



Denali National Park and Preserve Long-Range Transportation Plan

Appendix F: Denali Funding Plan

Denali National Park and Preserve Financial Analysis Technical Report – FINAL DRAFT

Introduction

This report discusses the transportation funding aspects of the Denali National Park and Preserve's first Long Range Transportation Plan. It includes a retrospective of transportation funding from 2006-2013, a projection of funds expected to be available for transportation during the plan's twenty year planning horizon, and a summation of the resources necessary to return transportation facilities at Denali National Park and Preserve (Denali NPP) to ideal conditions. As is true for all of the National Park Service (NPS), the amount of funding that is needed for transportation at Denali NPP exceeds the amount that will be available in coming years, and so this report includes an investment strategy that funds the highest priority needs.

The discussion must begin with two of the NPS's guiding transportation investment principles and Denali NPP's primary existing transportation document, the Vehicle Management Plan (VMP). It then discusses Denali NPP's place in Alaska Region transportation funding and the expected increase in funding needs due to climate change impacts. The middle section of this report discusses the LRTP methodology in general, and how the Denali NPP LRTP methodology differs from those used for other NPS LRTPs. There is also a discussion of historical, forecasted, and needed transportation funding that collectively make up the baseline transportation funding report for Denali NPP.

This report concludes with a discussion of the funding strategies which were evaluated for the Denali NPP LRTP and how the final strategy was selected. The investment strategy prioritizes operations and maintenance, the rehabilitation of the paved section of the Park Road, funds the unpaved sections of the Park Road to achieve management priorities, and provides approximately \$1m per year to address other transportation priorities. The Denali NPP transportation investment strategy is expressed with respect to each of the four LRTP planning scenarios to guide park management decisions during times when visitation is increasing or decreasing and when funding (or stakeholder support) is higher or lower than average. Funding shortfalls means that the condition of all transportation assets cannot be improved, but progress can be made to address the highest priorities.

Funding Denali Transportation Facilities

Capital Investment Strategy and Total Cost of Facility Ownership

As a best practice and formal policy, the NPS incorporates strategic facility planning into its asset management decision-making processes, including LRTPs. Two fundamental concepts, the NPS Capital Investment Strategy (CIS) and Total Cost of Facility Ownership (TCFO), underlie those best practices and are drivers of the investment planning and decision-making reflected in the Denali LRTP.

The NPS Capital Investment Strategy

The CIS is an NPS strategy for prioritizing project investment to ensure effective and responsible project funding. The CIS includes a scoring tool that decision-makers at all levels of the NPS have available to them to inform project investments and other asset management needs.

The purpose of the CIS is to help prioritize investments, focus on mission-critical assets, manage operations and maintenance, and ensure that the greatest impact can be made with available capital and operational funds. The CIS uses a scoring tool to evaluate projects on a number of different criteria: *Financial Sustainability*, *Visitor Experience*, *Resource Protection*, and *Health & Safety*. The four categories are weighted using a predefined algorithm to arrive at an overall project score. Projects can then be compared by score as needed; in theory the greater the score the higher the priority. The scoring strategy supports an asset management approach that emphasizes maintaining key assets and reducing the estimated value of deferred maintenance cost against those key assets.

Some of the key objectives in the *Financial Sustainability* strategy are to build only what can be maintained, right-size the asset portfolio, reduce liabilities, reduce resource consumption to promote sustainability, and eliminate non-essential development in order to emphasize the essential natural and cultural experience. The *Visitor Experience* strategy includes investment in assets or resources that enable recreation, and serve as gateways to park units, contact stations, and interpretive assets. The *Resource*

Protection strategy focuses on those historic, cultural, and natural resources that the NPS is tasked with protecting and preserving. Such tasks supported by the CIS could include preservation, repair, and restoration of assets. Finally, the *Health & Safety* strategy places an emphasis on correcting unsafe or hazardous conditions within park units that pose a threat to visitors or staff. Different parts of the Denali LRTP address these four strategies, which are used by fund program managers to allocate limited funding.

Total Cost of Facility Ownership

Applying the concept of Total Cost of Facility Ownership (TCFO) is considered by the NPS to be a vital part of a financially sustainable infrastructure strategy and practice to truly address transportation asset management.¹ It aligns closely with the intentions behind the CIS, especially the CIS Financial Sustainability component. TCFO is the full life-cycle cost of constructing, maintaining, and operating an asset until it needs replacement. This concept recognizes that assets require investment throughout their service lives until they need replacement or disposition and that preventive maintenance and facility operations activities are key to minimizing long-term costs and optimizing the life of said assets. Implementation of the TCFO concept involves a shift-away from a “just fix it” or “run to failure” mentality to more holistic planning, making cost estimates and decisions that consider not just the deferred maintenance (DM) of an asset but the ongoing O&M need over its service life, need for replacement, and ultimately disposition.

The Denali LRTP team took the concepts inherent to the CIS and TCFO and embedded them into all of its LRTP analyses and planning activities. Consequently, the resulting investment strategy selected by Denali NPP staff is consistent with the approaches and practices used across the NPS to develop, for example, the National LRTP and other unit or regional LRTPs.

The Denali Park Road and the Vehicle Management Plan

Denali NPP is one of the most visited National Park Service units in Alaska and the Denali Park Road is the means for the majority of visitors who wish to traverse deep into the interior by any mode, motorized or otherwise. For many visitors it is the most readily accessible transportation corridor for them to experience the Alaska wilderness, and for some it is their only option. Denali NPP is currently several years into the implementation of its VMP, the culmination of an intensive planning effort to balance the needs of the park’s natural resources with high visitor demand. The Denali LRTP is consistent with the recommendations in the VMP.

Generally, the VMP recommends limiting vehicle traffic on the Denali Park Road in order to reduce traffic impacts on natural and cultural resources. The VMP has a “telescoping” approach where visitor activity is highest and associated development is most extensive in the paved entrance area of the park, and declines and lessens respectively as the Park Road heads west. As shown later in the section on Funding Strategies, the Denali LRTP reflects this by realigning maintenance and rehabilitation investments along the Park Road to concentrate on the areas of highest visitor activity and most extensive development.

