42**	**9%**				
Road (Collector)	22	5%				
Road (Local)	15	3%				
Multi-Use Trail	5	1%				
Federal, US Forest Service	5	1%				

Land Use	Acres	% of Total	GSF	Employees	Units	Population
TOTAL	**493**		**499,000**	**1,500**	**8,700**	**19,000**

Note: Figures have been rounded. Column and category totals may not sum exactly due to rounding.

Cost Estimates

Table 12. Cost Estimates, Scenario D (Onsite Improvements and Parks)

Infrastructure	Quantity	UoM	Rate	Estimated Construction Cost
Road – Collector (70’ ROW)	22	Acre	$1,487,000	$34,312,000
Road – Local (50’ ROW)	15	Acre	$1,398,000	$20,679,000
Multi-Use Trail (12’ W)	5	Acre	$543,000	$2,677,000
Water Infrastructure	493	Acre	$87,000	$42,748,000
Wastewater Infrastructure	493	Acre	$76,000	$43,999,000
Stormwater Management	493	Acre	$30,000	$14,920,000
Subtotal – Sitework, Scenario D	*493*	*Acre*	*$327,000*	*$159,335,000*
Parks	121	Acre	$2,252,000	$272,500,000
TOTAL – SCENARIO D				**$431,835,000**

NOTE: Column and category totals may not sum exactly due to rounding. Cost estimates are expressed in Q3 2024 dollars. The Parks cost estimate in Scenario D assumed a per-acre cost of $1,500,000 for the neighborhood park type and a per-acre cost of $2,500,000 for the regional park type.

4. Urban Services Evaluations

4.1 Water

The City of Boulder does not have existing water or wastewater infrastructure within the Planning Reserve. A high-level evaluation was conducted to estimate the water supply, water infrastructure, and wastewater infrastructure needed to serve the Planning Reserve which would generally include large diameter waterlines, sufficient water treatment and storage capacity, large diameter wastewater gravity mains, and sufficient wastewater treatment capacity.

4.1.1 Water Supply, Demand, and Infrastructure Sizing Criteria

Water demand and infrastructure sizing criteria were compiled to calculate the water demands and size the water infrastructure needed for the Planning Reserve. The water demand and infrastructure sizing criteria are primarily based on the Boulder Design and Construction Standards (DCS), historic water use data, and the 2023 Water Efficiency Plan. A few criteria were sourced from the 2019 Boulder Water Transmission Study. The water demand and infrastructure sizing criteria can be referenced in Appendix B.

The DCS are the City's engineering requirements for sizing water and wastewater infrastructure. The DCS water demand criteria are more conservative than typical customer water usage within the City because they incorporate safety factors to ensure adequate sizing of infrastructure (e.g., sufficient water supply is available for fire-fighting purposes). Therefore, water use criteria from the 2023 Water Efficiency Plan and historic water use data were selected to calculate customer water usage to understand the volume of water supply needed to serve the Planning Reserve. These criteria are based on Boulder's recent water use as summarized in the 2023 Water Efficiency Plan, and already factor in significant water savings seen within the community since the early 2000's. Additionally, Boulder updates its water efficiency plan every seven years, which includes a detailed review of current water use trends and updates to the city's buildout water demand projections based on those trends and applicable future water saving measures.

4.1.2 Water Demands for Treated Water Infrastructure Sizing and Safety

As mentioned above, water demands were developed using the DCS to understand 1) the approximate size of onsite water infrastructure needed and 2) potential existing system improvements that would likely be needed to serve the Planning Reserve. The average day and maximum day water demands used to size infrastructure for the Planning Reserve are shown below.

Table 13. Average Day and Max Day Water Demands for Infrastructure Sizing

Scenario	Average Day Water Demand (mgd)	Maximum Day Water Demand (mgd)
Scenario A	2.0	4.9
Scenario B	2.4	5.9
Scenario C	2.7	6.6
Scenario D	3.1	7.7

Average day water demands represent the average amount of water delivered by the water distribution system to customers (including indoor and outdoor use) in a single day. The average day water demands for the Planning Reserve range from 2 million gallons per day (mgd) for Scenario A to 3.1 mgd for Scenario D. In comparison, the average day water demand for the city from 2008 through 2018 was approximately 16.1 mgd and the projected buildout average day water demand for the city without the Planning Reserve is estimated to be approximately 22.7 mgd (2019 Boulder Water Transmission Study). The average day water demands for the four scenarios indicate that the Planning Reserve could add approximately 9% to 14% of additional average day water demand to the current citywide build-out projections.

The maximum day water demands, which represent the largest amount of water delivered by the water distribution system to customers in a single day, ranges from 4.9 mgd for Scenario A to 7.7 mgd for Scenario D. For comparison, the maximum day water use for the city from 2008 through 2018 was approximately 33.7 mgd and the buildout maximum day water demand is projected to be approximately 47.0 mgd (2019 Boulder Water Transmission Study). The maximum day water demands for the four scenarios indicate that the Planning Reserve could add approximately 10% to 16% of additional water demand to the current citywide buildout projections.

4.1.3 Onsite Treated Water Infrastructure Improvements

Potential onsite transmission and distribution (T&D) waterlines and treated water storage infrastructure needed to serve the Planning Reserve were developed through a high-level evaluation based on estimated land use types, calculated water demands, DCS design criteria, and professional engineering judgement. All infrastructure sizes are approximate and will need to be verified through more detailed design and hydraulic analyses in the future.

4.1.3.1 Treated Water Storage

Additional treated water storage will also be necessary to accommodate the Planning Reserve. Scenario A, with the lowest demands, would require approximately 3.7 million gallons of additional storage while Scenario D, with the highest demands, would require approximately 5.1 million gallons of additional storage. Potential options for additional storage are discussed below in the Offsite Treated Water Infrastructure Improvements (see Section 4.1.4).

4.1.3.2 Waterlines

It is estimated that the four Scenarios would require approximately eight to nine miles of backbone waterlines ranging from 12-inches to 24-inches in diameter. Scenario A, with the lowest overall development intensity would have the smallest backbone pipe diameters ranging from 12 to 16-inches, while Scenario D with the highest overall development intensity would have larger backbone pipe diameters ranging from 12 to 24-inches. The onsite T&D infrastructure would need to connect to the existing water T&D system at a minimum of six tie-in locations, which would cross US-36. These proposed T&D improvements do not include smaller diameter waterlines that would need to be designed and constructed for individual development sites throughout the Planning Reserve.

4.1.3.3 Pressure Reducing Valves and Booster Pump Station

The City's existing T&D system has three Pressure Zones, which are distinct areas within the T&D system where water pressure is maintained within a specified range and are separated by pressure-reducing valves and booster pump stations. The Planning Reserve connects to the existing T&D infrastructure in two Pressure Zones: Zones 2 and 3. To allow water to travel between the pressure zones, one pressure reducing station would be necessary and would include three pressure relief valves and two booster pumps.

4.1.3.4 Onsite Treated Water Infrastructure Cost Estimates

Estimates for onsite treated water infrastructure include direct costs, such as piping, pressure relief valves (PRV), PRV & Hydroelectric Generator/Booster Pump Building, and road crossings, as well as indirect costs such as contractor/subcontractor markups, contingency, contractor fees, bonds & insurances. The table below compares estimated water infrastructure costs across scenarios.

Table 14. Onsite Water Infrastructure Cost Estimates

Water Infrastructure	Total Direct	Total Indirect	Total Construction
Scenario A	$28,195,000	$5,921,000	$34,116,000
Scenario B	$28,643,000	$6,015,000	$34,659,000
Scenario C	$30,116,000	$6,324,000	$36,441,000
Scenario D	$35,329,000	$7,419,000	$42,748,000

Note: Cost estimates are expressed in Q3 2024 dollars. Column and category totals may not sum exactly, due to rounding.

A more detailed cost estimate can be found in Appendix E.

4.1.4 Offsite Treated Water Infrastructure Improvements

Several improvements to the City's existing treated water infrastructure would be needed to serve the Planning Reserve, which include T&D modifications, additional storage, additional pumping capacity and treatment upgrades. The existing system improvements identified were based on input from Boulder Engineering Managers, the 2019 Asset Inventory & Maintenance Study, 2019 Boulder Water Transmission Study, and professional judgement. Additional engineering analyses will be required to provide further details on the potential impacts the Planning Reserve would have on Boulder's existing treated water system.

As mentioned in the previous section, the City has three water distribution pressure zones separated by pressure reducing valves and booster pump stations. The pressure zones work synergistically to supply water throughout the water distribution system at an acceptable water pressure. Many of the potential T&D system improvements are specific to each pressure zone. The treated water infrastructure improvements identified are summarized below.

4.1.4.1 T&D Waterlines

Pressure Zone 1 has a transmission (large diameter pipeline) capacity of approximately 15 mgd. The need for additional capacity has already been identified in Zone 1 to support future changes envisioned by the Boulder Valley Comprehensive Plan and East Boulder Subcommunity Plan. Further improvements, such as larger pipe sizes, may additionally be needed to support development of the Planning Reserve.

Approximately six miles of watermain along 63rd Street and 61st Street from the 63rd St. Water Treatment Plant to Baseline Road would need to be upsized from 24-inch diameter to 30-inch diameter. In addition, approximately two miles of large diameter watermain in Zones 1 and 2 would need to be replaced along Baseline Road from the Cherryvale Pump Station west. These improvements would be needed to allow sufficient water from the 63rd St. Water Treatment Plant to reach the Area III-Planning Reserve.

Additional 12-inch and 16-inch zone 2 watermains in Pressure Zone 2 would also be needed south of the Planning Reserve to be able to adequately convey treated water to the area. The large diameter watermains would need to be looped for redundancy and safety purposes.

4.1.4.2 Pump Station

Pump stations are critical infrastructure in a T&D system because they pump water from lower Pressure Zones (i.e., lower elevation) to higher Pressure Zones (i.e., higher elevation). To serve the Planning Reserve, water would need to be pumped from Pressure Zone 1 to Pressure Zone 2. The City's existing Zone 1 pumping capacity would be insufficient to comfortably serve the Planning Reserve. Therefore, additional pumping capacity would be required to reliably serve the Planning Reserve.

4.1.4.3 Treated Water Storage

The existing storage in Boulder's T&D system is not sufficient to serve the Planning Reserve. Therefore, additional treated water storage will be required to support the Planning Reserve. There are a few potential options the City could consider for additional storage which could include renovating an existing storage tank, building a new storage tank, or adding capacity to a future storage tank. The City has previously identified a new 2+ million-gallon East Boulder storage tank as a needed system improvement for Pressure Zone 1. The storage capacity needed to serve the Planning Reserve could potentially be added to that proposed facility. Another potential option is a new Pressure Zone 3 storage tank constructed near the Booton Tank in North Boulder, just west of the Planning Reserve area. The City could also consider renovating the Devil's Thumb Zone 3 tank (located in South Boulder) and repurposing it to provide the capacity needed to serve the Planning Reserve. Each of these potential options would need to be evaluated further to determine their viability and cost effectiveness. For the purposes of this study, the Zone 3 Devil's Thumb tank was assumed to be renovated and sized for the Planning Reserve and included in the Order of Magnitude costs. Along with the new storage tank, upgraded supply waterlines would be required to convey water from the proposed storage to the remaining T&D system. Small initial phases of development in the Planning Reserve could receive limited services, however the

improved waterline and storage improvements would need to be in place before the Planning Reserve could be fully served under all four scenarios.

4.1.4.4 Treatment

The City of Boulder relies on two water treatment plants – 63rd St Water Treatment Plant and Betasso Water Treatment Plant, which have sufficient capacity, approximately 40 mgd, and adequate redundancy to meet Boulder's existing demands and future buildout projections (excluding the Planning Reserve).

The Planning Reserve has the potential to increase treatment plant production by 2.2 mgd to 3.4 mgd for average day conditions and 5.4 to 8.5 mgd for maximum day conditions based on the four scenarios evaluated. The addition of the Planning Reserve would reduce the existing treatment redundancy level of service and would likely trigger the need for additional water treatment plant improvements. The 63rd St. Water Treatment Plant would need to be bolstered to increase its reliability and would potentially need to be expanded to increase its capacity.

To make the 63rd St. Water Treatment Plant more resilient, multiple improvements would likely be needed for all four scenarios including the addition of a fourth pre-treatment train, the addition of two or more filters, and increased disinfection capacity (e.g., improved chemical feed equipment). If the Planning Reserve demands are significant enough (e.g., Scenario D), additional improvements would be needed to increase the capacity of the water treatment plants.

4.1.4.5 Potential Order of Magnitude Costs

Potential order of magnitude offsite treated water infrastructure costs were estimated for the existing treated water infrastructure improvements anticipated to serve the Planning Reserve. The costs are based on previous studies and engineering judgement and are intended to give a high-level range of potential costs. The costs reflect an opinion of potential construction and non-construction (engineering design, permitting, administration, legal, land acquisition, etc.) costs. See Appendix C for the order of magnitude cost assumptions. All costs will need to be further evaluated, refined, and verified with additional engineering studies and evaluations.

The potential existing system improvements described above, which include the T&D modifications, additional storage, additional pumping capacity, and treatment upgrades are anticipated to be within a range of $170 million dollars to $800 million dollars. These ranges are applicable to all four planning scenarios. These costs are limited to major infrastructure portions of the water system and do not include onsite treated water infrastructure improvements for the Planning Reserve (See Section 4.1.3.4) or additional costs for smaller, neighborhood water system infrastructure that can be significant and may be included as part of the development costs.

4.1.5 Customer Water Usage

As mentioned in Section 4.1.1, customer water usage was calculated using criteria from the 2023 Water Efficiency Plan and historic water use data. The average annual customer water usage represents how much water supply potential customers in the Planning Reserve would use in a single year. The Planning Reserve customer water usage could range from 1,534 acre-feet per year (acre-ft/yr) for Scenario A to 1,908 acre-ft/yr for Scenario D, which is approximately 7-9% of current buildout projections[3]. The average annual customer water usage by customer type for the four Planning Reserve scenarios are shown in Table 15 below. These estimates of water usage are for planning purposes and should be refined as needed based on input from legal counsel related to any statutory, legal, or other requirements associated with water supplies necessary for development of the Planning Reserve.

[3] Current build-out projections are based on 2040 water demand projections in the 2023 Water Efficiency Plan, which included projections for the East Boulder Subcommunity Plan. The 2023 Water Efficiency Plan projections were further adjusted for additional demands associated with the recent CU South annexation and employment projections through 2078.

Table 15. Average Annual Customer Water Usage for the Planning Reserve

Customer Type	Average Annual Customer Water Usage (acre-ft/year)			
	Scenario A	Scenario B	Scenario C	Scenario D
Commercial	207	304	362	147
Residential	917	950	1,042	1,519
Parks	410	435	435	242
Total	**1,534**	**1,689**	**1,839**	**1,908**

4.1.6 Source Water Availability

The four Planning Reserve scenarios were evaluated using the City's long-term water supply and demand model. A summary of the results is provided in the following sections.

4.1.6.1 Water Supply Reliability Criteria

Evaluation of the City's ability to supply water to the Planning Reserve under different planning scenarios relies on consideration of criteria adopted by City Council in 1989. These water supply reliability criteria (Reliability Criteria) aim to balance the costs and environmental impacts of increased water system reliability with the consequences of temporary water use restrictions. City staff use these Reliability Criteria to make water supply planning decisions and assess the reliability of Boulder's water supply. These Reliability Criteria are defined below.

- For water uses deemed essential to the maintenance of public health, safety, and welfare such as indoor domestic, commercial, and industrial uses and firefighting uses, the City shall make every effort to ensure reliability of supply against droughts with recurrence intervals of up to 1,000 years. (This means the city strives to assure water for all essential indoor needs in all drought years except a drought so severe that it might happen once in 1,000 years.)
- For that increment of water use needed to provide continued viability of outdoor lawns and gardens, the City shall make every effort to ensure reliability of supply against droughts with recurrence intervals of up to 100 years. (The phrase 'continued viability of outdoor lawns and gardens' has subsequently been interpreted to mean the city will provide, at a minimum, the amount of water necessary to meet the basic survival needs of outdoor landscaping in general, including trees and shrubs, although landscaping may go dormant or suffer some damage.)
- For that increment of water needed to fully satisfy all municipal water needs, the City shall make every effort to ensure reliability of supply against droughts with recurrence intervals of up to 20 years. (This translates into a goal of instituting water use restrictions, either voluntary or mandatory, no more often than five years out of every 100 years.)

4.1.6.2 Boulder's Long-term Water Supply without the Planning Reserve

Boulder's long-term water supply and demand modeling indicates that under current projected build-out demands and climate conditions ranging from current climate up to moderate climate change, the water supply system satisfies current Reliability Criteria. However, when considering climate change, under more severe hot and dry modeled future climate scenarios and current projected build-out demands, the system does not satisfy current Reliability Criteria.

The practical implication of not satisfying the Reliability Criteria is that the City would not meet its level of service goals because it would implement water use restrictions more frequently than the criteria prescribe. In addition to Reliability Criteria considerations, current build-out projections anticipate re-allocation of a portion of water currently used to support hydroelectric power production, agricultural leasing, and instream flows to residential and commercial needs.

4.1.6.3 Boulder's Long-Term Water Supply with the Planning Reserve

Under projected build-out demands that include all Planning Reserve scenarios and climate conditions ranging from current climate up to mild climate change, the water supply system satisfies the Reliability Criteria. However, under moderate to severe future climate scenarios, the inclusion of any of the Planning Reserve scenarios results in increased frequency of anticipated water use restrictions beyond the standard established by the Reliability Criteria, including indoor water use restrictions under Scenario D. In addition to Reliability Criteria considerations, all of the Planning Reserve scenarios would further re-allocate water currently used to support hydroelectric power production, agricultural leasing, and instream flows to residential and commercial needs. The following subsections describe the water supply results across all scenarios:

Scenarios A, B, and C

Under current climate and up to mild climate change conditions, modeling indicates that the Reliability Criteria would be satisfied with the addition of water demands for Scenarios A, B and C. However, under moderate to severe climate change scenarios, the introduction of water demands under Scenario A, B, or C results in increased frequency of anticipated outdoor water use restrictions beyond the standard established by the Reliability Criteria. Under Scenarios A, B, or C, even with more severe hot and dry climate change conditions, modeling results do not indicate a need for indoor water use restrictions throughout the city.

Scenario D

Under current climate and up to mild climate change conditions, modeling indicates that the Reliability Criteria would be satisfied with the addition of Scenario D water demands. However, under certain moderate to severe change scenarios, the introduction of Scenario D water demands results in increased frequency of anticipated water use restrictions beyond the standard established by the Reliability Criteria. Results from severe hot and dry climate change conditions also anticipate indoor water use restrictions throughout the city in approximately 1 out of 100 years, which were not previously identified under current build-out conditions or Scenarios A, B, or C.

4.1.6.4 Potential Long-term Water Supply Strategies Necessary to Serve the Planning Reserve

City staff recognize the potential for future water supply gaps from disruptions due to factors that are not considered in Boulder's long-term water supply and demand modeling, described above, such as Colorado River basin shortages, wildland fires, or infrastructure outages (both planned and unplanned). Given these factors and the associated need to strengthen Boulder's water supply reliability under certain future climate scenarios and current build-out projections, the City already plans to advance water conservation and opportunistically pursue water acquisition and development of new water supplies, including development of raw water storage space to optimize use of existing water rights.

Supplying water to the Planning Reserve will require balancing strategies such as water conservation (demand management), water supply reliability policy, and considering acquisition of new supplies alongside other community values such as landscaping, heat island reduction, recreation, environmental protection, and agriculture. A portion of Planning Reserve water demands could be met through city-wide changes in water use practices, such as wide-spread turf conversion to native, low-water use landscaping. Such an effort could result in tradeoffs for heat island reduction, recreation, and having a buffer for drought reserves. Some Planning Reserve water demands could also be met by strategically reducing the allocation of water for lower priority uses, such as outdoor irrigation. This approach would change the criteria used for long-range planning and could result in more frequent drought declarations and associated outdoor watering restrictions. Acquisition and development of additional water rights, full use of existing reusable water rights, and efficiency in operations could expand Boulder's water supply; however, there could be tradeoffs for water available to support instream flows, local agriculture, or other community values. Intentionally balancing strategies to achieve a reliable water supply for the Planning Reserve is feasible and will require community conversations about priorities and policy.

4.1.6.5 Potential Order of Magnitude Costs

Because acquisition and development of additional sources of water supply to support Area III-Planning Reserve development could be a future consideration but is not a foregone conclusion, the cost of additional water supply is included for reference. The amount of additional supply would depend on community conversations about priorities and policy. The cost associated with acquisition and development of new water rights and development of infrastructure to make full use of existing water rights varies depending on magnitude and scope of the effort, including permitting, legal proceedings, type of water right and market. For reference, acquisition of water rights currently ranges from approximately $7,000 to $75,000 per acre foot and construction of new raw water storage ranges from approximately $6,000 to $40,000 per acre foot[4].

4.2 Wastewater System

4.2.1 Wastewater Criteria

Wastewater flow and infrastructure sizing criteria were compiled to calculate the wastewater flows and size the wastewater infrastructure needed for the Planning Reserve. The wastewater flow and infrastructure sizing criteria are primarily based on the DCS and historic data. The wastewater flow and infrastructure sizing criteria can be referenced in Appendix B.

4.2.2 Customer Wastewater Flows

As mentioned above, wastewater flows were developed using the DCS to understand 1) the approximate size of onsite wastewater infrastructure needed and 2) potential offsite improvements to the existing system that would likely be needed to serve the Area III-Planning Reserve. The average day customer flows and peak customer flows with infiltration used to size infrastructure for the Area III-Planning Reserve are shown in the table below.

Table 16. Average Customer Flows and Peak Flow Customer Flows with Infiltration for Infrastructure Sizing

Scenario	Average Customer Flows (mgd)	Peak Customer Flows with Infiltration (mgd)*
Scenario A	1.1	2.7
Scenario B	1.4	3.4
Scenario C	1.6	4.1
Scenario D	2.0	5.0

**Infiltration is based on approximate pipe diameter and length.*

Average wastewater flows represent the average amount of customer wastewater flows conveyed by the collection system without inflow and infiltration (stormwater and groundwater that unintentionally enter the collection system). The average wastewater flows for the Area III-Planning Reserve range from 1.1 mgd for Scenario A to 2.0 mgd for Scenario D. This represents an increase in wastewater generation ranging from 9% to 17% above flows treated in 2023. Peak flows, which represent the largest amount of wastewater flow conveyed by the collection system range from 2.7 mgd for Scenario A to 5.0 mgd for Scenario D.

