2018

Sawmill Creek Road Transportation Corridor Assessment

AK NPS SITK 2015(2)

Figure 1 – Sawmill Creek Road Looking Westbound

U.S. Department of Transportation
Federal Highway Administration

NATIONAL PARK SERVICE

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LIST OF ACRONYMS

SAWMILL CREEK ROAD

ADA	Americans with Disabilities Act
ADOT&PF	Alaska Department of Transportation and Public Facilities
CBS	City and Borough of Sitka
DOT	Department of Transportation
EB	East Bound
FLAP	Federal Lands Access Program
FLTP	Federal Lands Transportation Program
NPS	National Park Service
PS&E	Plan Specifications and Estimates
ROW	Right of Way
RSA	Road Safety Audit
SMC	Sawmill Creek
Sitka NHP	Sitka National Historical Park
USFWS	United States Fish and Wildlife Service
WB	West Bound
WFLHD	Western Federal Lands Highway Division

1. INTRODUCTION

1.1 Project Overview

The National Park Service (NPS) and City and Borough of Sitka (CBS) requested a review of potential actions to improve the safety performance of Sawmill Creek (SMC) Road. The request is in response to concerns for the safety of visitors and residents who frequently cross SMC Road to access tourist sites and residences. SMC Road is a heavily trafficked corridor with pedestrian, bicycle, motorist, bus and industrial truck traffic competing for space and often coming into close conflict with one another. The safety components of SMC Road have been under discussion for many years, with city and Park officials seeking the implementation of additional safety measures.

SMC Road is a state-owned and maintained roadway located within the municipal jurisdiction of the CBS and bordering Sitka National Historical Park (Sitka NHP). It is the only road connection between downtown Sitka and the Jarvis Street/Price Street Industrial area, Allen Marine Ways, and the Sawmill Creek Business Complex, as well as the Blue and Green Lake Hydroelectric dams and power stations. A substantial percentage of Sitka residents live along this portion of Sawmill Creek Road. As a state-owned roadway, the state must approve modifications to the roadway, and current crash data may not support pedestrian improvements in the corridor.

Western Federal Lands Highway Division (WFLHD) has performed a planning corridor study, analogous to a Road Safety Audit (RSA), to evaluate the safety performance of SMC Road. The RSA will provide important information regarding existing infrastructure, safety concerns, operational conditions and suggest short-term, low-cost and long-term, higher cost improvements. The overall focus is to review existing traffic and safety information, identify improvements and suggest additions to incorporate into a future project. This RSA complements the *Sitka National Historical Park Transportation Study*, completed by WFLHD and Volpe staff in partnership with the NPS.

December, 2021 Update – this report and the Sitka National Historical Park Transportation Study have been reviewed due to the gap in time from the field work and initial reports. WFLHD has made minor updates to this report and to note that some changes in the existing conditions have occurred (i.e. the 2020 DOT&PF paving project made some modifications affecting the conditions and recommendations contained herein). Any updates are noted in italics. The DOT&PF project was 0933046/SFHWY00064 and plans were accessed here: https://www.bidx.com/ak/proposal?contid=SFHWY00064.

There are no other planned projects in the study limits according to DOT&PF staff. Outside of the project limits, one project is included in the DOT&PF STIP between Jeff Davis St. and the roundabout to the north along SMC Road. This project includes pavement reconstruction, ADA upgrades, bicycle facility upgrades (bike lanes), intersection improvements at SMC Road/DeGroff St. and drainage improvements. It is scheduled to be constructed in 2022.

1.2 Background

Sitka National Historical Park is the top visitor attraction in Sitka and is located adjacent to Sawmill Creek Road for the extent of the study corridor. The only access to Sitka NHP from SMC Road is a small parking lot serving Sitka Historical Park close to Jarvis Street, but not in alignment with the intersection. Another of the top visitor attractions in Sitka is the Raptor Center, which is located at approximately the halfway point of the study corridor and is entered from a gravel approach road. Each year thousands of visitors travel through Sitka National Historical Park, walk through the NPS parking lot and cross Sawmill Creek Road to get to the Raptor Center. Based on on-site observation and stakeholder reporting, almost all visitors cross Sawmill Creek Road at the approach road (Raptor Way) to the Raptor Center, without the assistance of a crosswalk or pedestrian safety enhancements.

In 2013, the Park Superintendent coordinated with the City of Sitka to request assistance from Western Federal Lands Highway Division in performing a safety review of Sawmill Creek Road. WFLHD staff visited Sitka, Alaska September 25-27, 2018 in coordination with staff from Alaska Department of Transportation & Public Facilities (DOT&PF), CBS and NPS. The site visit was utilized to survey the corridor, record the existing conditions and observe the behaviors of corridor users.

There are several photo examples provided in the Federal Lands Access Program (FLAP) application of hazardous conflicts between the various users of the roadway including pedestrians running in front of traffic, motorists not stopping or yielding for pedestrians, and bicyclists riding contraflow on both sides of the roadway. The WFLHD team witnessed similar examples of behavior during a site visit, and documented such situations in photos used throughout the report. There is concern for vehicle-pedestrian crashes with vehicles reportedly travelling at speeds along the corridor from 30-45 mph, according to the FLAP application. Posted speed limits for SMC Road range from 25-35 mph.

It is believed that a significant number of pedestrians not going to the Raptor Center cross at the Jarvis Street Crosswalk or at an unmarked crossing to access the convenience store.

The State of Alaska recognizes that SMC Road is in need of repairs, and is focusing efforts on rehabilitation of the existing roadway. A repaving project is scheduled for 2020 and will include select pedestrian safety enhancement measures.

Figure 2 - Study Corridor

December, 2021 Update – the referenced DOT&PF project was constructed in 2020. There were improvements made to ADA crossings, the trail, warning signage and drainage noted throughout the report.

1.3 Corridor Assessment Process

The Sawmill Creek Road assessment is similar in scope to a road safety audit, and follows the same basic steps. The first two steps in the RSA process represent the planning stages of the audit that take place prior to the site visit. Steps 3 to 6 are normally conducted on site. For the Sawmill Creek Road study, steps 3-5 were completed over the course of 3 days. Due to availability of stakeholders, step 6 was not completed on site. This report completes step 6 with a formal report that documents the data gathered for the site, observations and findings during the field visit, and suggested improvements.

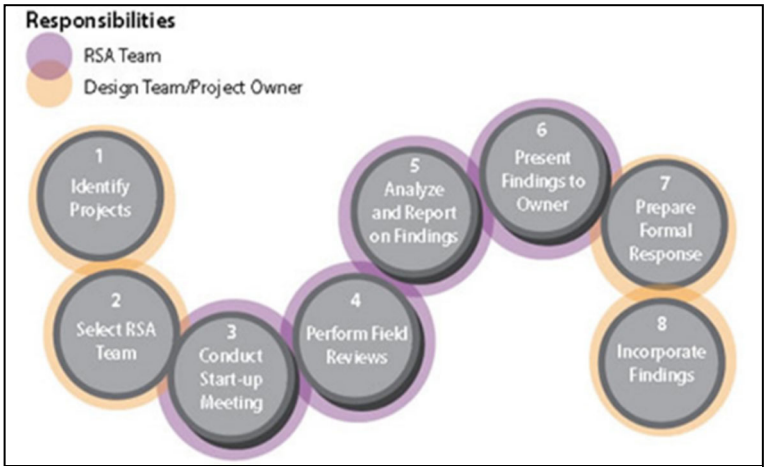

Figure 3 - Road Safety Audit Process

Road Safety Audits are a collection of the thoughts, findings, observations, opinions and recommendations from the RSA team at the time of the study and field work. As conditions inevitably change after the audit, the findings, observations and recommendations may change as well. Any cost estimates associated with proposed recommendations are intended to be a rough estimate, or relative cost. The preliminary cost estimates for suggested improvements could be considered at a planning and programming level, but should not be taken as true Plans, Specifications and Estimate (PS&E) level accuracy. Proposed recommendations of a higher order, such as geometric improvements, should take into consideration the appropriate topographical survey, environmental processes, preliminary engineering and other necessary processes in order to determine a more accurate cost estimate for implementation. In no way does the RSA imply that the locations under study are unsafe for the various modes of transportation in their current configuration, nor does the RSA imply fault or that action should immediately be taken by the governing agencies of each location.

2. STAKEHOLDER COORDINATION

2.1 Stakeholder Kick-Off Meeting

The Sawmill Creek Road assessment team worked in close coordination with the NPS and others for data gathering and discussion of issues. The field review was performed September 25-27, 2018. The team conducted a kickoff meeting on the morning of September 25 in the Sitka National Historical Park offices with CBS, NPS and DOT&PF staff. At this meeting, the team provided input and voiced safety concerns. Following the kickoff meeting, WFLHD, DOT&PF, and NPS stakeholders conducted a field review of the SMC Road location. WFLHD staff initiated field work prior to initial discussions and concluded evaluation post-kickoff by evaluating driver and pedestrian behavior along the corridor. The team documented the existing conditions, assessing possible recommendations to present as suggested improvements to the location. Participants in the meeting and field review are identified in Table 1.