Funding Trends

The Federal Lands Transportation Program in the NPS Alaska Region

The Federal Lands Transportation Program (FLTP) is the single largest source of transportation funding for the National Park Service and other Federal land management agencies. Project funding decisions are made at the regional level following national guidelines. The FLTP at a national scale has recently been reauthorized at a higher funding level than analyzed in this plan. However, interim program guidance suggests that the majority of the increase will be reserved for nationally significant major projects, with only a small increase to regional allocations.

Denali NPP has historically been the largest recipient of FLTP funding in Alaska, in part because 20 of the Region’s 27 miles of paved roads are within Denali NPP. The unpaved Park Road may also be funded by FLTP. NPS regional staff indicate that Denali NPP has in the past received all funding from the program by default, unless another NPS Alaska Region park unit has eligible needs (which is rare), at which point that project from another park unit moves to the top of the regional FLTP program. This means that FLTP will likely be a sustainable funding source for major investments at Denali NPP into the future. The next three years of FLTP investment at Denali will be primarily used to rehabilitate the 15 mile paved section of the Park Road, from the park entrance to the Savage River checkpoint.

¹ For example, reference “Memorandum: Guidance for Addressing Facilities in Planning Documents”, Associate Director, Park Planning, Facilities, and Lands, National Park Service, US Department of the Interior, January 4, 2016.

Climate Change and Geotechnical Hazards

As explained elsewhere in the LRTP, current research indicates climate change is dramatically affecting transportation facilities across Alaska. The impacts of climate change relevant to Denali NPP's transportation system include thawing permafrost, unstable slopes, a lengthening shoulder season, and other change indicators. Most of these changes will result in higher costs to operate and maintain Denali NPP's transportation network, which will further stress already limited funding.

Monitoring and evaluation of climate change impacts is an ongoing need and a recommendation of this LRTP. Tracking threats and hazards to the transportation system such as unstable slopes requires funding for specialized equipment and the technicians and scientists who collect and analyze the data. Funding updates to hydrology models and monitoring permafrost thawing are other near-term, relatively inexpensive data needs that can help avoid disastrous impacts over the medium to long term. Denali NPP has initiated the effort but funding has not been identified for developing specific plans for how to adapt the transportation system in the park to these expected impacts.

In the near term, a number of susceptible areas along the Park Road will likely encounter more frequent closures due to intermittent landslides, flooding, or debris flows with each requiring cleanup and reopening. The future impacts of one of the effects of climate change, increasing precipitation in the Denali Borough region, can already be previewed during excessively wet years. 2016 was a particularly wet year and staff were faced with unstable slopes and more frequent and more severe debris flows. Beyond the cost of cleaning up after these road closures there are short-term disaster management tasks for which Denali must be ready – evacuation or care of visitors, staff, users, and inholders on the far side of an interruption.

Some dedicated funding sources are available for recovery costs, such as NPS Emergency Storm & Flood Damage and FHWA's Emergency Relief for Federally Owned Roads (ERFO). These programs have limited budgets, and will be increasingly strained in an era of continued climate change impacts, not just in Denali NPP but across the National Park Service. These funding sources are currently limited to recovery costs only, and cannot be used for monitoring or preventive work that can anticipate and avoid a future event, such as by stabilizing slopes or realigning a road.

There are several segments of the Park Road and its associated bridges and structures that may become physically or financially untenable in the next few decades. There may come a time when the park will need to consider decommissioning, rerouting, and/or relocating these facilities. These costs are not yet known, but will likely far exceed Denali's typical past annual funding and may require special major project funding. US Department of Transportation (DOT) discretionary grants such as the (unfunded) Nationally Significant Federals Lands and Tribal Projects program or Transportation Investments Generating Economic Recovery (TIGER) are possible sources, as is the NPS Line Item Construction program. However, because these needs are not yet quantified, and because they are beyond the capacity of the current funding programs to address, the costs of fully adapting the transportation system to climate change are not included in the Denali LRTP financial analysis.

Denali LRTP Funding Baseline

Financial Analysis Methodology

The financial analysis methodology for the Denali LRTP is based on the data and methods first developed for the NPS National LRTP (NLRTP). A much more detailed technical summary is available for the NLRTP and generally applicable to the Denali LRTP, but this section will cover the basic steps as well as deviations used to adapt it to the unit level.

Historical Investments

Establishing a financial baseline of the historical average annual level of regional transportation spending provides a foundation for forecasting the likely future available funding levels which can be anticipated for Denali NPP's transportation facilities. This is important information for developing a fiscally-constrained LRTP. The LRTP team analyzed all of the fund sources that had been used for transportation investments at Denali NPP from fiscal year (FY) 2006 through FY 2013. These results provide a vital context for developing the Denali LRTP investment strategy.

Annual transportation investments at Denali NPP averaged \$9.23 M per year from 2006-2013 from all funding sources combined.

The financial data was extracted from various financial and project management data tracking systems.² The LRTP team:

- identified historical expenditures, awards and authorizations for transportation assets
- adjusted those prior year dollar values to equivalent 2014 values using GDP inflation factors, and
- calculated an annualized average transportation funding expenditure rate for the period FY 2006 – FY 2013.

This data was initially prepared by the National LRTP team, and then reviewed by the Denali LRTP team to remove any anomalies. To simplify reporting, the dataset was consolidated, coded and grouped by funding authorizations, funding programs, work types, and asset types. All identifiable American Recovery and Reinvestment Act (ARRA) investments, a one-time, extra-ordinary funding source, were removed from this analysis. A detailed technical methodology document is available from the NLRTP effort.

Because the data only includes transportation expenditures made by the National Park Service, it does not include transportation investments by third parties. The park's partners such as the Alaska Railroad, bus concessioners, Denali Borough, and the Alaska Department of Transportation and Public Facilities (ADOT&PF) all fund transportation work that helps visitors, employees, inholders, and freight carriers access the park. However, these investments are not accounted for in this analysis because these data do not enter NPS financial data systems.

