RESOLUTION NO. 08-____

RESOLUTION OF THE TOWN COUNCIL
OF THE TOWN OF MAMMOTH LAKES, STATE OF CALIFORNIA
APPROVING MINOR AMENDMENTS
TO THE TOWN OF MAMMOTH LAKES GENERAL BIKEWAY PLAN

WHEREAS, the General Bikeway Plan was previously updated by the
Town of Mammoth Lakes in by Town Council Resolution 02-25; and,

WHEREAS, the General Bikeway Plan is reviewed and updated as needed
every two years to provide consistent guidance to the Town's bicycle
transportation system; and,

WHEREAS, the 2002 General Bikeway Plan requires minor amendments to
provide continued bikeway transportation guidance;

NOW, THEREFORE, BE IT RESOLVED, that the Town Council of the Town
of Mammoth Lakes, California, hereby approves amendments to the General
Bikeway Plan in the form of the 2008 addendum.

APPROVED AND ADOPTED this 15th day of October 2008.

_____________________
Wendy Sugimuara. Mayor

ATTEST:

_____________________
Anita Hatter, Town Clerk
2008 General Bikeway Plan Addendum

Town of Mammoth Lakes, CA

October 15, 2008
This addendum is an update of the Town of Mammoth Lakes General Bikeway Plan. The Town of Mammoth Lakes General Bikeway Plan was considered by the Town in the fall of 1995 and approved by the Mono County Local Transportation Commission on November 7, 1995. An Addendum to the plan was approved in 1997 (General Bikeway Plan Addendum, March 10, 1997) and 1999 (General Bikeway Plan Addendum, December, 20, 1999). The present Addendum does not change bikeway alignments, projects or other physical considerations proposed in the 1995 General Bikeway Plan or in the 1997 or 1999 Addendum. The last addendum to this plan was adopted with the Town Council Resolution 02-25. This addendum updates the figures and maps, costs estimate data, and replaces Town Council Resolution 02-25. Figure 1 and 2 locate the Town of Mammoth Lakes within the State of California along the eastern side of the Sierra Nevada Mountains. The community is a gateway to public lands and a year round destination resort. Figure 3 is updated to provide permanent population projections through 2025 as shown in the 2007 General Plan. The visitor population swells to 35,000 during the summer and winter and is projected to be 52,000 in 2025. Figure 4, 5, 6, 7, 8, 9, and, 10. Figure 11 was updated to include the Library, Ice Rink, and Cero Coso College. Figure 12 was updated to indicate our current transit routes. Thee Town now has year round transit since the passage of a 1% increase in Transient Occupancy Tax. and 8 was updated to make the graphic easier to read. updated

Estimated Existing and Increased Bicycle Commuters - Section 891.2(a)

This section includes the estimated number of existing bicycle commuters in the plan area and the estimated increase in the number of bicycle commuters resulting from implementation of the General Bikeway Plan.

Existing Bicycle Commuters

Existing bicycle traffic estimates in the 1997 Addendum were delineated based on intersection counts conducted by Omni Means, Ltd.1 And by L.K. Johnston and Associates.2 Bicycle traffic estimates also utilized information contained in other successful grant applications submitted to Caltrans.3 Besides intersection counts, estimates for bicycle traffic were based on generation rates per residence and generation rates per vehicular ADT.4 These data were supplemented by comparison to traffic counts conducted as part

1 Intersection traffic counts, Juniper Ridge EIR, October 238, 1989.
2 Intersection bicycle counts conducted November 7, 1990 and November 10, 1990.
3 City of Merced BLA grant applications, Caltrans, District 10; Bear Creek Bridge, M Street Under crossing, Bear Creek to Olive Avenue Bikeway, 1986-88. Town of Mammoth Lakes BLA grant applications, Caltrans, District 9, Schools Bikeway Proje5ct, 1990; Old Mammoth Road Undercrossing, 1991 Meridian Trail, Caltrans 1992.
4 It should be noted that data used for estimating bicycle trips are limited in both the number of counts conducted, the timing of the counts and the purpose of the counts. However, for estimating bicycle traffic, they are the best available data.
Population Growth Projections
Source: US Census Bureau and TOML General Plan

Figure 3

Population

Year


@1.4%*  @2.4%*

*Min & Max Population Growth per General Plan
of the Town for Mammoth Lakes General Plan and counts conducted by RKJK and Associates.⁵

A review of these estimates for this 2008 Addendum reaffirmed the previous methods and estimates. Using these data, the number of existing commuting bicycles can be roughly estimated both as a function of street traffic (ADT) and as a function of residential units. As a function of street traffic, the number of existing commuting cyclists per vehicular ADT has been estimated as 0.01 (see Figure 14). As a function of residential units, the total number of existing commuting cyclists has been estimated at 0.1 commuting cyclists per residence. The present number of residential units in the Town of Mammoth Lakes is approximately 9,000. At 0.1 commuting cyclists per residence this would result in 900 existing commuting cyclists throughout the Town. Annual comprehensive cyclist and path user counts are planned in future years which may include automated count stations at key locations.

