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FROM: Brad Hammerquist, PE
DATE: 12/14/2023
JOB NO.: 0417.088
RE: Engineering Standards and Compact Development
CC: James Nickelson, PE

Urgent For Review Please Comment Please Reply For Your Use

Introduction

Morrison-Maierle is assisting the City of Bozeman (COB) with updating the Design Standards and Specifications Policy (DSSP) and the City of Bozeman Modifications to Montana Public Works Standard Specifications (City Modifications). The overarching function of these engineering design standards is to protect public health and safety, provide for clear design criteria, provide review procedures and inspection requirements, and generally promote operational efficiency while minimizing cost of public infrastructure. More specifically, City of Bozeman standards are intended to assure the following:

- Infrastructure design and construction within the COB meet applicable federal, state, and local laws, regulations, and ordinances
- Infrastructure design and construction within the COB is consistent with respective facility plans
- Uniform materials and methods of construction for efficiency of repairs and maintenance

Compact development has been identified by the City of Bozeman as one of the tools to help achieve a diversity of housing opportunities in the community. High density, or compact development, is often associated with reduced housing costs and preserving open space as it is considered to promote efficient use of land and infrastructure. Another desired effect of increasing density is to contribute to housing supply.

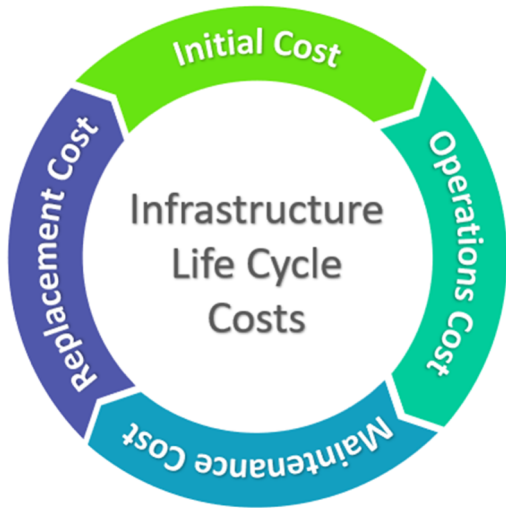
Engineering design standards dictate how public infrastructure such as transportation, water, sewer, and storm drainage systems are designed, approved, and constructed within the City of Bozeman. The purpose of this memo is to explore how the City's goals for compact development and affordable housing relate to engineering standards.

The following topics are discussed:

- Best practices for making engineering decisions
- How public infrastructure fits within the cost of housing
- Ongoing City efforts and development trends related to compact development

How are infrastructure costs evaluated?

The initial construction cost of public infrastructure is often a central focus when planning, designing, and constructing projects. However, it is necessary to consider life cycle cost to understand the full cost of ownership of a facility over its useful life. The cost of ownership is paid for by the users of the infrastructure in one form or another (i.e. purchase price of home, property taxes, maintenance fees, HOA dues, etc.).



Life cycle costs of public infrastructure can be divided into the following categories:

Initial Cost is often referred to as capital cost. This is the initial cost of construction.

Operations Cost could include electrical consumption for traffic lighting and pump stations, fuel for backup generators, chemicals for treatment systems, and water for landscape irrigation.

Maintenance Cost could include snow removal, repainting of street striping, trimming of trees within the City right-of-way, and small repair costs.

Replacement Cost could include disposal and replacement of entire systems or components of systems such as road surfacing or lift station pumps.

Engineering best practices call for making decisions based on which project alternative provides the lowest overall cost of ownership while also meeting the required and desired functional and performance goals (i.e. level of service goals). As illustrated Figure 1, the cumulative cost of operations, maintenance, renewal/repairs over the life of a system can be significant. These costs can be equal to, or greater than, the initial capital cost.