2.2 Stakeholder Close-Out Meeting

WFLHD did not conduct a formal close-out meeting on-site. The team's findings and initial options for improvement were discussed with the assembled team during the field meeting and are presented in Chapter 4. The final suggested improvements are presented in Chapter 5 as both short-term and long-term recommendations.

Table 1 - RSA Meetings and Field Review Participants

Participants	Title	Informational Conference Call 09/21/18	Field Review 09/25/18
NPS			
Brinnen Carter	Chief of Resources	X	X
FHWA – WFLHD			
Shaneka Owens	Highway Safety Engineer	X	X
Quinn Newton	Senior Transportation Planner	X	X
Alaska Department of Transportation & Public Facilities			
David Epstein	Regional Traffic and Safety Engineer	X	X
Loren Gehring	Project Manager	X	
City and Borough of Sitka			
Cliff Richter	Municipal Engineer	X	X
David Longtin	Senior Engineer	X	
Sitka Tribe of Alaska			
Gerry Hope	Transportation Director		X

3. EXISTING CONDITIONS

3.1 Existing Sawmill Creek Road

Sawmill Creek Road originates near the center of town at the intersection of Lake Street and Halibut Point Road and extends primarily in an east-west direction. SMC Road is the only road connection between downtown and all activity east of Jeff Davis Street. A significant percentage of Sitka residents live along this extent of Sawmill Creek Road, and numerous commercial activities have operations here. Access is provided to Allen Marine Ways, Sawmill Creek Business Complex, the United States Post Office and the Blue and Green Lake Hydroelectric dams and power stations.

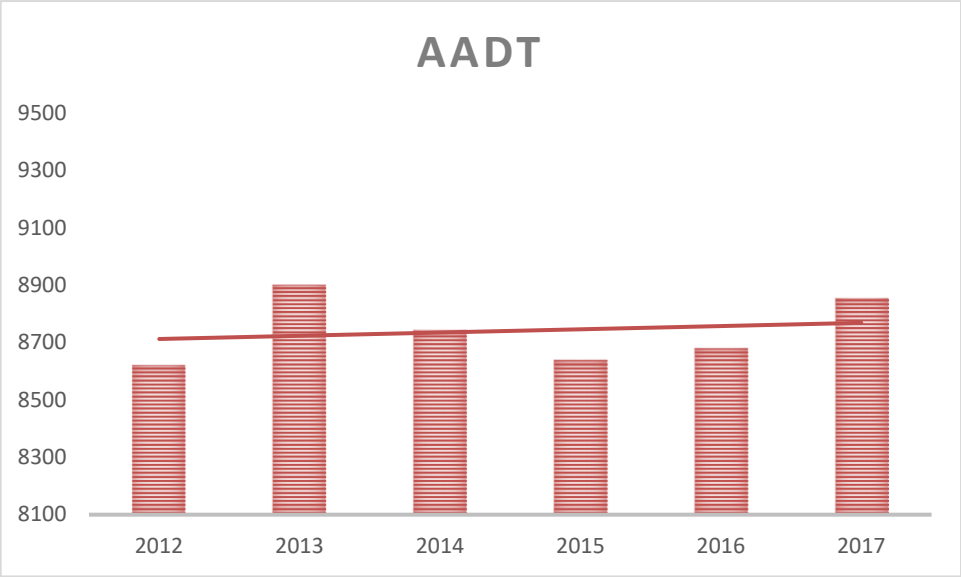

Table 2 - Average Annual Daily Traffic. Data provided by DOT&PF.

The subject roadway has a posted speed of 35 mph, though it is reported by NPS in the FLAP application that average speeds are often closer to 45 mph. Average daily traffic on this section of roadway averages 8,740 vehicles per day based on data between 2012-2017. Traffic has been consistent over that time with a slight upward trend. Population growth and visitor trends suggest that overall AADT will continue to increase at a consistent but conservative pace (Table 2). It is unlikely there will be a significant spike in residential traffic, as land available for housing development is limited by the boundary of Tongass National Forest and dramatic topography. Commercial vehicle traffic is common on the route and with a review of aerial photos dating back to 2003 it is evident there has been significant infill within the industrial/business park. Additional infill is still possible, and it may still be possible to increase intensity of operations.

Throughout the summer, buses delivering tourists to the various sites travel Sawmill Creek Road extensively. There is also a bus route operated by The Ride, a transportation agency managed by the Sitka Tribe of Alaska, and operated on behalf of the City and Borough of Sitka. The Ride buses use the Park parking lot as the eastbound stop on the route, and the westbound stop is located outside the eastern edge of the study corridor in the US Post Office parking lot.

The section of road under evaluation extends from Indian River Road (MP 0.4) to just south of Jarvis Street (MP 0.95, including an area of mid-block pedestrian crossing near the convenience store), and consists of a two-lane roadway with left turn lanes at intersections. A 5' bike lane, curb and gutter, and a concrete sidewalk extend the length of the corridor on the westbound side of Sawmill Creek Road. On the eastbound side, there is a 5' bike lane, no curb, a ditch and a

Figure 4 - (L) Sawmill Creek Road looking South from Indian River Road. Figure 5 - (C) Multi-use path looking south. Figure 6 - (R) Multi-use path where it abuts the roadway.

separated variable width, but 6' typical, shared-use asphalt path. The shared-use path is detached from the roadway, except where it crosses Indian River (Figure 42).

There are many points along the corridor where pedestrians cross Sawmill Creek Road. Many of them are not official crossings and a few of these locations have been identified in the FLAP application as points of concern along the corridor. Where marked crosswalks exist, concerns for pedestrian safety remain, and two marked crossings have been identified in the application as additional points of concern. The marked crosswalks at the intersection of Jarvis Street and Sawmill Creek Road (for crossings across SMC Road and Jarvis Street) are highlighted in the application.

The project team identified an additional conflict point, and extended the study corridor to include in this evaluation. The marked crossing at Indian River Road is equipped with an overhead pedestrian crossing pendent light. The light is activated at all times, and hangs above the crossing. The striping in this location is of the high-visibility continental style. This crossing appears to be ADA accessible, and provides a connection to the multi-use trail and the sidewalk on either side of Sawmill Creek Road. The crossing is near the apex of a horizontal curve.

Figure 7 - A lighted sign hangs above a crosswalk at the intersection of Indian River Road and Sawmill Creek Road.

The additional 5 areas of concern identified in the project application along the corridor are listed in a west to east direction of travel starting from the Indian River Road intersection at the western edge of the study corridor.

Figure 8 - (L) Trail connection in 2014. Water started to wear channels into the soil. Figure 9 - (R) Trail connection in 2018. Trail surface has continued to deteriorate and large rocks are starting to show through. The surface is very loose with uneven footing.

1. Connection to multi-use trail at Indian River Bridge – An existing walking trail borders the Indian River and provides a connection between the Sitka National Historical Park visitor center and the base of the Indian River bridge. A formal access connection, such as stairs or other hardscaped improvements, between Sawmill Creek Road and the trail below has not been established. The trail connecting to the visitor center is visible at the bottom of the slope adjacent to Sawmill Creek Road, and is even shown on many of the National Park Service maps for the historical park. There are currently erosion concerns with this connection as well. The Park is interested in creating a formal connection, but wants to ensure that the access is as safe and accessible as possible and is supported by the right-of-way owner, Alaska DOT&PF. WFLHD believes that the connection and current access point is not acceptable for the intended use of the trail and should be improved. The agencies should consider stairs and handrails or potentially a rerouted graded trail connection, taking into account the topography and any cultural or environmental impacts.

2. Unmarked crossing at Raptor Center –

Figure 10 - (L) Intended walking route to Raptor Center. Figure 11 - (R) Path worn into ditch across from Raptor Center entrance.

Evidence suggests that many people travelling to the Raptor Center by foot traverse the roadway in the middle of the block rather than use the crosswalk at Jarvis Street. The intended route for access to the Raptor Center from the national park parking lot consists of turning right on the multi-use path, crossing SMC Road near Jarvis Street, then turning left and following the sidewalk on the north side of the road to the Raptor Center entrance. Raptor Way is the vehicle entrance to the Raptor Center, and is a gravel road without a designated pedestrian path. Instead of taking the desired route, most people are observed turning left out of the parking lot, walking along the multi-use path, and crossing Sawmill Creek Road at the point they can see the entrance. Pedestrians use an informal path worn into the ditch for crossing Sawmill Creek Road from the multi-use path. When visiting the site, many tourists asked our team for directions to the Raptor Center, and were very reluctant to use the Jarvis Street crossing, knowing the Raptor Center was located in the opposing direction. The shortest distance to the destination is certainly the desired option.

Figure 13 – A pedestrian crossing Sawmill Creek Road at the entrance to the national park SMC parking lot.

3. Entrance to national park parking lot along SMC Road – The entry driveway to the national park lot is offset from the Jarvis Street intersection by approximately 150'. The paved portion of the driveway is approximately 30' in width, but the current driveway opening including gravel shoulder is approximately 60' wide. The driveway opening has been widened inadvertently by traffic entering and exiting the parking and not utilizing the pavement. There are no curbs at the limits of the driveway which may allow faster turns into the parking lot than desired. The ditches on either side of the driveway are not very deep, and the culvert extends well beyond the edges of the pavement. There is a possibility that the culvert has sustained some damage from the vehicle activity as well.