Projected Bicycle Commuters

Estimates for projected commuting bicycle traffic were based on generation rates per residence and generation rates per vehicular ADT. The generation rate per residence method makes it possible to calculate future bicycle traffic originating from both existing development as well as future residential development proposals. In addition, it is expected that the installation of bikeway facilities will result in increasing commuter bicycle generation rates, above the present estimated rates of 0.1 per residence and 0.01 per ADT. For purposes of projecting commuting bicycle traffic after implementation of the General Bikeway Plan, an increased generation of 0.02/ADT and 0.2/residence appears well within the reasonable limits. As a function of projected ADT, the results are shown in Figure 15. As a function of residential units the number of commuting cyclists is expected to be 2,346 (based on 11,730 residential units at build out in the Town⁶ x 0.2 commuting cyclists per residence).

Completion of the core bicycle transportation plan is expected to increase usage on some segments of the system to 1000 bicycle ADT or more in peak season, which includes commuter cyclists and other users. The Town 2007 General Plan places a high priority on circulation with feet first and bicycle, first, transit second and vehicles last as way of travel and commute around town. One of the elements of this goal is the development and adoption of a comprehensive Mobility Plan that is currently underway. A comprehensive update of this plan is expected upon adopting of the Mobility Plan and the Mammoth Lakes Trails Master Plan that is currently in draft form.⁷

Land Use and Settlement Patterns - Section 891.2 (b)

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⁶ Town of Mammoth Lakes Planning Department September, 2001: 3470 SFR, 2400 MF, 5700 Condos, 160 MH.
This map is for reference purposes only and is not intended to provide legal descriptions of lots or other physical features. Any information on this map is subject to change without notice at any time.
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Legend
- X-Country Ski Trails
- Town & County Roads
- Planning Area
- Town Boundary
- Groomed X-Country Trails
- Mammoth Nordic
- Groomed X-Country Trails
- USFS
- Groomed X-Country Trails
- Tamarack
- Highways

*Technical Revision Required by RPA-LTC

This map is subject to change without notice at any time.
FIGURE 9

Legend

Land Use with Generalized Residential Density

- Commercial-1 (C1)
- Commercial-2 (C2)
- Resort (R)
- High Density Residential (HDR-1)
- Industrial (I)
- Low Density Residential (LDR-2)
- North Village Specific Plan (NVSP)
- Open Space (OS)
- Institutional / Public Facilities (IP)
- National Forest (NF)

This map is for reference purposes only and is not intended to provide legal descriptions of lots or other physical features. Any information on this map is subject to change without notice at any time.
This map is for reference purposes only and is not intended to provide legal descriptions of real or other physical features. Any information on this map is subject to change without notice at any time.
This map is for reference purposes only and is not intended to provide legal descriptions of land or other physical features. Any information on this map is subject to change without notice at any time.
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Legend
Existing Bicycle Commuters as a Function of Projected Vehicular ADT * Based on 2007 General Plan EIR

- **Town Road ROW**
- **Class I Bikeway off street - Future path marked and signed**
- **Class I Bikeway off street - Existing path marked and signed**
- **Class II Bikeway on street - Lane marked and signed**
- **Class III Bikeway on street - route signed only**

* Based on 2007 General Plan EIR
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Legend

Existing and Proposed

- Town Road ROW
- Class I Bikeway off street - Future path marked and signed
- Class I Bikeway off street - Existing path marked and signed
- Class II Bikeway on street - Lane marked and signed
- Class III Bikeway on street - route signed only

- Bicycle Parking Area
- Bicycle Staging Area

This map is for reference purposes only and is not intended to provide legal description of lots or other parcel boundaries. Any information on this map is subject to change without notice at any time.
End-of-Trip Bicycle Parking Facilities – Section 891.2 (d)

The major end-of-trip bicycle parking facilities are shown in Figure 17a and 17b. Business establishments provide many of these facilities. The Town proposes to incorporate bicycle parking facilities (e.g., bicycle racks) in future public funded facilities and private projects when feasible.

