



## Technical Memo

**To** Laura Parson, PE, City of Port Townsend  
**From:** Scott Sawyer, PE  
**Date:** March 15, 2021  
**Project:** 0699.014 – Discovery Road Bikeway and Sidewalk Project  
**Subject** Results of Alternatives Analysis and Ranking of Alternatives for Discovery Road Cross-sections

---

This technical memorandum summarizes the alternatives, criteria, and scoring used in the ranking of alternatives for six different Discovery Road cross-sections. A recommendation for *Alternative 2 – 2-way Cycle-track* is stated in Section 2 below.

A full report documenting project background and context, public engagement and Stakeholder Advisory Group participation, alternatives analysis, and recommendations is available for viewing on Hightail using the following URL link:

*Ranking of Alternatives Report* - <https://spaces.hightail.com/space/BM1fq0nI9Z>

## 1 Alternatives Analysis

### 1.1 Alternatives

During Meeting 3, the Stakeholder Advisory Group brainstormed alternative roadway cross-sections for Discovery Road between Rainier Street and McClellan Street. The Group identified a total of seven alternatives.

- ◆ Alternative 1: 1-way Cycle-track Both Sides
- ◆ Alternative 2: 2-way Cycle-track South Side
- ◆ Alternative 3: 2-way Cycle-track South Side w/ On-street Bike Lane North Side
- ◆ Alternative 4: 2-way Cycle-track South Side w/ Sharrow North Side
- ◆ Alternative 5: Buffered On-street Bike Lane Both Sides
- ◆ Alternative 6: Shared Use Path North Side w/ Sharrow South Side
- ◆ Alternative 7: Shared Use Path South Side

Between Meeting 3 and Meeting 4, the Project Team vetted the seven alternatives and screened out Alternative 3 – 2-way Cycle-track South Side w/ On-Street Bike Lane North Side. This alternative does not fit within the available roadway right of way using reasonably minimal dimensions for each cross-section elements. There is only 15 inches left for grading buffer between back of walk and the right of way line on each side, which is not viewed as sufficient to avoid cost-prohibitive temporary construction easements. The Project Team also made

minor adjustments to width dimensions to create better consistency between alternatives and changed the use of sharrows for Alternatives 4 and 6 to the use of a wider travel lane (12-ft travel lane plus 1-ft gutter pan instead of 10-ft lane with 1-ft gutter pan) without sharrow markings. It is the judgment of the Project Team that the traffic volumes (~5,000 ADT) and speeds (posted 25 mph) are not appropriate for the use of sharrows; however, more confident cyclists may choose to stay on-street using a wider lane. The final list of six alternatives used in the analysis is listed below.

- ◆ Alternative 1: 1-way Cycle-track Both Sides
- ◆ Alternative 2: 2-way Cycle-track South Side
- ◆ Alternative 4: 2-way Cycle-track South Side w/ Wider Lane North Side
- ◆ Alternative 5: Buffered On-street Bike Lane Both Sides
- ◆ Alternative 6: Shared Use Path North Side w/ Wider Lane South Side
- ◆ Alternative 7: Shared Use Path South Side

Illustrations of the original alternative roadway cross-sections from the Meeting 3 brainstorming and the alternatives screened and adjusted by the Project Team between Meetings 3 and 4 are provided in Appendix A. Illustrations of the final alternative roadway cross-sections are provided in Appendix B.

## 1.2 Criteria and Weighting

### 1.2.1 Criteria

During Meeting 3, the Stakeholder Advisory Group brainstormed a list of criteria that could be used to evaluate and compare roadway cross-section alternatives to identify the best performing alternative. The Group started with a draft list provided by the Project Team in advance of the meeting. The Group added several criteria during the discussion.

#### **Draft Criteria Provided Prior to Stakeholder Meeting 3**

- ◆ Safety, as determined by:
  - ◆ Separation from drivers
  - ◆ Separation from people walking
  - ◆ Number of street crossings
  - ◆ Type of street crossings (i.e. contraflow)
  - ◆ Number of driveway crossings
- ◆ Connections to the immediate existing bikeways
- ◆ Suitability for related routes in the bike network (e.g. Discovery Road between Rainier Street and Mill Road, 19<sup>th</sup> Street and Blaine Street between Sheridan Street and Walker Street)
- ◆ Directness
- ◆ Intuitiveness
- ◆ Ease of access (i.e. How often and by whom will Discovery Road need to be crossed to access the bikeway?)
- ◆ Access to important destinations
- ◆ Width (for passing and social cycling)
- ◆ Efficient use of right of way

- ◆ Ease of transit stop integration
- ◆ Critical area (wetlands) impacts
- ◆ Ease of maintenance (e.g. sweeping)

### **Draft Criteria Added During Stakeholder Meeting 3**

- ◆ Provide space for landscaping/greenery
- ◆ Consider the typical driver for vehicles on Discovery Road
- ◆ Calm traffic/reduce vehicle speeds
- ◆ Increase bike/ped comfort
- ◆ Create human-scale sense of place/place-making
- ◆ Meet grant requirements (i.e., minimize impervious surfaces)
- ◆ Be authentic to Port Townsend and project context

Between Meetings 3 and 4, the Project Team filtered these criteria to make sure each criterion helps to create distinction between alternatives and there is a reasonable way to score the performance of each alternative for a criterion.

After filtering, the Project Team identified the following six criteria to use for the alternatives analysis. The proposed method for measuring performance for each alternative is shown in brackets.

### **Final Criteria Used in the Alternatives Analysis**

- ◆ Maximize separation from vehicles [width in feet]
- ◆ Separate pedestrians and bicyclists [qualitative judgment]
- ◆ Minimize the number of street crossings – side streets and driveways [count]
- ◆ Minimize the number of street crossings – Discovery Road [count]
- ◆ Connect to Rainier Street and Salish Coast Elementary bikeways in a manner that is intuitive and clearly understood [qualitative judgment]
- ◆ Supports passing and social cycling [qualitative judgment]

Although several criteria from the original list were filtered from this final list, there are still criteria that are important considerations as the project design progresses. The Project Team will use the following items to guide the development of details during preliminary and final design.

### **Filtered Criteria to be Used as Design Considerations**

#### Original Criteria that Doesn't Help Create Distinction Between Alternatives

- ◆ Suitability for related routes in the bike network (e.g. Discovery Road between Rainier Street and Mill Road, 19<sup>th</sup> Street and Blaine Street between Sheridan Street and Walker Street)
- ◆ Ease of access (i.e. How often and by whom will Discovery Road need to be crossed to access the bikeway?)

---

### **Criteria Filter**

- ◆ Does a criterion help us distinguish between alternatives?
  - ◆ Is scoring a criterion for each alternative measurable and/or defensible?
-

- ◆ Critical area (wetlands) impacts
- ◆ Ease of maintenance (e.g. sweeping)
- ◆ Provide space for landscaping/greenery
- ◆ Meet grant requirements (i.e., minimize impervious surfaces)

Original Criteria Covered by Other Criterion or Combined with Other Criterion

- ◆ Type of street crossing (i.e., contra-flow)
- ◆ Number of driveway crossings
- ◆ Directness
- ◆ Intuitiveness
- ◆ Access to important destinations
- ◆ Efficient use of right of way
- ◆ Ease of transit stop integration
- ◆ Increase bike/ped comfort
- ◆ Create human-scale sense of place/place-making

Original Criteria to be Used as Design Considerations as Design Progresses

- ◆ Consider the typical driver for vehicles on Discovery Road
- ◆ Calm traffic/reduce vehicle speeds
- ◆ Be authentic to Port Townsend and project context

### 1.2.2 Weighting of Criteria

Between Meetings 3 and 4, the Project Team provided the Stakeholder Advisory Group with the final list of six criteria for their use to opine on the importance of each criterion relative to the other criteria. This relative importance is termed *criteria weighting*.

Each Stakeholder Advisory Group member was provided with a table to readily make pair-wise comparisons between each criterion to decide which one is more important (or decide both are equally important).

Prior to Meeting 4, the Project Team compiled the pair-wise comparisons from nine of the ten Stakeholder Advisory Group members. Based on the comparisons provided by the Group, the Project Team judged there to be two separate criteria weightings that generally reflected the opinions of the Group as a whole.

	A	B	C	D	E	F		
<i>Performance Attributes</i>	Max Sep from Vehicles	Min # of St Xings (side st)	Min # of St Xings (Discovery)	Connect to Rainer and Salish	Support Passing & Social	Separate Peds & Bikes	TOTAL COUNT	PRIORITIES
A	A	A	A	A	A	A	6.0	28.6%
B		B	B	B/D	B/E	B	4.0	19.0%
C			C	D	E	F	1.0	4.8%
D				D	E	F	2.5	11.9%
E					E	E	4.5	21.4%
F						F	3.0	14.3%

Figure 1 – Sample pair-wise comparison table

#### 1.2.2.1 Weighting Scheme 1

The top three most important criteria for Weighting Scheme 1 are as follows:

- ◆ Connect to Rainier Street and Salish Coast Elementary bikeways in a manner that is intuitive and clearly understood [qualitative judgment]
- ◆ Minimize the number of street crossings – side streets and driveways [count]
- ◆ Minimize the number of street crossings – Discovery Road [count]

### 1.2.2.2 Weighting Scheme 2

The top three most important criteria for Weighting Scheme 2 are as follows:

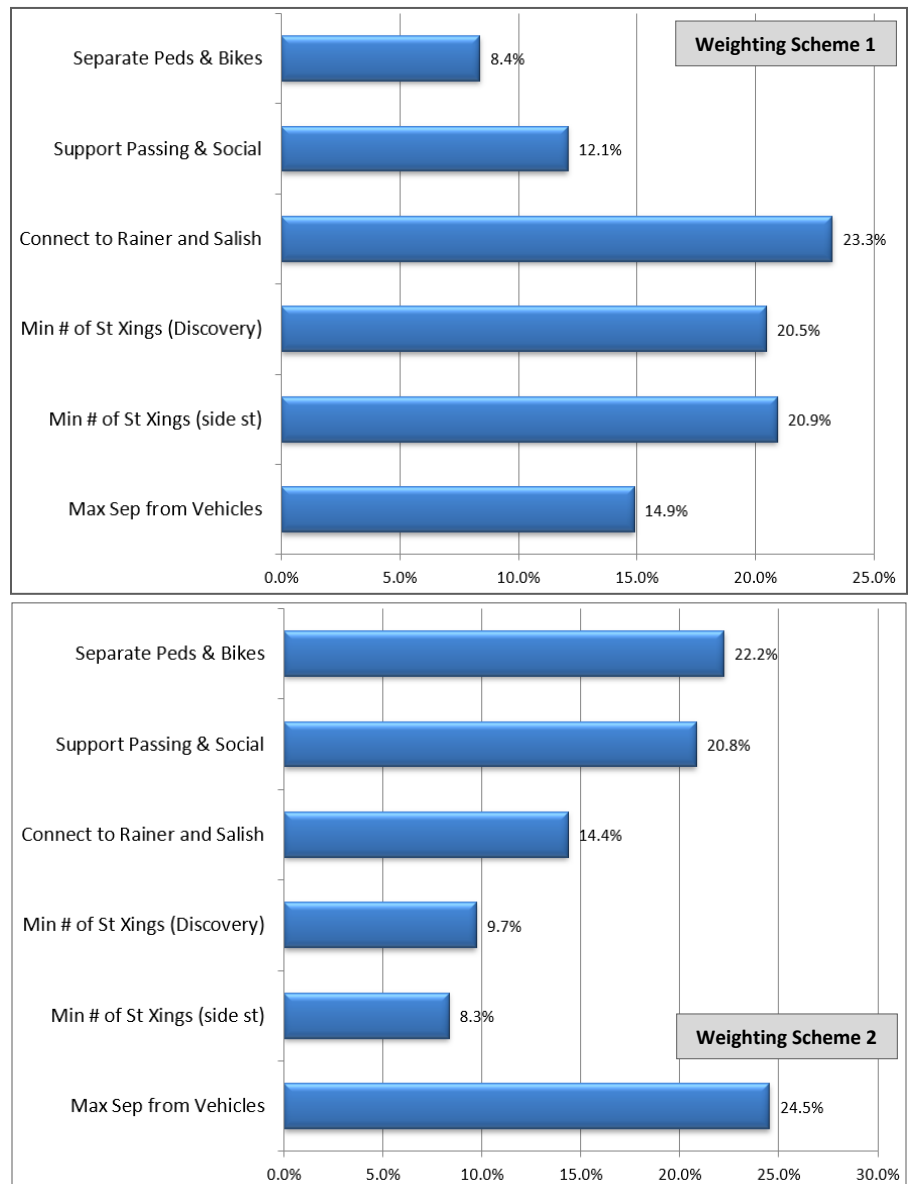
- ◆ Maximize separation from vehicles [width in feet]
- ◆ Separate pedestrians and bicyclists [qualitative judgment]
- ◆ Supports passing and social cycling [qualitative judgment]

These two weighting schemes were used by the Project Team to model the ranking of alternatives as discussed in Section 5.4.

## 1.3 Scoring of Alternatives by Criteria

Between Meetings 3 and 4, concurrent with the Stakeholder Advisory Group members preparing pair-wise comparisons of criterion, the Project Team evaluated each of the six alternatives listed in Section 5.1 for performance by each of the six criteria listed in Section 5.2.

A summary of the scoring of alternatives by criteria is shown in Figure 3. A full pie-shape indicates a score of 4 and an empty pie-shape indicates a score of zero.



**Figure 2 – Weighting Schemes 1 and 2**  
(relative importance of criteria by percentages)

Note, the scoring of alternatives is independent of the weighting of criteria; therefore, there is only one set of scores for alternatives by criteria.

Discovery Road Bikeway and Sidewalk Project

## Summary - Scoring of Alternatives

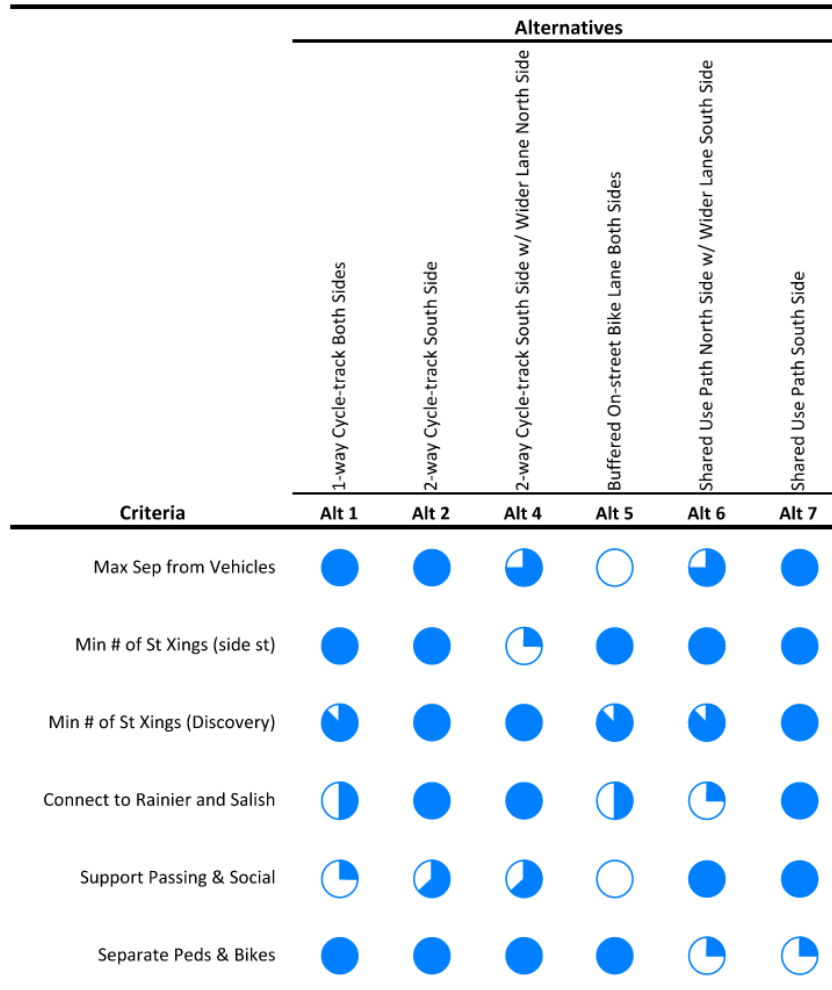


Figure 3 – Summary of scoring of alternatives by criteria

## 1.4 Ranking of Alternatives

Based on the scoring of alternatives, the Project Team prepared two models to rank the alternatives from highest to lowest performing alternatives, one model of each weighting scheme discussed in Section 5.2.

The ranking value for each alternative is based on the sum of the score for each criterion multiplied by that criterion’s weight (relative importance).

The methodology to rank alternatives is shown schematically in Figure 4.

### 1.4.1 Ranking of Alternatives – Weighting Scheme 1

Based on the methodology shown in Figure 4, the ranking of alternatives for Weighting Scheme 1 resulted in the following top three alternatives (listed from highest to lowest ranked):

- ◆ Alternative 2: 2-way Cycle-track South Side
- ◆ Alternative 7: Shared Use Path South Side
- ◆ Alternative 1: 1-way Cycle-track Both Sides

### 1.4.2 Ranking of Alternatives – Weighting Scheme 2

Based on the methodology shown in Figure 4, the ranking of alternatives for Weighting Scheme 1 resulted in the following top three alternatives (listed from highest to lowest ranked):

- ◆ Alternative 2: 2-way Cycle-track South Side
- ◆ Alternative 7: Shared Use Path South Side
- ◆ Alternative 4: 2-way Cycle-track South Side w/ Wider Lane North Side

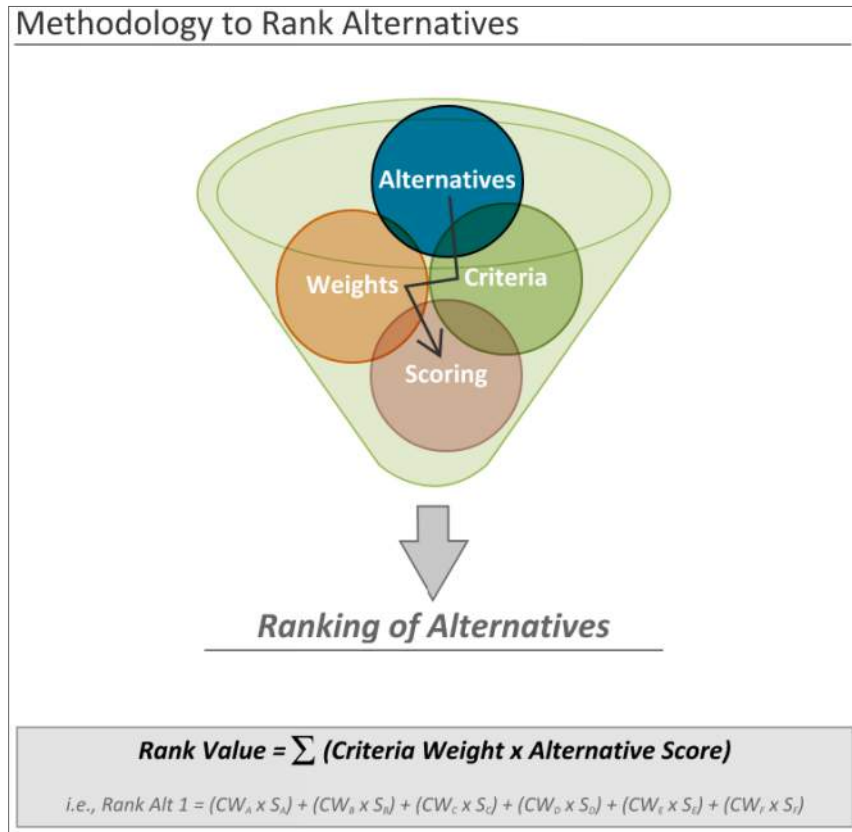


Figure 4 – Methodology to rank alternatives by criteria weight and score

### 1.4.3 Stacked Bar-charts for Ranking of Alternatives

The modeling prepared by the Project Team also shows the ranking of alternatives in a stacked-bar chart format that visually displays (1) relative overall performance of each alternative, and (2) the contribution of each criterion for the overall ranking score for each alternative.

The contribution of each criterion (illustrated by the six different colors comprising each horizontally stacked bar) is readily apparent by use of this visual display of the modeling results.

Stacked-bar charts showing the ranking of alternatives for Weighting Scheme 1 and Weighting Scheme 2 are shown in Figures 5 and 6, respectively.

## 2 Recommendation

The modeling to rank alternatives by overall performance under both weighting schemes yielded similar results with the top two alternatives unchanged between Weighting Scheme 1 and Weighting Scheme 2.

The Project Team further assessed the sensitivity of the model by equally weighting all criteria. This neutral weighting scheme also resulted in the same top two alternatives with Alternative 2 – 2-way Cycle-track South Side – as the highest ranked alternative.