Potential average and peak wastewater flows were also evaluated to understand the additional load the Area III-Planning Reserve will place on the Boulder Water Resource Recovery Facility (WRRF). The types of loadings evaluated include the biochemical oxygen demand (BOD), suspended solids (SS), and Total Kjeldahl Nitrogen (TKN).

[4] Order of magnitude costs were provided by Boulder's Utilities Department.

4.2.3 Onsite Collection System Improvements

Potential onsite wastewater collection system infrastructure needed to serve the Area III-Planning Reserve was identified through a high-level evaluation based on estimated land use types, calculated sewer flows, DCS design criteria, and professional engineering judgement. All infrastructure sizes are approximate and will need to be verified through future design and hydraulic analyses.

The Area III-Planning Reserve's topography naturally slopes east/southeast, which is favorable for a gravity collection system. Based on the existing contours and preliminary analysis, it was assumed that the wastewater flows from Area III-Planning Reserve could primarily be conveyed via gravity thereby eliminating the need for pumping via wastewater lift stations. Gravity service to this area will need to be further evaluated and confirmed through design and hydraulic analysis.

Potential wastewater collection system infrastructure within the Area III-Planning Reserve was estimated for all four scenarios. Based on a high-level evaluation, it was estimated that Scenarios A, B, C, and D would require approximately seven to eight miles of new backbone gravity main to serve the Area III-Planning Reserve. The gravity main sizes vary by scenario. Scenario A, with the lowest development intensity, had the smallest backbone gravity main sizes ranging from 10- to 36-inch pipelines. Scenario D, with the highest development intensity, had the largest backbone gravity main sizes ranging from 10- to 42-inch pipelines. These backbone mains do not include smaller diameter lines that would need to be constructed for individual development sites throughout the Area III-Planning Reserve.

The nearest collector/interceptor sewer to the Area III-Planning Reserve is the Fourmile Trunk Sewer, located near 47th Street and Four Mile Canyon Creek, which is approximately one mile east of the southeastern corner of the Area III-Planning Reserve. Capacity limitations of this line are discussed in the offsite system improvements section of this report. All scenarios could potentially connect to the upsized Fourmile Trunk Sewer (or parallel relief sewer) to convey flows for treatment.

4.2.3.1 Onsite Collection System Cost Estimates

Estimates for onsite collection system infrastructure includes direct costs, such as gravity main piping and manholes, as well as indirect costs such as contractor/subcontractor markups, contingency, contractor fees, bonds & insurances. The table below compares estimated wastewater infrastructure costs across scenarios.

Table 17. Onsite Wastewater Infrastructure Cost Estimates

Scenario	Total Direct	Total Indirect	Total Construction
Scenario A	$26,962,000	$5,662,000	$32,624,000
Scenario B	$28,154,000	$5,912,000	$34,067,000
Scenario C	$34,179,000	$7,178,000	$41,357,000
Scenario D	$36,363,000	$7,636,000	$43,999,000

Note: Cost estimates are expressed in Q3 2024 dollars. Column and category totals may not sum exactly, due to rounding.

4.2.4 Offsite Collection System and Boulder Water Resource Recovery Facility Improvements

Several improvements to the existing wastewater infrastructure would be needed to serve the Planning Reserve, which include trunk sewer system modifications, and wastewater treatment modifications. The existing system improvements identified were based on input from Boulder Utilities Engineering staff, a preliminary modeling evaluation, and professional judgement. Additional engineering analyses will be required to provide further details on the potential impacts the Planning Reserve will have on the City's existing wastewater system.

4.2.4.1 Wastewater Collection System

The wastewater collection system just south of the Planning Reserve includes the Fourmile Trunk Sewer, which is the backbone pipeline within the Fourmile sewer basin that conveys flows east to the WRRF. The

Fourmile Trunk Sewer ranges in size from 18-inch to 27-inch and eventually ties into a 42-inch interceptor pipeline on 61st Street near Boulder Creek. Both pipelines have reached the end of their useful lives and are due for rehabilitation. The 42-inch interceptor is scheduled for rehabilitation around 2029. There are no near-term plans to rehabilitate the Fourmile Trunk Sewer.

Hydraulic modeling of the system indicates that the Fourmile Trunk Sewer has capacity limitations under current conditions. Additional flows on the scale projected for the Planning Reserve would further stress the system and could lead to surcharges and sewer overflows during design rainfall events.

The Fourmile Trunk Sewer would need to be upsized to increase the capacity of the pipeline, or a parallel sewer line constructed, to convey the Planning Reserve flows to the 42-inch interceptor. For the purposes of this study, it was assumed a parallel pipeline approximately two miles in length would be needed from 47th Avenue and Fourmile Creek to the existing 42-inch interceptor near 61st and Boulder Creek. A parallel pipeline would also require substantial property acquisition. A more detailed analysis will be necessary to provide more details on the feasibility and cost associated with increasing the capacity in the Fourmile Trunk Sewer or constructing a parallel sewer line.

4.2.4.2 Boulder Water Resource Recovery Facility Improvements

The Boulder Water Resource Recovery Facility (WRRF) has a permitted capacity of 25 mgd based on a maximum monthly average daily flow. The WRRF currently treats approximately 10 to 15 mgd, which indicates excess capacity is available to serve the Planning Reserve. Although the excess capacity appears to be sufficient, the WRRF has treatment constraints that should be considered prior to serving the Planning Reserve.

Rated Peak Hour Hydraulic Capacity

The WRRF currently has a rated peak hour capacity of 52.5 mgd, which represents the largest rate of flow that can be conveyed through the facility with a single critical component out of service, without causing a spill/overflow. The City's peak hour wastewater treatment level of service goal is to be able to sufficiently convey all peak hour wastewater flows including rain derived inflow and infiltration associated with a 25-year rainfall event (stormwater and/or groundwater that unintentionally enters the wastewater collection system) with one redundant unit out of service. Under current projections, that corresponds to a flow of 72.5 mgd, which exceeds the current peak hour capacity. The addition of the Planning Reserve flows would further stress the WRRF peak hour capacity limitations. Boulder Utilities Engineering staff and an outside consultant completed a study in 2022 identifying specific improvements necessary for the WRRF to convey the 25-year flow from the collection system. Those improvements should be contemplated as a system need for the Planning Reserve, and that study updated to confirm those improvements are adequate to support the additional Planning Reserve flows.

Solids Processing

As part of the WRRF treatment process, solids are produced and processed into biosolids (solid organic matter). Ideally the solids are processed into Class B biosolids, which are suitable for land application (e.g., fertilizer) and are cost effective. If the solids are only partially treated, the biosolids must be hauled off and managed at a much higher cost.

The City has a level of service standard to produce Class B biosolids when a single digester is out of service. The additional Planning Reserve loads, coupled with secondary impacts from nutrient removal are expected to increase digester maintenance frequency. This will require taking one digester out of service for maintenance more often. To be able to continue to meet Class B biosolids, the resilience of the solids stabilization (digestion) systems would have to be improved with a new anaerobic digester, and associated piping and gas handling equipment.

4.2.4.3 Potential Order of Magnitude Costs

Potential order of magnitude offsite collection system and WRRF costs were estimated for the existing wastewater infrastructure improvements anticipated to serve the Planning Reserve. The costs are based on a preliminary modeling and high-level evaluation prepared for the City by HDR (engineering consultant). The costs reflect an opinion of potential construction costs and non-construction (engineering

design, permitting, administration, legal, land acquisition, etc.) costs. See Appendix C for the order of magnitude cost assumptions. All costs will need to be further evaluated, refined, and verified with additional engineering studies and evaluations.

The potential existing system improvements described above, which include the parallel Fourmile Trunk Sewer and the WRRF improvements are anticipated to be within a range of $40 million dollars to $180 million dollars. These ranges are applicable to all four demand scenarios. These costs are limited to major infrastructure portions of the wastewater system and do not include onsite wastewater infrastructure improvements for the Planning Reserve (See Section 4.2.3.1) or additional costs for smaller, neighborhood collection system infrastructure that can be significant and may be included as part of the development costs.

4.3 Stormwater and Flood Management

The Area III-Planning Reserve spans two watersheds, with a topography naturally sloping to the east/southeast. The majority of the Planning Reserve is located within the upstream end of the Lower Boulder Creek watershed, with the northwest corner of the Planning Reserve naturally draining into the Dry Creek watershed. The east side of the Planning Reserve is bounded by Farmers Ditch, with a small portion of the Planning Reserve being located on the east side of Farmers Ditch, where the land slopes towards Poors Reservoir.

The Comprehensive Flood and Stormwater Master Plan from September 2022 and the City's Stormwater Master Plan from 2016 were reviewed and do not include the Planning Reserve. Therefore, it is imperative that studies of the Planning Reserve be performed to provide further details on the potential impacts the Planning Reserve will have on the City's existing stormwater systems and flood management systems. These studies would provide more comprehensive and current information to guide future decision-making related to development of the Planning Reserve.

4.3.1 Stormwater

The existing stormwater collection infrastructure in the Planning Reserve is limited. Adjacent stormwater infrastructure is intermittent, old, and undersized. Across all four scenarios, new development would require stormwater collection improvements in accordance with City of Boulder Design Criteria for minor storm runoff events to maintain historic flow patterns and to meet detention requirements and water quality standards. Stormwater improvements for the Planning Reserve include storm sewer collection and trunklines in the collector and local roadways, detention and water quality treatment of runoff, and downstream conveyance upgrades to discharge flows to existing waterways. Appropriate sizing for the City's trunkline system would be determined through a future planning process.

Additionally, it is assumed that privately developed areas will be responsible for providing storm drainage systems onsite that will connect to City stormwater conveyance systems. Developments within the Planning Reserve will also be required to comply with planned discharges and provide detention and water quality in accordance with City standards, prior to discharging into the City's system. Items to consider during any future design phase would be to incorporate nature-based design and low impact development, where feasible, to collect and provide treatment of the stormwater as part of city infrastructure and encourage, or require, private developments to follow similar methods.

The Planning Reserve's stormwater conveyance systems will discharge at two major outfall points to coincide with existing watershed boundaries. Prior to discharging outside of the Planning Reserve, it is required that the stormwater be treated in a water quality feature or features so it is "clean" and has been detained to preserve historic flow rates. One outfall is required at the northwestern corner of the Planning Reserve and will discharge to the Dry Creek watershed. The second outfall, appropriate for the majority of the Planning Reserve, will discharge into an upgraded stormwater conveyance system along US-36 and ultimately discharge into Fourmile Canyon Creek. There is small area east of Farmers Ditch that may require an additional, smaller, outfall east of the Planning Reserve, as it would be difficult to drain that area into the upgraded US-36 system. Additional studies would further refine details for outfall requirements and options for stormwater management.

As noted in the previous paragraph, stormwater for the majority of the Planning Reserve is expected to drain southeasterly to US-36 and Jay Road. Along US-36, existing stormwater infrastructure consists of intermittent ditches and culverts. Irrigation ditches running across and along Jay Road are part of the Farmers Ditch system. Capacity constraints present in existing stormwater infrastructure, and the inability to co-mingle stormwater flows with irrigation flows, indicate the need for an upgraded storm conveyance system along US-36, to ultimately discharge into Fourmile Canyon Creek (less than one mile downstream). Upgrades to the stormwater conveyance system along US-36 would be recommended for all four scenarios.

For the purposes of this high-level evaluation, it was assumed that irrigation ditch infrastructure cannot be utilized to convey any stormwater flows, the irrigation ditches will remain in place, and no improvements requiring ditch company approval to irrigation infrastructure will be made. Future coordination with the ditch company may be required if the City's stormwater systems cross ditch infrastructure. It was also assumed that the ditch company does not have any legal interest in stormwater draining from the Planning Reserve, and therefore stormwater can be managed as needed to comply with the City's stormwater conveyance requirements.

4.3.2 Flood Management

There are no FEMA delineated floodplains in the Planning Reserve. A flood management study for the major storm runoff events for each watershed would need to be conducted to determine the natural flood corridors throughout the Planning Reserve, consistent with the Comprehensive Flood and Stormwater Master Plan. These natural flood corridors shall be maintained to provide flood conveyance through the site as determined by the flood study. As these corridors are defined and depending on the requirements to preserve the natural flood corridor, a future property developer may decide to partner with the Mile High Flood District (MHFD) to construct stream improvements through its Fee-In-Lieu Improvement Process.

In general, assumptions for flood management are that the developer will maintain natural drainages as required through their site. The City will also be required to maintain the natural drainages on City property and any roadway crossings. Flood corridor sizing and requirements will be determined in future studies.

4.3.3 Onsite Cost Estimates for Stormwater and Flood Management

Cost estimates for onsite stormwater and flood management includes direct costs, such as trunkline infrastructure, detention and water treatment, as well as indirect costs such as contractor/subcontractor markups, contingency, contractor fees, bonds & insurances. The table below compares estimated stormwater and flood management infrastructure costs across scenarios.

Table 18. Onsite Stormwater Infrastructure Cost Estimates

Scenario	Total Direct	Total Indirect	Total Construction
Scenarios A, B, C	$12,224,000	$2,567,000	$14,791,000
Scenario D	$12,331,000	$2,589,000	$14,920,000

Note: Cost estimates are expressed in Q3 2024 dollars. Column and category totals may not sum exactly, due to rounding.

4.4 Transportation

4.4.1 Development Roadways within the Planning Reserve

Preliminary street placements and designs were identified during development of the Service Demand Scenarios and used to determine a high-level estimation of the transportation network that could be required to serve new residential, retail, business, and recreation destinations within the Planning Reserve, based on City of Boulder Design and Construction Standards (DCS). Per BRC 1981 Section 9-

2-14, roadway dimensions can be revised upon site review and will be subject to future choices made by developers regarding the actual development of the Planning Reserve.

Collector Streets with Multi-use Path (Assumptions per Boulder Design and Construction Standards)

- Two-lane section (one thru lane in each direction) (11')
- Buffered Bicycle lanes in each direction (8')
- On-street parking on both sides of street (6.5')
- Curb and gutter on both sides of street (2')
- Planting Strip on both sides of street (8')
- Sidewalk on one side of street (5')
- Replace sidewalk with multi-use path on one side of street (12')
- ROW can be established from back of curb, front of sidewalk or back of sidewalk depending on land-use needs and configuration. Locations where sidewalk and multi-use path is not located in right-of-way would be located in a public easement.

Local Streets (Assumptions per Boulder Design and Construction Standards)

- Two-way section
- 30' from curb face to curb face to accommodate two-way travel and on-street parking
- On-street parking on both sides of street (6.5')
- Curb and gutter on both sides of street (2')
- Landscaped area on both sides of street (8')
- Sidewalk on both sides of street (5', at minimum, wider where possible)

As with Collector Streets, detailed above, ROW can be established from back of curb, front of sidewalk or back of sidewalk depending on land-use needs and configuration. Locations where sidewalk and multi-use path is not located in ROW, would be located in a public easement. Future planning efforts will be needed to determine whether additional ROW will need to be preserved for turn lanes at intersections, or to accommodate increased demand for bicycle facilities or on-street parking.

Miscellaneous
Multi-modal travel can be further accommodated with bicycle and scooter parking located throughout the Planning Reserve. Consider installing enhanced pedestrian cross- treatment traffic control devices at primary pedestrian and bicycle crossings, such as the proposed multi-use path intersecting with US-36 south of Broadway.

Bus Service:

To explore options for local and regional bus service, able to accommodate additional mobility and safety needs arising from a projected increase in travel patterns within the Planning Reserve, Boulder may need to work in partnership with RTD and CDOT. Potential adjustments to existing routes could include:

- Consider additional bus service along US-36 between Jay Road and Broadway, linking RTD Routes 204, 205, and SKIP
- Consider extending RTD Routes 204, 205, and SKIP into or near the Planning Reserve.
- Consider providing Lyons Flyer stop near the Broadway / US-36 intersection

- Consider adding sidewalk connections between Route 205 at Jay Rd and 51st St and the BOLT bus stop at CO-119 and Jay Road to connect to the proposed CO-119 BRT Service (anticipated to begin operations in 2027)
- Evaluate feasibility of extending Flatiron Flyer service into or near the Planning Reserve or providing logical and efficient transfer services from Downtown Boulder Station to routes proximal to the Planning Reserve.

4.4.2 Analysis of Future Travel Demand

AECOM completed a high-level trip projection and analysis of the four service demand scenarios, using the proposed land uses and their respective size under each scenario. The trip projection was used to determine expected future travel demand accessing the Planning Reserve via the adjacent roadway network, specifically US-36, and develop recommendations for improvements to accommodate the estimated increase in trips.

The average trip generation rate for each type of land use was used to determine the trips generated daily (Average Annual Daily Traffic or AADT), and in the AM and PM peak hours, for each proposed land use. Certain trip reductions, pass-by trips, and linked trips were then applied to the trip generation to prevent an over-estimation of the generated trips.

Table 19. Trip Generation Summary, Scenario A

Scenario A	Average Annual Daily Traffic (AADT)			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,300	700	600	1,800	800	1,000
New Planning Reserve Trips	32,000	16,000	16,000	2,200	900	1,300	2,800	1,500	1,300
Total Trips	**50,000**	**25,000**	**25,000**	**3,500**	**1,600**	**1,900**	**4,600**	**2,300**	**2,300**

Note: Figures have been rounded and may not sum precisely.

Table 20. Trip Generation Summary, Scenario B

Scenario B	Average Annual Daily Traffic (AADT)			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,300	700	600	1,800	800	1,000
New Planning Reserve Trips	40,800	20,400	20,400	2,800	1,200	1,600	3,600	1,900	1,700
Total Trips	**58,800**	**29.400**	**29,400**	**4,100**	**1,900**	**2,200**	**5,400**	**2,700**	**2,700**

Note: Figures have been rounded and may not sum precisely.

Table 21. Trip Generation Summary - Scenario C

Scenario C	Average Annual Daily Traffic (AADT)			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,300	700	600	1,800	800	1,000
New Planning Reserve Trips	46,600	23,300	23,400	3,200	1,300	1,900	4,300	2,300	2,000
Total Trips	**64,800**	**32,400**	**32,400**	**4,500**	**2,000**	**2,500**	**6,100**	**3,100**	**3,000**

Note: Figures have been rounded and may not sum precisely.

Table 22. Trip Generation Summary - Scenario D

Scenario D	Average Annual Daily Traffic (AADT)			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,300	700	600	1,800	800	1,000
New Planning Reserve Trips	53,400	26,700	26,700	3,400	1,100	2,300	4,400	2,600	1,800
Total Trips	**71,400**	**35,700**	**35,700**	**4,700**	**1,800**	**2,900**	**6,200**	**3,400**	**2,800**

Note: Figures have been rounded and may not sum precisely.

The trip generation projections were used to frame potential improvements necessary to provide reliable and safe transportation options under the developed Demand Scenarios. Details of the trip assignment and complete results of the trip generation and analysis are provided in Appendix D.

Trip projections across all four scenarios demonstrated an increase from existing volumes. Potential improvements to the transportation network have been identified to accommodate the additional volume of travelers, and are summarized below:

US-36 Study Area (Broadway to Jay Road):

- Conventional traffic analysis indicates that across all four scenarios, US-36 will need to accommodate additional trips regardless of scenario. As development intensity increases towards Scenario D, the number of trips may lead to capacity limitations where additional right-of-way may be needed to accommodate various multimodal facilities.
- The City of Boulder will need to partner with CDOT and RTD to support transportation demand management (TDM) strategies to accommodate additional trips in alignment with City of Boulder transportation policies and goals.
- Additional right-of-way may need to be reserved as part of future Planning Reserve efforts to ensure that adequate space has been reserved for additional bus lanes, bike lanes, multi-use paths and auxiliary lanes, which may reduce the need to expand the US-36 right-of-way.
- Where changes to intersections are made, prioritize bike and pedestrian experience and connectivity by implementing treatments such as protected corners and pedestrian refuges.
- Explore converting the Broadway / US-36 intersection into a four-leg signalized intersection.
- Explore converting the Lee Hill Drive / US-36 intersection into a four-leg signalized intersection.
- Explore realigning the Yarmouth Avenue west leg with the proposed east leg to create a four-leg signalized intersection with US-36.
- Potential changes to 26th Street & Violet Avenue intersection:
    - Option A:
        - Convert the Violet Avenue / US-36 intersection west leg into a right-in / right-out only movement and eliminate the east leg.
        - Realign the 26th Street south leg to intersect with US-36 at the proposed north leg to create a four-leg signalized intersection with US-36
    - Option B:
        - Realign the Violet Avenue west leg with the proposed east leg to create a four-leg signalized intersection with US-36

- Eliminate the 26th Street intersection with US-36 or convert to a right-in / right-out only intersection

- Explore creating a roundabout that accommodates access and mobility needs from Violet and 26th Street. This option would be subject to ROW availability.

- Maintain the Jay Road / US-36 signalized intersection. Provide a new north / south connection from the east side of the development to Jay Road.

US-36 Influence Area (Jay Road to Kalmia Avenue):

- Conventional traffic analysis indicates that across all four scenarios, US-36 will need to accommodate additional trips regardless of scenario. As development intensity increases towards Scenario D, the number of trips may lead to capacity limitations where additional right-of-way may be needed to accommodate various multimodal facilities. The City of Boulder will need to partner with CDOT and RTD to support transportation demand management strategies and options to accommodate additional trips in alignment with the city's transportation policies and goals.

- Consider upgrading bicycle facilities along Lee Hill Dr., Yarmouth Ave., Violet Ave., and Jay Rd. to increase connectivity between the Planning Reserve and destinations throughout the city.

4.4.2.1 Onsite Transportation Cost Estimates by Scenario

Cost estimates for onsite transportation infrastructure includes direct costs, such as pavement, concrete, sidewalk, trees, light posts, and intersection improvements, as well as indirect costs such as contractor/subcontractor markups, contingency, contractor fees, bonds & insurances. The table below compares estimated transportation infrastructure costs across scenarios. These estimates do not include an estimate of changes on US-36.

Table 23. Onsite Transportation Infrastructure Cost Estimates

Scenario	Direct Costs	Indirect Costs	Total Costs
Scenarios A, B, C	$45,206,000	$9,493,000	$54,699,000
Scenario D	$47,660,000	$10,009,000	$57,668,000

Note: Cost estimates are expressed in Q3 2024 dollars. Column and category totals may not sum exactly, due to rounding.

