# Lincoln Gap Road Winter Access Study

Addison Regional Planning Commission & the Town of Lincoln

February 2018 – FINAL REPORT



# Acknowledgements

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# **Table of Contents**

#### 1. INTRODUCTION

Context Study Purpose and Process Relevant Studies and Plans Problem Statement Guiding Principles and Goals

#### 2. EXISTING CONDITIONS

Environmental Resources Evaluation Land Analysis and Maps On-Site Information about Winter Road Closure Online Information about Road Closure Winter Use of Lincoln Gap Road Roadway Characteristics & Ownership Safety & Access Management

#### 3. OUTREACH

Stakeholder Summary

#### 4. **ALTERNATIVES**

Management Alternatives Parking Alternatives Order of Magnitude Cost Evaluation of Alternatives Design Considerations

#### 5. NEXT STEPS

#### 6. **RESOURCES**

Introduction

# Introduction

#### CONTEXT:

Lincoln Gap Road is a mountain pass over the Green Mountains of Vermont that connects the Town of Lincoln to the west and the Town of Warren to the east. The road crosses the Lincoln Mountain section of the Green Mountain National Forest (GMNF), between Addison County, part of the Lake Champlain Valley on the west, and Washington County to the east. The portion of Lincoln Gap Road which is in Lincoln is approximately 3.9 miles<sup>i</sup> (Figures 1 & 2).

Lincoln Gap Road has the steepest paved mile in the United States, with maximum gradients up to 24%<sup>ii</sup>. As a Class 2 road, it is partially paved, with about 2 miles unpaved on the west side towards Lincoln. The road cannot be plowed safely in its entirety due to very steep grades, narrow width, sharp turns up and down the mountain, and significant changes in elevation. As a consequence, part of the road is closed from both the Lincoln and Warren sides from mid-October to mid-May each year<sup>iii</sup>.

Figure 1: Lincoln Gap Road in Lincoln, VT





Figure 2: Location of Lincoln Gap Road



#### STUDY PURPOSE AND PROCESS:

While similar problems related to winter road closure of Lincoln Gap Road exist on both the Lincoln and Warren side of Lincoln Gap Road, this study focuses on the Lincoln portion of the gap road.

The study was initiated by the Town of Lincoln with the Addison County Regional Planning Commission (ACRPC), as a way to address challenges that ensue when the gap portion of Lincoln Gap Road is closed during winter months. The study assesses the challenges from the perspective of public works staff that are charged with plowing the road in winter, stakeholders who access the road for winter recreation and those who respond to emergencies on the road during the winter months.

There are two purposes to the Lincoln Gap Road Winter Access Study:

 Identify ways to restrict motorists from driving up the closed portion of Lincoln Gap Road between October and May, when the gap portion of the road is closed for the winter, that do not impede winter recreational use.

2) Identify and propose solutions to winter parking and snowplow turnaround conflicts along Lincoln Gap Road.

The study process included collecting data and analyzing existing conditions, a large focus on informal interviews with relevant stakeholders and identifying possible alternatives for solutions.

#### **RELEVANT STUDIES:**

Winter road closures are not unique to Lincoln Gap Road, or to Vermont. Several nationally-known areas, such as Yosemite, close some of their roads between fall and spring due to the challenges of mountainous topography combined with snow. In 2014, the Utah Department of Transportation (UDOT) announced that based on a study, it would close winter passage to seven out of eight mountain highways based on cost and safety challenges. Closer to our study area, Smuggler's Notch Pass on Route 108 between Stowe and Jeffersonville, is closed to all vehicular traffic in the winter and closed year round to motorcoaches, motorhomes and commercial vehicles. Like Lincoln Gap, Smuggler's Notch is also used recreationally when closed for walking, snowshoeing and skiing on the road. Each of these areas addresses its road closure(s) differently and provided insight into how road closures are communicated to the general public.

#### **PROBLEM STATEMENT:**

Although vehicular access to Lincoln Gap Road is restricted during the winter months, several types of winter recreation enthusiasts venture via Lincoln or Warren to the gap portion of the road to use either the snow covered road or adjacent existing trails to participate in their sport of choice.

Without a designated parking area on the Lincoln side of Lincoln Gap Road, parking becomes problematic for both recreation enthusiasts and Town staff that are charged with plowing the portion of Lincoln Gap Road that remains open year-round. In some instances, up to 20 cars have been noted parked on either side of the road, sometimes preventing the snowplow from being able to turn around, and requiring it to return in reverse until it can turn around safely, which is hazardous.

An additional problem that exists on Lincoln Gap Road are motorists who continue past the "Road Closed" signs during winter road closure months and become stuck or are involved in accidents and then need help. These motorists not only put themselves in danger, but also endanger the lives of emergency workers who are called upon to help. These scenarios are not unique to the Lincoln side of the road, but also occur because motorists also venture up the Warren side of the Gap when the road is closed. This second problem has been attributed to motorists who are overly dependent on their GPSs and either miss or ignore signs stating the road is closed, or believe that conditions at the base of the mountain mimic those at the top. They continue up the road, only to encounter snow drifts and icy conditions and need help coming back down.

To document both challenges with Lincoln Gap Road's winter closure, as well as benefits of access for recreational purposes, a number of stakeholders were interviewed for the study. Interviews were informal discussions with several recreation group leaders, town workers, and residents about their use of the road, as well as their experiences with either the parking or the road closure or both problems on the Lincoln Gap Road. These have included both current and potential private landowners along Lincoln Gap Road, Town of Lincoln Selectboard members and road crew, emergency management personnel, the local snowmobile, hiking and backcountry skiing clubs, as well as forest service personnel. The report is a compilation of information gleaned from these interviews, as well as data collected throughout the study.

### STUDY GOALS:

The goals for the project included:

- seeking input on challenges encountered on Lincoln Gap Road from different stakeholders; and
- develop solutions, supported by the community and landowners, which can facilitate safe access to and from Lincoln Gap Road for both winter recreation enthusiasts and for public works personnel who need to plow the road during the winter.

Study goals included identifying methods, aside from existing signage, to discourage motorists from venturing past the Road Closed signage along Lincoln Gap Road as well as identifying potential areas for parking for winter use of the closed portion of the road.