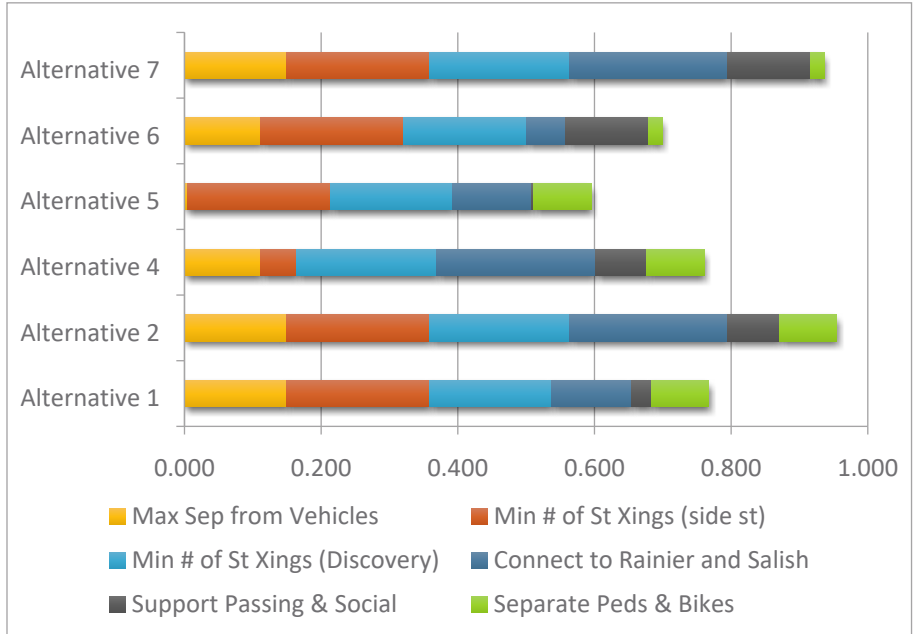


Figure 5 – Ranking of alternatives by stacked-bar chart for Weighting Scheme 1

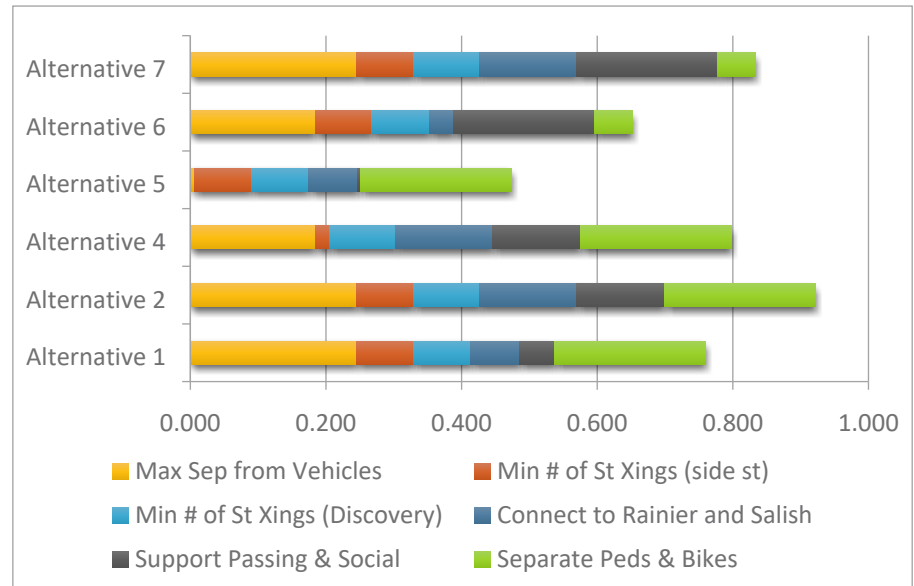


Figure 6 – Ranking of alternatives by stacked-bar chart for Weighting Scheme 2



Based on the modeling, the Project Team recommends the adoption of Alternative 2 – 2-way Cycle-track South Side – as the preferred alternative.

Note, during design progression through preliminary and final design, specific width dimensions may be slightly refined overall to improve performance and/or refined at site-specific locations based on localized constraints (i.e., wetlands).

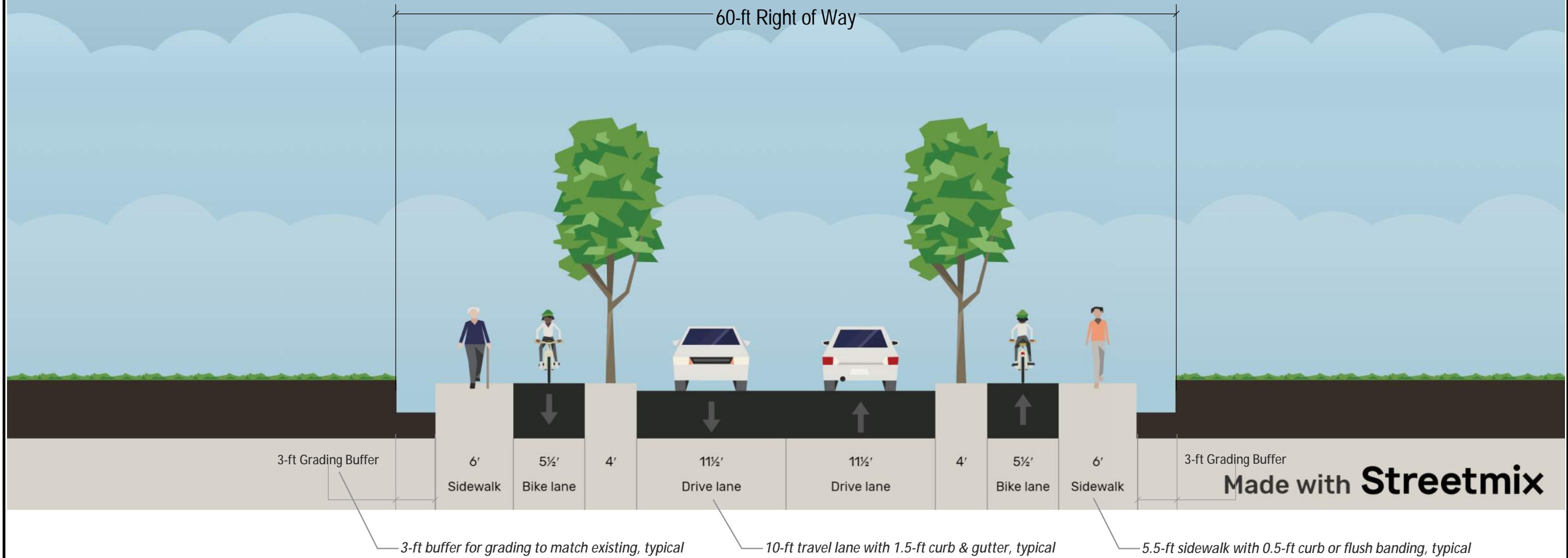
The Project Team will also continue to consider the filtered criteria described in Section 5.2.1 and continue to develop design details, such as the following, based on the adoption of Alternative 2 – 2-way Cycle-track South Side – as the preferred alternative:

- ◆ Raise intersection at Discovery/McClellan
- ◆ Intersection cross-walks
- ◆ Transition/mixing area to connect to the Salish cycle-track
- ◆ Traffic calming ideas/features