4.5 Parks and Recreation

Any development within the Planning Reserve should consider the urban service criteria for the location and adequacy of Urban Parks. As it relates to location, Boulder's level of service (LOS) standard is to have neighborhood parks of a minimum of five acres in size within one-half mile of the population to be served; community parks of a minimum of 50 acres in size within three-and-one-half miles of the population to be served, and playground facilities for toddlers, preschoolers and school-age children up through age 12 within one-quarter to one-half mile of residents. Proximity to Foothills Community Park and additional park development within the Planning Reserve would satisfy the community park standard. Neighborhood park and playground proximity would need to be considered as neighborhood centers are identified through a future planning process.

The City of Boulder owns approximately 190 acres of land within the Area III-Planning Reserve, specifically identified for development of a new community-serving regional park. Regional parks offer key amenities for active recreation, such as paying fields and sport courts, and generally encompass the largest park properties (100-200 acres). Regional parks typically feature a set of assets which attracts visitors within a 20–30-minute drive time, such as a multi-field sports complex, indoor recreation center, golf course, or waterpark. Additional park amenities may include picnic pavilion(s), playground(s), an on-site trail system, permanent restrooms, and on-site parking (consistent with fields/buildings).

In contrast to regional parks, neighborhood parks serve residents within a 5–15-minute walk/roll or bike ride to the park, offering accessible open space for those with little or no yards in suburban and urban

settings. Ranging in size from three to 20 acres, neighborhood parks feature a set of amenities more suited to the park's size, such as singular field/open play areas, a singular court, picnic pavilion, and playground. Portable restrooms are more typical, and as residents are not generally expected to drive to a neighborhood park, on-site parking is preferred, and on-street parking is acceptable.

Boulder is currently keeping pace with acres per capita of urban parkland, evaluating data from the National Recreation and Park Association (NRPA) Agency Performance Review and the Trust for Public Land (TPL) overall ParkScore® median. To maintain the current LOS by 2040 the City must utilize all existing undeveloped parkland for park uses, based upon total park land acreage (which includes developed and undeveloped land) and population projections. Boulder would continue to meet national benchmark standards for parkland per capita under Scenarios A, B, and C. Any reduction of the City's overall park land acres, such as in Scenario D which repurposes a portion of city-owned land for housing, is expected to impact Boulder's LOS and ability to conform to national benchmark standards.

Recently published performance metrics for NRPA members with jurisdiction populations of 100,000-250,000 residents were reviewed (https://www.nrpa.org/publications-research/ParkMetrics/). Boulder's population is expected to grow from approximately 106,000 residents (2023) to 125,000-140,000 residents by 2040. Current and projected population figures were used to identify the level of service required for a regional park, understanding that the total population of a city is considered for regional parks, as opposed to local populations numbers and proximity used for neighborhood and pocket parks. Additional benchmarks and estimations of operating expenses, staff requirements, and revenue potential were determined from NRPA data.

In addition, future planning evaluations for park land within the Planning Reserve should incorporate other factors:

- Boulder community members participate in many recreation activities at higher-than-average participation rates, which makes benchmarking problematic. For example, in recent studies, research confirmed that both swimming and tennis are activities in which Boulder community members participate at in significantly higher proportions than benchmark communities and national averages.
- Park land should be considered carefully when serving medium and high-density residential areas so that the green space can effectively serve as a welcoming place for all. It should be sized and designed to provide opportunities for connection and recreation that might otherwise occur in a private backyard.
- Effective parks and recreation systems consider equity in developing and operating parkland. It would be appropriate to evaluate, on a per person basis, ratio of nearby public park space between low-income neighborhoods and high-income neighborhoods to ensure that any low-income housing areas are appropriately served by park land.
- Many amenities are only possible in a regional park, and some have limited opportunities within existing park land).

4.5.1 Potential Order of Magnitude Costs

An estimate for park land development within the Planning Reserve was included in Section 3 for each scenario. Tables 24 and 25, below, provide additional detail to estimate a range of potential park construction costs, including a breakdown by park type. Due to the variability across park types, design, assets, and amenities, and the evolution of recreational activity trends, it is difficult to determine a succinct cost per acre for park developments – especially for regional park types. To arrive at these estimates, Boulder staff created two conceptual Regional Park development examples (1 and 2), which identified potential assets and programming to arrive at a high-level estimate of the cost of park development.

These examples were developed through review of national standards of parks programming and the Boulder Parks and Recreation (BPR) Design Standards Manual (DSM), then cross-referenced with BPR's

cost estimating tool which was updated in 2023. As with the broader Service Demand Scenarios, the park development examples and cost estimates are presented as points on a spectrum of potential park development outcomes, and not intended to represent choices or the only available options. Rather, they intend to capture possible bookends of park development in order to model cost estimates. Additional assessments of community and regional needs would be necessary to more specifically determine park assets appropriate for regional and neighborhood parks within the Planning Reserve.

Scenarios A, B, C

The availability of city-owned land for urban park use was maintained in Service Demand Scenarios A, B, and C, dedicating 189 acres for a regional park, as well as dedicating appropriate acreage for 3-5 neighborhood parks within the Planning Reserve.

Table 24. Estimated Park Construction Cost Ranges, Scenarios A, B, C

Park Type	Scenario	Scenario A	Scenarios B and C
	Estimated Cost Per Acre	Regional: 189 acres Neighborhood: 16 acres	Regional: 189 acres Neighborhood: 28 acres
Regional 1 Low	$2,500,000	$472,500,000	$472,500,000
Regional 1 High	$5,000,000	$945,000,000	$945,000,000
Regional 2 Low	$1,500,000	$283,500,000	$283,500,000
Regional 2 High	$2,000,000	$378,000,000	$378,000,000
Neighborhood Low	$1,500,000	$24,000,000	$42,000,000
Neighborhood High	$2,700,000	$43,200,000	$75,600,000
Subtotal Regional Range		$283,500,000 – $945, 000,000	
Subtotal Neighborhood		$24,000,000 - $43,200,000	$42,000,000 - $75,600,000
Total Estimated Park Cost Range		**$307,500,000 - $988,200,000**	**$325,500,000 - $1,020,600,000**

Note: Cost estimates are expressed in 2024 dollars. City of Boulder provided high level estimates of costs per acre by park type, and the ranges shown above reflect a range of options for park design determined by park type and community needs.

Scenario D

Development of Service Demand Scenario D highlighted the opportunity to repurpose a portion of city-owned land for housing, reducing the number of acres available for a regional park from 189 to 91. Per the Boulder Revised Code, disposal of park land requires an affirmative vote of at least 4 members of the Parks and Recreation Advisory Board, a non-binding recommendation from the Planning Board, and approval by City Council.

In addition, any reduction of the City's overall park land acres is expected to impact Boulder's LOS and ability to conform to national benchmark standards. As Scenario D repurposes city-owned land for housing and reduces land available for park use, future planning efforts would include a reassessment of citywide BPR service levels and performance metrics to determine whether Boulder is able to maintain a LOS in alignment with community needs and national benchmarks.

Table 25. Estimated Park Construction Costs, Scenario D

Park Type	Estimated Cost/Acre	Scenario D Regional: 91 acres Neighborhood: 30 acres
Regional 1 Low	$2,500,000	$227,500,000
Regional 1 High	$5,000,000	$455,000,000
Regional 2 Low	$1,500,000	$136,500,000

Park Type	Estimated Cost/Acre	Scenario D Regional: 91 acres Neighborhood: 30 acres
Regional 2 High	$2,000,000	$182,000,000
Neighborhood Low	$1,500,000	$45,000,000
Neighborhood High	$2,700,000	$81,000,000
	Regional Subtotal (Range)	$136,500,000 - $455,000,000
	Neighborhood Subtotal (Range)	$45,000,000 - $81,000,000
	Total Estimated Park Cost Range	**$181,500,000 - $536,000,000**

Note: Cost estimates are expressed in 2024 dollars. City of Boulder provided high level estimates of costs per acre by park type, and the ranges shown above reflect a range of options for park design determined by park type and community needs.

4.6 Boulder Police Department

The Planning Reserve is assigned to District 1 and can be served by the North Foothills Police Annex, located approximately 2.0 miles west of the US-36 and Yarmouth Ave intersection. Police response services in the Planning Reserve are currently managed by the Boulder County Sheriff's Office. Should the land be annexed into the City of Boulder, police response services would shift to the Boulder Police Department.

- Adding residents, business operations, and employees within the Planning Reserve should not immediately cause shifts to the District Plan or the City's broader police response strategy.
- Anticipated increases in population associated with increased calls for service in the Planning Reserve will likely necessitate a reassessment of district operations, resulting in a potential redrawing of district boundaries, and the need for additional staff (both patrol office as well as detective) and equipment.
- There are no immediate Police real estate impacts in North Boulder resulting from the service demand scenario-defined population and employee growth within the Planning Reserve.
- A majority of Boulder's police teams work out of Department headquarters, with limited staff working from the 13th/Canyon location.
- Boulder's Police Department headquarters are at buildout, and the need for additional staff may require an associated review of headquarter operations.

4.7 Boulder Fire-Rescue Department

The Boulder Fire-Rescue Department provides a full range of emergency response services. The closest fire station to the Planning Reserve is Boulder Fire Station 5 at the corner of 19th Street and Violet Avenue. Station 5 houses a three-person engine company and responds to approximately 1,100 emergency calls per year. It is not anticipated that an additional fire station or staff would be required under the assumptions of the four service demand scenarios. Based on service trends, 80% of current call volume is medical, and additional population density within the Planning Reserve may require adding ambulance capacity. Current equipment inventories are also considered appropriate for the level of fire risk within the Planning Reserve.

Within the Planning Reserve, the primary risk is wildfire risk. To enhance wildfire safety and reduce risk, Boulder led a 2023-2024 effort to update the Community Wildfire Protection Plan (CWPP), last updated in 2007. Collaboratively created and developed with the participation of local residents, community leaders, fire personnel and other stakeholders, CWPPs are comprehensive and strategic plans recommending wildfire risk reduction measures to protect people, property, and natural and cultural resources.

Boulder's CWPP identifies areas where wildland fuels and human development intersect to assess the risk of wildfires in these areas. It also makes recommendations for risk reduction strategies, such as clearing vegetation and flammable materials to increase defensible space around a structure, requiring adherence to ignition-resistant construction standards for new construction, and routine vegetation management.

4.8 Economic and Fiscal Impacts

Economic impacts include new development, population and employee growth, earnings and spending, which lead to fiscal impacts (i.e., collection of additional taxes, fees and utility service charges). This section describes the estimated fiscal impacts of all four Service Demand Scenarios. In all cases, the approach assumes a 20-year conceptual buildout of the Planning Reserve, and all values are inflated at 3% annually.

Table 26. Fiscal Impact Summary

Scenario	A	B	C	D
Citywide Impacts (Excluding Utilities)				
Citywide Sources	$305M - $547M	$375M - $676M	$459M - $835M	$558M - $1.03B
Ad Valorem Tax	$62M	$72M	$84M	$85M
Sales & Use Taxes	$224M - $466M	$279M - $580M	$350M - $727M	$440M - $912M
Planning & Permit Fees	$19M	$24M	$25M	$33M
Citywide Uses	($501M)	($630M)	($785M)	($923M)
Citywide Net Impact	($195M) - $46M	($254M) - $46M	($325M) - $50M	($366M) - $107M
Other Revenues				
Utility Enterprise Fund Revenues	$55M	$61M	$54M	$58M
Capital Facility Impact Fees	$67M	$82M	$93M	$102M

Note: All values are rounded. Citywide Sources (Excluding Utilities) include ad valorem taxes levied on the new assessed value of Area III-Planning Reserve improvements, estimated sales and use taxes, and planning and permitting fees related to improvements. Each revenue stream captured within identified Citywide Sources (Excluding Utilities) may flow to one or more City of Boulder funds. Citywide Uses (Excluding Utilities) include an estimated total for all City of Boulder budgetary departments, excepting utilities, combining multiple sources and funds. Other Revenues are separate from Citywide Sources and include utility enterprise fund revenues (water, wastewater, storm water) and capital facility impact fees.

Based on current assumptions, each Service Demand Scenario is estimated to have a potential net impact to the citywide budget ranging from negative to positive. The majority of Citywide Sources are in the form of sales and use taxes, driven by the addition of new residents and commuters. Utility enterprise funds are projected to collect between $54 million and $61 million during the 20-year period, while development could produce up to $102 million in capital facility impact fees.

4.8.1 Scenario A

Scenario A is projected to house 9,350 new residents and employ roughly 1,000 non-resident workers by 2053 (Year 20 of development period). Residential and commercial development within the Planning Reserve could increase City of Boulder assessed real estate value by $5.3 billion, as of 2053.

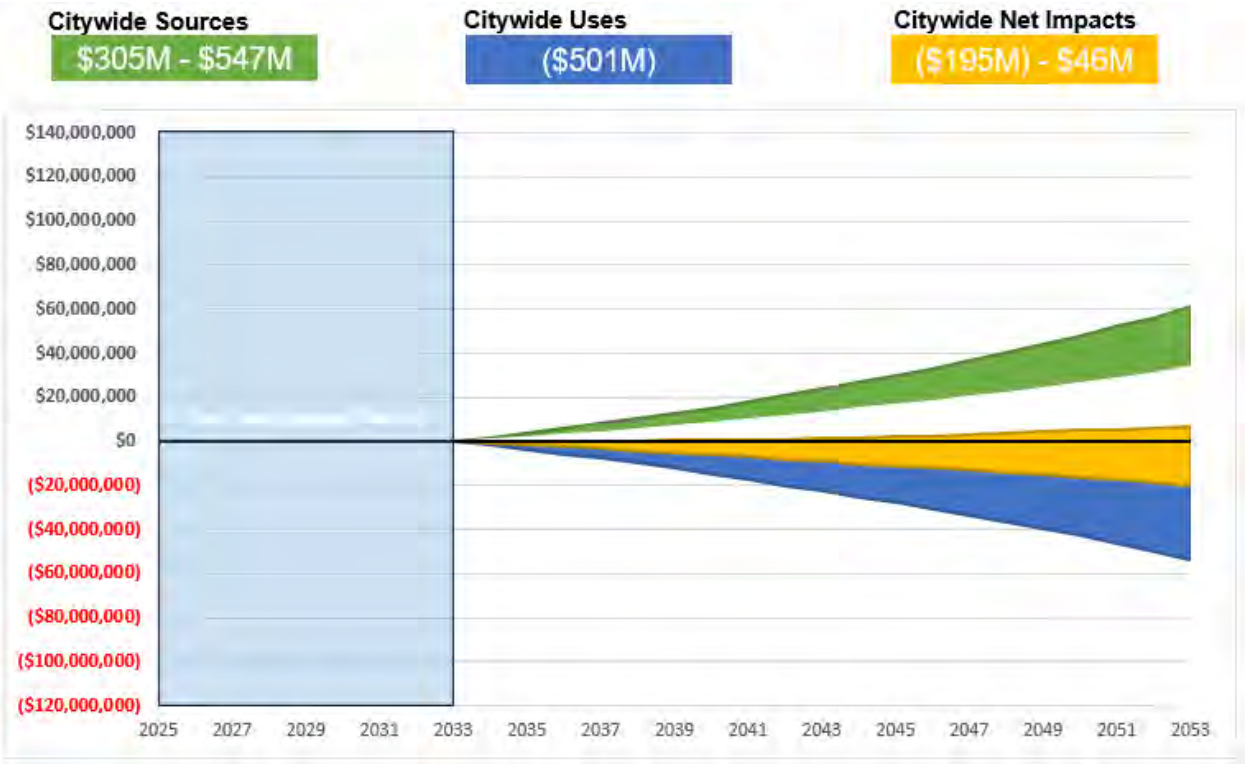

Figure 5. Citywide Impact Summary, Scenario A

Scenario A could produce between $305 million and $547 million in Citywide Sources via property tax ($62 million), sales and use taxes ($224 million - $466 million), and planning and permit fees ($19 million) during the 20-year development period. Citywide Uses are estimated to total $501 million during the period, creating a net impact between -$195 million and $46 million on the City of Boulder budget.

Additional fiscal revenues could also be expected to be produced by expansion into the Planning Reserve. Utility enterprise funds could generate more than $55 million during the 20-year development period, while development is projected to produce another $67 million in capital facility impact fees. These estimates are conceptual and reflect current City development policy.

4.8.2 Scenario B

Scenario B is projected to house 11,580 new residents and employ 1,400 non-resident workers by 2053 (Year 20 of the development period). Residential and commercial development within the Planning Reserve could increase City of Boulder assessed real estate value by $6.2 billion as of 2053.

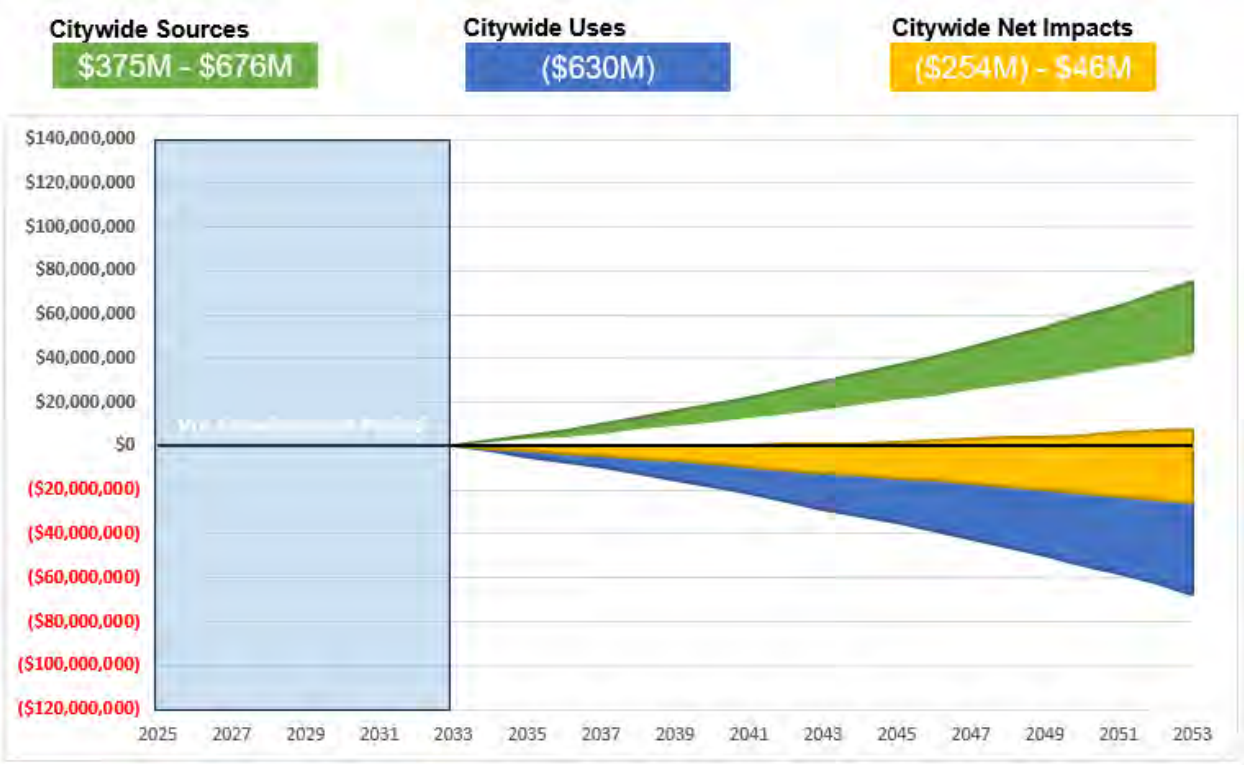

Figure 6. Citywide Impact Summary, Scenario B

Scenario B could produce between $375 million and $676 million in Citywide Sources via property tax ($72 million), sales and use taxes ($279 million - $580 million), and planning and permit fees ($24 million) during the 20-year development period. Citywide Uses are estimated to total $630 million during the period, creating a net impact between -$254 million and $46 million on the City of Boulder budget.

Additional fiscal revenues could also be expected to be produced by expansion into the Area III-Planning Reserve. Utility enterprise funds could be expected to generate more than $61 million during the 20-year development period, while development is projected to produce another $82 million in capital facility impact fees.

4.8.3 Scenario C

Scenario C is projected to add 14,400 new residents and employ nearly 1,400 non-resident workers by 2053 (Year 20 of the development period). Residential and commercial development within the Planning Reserve could increase City of Boulder real estate by more than $9 billion as of 2053.

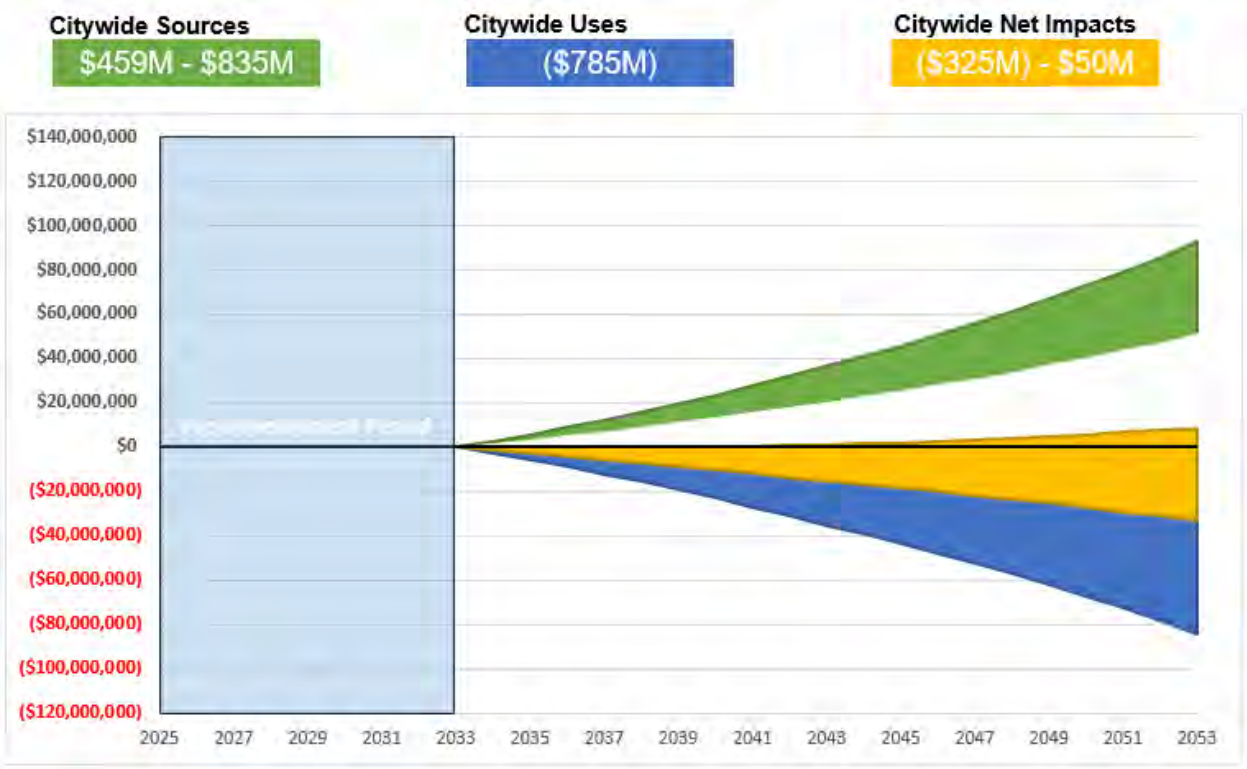

Figure 7. Citywide Impact Summary, Scenario C

Scenario C could produce between $459 million and $835 million in Citywide Sources via property tax ($84 million), sales and use taxes ($350 million - $727 million), and planning and permit fees ($25 million) during the 20-year development period. Citywide Uses are estimated to total $785 million during the period, creating a net impact between -$325 million and $50 million on the City of Boulder budget.

