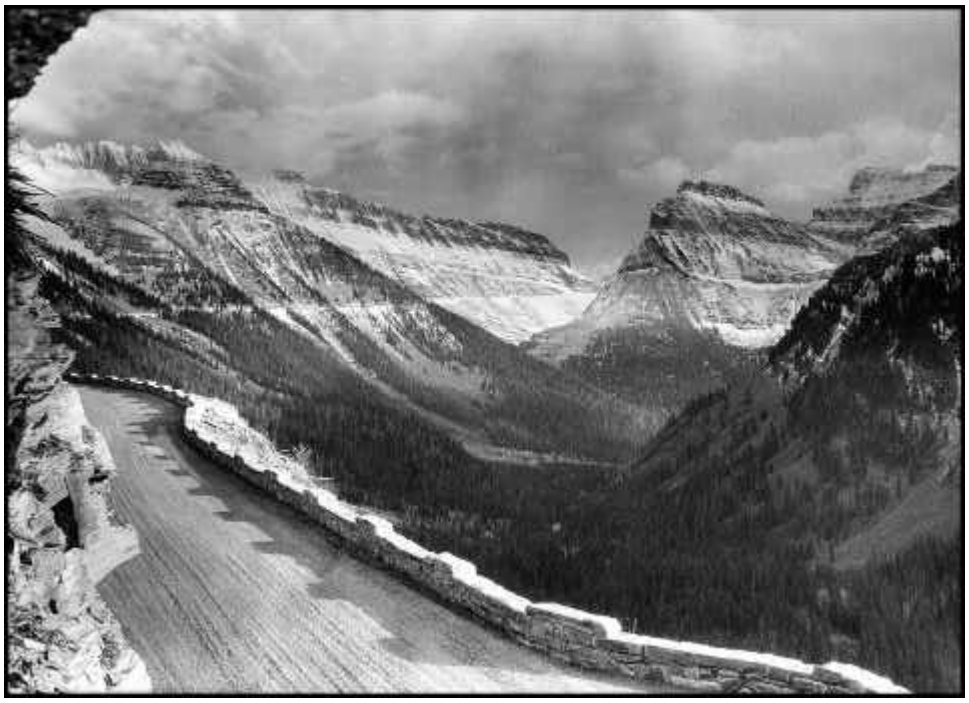
GOING-TO-THE-SUN ROAD
GLACIER NATIONAL PARK, MONTANA

CULTURAL LANDSCAPE REPORT

VOLUME 1: NARRATIVE



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Going-to-the-Sun Road, Glacier National Park, Montana: Cultural Landscape Report

Volume 1: Narrative

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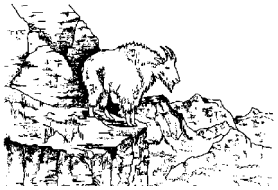

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Abbreviations and Acronyms

BPR	Bureau of Public Roads
CCC	Civilian Conservation Corps
CLI	Cultural Landscape Inventory
CLR	Cultural Landscape Report
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
Glacier	Glacier National Park
GN	Great Northern Railway
GNP	Glacier National Park
GNPA	Glacier National Park Archives, West Glacier, Montana
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
NARA	National Archives and Records Administration, Washington, D.C./College Park, Maryland
NHL	National Historic Landmark
NPS	National Park Service
NRHP	National Register of Historic Places
OPR	Office of Public Roads
PRA	Public Roads Administration
RG	Record Group
the Road	Going-to-the-Sun Road
Sun Road	Going-to-the-Sun Road
SHPO	State Historic Preservation Office
TIC	Technical Information Center, Lakewood, Colorado (National Park Service)
US DOI	U.S. Department of the Interior

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Chapter 1: Introduction

1.1 Purpose of the Study

Glacier National Park, Montana, is home to one of the most spectacular and significant linear cultural resources in the United States: the Going-to-the-Sun Road. The road (referred to in this document as the "Sun Road" or GTSR) was completed through Glacier in 1932, and is the primary route used by visitors to experience the Park. As the only vehicular route to directly enter the park's renowned alpine landscapes, the Sun Road provides access to exceptional scenery, but the route is equally famous for its torturous, spectacular alignment. The road's narrow routing hugs lakeshores, mountain streams, and massive cliffs, and its design reflects a strong sensitivity to these dramatic natural features. The roadway adapts to the scenery and reflects its values, rather than attempting to change its surroundings. Combined, these qualities help make the Road far more than just an access route – it is an important and noteworthy visitor experience in its own right.

These noteworthy characteristics of the Sun Road are reflected by – and partially dependent on – the route's careful and extensive use of appropriately-designed engineering features. The extreme topography traversed by the road mandated the construction of numerous complex retaining walls, long stretches of protective guardwall, and a variety of bridges, culverts, and other structures. Almost without exception, these features were designed and built with a thoughtful, discerning eye towards their natural setting. The walls and bridges display graceful, subtle lines, and feature native stonework that blends elegantly into the surrounding landscape.

Figure 1. Early retouched photo postcard of the Sun Road ascending Logan Pass. Author's collection.

Individually, these structures are often significant examples of period engineering and design philosophy; collectively, they comprise a vital, integral component of the road's unique and famous character.

Most of these engineering features are now in their seventh or eighth decade of existence and use, in an environment that can be uncommonly severe. Especially along the upper reaches of the road, avalanches, rockfall, and heavy snow have caused considerable damage to the historic stonework over the years. Resources for maintenance and repair to the walls have traditionally been insufficient, and not all repair projects have been fully compatible with the historic craftsmanship and design philosophies of the original road. Combined, these circumstances have lessened the historic appearance of some portions of the route. The continuing long-term decay and damage also points to the imminent need for further, substantial rehabilitation work on the walls, with consequent additional potential for alterations to the road's historic character.

The historic and engineering significance of the Sun Road is well-recognized by the federal government: the road is a National Historic Landmark and a National Civil Engineering Landmark, and is listed on the National Register of Historic Places. These designations require that maintenance and repair projects on the road be undertaken only after consideration of the road's unique cultural values. Since the historic walls and other engineering features along the route contribute to the road's overall significance, it is important that these resources be identified and evaluated as part of the process of planning for the future of the road. It is equally important that future work projects protect and preserve these historic features.

This two-volume Cultural Landscape Report (CLR) is intended to assist in that effort. The first volume (this document) includes in-depth background, descriptive, and evaluative information on the Road and its cultural features, providing park managers and others with the contextual background necessary to properly plan for the Road's preservation and continued use. The following primary topics are addressed:

- the history of the Going-to-the-Sun Road and the corridor through which it travels;
- the "landscape" of the roadway corridor, including the Road, its setting, and the interaction between the Road and its natural and cultural environment;
- the landscape of the primary areas of historic development along the Road (Headquarters/Apgar, Lake McDonald, and Rising Sun); and
- the historic features directly associated with the Road itself, including guardwalls, retaining walls, bridges, tunnels, and other structures.

Volume 2 of the CLR, scheduled for completion in the summer of 2002, includes highly detailed maps of the Road itself and comprehensive listings snd evaluations of the historic structures in the immediate roadway corridor. (An earlier edition of the Volume 2 data was published separately in 2001 under the title "Going-to-the-Sun Road Cultural Landscape Inventory."

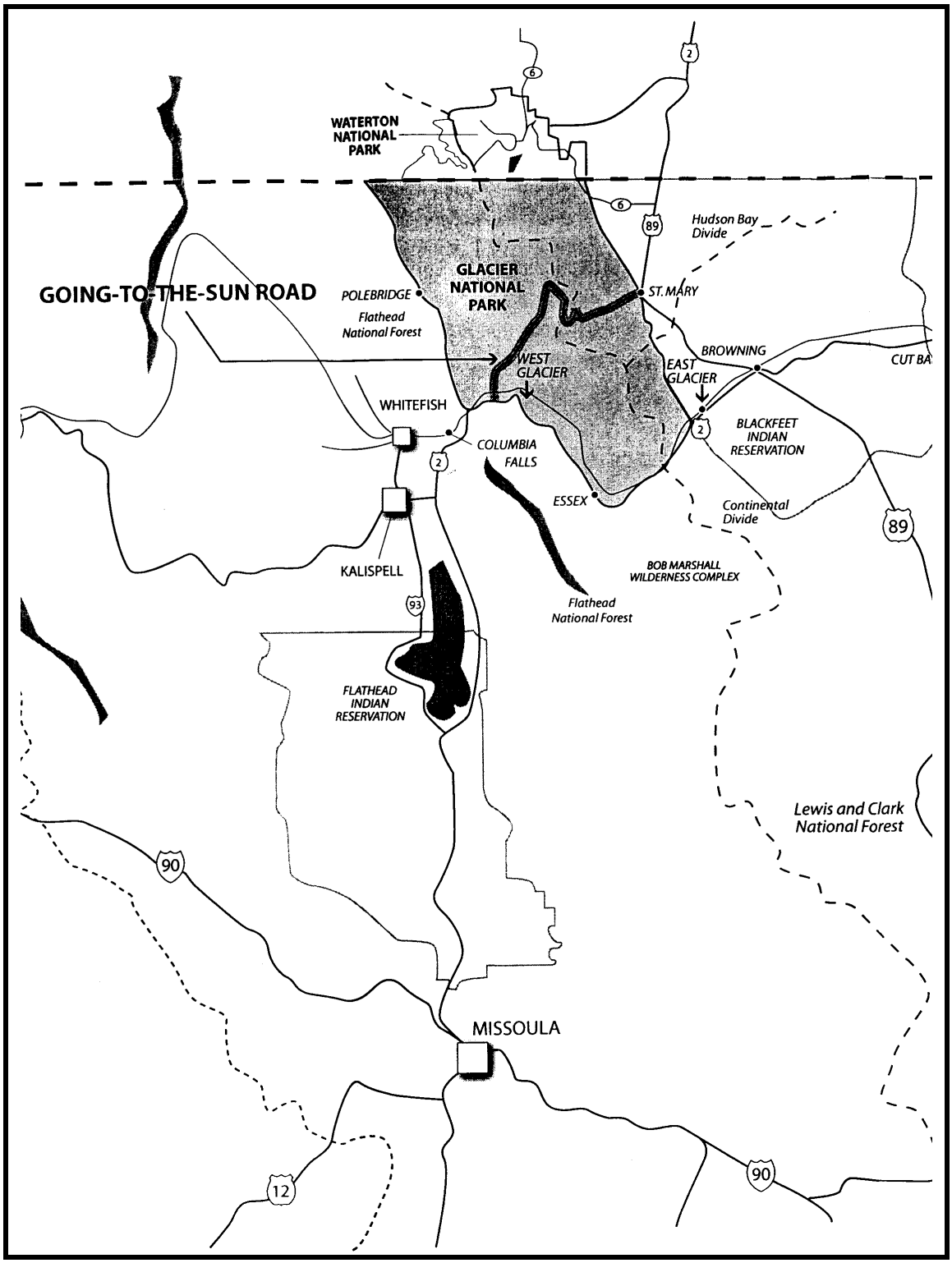


Figure 2. Location map of Glacier National Park and Going-to-the-Sun Road.

1.2 Historical Overview

1.2.1 Summary History

When Glacier National Park was established in 1910, travel in and near the park was essentially seasonal, slow, and inconvenient outside of the railroad corridor along the park's southern boundary. The development of improved transportation corridors was thus an early goal of those involved with Glacier's management, operation, and promotion. Park Service efforts in this regard began with the construction of a new road from West Glacier to the foot of Lake McDonald in 1911 and 1912. The work on this short segment of road marked the beginning of the construction of what would become the Going-to-the-Sun Road, although today's roadway between these two points does not follow the 1911 alignment.

In the park's earliest years, far more significant road and trail construction was accomplished by the Great Northern Railway (GN). During the 1910s, the GN constructed a north-south wagon road just beyond the eastern boundary of the park, along with spurs into the Two Medicine, Cut Bank, St. Mary, and Many Glacier valleys. (The east side road became known as the Blackfeet Highway; its alignment is now roughly followed by Montana highway 49 and U.S. highway 89.) Most of the Great Northern's work was in conjunction with the railway's ambitious hotel and chalet construction program in Glacier.

As the decade of the 1910s progressed, a series of federal engineers evaluated various proposed roadway routes across the Continental Divide through Glacier. The proposals included routes from Lake McDonald to Waterton and from Lake McDonald to the east side of Glacier via Swiftcurrent, Gunsight, Logan, and other passes. In 1916, an engineer with the Office of Public Roads conducted reconnaissance surveys of several of the favored routes for an east-west highway, and ultimately recommended a route over Logan Pass – the first professional engineer to do so. In the end, all subsequent planning and surveys followed this general recommendation. Two years later, NPS Chief Engineer George Goodwin completed a location survey for a road over Logan Pass. Goodwin's route switchbacked up the valley of Logan Creek, up the side of Haystack Butte and Pollack Mountain, and then on to Logan Pass.

After World War I, NPS Director Stephen Mather aggressively pursued funding for the east-west road across the mountains in Glacier. In 1921, Congress appropriated $100,000 for work on the road – the first significant funding for the project. That year, the park hired laborers to clear the right-of-way some eleven miles from Apgar to the crossing of Upper McDonald Creek. The park opened the road to Lake McDonald Lodge in August 1922.

Between 1922 and 1932, seven contracts were let for construction of the Sun Road. Congress appropriated $65,000 to Glacier for the 1922 construction season and $100,000 for both 1923 and 1924. These figures were over half the total appropriation for all national park roads, reflecting the importance of the project to NPS management. The contract awarded in 1922 began at the head of Lake McDonald and ended in the vicinity of Avalanche Creek. On the east side, the grading of the first segment along St. Mary Lake, to a point about two miles east of Sun Point, began in 1923. These early contracts resulted in roadway segments that were relatively primitive, and would require significant upgrading later.

The turning point for national park roads came in April 1924, when Congress passed a bill authorizing $7.5 million for construction, reconstruction, and improvement of roads, trails, and bridges in national parks. As a result, economy of construction as the driving force behind park road design fell to the wayside. About $410,000 was earmarked for the Sun Road, and the project was put on an accelerated schedule.

A few months later, NPS civil engineers, landscape architects, and administrators began to re-examine the proposed route over Logan Pass that had been surveyed by George Goodwin in 1918. In early August 1924, four NPS officials met on-site to discuss the proposed route. Landscape architect Thomas Vint recommended a longer, more expensive route up the west side, carved directly into the steep cliffs of the Garden Wall with only one switchback. He felt this route would preserve the scenery better and that its exposure to spring sunshine would allow the road to be opened earlier in the spring. As a result, the NPS officially requested that the Bureau of Public Roads (BPR) provide a locating engineer to oversee a survey of the new route over Logan Pass. Civil engineer Frank Kittredge completed the survey that fall, locating a route that is very close to the current alignment of the Road.

The NPS response to Kittredge's survey was highly positive. NPS Director Stephen Mather asked Kittredge to prepare an overall program for main road construction in the national parks. Kittredge fully agreed with the NPS policy of constructing one well-built scenic road per park, and he also agreed that roads should not detract from the scenery of the park. The NPS established an Engineering Division in 1927, and Kittredge was appointed the first chief engineer. These events, and others associated with the planning and construction of the Sun Road, developed an ongoing relationship between the NPS and BPR (and its successor, the FHWA) that endures today.

In 1925, the NPS awarded Tacoma contractor Williams & Douglas the contract for the 12.4-mile construction of the Sun Road on the west side up to Logan Pass. This was the largest single contract the BPR had ever let, and it took three seasons to complete. Williams & Douglas worked on the project from several different locations at one time, ultimately establishing six construction camps that housed an average of 225 men each season. The work was done with two steam shovels, one gas shovel, pneumatic jack hammers, and hand

labor. They consumed just under one pound of explosive per cubic yard of material removed. In June 1929, the Sun Road opened to tourist travel between West Glacier and Logan Pass.

Construction of the remaining stretch of road – on the east side of Logan Pass – was less challenging technically than that on the Garden Wall section of the west side. The east side construction work was divided into two contracts, with work beginning in 1931 and continuing through July 1933. These contracts included construction of the East Side Tunnel, the spur road to Sun Point, and construction of the Baring Creek Bridge. The Sun Road opened to travel over Logan Pass from both directions in October of 1932, and the road was officially dedicated the following year.

Although the Sun Road was now open to the public, park administrators still considered the Road far from "completed." The first phase of reconstruction projects, accomplished in several separate contracts, took place between 1929 and World War II. The Road was graded to a 24-foot width and gravel surfaced to 22 feet; curvatures and grades were reduced; drainage was improved; masonry retaining walls, guardwalls, bridges, and culvert headwalls were constructed; and numerous other improvements were performed. In addition, all but ten miles of the Road received either bituminous chip-seal treatment or bituminous pavement. Significant realignments during the 1930s included segments along upper McDonald Creek, the construction of a bypass around Lake McDonald Lodge, and a new alignment from the foot of Lake McDonald to the Middle Fork of the Flathead.

World War II and a subsequent shortage of funds led to almost a decade during which no significant work on the Road was completed except for routine maintenance. Work resumed in 1950, as Morrison-Knudsen of Seattle won a contract to improve drainage and do other work on the ten miles on the west side from Logan Creek up to Logan Pass. This included guardwall and retaining wall construction and repair, and saw the first significant use of non-native stone in those structures. A 1955 contract included hot plant mix paving of the ten miles between Logan Creek and Logan Pass plus drainage improvement, high scaling of dangerous rock cliffs, and road widening. The Road was now completely paved in asphalt; its width in all but the Logan Pass section was at least 22 feet; and the masonry work was complete.

The next three decades saw relatively little improvement work on the Sun Road, although some ongoing repair work to guardwalls and other roadway features took place. Flood damage in 1964 and 1975 mandated the reconstruction of damaged or destroyed segments of the Road, and the mid-1960s construction of the Camas Road included the completion of a short Sun Road realignment near Apgar. The inadequate maintenance of the road during these years – reflecting the limited funding available – helped to contribute to its deterioration, and by the late 1980s the need for very substantial work on the road was evident.

These long-standing repair needs began to be addressed in the decade of the 1990s, as increased federal funding enabled the reconstruction of several segments of the Sun Road. Approximately 20 miles of roadway were rehabilitated through a series of major, contracted construction projects, including segments from Apgar to Avalanche, from Oberlin Bend to Logan Pass, and from Rising Sun to St. Mary. Still, in 2002 much of the Sun Road – and nearly all of its upper reaches – remained in clear need of major repairs.

1.2.2 Historic Engineering Features

The masonry features along the Sun Road – including guardwalls, retaining walls, bridges, and culvert headwalls – are vital in defining the road's historic, visual, and engineering character. Most of these structures were designed to harmonize with the roadway setting by using native materials and by blending with the landform as much as possible. There was little precedent for this sort of work on National Park roads, and the original designs were often modified in the field. Many of the designs developed on the Sun Road appeared in specifications for later NPS contracts in other parks.

Guardwalls are among the most ubiquitous and visible of the Sun Road's engineering features. Two primary types of guardwall were constructed on the road. The first was rubble construction with a random top course, visually characterized by variations in stone size, shape, and color and by the random alignment of the major axes of the stones. As designed, these walls were 18 inches high and wide, with 6-inch-high parapets that were 3.5 to 5 feet long. Williams & Douglas built about 11,000 feet of this style of guardwall on the west side of Logan Pass. The second wall type, of which about 27,000 linear feet were built, had similar dimensions, but was constructed primarily of shaped ashlar material. This type was felt to blend in better with the natural setting of the roadway.

As a group, the guardwalls along the road have experienced a higher level of damage and decay that most other roadway features. On the approaches to Logan Pass, in particular, rockfall, avalanches and other events have destroyed or damaged substantial lengths of guardwall. Repairs are incomplete, and reflect both historic and non-historic designs, techniques, and materials.

Most of the bridges along the Sun Road are flat concrete-slab bridges with arched portals assembled of local stone. Landscape architects carefully inspected the bridges in the field as they were being built to make sure that the workers were avoiding regularity in the joints and placement of stone. Nearly all of these bridges survive today, and reflect a high level of historic integrity.

Two tunnels were built on the Sun Road. Landscape architects tried to give tunnel openings the character of a cave entrance, helping the man-made portal blend with its natural surroundings. The exposed rock faces which originally characterized the interiors of the tunnels disappeared in later years when the bores were enlarged and lined with concrete.

Between 1925 and 1937, contractors installed over 30,000 linear feet of drainage culverts beneath the surface of the Sun Road. Pipe culverts were mostly corrugated metal, although concrete pipe was specified in 1930s contracts. Box culverts were also built of reinforced concrete slabs with mortared stone headwalls, particularly for larger-diameter culverts. Most of these historic features survive, and a number of modern drainage structures have been added.

1.2.3 Conclusion – the Landscape Philosophy of the Road

The Going-to-the-Sun Road is important for a variety of historic and engineering associations Nationally, the completion of Road marked the first product of the 1926 NPS/BPR interagency agreement facilitating the cooperative construction of park roads. The experience of building the Sun Road shaped subsequent mountain road construction standards and cooperative administrative procedures between the two agencies. This agreement was in effect until 1983 and has been only slightly modified since that time.

Locally, the construction of the Road enabled a significant in local tourism, and marked a dramatic shift in the patterns of visitor use in Glacier. The completion of an automobile road through the heart of Glacier encouraged the use of private automobiles as the primary means to see the park. Since the entire road opened to the public in 1932, driving the Road has been one of the primary ways that visitors see and experience the park. The extraordinary qualities of the Road have made it one of the primary attractions for Glacier visitors, and it has become perhaps the most noted highway in the entire National Park system.

Among historians, engineers, and landscape architects, however, the Road's greatest significance is perhaps as an early, preeminent example of a design philosophy for National Park roads that emphasized a visual harmony with the roadway's natural setting. While the initial design approach for the Sun Road generally reflected traditional engineering goals – a road that was "safe and easy to travel, economical in construction and maintenance, [and] as free from snow conditions as possible" – this philosophy was soon superceded by one that reflected a strong appreciation of the National Park ethic of resource preservation and appreciation. This was largely due to the involvement of the Landscape Engineering Division of the NPS, and of Thomas Vint, its on-site representative. Examining the Sun Road project, Vint stated his belief that the finished roadway "should minimize the effects of the work of the hand of man that the effects of the work of nature will predominate." Guided in large part by Vint, this approach saw expression throughout the later phases of the Road's construction, resulting in a careful, visually sensitive alignment that was enhanced by handsomely designed and skillfully crafted bridges and walls of native stone. This exceptional design – and its impressive execution – resulted in a roadway that was a masterful unification of the fields of engineering and landscape architecture. The Road endures today as perhaps America's finest example of this important design ethic.[1]

1.3 Scope of Work & Methodology

This Cultural Landscape Report (CLR) is a primary product of a broad-based evaluative examination of the cultural landscape qualities of the Going-to-the-Sun Road. The overall study, conducted during the years 2000, 2001 and 2002 by Renewable Technologies, Incorporated (RTI) under contract to the National Park Service, includes both this CLR and an accompanying Cultural Landscape Inventory (CLI). The CLI, completed in March 2001, contains a comprehensive, map-based inventory of all ancillary structural and engineering features along the Sun Road, with information about the design, condition, and historic significance of each feature. The data contained in the CLI serves as a basis for the broader contextual information contained in the CLR.

The development of both the CLI and CLR was undertaken, in part, to provide background material to assist in the planning for a major reconstruction of the upper reaches of the Sun Road. A variety of other studies – including engineering, socioeconomic, and visitor use analyses – are also being prepared to support the reconstruction planning process. The NPS contracted the development of the latter documents to the Washington Infrastructure Group, and RTI's Glacier work is being performed as a subcontractor to Washington.

Mark Hufstetler, a professional historian on RTI's staff, served as the project manager for the Sun Road contract and was the principal author of this document. Substantial portions of the text were prepared by Kathryn McKay and Janet Cornish, working as subcontractors to RTI. A draft outline of this document was submitted to the NPS for its approval in December 2000. Research and fieldwork were conducted during the autumn of 2000 and the spring of 2001 by all three co-authors, and the text itself was written during the summer of 2001. A draft product was submitted for NPS review that August, and the final report was prepared during the winter of 2001-2002.

The Scope of Work for this project was defined by two Task Orders crafted by the National Park Service. NPS Task Order #6, the primary governing document for this project, specified the following contents for this report:

- Introduction, document purpose, and methodology;
- Historical overview of the GTSR and its construction background;
- Detailed discussion of characteristic cultural and natural feature types along the GTSR;
- Discussions of viewsheds and cultural landscapes along the GTSR;
- Broad-based planning guidelines and recommended treatments for the preservation of the landscape features and historic character of the GTSR.

1.4 Description of Study Boundaries

By definition, the study area for this report consists of the current and former alignments of the Going-to-the-Sun Road in Glacier National Park, Montana (figures 2 and 3). The current roadway corridor extends some 50 miles, from West Glacier (the park's western boundary) to St. Mary (the eastern boundary). The western 2.9 miles of the Road are on a modern alignment, with an historic alignment still partially extant; smaller realignments also exist elsewhere along the Road.

The width of the survey corridor for this cultural landscape study is variable, depending on the types of resources examined. Man-made structural and engineering features were examined only when they were constructed for a purpose directly related to the roadway itself (such as drainage, structural support, vehicle safety, etc.) In nearly all cases, these features are on, directly beneath, or immediately adjacent to the roadway. Most other nearby man-made features were not a part of this study. The exceptions are three areas with concentrated historic and modern development: Headquarters/Apgar, Lake McDonald Lodge, and Rising Sun. Separate "cultural landscape" evaluations for these three locations are provided in this report (Chapter 4).

In contrast to the above constraints, the landscape discussions contained in Chapter 3 of this report often describe (and are impacted by) natural features and environmental conditions that are well beyond the physical boundaries of the roadway itself. The views from certain locations along the Sun Road are often dramatically expansive, and the visibility of landmarks that are miles from the roadway itself frequently have profound impacts on the viewsheds of the roadway corridor. The natural settings and environments of the entire McDonald Creek and St. Mary Creek watersheds, for example, play significant roles in defining the visual character of the roadway experience. Views are even more expansive from the Road's alpine locations, with relatively distant peaks such as Stony Indian and Blackfoot readily visible from the Road – and hence helping to form the roadway's overall landscape setting.

It is important to note that prior historic studies of the Sun Road have defined the boundaries of the roadway corridor more narrowly. In general, those studies – which continue as important legal documents and management tools – establish study boundaries based on the physical extent of the road itself, rather than the settings and broad views associated with it. The National Register of Historic Places nomination for the Road provides the following boundary description:

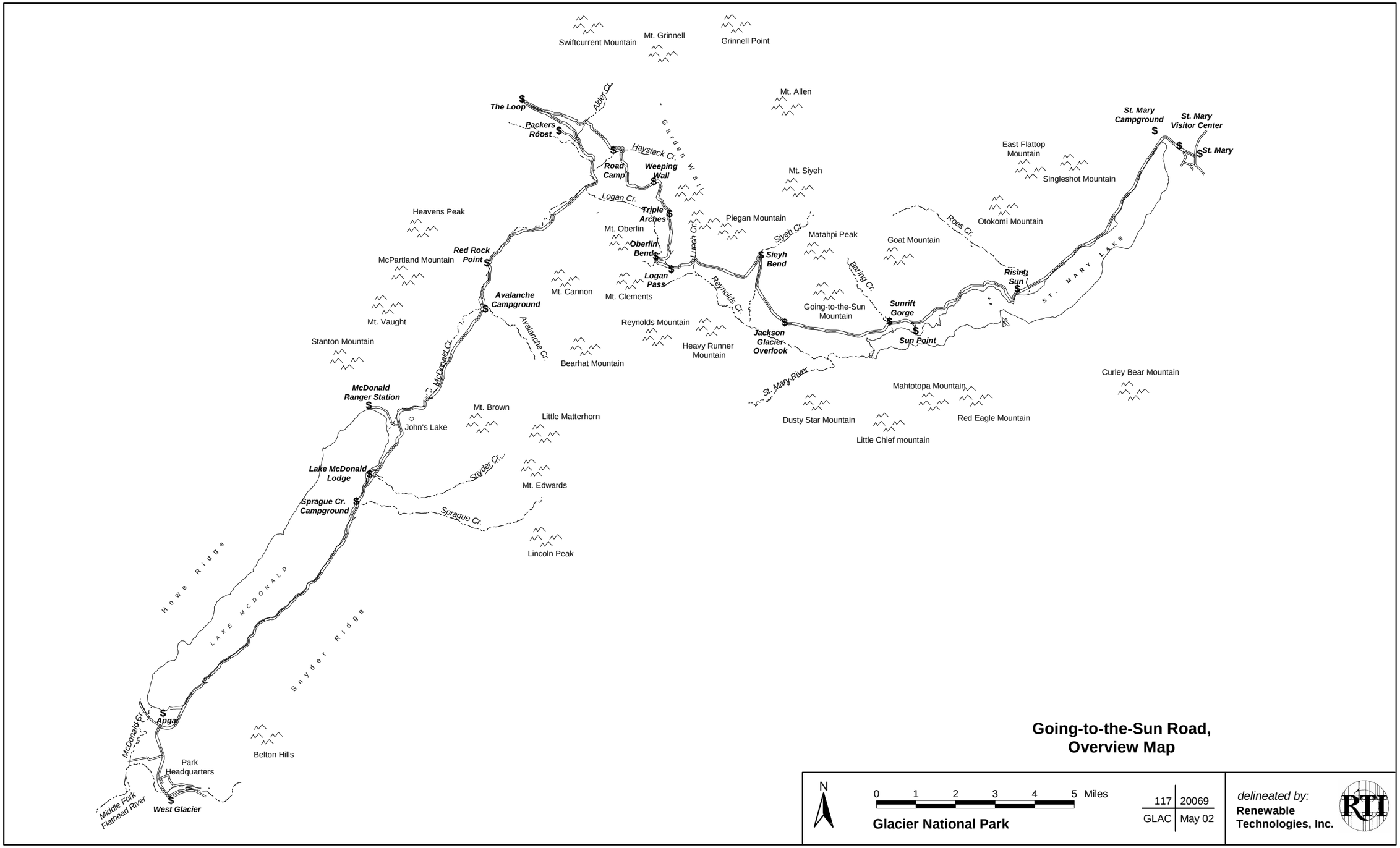
> The nominated portion of the Going-to-the-Sun Road begins at a point 30 feet east of the center of the T-junction on the west side and goes 48.7 miles to the eastern park boundary at the eastern edge of the Divide Creek Bridge. . . . However, the width of the boundary extends 15 feet on either side of the

> center of the road. Thus the nominated portion is 30 feet wide by 48.7 miles long or 177.09 acres. The only variation from the 30 foot width of the boundary is at the West Side Tunnel where the extended porch-like shelf extends an additional 5 feet.

The area included within the National Historic Landmark nomination extends 30 feet on either side of the road's centerline, and also includes parking and turnout areas. While the two nominations have similar overall boundaries, the documents provide slightly different lists of contributing, road-related structures. The Historic American Engineering Record (HAER) documentation for the Road includes the roadway itself, seventeen individual structures along the road, and the old Belton Bridge. Table 1, on the following page, lists the individual contributing features specified in each of these three documents:

Table 1. Going to the Sun Road – Contributing features specifically identified in prior historic significance documentation			
	NRHP[1]	**HAER[2]**	**NHL[3]**
Going-to-the-Sun Road	X	X	X
Belton Bridge		X	
Sprague Creek Culvert		X	X
Snyder Creek Bridge	X	X	X
Horse Trail Underpass (west side)		X	X
Avalanche Creek Bridge	X	X	X
Logan Creek Bridge	X	X	X
West Side Tunnel	X	X	X
Granite Creek Culvert		X	X
Haystack Creek Culvert[4]	X	X	X
Triple Arches	X	X	X
East Side Tunnel	X	X	X
Siyeh Creek Culvert		X	X
Baring Creek Bridge[5]	X	X	X
Golden Stairs Retaining Wall		X	
St. Mary River Bridge	X	X	X
Divide Creek Bridge	X	X	X
"typical drainage culvert"		X	
"(No Name) Creek Culvert"		X	

[1]National Register of Historic Places listing (1983)
[2]Historic American Engineering Record documentation (1990)
[3]National Historic Landmark designation (1997)
[4]Listed as "Haystack Butte/Amphitheater Bridge" in NRHP.
[5]Listed as "Sun Rift Gorge Bridge" in NRHP.



Going-to-the-Sun Road, Overview Map

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0 1 2 3 4 5 Miles

Glacier National Park

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delineated by:
Renewable Technologies, Inc.

Figure 3. Overview map of the Going-to-the-Sun Road corridor.

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Chapter 2: History and Background

2.1 Introduction

Figure 4. Historic view of the Going-to-the-Sun Road on the west approach to Logan Pass. Photo by Hileman, GNPA #8136.

The Going-to-the-Sun Road (Sun Road) extends from the western to the eastern boundary of Glacier National Park, crossing the Continental Divide and following the shores of Lake McDonald and St. Mary Lake. For most visitors to Glacier, driving the Sun Road is a primary park experience. The 50-mile mountain road has provided access to Glacier's spectacular high country since the late 1920s. The Road played a pivotal role in national park development, and it is recognized today as an engineering landmark and a cultural treasure. The construction of the Road changed park development patterns and the visitor travel experience in Glacier, and it strongly influenced road design in other national parks.