Figure 12 - A wheelchair user can be seen crossing Jarvis Street. The sidewalk on Jarvis Street includes ramps. The crossing on Sawmill Creek Road connects to a gravel and dirt connection.

4. Marked crossings at Jarvis Street – Pedestrians who use the crosswalk on SMC Road must connect to the road by a gravel connection worn into the grass. There is no paved connection between the multi-use path and the roadway. The crosswalk is marked with white pavement markings and is located at the intersection. The crosswalk is in the form of continental stripes and the existing markings are in good condition. The crosswalk on Jarvis Street is a simple design of two parallel white markings. There are ramps on the sidewalk on either side of the intersection.

5. Unmarked crossing to convenience store – The SMC Road crossing at the convenience store is another situation of an unmarked crossing located at the midblock instead of at an intersection. The convenience store is located about 600 feet from the Jarvis Street intersection and marked crosswalk.

Figure 14 - Unmarked Crossing at Convenience Store (Approximate Location Marked in Red)

An informal path has been worn into the ditch between the multi-use path and SMC Road immediately adjacent to the convenience store. On the opposing side of the multi-use path, a trail is worn into the woods where people familiar with the area take a shortcut through the national park. It is thought that this occurs because passing through the park is a more enjoyable walk than if near a roadway. The informal path provides the shortest connection between the trail in the park and the convenience store across the road. The connector trail crosses the multi-use path, takes advantage of a culvert in the ditch, and crosses the road in a location with no crosswalk. The culvert at this location facilitates the crossing of the ditch during the often wet conditions. It is not known exactly why the culvert exists in this location, other than to help with crossing of the ditch.

Figure 15 - (L) Crossing area worn into the grass. A culvert in this location facilitates the crossing. Figure 16 - (R) Picture of the path worn into the woods leading to the park trail network.

4. FINDINGS AND OBSERVATIONS

The team reviewed the Sawmill Creek Road corridor in the field, made observations related to the safety performance and identified preliminary options for improvement at each location. The team focused on both short- and longer-term countermeasures that can improve the safety performance throughout the corridor. The options for improvement and ultimate recommendations are discussed further in section 5. S.

4.1 Sawmill Creek Road at Sisters Lane

Figure 17 - EB SMC Road approaching Sisters Lane

Observations:	- Pedestrian signs in both directions approaching the crosswalk appear to be outdated and are not optionally a fluorescent color; - Signs do not include supplemental “AHEAD” plates.
Improvement Options:	- Replace signs with updated fluorescent yellow signs; o *December, 2021 Update – 2020 project replaced these, unknown if fluorescent or standard yellow.* - Add supplemental “AHEAD” plates. o *December, 2021 Update – 2020 project added this for the eastbound approach but not westbound.*

4.2 Sawmill Creek Road at Indian River Road

Figure 18 - EB Sawmill Creek Road approaching Indian River Road

EB Observations:	- Overhead pedestrian warning sign is outdated and is not visible enough to be effective; - Existing "NO STUDDED TIRES" sign is deteriorated; - Shared use path has vegetation overgrowth along outer parameter; - Lighting is present near the sign and crosswalk
Improvement Options:	- Reevaluate the overhead sign with recommendations from Table 1 of the FHWA Federal Lands Highway Action Plan for Implementing Pedestrian Crossing Countermeasures at Uncontrolled Locations. Options could include one or several of the following: o High-visibility crosswalk markings and signing o Advance Yield Here To (Stop Here For) Pedestrian sign and yield (stop) line (depending on state law) o Pedestrian refuge island o Rectangular Rapid-Flashing Beacon (RRFB) or Pedestrian Hybrid Beacon (PHB)

Figure 19 & 20 - EB Sawmill Creek Road facing Indian River Road intersection

	○ *December, 2021 Update – pedestrian warning signs, with push-button activated LED border lights, and down arrows were added for the crosswalk to replace the overhead signs.* - Replace fading "NO STUDDED TIRES" sign; ○ *December, 2021 Update – sign was replaced.* - Perform basic maintenance along the path to better delineate the path.
Crosswalk Observations:	- Crosswalk is highly visible and centerline markings are visible even when pavement is wet; - Appear to be drainage issues where crosswalk ties into shared use path; - Not able to visibly determine if overhead lighting is operational.
Improvement Options:	- For ADA compliance, install a clear separation between crosswalk and shared use path; ○ *December, 2021 Update – ADA crossing added on each side of crosswalk.* - Address the drainage issue along path to prevent pooling water. ○ *December, 2021 Update – may have addressed some drainage issues with new ADA ramp.*

Figure 21 - WB Sawmill Creek Road approaching Indian River Road

WB Observations:	- Curve warning sign visibly old and not retroreflective on initial inspection; - Pavement in poor condition near centerline and roadway edges; - Centerline striping was faded in some locations.
Improvement Options:	- Evaluate the need for the curve warning sign. Even near the upper range of the assumed prevailing speed (35-45 mph), this sign may not be warranted per the 2009 Manual for Uniform Traffic Control Devices (MUTCD). Removing this sign can improve motorist adherence to more critical traffic control devices such as pedestrian warning signs; ○ *December, 2021 Update – sign was replaced in-kind.* - Resurface roadway and replace all pavement markings. ○ *December, 2021 Update – the resurfacing was completed. It is assumed that all pavement markings were reinstalled in their*

	existing configuration. Durable MMA markings used at crosswalks; painted markings for others.

Figure 22 - WB Sawmill Creek Road at Indian River Road

Westbound Observations closer to intersection:	- Overhead pedestrian warning light is ineffective. The sign is lit at all times, but is difficult to see during the daytime, and is quite small; - "HEADLIGHTS ON" with supplemental sign was visible and was visibly in good condition. - Center line pavement marking were somewhat worn.
Improvement Options:	- Upgrade overhead pedestrian warning traffic control device; o Pedestrian hybrid beacon; o Rectangular rapid flashing beacon; o Pedestrian activated signal. o *December, 2021 Update – pedestrian warning signs, with push-button activated LED border lights, and down arrows were added for the crosswalk to replace the overhead signs.* - Repaint pavement markings o *December, 2021 Update – pavement markings were reinstalled.*

4.3 Sawmill Creek Road at and Approaching Indian River Bridge


Figure 23 & 24 - EB Sawmill Creek Road approaching Indian River bridge

Observations Approaching Indian River Bridge:	- Roadway runoff drains directly onto the shared use path; - No separation between pedestrian and roadway; - Pavement was visibly in poor condition; - Ponding on path causing debris deposits. - Handrail provides delineation and some protection for bicyclists and pedestrians along steep drop-off.
Improvement Options:	- Add curb and gutter to Sawmill Creek Road to alleviate the drainage issues on shared use path; - Resurface roadway and replace all pavement markings; - Provide a clear separation between roadway and shared use path by constructing curb and gutter along SMC Road. o *December, 2021 Update – a recently crash-tested aluminum 42" pedestrian rail/fence may be a good option for shared use path delineation and pedestrian fall accommodations along any steep areas. The existing handrail may or may not be considered crashworthy. For reference, see pg. 181: https://onlinepubs.trb.org/onlinepubs/circulars/ec220.pdf* o *The 2020 project replaced this handrail with a galvanized steel 42" rail. Unlikely to be cost effective to replace this with the new crash-tested Manual for Assessing Safety Hardware (MASH) Test Level-2 barrier.*

Figure 25 - EB Sawmill Creek Road approaching Indian River Bridge

Figure 26 - EB multi-use path at Indian River bridge

Bridge Rail and Guardrail Observations:	- The purpose of the guardrail appears to be to shield the river hazard and provide a transition to the interior bridge rail along the path; - The purpose of the interior bridge rail appears to be to shield pedestrians and trail-users along the bridge. However, the opposite side does not have a similar treatment and much of the shared-use trail is similarly exposed to vehicular traffic.
Improvement Options:	- Evaluate guardrail and bridge railing to determine if the existing treatment is appropriate for the location. o *December, 2021 Update – guardrail height of 28" was maintained. The downstream/opposite side transition rail was modified to match the downstream guardrail height. The terminal grading may have been improved.*

4.4 Sawmill Creek Road at Raptor Way


Figure 27 & 28 - WB Sawmill Creek Road at Raptor Way

Observations:	- Pedestrians were observed crossing midblock to access the Raptor Center; there is an informal path indicating that this is a high crossing location for pedestrians; - The gravel roadway along Raptor Way is visibly in poor condition; - Gravel is tracked out by vehicles onto the SMC roadway, including the SMC Rd. bike lane - Water observed flowing from the informal path onto the shared use path.
Improvement Options:	- Surface roadway along Raptor Way; - Evaluate the uncontrolled crossing on SMC Rd. with Table 1 of the FHWA Federal Lands Highway Action Plan for Implementing Pedestrian Crossing Countermeasures at Uncontrolled Locations. Options could include one or several of the following: o High-visibility crosswalk markings and signing o Advance Yield Here To (Stop Here For) Pedestrian sign and yield (stop) line (check state law) o Rectangular Rapid-Flashing Beacon (RRFB) or Pedestrian Hybrid Beacon (PHB) o *December, 2021 Update – Pedestrian warning signs with "300 FT AHEAD" plaques were installed in advance of Raptor Way.* - Instead, provide delineation such as guardrail to prevent pedestrians from crossing at this location; o *December, 2021 Update – consider the crash-tested aluminum pedestrian rail/fence. Note, this is considered a channelizer and not a redirective barrier like guardrail, though guardrail also deflects and may not prevent vehicle-pedestrian crashes.* - Provide guide signage that directs pedestrians to marked crosswalks in order to access Raptor Way. - Provide SMC Road MUTCD highway guide signage for road users to guide them to the Raptor Center (currently no wayfinding signage on SMC Road for the Raptor Center).