Bicycle Transport / Parking Facilities and Connections with Other Modes of Transportation – Section 891.2 (e)

A map of the local transit routes is contained in the 1995 General Bikeway Plan (Figure 12 of the 1995 GBP). Figure 12 has been updated to show the existing transit routs and Transit stops. Transit stops are found along these transit routes. Bicycles are allowed on transit buses. As the use of bicycles increases, buses are planned to be equipped with bicycles trailers to accommodate the increase demand. The Town does not have rail or other improved transit terminals, ferry docks and landings, or park and ride lots at present.

Changing and Storing of Clothes / Equipment – Section 891.2 (f)

No modifications are proposed by this 2008 Addendum. The average distance for commuting cyclists in the Town is less than three miles so the need for lockers, restrooms, shower facilities, changing facilities, clothing and equipment storage is very limited. As a matter of local custom, the level of dress in the Town is substantially less than what it would be in larger urban areas. Most commuting cyclists can wear to work what they cycle in. As such, the Town does not propose public changing equipment storage areas as part of the General Bikeway Plan. There is a discussion of a potential need for showers and changing facilities in the draft Mammoth Lakes Trails Mater Plan. An evaluation and public outreach of that document may demonstrate a need for ancillary facilities that will be incorporated into this plan in the future.

Bicycle Safety and Education Programs – Section 891.2 (g)

The Town of Mammoth Lakes Police Department continues to have an ongoing program of bicycle safety and education primarily oriented toward elementary school-aged children. The program includes a yearly “Bicycle Rodeo” for all grades, bicycle inspection, bicycle safety handouts, and bicycle registration. The Bicycle Rodeo focuses on riding safety and instruction, helmet use, traffic sign recognition, bicycle lane use, handling cross-walks, hand signals, etc. Bicycles are checked for safety features such as seats, handlebars, brakes, and tires; a special sticker is issued showing inspection. The program is conducted on a yearly basis. Safety handouts are also available for younger children in the first and second grades. Although there is no specific study on bicycle accident reduction, officials believe the program is very helpful and plan to continue it yearly.  

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8 Office David Dorman, Town of Mammoth Lakes Police Department.
Two maps, which are presently in the 1995 General Bikeway Plan, are the Town of Mammoth Lakes General Plan have been updated and Major Destination Areas (Figure 11). A third map was added with the 1997 Addendum, Figure 16, which shows generalized residential areas (higher density areas and lower density areas) of the Town.

Taken together, these three maps delineate the land use settlement patterns and likely commute cyclist destinations. Updates to these maps in this addendum include; the existing path that parallels Load Star Drive between Meridian Boulevard and Majestic Pines including a connection to Hidden Valley Road; a path between Mammoth Community Library to Cerro Coso College and continuing past the new student housing and connecting to the Main Path along Mammoth Creek; class 2 bike lanes on Mammoth Scenic Loop; showing the Lake Mary Bike Path as a Class 1 bike path; indicate a class 1 bike path between Mammoth Creek Park and Meadow Lane, another connection between Manzanita and the Hidden Creek Project site, and a connection from Hidden Valley Road to Minaret Road. These connections are shown on the updated Figures with this 2008 Addendum.

**Existing and Proposed Bikeways - Section 891.2 (c)**

The figures in the maps showing the information contained in the 1995 General Bikeway Plan (Figure 4,5,6,7,8, & 13 of the 1995 GBP) have been updated to clarify the graphics form the 2007 General Plan. Trail design is conceptual only. Actual alignment, design and appearance may be affected by the environmental review and the architect’s approved construction design.
Citizen and Community Involvement – Section 891.2 (h)

The 1995 General Bikeway Plan contains this information. It should be noted that four public hearings were held to adopt the 1995 General Plan and the 1997 Addendum (Parks and Recreation Commission, Planning Commission, Town Council and Mono County Local Transportation Commission). This update included three public meetings as follows: the Tourism and Recreation Commission, the Mobility Commission, and the Planning Commission at public meetings and comments were positive and each commission recommend approval of this 2008 addendum. The Town Council held a Public Hearing on October 15, 2008 for this addendum.

Coordination with Other Plans – Section 891.2 (i)

The 1995 General Bikeway Plan contains this information; no modifications are proposed by this 2008 Addendum. The plan is integrated with the Mammoth Mountain Ski Area bike park, connections with other single track trails on the USFS lands. The new transit routes and stops are shown on the updated Figure to integrate the system for multiple modes of transportation in reaching a particular destination.

