Sudbury Master Plan Steering Committee
Route 20 Workshop

February 28, 2020

The purpose of the Route 20 Workshop is to determine policy direction related to the Route 20 area. Specifically:

- Does the Town support more development along Route 20, what that development might look like? What are the public and private investments needed?
- What is the level of commitment the town will make in the next 5, 10 and 20 years?
- Identify potential policies and actions to meet to these objectives and/or give the consultants direction to draft them

Items in this packet:

- Draft Formative Issues from November workshops related to Route 20
- Key findings and recommendations from *Route 20 Corridor: Urban Design Studies and Zoning Evaluations* by The Cecil Group (2015)
- Draft Fiscal Impact scenarios for Route 20 development (to be presented at meeting)
- Materials from the Transportation/Connectivity workshop: Bicycle Facility Selection Guidance, Bicycling Fact Sheet, Context Sensitive Traffic Calming Solutions, Excerpts from *Public Transportation's Impact on Rural and Small Towns* (2017) by the American Public Transportation Association

Draft Formative Issues Related to Route 20

The following are taken from the Draft Formative Issues reviewed during the November joint workshops with the MPSC and Planning Board.

Economic Development

1. Sudbury relies heavily on its residential tax base, accounting for over 93% of the total assessed value. Both its residential and commercial tax rates fall in the middle of the range of neighboring communities. Per capita spending is on the higher end of neighboring towns, with the majority of revenues coming from tax levies.

    a. Pursue local opportunities to strengthen the commercial tax base. Route 20 has the highest potential for economic development, but requires regulatory reform, circulation improvements, and significant infrastructure investment. There is currently no guidance for design.

2. The largest local employer is the Town (municipal employment). Health Care and Professional Services have also contributed to job growth. These sectors are expected to continue driving future growth.

    a. Ensure local regulations are well-suited for existing market opportunities. Provide opportunities for expansion in health care and profession services.

3. Median annual earnings for jobs within Sudbury ($44,300) are considerably lower than the median earnings of Sudbury residents ($81,609). This points to a mismatch between resident skills and the types of employment opportunities in town and explains the high level of cross-commuting. Over 90% of resident workers commute out of Sudbury for work, and 88% of workers commute into the Town for work.
4. Create opportunities for "flex space" where residents who work from home can have access to technology or meeting space rather than commuting.

Housing

1. There are few rental housing options in Sudbury.

    a. Invest in areas like Route 20 (infrastructure) to allow for small-scale multi-family and mixed-use housing options.

Transportation

1. Traffic congestion is an issue in Sudbury, particularly on the state routes near the Town Center and along Route 20. Congestion is a result of both local and regional traffic trips.

    a. Build the Town's walking and biking network to encourage residents to take local trips without a car.
    b. On Route 20, synchronize traffic lights, look for ways to consolidate driveways with internal circulation.

2. The Route 20 Commuter Shuttle is a great amenity but is not currently meeting commuter needs.

    a. Consider adding a fixed stop(s) on Route 20.
    b. Consider adding later times leaving from Riverside T Station.

3. Sudbury has a robust walkway network, and improvements continue, but gaps exist with missing links between residential areas and important destinations like commercial areas, schools, and parks/open space. The nature of Sudbury's roads, which are winding, narrow, and tree-lined, make it difficult to add some of the missing connections.

    a. Streamline the process for acquiring easements. Educate residents.
    b. Improve lighting at key destinations.
    c. Upgrade and add crosswalks to be more accessible at major intersections and key points throughout Town.

Key Findings and Recommendations from *Route 20 Corridor: Urban Design Studies and Zoning Evaluations* by The Cecil Group (2015)

See https://sudbury.ma.us/pcd/wp-content/uploads/sites/326/2015/03/Sudbury-Zoning-Final-Report.pdf.

Potential for Redevelopment of Existing Sites: Site Capacity

• THERE IS LIMITED CAPACITY FOR MIXED-USE REINVESTMENT WITHIN THE STUDY AREA WITHOUT INNOVATIVE ZONING CHANGES, IMPLEMENTATION OF SEWER IMPROVEMENTS AND OTHER POTENTIAL TOWN LAND USE MANAGEMENT ACTIONS – The evaluations of existing development patterns indicated that the prototypical sites are approaching maximum build-out capacities within the existing zoning standards, site constraints, and the practical limits of market conditions that prevail in similar suburban locations. Without the ability to expand the range of uses through land use standards, many owners will have very limited incentive to pursue significant changes.

• IF ZONING AND OTHER CHANGES OCCUR, SOME INDUSTRIAL-ZONED AND VACANT PARCELS MAY HAVE SIGNIFICANT ADDITIONAL POTENTIAL FOR MIXED-USED DEVELOPMENT – Zoning changes are particularly important for industrial zoning categories if mixed-use redevelopment is to occur. Because of the constraints of industrial zoning categories, parcels in the Limited Industrial District (LID) and Industrial (ID) designations would have very limited ability to absorb the type of development envisioned in the 2012 MAPC Report and in Town planning concepts for the study area.

• SUBSTANTIAL RE-ORGANIZATION OF SITES AND REDEVELOPMENT IS LIKELY WITHIN PARTICULAR PARCELS AND LOCATIONS – Redevelopment meeting the urban design and land use goals of the Town with substantial reinvestment is most probable/feasible where existing buildings are outmoded and need to be replaced or where land is underutilized relative to mixed-use development potential.

• INCREMENTAL IMPROVEMENTS TO EXISTING DEVELOPMENT MAY BE ENCOURAGED ON SITES THAT ARE LARGELY OCCUPIED BY VIABLE RETAIL AND COMMERCIAL BUILDINGS ALONG WITH THE PARKING NEEDED TO SUPPORT THE USES WITHIN THEM – Where there is limited site capacity for redevelopment, re-organization of the sites and reinvestment may occur through building additions or relatively small new buildings which could be added to existing retail and commercial complexes.

Relationship between Zoning and Sewer Improvements

• THE COMBINATION OF PROSPECTIVE SEWER IMPROVEMENTS AND ZONING CHANGES COULD PROVIDE SIGNIFICANT INCENTIVES TO ATTRACT NEW INVESTMENT THAT WOULD MEET TOWN GOALS – The Town has undertaken separate evaluations regarding the direct benefits for potential mixed-use redevelopment associated with added sewer capacity through a shared system. Without a new shared system, prospective redevelopment would generate additional sewerage demand that would require on-site septic systems. In locations where on-site septic systems could be feasibly expanded or created, such on-site systems limit the amount and location of buildings, parking and other improvements.

• A SHARED SEWER SYSTEM WILL UNLOCK LAND AREAS THAT ARE CURRENTLY USED FOR SEPTIC SYSTEMS WITHIN EXISTING PARCELS OF THE STUDY AREA – Some reinvestment opportunities could result from a shift to a shared sewer system by removing the land needs of on-site sewer systems. In cases where new septic systems or system expansion is not feasible, a shared sewer system would be a pre-requisite for new and expanded development, regardless of changes in zoning.

Potential Zoning Overlay Provisions

Revised Use Standards

• ADDITIONAL USES THAT COULD BE ALLOWED IN THE UNDERLYING ID AND LID ZONES WOULD BE A SIGNIFICANT INVESTMENT INCENTIVE – In order to promote reinvestment and mixed-use development, additional uses such as retail, personal services, housing and certain medical uses can be provided through an overlay zone.

• EXPANDING THE RANGE OF USES IN THE OTHER UNDERLYING ZONING CATEGORIES WOULD PROVIDE A LESSER INVESTMENT INCENTIVE – Because the allowed use mix is fairly broad and aligned with market-supported uses in the other underlying zones, the expansion of allowable uses in the Limited Business and Business zones would provide a more limited incentive than in industrial zoned land.

• RESTRICTIONS ON THE USE OF GROUND FLOORS FOR COMMERCIAL OR RETAIL USE MAY BE PRACTICAL ALONG THE PRINCIPAL STREET FRONTAGES, BUT IS NOT LIKELY TO BE A PRACTICAL RESTRICTION FOR SOME LARGE SITES – Various market and design considerations typically make "stacked" mixed-use development impractical and unfeasible for entire large sites. If the Town wishes to incorporate housing as part of a mixed-use pattern, then the constraint regarding ground floor uses should be limited to buildings within an established setback from the street.

Potential Revised Dimensional Standards

• THE EXISTING DIMENSIONAL STANDARDS ARE NOT A SIGNIFICANT HURDLE – The existing zoning standards that govern height, bulk, setbacks and the like are not a significant restriction for the uses allowed in the existing zoning districts.

• INCREASING HEIGHT LIMITS TO 3 STORIES OR 45 MORE FEET WOULD BE AN INCENTIVE FOR NEW MIXED-USE DEVELOPMENT – The current limits in the area range from 2 to 2.5 stories; development opportunities could be marginally increased by an increase in allowable height.

• AN ADDITIONAL STORY COULD BE PROVIDED FOR BUILDINGS WITH SETBACKS OF MORE THAN 1,000 FEET FROM POST ROAD – Prospective zoning revisions include a provision allowing four-story buildings if they are a considerable distance from the major public road. This provision would be consistent with the planning area goals, by encouraging reinvestment and limiting the visual impacts from public ways.

• CHANGED SETBACK REQUIREMENTS FROM THE STREET EDGE WILL HAVE BENEFICIAL EFFECTS – A combination of minimum and maximum setbacks can encourage existing uses to expand and allow new buildings to be constructed along pedestrian-oriented frontages that will reduce the visual impacts of automobiles and create more attractive districts.

• A SUGGESTED REQUIREMENT FOR MINIMUM BUILDING HEIGHTS HAS PRACTICAL DRAWBACKS – The MAPC Study suggested requiring a minimum building height of 2 stories along the Post Road. This standard would need to be accompanied by a phasing standard that would require frontage development prior to development of the backland portions of a property. The two-story standard could prevent development or additions to existing buildings if there is inadequate demand for the use of upper floors, or leave portions of parcels undeveloped while backland portions proceed.

Potential Revised Parking Standards

• REDUCING PARKING REQUIREMENTS IS A PRACTICAL AND DESIRABLE CHANGE THAT COULD BE ACCOMPLISHED THROUGH OVERLAY ZONING – The underlying zoning requirements for parking exceed practical requirements for typical uses in similar suburban environments. Reduced requirements would provide an incentive for productive redevelopment of sites.

• MAXIMUM PARKING REQUIREMENTS IS NOT ADVISABLE FOR THE STUDY AREA – There is no incentive for owners and developers to provide parking that is not demanded by market conditions. Because there is no robust transit system and significant population density within walking distance as occurs in urbanized districts, parking maximum requirements will deter potential investment within the study area.

Potential Open Space Requirements

• THE TOWN CAN ESTABLISH AN EXPLICIT OPEN SPACE REQUIREMENT THROUGH OVERLAY ZONING – The zoning could articulate the amount of undeveloped green space that should be provided for landscaping, in keeping with the Town's goals for zoning in the study area and the preceding MAPC study.

Potential Definition Changes

• ENHANCED ZONING DEFINITIONS WOULD BE APPROPRIATE TO ACCOMPANY NEW OVERLAY DISTRICTS – Definitions would be appropriate for uses such as applicable multi-family or attached single family residences (town houses) which do not appear in the existing zoning. Similarly, live/ work uses should be defined.

Observations on Potential Standards for Minimum Parcel Size

• PROVIDING MINIMUM PARCEL SIZE IN THE ID AND LID ZONES COULD CREATE INCENTIVES FOR REDEVELOPMENT, IF USED IN CONCERT WITH OTHER PROVISIONS – The industrially zoned land in the study area is currently composed of large parcels. Provisions for minimum lot sizes in the industrial-zoned land could help lead to comprehensive site planning and avoid future problems associated with small parcels that could be created by subdivision in an unplanned manner. To be effective, the minimum lot size would be a pre-requisite for expanding the range of uses allowed under the mixed-use overlay zone. However, the minimum parcel standards should not preclude subsequent reasonable future subdivision of land into smaller parcels that would be needed to support market requirements such as the financing and sale of development components.

Comments on Potential Procedural Changes

• DESIGN GUIDELINES COULD BE BENEFICIAL TO FUTURE PERMITTING AND APPROVAL PROCESSES – Design guidelines could be provided as a shared basis for the design and site planning decisions associated with new development within the study area.