4.5 Sawmill Creek Road at Sitka National Historical Park Parking Lot

Figure 29 - Sawmill Creek Road at Sitka National Park Lot

Observations at Parking Lot:	- Driveway apron into Sitka National Historical Park has drainage issues (ponding and erosion); - The shared use path asphalt is visibly in poor condition; - Water observed pooling in various sections of the path and parking lot; - The parking lot driveway is not delineated with curb, allowing vehicles entering the parking lot to carry higher speeds when making the turn, and endangering pedestrians in the area; - The Ride uses the driveway as a stop on the city bus route; - During the field visit pedestrians were observed walking west along this path to reach the Raptor Center; - Pedestrians were observed crossing midblock without a designated crossing; - The preferred crossing maneuver is to walk east to Jarvis Street, cross at the marked crosswalk, then walk west to reach the Raptor Center; - There is no visible signage directing pedestrians to the preferred route to the Raptor Center. This may contribute to the safety issues as noted by the City of Sitka and NPS Staff; - The pooling water can cause additional safety issues during extreme weather conditions especially freezing rain/snow events; - Several vehicles were observed spinning gravel in an effort to accelerate quickly into traffic.
Improvement Options:	- As discussed in 4.4, install wayfinding guide signage near the parking lot giving pedestrians safety directions to access the Raptor Center; - Construct designated bus stop; - Redesign entrance to guide pedestrians to the marked crosswalk at Jarvis Street;

	- Install midblock crossing at Raptor Way; - Correct the drainage issue with shared use path and driveway; - Install curb and gutter to delineate the entrance and construct tighter radii to slow speeds of entering vehicles. - Alternatively, or in addition to improvements at and near this small parking lot, which is infeasible to expand at this location, the Park would like to work with the DOT&PF and City of Sitka to consider the creation of a transportation hub just southeast of the Park boundary and across SMC Road from the convenience store. There may be an opportunity to create a transportation hub that includes public transit, additional parking capacity, concessions and other amenities in order to create a holistic solution for the City. This would include a significant acquisition of private property.

4.6 Sawmill Creek Road at Jarvis Street and East End of Park

Figure 30 - Sawmill Creek Road EB approaching Jarvis Street

Observations Approaching Jarvis Street Crossing:	- Pavement markings approaching intersection are visibly faded; - Pedestrian crossing signing seems old and is not very reflective.

Improvement Options:	- Restripe pavement markings;
	  o *December, 2021 Update – Pavement markings were reinstalled with the paving project.*
	- Check retroreflectivity of existing signs and replace if needed.
	  o *December, 2021 Update – the pedestrian warning signs were replaced in advance of the crosswalk with "AHEAD" plaques for each direction. The pedestrian warning signs at the crosswalk were replaced, however, the required down arrow plaques may have not been reinstalled. They were not called out specifically in the plans.*

Figure 31 - EB Sawmill Creek path at Jarvis Street

Observations Along Path Near Jarvis Street:	- Shared used path is in poor condition; - Pooling water observed along path; - Pavement rutting present along shared use path; - Vegetation along path overgrown; - Drainage issues along ditch line. - No ADA facilities on west side (from path)
Improvement Options:	- Repave shared use path; o *December, 2021 Update – a portion of this path was repaved, likely to facilitate the ADA crossing.* - Evaluate existing drainage issues along the road edge and shared use path; o *December, 2021 Update – some improvements to this condition may have been made.* - Address issues with vegetation and evaluate the condition of asphalt in shared use path. o *December, 2021 Update – some improvements to this condition may have been made.*


Figure 32 & 33 - EB Sawmill Creek Path Beyond Jarvis Street near East End of Park

Observations near east end of Park:	- Pedestrians were observed using a path from Sitka National Park as a quick access to the convenience store on Sawmill Creek Road (as shown in Figure 32); - Pedestrian were observed crossing midblock as indicated by the informal path above in Figure 32.
Improvement Options:	- Provide better delineation and/or wayfinding signage to promote crossing at the marked crosswalk at Jarvis Street; - Improve the ditch line and evaluate condition of shared use path. o *December, 2021 Update – the culvert and gravel path from the shared use path were removed with the 2020 project, likely to discourage crossing at this uncontrolled location. The Park plans to restore the informal path within the Park boundary as well.* - Install curb and gutter along SMC Road

Figure 34 – Jarvis Street facing Sawmill Creek Road pedestrian crossing

Observations from Jarvis Street	- Crosswalk pavement markings in poor condition; - Pavement markings are not consistent with one another;

Looking toward SMC Rd.:	- Pavement visibly in poor condition; - Existing curb ramps were not perpendicular to the crosswalks at Jarvis Street and Sawmill Creek Road.

Improvement Options:	- Resurface roadway;
	  o *December, 2021 Update – the resurfacing was completed along SMC and through the return along Jarvis St.*
	- Restripe pavement markings, and ensure markings are consistent with pavement marking plans;
	  o *December, 2021 Update – pavement markings were reinstalled with the project. The same crosswalk types were used and are likely adequate.*
	- Provide separated curb ramps that are perpendicular to the crosswalk for ADA compliance.
	  o *December, 2021 Update – new ADA facilities were constructed at Jarvis St. for the crossing across Jarvis St. as well as the crossing across SMC Rd.*

5. SUGGESTED IMPROVEMENTS

This section presents the site-specific recommendations for the various sites audited during the field visits. Preliminary cost estimates are provided along with the improvements. Suggested improvements were identified by the RSA team and preliminarily discussed during the closeout meeting.

5.0 Partnership and Funding Opportunity:

In order to complete some or all of the work needed to implement the suggested improvements described below, it is advisable to partner with Alaska DOT&PF, WFLHD, and CBS to determine whether it's feasible to move forward with the proposed suggestions in this report. It is known that a DOT&PF roadway resurfacing project is currently in design and planned for execution in 2020. Some recommendations may be possible to incorporate into that project, but future projects may be planned as well.

5.1 DOT & PF Sawmill Creek Resurfacing Project

The roadway will get resurfaced from Jeff Davis Street to Smith Street. In conjunction with the repaving project, some of the signage will be updated and the pavement markings on the roadway

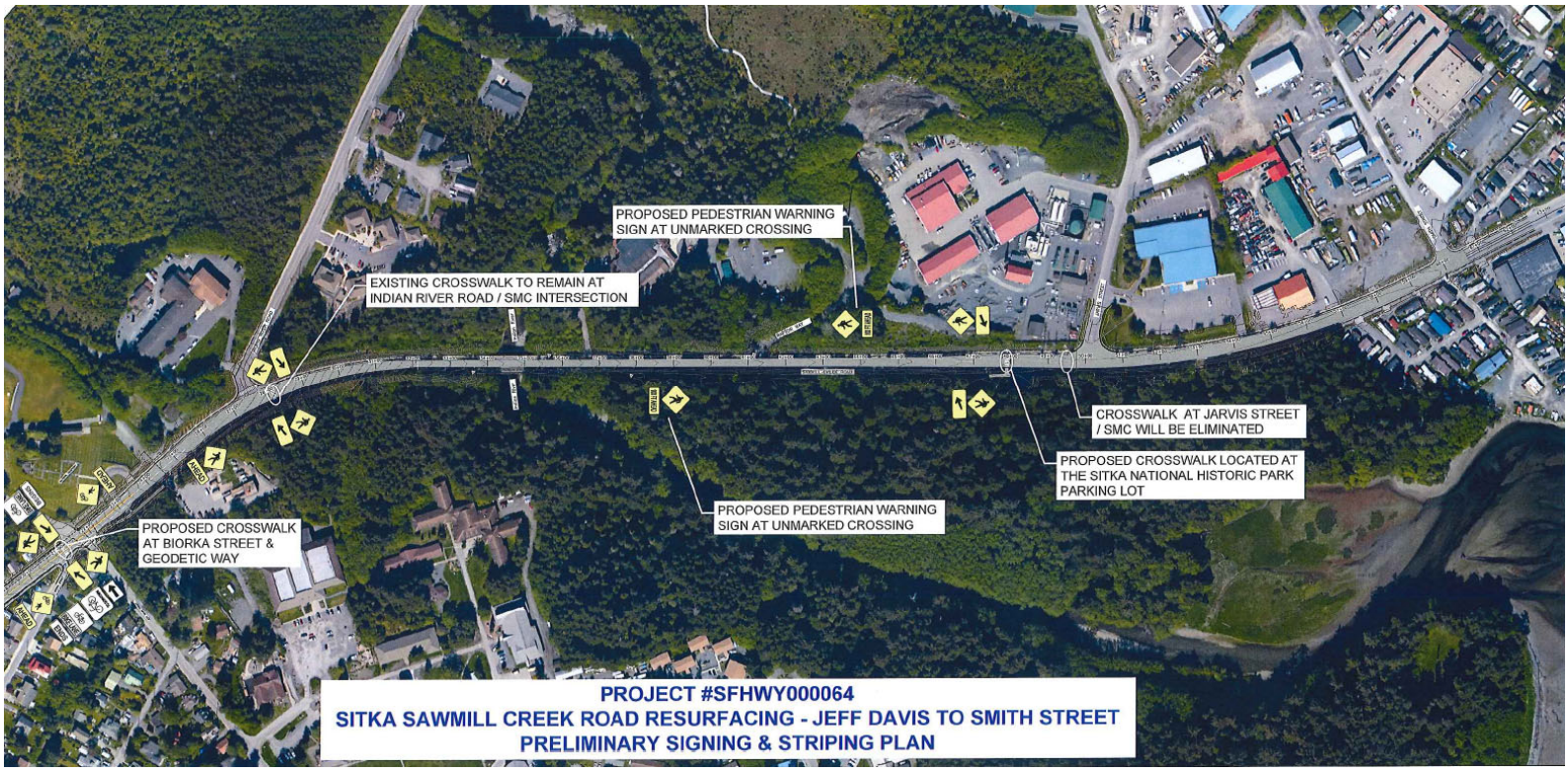

Figure 35 - Planned ADOT&PF resurfacing project.