# **Existing Conditions**

The Lincoln Gap Road is one of several 'gap' roads that cross over the Green Mountains. The road runs 7.67 miles between the towns of Lincoln and Warren and through portions of the Green Mountain National Forest. The gap is 0.5 miles west from the Lincoln/Warren border. Although the road is closed for several months during the winter, it is a well-known destination for visitors who seek to admire the views at the top of the gap, to hike or ski the trails that connect the state north-south and for commuters seeking a cut-through over the mountain.

Lincoln Gap Road's elevation varies between 1,820 and 2,428, with the road weaving its way up and down again. In some areas, the grade can be as steep as 24% and it is known for its challenging twists and turns. As the elevation mounts, so does the amount of forest cover over the land, which includes several blocks owned by the Forest Service; private residences become scarce as the severity of topography increases.



Figure 3: Lincoln Gap Road Winter Closure

The Long Trail, a 272-mile hiking trail that runs the length of Vermont, maintained by the Green Mountain Club and owned and managed by the Green Mountain National Forest, crosses the summit ridge of Lincoln Peak and Lincoln Gap Road between Mount Grant to the south and Mount Abraham to the north. Views and sunsets are draws to this area of the trail, for both thru hikers and day hikers. On the northeastern side of Lincoln Gap Road is Sugarbush Ski Resort and Mount Abraham, the fifth highest peak in Vermont, which is popular with hikers. Sugaring operations are found around the area, with sap lines running both overhead and underfoot. Figure 4 & 5 illustrate the section of the Long Trail as it crosses Lincoln Gap Road.

Figure 4: Long Trail Crossing Lincoln Gap Road





Figure 5: Information Panel about the Long Trail and Surrounding Destinations

The Catamount Trail, which is a long-distance, Nordic ski trail that spans the length of Vermont, extending more than 300 miles (480 km) from the border with Massachusetts at Readsboro, Vermont to the Canada-United States border at North Troy, Vermont, includes the Lincoln Gap Road as part of Section 18: Lincoln Gap to Route 17. Figure 6 & 7 illustrate this part of the Catamount Trail.

Figure 6: Catamount Trail: Lincoln Gap Road to Route 17



Section Elevation Profile (South to North)





**SECTION 18:** 

LINCOLN GAP TO ROUTE 17

Map Scale 1:75000

0 0.5 Miles

0.5

Catamount Trail	No	n-Catamount Trail
	Ungroomed Trail	
	Groomed Ski Center Trail	
	Snowmobile Trail	
	Unplowed Road	
	Road Walk	
Federal Land	State Municipal Land Land	Private Land

© 2008 Catamount Trail Association

Figure 7: Catamount Trail Information at Top of Gap - Highlighting User Conflicts



#### **Environmental Resources Evaluation**

On either side of Lincoln Gap Road are large intact habitat blocks, which are in part owned by the Green Mountain National Forest. Habitat blocks are forest lands where there is little or no permanent habitat fragmentation from roads, agricultural lands, or other forms of development. Larger habitat blocks provide valuable habitat, support the needs of wide-ranging wildlife, and are most likely to include a diversity of physical and environmental conditions<sup>iv</sup>. Closing Lincoln Gap Road is a safety precaution, but its closure also aids wild habitats by limiting human presence during part of the year. Preserving these habitat blocks is a high priority for the state and any alterations to the blocks should be carefully considered. There are also a series of streams that flow down from the gap and their locations limit where a parking area could be sited. Most of the areas along the road are forested, except where cleared for private residences and a few pull-offs along the road (Figure 8 & 9). While there are no recorded significant communities of flora or fauna, it is apparent that this intact forest is home to many species. Any changes to the area will impact the existing natural communities and should be minimized through careful and thoughtful design, placing emphasis on careful siting, and consideration for the choice of material of any modifications.



#### Figure 8: High Priority Habitat Blocks in Project Area

Figure 9: Existing Pull-Offs along Lincoln Gap Road



Lincoln Gap Road has several streams crossing it and following it. It is drained on the east side by Lincoln Brook, which flows into the Mad River, the Winooski River, and ultimately, Lake Champlain. To the west, the gap is drained by Cota Brook, which drains into the New Haven River, Otter Creek, and into Lake Champlain. Below is a summary of other potential natural resources along the road and presence or absence in the study area based on available GIS information (Table 1 and Figure 10).

Table	1:	Environmental	Resources	Evaluation
Table	••	LINNOTHICHUM	nesources	LValation

Potential Resources	Presence/Absence in Study Area
Wetlands	A Class 2 Wetland is located on private property, adjacent to the current snowplow turnaround.
Lakes/Ponds/Streams/Rivers	There is reduced fish passage through a culvert that crosses Lincoln Gap Road at the existing snowplow turnaround area.
Floodplains	There are no FEMA designated floodplains within the project area.
Endangered Species	There are no identified endangered species near the study area.
Flora/Fauna	There are large, high priority, habitat blocks on either side of the road.
Stormwater	Per ANR Atlas, there is an undersized culvert near the current snowplow turnaround.
Hazardous Wastes	There are not any hazardous waste sites in the project area.
Forest Land	Most of the study area is covered by forest, except for a seasonal home and the Lincoln Gap Road.

Figure 10: 20' Contours, Streams, Waterbodies in Study Area



### Land Analysis and Maps

The project area is surrounded by Green Mountain National Forest, and a site visit confirms that topography is both a challenge and a highlight to the area; a draw for both visitors and locals year-round due to the views and for some, the recreation appeal. The enclosing topography amplifies the experience of motorists (and cyclists) as they make the trek up and down the gap. With steep grades and curves, visibility is a challenge in several areas. As the road climbs steadily to the top of the gap, the temperature can drop and precipitation can change suddenly from rain to snow or ice.

A hillshade map (Figure 11) generated by LiDAR data in ANR's Atlas illustrates the land's undulations around the road and constraints for any development beyond the road's right-of-way. The last developed parcel along the road on the Lincoln side is at 2668 Lincoln Gap Road, which is

on a plateau/ flat area. The slope map (Figure 12), also illustrates the intensity of the slope along this portion of the road. Per the slope map, the current plow turnaround is in an area of gentle slope, varying between 5-15%, with intense slopes of 25% or greater as the road progresses east towards Warren. The first bend after the current road closure area is especially intense, with an approximate 22% incline (based on GIS data of 20 foot interval contours).