Forecasted Transportation Funding

This section documents the Denali NPP financial forecast for transportation based on anticipated future funding levels that can be reasonably assumed to be available. The forecast of available funding provides the principal financial constraint against which future investment plans must be prioritized, and represents the result of the most likely funding scenario for each funding source that Denali NPP has recently used for transportation. It

does not include a forecast for work done by other parties, such as the State of Alaska or Denali Borough, that may benefit Denali NPP, and it also doesn't include any unforeseen additional funding which may result in a "Popular Park" scenario (increased funding and support with an increase in visitation) or "Surplus of Money" scenario (increased funding and support with a decrease in visitation) when compared to the historical average. However, for the purposes of the investment strategy in this plan, the funding forecast is considered to be at the center of our "Management Strategies of no Regret" - those actions that make sense given a normal variation in expected support, funding, and visitation levels.

The LRTP team estimates that approximately \$7.75 M per year will be available to Denali NPP for transportation purposes over the next six years.

The Denali LRTP team leveraged the approach applied in the development of the NPS National LRTP to forecast anticipated funding availability for transportation investments in the near future. There were two main sources of forecasting information:

The NPS budget office. The Budget Office conducts forecast exercises servicewide and with individual units. The Budget Office suggested the LRTP program assume a one-time reduction to Title 54 (DOI) Non-Fee program fund sources of three percent for ONPS and Cyclic Maintenance programs in the NPS National LRTP. The DENA LRTP forecast was based on a combination of actual funding program investment plans where possible and the three percent cut when it wasn't. The three percent reduction only applied to programs for which the Denali LRTP project team did not have access to an investment plan (e.g. Operational Base).

Regional Funding Programs. The Denali LRTP project team consulted several regional-level program plans to acquire information on planned investment levels: Title 54 Non-Fee programs for Cyclic Maintenance, Repair/Rehabilitation, and Line Item Construction; Title 16 / 54 Fee programs for Recreation Fee, Transportation Fee, and Concession Franchise Fees; and the Title 23 Federal Lands Transportation Program. These forecasts replaced the National LRTP-style (i.e., three percent reduction) forecasts for these programs as they provide more certainty than broad program-level authorizations and appropriation amounts.

The elimination of the Paul S. Sarbanes Transit in the Parks Program (TRIP) is another factor to note in the forecast, but the only analysis needed is to not project any future grant awards from this program. Denali made use of TRIP in the past, but will need to seek other funding sources to fund future transit and trails projects. This is also true of various grant programs formerly used by many parks, but not Denali NPP, such as Scenic Byways or the Public Lands Highway Discretionary Program.

² Systems used included the NPS Administrative Financial System (i.e., AFS Versions 3 and 4) and the joint Federal Highway Administration (FHWA)/NPS Park Roads and Parkways Transportation Allocation and Tracking System, a.k.a. PTATS.

Unfortunately, transportation funding for Denali NPP is expected to decline unless additional funding sources are found or funds are redirected from other critical areas. The declining funding environment coupled with historically high visitation may result in a “Losing Ground” scenario (decreased funding and support with an increase in visitation) when compared with historical averages. These conditions are not dissimilar from recent years (e.g., 2013-2015).

Transportation Investment Needs

Investment needs are defined in this plan as the amount of funding required to bring transportation assets to good condition and sustain them at that level. Investment needs also include costs to address programmatic needs such as code compliance, structural fire and accessibility. Other goal area needs such as resource protection may overlap with asset management (TCFO) needs or may be additional, potentially unfunded requirements.

The LRTP team estimated an annual need of \$12.42 M to return the Denali NPP transportation system to good condition and keep it there over six years.

The Denali LRTP used a similar methodology as the National LRTP and other Regional LRTPs, using needs data from the best available data system or report that covers a particular type of transportation facility and type of work. However, many of the reports and systems available at the regional or national level do not apply to individual parks. The principal difference between the needs in the Denali LRTP is the use of automated systems. The data sources used for the Denali LRTP are:

- **Reoptimization File:** O&M needs for all facilities except the unpaved Park Road
- **2013 Alaska Region Unpaved Road Analysis (pilot):** Detailed analysis for the unpaved Park Road
- **Facility Management Software System (FMSS):** Component renewal and programmatic needs
- **Project Management Information System (PMIS):** Capital investment needs, planning, natural/cultural resources
- **National list of megaprojects:** Paved Park Road repair project and replacement of the Toklat River Bridge

Differences between the needs sources, such as timespans and prioritization systems, were reconciled in order to create a single set of transportation facility needs for Denali NPP. Park staff also reviewed the needs data and removed several projects that were already underway or would be accomplished through partners rather than by the park. At \$12.42 M per year, the estimated annual transportation investments needs exceed the annual transportation funding amount by \$4.67 M per year.

Transportation Funding for Denali NPP

This section discusses the current and near future transportation funding outlook for Denali NPP. It covers where funds have come from and how they have been used in terms of what type of transportation facility was funded, what type of work was funded, and how transportation funding is prioritized.

Investments by funding source

From 2006-2013, the National Park Service as a whole used more than 60 different funding program and accounts to fund transportation activities, but only ten programs funded investments at Denali NPP. Table 1 below shows how much each funding program provided in the past, how much it is expected to provide in the future, and how much would be needed from each funding program to cover Denali’s total transportation need each year if past investment patterns were continued.