will be reapplied. It is anticipated that many of the retroreflectivity recommendations from the report will or should be incorporated into the resurfacing project. The project intends to repair and improve curb ramps as needed and address drainage and other roadway related needs.

December, 2021 Update – the resurfacing was completed in 2020. It is assumed that all pavement markings were reinstalled in their existing configuration. As noted in Section 4, this project completed several improvements to signage, ADA ramps and localized trail reconstruction. The project also added additional corridor lighting. The crosswalk location at Jarvis St. was not modified.

Note – cost data for remaining recommendations has not been updated since the 2018 estimates.

5.2 Recommended Actions – Short-Term

The RSA team offers the following discussion and improvements with the assumption that the proposed DOT&PF project is going forward. The cost estimate breakout is included in Appendix A and includes contingencies for all estimates due to inflation and unforeseen additional expenses.

5.2.1 Sawmill Creek Road at Sisters Lane

Discussion:

High-visibility pedestrian warning signing is desired throughout the SMC corridor. It appears that the existing signs may not meet current retroreflectivity requirements.

Recommendations:

1. Replace the eastbound pedestrian warning sign with a new fluorescent sign and “AHEAD” supplemental plaque or “NEXT ½ MILE” (MUTCD W11-2 with W16-9P or W16-4P). Replace the westbound pedestrian warning sign as well with an “AHEAD” plaque. *December, 2021 Update – completed for eastbound but not westbound. Consider fluorescent yellow for higher visibility against grey skies for future updates.*

Cost estimate for this option: $4,000 (5.2.1.1)

5.2.2 Sawmill Creek Road at Indian River Road

Discussion:

Currently, the existing overhead pedestrian warning sign does not appear to be effective and visible to motorists. According to Table 1 of the FHWA Federal Lands Highway Action Plan for Implementing Pedestrian Crossing Countermeasures at Uncontrolled Locations, there are several options for improvement. The current AADT is close to 9,000 vpd, so the middle category is used with a 35 mph posted speed. The location has 3 lanes without a raised median. According to the table, the options for consideration are:

1. Install Advance Yield Here to (Stop Here For) Pedestrians signs and yield (stop) line only or
2. Install Rectangular Rapid Flashing Beacon (RRFB) with signs and markings from Number 1. Or
3. Install a Pedestrian Hybrid Beacon (PHB) with signs and markings from Number 1.

With any of the above options, a pedestrian refuge island could be constructed as well to further delineate the crossing location. With the hatched area opposing the left-turn lane, this presents a viable location for the refuge island. Curb extensions are not feasible due to the existing bicycle lanes. With all options, high-visibility crosswalk markings and crossing warning signs are recommended to supplement safety features.

Installing Advance Yield Here to (Stop Here For) Pedestrians signs and yield (stop) lines have been shown to result in crash reduction factors (CRFs) of 11-25% for various crash types and all severities in urban areas. This option shows a MUTCD reference number R1-5 or R1-5a (depending on state law) with a R1-6 or R1-6a accompanying sign mounted in the roadway at the crossing. An overhead warning sign could also be used but could be reserved for later if the other signs do not give the desired safety performance. The installation could look like Figure 1Figure 36.

Figure 36 - Advance Yield Control Signs and Pavement Markings (Ped Bike Safe)

Installing a PHB has been shown to result in CRFs of 15-69% for various crash types and severities in urban areas. Installing a PHB with Advanced Yield or Stop signs and markings (essentially including Option 1) has been shown to result in CRFs of 12-56% for various crash types and severities in urban areas. The "Safety Effectiveness of Pedestrian Crossing Enhancements" describes PHB research:

> "Studies of PHBs looked at pedestrian crosswalk compliance, pedestrian-vehicle compliance and driver yielding behavior, and results suggest very high levels of driver yielding rates which are comparable to other red signal and beacon treatments (Fitzpatrick et al., 2006). Most studies were typically completed on arterials with high levels of traffic and high speeds. Statistically significant reductions in total crashes were observed, with even greater reductions in pedestrian crashes (Fitzpatrick et al., 2010). Furthermore, the proportion of trapped pedestrians was statistically significantly reduced following the installation of a PHB (Pulugurtha et al., 2014)."

One study showed that installing a RRFB can reduce vehicle/pedestrian crashes by 47% and another study showed that rear-end vehicle crashes were reduced by 7%. The "Safety Effectiveness of Pedestrian Crossing Enhancements" describes RRFB research:

> "Many research studies have demonstrated the effectiveness of RRFBs in statistically significant increases in driver yielding behavior (Van Houtenet al., 2008; Pecheux et al., 2009; Hua et al., 2009; Hunter et al., 2009; Shurbutt et al., 2010; Ross et al., 2011; Domarad et al., 2013; and Foster et al., 2014). All these studies reported a statistically significant decrease in the number of pedestrian-vehicle conflicts and trapped pedestrians. One study also reported that enhanced crosswalks with RRFBs attracted more pedestrians even though other crossing options were present nearby (Foster et al., 2014). Many studies have recommended that RRFBs should be considered as a "highly effective" countermeasure due to their proven safety benefits (yielding),but crash performance has not yet been measured."

It is likely that both RRFBs and PHBs would have a similar benefit to safety performance at this location, so the main considerations should be cost, operations and maintenance in order to choose between these. Due to significant portions of the "daytime" hours being dark in Alaska, it is possible that RRFBs and PHBs may be even more effective than the above research, since the lighting components will be more prominent for those dark "daytime" hours.

A complete PHB system may cost $58,000 on average, with a low of $21,000 and high of $129,000 found.[1] A complete RRFB system may cost $22,000 on average, with a low of $4,500 and high of $52,000 found.[2] With utilities in the area, the RRFB would not need a solar panel system for power, therefore the cost may come in towards the lower end of the range. These costs for the RRFB and PHB systems includes supplemental signing that may satisfy some or all of Option 1. Based on the latest research, for both RRFBs and PHBs, the additional advanced stop or yield and associated pavement markings shown in Figure 36 are highly recommended to be included as well to gain the most safety benefit with the RRFB or PHB system.

Furthermore, the MUTCD gives guidelines for the use of PHBs, with Figure 4F-1 giving guidelines for speeds of 35 mph and less. With no pedestrian counts available, and limited traffic data (no

[1] http://pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=53
[2] http://pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=54

hourly traffic is believed to be available throughout SMC Road), it is difficult to fully recommend a PHB. It is recommended to gather more specific traffic data if considering a PHB.

Recommendations:

WFLHD recommends the installation of either Option 1 or Option 2. If more traffic data is collected, Option 3 may become viable as well, but is likely to be more expensive than RRFBs, without much difference in safety performance. Furthermore, the City of Sitka has installed some RRFBs, so motorists and pedestrians may be familiar with these systems already.

Cost Estimates:

- Option 1.: the approximate cost to install this system and high durable crosswalk pavement markings is $20,000 (Option 5.2.2.1)
- Option 2: the approximate cost of a complete RRFB system, associated pavement markings and curb ramps on the south/west landing is $69,000 (Option 5.2.2.2)
- Option 3: the approximate cost of a complete PHB system, associated pavement markings and curb ramps on the south/west landing is $95,000 (Option 5.2.2.2)
- Raised pedestrian refuge island to accompany all above options (Option 5.2.2.4): $3,500

For the westbound direction, it is recommended to remove the advanced curve warning sign. The curve radius is approximately 1,000 ft and there is superelevation on the roadway. Assuming the roadway is superelevated at 3.0%, and using the AASHTO minimum radii table for an max superelevation rate of 4.0% (for urban areas), the curve design speed meets the posted speed of 35 mph and therefore does not need a curve warning sign per the MUTCD. Furthermore, given the more urban context, the sign is not as effective as a rural setting.

December, 2021 Update – the 2020 project installed a push-button sign with flashing LED border around the pedestrian sign. The safety performance of this new treatment can be evaluated in the short-term to see if any other modifications are needed in the future.

The curve warning sign was replaced in-kind.