Additional fiscal revenues could also be expected to be produced by expansion into the Area III-Planning Reserve. Utility enterprise funds could be expected to generate more than $54 million during the 20-year development period, while development is projected to produce another $93 million in capital facility impact fees.

4.8.4 Scenario D

Scenario D is projected to house 18,930 new residents and employ 700 non-resident workers by 2053 (Year 20 of the development period). Residential and commercial development within the Planning Reserve could increase City of Boulder assessed real estate value by more than $7.2 billion as of 2053.

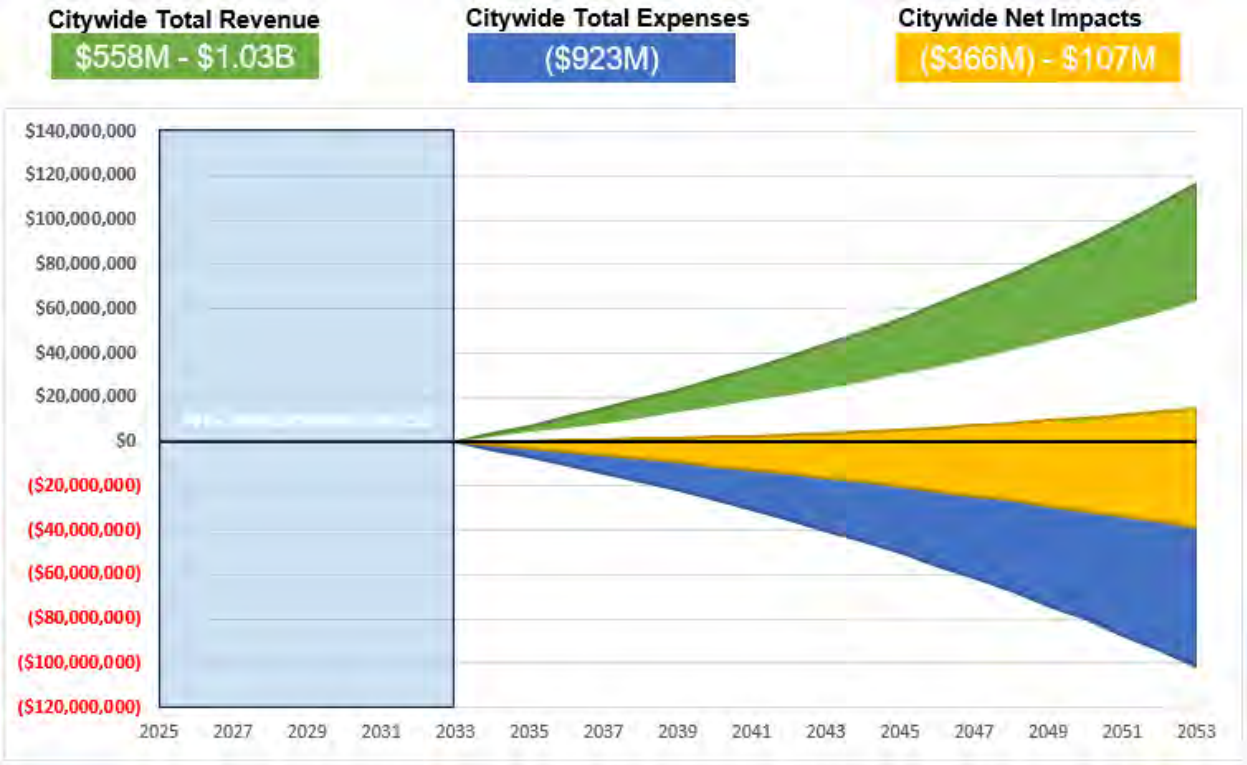

Figure 8. Citywide Impact Summary, Scenario D

Scenario D could produce between $558 million and $1.03 billion in Citywide Sources via property tax ($85 million), sales and use taxes ($440 million - $912 million) and planning and permit fees ($33 million) during the 20-year development period. Citywide Uses are estimated to total $923 million during the period, creating a net impact between -$366 million and $107 million on the City of Boulder budget.

Additional fiscal revenues could also be expected to be produced by expansion into the Area III-Planning Reserve. Utility enterprise funds could be expected to generate $58 million during the 20-year development period, while development is projected to produce another $102 million in capital facility impact fees. This scenario includes a provision for affordable housing to be built on a portion of parkland. Reflective of the conceptual nature of this analysis, the approach for affordable housing simply assumes a 25% reduction in values for units seen as “affordable”, yielding slightly less property tax revenue per unit over the conceptual 20-year period.

5. Conceptual Phasing

5.1 Water and Wastewater Conceptual Phasing

While this evaluation assumes straight-line development over a 20-year period, assumptions for when and where development is initiated could have major implications on phasing requirements for identified water and wastewater on-site and off-site improvements. A Planning Reserve infrastructure phasing plan should be developed in the future and should consider the following items:

- The time it takes to design, permit, and construct the infrastructure projects. Several water and wastewater projects needed to support the Planning Reserve could take over ten years for design, permitting, and construction due to the nature of the projects. Additional factors that could affect the length of time to design and construct these projects include land use updates, permitting, water supply operations and portfolio updates, available human resources (both internal to the City and regional to the industry), available funding, and public willingness. Understanding the timing and location of development will be critical for Boulder to incorporate these improvements into their capital improvement program (CIP).

- Competing priorities with other water and wastewater projects in Boulder's CIP and other developments occurring within the city. The current CIP has identified and prioritized critical water and wastewater infrastructure projects and the associated funding. The addition of water and wastewater projects needed to support the Planning Reserve will require its own dedicated funding or will require Boulder Utilities Engineering to reprioritize the CIP portfolio. Funding and cash flow timing having significant impacts and implications for previously identified projects and newly identified projects supporting the Planning Reserve.

- Critical water and wastewater projects required prior to significant development of the Planning Reserve such as replacement of the Fourmile Trunk Sewer. The development of the Planning Reserve without key water and wastewater improvements has implications on the ability to meet existing water and wastewater level of service goals. Additional evaluations will be needed to identify which system improvements will be required at different phases of development to effectively support the Planning Reserve and the desired timing of its development.

As mentioned above, a more detailed evaluation will need to be conducted to identify how infrastructure should be phased to support the Planning Reserve. A high-level overview of potential phasing options and considerations is summarized below.

5.1.1 Water

- Offsite Improvements: As noted in the Water section above, due to capacity limitations of existing off-site infrastructure treated water infrastructure improvements would be required to serve the Planning Reserve. Initial small phases of development could potentially be served with limited improvements (e.g., waterline, PRV, pumping, and storage improvements), however the progression of development would require significant improvements (e.g., pump station and water treatment plant improvements).

- Onsite Improvements: Backbone water lines will need to be constructed as development is phased. The onsite waterlines will have to be looped for safety (e.g., fire flow requirements). As development progresses into multiple pressure zones, PRVs and booster pump stations will need to be constructed.

5.1.2 Wastewater

- Offsite Improvements: Due to capacity limitations of the existing collection system and WRRF, system improvements would be required to serve the Planning Reserve. Prior to any development occurring at the Planning Reserve, the Fourmile Trunk Sewer would have to be upsized, or a parallel sewer line would have to be constructed. Initial small phases of

development could potentially be served by the WRRF with limited improvements. As development progresses, additional WRRF improvements would be needed.

- Onsite Improvements: Identified in WW Section, above, all scenarios could potentially connect to the upsized Fourmile Trunk Sewer (or a parallel relief sewer) at one tie-in location approximately one mile east of the southeastern corner of the Planning Reserve. If development of the Planning Reserve starts on the western edge of the area, a long backbone gravity main would be required to convey flows to the offsite system. Should development initiate on the eastern side of the area, a shorter backbone gravity main would be required.

6. Innovation Strategies

The purpose of this chapter is to identify innovative strategies and goals (where applicable) that could be considered for the Area III-Planning Reserve in future policymaking and planning stages if the Service Area Expansion process continues. Additionally, this chapter identifies high-level sustainability, resilience and climate action strategies to incorporate flexibility and "future-proofing" (e.g. anticipating the future and developing strategies to adapt/mitigate), into the planning process. Should the City of Boulder continue to assess the feasibility of expanding urban services to the Area III-Planning Reserve, the strategies identified in this section and others could be further explored to support resilience, reduction of energy and water use, integrate co-benefits, and provide opportunities for innovation.

6.1 Urban Service Areas

The list of Urban Service Areas addressed in this section is based on the Boulder Valley Comprehensive Plan and includes water, wastewater, stormwater and flood mitigation, multimodal transportation and urban parks. Police and fire services were not addressed directly but may also benefit from some of the potential strategies presented. This list has been expanded to include planning, ecosystem services (the natural systems that directly or indirectly influence humans[5]) and energy. These new focus areas capture key information to account for innovative strategies in sustainability. Following is a brief summary of each area and identified strategies.

6.1.1 Planning

Establishing a strong foundation through smart planning supports creation of a sustainable future. The planning strategies identified include innovative concepts and third-party rating programs. The following strategies identify future planning opportunities to consider if the City moves forward with exploring the expansion of urban services into the Area III-Planning Reserve:

- Resilient Neighborhoods are designed to withstand shocks and stresses such as flooding, urban heat and wildfires based on optimum location(s) with adaptation and mitigation strategies incorporated.
- 15-Minute Community is the idea that a community should be built so that all daily needs can be met within a 15-minute walk or bike ride.[6] This would reduce individual car use and decrease transportation needs.
- Integration of Systems for Co-Benefits refers to the coordination between different systems or processes to achieve successful outcomes. For example, if we are saving water, we are also saving energy because there is no longer as much need to pump and treat water.
- EcoDistricts are a model for urban development focused on sustainability and social equity. The concept is to reduce the ecological footprint of an area. Additionally, EcoDistricts create inclusive and resilient communities. EcoDistricts is also a third-party certification through the Green Building Alliance.[7]
- Envision is a holistic sustainability certification program developed by the Institute for Sustainable Infrastructure. The accreditation of a community or project focuses on quality of life, leadership, resource allocation, the natural world, and climate and resilience.[8]
- LEED for Cities and Communities is a certification developed by the U.S. Green Building Council. The certification helps enhance and protect ecosystems, it promotes energy efficiency, efficient

[5] Ecosystem services | Definition, History, & Importance | Brittanica
[6] POTM Sustainability Plan 100 (Preliminary Report), (secureserver.net), and The 15-minute City meets human needs but leaves desires wanting | World Economic Forum (weforum.org)
[7] EcoDistricts AP | Green Building Alliance (gba.org)
[8] Envision Sustainability Professional (ENV-SP) – Institute for Sustainable Infrastructure

water use and improving waste management practices. Additionally, LEED encourages reducing reliance on fossil fuels.[9]

6.1.2 Ecosystem Services

Ecosystem services are fundamental to the relationship and connection between the natural environment and human well-being. The following strategies highlight the most effective and innovative approaches to creating a sustainable and resilient expansion of Boulder in the Area III-Planning Reserve:

- Habitat Protection and Enhancement refers to strategies and actions taken to safeguard existing habitats from destruction and improve the habitats to support quality and functionality. One strategy, Regenerative Landscaping, enhances the natural environment through biodiversity by creating a variety of habitats for plants and animal species.[10]
- Nature-Based Solutions are strategies to address diverse environmental issues. The approaches use nature and natural infrastructure to sustainably manage and protect ecosystems.[11]
- Urban Heat Island Mitigation represents approaches to alleviate the temperature differences between urban areas compared to rural areas.
- Pollinator Pathways and Gardens are designed to encourage insect pollination. Strategies for pollinator gardens and corridors include flower gardens, pesticide free zones and native plant locations.
- Community Gardens enhance ecosystems through social and environmental impact. Community gardens provide social connection, health benefits, and access to fresh food. The environmental impact of community gardens includes enhancing biodiversity, encouraging sustainable practices and creating living classrooms.
- Carbon Sequestration is the process of capturing carbon dioxide, one of the common greenhouse gasses, and storing it typically in the ground, soil, or water areas.[12] The method helps reduce the amount of carbon dioxide in the atmosphere through plants, soil, and natural system absorption.
- Waterwise Plant Palette refers to plants that are drought tolerant and can survive in environments with limited water. Waterwise Plant Palettes can be used to plan for low annual precipitation within urbanized areas.[13]
- Wildfire Resistant Landscape is designed to mitigate fire damage to communities and the nearby property. Methods to create wildfire resistant landscapes include fire-resistant plants, a buffer zone between structures and foliage and maintenance to upkeep fire practices, such as clearing dead leaves and flammable vegetation.

6.1.3 Energy

Boulder's initiatives to enhance energy efficiency and expand renewable energy use are crucial to mitigate and plan for the impacts of climate change. Successful energy planning follows three main strategies including minimizing demand through energy conservation and efficiency, eliminating on-site emissions through electrification, and maximizing on-site clean generation. Following is an overview of possible energy strategies for the Area III-Planning Reserve and potential energy policy goals to consider.

[9] LEED for Cities and Communities | U.S. Green Building Council (usgbc.org)
[10] Regenerative Landscaping in Colorado – Habitat Guild | Regenerative Landscapes
[11] What Exactly Are 'Nature-based Solutions'? | World Resources Institute (wri.org)
[12] What is carbon sequestration | U.S. Geological Survey (usgs.gov)
[13] Sustainable Colorado Yards – Waterwise Yards

Goal: The energy goal for the Area III-Planning Reserve is to create a net zero carbon community. Including 100% electric community, 50% reduction in energy consumption from the grid, and a stretch goal of 50+% on-site renewable energy.

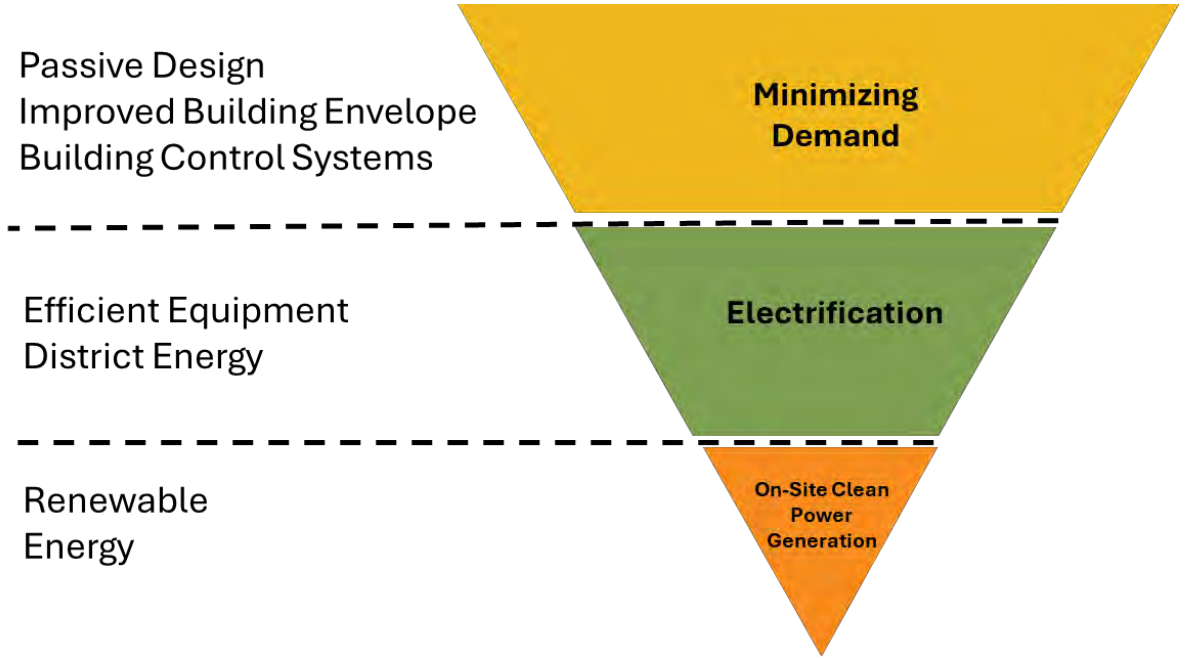

Figure 9. Components of a Holistic Energy Strategy

6.1.3.1 Minimizing Energy Demand

Minimizing energy demand is typically the first step in smart energy planning and is focused on energy conservation and using less energy through strategies such as passive design of buildings, improved building envelopes, building control systems and high-performance HVAC systems.

- Passive Design is a strategy to build structures informed by the surrounding area to harness natural resources such as sunlight to optimize building efficiency.
- Improved Building Envelope Systems are achieved through improving insulation and the use of energy efficient windows and doors to release as little air/energy as possible.
- Building Control Systems refers to the method of managing energy consumption data and control systems. This process allows for buildings to track their energy usage and adjust settings accordingly to make sure energy overuse is not occurring.
- High Performance HVAC Systems can be incorporated into the design to maximize efficiency onsite. Heat recovery systems utilize wasted heat within a building to heat other areas, whilst heat pumps operate at efficiencies much higher than a traditional system. Such systems can be cost effectively designed and reduce overall energy demand significantly.

6.1.3.2 Electrification

Electrification is a process focused on converting sources that do not use electricity like heating systems using natural gas to electric systems. Specifying electrification for projects in the Area III-Planning Reserve could be a goal as all construction would be new buildings.

- All-electric buildings are structures that operate completely on electricity and only have electric appliances.
- District energy solutions are thermal networks of underground pipes connected to a centralized plant which can more efficiently heat and cool buildings. If implemented correctly, they can help reduce energy costs and emissions through electrification.[14]

[14] Combined Heat and Power Technology Fact Sheet Series: District Energy

- Geothermal opportunities can improve the efficiency of electrified heating systems by using the ground as a heat source and sink.
- Anticipating and enabled electric vehicle charging refers to the concept of proactive planning to prepare for the transition to electric vehicles.

6.1.3.3 On-Site Clean and/or Renewable Energy

Onsite clean and renewable energy generation further mitigates the demand for grid power and can reduce emissions and energy cost. Based on preliminary analysis, the Area III-Planning Reserve could produce approximately half of the energy required for through renewable sources. In addition, an electric microgrid could enable the integration of advanced technologies for energy production, storage, and distribution within a community.

- Net Zero Energy Buildings are structures designed to not consume more energy than they can produce.[15]
- Onsite Renewable Energy is the generation of energy from renewable sources such as solar directly at the location where the energy will be used.[16]
- Energy Storage through batteries or other systems can allow for increased on-site generation (by storing excess generation for when it is needed. This can reduce energy costs and can provide resilience benefits such as increased power reliability and supply redundancy.
- Demand Management is the method of balancing energy supply and demand. Smart grid enabled demand management can utilize advanced metering to assist in facilitating communication between energy suppliers and consumers for efficient energy use.[17]
- Waste Heat recovery is a method that involves using heat produced during different processes, such as composting, to produce energy. For example, one application involves recovering heat from a large sanitary sewer pipe to be beneficially reused in a building with a heat demand (such as a swimming pool).

6.1.4 Water and Wastewater

Successful water and wastewater planning for the Area III-Planning Reserve includes minimizing water demand, maximizing water reuse as supported by water rights, and utilizing native water-wise landscaping. Water innovations described in this section consider Colorado water law and state regulations and strike a balance between water and energy conservation.

Goal: The water and wastewater goal for Area III–Planning Reserve is to have 40-50% reduction from a typical turf-based landscape in outdoor water use for residential and commercial spaces.

6.1.4.1 Minimize Water Demand

Minimizing water demand for the Area III-Planning Reserve is focused on using less and monitoring the amount of water use. Water efficient buildings and landscapes are systems and technologies that incorporate strategies outlined below:

- Ultra-Low-Flow Plumbing are plumbing fixtures that are designed to use significantly less water than typical plumbing apparatus. Fixtures such as non-water urinals and ultra-low-flow commercial dishwashers could be installed in commercial spaces.
- Smart Irrigation Systems are systems designed to use real-time location-based information such as weather, soil moisture, and soil nutrient levels to determine when and for how long to water and to recommend soil amendments to maximize absorbency.

[15] Net Zero Energy Buildings | WBDG – Whole Building Design Guide
[16] On-Site Renewable Energy Generation | U.S. EPA
[17] The Smart Grid Promise Demand Side Management (smartgrid.gov)

- Drip/Subsurface Irrigation is a highly efficient way to water landscapes by wetting only the root zones of the plants.[18] Subsurface irrigation systems can also be supplied via graywater systems.
- Raw Water Irrigation, as opposed to using treated water, is an opportunity to save on cost and better match water quality with use type as well as reduce water loss through additional steps of treatment and distribution.
- Water Monitoring/Controls refers to the method of managing consumption of water through real-time data (sourced from Advanced Metering Infrastructure or "AMI") and control systems. This process allows for buildings/sites to track water usage, automate alerts, automate shutoff of irrigation systems based on leak alerts, and optimize settings in coordination with smart irrigation systems to minimize water use.
- Water Use Limitations are implemented during drought conditions to preserve water for higher priority uses, such as health and safety. Increasing the frequency of such water use limitations, through policy changes, results in lower water use by the community on a long-term basis.

6.1.4.2 Maximize Water Reuse

Maximizing water reuse is about making sure that water serves multiple purposes before returning to the stream or groundwater.

- Graywater is water that has been discharged from showers, clothes washers and sinks, and is captured, treated, and reused for drip/sub-surface irrigation for gardens and toilet flushing.
- Water Reuse is treated municipal wastewater that is able to be used again.[19] An example of this is capturing reusable wastewater effluent and exchanging that water back into the source water system.[20]

6.1.4.3 Native Landscaping/Water-wise Landscaping

Native landscaping and water-wise landscaping are crucial for conserving water, as they use drought-resistant plants suited to the local climate. These practices also support local ecosystems by providing habitats for native wildlife and promoting biodiversity.