• CONSOLIDATING THE PERMITTING AND REVIEW PROCESS FOR DEVELOPMENTS WITHIN THE CORRIDOR WOULD PROVIDE FOR A MORE PREDICTABLE, CONSISTENT, AND EFFICIENT PROCESS FOR DEVELOPERS AND FOR THE TOWN – Clear, predictable review and approval processes are an incentive for desirable reinvestment. They also lead to more coherent and consistent project reviews and approvals to link planning and the zoning that implements Town goals.

Fiscal Impact of Route 20 Development

Presented by: Tom Dworetsky, Director of Research
Camoin 310

February 2020

Agenda

- Framing the Issue
- Operating Budget
- Tax Rates
- Future Scenarios
- Net Fiscal Impact of Development
- Key Takeaways

Key Questions

- What is the current trajectory of the Town's operating budget?
- What does this mean for taxpayers?
- How do different types of development impact the Town's fiscal situation?
- How can new development lower the burden on existing taxpayers?

Top General Fund Budget Items – FY19

Expenditures

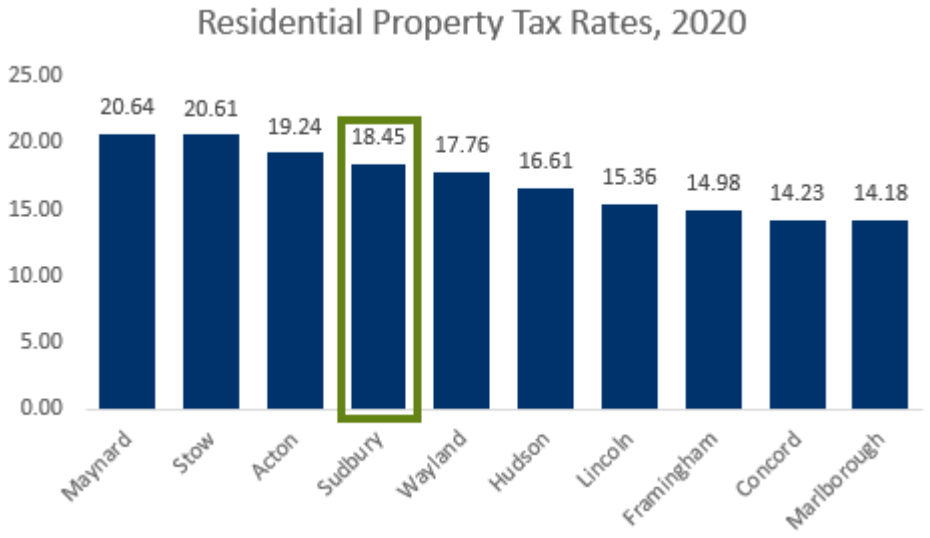
- Education ($62 M, 63%)
- Employee Benefits ($12 M, 12%)
- Public Safety ($9 M, 9%)
- Public Works ($5 M, 5%)

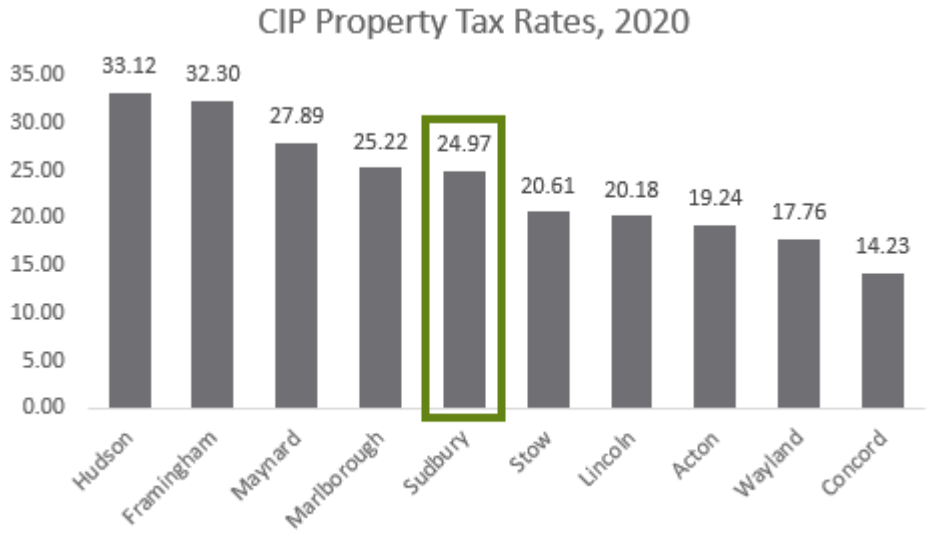
Revenues

- Real Estate and Personal Property ($86 M, 87%)
- State Aid ($6 M, 6%)
- Local Receipts($5 M, 5%)

2020 Property Tax Rates

- Sudbury has a split tax rate
  - 18.45 residential
  - 24.97 commercial, industrial, and personal property (CIP)
- 4th highest residential rate (out of 10)
  - 5th highest in 2019
- CIP rate is average compared to neighbors

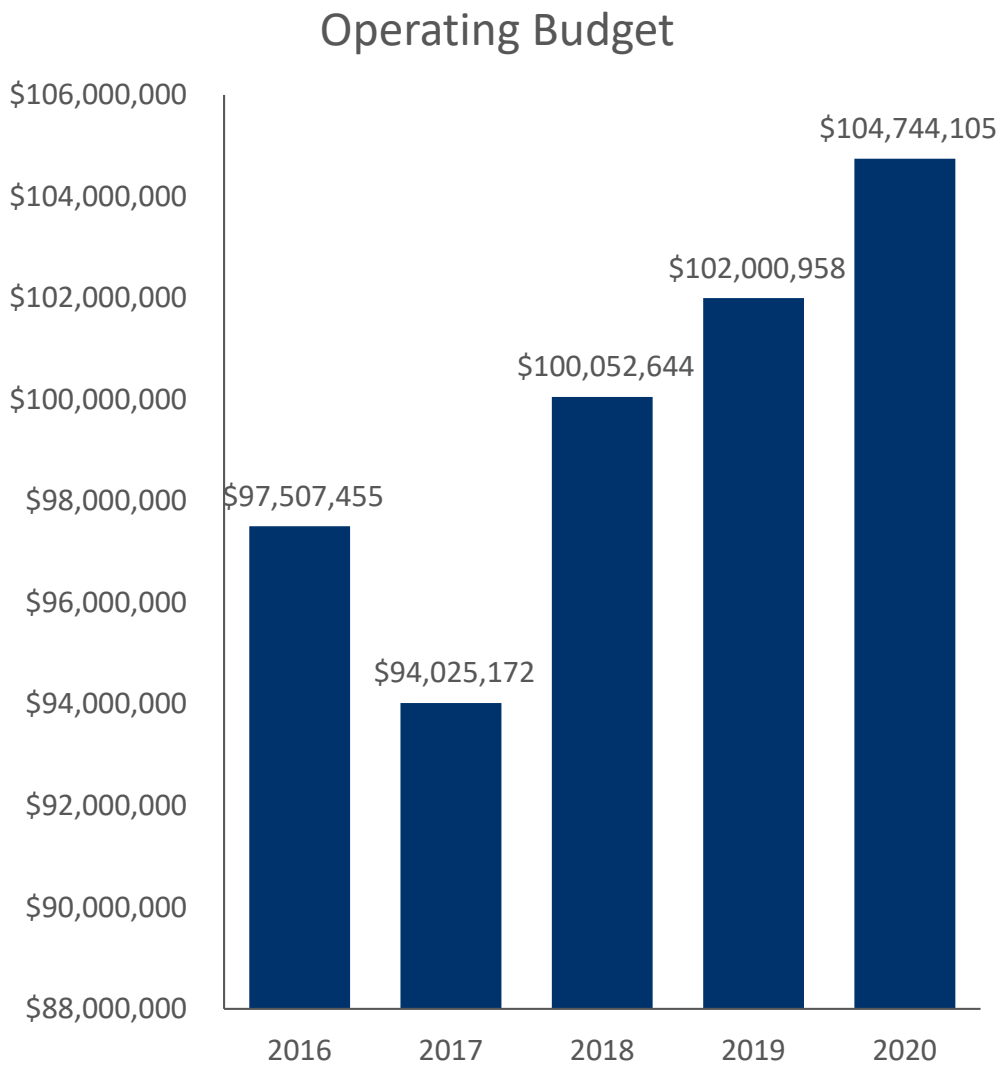




Source: Division of Local Services, MA Department of Revenue

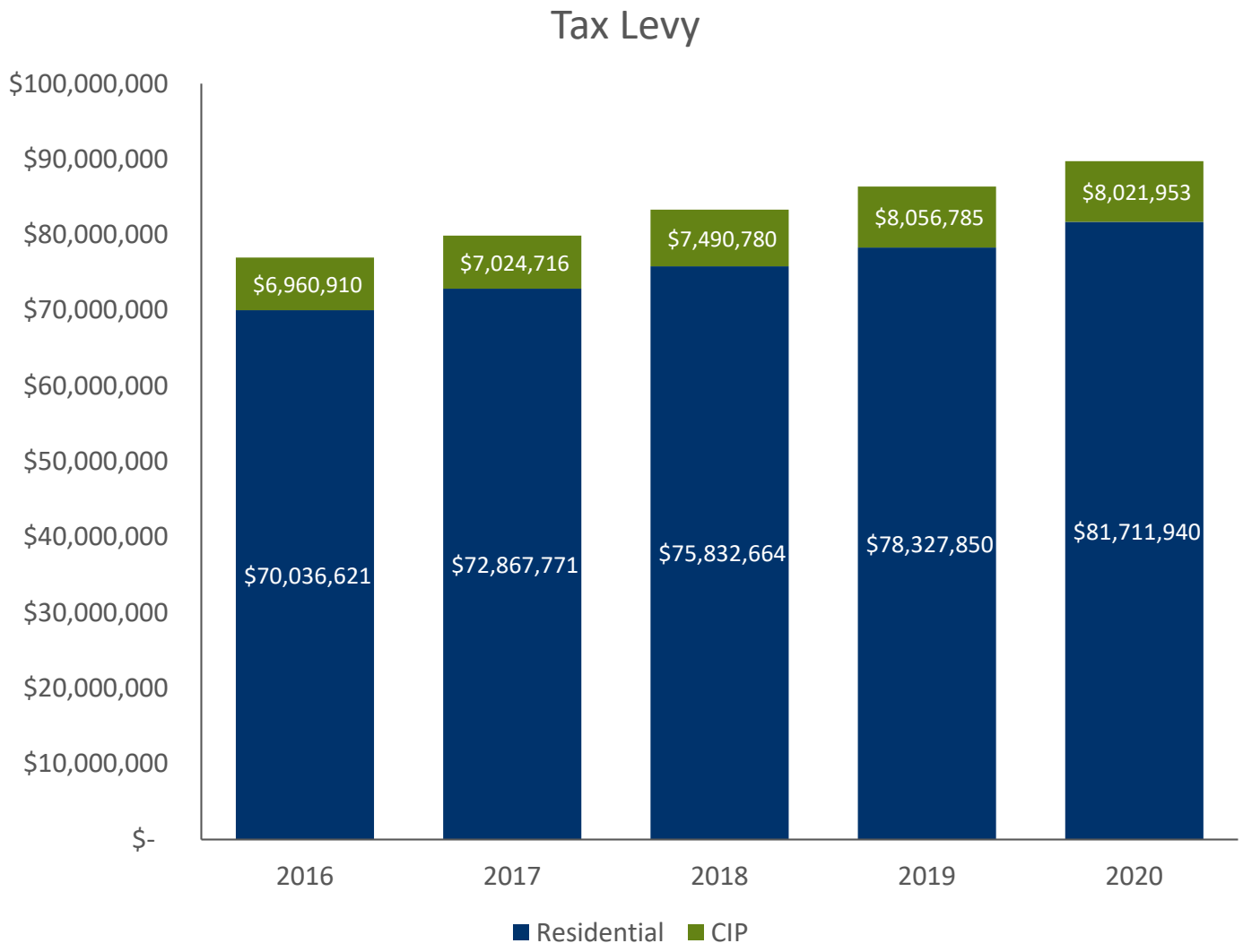
Operating Budget

- Sudbury's operating budget was over $104.7 million in 2020.
- 5-year trend: 2% annual increase
- 3-year trend: 4% annual increase