Table 1: Denali NPP Transportation Investments and Needs by Funding Source (in millions of 2013 \$)

Investments by funding source	Historical Average Annual Investment	Forecasted Annual Average Investment	Estimated Annual Needs
Title 54 Non-Fee	\$1.75 M	\$1.01 M	\$3.35 M
Cyclic Maintenance	\$0.63 M	\$0.04 M	\$0.01 M
Line Item Construction	\$0.34 M	\$0.32 M	\$0.07 M
Operational Base	\$0.64 M	\$0.55 M	\$2.70 M
Other NPS Programs	\$0.07 M	\$0.07 M	\$0.19 M
Repair/Rehab	\$0.07 M	\$0.02 M	\$0.39 M
Title 54 / Title 16 Fee	\$1.34 M	\$2.11 M	\$2.61 M
Concessions Franchise Fees	\$0.67 M	\$1.44 M	\$0.51 M
Recreation Fee	\$0.67 M	\$0.67 M	\$2.10 M
Title 23	\$6.01 M	\$4.62 M	\$5.86 M
FLTP	\$6.01 M	\$4.62 M	\$5.86 M
Other/External	\$0.14 M	\$0.01 M	\$0.60 M
FTA TRIP/ATPPL	\$0.12 M	--	--
Reimbursable Agreements	\$0.01 M	\$0.01 M	\$0.60 M
Grand Total	\$9.23 M	\$7.75 M	\$12.42 M

Each of these funding programs have a different legislative authorization and project eligibility criteria. Title 54 programs are those authorized by Title 54 of the U.S. Code (National Park Service-specific programs). Title 16 includes other relevant Department of the Interior programs (i.e., Recreation Fee Program). Title 23 includes programs overseen by the Federal Highway Administration, and the “Other/External” category includes other funding sources, such as the discontinued TRIP program, as well as reimbursable agreements, donations, partnerships, and other less common sources.

Investments by Facility Type

Denali NPP maintains a diverse system of transportation facilities including paved and unpaved roads, bridges, paved and unpaved transportation trails, transit facilities, developed airstrips, as well as support infrastructure such as a materials (gravel) quarry. Table 2 below shows historical investments, forecasted investments, and the estimated annual investment needs for each of the park’s transportation facility types.

Of all historical investments in transportation at Denali NPP in the recent past, about 55% went to the Park Road and associated structures, and 18% supported parkwide operations that include the Park Road. Less than a third was used for separate transportation facilities, such as trails and access roads. Park Road funding was oriented to the unpaved segments that require frequent repair work to remain in even fair condition given the extreme conditions and heavy vehicle traffic in Denali NPP. Recent investments in several difficult sections in the western end of the Park Road helped restore user comfort and safety.

Table 2: Denali NPP Transportation Investments and Needs by Asset Type (in millions of 2013 dollars)

Asset Type	Historical Average Annual Investment	Forecasted Average Annual Investment	Estimated Annual Needs
Unpaved Roads	\$3.86 M	\$2.35 M	\$5.27 M
Road Bridges	\$1.84 M	\$0.42 M	\$1.35 M
Trails and Transit	\$1.47 M	\$0.66 M	\$1.37 M
Paved Roads	\$1.44 M	\$2.91 M	\$2.97 M
Other³	\$0.51 M	\$0.53 M	\$0.66 M
Parking	\$0.11 M	\$0.89 M	\$0.81 M
Grand Total	\$9.23 M	\$7.75 M	\$12.42 M

Investments by Asset Lifecycle stage

As discussed in the section on Total Cost of Facility Ownership, different types of work are needed at different points in a transportation facility’s lifespan, from planning through to rehabilitation or disposition. Table 3 below shows historical and forecasted annual investments as well as estimated annual investment needs for each lifecycle stage, for all asset types combined.

Table 3: Average Annual Investments by Lifecycle Stage (in millions of 2013 dollars)

Lifecycle Stage	Historical Average Annual Investment	Forecasted Average Annual Investment	Estimated Annual Needs
Planning and Administration⁴	\$0.58 M	\$0.57 M	*
Capital Investment	\$1.34 M	\$2.59 M	\$1.30 M
Operations and Preventive Maintenance	\$0.45 M	\$0.48 M	\$1.86 M
Recurring Maintenance	\$1.42 M	\$0.83 M	\$3.74 M
Component Renewal	\$5.27 M	\$2.59 M	\$5.08 M
Grand Total	\$9.23 M	\$7.75 M	\$12.42 M

Denali NPP’s greatest area of transportation investment need is in heavy repair and rehabilitation work, similar to much of the rest of the National Park Service. Insufficient funding often leads to smaller, routine maintenance work being deferred, which causes transportation facilities to fall out of a state of good repair. Other significant needs at the park include annual operations and maintenance of transportation facilities and making improvements to culverts that provide for fish passage and building an aircraft hangar.

Note that some categories, such as capital investment, show “surpluses” where more funds are forecasted for investment than are needed. This is the result of project programming where several capital investment projects are scheduled for near-term construction in 2016-2021, whereas the needs represent the average annual needs over twenty years.

³ Other category includes aviation, buildings that support transportation, equipment, and multimodal facilities. Trails and Transit notably excludes investments and O&M spending made by the transit contractors who operate within Denali NPP, but does include Denali’s own investment in bus transit facilities such as buildings, lots, and experimental hybrid buses.

⁴ Routine planning and administration needs are not included in NPS facilities management data systems, but can be assumed to continue at historical levels. Additional unquantified planning needs are likely in the LRTP’s horizon, including work in the park’s entrance area, coordination with private shuttle services and the Alaska Railroad, and transportation planning to maintain park operations in the face of climate change impacts.

Programmatic Needs

Some of the lifecycle stage needs are also considered programmatic needs for transportation facilities at Denali NPP. Programmatic needs include work necessary to meet standards set by safety, accessibility, environmental, and fire safety requirements. It is generally analogous to code compliance work that would be the responsibility of a facilities manager or an architect hired by a private business.

Figure 1 summarizes estimated programmatic needs for the Denali NPP transportation asset portfolio, which total less than \$300,000. Transportation facilities generally have relatively small programmatic needs compared to facilities such as visitor centers, housing, and offices. Although not broken out in the historical and forecast data, these types of projects are included in the NPS Facility Management Software System (FMSS) as needs. Denali NPP's programmatic needs are included in the overall \$12.42 M per year needs as capital investment or component renewal needs. They are classified as capital investment if plans are to proactively address them as individual projects, or as component renewal when addressed through a rehabilitation project that focuses on a low condition rating.