#### Figure 11: Hillshade Map of Lincoln Gap Road

Figure 12: Slope Map of Lincoln Gap Road



A road profile generated with existing Vermont Center for Geographic Information (VCGI) data illustrates that the current plow turnaround area has an approximate grade of 6.4% (Figure 13 & 14).

Figure 13: Existing Plow Turnaround Area on Lincoln Gap Road



Figure 14: Lincoln Gap Road Profile in Project Area

		CHODENIT										
1900		TOTINAR										
E 1800		1817										
ION												
1700 8.7%	7.5%	6.4%	9.7%	10%	13%	5.5%	22.2%	15.5%	8.3%	7.7%	13%	
1600												
ROAD GRA	ADES (PER 20 FT CONT	OUR INTERVALS)										

#### LINCOLN GAP ROAD PROFILE IN STUDY AREA

#### **On-Site Information about Winter Road Closure**

Along Lincoln Gap Road from the Town of Lincoln side, there are 4 posted signs indicating that the road is closed during winter. These signs are installed by the Town on or around October 15<sup>th</sup> and removed and stored in May each year. The signs are posted progressively up the mountain, until reaching the area where the plow currently turns around (Figures 15, 16 & 17). At the time of the study, the Town of Lincoln's plow clears the road up to the last home on its side of the gap, at 2668 Lincoln Gap Road, which is a seasonal cabin. This is approximately half a mile beyond the next closest residence.

Figure 15: Road Closed Signs on Lincoln Side at East River Road/South Lincoln Road/Lincoln Gap Road Intersection



Figure 16: Signage: South Side of Lincoln Gap Road: No Parking: Town Plow Truck Turn Around



Figure 17: No Parking Plow Truck Turnaround on North Side of Lincoln Gap Road



Signage is also posted within the same timeframe from the Warren side of Lincoln Gap Road. In addition, Warren posts that there is a gate ahead to further deter motorists from continuing up the closed road, or from the Lincoln side, from venturing down the gap if they've ignored signage on the Lincoln side and are headed down towards Warren (Figures 18, 19 & 20).



Figure 18: Road Closure Signs: Warren at bottom of Gap

Figure 19: Road Closure Sign: Warren at Top of Gap





Figure 20: Lincoln Gap Closed, Lincoln Side of Gap (Photo Courtesy of Josh Donabedian, ACRPC)

#### **Online Information about Winter Road Closure**

Before the road is closed, information about the Lincoln Gap Road closures during winter can be found online under the general town ordinances.

#### From Town of Lincoln Website: (Ordinances)

#### Lincoln Gap:

We want to remind you that in spite of the sometimes balmy weather, the Lincoln Gap Road is closed from October through May. If you choose to go over the Gap, you do so totally at your own risk. Town trucks and tow trucks will not come sand, plow or tow you if you get stuck. Of course, if you are lost or injured and need emergency care, call 9-1-1, but be prepared to wait as rescue teams will likely be coming to you on foot since the road is not

maintained in winter. Even if your GPS says the road is open, kindly remind yourself that you are smarter than your GPS, because you can read the sign that says "Road Closed."

Once road closure has occurred, several other areas of the website feature the road closure information, including Town News and Upcoming Events:

#### From Town of Lincoln Website: (Events)

#### Lincoln Gap Road Closed for the Winter:

As of mid-October, the Lincoln Gap Road is closed for the winter. Some of the white stuff has already been seen up on the mountain!

#### In mid-December, the event was updated:

#### Lincoln Gap Road Closed for the Winter

As of mid-October, the Lincoln Gap Road is closed for the winter. If you choose to ignore the ROAD CLOSED signs, you probably won't be able to get a tow truck to pull you back up the bank when you slide off into the woods. The Warren side is darker, steeper, and icier! Be prepared to walk home and recover your vehicle in the spring!

#### From Town of Lincoln Website: Town Services/ Highway Department

The top of the Lincoln Gap Road to Warren is CLOSED for the winter. If parking in the area, please be considerate of plow trucks needing to turn around at the last driveway. Thank you!

There is not a specific date cited, but indication that the road is closed October to May of every year. Online searches for Lincoln Gap Road celebrate it as a great road for sledding, but a general search does not provide information on the road being closed over winter as October approaches. Google Maps, however, has the portion of the road that is closed for winter noted as: Lincoln Gap Road (Closed Winters) for the portion that is closed from Lincoln to Warren. Some GPS applications on phones note that the road may include unpaved roads, but road closures during the winter were not observed.

#### Winter Use of Lincoln Gap Road

While Lincoln Gap Road is a destination for locals seeking to experience the road as a winter recreation spot, parking and access is problematic for both those recreating and town workers attempting to plow the road. For those recreating, parking is limited to narrow shoulders and some wider informal pull-offs along the Lincoln Gap Road. In previous winters, vehicles have been found parked along the Lincoln Gap Road, from the road closure sign down towards Lincoln. Residents have witnessed up to 20 vehicles parked along the road on days when fresh snow has fallen.

Visitors venture uphill to backcountry ski, to sled or to hike down the road or trails along the ridge of the mountain. Sledding in this area is advertised online as not for the young - for the steep grades and sharp turns are challenging to maneuver. The Catamount Trail Association leads backcountry skiing tours up the mountain (sometimes groups of 20 people), but coordinates to meet off of Lincoln Gap Road to carpool and minimize the number of vehicles that park along the road. Backcountry skiing poses challenges to neighbors in the vicinity, as sugaring operations in the area have had their lines damaged or destroyed by skiers cutting through their properties. Both anecdotes and signage note this conflict. There is also a rise in the number of people "jack-jumping" (sitting on one ski) in the area. Stakeholders interviewed anticipate a rise in the number of recreation-seeking visitors to Lincoln Gap Road as snow becomes limited in other areas and snow tourism to the state increases.<sup>v</sup> While Lincoln Gap Road is a significant access point for the Long Trail and associated trails and lookouts for hikers, the number of hikers drops significantly during winter months.

The road is more often accessed from the Lincoln Side in early spring, as it receives the afternoon sun and can appear to be clear of snow. The Warren side is much more shaded and both snow and ice linger longer. Visitors to the area who are unfamiliar with elevation's impact on weather continue up the gap.