The chronological narrative in this chapter provides a detailed history of the Sun Road, with emphasis on its areas of significance as a National Historic Landmark. The Sun Road history itself is preceded by four brief background essays, providing introductory contextual information on NPS landscape philosophy, on Glacier's early history, and on the evolution of visitor services in the park

2.2 Background Essays

2.2.1 Landscape Architecture and the Early National Park Service

The Going-to-the-Sun Road is a premiere example of a design philosophy that was developed in the 1920s and 1930s by National Park Service (NPS) landscape architects. This philosophy was greatly influenced by the work and ideas of landscape architects of the late nineteenth and early twentieth centuries. The profession of landscape architecture in the United States grew rapidly during this period in response to the demand for public parks in the nation's cities. Landscape architects of that period worked to preserve and "improve" on the existing scenic values of a place through calculated visual compositions. Selected viewpoints, framed vistas, use of moss- and lichen-covered local rocks in construction, planting native vegetation, comprehensive park planning, avoiding straight lines and right angles in design, screening inappropriate elements, and creating a sequence of views and scenes were some of the tools they employed.[2]

Landscape architects, called "landscape engineers" in the early years of the NPS, shaped the physical development of the national parks. The NPS was created in 1916, and its mandate called for conserving the scenery, natural and historic objects, and wildlife within the national parks as well as providing for their enjoyment by the public in a way that left them unimpaired for future generations. Landscape architects assisted the agency with the task of planning well-designed development so that tourists would not damage the resources entrusted to the NPS. In other words, NPS leaders believed that landscape preservation could be accomplished through planned park development. From the beginning, roads were recognized as an integral part of this development effort, and NPS road-building activities were seen as exemplifying the effort to make the parks accessible while preserving them for the future.[3]

In 1918, Secretary of the Interior Franklin Lane signed a letter that set out official policy for the NPS and that guided development and management of the National Park System for years to come. The letter underlined the importance of planned park development and stated, "In the construction of roads, trails, buildings, and other improvements, particular attention must be devoted always to the harmonizing of these improvements with the landscape." Lane urged the agency to hire trained engineers with knowledge of landscape architecture or appreciation of the "esthetic value of park lands." All improvements (including roads, trails, and buildings) were to be constructed in accordance with a preconceived plan developed "with special reference to the preservation of the landscape." Trained engineers would be hired to design roads, and comprehensive plans (later known as Master Plans) would be prepared as funds became available.[4]

Two years after the NPS was founded, the agency hired its first landscape architect (then called "landscape engineer"). Charles Punchard initiated a design process that involved the collaboration of park managers, engineers, and other NPS officials. Landscape architects conferred on-site with park superintendents to develop solutions that were both practical and aesthetic, often consulting with the NPS Director on the most important decisions. Punchard advocated careful planning and the accommodation of changing conditions as they occurred. When Punchard died in 1920, his assistant Daniel Hull took over as head of the division. In 1922, Thomas Vint became Hull's assistant, and he took charge of the division in 1927. The NPS Landscape Engineering division was based in Los Angeles from 1923 until 1927 and then moved to San Francisco, where the landscape architects shared space with the civil engineers.[5]

NPS landscape architects, architects, and engineers worked together to create a cohesive style of landscape design that met the demands for park development while preserving the outstanding natural qualities for which each park had been designated. All built features, both those constructed by the NPS and those constructed by concessionaires, were subordinated to the natural and sometimes cultural influences of the local environment, giving each park a cohesive unity that often contributed to the park's identity. Principles of "naturalistic" landscape design were adopted to blend construction with the natural setting. Master Plans zoned parks for various uses. They delineated the transportation network, utilities, and visitor and administrative facilities. The designed landscapes that the NPS created defined the pace and sequence of much of the visitor experience and mediated between the visitor and the vast expanse of the undeveloped backcountry.[6]

Stephen Mather took over leadership of the national parks in 1915, and he served as the agency's first director from 1916 until 1929. Mather felt that it was critical to make the parks accessible to the general public, and thus he supported the extension of road systems in the parks. He saw national parks as destinations in regional and national networks of scenic highways. Mather expected expenditures on improved facilities and publicity to lead to higher visitation and a broader constituency for the NPS. In 1922, Mather stated that the NPS wanted to build roads to provide automobile access to the major scenic areas without disturbing the solitude and quiet found in other sections. Three years later, he instructed the Landscape Engineering division to design unobtrusive roads that marred the "native beauty" as little as possible. He grew to favor the idea of one grand, scenic roadway per park that provided access to at least some of the scenery for those who would not or could not travel by trail.[7]

From 1916 forward, NPS employees "managed" vegetation through thinning, transplanting, clearing, and reintroduction to open up vistas, reduce fire hazard, blend construction with the natural setting, "clean up" the roadside, and screen facilities and sites such as borrow pits. In 1921, Hull introduced the idea of grading road cuts to form gently sloping banks that could be reseeded and would blend into the natural landscape. Scenic overlooks and other designs of landscape architects framed the visitors' visual encounters with the vast,

glacier-carved landscape. One of the most important principles promoted for park roads by NPS landscape architects Punchard, Hull, and Vint was the concept of a carefully planned, sequential experience for the visitor.[8]

Until 1924, the national parks did not have sufficient funding to allow the designers of park roads to meet the higher standards they would have preferred. Insufficient and irregular funding discouraged comprehensive planning and added to construction costs until the mid-1920s.[9] This situation changed during the 1920s and 1930s, with a greatly increased emphasis on landscape planning and design. The Going-to-the-Sun Road was one of the earliest major beneficiaries of this new philosophy, and helped set the standard for future NPS road projects based on a strong landscape philosophy.

2.2.2 Development of the Glacier National Park Area Prior to 1910

People have lived in and traveled through the area known today as Glacier National Park for the past 10,000 years. American Indian tribes using the area within the past two hundred years have included the Pikuni (Blackfeet, Blood), Cree, Kootenai, Gros Ventre, Stony (Assiniboine), Crow, Pend Oreille, and Salish. Some of these people traveled across the mountains to hunt, fish, or raid. Passes within today's park that were regularly used included Cut Bank, Red Eagle, Kootenai, and Brown. Blackfeet and Kootenai groups often camped at the foot of Upper St. Mary Lake during the 1800s. An Indian trail may have led from Lake McDonald to Waterton Lake. Logan Pass, where today's Sun Road crosses the Continental Divide, is thought to have been a route of travel before horses were introduced to the area in the 1700s (the heavily wooded Logan Creek and Reynolds Creek valleys were better suited to travel on foot than on horses). Logan Pass was reportedly known to some Indians as Misum Oksokwi, or the Ancient Road, and the Kootenai called it Big Feet Was Killed. The area east of the Continental Divide in today's park became part of the Blackfeet/Gros Ventre Reservation, established by treaty in 1855.[10]

Changing Names in Glacier National Park

- *Oksokwi (Ancient Road) / Big Feet Was Killed / Trapper Pass / Logan Pass*
- *Belton / West Glacier*
- *Midvale / Glacier Park Station / East Glacier Park*
- *Snyder Hotel / Lewis' Glacier Hotel / Lewis Hotel / Lake McDonald Hotel / Lake McDonald Lodge*
- *Transmountain Highway / Going-to-the-Sun Highway / Going-to-the-Sun Road*
- *Blackfeet Highway / Highway 89*
- *Office of Public Roads / Bureau of Public Roads / Public Roads Administration / Federal Highway Administration*
- *Roosevelt Highway / Highway 2*
- *East Glacier Auto Cabins / Rising Sun*
- *Camp 5 / Garden Wall Road Camp / Road Camp 9*

Euro-Americans did not enter northwestern Montana until the 1800s. The earliest whites into the area that is now Glacier National Park were probably fur trappers and prospectors willing to brave the rugged terrain and frequently severe weather conditions. The first known group of whites to cross Logan Pass was a small group of prospectors who traveled in 1876 from St. Mary to today's West Glacier and then up the North Fork of the Flathead. They encountered an Indian camp on the lower end of St. Mary Lake and a white trapper living in a cabin on the north shore. The prospectors spent three days of "very difficult travel" getting to Lake McDonald via Logan Pass.[11]

In the 1880s, hunting and fishing expeditions began coming to the eastern valleys of today's park. One of the early visitors to the area was James Willard Schultz. Schultz claimed that he and a Blackfeet man gave Going-to-the-Sun Mountain its name in the 1880s, replacing the already established Indian name that translated as Lone High Mountain. He reported that there was no Indian legend in connection with the new name. This mountain is the namesake of the Going-to-the-Sun Road.[12]

The arrival of the transcontinental rail line opened up the area to settlers. The Great Northern Railway worked its way west from Minnesota and reached Belton (today's West Glacier) towards the end of 1891. Soon, homesteaders had settled at the foot and head of Lake McDonald. Some of these early settlers, including Milo Apgar, Charles Howe, and Frank Geduhn, built cabins on the lakeshore to accommodate the slowly growing number of visitors to the area. In 1895, Harvey Apgar (brother of Milo) moved to the foot of the lake, and he later constructed a dining room/kitchen and several tourist cabins. The community of Apgar was named for this man. These Lake McDonald homesteaders catered to a mostly local clientele who appreciated the scenic beauty and the natural resources of the Lake McDonald area.[13]

Over the next two decades, the facilities in the Lake McDonald vicinity expanded to meet the growing demand for tourist accommodations. George Snyder built a nine-room hotel near the head of the lake in 1895. The first horse trail from Apgar to the head of the lake followed the Camas Creek drainage (across the lake from today's Sun Road). Snyder established steamboat transportation on Lake McDonald in 1895 to take guests to his hotel, and gas launches followed. Ed Dow constructed two hotels in the 1890s near the depot at Belton. Frank Kelly established a cabin-camp business at the head of the lake in 1899. Geduhn expanded his log-cabin complex in 1900 to include a two-story hotel with five rooms.[14]

Perhaps the earliest trail constructed for recreation in what is now Glacier was built by private parties in 1895 between the head of Lake McDonald and the foot of Avalanche Lake. In the early 1900s, college professor Lyman Sperry led a group of students in building a trail over Gunsight Pass, with the support of the Great Northern Railway. By the early 1900s, several outfitters led guided horse trips from Lake McDonald into the mountains.[15]

Figure 5. Lewis Hotel viewed from the lake, pre-1914. GNPA photo #2749.

In 1904, John and Olive Lewis purchased the Snyder hotel near the head of Lake McDonald. Over the next six years, they built eleven guest cabins and a first aid-laundry building, making this the largest tourist complex in the region at the time. John Lewis then retained the respected Spokane, Washington architectural firm of Cutter and Malmgen to design a grand hotel on the property. He moved the old Snyder hotel to the rear of the site and converted it into a general store. The new 65-room "Lewis Glacier Hotel" (today's Lake McDonald Lodge) opened for business in June of 1914. Lewis continued to add buildings to the complex, including a public assembly hall, employee dorm, recreation hall, and caretaker's house. Until a road was built up Lake McDonald to the hotel in 1921, most guests arrived via boat and walked from the dock up to the hotel along a shrub-lined gravel path bordered by manicured lawn and native cedar.[16]

The east side of the mountains developed more slowly than the west side in these early, pre-park years. Jack Monroe moved to the St. Mary Valley some time after 1887, and he provided for the needs of the few travelers and also offered guided hunting trips. On the Great Northern line, the nearest station to the area was located at Midvale (today's East Glacier Park), well south of St. Mary Lake.[17]

The U.S. Congress established the Flathead Forest Reserve in 1897. This federal reserve included most of today's Glacier National Park plus much land west of the North Fork of the Flathead. The few rangers hired to patrol the vast public lands in their jurisdiction slowly established a trail network. They also built several ranger stations, including ones located at Belton and near the foot and the head of Lake McDonald.[18]

The portion of Glacier Park east of the Continental Divide was part of the Blackfeet reservation prior to its 1896 purchase by the federal government. Known as the "Ceded Strip," this area was opened to mining in 1898, leading to a brief and minor period of minerals exploration and extraction. The small settlement of St. Mary formed at the foot of the upper lake during this period, although it was not a mining community. Its residents

raised horses, provided services to occasional travelers, hunted, trapped, freighted, and fished. By 1911, however, the population had dwindled to only one family. The group of buildings that formed the original community at St. Mary was mostly in the vicinity of today's sewage treatment plant and lagoons.[19]

The transportation system on the west side improved in the 1890s, due mostly to private efforts. Local residents of the Belton/Lake McDonald area carved a rough wagon road out of the forest from the train depot to Apgar in 1893. The first bridge across the Middle Fork at Belton was built in 1897, eliminating the need for rowboats. This was located at the site of the concrete bridge upstream of today's highway crossing. In 1895, community members widened the road and corduroyed some sections, enabling George Snyder's steamboat to be delivered to the lake. This seasonally passable road was a slender ribbon through a dense red cedar-hemlock forest all the way to the foot of Lake McDonald. As one 1900 traveler described it, "And then suddenly the road emerged from the forest and the whole beauty of the entire lake was before us."[20]

The first road up the North Fork of the Flathead, on the east side of the river, was built in 1901 from Apgar, at the foot of Lake McDonald, to lower Kintla Lake. This rough, remote road was constructed to access some unsuccessful oil drilling sites, but it also served homesteaders in the area for many years and remains a part of Glacier's roadway network.[21]

By the time the park was established in 1910, Apgar boasted a number of residences, a large pier, a storehouse with camping supplies, and a big hay warehouse. Several boats plied the lake regularly, and another boat carried passengers on the waters of St. Mary Lake. However, despite the development in the Lake McDonald area and elsewhere, travel in the area of today's park remained essentially seasonal, slow, and inconvenient outside of the railroad corridor. Travelers going to the Geduhn cabins at the head of Lake McDonald, for example, had to take a train to Belton, a stagecoach to the foot of the lake, and then a boat to their destination.[22]

2.2.3 Early Development of Glacier National Park

In the early 1900s, preservationists, scientists, and Great Northern Railway officials urged the U.S. Congress to establish a national park straddling the Continental Divide in Montana, just south of the international boundary. As a result of their efforts, Glacier National Park was established May 11, 1910, as the tenth national park in the United States. The first park Headquarters was based out of tents in Apgar on the west side of the new park. The small staff's energy was devoted largely to fighting forest fires that hot, dry summer. In 1911, Superintendent William Logan rented a log cabin at the foot of Lake McDonald to serve as administrative headquarters. From 1913 until 1916, park Headquarters were located in rented cabins and an old Forest Service ranger station at Fish Creek, not far from Apgar.

Administrative staff considered other locations for permanent Headquarters, including sites in the Apgar-Belton area, Midvale (East Glacier), St. Mary, and Two Medicine. The issue was resolved in 1917, when park Headquarters moved to its current location near Belton (West Glacier), on the north bank of the Middle Fork.[23]

Superintendent Logan faced significant challenges when he arrived at the new one-million-acre park in 1910. The only visitor accommodations were at Belton, Apgar, the head of Lake McDonald, and a bunkhouse at the foot of St. Mary Lake. Most of the land at the foot of Lake McDonald was privately owned. Only two trails (across Swiftcurrent and Gunsight passes) linked the east and west sides of the park. The two roads on the east side, both in very poor condition, led from Browning to St. Mary Lake and Sherburne Lake. On the west side, the road from Belton to park Headquarters at Apgar was only seasonally passable, and a rough wagon road continued on up the North Fork. Visitors and rangers alike traveled east-west by the Great Northern Railway.[24]

In common with many other national parks at the time, Glacier National Park in 1910 was virtually inaccessible by automobile. A local newspaper described the road between Belton and the foot of Lake McDonald as "a combination of quagmire, corduroy and misery, the worst and most objurgated three miles in the state of Montana, dreaded by those who had ridden over it, feared by those who expected to, fitted to take the blue ribbon at an exhibition of horrible examples." The closest road from the Flathead Valley ended eight miles away in Coram.[25]

The lack of roads suitable for automobiles was soon addressed by NPS administratiors. During the 1910s, as automobiles became more affordable and reliable, public pressure grew to provide park roads passable for automobiles. William Logan, whose first official title was Glacier's "Superintendent of Road and Trail Construction," urged the construction of a transportation network to make the park more accessible. Like his successors, he felt that higher visitation would provide leverage for more funding from Congress. Meanwhile, private citizens took the initiative. The Flathead County Commissioners and the Flathead County Auto Club worked together to build a road from Columbia Falls to Belton in 1911. The first car to reach Belton arrived in the spring of 1911 (traveling the last five miles along the railroad tracks), and the driver continued bravely on to the foot of Lake McDonald.[26]

Logan spent most of his 1911 appropriation of $15,000 for maintenance and improvements developing the west side of the park because most visitors entered the park at West Glacier rather than from points on the east side. Logan constructed a "new government road" from Belton to the foot of Lake McDonald along a 60-foot-wide right-of-way.[27] The work on this short segment of road marked the first federal construction activity on what was to become the Going-to-the-Sun Road.

The macadamized road, completed in the spring of 1912, was 24 feet wide with an 8-foot shoulder on each side. Admiring local newspaper reporters called it a "boulevard" and a "speedway." The roadbed was cleared of trees and stumps and then excavated for the subgrade and fine fill. Roadway surfacing included 6 inches of crushed rock and gravel covered with 3 inches of small rocks. The surface was covered with a layer of crushed gravel that was rolled and compacted, and then layers of fine materials were laid on and compressed into the gravel. Much of the sand and gravel that was used came from a right-of-way granted by hotel owner John Lewis. The borrow pits along the road later caused erosion and cave-ins, which were eventually filled in as funds allowed. Macadam roads such as this were considered state of the art for stagecoach travel at that time, but they did not hold up well to automobile travel.[28]

Figure 6. Cleared right-of-way for government road from Belton to foot of Lake McDonald, ca. 1911. Photo by Morton Elrod, GNPA #2359.

Leading citizens of the Flathead Valley, elected officials, and commercial clubs pushed for increased appropriations for road construction in Glacier. This desire, however, conflicted with Department of the Interior philosophy of the time, which resisted allowing autos in protected federal areas; in Yellowstone National Park, for example, cars were banned until 1915 because of anticipated conflicts with horses. Flathead civic boosters were concerned that Glacier National Park was a barrier to interstate automobile travel, thus limiting local income from the tourism business. P. N. Bernard, Secretary of the Kalispell Chamber of Commerce, commented, "A Park without roads is a menace to civilization and settlement."[29] Fred Whiteside of Kalispell wrote in 1911, "In the Yellowstone Park nothing but horses are allowed, but we believe we have now reached the stage of civilization where it will be better to use automobiles even if the horses are to be left out." Regulations allowing private automobiles in Glacier were drafted the following year, based on those for Mount Rainier National Park.[30]

When Stephen Mather became Director of the NPS in 1916, he lifted the remaining restrictions on allowing cars in national parks and began lowering the entry fees, which had been quite high. Travelers arriving in Glacier by automobile in 1924 had to obey park rules, which included 12 mile-per-hour speed limits on grades and 20 mile-per-hour on open stretches and the sounding of horns on curves. Drivers had to obtain a permit for their automobile at a park checking station before entering the park. In the national parks as a whole, about 60 percent of visitors arrived in the parks by automobile in 1923. This figure was lower for Glacier, however, because of the park's limited road network and the fact that many visitors still arrived by train. In 1924, fewer than 5,000 automobile permits were issued at Glacier.[31]

Figure 7. Joe Howell, Glacier park ranger, ready to register automobile visitors to Glacier at the St. Mary entrance station, 1923 or 1924. GNPA photo #2874.

Because transportation and communication between the west and east sides of the park were so difficult in these early years, park staff established a subheadquarters at Glacier Park Station (East Glacier) for administering that side of the park. The Chief Ranger was stationed there as the administrative officer for the east side. Park staff initially relied on the railroad's telegraph to communicate with each other, dur to the lack of telephone communications. North-south communications were also poor; it took two days to travel from the foot of Lake McDonald to Waterton Lake in Alberta. Central administrative operations were consolidated in West Glacier in 1932 when the opening of the Sun Road to automobiles finally linked the two sides of the park.[32]

The placement of permanent park Headquarters on the main entrance route at the west entrance to the park emphasized to visitors the presence and authority of the NPS. Travelers crossed the bridge over the Middle Fork at Belton, drove up a graded road along the river, and then entered the park by a road lined with administrative buildings. The first buildings, constructed between 1917 and 1919, were four residences, a warehouse, a stable, and a water/sewer system. Park crews built the Superintendent's residence and the administrative building in 1923. Buildings were added in the 1920s to handle the growing number of seasonal employees and to provide centralized maintenance facilities grouped in the area west of the road known as the utility yard.[33]

Figure 8. Original road to park Headquarters at West Glacier, 1925. View is looking east along Middle Fork of Flathead River. GNPA photo #3711.

2.2.4 Glacier's Visitor Services

The Early Years, 1910-29

National parks are provide many different facilities for the comfort and convenience of park visitors, including roads and trails, lodging, campgrounds, comfort stations, picnic areas, grocery stores, and gasoline stations. Administrative facilities required in national parks such as Glacier include checking (entrance) stations, museums/visitor centers, ranger stations, patrol cabins, maintenance shops, and employee housing. At Glacier and other parks, the need for roads and trails, for both visitor and administrative use, was particularly acute. As popular author and Glacier visitor Mary Roberts Rinehart commented in 1916, "A Government mountain reserve without plenty of roads is as valuable as an automobile without gasoline."[34]

Although there was a tremendous perceived need for improved roads, trails, and visitor facilities during Glacier's first years, the park's limited federal appropriations typically allowed for only minimal government-sponsored construction activity. As a result, the Great Northern Railway was responsible for the development of much of the park's early road and trail network, particularly on the east side. Louis W. Hill, the Great Northern's president, was a strong booster of the park, and the railway saw Glacier as a potential tourist

destination for travelers on its passenger trains. Soon after the park's establishment, the railway incorporated a subsidiary named the Glacier Park Hotel Company to build hotels and other tourist facilities in the park. To succeed, this company required a good transportation network connecting its guest facilities. Roads and trails built by the railroad aided their business activities and simultaneously helped the NPS administer the new park.[35]

Some of the early roads built within the park were funded by the NPS but were designed and built by Great Northern engineers. The railroad built the original wagon road along the eastern border of the park from East Glacier to today's Swiftcurrent Lake. In the summer of 1912, the Great Northern hired A. Guthrie & Company of St. Paul to build a 4.8-mile wagon road along the lower end of Upper St. Mary Lake that connected with the main wagon road from East Glacier. (The NPS later reimbursed the railway for this project.) By August 1912, travelers could make their way from East Glacier to St. Mary by a rough 34-mile-long road, crossing stringer span and truss bridges on the way. The bridge over Divide Creek was made of timbers cut and hewed on-site. Travelers had to ford the St. Mary River to continue on the spur road up St. Mary Lake to Roes Creek. Over the next few years, the government took greater responsibility for road maintenance on the east side. In 1917, the main road on the east side was rebuilt with government funds, even though it lay outside the boundaries of the park.[36]

The railroad also paid for the construction of trails, sometimes on a cost-reimbursable basis. One such trail was the 1913 trail over Piegan Pass that connects St. Mary Lake and Many Glacier. This was an important link in the railroad's network of tent camps, chalets, and hotels.[37]

The completion of the roadway from East Glacier to Swiftcurrent Lake was soon followed by the formation of a transport company to carry tourists along the route in eleven-passenger, four-horse stagecoaches. Rowe Emery brought the first buses made by White Motor Company of Cleveland to Glacier in 1912, and he formed the Glacier Park Transport Company in 1914. This company became the park's only bus transportation concession. At first it served only east-side travelers and was closely tied to the railroad's needs, but by the late 1920s buses also traveled on the west side of the park, taking passengers from the Belton depot to the Lewis Glacier Hotel. (This service succeeded the early stage operations conducted in the Belton/Apgar area by James Weightman and others.) Because the roads on the east side were so rough, teams of horses sometimes were required to pull the buses through mud holes. The bus bodies were replaced in 1923 with bodies with fold-down tops. This company sold the business in 1927 to the Glacier Park Transport Company. By 1930, the concessionaire was operating sixty-six buses in Glacier.[38]

The Great Northern financed an extensive advertising campaign designed to attract people to visit Glacier. One aspect of this program was the See America First campaign, intended to encourage wealthy Americans to spend their holidays in America rather than in Europe.

The railroad catered primarily to travelers who arrived in East Glacier by train, stayed at the adjacent Glacier Park Hotel, and then set off on a multi-day horse trip with lodging at concession-operated backcountry chalets and tent camps. The railway's visitor facilities in Glacier were designed to appeal to travelers' interest in the American West, while also reflecting European themes. The Great Northern hired traditionally dressed members of the Blackfeet tribe to meet the trains at the East Glacier depot; the early tent camps were modeled on tepee villages; and the hotels and chalets had Swiss-influenced architectural styles. The placement of facilities along a rail, road, and trail network, one day's horseback ride or walk apart, was based on European precedents.[39]

Great Northern Chalets Along the Sun Road

	built	***auto access***	***closed***	***destroyed***
Belton	*1910-11*	*1911*	*n/a*	*n/a*
St. Mary	*1912*	*1912*	*ca. 1942*	*1944*
Going-to-the-Sun	*1913*	*1932*	*1941*	*1949*
		Other Chalet Locations		
Two Medicine	*1914*	*1914*	*n/a*	*n/a*
Cut Bank	*1913*	*1913*	*ca. 1934*	*1949*
Many Glacier	*1913*	*1913*	*1936*	*1936*
Gunsight	*1911*	*n/a*	*1915*	*1916*
Sperry	*1913*	*n/a*	*n/a*	*n/a*
Granite Park	*1914*	*n/a*	*n/a*	*n/a*

Note: Many dates are approximate, since some properties were constructed or removed incrementally, or operated intermittently. Lodging facilities at Two Medicine closed in the early 1950s and were removed by 1956.

Figure 9. Belton Chalets, West Glacier 2001 photo.

The hotel in East Glacier, which opened in 1913, was the cornerstone of the Great Northern operation, and one of four major hotels ultimately operated by the Hotel Company. Many Glacier Hotel, on the shore of Swiftcurrent Lake, opened in 1915, and it remained Montana's largest hotel for decades. The Great Northern's dramatic Prince of Wales Hotel, in Canada's adjacent Waterton Lakes National Park, opened for guests in 1927. Three years later, the railway took

over the management of the Lewis Glacier Hotel, as part of an arrangement which saw the hotel property itself transferred to the federal government. (The facility was then officially renamed "Lake McDonald Hotel.")[40]

Figure 10. Going-to-the-Sun Chalets, n.d. GNPA photo #8383.

The railroad also built nine chalet groups in Glacier, including three along the route of the future Sun Road: at Belton, at the foot of St. Mary Lake, and at Sun Point (the latter was known as Going-to-the-Sun Chalets). The west-side Belton Chalets was constructed first, in 1910, because at that time most park visitors came from nearby Montana communities and entered the park from the west. The chalet complexes at Belton, St. Mary, Two Medicine, and Cut Bank were accessible primarily by train or road, the others primarily by boat or trail. The St. Mary Chalets served as a transfer point for travelers heading north to Many Glacier, south to Glacier Park Hotel, or east to Going-to-the-Sun Chalets.[41]

Figure 11. St. Mary Chalet at the foot of St. Mary Lake. GNPA photo #9395.

The visitor facilities erected by the Great Northern in Glacier employed a distinct architectural style on a massive scale. They were built of local wood and stone in a rustic style with Adirondack and Swiss influences. When the NPS negotiated a twenty-year contract with the Glacier Park Hotel Company in 1917, one provision was that the NPS landscape architect must approve the design and location of all

important structures. The picturesque design of Glacier's grand hotels and chalets appealed to eastern guests and allowed the buildings to be perceived as harmonious elements of the landscape. The building complexes included a variety of structures, including guest quarters, dining halls, employee dorms, corrals, and other facilities.[42]

In anticipation of the completion of the Sun Road, in 1920 Stephen Mather urged the Great Northern Railway to build a chalet or small hotel on Logan Pass. This was still early in the history of automobiles in national parks, however, before park administrators realized that automobile tourists wanted different types of services than those provided at the grand hotels and chalets. As Glacier's administrators and other NPS officials tried to meet the needs of automobile travelers, they began to view the Great Northern's network of expensive lodging and guided horse trips as anachronistic.[43]

A variety of other visitor services supplemented and accompanied the Great Northern's hotel and chalet network in Glacier. Commercial boat services, for example, appeared on several of the park's lakes during the late nineteenth and early twentieth centuries. Privately-operated boats entered service on Lake McDonald in the 1890s; these were succeeded by a small concessionaire business that was acquired by the Glacier Park Transport Company in 1924. On the east side, launch service was dominated by the Great Northern, which eventually operated boats on Two Medicine, St. Mary, Swiftcurrent, Josephine, and Waterton Lakes. Most of these services were intended purely as scenic excursions, but the St. Mary Lake boat was the primary means of access to Going-to-the-Sun Chalets until the completion of the Sun Road..[44]

During the 1910s through the 1920s, before the Sun Road was completed, Glacier was very much a trail park. Most of the park's main trails were built by 1918. By 1930, the park had about 400 miles of "tourist trails." In 1915, seventeen separate concessionaires supplied saddle horses and guides for backcountry trips. The Park Saddle Horse Company consolidated these in 1916. This company ran a large operation with hundreds of head of stock, and in 1926 over one-quarter of all park visitors went on at least one horse ride.[45]

Throughout the nation, automobiles revolutionized the nature of tourist facilities in national parks. In 1929, tourists could first drive to Logan Pass from the west side. This attraction, plus the increasing popularity of automobiles in America, led to growing numbers of motorists coming to Glacier. Cabins and hotels were fine for some, but many wanted the parks to provide free public campgrounds. Stephen Mather noted in 1921 that Glacier needed more campgrounds to accommodate such travelers. In the 1920s, Glacier expanded the existing campgrounds at Many Glacier and Two Medicine and developed new ones at St. Mary (not in the current location), Avalanche Creek, and Cut Bank. NPS staff began to design and install facilities such as comfort stations, drinking water, and fireplaces. By 1930, the campground at Avalanche even had shower and laundry buildings. Campsites that were planned in 1924 (but apparently not constructed) included ones at the head of Lake McDonald and at Logan Creek on the west side and near Baring Falls and at the Golden Stairs on the east side.[46]

Private property owners ("inholders") on Glacier's west side also responded to the demand for facilities suited to automobile travelers. Businesses at the foot of Lake McDonald included the Gold Brothers' bungalows or "auto-cabins," the eight-cabin Greenwalt Camp complex, and the Houston Camp. The Greenwalts built and operated the park's first service station, located in Apgar in 1924. Private tracts at the foot and the head of the lake were subdivided into summer cottage sites, and more rental cabins were added to existing tourist facilities.[47]

Figure 12. Privately owned gasoline station at Apgar, ca. 1920s. GNPA photo #2490

As the twentieth century progressed, the NPS worked to reduce the number of inholders in Glacier, attempting to acquire private land when possible. After the 1929 Half Moon fire burned through Apgar, the NPS received a special appropriation to purchase private land along the shore of Lake McDonald. The fire destroyed many of the facilities owned by the Gold brothers, for example, and they sold their inholdings to the government in 1930. The NPS sold many of the former Gold buildings, but kept the dance hall that had held a soda fountain and gift shop. Considered in the 1930s for a role in a planned NPS tourist camp, the building was moved to Headquarters in 1938 and now serves as the community building.[48]

Figure 13. Land burned over in 1929 Half Moon fire and cleared by CCC crews, ca. 1931. Apgar is to the left, and Lake McDonald is visible in the distance. GNPA photo #3691.

The 1929 Half Moon fire burned from west to east, passing through Apgar and continuing partway up Lake McDonald. The dense red cedar-hemlock community along the first miles of the Sun Road became an open, charred landscape dotted with black snags. During the 1930s, Civilian Conservation Crew (CCC) members based at the foot of Lake McDonald harvested the charred timber on 3,000 acres in a massive clearing effort. The clearing was done to "beautify" the burned areas. Over the years, natural forest succession led to a new community of lodgepole, western larch, black cottonwood, and other vegetation quite different from the earlier appearance of the roadway. Those Apgar people who rebuilt their residences and visitor accommodations relied on frame rather than the cedar-log construction that had previously typified the area.[49]

NPS and private tourist facilities in the St. Mary area were less developed than those on the west side, in part because the Great Northern Railway was essentially meeting the demand for visitor facilities on that side of the park. A ranger station was constructed at St. Mary in 1913, followed by a barn and woodshed. One obvious NPS facility in St. Mary was the checking station, originally a tent located not far beyond Divide Creek. This was replaced by a more formal entrance station in 1942.[50]

Visitor Services, 1930-55

In the early 1930s Thomas Vint compiled a book of drawings and plans of successful park buildings. These rustic-style buildings highlighted the most successful and representative designs. The comfort station built at Logan Pass in 1931 was included in the 1932 portfolio. This comfort station used native rock in a proper scale, avoided straight lines and "oversophistication," and related well to the high mountain meadow in which it was located.[51]

Figure 14. Comfort station built 1932 at Logan Pass, later used as information center by park naturalists. GNPA photo #1296.

As the 1930s progressed, however, the rustic design philosophies exemplified by the Logan Pass building began to lose favor among NPS planners and landscape architects. By the 1940s, the NPS's Branch of Plans and Designs preferred unpretentious buildings that blended with their site rather than dominating it the way some of the Great Northern hotels

and chalets dominated their settings. New tourist facilities such as auto cabin camps and cafeterias were located close to major roads rather than on high points with scenic vistas. Rustic architecture, with its attention to detail and use of hand labor, gave way to functional designs, modern materials, streamlined forms, and mechanized technology.[52] Developed areas of parks, including campgrounds, were typically arranged according to naturalistic principles of landscape design. This incorporated features such as curvilinear roads and trails (for example, loop roads in campgrounds) and the siting of buildings and structures in an irregular pattern related to scenic views or screens of vegetation.[53]

Figure 15. Private cars, concessionaire buses, and visitors at Logan Pass, taken from the roof of the comfort station,1940. Notice the rock outcroppings in area that is part of today's parking lot. Photo by T. J. Hileman, GNPA #10096.

In Glacier, the coming of the automobile foreshadowed a dramatic revolution the nature of the park's tourist facilities beginning in the 1930s. The opening of the Roosevelt Highway across Marias Pass in 1930 and of the entire Sun Road in 1932 boosted the park's overall visitation. In 1934, President Franklin D. Roosevelt visited Glacier National Park, and his visit drew national attention to the newly completed Sun Road. By 1941, an average of 400 vehicles per day traveled over the Sun Road, peaking at 700 on weekends and holidays. At the same time, the Depression and the increased popularity of automobiles led to a continued decline in rail travel and in occupancy of the Great Northern hotels.[54]

As early as 1930, Glacier's superintendent felt that the most pressing need for the park was moderately priced "housekeeping cabins." Such accommodations had already proven popular with both visitors and concessionaires in other national parks. Glacier's administrators were concerned about the number of auto camps and campgrounds being built outside the park's boundaries. NPS planners wanted cabin camps along the new Sun Road, and they asked the railroad to construct cabins at Apgar and Roes Creek. The Glacier Park Hotel Company resisted this plan, both because they were afraid that auto camps would reduce the patronage at their hotels and chalets and also because the Depression was hurting their business. The concessionaire began to relent in the early 1930s, however, and in 1933 constructed an "auto cabin camp" at Swiftcurrent in the Many Glacier area that

became very popular. During the 1930s, garages and gas pumps were added to Glacier's hotel complexes and chalets, but park administration required that they be placed off the main roads.[55]

The NPS opened a new campground at Roes Creek in 1933, just in time for the formal opening of the full length of the Sun Road, and the location was also chosen as the site for a second "auto cabin camp" complex. For the cabins, the NPS suggested low, rambling structures of uniform design, and the concession architects met these general specifications. They were designed as sleeping accommodations rather than as "housekeeping cabins" with cooking facilities like the cabins at Many Glacier. The East Glacier Auto Cabins complex (later known as Rising Sun), built in 1940, consists of small cabins irregularly spaced along the hillside with only occasional views of the mountain and lake scenery. The NPS allowed some of the buildings to be within view of the Road, including one guest cabin, although this went against the general policy of hiding development. The original Rising Sun complex included nineteen simply-built cabins with private bathrooms, a campground, camp store, coffee shop, employee dorm, and camp-tender's cabin. Travelers could get gasoline, oil, air for their tires, and water at the complex.[56] The new facility proved to be the automobile-oriented successor to the historic Going-to-the-Sun Chalet complex nearby, which closed for good in 1941.