- Rainwater harvesting/rain gardens are two methods used create absorbent landscapes that manage stormwater, conserve water, and support the ecosystems.
- Eliminating nonfunctional turf areas restricts the use of turf in areas that do not serve a designated purpose, paving the way for climate adaptive landscapes that provide ecosystem services.
- Native/low water plant palette refers to plants that are drought tolerant and can survive in environments with limited water. This type of plant palette includes plants that naturally occur in the Boulder ecosystem. Plants can be grouped by hydrozone to maximize water savings potential.

6.1.5 Stormwater and Flood Mitigation

Stormwater and flood mitigation strategies are key to maintaining water quality and protecting life and property. Mitigation can also help create healthier ecosystems.

Goal: The stormwater and flood mitigation goals for the Area III–Planning Reserve are to have 100% managed conveyance and to have strategies and measures in place for mitigation for a 100-year flood event.

[18] Subsurface Drip Irrigation (SDI) – Understanding Crop Irrigation (wisc.edu)
[19] Basic Information about Water Reuse | U.S. EPA
[20] Water Law Policy: Leases – Exchanges | Water Education Colorado

- Nature based solutions incorporated into the design of modified channels and associated floodplains that protect people and property while also restoring or creating adaptive ecosystems and offset the city's carbon footprint.

- High-functioning and low maintenance stream design to mimic natural processes through the design of engineered channels and floodplains.

- Green infrastructure refers to natural systems that manage water using strategies involving vegetation and soil. Green infrastructure encourages natural processes such as evapotranspiration, reuse, and stormwater infiltration to reduce the burden water can create on traditional stormwater systems.

- Low impact development is a management approach and set of practices that can reduce runoff and pollutant loadings by managing runoff as close to its source(s) as possible.[21]

- Permeable Paving is when ground surfaces are designed to allow for water to infiltrate into the soil below. This strategy allows for reduced runoff, flooding mitigation, and groundwater recharge.

- On-site and off-site flood mitigation – retention and detention are two main systems in stormwater management. A retention system's goal is to hold stormwater. Examples of retention systems are rain gardens and infiltration basins. These systems reduce the volume of runoff to the stormwater system and promote groundwater recharge. Detention, on the other hand, is a system designed to reduce peak flow rate and minimize risk from downstream flooding by storing stormwater temporarily and releasing it slowly overtime.

- Green roofs are buildings with vegetation growing typically on the roof over waterproofing of the building. Green roofs or living roofs can be used for stormwater management through plants absorbing water and decreasing runoff.[22]

6.1.6 Multimodal Transportation

Boulder's strong focus on encouraging alternative modes of mobility over single-occupancy vehicle travel makes a multimodal transportation system critical to the success of any future community uses in the Area III-Planning Reserve. Comprehensive multimodal transportation planning goals and strategies that could be considered include planning for mobility, minimizing vehicle miles traveled, and electrifying mobility.

Goal: The multimodal transportation goal for the Area III–Planning Reserve is to reduce vehicle miles traveled by at least 50% from the base rate and provide 100% electric transit.

6.1.6.1 Planning for Mobility

Planning for mobility involves creating strategies to ensure that people can move efficiently and safely within the community and region.

- Complete, mixed-use neighborhoods including a variety of residential, community and commercial spaces which encourage walkability and reduces the need for vehicles.

- Vehicle-free areas/neighborhoods are community areas designed to provide attractive travel choices to include walking, biking, and public transportation.

- Pedestrian/bike multi-modal trails are pathways designed to accommodate people walking and people cycling, separate from main roads and vehicular traffic.

[21] Terminology of Low Impact Development, Distinguishing LID from other Technologies that Address Community Growth Issues | U.S. EPA
[22] What to Know About Green Roofs: Benefits, Types, and More | Forbes Home

- Developing a trip budget to limit vehicle miles traveled and minimize the burden on roadway and infrastructure systems.
- Increase local street connectivity to promote walkability and reduce vehicles miles traveled.

6.1.6.2 Minimize Vehicle Miles Traveled (VMT)

Minimizing Vehicle Miles Traveled involves strategies to reduce the total distance driven by vehicles.

- 1st Mile and last mile solutions are strategies to address and improve connection between public transportation and the initial start and end of an individual's trip.
- Accessible/convenient public transit (smart bus stations) refers to public transit that is frequent, reliable, and user friendly with systems to inform passengers of arrival/departure times.
- Active transportation and micromobility refer to providing transportation choices that focus on reducing VMT. Active transportation is specifically methods of transportation that are human powered i.e. walking and biking. Micromobility is transportation that is typically electric, or human powered such as bikes, e-bikes, scooters, or e-scooters that provide a cost-effective, first and last mile solution, or a solution to shorter travel.[23]
- Car share is a strategy to reduce emissions by lowering the amount of cars on the road. The concept is that individuals can rent cars for short periods of time, examples include Zipcar and Colorado CarShare.
- Mobility hubs are locations that connect multiple types of transportation modes. The hubs are intended to enhance connectivity and convenience in urban locations through sustainable options.
- Connected intersection is an infrastructure system designed to enhance traffic operations and management. Connected intersections improve safety, traffic efficiency, and help to decrease emissions by minimizing stop and go traffic.[24]
- Land Use and Parking should be planned in concert with transportation goals. To minimize VMT, consider eliminating parking minimums and establishing parking maximums within the Area III-Planning Reserve.

6.1.6.3 Electrify Mobility

Electrifying mobility involves transitioning traditional vehicles to electric powered.

- Smart EV charging management and vehicle-to-grid charging are both strategies to optimize the connection between the power grid and electric vehicles.
    - Smart EV Charging Management is a strategy that uses communication technology to coordinate charging activities with the grid; this includes managing time, rate and consumptions.[25]
    - Vehicle-to-Grid Charging is a method that allows for electric vehicles to act as supply power to the grid during peak demand periods.[26]
- Inductive charging is method of charging that does not involves plugs or wires attached to the vehicle.
- Electric transportation options (fleet of shared e-bikes, e-scooters and electric vehicles) provide accessible and eco-friendly mobility options.

[23] Alternative Fuels Data Center: Active Transportation and Micromobility
[24] Connected Intersection – Institute of Transportation Engineers (ite.org)
[25] Why Smart Charging Essential to a Sustainable EV Transition? | World Resources Institute (wri.org)
[26] Electric Vehicles at Scale Consortium: Smart Charge Management and Vehicle Grid Integration | U.S. Dept of Energy

6.1.7 Urban Parks

Urban Parks are a crucial part of communities because they enhance the quality of life, provide recreation spaces, improve air quality, and support physical health. Strategies to consider for the Area III-Planning Reserve could include the following:

- Sustainable Landscapes are comprehensive approaches to create urban parks that are resilient, resource-efficient, and improve the quality of life.
- Enhancing Biodiversity is a key strategy to increase resilience within communities that introduces a wide variety of plant and animal species into the ecosystem.
- Improving Air Quality is achieved through creating successful urban parks with diverse foliage.
- Increase Urban Canopy to reduce the heat island effect by increased tree and plant coverage in parks.
- Access for All regarding urban parks means making sure that everyone regardless of differences can utilize the community parks.
- Universal Design and All-Ages amenities can include playgrounds, clear signage, seating, and shaded shelter.
- Exceeding ADA Standards (ramps, access) is about going above and beyond regardless of the requirements. Some ways that urban parks can exceed the standards is through enhanced pathways and trails along with enhanced amenities such as restrooms with changing tables.
- Leveraging community partnerships means working with for profit, non-profit, and community-based organizations to provided accessibility for all park users.

Area III-Planning Reserve Urban Services Study

Appendix

Prepared for: City of Boulder

November 7, 2024

Quality information

Prepared by	Checked by	Verified by	Approved by
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Revision History

Revision	Revision date	Details	Authorized	Name	Position

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Table of Contents

1. Appendix A – Service Demand Scenario Assumptions

Residential Assumptions:

- Low Density – 12 units/acre
- Medium Density – 30 units/acre
- High Density – 50 units/acre
- Mixed Use (Residential) – 35 units/acre; 3-4 story building, ¼ to commercial, ¾ to residential
- People per Dwelling Unit: 2.18

Non-Residential Assumptions:

- Mixed Use (Commercial) – 3-4 story building, ¼ to commercial, ¾ to residential
- Commercial use employee creation:
    - Mixed Use – 303 Square Feet/Employee
    - Business Use – 285 Square Feet/Employee
    - Public/Community Services – 326 Square Feet/Employee
    - Light Industrial ('Maker Space') – 600 Square Feet/Employee

2. Appendix B – Water and Wastewater Design Criteria

Water Demand and Infrastructure Sizing Criteria

Water Demand Criteria

Customer Type	Factor	Units	Comments	Source
Irrigated Areas	15	Gallons per square foot per year (gal/sf/yr)		City Manager Rule 11-1-3.A(21), revised January 2021
Medium Density Residential	150	Gallons per capita per day (gpcd)	Use for low, medium, and high density residential	Boulder Design and Construction Standards
High Density Residential	75	Gallons per capita per day (gpcd)	Use for mixed use residential	Boulder Design and Construction Standards
Commercial	10,000	Gallons per capita per day (gpcd)	Use for commercial and light industrial	Boulder Design and Construction Standards

Water Peaking Factors

Customer Type	Max Day	Max Hour	Comments	Source
Irrigation	2.5	2.5		Boulder Design and Construction Standards
Medium Density Residential	2.5	5	Use for low, medium, and high density residential	Boulder Design and Construction Standards
High Density Residential	2	5	Use for mixed use residential	Boulder Design and Construction Standards
Commercial	2.5	2.5	Use for commercial and light industrial	Boulder Design and Construction Standards

Water Storage Tank Sizing Criteria

Storage Type	Amount	Source
Operational Storage	30% of Average Day Demand	2019 Boulder Water Transmission Study
Emergency Storage	100% of Average Day Demand	2019 Boulder Water Transmission Study
Fire Flow Storage	Commercial Fire Flow = 1.08 MG	2019 Boulder Water Transmission Study

Water Supply Criteria

Water Demand Criteria

Customer Type	Factor	Units	Source
Irrigated Areas	15	(gal/sf/yr)	City Manager Rule 11-1-3.A(21), revised January 2021
Low Density Residential	121	gpcd	2023 Water Efficiency Plan
Medium Density Residential	70	gpcd	2023 Water Efficiency Plan
High Density Residential	49	gpcd	2023 Water Efficiency Plan
Mixed Use Residential	70	gpcd	2023 Water Efficiency Plan

Commercial	10,000	gpad	Median 2021-2023 water use for Boulder customers within specified zoning type
Public/Community Services	5,000	gpad	Median 2021-2023 water use for Boulder customers within specified zoning type
Light Industrial/ ("Maker Space")	3,000	gpad	Median 2021-2023 water use for Boulder customers within specified zoning type

Water Peaking Factors

Customer Type	Max Day	Max Hour	Comments	Source
Irrigation	2.5	2.5		Boulder Design and Construction Standards
Medium Density Residential	2.5	5	Use for low, medium, and high density residential	Boulder Design and Construction Standards
High Density Residential	2	5	Use for mixed use residential	Boulder Design and Construction Standards
Commercial	2.5	2.5	Use for commercial and light industrial	Boulder Design and Construction Standards

Unaccounted for Water & Safety Factor

Criteria	Factor	Units	Source
Unaccounted for Water Distribution System	10	%	Industry standards and professional judgement
Treatment Plant Losses	5	%	Industry standards and professional judgement
Water supply losses	15	%	Industry standards and professional judgement

Wastewater Flow and Infrastructure Sizing Criteria

Wastewater Flow Criteria

Customer Type	Factor	Units	Comments	Source
Residential	100	gpcd		Boulder Design and Construction Standards
Commercial	5,000	gpad	Use for commercial and light industrial	Boulder Design and Construction Standards

Wastewater Flow Peaking Factors

Collection Main Diameter	Peak Flow Factor	Source
≤10-inches	4	Boulder Design and Construction Standards
12 - 15-inches	3.5	Boulder Design and Construction Standards
18-27-inches	3	Boulder Design and Construction Standards
≥30-inches	2.5	Boulder Design and Construction Standards

Wastewater Infiltration

Criteria	Factor	Units	Source
Infiltration	200	Gallons per inch-diameter-mile	Boulder Design and Construction Standards

Wastewater Pipe Sizing – Minimum Slopes

Diameter (inches)	Minimum Slope (%, ft/100-ft)	Source
42	0.045	Calculated using minimum velocity and Boulder Design and Construction Standard requirements
36	0.055	Calculated using minimum velocity and Boulder Design and Construction Standard requirements
30	0.071	Calculated using minimum velocity and Boulder Design and Construction Standard requirements
27	0.071	Calculated using minimum velocity and Boulder Design and Construction Standard requirements
24	0.092	Boulder Design and Construction Standards
21	0.113	Boulder Design and Construction Standards
18	0.144	Boulder Design and Construction Standards
15	0.193	Boulder Design and Construction Standards
12	0.247	Boulder Design and Construction Standards
10	0.332	Boulder Design and Construction Standards
8	0.4	Boulder Design and Construction Standards

Notes:
1. Velocities: Collection mains shall be designed with an adequate slope to provide flow velocities of two (2) feet per second during peak flow conditions. Minimum allowable slope shall provide half-full pipe flow velocities of two (2) feet per second. Maximum allowable slope shall provide half-full pipe flow velocities of 10 feet per second. The design slope will usually be greater than the minimum allowable slope, where less than half-full or full pipe peak flow conditions occur.

Wastewater Loading Criteria

Customer Type	BOD (mg/L)[1]	SS (mg/L)[2]	TKN (mg/L)[3]	Source
Residential	255	260	40	Metro Water Recovery Rules and Regulations
Commercial	840	840	126	Metro Water Recovery Rules and Regulations
Industrial	400	400	60	Metro Water Recovery Rules and Regulations

Notes:
1. BOD (lbs/day) = Flow (MGD) X 8.34 X BOD (mg/L)
2. SS (lbs/day) = Flow (MGD) X 8.34 X SS (mg/L)
3. TKN (lbs/day) = Flow (MGD) X 8.34 X TKN (mg/L)

Wastewater Loading Peaking Factors

Criteria	Average Day Max Month Peaking Factor	Source
BOD	1.16	2002-2023 Peaking Factor Data
SS	1.12	2002-2023 Peaking Factor Data
TKN	1.2	2002-2023 Peaking Factor Data

3. Appendix C – Water and Wastewater Order of Magnitude Cost Assumptions

Potential order of magnitude offsite treated water infrastructure costs were estimated for the offsite treated water infrastructure and existing wastewater infrastructure improvements anticipated to serve the Planning Reserve. The costs are based on previous studies and engineering judgement and are intended to give a high-level range of potential costs. The costs are in alignment with Association for the Advancement of Cost Engineering (AACE) Class V estimating guidance. The order of magnitude costs are based on high-level conceptual design and represent a planning level accuracy of -50% to +100%. The costs reflect an opinion of potential construction and non-construction (engineering design, permitting, administration, legal, land acquisition, construction management, etc.) costs. The following items are not included in the costs: operation, maintenance, and energy costs. No costs were inflated or discounted to account for future pricing.

4. Appendix D - Transportation

The expected traffic volumes generated by the proposed development are based on the size and type of proposed land uses and on the trip data published in the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition*. The land use types from the ITE Manual used for trip generation were selected to match the proposed land use types in the development area. The proposed development land uses compared to the ITE land uses selected for trip generation, along with assumptions associated with the land use types, are shown in Table 1.

Table 1. Potential Land Uses Compared to ITE Land Uses for Trip Generation

Development Proposed Land Use	ITE Land Uses for Trip Generation	Notes/Assumptions
Mixed Use (Commercial)	Strip Retail Plaza (<40k sq ft)	4- story apartment with commercial on the first floor (see Mixed Use (Residential))
Business	General Office Building	
Public/Community Services	Recreational Community Center	Assumed more general land use of Community Center.
Light Industrial ('Maker Space')	General Light Industrial	
Residential-Low Density	Single Family Attached Housing	Assumed town duplex/triplex/quadplex
Residential-Medium Density	Multifamily Housing (Low-Rise)	2-3 story town homes
Residential-High Density	Multifamily Housing (Mid-Rise)	4- story apartment
Mixed Use (Residential)	Multifamily Housing (Mid-Rise)	4-10 story apartment with commercial on the first floor (See Mixed Use (Commercial))
Parks & Recreation	Public Park	

The average trip generation rate for each type of land use was used to determine the trips generated daily, and in the AM and PM peak hours, for each proposed land use. Certain trip reductions, pass-by trips, and linked trips were then applied to the trip generation to prevent an over estimation of the generated trips.

Pass-by trips are trips currently on the adjacent roadway that make an intermediate stop at the Planning Reserve between their origin and destination. An example of a pass-by trip would be a vehicle that typically travels to work on US-36 but now accesses the Planning Reserve for a retail land use, and then exits the area and continues to work along US-36. Pass-by trips affect the number of vehicles entering and exiting the development but are not added to the adjacent street network. The percentage of pass-by trips of each applicable land use was determined from the *ITE Trip Generation Manual, 11th Edition*.

Linked trips are trips that use more than one land use within the study area. One example would be a resident at a new home within the Planning Reserve going to and from a commercial land use within the area. A linked trip/internal capture of 20% was determined in accordance with the methodology in the *ITE Trip Generation Handbook, 3rd Edition, September 2017*. This indicates that 20% of the total projected trips would occur within the Planning Reserve and would not add any additional trips to the roadway network adjacent to the area.

After selecting the land use types, determining expected trips using the average trip generation rate, and applying trip reductions, the total expected new trips generated by the Planning Reserve under each demand scenario were determined. These volumes were added to the existing traffic volumes along US-

36, established by the *Boulder County Traffic Volumes*, to estimate expected future traffic volumes on US-36 and develop roadway network improvement recommendations. The *Boulder County Traffic Volume* data was determined to be more detailed than the CDOT OTIS data previously used in Task 2. Boulder's data sources also used a more conservative estimate of 18,000 average annual daily traffic (AADT) compared to the aggregate 16,809 provided by CDOT OTIS. The trip generation summaries for each scenario are presented in Table 2, Table 3, Table 4, and Table 5.

Table 2. Trip Generation Summary – Scenario A

Scenario A	AADT			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,379	734	645	1,855	834	1,022
New Development Trips	32,074	16,037	16,036	2,202	905	1,297	2,796	1,485	1,311
Total Trips	50,074	25,037	25,036	3,581	1,639	1,942	4,651	2,318	2,333

Table 3. Trip Generation Summary – Scenario B

Scenario B	AADT			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,379	734	645	1,855	834	1,022
New Development Trips	40,854	20,427	20,425	2,770	1,185	1,585	3,590	1,903	1,687
Total Trips	58,854	29,427	29,425	4,149	1,919	2,230	5,445	2,737	2,708

Table 4. Trip Generation Summary – Scenario C

Scenario C	AADT			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,379	734	645	1,855	834	1,022
New Development Trips	46,740	23,370	23,368	3,204	1,284	1,920	4,286	2,305	1,981
Total Trips	64,740	32,370	32,368	4,583	2,018	2,565	6,141	3,139	3,002

Table 5. Trip Generation Summary – Scenario D

Scenario C	AADT			AM Peak Hour			PM Peak Hour		
	Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
Existing Volumes	18,000	9,000	9,000	1,379	734	645	1,855	834	1,022
New Development Trips	53,398	26,699	26,697	3,366	1,057	2,309	4,414	2,584	1,830
Total Trips	71,398	35,699	35,697	4,745	1,791	2,954	6,269	3,418	2,851

A trip assignment was also completed in which new peak hour trips were assigned to US-36, using the assumption that 75% of new traffic travels south on US-36 and 25% of new traffic travels north on US-36. This assumption was made due to the vast majority of existing urban area and trip generators being located to the south such as downtown Boulder and the Denver metro region, as well as key transportation routes such as CO-119, CO-7, and CO-93. Additionally, routes to Fort Collins to the north would likely utilize CO-119 which would be accessed via Jay Road in the south end of the Planning Reserve.

A high-level capacity analysis was conducted in order to determine recommended improvements necessary to maintain acceptable levels of traffic operations under the four scenarios. The projected AADT on US-36 for each scenario, shown in Table 2, Table 2, Table 4, and Table 5, were compared to the

roadway capacities presented in the signalized highway generalized service volume table in the *Simplified Highway Capacity Calculation Method for the Highway Performance Monitoring System, Federal Highway Administration, October 2017*.

5. Appendix E – Cost Estimations

- AECOM's cost estimates detailed in this section include onsite horizontal infrastructure improvements within the Area III-Planning Reserve. Order of Magnitude Cost Assumptions for infrastructure are in alignment with the Association for the Advancement of Cost Engineering (AACE) Class V estimating guidance, which indicates an accuracy range of -50% to +100%. Class V costs are an engineering industry standard for infrastructure improvements with a planning level accuracy/high-level design.
- Offsite improvements and urban park development cost estimates were developed separately, and summarized below:
    - Cost assumptions for offsite water and wastewater infrastructure improvements are detailed in Appendix C.
    - City of Boulder provided high-level, rough order of magnitude cost estimates for urban park development, based on park type (neighborhood or regional). These estimates were developed through review of national standards of parks programming for cities of a similar size (100,000 – 200,00) and the Boulder Parks and Recreation (BPR) Design Standards Manual (DSM), then cross-referenced with BPR's cost estimating tool which was updated in 2023.
        - Due to a wide range of potential assets, amenities, park designs and community and regional needs, there is extensive variability across cost estimates for regional park development and construction. To address this for the Planning Reserve study, Boulder staff created two conceptual Regional Park development examples (1 and 2), identifying different sets of potential assets and programming to arrive at a high-level estimate of the cost of park development (expressed as a cost per acre).
        - The table below summarizes cost range estimates provided for urban park development:

Table 6. Park Construction Cost Range Estimates

	Low	High
Neighborhood Park	$1,500,000	$2,700,000
Regional Park 1	$2,500,000	$5,000,000
Regional Park 2	$1,500,000	$2,000,000

Ranges provided by City of Boulder. Figures are rounded and expressed in 2024 dollars.

        - The estimates above were applied to each Service Demand Scenario:
            - For all scenarios, it was assumed that Neighborhood Park development would cost $1,500,000/acre.
            - For scenarios A, B, and C, it was assumed that Regional Park development would cost $1,500,000/acre, assuming the larger regional park acreage would result in per-acre cost efficiencies.
            - For Scenario D, it was assumed that Regional Park development would cost $2,500,000 per acre, as the smaller regional park size in this scenario would not recognize the same per-acre cost efficiencies as in Scenarios A-C.