#### Winter Clearing of Lincoln Gap Road

The Lincoln Gap Road is cleared of snow as part of the Town of Lincoln's plow route. The turnaround is currently near 2668 Lincoln Gap Road, which is a seasonal residence. This is also a relatively flat part of the road, with reasonable visibility. Further along the road, the elevation rises significantly, as does the steepness of the road. The Town tries to plow the road as early as possible after snowfall to avoid conflicts with any parked cars, sometimes as early as four A.M., as snowfall tends to attract recreational users to the gap. However, when snow continues to fall and they are obligated to plow a second time, the inability to turn around due to parked cars poses both a hazard and hardship on town forces, often exhausted from many hours behind the wheel of a plow truck.

#### **Roadway Characteristics**

Lincoln Gap Road is a Class 2 highway with a Right-of-Way of approximately 49.5 feet and a roadway width of approximately 30 feet in width. Road elevation varies between 1400 feet from the intersection with Geary Road North to 2428 feet at the top of the gap; a difference of 1028 feet of elevation. The current road closure begins at 1820 feet, which is also where the snowplow turns around. The road is characterized by several challenging switchbacks that wind up the gap and back down. Average daily traffic (ADT) recorded by VTrans from 2016 was 340 for the Lincoln portion of Lincoln Gap Road.

### Safety

The study was initiated due to concerns for the safety and welfare of motorists, public works crew members, and those who seek to recreate on and around Lincoln Gap Road during the winter. There are no High Crash Locations on the gap portion of the road, but conflicting uses have the potential to increase the severity of incidents that result from improper use of the road. Additionally, there is a potential hazard created by cars parked along the road, impeding road crews from clearing snow in a safe manner and potentially preventing emergency access.

# Outreach

#### Stakeholder Summary

To understand issues and analyze a unique road such as Lincoln Gap, it is essential to reach out to those who use it. To inform the study, several informal stakeholder interviews were conducted to understand the context, problems and identify potential solutions to the project goals. Agencies who are involved in responding to issues created by the Lincoln Gap Road Winter Closure were also interviewed. Table 2 is a summary of stakeholders and key points that emerged as part of informal conversations around the two key project goals.

#### Table 2: Summary of Stakeholder Interviews

Agency	Discussion Topics
Town of Lincoln Emergency Management Team	<ul> <li>Challenge with mapping programs or GPSs not documenting that the road is 'seasonal' and closed part of the year, even though there is adequate signage leading to the gap portion of the road. Tow trucks are not equipped to go past the last 'road closed' sign.</li> <li>Weather in the lower elevations is different than high up on the gap. Individuals assume that a warm spell in town means that conditions are okay on the gap, which leads to problems.</li> </ul>
Town of Lincoln Fire Services	<ul> <li>No major emergencies during the winter due to road closure; usually due to recreating injuries, rather than vehicular emergencies.</li> <li>Wouldn't consider closing off the road completely with a gate or not permitting use - would impede commuters and individual recreational use of the road and surrounding area.</li> <li>Parking would be helpful.</li> </ul>
Town of Lincoln Road Crew	<ul> <li>Cars are always parked along the road, even directly below signs that read: "no parking, plow turnaround".</li> <li>Plow crew tries to plow as early as possible after/during a storm (~4am) to avoid any cars parked along the road, but often need to plow a second time later in the day when cars are parked.</li> <li>Plow route currently extends an extra half a mile to get to the seasonal home where the plow turnaround is located.</li> <li>Plow crew have needed to back out and down Lincoln Gap Road because of parked cars in the past.</li> <li>To date, the town has been lenient with not towing cars.</li> </ul>
Town of Warren	<ul> <li>Both towns need funding to complete the paving of Lincoln Gap Road to make it safer overall.</li> <li>The road is very dangerous: difficult to plow in the winter and mowing is challenging in the summer; a truck follows the mower as a precaution.</li> </ul>

	<ul> <li>Signage has been stolen in the past; gate has been cut and taken down as well.</li> <li>Tow Truck company in Waitsfield refuses to go up the Gap to tow cars that become stuck because of the risks and costs.</li> <li>Emergency workers have had to rescue a hiker.</li> <li>Property owner at 2710 Lincoln Gap Road on the Warren side, has often been the first responder/ house where people who get their vehicles stuck walk down to and call for help.</li> <li>Cars parked around/ along the road near 2710 means that the plow has had to go back down backwards.</li> <li>Lincoln side of the gap gets more sun in early spring, prompting people to go up that side, and then start down the Warren side only to get stuck or slip because of the ice, causing accidents.</li> </ul>
Vermont State	New Haven Barracks serves this area.
Police	<ul> <li>No statistics found about this specific problem.</li> <li>Vehicles that get stuck are referred to VAOT.</li> </ul>
Vermont Agency of Transportation	Both traffic counts and crash data were reviewed for this study. Annual average daily traffic (AADT) recorded by VTrans from 2016 was 340 for the Lincoln portion of Lincoln Gap Road.
United States Forest Service (USFS)	<ul> <li>Limited discussions have occurred with the Town of Lincoln about the issues of this study and about parking for the Gap portion.</li> <li>They have done their own limited exploration of potential parking areas and have identified one area near the Forest Service road, past the current plow turnaround that could potentially be suitable; but would need to be accessed through private land.</li> <li>Are open to discussing parking, but would prefer an area with low or no impact. Any ground disturbance would require NEPA review.</li> <li>Recognize that a parking area could contribute to improving safety and welfare.</li> <li>Question of jurisdiction and ultimate responsibility if a parking area were to be constructed?</li> </ul>
Vermont Association of Snow Travelers (VAST)	<ul> <li>VAST trail on Lincoln Gap Road is groomed once a week; twice when there is very heavy snowfall - there is currently no connection to the Warren side.</li> <li>Grooming truck is 9' wide, takes about 4-5 hours to groom this portion of the trail; grooms at night.</li> <li>Has seen cars parked along both sides of the road.</li> <li>Trail is used by hikers and snowshoers as well once the trail is groomed, especially when there is high snow in the valley.</li> <li>Once a good snowfall has occurred, the town plow creates a berm of snow blocking passage up the road, which the VAST groomer can go over (up to 5'), especially once it has been compacted.</li> <li>Individuals who get stuck are usually out-of-town travelers, not recreation enthusiasts.</li> <li>VAST groomer is often called to help stranded motorists from the Lincoln Side.</li> <li>Has seen up to 50 people on the road on weekends with good snow.</li> <li>Estimates at least 5 vehicles per year get stuck on the closed portion of the road; mainly because they are following their GPSs.</li> </ul>