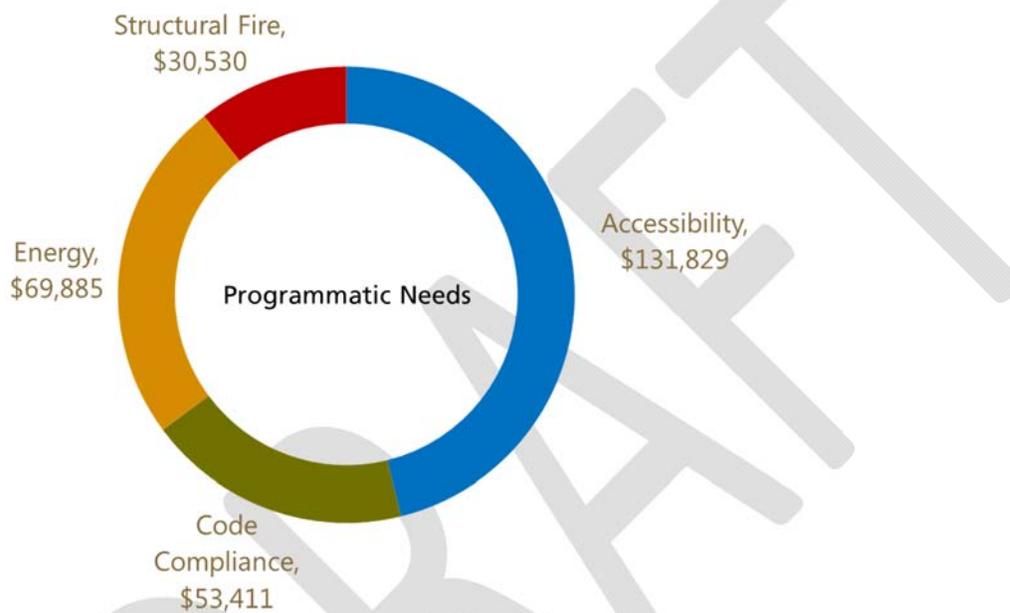


Figure 1: Denali NPP Transportation Programmatic Needs

Investments by Asset Priority

The final classification for investments is what priority of assets they were used to build, maintain, or repair. NPS financial and asset management systems do not support this analysis for the historical or forecast data. Each future investment need at Denali NPP is associated with the priority of the asset or the project itself, this is shared below in Table 4. For the purposes of this plan, Highest Priority is generally defined as Optimizer Band 1. High Priority is defined as Optimizer Band 2. Optimizer bands 3-5 are defined as “other priority.” Although they are not banded as such, critical Park Road work is labeled as Highest Priority, consistent with the priorities discussed during the investment strategy section later in this report.

Table 4: Estimated Annual Needs by Priority.

Priority	Estimated Annual Transportation Needs	Optimizer Band Equivalent
Highest Priority	\$3.77 M	Band 1
High Priority	\$5.84 M	Band 2
Other Priority	\$2.81 M	Bands 3, 4, 5

Denali NPP differs from other National Parks and the NPS as a whole due to the relatively low proportion of the total need in the highest

priority need category. Many transportation facilities in Denali NPP have been categorized in optimizer bands 2-5. This reflects the values laid out in Denali NPP's *Foundation Statement* that place a high priority on investment in resource protection, science, and other portfolio areas ahead of transportation and broader visitor use needs. As a result the park is able to cover its entire highest priority transportation needs given current funding. In fact, the \$7.75 M per year in forecasted funding is enough to cover 80% of the highest and high priority transportation needs combined. However, there are still high priority transportation needs that will remain unmet unless additional funding is found, and longer-term and lower-priority needs that cannot be met with forecasted funding.

Investment Strategies

The final step of the financial planning process for NPS LRTP development is the formulation of an investment strategy. It is a synthesis of the plan's goals and objectives, already formulated projects and other transportation-related needs, and the reality of the constraints that exist in the current funding environment. This section of the report describes the process used by the Denali LRTP team to identify several potential investment strategies, including the strategy selected by Denali NPP staff for the Denali LRTP. It also discusses potential alternatives which park management may consider if future funding or visitation deviates significantly from the forecast, referencing the planning scenarios used in the development of the Denali LRTP.

Methodology

The key to understanding the funding strategy process is that funding in a constrained environment is a zero-sum game. All investment strategies make use of the same \$7.8 M annual funding amount that is forecasted for the near future. Because transportation needs exceed this amount and because moving funds from other purposes deprives those projects of needed funding, all investment strategies shift funds from one set of priorities to another. The O&M strategy option shown in Table 5, for example, focuses on staying current on annual operations and preventive maintenance work at the expense of larger repair projects.

Unlike the plans for the National Capital, Southeast, Midwest Regions and the NPS as a whole, the Denali LRTP used a single modeling tool to model the results of the different funding strategies on the Denali NPP transportation system. A deferred maintenance (DM), FMSS-based tool was modified by a contractor (Booz Alan Hamilton) to work at the unit level and take into account park specific facilities such as the unpaved Park Road. This tool uses extracts from FMSS to estimate Facility Condition Index (FCI) and DM outcomes given a known annual funding level. The FCI outcomes reported for this effort are 'Adjusted FCI', which includes programmatic needs and an anticipated 35% cost markup in addition to the "raw" DM normally used in calculation of the FCI.

Strategy Development Process

Methodology and Initial Strategy Concepts

The team held several workshops and follow-up discussions with NPS stakeholders and partners to identify candidate strategies and to select the Denali NPP LRTP Investment Strategy (p. 12). Internal NPS stakeholders included Denali NPP staff, Alaska Region staff, and the Washington Support Office (WASO). Partner input included expertise from FHWA Western Federal Lands Highway Division and US DOT Volpe Center staff familiar with the NPS LRTP financial planning process.

The team worked with stakeholders to identify potential candidate strategies in light of CIS and TCFO policies, best practices, and past investment patterns (see Table 2 and Table 3). The initial investments strategies are shown in Table 5 below and were based on trends discussed by the project team early on in the Denali LRTP.