The upcoming DOT&PF project should address other roadway and pavement marking deficiencies noted near this area.

December, 2021 Update – the resurfacing was completed. It is assumed that all pavement markings were reinstalled in their existing configuration. Durable markings were used for crosswalks.

5.2.3 Sawmill Creek Road at and Approaching Indian River Bridge

WFLHD has no specific short-term improvement recommendations at this location at this time. It is recommended to evaluate the interior bridge rail and guardrail to verify that this is the desired treatment here, given that the opposite side has no interior bridge rail or guardrail.

Longer-term recommendations applicable here are listed in 5.3.2.

5.2.4 Sawmill Creek Road at Raptor Way

Discussion: Similar to the crossing at Indian River Road, this uncontrolled crossing should be evaluated for a crossing improvement.

Additional traffic and pedestrian counts would be beneficial in order to form a solid recommendation here. Relative to the corridor, since Indian River Road currently contains a "higher-level" traffic control device, it is assumed that the uncontrolled crossing at Raptor Way is used less than the crossing at Indian River Road. However, based on the evidence presented in the existing conditions, input from partner agencies, etc., this assumption may not be accurate, and a new enhanced crossing at Raptor Way may greatly benefit the safety performance of SMC Road.

Recommendations:

Therefore, WFLHD recommends a similar treatment at Raptor Way if the revised crossing in the DOT&PF project (relocated from Jarvis to just west of the NPS parking lot) does not have the intended effect of encouraging pedestrians to cross within the crosswalk rather than the uncontrolled crossing at Raptor Way. Either Option 1 or Option 2 from 5.2.2.

December, 2021 Update – the pedestrian warning signs with "300 FT AHEAD" plaques were added with the 2020 project and may improve safety performance in this area. The situation should be monitored, with additional observation and pedestrian counts, to help assess further actions. The traffic and pedestrian counts and overall transportation pattern observations should extend along SMC Road from the Raptor Way approach road through Jarvis Street and just

beyond in order to capture the midblock crossing concerns at those locations as well so that holistic solutions can be determined.

The crosswalk was not relocated from its existing location at Jarvis St. Both the existing crosswalk and an additional crosswalk at Raptor Way (plus appropriate uncontrolled mid-block crossing treatments) may be necessary. Providing separation of modes/delineation with the MASH TL-2 fence may also benefit the safety performance along the roadway.

Additionally, WFLHD and NPS discussed a desire to include wayfinding/MUTCD guide signage along SMC Road to direct road users to the Raptor Center (i.e. brown or green guide signs). Both advance signage and a wayfinding sign right at Raptor Way could be included. These, along with the pedestrian guide signage discussed in 4.4, 4.5 and 5.2.5 for users near the parking lot, should be considered to improve wayfinding for all modes. No additional costs are included in the cost estimates for the SMC Road MUTCD guide signage but costs should be very low and similar to other option cost estimates for signage.

Costs: same as 5.2.2 but no pedestrian refuge island due to only two-lanes here.

5.2.5 Sawmill Creek Road at Sitka NHP Parking Lot

If speeds turning into the parking lot continue to be higher than desired, it is recommended to install curb from the edge of pavement along mainline near the entrance around the turn to the sidewalk. The ends could be tapered down to eliminate an abrupt edge facing SMC traffic. The radii should be kept smaller (15-20') to help reduce motorists' speeds when making the turn into the parking lot. A slotted drain can be installed to help drain the low, ponding areas to the ditch. In the long term, storm sewer could be installed.

If additional guide signing does not help increase compliance with pedestrians crossing at the crosswalk at Jarvis Street or the relocated crossing just west of the lot, rather than crossing at uncontrolled points to the west, then adding an additional crosswalk near Raptor Way should be considered (see 5.2.4). The DOT&PF project indicates that the Jarvis Street crosswalk will be eliminated and moved to a new location just west of the Park parking lot. This may solve the issue of pedestrians crossing at an uncontrolled location even without additional guide signing. If the new crosswalk contains signs and pavement markings only, an RRFB or PHB could also be considered, with similar discussion as recommended in 5.2.2. Further evaluation is likely necessary.

Lastly, shared-use paths parallel to roadways that have two-way riding or walking (contraflow) can be a safety concern for motorists exiting parking lots and driveways and making a right-turn. Often, a motorist is used to only looking to the left when making a right turn onto the roadway. A bicyclist riding from right to left with respect to the motorist's field of vision may not be noticed by the motorist. A sign posted facing the parking lot near the trail crossing can alleviate this concern. Similarly, signs can be posted along the share-use path at intersections with parking lots and approach roads throughout the extent of the shared-use path.

Figure 37 - MUTCD W11-15 and W11-15P

Recommendations:

Depending on the effects of the proposed DOT&PF project on moving the Jarvis St. crosswalk, follow the recommendations for 5.2.2 for either Option 1 or Option 2. Even if the relocated crosswalk is successful with pedestrians using the crossing, enhancements in Option 1 and Option 2 are believed to be viable based on the understood use by pedestrians accessing the Raptor Way. Again, more traffic, bicycle and pedestrian data would be beneficial.

Cost: same as 5.2.2

Install the informational signing and trail crossing warning signs at the parking lot.

Cost: $7,300

Continue to evaluate speeds of vehicles entering the parking lot. If speeds remain higher than desired, install curb with a slotted drain to control speeds.

Cost: $17,800

December, 2021 Update – continue to monitor the location and consider these recommendations. Additionally, consider the creation of a transportation hub as mentioned in 4.5. As mentioned in 5.2.1, study the best location of bus stop(s) along this corridor, including here at the existing parking lot. A more formal bus stop infrastructure improvement (with pullout, shelter, signing improvements) may be desired.

Similar to 5.2.4, the Park may desire to relocate the NPS sign from SMC Road to the trail entrance as highway guide signage is added along SMC Road to indicate the Park entrance, Raptor Center, etc.

5.2.6 Sawmill Creek Road at Jarvis Street and East End of Park

Discussion:

The DOT&PF project plans to eliminate the crosswalk at Jarvis Street, but if it remains, it is a candidate for restriping and sign replacement based on conditions present at field review. Additional treatments should be considered here, similar to the recommendations in 5.2.2, 5.2.4 and 5.2.5 (advanced stop/yield signing and markings, RRFBs and PHBs). However, if the crosswalk is moved to just west of the parking lot for Sitka National Park, then these crosswalk enhancements should be considered at the new location.

Similar to the uncontrolled crossing at Raptor Way, the uncontrolled crossing from the path near the east end of the Park to the convenience store could be enhanced with Option 1 or Option 2 from 5.2.2, along with a pedestrian refuge island. Or, the culvert could be removed, the ditch regraded and seeded to remove the ease of access here and discourage crossings. However, pedestrians typically take the shortest path possible to reach their destination, regardless of safety concerns. Therefore, simply removing the ease of access here is unlikely to fully remove the concern. Moving the Jarvis Street crosswalk to the west side of the Park parking lot may increase the use of this uncontrolled crossing at the convenience store.

Recommendations:

Observe and collect data to verify next steps at these locations. Utilize Option 1 or Option 2 with pedestrian refuge islands at these locations as needed.

Cost: same as Option 5.2.2

December, 2021 Update – The culvert was removed and the ditch regraded likely to discourage crossings at this location. As mentioned in 5.2.4, continue to monitor this and the nearby crossings to determine the best long-term solutions. Pedestrians may not be as visible as desired when attempting to make crossings at various locations along SMC Road.

5.2.7 Traffic and Pedestrian Data Collection

With all recommendations, it is desired to obtain additional traffic data and pedestrian data at a minimum throughout the corridor. It may also be desired to obtain bicycle counts along the trail. A study of pedestrian directional movements overall and counts can help validate the short- and long-term plans for the corridor.

There is newer technology available to help automatically continually count bicyclists and pedestrians. Counters can be set up at key locations throughout the corridor. For vehicular counts, similar technology is available, however, some manual counts at representative times would likely suffice. It would be useful to obtain peak hour traffic data to assist with PHB guidance.

5.2.8 Roadway Lighting

The team did not evaluate the existing lighting with an illuminance meter during the field visit. Therefore, no objective conclusions can be drawn regarding the effectiveness of the existing lighting in the SMC Rd. corridor. Effective lighting can be a very important countermeasure for all crash types and severities, with CRFs ranging from 18-69%, according to the Crash Modification Factors Clearinghouse. Furthermore, adequate lighting gives drivers a sense of comfort and improves pedestrians' senses of safety and security. Light sources with "whiter" light, compared to high pressure sodium lighting, were found to be associated as safer by drivers and pedestrians.[3]

The owner agencies are encouraged to consult the FHWA Lighting Handbook, AASHTO Roadway Lighting Design Guide and online training[4] to evaluate the existing lighting and determine if additional or upgraded lighting is a practical improvement. Depending on the extent of the upgrade or improvement that may be recommended, the improvement timeline could be in the short- or long-term.

[3] https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadway_lighting_workshop/Module_1_Final/Module_1_Final.htm
[4] https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadway_lighting_workshop/

Several guidelines for lighting design are published by the American National Standards Institute (ANSI), Illuminating Engineering Society (IES) and AASHTO. These are referenced in the FHWA web-based training noted in Footnote 4.