Boulder County Planning

Boulder, Colorado
Order of Magnitude Estimate R2

October 9, 2024

Document Issue Sheet

Issue No.	Document	File Path	Issue Date	Parties Sent To	Prepared By	Checked By	Reviewed By
A	ROM Cost Estimate	https://aecom.sharepoint.com/:x:/r/sites/BoulderCountyPlanning/Shared%20Documents/Docu	10/2/2024	AECOM	GB/WR	GB	JL
B	ROM Cost Estimate R1	https://aecom.sharepoint.com/:x:/r/sites/BoulderCountyPlanning/Shared%20Documents/Docu	10/7/2024	AECOM	GB/WR	GB	JL
C	ROM Cost Estimate R2	https://aecom.sharepoint.com/:x:/r/sites/BoulderCountyPlanning/Shared%20Documents/Documents/Estimate	10/9/2024	AECOM	GB/WR	GB	JL
D							
E							
F							

CONTENTS

1.0 Basis of Assumptions

The following information has been utilized in the compilation of this cost model.

Early Stage Design Information including the following:

PREPARED FROM	**Dated**
Water and Waste Water Inventory	September 04, 2024
Storm Inventory	September 16, 2024
Transportation Inventory	September 17, 2024
BUSS Inventory	September 25, 2024

Subsequent correspondence with desing team

This is a DRAFT issue, the quantities, costs and contents of this document are subject to change after design team and client DRAFT review

Qualifications of Cost Model

The Cost Model is based on the following assumptions:

- This estimate is based on preliminary information provided prior to the completion of any design. These cost models are pre-conceptual and are not representative of the final construction costs nor does it include for any additional scope or information not determined by the date of the models. AECOM cannot and does not guarantee that the proposals, bids, and actual construction costs will not vary from this estimate.
- The estimate includes all Direct Construction Costs (Labor, material and equipment) as well as Indirect Construction Costs (General Contractor & Subcontractor Markups). The Indirect Construction Costs include the following:
  - Phasing, logistics and security premium
  - GC's and GR's
  - Bonds and insurances
  - Contractor's Overhead & Profit or Fee
  - Construction Contingency
  - Design Contingency
- This Basis of Estimate report (along with the above inclusions, exclusions, assumptions and clarifications), and the attached ROM Cost Estimate are intended to be, and constitute a single document
- Estimates are prepared using current dollars (Q3 2024)
- Normal productivity rates as historically experienced are utilized
- Assumed that general building permits if required, will be obtained by, and paid for by the owner (allowances included in soft costs)
- Assumed that all easements, if required, will be obtained by, and paid for by the owner
- Assumed that all public space permits, if required, will be obtained by, and paid for by the owner
- Assumed that all 3rd party inspections, materials and soil testing will be conducted by the owner's consultants, and paid for by the owner (allowances included in soft costs)
- Quantities for building and site have been included based on quantities and sizing provided in the pricing package

1.0 Basis of Assumptions

- The Core and Shell Spaces and Fitout costs have been included on a $/SF approach based on program summary
- It is assumed no contaminated material is at the site
- The general contractor will have full access to the site during normal business hours, within the constraints of a working / ongoing health care environment
- We have assumed that all easements, if required, will be obtained by, and paid for by, the owner.
- We have assumed that all 3rd party inspections, materials, and soil testing will be conducted by the owner's consultants and paid for by the owner.
- Allowances for utility infrastructure is a ROM estimate based on quantities provided by designer

2.0 Exclusions

The following are excluded, but may have an impact on the financial robustness of this scheme. It is advised that this list is reviewed and managed in conjunction with the design team in order to make alternative provisions for these items as required - in conjunction with the client.

Exclusions from Construction Costs:

- Compression of Schedule, premium shift work and restrictions on the contractor's working hours
- Out of hours working
- Modifications to the scope of work
- Restrictive technical specifications or excessive contract conditions
- Land and easement acquisition
- Non-competitive bidding conditions
- Sole source specifications of materials or products
- Off-site work and other infrastructure improvements
- Hazardous material abatement
- Remediation of contaminated land and residual asbestos
- Bids delayed beyond the project schedule
- Buildings / Vertical construction
- Site development generally or around buildings
- Parks and Recreation development
- Police and Fire
- Federal (USFS)
- Utility infrastructure for electrical / gas / fiber utilities
- Escalation

The following contingencies are excluded:

- Contractor Change Order contingency
- Furnitures, Fixtures & Equipment (FF&E) Contingency

The following risk exist and will be evaluated further as the design progresses:

- Extent of hazardous materials and abatement
- Unforeseen subsurface conditions
- Extent of bulk excavation and carting away (over excavation required)
- Constraints imposed by phasing, secure facility logistics etc.
- Extent of additional landscaping required
- Incoming services (electrical); minor provision for reinforcement allowed
- Extent of Public Right of Way improvements
- Extent of renewable or sustainability targets beyond current best practice and code
- Off site infrastructure; delays due to dependencies on 3rd parties
- Short-term escalation; market spikes and delays to start-on-site due to planning; design decisions etc.
- Stormwater management capacity

3.0 Scenario Summary

TOTAL COSTS (including all phases at current day)

Ref.	Project Category	Scenario A	Scenario B	Scenario C	Scenario D
A	**Vertical Construction**	**$ -**	**$ -**	**$ -**	**$ -**
A.1	MIXED USE (COMMERCIAL)	Excluded	Excluded	Excluded	Excluded
A.2	BUSINESS	Excluded	Excluded	Excluded	Excluded
A.3	PUBLIC/COMMUNITY SERVICES	Excluded	Excluded	Excluded	Excluded
A.4	LIGHT INDUSTRIAL ('MAKER SPACE')	Excluded	Excluded	Excluded	Excluded
A.5	RESIDENTIAL - LOW DENSITY	Excluded	Excluded	Excluded	Excluded
A.6	RESIDENTIAL - MEDIUM DENSITY	Excluded	Excluded	Excluded	Excluded
A.7	RESIDENTIAL - HIGH DENSITY	Excluded	Excluded	Excluded	Excluded
A.8	MIXED USE (RESIDENTIAL)	Excluded	Excluded	Excluded	Excluded
	SUB TOTAL - Building	***$ -***	***$ -***	***$ -***	***$ -***
	TOTAL GROSS SQUARE FOOT	***-***	***-***	***-***	***-***
	AVERGAE BUILDING $/GSF	***$ -***	***$ -***	***$ -***	***$ -***
B	**Sitework / Site Development**	**$ 136,229,320**	**$ 138,214,689**	**$ 147,287,012**	**$ 159,335,308**
B.1	MIXED USE (COMMERCIAL)	Excluded	Excluded	Excluded	Excluded
B.2	BUSINESS	Excluded	Excluded	Excluded	Excluded
B.3	PUBLIC/COMMUNITY SERVICES	Excluded	Excluded	Excluded	Excluded
B.4	LIGHT INDUSTRIAL ('MAKER SPACE')	Excluded	Excluded	Excluded	Excluded
B.5	RESIDENTIAL - LOW DENSITY	Excluded	Excluded	Excluded	Excluded
B.6	RESIDENTIAL - MEDIUM DENSITY	Excluded	Excluded	Excluded	Excluded
B.7	RESIDENTIAL - HIGH DENSITY	Excluded	Excluded	Excluded	Excluded
B.8	MIXED USE (RESIDENTIAL)	Excluded	Excluded	Excluded	Excluded
B.9	ROAD - COLLECTOR (70' ROW)	23,752,106	23,752,106	23,752,106	$ 34,312,045
B.10	ROAD - LOCAL (50' ROW)	28,269,654	28,269,654	28,269,654	$ 20,679,142
B.11	MULTI-USE TRAIL (12' W)	2,677,052	2,677,052	2,677,052	$ 2,677,052
B.12	PARKS & RECREATION	Excluded	Excluded	Excluded	Excluded
B.13	WATER INFRASTRUCTURE	34,115,852	34,658,515	36,440,716	$ 42,747,853
B.14	WASTEWATER INFRASTRUCTURE	32,624,065	34,066,772	41,356,894	$ 43,998,972
B.15	STORMWATER MANAGEMENT	14,790,590	14,790,590	14,790,590	$ 14,920,243
B.13	FEDERAL (USFS)	Excluded	Excluded	Excluded	Excluded
	SUB TOTAL - Sitework	***$ 136,229,320***	***$ 138,214,689***	***$ 147,287,012***	***$ 159,335,308***
	TOTAL ACRES	***493***	***493***	***493***	***493***
	SITE DEVELOPMENT / ACRE	***$ 276,327.22***	***$ 280,354.34***	***$ 298,756.62***	***$ 323,195.35***
	TOTAL (TOTAL CONSTRUCTION COST - Q3 2024	***$ 136,229,320***	***$ 138,214,689.30***	***$ 147,287,012.21***	***$ 159,335,307.97***

4.0 Control Quantities

BUILDING / SITE AREAS

Building Areas	SCENARIO A Quantity	SCENARIO A Unit	SCENARIO B Quantity	SCENARIO B Unit	SCENARIO C Quantity	SCENARIO C Unit	SCENARIO D Quantity	SCENARIO D Unit
VERTICAL CONSTRUCTION 1								
MIXED USE (COMMERCIAL)	128,850	GSF	193,276	GSF	386,551	GSF	193,276	GSF
BUSINESS	112,744	GSF	187,907	GSF	187,907	GSF	37,581	GSF
PUBLIC/COMMUNITY SERVICES	214,751	GSF	322,126	GSF	322,126	GSF	214,751	GSF
LIGHT INDUSTRIAL ('MAKER SPACE')	268,439	GSF	268,439	GSF	107,375	GSF	53,688	GSF
VERTICAL CONSTRUCTION 2								
RESIDENTIAL - LOW DENSITY	2,440,350	GSF	887,400	GSF	443,700	GSF	1,153,620	GSF
RESIDENTIAL - MEDIUM DENSITY	2,129,760	GSF	3,993,300	GSF	2,662,200	GSF	7,099,200	GSF
RESIDENTIAL - HIGH DENSITY	369,750	GSF	616,250	GSF	2,588,250	GSF	1,232,500	GSF
MIXED USE (RESIDENTIAL)	776,475	GSF	1,164,713	GSF	2,329,425	GSF	1,164,713	GSF
Site Areas	**Quantity**	**Unit**	**Quantity**	**Unit**	**Quantity**	**Unit**	**Quantity**	**Unit**
VERTICAL CONSTRUCTION 1 - SITE								
MIXED USE (COMMERCIAL)	4.93	Acre	7.40	Acre	14.79	Acre	7.40	Acre
BUSINESS	7.40	Acre	12.33	Acre	12.33	Acre	2.47	Acre
PUBLIC/COMMUNITY SERVICES	4.93	Acre	7.40	Acre	7.40	Acre	4.93	Acre
LIGHT INDUSTRIAL ('MAKER SPACE')	12.33	Acre	12.33	Acre	4.93	Acre	2.47	Acre
VERTICAL CONSTRUCTION 2 - SITE								
RESIDENTIAL - LOW DENSITY	135.58	Acre	49.30	Acre	24.65	Acre	64.09	Acre
RESIDENTIAL - MEDIUM DENSITY	59.16	Acre	110.93	Acre	73.95	Acre	197.20	Acre
RESIDENTIAL - HIGH DENSITY	7.40	Acre	12.33	Acre	51.77	Acre	24.65	Acre
MIXED USE (RESIDENTIAL)	14.79	Acre	22.19	Acre	44.37	Acre	22.19	Acre
VERTICAL CONSTRUCTION 2 - SITE								
ROAD - COLLECTOR (70' ROW)	14.79	Acre	14.79	Acre	14.79	Acre	22.19	Acre
ROAD - LOCAL (50' ROW)	17.26	Acre	17.26	Acre	17.26	Acre	14.79	Acre
MULTI-USE TRAIL (12' W)	4.93	Acre	4.93	Acre	4.93	Acre	4.93	Acre
PARKS & RECREATION	204.60	Acre	216.92	Acre	216.92	Acre	120.79	Acre
FEDERAL (USFS)	4.93	Acre	4.93	Acre	4.93	Acre	4.93	Acre
TOTAL SITE AREA (ACRE)	**493.00**	**ACRE**	**493.00**	**ACRE**	**493.00**	**ACRE**	**493.00**	**ACRE**

5.0 Scenario A Summary

TOTAL COSTS (including all phases at current day)

Ref.	*Project Category*	*Scenario A*				
A	**Vertical Construction**	**Qty**	**UoM**		**Rate**	**Total Const. Cost**
A.1	MIXED USE (COMMERCIAL)	128,850	GSF	$	-	Excluded
A.2	BUSINESS	112,744	GSF	$	-	Excluded
A.3	PUBLIC/COMMUNITY SERVICES	214,751	GSF	$	-	Excluded
A.4	LIGHT INDUSTRIAL ('MAKER SPACE')	268,439	GSF	$	-	Excluded
A.5	RESIDENTIAL - LOW DENSITY	2,440,350	GSF	$	-	Excluded
A.6	RESIDENTIAL - MEDIUM DENSITY	2,129,760	GSF	$	-	Excluded
A.7	RESIDENTIAL - HIGH DENSITY	369,750	GSF	$	-	Excluded
A.8	MIXED USE (RESIDENTIAL)	776,475	GSF	$	-	Excluded
SUB TOTAL - Building		***-***	***GSF***	***$***	***-***	***$ -***

B	**Sitework**	**Qty**	**UoM**		**Rate**	**Total Const. Cost**
B.1	MIXED USE (COMMERCIAL)	4.93	Acre	$	-	Excluded
B.2	BUSINESS	7.40	Acre	$	-	Excluded
B.3	PUBLIC/COMMUNITY SERVICES	4.93	Acre	$	-	Excluded
B.4	LIGHT INDUSTRIAL ('MAKER SPACE')	12.33	Acre	$	-	Excluded
B.5	RESIDENTIAL - LOW DENSITY	135.58	Acre	$	-	Excluded
B.6	RESIDENTIAL - MEDIUM DENSITY	59.16	Acre	$	-	Excluded
B.7	RESIDENTIAL - HIGH DENSITY	7.40	Acre	$	-	Excluded
B.8	MIXED USE (RESIDENTIAL)	14.79	Acre	$	-	Excluded
B.9	ROAD - COLLECTOR (70' ROW)	14.79	Acre	$	1,605,957	$ 23,752,106
B.10	ROAD - LOCAL (50' ROW)	17.26	Acre	$	1,638,346	$ 28,269,654
B.11	MULTI-USE TRAIL (12' W)	4.93	Acre	$	543,013	$ 2,677,052
B.12	PARKS & RECREATION	204.60	Acre	$	-	Excluded
B.13	WATER INFRASTRUCTURE	493.00	Acre	$	69,201	$ 34,115,852
B.14	WASTEWATER INFRASTRUCTURE	493.00	Acre	$	66,175	$ 32,624,065
B.15	STORMWATER MANAGEMENT	493.00	Acre	$	30,001	$ 14,790,590
B.16	FEDERAL (USFS)	4.93	Acre	$	-	Excluded
SUB TOTAL - Sitework		***493***	***Acre***	***$***	***276,327***	***$ 136,229,320***

TOTAL CONSTRUCTION COST - Q3 2024	***$ 136,229,319.61***

6.0 Scenario B Summary

TOTAL COSTS (including all phases at current day)

Ref.	*Project Category*	*Scenario B*				
A	**Vertical Construction**	**Qty**	**UoM**		**Rate**	**Total Const. Cost**
A.1	MIXED USE (COMMERCIAL)	193,276	GSF	$	-	Excluded
A.2	BUSINESS	187,907	GSF	$	-	Excluded
A.3	PUBLIC/COMMUNITY SERVICES	322,126	GSF	$	-	Excluded
A.4	LIGHT INDUSTRIAL ('MAKER SPACE')	268,439	GSF	$	-	Excluded
A.5	RESIDENTIAL - LOW DENSITY	887,400	GSF	$	-	Excluded
A.6	RESIDENTIAL - MEDIUM DENSITY	3,993,300	GSF	$	-	Excluded
A.7	RESIDENTIAL - HIGH DENSITY	616,250	GSF	$	-	Excluded
A.8	MIXED USE (RESIDENTIAL)	1,164,713	GSF	$	-	Excluded
SUB TOTAL - Building		*-*	*GSF*	*$*	*-*	*$ -*

B	**Sitework**	**Qty**	**UoM**		**Rate**	**Total Const. Cost**
B.1	MIXED USE (COMMERCIAL)	7.40	Acre	$	-	Excluded
B.2	BUSINESS	12.33	Acre	$	-	Excluded
B.3	PUBLIC/COMMUNITY SERVICES	7.40	Acre	$	-	Excluded
B.4	LIGHT INDUSTRIAL ('MAKER SPACE')	12.33	Acre	$	-	Excluded
B.5	RESIDENTIAL - LOW DENSITY	49.30	Acre	$	-	Excluded
B.6	RESIDENTIAL - MEDIUM DENSITY	110.93	Acre	$	-	Excluded
B.7	RESIDENTIAL - HIGH DENSITY	12.33	Acre	$	-	Excluded
B.8	MIXED USE (RESIDENTIAL)	22.19	Acre	$	-	Excluded
B.9	ROAD - COLLECTOR (70' ROW)	14.79	Acre	$	1,605,957	$ 23,752,106
B.10	ROAD - LOCAL (50' ROW)	17.26	Acre	$	1,638,346	$ 28,269,654
B.11	MULTI-USE TRAIL (12' W)	4.93	Acre	$	543,013	$ 2,677,052
B.12	PARKS & RECREATION	216.92	Acre	$	-	Excluded
B.13	WATER INFRASTRUCTURE	493.00	Acre	$	70,301	$ 34,658,515
B.14	WASTEWATER INFRASTRUCTURE	493.00	Acre	$	69,101	$ 34,066,772
B.15	STORMWATER MANAGEMENT	493.00	Acre	$	30,001	$ 14,790,590
B.16	FEDERAL (USFS)	4.93	Acre	$	-	Excluded
SUB TOTAL - Sitework		*493*	*Acre*	*$*	*280,354*	*$ 138,214,689*

TOTAL CONSTRUCTION COST - Q3 2024	***$ 138,214,689.30***

7.0 Scenario C Summary

TOTAL COSTS (including all phases at current day)

Ref.	*Project Category*	*Scenario C*

A	Vertical Construction	Qty	UoM		Rate	Total Const. Cost
A.1	MIXED USE (COMMERCIAL)	386,551	GSF	$	-	Excluded
A.2	BUSINESS	187,907	GSF	$	-	Excluded
A.3	PUBLIC/COMMUNITY SERVICES	322,126	GSF	$	-	Excluded
A.4	LIGHT INDUSTRIAL ('MAKER SPACE')	107,375	GSF	$	-	Excluded
A.5	RESIDENTIAL - LOW DENSITY	443,700	GSF	$	-	Excluded
A.6	RESIDENTIAL - MEDIUM DENSITY	2,662,200	GSF	$	-	Excluded
A.7	RESIDENTIAL - HIGH DENSITY	2,588,250	GSF	$	-	Excluded
A.8	MIXED USE (RESIDENTIAL)	2,329,425	GSF	$	-	Excluded
SUB TOTAL - Building		*-*	*GSF*	*$*	*-*	*$ -*

B	Sitework	Qty	UoM		Rate		Total Const. Cost
B.1	MIXED USE (COMMERCIAL)	14.79	Acre	$	-		Excluded
B.2	BUSINESS	12.33	Acre	$	-		Excluded
B.3	PUBLIC/COMMUNITY SERVICES	7.40	Acre	$	-		Excluded
B.4	LIGHT INDUSTRIAL ('MAKER SPACE')	4.93	Acre	$	-		Excluded
B.5	RESIDENTIAL - LOW DENSITY	24.65	Acre	$	-		Excluded
B.6	RESIDENTIAL - MEDIUM DENSITY	73.95	Acre	$	-		Excluded
B.7	RESIDENTIAL - HIGH DENSITY	51.77	Acre	$	-		Excluded
B.8	MIXED USE (RESIDENTIAL)	44.37	Acre	$	-		Excluded
B.9	ROAD - COLLECTOR (70' ROW)	14.79	Acre	$	1,605,957	$	23,752,106
B.10	ROAD - LOCAL (50' ROW)	17.26	Acre	$	1,638,346	$	28,269,654
B.11	MULTI-USE TRAIL (12' W)	4.93	Acre	$	543,013	$	2,677,052
B.12	PARKS & RECREATION	216.92	Acre	$	-		Excluded
B.13	WATER INFRASTRUCTURE	493.00	Acre	$	73,916	$	36,440,716
B.14	WASTEWATER INFRASTRUCTURE	493.00	Acre	$	83,888	$	41,356,894
B.15	STORMWATER MANAGEMENT	493.00	Acre	$	30,001	$	14,790,590
B.16	FEDERAL (USFS)	4.93	Acre	$	-		Excluded
SUB TOTAL - Sitework		*493*	*Acre*	*$*	*298,757*	*$*	*147,287,012*

TOTAL CONSTRUCTION COST - Q3 2024	*$ 147,287,012.21*

8.0 Scenario D Summary

TOTAL COSTS (including all phases at current day)

Ref.	*Project Category*	*Scenario D*				
A	**Vertical Construction**	**Qty**	**UoM**		**Rate**	**Total Const. Cost**
A.1	MIXED USE (COMMERCIAL)	193,276	GSF	$	-	Excluded
A.2	BUSINESS	37,581	GSF	$	-	Excluded
A.3	PUBLIC/COMMUNITY SERVICES	214,751	GSF	$	-	Excluded
A.4	LIGHT INDUSTRIAL ('MAKER SPACE')	53,688	GSF	$	-	Excluded
A.5	RESIDENTIAL - LOW DENSITY	1,153,620	GSF	$	-	Excluded
A.6	RESIDENTIAL - MEDIUM DENSITY	7,099,200	GSF	$	-	Excluded
A.7	RESIDENTIAL - HIGH DENSITY	1,232,500	GSF	$	-	Excluded
A.8	MIXED USE (RESIDENTIAL)	1,164,713	GSF	$	-	Excluded
SUB TOTAL - Building		*-*	*GSF*	*$*	*-*	*$ -*