Proposed Projects and Implementation Priorities – Section 891.2 (j)

The following are the remaining proposed projects and implementation priorities for the General Bikeway Plan:

<table>
<thead>
<tr>
<th>Project</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library, Cero Coso College, Student Housing Connector Path</td>
<td>1</td>
</tr>
<tr>
<td>Lake Mary Road Bike Path enhancements and completion</td>
<td>2</td>
</tr>
<tr>
<td>Segment 4a (from Mammoth Creek Park to Minaret Road)</td>
<td>3</td>
</tr>
<tr>
<td>Segment 4b (Waterford Ave and bridges)</td>
<td>4</td>
</tr>
<tr>
<td>Segment 4b Minaret Road Undercrossing (north of Old Mammoth Road)</td>
<td>5</td>
</tr>
<tr>
<td>Minaret Road Undercrossing (north of Meridian Boulevard)</td>
<td>6</td>
</tr>
<tr>
<td>On street Bikeways completion</td>
<td>7</td>
</tr>
<tr>
<td>Miscellaneous Connecting Bikeways</td>
<td>8</td>
</tr>
<tr>
<td>Miscellaneous Bicycle Facilities (racks, transit trailers, etc.)</td>
<td>9</td>
</tr>
</tbody>
</table>

Past Expenditures and Future Financial Needs – Section 891.2 (k)

The Town of Mammoth Lakes, along with the assistance of new development project/fees and BLA (BTA) grants and other grants, has expended or has received approval for projects costing approximately $16.1 million. Estimated future financial needs for the projects listed in the previous section are shown below:

<table>
<thead>
<tr>
<th>Project</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Library, Cero Coso College, Student Housing Connector Path</td>
<td>$1,050,000</td>
</tr>
</tbody>
</table>
2. Lake Mary Road Bike Path enhancements and completion $1,750,000
3. Segment 4a (from Mammoth Creek Park to Minaret Road) $500,000
4. Segment 4b Minaret Road Undercrossing (north of OMR) $500,000
5. Segment 4b (Waterford Ave and creek Crossing) $2,000,000
6. Minaret Road Undercrossing (north of Meridian Blvd.) $500,000
7. On Street Bikeways Completion $500,000
8. Miscellaneous Connecting Bikeways $500,000
9. Mammoth Scenic Loop Bike Lanes $1,000,000
9. Miscellaneous Bicycle Facilities $200,000

Total $9,450,000

Appendix Revisions

No changes to the Appendix A, B, or C are proposed by this 2002 Addendum. Appendix D is added to document the Lake Mary Road Design Criteria. Appendix A of the 1995 General Bikeway Plan was amended by the 1997 Addendum to include the latest versions of excerpts from the Objectives and Policies of the Mono County Regional Transportation Plan. Appendix B of the 1995 General Bikeway Plan was amended to include the latest version of the State of California Highway Design Manual, Chapter 1000, Bikeway Planning and Design. Appendix C, Environmental Documentation is included on the next page of this Addendum (i.e., Notice of Exemption under 15164 of CEQA Guidelines). Appendix D is included for the Lake Mary Road Bike Path Engineering Report.
ENGINEERING REPORT – Lake Mary Bike Path

General

Bikepath design guidelines are presented in the American Association of State Highway and Transportation Officials (AASHTO) “Guide for the Development of Bicycle Facilities”, 1999 edition\(^1\) (AASHTO Guide). The AASHTO guide provides design recommendations and also measures to mitigate areas of a bikepath where the design varies from their recommendations. This report presents a description of the Lake Mary Bike Path design providing discussion where the path is in conformance with the AASHTO recommendations and the mitigations implemented where the design deviates from those recommendations.

Project

The Lake Mary Bike Path (Bike Path) is a shared use (both bicycle and pedestrian), Class 1 (separated from traffic) bike path located in the town of Mammoth Lakes, Mono County, California. The design alignment of the Bike Path starts at the Horseshoe Lake parking area (Station 1+00.00 Bike Path alignment) and ends at the intersection of Lake Mary Road and Minaret Road (State Route 203) (Station 558+63.40 Bike Path alignment). The two figures following this page present the alignment of the path. The total length of the Bike Path is approximately 5.3 miles (27,980 linear feet (lf)) long. Of this, approximately 24,900 lf is a Class 1, shared use, two-way paved path; 740+/- lf is the rehabilitation of an existing shared use path; 1,810+/- lf is a Class 3 “share the road” path along Twin Lakes Loop Road; and 540+/- lf is a Class 2 bike lane striped on either side of Lake Mary Road.

The following description of the path begins at Minaret Rd going up to the Mammoth Lakes basin which is opposite of the plan alignment stationing discussed in the last paragraph.