The Rising Sun facility opened to the public in 1941, and the Glacier Park Hotel Company closed the St. Mary Chalets at the foot of the lake that same year. By July, however, the chalet complex was temporarily reopened to provide overflow housing for visitors. NPS planners visualized dozens more cabins being built to the north and east of the original cabins at Rising Sun, but these were never constructed. After World War II, the NPS and the concessionaire both favored more space-efficient and economical motel units. Thus, two motels were built east of the cabin complex at Rising Sun in the 1950s. A new dock was built at Rising Sun in the late 1950s, to replace the old dock at Sun Point, and a new coffee shop and a service station were later added to the Rising Sun complex.[57]

The locations of Glacier's campgrounds were closely tied to the development of its road network. As early as 1927, Glacier's Superintendent J. R. Eakin wrote, "We must have greatly increased funds for automobile camp construction if we are to give the service that visitors receive in other national parks and which they naturally expect to receive at Glacier."[58] That year, Eakin announced that the Avalanche campground would be built by the time the Sun Road was open to the public. He envisioned that it would have housekeeping cabins, delicatessen, community house, shower bath, and service station.[59]

In 1930, the park had five developed campgrounds, including ones along the Sun Road at Avalanche Creek and at the foot of St. Mary Lake. Visitors who stayed at campgrounds were provided with camping space, firewood, comfort stations, and limited shower and laundry facilities. Once the Sun Road opened, the park concentrated on expanding existing auto campgrounds. The popularity of trailer camping increased in the 1930s, so the NPS

Figure 16. Comfort station at Avalanche Creek, ca. 1940s. GNPA photo #441.

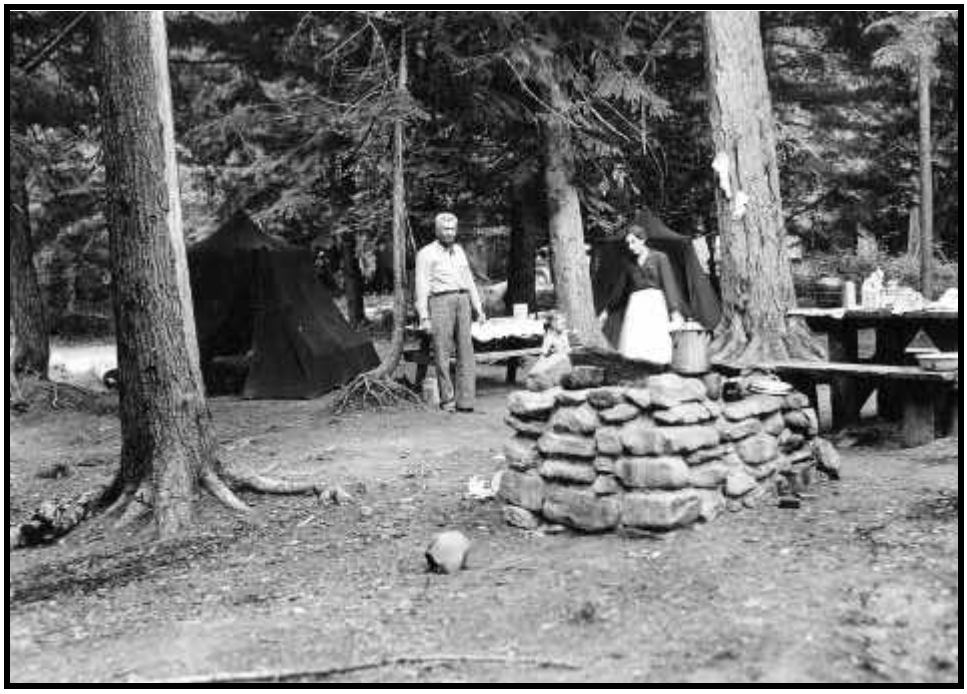


Figure 17. Typical campsite at Avalanche, with rock fireplace and picnic table, 1941. Photo by R. J. Anderson, Jr., GNPA #565.

developed layouts that could accommodate trailers as well as cars. In addition to the new Roes Creek campground, the 1930s saw the construction of a new campground at Sprague Creek and the enlargement of the Avalanche Creek campground.[60]

The configurations of the two checking (entrance) stations on the east and west ends of the Sun Road changed significantly in the 1930s and early 1940s. Until then, all automobile visitors had to stop at a tent or a building along the side of the road and register with a ranger. In 1936, NPS Landscape Architect Albert Good recommended that park entrance stations be located in the center of the road. The first permanent checking station in the Headquarters area had been built in 1924. This was an employee residence with a covered passageway leading to a small roadside entrance station. After the Road was realigned through Belton and the new bridge over the Middle Fork was constructed in 1938, the Headquarters area and this entrance station were bypassed. A shack served as a temporary entrance station for several years. Then, in 1941, CCC crews built similarly designed entrance stations at both West Glacier and St. Mary. The entrance station at West Glacier was landscaped with oval planting areas delineated by low mortared stone walls. At St. Mary, the turnouts around the entrance station were defined by log guardrail (this entrance was replaced in 1968 by a new one closer to the newly constructed St. Mary visitor center).[61]

During World War II, all plans for additional commercial development in Glacier were suspended. All the hotels and chalets were closed, and no transportation, launch, saddle-horse, or naturalist services were available in the park between 1943 and 1945. The only visitor services were at Rising Sun, and these were provided primarily for the convenience of traveling servicemen.[62]

After World War II ended, Glacier's transition to serving the needs of automobile tourists was nearly complete. The opening of Flathead County Airport in 1949 provided new competition to the railroad. In 1957, only 1.1 percent of park visitors arrived by rail. The Going-to-the-Sun, St. Mary, and Cutbank chalets were all razed between 1944 and 1949, and the last overnight accommodations at Two Medicine Chalets closed in 1953.[63]

The Park Saddle Horse Company terminated its contract in 1945 because of the shift in interest among visitors away from horseback riding towards hiking and towards seeing the park in a day or two from the seat of an automobile. This large concessionaire was replaced by small-scale operators who responded to the changing conditions by concentrating on short day-trips. In 1951, E. George Wellman took over the saddle horse concession and operated for a number of years throughout the park. Package rail/bus "circle tours" replaced the extended pack trips of the pre-World War II decades. Glacier was no longer the trail park it had once been; driving the Sun Road had become a park experience in and of itself.[64]

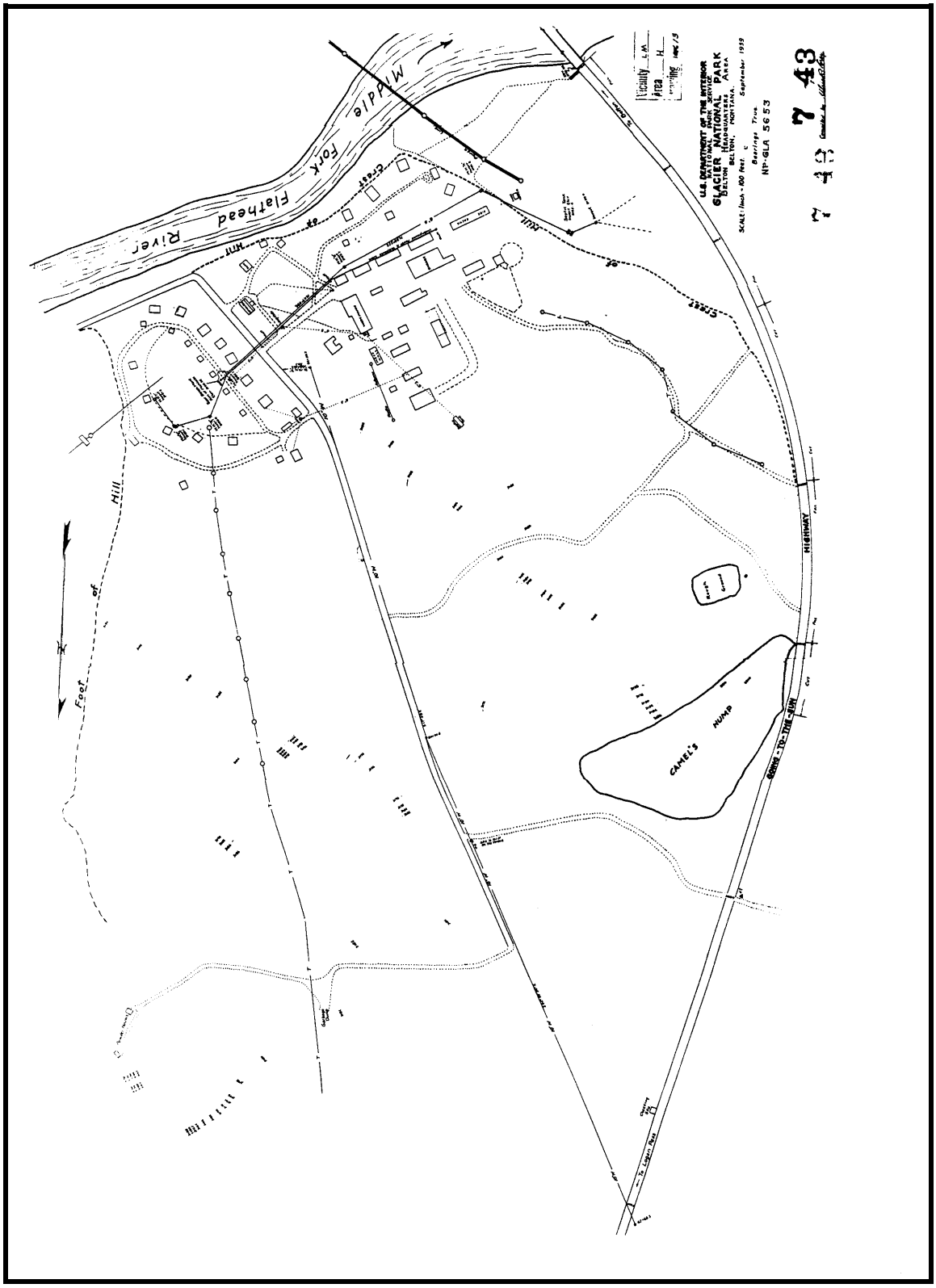


Figure 18. Headquarters area, 1939. Notice that the maintenance area (center) is separated from the realigned main entrance road to the park (bottom of map). TIC drawing 5653.

As was true at other national parks, visitation to Glacier grew dramatically after World War II. Between 1946 and 1952, annual visitation more than tripled to over 600,000. Most of Glacier's hotels and auto camps had to impose nightly limits. By 1947, the park's campground facilities could not meet the demand; campers overflowed the defined camping areas and damaged surrounding vegetation. In response, the park expanded the Avalanche and Apgar campgrounds. Even so, a 1954 study found that the park's facilities could not accommodate the rapidly increasing numbers of visitors.[65]

A 1949 survey of Glacier's overnight visitors found that about 27 percent were campers and 17 percent used a combination of hotel or cabin and camping. Another survey two years later found that only 14 percent of the visitors stayed in hotels. By this time, 4.5 percent were staying in trailers. In 1958, all of Glacier's campgrounds had spaces for trailers except Sprague Creek.[66]

Although overall park visitation grew during the post-World War II years, Glacier's hotels and remaining chalets experienced low occupancy rates and continued financial losses in the years after the war. Discouraged, the Great Northern began to seek a buyer for its Glacier properties in 1951. It operated during the 1950s under one-year contracts until the 1960 sale of the concession operation to Don Hummel, an Arizona businessman who had previously operated facilities in Mt. McKinley and Lassen Volcanic National Parks. Hummel then operated the business as Glacier Park Incorporated under a 25-year contract with the NPS.[67]

Figure 19. Lobby of Lake McDonald Lodge. GNPA photo #8115.

Management changes to other Park concession facilities also occurred during this period. The NPS acquired the Granite Park and Sperry chalet complexes from the railroad in 1954 and contracted their operation to a new concessionaire, Ross Luding of Martin City. The following year Howard Hays, who had owned the Glacier Park Transport Company since 1927, sold his business to the Great Northern. The railway merged the transport operation into the hotel concession, and it was part of the business acquired by Hummel in 1960. The moribund Belton Chalet was sold by the railway in 1946, and was later acquired by the Luding family, who operated it as a bar and restaurant for a time. Under new ownership, the Belton buildings were fully restored in the late 1990s, and the facility once again provides historic-style lodging for Glacier visitors.[68]

The Headquarters area at West Glacier developed over the decades to meet the changing needs and evolving architectural design principles of the NPS. The NPS Landscape Division or Branch of Plans and Design designed all the buildings that date from the first phase of its development (1917-30). These buildings are very good examples of rustic architecture, which was very popular in the nation's parks in the 1920s and 1930s. They have simple massing, horizontal profiles, rustic siding such as wood shingles or board-and-batten, stone fireplaces, and subdued paint tones (originally they were all stained dark brown and were finished with wood shingle roofs painted dark green).[69]

Glacier has two primary "utility areas" which serve as bases for the park's maintenance crews. They are located at each end of the Sun Road, a short distance off the Road and screened from the view of the general public. They are composed of simplified rustic-style wood-frame utilitarian buildings arranged in a practical, linear design. Changes at the Headquarters maintenance area, particularly the increase in vehicular-support facilities, reflect changes in park administration and the growing need for heavy equipment. The original 1917 warehouse and stable no longer exist at Headquarters. In 1925, an automobile repair shop was built at the complex. This was added on to in 1929 and again in 1934 because of the rapid increase in motor vehicles operated by park employees. A blacksmith shop was built in 1936. The construction of the Sun Road and the maintenance activity associated with it led to an expansion of the utility area beginning in 1928, when the barn complex was built. Other buildings related to road maintenance include equipment sheds (1928-33), a barn and sign shop (1928), gas and oil house (1928), warehouse (1928), equipment shed (1937), and sign shop (1940). In 1941, the CCC built four 10-stall equipment sheds in the maintenance area, allowing much heavy equipment to be stored under shelter instead of outdoors.[70]

As visitation to the park increased, park staffing also grew, requiring more housing and administrative facilities. New dormitory and mess hall buildings were constructed at Headquarters in 1927. WPA funds and CCC crews built additional employee housing between 1934 and 1941, including a dormitory, eight single residences, and nine combination garage/woodsheds. The Assistant Superintendent's residence was built in 1932. "Temporary" housing for married seasonal employees was constructed of materials

salvaged from CCC camp buildings (prefab wood panels with drop siding and corrugated metal roofs) in 1946. New administrative facilities were scattered throughout the complex and included a naturalist office (1936) and an administrative annex (1941).[71]

The administrative complex at St. Mary was developed beginning in 1933, a response to the location's increased importance as the eastern terminus of the newly completed Sun Road. As at Headquarters, NPS landscape architects designed most of the buildings in the complex. CCC crews built facilities integral to this centralization, including equipment sheds, an automobile shop, a log rustic-style gas and oil house, a storage shed, barn facilities, a large wood-frame men's dormitory, and the east side entrance station. A CCC camp was located near today's St. Mary campground.[72]

The small community of St. Mary began to expand after the closure of the St. Mary Chalets and the opening of the Sun Road. A few people lived year-round in the NPS complex at St. Mary or on Lower St. Mary Lake. By the mid-1930s, entrepreneur and NPS ranger Hugh Black had built a gas station at the junction of the Sun Road and the Blackfeet Highway (this was farther north than today's junction because of a later realignment). Soon, Hugh Black and his wife Margaret expanded their tourist facilities to include a small restaurant, a small store, and six guest cabins for automobile travelers. In 1938, the Blacks constructed a larger restaurant. In 1952, the Blacks built a 27-room lodge, a gift shop, and a new restaurant. Today, St. Mary has two lodges and other lodging, restaurants, gift shops, grocery store, sporting goods store, service stations, and other visitor facilities. Most of the buildings were constructed and are still owned by the Black family. The family's latest St. Mary development – the three-story log "Great Bear Lodge" – was completed in 2001.[73]

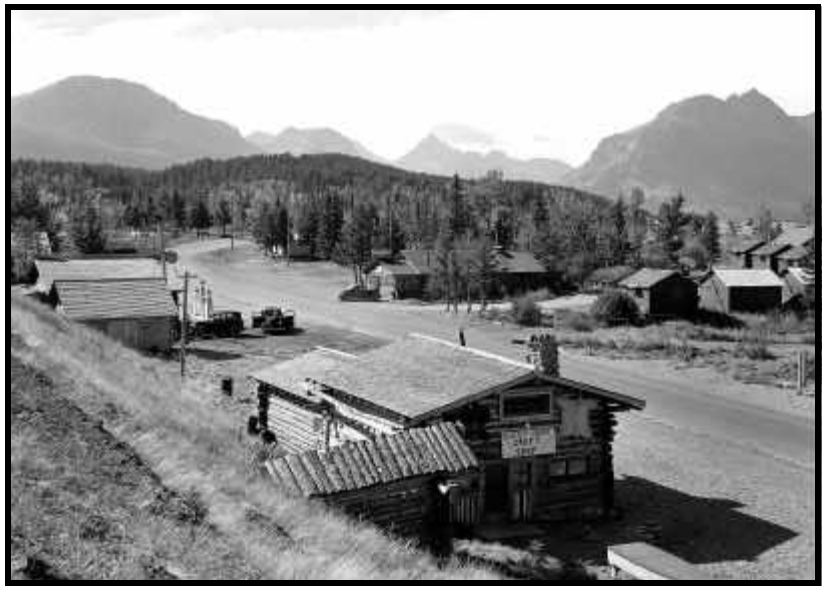


Figure 20. Hugh Black's cabin camp and other facilities at St. Mary, ca. 1941. GNPA photo #11492.

Visitor Services Since 1955

The Mission 66 program was designed to meet the needs of increasing numbers of visitors and also to protect the resources of the parks. The program called for increasing overnight accommodations in campgrounds and concessionaires' facilities, building better housing for park staff, and other programs. Road improvements funded under the Mission 66 program in the national parks included constructing turnouts, parking areas, and overlooks to increase the visitors' enjoyment of their drive. Mission 66 improvements can be seen today in many of Glacier's developed areas, including the concession locations, campgrounds, visitor centers, and administrative areas associated with the Sun Road.[74]

A variety of improvements took place at the Lake McDonald Lodge area during the Mission 66 years. During the late 1950s, the Great Northern partially remodeled the Lodge interior, adding the cocktail lounge and gift shop, and reconfiguring other public spaces. Private bathrooms were added to the guest cabins by about 1960. Newly-constructed buildings at the site included a gas station (1962; now the post office) and a large coffee shop (1965). The Stewart Motel, located on an inholding just north of the lodge, was acquired by the concessionaire and began to be operated as part of the lodge complex. Later renovation and rehabilitation work included changes to the interior floor plan of the lodge and structural work. The 1930s parking boulevard was changed somewhat in 1989 by the addition of log curbs, and the entrance circle was lowered and was bordered by a stone wall and boulders. The complex now provides 100 guest rooms (hotel, cabin, or motel).[75]

Figure 21. Gasoline and service station at Rising Sun, July 1964. GNPA photo #9183.

The site of the former Inwood Cabins and store is alongside the Sun Road just north of Lake McDonald Lodge. The facility last operated in 1978; after its acquisition by the federal government, its buildings were relocated to Headquarters and St. Mary for use as seasonal housing. The nearby privately operated Greve cabins closed about the same time. Other tracts of private land still remain in this area, including some along the shoreline north and south of the lodge.

Included among these properties is the historic "Kelly's Camp" tourist development, located across the lake from the Lodge area, well-removed from the Sun Road corridor.[76]

The Rising Sun complex also received new facilities during the Mission 66 years. A coffee shop was added in 1965, with large picture windows oriented toward St. Mary Lake and the Sun Road. Thirty-seven motel rooms in two buildings added more capacity in 1956. A filling station identical to the one at Lake McDonald Lodge was built in 1962. Rising Sun's filling station was removed in 1993 (the building is now at the East Glacier golf course); today there are no service stations within the park.[77]

Horseback travel by visitors to Glacier peaked in the 1920s and 1930s, before World War II brought an end to the famous multi-day concessionaire pack trips. By 1976, only 100 or 200 horses were needed for the short, single-day trips that have been offered since the war. In the Sun Road corridor, a concessionaire provides guided trail rides that leave from the Lake McDonald Lodge area and from a corral near Apgar.[78]

The NPS bought several very important properties from private owners in Apgar in the 1950s and 1960s. In 1956, the government obtained the Greenwalt properties, which included a service station and cabin camp that had been built over a period of thirty years. Much of this complex was demolished or moved elsewhere. The NPS also bought the 1956 Village Inn at Apgar in 1960, and it has been run by the major concessionaire since then. Private inholdings in the Apgar area today include retail shops, restaurants, guest lodgings, and associated employee housing. Privately owned summer homes and tourist cabins line the foot of the lake and extend northward toward the west shore.[79]

The Mission 66 program of the NPS was promoted as a program to bring the parks up to modern standards of comfort and efficiency and also to better conserve natural resources. It led to the construction of visitor and administrative facilities and the expansion of visitor services such as interpretation. Glacier was appropriated $23 million during the 1956-66 Mission 66 program. Most of the facilities and other improvements funded under this program were confined to already developed areas. Many of the small projects that were originally planned under the Mission 66 program were accomplished through the Accelerated Public Works Program of 1962 and 1963, which provided more funding to the park as well as workers to accomplish projects.[80]

During the Mission 66 period, NPS policy favored locating administration offices, maintenance facilities, and residences away from areas frequented by visitors. For example, the park's new administrative building at Headquarters was built off the Sun Road in 1963, and the old administrative building (on the now-bypassed park entrance road) is now the West Lakes District Office. Mission 66 housing was built at Headquarters in West Glacier and also in the administrative area at St. Mary. Both locations are now off the main Sun Road, and visitors rarely see them. Changes to the Headquarters area at West Glacier in

recent years include the removal of a ranger's residence, the loss of the rustic flagstone walkways (constructed of stone slabs taken from the roadside above the head of Lake McDonald), and the construction of modern buildings.[81]

Some of Glacier's campgrounds, including those at Avalanche and Apgar, were expanded under the Mission 66 program. The existing St. Mary and Fish Creek campgrounds were added during this period. The St. Mary campground was designed to accommodate larger camping vehicles; each vehicle was given its own pull-through loop (the vehicle length limit there is 35 feet). New picnic tables and comfort stations were added. Picnic areas along the Road were increased, too, because they concentrate daytime use and minimize damage to the landscape. Today, Glacier has thirteen campgrounds containing over 1,000 sites, and five of these are located along the Sun Road. Campers and other visitors can rent canoes and rowboats on Lake McDonald, and boat cruises depart regularly from Lake McDonald Lodge and from Rising Sun.[82]

Glacier's only two full-fledged visitor centers, both of them along the Sun Road, were constructed at St. Mary and Logan Pass as part of the Mission 66 program. At first, the park considered building visitor centers at Apgar, St. Mary, and Many Glacier, with secondary centers at Sun Point, Logan Pass, and Lake McDonald Lodge. The Mission 66 prospectus, prepared in 1956, suggested that a "modest shelter and information station," with comfort stations, be built at Logan Pass.[83]

The Kalispell architectural firm Brinkman & Lenon designed the two visitor centers. Like others of the period, they are constructed of modern materials and are stripped of most overtly decorative elements. The "Park Service Modern" style, which these buildings represent, reinterpreted the NPS's commitment to "harmonize" architecture with park landscapes. Stone facades, earth-toned colors, and modern, linear designs were intended to reflect this traditional harmony in a new way. The St. Mary visitor center was located at one of the main entrances to the park, a concept favored during Mission 66, but the Logan Pass visitor center is in the heart of the park at a highly scenic spot. It is, however, located next to the Sun Road and is thus within the developed corridor. The placement of the two visitor centers in existing "front country" rather than opening backcountry areas to new uses helped protect the park's resources.[84]

Glacier's two new showcase visitor centers, like those of the period in other national parks, were part of a broader effort of the NPS to create a new image for the agency that would fit the postwar world. For projects such as these, where the plans were drawn by consulting architects, the NPS still determined the circulation plans and programmatic requirements and often prepared preliminary studies. The NPS was trying to anticipate the requirements of modern transportation and increased visitation and to take advantage of new construction technology. The open interiors allowed large numbers of visitors to circulate easily and to locate the services they needed with little trouble. Large windows helped reduce the division between the outdoors and the interior space. The NPS felt that this design would help their goals of improving interpretation and stimulating the interest of the public in the park.[85]

The Logan Pass visitor center opened to the public in 1967, replacing the stone outhouse at the Pass that had served visitors since 1932. Since then, it has been the most visited visitor contact point in the park. (The St. Mary and Logan Pass buildings are supplemented by a third contact station, at Apgar. This small facility, a converted two-bedroom house, is frequently overcrowded.)[86]

Figure 22. Logan Pass visitor center, 2000 photo.

The 1960s construction of the Logan Pass visitor center led to a redesign and expansion of the parking lot at the pass that had been in use since 1929. The new parking lot eliminated all the original irregularly shaped islands in order to provide more parking spaces. New stone guardwall was built on the eastern and southern end of the parking area, and a network of surfaced paths developed. In 1986 and 1987, the paths were rerouted and rebuilt, the restrooms were enlarged, and an employee break room was added to the building. The parking lot was reconfigured yet again in 1996, to increase the lot's capacity and efficiency while eliminating informal parking opportunities in the area. The lot now holds 210 passenger vehicles and 6 to 14 tour buses.[87]

Park staff began to express concern about traffic on the Sun Road as early as the 1950s. In 1955, Superintendent Emmert proposed that the Sun Road be made one-way at certain hours of the day and also suggested completing a road to Waterton via Akamina Pass in order to relieve congestion in the southern part of the park.[88]

George Hartzog, Director of the NPS from 1964 to 1972, felt that the agency should not accommodate new kinds of mobile camping vehicles such as recreational vehicles. He felt that exclusion of vehicles from park roads not capable of handling them would be appropriate. Glacier staff responded accordingly. The first known restriction on vehicular length for vehicles on the Sun Road was established in 1967, a year when nearly one million visitors came to Glacier and the peak-hour travel on the Sun Road was 350-400 vehicles in both directions. The only traffic congestion at that time was at Logan Pass and, rather surprisingly, at Logan Creek. A study of the road completed that year recommended against one-way travel and noted that widening the Road would be very costly.[89]

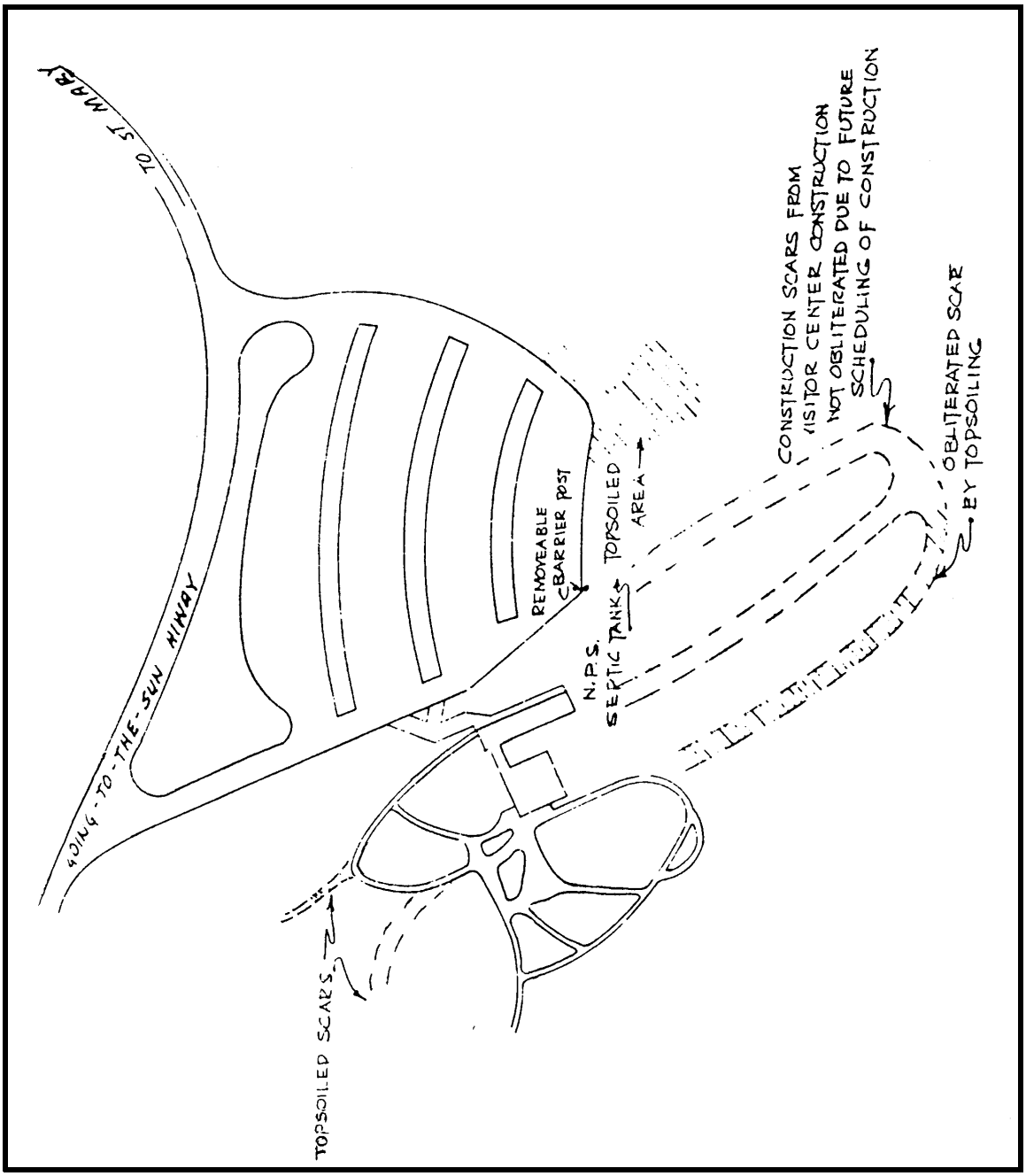


Figure 23. Sketch of Logan Pass area after new visitor center was constructed, 1967. TIC drawing 3704A.

Over the years since 1967, the park has imposed increasingly strict restrictions on vehicle length on the Road. In 1970, Glacier's Chief of Maintenance recommended that single vehicle length be restricted to 25 feet and trailer combinations to 40 feet. By 1978, the park had prohibited truck traffic and vehicle combinations over 30 feet in length. Today, vehicles and vehicle combinations over 21 feet in length or 8 feet in width are prohibited between Avalanche Campground and the Sun Point parking area.[90]

Currently, over 660,000 vehicles travel on the Sun Road per year. The July and August hourly average number of vehicles on the Sun Road during the 1990s was 388, with an average daily total of 3,876. This total is almost ten times the 1941 figure but – perhaps surprisingly – is relatively little-changed from the 1960s.[91]

Over the years, the park has considered many different ways to continue to provide an enjoyable visitor experience to motorists on the Sun Road while preserving its historic features. Some of the ideas that have been considered but rejected have included building another road in the park, making the Sun Road one way, providing a mandatory shuttle bus system during peak periods, widening the paved surface, and turning the Sun Road into a light rail or cog rail system.[92]

The park's 1977 Master Plan recommended providing a public transportation system along the Sun Road. The 1991 Vail Agenda, a series of recommendations for the NPS as a whole, suggested that the development of visitor facilities within park boundaries should be restricted to those that were absolutely necessary and encouraged well-planned gateway communities. The Vail Agenda also called on the parks to provide innovative alternatives to private vehicles in the parks, including the coordination of public transportation with nearby gateway communities. In 1992, a pay-per-ride voluntary shuttle system was established by a private concessionaire in Glacier to meet the needs of hikers. This service only runs a few buses a day, however, so it does not have much impact on the overall travel on the Road. The major concessionaire took over this limited shuttle service in 1997; it is not subsidized by the federal government.[93]

Interest in providing a system of bicycle trails in Glacier surfaced in the 1970s as the popularity of bicycling increased nationwide. Glacier's 1977 Master Plan recommended providing bicycle trails in the park, and in 1978 a study evaluated alternative bicycle routes along Lake McDonald. It considered two routes, one on the west shore and the other on the east shore along the telephone right-of-way. At that time, the only bicycle paths in the park were in the Apgar area. In 1978, some restrictions had already been imposed on bicyclists on the Sun Road. Currently, certain stretches of the Road are closed to bicyclists between 11 a.m. and 4 p.m. In recent years, organized tours of bicyclists have become more of a presence on the Road during the summer months.[94]

Glacier National Park
Annual Visitation Figures, 1911-2000

Year	Visitors	Year	Visitors	Year	Visitors	Year	Visitors
1911	4,000	1934	116,965	1957	759,161	1980	1,475,538
1912	6,527	1935	143,240	1958	706,841	1981	1,786,843
1913	12,138	1936	210,072	1959	722,338	1982	1,666,431
1914	12,168	1937	194,522	1960	724,538	1983	2,204,131
1915	13,465	1938	153,528	1961	739,982	1984	1,946,783
1916	12,839	1939	170,073	1962	966,100	1985	1,580,620
1917	15,050	1940	177,307	1963	811,214	1986	1,579,191
1918	9,086	1941	179,082	1964	642,100	1987	1,660,737
1919	18,956	1942	63,082	1965	847,104	1988	1,817,733
1920	22,449	1943	23,496	1966	907,839	1989	1,821,523
1921	19,736	1944	36,192	1967	884,049	1990	1,987,000
1922	23,935	1945	67,179	1968	964,493	1991	2,096,966
1923	33,988	1946	201,145	1969	1,051,165	1992	2,199,767
1924	33,972	1947	324,396	1970	1,241,603	1993	2,141,704
1925	40,062	1948	281,562	1971	1,303,073	1994	2,152,989
1926	36,901	1949	478,839	1972	1,392,145	1995	1,839,518
1927	41,745	1950	485,950	1973	1,398,958	1996	1,720,805
1928	53,454	1951	500,125	1974	1,406,643	1997	1,708,877
1929	70,742	1952	630,949	1975	1,571,393	1998	1,830,944
1930	73,783	1953	633,480	1976	1,662,678	1999	1,686,007
1931	59,846	1954	608,230	1977	1,656,212	2000	1,728,633
1932	53,202	1955	674,004	1978	1,601,131		
1933	76,615	1956	718,938	1979	1,446,236		

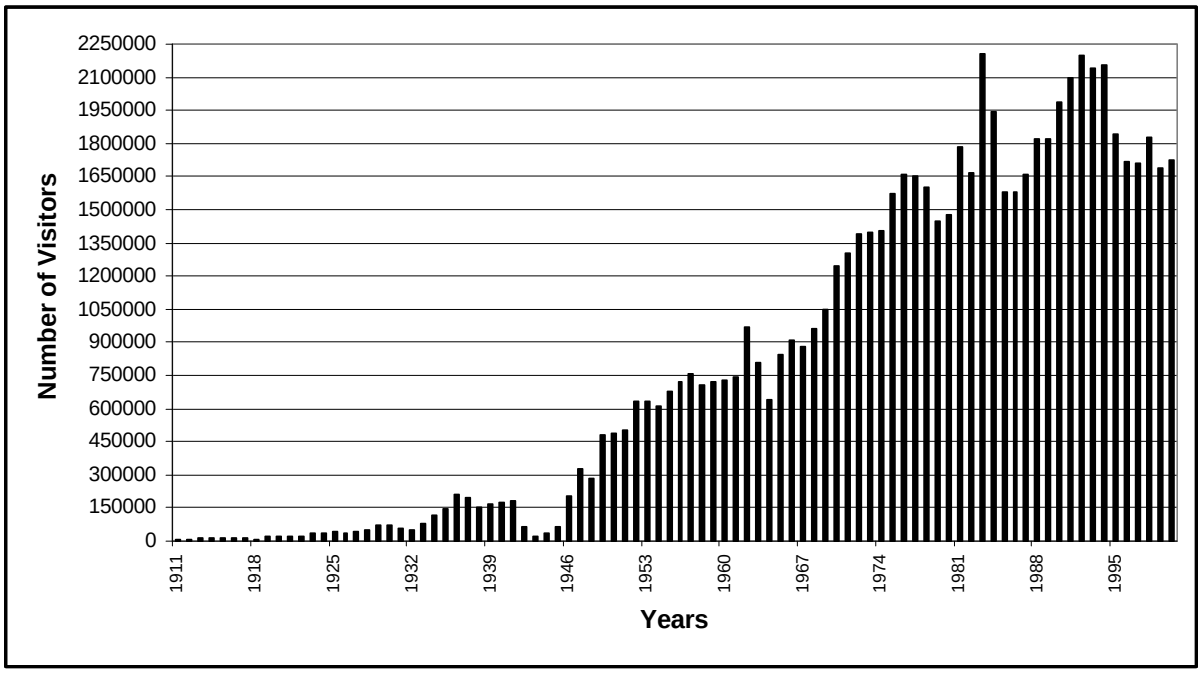


Figure 24. Annual Visitation Figures, Glacier National Park, 1911-2000.