December, 2021 Update – the 2020 project installed additional lighting in the corridor from Jeff Davis St to the Indian Creek Bridge. This is an excellent countermeasure and may complete the lighting recommendation for the corridor.

5.3 Recommended Actions – Long-Term

In the long term, the RSA team offers the following discussion and improvements. The cost estimate breakout is included in Appendix A and includes contingencies for all estimates due to unforeseen additional expenses.

5.3.1 Sawmill Creek Road at Sitka National Park Parking Lot

Discussion:

A more formal bus stop could be considered along Sawmill Creek Road, though it is tight with the current location of the shared-use path. In the long term, if the shared-use path was reconstructed and widened away from SMC Road, it could provide more room for the bus stop. The agencies should study the best long-term solution for the bus stop(s) along this corridor in conjunction with pedestrian/traffic counts and other improvements.

Cost: $76,500 (Option 5.3.1.1)

5.3.2 Sawmill Creek Road – Shared-Use Path Reconstruction, Curb and Gutter and Storm Sewer

Discussion:

In the long term, if it is desired to make the shared-use path width consistent and wide enough for true sharing (at least 10’ wide per AASHTO guidance), then the trail could be reconstructed to also alleviate pavement unevenness and some drainage issues. It appears that the shared-use path east of the study area is approximately 10’ wide.

Figure 38 - Existing Shared-Use Path Along SMC Road East of Study Area, Approx. 10' Wide

Curb and gutter can be added to better separate and delineate motorist traffic from the path when the path needs to be close to SMC Road. The gutter could be added to the existing edge of pavement so that the bike lane/shoulders can remain without alteration for additional width due to a gutter and curb adjacent to the lane. Storm sewer can be installed to control drainage. Improving drainage can help with the shared-used path maintenance and ponding concerns found in several observations in the corridor. The trail could be reconstructed slightly higher to improve drainage concerns as well. Eliminating the ditch may fit in better with the surrounding urban corridor, however, some significant costs could likely be saved by using biofiltration and other stormwater techniques to drain runoff to the existing ditches.

Figure 39 - Example of a Bioswale in Portland, OR

Curbs may begin to have some redirectional capabilities at vehicle speeds of 25 mph and less. Since most vehicle speeds in the corridor are going to be closer to 35 mph, using curbs cannot objectively improve the safety performance of a runoff the road type collision by a motorist, however, there is likely some safety improvement for trail users in the event of a lane departure with a vehicle striking the curb. Furthermore, curbs can help delineate the roadway and may improve the chances of keeping vehicles on the roadway.

The recommended clear zone, the lateral distance used by vehicles to recover during a runoff the road event, is approximately 12-14' from the existing traveled way (white edge line), per the FLH Barrier Guide For Low Volume and Low Speed Roads. SMC Road is not a low-volume road, but applicable clear zone values are only given for roads with 45 mph speeds and above in the AASHTO Roadside Design Guide. Therefore, much of the existing shared-use path is contained within the area preferred to be available for vehicle clear zone. The use of a curb will not shorten the clear zone distance guideline, as vehicles can mount curbs and still encroach beyond the curb, but there is some safety benefit to including a curb.

The drop-off near the approach of the Indian River Bridge along the shared-use trail would need to be evaluated for improvement options if the trail needed to be widened here to reach a 10' width. It appears that the existing trail width is less than 10'. Improvement options may include a geotechnical wall such as a mechanically stabilized earth (MSE) wall with a similar handrail meant to accommodate bicyclists and pedestrians (generally at least 42" in height).

Additionally, the connection from the sidewalk at the bridge to the trail along Indian River as discussed in 3.1 is included in this recommendation.

Costs for installing curb and gutter, storm sewer, shared-use path reconstruction, wall construction: $1,305,000 (Option 5.3.2.1)

December, 2021 Update – For the short sections of trail reconstruction in the 2020 project, an 8'-wide paved trail with 1' gravel shoulders was constructed. Consider wider facilities for shared use applications in the future. Consider crashworthy handrail/fence treatments to help control pedestrian and bicyclist movements in the corridor as well as provide drop-off mitigation.

5.3.3 Sawmill Creek Road – Other Improvements and Recommendations

If the existing lane widths are 11' or 12' along Sawmill Creek Road, it can be shown that reducing the lane width by 1-2', to a width of 10' or 11', while increasing the shoulder (or bike lane) width by 1-2' and maintaining the overall roadway width, will result in no change to vehicular safety performance, while improving bicyclist safety and possibly pedestrian safety as well. Furthermore, a narrowing of the lane widths may have a subtle effect on improving (lowering) speeds by motorists in the corridor. This is recommended to be included with the DOT&PF project and future maintenance. With the urban context, it lends even more credence to narrower lanes. If speeding continues to be an issue, temporary or permanent digital speed feedback signs could be utilized

to display motorists' speeds and gain compliance. These signs are known to have temporary or short-lived effects, however, similar to motorists slowing down in areas of enforcement presence.

Costs: $0 to minimal.

December, 2021 Update – the 2020 project is assumed to have reinstalled pavement markings at their existing locations, maintaining the existing widths.

Speed humps, speed cushions or speed tables are possible options for the Sawmill Creek corridor but are unlikely to be favored by a high ADT, higher speeds at 35 mph and significant transit traffic. However, they can be designed to accommodate transit and emergency vehicles with speed cushions. If they were used, they could be used at crosswalk locations (as a raised crosswalk) to add even more visibility to pedestrians and encourage lower speeds.

An enforcement presence can help keep speeds lower during peak tourist times and improve safety. Enforcement, emergency management and education strategies make up the other 3 E's in the 4 E's approach to highway safety, where engineering is the 4th approach. The public agencies in Sitka are encouraged to keep emergency management plans coordinated for best response times to crashes. Education strategies can include important safety information in NPS visitor brochures, bulletin boards, social media sites, etc. This information could direct visitors to use the appropriate crosswalks as intended.

6. CONCLUSIONS

The overall range of short-term and long-term improvements are presented in 6.1 and 6.2. Cost estimates are included in Appendix A. The DOT&PF, NPS and CBS are encouraged to discuss the suggested safety improvements and determine next steps in proceeding with improvements. The agencies are commended for their proactive approach to pedestrian, bicyclist and motorist safety to help prevent future crashes from occurring.

December, 2021 Update – since this study, the transportation safety community has stressed the importance of Complete Streets and the Safe System Approach concepts. Many of the recommendations in this study are the types included in those design approaches and will help facilitate a safer multimodal experience in the corridor.

No updates to cost estimates have been made. WFLHD can provide updated recommendations and costs as needed during further studies.

6.1 Total Cost of Short-Term Improvements

The recommendations in the short-term will be dependent on what is included in the DOT&PF project and its effects on pedestrian patterns and use. The DOT&PF is encouraged to consider incorporating the recommendations from this report and use crosswalk enhancements as identified.

The range of costs for the short-term are shown below. Each location is grouped and the corresponding total of low and high cost options are listed. Several options reference the options discussed in 5.2.2, and depend on the factors discussed above.

Low Cost Corresponding Options	Cost	High Cost Corresponding Options	Cost
5.2.1 Low Cost		5.2.1 High Cost	
5.2.1.1	$3,968	5.2.1.1	$3,968
5.2.2 Low Cost		5.2.2 High Cost	
5.2.2.1	$19,849	5.2.2.3	$95,044
5.2.2.5	$3,608	5.2.2.4	$3,467
		5.2.2.5	$3,608
5.2.4 Low Cost		5.2.4 High Cost	
5.2.2.1	$19,849	5.2.2.3	$95,044
5.2.5 Low Cost		5.2.5 High Cost	
5.2.5.1	$7,335	5.2.2.3	$95,044
		5.2.2.4	$3,467
		5.2.5.1	$7,335
		5.2.5.2	$17,810
5.2.6 Low Cost		5.2.6 High Cost	
5.2.2.1	$19,849	5.2.2.3	$95,044
		5.2.2.4	$3,467
Totals =	$74,458		$423,299

Table 3 - Short-Term Improvements Cost Range

The overall range is $75,000 to $425,000. If RRFBs are used, significant savings can be realized from the high end, as the above high costs assume the use of PHBs at all crossings, which is not desirable from an operational or cost perspective.

6.2 Total Cost of Long-Term Improvements

The long-term improvements identified above result in a cost range of $76,500 to $1,305,000. The costs for any lighting improvements are not included in these estimates.