From Minaret Road to just north of the Twin Lakes bridge, the Path will generally parallel Lake Mary Road. Along this section, the Bike Path is either adjacent to Lake Mary or meanders slightly away from the road. The path includes a new tunnel adjacent to the existing Lake Mary Rd tunnel near Juniper Ridge.
Prior to crossing the Twin Lakes Bridge, the single Bike Path diverges into two paths, one-way on each side adjacent to Lake Mary Road. The two Class 2 one-way paths continue for approximately 415 feet, until the Bike Path leaves Lake Mary Road and joins the existing Twin Lakes Loop Road. The Bike Path continues along the Loop as a class 3 “share the road” path for approximately 1,800 +/- feet passing by Tamarack Lodge leaving Twin Lakes Loop Road at the campground entrance onto an existing Class 1 path aligned adjacent to Twin Lakes for approximately 740 feet. This existing path will be rehabilitated with aggregate base and asphalt. The Path leaves the existing path near the Twin Lakes General Store and meanders through the wooded areas uphill toward Lake Mary Road for approximately 2,200 feet. The new Class 1 Bike Path generally parallels Twin Lakes Loop Road along this portion of the alignment. Approximately 200 feet from the intersection of the Twin Lakes Loop and Lake Mary Roads the Path turns south running parallel with Lake Mary Road for approximately 2.1 +/- miles to the Horseshoe Lake parking / picnic area.

Approximately 1.5 miles of Lake Mary Road will be realigned to accommodate the Bike Path. These portions are between the Twin Lakes bridge (Station 1402+30 Lake Mary realignment) to the Lake Mary tunnel (Station 1455+35 Lake Mary realignment), and from 3,300+/- feet north of the Lake Mary tunnel (Station 1530+00 Lake Mary realignment) to Minaret Road (Station 1558+64 Lake Mary realignment).

The Bike Path includes the construction of approximately 23,500 linear feet of new paths, construction of bridges, retaining walls, curb and gutter, associated grading and drainage improvements, rehabilitation of an existing path, the realignment of portions of Lake Mary Road, and associated signage and symbols.

**AASHTO / DESIGN MANUAL GUIDELINES AND RECOMMENDATIONS**

The AASHTO Guide\(^1\) and Design Manual\(^2\) have guidelines and recommendations that should be implemented, when possible, in the design of bike paths. Where a bike path deviates from the design recommendations mitigation measures are recommended such as posted speed limits and warning signs to warn the cyclist prior to encountering the design modification. The majority of the Bike Path is to be a Class 1 “Shared Use Path”, which is a facility for use by non-motorized transportation (other than motorized wheelchairs), and
with minimal cross flow by motor vehicles. Recommendations for shared use paths include, but are not limited to:

- **Separation** – Per AASHTO Guide¹, when a two-way shared use path is located adjacent to a roadway, separation from the edge of pavement of 5 feet or more is desirable. If the distance between the edge of the shoulder and the path is less than 5 feet, a suitable physical barrier is recommended.

- **Width and Clearance** – Based on the AASHTO Guide, the minimum paved width for a two-way shared use path shall be 10 ft and the minimum paved width for a one-way bike path shall be 5 feet. A minimum 2-foot wide graded area shall be provided adjacent to the pavement. However where bicycle and pedestrian traffic is expected to be low (even on peak days or hours) there will be safe and frequent passing opportunities and AASHTO allows a reduced path width to 8 feet which is also the minimum width recommended in the Design Manual. Where the path is adjacent to down slopes steeper than 3:1, a 5-foot minimum shoulder is recommended from the edge of the path to the top of the slope. If this recommendation cannot be met a physical barrier is recommended as mitigation depending on the height of the slope adjacent to the path, or if the condition at the bottom of the slope warrants it.

- **Design Speed** – Based on the AASHTO Guide¹ a design speed of 20 mph is recommended where path grades are less than 4% and 30 mph where path grades exceed 4% for long stretches of the path. The Design Manual², Section 1003.1 recommends a design speed of 25 miles per hour (mph) for a Class I “shared use” bike path. The design speed affects the radius of horizontal curves used in the path design. A 20 mph design speed allows for a smaller radius curve than a 25 mph design speed. In addition the stopping sight distance is also shorter for a 20 mph design speed.