Snowmobiling began in Glacier in the early 1960s, and the use of snowmobiles in the park peaked in 1971. In the mid-1960s, all unplowed roads were open to snowmobilers except for the Sun Road between the Packers Roost turnoff and Jackson Glacier overlook, which was off-limits because of avalanche danger. Later, some of the areas open to snowmobiling along the Road were closed because of wildlife considerations, drifting, and snow slides. All snowmobiling was prohibited in the park about 1975.[95]

In 1968, the Camas Road was opened to the public. This road, the first new road constructed in the park in several decades, connects the Going-to-the-Sun Road and Apgar with the main North Fork Road. When built, the Camas Road was seen as the initial leg of a new paved roadway that would extend up the North Fork into Canada and Waterton Lakes National Park. This plan, which was not pursued further, would have created a loop drive through the two parks, in conjunction with the existing Sun Road and Blackfeet Highway.[96]

2.3 History of the Going-to-the-Sun Road

2.3.1 Initial Planning for a Park Road Across the Continental Divide

During Glacier's earliest years as a national park, its inaccessibility and lack of a transportation infrastructure were seen as being among the park's most significant problems. Glacier's first superintendent, William Logan, wanted to make as much of the park accessible to the public as possible, whether by road or by trail. As part of this goal, Logan hoped to obtain funding for an east-west road across the mountains, although little was accomplished during his short tenure at the park. Logan's successors at Glacier continued to strongly endorsed the concept of such a road connecting the east and west sides of the park. Roadway planning continued during the 1910s, as several engineers and other specialists were called to Glacier to evaluate various proposed routes across the Continental Divide. These early proposals did not result in construction, however, because of the chronic shortage of funds. The proposed road became known as the Transmountain Highway.[97]

In 1910 the Chief Topographer of the U.S. Geographical Survey, Bob Marshall (in whose memory the Bob Marshall Wilderness south of Glacier is named), recommended a park road system totaling 213 miles to provide access to all the major scenic points in Glacier. He suggested that a transmountain route go from Belton along the west shore of Lake McDonald and follow McDonald Creek north to Waterton Lakes in Canada. In 1911, the Assistant Secretary of the Interior mentioned that a transmountain road in Glacier would be "advisable," but he felt it would be impossible to build. The following year, a Department of Interior investigator named Edward Keys proposed a 16-foot-wide road along the west shore of Lake McDonald that circled back to Lewis' hotel. Keys felt that the west shore route would be "much more scenic" than the east shore route, even though the east shore route would be cheaper to build because it was shorter and did not require a bridge over Upper McDonald Creek.[98]

A Great Northern Railway assistant engineer, M. A. Butler, entered the debate in 1912. Butler recommended that the existing rough wagon road that went from the foot of St. Mary Lake to Roes Creek be extended to Sun Point. He then suggested that this road should be continued as a trail but later improved to a wagon road up and over Logan Pass and down the side of Pollock Mountain to Upper McDonald Creek and along the east side of Lake McDonald. This route was ultimately chosen for the Transmountain Highway (the Sun Road), but not until 1924.[99]

R. H. Chapman, who served as Glacier's Acting Superintendent in 1912, had participated in U.S. Geological Survey work in the area before the park was created. He recommended a road from Lake McDonald to Waterton Lakes, and he also raised the possibility of a road from McDonald Creek to St. Mary.[100]

Glacier Superintendent S. F. Ralston supported a Lake McDonald-to-Waterton route in 1914. He felt the road could later be connected to the east side via Swiftcurrent Pass and to the North Fork Road via Browns Pass and either Kintla or Bowman lake. Trails from the road would make "practically every place worth seeing in the park" accessible by either wagon, automobile, or horse. In 1915 he recommended building a road to the head of Lake McDonald, arguing that whether the park's main road ended up going to Waterton or over Gunsight or Logan passes, the road would have to first follow Lake McDonald. He commented that a such a "Transcontinental Highway" would provide access to "hundreds of tourists" unwilling or unable to travel by horse, and that it would open up a scenic route for automobiles, "a constant procession of which would traverse this route during the summer months." Such a road, he believed, would open the park to many more people *and* would greatly increase park revenues.[101]

Lyman Sperry, the person responsible for the initial construction of the Gunsight Pass trail with support from the Great Northern Railway, put his weight and influence behind the selection of Gunsight Pass over Swiftcurrent Pass for an east-west highway in the park. In 1915 Sperry wrote a letter to the Kalispell Chamber of Commerce (later published in the *Kalispell Bee)* defending his preference for this route over the Swiftcurrent Pass route. Sperry argued, in part, that

> A National Park highway should have not only fine natural scenery, but exhibitions of ingenious engineering skill. It should have at least a few tunnels, galleries, terraces, bridges, "hairpin" turns, and all that sort of thing – to produce the surprises, thrills and joys that tourists seek. European tourists are accustomed to such things, and demand them.[102]

Sperry's proposal included blasting a tunnel through the mountain north of the Sperry Chalets that would exit high above the foot of Lake Ellen Wilson, with the road running along Gunsight Lake and Upper St. Mary Lake to reach the eastern boundary of the park. Sperry felt this route would be more scenic and less expensive to maintain than any other.

In response, Louis Hill of the Great Northern Railway stated his own preference for a road to Many Glacier, probably via Logan Pass and Piegan Pass.[103]

And, in another twist, in 1915 the Chief Superintendent of Dominion Parks, P. C. Barnard-Hervey, advocated a route connecting Glacier and Waterton parks via the North Fork of the Flathead and Akamina Pass. He also urged the Canadian government to support a road between Waterton and Many Glacier via Goathaunt (at the foot of Waterton Lake) and Swiftcurrent Pass.[104]

Many local organizations and individuals supported the concept of a "Transmountain Highway" through Glacier. The Montana State Highway Commission, the Kalispell Chamber of Commerce, the Columbia Falls Commercial Club, and the Interstate Wonderland Trail Association (a good roads group promoting a highway from Minnesota to Puget Sound) all memorialized Congress for construction of an east-west highway through Glacier. The latter group supported the route over Gunsight Pass.[105]

In 1914, the Department of the Interior and the Office of Public Roads (OPR) agreed to cooperate in constructing and maintaining national park roads. The OPR provided an engineer to the Department of the Interior as requested. As a result of this agreement, T. Warren Allen, Chief of the Division of Park and Forest Roads in the OPR, examined road possibilities in Glacier in the summers of 1914 and 1915. He evaluated several passes, including Ahern, Swiftcurrent, Logan, Kootenai, and Browns.[106]

In 1916, the NPS paid for Allen to conduct a reconnaissance survey of the various routes being considered for Glacier's primary roads. Allen felt that a road across Flattop Mountain to Waterton Lakes (similar to the one proposed by Bob Marshall in 1910) should be the primary park road, despite the desires of civic boosters and automobile travelers for an east-west route. (His second priority was improving the North Fork Road.) For the transmountain route, Allen concluded that Gunsight, Swiftcurrent, and Ahern passes would be too difficult and costly to construct, noting that Gunsight Pass would be difficult to maintain east of the divide because the snow would be slow to thaw. He became "firmly convinced" that the route over Logan Pass was the best choice for an east-west route because of gradient, snow, and cost considerations. Glacier's superintendent James Galen, however, favored the route over Swiftcurrent Pass to Many Glacier. And for the east side of the Logan Pass route, he preferred a road that would go over Piegan Pass to Many Glacier rather than one along St. Mary Lake to the foot of the lake.[107]

Allen was the first professional engineer to recommend a route over Logan Pass. In the end, all subsequent planning and surveys followed his recommendation.

2.3.2 George Goodwin's 1918 Survey

George Goodwin was a civil engineer who worked on railroad and government reclamation projects before joining the Corps of Engineers in 1913. The NPS hired Goodwin as Chief Engineer in 1917, and from then until 1925 all planning for national park roads went through his office. Within a few months of being hired, Goodwin was sent to Glacier to serve as Acting Superintendent. NPS Director Stephen Mather had decided by this time that a Transmountain Highway should be the priority for Glacier rather than a north-south route to Waterton Lakes. Accordingly, in 1917 Goodwin conducted a reconnaissance survey of the several routes being considered for an east-west road in the park. He concluded that the route over Logan Pass was the most practical way to connect the short roads already developed to the foot of Lake McDonald and partway up the north shore of St. Mary Lake. A trail over the pass was completed in 1918 from St. Mary Lake to Granite Park, following the west side of the Garden Wall.[108]

Goodwin returned to Glacier in 1918 and completed a location survey for a road over Logan Pass. He aimed for a road that would be safe and easy to travel, economical to construct and maintain, as free from snow as possible, and scenic. The route he selected avoided the cliffs along the Garden Wall by following Upper McDonald Creek to Logan Creek and then climbing the toe of Mount Cannon, up the valley of Logan Creek (crossing that stream seven times), up the side of Haystack Butte and Pollack Mountain, and then on to Logan Pass. The route included fifteen switchbacks on the west side. On the east side, the road switchbacked three times and then ran along the West Fork of Reynolds Creek, down along the slopes of Piegan and Going-to-the-Sun mountains, and then along the north shore of St. Mary Lake. The specifications developed by Goodwin included a 17-foot road surface, with an extra 3 feet for drainage; earth side slopes with a 1:1 ratio and rock slopes at ¼:1; a maximum grade of 8 percent; a minimum radius on curves of 50 feet; right-of-ways cleared up to 50 feet; "rustic" log bridges and culverts; and corrugated iron culverts for small drainage requirements. Goodwin felt that "spectacular" engineering could be an attraction in itself; visitors could look down from upper stretches of the road and see several sections of the road below.[109]

In a telling comment, Goodwin noted that he envisioned a road that would be a first-class highway able to "meet every requirement for park travel or commercial hauling." He did not distinguish the design of national park roads from that of any other mountain roads in scenic areas. Goodwin's main criteria in his 1918 survey were cost-efficiency and practicality. At the time, NPS leadership was also committed to maximum roadway mileage per dollar. Funding was limited, and park administrators felt that opening up the national parks to more people would create a constituency that would pressure Congress for funding to improve the roads. In 1919, Glacier still had relatively few visitors (fewer than 19,000 entered the park that year). From 1919 until 1933, every Glacier Superintendent pinpointed park road construction as the key to higher visitation.[110]

Critiques of Goodwin's route came in almost immediately. In November 1918, Kalispell's *Daily Inter Lake* published a generally positive editorial about the proposed road. The author commented on the beautiful views from the route, based on a description by G. A. Fessenden, who had worked on the 1918 survey. Fessenden told the reporter that it would be "a very easy thing" to run a spectacularly scenic spur road along the top of the Garden Wall for ten or twelve miles. The following year, Civil Engineer J. H. Zahner, who had also worked on the survey, wrote to Horace Albright (Field Assistant to the NPS Director) suggesting that a more scenic road would go from Logan Pass high along the Garden Wall behind Haystack Butte to Granite Park (similar to the Highline Trail) and then down the hill to Upper McDonald Creek. He also recommended a spur road from Granite Park over Swiftcurrent Pass to Many Glacier. Zahner commented, "I call it a rotten job to build a road right down through the brush where a person can not see what they go to the Park to see, That looks like catering to the hotel keepers."[111]

In approximately 1919, some members of the public, including the Flathead and Glacier county commissioners, began to object to the idea of building an east-west road in the park. This concern was related to the State of Montana's plans to build a less expensive and longer-season highway over Marias Pass along the southern boundary of the park and to the fear that such a road through the park would "desecrate the natural splendor."[112] Goodwin argued that both roads would be about the same length, that the Logan Pass route would be open five months each year (and Marias Pass only six or seven months without snow removal), and that a mountain highway was not needed for commercial hauling because the railroad met that need. He could not deny, however, that the Marias Pass route was more practical. Glacier Superintendent J. Ross Eakin argued that the Transmountain Highway and the highway over Marias Pass would serve two distinct purposes; they were not competing. The road within the park would complete the Park-to-Park Highway and attract tourists from all over the country. The NPS supported the construction of the Marias Pass route. Various organizations supported the construction of a scenic east-west road through Glacier, however, including local chambers of commerce, the Kiwanis, the Interstate Wonderland Trail Association, the Flathead Motor Club Association, and the Montana State Highway Commission. By 1923, local opposition to the road was no longer evident. Meanwhile, the Roosevelt Highway (today's Highway 2) was built across Marias Pass between 1921 and 1930.[113]

Until the state completed the highway over Marias Pass in 1930, the west side and east sides of the park had been essentially cut off from each other. Motorists could ship their vehicles across the Continental Divide on a Great Northern Railway flatbed car, but this was an expensive and not very popular option. The only other alternative was to drive far to the north or south to a highway crossing.[114]

2.3.3 Early Work on the Transmountain Road, 1919-25

T. Warren Allen of the OPR surveyed both shores of Lake McDonald in 1914 and 1915 to determine which would be the better route for a road to Lewis' Hotel. He recommended that the road be built along the west shore of the lake because it would be cheaper. A lack of funding prevented the letting of any contracts for construction of a road along Lake McDonald, however, until the early 1920s.[115]

Although a trail had been built along the east shore of Lake McDonald to John Lewis' hotel in 1917, Lewis was frustrated with the lack of progress on a road to his business. In 1919, he spent $3,200 to cut 3.5 miles of right-of-way, grade 2 miles of roadway, and build 3 bridges along the east shore, starting in Apgar.[116]

After World War I, NPS Director Mather aggressively pursued funding for the Transmountain Highway in Glacier, but Congress did not fund any road construction in the nation's parks in 1919 or 1920. The funding situation improved dramatically the following year. Congressional appropriations to the NPS allowed for the start of construction on three major national park road projects: the Carbon River Road at Mount Rainier, the Middle Fork Road at Sequoia, and the Transmountain Highway at Glacier. The sum of one hundred thousand dollars was earmarked for the Glacier project.[117]

Going-to-the-Sun Road Contractors

Construction

Carlson-Norman Co., 1922
Laux & Gardner, 1922-23
Stevens Brothers, 1924-25
Stevens Brothers/Thomas McGovern, 1924-25
Williams & Douglas, 1925-28
A. R. Guthrie & Co., 1931-32
Colonial Building Co./A. R. Douglas, 1931-32

Reconstruction

A. R. Douglas, 1933
Chris Yonlick, 1933-36
Lawler Corp., 1934-35
Tomlinson-Arkwright Co./J. L. McLaughlin, 1934-36
W. K. Trippet, 1936-37
Williams & Douglas, 1936-37
Martin Wunderlich, 1936-37
Carl Nyberg, 1938-39
S. Birch & Sons, 1939-40
Morrison-Knudsen, 1950-52
McLaughlin, Inc., 1955

The NPS decided that the east shore route along Lake McDonald was more cost-effective because it was shorter and required removing less rock than the west side, even though Goodwin emphasized that the west shore was more scenic and Allen had felt it would be less costly to build. The NPS decided to follow the route laid out by Lewis as much as possible. Goodwin wanted the road to start at the foot of the lake so that the view up the lake would be part of the visitor experience. Lewis' road had taken a different route to avoid the property of two resort cabin owners who refused to grant a right-of-way. When funding came through for the 1921 season, four private landowners

along the route, including the two who had been resistant earlier, gave easements for the new road, allowing it to take off from the foot of the lake. In 1921, force account labor (temporary laborers hired directly by the park) cleared the right-of-way some 11 miles to the crossing of Upper McDonald Creek. All subsequent original construction on the Sun Road was done under contract with private construction firms. The grading contract for this segment was awarded to the Carlson-Norman Company of Spokane.[118]

By late summer 1921, motorists could drive to Lake McDonald Lodge for the first time. The park opened the Road to the public on August 20, 1922, and on that day over 200 automobiles drove to the hotel from the Flathead Valley. The road, including the spur road to the ranger station at the head of the lake, was graveled and graded. Soon the rear doors to the building were serving as the front entrance as increasing numbers of tourists arrived by automobile rather than by boat. Although most people were pleased to see the improved access, some were dismayed by the new road. R. E. McDonnell, for example, who had a cabin near the Lewis Hotel, commented that, "The building of the highway and circling of the first automobile around the hotel wiped out the primitive beauty of the spot in the minds of many."[119]

Congress appropriated $65,000 to Glacier for the 1922 construction season and $100,000 for both 1923 and 1924. These figures for 1923 and 1924 were over half the total appropriation for all national park roads, reflecting the importance of the project to NPS management. Goodwin pushed the work along the west side in order to make significant progress towards the Continental Divide so Congress would not lose interest. The contract awarded in 1922 began at the head of Lake McDonald and continued along Upper McDonald Creek, apparently ending in the vicinity of Avalanche Creek. The specifications called for 16- to 20-foot widths. Goodwin's 1918 preliminary survey was probably revised some to reduce curvature and perhaps grade. The contractor, Laux & Gardner of Kalispell, was delayed by labor shortages and by the requisitioning of all laborers except a blacksmith as firefighters (this was the first of many times that these types of labor problems hindered the building of the Sun Road). For a number of years after these contracts were completed, park visitors were able to drive only as far as Avalanche Creek, and the NPS developed a campground there.[120]

On the east side, until the early 1920s the rough wagon road to Roes Creek, built by the Great Northern Railway in 1912, was the only road along St. Mary Lake. The grading of the first segment along the lake, almost to Sun Point, began in 1923, after NPS Director Mather urged that Glacier initiate work on the east side of the Road so that visitors could see the beauty of the lake. He was concerned about rumors of plans to use the lake as a reservoir for power and irrigation storage. Stevens Brothers Construction of St. Paul was the low bidder for the first section work on the east side (and also for the section from near Avalanche Creek to Logan Creek). In 1924, Thomas McGovern of Browning took over the Stevens contract on the east side and constructed an eight-mile segment to a point about two miles east of Sun Point.[121]

The work done on the Sun Road between 1921 and 1925 was accomplished with horse-drawn equipment such as fresnos, slips, plows, graders, drags, wheeler wagons, dump wagons, and stone boats. Contractors used explosives to blast out stumps and to do heavy excavation. Laborers and materials were hauled by trucks. Compressors may or may not have been used for drilling blastholes on these early contracts.[122]

Some landscape concerns were raised by NPS staff during this early phase of construction. Daniel Hull, NPS Chief of Landscape Engineering, was concerned that park road projects should not damage the landscape. His suggestions during this period mostly concerned the removal of dead trees near the roadway and the protection of trees with trunk guards or retaining walls during blasting and grading operations. He apparently left matters of route location, roadway geometry, and construction standards to Goodwin.[123]

In the fall of 1923, Senator Thomas Walsh, the influential owner of a summer home at the head of Lake McDonald, claimed that blasting associated with road construction in the McDonald Falls area had damaged trees. Daniel Hull, Horace Albright, and George Goodwin of the NPS inspected the damage. This is the first known occasion that the NPS Landscape Engineering division participated in a matter related to road construction in Glacier.[124]

Figure 25. Concessionaire buses at Dead Horse Point. Photo by T. J. Hileman, GNPA #3082.

Two unusual features were designed for the road during this period. One was approximately 1,000 feet of log cribbing, some of it 20 feet high, that supported the road as it traversed a cutbank adjacent to McDonald Creek about one mile north of Avalanche Creek (the avalanche slide area near Red Rock Point). The other was a rustic overpass bridge constructed of massive logs and designed by NPS Assistant Landscape Engineer Thomas Vint. This bridge carried a trail over the Sun Road about one mile beyond the head of Lake McDonald. (The road construction work along Upper McDonald Creek destroyed segments of two trails.) Neither of these features survives today.[125]

By 1925, when this second round of work on the Sun Road had been completed, the Road extended 18.5 miles towards Logan Creek on the west and 8 or 9 miles towards Sun Point on the east. With the possible exception of a dry rubble retaining wall on the east side (perhaps at the Golden Stairs or Dead Horse Point), no masonry work was done in

any of these contracts. Some segments were so narrow that they were classified as one-way roadway. All bridges were of timber construction. Curves were sharp, grades were up to 8 percent, the road width varied from 12 to 20 feet, and the surfacing was poor to nonexistent (in some places, in fact, the road was corduroy). Surfacing work was often exchanged for more clearing and grading mileage. The alignment avoided areas that required much excavation or fill. The road was probably designed so that it could be upgraded economically if needed in the future (this was standard OPR practice at the time). The sections of the road built during the early 1920s were not built to a high standard due to fiscal constraints, but the finished product did improve with each contract. Even so, the Road compared poorly with the approach roads outside the park, which were 22 or 24 feet wide, with 5 percent maximum grades and curves with wide radii.[126]

2.3.4 1924 Survey by Frank Kittredge

The turning point for national park roads came in April 1924, when the U.S. Congress passed a bill authorizing $7.5 million for construction, reconstruction, and improvement of roads, trails, and bridges in national parks over the following three years. As a result, economy of construction as the driving force behind park road design fell to the wayside. NPS Director Stephen Mather now supported the construction of scenic roads built to a higher standard than had previously been considered possible. About $410,000 was earmarked for the Sun Road, and the project was put on an accelerated schedule.[127]

Just a few months after the new appropriation for park road construction was passed, NPS civil engineers, landscape architects, and administrators began to re-examine the proposed route over Logan Pass that had been surveyed by George Goodwin in 1918. Mather and other high officials in the NPS recognized the importance of selecting the very best route over Logan Pass. In many ways, the Sun Road was a model for future road projects in other parks; the image and reputation of the NPS was at stake.[128]

Superintendents of Glacier National Park

William R. Logan	*1910-12*
Henry W. Hutchings (Acting)	*1912*
Robert W. Chapman (Acting)	*1912*
James L. Galen	*1912-14*
Samuel F. Ralston	*1914-17*
George E. Goodwin (Acting)	*1917*
Walter W. Payne	*1917-20*
George E. Goodwin (Acting)	*1920*
Henry W. Hutchings (Acting)	*1920-21*
J. Ross Eakin	*1921-24*
Henry W. Hutchings (Acting)	*1924*
Charles J. Kraebel	*1924-27*
Raymond R. Vincent (Acting)	*1927*
J. Ross Eakin	*1927-31*
Eivind T. Scoyen	*1931-38*
Donald S. Libby	*1939-44*
John W. Emmert	*1944-58*
Stanley C. Joseph (Acting)	*1958*
Edward A. Hummel	*1958-62*
Harthon L. Bill	*1962-64*
Keith P. Neilson	*1964-69*
William J. Briggle	*1969-74*
Phillip R. Iversen	*1974-80*
Robert C. Haraden	*1980-86*
H. Gilbert Lusk	*1986-94*
David A. Mihalic	*1994-99*
Suzanne Lewis	*2000-02*

One of the key players in determining the route over Logan Pass was Charles Kraebel, who became Superintendent of Glacier in February 1924. While traveling to his new job in Glacier, Kraebel stopped in Portland to meet with George Goodwin. He examined plats for the proposed highway, based on Goodwin's 1918 survey, and was unhappy with the multiple proposed switchbacks and the 8 percent grade. He was also concerned that snow in the "north gulch" would delay opening the road each spring. Kraebel discussed his objections with Stephen Mather and with assistant landscape architect Thomas Vint.[129]

Vint was also disturbed by the planned series of switchbacks up the Logan Creek valley, noting that the road would tear up the ground as if miners had been there (far from the park road ideal of understated construction that harmonized with the scenery). He urged Mather to come look at the proposed route in person. In early August 1924, Kraebel, Mather, Vint, and Goodwin met on-site to discuss the proposed route over Logan Pass. Standing near Logan Pass after riding on horses up the west-side trail, Vint recommended an alternate route that would be longer and more expensive, carved directly into the steep cliffs of the Garden Wall with one switchback to bring the road back down along Upper McDonald Creek. Vint favored this route because it would preserve the scenery, and it would be located in spring sunshine to hasten opening of the road in the spring.[130]

Figure 26. Chainman scaling cliff to take sections and run alignments for Williams & Douglas contract, August 1927. GNPA photo #9527.

As a result of this fateful meeting at Logan Pass, Mather brought in BPR engineer Bill Austin a few days later to go over the new proposed route on-site with Vint. Austin agreed with Vint's recommendation of a road sweeping along the Garden Wall rather than switchbacks up Logan Creek, and he recommended that the BPR perform a new survey. Austin and Vint's collaboration on this stage of the designing of the Sun Road helped pave the way for an interbureau agreement between their two agencies that was formalized in 1926.[131]

Next, Austin and Kraebel drove to Yellowstone to consult in person with Horace Albright, who was the Yellowstone Superintendent and also Mather's Field Assistant. Soon afterwards, Albright and Mather officially requested that the BPR provide a locating engineer to oversee a survey of the new route over Logan Pass, covering about 12.5 miles on the west side and 8.5 miles on the east side. Civil engineer Frank Kittredge arrived in Glacier in early September to do the work. His task was made more challenging by the deadline imposed by the NPS; Mather wanted the work to be completed that season so the agency could prepare construction

contracts over the winter and award them in the spring of 1925. According to Kraebel, Mather and Albright also decided that there should be a complete revision of the specifications (they recommended following those of the BPR). Kittredge completed the survey November 10, 1924, in snow up to 3 feet deep.[132]

Kittredge established two base camps for the preliminary and location surveys. On the east side, the camp was at Baring Falls (0.5 mile west of the Going-to-the-Sun Chalets), and on the west side it was at a cabin near the confluence of Logan and Upper McDonald creeks. But the men generally stayed in temporary camps closer to the work. Many of the men who worked on the survey were World War I veterans. In the fifty-four days of the survey, a total of 105 men were employed, and because of very high turnover, at the end only 8 out of the first 30 who were hired remained on the job. As Kittredge later remarked, there were always three crews on the survey: one coming, one working, and one going. The daily climb of 1,200-1,300 feet over cliffs and through brush, often in very poor weather, took its toll.[133]

By winter, the crew had finished the preliminary survey for all 21 miles of the new route. The more detailed location survey was completed from Logan Pass down for 7 out of 8.5 miles on the east side and for 3 of 12.5 miles on the west side. Over the winter, Kittredge prepared a survey map, marking the distances by the 100-foot intervals known to surveyors as stations. These stations served as reference points for later construction.[134]

The route that Kittredge surveyed in 1924 followed Upper McDonald Creek past the junction with Logan Creek. From there, the proposed road began to climb towards the west, up to 4,300 feet. There, he planned the only switchback on the west side (today's Loop). Then the road took off on its steady 6 percent climb to the pass. The road curved along the contours of Haystack Butte and Pollock Mountain. On the east side, it descended on a higher line than the 1918 survey. The recommended route was nearly 3 miles longer than the 1918 route Goodwin had surveyed, even though it was about 1.25 miles shorter on the east side.[135]

Kittredge's 1925 report on his survey discussed three possible routes on the west side and two on the east side. He did not favor the 1918 route up the west side for several reasons, similar to the ones already stated by NPS personnel. It had many dangerous sharp curves and switchbacks; snow would remain late in the season in some areas; the grade and alignment could not be easily improved in the future without relocation; the view from the lower levels was "repetitious"; it had heavy cuts and high fills; and it was a "second-gear road," meaning that drivers would have to switch into second gear to climb grades higher than 6 percent (this was less efficient and more hazardous). He criticized the east side route as well because it had heavy grades, sharp curves, and switchbacks to avoid a cliff.[136]

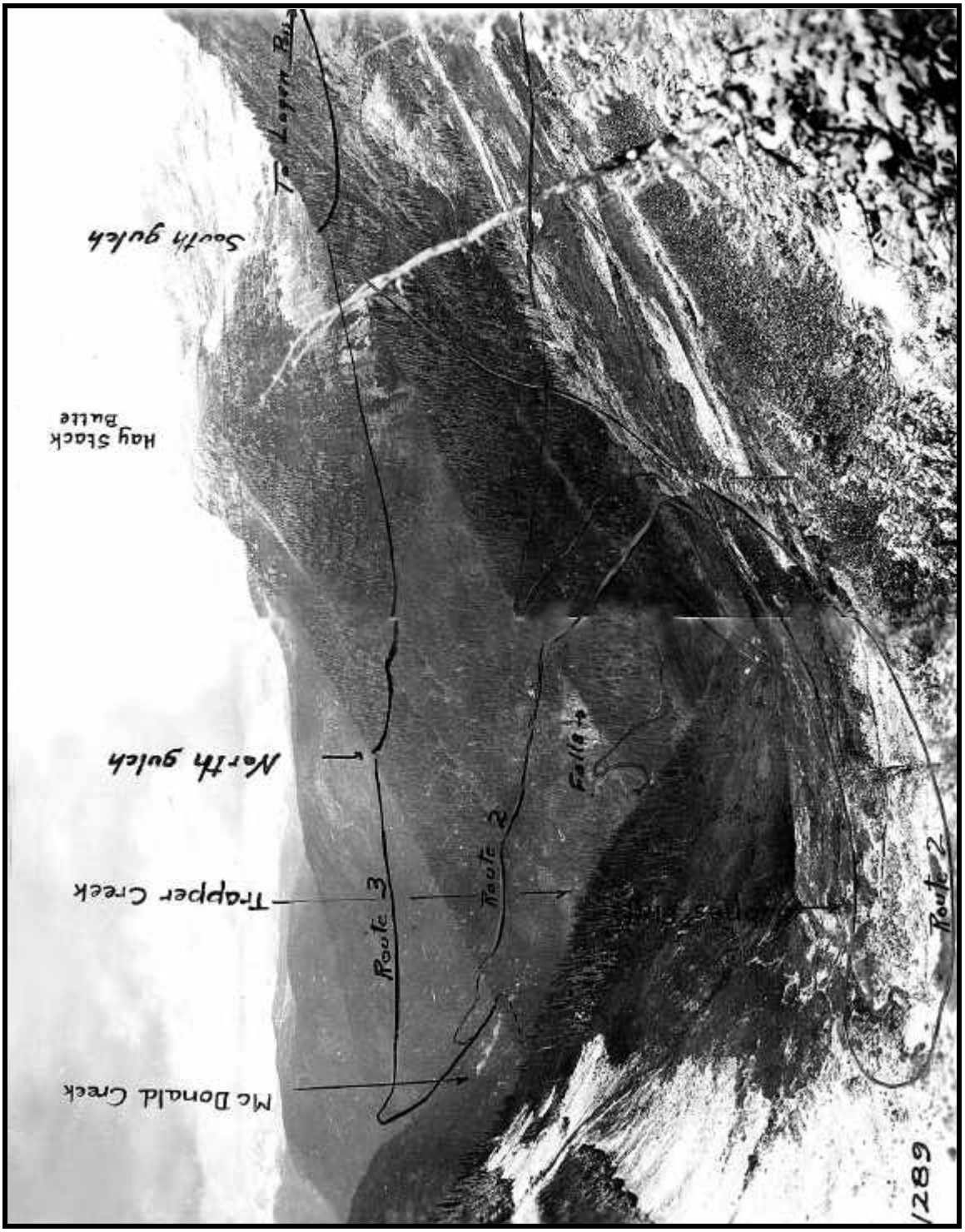


Figure 27. Photographs with the three routes considered by Frank Kittredge in 1924, looking northwest from Jones Flat. (From Kittredge, "Report to National Park Service," GNPA)

Kittredge's report mentioned the desirability of leaving several "half tunnels" (dramatic overhanging rocks) along the steep sides of the road. He felt that engineering features along the road above the Loop such as a series of short tunnels, half tunnels and perhaps window sections with intervening walls and parapets would be "a great scenic feature in itself" and would "harmonize" with the natural environment. He also suggested a possible short loop road to a promontory to view the scenery some five miles from Logan Pass, along with road and trail access to the glacier on Clements Mountain. He noted that the view from Logan Pass would show much of the road on the west side. Kittredge also proposed a 500-foot walk (or stairway down the cliff) from a certain place on the road on the east side of Logan Pass to access a snow and ice bank at the base of some cliffs.[137]

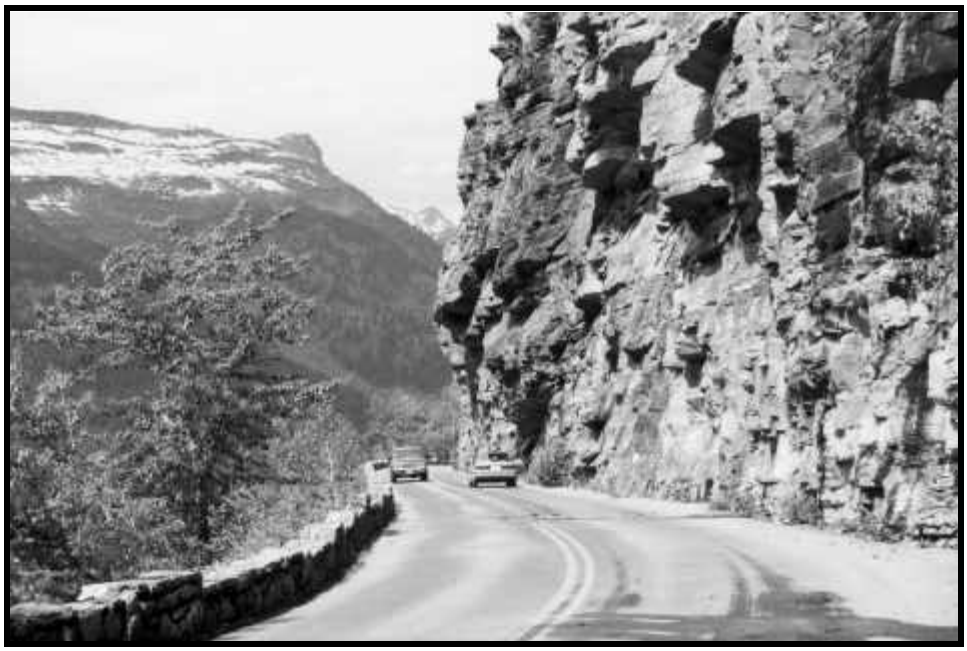


Figure 28. Half-tunnel roadway construction near Crystal Point. 2001 photo.