Catamount Trail Association	<ul> <li>Tour groups (sometimes up to 20 people) go up the mountain during the winter, but due to the parking challenges, they meet elsewhere and take only 1-2 cars to park along Lincoln Gap Road.</li> <li>Seen a growing interest in backcountry skiing and also "Jack Jumpers" that go down the Gap Road or go up to the ridge and go down from there.</li> <li>Conflict with locals: some skiers go down the ridge and onto private land, including sometimes cutting sugaring lines. There are signs at the top warning users of this conflict, but the signage does not seem to deter them.</li> <li>Access point to Catamount Trail can be from either Lincoln or Warren, but tend to go up the Lincoln side because their trail description refers to Lincoln.</li> <li>The Warren side holds snow longer.</li> <li>Have met with the Lincoln Selectboard to plow further up for parking purposes and conversation with Green Mountain National Forest about the use of the Forest Service Road as a potential area for parking.</li> </ul>
Green Mountain Club	<ul> <li>Long Trail primarily used in summer months and Lincoln Gap Road is a great access point for the trail; even though some hike through</li> <li>When the Gap is closed/ during winter, there is a significant drop in hikers</li> <li>Forest Services has a sign in box for users to sign in along the trail and notice a summer/ winter count drop; includes where people come from, not necessarily which side they came up</li> <li>Mt. Abraham is a big draw to the trail, but many people will go up Jerusalem Trail where is parking</li> <li>Hikers' need of parking is much less in winter; but in the summer months, especially on a nice weekend day, there can be between 20-30 cars parked alongside the road at the gap; limited infrastructure creates unsafe situations</li> <li>Warren has overflow parking</li> <li>Sunset Ledge, which attracts tourists/families, sees a lot more use/ parking in the area (Figure 4 Catamount Trail)</li> </ul>
MAD River Rocket	<ul> <li>Use of Lincoln Gap Road for sledding.</li> <li>Parking on the Warren side is not a problem; park on side of the road where the road closure begins.</li> <li>Has not seen more than 5-6 cars parked on the Warren side.</li> <li>Hike up and sled down the road; a great sledding hill especially after a good snowstorm.</li> <li>Has witnessed skiers too, skinning up and skiing down the Lincoln Side; often they are from the Lincoln side. Other users include: dog walkers, people skiing with their dogs, snowmobiling.</li> <li>Has also hiked to the top and continued hiking the portion of the Long Trail and sled down towards the road.</li> </ul>

# **Alternatives**

#### **Management Alternatives**

To address the challenge of motorists bypassing "Road Closed" signage and relying on GPSs for directions, several strategies that can be implemented immediately are recommended.

#### Information-based:

Since social media and the World Wide Web are relied on heavily by travelers to Vermont, it is suggested that information about road closures be easily found on the Town's website. This may include a page dedicated to describing the road closure, dates when the road has been closed and re-opened in the past, and reasons why the road is closed. Including a map of the area, with the specific end-to-end points of the closure between Lincoln and Warren and alternative routes clearly outlined can help reduce unwanted traffic to the area. Encourage the stakeholders that were consulted during this study to link their information about Lincoln Gap Road to the website to see current road closures and updates. Emphasize that the road has the steepest paved mile and therefore, is not safe to plow, nor traverse when it's closed.

Some specific high-traffic websites should be contacted to provide the necessary information to make the road closure obvious when doing a general search for Lincoln Gap Road:

**Wikipedia**: Provide Wikipedia with additional information about Lincoln Gap Road, including a link to the Town of Lincoln website and road closure information.

Town of Lincoln Calendar of Events: Make the road closure a prominent feature on the Town of Lincoln Calendar of Events. Highlight the date when the road has been posted as closed and blast the information through social media, including Facebook.

**Press Release:** Issue a press release that the road is officially closed for winter, with image, similarly to Smuggler's Notch.<sup>vi</sup>

Alternative Route: Consider providing an alternate route for reaching Lincoln and surrounding areas during winter road closures.

#### Site-based:

Consider enforcement by towing vehicles that are parked in the area of the current plow turnaround and adding signage to emphasize the right to tow. Offer alternative areas at the bottom of Lincoln Gap Road where groups can carpool to the road closure, reducing the number of vehicles that need to park at one time. Consider imposing a fine to cars that park in the plow turnaround area. Consider imposing a fine to vehicles that continue up the gap when it is closed.

#### **Parking Alternatives**

Three sites were considered for winter parking: an on-road option, and two off-road options. Following the presentation of the draft report at the Selectboard meeting in December 2017, a fourth site was added for evaluation as a potential location for parking and/or plow turnaround. What ensues is a summary of the sites that were evaluated and several criteria against which they were evaluated.

Considering the location, there are few relatively flat areas near the current snowplow turnaround that can provide a suitable parking area. In addition to geographic constraints, the flatter areas are located on private and public property, or are near natural resources such as streams. Figures 21 and 22 illustrate both in plan and section the current grades and landownership along Lincoln Gap Road in the vicinity of the current snowplow turnaround.

Figure 21: Parking Alternatives — Land Ownership and Existing Grades



Figure 22: Parking Alternatives — Landownership and Existing Grades Profile



Alternatives

Table 3 "Initial Criteria to Evaluate Alternatives" is a summary of a first set of variables comparing selected areas near the current snowplow turnaround for potential parking and snowplow turnaround. Evaluations using slope and topography are based on available data at 20 foot contour intervals. Area 1 is located before the current plow turnaround on private property and is an area adjacent to Lincoln Gap Road. Area 2 is an area located back from the road, on GMNF land and would require an access road. Area 3 is located slightly off the road and is located on private property.