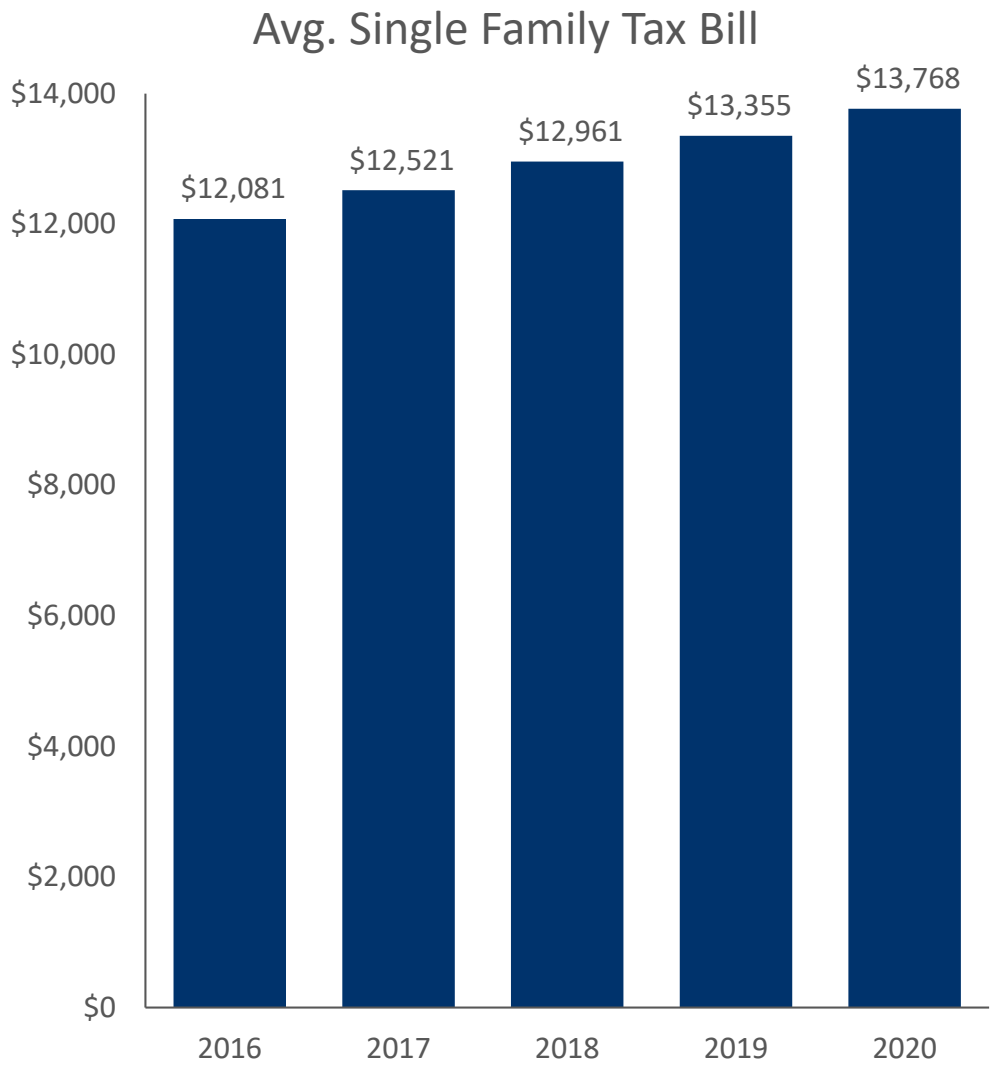
Tax Levy

- Sudbury's total tax levy is over $89.7 million in 2020.
- 5-year trend: 3.9% annual increase
  - Residential - 3.9% annual increase
  - CIP - 3.7% annual increase



Average Single Family Tax Bill

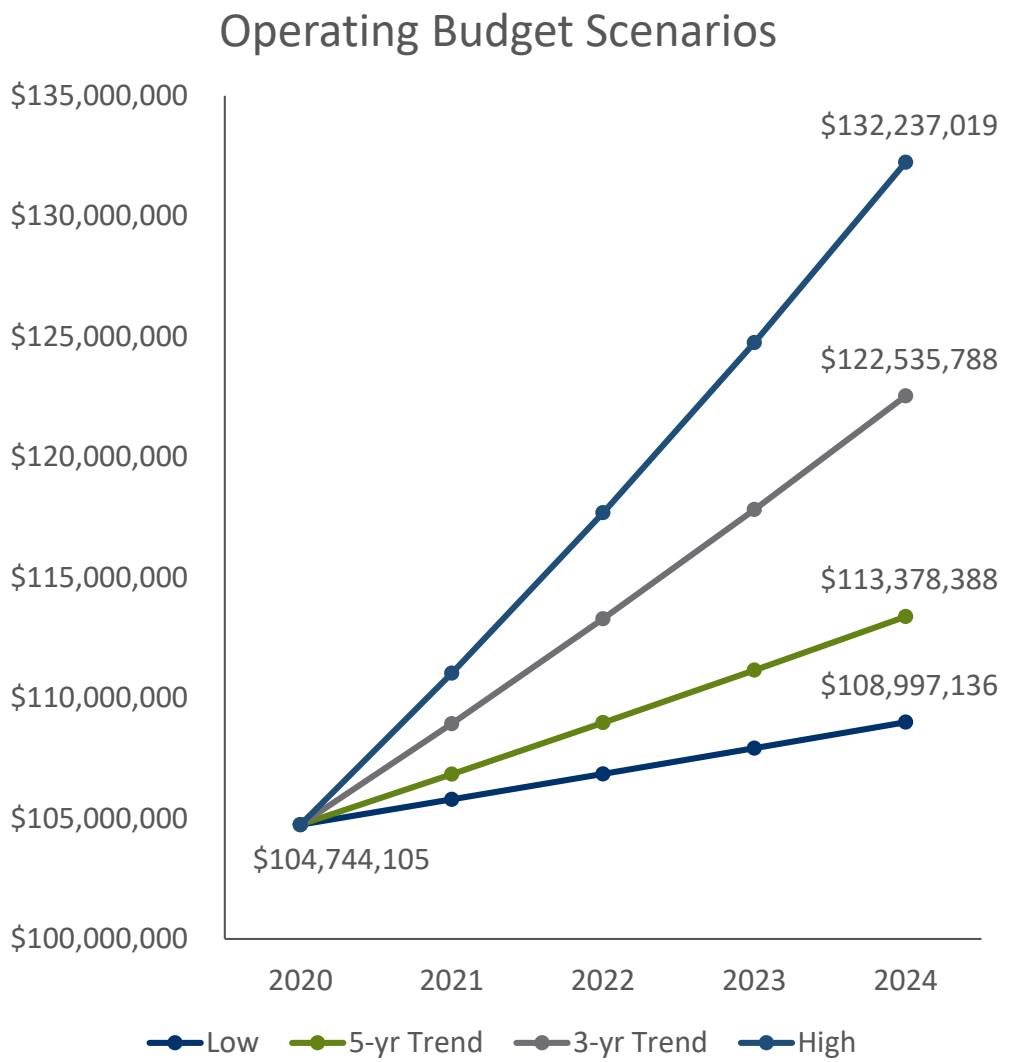
- The average single family tax bill in Sudbury is $13,768 in 2020.
- The average tax bill has increased on average by $422, or 3.3%, annually since 2016.



Operating Budget Scenarios

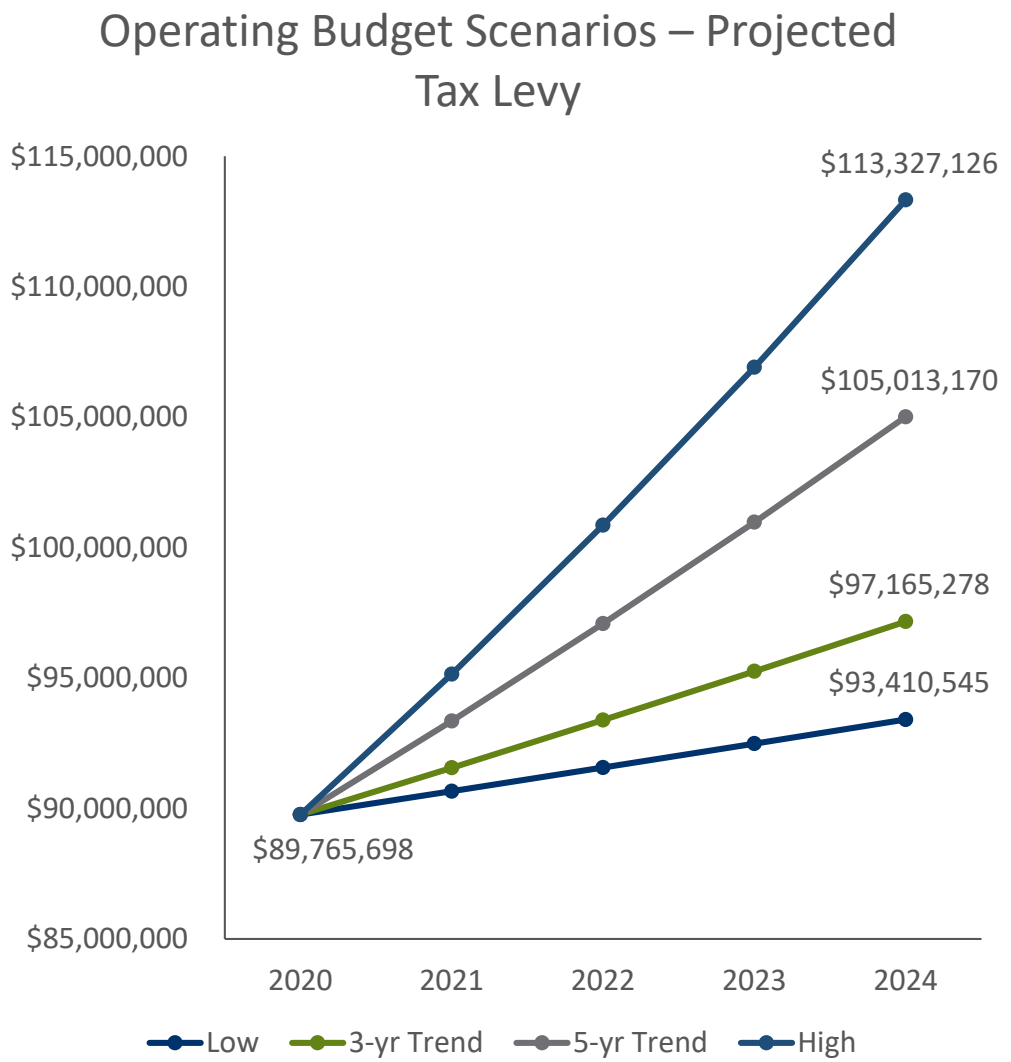
- Low increase scenario: 1%
- 5-yr Trend: 2%
- 3-yr Trend: 4%
- High increase scenario: 6%

- The operating budget in 2024 could range from $109 million to $132 million.



How to Cover Operating Budget Increases?