Kittredge recommended that the proposed road have a driving surface 16 feet wide, with 3 feet of shoulder and ditch on each side (a total of 22 feet). He included estimates for 22-, 24-, and 28-foot-wide roads. He felt the minimum curve radius should be 100 feet (200 feet on blind curves). He noted that a 28-foot roadway seemed unjustified because truck traffic would be very light on the road, but he commented that if three lanes of traffic were ever needed, the proposed road be could be widened to make it 33 feet overall. Kittredge stated that if the cost of the proposed route was too high, the NPS should save money by reducing its width, not by changing its location, alignment, or grade. He mentioned that it could even be possible to have a one-way road between "sight-to-sight" turnouts, rather than building a road with steeper grades and sharper curves or destroying points of interest in order to save money.[138]

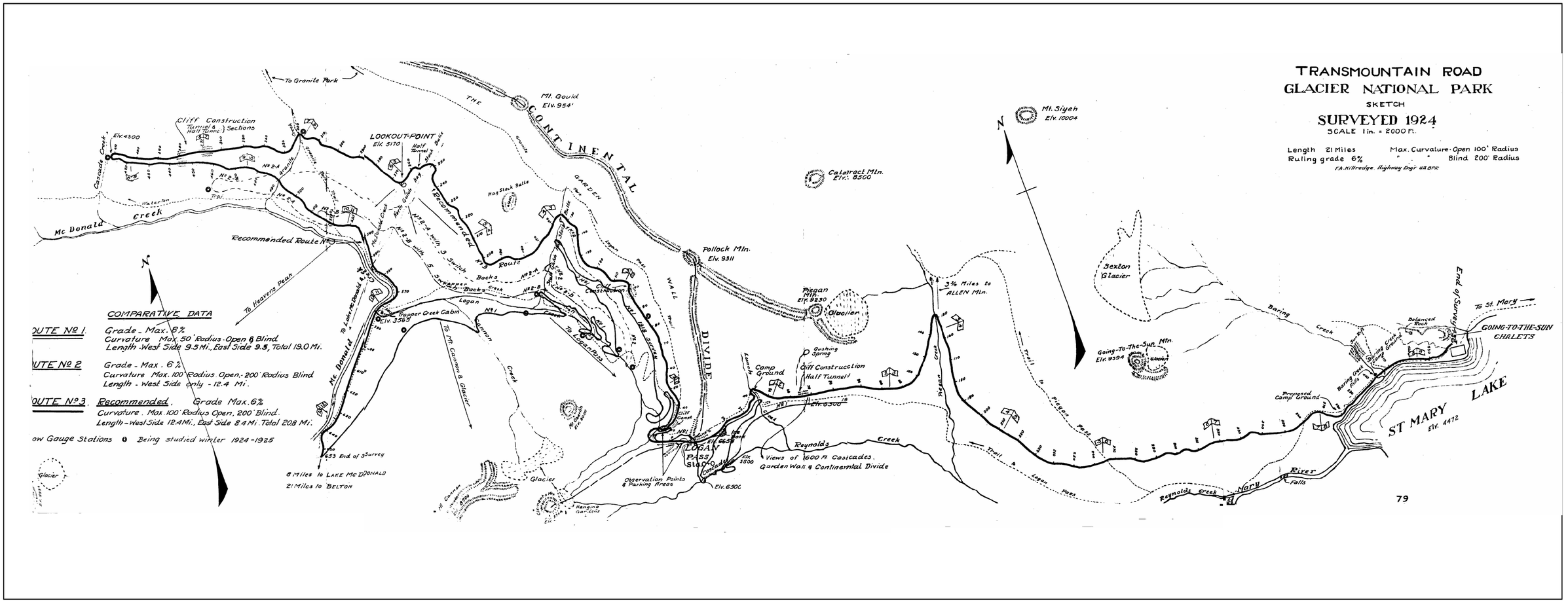
Overall, Kittredge felt that the route that was eventually selected was best because it permitted safe grades and curvature, was capable of future improvement, could be kept snow-free and open the longest, and would "exhibit the grandeur of the Park to the maximum."[139] The other new route he surveyed on the west side, at Goodwin's request, would have had the same 6 percent grade and 100-foot radius curves as the selected route, but because it went up the Logan Creek drainage and had some switchbacks, Kittredge felt that it would have a short season, restricted views, and high maintenance costs, similar to the 1918 route. Kittredge ended up not surveying that route because of a snowstorm.[140]

The NPS response to the Kittredge survey was highly positive. Superintendent Kraebel commented on the survey in October 1924, "I find it difficult to speak in anything but terms of superlative praise." He felt the new route was well worth the increased cost. In November, he wrote to Mather that it would be more easily maintained than the 1918 route, would have a longer season, and would have stupendous scenic values.[141]

Thomas Vint wrote a detailed memo to Daniel Hull endorsing the route that Kittredge had surveyed, with special emphasis on how it met NPS landscape requirements. Vint quoted Superintendent Thomson of Crater Lake, who had said, "Let the finished [park] road appear that you were able to buy it as you would a strip of carpet and unroll it through the forest." He noted that the route provided views of Glacier's scenic features such as lakes, streams, forests, and high mountain scenery "in their proper proportions." He approved of the way the road gave less views of the road itself, commenting, "One might say it performs its work more silently." He did note that the road would destroy some cliffs, particularly on the west side, but commented that the route would not interfere significantly with any well-established trails. The only change Vint recommended was to move the road back from the shoreline of St. Mary Lake in the Sun Point area in order to preserve the shoreline, to provide panoramic views of the lake, and to protect the feeling of seclusion at Going-to-the-Sun Chalets. A spur road could (and later did) access the chalet complex, he noted. The BPR agreed to this realignment.[142]

Even George Goodwin approved of the new route that displaced his 1918 survey. He did, however, write Mather stating that the 22-foot roadway recommended by Kittredge was below ordinary road standards and should be changed to 24-foot. He felt such a reduction in standards was false economy.[143]

As for Stephen Mather, he was so pleased with Kittredge's work in Glacier that he asked Kittredge to prepare an overall program for main road construction in the national parks. Kittredge fully agreed with the NPS policy of constructing one well-built scenic road per park, and he thought roads should not detract from the scenery of the park. The NPS established an Engineering Division in 1927, and Kittredge was appointed the first chief engineer. He served in that position from 1927 until 1937 and again from 1947 until his retirement in 1952, with time in between as Regional Director and Superintendent in various units of the National Park System.[144]


TRANSMOUNTAIN ROAD
GLACIER NATIONAL PARK
SKETCH
SURVEYED 1924
SCALE 1 in. = 2000 Ft.
Length 21 Miles
Ruling grade 6%
Max. Curvature - Open 100° Radius
" " Blind 200° Radius
F.A. Kittredge, Highway Engr. U.S.B.P.R.
COMPARATIVE DATA
ROUTE No 1. Grade - Max. 8%
Curvature Max. 50° Radius - Open & Blind.
Length - West Side 9.5 Mi., East Side 9.5, Total 19.0 Mi.
ROUTE No 2 Grade - Max. 6%
Curvature Max. 100° Radius Open. - 200° Radius Blind.
Length - West Side only - 12.4 Mi.
ROUTE No 3. Recommended. Grade Max. 6%
Curvature - Max. 100° Radius Open, 200° Blind.
Length - West Side 12.4 Mi., East Side 8.4 Mi. Total 20.8 Mi.
Snow Gauge Stations ● Being studied winter 1924-1925
To Granite Park
Cliff Construction
Tunnel & Half Tunnel Sections
Elv. 4300
Cascade Creek
LOOKOUT-POINT
Elv. 5170
Half Tunnel
Mt. Gould
Elv. 9541
THE CONTINENTAL DIVIDE
GARDEN WALL
Mt. Siyeh
Elv. 10004
Calcareol Mtn.
Elv. 8500
Mc Donald Creek
Recommended Route No 3
No 2-A
No 2-B
No 2-C
No 2-D
No 2-E
No 2-F
No 2-G
No 2-H
No 2-I
No 2-J
No 2-K
No 2-L
No 2-M
No 2-N
No 2-O
No 2-P
No 2-Q
No 2-R
No 2-S
No 2-T
No 2-U
No 2-V
No 2-W
No 2-X
No 2-Y
No 2-Z
No 2-A with 3 Switch Backs
No 2-B with 5 Switch Backs
No 2-C with 4 Switch Backs
No 2-D with 3 Switch Backs
No 2-E with 3 Switch Backs
No 2-F with 3 Switch Backs
No 2-G with 3 Switch Backs
No 2-H with 3 Switch Backs
No 2-I with 3 Switch Backs
No 2-J with 3 Switch Backs
No 2-K with 3 Switch Backs
No 2-L with 3 Switch Backs
No 2-M with 3 Switch Backs
No 2-N with 3 Switch Backs
No 2-O with 3 Switch Backs
No 2-P with 3 Switch Backs
No 2-Q with 3 Switch Backs
No 2-R with 3 Switch Backs
No 2-S with 3 Switch Backs
No 2-T with 3 Switch Backs
No 2-U with 3 Switch Backs
No 2-V with 3 Switch Backs
No 2-W with 3 Switch Backs
No 2-X with 3 Switch Backs
No 2-Y with 3 Switch Backs
No 2-Z with 3 Switch Backs
Recommended Route No 3
Back-1
Back-2
Back-3
Back-4
Back-5
Back-6
Back-7
Back-8
Back-9
Back-10
Back-11
Back-12
Back-13
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2.3.5 NPS/BPR Agreement Concerning Park Roads, 1925

By the mid-1920s, BPR engineers were quite experienced in mountain road design because they had worked with the Forest Service on forest road design and construction since 1916. By 1924, after Bill Austin came to Glacier Park and recommended that the NPS work with the BPR on the Transmountain Highway project, Stephen Mather had begun considering the possibility of having the BPR administer all road projects within national parks. He felt that the BPR could provide the engineering expertise that the NPS lacked. Horace Albright disapproved unless the NPS could set the standards, specifications, budgets, and priorities for each road project, with continuous input from the Landscape Engineering division. He was concerned that the BPR had higher standards for roads than were absolutely necessary for park roads; meeting these standards would limit the mileage of roads that could be built with the funding available to the NPS. Albright also knew of road construction projects that had resulted in the destruction of trees and permanently scarred roadsides.[145]

NPS policy regarding road planning and construction responded to the growing budgets and maturing park policy of the mid-1920s in several ways. Administrators had to define the desired limits of development. The policy of each park having one major scenic road was affirmed. Higher standards for the main, expensive road siphoned funds and other resources away from other road projects in the parks. The Landscape Engineering division pursued a larger role in planning and in monitoring construction.[146]

In April 1925, representatives of the NPS (landscape architect Thomas Vint and Glacier superintendent Charles Kraebel) and of the BPR (Frank Kittredge and two other BPR engineers) met in Spokane to outline how the Sun Road contracts would be prepared and supervised. This meeting, although focused on the Glacier project, established the basic procedures for how the two agencies would cooperate on park road projects for decades to come. During the conference, Vint was able to keep the policies and concerns of the NPS Landscape Engineering division in the forefront. The BPR engineers brought tentative plans and specifications for the road with them. The review process showed the willingness of all parties to cooperate. For example, drawings showing four types of masonry parapet and one of log construction were completely revised to include only one type of masonry parapet, and even its design was changed to fit NPS landscape principles.[147]

As a result of the meeting, the BPR in 1925 took over responsibility for the reconstruction or location surveys for several park roads, including the Sun Road. The agreement prepared in 1925 was formalized through an interbureau agreement signed by the Department of the Interior and the Department of Agriculture on January 18, 1926. By 1927, the BPR was involved in all of Glacier's major road projects such as the Sun Road, the North Fork Road, Babb-Many Glacier, and Lower Two Medicine, but the NPS continued to build minor and service roads within the park.[148]

Under the terms of the 1925 agreement, the NPS Director could initiate a park road project by requesting the Chief of the BPR to send an engineer to investigate. This engineer, the park superintendent, and the NPS landscape architect then submitted independent reports to the NPS Director concerning landscape features, cost estimates, and preliminary construction data. If the project was approved, the location survey was done. Then, the road engineer and the landscape architect prepared contract plans and specifications, which were signed by them, the park superintendent, and the NPS Director. The NPS supervised the bidding and letting of contracts. During the course of construction, NPS landscape architects and the superintendent could inspect the work at any time, particularly the construction of bridges and guardwalls and the preservation of the landscape. Thus, the NPS was able to benefit from the roadbuilding expertise of the BPR while retaining ultimate control of design, location, and important aspects such as landscape preservation.[149]

At the spring 1925 meeting in Spokane, the participants realized that existing funding would not allow completion of the Road. They therefore decided to concentrate available funds on finishing the west side of the road to Logan Pass and the east side to Sun Point to the highest standards possible. The participants agreed to a minimum 16-foot two-way surfaced road with permanent retaining walls and other features. The NPS commitment to preserve landscape and the higher construction standards of the BPR led to much higher costs for the Sun Road than had originally been anticipated. This project tested the interbureau agreement and forced the NPS Landscape Engineering division to assert its authority in various aspects of park road construction.[150]

The 1925 agreement benefited both agencies. The BPR increased its budget by taking over the management of park road construction. The NPS was able to ask Congress to put park roads on an equal basis with federal-aid highways by funding them through the same general roads legislation that authorized BPR expenditures. The BPR and NPS estimated in 1926 that building and modernizing park roads around the nation would require about $51 million. Congress approved this budget the following year, funding $5 million for 1928 (thus doubling the annual rate of park road appropriations).[151]

Once the agreement with the BPR had been arranged, the NPS relocated its Engineering division from Portland to Yellowstone. George Goodwin, reluctant to accept the new, cooperative approach to park road planning and construction and the higher standards, resigned under some pressure from Mather in 1925. Three resident engineers were hired to directly supervise road and trail construction. In 1927, Frank Kittredge was appointed Chief Engineer of the NPS, and his arrival expanded the role of civil engineers in the overall park roads program. Thomas Vint became Chief Landscape Engineer in 1927, and Ernest Davidson was his new assistant (Hull by this time had moved full-time into private practice).[152]

In early May of 1925, an interbureau team carved foot-holds in frozen snow on the west side of Logan Pass as they worked out details on-site related to the construction of the next sections of the Sun Road. Park superintendent Charles Kraebel, BPR engineer Frank Kittredge, BPR Assistant Engineer Hill, and Landscape architect Thomas Vint discussed landscape protection techniques and made changes along the route. This was the first step in implementing the procedures for interbureau cooperation that had been outlined in Spokane a month earlier.[153]

Daniel Hull wrote the first relatively detailed standards for park roads in 1925. The basic principle was to achieve maximum scenic beauty with the least scarring of the landscape. Topography – including the possibility of scenic vantage points - should determine road location, he wrote. Native materials should be used so that features such as bridges and guardwalls harmonized with the landscape rather than appeared monumental or stylistic. Landscape architects should consider the view from the road and the view of the road itself in their designs. Over the next several years, landscape architects working on projects such as the Sun Road gained experience with these requirements. By 1930, they were preparing detailed designs for structures such as parking areas, guardwalls, the treatment of road banks, and bridge masonry for BPR engineers. Masonry techniques that used standardized construction principles carefully adapted to the local stone gradually evolved. A concept of park planning gradually developed that allowed park superintendents to program park developments over a several-year period. The review procedure for park Master Plans ensured that designs would harmonize with nature and support the agency's mandate for stewardship and visitor use.[154]

As part of this program, Hull devised recommendations in 1929 for rounding the overhanging, jagged edges of cut slopes so they blended into the natural setting and had less erosion. His division produced cross-section drawings of slopes with rounded tops. The ideal proportion was not to exceed 3:1 (3 feet in depth for every 1 foot of elevation). Directions were even given for cutting the swaths with an irregular edge to increase the natural appearance of the slope. This treatment became standard in all national park road contracts and soon was being used on national forests and other federal lands. The edges of forests were often set back in an undulating line, also helping the aesthetics along the roadway.[155]

The main problem with park road construction in the late 1920s from the viewpoint of the landscape architects was the destruction of natural features caused by blasting. During the construction of the west-side approach to Logan Pass, the contractor at times apparently ignored clauses in the contract requiring limited blasting (a series of smaller charges) and the specification that excavated material be thrown over the side of the road only where roadsides and trees were less likely to be damaged. The contractor was supposed to dump waste material in designated areas rather than over the side of the road. The NPS added an amendment to the interbureau agreement in 1928 that contained more stringent guidelines.

A letter clarified the role of the NPS landscape architect in park road work, and special provisions were included in future contracts. Vint was given the power to emphasize the landscape point of view in road projects.[156]

Other landscape-related concerns during road construction included damage to vegetation by machinery, by fills that choked roots, and by trampling by humans. The creation of unnatural canyons when new roads were built also caused trees to die, sometimes because of blowdowns. The trees then were subject to insect infestations, which spread to nearby living trees. In 1949, Park Engineer Ira Stinson commented that dead and dying trees were visible along highways and clearings throughout Glacier.[157]

To help blend the road with the environment, the west approach to Logan Pass was designed to wind gracefully along the mountain, using cut-and-fill operations rather than borrow-and-waste to create an even grade. Superelevations (banking of curves) were designed into the road to allow visitors to drive at higher speeds. Rough, steep edges of cut slopes were rounded and re-planted to appear natural.[158]

During the construction of the Sun Road in the late 1920s, NPS landscape architects frequently made on-site inspections. In 1927, they provided almost constant supervision in order to prevent unnecessary damage to the existing landscape. They were involved in planning, road construction, roadside cleanup, and construction of features such as bridges, guardwalls, turnouts, and parking areas. Overall, they wanted the structures associated with the Road to be "appropriate, pleasing and as inconspicuous as possible."[159]

Based on the experience of the previous several years, in 1929 the Landscape Engineering division prepared a list of standard general provisions for landscape protection. These included the removal or restoration of any trees or other natural features scarred or damaged by the contractor; removal of rocks that fell outside finished slopes; limited development of temporary trails and roads; leaving uncut trees and bushes along the shoulders within the right-of-way during blasting to protect adjacent vegetation from damage; backfilling all holes; and locating borrow pits in areas not visible from the road. One provision resulted from unsatisfactory excavations that had been done on the Sun Road. This was the introduction of Type B excavation, developed in consultation with BPR engineers and the DuPont Powder Company, which required careful rock excavation and minimal casting of debris. Block holing (drilling large holes for explosives, resulting in extensive rock falls and scarring) was prohibited. Type B was only required in specified areas identified during the preliminary road surveys.[160]

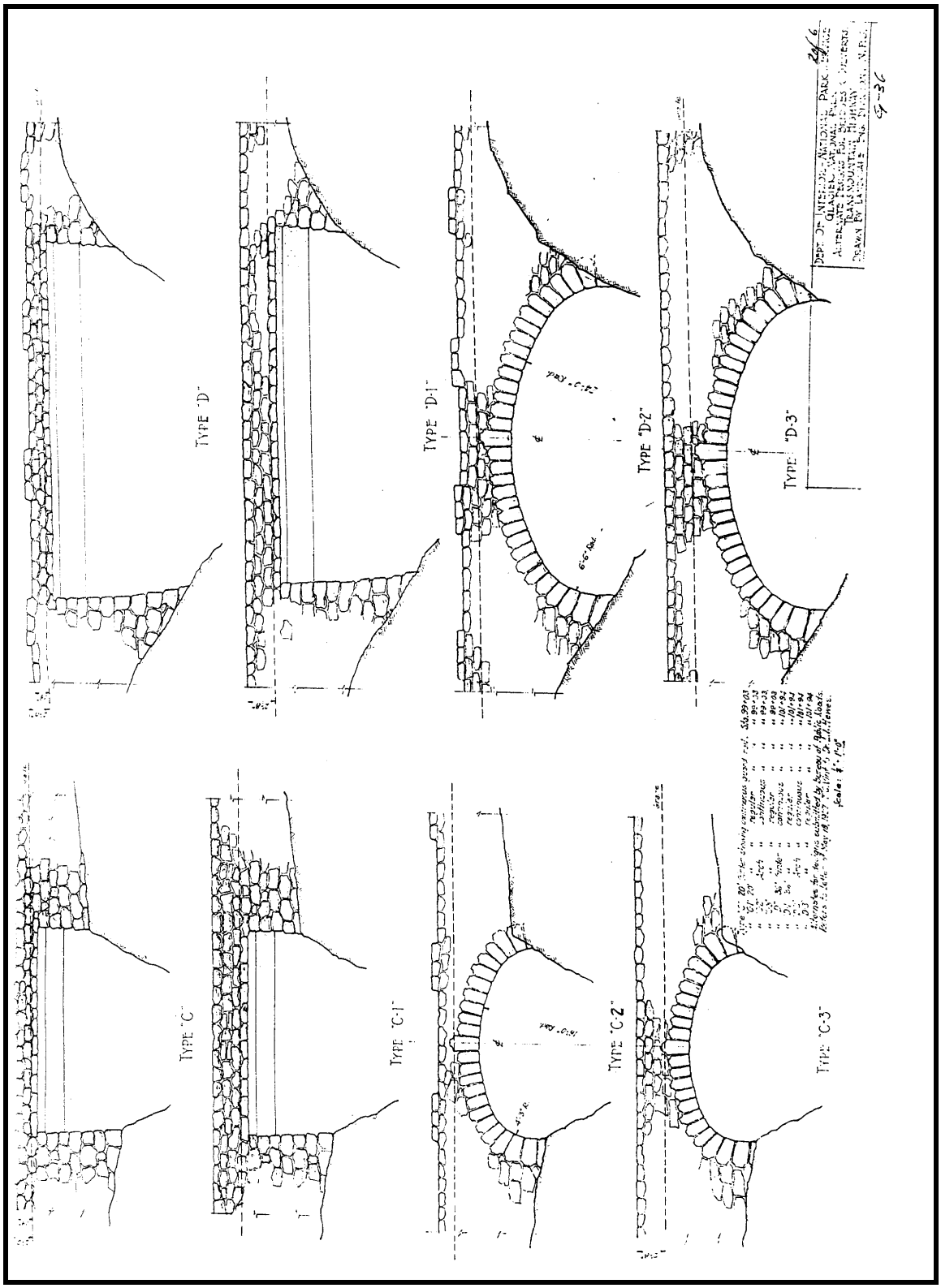

Figure 30. BPR drawings of recommended bridge designs for the Sun Road, 1920s. TIC drawing 36, no. 2

2.3.6 Construction of the Sun Road, 1925-33

As of spring 1925, 29 of the eventual 50 miles of the Sun Road had been constructed, all in the relatively low stretches on both sides of the Divide. The NPS knew that it had to find expert contractors with skilled crews for the high-elevation sections of the road. The agency opened bids for the 12.4-mile construction on the west side up to Logan Pass in June of 1925. This was the largest single contract the BPR had ever let, and it took four seasons to complete. The contract called for 480,000 cubic yards of general excavation, 16,00 cubic yards of tunnel excavation, 2,200 cubic yards of retaining wall and other masonry construction, 7,000 cubic yards of guardwall construction, and 14,500 cubic yards of surfacing. Snow sheds, detailed in the plans for the project, were later deleted from the contract. Tacoma contractor Williams & Douglas was awarded the contract for their bid of less than $900,000. In fact, over subsequent years and later contracts, Archie R. Douglas worked on more Sun Road contracts than any other contractor. The NPS considered him an effective "dirt mover."[161]

W. G. Peters served as the resident BPR engineer for the three-year project. Park Superintendent Kraebel assigned a ranger who had been trained by landscape architect Vint to be present throughout the construction work. The ranger's job was to ensure protection of the landscape and to make sure that fire prevention guidelines were followed.[162]

Williams & Douglas worked on the project from several different locations at one time. Although the original contract had specified that no power shovels should be used, the contractors convinced the NPS and the BPR that this was unreasonable (the next lowest bid that did not include such equipment was almost $150,000 higher). Most of their segment was built using two steam shovels and one gas shovel, all with ¼-yard buckets. They used pneumatic jack hammers and consumed 490,000 pounds of explosives (just under one pound of explosive per cubic yard of material removed). The contractors had to use about 15 miles of construction trails and a tote road to haul supplies around incomplete sections of the road (a tote road up to the Loop and a cabin at Packer's Roost, on a spur road below the Loop, were built during this period).[163]

Williams & Douglas eventually established six construction camps along their 12.4 miles of the Sun Road. Camp One was at Logan Creek, and this served as headquarters for the contractors and also for the BPR engineering crew (this camp was also used by later contractors). There, they had an office/supply cabin, a mess hall, and tents to sleep 50-60 men. The other camps were at the Loop, three places along the Garden Wall, and at Oberlin Bend. The camps were supplied from Logan Creek by pack string until 1927, when enough of the roadbed had been established so that trucks could get through to the camps.

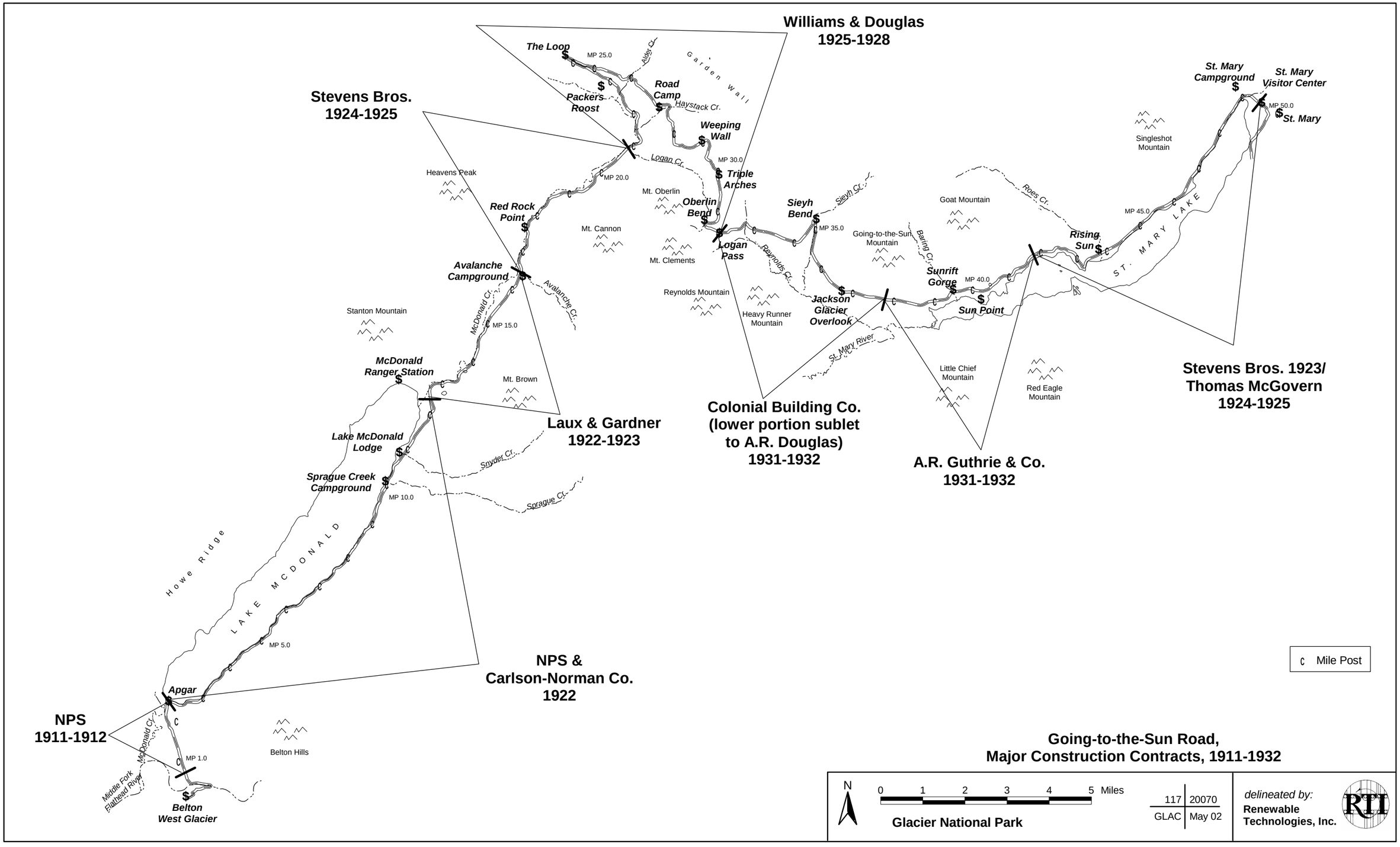

Figure 31. Map of the Going-to-the-Sun Road, showing approximate locations of major construction contracts, 1911-32.

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The trip with a full pack string up to camps 5 or 6 was usually an all-day journey, and the packers took care to stay above the workers to avoid falling rocks. The packers hauled up provisions, powder, steel, and tools to the workers – everything but whiskey, which the workers had to carry in themselves. The camp cooks played a critical role in this as in all the other contracts along the Road. As one construction worker recalled, "If the food wasn't any good, they had a new cook in the morning. By God, we had good grub."[164]

According to contract specifications for the east-side work, the camps were approved by Glacier staff and were located in the road right-of-way whenever possible to reduce damage to the surrounding landscape. The contractor on the stretch between Logan Pass and Sun Point, for example, had a 120-man camp at Lunch Creek close to the right-of-way. The tents at the camp at the Loop were built on stilts because of the lack of level ground and the prohibitions against destroying vegetation. Forest Farris, who lived at a camp by Jackson Overlook while working for A. R. Douglas, remembers that the bunkhouses there were also supported off the ground. He notes, "You saved brush – it was just as valuable as saw logs."[165]

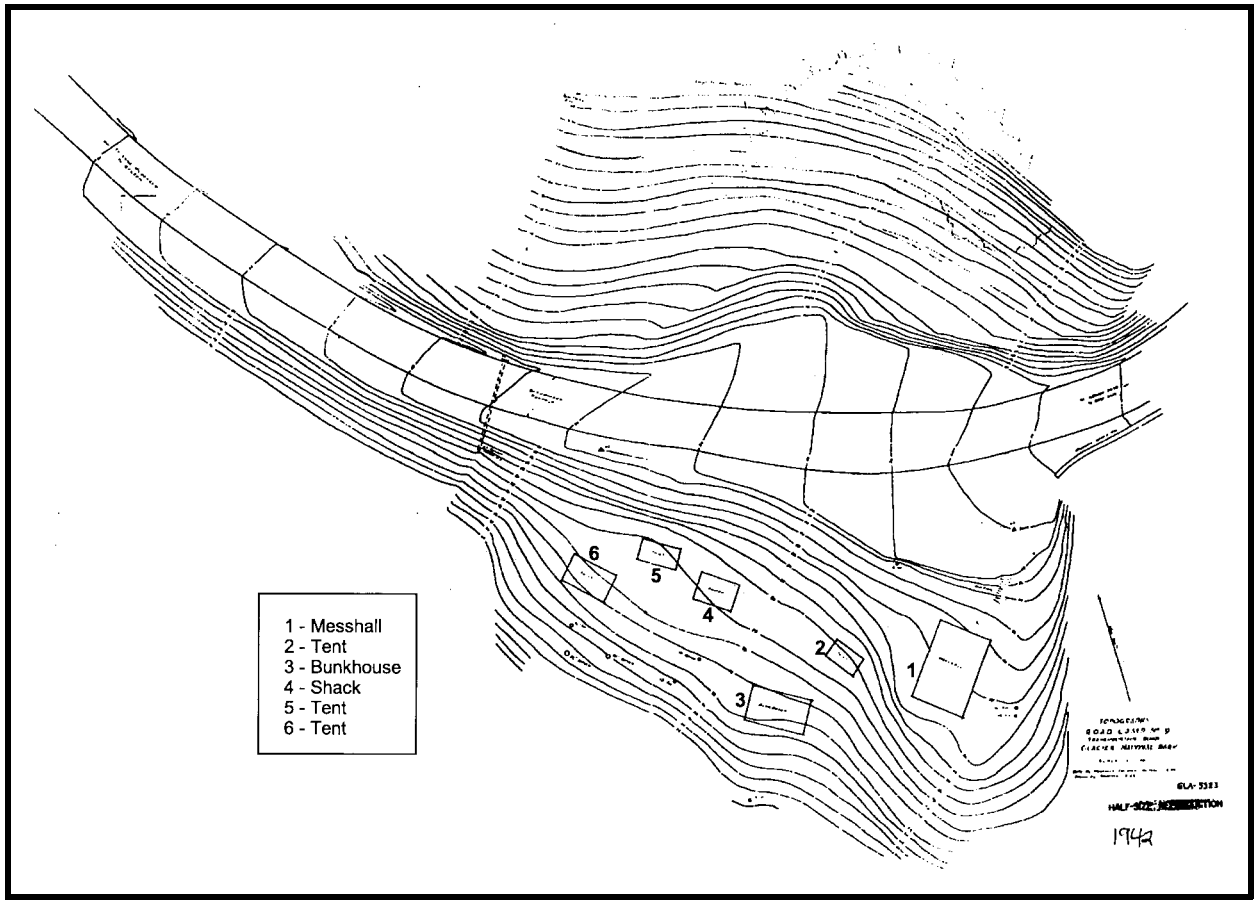

Figure 32. Sketch, dated 1942, of building locations at Road Camp 9. This was also the location of Williams & Douglas Road Camp #4. (Added labels indicate building functions.) TIC drawing 5323.