- **Horizontal Alignment** – The desired minimum radii for paved shared use paths at a design speed of 20 mph, and a lean angle of 15° (maximum lean angle for casual bicyclists is 15-20°) is 100 feet. The desired minimum radii with a design speed of 25 mph and lean angle of 20° is 155 feet. When smaller radii must be used, curve warning signs, supplemental pavement markings and/or widened pavement are recommended to be used.
Lake Mary Road Bike Path

- **Grade** – Grades should be kept to a minimum. Though grades of greater than 5% are not desirable it is recognized that this condition can be unavoidable in design of a bike path due to existing terrain constraints. Therefore AASHTO provides the following design recommendations where the bike path grade must exceed 5%. This recommendation limits the length of path at a particular grade which is listed as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6%</td>
<td>up to 800 feet</td>
</tr>
<tr>
<td>7%</td>
<td>up to 400 feet</td>
</tr>
<tr>
<td>8%</td>
<td>up to 300 feet</td>
</tr>
<tr>
<td>9%</td>
<td>up to 200 feet</td>
</tr>
<tr>
<td>10%</td>
<td>up to 100 feet</td>
</tr>
<tr>
<td>11+%</td>
<td>up to 50 feet</td>
</tr>
</tbody>
</table>

Mitigations to the design where the maximum recommended length of path is unavoidable at the steeper grades listed above are also provided by AASHTO. The mitigations include additional pavement width to allow bicyclists to dismount and walk; signage alerting the cyclist to the upcoming steep grade and posting of a speed limit for descending cyclists.

- **Sight Distance** – Bike paths should have adequate stopping sight distances. For a design speed of 20 mph with a grade of 5%, the minimum stopping sight distance is approximately 140 feet; for a 10% grade at the same design speed, the minimum stopping sight distance is approximately 160 feet. Where necessary, AASHTO recommends advanced signage should be posted on the path to warn cyclists.

- **Path-Roadway Intersections** – There are three basic intersections between a path and roadway: midblock, adjacent and complex.

  Midblock intersections should be far enough away from road intersections to be clearly separate from those road intersections. For a skewed crossing, a minimum 45° crossing angle may be acceptable.

  Adjacent path crossings should be integrated close to the intersection to allow motorists and path users to recognize each other as intersecting traffic.

  Complex intersection crossings need to be considered on a case-by-case basis, as the crossing layout will vary.
With all crossings, various design considerations should be taken into account, including, but not limited to: right of way assignments, traffic control devices, sight distance, transition zones, approach treatments, refuge island use, access control, pavement markings, and separation distance between the road and path.

- **Signing and Marking** – Adequate signing and marking is essential in the design of bike paths. Some recommendations include a 4-inch wide yellow center line stripe; pavement markings at crossings; and warning signs as discussed previously for sharp turns, steep grades and upcoming intersections.

- **Pavement Structure** – The recommended surface type for a path is a hard, all-weather pavement surface, such as asphalt or concrete. The path should be constructed and maintained as a smooth riding surface. AASHTO does not provide a recommended minimum pavement thickness for a path however the Design Manual does so recommending a minimum pavement thickness of 2 inches.

- **Structures** – The minimum clear width of the path along a bridge or through a tunnel should be the same as the approach paved path, plus a 2-foot wide clear area. Barriers on both sides should be a minimum of 42-inches high.

- **Drainage** – Adequate drainage is provided with the recommended minimum cross slope of 2%. It is also recommended to slope in one direction with a smooth surface. The path is located on the side of a hill and the storm water is allowed to flow across the path in a historic manner. It is not recommended to add a swale on the uphill side of the path, which would concentrate the flow and alter the natural flow pattern. Since this path is recreational, it is not anticipated to be used during the storm events. If catch basins are necessary, they should be located outside of the travel path. Natural ground cover should be preserved as much as possible, and seeding, mulching and sodding of erodible areas should be considered.

- **Lighting** – Fix-source lighting is recommended by the AASHTO Guide\(^1\) for if night time use is anticipated. Lighting of tunnels is also recommended where the length of tunnel reduces interior lighting to less than 5 lux.

- **Shared Use with Motorbikes, Horses and Snowmobiles** – AASHTO recommends a shared path be limited to bicycle and pedestrian traffic, horse riding should not be
allowed. In the winter months if snow removal will not occur the path may be used by cross country skiers or snowmobiles.

- **Bicycle parking facilities** – AASHTO recommends facilities for parking bicycles should be provided at the beginning and ending of the path. These facilities should offer protection from theft and damage.

- **Additional Bicycle Amenities** – There are several other amenities that are recommended by AASHTO to complement the path. These include, but are not limited to: turnouts, rest areas, view points, interfacing with public transport, and bikeway maps.