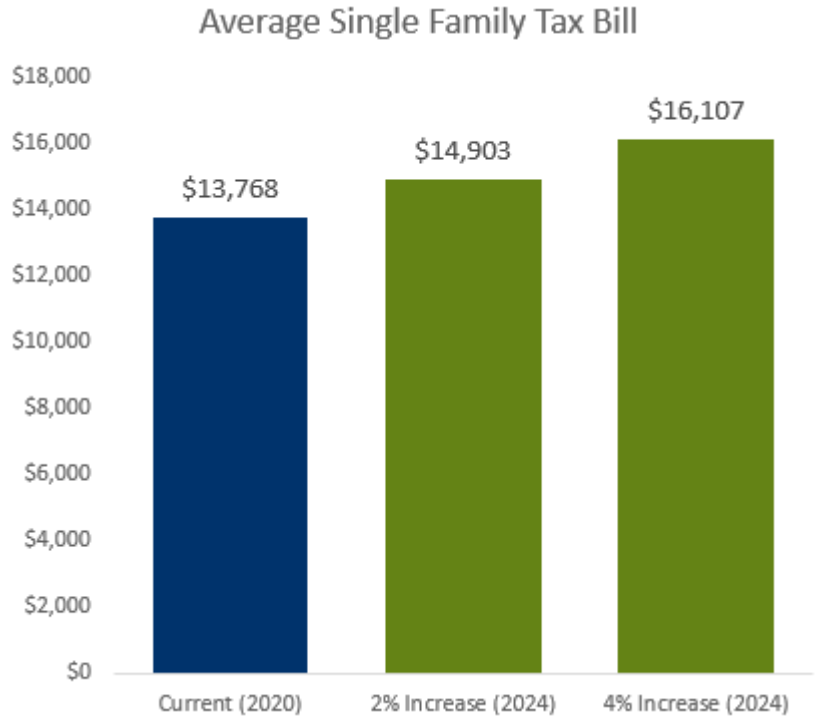
- Tax levy will have to increase at a similar rate
- 2020 tax levy is 85.7% of the operating budget.
- The tax levy will need to increase to between $94 and $113 million depending on the operating budget scenario.
- **This is an increase of between $3.6 million and $23.6 million in taxes that will need to be raised.**



Additional Tax Revenue Needed

- At a 4% annual growth rate, single family taxes will increase to $16,107 in 2024.
  - Single family taxes will increase by $2,339
  - $468 increase per year

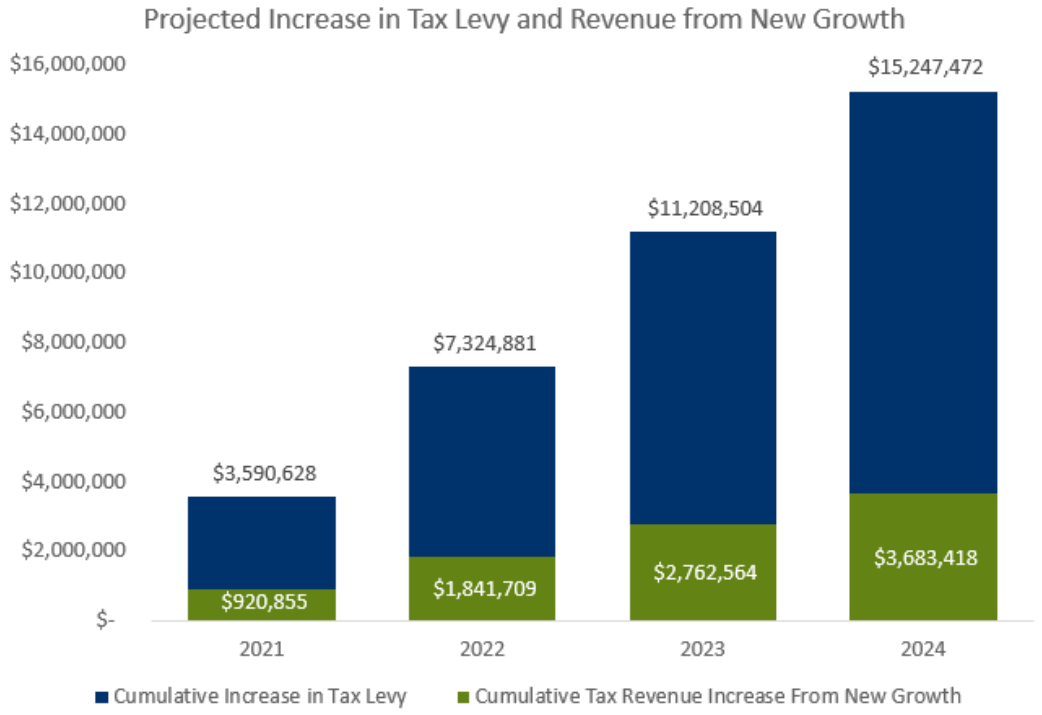
- At a 2% annual growth rate, single family taxes will increase to $14,903 in 2024.
  - Single family taxes will increase by $1,135
  - $227 increase per year



Looking Forward

Tax Revenue from New Growth

- New growth helps to close the gap
- Average annual new growth generates $920,855 in new tax revenue annually
- Continued operating budget increases at 4% per year will require additional new growth to limit tax increases



Tax Revenue Gap at Current 4% Avg. Annual Operating Budget Increase				
Year	Projected Tax Levy	Cumulative Increase in Tax Levy	Cumulative Tax Revenue Increase From New Growth	Gap
2020	$ 89,765,698			
2021	$ 93,356,326	$ 3,590,628	$ 920,855	**$ 2,669,773**
2022	$ 97,090,579	$ 7,324,881	$ 1,841,709	**$ 5,483,172**
2023	$ 100,974,202	$ 11,208,504	$ 2,762,564	**$ 8,445,940**
2024	$ 105,013,170	$ 15,247,472	$ 3,683,418	**$ 11,564,054**

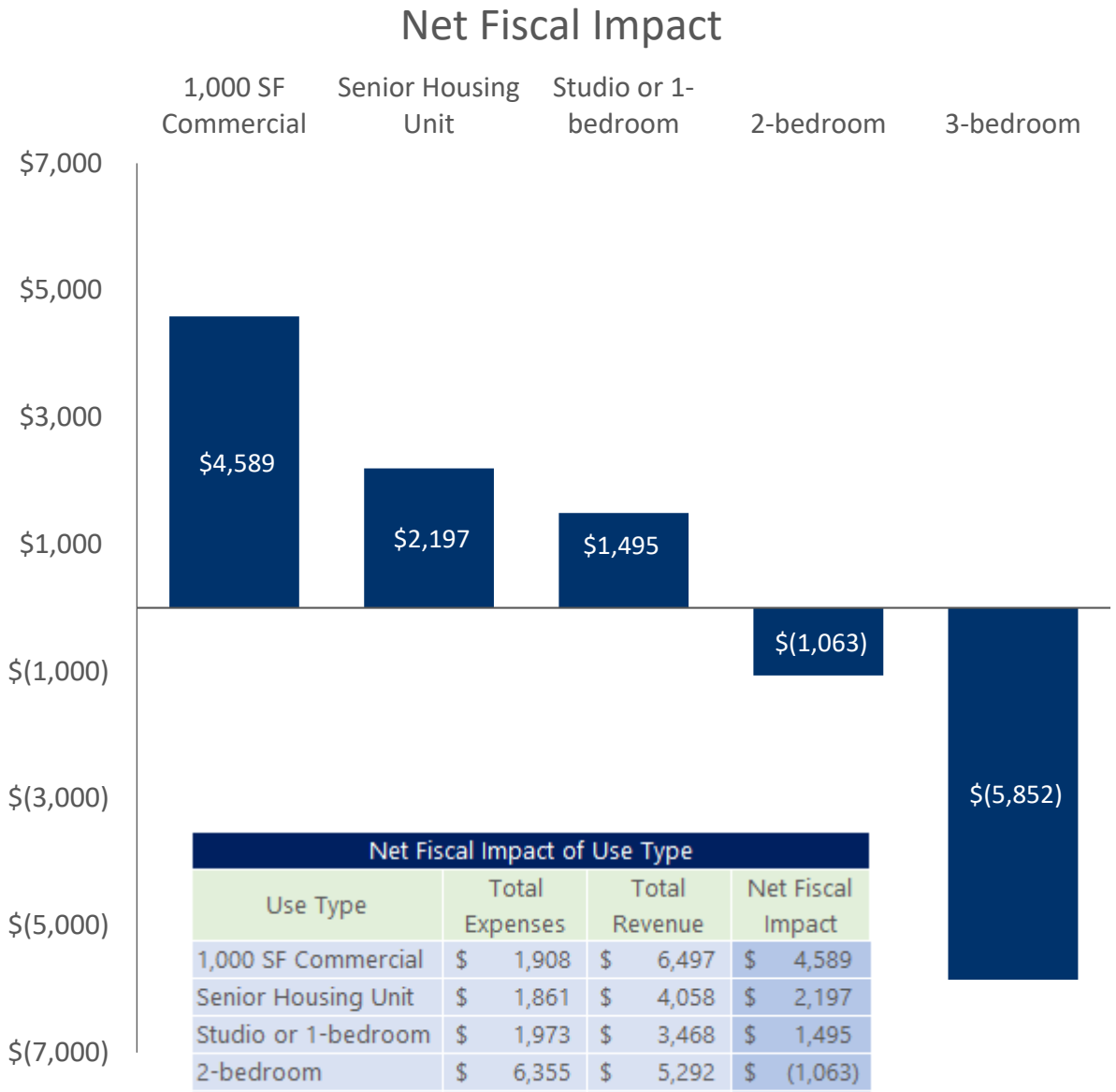
Fiscal Impact Methodology

- Determine net fiscal impact per “unit” of development type:
  - 1,000 SF commercial
  - Senior housing unit (age restricted, 55+)
  - Multifamily unit (studio/1-BR, 2-BR, 3-BR)
- Per capita/average cost method:
  - Calculate per capita impact of development on residents, public school children, and daytime population.
  - Calculate assessed value increase per development of unit.
- Apply multipliers to variable budget expenses and revenue.
- Calculate net fiscal impact.

The average cost method assumes incremental increases in development have proportional impacts on revenues and expenses. In reality, no fiscal impacts are experienced until service providers reach certain thresholds that trigger larger expenditures.

Net Fiscal Impact

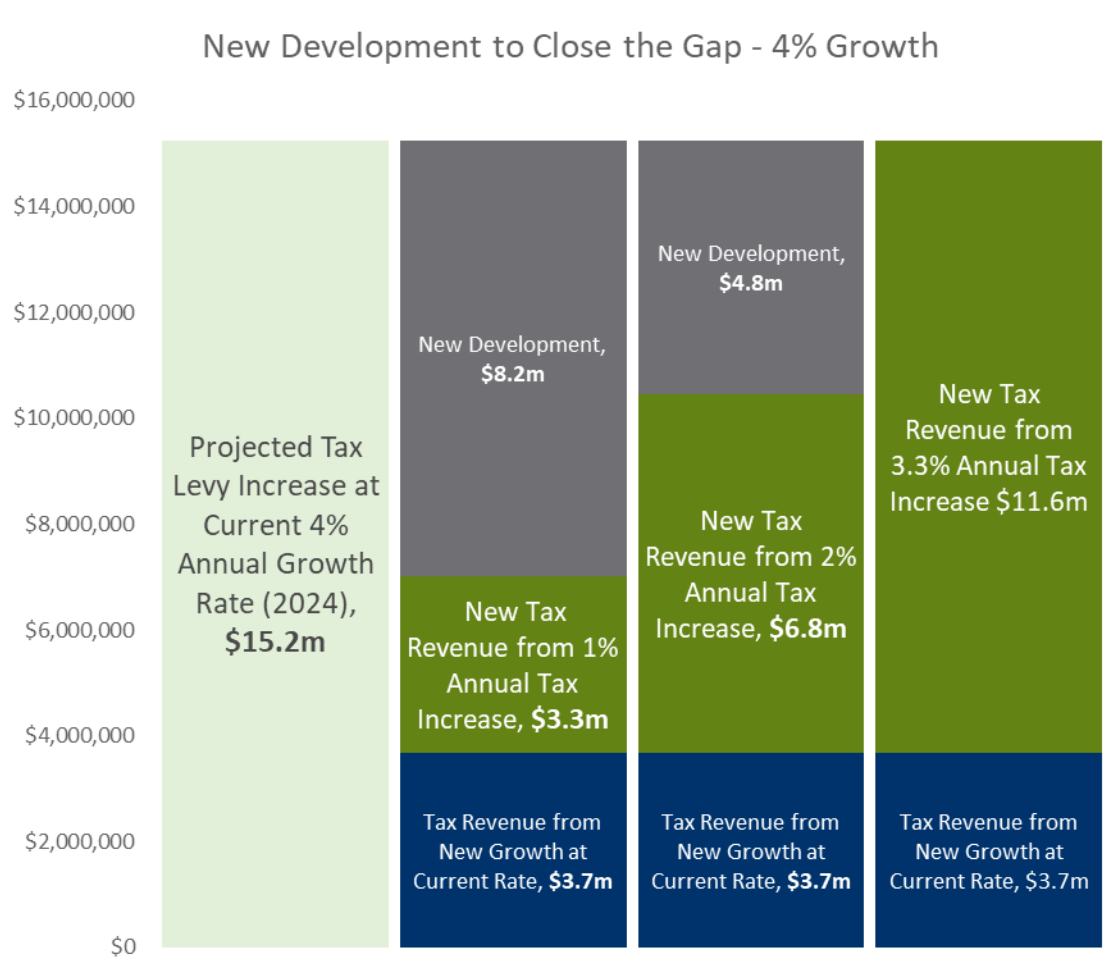
- Positive: commercial space, senior housing unit, studio or 1-bedroom apartments
- Negative: 2- and 3- bedrooms



Net Fiscal Impact of Use Type			
Use Type	Total Expenses	Total Revenue	Net Fiscal Impact
1,000 SF Commercial	$ 1,908	$ 6,497	$ 4,589
Senior Housing Unit	$ 1,861	$ 4,058	$ 2,197
Studio or 1-bedroom	$ 1,973	$ 3,468	$ 1,495
2-bedroom	$ 6,355	$ 5,292	$ (1,063)
3-bedroom	$ 12,415	$ 6,563	$ (5,852)