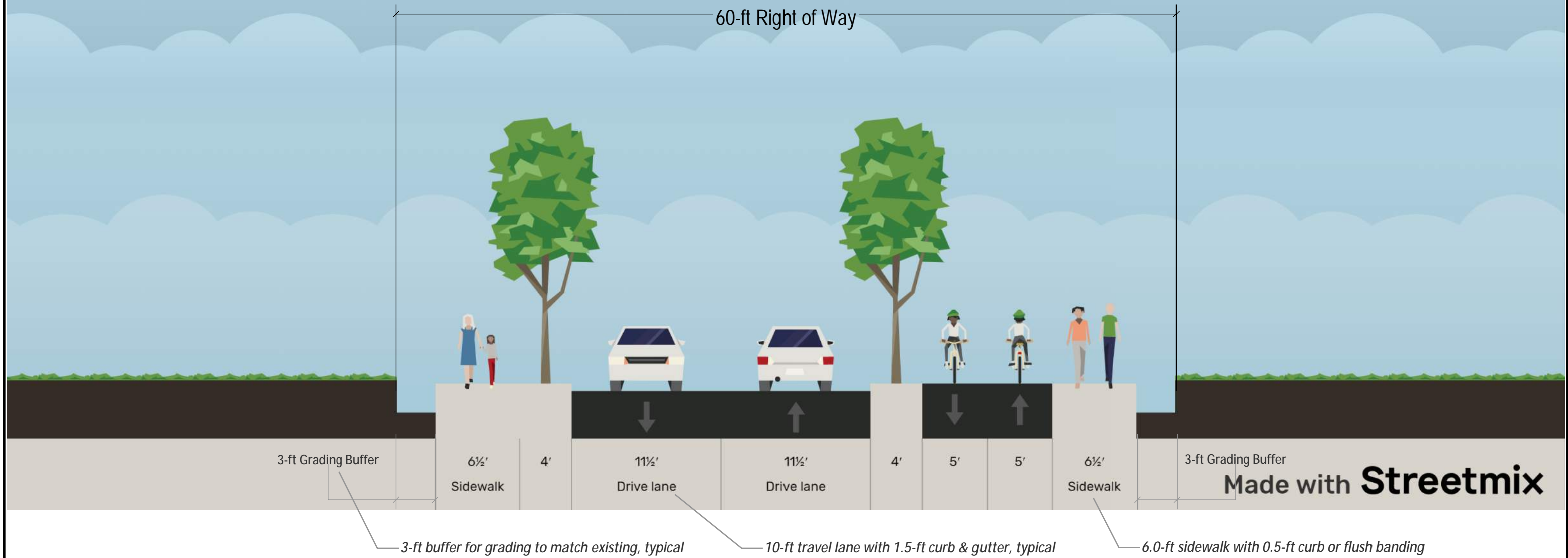
# **Appendix A**

Original Roadway Cross-section Alternatives and Screened/Adjusted  
Alternatives

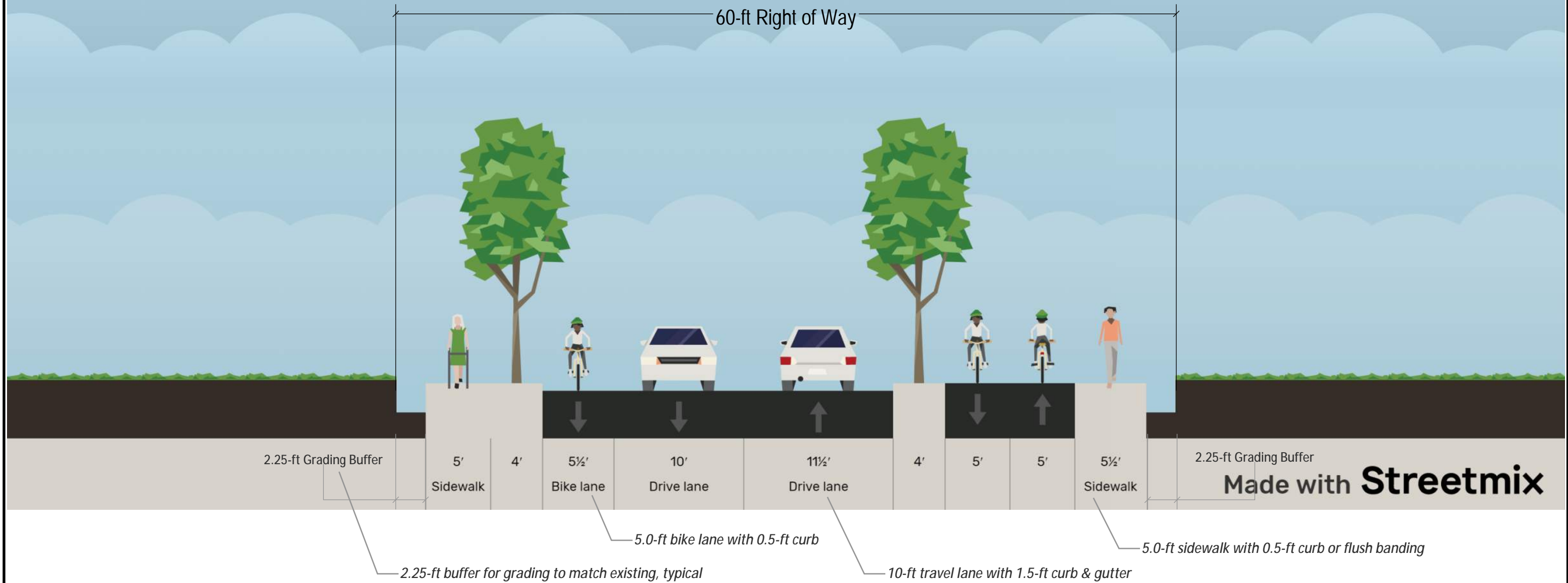
# 1-way Cycle-track Both Sides



# 2-way Cycle-track South Side



# 2-way Cycle-track South w/ On-street...

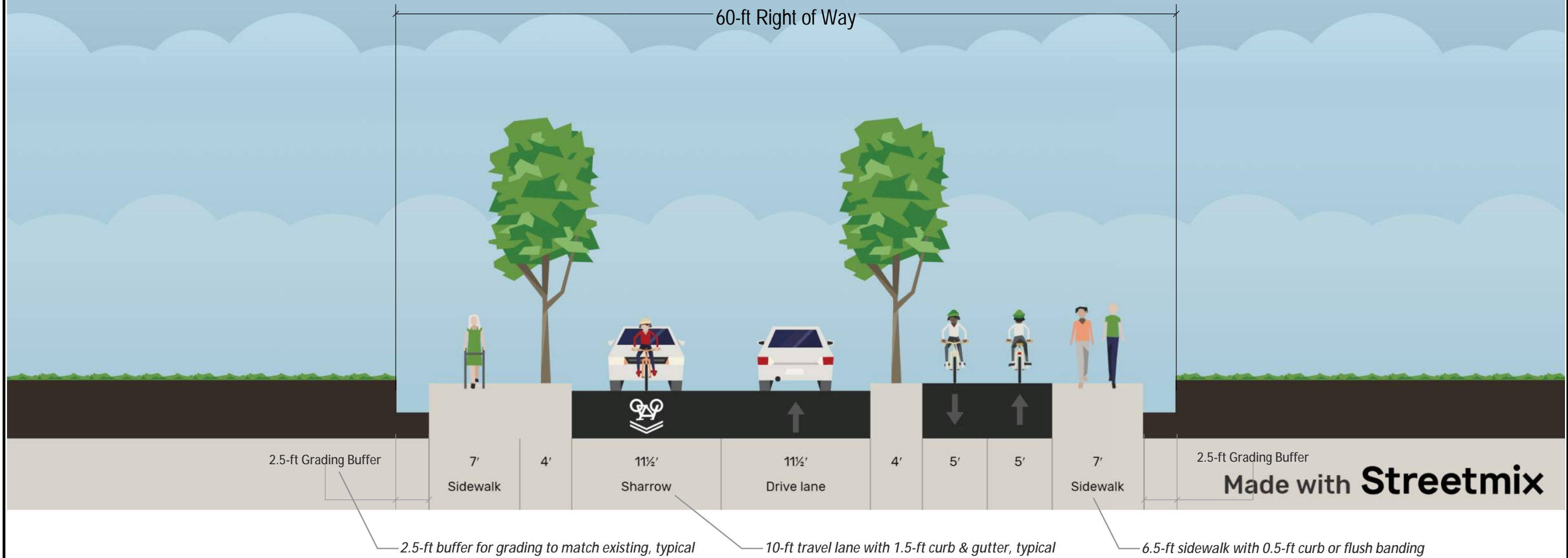


HORIZONTAL SCALE:  
NTS  
DATE:  
February 25, 2021  
JOB No.:  
0699.214  
DRAWING FILE No.:  
N/A

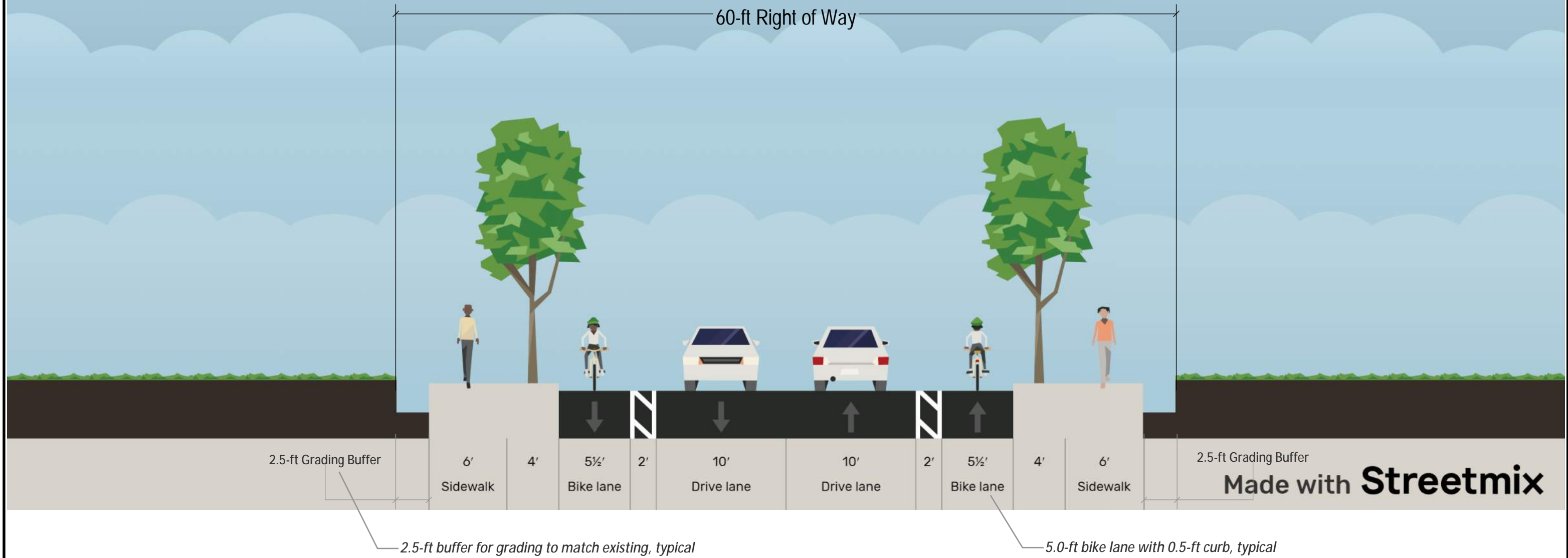
CITY OF PORT TOWNSEND  
PDISCOVERY ROAD BIKEWAY AND SIDEWALK PROJECTE  
ALTERNATIVE C: 2-WAY CYCLE-TRACK SOUTH SIDE W/ ON-STREET BIKE LANE NORTH SIDE

EXHIBIT No:  
EX-01  
SHEET No:  
Sheet 3 of 7

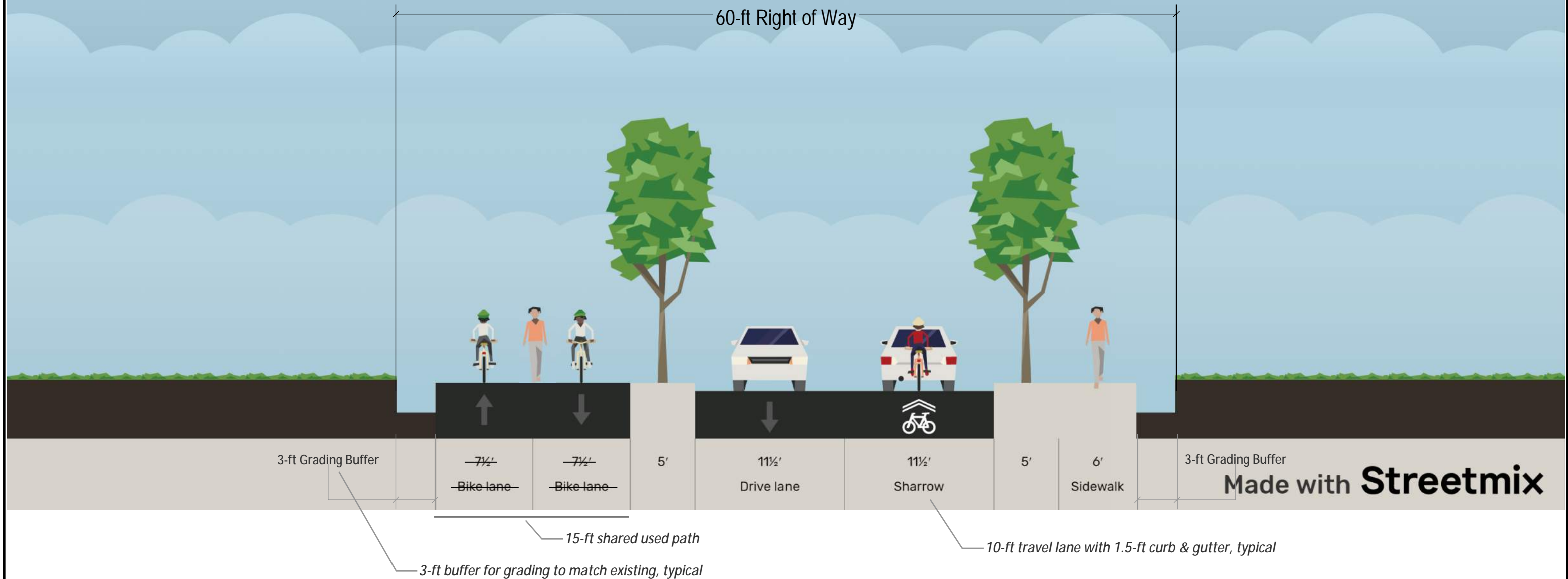
# 2-way Cycle-track South w/ Sharrow ...