7. REFERENCES

1. Monsere, Figliozzi, Kothuri, Razmpa and Hazel. Safety Effectiveness of Pedestrian Crossing Enhancements. December, 2016. Portland State University, PDXScholar: https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1353&context=cengin_fac

2. Action Plan for Implementing Pedestrian Crossing Countermeasures at Uncontrolled Locations. FHWA, Federal Lands Highway. August, 2019

APPENDIX A – COST ESTIMATE DETAIL

Option	5.2.1.1						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
63302-0000	SIGN SYSTEM (2 Signs)	W11-2, PED, 30" x 30", fluorescent	12.5	SQFT	$185	$2,313	Alaska projects, remote
63302-0000	SIGN SYSTEM (2 Signs)	W16-9P, AHEAD/NEXT 1/2 MILE, 24" x 12", fluorescent	4	SQFT	$185	$740	Alaska projects, remote
						$3,053	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$153	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$153	
	Contingency, 20%		1	LPSM		$611	
				Recommendation Total =		$3,968	

Option	5.2.2.1						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
63302-0000	SIGN SYSTEM (2 Signs)	R1-5a or R1-5b, 36" x 36"	18	SQFT	$185	$3,330	Alaska projects, remote
63302-0000	SIGN SYSTEM (2 Signs)	R1-6 or R1-6a, 36" x 36"	6	SQFT	$185	$1,110	Alaska projects, remote
63302-0000	SIGN SYSTEM (2 Signs)	W11-2, PED, 30" x 30", fluorescent	12.5	SQFT	$185	$2,313	Alaska projects, remote
63302-0000	SIGN SYSTEM (2 Signs)	W16-9P, AHEAD, 24" x 12", fluorescent	4	SQFT	$185	$740	Alaska projects, remote
63401-1500	PAVEMENT MARKINGS, TYPE H, SOLID	Thermoplastic for better durability	648	LNFT	$12	$7,776	
						$15,269	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$763	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$763	
	Contingency, 20%		1	LPSM		$3,054	
				Recommendation Total =		$19,849	

Option	5.2.2.2						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
63302-0000	SIGN SYSTEM (3 Sign systems total)	Complete RRFB system (assuming 3 assemblies for refuge curb island), includes supplemental signing and pavement markings	1	EACH	$50,000	$50,000	Alaska projects, remote, but no solar panels needed since local power available. Recent FLH project RRFB was $26k for the system.
61501-0100	SIDEWALK	Rebuild south/west landing/ramp to meet ADA	15.6	SQYD	$200	$3,111	Alaska projects, remote.
						$53,111	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$2,656	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$2,656	
	Contingency, 20%		1	LPSM		$10,622	
				Recommendation Total =		$69,044	

Option	5.2.2.3						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
63302-0000	SIGN SYSTEM (2 Sign systems)	PHB, includes supplemental signing and pavement markings	1	EACH	$70,000	$70,000	Alaska projects, remote. PEDSAFE website. Current warning device arm may be able to be reused on westbound side.
61501-0100	SIDEWALK	Rebuild south/west landing/ramp to meet ADA	15.6	SQYD	$200	$3,111	Alaska projects, remote.
						$73,111	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$3,656	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$3,656	
	Contingency, 20%		1	LPSM		$14,622	
				Recommendation Total =		$95,044	

Option	5.2.2.4						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
61501-0100	SIDEWALK	Raised pedestrian refuge island, 12' long by 10' wide total.	13.3	SQYD	$200	$2,667	Alaska projects, remote.
						$2,667	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$133	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$133	
	Contingency, 20%		1	LPSM		$533	
				Recommendation Total =		$3,467	

Option	5.2.2.5						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
63302-0000	SIGN SYSTEM	No studded tires (regulatory sign), assumed dimension of 5' x 3'.	15	SQFT	$185	$2,775	Alaska projects, remote.
						$2,775	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$139	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$139	
	Contingency, 20%		1	LPSM		$555	
				Recommendation Total =		$3,608	

Option	5.2.5.1						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
63302-0000	SIGN SYSTEM (1 Signs)	Pedestrian guide sign to direct Raptor Center visitors to nearby crosswalk.	16	SQFT	$185	$2,960	Alaska projects, remote
63302-0000	SIGN SYSTEM (2 Signs)	W11-15 and W11-15P on parking lot and W2-1 and W11-15P along trail for bicyclists.	14.5	SQFT	$185	$2,683	Alaska projects, remote
						$5,643	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$282	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$282	
	Contingency, 20%		1	LPSM		$1,129	
				Recommendation Total =		$7,335	

Option	5.2.5.2						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
60901-1000	CURB, CONCRETE, 12-INCH DEPTH	Curb to delineate entrance.	60	SQFT	$45	$2,700	Alaska projects, remote, small quantity.
60203-0600	18-INCH SLOTTED DRAIN PIPE	12-18" slotted drain pipe.	40	LNFT	$275	$11,000	Alaska projects, remote, small quantity.
						$13,700	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$685	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$685	
	Contingency, 20%		1	LPSM		$2,740	
				Recommendation Total =		$17,810	

Option	5.3.1.1						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
60901-1000	CURB, CONCRETE, 12-INCH DEPTH	Curb to delineate entrance.	100	SQFT	$45	$4,500	Alaska projects, remote, small quantity.
60203-0600	18-INCH SLOTTED DRAIN PIPE	12-18" slotted drain pipe.	40	LNFT	$275	$11,000	Alaska projects, remote, small quantity.
50101-0800	MINOR CONCRETE PAVEMENT, REINFORCED, 8-INCH DEPTH	Concrete pavement for bus stop.	133	SQYD	$325	$43,333	Alaska projects, remote, small quantity.
						$58,833	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$2,942	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$2,942	
	Contingency, 20%		1	LPSM		$11,767	
				Recommendation Total =		$76,483	

Option	5.3.2.1						
FLH Pay Item	**Pay Item Description**	**Supplemental Description**	**Quantity**	**Unit**	**Price**	**Line Item**	**Basis for Cost Estimate**
60901-1000	CURB, CONCRETE, 12-INCH DEPTH	Curb to delineate entrance.	3225	SQFT	$35	$112,875	Alaska projects, remote.
60203-0600	18-INCH SLOTTED DRAIN PIPE	12-18" slotted drain pipe.	40	LNFT	$275	$11,000	Alaska projects, remote, small quantity.
50101-0800	MINOR CONCRETE PAVEMENT, REINFORCED, 8-INCH DEPTH	Concrete pavement for bus stop.	133	SQYD	$325	$43,333	Alaska projects, remote.
60201-0800	24-INCH PIPE CULVERT	Storm sewer, may be able to be 18".	3225	LNFT	$175	$564,375	Alaska projects, remote.
60403-0000	INLET	Storm sewer inlets.	6	EACH	$5,500	$33,000	Alaska projects, remote.
40301-0000	ASPHALT CONCRETE PAVEMENT	Trail reconstruction. Assume base is obtained from existing trail.	470	TON	$360	$169,313	Alaska projects, remote.
25501-0000	MECHANICALLY STABILIZED EARTH WALL	Assumed 50' long, 10' tall wall.	500	SQFT	$140	$70,000	Alaska projects, remote.
						$1,003,896	
Contingent Quantities							
15101-0000	MOBILIZATION	5% of construction items	1	LPSM		$50,195	
63501-0000	TEMPORARY TRAFFIC CONTROL	Devices, 5% of construction items	1	LPSM		$50,195	
	Contingency & minor grading.	20% of construction items.	1	LPSM		$200,779	
				Recommendation Total =		$1,305,065	

APPENDIX B – SUPPLEMENTAL SAFETY INFORMATION

Crash Modification Factors used in this report, from the Crash Modification Factors clearinghouse:

CMF ID	Study Title	Countermeasure	CRF	CMF	Crash Type
9017	Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments	Install advanced yield or stop markings and signs	25	0.75	Vehicle/pedestrian
9018	Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments	Install advanced yield or stop markings and signs	11.4	0.886	All
9019	Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments	Install advanced yield or stop markings and signs	20	0.8	Rear end,Sideswipe
2911	Safety Effectiveness of the HAWK Pedestrian Crossing Treatment	Install a pedestrian hybrid beacon (PHB or HAWK)	29	0.712	All
2917	Safety Effectiveness of the HAWK Pedestrian Crossing Treatment	Install a pedestrian hybrid beacon (PHB or HAWK)	15	0.849	All
2922	Safety Effectiveness of the HAWK Pedestrian Crossing Treatment	Install a pedestrian hybrid beacon (PHB or HAWK)	69	0.309	Vehicle/pedestrian
9020	Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments	Install a pedestrian hybrid beacon (PHB or HAWK)	54.7	0.453	Vehicle/pedestrian
9021	Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments	Install pedestrian hybrid beacon (PHB or HAWK) with advanced yield or stop markings and signs	56.8	0.432	Vehicle/pedestrian
9022	Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments	Install pedestrian hybrid beacon (PHB or HAWK) with advanced yield or stop markings and signs	18	0.82	All
9023	Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments	Install pedestrian hybrid beacon (PHB or HAWK) with advanced yield or stop markings and signs	12.4	0.876	Rear end,Sideswipe

Speed cushions and tables –

Speed cushions are similar to speed humps but have "cutouts" within the bump to allow easier passage of emergency and transit vehicles, as well as some trucks to pass without any vertical deflection[5].

Figure 40 – Speed Cushion

Two field studies found a 5 to 7mph difference in the 85th percentile speed with the installation of crash cushions[6].

Speed tables are a further, similar treatment to encourage traffic calming. Speed tables may not have quite the same calming effect as speed humps or cushions, as the wheelbase on passenger cars can typically extend across the flat top, reducing the impact to the vehicle.

[5] https://safety.fhwa.dot.gov/speedmgt/ePrimer_modules/module3pt2.cfm
[6] https://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/reducing_speed.cfm

Figure 41 – Traditional Speed Table

They are harder for emergency and transit vehicles to navigate, however, an offset design can mitigate the impacts on emergency vehicles.

Figure 42 – Speed Table with Offset Design