B	**Sitework**	**Qty**	**UoM**		**Rate**	**Total Const. Cost**
B.1	MIXED USE (COMMERCIAL)	7.40	Acre	$	-	Excluded
B.2	BUSINESS	2.47	Acre	$	-	Excluded
B.3	PUBLIC/COMMUNITY SERVICES	4.93	Acre	$	-	Excluded
B.4	LIGHT INDUSTRIAL ('MAKER SPACE')	2.47	Acre	$	-	Excluded
B.5	RESIDENTIAL - LOW DENSITY	64.09	Acre	$	-	Excluded
B.6	RESIDENTIAL - MEDIUM DENSITY	197.20	Acre	$	-	Excluded
B.7	RESIDENTIAL - HIGH DENSITY	24.65	Acre	$	-	Excluded
B.8	MIXED USE (RESIDENTIAL)	22.19	Acre	$	-	Excluded
B.9	ROAD - COLLECTOR (70' ROW)	22.19	Acre	$	1,546,633	$ 34,312,045
B.10	ROAD - LOCAL (50' ROW)	14.79	Acre	$	1,398,184	$ 20,679,142
B.11	MULTI-USE TRAIL (12' W)	4.93	Acre	$	543,013	$ 2,677,052
B.12	PARKS & RECREATION	120.79	Acre	$	-	Excluded
B.13	WATER INFRASTRUCTURE	493.00	Acre	$	86,710	$ 42,747,853
B.14	WASTEWATER INFRASTRUCTURE	493.00	Acre	$	89,247	$ 43,998,972
B.15	STORMWATER MANAGEMENT	493.00	Acre	$	30,264	$ 14,920,243
B.16	FEDERAL (USFS)	4.93	Acre	$	-	Excluded
SUB TOTAL - Sitework		*493*	*Acre*	*$*	*323,195*	*$ 159,335,308*

TOTAL CONSTRUCTION COST - Q3 2024 ***$ 159,335,307.97***

9.0 Scenario A Detail (Lower Service Demand)

TOTAL COSTS (including all phases at current day)

Ref.	Project Category			Scenario A			
B	**Sitework**	**Qty**	**UoM**	**Rate**	**Total Direct Cost**	**Total Indirect Cost**	**Total Construction**	**Notes**
B.9	**ROAD - COLLECTOR (70' ROW)**	**14.79**	**Acre**	**$ 1,327,237**	**$ 19,629,840**	**$ 4,122,266**	**$ 23,752,106**	*Asphalt Road*
	HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.	9,200.00	LF	$ 987	$ 9,080,400			*9,200 LF X 47' = 432,400SF*
	Concrete curb and gutter, 2'	18,400.00	LF	$ 35	$ 644,000			
	Sidewalk, 5' wide both sides	9,200.00	LF	$ 120	$ 1,104,000			
	Multi-use path, 12' wide both sides	9,200.00	LF	$ 247	$ 2,274,240			
	Planting strip, 8' wide both sides, assume seeding and topsoil	9,200.00	LF	$ 56.0	$ 515,200			
	Trees	736.00	EA	$ 1,000	$ 736,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	368.00	EA	$ 8,250	$ 3,036,000			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$ 448,000	$ 2,240,000			*4 way intersection traffic signal scope*
B.10	**ROAD - LOCAL (50' ROW)**	**17.26**	**Acre**	**$ 1,354,005**	**$ 23,363,350**	**$ 4,906,304**	**$ 28,269,654**	*Asphalt Road*
	HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.	15,030.00	LF	$ 770	$ 11,573,100			*15,030 LF X 35' = 526,050SF*
	Concrete curb and gutter, 2'	30,060.00	LF	$ 35	$ 1,052,100			
	Sidewalk, 5' wide both sides	15,030.00	LF	$ 120	$ 1,803,600			
	Planting strip, 5' wide both sides, assume seeding and topsoil	15,030.00	LF	$ 35.0	$ 526,050			
	Trees	1,202.00	EA	$ 1,000	$ 1,202,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	602.00	EA	$ 8,250	$ 4,966,500			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$ 448,000	$ 2,240,000			*4 way intersection traffic signal scope*
B.11	**MULTI-USE TRAIL (12' W)**	**4.93**	**Acre**	**$ 448,771**	**$ 2,212,440**	**$ 464,612**	**$ 2,677,052**	*Assumed asphalt multi-use path*
	Includes fine grading, subbase, gravel pavement, signs. No design, no contingency, no utility relocations, no mobilization, no general conditions.	17,900.00	LF	$ 124	$ 2,212,440			*17,900 LF X 12' = 214,800 SF*
B.12	**PARKS & RECREATION**	**204.60**	**Acre**	**$ 1,500,000**	**$ 306,892,500**	**$ 64,447,425**	**$ 371,339,925**	*Excluded*
	Regional Park	189.00	Acre	$ 1,500,000	$ 283,500,000			
	Neighborhood Park	15.60	Acre	$ 1,500,000	$ 23,392,500			
B.13	**WATER INFRASTRUCTURE**	**493.00**	**Acre**	**$ 57,191**	**$ 28,194,919**	**$ 5,920,933**	**$ 34,115,852**	
	Piping, assume 4.5-ft depth. Include typical appurtenances (e.g., valves, ARVs, etc.)							*Including excavation, backfill and bedding*
	12" dia.	25,267.11	LF	$ 434	$ 10,965,924			
	16" dia.	16,566.69	LF	$ 536	$ 8,879,745			
	Storage Tank Expansion							
	Additional storage requirement, 3.65 MG	-	LS	$ -	$ -			*Excluded*
	Pressure Relief Valves, 2 redundant PRVs for each planned PRV							
	12" dia.	2.00	EA	$ 47,280	$ 94,560			
	2" dia.	1.00	EA	$ 4,690	$ 4,690			
	Pressure Relief Valve & Hydroelectic Generator/Booster Pump Building Assume an internal building footprint of 25' x 35' for the PRV stations based on a total of 3 PRVs and one hydro electric turbine unit and associated electrical gear, piping, and HVAC.	1.00	LS	$ 1,850,000	$ 1,850,000			*Assume 875SF CMU*
	Hydroelectric Generator/Booster Pump							
	2 MGD capacity	2.00	EA	$ 200,000	$ 400,000			*Assume 1,400GMP pumps N+1*
	Major Road Crossing - US 36	6.00	LOC	$ 1,000,000	$ 6,000,000			*Assume 250LF jack and bore @$4k/LF*
B.14	**WASTEWATER INFRASTRUCTURE**	**493.00**	**Acre**	**$ 54,690**	**$ 26,962,037**	**$ 5,662,028**	**$ 32,624,065**	
	Gravity Main Piping							*Including excavation, backfill and bedding. Assume HDPE*
	10" dia.	18,978.00	LF	$ 358	$ 6,794,124			*Assume 8' depth*
	12" dia.	2,405.00	LF	$ 413	$ 993,265			
	15" dia.	5,076.00	LF	$ 458	$ 2,324,808			
	21" dia.	2,960.00	LF	$ 576	$ 1,704,960			
	30" dia.	3,630.00	LF	$ 1,140	$ 4,138,200			
	36" dia.	6,448.00	LF	$ 1,300	$ 8,382,400			

9.0 Scenario A Detail (Lower Service Demand)

	Manhole									
	4' dia.	89.00	EA	$	19,040	$	1,694,560			*Including excavation, backfill and bedding*
	5' dia.	44.00	EA	$	21,130	$	929,720			
B.15	**STORMWATER MANAGEMENT**	**493.00**	**Acre**	**$**	**24,794**	**$**	**12,223,628**	**$ 2,566,962**	**$ 14,790,590**	
	Upsize existing downstream storm drainage infrastructure	3,250.00	LF	$	473	$	1,538,826			(Pricing from Designer)
	Upgrade from 26th street along US-36 (SE) to Fourmile Creek									
	Trunkline Infrastructure									
	Assumes inlets, pipe for conveyance of stormwater on city streets. No treatment required for trail	24,230.00	LF	$	379	$	9,178,030			
	Dentention/WQ Treatment									
	Assumes 61' of 70' impervious, 50' of 50' impervious, 49' of 61' impervious assuming 2 ponds and 1.5 acres land with outlet works	1,312,700.00	SF	$	1.15	$	1,506,772			
SUB TOTAL - Sitework		***493***	***Acre***	***$***	***1,029,552***	***$***	***419,478,715***	***$ 88,090,530***	***$ 507,569,245***	
TOTAL CONSTRUCTION COST - Q3 2024						***$***	***419,478,714.55***	***$ 88,090,530.06***	***$ 507,569,244.61***	

10.0 Scenario B Detail (Medium Service Demand)

TOTAL COSTS (including all phases at current day)

Ref.	Project Category	Scenario B					
	SUB TOTAL - Building	*-*	*GSF*	*$ -*	*$ -*	*$ -*	*$ -*

B	Sitework	Qty	UoM	Rate	Total Direct Cost	Total Indirect Cost	Total Construction	Notes
B.9	**ROAD - COLLECTOR (70' ROW)**	**14.79**	**Acre**	**$ 1,327,237**	**$ 19,629,840**	**$ 4,122,266**	**$ 23,752,106**	*Asphalt Road*
	HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.	9,200.00	LF	$ 987	$ 9,080,400			*9,200 LF X 47' = 432,400SF*
	Concrete curb and gutter, 2'	18,400.00	LF	$ 35	$ 644,000			
	Sidewalk, 5' wide both sides	9,200.00	LF	$ 120	$ 1,104,000			
	Multi-use path, 12' wide both sides	9,200.00	LF	$ 247	$ 2,274,240			
	Planting strip, 8' wide both sides, assume seeding and topsoil	9,200.00	LF	$ 56.0	$ 515,200			
	Trees	736.00	EA	$ 1,000	$ 736,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	368.00	EA	$ 8,250	$ 3,036,000			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$ 448,000	$ 2,240,000			*4 way intersection traffic signal scope*
B.10	**ROAD - LOCAL (50' ROW)**	**17.26**	**Acre**	**$ 1,354,005**	**$ 23,363,350**	**$ 4,906,304**	**$ 28,269,654**	*Asphalt Road*
	HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.	15,030.00	LF	$ 770	$ 11,573,100			*15,030 LF X 35' = 526,050SF*
	Concrete curb and gutter, 2'	30,060.00	LF	$ 35	$ 1,052,100			
	Sidewalk, 5' wide both sides	15,030.00	LF	$ 120	$ 1,803,600			
	Planting strip, 5' wide both sides, assume seeding and topsoil	15,030.00	LF	$ 35.0	$ 526,050			
	Trees	1,202.00	EA	$ 1,000	$ 1,202,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	602.00	EA	$ 8,250	$ 4,966,500			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$ 448,000	$ 2,240,000			*4 way intersection traffic signal scope*
B.11	**MULTI-USE TRAIL (12' W)**	**4.93**	**Acre**	**$ 448,771**	**$ 2,212,440**	**$ 464,612**	**$ 2,677,052**	*Assumed asphalt multi-use path*
	Includes fine grading, subbase, gravel pavement, signs. No design, no contingency, no utility relocations, no mobilization, no general conditions.	17,900.00	LF	$ 124	$ 2,212,440			*17,900 LF X 12' = 214,800 SF*
B.12	**PARKS & RECREATION**	**216.92**	**Acre**	**$ 1,500,000**	**$ 325,380,000**	**$ 68,329,800**	**$ 393,709,800**	*Excluded*
	Regional Park	189.00	Acre	$ 1,500,000	$ 283,500,000			
	Neighborhood Park	27.92	Acre	$ 1,500,000	$ 41,880,000			
B.13	**WATER INFRASTRUCTURE**	**493.00**	**Acre**	**$ 58,100**	**$ 28,643,401**	**$ 6,015,114**	**$ 34,658,515**	
	Piping, assume 4.5-ft depth. Include typical appurtenances (e.g., valves, ARVs, etc.)							*Including excavation, backfill and bedding*
	12" dia.	22,929.07	LF	$ 434	$ 9,951,216			
	16" dia.	14,866.23	LF	$ 536	$ 7,968,298			
	18" dia.	4,038.50	LF	$ 588	$ 2,374,636			
	Storage Tank Expansion							
	Additional storage requirement, 4.19 MG	-	LS	$ -	$ -			*Excluded*
	Pressure Relief Valves, 2 redundant PRVs for each planned PRV							
	12" dia.	2.00	EA	$ 47,280	$ 94,560			
	2" dia.	1.00	EA	$ 4,690	$ 4,690			
	Pressure Relief Valve & Hydroelectic Generator/Booster Pump Building Assume an internal building footprint of 25' x 35' for the PRV stations based on a total of 3 PRVs and one hydro electric turbine unit and associated electrical gear, piping, and HVAC.	1.00	LS	$ 1,850,000	$ 1,850,000			*Assume 875SF CMU*
	Hydroelectric Generator/Booster Pump							
	2 MGD capacity	2.00	EA	$ 200,000	$ 400,000			*Assume 1,400GMP pumps N+1*
	Major Road Crossing - US 36	6.00	LOC	$ 1,000,000	$ 6,000,000			*Assume 250LF jack and bore @$4k/LF*
B.14	**WASTEWATER INFRASTRUCTURE**	**493.00**	**Acre**	**$ 57,108**	**$ 28,154,357**	**$ 5,912,415**	**$ 34,066,772**	
	Gravity Main Piping							*Including excavation, backfill and bedding. Assume HDPE*
	10" dia.	17,313.00	LF	$ 358	$ 6,198,054			*Assume 8' depth*
	12" dia.	1,665.00	LF	$ 413	$ 687,645			
	15" dia.	6,821.00	LF	$ 458	$ 3,124,018			
	18" dia.	660.00	LF	$ 517	$ 341,220			
	21" dia.	1,325.00	LF	$ 576	$ 763,200			
	24" dia.	1,635.00	LF	$ 804	$ 1,314,540			
	36" dia.	10,078.00	LF	$ 1,300	$ 13,101,400			

10.0 Scenario B Detail (Medium Service Demand)

	Manhole								*Including excavation, backfill and bedding*
	4' dia.	89.00	EA	$	19,040	$	1,694,560		
	5' dia.	44.00	EA	$	21,130	$	929,720		
B.15	**STORMWATER MANAGEMENT**	**493.00**	**Acre**	**$**	**24,794**	**$**	**12,223,628**	**$ 2,566,962**	**$ 14,790,590**
	Upsize existing downstream storm drainage infrastructure	3,250.00	LF	$	473	$	1,538,826		
	Upgrade from 26th street along US-36 (SE) to Fourmile Creek								
	Trunkline Infrastructure								
	Assumes inlets, pipe for conveyance of stormwater on city streets. No treatment required for trail	24,230.00	LF	$	379	$	9,178,030		
	Dentention/WQ Treatment								
	Assumes 61' of 70' impervious, 50' of 50' impervious, 49' of 61' impervious assuming 2 ponds and 1.5 acres land with outlet works	1,312,700.00	SF	$	1.15	$	1,506,772		
	SUB TOTAL - Sitework	***493***	***Acre***	***$***	***1,078,954***	***$***	***439,607,016***	***$ 92,317,473***	***$ 531,924,489***
	TOTAL CONSTRUCTION COST - Q3 2024					***$***	***439,607,015.95***	***$ 92,317,473.35***	***$ 531,924,489.30***

11.0 Scenario C Detail (Higher Service Demand)

TOTAL COSTS (including all phases at current day)

Ref.	Project Category			Scenario C				
B	**Sitework**	**Qty**	**UoM**	**Rate**	**Total Direct Cost**	**Total Indirect Cost**	**Total Construction**	**Notes**
B.9	**ROAD - COLLECTOR (70' ROW)** *HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.*	**14.79**	**Acre**	**$ 1,327,237**	**$ 19,629,840**	**$ 4,122,266**	**$ 23,752,106**	*Asphalt Road*
		9,200.00	LF	$ 987	$ 9,080,400			*9,200 LF X 47' = 432,400SF*
	Concrete curb and gutter, 2'	18,400.00	LF	$ 35	$ 644,000			
	Sidewalk, 5' wide both sides	9,200.00	LF	$ 120	$ 1,104,000			
	Multi-use path, 12' wide both sides	9,200.00	LF	$ 247	$ 2,274,240			
	Planting strip, 8' wide both sides, assume seeding and topsoil	9,200.00	LF	$ 56.0	$ 515,200			
	Trees	736.00	EA	$ 1,000	$ 736,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	368.00	EA	$ 8,250	$ 3,036,000			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$ 448,000	$ 2,240,000			*4 way intersection traffic signal scope*
B.10	**ROAD - LOCAL (50' ROW)** *HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.*	**17.26**	**Acre**	**$ 1,354,005**	**$ 23,363,350**	**$ 4,906,304**	**$ 28,269,654**	*Asphalt Road*
		15,030.00	LF	$ 770	$ 11,573,100			*15,030 LF X 35' = 526,050SF*
	Concrete curb and gutter, 2'	30,060.00	LF	$ 35	$ 1,052,100			
	Sidewalk, 5' wide both sides	15,030.00	LF	$ 120	$ 1,803,600			
	Planting strip, 5' wide both sides, assume seeding and topsoil	15,030.00	LF	$ 35.0	$ 526,050			
	Trees	1,202.00	EA	$ 1,000	$ 1,202,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	602.00	EA	$ 8,250	$ 4,966,500			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$ 448,000	$ 2,240,000			*4 way intersection traffic signal scope*
B.11	**MULTI-USE TRAIL (12' W)** *Includes fine grading, subbase, gravel pavement, signs. No design, no contingency, no utility relocations, no mobilization, no general conditions.*	**4.93**	**Acre**	**$ 448,771**	**$ 2,212,440**	**$ 464,612**	**$ 2,677,052**	*Assumed asphalt multi-use path*
		17,900.00	LF	$ 124	$ 2,212,440			*17,900 LF X 12' = 214,800 SF*
B.12	**PARKS & RECREATION**	**216.92**	**Acre**	**$ 1,500,000**	**$ 325,380,000**	**$ 68,329,800**	**$ 393,709,800**	*Excluded*
	Regional Park	189.00	Acre	$ 1,500,000	$ 283,500,000			
	Neighborhood Park	27.92	Acre	$ 1,500,000	$ 41,880,000			
B.13	**WATER INFRASTRUCTURE**	**493.00**	**Acre**	**$ 61,088**	**$ 30,116,294**	**$ 6,324,422**	**$ 36,440,716**	
	Piping, assume 4.5-ft depth. Include typical appurtenances (e.g., valves, ARVs, etc.)							*Including excavation, backfill and bedding*
	12" dia.	18,356.39	LF	$ 434	$ 7,966,672			
	16" dia.	14,167.56	LF	$ 536	$ 7,593,813			
	18" dia.	5,719.80	LF	$ 588	$ 3,363,243			
	24" dia.	3,590.05	LF	$ 792	$ 2,843,317			
	Storage Tank Expansion							
	Additional storage requirement, 4.60 MG	-	LS	$ -	$ -			*Excluded*
	Pressure Relief Valves, 2 redundant PRVs for each planned PRV							
	12" dia.	2.00	EA	$ 47,280	$ 94,560			
	2" dia.	1.00	EA	$ 4,690	$ 4,690			
	Pressure Relief Valve & Hydroelectic Generator/Booster Pump Building Assume an internal building footprint of 25' x 35' for the PRV stations based on a total of 3 PRVs and one hydro electric turbine unit and associated electrical gear, piping, and HVAC.	1.00	LS	$ 1,850,000	$ 1,850,000			*Assume 875SF CMU*
	Hydroelectric Generator/Booster Pump							
	2 MGD capacity	2.00	EA	$ 200,000	$ 400,000			*Assume 1,400GMP pumps N+1*
	Major Road Crossing - US 36	6.00	LOC	$ 1,000,000	$ 6,000,000			*Assume 250LF jack and bore @$4k/LF*
B.14	**WASTEWATER INFRASTRUCTURE**	**493.00**	**Acre**	**$ 69,329**	**$ 34,179,251**	**$ 7,177,643**	**$ 41,356,894**	*Including excavation, backfill and bedding. Assume HDPE*
	Gravity Main Piping							*Assume 8' depth*
	10" dia.	12,413.00	LF	$ 358	$ 4,443,854			
	12" dia.	5,665.00	LF	$ 413	$ 2,339,645			
	15" dia.	3,875.00	LF	$ 458	$ 1,774,750			
	18" dia.	2,186.00	LF	$ 517	$ 1,130,162			
	21" dia.	2,320.00	LF	$ 576	$ 1,336,320			

11.0 Scenario C Detail (Higher Service Demand)

	24" dia.	1,635.00	LF	$	804	$	1,314,540			
	27" dia.	1,325.00	LF	$	1,140	$	1,510,500			
	36" dia.	3,630.00	LF	$	1,300	$	4,719,000			
	42" dia.	6,448.00	LF	$	2,000	$	12,896,000			
	Manhole									*Including excavation, backfill and bedding*
	4' dia.	81.00	EA	$	19,040	$	1,542,240			
	5' dia.	30.00	EA	$	21,130	$	633,900			
	6' dia.	22.00	EA	$	24,470	$	538,340			
B.15	**STORMWATER MANAGEMENT**	**493.00**	**Acre**	**$**	**24,794**	**$**	**12,223,628**	**$**	**2,566,962**	**$** **14,790,590**
	Upsize existing downstream storm drainage infrastructure Upgrade from 26th street along US-36 (SE) to Fourmile Creek	3,250.00	LF	$	473	$	1,538,826			
	Trunkline Infrastructure Assumes inlets, pipe for conveyance of stormwater on city streets. No treatment required for trail	24,230.00	LF	$	379	$	9,178,030			
	Dentention/WQ Treatment Assumes 61' of 70' impervious, 50' of 50' impervious, 49' of 61' impervious assuming 2 ponds and 1.5 acres land with outlet works	1,312,700.00	SF	$	1.15	$	1,506,772			
	SUB TOTAL - Sitework	***493***	***Acre***	***$***	***1,097,357***	***$***	***447,104,803***	***$***	***93,892,009***	***$*** ***540,996,812***
	TOTAL CONSTRUCTION COST - Q3 2024					***$***	***447,104,803.48***	***$***	***93,892,008.73***	***$*** ***540,996,812.21***

12.0 Scenario D Detail (Adjusted Medium Service Demand)

TOTAL COSTS (including all phases at current day)