Funding a 4% Budget Increase

- Single family tax bills would need to increase by $485 annually, or $1,938 over 5 years to cover the entire increase.
- If taxes increase by 1%, new development needed is:
  - 1.8 million SF – commercial OR
  - 3,746 senior housing units OR
  - 5,506 studio/1-br units
- If taxes increase by 2%, new development needed is:
  - 1.0 million SF – commercial OR
  - 2,182 senior housing units OR
  - 3,207 studio/1-br units



Funding a 2% Budget Increase

- Single family tax bills would need to increase by $156 annually, or $623 over 5 years to cover the entire increase.
- If taxes increase by 1%, new development needed is:
  - 83,000 SF – commercial OR
  - 173 senior housing units OR
  - 255 studio/1-br units

Key Takeaways

- The Town's budget has increased at a high rate over the last 3 years.
- Depending on future budget increases, the Town will either need to:
  - Raise taxes,
  - Attract new development that is fiscally net positive, or
  - Do a combination of the two.
- Most likely development based on the market is senior housing, multifamily residential, mixed use retail/services

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ECONOMIC DEVELOPMENT

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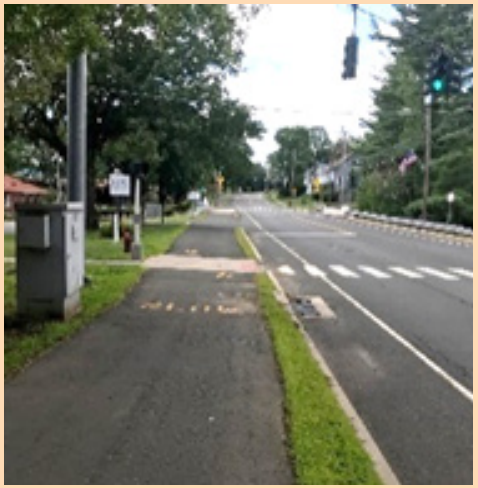
Facility Selection Guide

Several factors should be considered when selecting appropriate bicycle facilities for a street or roadway corridor. The primary factors include traffic speed and volume, but also include anticipated usership, roadway geometry, adjacent land uses, and existing and planned bicycle facilities in proximity to the corridor for which bicycle facilities are considered.

The selection of a bicycle facility for a corridor should seek to maximize the safety and comfort of bicyclists while maintaining the safe and effective operation of other modes of travel along that corridor. As such, the selection of appropriate bicycle facilities is not a "one size fits all" approach; facilities should be selected in response to the unique characteristics of that corridor. In some contexts, the provision of bicycle facilities may not be feasible given operational impacts, physical constraints, or construction cost.

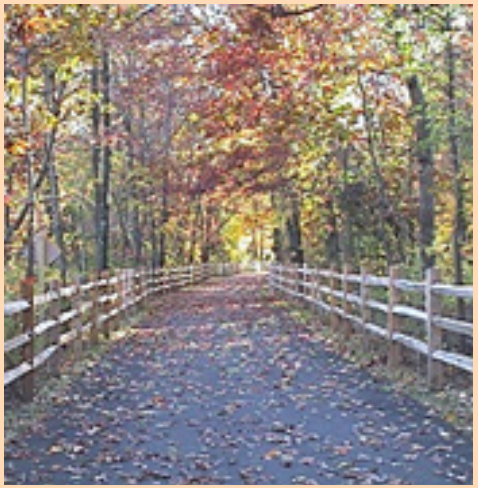
The guidance provided in this manual is based upon the best practices of transportation departments from states and municipalities across the country and from guidance documents from the National Association of City Transportation Officials (NACTO) the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA). Where specific guidance is lacking, recommendations are based upon published research and professional judgement.

Sidepath



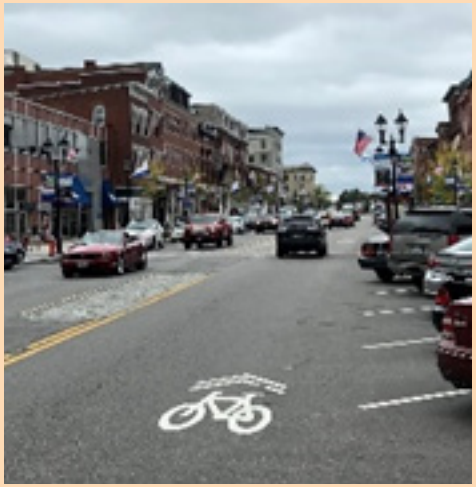
Sidepaths provide a separated facility for the shared use of bicyclists and pedestrians. Like sidewalks, these facilities are physically separated from motor vehicles by a curb, open space, or barrier. These facilities are adjacent to the roadway and are typically located within the right-of-way.

Shared-Use Path



A shared-use pathway is a facility that is shared by bicyclists and pedestrians. These facilities are recreational in nature and often travel through open space areas and along natural features such as riverfronts. While similar in design and function to a sidepath, shared-use pathways, are not typically located adjacent to a roadway.

Shared Roadway



Shared roadways allow bicyclists and motor vehicles to use the same roadway space without any separate lane designations. Shared roadways are typically delineated by “sharrow” pavement markings and accompanying signage.

Buffered Bike Lane

Buffered bicycle lanes are conventional striped bike lanes with a painted or textured pavement buffer space that is used to separate the bike lane from the adjacent motor vehicle lane and/or parking lane.

Bike Lane

Bike lanes designate an exclusive space on the roadway for bicycle travel, which is signified by pavement markings, striping, and signage. Bike lanes are typically located between a motor vehicle travel lane and the curb, road edge, or parking lane.

Separated Bike Lane:

Separated Bike Lanes (also known as cycle tracks or protected bike lanes) are bicycle lanes that are physically separated from motor vehicle traffic. Separated bike lanes can be designed for one-way or two-way travel and can be at street level, at sidewalk level, or at an intermediate level between the two.

Recommended Facilities

A recommended facility is the most appropriate facility type based upon traffic volume and speed. Recommended facility classifications do not account for other factors such anticipated usership, roadway conditions, construction costs, and maintenance requirements.

User preference may differ from the recommended facility type. Bicyclists generally prefer off-street "low stress" facilities which may, or may not, be appropriate to the context or feasible for implementation. The selection of appropriate facilities should balance planning and engineering considerations with user expectations and preferences.

Table 2 below identifies recommended bicycle facility types based upon average daily traffic volume (ADT) and 85th percentile traffic speeds.

Table 1: Recommended Facilities

Bicycle Facility	ADT	85th Percentile Speed
Shared Roadway	5,000 or less	25 mph or less
Bike Lane	10,000 or less	35 mph or less
Buffered Bike Lane	10,000 - 20,000	31 - 40 mph
Separated Bike Lane	20,000 or more	36 mph or higher
Sidepath	15,000 or more	31 mph or higher

Acceptable Facilities

Acceptable facilities are applied where physical conditions, cost of construction, right-of-way constraints, and/or other factors do not allow for implementation of the recommended facility type.

The acceptable traffic volume and speed range is higher for acceptable on-street facilities compared to recommended on-street facilities. The range of acceptable conditions is, however, lower for acceptable off-street facilities when compared to recommended off-street facilities.

Table 3 below identifies acceptable bicycle facility types based upon average daily traffic volume (ADT) and 85th percentile traffic speeds.

Table 2: Acceptable Facilities

Bicycle Facility	ADT	85th Percentile Speed
Shared Roadway	10,000 or less	30 mph or less
Bike Lane	15,000 or less	40 mph or less
Buffered Bike Lane	25,000 or less	45 mph or less
Separated Bike Lane	All conditions	All conditions
Sidepath	All conditions	All conditions

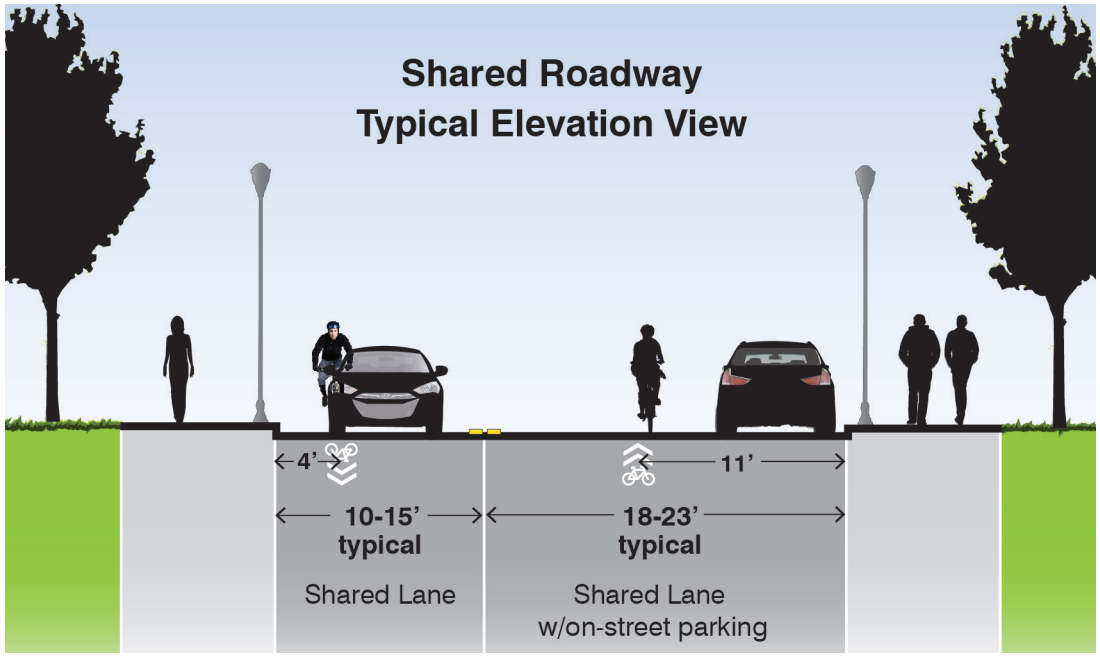
Shared Roadway

Shared roadways allow bicyclists and motor vehicles to use the same roadway space without separate lane designations. Motorists have a greater awareness of, and are more like to yield to, bicyclists on shared roadways when compared to roadways that lack bicycle accommodations. Shared roadways should be used where the provision of dedicated bike lanes or other dedicated bicycle facilities is not feasible due to geometric or right-of-way constraints. Shared roadways are suitable for use on State and local roadways where the conditions conform with the standards provided in this section.

One of the limitations of shared roadways is that they are susceptible to bicycle and vehicular conflicts because of the lack of designated space and/or separation between bicyclists and motorists. As such, the application of shared roadways should be sensitive to conditions such as lane and roadway width, on-street parking, and traffic volume and speed.

On a shared roadway, bicyclists can position themselves where they feel safest and most comfortable. While bicyclists often prefer the right edge of the shared lane, they may also opt to ride in the middle of the shared lane to discourage passing vehicles from attempting to pass within the lane.

Shared roadways can be a valuable tool in developing a bicycle network and providing strategic connections between corridors with dedicated bicycle facilities. Shared roadway pavement markings and accompanying signage provide cyclists with wayfinding assistance and promote awareness of the presence of bicyclists in the roadway environment.