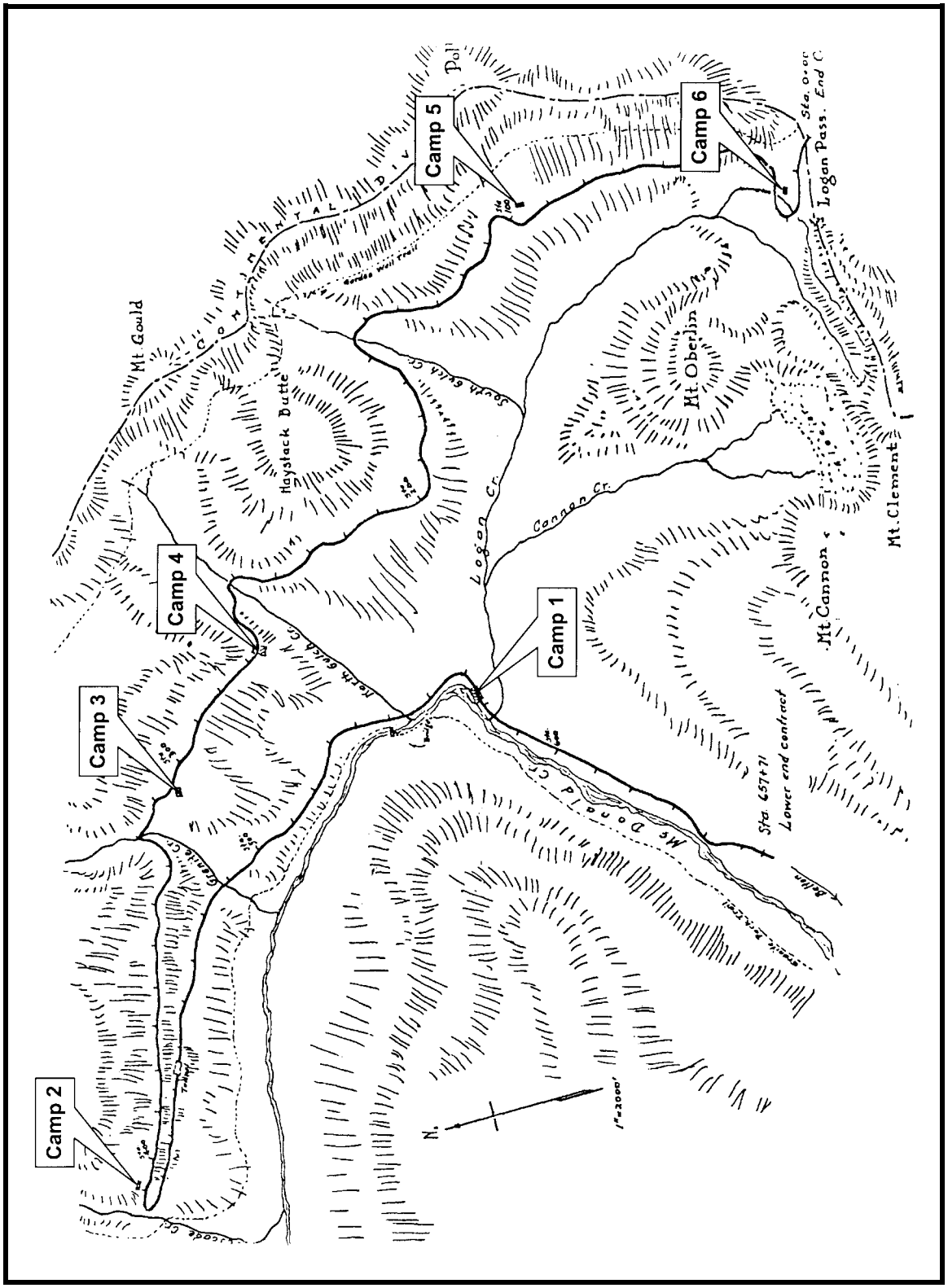

Figure 33. 1920s map showing the Sun Road's western approach to Logan Pass. Added labels indicate the locations of Williams & Douglas construction camps. GNPA.

An average of 225 men worked for Williams & Douglas during the construction seasons. The men earned 50 cents to $1.15 per hour. Many subcontractors took on specific aspects of the project, such as sections of masonry retaining and guardwalls or drilling, blasting, and excavating through a specified section of stations. Station gangs working on the Williams & Douglas contract were paid by the cubic yard of material they moved. They accomplished about 38 percent of the excavation; the three power shovels did the rest. The hand labor was formidable; sometimes, for example, it took six men with crowbars to move one rock. One subcontracting crew was composed of sixteen Russians who were based out of "Russian camp," the construction camp at Oberlin Bend. Besides the power shovels, other machinery used on the contract included four gas locomotives with two-cubic-yard dump cars that ran on 24-inch-gauge track (used for hauling and dumping broken rock); six portable compressors; one Fordson tractor; two team graders; and various trucks, teams, and wagons.[166]

Figure 34. Jones Flat, near Oberlin Bend. This was the site of the so-called "Russian Camp" for road construction workers. 2001 photo.

Jobs as laborers were not easy to come by during the Depression, so Sun Road construction workers had to put up with the sometimes difficult working and living conditions or risk being fired. According to construction worker Clarence Ufford, "you had to do something and you had to do it right or get fired." Another general laborer who worked on the east side in the early 1930s recalled that contractor A. R. Douglas "would follow you over to get a drink of water and make sure you came back quick." Forest Farris, a Kalispell teenager who worked as a flunky at a camp in the 1930s, was on the job seven long days a week throughout the summer. He earned $45 a month plus room and board. He noted that the laborers worked quite hard: "They done more than they had to do, in order to make an impression on the man they was hired under. I don't mean that they polished the apple necessarily, but they realized that a little extra effort went along with holding your job." When Farris later worked as a crane operator, he was paid overtime under the table; this was a benefit that contractors paid good workers to keep them on.[167]

The work on the Williams & Douglas contract began with the engineering crew marking the route. Then the contractors cleared the right-of-way, falling trees and removing stumps and roots. The cleared timber was used as fuel at the construction camps or at the rock crusher plants. Men trained in explosives broke up the rock, often hanging from ropes to drill the blast holes. Pack strings hauled in supplies until a 12-foot roadway had been cleared so that heavy equipment could be brought in to the job sites. Power shovels cleared and loaded the debris into trucks or ore cars pulled by a gas locomotive that hauled the rock several hundred feet to designated locations. Then the rock bed was surfaced and any masonry work was completed. Subcontracting station gangs of eight to ten men did most of the masonry work, including bridges, culvert headwalls, retaining walls, and guardwalls.[168]

The Williams & Douglas contract was completed in October 1928, more than a year later than originally anticipated. The delay was caused by an addition to the contract requiring reconstruction and improvement of the Mount Cannon section along Upper McDonald Creek.[169]

In June 1929, the Sun Road opened to tourist travel between West Glacier and Logan Pass. That year, 13,983 automobiles entered Glacier, which represented a 46 percent increase over 1928. Park planners discovered that they had to devise a way to confine traffic at Logan Pass to protect the "flower fields" there, because motorists could drive several miles on the summit by "dodging cliff out-croppings and clumps of timber." Assistant landscape architect Ernest Davidson, in cooperation with Glacier's superintendent and engineer, worked out a solution on the ground. He had temporary movable cedar post-and-rail installed in a few critical places to define a parking area in June 1929, about the same time that the Road opened to the public.[170]

The NPS was generally pleased with the 1925-28 work of Williams & Douglas. Frank Kittredge did, however, complain that too much excavated material had been cast over the side of the road rather than dumped in specific gulches, leading to destruction of vegetation and to a shortage of fill material. Ernest Davidson documented the destruction of hundreds of trees caused by boulders rolling downhill. Reportedly the largest blast on the entire Road occurred about one mile above the Loop. That one blast used 500 kegs of black powder and 80 boxes of dynamite to excavate some 10,000 cubic yards of material.[171] Packer Joe Opalka spent three weeks hauling powder to a blast site on the west side, perhaps the same as the one above the Loop. He described the blast as follows:

> [The powder monkey] hollered fire, and that whole hillside gave a little thud, with the black powder, then the rock powder went off and the whole thing just moved into the canyon. It was quite a rumble, but not too much noise.
>
> You could have drove a truck through it when the blast was done. It was just like a finished road bed.[172]

As the west-side project was nearing completion, Glacier Superintendent J. R. Eakin commented that motorists would not go where they could not drive their cars, and he noted that "a through road will revolutionize motor travel over the whole northwest." Soon after the road was open to Logan Pass, park naturalist Morton Elrod described the road from the Loop to Logan Pass as "a series of continuous delights and surprises."[173]

In 1930, park officials were concerned that private property values would increase significantly when the Sun Road was completed, making it more difficult for the park to purchase private inholdings close to the Road. By the end of July 1930, the NPS had spent $200,000 acquiring private property, but many property owners still remained unwilling to sell their land and buildings. The highway over Marias Pass had just opened, causing a new influx of visitors to the area, and the Great Northern Railway was urging the NPS to complete the Road at least as far as the Going-to-the-Sun Chalets. Property values were rising even though work on the Sun Road had stalled for two years. Horace Albright recommended that Glacier delay no longer and begin building the last link in the Road.[174]

Construction of the remaining stretch of road on the east side was less challenging technically than that on the Garden Wall section of the west side. In 1929, the new BPR resident engineer, A. V. Emery, began resurveying the east-side approach to Logan Pass. In August 1930 the park advertised for a contract to clear a segment running 10.5 miles east of Logan Pass. The construction work was divided into two contracts going from Logan Pass to about two miles east of Sun Point where the 1924 contract had ended. A. Guthrie & Company of Portland, Oregon, and Colonial Building Company of Spokane were awarded the two contracts, and Colonial subcontracted more than half their road length to A. R. Douglas. Grading and construction began in 1931 and continued through 1932 (Guthrie actually completed their portion July 7, 1933). The work included the East Side Tunnel, a spur road to Sun Point, and the construction of the Baring Creek Bridge.[175]

The Sun Road contractors faced many unusual challenges in building the road. The work season was only about seven months long, and it started in the spring with the laborious removal of snow from the construction camps and roadway. They had to bench much of the road into sheer cliffs, requiring workers to hang from ropes in the early stages of construction. Snowdrifts, extreme weather, and even bears searching for food in the construction camps made the work more difficult. The west-side contractors left their heavy equipment up high on the road in safe areas over the winters because it took so long to walk the equipment down. When the workers returned in the spring, corrosion of the machinery made it difficult to get the equipment working again. On the east side, access to the work sites was a problem for both of the 1931-32 contractors. Douglas had to float heavy machinery and other equipment on a barge up St. Mary Lake to reach the construction site (and rough water often delayed the operation by several days). There was a 250-foot elevation difference between the dock at Roes Creek and the right-of-way, and Douglas had to build a 1,000-foot tote road to connect the two. Sand and gravel for concrete work on the lower section came from the shore of St. Mary Lake, but it had to be trucked from Kalispell for the upper section. Colonial had to build a trail above the road from Logan Pass

to Lunch Creek Camp for hauling supplies. Because power machinery such as shovels and dump trucks could not reach the east side tunnel site, laborers had to load all debris excavated from the east side tunnel into ore carts and dump it over the edge of the cliff.[176]

The Sun Road opened to travel over Logan Pass from both directions in October of 1932. The east side and the west side of Glacier National Park were finally connected by an automobile road. The total expenditure on the Road up to that point in July 1933 was $1.7 million.[177]

The parking area at Logan Pass was completed in October 1932. Back in 1925, Thomas Vint had commented that the amount of ground at Logan Pass used for the road should be minimized so that the "native soil will be the predominating note in the landscape rather than that of road surface." In accordance with this idea, the NPS directed the workers to do as little grading as possible at the pass. Because the cuts were mostly in rock, workers had to sort and cross-haul the waste material and also borrow fines along the roadway in order to have enough fine material to cover the fill areas. Cut slopes in earthen material were flattened to conform to existing surface slopes or were rounded at the top to help with seeding. Cars were prevented from driving outside the defined parking area by "log-type protection rail," masonry guardwall, and embedded boulders. One person who knew the parking lot well in the 1930s described it in this way: "You'd drive up and point your car at the rock wall and that was your parking."[178] When completed, the parking area sat relatively lightly on the land. Its irregular parking areas were separated by islands of vegetation.[179]

Figure 35. Dedication of the Sun Road at Logan Pass, July 15, 1933. Photo by R. E. Marble, GNPA #8137.

The full 50 miles of the Sun Road officially opened to the public July 11, 1933. Four days later, Glacier hosted a well-attended ceremony to dedicate the Sun Road at Logan Pass. Park cooks prepared a chili lunch for 2,500 people but ran out of food because over 4,000 people attended. Various dignitaries from the United States and Canada spoke, including politicians and representatives of the NPS, BPR, Montana State Highway Commission, and the Blackfeet, Salish, and Kootenai tribes. A plaque honoring Steven Mather was placed at one of the entrances to the parking area.

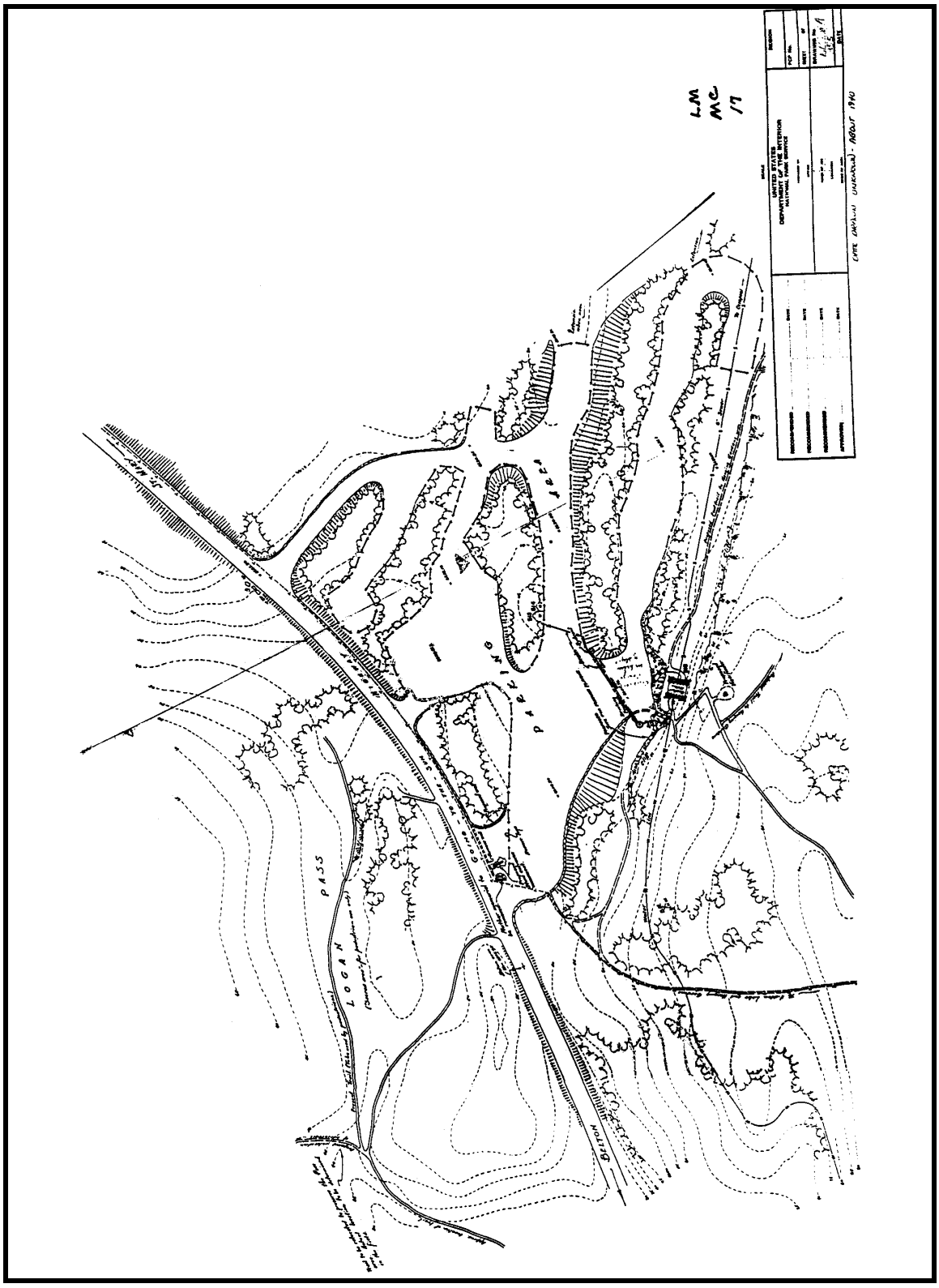

Figure 36. Map of roads and facilities at Logan Pass, circa 1940. Note curved, irregularly-shaped parking area. Historic stone comfort station building is near bottom center of map, near the site of the current Visitor Center. TIC drawing 354A.

Glacier's superintendent E. T. Scoyen read a letter from NPS Director Horace Albright to the crowd that stated in part, "Let there be no competition of other roads with Going-to-the-Sun Highway. It should stand supreme and alone."[180]

Landscape architects and highway engineers, working together, had designed and constructed a dramatic mountain road that adapted to the park's scenery as much as possible, blending in with the surrounding landscape. Automobile tourists could now visit Glacier's high country without having to leave their cars. Rail passengers could leave their train and travel across the park in a bus via the new road, resuming their train travel the next day at the opposite end of the park.[181]

Construction of the Sun Road took three lives. The deaths were caused by a fall from a rope, a falling rock, and a fall from the roadway. Almost two million cubic yards of material were moved, and more than 22,500 cubic yards of masonry work was constructed. Back in 1921, using lower road standards, the NPS had estimated that the road would cost about $600,000 to complete and would be finished in just over five years. They felt that when completed, Glacier would have as many as 15,000 automobile visitors per year. As it turned out, the total visitation to the park in 1933 was over 76,000, and by 1936 this figure had more than doubled.[182]

The Road had been called the Transmountain Highway since the late 1910s. In 1929, Glacier naturalist George Ruhle suggested the name Going-to-the-Sun Highway, and this name was officially adopted at the dedication ceremony. The name was later changed to Going-to-the-Sun Road, as it is known today.[183]

The experience of surveying and then constructing the steep, high-elevation "alpine section" of the Sun Road shaped the partnership between the BPR and the NPS. The Road became a prototype for successful collaboration of civil engineers and landscape architects in designing roads that provide access to national parks without destroying their scenic values.

2.3.7 Roadside Cleanup

Roadside cleanup along park roads began in Yellowstone in 1924. This work included the removal of dead trees and other "debris" visible from the roadway, screening undesirable views, opening up scenic vistas, and placing phone lines underground. Soon, the cost of roadside cleanup was included in estimates for all new roads. At the end of the 1920s, this work became an integral part of NPS road work and began to be funded under annual appropriations. By 1930, roadside cleanup included planting slopes along roadways.[184]

Roadside cleanup began on the Sun Road along the shore of Lake McDonald in 1929. The work was done by seasonal trail crew and road maintenance workers. The gathered material was piled on the edge of the road or on the lake shore to be burned, in order to prevent damaging any living vegetation. Dead trees were cut off close to the ground. In the summer of 1930, Glacier received funding to remove all the timber burned in the Half Moon fire of

1929 on public land within 150 feet of the Sun Road. Three crews worked on the cleanup for two years, completing most of the needed cleanup between Belton and Avalanche Creek. This work led to "more favorable comments than any other expenditure in the Park." Park administrators approved of the work because it removed "unsightly" downfall that was a fire hazard and that "cluttered" ground that had been carefully cleaned.[185]

Figure 37. Roadside cleanup operations on west side, July 1934. GNPA photo #378.

Glacier's road program during the 1930s was heavily influenced by an infusion of New Deal public works money. Around the nation, some 40 percent of relief workers were employed in working on highways. New Deal legislation after 1933 directed over $1 million to the Sun Road. Public Works Administration funds provided needed monies, and Emergency Conservation Work carried out by the Civilian Conservation Corps enabled the park to accomplish many projects outlined in its development plans. These projects included various road and trail projects, patrol cabins, campgrounds, and boathouses. Development plans guided the work. Civilian Conservation Corps enrollees were involved with roadside cleanup, campground maintenance, and some construction projects. They lived at various camps in the park from 1933 until 1941. For projects funded by the Public Works Administration, the work was done to NPS standards and designs with skilled labor provided by private contractors. The resident landscape architect supervised the work.[186]

2.3.8 Reconstruction and Repair Work on the Sun Road, 1929-42

The first phase of reconstruction projects took place between 1929 and World War II. When the Sun Road was officially opened to the public in 1933, park administrators still considered the Road far from "completed." Some reconstruction work on the Lake McDonald section to bring that section up to higher standards had already been done, but extensive improvements still needed to be completed on other sections. The Road was graded to a 24-foot width and was gravel surfaced to 22 feet; curvatures and grades were

reduced; some segments were realigned; drainage was improved; masonry retaining walls, guardwalls, and culvert headwalls were constructed; slopes alongside roads were rounded and stabilized; through cuts were daylighted; wooden guardrails were installed; pullouts were developed; log bridges were replaced by masonry structures; and all but ten miles of the Road received either bituminous chip-seal treatment or bituminous pavement. Much of the reconstruction work was done with financing from public works programs and with laborers supplied by the Civilian Conservation Corps.[187]

As in later years, these initial reconstruction programs occurred simultaneously with site-specific repair projects necessitated by avalanches, rockfall, and other road failures. One of the earliest known emergency repairs to the Road occurred in 1930 and 1931, when NPS crews replaced a failed dry-laid retaining wall built in 1924 near Red Rock Point (about a mile above Avalanche Creek) with a retaining wall with guardwall conforming to design standards adopted during the Williams & Douglas contract. This was the first "wet wall" masonry constructed on a section of previously built road. The workers had to dig down 22 feet to reach a solid rock foundation for the wall. The sand was shipped from Kalispell to Belton by train and then hauled to the construction site. The wall contained about 150 cubic yards of masonry and was 74 feet long. Two masons and two helpers laid the wall, while one man mixed mortar and three men lowered rock to the masons with a hand hoist.[188]

In 1933, the NPS had to replace a failed log cribbing about one mile above Avalanche Creek. The 575 feet of cribbing along the creek edge was up to 20 feet high. About 200 feet of the cribbing and road gave way in June of 1932 and slid into Upper McDonald Creek. A temporary timber half-bridge made the road passable in time for the June 15 opening. Then that fall and the following spring, a dry masonry wall was constructed to replace the cribbing.[189]

Figure 38. New road alignment and retaining wall near Avalanche Creek, replacing old road and log cribbing, June 1934. GNPA photo #789.

More subatantive reconstruction work on the west side began in 1931, with the most extensive projects taking place between 1934 and 1937. The period was highlighted by a series of construction contracts that saw a near-total rebuilding of the road from West Glacier to about a mile east of Logan Creek.[190]

In 1926 and 1927, resident BPR engineer W. G. Peters had made several recommendations for improvements to the Belton-to-Avalanche section of the Sun Road, and these served as guidelines for early 1930s work on the Lake McDonald section. The recommendations included reducing curves, widening narrow sections, installing wooden guardrails on sidehill sections, and placing surfacing material over the foundation. When the Road had been built along Lake McDonald in 1921, several sections through rock were constructed with only a 12-foot-wide roadway because of insufficient funds. These narrow sections could accommodate one-way traffic only. They were widened during a project to improve this stretch of the Road in 1930 and 1931. Also, the early construction of this stretch had not provided for cut-slope stabilization, and drainage provisions were only minimal (narrow roadside ditches, wooden culverts, and wooden bridges). Every year through the 1920s, sloughing and spring mudslides created problems along this stretch of the Road.[191]

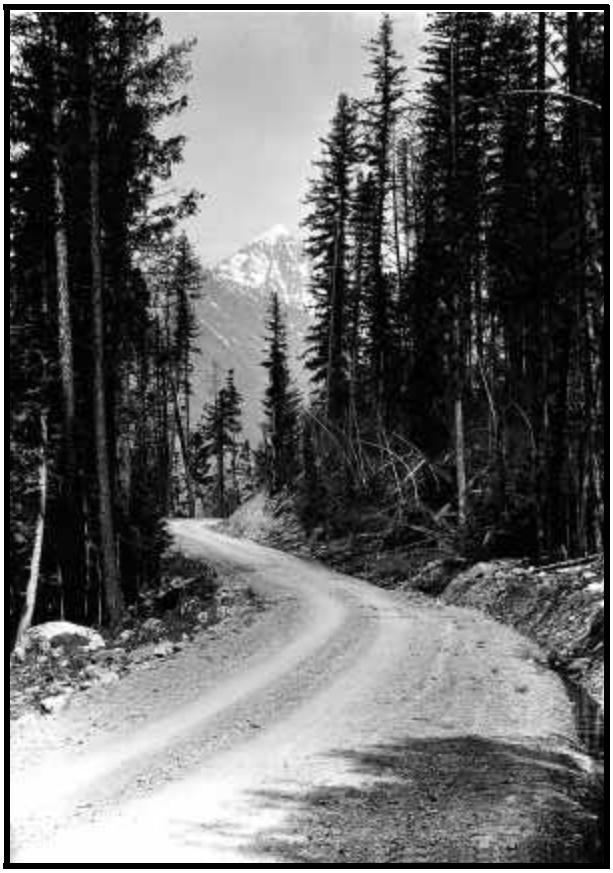

Figure 39. The "winding, woods-road atmosphere" of the Sun Road is evident in this T. J. Hileman photo from the 1920s. Mount Vaught is visible in the background. GNPA photo #8069.

NPS-supervised day laborers did the 1930 and 1931 reconstruction work on the 12-mile Lake McDonald stretch of the Road. They realigned the roadway on curves of standard radii of 150 feet or more and gave it a width of 22 feet on the cuts and 24 feet on the fills. The quantities of material in adjacent cuts and fills were balanced as much as possible to avoid long hauls by dump trucks. In some places, the widening was accomplished by casting material with the park's gasoline shovel from the upper side to the lower side of the Road.

One area that was widened significantly to provide parking spaces and a viewpoint was at McDonald Falls, thus meeting a "long-felt need." Steep road cuts with overhanging tops that sloughed away each spring were sloped. Curves were superelevated. The old roadway was obliterated in one place and was then planted to shrubs, trees, and grass. About 28 deteriorating or failed wooden culverts were replaced with corrugated iron culverts with masonry headwalls, and headwalls were placed on other earlier iron culverts.[192]

In the fall of 1934, representatives of the NPS Landscape Engineering division, the resident BPR project engineer, and Superintendent Scoyen agreed on guidelines for reconstruction of the Lake McDonald section. These were: reduce curvature, hold centerline of new road on present roadway width wherever possible; eliminate a number of short vertical curves; retain long vertical curves where no traffic hazard was involved; obtain additional width by filling present grade with borrow materials from the lake; cut back slopes to obtain width only when no other method is practicable; and depart from conventional balanced cut-and-fill practice by using lake borrow (in the end, borrow material came instead from the Jackson Creek pit). Ernest Davidson, the resident landscape architect, strongly recommended making a safe road "without destroying the charm of the present roadway, its winding, woods-road atmosphere."[193]

The NPS became interested in treating the slopes of park roads in the late 1920s and early 1930s. This coincided with a growing interest nationally in planting highways for scenic beauty. Along Lake McDonald, slope treatment standards established in the 1930s specified slope ratios and required the rounding of slope tops. Slope stabilization work during the 1930s along the Sun Road included paving unstable cut slopes with flagstones, rounding slopes, placing brush mats on slopes, digging surface drainage ditches on the hillsides above the slopes, paving culvert inlets to prevent culverts from getting plugged during spring run-off, installing perforated pipe in the slopes, placing log lattices on slopes, and planting willows on slopes. Laborers walked behind the park shovel, removing projecting roots and other debris and finishing the tops of banks and slopes. These were later planted with a mixture of Kentucky bluegrass and clover "to add to their beauty" and to protect them from erosion. (In 1930, the NPS banned all exotic seeds and plants from the national parks except for non-native grasses, which already were in abundance.)[194]

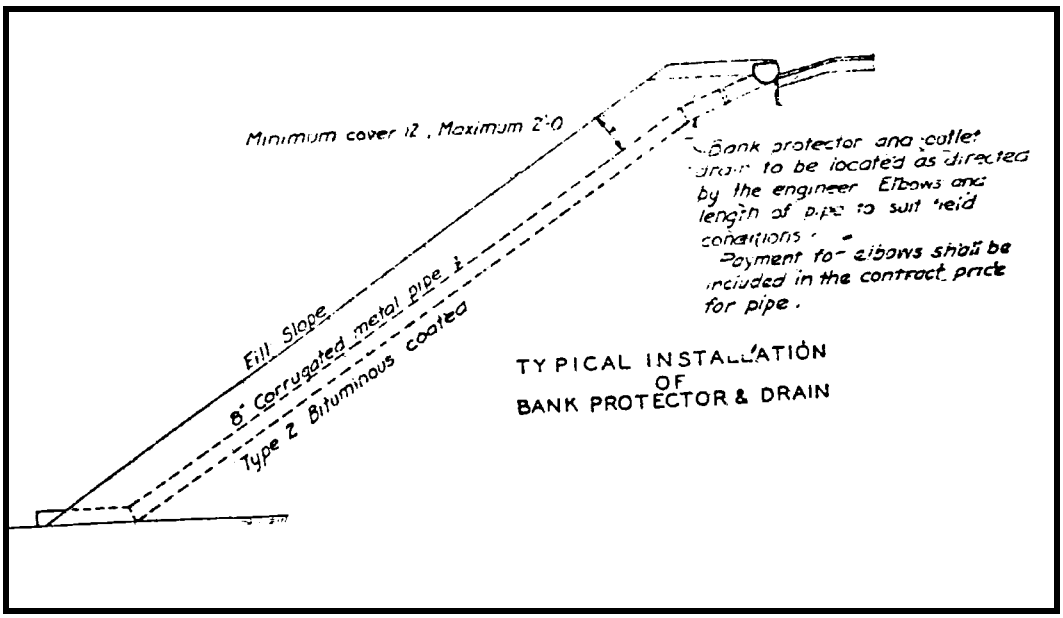

Figure 40. Typical installation of bank protection and drain, 1938. TIC drawing 9379, no. 8.

BPR engineer Peters recommended two significant roadway realignments. The first was designed to bypass the Lake McDonald Lodge developed area. The second was to construct a new road south of Lake McDonald to tie in to a new crossing of the Middle Fork of the Flathead and bypass the Apgar developed area. Resident BPR engineer A. V. Emery surveyed both of these extensive realignments of the Sun Road in 1934 and 1935, and they were built in the 1930s.[195]

Glacier's staff took an active interest in Lake McDonald Lodge after 1930, when the NPS purchased the Lewis Glacier Hotel and leased it to the Great Northern Railway under its concession contract. The complex at that time included the hotel, twenty cabins, boating facilities, employee quarters, and many outbuildings. The facility was re-named Lake McDonald Hotel at this time. Soon after the sale, in 1933, Glacier Superintendent Scoyen agreed with plans to tear the hotel down and build new facilities, stating that the hotel was not very well located in relation to the highway. Instead, modifications were made to the facility to make it appeal more to automobile travelers. These included remodeling the cabins to allow for rear access from parking areas, removing service buildings at the rear of the lodge, building a new parking area, and constructing a general store and a filling station/garage along a new service road near the cabins. Disagreement continued within the NPS over the desirability of initiating new development at the foot of Lake McDonald versus remodeling or building new cabins or motel units at Lake McDonald Lodge.[196]

Williams & Douglas, which had constructed the higher-elevation west-side segment of the Road, was awarded the 1936-37 contract to reconstruct 11 miles of the Sun Road. This contract went from the north approach of the new bridge at Belton, including the new west entrance station and two miles of realignment at the Middle Fork, plus the new section bypassing Apgar (the "Apgar cut-off"), up to and including the Lake McDonald Lodge realignment. The contractors established their camp near Apgar in the vacant, government-owned Gold Bungalow. Because of the relatively heavy tourist traffic, the contractors tried to save for fall the sections in which the construction work would interfere with traffic. On this contract, less than one-quarter of the work hours came from relief labor; this was a decline from earlier contracts during the Depression.[197]

The road that serves today as the access loop to the rear of Lake McDonald Lodge was originally (built in 1921) the main alignment of the Sun Road. The section to the north was realigned ca. 1933. The current alignment of the Sun Road east of Jackson Creek, which bypasses the hotel, was built between 1936 and 1937 under a contract awarded to Williams & Douglas. As a result, about half a mile of the Sun Road was relocated 1000 feet to the east. The contract specified landscaping details such as log and boulder curbs, masonry flagstone steps, and terrace boulders. The old store at Lake McDonald Lodge (the original Snyder hotel) had to be moved because of the 1933 road realignment, and it was dismantled a few years later. Great Northern Railway architect Thomas McMahon designed a new general store for the lodge in 1937, and this building is still in use today.[198]

Figure 41. New parking lot at Lake McDonald Lodge, July 28, 1937. GNPA photo #4581.

The contractors also created a large parking area that NPS landscape architects described as a "wide mall which would function as a parking area and landscaped approach to the hotelÿcreating a front-door impression to what is really the back of the hotel." Balconies were added to the rear of the hotel.[199]

Several options were considered for constructing a grade separation where the new highway would cross the Great Northern tracks at Belton. Among the routes considered were alignments that went through the existing park Headquarters area and ones that bypassed it to the west. Planners also considered an overpass near the depot. NPS landscape architect Ernest Davidson urged the Montana State Highway Commission to make the bridge as attractive as possible, and he showed the state representatives drawings of the St. Mary and Lee Creek bridges as examples. The NPS hoped to keep the residential and utility areas of park Headquarters off the main highway, as they were with the new alignment, but to build a new administrative building at Belton. Belton residents, in turn, did not like any proposal that detoured around or involved a bypass over the existing town.[200]

Figure 42. Railway underpass at West Glacier, 2000 photo.

The new alignment of the Sun Road in the West Glacier/Apgar area tied in with the new underpass built by the Great Northern Railway, BPR, and Montana State Highway Commission at Belton in 1937. The Highway Commission put in a new concrete bridge over the Middle Fork, replacing the 1920 bridge farther upstream. This bridge received national recognization as the most beautiful bridge of its class built in the United States in 1938 (it was replaced in 1965 after it was damaged by the 1964 floods). The waste material from the underpass was used to build up the north approach for the new bridge. Once the bridge was constructed, the Belton Mercantile complex moved to its present site south of the bridge. The railroad depot was moved about 800 feet west and was remodeled, enlarged, and stained to blend with the Belton Chalet buildings.[201]

Figure 43. Post office, gift shop, mercantile, and café at Belton Mercantile complex on west side of highway through West Glacier. Photo by R. E. Marble, GNPA #8302.

Figure 44. Original park administration building and old Sun Road alignment, 2000 photo.

Williams & Douglas also built the new road in the Apgar area. This road ran directly from Belton to the east shore of Lake McDonald without passing through Apgar. This alignment was completed in 1936 but was not put into use until the new bridge across the Middle Fork was completed in 1938 (and the old alignment, which led directly to Apgar, was not immediately obliterated). Year-round residence at Apgar peaked in the 1930s. Despite the 1938 rerouting of the Sun Road to bypass the community, summer trade there increased.[202]

Early visitors to Glacier passed right in front of the rustic-style administration building and employee housing fronting the original Sun Road alignment, just above the Middle Fork. Over the years, NPS philosophy changed to the belief that man-made resources within parks should be screened from view whenever practical. The 1938 realignment of the Sun Road to bypass Headquarters accomplished this goal for the west entrance of the park.[203] From an engineering perspective, the new road alignment also provided a more suitable location for the Middle Fork bridge crossing.