Table 5: Initial Investment Strategy Concepts

Investment Strategy Option	Invests in...	At the expense of...
Business as usual	Highest priority assets	Lower priority assets
O&M emphasis	Fund 100% of annual O&M needs for all assets	Capital investments and rehabilitation
Transit and trails	\$1 M for existing transit and trails before other investments	\$1 M for roads and parking
Make improvements	\$1 M per year for new assets/services (e.g., employee transit, real-time bus trackers, new trails)	\$1 M less for annual O&M, and rehabilitation
Safety and programmatic needs	Programmatic and safety needs before everything else (e.g. accessibility, slope stability)	\$1 M less for annual O&M, rehabilitation

The reaction to the strategies from park staff indicated high interest in the O&M strategy – if the park is able to at least stem the growth in deferred maintenance using its typical transportation funding sources then the park can later seek out additional funds to rehabilitate facilities that are no longer in a state of good repair. The specificity of the three strategies that make different kinds of improvements was eliminated in favor of a general “make improvements” strategy since transit and trails, enhanced ITS, and safety and emergency response are all priorities at the park that vary from year to year. Finally, Denali NPP staff noted that, given its current condition, the unpaved section of the Denali Park Road could still be one of the best unpaved roads in Alaska even with a reduction in maintenance levels, so exploring redirecting some funding from the Park Road to other facilities in the park might be a viable option. Various sections of the Park Road meet different condition criteria, from good to fair to poor.

Refined Investment Strategies

No one strategy rose above others as a preferred strategy in the first round of modeling, but the number of strategies was narrowed to two. Both strategies funded all operations and maintenance needs and ensure that planned projects such as the paved Denali Park Road rehabilitation are completed, but one option set aside \$1 M per year for improvements or new facilities. Table 6 below shows the tradeoffs of the two refined general strategies.

Table 6: Refined Investment Strategies

Strategy	Invests in...	At the expense of...
Cover all O&M, complete planned projects	O&M and critical near-term repair needs	Making improvements
Cover all O&M, complete planned projects, and reserve \$1M/yr for improvements	O&M, critical near-term repair needs, and improving transportation at Denali	Buying down deferred maintenance

Unpaved Denali Park Road Analysis

In addition to these two strategies, Denali NPP staff also wanted to test whether transportation funds allocated to the unpaved Park Road in a business as usual approach could be shifted to other purposes. The LRTP team, as well as staff from Denali NPP and the Alaska Region developed five different options for unpaved road condition targets that could be modeled to estimate costs of different sets of conditions. Table 7 below summarizes these five sets of condition targets. Each of the two general strategies were tested using the five sets of condition targets, for a total of ten investment strategy and condition results. The strategies in Table 7 highlighted in red were not achievable given projected funding levels and established higher priorities.

Table 7: Unpaved Park Road Conditions

Strategy	Goals	Annual Cost
Plan A	Maintain all Park Road segments in good condition	\$4.3 M
Plan B	Maintain all Park Road segments in fair condition	\$3.7 M
Plan C	Set Park Road conditions from segment to segment, recognizing that some segments are costlier to maintain in good condition than others	\$2.9 M
Plan D	Follow the VMP’s “telescoping” approach by keeping conditions good in the first part of the road, fair in the middle part, and poor at the western end	\$2.5 M
Plan E	Follow the VMP’s “telescoping” approach by keeping conditions good to fair in the first to middle parts of the road and poor at the western end.	\$2.7 M
Plan F	VMP “telescoping” approach as in Plan E, but with further lowered condition targets for two of the most expensive areas - MP 43-47 and MP 88-92	\$2.0 M

Refined Strategy Results

Unlike the initial strategies, several of the refined strategies were not viable. None of the condition targets on the unpaved Park Road could be met if Denali NPP was to reserve \$1 M per year for making improvements elsewhere on the park, and so that general strategy was discarded. Even without reserving \$1 M per year, projected funding is insufficient to meet the good to fair conditions proposed under plans A and B for the unpaved park road without scaling back commitments to O&M, planned repaving of the paved sections of the Park Road, and the rest of Denali NPP’s transportation facilities. Additional funding could make Plans A and B possible – about \$1.3 M per year more would allow for Plan A to be achieved, and \$0.7 M more per year would allow plan B to be achieved.

Plans C, D, E, and F are viable given currently constrained funding levels. Plan C shows that it is possible to meet all of the investment strategy’s commitments and still maintain the unpaved Park Road on a segment-by-segment basis. The conditions explored in Plan C take the relative expensive of each segment into account, and the most difficult segments are allowed to remain in fair to poor condition. However, modeling showed that meeting these conditions would provide almost no funding for other transportation priorities.

Plan D applies the Vehicle Management Plan’s “telescoping” approach to the maintenance of the unpaved Denali Park Road and targets mid-poor condition for the farthest west segments which are intended to be more rustic and less traveled, but keeps the middle and eastern segments in fair to good condition. Under this plan nearly \$0.5 M per year would be available for other transportation priorities. Plan E made slight changes to keep more of the road in good condition instead of fair.

Plan F was ultimately selected as the condition target for the Denali NPP LRTP. This option retains the approach of Plan E but reduces condition targets for two sections, which are particularly challenging and expensive to maintain. Under plan F, Polychrome Pass would be improved slightly (but still be in poor condition) while the final stretch of the park road would be allowed to decline to poor condition. These two changes free about \$0.6 M per year for use elsewhere on the road and in Denali NPP. More information about these two segments is provided in Appendix A at the end of this technical report.

Denali LRTP Investment Strategy

The refined strategy results narrowed down the policy options for the unpaved Park Road and led to the selection of the Denali LRTP Investment Strategy as the best fiscally-constrained option for meeting the goals and objectives of the plan. This strategy

would invest Denali’s forecasted \$7.75 M per year in four categories as shown below in Table 8 and **Error! Reference source not found.** below.