# Buffered On-street Bike Lanes



# Shared Use Path North w/ Sharrow So...



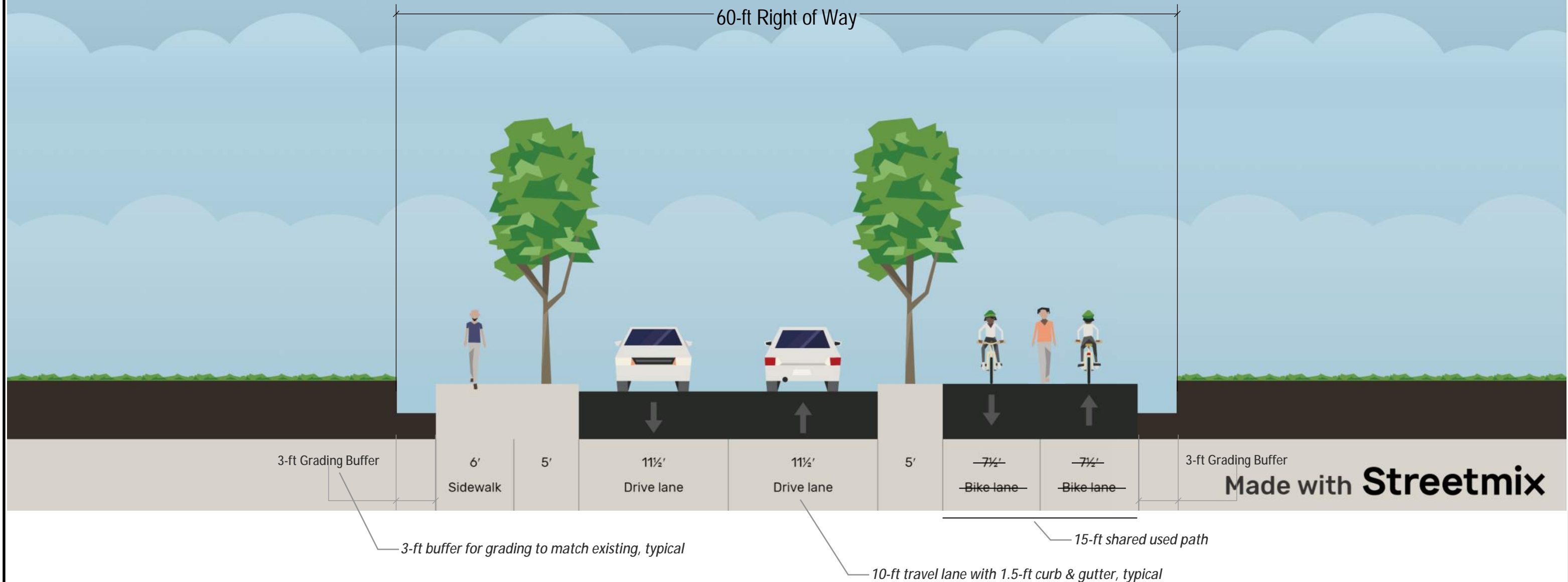
HORIZONTAL SCALE:  
NTS  
DATE:  
February 25, 2021  
JOB No.:  
0699.214  
DRAWING FILE No.:  
N/A

CITY OF PORT TOWNSEND  
PDISCOVERY ROAD BIKEWAY AND SIDEWALK PROJECTE  
ALTERNATIVE F: SHARED USE PATH NORTH SIDE WITH SHARROW SOUTH SIDE

EXHIBIT No:  
EX-01  
SHEET No:  
Sheet 6 of 7



# Shared-use Path South Side



March 2, 2021

## Discovery Road Bikeway and Sidewalk Project

# Alternatives Analysis – Alternatives

## Screened Alternatives from Meeting 3

- Alternative 1: 1-way Cycle-track Both Sides
- Alternative 2: 2-way Cycle-track South Side
- ~~Alternative 3: 2-way Cycle-track South Side w/ On-street Bike Lane North Side~~
- Alternative 4: 2-way Cycle-track South Side w/ Wider Lane North Side
- Alternative 5: Buffered On-street Bike Lane Both Sides
- Alternative 6: Shared Use Path North Side w/ Wider Lane South Side
- Alternative 7: Shared Use Path South Side

### Desired Outcomes

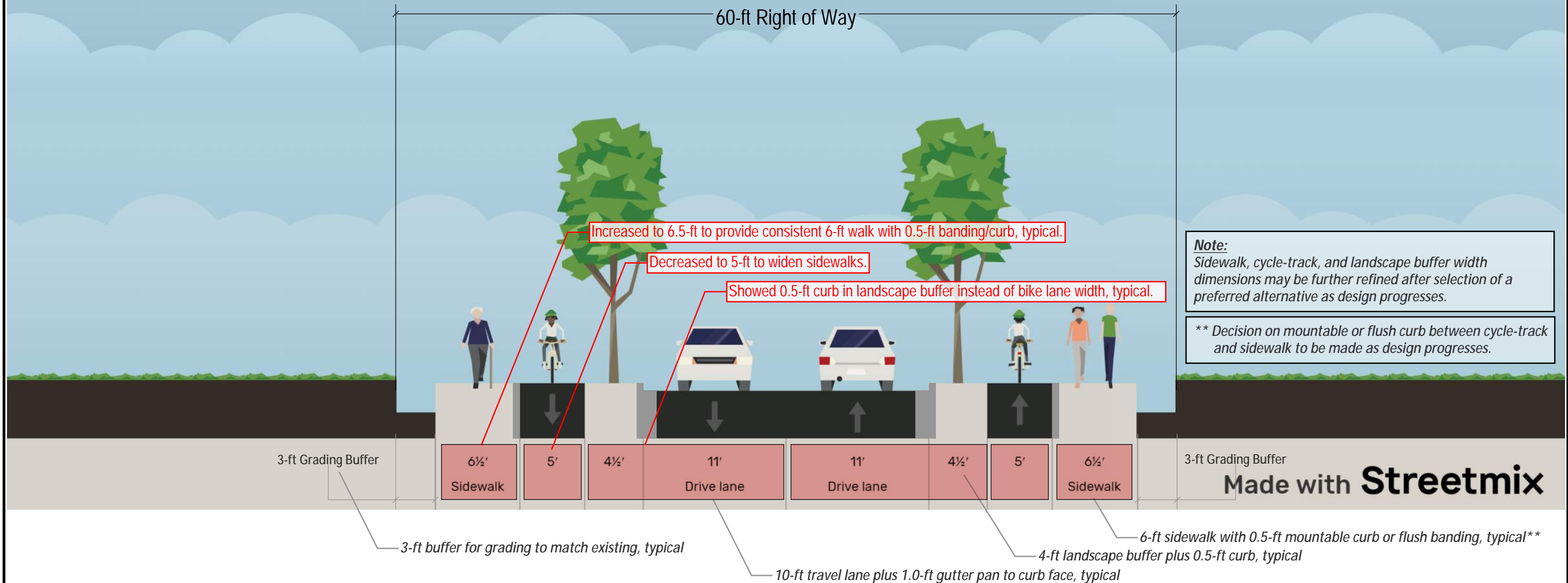
**Safety:** Establish a lower-speed roadway with safety considered for all modes/users and prioritized for peds and bikes.

**Comfort:** Provide a user-experience for peds and bike that is perceived as comfortable for a wide-range of user skills and abilities.

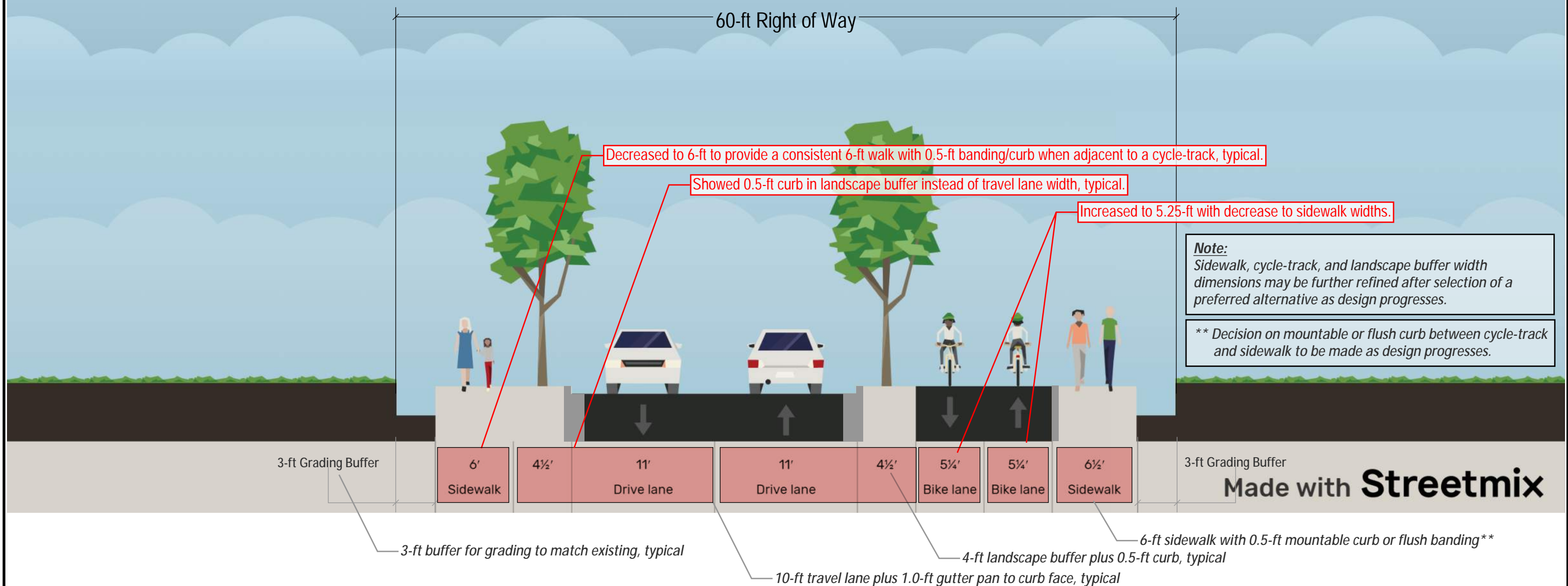
**Appearance:** Create a human-scale sense of place that feels authentic to Port Townsend and strives for beauty.

**Commented [SS1]:** There is not enough space to accommodate all elements with reasonably minimal dimensions. Using reasonably minimal dimensions ends up basically the same as Alternative D.