Lincoln Gap Road Winter Access - Initial Criteria						
Alternative Sites	(1)	(2)	(3)	(4)		
Variables						
On or Off Road	Adjacent to Road	Off Road	Off Road	Adjacent or Off Road		
Private or Public Property	Public and Private	Public (Access via Private)	Private	Private		
Distance from Road	Adjacent	~266 feet	Adjacent or near	~25 feet		
Distance from Current Plow Turnaround	100 feet BEFORE	800 feet	1,320 feet	800 feet		
Elevation	1820	1870	1950	1886		
Steepest slope for Plow	7%	13%	22%	13%		
Existing Slope at Road	7%	5.5%	7.7%	5.5%		

Table 3: Initial Criteria to Evaluate Alternatives Sites

This first series of criteria underline how both off road options 2 and 3 would be more challenging to implement and maintain. Option 2 has fewer topographic challenges, but would require easements or a landowner agreement, and a road to be graded on land with 22% slopes. This option will also require plowing a section of Lincoln Gap Road with grade of 13% before arriving at the road leading to the parking area. Option 3 requires traveling up an extremely steep incline (22%) and switchback on Lincoln Gap Road, and would increase the length of road plowed by approximately a quarter of a mile and an elevation change of approximately 70 feet. Due to hazards associated with the extremely steep grade, no further evaluation of this option was undertaken. Option 4 was evaluated as a parking area both adjacent to the road or slightly off

#### Alternatives

road. Against the initial criteria, the variables are similar to option 2, where the snowplow would be required to plow further, there is an increase in elevation, and the slope up from the road is over 22%.

Figure 23: View going uphill towards the gap



Current landownership is included in Figures 20 and 21. Option 1, which is before the current snowplow turnaround and adjacent to road, would require an easement beyond the right-of-way limits. Option 2 is on GMNF land, and would require an easement from an adjacent landowner. Options 3 and 4 are on land that could potentially be purchased, and the current owner has expressed willingness to negotiate parking and a snowplow turnaround on their land.

The no build alternative is a basis against which to evaluate subsequent options. The status-quo does not improve the safety and welfare of motorists and winter road users. Even though the no build option would have the least environmental impact and presents the least measurable financial cost, it is vital to note that less tangible costs are not presented as part of the matrix. These include costs to the public for emergency personnel time and constraints imposed to road crews who regularly encounter unsafe and taxing conditions on Lincoln Gap Road.

Option 1, is along the road below the current snowplow turnaround. Based on available information, this area has a grade between 6 and 8%. However, due to the rising topography from the road and consideration of a buffer between the road and parking area, this option would entail widening beyond the existing right of way and cutting into the existing upward slope to create an area suitable for parking. The slope varies up to 10% for the length of the proposed parking area. For this option, approximately 7,000 square feet require regrading to accommodate a buffer from

the road, parking for 20 vehicles, including 4 of these to accommodate trailers, and reconnecting to the existing topography at a 2:1 (50%) slope. As the area is adjacent to the road, the parking would widen the existing break of the high priority habitat blocks but would not create a new 'break'. Figure 24 illustrates in plan the 20 proposed parking spaces (including 4 longer spaces to accommodate snowmobile trailers) along the existing road. Figure 25 illustrates in section the existing grades and the potential area of 'cut' that would be required to create a parking area at this location. A substantial amount of vegetation would need to be removed to create the parking area. Per soil maps, the area could be rocky and may require challenging excavation to accommodate a parking lot.

#### Figure 24: Option 1: On-Road Plan



Figure 25: Option 1: On-Road Section



Option 2 would be at least 80 feet up the road from the current plow turnaround and require a minimum of a 410 foot access road to reach a reasonably gradable area on forest service land. Benefits to locating the parking area away from the road include: safety, an ability to close it off during non-winter months, and the potential for expansion. However, this option would require the removal of a significant amount of vegetation, regrading a large area and a break into the habitat block surrounding the road. The access road would cross private land, requiring an easement. Changes to GMNF land may trigger a NEPA evaluation. Where it is possible to follow the contours for part of a proposed road, the average grade is 7% between Lincoln Gap Road and the proposed parking lot, with steep sections with grades of up to 22%. The steep grades on the road will be difficult to maintain and plow. Parking in this area is also limited by streams and their buffers, limiting the option of future expansion and increasing potential environmental impact.

Figure 26: Option 2: Off-Road Plan



Option 4 envisions building a parking area near or off of the road on the north side of Lincoln Gap Road, and would also be at least 80 feet up the road from the current plow turnaround. The existing slopes are prohibitively steep. It would require significant cutting into the hillside to create a reasonable grade for access and more cutting for a parking area and plow turnaround (Figure 27 illustrates a potential parking area in order to illustrate these challenges, with only half the desired number of parking spaces and no spaces for trailers). Figure 28 illustrates a section from the right-of-way of Lincoln Gap Road, and the space required to provide perpendicular parking similar to site 1. Construction of a parking area in this location would require significant clearing, result in erosion due to the steep slopes, and would create a new break in the intact habitat blocks. Due to the above considerations of topography and environmental impacts, option 4 is not feasible.

Figure 27: Option 4 - Near Road Plan



Figure 28: Option 4: Section



Aside from 'no build', the remaining options would impact stormwater infiltration, as they would all require some amount of vegetative clearing and varying levels of soil compaction, contributing to the amount of sheetflow in the area. It is therefore recommended that any alternative include the evaluation of green infrastructure for the parking area, and if needed, any access road that

Alternatives

would connect the existing road to a parking area. This could include using grass pavers that can withstand vehicular loads while preventing additional soil compaction and allowing vegetation to grow through, considering ways to divert runoff from flowing to the road and redirecting it to vegetation to slow it down and to absorb pollutants from vehicular traffic. Strategies for snow storage that help remove sediment as the snow melts and before the water reaches adjacent streams are also recommended, as the slope and topography require the use of salt and sand for the safety of motorists.

#### Order of Magnitude Cost

Consideration for the potential cost of construction for alternatives 1 and 2 is outlined in Table 4. In summary, the off-road option is more expensive to implement based on additional plowing on the road and also for an access road to the parking area, additional clearing and grubbing and more right-of-way required. The on-road option would require an important amount of grading (Figure 24).