Ref.	*Project Category*							*Scenario D*			
B	**Sitework**	**Qty**	**UoM**		**Rate**		**Total Direct Cost**	**Total Indirect Cost**	**Total Construction**	**Notes**
B.9	**ROAD - COLLECTOR (70' ROW)**	**22.19**	**Acre**	**$**	**1,278,209**	**$**	**28,357,062**	**$ 5,954,983**	**$ 34,312,045**	*Asphalt Road*
	HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.	13,810.00	LF	$	987	$	13,630,470			*13,810 LF X 47' = 649,070 SF*
	Concrete curb and gutter, 2'	27,620.00	LF	$	35	$	966,700			
	Sidewalk, 5' wide both sides	13,810.00	LF	$	120	$	1,657,200			
	Multi-use path, 12' wide both sides	13,810.00	LF	$	247	$	3,413,832			
	Planting strip, 8' wide both sides, assume seeding and topsoil	13,810.00	LF	$	56.0	$	773,360			
	Trees	1,105.00	EA	$	1,000	$	1,105,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	554.00	EA	$	8,250	$	4,570,500			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$	448,000	$	2,240,000			*4 way intersection traffic signal scope*
B.10	**ROAD - LOCAL (50' ROW)**	**14.79**	**Acre**	**$**	**1,155,524**	**$**	**17,090,200**	**$ 3,588,942**	**$ 20,679,142**	*Asphalt Road*
	HMA pavement, includes fine grading, subbase, pavement, signs, striping, drainage. No design, no contingency, no utility relocations, no mobilization, no general conditions.	10,560.00	LF	$	770	$	8,131,200			*10,560 LF X 35' = 369,600 SF*
	Concrete curb and gutter, 2'	21,120.00	LF	$	35	$	739,200			
	Sidewalk, 5' wide both sides	10,560.00	LF	$	120	$	1,267,200			
	Planting strip, 5' wide both sides, assume seeding and topsoil	10,560.00	LF	$	35	$	369,600			
	Trees	845.00	EA	$	1,000	$	845,000			
	Light post including foundation, wires and conduits, @ every 50' both sides of the road, allowance	424.00	EA	$	8,250	$	3,498,000			
	Intersection improvements, including new 4-way intersection traffic signal and ADA upgrade allowance (4 per intersection)	5.00	EA	$	448,000	$	2,240,000			*4 way intersection traffic signal scope*
B.11	**MULTI-USE TRAIL (12' W)**	**4.93**	**Acre**	**$**	**448,771**	**$**	**2,212,440**	**$ 464,612**	**$ 2,677,052**	*Assumed asphalt multi-use path*
	Includes fine grading, subbase, gravel pavement, signs. No design, no contingency, no utility relocations, no mobilization, no general conditions.	17,900.00	LF	$	124	$	2,212,440			*17,900 LF X 12' = 214,800 SF*
B.12	**PARKS & RECREATION**	**120.79**	**Acre**	**$**	**2,253,405**	**$**	**272,177,500**	**$ 57,157,275**	**$ 329,334,775**	*Excluded*
	Regional Park	91.00	Acre	$	2,500,000	$	227,500,000			
	Neighborhood Park	29.79	Acre	$	1,500,000	$	44,677,500			
B.13	**WATER INFRASTRUCTURE**	**493.00**	**Acre**	**$**	**71,661**	**$**	**35,328,804**	**$ 7,419,049**	**$ 42,747,853**	
	Piping, assume 4.5-ft depth. Include typical appurtenances (e.g., valves, ARVs, etc.)									*Including excavation, backfill and bedding*
	12" dia.	15,707.97	LF	$	434	$	6,817,261			
	16" dia.	13,594.03	LF	$	536	$	7,286,401			
	18" dia.	5,646.30	LF	$	588	$	3,320,022			
	24" dia.	12,065.49	LF	$	792	$	9,555,871			
	Storage Tank Expansion									
	Additional storage requirement, 5.12 MG	-	LS	$	-	$	-			*Excluded*
	Pressure Relief Valves, 2 redundant PRVs for each planned PRV									
	12" dia.	2.00	EA	$	47,280	$	94,560			
	2" dia.	1.00	EA	$	4,690	$	4,690			
	Pressure Relief Valve & Hydroelectic Generator/Booster Pump Building Assume an internal building footprint of 25' x 35' for the PRV stations based on a total of 3 PRVs and one hydro electric turbine unit and associated electrical gear, piping, and HVAC.	1.00	LS	$	1,850,000	$	1,850,000			*Assume 875SF CMU*
	Hydroelectric Generator/Booster Pump									
	2 MGD capacity	2.00	EA	$	200,000	$	400,000			*Assume 1,400GMP pumps N+1*
	Major Road Crossing - US 36	6.00	LOC	$	1,000,000	$	6,000,000			*Assume 250LF jack and bore @$4k/LF*
B.14	**WASTEWATER INFRASTRUCTURE**	**493.00**	**Acre**	**$**	**73,758**	**$**	**36,362,787**	**$ 7,636,185**	**$ 43,998,972**	*Including excavation, backfill and bedding. Assume HDPE*
	Gravity Main Piping									*Assume 8' depth*
	10" dia.	12,538.00	LF	$	358	$	4,488,604			
	12" dia.	7,818.00	LF	$	413	$	3,228,834			
	15" dia.	6,651.00	LF	$	458	$	3,046,158			
	18" dia.	3,633.00	LF	$	517	$	1,878,261			

12.0 Scenario D Detail (Adjusted Medium Service Demand)

	24" dia.	2,960.00	LF	$	804	$	2,379,840				
	36" dia.	2,685.00	LF	$	1,300	$	3,490,500				
	42" dia.	7,393.00	LF	$	2,000	$	14,786,000				
	Manhole										*Including excavation, backfill and bedding*
	4' dia.	103.00	EA	$	19,040	$	1,961,120				
	5' dia.	19.00	EA	$	21,130	$	401,470				
	6' dia.	26.00	EA	$	27,000	$	702,000				
B.15	**STORMWATER MANAGEMENT**	**493.00**	**Acre**	**$**	**25,012**	**$**	**12,330,779**	**$**	**2,589,464**	**$**	**14,920,243**
	Upsize existing downstream storm drainage infrastructure	3,250.00	LF	$	473	$	1,538,826				
	Upgrade from 26th street along US-36 (SE) to Fourmile Creek										
	Trunkline Infrastructure										
	Assumes inlets, pipe for conveyance of stormwater on city streets. No treatment required for trail	24,370.00	LF	$	379	$	9,231,061				
	Dentention/WQ Treatment										
	Assumes 61' of 70' impervious, 50' of 50' impervious, 49' of 61' impervious assuming 2 ponds and 1.5 acres land with outlet works	1,359,850.00	SF	$	1.15	$	1,560,893				
SUB TOTAL - Sitework		***493***	***Acre***	***$***	***991,217***	***$***	***403,859,573***	***$***	***84,810,510***	***$***	***488,670,083***
TOTAL CONSTRUCTION COST - Q3 2024						***$***	***403,859,572.70***	***$***	***84,810,510.27***	***$***	***488,670,082.97***

6. Appendix F – Fiscal Analysis

AECOM calculated the fiscal impacts of each scenario, including impacts on the general fund from ad valorem tax, sales & use taxes, and planning and permitting fees, increased expenditures, and the net impact on an annual basis. AECOM also estimated the collection of utility enterprise fund revenues and capital facility impact fees, as well as the total capital investment in on-site infrastructure. This section will provide assumptions for each scenario.

Table 1. Per Capita Assumptions – All Scenarios

Per Capita Assumptions			
Residents Per Unit			
Apartments			2.18 per unit
Detached Single Family			2.18 per unit
Duplex / Fourplex			2.18 per unit
Attached Townhouse			2.18 per unit
Employees			
Retail			303 sf per employee
Office			285 sf per employee
Hotel			5 rooms per employee
Light Industrial			600 sf per employee
Percent of Total Jobs Employed in Boulder Living Outside			82.4%
Sales/Use Tax (2010-2018 average)			Low / High
Sales Tax			$860 / $1230
Business Tax			$70 / $690
Construction Use Tax			$100 / $220
Motor Vehicle Tax			$40 / $80
General Fund Costs Per Capita (residents + commuters)(Avg Last 3 years)			
Total	**3.0%**	**0.030**	**$2,356**

Table 2. Ad Valorem Tax Assumptions – All Scenarios

Ad Valorem Tax Rates & City Rate Splits	
City Tax Rate	**1.164800%**
County Tax Rate	2.128700%
School Tax Rate	4.802400%
Total Tax Rate	8.095900%
Assessed Value as % of Market Value	
Residential	7.0%
Commercial	25.0%
Assessed Value Reduction	
Residential	$70,000
Commercial	$0

Table 3. Scenario A – Residential Development Assumptions

Development Assumptions - Scenario A

Use	Use 1	Use 2	Use 3
Proposed Type	Apartments	Residential Community	Residential Community
Proposed Sub Type	Less Than 5 Stories	Duplex / Fourplex	Attached Townhouse
Construction Description	Protected Wood Frame - Common in Apartment Construction	Unprotected Wood Frame - Common in Single Family Construction	Unprotected Wood Frame - Common in Single Family Construction
Stories	4 stories	2 stories	3 stories
Land Area	966,596 sf	5,905,865 sf	2,577,010 sf
Number of Buildings	20 buildings	407 buildings	444 buildings
Units/Tenants Per Building	44 units	4 units	4 units
Unit/Tenant Area	950 sf	1,500 sf	1,100 sf
Area Per Building	42,180 sf	6,000 sf	4,400 sf
Total Building Area	843,600 sf	2,440,500 sf	1,952,500 sf
Construction Timeline	20 years	20 years	20 years

Assessed Value

	Use 1	Use 2	Use 3
Assessment Values			
Construction Cost	$530.00 per sf	$500.00 per sf	$520.00 per sf
Land Value	$6.00 per sf	$7.06 per sf	$7.39 per sf
Improvement Value	$447,108,000	$1,220,250,000	$1,015,300,000
Land Value	$5,799,579	$41,670,867	$19,033,446
Total Market Value	$452,907,579	$1,261,920,867	$1,034,333,446
Override Value			
Value per unit	$510,031	$775,612	$582,723

Capital Facility Impact Fees

Residential (per dwelling unit)	$5,124	$7,150	$5,927

Table 2. Scenario A – Commercial Development Assumptions

Development Assumptions - Scenario A

Use	Use 4	Use 5	Use 6
Proposed Type	Office	Retail	Light Industrial
Proposed Sub Type	Less Than 5 Stories	General Retail	General Industrial
Construction Description	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings
Stories	3 stories	1 stories	2 stories
Land Area	322,344 sf	214,751 sf	537,095 sf
Number of Buildings	10 buildings	10 buildings	36 buildings
Units/Tenants Per Building	3 tenants	6 tenants	5 tenants
Unit/Tenant Area	3,758 sf	2,148 sf	1,490 sf
Area Per Building	11,274 sf	12,885 sf	7,450 sf
Total Building Area	112,744 sf	128,850 sf	268,200 sf
Construction Timeline	10 years	10 years	10 years

Assessed Value	Use 4	Use 5	Use 6
Assessment Values			
Construction Cost	$305.00 per sf	$450.00 per sf	$260.00 per sf
Land Value	$7.91 per sf	$7.91 per sf	$1.23 per sf
Improvement Value	$34,386,920	$57,982,500	$69,732,000
Land Value	$2,548,730	$1,698,005	$660,232
Total Market Value	$36,935,650	$59,680,505	$70,392,232
Override Value			
Value per unit	$328	$463	$262

Capital Facility Impact Fees

Non-Residential (per square foot)	$34.70	$24.23	$20.34

Table 3. Scenario B – Residential Development Assumptions

Development Assumptions - Scenario B

Use	Use 1	Use 2	Use 3
Proposed Type	Apartments	Residential Community	Residential Community
Proposed Sub Type	Less Than 5 Stories	Duplex / Fourplex	Attached Townhouse
Construction Description	Protected Wood Frame - Common in Apartment Construction	Unprotected Wood Frame - Common in Single Family Construction	Unprotected Wood Frame - Common in Single Family Construction
Stories	4 stories	2 stories	3 stories
Land Area	1,503,691 sf	2,147,508 sf	4,832,111 sf
Number of Buildings	20 buildings	148 buildings	832 buildings
Units/Tenants Per Building	70 units	4 units	4 units
Unit/Tenant Area	950 sf	1,500 sf	1,100 sf
Area Per Building	66,120 sf	6,000 sf	4,400 sf
Total Building Area	1,322,400 sf	888,000 sf	3,660,800 sf
Construction Timeline	20 years	20 years	20 years

Assessed Value	Use 1	Use 2	Use 3
Assessment Values			
Construction Cost	$530.00 per sf	$500.00 per sf	$520.00 per sf
Land Value	$6.00 per sf	$7.06 per sf	$7.39 per sf
Improvement Value	$700,872,000	$444,000,000	$1,903,616,000
Land Value	$9,022,148	$15,152,484	$35,689,319
Total Market Value	$709,894,148	$459,152,484	$1,939,305,319
Override Value			
Value per unit	$509,981	$775,595	$582,724

Capital Facility Impact Fees

Residential (per dwelling unit)	$5,124	$7,150	$5,927

Table 4. Scenario B – Commercial Development Assumptions

Development Assumptions - Scenario B

Use	Use 4	Use 5	Use 6
Proposed Type	Office	Retail	Light Industrial
Proposed Sub Type	Less Than 5 Stories	General Retail	General Industrial
Construction Description	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings
Stories	3 stories	1 stories	2 stories
Land Area	537,095 sf	322,344 sf	537,095 sf
Number of Buildings	10 buildings	10 buildings	36 buildings
Units/Tenants Per Building	5 tenants	6 tenants	5 tenants
Unit/Tenant Area	3,758 sf	3,221 sf	1,490 sf
Area Per Building	18,791 sf	19,328 sf	7,450 sf
Total Building Area	187,907 sf	193,276 sf	268,200 sf
Construction Timeline	10 years	10 years	10 years

Assessed Value	Use 4	Use 5	Use 6
Assessment Values			
Construction Cost	$305.00 per sf	$450.00 per sf	$260.00 per sf
Land Value	$7.91 per sf	$7.91 per sf	$1.23 per sf
Improvement Value	$57,311,635	$86,974,200	$69,732,000
Land Value	$4,246,735	$2,548,730	$660,232
Total Market Value	$61,558,370	$89,522,930	$70,392,232
Override Value			
Value per unit	$328	$463	$262

Capital Facility Impact Fees

Non-Residential (per square foot)	$34.70	$24.23	$20.34

Table 5. Scenario C – Residential Development Assumptions

Development Assumptions

Use	Use 1	Use 2	Use 3
Proposed Type	Apartments	Residential Community	Residential Community
Proposed Sub Type	Less Than 5 Stories	Duplex / Fourplex	Attached Townhouse
Construction Description	Protected Wood Frame - Common in Apartment Construction	Unprotected Wood Frame - Common in Single Family Construction	Unprotected Wood Frame - Common in Single Family Construction
Stories	4 stories	2 stories	3 stories
Land Area	4,187,858 sf	1,073,754 sf	3,221,262 sf
Number of Buildings	41 buildings	74 buildings	555 buildings
Units/Tenants Per Building	100 units	4 units	4 units
Unit/Tenant Area	950 sf	1,500 sf	1,100 sf
Area Per Building	95,000 sf	6,000 sf	4,400 sf
Total Building Area	3,933,000 sf	444,000 sf	2,440,900 sf

Assessed Value

	Use 1	Use 2	Use 3
Assessment Values			
Construction Cost	$530.00 per sf	$500.00 per sf	$520.00 per sf
Land Value	$6.00 per sf	$7.06 per sf	$7.39 per sf
Improvement Value	$2,084,490,000	$222,000,000	$1,269,268,000
Land Value	$25,127,151	$7,576,242	$23,791,807
Total Market Value	$2,109,617,151	$229,576,242	$1,293,059,807
Override Value			
Value per unit	$509,569	$775,595	$582,722

Capital Facility Impact Fees

Residential (per dwelling unit)	$5,124	$7,150	$5,927
Non-Residential (per square foot)			

Source: CoStar, Redfin, City of Boulder, AECOM Calculations

Table 6. Scenario C – Commercial Development Assumptions

Development Assumptions

Use	Use 4	Use 5	Use 6
Proposed Type	Office	Retail	Light Industrial
Proposed Sub Type	Less Than 5 Stories	General Retail	General Industrial
Construction Description	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings
Stories	3 stories	1 stories	2 stories
Land Area	558,875 sf	644,252 sf	214,751 sf
Number of Buildings	10 buildings	10 buildings	10 buildings
Units/Tenants Per Building	5 tenants	12 tenants	7 tenants
Unit/Tenant Area	3,758 sf	3,221 sf	1,500 sf
Area Per Building	18,791 sf	38,655 sf	10,500 sf
Total Building Area	187,907 sf	386,551 sf	105,000 sf

Assessed Value

	Use 4	Use 5	Use 6
Assessment Values			
Construction Cost	$305.00 per sf	$450.00 per sf	$260.00 per sf
Land Value	$7.91 per sf	$7.91 per sf	$1.23 per sf
Improvement Value	$57,311,635	$173,947,950	$27,300,000
Land Value	$4,418,947	$5,094,016	$263,986
Total Market Value	$61,730,582	$179,041,966	$27,563,986
Override Value			
Value per unit	$329	$463	$263

Capital Facility Impact Fees

Residential (per dwelling unit)			
Non-Residential (per square foot)	$34.70	$24.23	$20.34

Source: CoStar, City of Boulder, AECOM Calculations

Table 7. Scenario D – Residential Development Assumptions

Development Assumptions - Scenario D

Use	Use 1	Use 2	Use 3
Proposed Type	Apartments	Residential Community	Residential Community
Proposed Sub Type	Less Than 5 Stories	Duplex / Fourplex	Attached Townhouse
Construction Description	Protected Wood Frame - Common in Apartment Construction	Unprotected Wood Frame - Common in Single Family Construction	Unprotected Wood Frame - Common in Single Family Construction
Stories	4 stories	2 stories	3 stories
Land Area	2,042,964 sf	2,792,196 sf	8,590,032 sf
Number of Buildings	20 buildings	192 buildings	1,479 buildings
Units/Tenants Per Building	100 units	4 units	4 units
Unit/Tenant Area	950 sf	1,500 sf	1,100 sf
Area Per Building	95,000 sf	6,000 sf	4,400 sf
Total Building Area	1,900,000 sf	1,153,500 sf	6,507,600 sf
Construction Timeline	20 years	20 years	20 years
Affordable Housing @ 60% FMV	0%	23%	44%

Assessed Value

	Use 1	Use 2	Use 3
Assessment Values			
Construction Cost	$530.00 per sf	$500.00 per sf	$520.00 per sf
Land Value	$6.00 per sf	$7.06 per sf	$7.39 per sf
Improvement Value	$1,007,000,000	$576,750,000	$3,383,952,000
Land Value	$12,257,785	$19,701,302	$63,444,819
Total Market Value	$1,019,257,785	$596,451,302	$3,447,396,819
Override Value			
Value per unit	$509,629	$775,619	$582,724

Capital Facility Impact Fees

Residential (per dwelling unit)	$5,124	$7,150	$5,927

Source: CoStar, Redfin, City of Boulder, AECOM Calculations

Table 8. Scenario D – Commercial Development Assumptions

Development Assumptions - Scenario D

Use	Use 4	Use 5	Use 6
Proposed Type	Office	Retail	Light Industrial
Proposed Sub Type	Less Than 5 Stories	General Retail	General Industrial
Construction Description	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings	Unprotected Non-Combustible - Common for Commercial Buildings
Stories	3 stories	1 stories	2 stories
Land Area	108,900 sf	322,344 sf	108,900 sf
Number of Buildings	2 buildings	10 buildings	4 buildings
Units/Tenants Per Building	5 tenants	9 tenants	9 tenants
Unit/Tenant Area	3,758 sf	2,148 sf	1,500 sf
Area Per Building	18,791 sf	19,328 sf	13,500 sf
Total Building Area	37,581 sf	193,276 sf	54,000 sf
Construction Timeline	2 years	10 years	4 years

Assessed Value	Use 4	Use 5	Use 6
Assessment Values			
Construction Cost	$305.00 per sf	$450.00 per sf	$260.00 per sf
Land Value	$7.91 per sf	$7.91 per sf	$1.23 per sf
Improvement Value	$11,462,205	$86,974,200	$14,040,000
Land Value	$861,057	$2,548,730	$133,867
Total Market Value	$12,323,262	$89,522,930	$14,173,867
Override Value			
Value per unit	$328	$463	$262

Capital Facility Impact Fees

Non-Residential (per square foot)	$34.70	$24.23	$20.34

Source: CoStar, City of Boulder, AECOM Calculations

7. Appendix G - References

Black & Veatch Corporation. (2022). 2019 Boulder Water Transmission Study.

City of Boulder (2023). City of Boulder Design and Construction Standards.

City of Boulder Public Works (2019). 2019 Treated Water Asset Inventory & Maintenance Project.

City of Boulder Utilities Department (2023). City of Boulder 2023 Water Efficiency Plan.

City of Boulder Utilities Department (2024). Impacts of Area 3 Planning Reserve Development on the Wastewater Utility.

HDR (2024). City of Boulder Planning Reserve Development Review Technical Memorandum.

Weblinks:

Ecosystem services | Definition, History, & Importance | Brittanica

POTM Sustainability Plan 100 (Preliminary Report), (secureserver.net),

The 15-minute City meets human needs but leaves desires wanting | World Economic Forum (weforum.org)

EcoDistricts AP | Green Building Alliance (gba.org)

Envision Sustainability Professional (ENV-SP) – Institute for Sustainable Infrastructure

LEED for Cities and Communities | U.S. Green Building Council (usgbc.org)

Regenerative Landscaping in Colorado – Habitat Guild | Regenerative Landscapes

What Exactly Are 'Nature-based Solutions'? | World Resources Institute (wri.org)

What is carbon sequestration | U.S. Geological Survey (usgs.gov)

Sustainable Colorado Yards – Waterwise Yards

Combined Heat and Power Technology Fact Sheet Series: District Energy

Net Zero Energy Buildings | WBDG – Whole Building Design Guide

On-Site Renewable Energy Generation | U.S. EPA

The Smart Grid Promise Demand Side Management (smartgrid.gov)

Subsurface Drip Irrigation (SDI) – Understanding Crop Irrigation (wisc.edu)

Basic Information about Water Reuse | U.S. EPA

Water Law Policy: Leases – Exchanges | Water Education Colorado

Terminology of Low Impact Development, Distinguishing LID from other Technologies that Address Community Growth Issues | U.S. EPA

What to Know About Green Roofs: Benefits, Types, and More | Forbes Home

Alternative Fuels Data Center: Active Transportation and Micromobility

Connected Intersection – Institute of Transportation Engineers (ite.org)

Why Smart Charging Essential to a Sustainable EV Transition? | World Resources Institute (wri.org)

Electric Vehicles at Scale Consortium: Smart Charge Management and Vehicle Grid Integration | U.S. Dept of Energy

8. Appendix H – General Limiting Conditions

Deliverables and portions thereof shall be subject to the following General Limiting Conditions:

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