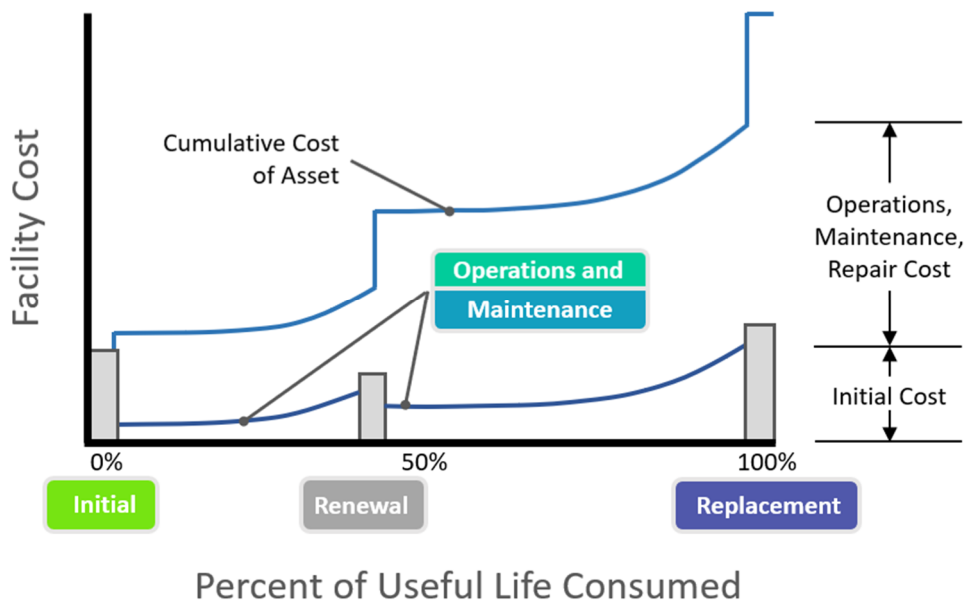


Figure 1

(Source: Graphic adapted from EPA Fundamentals of Asset Management Session 4 – Determine Life Cycle & Replacement Cost)

How does public infrastructure relate to the cost of housing?

There are numerous components that contribute to the cost of purchasing a new home. The cost of undeveloped land, the entitlement process, installing utilities, and building roads varies depending on the proposed use, project complexity, and proximity to public services. Figure 1 shows examples of the expected cost distributions for a 2,300 square foot single-household home on a 0.1 acre lot and a 1,650 square foot condominium in newly developed subdivisions in Bozeman. The costs were estimated based on house and lot price information found online, City of Bozeman’s impact fee calculator, “rule of thumb” feedback from developers, and engineering judgement. Both scenarios yielded similar cost distributions with higher density development having a reduced overall cost per residence.

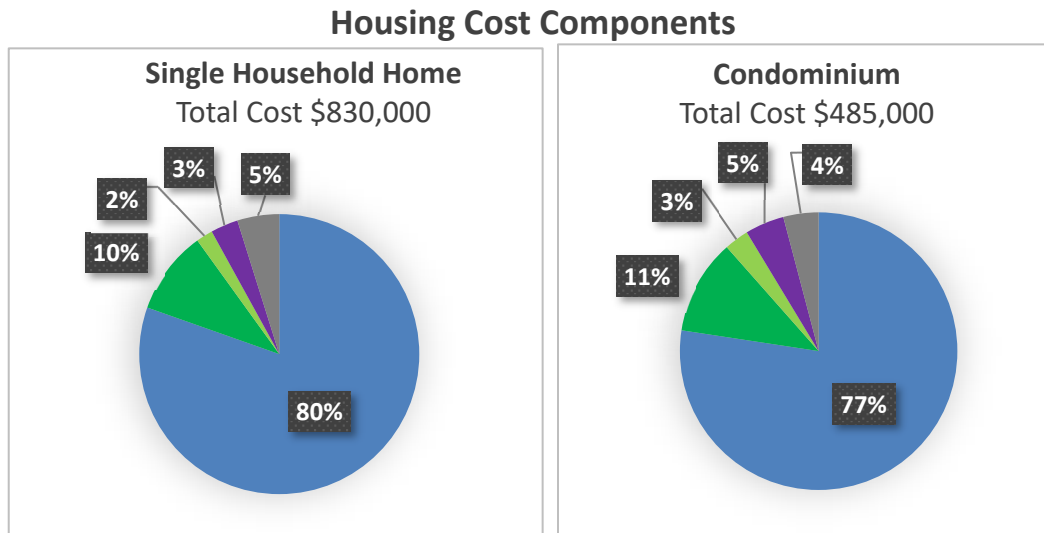


Figure 2 – Housing Cost Components

House Construction	The cost of building the home can be the largest expense, often constituting up to 80% of the total cost of a finished home. This is primarily driven by material costs, labor rates, and home design. Compact development (smaller homes) results in lower overall home costs.
Undeveloped Land	The price of purchasing undeveloped land can be one of the other larger cost components and is primarily driven by the market. Compact development (smaller lots) results in lower land costs. The cost of land per home decreases with higher densities.
Financing/Holding	Financing and holding costs are partially related to the time it takes to bring a property to market after purchasing undeveloped land.
Entitlement & Impact Fees	The entitlement process (planning, engineering, permits and other approvals) is related to the time and effort needed to proceed through the approval processes. Impact fees are a one time fee used to increase capacities of water, sewer, fire/EMS, and transportation systems for those who need new services. The fees recover the cost of construction only and are necessary to limit cost increases on existing property owners. Impact fees are primarily based on square feet of living area, however fees for multi household homes are slightly less than single household homes.
Infrastructure	Infrastructure cost per home decreases with higher densities. Of the cost components identified above, the infrastructure construction cost is most directly related to the engineering and construction standards but is not a primary driver of home prices.