Table 8: Denali NPP LRTP Investment Strategy

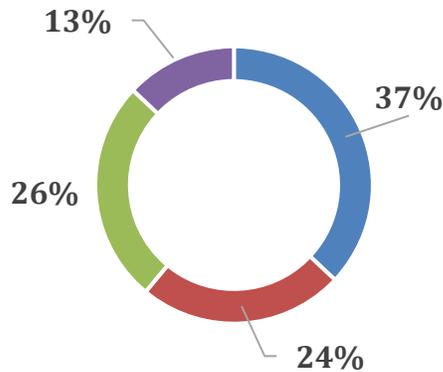
Category	Estimated share of annual funds	Estimated annual investment	Percentage of needs met
Operations and Preventive			
Rehabilitate Paved Portion of the Denali Park Road	24%	\$1.9 M	100% of needs met
Repair and Improve Other High-Priority Transportation Assets	13%	\$ 1.0 M	24% of needs met

The Denali LRTP Investment Strategy strikes a balance between several different priorities for transportation at the park, and lies within the “Management Actions of No Regret” area of the Denali LRTP scenario chart. The strategy proposes to fully fund O&M needs in order to slow the decline of facilities and ensure a better visitor experience. It continues planned investments on the paved section of the Park Road to achieve a good condition rating, and continues to make funding available to address deferred maintenance on the unpaved sections of the Park Road. However, the strategy sets lower condition targets for sections of the unpaved Park Road which are further into the park and which are less traveled by visitors, in order to reserve funding for other segments of the Park Road, and for entrance area transportation facilities (e.g., aviation, parking areas, new priorities). This approach is consistent with the Vehicle Management Plan which envisions lower traffic volumes and a more rustic experience the further the road extends from the park entrance area.

Ultimately, because funding needs exceed available resources, the condition of transportation facilities at Denali NPP is expected to decline overall. FCI ratings across the Denali NPP transportation system today are modeled at 0.148, or the low end of fair condition. Continued scarce funding for transportation will reduce conditions to 0.185 by 2021⁵. However, higher priority transportation facilities are expected to remain in fair condition overall, as described by the Investment Strategy.

⁵ FCI ratings are modeled on a 0-1 scale where 0.000 is perfect condition, and 1.000 is completely degraded condition.

Denali LRTP Investment Strategy



- Operations and Preventive Maintenance (all transportation assets)
- Rehabilitate Paved Portion of the Denali Park Road
- Repair and Maintain the Unpaved Portion of the Denali Park Road
- Repair and Improve Other High-Priority Transportation Assets

Figure 2: Denali LRTP Investment Strategy

Denali Investment Strategy and LRTP Scenarios

All of the funding strategies considered for the Denali NPP LRTP assumed the same funding forecast, and would fall within the “Management Actions of No Regret” area on the scenario planning graphic reproduced in **Error! Reference source not found.** below. This area represents a balance between times of high and low visitation, and high and low funding for the park. It is calibrated based on an average of funding and visitation over time. Years within one standard deviation of these means lie within it, if they are more than one standard deviation away from the average then they are said to be in one of the four “quadrants”

The funding forecast in the Denali LRTP is only the most likely scenario for each program, and in reality the amount of annual transportation funding will vary, as will visitation. Table 9 **Error! Reference source not found.** below shares some management actions for when funding and visitation levels take Denali NPP out of the area of management actions of no regret. Generally, when visitation is lower it is a better time for disruptive work such as addressing major needs and accomplishing maintenance projects that were deferred. Times of high visitation call for more investment in O&M and investment in new services to meet emerging visitor needs. When funding prospects are good then more money is available to make improvements, catch up on deferred maintenance, and prepare plans for the future. When funding is short then many necessary improvements have to be delayed, and park staff can only fund core operations and critical repair work.

Table 9: Potential Management Actions by Scenario

Losing Ground	Popular Park
<p>Emphasize more of: Funding O&M Introducing new services</p> <p>Emphasize less of: Making improvements Funding deferred maintenance Initiating major capital/rehabilitation projects</p>	<p>Emphasize more of: Funding O&M Making improvements Introducing new services Planning for future needs</p> <p>Emphasize less of: Funding deferred maintenance Initiating major capital/rehabilitation project</p>
Turn out the lights	Surplus of Money
<p>Emphasize more of: Funding deferred maintenance</p> <p>Emphasize less of: Funding O&M Making improvements Introducing new services</p>	<p>Emphasize more of: Making improvements Funding deferred maintenance Initiating major capital/rehabilitation projects Planning for future needs</p> <p>Emphasize less of: Funding O&M Introducing new services</p>

Appendix A: Unpaved Park Road Condition Targets

Unpaved Denali Park Road Condition Targets

Plans C, D, and E for the unpaved Denali Park Road examined options for managing each segment of the road to an individually set condition target. Each of these targets is based on the overall Vehicle Management Plan and accounts for past challenges or known issues with individual segments. Plan F was ultimately selected for its ability to maintain acceptable condition levels while also freeing up funding for other transportation needs. In particular, Plan F was selected because the condition targets reflect the overall management approach to the road, where the western-most sections are desired to be more rustic and remote-feeling and the eastern-most sections are in better conditions to handle more intensive use. Tables 10 and 11 below summarize the conditions for the unpaved segments of the Denali Park Road under the Denali LRTP investment strategy.

Conditions are measured in FCI, where a higher value represents worse condition and a lower value represents better condition. FCI data for the unpaved Park Road is based on estimates by staff responsible for maintaining the unpaved Park Road after the 2016 opening.