**LAKE MARY BIKE PATH DESIGN AND MITIGATIONS TO DESIGN MODIFICATION**

The AASHTO Guide\(^1\) and the Design Manual\(^2\) guidelines and recommendations were taken into account and implemented, when possible, in the design of the Bike Path. In some instances, the recommended design standards could not be attained, due to factors like the mountainous terrain the path follows. AASHTO recommended mitigation measures were implemented for the portions of the path where the design could not maintain the recommendations. The following discusses the design of the Lake Mary Bike Path (Path) with respect to the AASHTO recommendations and mitigation measures implemented in the Bike Path design.

- **Separation** – A significant portion of the Path could not be designed to meet the recommended separation from the edge of pavement of 5 feet or more without the construction of a curb and gutter along Lake Mary Rd. The addition of the curb and gutter eliminates the need for a paved shoulder which provides a vehicle recovery zone adjacent to the traveled way as recommended by both AASHTO and the Design Manual. The addition of a vertical curb and gutter 1 to 2 feet from the edge of the traveled way eliminates the need for a paved shoulder. This reduced the necessary paved width of Lake Mary Rd creating the recommended separation of 5 feet from the flowline of the curb and gutter. The need for the curb and gutter on
Lake Mary Road occurs from Path Station 401+34 to Path Station 558+51. This length of Path starts at the bridge at the outlet of Twin Lakes down to the terminus of the Path at Minaret Road. Lake Mary Road was constructed on the steep side slope of Mammoth and Lincoln Mountains and the existing road bed width was not wide enough to provide for construction of the Path with the recommended separation between the Lake Mary Rd paved width with a paved shoulder.

Between Path stations 100+00 and 344+17, the Path generally follows either Twin Lakes Loop Road or Lake Mary Road, mostly in the wooded areas, with a significant separation from both roadways. However between stations 231+42 and 244+40, the path is located adjacent to Lake Mary Road. Recommended separation from the road cannot be maintained due to both areas of wetlands and the Mammoth Lakes Pack Station. Where the 5-foot separation between the path and roadway cannot be maintained along this length a log curb barrier will be installed.

- **Width and Clearance** – The majority of the Path is an 8-foot ac pavement path with 2-foot shoulders on each side of the Path. This is the recommended design width by AASHTO for paths with light pedestrian and bicycle use. The justification that the Path will have light use is: the Town population base is small and the Path will be used for recreation mainly and not a source of transportation to the Lakes Basin as the Path climbs close to 1000 feet over 5 miles. Due to the light use safe and frequent passing opportunities will occur along the path.

There are several places along the path where the 2 foot dirt shoulder is not adequate clearance per AASHTO recommendations. AASHTO recommends at least 5 feet of shoulder where a bike path is adjacent to a down slope that is steeper than 3:1 which occurs in numerous places along the Path. Where a 5 foot shoulder is not possible along the Path the AASHTO design mitigation recommendation of a barrier such as a 4.5 ft high guardrail will be used. Some of the locations along the Path that will require the guardrail include:

Stations 130+20 to 130+75, 136+08 to 136+82, 137+25 to 139+00, 140+30 to 141+47, 215+75 to 216+46, 405+95 to 406+55, 407+46 to 421+45, 424+31 to 426+31, 428+10 to 452+80, 454+25 to 455+10, 462+98 to 463+92, 507+75 to 517+25, 524+90 to 525+80, 530+88 to 545+98, 545+98 to 546+57, and 556+87...
to 558+51. A barrier is not limited to these locations, during any future design and/or construction, if field situations dictate, additional barriers may be required and will be installed.

- **Design Speed and Horizontal Alignment** – A design speed of 15 mph was used for the Path. The design speed is not in conformance with either AASHTO or the Design Manual recommendations which are 20 mph and 25 mph respectively. There are numerous reasons the design speed was reduced to 15 mph. The reasons include: environmental constraints which are limiting tree removal, avoidance of archeological sites and wetlands and existing horse trails; the restricted location of the Path to the existing path through the Twin Lakes Campground; and the general terrain associated with the path which as stated previously includes almost a 1000 ft elevation difference between the beginning and ending of the Path. A minimum radius of 50 feet is used for the design speed of 15 mph, along with a lean angle of 15°. Due to the reduced design speed and short radii associated with the design speed there will be constant signage placed along the Path stating the speed limit of 15 mph. Also at several locations throughout the Path alignment warning signs will be placed designating where a very windy section of Path will occur and where potentially hazardous situations occur such as the tunnel and approach to roadway crossings. Supplemental pavement markings striping the centerline of the Path to demarcate lanes will also be utilized to control speed. In some areas of significantly tight curves the Path will be wider at those locations.