City of Bozeman Ongoing Affordability Efforts and Development Trends

Community Housing Plan

The City of Bozeman Community Housing Action Plan (updated April 2020) identifies “Removal of Regulatory Barriers” as one of 17 action strategies to address Bozeman’s community housing needs. One of the proposed actions associated with this action strategy is to revisit the Engineering Design Standards and Specifications Policy to allow more compact development standards.

Community Plan

The City of Bozeman’s 2020 Community Plan identifies numerous goals that are related to supporting higher densities and compact development. Most of these goals are related to planning, zoning, and policy decisions, however there is a common thread of locating higher density developments in appropriate locations such as near schools, services, transportation corridors, and public transit routes. The following Community Plan goals are related to increased development density:

- N-1.11 Enable a gradual and predictable increase in density in developed areas over time.
- N-2.2 Revise the zoning map to support higher intensity residential districts near schools, services, and transportation.
- N-3.7 Support compact neighborhoods, small lot sizes, and small floor plans, especially through mechanisms such as density bonuses.
- **N-3.8 Promote the development of "Missing Middle" housing (side by side or stacked duplex, triplex, live-work, cottage housing, group living, rowhouses/ townhouses, etc.) as one of the most critical components of affordable housing.**
- DCD-2.2 Support higher density development along main corridors and at high visibility street corners to accommodate population growth and support businesses.
- DCD-2.3 Review and update minimum development intensity requirements in residential and nonresidential zoning districts.
- DCD-2.7 Encourage the location of higher density housing and public transit routes in proximity to one another.
- DCD-3.5 Encourage increased development intensity in commercial centers and near major employers.

Municipal Code

Section 38.360.120 of Bozeman Municipal Code includes criteria for Cottage housing subdivisions which are a form of compact development. The code primarily addresses lot size, lot coverage, lot configuration, and architectural building elements.

The City is in the process of revising Bozeman Municipal Code to implement the vision and goals established in the city’s guiding documents such as the 2020 Community Plan (aka Growth Policy), the Climate Plan, and strategic priorities like affordable housing.

Development Trends

Development in Bozeman has become increasingly dense in recent years. Home construction trends have seen a decrease in single household homes and increase in multi-household and townhomes. See Figure 3 for home construction permit history from 2014 to 2022.

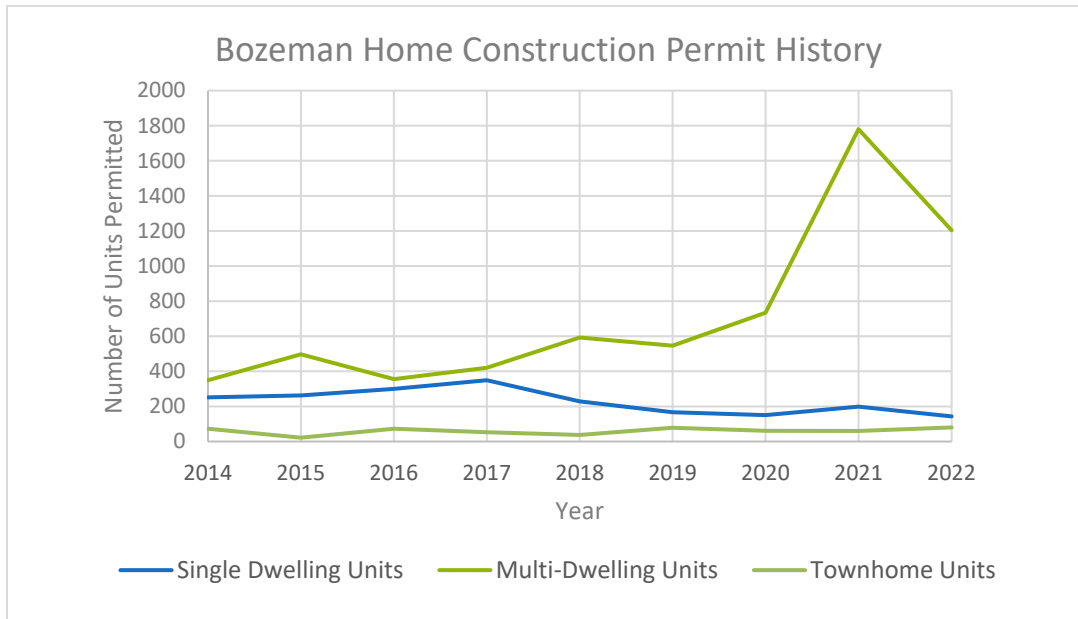


Figure 3 – Home Construction Permit History

Conclusions

The City’s goal of increasing development density is being realized. Single dwelling unit subdivisions are no longer the norm. The City should continue to work with the community to refine the Unified Development Code to meet its strategic priorities.

Public infrastructure costs are a small portion of the overall cost of a home but do have an impact on initial costs and operations and maintenance costs. It is recommended that infrastructure design elements associated with compact development be analyzed in further detail to better understand the relationship between initial construction and long-term infrastructure costs.