# 1-way Cycle-track Both Sides

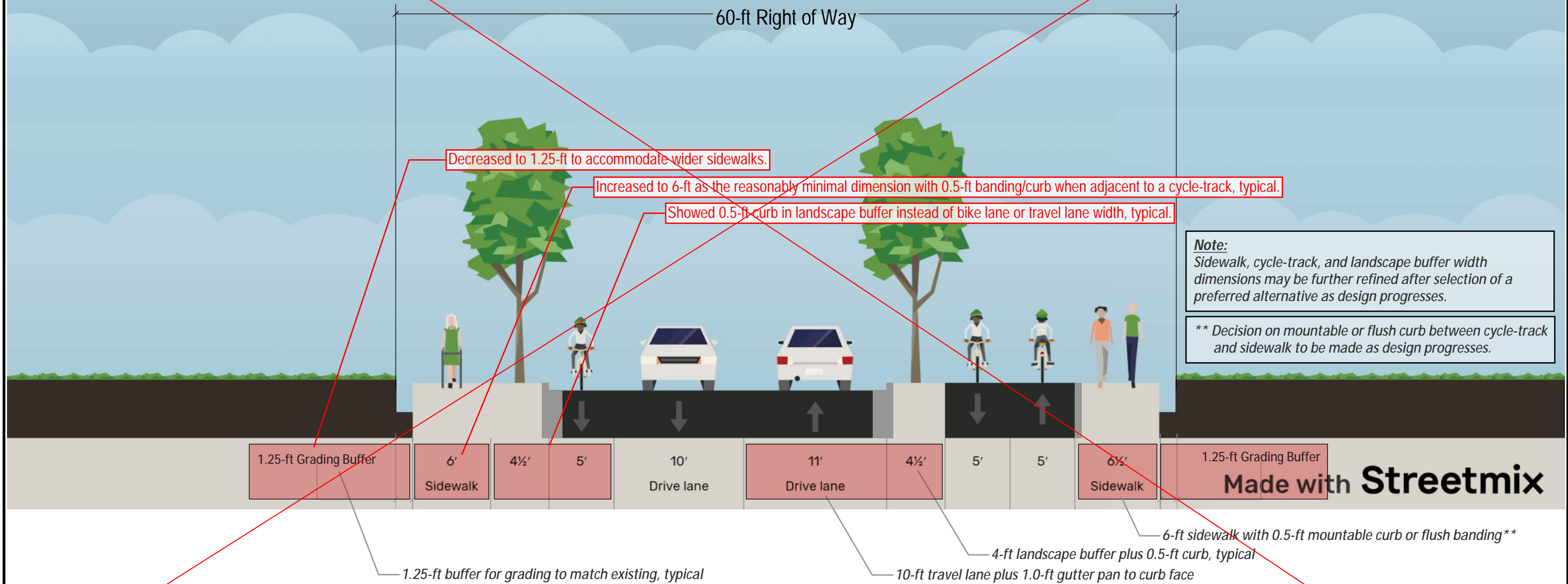


# 2-way Cycle-track South Side



There is not enough space to accommodate all elements with reasonably minimal dimensions. Using reasonably minimal dimensions ends up basically the same as Alternative D.

# 2-way Cycle-track South w/ On-street...

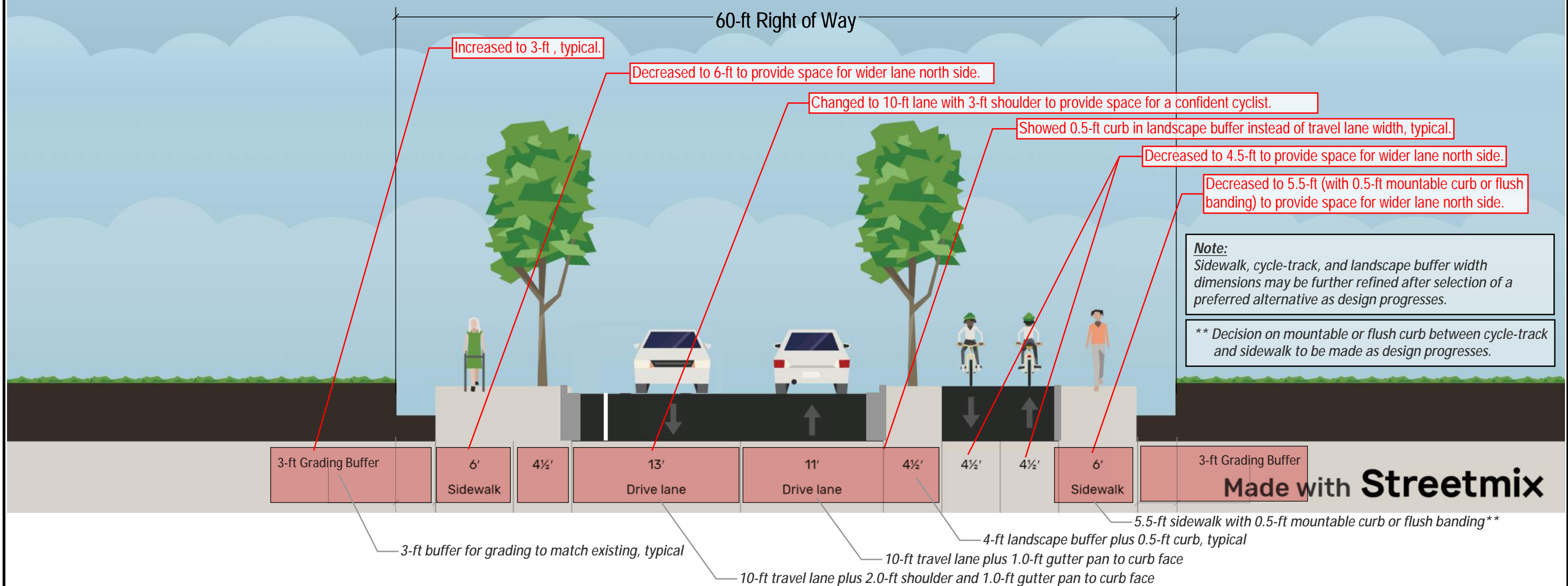


HORIZONTAL SCALE:  
NTS  
DATE:  
February 25, 2021  
JOB No.:  
0699.214  
DRAWING FILE No.:  
N/A

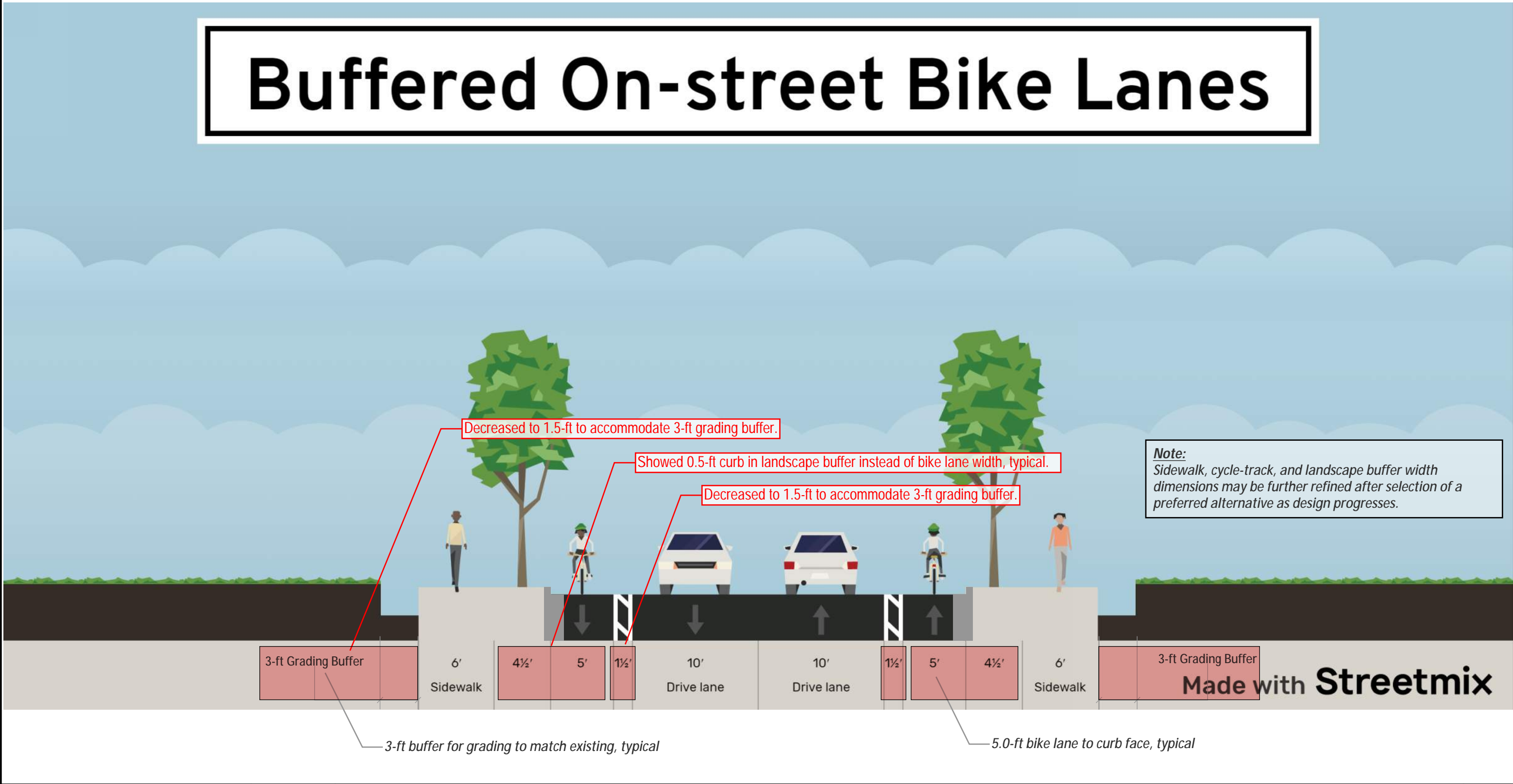
CITY OF PORT TOWNSEND  
PDISCOVERY ROAD BIKEWAY AND SIDEWALK PROJECTE  
ALTERNATIVE 3: 2-WAY CYCLE-TRACK SOUTH SIDE W/ ON-STREET BIKE LANE NORTH SIDE