Between 1934 and 1937, the NPS awarded four major contracts for reconstruction work on the Sun Road's west side. The first, given jointly to the Tomlinson-Arkwright Construction Company and J. L. McLaughlin of Great Falls, was a 1935-36 project beginning at Avalanche Creek and extending eastward for 5.6 miles. The contractors were based out of the old Williams & Douglas camp at Logan Creek. The contract included reconstruction grading and surfacing, building a small amount of culvert headwalls and retaining walls, eliminating sharp blind turns and narrow stretches, and deepening and widening ditches to provide ample drainage. On this contract, the clearing and grubbing line was designed to weave in and out, eliminating "the narrow, deep swarth [sic] of cutting through the timber." The rock excavation was quite difficult because of large boulders and hard ledge rock that did not explode in a predictable manner. Trees were damaged during the work, and the larger scars were hidden with paint. The road was surfaced with two layers of crushed rock taken from a gravel pit 500 feet south of the road and about 2,000 feet west of Avalanche Creek.[204]

The second reconstruction contract of this period on the west side was awarded to Martin Wunderlich, a contractor from Jefferson City, Missouri. The 1936-37 work covered the 5.5-mile section of road between the Lake McDonald Lodge and Avalanche Creek, and the contractor's camp was along McDonald Creek. Included in the contract were eight realignments (totaling about 1.75 miles), drainage pipes, crushed-rock surfacing, retaining wall, Type 2a masonry guardwall, Type 7 wooden guardrail, and the horse trail underpass above the head of Lake McDonald. In some areas, such as at McDonald Falls, masonry wall foundations were reinforced by removing loose ledge rocks, flushing out cavities, and then mortaring or grouting the original rocks back into their original locations. Wunderlich, like other contractors, had trouble hiring enough masons. Even so, the masonry work done on this contract displays fine workmanship. In comparison with the Type 2a masonry guardwall built under other contracts, the Wunderlich masonry is more substantial and formal in appearance. The guardwalls have more uniform stone size, a larger average stone size, a greater regularity in stone shape, a larger proportion of stones of full-wall width, and a greater average length to height ratio for individual stones. Wunderlich, like Yonlick, lost money on the project.[205]

W. K. Trippet won the contract to build the two Snyder Creek bridges and the Avalanche Creek Bridge. The Snyder Creek bridges (on the main road and on the loop access road) are nearly identical. Both are single-span concrete-slab bridges with stone abutments and portals and masonry arch facades. Curbs, railing, and hand-laid riprap along the creek's banks were

included in the project. The Avalanche Creek Bridge has three spans, and it replaced a log bridge constructed in 1923 by Laux & Gardner. The rock for the bridges came from the cliffs near the Haystack Creek culvert (near Bird Woman Falls overlook). The sand and gravel was brought in from towns outside the park. Trippet also subcontracted to build large culverts and the horse trail underpass for Williams & Douglas and for Wunderlich. Trippet's camp was near the Avalanche Creek Bridge, and it included an office, bunkhouse, cookhouse, blacksmith shed, and warehouses.[206]

Figure 45. Snyder Creek bridge, 2000 photo.

Chris Yonlick of Seattle was also awarded a 1933-36 contract for work on the west side. It included constructing masonry retaining walls and guardwalls from a point about one mile west of Logan Creek up to Logan Pass to supplement those built under the 1925-28 Williams & Douglas contract. Yonlick opened up a quarry near Haystack Creek and later moved to one 400 feet west. The sand for the mortar came from a pit north of Coram. The contractor found the rock from both quarries brittle and difficult to work. He also found that there were not enough experienced masons available, forcing him to rebuild much of his newly completed masonry. The guardwall was much more difficult to build than the retaining wall because of the additional shaping required. During this project, traffic on the Sun Road was delayed approximately 25 minutes at the quarry and 10 minutes wherever the masons were working. The job was completed in 1936 after Yonlick became insolvent and his bonding company took over as his agent.[207]

2.3.9 East Side Reconstruction

The first contract for east-side reconstruction work was let in 1933 to contractor Archie R. Douglas. This covered the 7.1-mile segment from the St. Mary River to Dead Horse Point, and it included construction of a bridge over Roes Creek and some masonry retaining wall and guardwall. Stone for the masonry work came from excavations at the Golden Stairs under the same contract.[208]

By this time, the alignment of the roads in the St. Mary area had been under discussion for a number of years. When the east end of the Sun Road was first constructed in the 1920s, travelers turned off the Blackfeet Highway (Highway 89) onto a spur road to the St. Mary Chalets in order to access the Sun Road. In 1930, NPS Chief Landscape Architect Thomas Vint suggested that a primary junction between the Sun Road and the Blackfeet Highway that bypassed the St. Mary Chalets should be built.[209]

In 1934, the NPS and BPR let a contract for the realignment of the intersection of the Sun Road-Blackfeet Highway intersection at St. Mary, a project that also included the construction of new Sun Road bridges over the St. Mary River and Divide Creek. This work created the wye intersection at St. Mary that is still in use today. The Lawler Corporation of Butte, which was already working on another east-side contract, submitted the low bid. Their 60-person camp for this project was near the bridge, as was their stockpile of sand, gravel, and stone. The proposed wye in the road was outside the park boundaries, so the work was delayed while the NPS obtained the right-of-way and appropriation for that part of the work. As part of the project, the turnouts around the east-side entrance station were enclosed by wooden guardrail.[210]

Figure 46. St. Mary Bridge under construction, showing ring stone being placed. Note masonry nose on pier designed to deflect debris. (John Zoss, "Final Construction Report (1934-1935) on St. Mary's Riverÿ," 12, in "Development & Maintenance: Report; Situation" folder 6, box 116, GNPA)

The new St. Mary River Bridge replaced a utilitarian pony-truss span that was felt to conflict with the rustic design philosophies evidenced elsewhere on the Road. The 1934 bridge was built by highly-skilled teams of Italian stonemasons, as was much of the masonry guardwall elsewhere along the Road itself.

The sand and gravel for the project came from river bars located about 0.5 mile below the St. Mary Bridge site, and the rock was carefully selected for color, texture, and weathered faces from along the Road near Piegan Creek. The rock is a mix of buff limestone with individual green stones spread randomly throughout the walls, piers, and abutments. The contractor built the wooden falsework, laid the ringstones on the edges of the timber frame, and then poured the entire concrete slab floor in one 17.5-hour period. Crews finished the bridge in 1935 by constructing the railings, curb stones, and surfacing. On the upstream side, the piers have masonry nose cones ("cutwaters") to deflect ice and debris.[211]

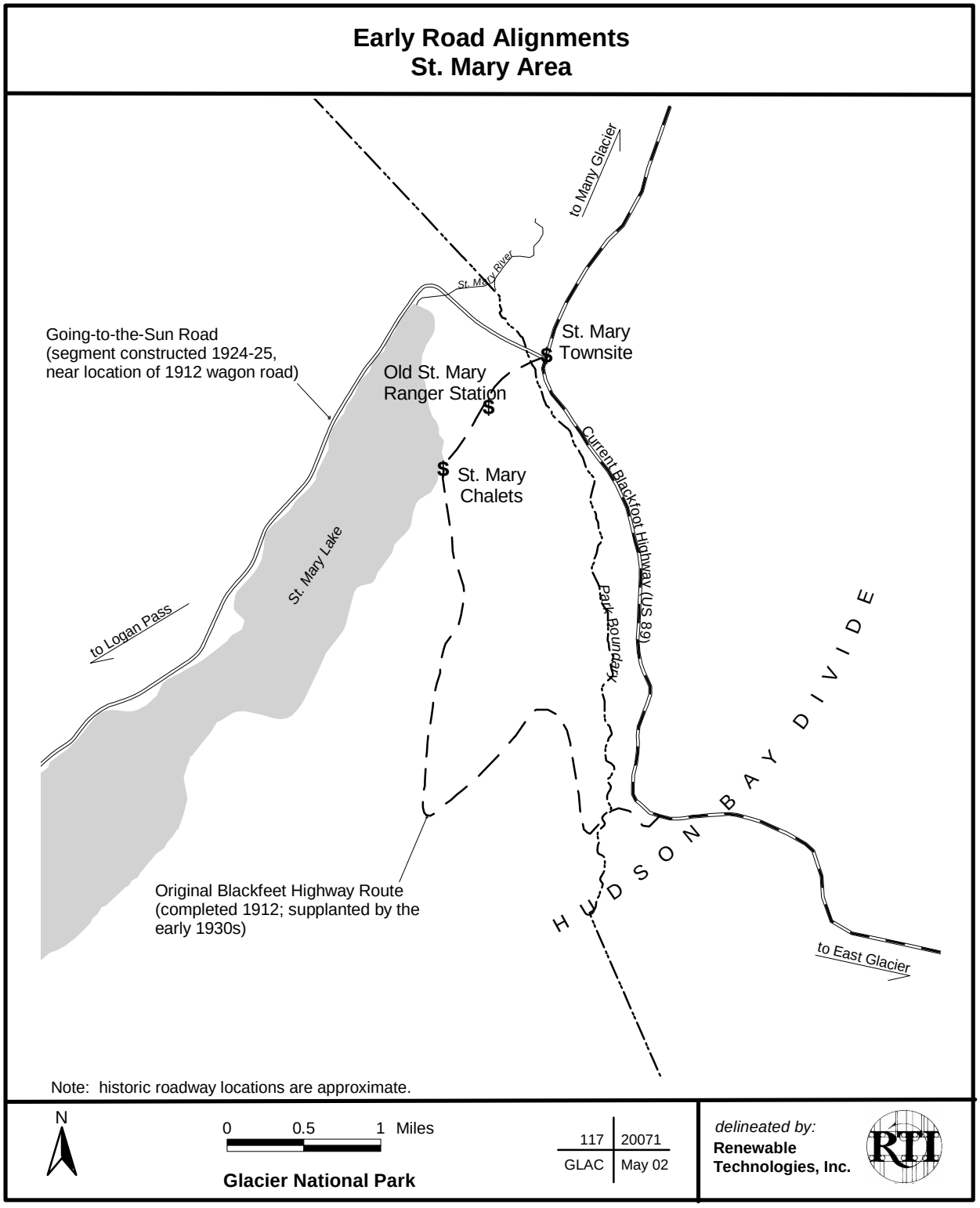

Figure 47. Sketch map showing the original location of the Blackfeet Highway in the St. Mary area.

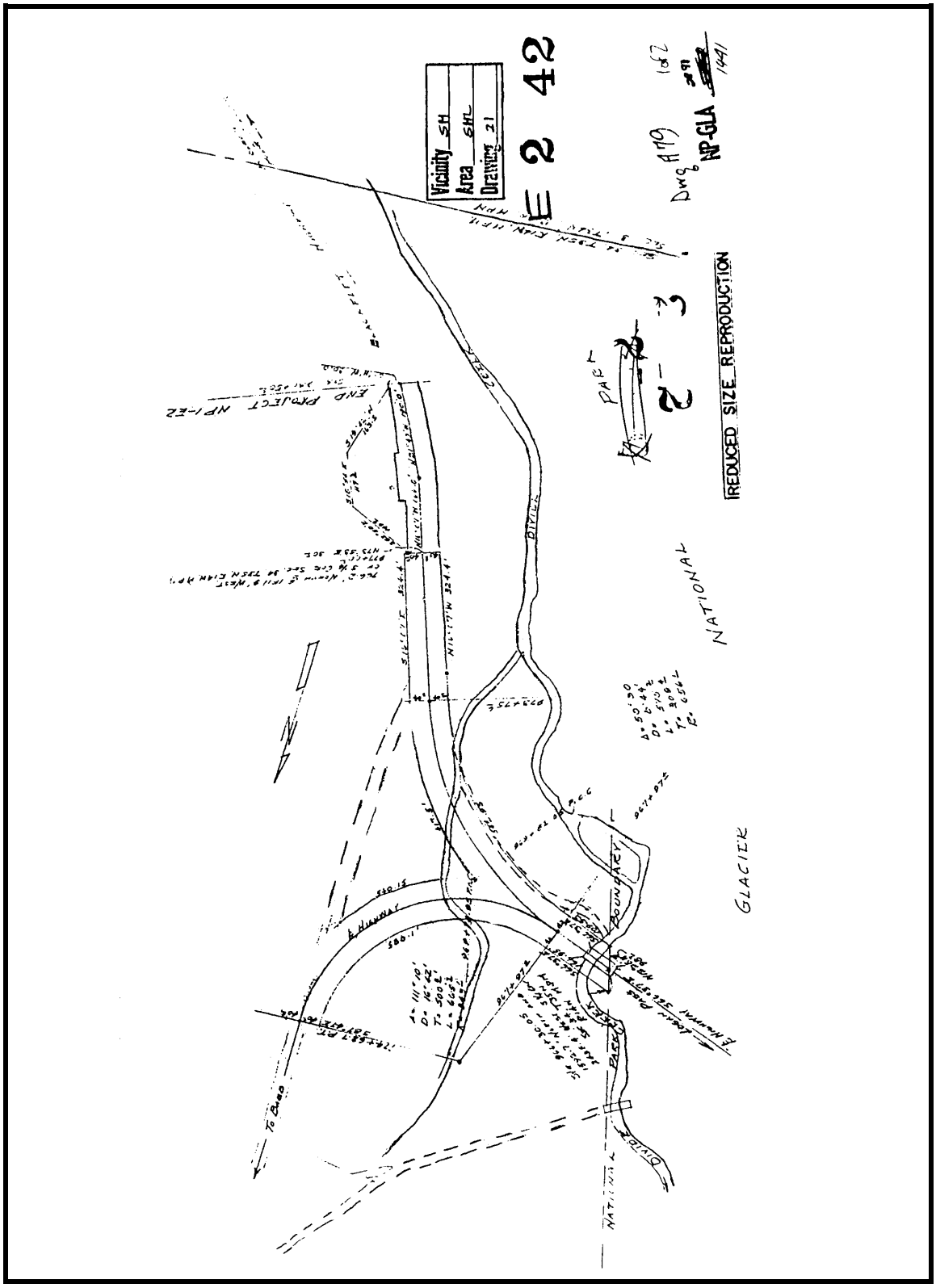

Figure 48. NPS map showing the wye intersection designed in 1934 at the St. Mary terminus of the Sun Road. The original (1912) road alignment is at far left. TIC drawing 291-1.

The Divide Creek Bridge was an unusual project on the Sun Road because half the bridge lies outside the park boundary. But, the design of the bridge conformed to the specifications of other bridges along the Road. In order to build the three-span bridge, the contractor had to use a gas shovel to change the channel of the stream 350 feet upstream and 300 feet downstream. He then poured the footings, built the falsework, installed steel reinforcing bars, and poured the slab. Then the workers completed the masonry and applied a crushed-rock surface to the bridge roadway. As part of this contract, Lawler also installed drainage pipes and Type 7 log guardrails.[212]

The Lawler contract on the east side included crushed-rock surfacing of the Road from Logan Pass to St. Mary, along with surfacing the parking areas at Logan Pass and Sun Point and the spur road to Sun Point. Some masonry retaining wall and guardwall was also built under this contract, probably including the curving guardwalls with matching stone curbs at Sun Point. Most of the guardwall was built on fills created by earlier grading projects, including a long stretch of guardwall above Siyeh Bend at the Piegan Creek crossing. The design standards for this work were the same as for the Yonlick contract. The contractor set up a 125-person camp at Roes Creek. Laborers lived in tents, and the supervisors and shovel operators lived in cabins. The first quarry selected for this contract by the Landscape Engineering division was located about halfway between Sun Point and Roes Creek. The Road gained a 30-foot parking area using material from this quarry, and the curve where the quarry was located was reduced.[213]

Much of the reconstruction work on the east side involved heavy rock work and blasting. NPS landscape architects were on-site frequently, and they wrapped vulnerable trees in burlap to protect them from the blasting. One shovel oiler recalls that the shovel operator was allowed to cast rock off the Road any place that was convenient, saying, "We would balance [a rock] on the end of the bucket and kick it over and watch it go banging down."[214]

NPS and BPR representatives continued to work closely with contractors doing the reconstruction work. They inspected the job sites frequently to make sure that the contract specifications were being met, including those related to protecting the scenery. Forest Farris, who worked for both A. R. Douglas and Tomlinson-Arkwright, remembers that the BPR engineers were "real fussy" about protecting the landscape. They restricted large blasts so that rocks would not fly into the lakes, but workers were allowed to drop large rocks over the side of the road. He remembers that all culverts had to be laid in place at a certain grade so that the water would flow at just the right rate. "I tell you, there was more measuring sticks out there than you can shake a stick at!" The BPR (Farris does not remember NPS landscape architects or engineers on-site) had men at rock quarry sites and at the scales where crushed rock was being quarried, and he felt they were quite "stiff-necked" in their inspections. The contractors, according to Farris, used choice words to describe the requirements imposed by the BPR. But, they had to comply.[215]

Farris recalls that A. V. Emery and others with the BPR selected the rock to be used in the masonry features based on color and texture. The rock usually was quarried from a cut along the Road. The stonemasons, too, were very particular about their rock. Most of the masons Farris worked with were immigrants from southern Europe who had learned their craft in their home country. Farris operated a mobile, gas-powered quarry crane. He routinely turned the rocks with the crane so the masons could inspect the seams in order to avoid putting in a day's work on a rock that ultimately would not be useable. He recalls, "Many a time you'd think you was going to wear a rock out turning it over for them."[216]

Laurence Staab worked on the Sun Road in the late 1920s or early 1930s. He recalled that one morning when he was plowing snow he "knocked the bark off 37 lodgepole pines, and knocked down a little fir." News of this incident reached the office of Montana senator Burton K. Wheeler in Washington, D. C. As a result, Staab had to return to the site to "patch" the trees and conceal the fir tree.[217]

By the end of the 1937 construction season, the entire Sun Road had a crushed-rock surface. The surfacing materials were taken from talus slopes within the park and were crushed on-site. On the Lake McDonald section, for example, the surfaces varied from four to twelve inches in depth, depending on the subgrade conditions. The roadbed was 22 feet wide all along the Road except for the ten-mile section west of Logan Pass, which had (and still has) more narrow sections. A typical ditch on the east side had a 24-30-inch rounded bottom, was 5 inches deep, and had bituminous surfacing.[218]

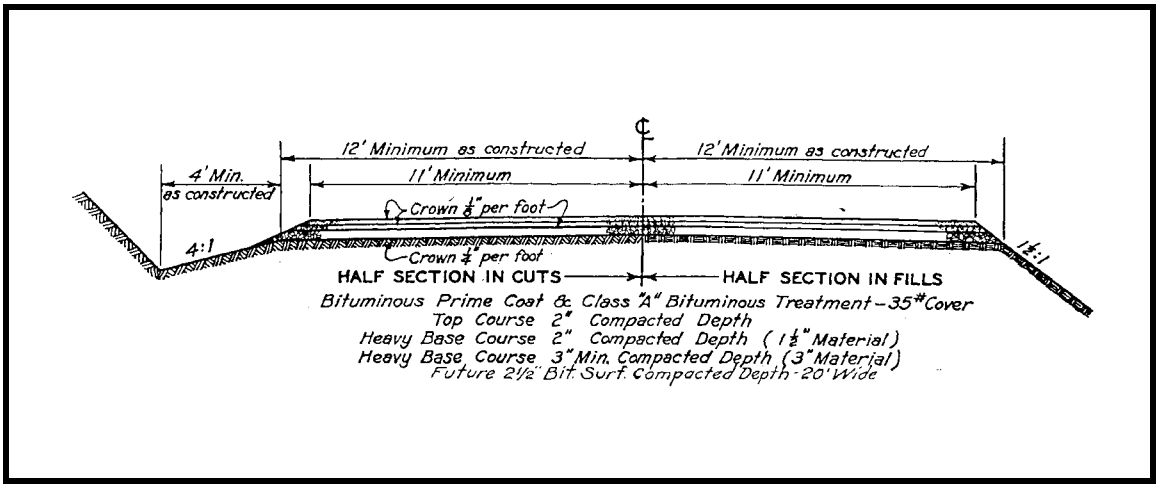

Figure 49. Typical surfacing and road profile, 1937. TIC drawing 9163.

The next step in road improvement was paving the Road with a bituminous treated surface with a chip-seal cover, which was accomplished by several contracts beginning in 1938 and ending in 1955. The first of these also included slope stabilization and drainage improvements. The first contract, awarded to Carl Nyberg of Spokane, paved 21.4 miles of

the Road from West Glacier to the Logan Creek area (1938-39). This contract resulted in a chip-seal bituminous surfacing comprised of a thin layer of hot liquid asphalt followed by a layer of small crushed rock, then another light shot of hot liquid asphalt as a seal. This was covered with a thin layer of rock chips, and then the whole mixture was rolled flat to ¾ inch.

The material was taken from slopes along the Road and was crushed on-site. The first 1.6 miles of this contract had a 26-foot roadbed, the widest on the road at that time. The second contract, awarded to S. Birch & Sons, paved 18.1 miles from Logan Pass to St. Mary in 1939 and 1940, with a minimum 20-foot roadway. No work of this kind was done during World War II.[219]

2.3.10 Reconstruction Work, 1942-55

World War II and a subsequent shortage of funds led to almost a decade during which no significant work on the Road was completed except for routine maintenance. The second phase of reconstruction took place under one contract between the years 1950 and 1952 and then under a "final paving" contract in 1955.

Back in 1933, Frank Kittredge had noted that the standard width that was adopted when the Road was built allowed for additional width to be obtained by paving the ditch and providing a curb on both sides of the road to keep cars away from the cliffs and guardwalls. In the early 1940s, the BPR recommended widening the segment of the Sun Road between the Logan Creek area and Logan Pass to 24 feet throughout. The engineers felt this could be done by replacing masonry guardwalls with railings bolted into concrete on top of retaining walls and with the placement of a cast concrete curb on the outside of the road.[220]

Planning for improvements on the Logan Pass section resumed in 1948. That year, a review of the work still required on the western ascent to Logan Pass identified the need for paving, masonry work, and several additional items. These included the construction of a parking area at the "algal colony" geologic site near the West Side Tunnel, restoring the water supply line at Road Camp 9 (this was the construction camp near Bird Woman Falls overlook known as Camp 5 during the Williams & Douglas contract), installing metal culvert pipes for drainage, and repairing damage to an existing wire net and brush mat slope protection. In areas where the Road was benched into the cliff (precluding widening with fill), the 26-inch inside ditch was filled and paved in order to widen the Road. In areas with fill embankments, material was cast over the side to increase the width of the roadway.[221]

Morrison-Knudsen of Seattle won a 1950-52 contract to improve the drainage on the remaining 10 miles on the west side from Logan Creek up to Logan Pass. They also built and repaired retaining walls and guardwalls. The masonry work proved particularly difficult. The contract called for a new retaining wall at the Weeping Wall plus 150 cubic yards of masonry guardwall, including repair work, treating the ends of existing walls that would abut new removable guardrail, and new construction. Stonecutters and masons were flown in to

the project from all over the country. A problem developed in that the rock obtained from the quarry at the Bird Woman Falls overlook often broke in two, sometimes when the mason was just about to finish shaping the stone. Engineers at the time felt that this was probably due to cracks in the limestone resulting from "overshooting" the quarry (using excessive explosive), making the stone unworkable. Until the 1940s, Sun Road contracts had called for "approved stones" but had never clearly prohibited the use of stone from outside the park. By the time of this contract, a clause stated that the stone should "preferably" be native. The contractor tried unsuccessfully to find matching stone outside the park. Eventually, the NPS arranged to import a dark gray granite from Minnesota to use in the Type 1 guardwalls, with a transition zone between the two types of rock. One retaining wall constructed of this Minnesota granite is located near the West Side Tunnel.[222]

Morrison-Knudsen also installed 1,600 linear feet of removable log guardrail along the Road in locations prone to avalanches. This guardrail was constructed of 8-foot logs that were 14 to 20 inches in diameter placed on two 3-foot-long saddle "feet" that were 12 inches in diameter. Each log was given a light coloring that was close to natural in appearance. The contractor had to send some of his own employees to fabricate the sections at the log treatment plant in Drummond, Montana. But when installed, according to the BPR engineer on the project, they did not have a very good appearance. Some of this sturdy log guardrail lasted into the 1970s, but none exists on the Road today.[223]

The final paving contract for the Sun Road, completed by contractor McLaughlin, Inc., in the fall of 1955, included hot plant mix paving of the 10 miles between Logan Creek and Logan Pass plus drainage improvement, high scaling of dangerous rock cliffs, and road widening. This work marked the end of the series of reconstruction projects of the Sun Road that had been envisioned since at least the early 1930s. By this time, the estimated cost of the Road came in at $4.25 million. The Road was now completely paved in asphalt; its width in all but the Logan Pass section was at least 22 feet, and the masonry work – retaining walls, guardwalls, bridges, culvert headwalls – was complete. Removable guardrail had been installed in the areas most vulnerable to avalanches and rockfalls.[224]

2.3.11 Reconstruction and Rehabilitation of the Sun Road Since the 1950s

Reconstruction and rehabilitation projects on the Sun Road from the 1950s until the 1980s were relatively limited in scope. This period opened with the "Mission 66" era (1956-66), a nationwide program designed to improve infrastructure and visitor facilities at NPS units. At Glacier, Mission 66 projects included the construction of the Logan Pass and St. Mary Visitor Centers; campground construction and improvement; new comfort stations at camping and picnic areas; and other work. The roadway itself, however, was relatively little-impacted by Mission 66 projects. (Mission 66 and subsequent developments are outside the recognized period of historic significance for the Going-to-the-Sun Road, and the historic significance of these resources has not been fully established.)

Northwest Montana experienced a major flood in June of 1964. Lake McDonald peaked at eight feet above normal high level, and the St. Mary area was flooded. Park Headquarters at West Glacier was isolated after the 1938 bridge over the Middle Fork collapsed and the 1920 bridge upstream lost its decking. The Roes Creek bridge was destroyed. The total damage to the Sun Road reached $2.25 million. The destruction was particularly heavy along upper McDonald Creek, requiring some sections of the road in that area to be wholly reconstructed 1965. (These reconstructions included a 28-foot roadway top width, wider than the 22 to 26 foot roadway that had previously existed.) The 1964 flooding also demolished the 1937 Middle Fork bridge at West Glacier, forcing the Park Service to quickly repair the old Belton Bridge and temporarily reopen the original entrance roadway through Park Headquarters. (This historic route reverted to pedestrian use when a replacement West Glacier bridge was completed in 1966.) Other major floods in 1975 and 1995 caused additional, but less significant, damage to the Sun Road, forcing other rounds of temporary closures and hasty repairs.

Figure 50. Repairing a washout on the Sun Road near West Side Tunnel, 1964. Photo by John J. Palmer, GNPA #3811.

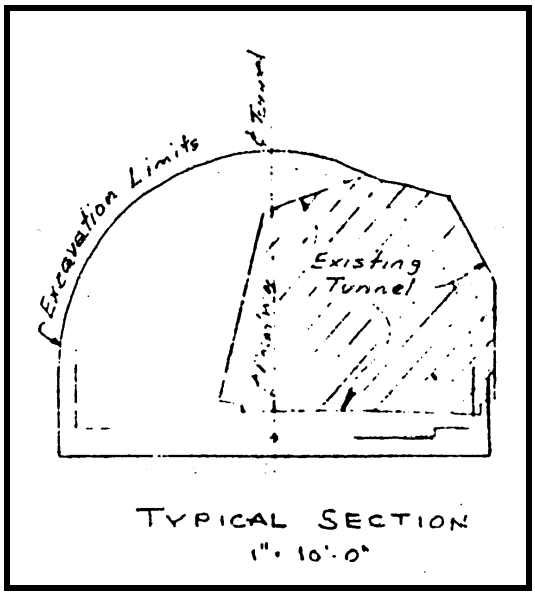

Figure 51. Typical section of West Side Tunnel, showing existing tunnel and inside face of tunnel lining after 1966-67 work. TIC drawing 351.

One major project on the west side of the Road took place over the winter of 1966-67. The West Side Tunnel was significantly enlarged, straightened, and lined with concrete. The work was done to eliminate "the worst bottleneck and safety hazard" on the Road, but it significantly damaged the historic character of the tunnel.[225]

In the mid-1960s, the NPS assembled a team to prepare formal guidelines for park roads. The 1967 *Park Roads Standards* established an ethic for road design, emphasizing the blending of roads with the natural setting and controlling soil erosion. The standards included familiar recommendations such as rounding cut-and-fill slopes and then seeding, fertilizing, and mulching to encourage revegetation. Clearing timber was to be selective cutting only, to allow a naturalistic treeline along the road. In some ways, the standards represented a reaction to the bold modernity and the "use over preservation" philosophy of the Mission 66 program. The standards also acknowledged the need to manage visitor use of park roads. They suggested that the NPS consider reducing speed limits, convert some roads to one-way, limit automobile use in certain areas, and exclude larger vehicles rather than building roads to higher standards.[226] These techniques for managing visitor use of park roads became important in Glacier soon after they were formulated.

In 1982, Congress recognized the need to rehabilitate and upgrade the deteriorating road system in national parks and on national parkways and passed the Surface Transportation Assistance Act. This act established a Federal Lands Highways Program that made Highway Trust Fund money available for constructing and rehabilitating park roads. The act allowed Glacier to obtain federal funding for road rehabilitation projects rather than having to fund such work from the park's general operating budget. The park roads standards developed in 1967 were revised and expanded in 1984 in preparation for the massive park roads work funded under this act. The new standards retained the basic philosophy and principles of the 1967 version.[227]

The Sun Road was and continues to be eligible for rehabilitation under this program. The FHWA and the NPS signed a new interagency agreement in 1983. Under this agreement, the role of the NPS was defined as developing park road design, construction, maintenance, and safety standards and providing architectural and landscape architecture services. The FHWA is responsible for planning, assistance, research, engineering studies, traffic engineering services, project development, and contract administration.[228]

In 1984, the FHWA prepared a Road Rehabilitation Planning Study that proposed corrective actions and a range of alternatives for Glacier's roads. It identified over $50 million in road repair and rehabilitation needs to maintain the park's road system, the majority on the Sun Road. By the end of the decade, the first substantive federal funding was received to begin addressing that backlog, and a series of significant rehabilitation projects took place along the road in the years since. Some $28,000,000 in repair and rehabilitation work on the Road has been undertaken since 1984.[229]

As outlined in the table on the following page, some twenty-four miles of the Sun Road were improved under FHWA contracts in the 1990s, for a total cost of approximately $18 million. These projects saw the reaffirmation of a number of design standards for the Road based on historic precedents and plans. The first contract – between Apgar and Lake McDonald Lodge – took place from 1990 to 1992. Work completed on the segment included subgrade improvements and repaving the segment to provide a consistent 22-foot-wide travel lane.

Major Reconstruction Projects on the Going-to-the-Sun Road, 1990-2000.

1. Lake McDonald Segment (Apgar-Lake McDonald Lodge)
   Length: 10 miles
   Contractor: Nelcon (Missoula, Montana)
   Cost: $ 3,900,000
   Construction Period: October 1990 - August 1992

2. St. Mary Segment (from St. Mary westward)
   Length: 4.17 miles
   Contractor: Nelcon (Missoula, Montana)
   Cost: $ 3,500,000
   Construction Period: October 1991 - September 1993

3. Rising Sun Segment (from endpoint of project #2 to Rising Sun)
   Length: 1.5 miles
   Contractor: A-1 Paving (Kalispell, Montana)
   Cost: $ 2,700,000
   Construction Period: April 1994 - July 1995

4. Logan Pass Segment (Logan Pass to below Oberlin Bend)
   Length: 0.75 miles
   Contractor: Nelcon (Missoula, Montana)
   Cost: $ 2,900,000
   Construction Period: July 1995 - October 1996

5. Avalanche Segment (below Avalanche, along upper McDonald Creek)
   Length: 4.5 miles
   Contractor: A-1 Paving (Kalispell, Montana)
   Cost: $ 3,200,000
   Construction Period: June 1998 - October 1999

Note: Additional related contracts during this period included flood repair work (near the West Side Tunnel and elsewhere) and various retaining wall repair/stabilization projects along the west ascent to Logan Pass. The southern portion of the Camas Road was also reconstructed (1997-98).

source: landscape architect's office, Glacier National Park

Figure 52. Major Reconstruction Projects on the Going-to-the-Sun Road, 1990-2000.