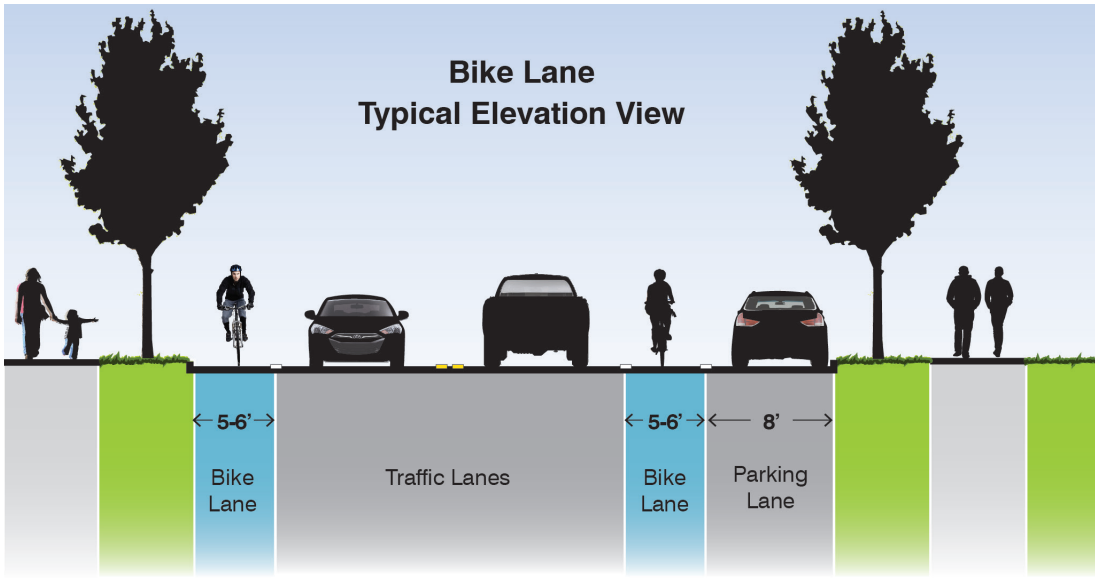


Bike Lane

Bike lanes designate an exclusive space on the roadway for bicycle travel, which is signified by pavement markings and signage. Bike lanes are typically located between a motor vehicle travel lane and the curb, road edge, or parking lane. Bike lanes are used for one-way travel in the same direction as the adjacent traffic lane.

Bike lanes provide separation between bicyclists and traffic and require minimal roadway space which allows for their inclusion via traffic lane width reductions, removal of traffic lanes, and/or removal of on-street parking lanes. Bike lanes may be provided in isolated segments as climbing lanes. Climbing lanes are placed on the uphill direction of a steep roadway grade to provide bicyclists space to ride without slowing down vehicular traffic.

Bike lanes may not be suitable for all users; some bicyclists, especially those with less experience, may not feel comfortable riding without physical separation from traffic.

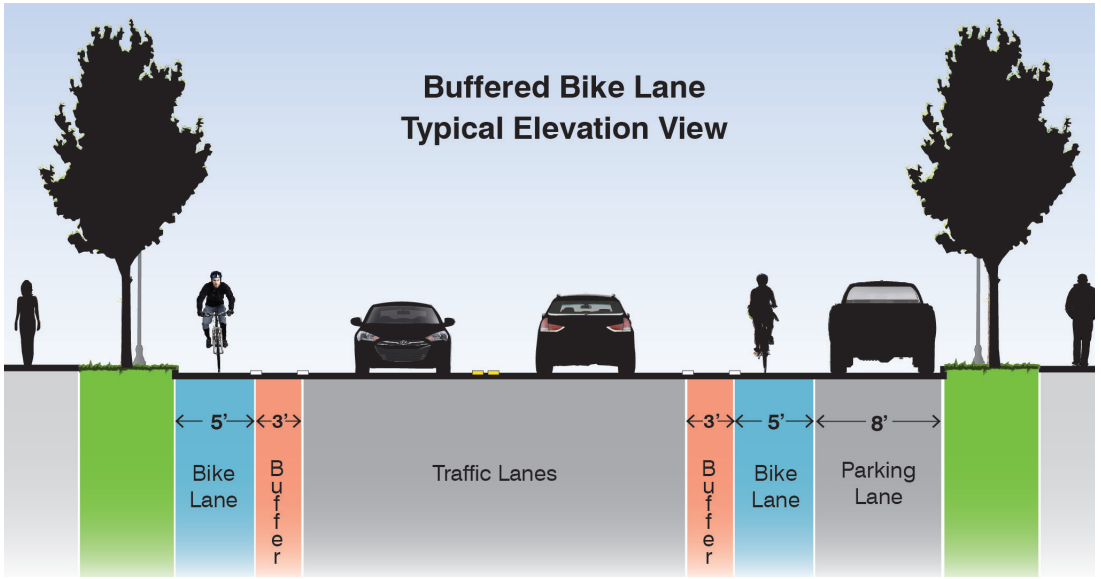


Buffered Bike Lane

Buffered bike lanes are located on the roadway and include a flush painted, colored, or textured buffer space that is used to separate the bike lane from the adjacent traffic or parking lane. Buffered bike lanes provide an improved level of comfort for the bicyclist above that provided by a standard bike lane by providing more space between bicyclists and motorists and more space for bicyclists to pass one another without encroaching into a traffic lane. Buffered bike lanes should be used where traffic volume and/or speed require additional separation between bicyclists and motor vehicles so as to improve bicyclist safety and comfort. Buffered bike lanes are typically paired, one-way facilities but may also take the form of two-way facilities located on one side of the roadway.

One of the challenges of incorporating buffered bike lanes is the additional roadway space needed to accommodate the buffer space. Buffered bike lanes, while providing additional separation between bicyclists and motor vehicles, do not provide the physical protection and separation associated with facilities such as separated bike lanes. Buffered bike lanes may require additional maintenance when compared to a standard bike lane because of the need to maintain the buffer striping or surface treatment.

A benefit of buffered bike lanes compared to separated bike lanes is that they cost less to construct and do not require specialized equipment for sweeping or winter maintenance.



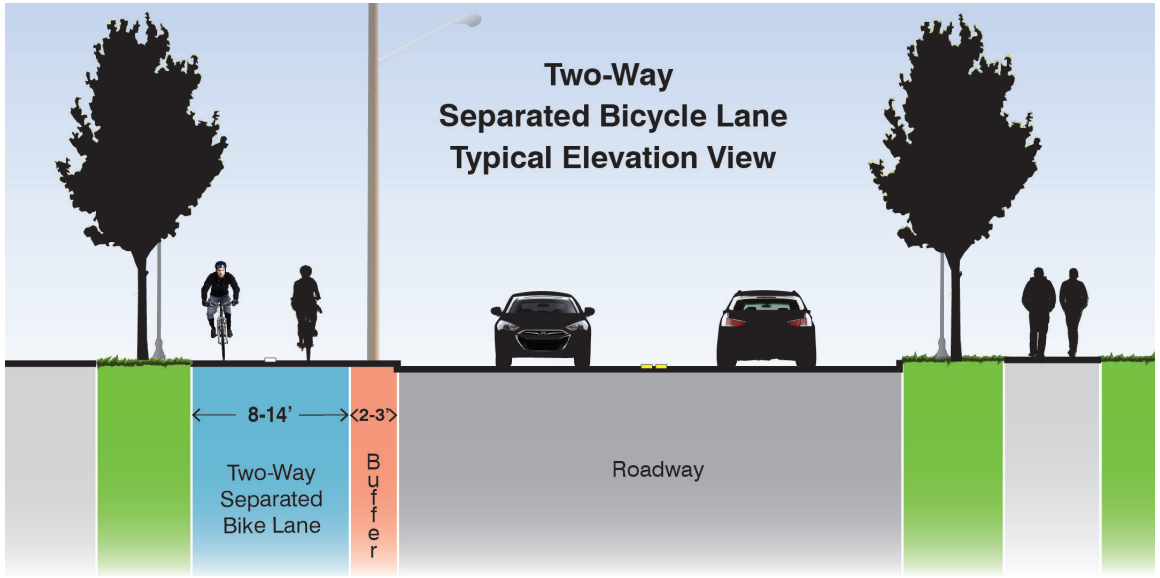
Separated Bike Lane

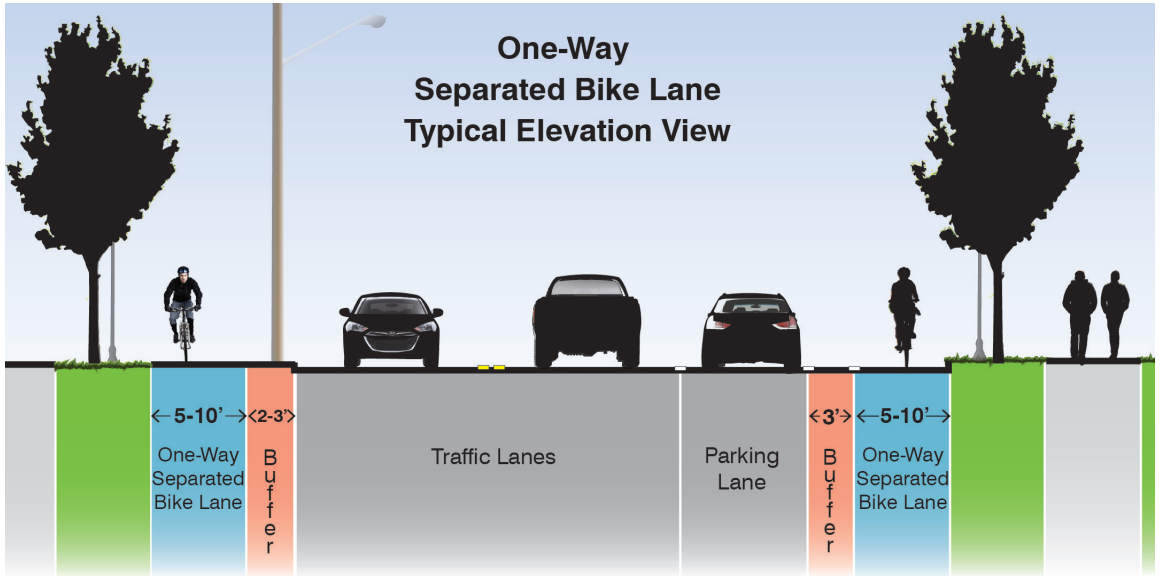
Separated bike lanes are physically separated from motor vehicle traffic. Physical separation can be provided by grade separation or by physical barriers such as curbs, guardrails, bollards, or other traffic barrier systems. Separated bike lanes can be designed for one-way or two-way travel and can be at roadway or sidewalk level.

Separated bike lanes are preferred by less experienced bicyclists and bicyclists of all ages because of the physical separation from traffic. While separated bike lanes improve safety and comfort along a corridor, the physical separation does not resolve conflicts with turning motor vehicles at intersections and driveways. Special treatment is therefore required at intersections to maintain safety. Separated bike lanes usually require bicycle specific traffic signals at signalized intersections or require bicyclists to use a pedestrian crossing signal phase to assist with intersection crossings.

Two-way separated bike lanes located on one side of the roadway may be a desirable facility where the opposite side of the roadway experiences significant turning movements such as at a highway interchange. Two-way separated bike lanes are most appropriately located along the side of a roadway that is not frequently interrupted by driveways or intersections.

Paired (a one-way lane on each side of the road) one-way separated bike lanes are generally preferable to two-way separated bike lanes as they present less conflict at intersections and driveways due to the lack of contraflow traffic. Paired one-way facilities may, however, require more space than a two-way separated bike lane.



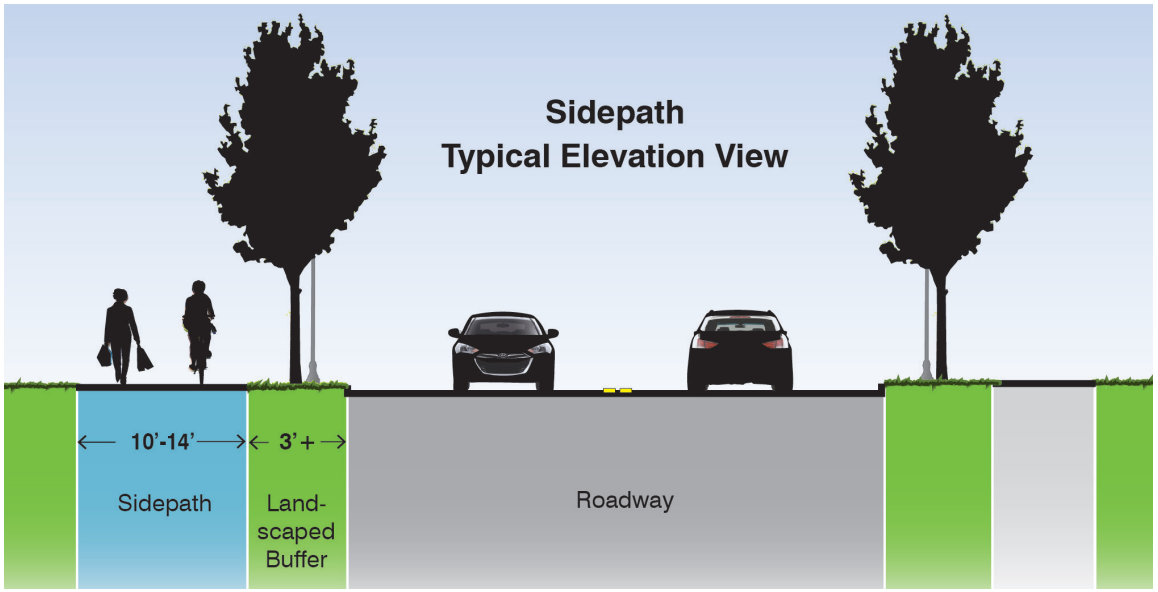


Sidepath

Sidepaths provide a separated facility for the exclusive use of bicycles and pedestrians. Sidepaths are physically separated from motor vehicles by open space, a curb or a barrier and run adjacent to the roadway. They differ from separated bike lanes in that they are used by both bicyclists and pedestrians. Sidepaths often connect recreational pathways and are commonly found along the edge of parks and water features. Sidepaths may also be used to close gaps in a bicycle network created by features such as a highway interchange.