For example, from Station 331+21 – 333+19, the pavement is widened from the 8-foot width to 12-foot width, and signage is to be installed at the beginning and ending station.

- **Grade** – Due to topographical features of the mountainous terrain, the recommended 5% maximum grade rate could not be maintained over the entire path. The grades for all of the new portions of the Bike Path range from flat (0.0%) to a maximum 10%. Recommendations for the maximum grade length where followed, where possible, when the grade was greater than the desired 5%. In some locations, due to the terrain, the grade length was longer than the recommendation presented previously. Mitigation measures used in places where
At another example, from Station 307+00 – 310+40, the grade rate is 10% and the design at these locations, and the crossings were designed individually based on specific criteria at that location. At various crossings, the design included: curb ramps, signage on the path and road, pavement markings on the path and road, traffic control devices, sight distance, transition zones, and approach treatments.

- **Sight Distance** – The Path design incorporated the recommended sight distance where possible, by using the minimum stopping sight distance, minimum vertical curve length and the minimum clearance for line of sight obstructions. Where it was not feasible due to terrain conditions, trees or other topographical features, additional design features were included. These features include, but are not exclusive to, path sectioned widened, adding a center lane stripe and the installation of “Curve Ahead” warning signs.

- **Path-Roadway Intersections** – Along the Bike Path, there are several locations where the path crosses a roadway or driveway. The crossings are designed to be perpendicular to the road and crossings which are close to an intersection but not at the intersection, have been designed to ensure there is a distance between the street intersection and the crossing. Many variables were considered in the path design at these locations, and the crossings were designed individually based on specific criteria at that location. At various crossings, the design included: curb ramps, signage on the path and road, pavement markings on the path and road, traffic control devices, sight distance, transition zones, and approach treatments.

- **Signing and Marking** – Adequate signing and marking is incorporated in the design of the Bike Path.
• **Pavement Structure** – The surface type for the Bike Path is asphalt concrete (a.c.) pavement on aggregate base. The thickness of the a.c. pavement and base varies based on sections in the plan set.

• **Structures** – The Bike Path has one undercrossing (tunnel) and some bridge crossings. The design of both the tunnel and the bridges includes the minimum clear width of the path through the tunnel, and along the bridges are the same as the approach paved path, plus a 2-foot wide clear area. Barriers on both sides of the bridges are a minimum of 42-inches high.

• **Drainage** – The Bike Path is designed with a 2% cross slope in one direction. There are some drainage swales designed outside of the travel path to convey storm water to existing swales. Drainage in general will be conveyed along the edge of the shoulder where the uphill edge of the Path is cut into the existing terrain. There will be a number of locations where the drainage will be cross the Path where there are low points in the Path due to the existing topography. The limits of construction are noted and all facilities and vegetation outside of the limits are to be protected in place. Hydroseeding of disturbed areas is specified in the plans, to assist in erosion control.

• **Lighting** – Generally street lighting is not provided in Mammoth Lakes. Street lighting is limited to the major thoroughfares to avoid light pollution. Therefore lighting of the path will not provided. Lighting will be installed at some of the road intersections for safety purposes. For example, at 453+75, the crossing at the intersection of Lake Mary Road and Juniper Road, a streetlight is noted in the plans.

• **Shared Use with Motorbikes, Horses and Snowmobiles** – The Bike Path will not be shared with horseback riders or motorbikes. There are some locations where the path crosses a horse trail. This occurs in the Mammoth Lakes basin adjacent to the Mammoth Lakes Pack Station and near Lake Mary. Signage is provided where the crossings occur. In the winter months, the Bike Path will not be plowed therefore bicycle use will not occur. In some locations in the Lakes Basin the path is part of the Tamarack Cross Country ski facilities therefore the use of the path in the basin will be limited to cross country skiing during the winter. The Path location from the Twin Lakes bridge down to Minaret Rd will make winter use impossible due to the
Lake Mary Road Bike Path

Path being used for storage of snow removed from Lake Mary Road. Snowmobiles and cross country skiers may make use of the path in the early winter months when the accumulation of snow is not very deep however the Path will not be groomed to encourage winter use at the present time.

- **Bicycle parking facilities** – There are no bicycle parking facilities at this time.

- **Additional Bicycle Amenities** – There are several turnouts and viewpoints implemented in the Bike Path design. There are a number of bus turnouts along the Path that will be used by the Town Trolley during summer months providing the opportunity for Path users to board the Trolley (the trolley is equipped to transport bicycles). Also, there are portions of the path that have restroom facilities available, access to the Twin Lakes General Store during business hours and picnic facilities.