EXHIBIT No:  
EX-01  
SHEET No:  
Sheet 3 of 7

# 2-way Cycle-track South w/ Wider La...



# Buffered On-street Bike Lanes

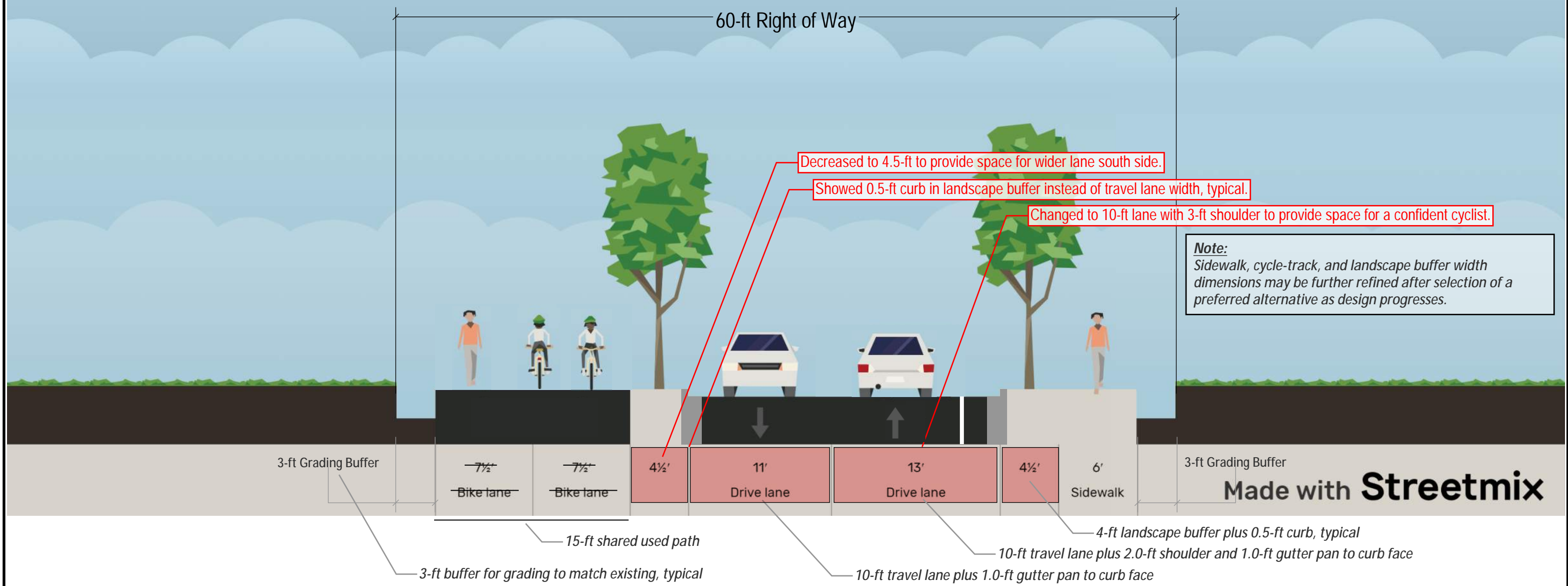


HORIZONTAL SCALE:  
NTS  
DATE:  
February 25, 2021  
JOB No.:  
0699.214  
DRAWING FILE No.:  
N/A

CITY OF PORT TOWNSEND  
PDISCOVERY ROAD BIKEWAY AND SIDEWALK PROJECTE  
ALTERNATIVE 5: BUFFERED ON-STREET BIKE LANES BOTH SIDES

EXHIBIT No:  
EX-01  
SHEET No:  
Sheet 5 of 7

# Shared Use Path North w/ Wider Lane ...



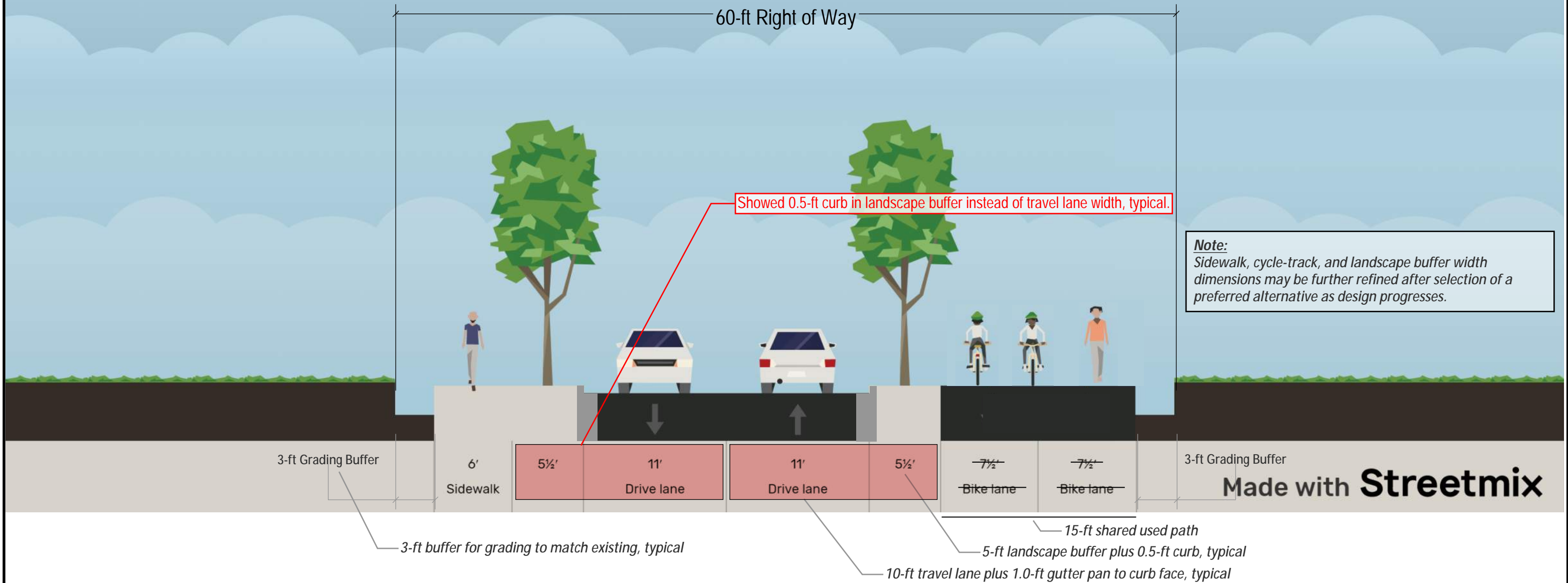
HORIZONTAL SCALE:  
NTS  
DATE:  
February 25, 2021  
JOB No.:  
0699.214  
DRAWING FILE No.:  
N/A

CITY OF PORT TOWNSEND  
PDISCOVERY ROAD BIKEWAY AND SIDEWALK PROJECTE  
ALTERNATIVE 6: SHARED USE PATH NORTH SIDE WITH WIDER LANE SOUTH SIDE

EXHIBIT No:  
EX-01  
SHEET No:  
Sheet 6 of 7



# Shared-use Path South Side



# **Appendix B**

## Final Roadway Cross-section Alternatives

## Discovery Road Bikeway and Sidewalk Project

# Alternatives Analysis – Alternatives

---

## Recommended Final Alternatives

- Alternative 1: 1-way Cycle-track Both Sides
- Alternative 2: 2-way Cycle-track South Side
- Alternative 4: 2-way Cycle-track South Side w/ Wider Lane North Side
- Alternative 5: Buffered On-street Bike Lane Both Sides
- Alternative 6: Shared Use Path North Side w/ Wider Lane South Side
- Alternative 7: Shared Use Path South Side

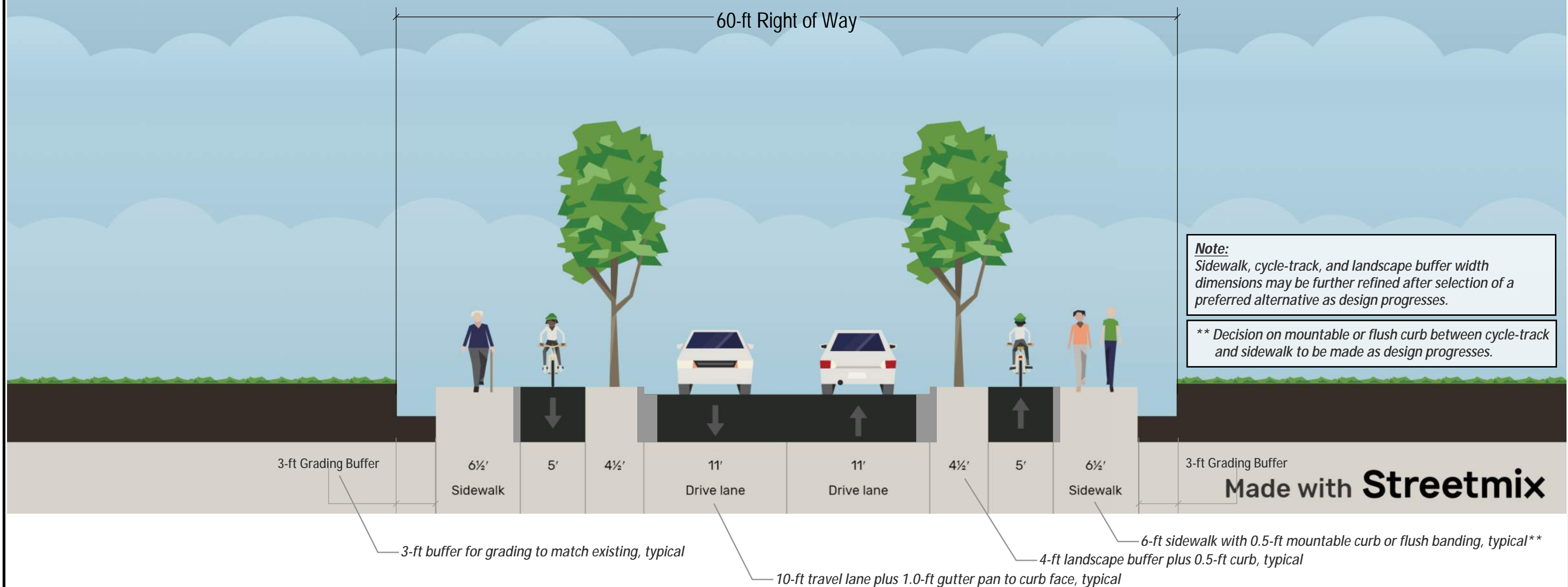
### **Desired Outcomes**

**Safety:** *Establish a lower-speed roadway with safety considered for all modes/users and prioritized for peds and bikes.*