Sidepaths provide significant flexibility in accommodating bicyclists because the facility can be used by both pedestrians and bicyclists in lieu of a sidewalk and on-street bicycle lanes. A sidepath would likely be used along a corridor where a two-way separated bike lane may be desirable, but where physical or right-of-way constraints do not allow for the provision of a sidewalk and separated bike lane.

Sidepaths can create conflicts when they are located alongside a roadway with multiple driveways or frequent intersections. Turning motor vehicles do not expect fast moving traffic and two-way traffic alongside the roadway and might turn right or left in front of a cyclist.



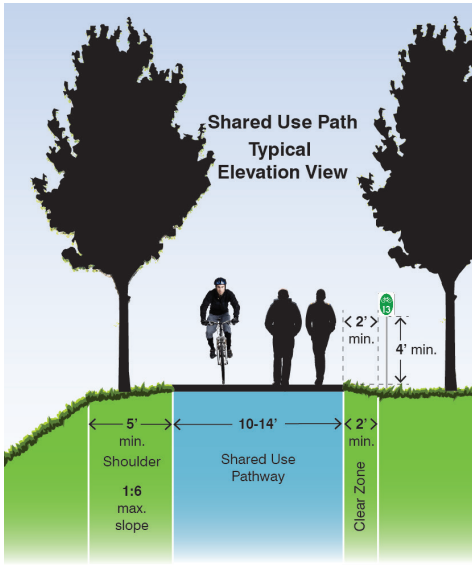
Shared Use Path

Shared use paths, similar to sidepaths, provide a separated facility for the exclusive use of bicycles and pedestrians. Shared use pathways differ from separated bike lanes in that they are used by a range of users including bicyclists, pedestrians and skaters. Shared use paths are typically recreational in nature but can also be effective facilities for transportation.

Shared use paths are typically physically separated from the roadway by a significant distance and have few roadway crossings. Shared use paths often travel through open space areas and along natural features such as rivers and waterbodies. Shared use pathways are also often developed along former rail corridors and may travel along the rear of residential, commercial, and industrial properties.

Path Surface

- Asphalt or concrete path surfaces are preferred.
- Crushed stone surfaces may be appropriate on rural paths where the intended use of the path is primarily recreational.
- A crushed stone shoulder may be provided along the edge of the path to accommodate users that prefer an unpaved surface. When provided for this purpose, the minimum recommended width is 3 feet. This area does not contribute to the required minimum width of the pathway.



Bicycling | A LIVABILITY FACT SHEET

Half of all trips taken in the United States are three miles or less, yet most Americans drive — even to the closest destinations. Only 3 percent of commuting trips in the U.S. are by bicycle, compared to up to 60 percent in The Netherlands.

Still, it's not unreasonable to believe we can improve our numbers. The popularity of bicycling has been on the rise. The number of bike trips doubled between 1990 and 2009, and many communities and the federal government are embracing the bicycle as a transportation solution for a healthy and viable future.[1]

Surveys show that 60 percent of Americans would ride a bicycle if they felt safe doing so, and eight out of 10 agree that bicycling is a healthy, positive activity.

Although issues related to bicycling continue to be debated, experience shows that bicycle-friendly features increase safety for all road users, including motor vehicles.[2]

In 2010, New York City removed a traffic lane and painted a two-way bicycle path with a three-foot parking lane buffer alongside Brooklyn's Prospect Park. Weekday bicycling traffic tripled, speeding by all vehicles dropped from 74 to 20 percent, crashes for all road users dropped 16 percent and injuries went down 21 percent, all without a change in corridor travel time.[3] Throughout New York City, deaths and serious crashes are down 40 percent where there are bike lanes.[4]

Bicycling also provides economic benefits: Two-thirds of merchants surveyed on San Francisco's Valencia Street say that bike lanes have improved business. In North Carolina's Outer Banks, bicycle tourism has already generated $60 million in annual economic activity on its $6.7 million bicycle infrastructure investment. In 2009, people using bicycles spent $261 million on goods and services in Minnesota, supporting more than 5,000 jobs and generating $35 million in taxes.[5]

Building bike infrastructure creates an average of 11.4 jobs for every $1 million spent. Road-only projects create 7.8 jobs per $1 million.[6] The average American household spends more than $8,000 a year on its cars; the cost to maintain a bicycle is about $300 a year.[7]

Building bike infrastructure creates an average of 11.4 jobs for every $1 million spent. Road-only projects create 7.8 jobs per $1 million.

This path in New Smyrna Beach, Fla., is part of a Volusia County plan to link schools, parks and businesses through interconnected paths. Fifteen miles were completed by 2012 with overwhelming public support. (Image: bikeflorida.net.)

AARP® Real Possibilities

Walkable and Livable Communities Institute

Myth-Busting!

"Bicyclists don't follow rules."

While there are bicyclists who do break the law, a large Federal Highway Administration study found that motorists failed to yield the right of way in 43 percent of crashes; bicyclists were at fault 36 percent of the time.[8] Since the 1982 passage of Idaho's "stop as yield" law, which allows cyclists to treat stop signs as yield signs, there has been "no discernible increase in injuries or fatalities," according to the Idaho Department of Transportation.[9]

"Bicyclists don't pay their fair share."

All road users — cars, trucks, bicycles, pedestrians, buses, light rail — are subsidized to some extent by society at large. Funding for U.S. roadways comes partly from vehicle taxes, fuel taxes and tolls, which together account for up to 60 percent of direct costs. General taxes and fees pay the remaining 40 percent. The federal gas tax of 18.4 cents per gallon has not been raised since 1992.

Cars, buses and trucks impose much higher maintenance and capital costs on roads than bicycles do, and they benefit from subsidies that are not directly paid by motorists.[10] In 2009, the Seattle Department of Transportation paid only 4 percent of its road expenses with the gas tax while non-motor vehicle funds paid for the rest.[11]

Motor vehicle crash injuries cost society $99 billion in 2010 due to medical expenses and lost productivity.[12] Pedestrians and bicyclists bear a larger share of costs than they impose.[13]

"Bicycling is for fit middle-class white guys."

Six in 10 young bicycle owners are women, eight out of 10 American women have a positive view of bicycling and two out of three believe their community would be a better place to live if biking were safer and more comfortable. Between 2001 and 2009, the fastest growth in bicycle use in the U.S., from 16 to 23 percent, occurred among self-identified Hispanics, African-Americans and Asian-Americans, 86 percent of whom have a positive view of bicyclists.[14]

"Bicycling is too dangerous."

Bicycling does tend to have higher fatality rates per mile than motorized travel, but a typical motorist drives five to 10 times more miles than a typical cyclist.

Bicycling risk can be significantly reduced through improved infrastructure and a greater number of bicycles on the road.[15] Bicycling also imposes a minimal risk to other road users and provides significant health benefits that can offset crash risks.[16]

There were no bicycling fatalities in bicycle-friendly Portland, Ore., in 2013 even though bicycling accounts for at least six percent of all trips. By comparison, 21 people were killed inside motor vehicles that year.[17]

"Bicyclists slow down cars and create congestion."

Average traffic speeds in Manhattan increased nearly seven percent since the installation of bicycle lanes south of 60th Street in 2008.[18] Bicycles take up way less road space than motor vehicles and cyclists tend to avoid congested roads that don't have bike lanes.[19]

"Bicycle lanes hurt business."

After the installation of protected bike lanes on Manhattan's 8th and 9th avenues in 2007, retail sales increased 49 percent in those areas compared to 3 percent in the rest of the borough.[19]

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14. League of American Bicyclists, Sierra Club (2013), *The New Majority: Pedaling Towards Equity.* http://www.bikeleague.org/sites/lab.huang.radicaldesigns.org/files/equity_report.pdf
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How To Get It Right

Bicycle parking promotes bicycle riding. Bike racks can be placed on or off the street. Fun Fact: One vehicle parking space can accommodate 12 bicycles.

Grade-separated, protected bike lanes (like this raised cycle track in Missoula, Montana) provide separate, defined spaces for riders and drivers.

To encourage bicycling and bicycle-friendly streets and communities, try the following:

■ Embrace a public process and build support

Develop an education and awareness campaign prior to implementation, and reach out broadly to community members, elected officials and municipal leaders. Government officials may need to see public support before acting. Toward that end, advocates can share this fact sheet, talk to neighbors, build community support and then meet with decision makers, the media, experts and others to discuss the benefits of bicycling. Agency staff can engage residents by hosting workshops to build acceptance and understanding.

■ Start with a pilot project

Do a simple, low-cost project, such as striping a bike lane in an area with high bicycling potential and an existing right of way. This can help residents become comfortable with bicycling and enable municipal staff to document what works and what doesn't. Promote the pilot as a road improvement project rather than only as a bicycle project.

■ Provide adequate bicycle parking

Bicycle racks encourage bicycling. Well-placed racks provide a secure place for parking bikes while shopping, working or playing. Racks can be located inside buildings or bolted into sidewalks or even the street. A single parking space can hold up to 12 bicycles on staple racks (they look like an inverted "U" shape) mounted in a row.

■ Create routes and wayfaring signs

Develop a system of routes cyclists can follow to get around town safely. Install highly-visible wayfaring signs that indicate distances, destinations and street names and install signs at all important crossings.

■ Establish a bike share

More than 500 communities worldwide, including at least 50 in the U.S., have a short-term bicycle rental or bike share program.[20] (New York City and Washington, D.C., feature popular bike share networks.) People can join a share program for the day or a full year by paying a nominal fee. To participate, a rider checks out a bicycle from a computerized kiosk and then returns the bike at a share program rack near his or her destination.

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Success Stories

Palo Alto, California: Bicycle Boulevards

Bicycle boulevards are low-volume, low-speed streets that have been optomized for bicycle travel. Palo Alto has an extensive network of paths, bike lanes and boulevards, including connections to schools throughout town.

Data from the 2010 Census showed 7.1 percent of residents commuted to work by bicycle, an increase from 5.6 percent in 2000. The city continues to provide facilities, services and programs to promote travel by bicycle.

Indianapolis, Indiana: Cultural Trail

The eight-mile, $63 million walk-bike trail was completed in May 2013, having been financed by both public and private dollars.

The trail winds through the downtown of this auto-oriented city (home of the Indy 500), connecting a half-dozen emerging cultural districts, a 1.5 mile section of the historic Indianapolis Canal and to White River State Park, a former industrial wasteland that's now filled with museums, lawns and attractions. By April 2014 the trail had added more than $864 million to the local economy.

Memphis, Tennessee: Broad Avenue

The Broad Avenue Arts District initiative revitalized a struggling commercial and residential area. The project's popularity exploded when the focus was expanded to include bicycles.

"The lanes slowed down traffic and people started noticing the businesses more," says Pat Brown, co-owner of T Clifton Art Gallery. "Our revenues have grown on average 30 percent per year. Yes, that's for an art-related business in a tough economy." The district has seen more than 15 new businesses and nearly 30 property renovations. Restaurants report a growth in business due to bicyclists.

WHY IT WORKS

Protected Bike Lanes provide a barrier between motor vehicles and cyclists. (This barrier can be installed and permanent, or as simple as a row of parked cars, planters or plastic posts.) They're good for …

Business: A Portland study found that bike riders will go out of their way to use a street that has good bicycling infrastructure. That's more business exposure.

Safety: Drivers don't have to worry about unexpected maneuvers by cyclists and pedestrians don't need to dodge bike riders on sidewalks.

Lawfulness: Protected bike lanes in Chicago resulted in a more than 150 percent increase in the number of bike riders obeying traffic lights.

Everyone: Bicycles don't pollute, they cause less wear and tear on roadways than cars do, they help people stay healthy!

Source: Adapted from the Tranitized.com infographic "Why Build Protected Bike Lanes?"