Table 10: Conditions of Unpaved Segments of Denali Park Road Reflected in Denali LRTP Investment Strategy

Mileposts	Segment Name	Current Condition	Target Condition	Change in Condition
MP 15 to 32	Savage to Teklanika Bridge	Low-good	High-fair	Small decline
MP 32 to 39	Igloo Forest to Sable Pass	Mid-fair	High-fair	Small improvement
MP 39 to 43	Sable Pass to East Fork Bridge	Mid-fair	High-fair	Small improvement
MP 43 to 47	Polychrome to Plains of Murie	Mid-poor	High-poor	Small improvement
MP 47 to 62	Plains of Murie to Stony Overlook	Mid-fair	Low-fair	Small decline
MP 62 to 66	Stony Overlook to Eielson	Low-fair	Low-fair	No change
MP 66 to 70	Eielson to Grassy Pass	High-poor	Mid-poor	Small decline
MP 70 to 88	Grassy Pass to Boundary Pit	Mid-fair	Mid-poor	Moderate decline
MP 88 to 92	Boundary Pit to Kantishna	Very-poor	Low-poor	No change

Table 11: Denali Unpaved Park Road Segments -- Current Conditions and Strategy Conditions Explored During LRTP Development

Mileposts	Segment Name	Current Conditions	Plan A		Plan B		Plan C	
			Plan A Desired Conditions	Plan A Annual Needs	Plan B Strategy Conditions	Plan B Annual Needs	Plan C Strategy Conditions	Plan C Annual Needs
MP 15 to 32	Savage to Teklanika Bridge	0.09	0.109	\$ 0.13 M	0.13	\$ <.01 M	0.109	\$ 0.13 M
MP 32 to 39	Igloo Forest to Sable Pass	0.13	0.109	\$ 0.14 M	0.12	\$ 0.11 M	0.129	\$ 0.93 M
MP 39 to 43	Sable Pass to East Fork Bridge	0.13	0.109	\$ 0.24 M	0.13	\$ 0.20 M	0.139	\$ 0.19 M
MP 43 to 47	Polychrome to Plains of Murie	0.35	0.109	\$ 1.20 M	0.14	\$ 1.10 M	0.245	\$ 0.74 M
MP 47 to 62	Plains of Murie to Stony Overlook	0.13	0.109	\$ 0.70 M	0.13	\$ 0.56 M	0.139	\$ 0.52 M
MP 62 to 66	Stony Overlook to Eielson	0.14	0.109	\$ 0.25 M	0.14	\$ 0.20 M	0.139	\$ 0.20 M
MP 66 to 70	Eielson to Grassy Pass	0.17	0.109	\$ 0.44 M	0.14	\$ 0.37 M	0.169	\$ 0.30 M
MP 70 to 88	Grassy Pass to Boundary Pit	0.12	0.109	\$ 0.56 M	0.12	\$ 0.51 M	0.169	\$ 0.32 M
MP 88 to 92	Boundary Pit to Kantishna	0.499	0.109	\$ 0.72 M	0.14	\$ 0.68 M	0.324	\$ 0.43 M
Total	MP 15 to 92 Total		Total	\$ 4.35 M	Total	\$ 3.76 M	Total	\$ 2.93 M

Mileposts	Segment Name	Current Conditions	Plan D		Plan E		Plan F (Selected)	
			Plan D Strategy Conditions	Plan D Annual Needs	Plan E Strategy Conditions	Plan E Annual Needs	Plan F Strategy Conditions	Plan F Annual Needs
MP 15 to 32	Savage to Teklanika Bridge	0.09	0.109	\$ 0.13 M	0.109	\$ 0.13 M	.109	\$ 0.13 M
MP 32 to 39	Igloo Forest to Sable Pass	0.13	0.109	\$ 0.14 M	0.109	\$ 0.14 M	.109	\$ 0.14 M
MP 39 to 43	Sable Pass to East Fork Bridge	0.13	0.109	\$ 0.24 M	0.109	\$ 0.24 M	.109	\$ 0.24 M
MP 43 to 47	Polychrome to Plains of Murie	0.35	0.149	\$ 1.1 M	0.149	\$ 1.1 M	.245	\$ 0.74 M
MP 47 to 62	Plains of Murie to Stony Overlook	0.13	0.149	\$ 0.47 M	0.149	\$ 0.47 M	.149	\$ 0.47 M
MP 62 to 66	Stony Overlook to Eielson	0.14	0.149	\$ 0.18 M	0.149	\$ 0.18 M	.149	\$ 0.18 M
MP 66 to 70	Eielson to Grassy Pass	0.17	0.325	\$ -	0.325	\$ -	.325	\$ -
MP 70 to 88	Grassy Pass to Boundary Pit	0.12	0.325	\$ -	0.325	\$ -	.325	\$ -
MP 88 to 92	Boundary Pit to Kantishna	0.499	0.325	\$ 0.43 M	0.325	\$ 0.43 M	.449	\$ 0.12 M
Total	MP 15 to 92 Total		Total	\$ 2.66 M	Total	\$ 2.66 M	Total	\$2.03 M

Plan F Unpaved Road Segments

The final change that the LRTP team made while discussing the road strategies with park staff was to lower the condition targets for two of the most difficult segments along the unpaved Park Road. This section describes these two segments and how accepting a lower condition in these areas can allow for better conditions on other parts of the Denali NPP transportation system.

Mileposts 43 to 47: Polychrome Pass to the Plains of Murie

The unpaved Denali Park Road segment of Polychrome Pass to the Plains of Murie has been identified by Denali NPP staff as especially difficult to maintain and repair. It is facing significant geotechnical hazards that will worsen as time goes on and climate

change accelerates permafrost thaw. Making improvements to this section that would take it from the middle of the poor condition band to the low end of fair condition band as explored in Plan D is projected to cost \$1.07 M per year. Making lesser improvements from the middle of the poor condition band to the high end of the poor condition band as called for in Plan C would cost \$0.74 M per year instead, saving \$0.33 M per year for other uses. Thus the selected strategy (Plan F) will target a condition rating at the high end of the poor band, instead of a fair rating as with other segments in the central segment of the unpaved Denali Park Road (Igloo Forest to Eielson Visitor Center). This is not an ideal or desired condition for this segment, but reflects the challenges of working in this area given limited funding.

Mileposts 88 to 92: Boundary Pit to Kantishna

The final segment of the unpaved Denali Park Road is currently at the very low end of poor condition and is bordering on severe condition. All of the alternative unpaved road plans propose to improve this section. However, improving the condition from the low end of poor condition to the middle of poor condition as explored in plans C and D is projected to cost \$0.43 M per year. Investing this much in one of the least-utilized segments of the Denali Park Road would limit funds for critical investments elsewhere. As a result, the Denali Investment Strategy proposes lesser improvements at a cost of \$0.12 M per year.

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