Table 4 Alternatives Order of Magnitude Cost Comparison

Item	On Road (Option 1)	Off-Road (Option 2)
Additional Plowing <sup>vii</sup>	Parking Lot only: Area of approximately 4,000 square feet	Parking Lot: Area of approximately 5,800 square feet; Additional length of plowing Lincoln Gap Road: approximately 800 feet. Connecting to and plowing an additional road of approximately 410 feet long.
	Additional plowing confined to parking lot.	Cost of additional plowing roads: \$2,665 <sup>viii</sup> plus additional parking lots approximately \$1,280/year.
	Approximately \$1,075/ year.	Total: minimum of approximately \$3,945/year
Right of way needed	Approximately 4,800 square feet on private land	Approximately 8,870 square feet for the road on private land and approximately 20,410 square feet for the road and parking area on Forest Service Land.
		Total: approximately 29,280 square feet
Clearing & Grubbing	Approximately 7,000 square feet for parking area and area to be graded	Approximately 12,000 square feet for the access road and approximately 7,000 square feet for parking area
	Cost of clearing and grubbing 0.2 acres: \$12,093	Cost of clearing and grubbing a minimum of 0.43 acres: \$38,100

#### **Evaluation of Alternatives**

Several factors were central in the evaluation of alternatives to address the goals of the study. Improving public safety (both users of the gap road and workers), is however, of primary importance in identifying an area that is suitable for parking. While cost and ease of implementation will ultimately determine the timeline of a solution being implemented, the emphasis on safety cannot be overstated and undervalued on a road such as Lincoln Gap, which already has several combined safety hazards.

Below is a matrix evaluating the alternatives against the goals of the study.

 Table 5: Alternatives Evaluated per Goals of the Study

Lincoln Gap Road Winter Access - Goals of the Study						
Alternatives	No Build	Option 1 (Adjacent to Road)	Option 2 (Off-Road)			
Objectives						
Improve Safety						
Reduce Conflicts between motorists and public workers						
Ease of Implementation	n/a					
Ease of Future Expansion	n/a	•	•			
Construction Costs	n/a	\$\$	\$\$\$			
Degree to which the alternative meet	rs objectives:	Does not meet objecti Moderately meets objective	ive ective			

The 'no build' alternative would leave the road and the conflicting parking challenges as they are today; where recreation enthusiasts of the Lincoln Gap Road in winter park alongside the road, creating potential conflicts with the snowplow turnaround. Without a designated parking lot, safety of both the public workers plowing the road and the venture-seeker continue to be at risk. Not adding a parking area near the current plow turnaround means no further impact to the natural resources in the area and no changes in the existing habitat blocks.

Option 1 is less expensive and potentially easier to implement. Expansion in the future is limited by geography, land ownership and how much parking can be included along the road before the aesthetic impact becomes detrimental to the destination.

Option 2 will require easements from both a private and public entity, and may require a complete NEPA process for implementation. It would also be more expensive to implement and maintain due to the length of road needed to reach a reasonable area that can be graded. While there may be

potential to expand the parking area beyond 20 cars in the future, the topography, adjacent streams and their required buffers will make both implementation and expansion challenging.

#### **Liability Considerations**

A concern that was raised during the meeting with the Selectboard was landowner liability for those recreating on their land. For further evaluation of liability by private landowners, it is suggested that Vermont's Landowner Liability Law 12 V.S.A. Sec. 5791-5795 be consulted.

An additional issue that needs consideration and evaluation, but is outside the scope of this study, is to evaluate and determine the Town's liability when it comes to plowing the road, and also its overall obligations in doing so. A thorough review of Vermont Statute 19 V.S.A. § 310 is recommended and a revision of Town ordinances and potentially, zoning, with regards to the future development and any plowing obligations of Lincoln Gap Road is suggested.

#### **Design Considerations**

Per the 2017 Adopted Lincoln Town Plan, one of the Town of Lincoln's Land Use Goals is to "[m]aintain the qualities of "working landscape" and "rural character" valued by Lincoln residents. Part of this goal includes "discourage[ing] costly infrastructure improvements" and "[k]eep[ing] Lincoln Gap Road...closed during the winter months". The Town of Lincoln will need to evaluate next steps to take to address the goals of the study, notably, creating a safe place for parking along Lincoln Gap Road, in conjunction with the goals outlined in the town plan to ensure that a selected alternative is not to the detriment of its overall town goals.

As one of this project's goals is to locate potential sites for parking in an area which is largely forested, it must be emphasized that any clearing will change the amount of light and water than reaches the soil. It will also affect wind and microclimates created by the winding road and vegetative cover. As a relatively flat topography is desired for parking, which is not readily available in the project area, any changes will require topographic modifications, whether cut or fill to create the necessary plane for vehicular parking. Grading changes that emphasize a varied slope, rather than a uniform slope, are preferred to create a less abrupt change in the topography that can contribute to erosion and sedimentation on adjacent slopes. Considering low impact development principles by respecting the natural topography of the site as much as possible is also recommended. In areas where retaining walls might be used to hold back a slope, green walls (for example, gabions with plantings) are recommended over rigid walls that do not blend into the existing surroundings and to avoid creating a visible break in the surrounding views and experience.

Considering alternatives outside of the right-of-way triggers questions of liability, responsibility and long-term viability of options. Creating a parking area along an already challenging topography can also cause slope instability, a need to consider load bearing impacts, effects on water flow and redirection of water, environmental disturbances and adverse effects on abutting properties. While

the current road alignment follows the natural topography in the lower elevations, cutting further out from the road corridor to create a parking area will have a significant environmental impact.

#### **Recommended Alternative**

Based on the design criteria, project goals and objectives and analysis of the four sites for a parking area along Lincoln Gap Road, Option 1 is recommended for further development. The final selection is dependent on discussions with the landowner of the Duckworth property, as well as the evaluation of other components including: maintenance requirements of any surface parking area, snow storage strategies, and signage directing users to the parking areas and away from the areas that are currently creating challenges for the snowplow.

Construction cost estimates for Option 1 have been prepared (Table 6) for a paved parking area accommodating 20 vehicles (4 with trailers), in order to provide more information for future funding and implementation by the Town of Lincoln.