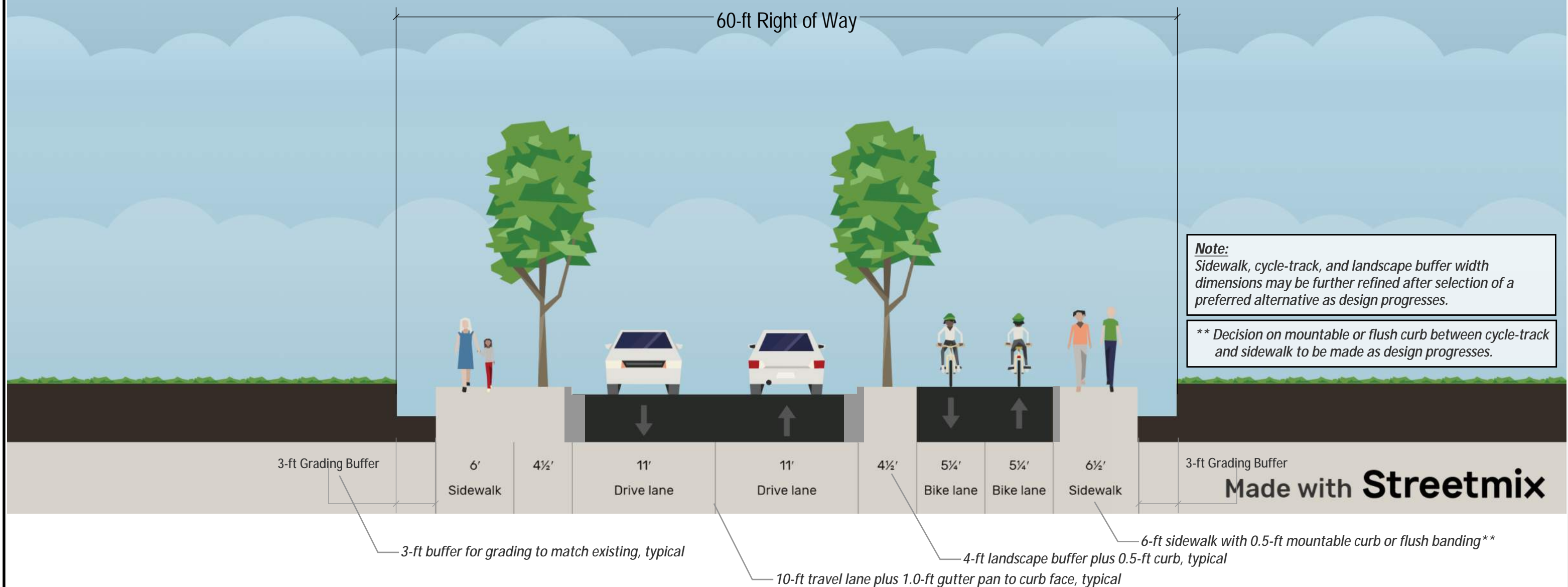
**Comfort:** *Provide a user-experience for peds and bike that is perceived as comfortable for a wide-range of user skills and abilities.*

**Appearance:** *Create a human-scale sense of place that feels authentic to Port Townsend and strives for beauty.*

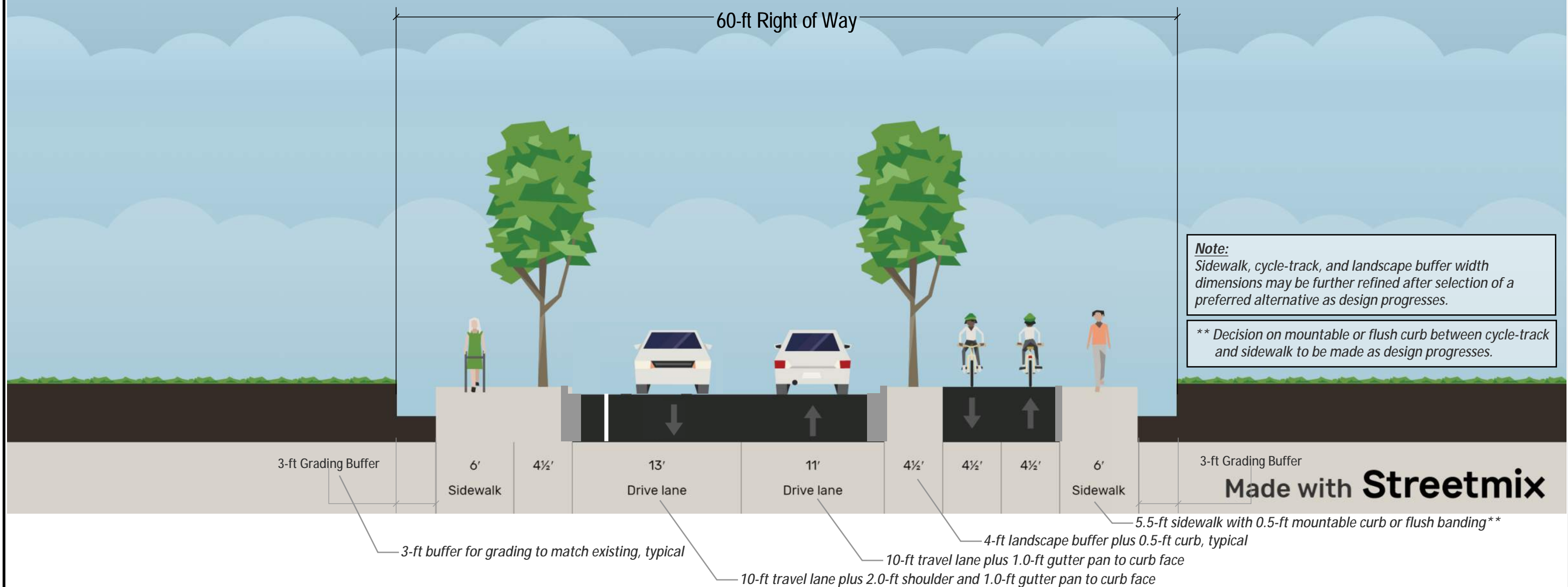
# 1-way Cycle-track Both Sides



# 2-way Cycle-track South Side



# 2-way Cycle-track South w/ Wider La...

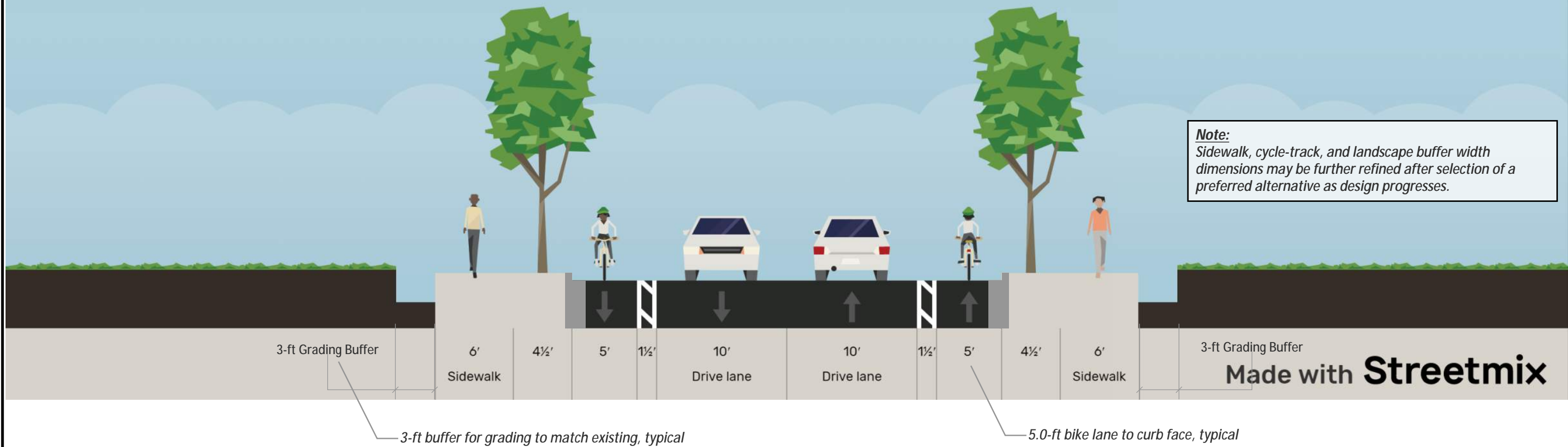


HORIZONTAL SCALE:  
NTS  
DATE:  
February 25, 2021  
JOB No.:  
0699.214  
DRAWING FILE No.:  
N/A

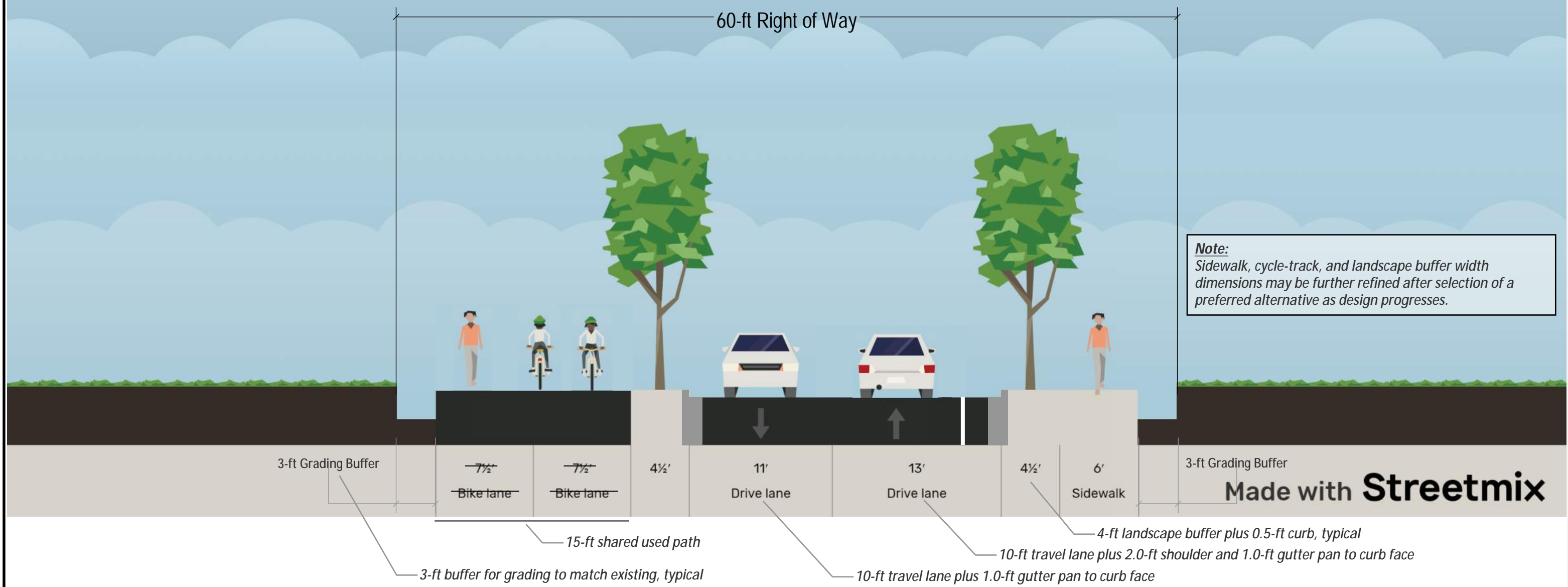
CITY OF PORT TOWNSEND  
PDISCOVERY ROAD BIKEWAY AND SIDEWALK PROJECTE  
ALTERNATIVE 4: 2-WAY CYCLE-TRACK SOUTH SIDE WITH WIDER LANE NORTH SIDE

EXHIBIT No:  
EX-01  
SHEET No:  
Sheet 4 of 7

# Buffered On-street Bike Lanes



# Shared Use Path North w/ Wider Lane ...





# Shared-use Path South Side