RESOURCES

1. **Whose Roads? Defining Bicyclists' and Pedestrians' Right to Use Public Roadways.** Litman, T. Victoria Transport Policy Institute (November 2004), http://www.vtpi.org/whoserd.pdf
2. **Bicycling Means Business: The Economic Benefits of Bicycle Infrastructure.** Flusche, D. League of American Bicyclists, Advocacy Advance (2009, 2012), http://www.advocacyadvance.org/site_images/content/Final_Econ_Update(small).pdf
3. **Urban Bikeway Design Guide.** National Association of City Transportation Officials (NACTO Sept. 2012), http://nacto.org/cities-for-cycling/design-guide/
4. **Pedestrian and Bicycle Information Center.** www.pedbikeinfo.org/
5. **Alliance for Biking & Walking.** Resource Library, http://www.bikewalkalliance.org/resources/resource-library/
6. **Safe Routes to School National Partnership.** http://www.saferoutespartnership.org/resourcecenter/National-Learning-Network Library-of-Resources
7. **Association of Pedestrian and Bicycle Professionals.** http://www.apbp.org/?page=Library
8. **Fundamentals of Bicycle Boulevard Planning & Design.** Portland State University, Initiative for Bicycle and Pedestrian Innovation (2009)
9. **Bicycling and Walking in the United States: 2014 Benchmarking Report.** http://www.bikewalkalliance.org/resources/benchmarking
10. **Protected Bike Lanes Mean Business.** http://www.bikewalkalliance.org/resources/reports/protected-bike-lanes-mean-business
11. **National Complete Streets Coalition.** http://www.smartgrowthamerica.org/complete-streets

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CONTEXT SENSITIVE SOLUTIONS OVERVIEW AND TRAFFIC CALMING STRATEGIES

Context sensitive solutions (CSS) refer to the planning, design, construction, and operation of **transportation facilities to enhance community livability**. CSS considers not only the goals of safety and mobility for a facility, but also the goals of the surrounding community in which the facility exists. This can include factors such as land use, aesthetics, historical considerations, and environmental quality.

CSS emphasizes a **holistic process to transportation development**, beginning with a **multi-stakeholder community input process**, and continuing throughout the lifecycle of the transportation facility to accommodate and enhance the desires of the community. CSS are an element of the larger Complete Streets movement involving multimodal access and safety. Not all CSS require accommodation of every mode of travel. It could be that in certain contexts, it makes sense to provide separate but parallel routes to different modes of travel, such as a multi-use path.

The following treatments are examples of traffic calming measures that operate at different scales depending on right-of-way dimensions, traffic volumes, and community goals relative to pedestrian accommodations. These improvements are discussed here to encourage the committee to consider where specific strategies might be appropriate.

Corner Extension/Bulb-Out

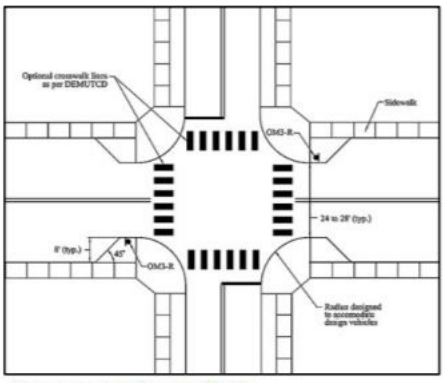
Description:

- Horizontal extension of the sidewalk into the street, resulting in a narrower roadway section
- If located at a mid-block location, it is typically called a choker

Application:

- When combined with on-street parking, a corner extension can create protected parking bays
- Effective method for narrowing pedestrian crossing distances and increase pedestrian visibility
- Appropriate for arterials, collectors, or local streets
- Can be used on one-way and two-way streets
- Installed only on closed-section roads (i.e. curb and gutter)
- Appropriate for any speed, provided an adequate separation is provided between the extension- and the travel lane
- Adequate turning radii must be provided to use on bus routes

(Source: James Barrera, Horrocks, New Mexico)



(Source: Delaware DOT)

Typical Costs:

- Cost between $1,500 and $20,000, depending on length and width of barriers

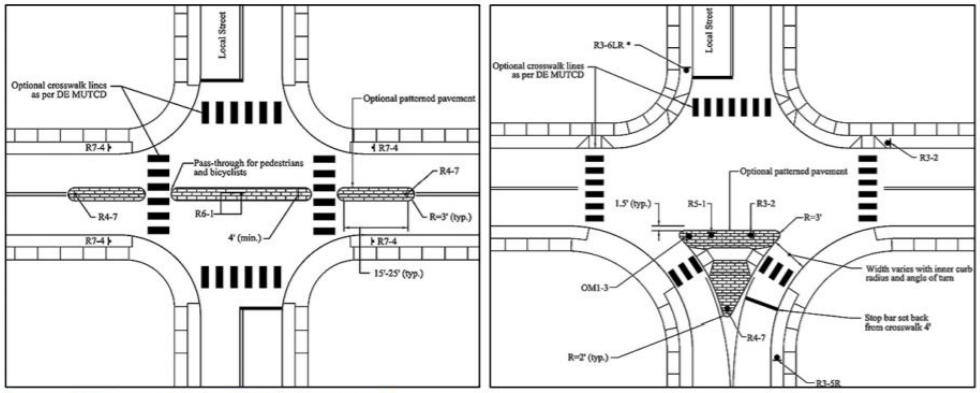
Median Barrier/Turn Island

Description:

- Raised islands along the centerline of a street and continuing through an intersection that block the left-turn movement from all intersection approaches and the through movement from the cross street; also called median diverter, intersection barrier, intersection diverter, and island diverter
- Raised island that forces a right turn is called a forced turn island

Application:

- For use on arterial or collector roadways to restrict access to minor roads or local streets and/or to narrow lane widths
- Typically applied only after other measures have failed or been deemed inappropriate/ineffective
- Barriers are made passable for pedestrians and bicyclists
- Often used in sets to make travel to/through neighborhoods more circuitous



(Source: Delaware Department of Transportation)

Typical Costs:

- Cost between $1,500 and $20,000, depending on length and width of barriers

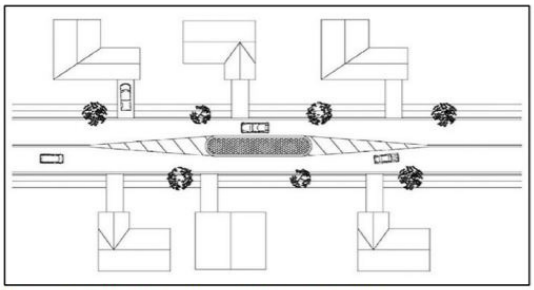
Median Island

Description:

- Raised island located along the street centerline that narrows the travel lanes at that location
- Also called median diverter, intersection barrier, intersection diverter, and island diverter

Application:

- For use on arterial, collector, or local roads
- Can often double as a pedestrian/bicycle refuge islands if a cut in the island is provided along a marked crosswalk, bike facility, or shared-use trail crossing
- If placed through an intersection, considered a median barrier



(Source: Delaware Department of Transportation)

(Source: James Barrera, Horrocks, New Mexico)

Typical Costs:

- Cost between $1,500 and $10,000, depending on length and width of island

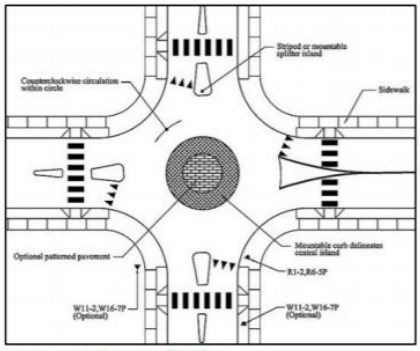
Mini Roundabout

Description:

- Raised islands, placed in unsignalized intersections, around which traffic circulates
- Motorists yield to motorists already in the intersection
- Require drivers to slow to a speed that allows them to comfortably maneuver around them
- Center island of mini roundabout is fully traversable, splitter islands may be fully traversab

Application:

- Intersections of local and/or collector streets
- One lane each direction entering intersection
- Not typically used at intersections with high volume of large trucks or buses turning left
- Appropriate for low-speed settings



(Source: Delaware DOT)


(Source: Gary Schatz)

Typical Costs:

- Cost is similar to bulb-outs because pedestrian ramps and outside curb lines usually have to be relocated

On-Street Parking

Description:

- Allocation of paved space to parking
- Narrows road travel lanes and increases side friction to traffic flow
- Can apply on one or both sides of roadway
- Can be either parallel or angled, but parallel is generally preferred for maximized speed reduction

Application:

- High likelihood of acceptability for nearly all roadway functional classifications and street functions
- More appropriate in urban or suburban settings
- Can be combined with other traffic calming measures
- Can apply alternating sides of street for chicane effect
- Can combine with curb extensions for protected parking, including landscaping for beautification


(Source: PennDOT Local Technical Assistance Program)


(Source: Google Earth, Fort Collins, CO)

Typical Costs:

- Approximately $6000 or less (factor of design specifics and length of application); can be much higher

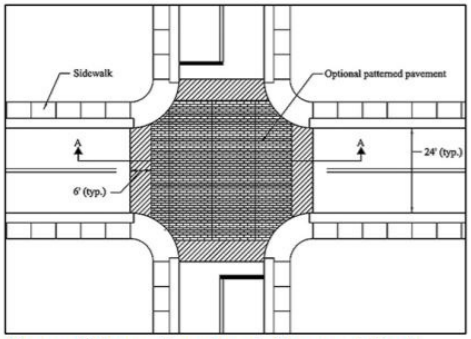
Raised Intersection

Description:

- Flat raised areas covering entire intersections, with ramps on all approaches and often with brick- or other textured materials on the flat section and ramps
- Sometimes referred to as raised junctions, intersection humps, or plateaus

Application:

- Intersections of collector, local, and residential streets
- Typically installed at signalized or all-way stop controlled intersections with high pedestrian crossing demand
- Works well with curb extensions and textured crosswalks
- Often part of an area-wide traffic calming scheme involving both intersecting streets in densely developed urban areas



(Source: Delaware Department of Transportation)


(Source: Chuck Huffine, Phoenix AZ)

Typical Costs:

- Costs range between $15,000 and $60,000

Road Diet

Description:

- Revision of lane use or widths to result in one travel lane per direction with minimum practical width, with goal of reducing cross-section; common application involves conversion of four-lane
- Two-way road to three-lane road – two through lanes and center two-way left-turn lane (TWLTL)
- Can also involve narrowing of existing travel lanes
- Alternate cross-section uses can include dedicated bicycle facilities, left-turn lanes, on-street parking, raised medians, pedestrian refuge islands, sidewalks, etc.

Application:

- High likelihood of acceptability for nearly all roadway functional classifications
- Can be applied in urban, suburban, or rural settings
- Appropriate for most common urban speed limits
- Can be applied at/near intersections or along road segments
- Appropriate along bus routes

Typical Costs:

- $6000 or less, depending on physical geometric changes and length of application
- The biggest impact to cost involves signal modifications, other costs include pavement marking and signing revisions
- Costs can be much higher if outside portion of pavement is converted to other non-motorized uses (dedicated bicycle facilities, sidewalks, grass buffers)

Roundabout

Description:

- Raised islands placed in unsignalized intersections around which traffic circulates
- Approaching motorists yield to motorists already in the intersection
- Requires drivers to slow to a speed that allows them to comfortably maneuver around them
- Different from traffic circles or mini-roundabouts; possible substitute for traffic signal control

Application:

- Intersections of arterial and/or collector streets
- One or more entering lanes
- Can be used at intersections with high volumes of large trucks and buses, depending on design

(Source: Grant Kaye)

(Source: PennDOT Local Technical Assistance Program)

Typical Costs:

- Cost varies widely by site, but is usually comparable to a traffic signal

Speed Hump

Description:

- Rounded (vertically along travel path) raised areas of pavement typically 12 to 14 feet in length
- Often placed in a series (typically spaced 260 to 500 feet apart)
- Sometimes called road humps or undulations

Application:

- Appropriate for residential local streets and residential/neighborhood collectors
- Not typically used on major roads, bus routes, or primary emergency response routes
- Not appropriate for roads with 85th-percentile speeds of 45 mph or more
- Appropriate for mid-block placement, not at intersections
- Not recommended on grades greater than 8 percent
- Work well in combination with curb extensions
- Can be used on a one-lane one-way or two-lane two-way street

(Source: City of Boulder, Colorado)

(Source: PennDOT Local Technical Assistance Program)

Typical Costs:

- Cost ranges between $2,000 and $4,000