Option 1	Design Options	Quantity	Units	Unit \$	Total Cost
Construction Costs					
	Clear zone + grading allowance	7,000	sq ft	\$ 2	\$14,000
	Solid Rock Excavation	2,120	CY	\$31	\$65,529
	Asphalt Paving	130	Ton	\$134	\$17,479
	Gravel Subbase	576	CY	\$365	\$210,217
General Costs					
	Erosion and Sediment Control	1	еа	5%	\$15,858
	Mobilization	1	ea	10%	\$31,3717
	Traffic Control	1	ea	10%	\$31,903
	Signage	5	ea	\$50	\$250
Total Construction It	ems				\$384,417
Contingency (15%)					\$57,663
Total Construction Cost\$442,079					

Table 6: Order of Magnitude Cost for Implementation of Option 1

Additional allowances for project development, construction engineering and local management as appropriate, would be additional costs to the project, depending on the funding source.

# Recommendations

At the time of the completion of this study (mid-December 2017), the Town of Warren had experienced four calls this season for rescues on the closed portion of Lincoln Gap Road. The Town of Warren was considering placing tree trunks across the road that is closed to restrict access to snowmobiles and rescuers. Warren had requested that Lincoln block the road at the top of the gap. Since part of Lincoln Gap on the Lincoln side is on the VAST trail network, any consideration of barrier should allow access to snow machines and skiers. On December 5, 2017, the Town of Lincoln voted to purchase two Jersey Barriers on the Lincoln side of the gap where the snowplow currently turns around. Further discussion ensued at the December 19, 2017 Selectboard meeting where the latter motion was amended to be the purchase of bags of gravel to be utilized to prevent motorists from venturing up the Gap (Figure 29).

Figure 29: Gravel Piles at beginning portion of closed Lincoln Gap Road in Lincoln, Winter 2018 (Photo courtesy of Josh Donabedian, ACRPC)



Given the increasing challenges of keeping motorists off of Lincoln Gap Road, even early in the season, it is suggested that several management options be pursued simultaneously and as soon as possible.

- Create a short history of Lincoln Gap Road and access limitations to post online
- Write a Press Release for media distribution about the problem and the temporary solution of gravel with emphasis on rescues, but also the parking issue, collaboratively with Warren
- Convene a joint meeting with the Town of Warren to discuss strategies and potential solutions both Towns can undertake with regards to motorists who disregard the closed road signs

With regards to a parking area, the Town will need to meet with the landowner to determine potential easements, as well as to address future maintenance and liability concerns that may rise.

It would also be beneficial for the Town to discuss its Town Plan goals of encouraging responsible use of National Forest Land and to work with the US Forest Service to protect sensitive natural areas and viewsheds, especially when properties are over 1,800 feet, per the Town Plan.

# Resources

Davidson, Lee. 2014. "Utah snowmobilers rejoice- study supports winter road closures" in The Salt Lake Tribune. Published June 13, 2014. Available at: http://archive.sltrib.com/article.php?id=58064606&itype=CMSID. Accessed October 23, 2017.

Smuggler's Notch, VT. Driving Directions to Smuggler's Notch Resort. <u>http://www.smuggs.com/pages/winter/directions.php</u>. And http://www.smuggs.com/pages/fall/directions-fall.php

Maze, Thomas H., Michael R. Crum and Garrett Burchett. 2005. An Investigation of User Costs and Benefits of Winter Road Closures. Iowa State University. Available from: <u>http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1019&context=intrans\_reports</u> Accessed October 10, 2017.

Nielsen, Liesl. 2017. "9 Local Roads Closing for the Winter". KSL.com. Available from: <u>https://www.ksl.com/?sid=46199751&nid=148</u>. Accessed November 20, 2017.

Upper Valley Land Trust. N.D. Vermont's Landowner Liability Law. Available from: http://www.uvlt.org/docs/landconservation/VTLiability.pdf. Accessed December 20<sup>th</sup>, 2017.

Additional websites where Lincoln Gap is mentioned and could use information about road closures/ parking availability:

https://www.youtube.com/watch?v=74gBQLLYEkA

http://www.findandgoseek.net/listing/lincoln-gap-road-bristol/sledding

https://vtvast.org/trails.html

http://www.newenglandriders.org/stowe/VT\_Gaps\_Ride.htm

http://www.summitpost.org/the-long-trail-from-lincoln-gap/166474

http://www.northeastcycling.com/six-gaps/

http://www.madrivervalley.com/listing/long-trail-lincoln-gap-to-mt-abraham

https://www.greenmountainclub.org/

http://www.happyvermont.com/2014/10/07/easy-vermont-hikes/

http://www.scenesofvermont.com/phpbb2/viewtopic.php?t=1496

### ENDNOTES

<sup>i</sup> VTrans. 2016. General Highway Map: Town of Lincoln, Addison County.

VTrans. 2015. General Highway Map: Town of Warren, Washington County.

<sup>ii</sup> Gran Fondo Guide. <u>http://www.granfondoguide.com/Contents/Index/969/gran-fondo-vermont-preview</u>. Accessed October 12th, 2017.

<sup>iii</sup> Town of Lincoln. 2017. Lincoln Town Plan 2017 Draft for PC Public Hearing. <u>http://lincolnvermont.org/wp-</u> <u>content/uploads/2017/10/Lincoln-Town-Plan-2017-Draft-for-PC-Public-Hearing-413-17-1.pdf</u>.

<sup>iv</sup> Sorensen, Eric and Jon Osborne. 2014. Vermont Habitat Blocks and Habitat Connectivity: An Analysis Using Geographic Information Systems. <u>http://www.vtfishandwildlife.com/UserFiles/Servers/Server\_73079/File/Conserve/Vermont\_Habitat\_Blocks\_and\_Habit</u>

at\_Connectivity.pdf. Accessed December 5, 2017.

<sup>v</sup> Kelsey, Amy. Executive Director, Catamount Trail Association. Personal Communication. October 5, 2017.

<sup>vi</sup> Stowe Today. 2017. "Smuggler's Notch/ Route 108 closed for winter" in Stowe Today. <u>http://www.stowetoday.com/stowe\_reporter/news/state\_news/notch-road-officially-closed-for-winter/article\_c74e0050-d5ee-11e7-a731-0f393037b0da.html</u>.

<sup>vii</sup> VTrans. 2015. White Paper: Class 1 Town Highways Routine Winter Maintenance Calculations. <u>http://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/Class%20I%20Town%20Highways%20White%20</u> <u>Paper.pdf.</u> Accessed November 11, 2017.

viii VTrans. Ibid.