Culverts were replaced, with the original stone headwalls reassembled around the new pipes. Twenty of the 41 turnouts on the road segment were removed, mostly small unplanned pullouts which had appeared over time in the course of road maintenance and use. Remaining turnouts were formalized and improved with log curbing and timber guardrail based on historic "Type 7" designs (see Section 2.3.12, below). Other pullouts were formally designated as "slow traffic" turnouts.[230]

The St. Mary contract (1991-93) was similar in design and scope to the work completed earlier along Lake McDonald. Subgrade deficiencies were corrected, a consistent 22-foot paved roadway width was confirmed, minor turnouts were removed and others improved, and slow traffic pullouts were established. Detailing at turnouts included both Type 7 timber guardrail, and three small sections of new rubblestone wall. The project also saw the rehabilitation of the historic St. Mary River bridge. Work at Rising Sun (1994-95) emphasized roadway and structure improvements in and near the Rising Sun concession area. The main parking lot was reconfigured and improved, Type 7 guardrail was installed, and log guardrails were placed on the upper Roes Creek bridge.[231]

Attention shifted to the Alpine portion of the road in 1995-96, with the rehabilitation of the Logan Pass parking lot and of the Sun Road from the Pass to just below Oberlin Bend. This project, the most significant rehabilitation effort to date on the Road's Alpine section, included grading and paving work, drainage improvements, and stone guardwall and retaining wall repair and reconstruction. The guardwall work near Oberlin Bend included construction of the first "cavity-fill" wall on the road. This modern design utilizes a central concrete stem surrounded by stone facing, creating a more-stable wall that emulates the historic "Type 2a" wall design. Visitor parking was a primary focus of this contract: the Logan pass parking area was reconfigured for greater efficiency, the Oberlin Bend pullout/parking area was formalized, and opportunities for informal roadside parking were eliminated. A new retaining wall, faced with stone, was added behind the Oberlin Bend pullout, and Type 7 log guardrail was also added to the area.[232]

The summers of 1998 and 1999 saw the rehabilitation of the Sun Road between Lake McDonald Lodge and Avalanche. Design precepts similar to those used on the road's other 1990s-era projects were also utilized along this segment. Pullouts and viewing areas along upper McDonald Creek were reconfigured and formalized; new stone guardwall and Type 7 log guardrail were utilized at these locations. Additional Type 7 guardrail was installed near Avalanche to discourage informal roadside parking. Together, this series of projects has seen the rehabilitation of over 24 miles of roadway; much remains to be done, however, particularly on the road's upper reaches.[233]

During the 1980s, the people involved in planning for the Sun Road included representatives of Glacier (maintenance, natural resources, administration, landscape architects), the FHWA, and the NPS regional office. Today, after a nationwide reorganization of the NPS, the regional office and the Denver Service Center no longer review designs related to the Road, but the park divisions still do. The park's landscape architect has the ability to inspect

projects and recommend acceptance to the park superintendent. If there are any problems, park staff has to go through the FHWA rather than deal with the contractor directly, because the FHWA administers the contracts.[234]

The significance of park roads as designed historic landscapes began to be recognized in the 1980s. At the same time, safety considerations grew in importance in park road design and rehabilitation. This led to conflicts in various national parks, including Glacier, relating to concerns about safety versus the preservation of cultural and scenic values.[235]

The FHWA and the NPS have disagreed in recent years on particular safety issues. The FHWA was concerned, for example, that the existing guardwalls were not high enough to meet federal crash standards. A team of NPS and FHWA representatives agreed to a compromise: a concrete cavity-fill wall built to the historic heights of 18 and 24 inches – lower than current national standards for such walls, but more in keeping with historic Sun Road designs. Minimum requirements for length and height in order to determine which sections of wall must be replaced with cavity-fill walls and which may be replaced with ashlar or rubble masonry walls have not, however, been established. Another recent issue that has not yet been decided is whether or not cavity-fill guardwall may be placed on top of historic masonry retaining walls. Cavity-fill guardwalls continue to be built along the Road on an as-needed basis as required by specific projects.[236]

Many of the rails on bridges built in the 1920s and 1930s along the Sun Road also do not meet present standards. An important agreement was reached recently as a result of a debate between the NPS and the FHWA over the rail on the upper Roes Creek Bridge (within the Rising Sun concession complex). The FHWA preferred steel-backed rail to the proposed log rail. In the end, however, the FHWA agreed that crash testing standards were not based on the speeds, angles of impact, and sizes of vehicle that are typical on the Sun Road, and log rail was allowed.[237]

A 1998 FHWA evaluation of the retaining walls along the Sun Road listed serious structural problems at 76 of the 126 walls. The NPS secured funding for some retaining wall repair; this masonry work has been contracted out and has been on-going since that time. Although some two miles of masonry guardwalls also need to be reconstructed, this work has been deferred because it is seen as aesthetic rather than structural in nature.[238]

A Sampler of Recent Planning Efforts Related to the Sun Road

- *Glacier transportation plan (1990)*
- *design guidelines for the Sun Road (1990 and subsequent years)*
- *roadside maintenance guideline for Glacier (1993)*
- *Sun Road retaining wall inventory (1994 with subsequent updates)*
- *cultural resource plan for the Sun Road (1995 draft)*
- *a Sun Road reconnaissance study (1997 draft)*
- *general management plan/environmental impact statement for Glacier (1999)*
- *cultural landscape inventory of the Sun Road (2001)*

As of 2002, approximately 30 miles of the Sun Road still needs to be reconstructed, including nearly all of the 11-mile section between the West Side Tunnel and Siyeh Bend. In 1999, Congress appropriated $1 million to conduct additional analysis of the proposed reconstruction of the Sun Road. The Secretary of the Interior appointed a federal Citizens Advisory Committee to advise the Park Service in the development of alternatives for reconstruction of the Road. The engineering firm MK Centennial (now known as the Washington Infrastructure Group) was hired to conduct further studies of the engineering, socioeconomic, cultural resource, transportation, and visitor use issues related to the reconstruction of the Sun Road. Until this work is completed, the NPS is continuing to contract out critical road reconstruction as necessary to address the most serious structural problems.[239]

2.3.12 Engineering and Traffic Structures Along the Sun Road

Masonry Guardwalls

The masonry engineering features of the Sun Road – its guardwalls, retaining walls, bridges, and culvert headwalls – strongly contribute to the visual and historic identity of the route. Even features that are often invisible to automobile travelers, such as retaining walls, were constructed with great care for appearances. These features were designed to harmonize with the Road by using native materials such as rock salvaged from excavation and by blending with the landform as much as possible. When the Williams & Douglas contract was signed in 1925, there was little precedent for this sort of work on park roads. The original designs were modified in the field, particularly on the Williams & Douglas contract on the west side, which was the first to include many masonry features. NPS landscape architects experimented and modified designs as needed. By 1928, many of the designs developed on the Sun Road appeared in specifications for other NPS contracts and on standardized plans and drawings such as for bridges and guardwalls. For example, the basic guardwall design that was developed on-site on the west side of Logan Pass during the summer of 1927 became a standard NPS design for park roads.[240]

Other park roads around the nation constructed similar masonry guardwalls and other features along their roads in the 1920s and 1930s. Among the NPS roadways with masonry engineering features utilizing the overall designs found on the Sun Road are the main road in Colorado National Monument and the Generals Highway in Sequoia National Park.[241]

Landscape architects and BPR engineers approved the sites of rock-crushing operations, quarries, and borrow pits along the Road. Most of the stone used in the masonry structures came from rock excavated during construction or from a suitable quarry along the Road. All the stone that was used was from sedimentary formations; diorite was not used, even in segments of the Road near that igneous sill. The rock used in the masonry work over the years included cream or buff Altyn limestone, green Appekunny argillite, and red Grinnell argillite, and gray or blue-gray weathered to buff limestone of the Helena (Siyeh) formation. During the 1930s, much of the rock used on west-side masonry work came from a quarry in

the Helena formation at Bird Woman Falls overlook near Haystack Creek, giving it a more uniform appearance in terms of color and texture than is found in the 1927-28 structures. This quarry was almost twenty miles from some construction sites. During the Lawler contract on the east side (1933-34), much of the rock came from a quarry near Roes Creek. Lawler employees also screened gravel from a source near the foot of St. Mary Lake.[242]

NPS landscape architects kept a vigilant eye on the construction of the guardwalls and retaining walls along the Sun Road. In the early work on the west side, in 1927, two short sections of guardwall with 18-inch-square parapets were completed. Landscape architect Ernest Davidson, "against almost unanimous objection," required them to be changed to have low, broad parapets instead. Once a few of the new style of walls had been completed, reported Davidson, almost everyone approved of the change. Davidson reported that the construction crews were not accustomed to "working for appearances" and required constant supervision and patient training. Many parts of walls were condemned because of their unsatisfactory appearance and had to be rebuilt. For example, masons wanted to use smaller stones for retaining walls; on the first wall, they created an obvious junction line between guardwall and retaining wall (not done in future walls); and they sometimes wanted to create "bizzare effects" such as a red arch ring surrounded by green rather than mixing the available colors of rock randomly, or "as they occur in nature."[243]

Two primary types of guardwall were constructed on the Sun Road during the 1920s and 1930s. The earlier type was rubble construction with a random top course, characterized by a wide variety in stone size, shape, and color and by the random alignment of the major axes of the stones ("Cement Rubble Masonry Type 2"). The wall was 18 inches high and wide, with 6-inch-high parapets that were 3.5 to 5 feet long with a spacing of 9 to 12 feet on center between each parapet. The outside batter was 1/10:1, and the inside batter was vertical. The stones were mixed sizes, including small irregular stones and thin "flagstones" that were placed on both vertical and horizontal surfaces like a masonry veneer. Williams & Douglas built about 11,000 feet of this style of guardwall on the

Figure 53. Glacier Park Transportation Company bus on west side of the Sun Road. Note the rubble masonry (Type 2) guardwall with short, blocky parapets. Photo by T. J. Hileman, GNPA #8101.

west side. The second (Type 2a), of which about 27,000 linear feet were built, had similar typical dimensions to Type 2, but its top course had transverse but no longitudinal joints. The lack of longitudinal joints reflected the specification that all stones span the full 18-inch width of the wall.

This type was quite a bit more difficult to build because it required significantly more sizing and shaping of the ashlar stones, but it was felt to blend in better with the setting. Type 2a guardwall was built in the area between the Big Drift and the end of the cliffs below the East Side Tunnel, as well as in gaps between the 1925-28 wall projects on the west side. Although different sources of stone were used by the three contractors who built these guardwalls, the stone is similar in appearance.[244]

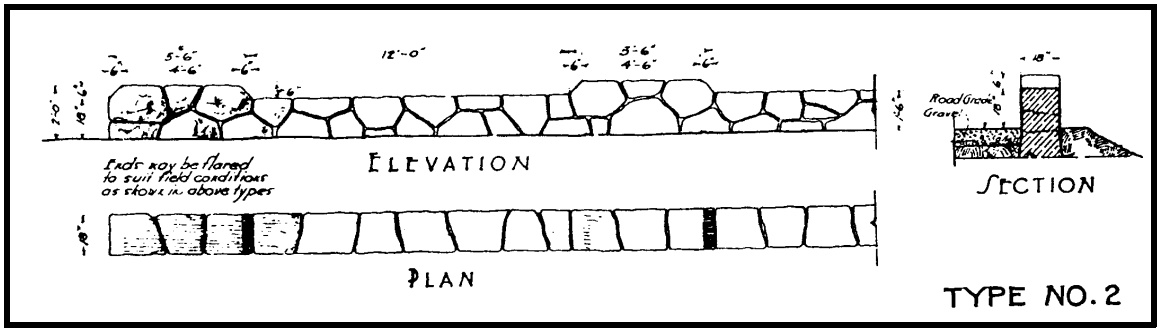

Figure 54. Standard design for masonry guardwall as used along the Sun Road, 1931. Although labeled as "Type 2," the drawing actually represents Glacier's Type 2a wall. TIC drawing 9390, no. 2.

Under the Williams & Douglas contract, masonry guardwall was constructed only on top of sections of retaining wall and where the edge of the road dropped off in a sheer precipice. These segments of guardwall thus had firm footings. When placed on top of retaining walls, they were designed to appear integral with the underlying wall. Much of the guardwall meanders along the edge of the road, blending well with the landscape and providing small parking areas. Much of the guardwall built in later years, however, had more of a linear alignment. A particularly fine example of masonry guardwalls was at the Loop parking and overlook areas (some of this masonry work no longer exists). The gracefully curved guardwalls and an ashlar stone stairway with stone balustrades were well-crafted and were quite noticeable at this popular stopping point on the road. The masonry work at the Loop was entirely constructed by one stonemason who requested that he be allowed to do all the work himself.[245]

The 1929 contract documents for the Colonial contract on the east side of the Sun Road listed many requirements aimed at improving the aesthetics of the masonry work along the Road. These had evolved during the work on the west side of Logan Pass. The guardwall specifications (Type 2a wall) required ranges of dimensions, including ratios of length to height; barred the nesting or bunching of rocks of the same size, shape, or color; required

the use of extra-large stones at all corners and of large stones at the base of walls; specified that mortar joints should be at least 1 inch wide and raked to a depth of at least 1 inch; prohibited any continuous joint between retaining walls and guardwalls; provided for weep holes (drainage openings) in the walls; required the laying of stones in courses with the major axis horizontal and so that no four corners were contiguous (giving a random, irregular appearance); prohibited longitudinal joints in the top courses; specified that parapet dimensions be 3 feet 6 inches in length and that the distance between parapets be 12 feet; stated that the use of weathered rocks covered with moss, lichens, or traces of color was preferable for exposed surfaces; and required that all pipe culverts have masonry headwalls on the upstream ends and on the downstream ends as designated by the plans or the engineer.[246]

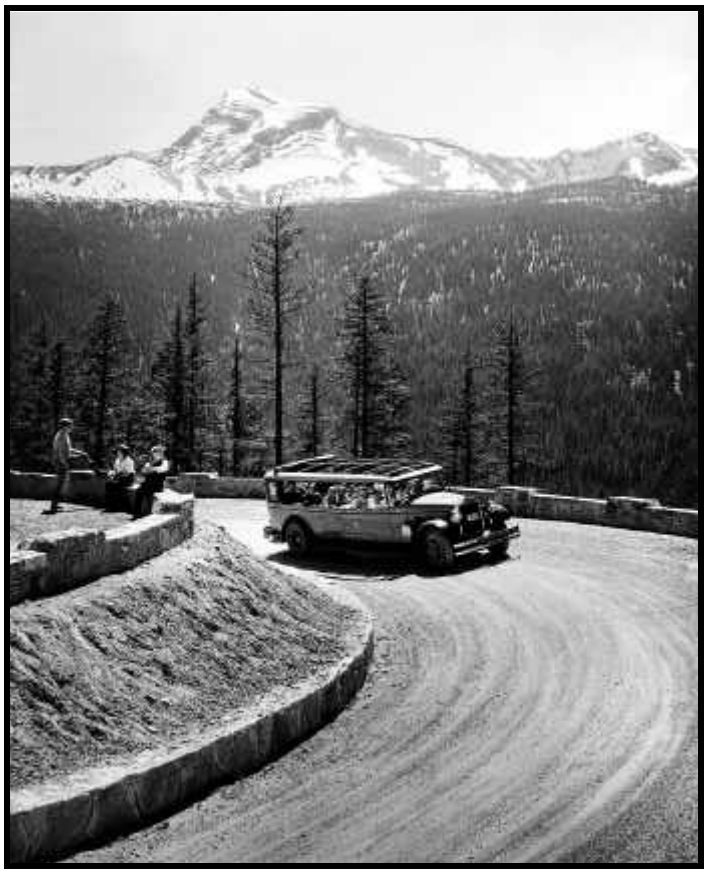

Figure 55. Bus and visitors at the Loop soon after its construction, 1929. Heaven's Peak is in background. GNPA photo #3937.

In 1933, six years after the first masonry guardwalls had been constructed on the west side of the Sun Road, plans were drawn up for constructing additional retaining walls and guardwalls. Some of the new guardwalls were built onto the ends of walls that had been built during the late 1920s. Guardwall was also specified, however, for areas with no existing retaining walls. Such walls would be placed on earth fill, despite Frank Kittredge's concern about the cutslopes not yet being stabilized nor the embankments fully settled. Superintendent Scoyen insisted that the new guardwalls be masonry guardwalls rather than log guardrail or isolated guard rocks, as had been suggested by the BPR. In the end, 4,000 cubic yards of additional masonry structures were built during the reconstruction work between 1934 and 1936.[247]

The last time the Type 2a masonry guardwall was specified in a the Sun Road contract was for the 1939-40 Birch & Sons contract for reconstruction work. This contract included a small amount of guardwall as a protective boundary marker at a parking area east of Baring Creek.[248]

Figure 56. Workers constructing guardwalls along the Sun Road, July 1934. GNPA photo #3275.

Changes in approved guardwall design for the Sun Road occurred in the years immediately following World War II. The successor to the BPR, the Public Roads Administration (PRA), viewed masonry guardwalls as too expensive for park roads. By that time, too, Glacier's masonry guardwalls did not conform with current design principles; the PRA felt they should be at least 2 feet high to be effective, but the ones in Glacier were only 1.5 feet high. A new style (Type 1) was approved for the Sun Road that lacked the characteristic parapets of types 2 and 2a.[249]

Wood Guardrails / Barrier Rocks

Since the early years of NPS landscape design, the agency's planners and engineers have utilized designs for wooden guardrails concurrently with plans for both stone guardwalls, with specific usage depending on both the park and the location. In 1928, Thomas Vint issued standardized designs for six types of stone guardwalls and five types of wood-and-log guardrails for park roads. New drawings replaced them a year later with designs for six stone guardwalls and seven log or wood guardrails. These were based on successful designs developed in the 1920s for the Sun Road and other roads. Irregularity, randomness, and the use of parapets to break the linearity of the rock wall dominated the designs. The various configurations provided options for different field conditions, uses, and needs. Removable guardrail was installed at the edge of the roadway in areas prone to snow slides, and it was removed each winter. The first design used short lengths of logs resting on log saddles.[250]

In 1934, Frank Kittredge suggested that temporary post-and-cable guardrails be used on the west side of the Sun Road. He was concerned that some of the fills might still be subject to settling, so he did not want masonry guardwall built on these unstable fills. He also felt that this type of guardrail would be suitable for places where the Road would later be widened or where slides often destroyed guardwall.[251]

About 1,600 linear feet of Type 7 log guardrail was installed on the Road for the first time along the St. Mary section of the Sun Road during the 1934-35 Lawler contract. This was the first time this type of log rail was used in Glacier. A lesser amount (782 linear feet) was constructed on the west-side Wunderlich contract (1936-37), in places where the road was not cut out of rock. Type 2a masonry guardwall was used instead of log guardrail in places with precipitous drops into Upper McDonald Creek.[252]

Figure 57. Boulders used as guardrail on the east side of the Sun Road, 1939. Photo by Solberg, GNPA #1835.

The idea had evolved by this time that when solid rock cuts required guardwalls built on a rock base, then the Type 2a masonry guardwall should be used, but the log guardrail was acceptable in other locations. The NPS was trying to match materials to those available at the site, with the exception that masonry wall should be used when it might provide an added sense of security to drivers on sections with steep drop-offs. The log guardrail was not installed until the engineers felt that the embankments had stabilized.[253]

In 1948, the PRA asked NPS planners to consider substituting a removable type of guardrail for the masonry guardwall sections that had to be replaced. Although Superintendent Emmert asked the Landscape Engineering division for a design for a removable guardrail, the NPS did not support constructing large amounts of this guardrail. Park planners wanted new construction to continue to be masonry (the new Type 1) except in heavy avalanche zones or where short sections were needed to bridge gaps in existing structures that needed drainage. Park staff also insisted that removable guardrail made of logs; they did not want to use the Flexbeam steel rail with concrete posts favored by the PRA because of lower costs. The PRA agreed to the use of the more expensive log guardrails for Glacier.[254]

Another alternative to masonry guardwall was the use of barrier rocks along the outside edge of the Road. A 1938 drawing specified that these "isolated curb stones" should be weathered, not rounded, quarried, and half-buried, with a 3.5-foot minimum spacing. Barrier-rock guardrail was installed, for example, at a pullout on the east side of Siyeh Bend.[255]

Figure 58. Masonry retaining wall under construction immediately west of East Side Tunnel, ca. 1932. Note the crane used to maneuver rocks. GNPA photo # 1871.

Retaining Walls

The criteria for retaining walls, constructed to hold the Road to the mountainside, included the principle that they should present a massive appearance. Workers were instructed to place stones as large as could be handled in the dry-laid, battered walls. On some sections, workers used a derrick rig to place large stones. To provide stability, most retaining walls were built with a triangular cross-section where the base was equal to one-half the height of the wall. The walls typically sloped with a rise-to-run ratio of 10:1 on the exterior and a ratio of 4:1 on the interior. Some of the retaining walls had a large, segmental half-arch opening near the upper end of the structure. Such an opening served as an outlet portal for a bridge or culvert and for aesthetics.[256]

During the Williams & Douglas contract, a much larger quantity of retaining walls – over 7,200 linear feet - was built on the west side of Logan Pass than had been estimated prior to construction. This was because the side-casting of thousands of cubic yards of excavated material left the contractor short of fill material with which to build embankments in gulches. Retaining walls were therefore built in lieu of hauling fill in for embankments.[257]

Among the largest and most visible retaining walls on the Road is the one at the Golden Stairs, built by A. R. Douglas crews above the shore of St. Mary Lake. The buff-colored limestone in the wall came from the blasting work necessary to widen the roadway as part of the contract. The wall is 550 feet long and 20 or 30 feet high. Douglas used a crane converted from a power shovel to help move the rocks into place.[258]

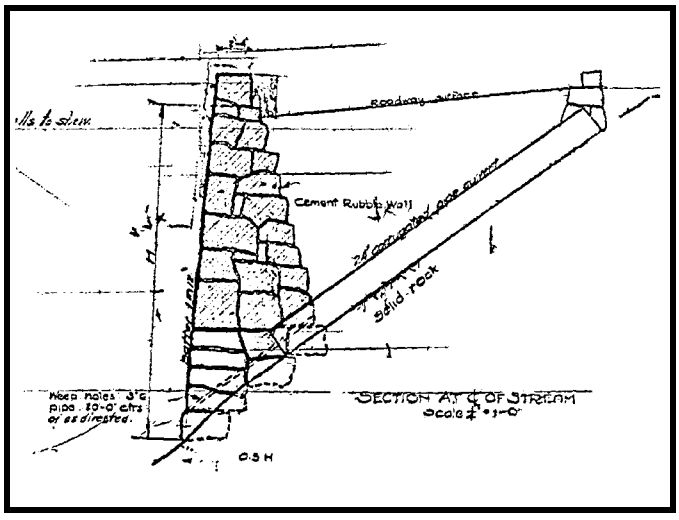

Figure 59. Typical masonry retaining wall design as used on the west approach to Logan Pass. TIC drawing 36, no. 5.

Bridges

By the 1920s, bridges along roads were a special concern within the Landscape Engineering division of the NPS. In the 1910s, most park bridges were built of timber cut on site and assembled unhewn. NPS administrators tended to reject truss bridges as inharmonious with the landscape (the NPS had a contractor build a one-lane steel truss bridge over the St. Mary River in 1924, but this "inharmonious" bridge was later replaced by a three-span reinforced concrete-arch bridge). Most of the bridges along the Sun Road are flat concrete-slab bridges with concrete arched portals veneered in local stone. The NPS chose this style for its appearance, even though the arches reduced the waterway by one-third. Landscape architects carefully inspected the bridges in the field as they were being built to make sure that the workers were avoiding regularity in the joints and placement of stone. The Landscape Engineering division collaborated with the BPR in designing the bridges, often providing detailed specifications for the stone facing, arch rings, walks and curbing, and masonry. Beginning in 1931, the drawings indicated the size and shape of each voussoir stone in an arch ring. As was typical in NPS designs of the period, the bridges followed the radical curve of the roadway and incorporated the guardrails, buttresses, spandrels, and arch into one continuous form.[259]

Figure 60. Bridge built in 1920 over Middle Fork of the Flathead, replacing earlier log bridge. Photo by R. E. Marble, GNPA #8151.

During this period, the Montana State Highway Commission favored truss, timber, and girder bridges over reinforced concrete-arch bridges, largely because of the cost and skill needed to build the latter. In the 1920s and 1930s, reinforced concrete-arch bridges were only built in Glacier and on important access roads to Glacier and Yellowstone. For example, in 1928 the state approved the construction of three small, single-span concrete-arch bridges on Highway 89 near the eastern boundary of Glacier National Park, probably to enhance the scenic qualities of the road. Two of these bridges are still in use on the highway; one is near Kiowa Junction and the other is at the next stream crossing to the north. The third bridge was bypassed several decades ago.[260]

A critical link in the Belton-to-Lake McDonald stretch of the future Sun Road was replaced in 1920, after Glacier received an appropriation of $12,000 to build a new bridge across the Middle Fork at Belton. The 1897 log bridge was replaced with a reinforced concrete arch bridge about 70 feet to the west of the old bridge's location. Potential contractors bid on either a reinforced concrete arch bridge or a steel truss bridge, even though most in the NPS at the time preferred concrete bridges for aesthetic reasons. NPS landscape architect Charles Punchard approved the design, which was based on the original Chittenden Bridge near the Grand Canyon in Yellowstone National Park. The gravel for the project came from a small gravel pit at the foot of Lake McDonald on land owned by Harvey Apgar. This bridge served as the main west entrance to the park visitors from 1920 until 1938.[261]

Figure 61. Eastern span of Logan Creek bridge, 2000 photo.

The bridges along the Sun Road reveal the evolution of NPS landscape architects' thinking about certain design aspects. For example, one of the oldest existing bridges on the road is the two-span Logan Creek Bridge, built between 1926 and 1928 by Williams & Douglas. This bridge has contrasting-color (red) keystone detailing, and most of the rocks below the level of the keystones are significantly smaller than those above. Soon after this bridge was built, the landscape architects began to emphasize their policies to mix stones randomly and to place larger stones toward the bottom of structures. Both these items were mentioned in the 1929 "Special Provisions" section of the Colonial contract for work on the east side of the road.[262]

The Baring Creek Bridge, built in 1931 by A. Guthrie & Company of Portland, is a good example of the ways in which the bridges along the Sun Road reflect NPS landscape concerns. This is a 72-foot single-span arch bridge. Vint vetoed a proposed campground in the Baring Falls area because he felt a campground would damage the scenery. He recommended that the bridge be sufficiently high and long to allow the existing trail to follow the creek underneath the bridge. He also felt that a high-arch bridge would do less damage to the landscape because it would require less fill on the approach spans. The contract included clauses designed to minimize the destructive effects of the construction.

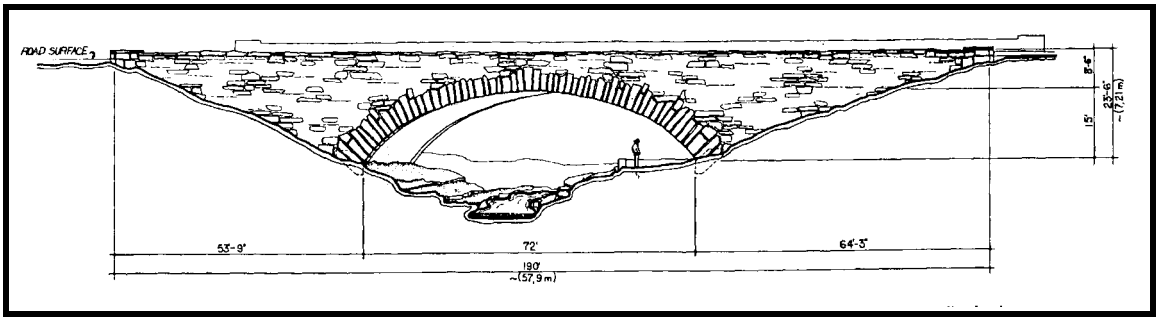

Figure 62. Elevation view of the Baring Creek Bridge. Historic American Engineering Record drawing (MT-102).

As built, the bridge incorporated Vint's recommendations. The arch spans 71.5 feet across Baring Creek and the trail, and it is 22 feet high from the spring line to the top of the guardwall. The masonry work is composed of a random mixture of Appekunny and Grinnell rubble slabs and is extremely well crafted. The matching stone guardwalls and curbs are integral to the bridge. The pedestrian sidewalk is protected by an ashlar curb. The structure is slightly curved to match the roadway. The contractor received permission to excavate the footings several feet lower than shown on the original plans because of unstable rock at the construction site.[263]

The Triple Arches is one of the most noticeable and aesthetically pleasing masonry structures along the Sun Road. This three-span arch half-bridge that supports part of the roadway high on the Garden Wall was not in the original plans. The arches turned out to be a less expensive alternative to a high, solid retaining wall that would have required massive amounts of excavation. The bases of the arches are supported by the solid rock cliffs of Pollock Mountain. The resident landscape architect apparently did not see the working plans until the first arch had already been built. As a result, the spring

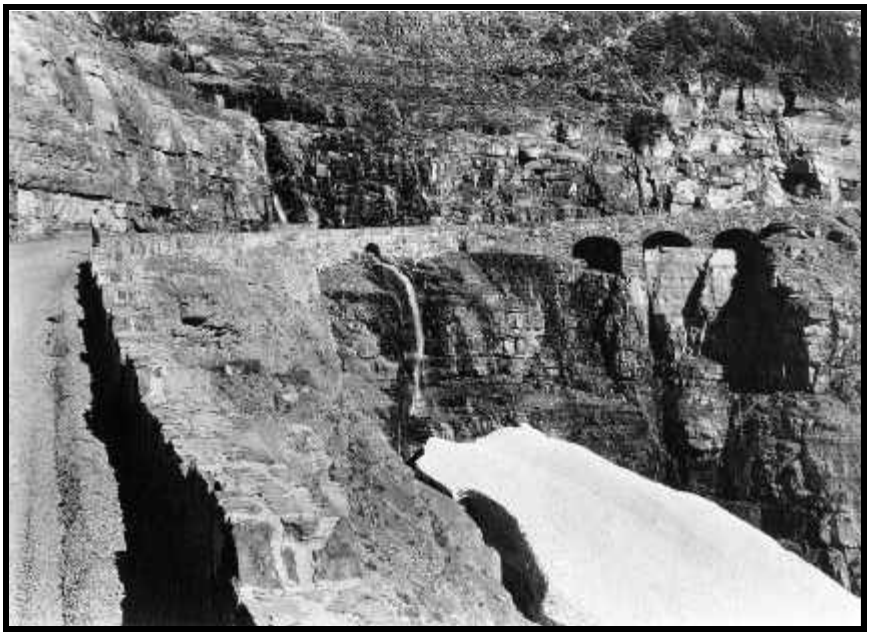

Figure 63. Sun Road, with Triple Arches in background, ca. 1930s. GNPA photo #7356.

line of the first arch (the imaginary line connecting the base points of the curves) runs parallel to the 6 percent grade of the road instead of running horizontally, as do the other two arches. NPS landscape architect Davidson believed that the Triple Arches were less obtrusive than a large solid wall would have been.[264]

Tunnels

The NPS used tunnels on park roads to prevent extensive blasting and scarring of rock cliffs. Tunnels also provided the opportunity for the dramatic effect of a restriction in views followed by a suddenly expansive vista. Landscape architects tried to give tunnel openings the character of a cave entrance, helping the man-made portals blend with their natural surroundings. Techniques for staining concrete portals or facing them with stone masonry began to be used. At Glacier and in other parks, years after the original construction, the exposed rock lining of the tunnels was replaced with concrete linings and carefully designed drainage systems because of problems with water seeping through the rock.[265]

Early in the planning for the west-side section towards Logan Pass, at least one tunnel and several half-tunnel sections were envisioned (half tunnels are sections of cliff where the rock overhangs the road above the motorists). The rock above Crystal Point, however, is not very stable, and so much of the overhanging rock that was originally left in place between there and Logan Pass was removed by the 1950s. Today, the West Side Tunnel and the half-tunnel near Crystal Point are the only the two such features on that side of the pass.[266]

Figure 64. Interior of West Side Tunnel prior to the concrete lining installed in 1941. Photo by R. E. Marble, GNPA #8351.

The tunnel on the west side may have been necessary because the Road runs back along the cliffs just above the tunnel site; blasting out the lower cliffs might have removed the rock that supports the upper stretch of road. The West Side Tunnel was constructed in 1926 by subcontractors to Williams & Douglas. It features two distinctive galleries (windows), each with a small porch and masonry guardwall, that frame vistas of Heaven's Peak and the McDonald Creek Valley. The contractors worked 24 men on two and then three shifts. They used compressed-air

jackhammers, and ore carts that ran on tracks carried the excavated rock outside. Some 3,800 cubic yards of rock had to be removed to create the 20-foot-wide and 18-foot-high tunnel (one construction worker reported many years later that they put too much powder in a blast at the lower portal and shot more rock off than had been intended at that location). Originally, the only masonry used in the tunnel was for the gallery guardwalls, which the landscape architect approved because it fit with the "simplicity" policy of the road project. The workers had to do considerable trimming and excavation to make the portals safe without masonry. As originally designed, the tunnel was curved rather than linear, and its interior was narrow and irregular in shape.[267]

The East Side Tunnel was built in 1931 by subcontractors to the Colonial Building Company. The contractor had to bring in the necessary equipment from Logan Pass, but access was difficult because of cliffs along Piegan Mountain. The subcontractors built a new 3.65-mile trail about 200 feet above the road from Logan Pass to a point above the tunnel site. They excavated 6,250 cubic yards in order to create a bench, or platform, on which to work. Materials were hauled by tractor or team to the compressor platform above the tunnel site (the jackhammers were powered by compressed air). From there, men packed supplies down a steep trail and then down a ladder, totaling a drop of 200 vertical feet, to the work site. The round trip took about 30 minutes. The work was conducted non-stop with three shifts of fourteen men each. At the tunnel portals, workers mixed lampblack with the curb concrete so that the color would blend with the natural rock, and this was faded to the light concrete color about 30 feet into the tunnel. The completed tunnel was 405 feet long, 26 feet wide, and 19 feet 9 inches high.[268]

Figure 65. View of Clements Mountain from inside the East Side Tunnel before the tunnel was lined with concrete, 1930s. Photo by R. E. Marble, GNPA #8327.

The NPS and BPR arranged for additional work on the East Side tunnel in the early 1940s because of water leakages that caused the formation of ice stalactites and stalagmites inside the tunnel. In addition, an ice coating over the roadbed, from a few inches to several feet thick, had to be blasted and picked and hauled out in the spring. In 1941-42, Elmer Genger

& Sons of Fairfield, Montana, placed a 12-inch reinforced concrete lining with a back form of corrugated iron on the inside of the East Side Tunnel and added concrete at both portals. The contractor was instructed to hide this concrete behind the natural rock facing and to disguise the "artificial" masonry as much as possible. The rocks for the portals were selected for color, texture, and size to match the adjacent natural rock. The white mortar joints at the portals were carefully stained with lamp black to help the masonry blend in with the natural rock. As part of the project, evidence of the earlier construction work pinned to the cliffs was removed.[269] Drill holes in the rock are still visible on the top of the lower portal, however.

Culverts

Culverts carry streams underneath roads. Beginning in 1925, contractors were required to use more long-lasting materials in the culverts than the cedar or larch logs that had previously been used along the Lake McDonald section of the Road. Between 1925 and 1937, contractors installed over 30,000 linear feet of drainage culverts beneath the surface of the Sun Road. Their general location was determined on paper by considering factors such as size of drainage area, slope gradient, type of soil, and local rainfall, but engineers made the final placement in the field. The diameters of the pipe culverts, which were mostly corrugated metal although concrete pipe was specified in 1930s contracts, ranged from 12 to 20 inches. Box culverts were also built of reinforced concrete slabs with mortared stone headwalls, particularly for larger-diameter culverts. The BPR provided specifications for corrugated iron pipe culverts, and Vint's office in 1928 issued standard drawings for culvert masonry headwalls. The headwalls were typically about 5 feet wide and 2-½ feet high. On the Sun Road, often only the upstream end of the culvert had a headwall. Like other masonry on park roads, the work was to be irregular in stone layout and color, and the exposed faces of the stones were to be weathered.[270]

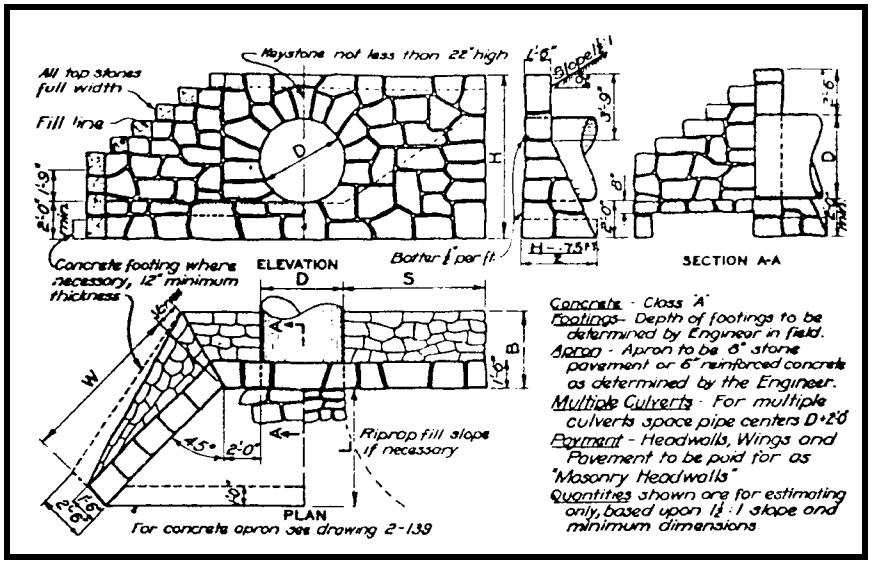

Figure 66. NPS drawing detailing typical stone culvert headwall design as used on the Sun Road. TIC drawing 9451.

Some of the corrugated metal pipe culverts on the Road today have modern stone headwalls; others retain the historic masonry headwalls. Some of the non-historic headwalls have had wingwalls added as more of the right-of-way was paved. A few historic culverts have been lengthened as the Road was

widened. Some of the concrete-box culverts, such as one at the Alder Creek crossing, have eroded bottom concrete slabs. Many of the culverts of all types, and the more modern cross-road drains, are plugged with debris.[271]

The Sprague Creek Culvert on the Sun Road is unusual because it is a masonry feature that was built by day laborers under park supervision rather than by a contractor under the supervision of BPR engineers. It was designed by the NPS for a section of road that was realigned in 1929. The decision to build a small culvert rather than a wide bridge was made by Glacier's resident engineer, with agreement from NPS Director Stephen Mather. It is a masonry concrete slab culvert with masonry guardwalls and wing walls, and it crosses the road at an angle.[272]

Trail Underpasses

When trails intersected the Sun Road, they could cross at grade or be carried over or under the Road. One intersection where considerable horse traffic was expected, requiring a structure above or below the Road, was a short distance north of the head of Lake McDonald. Construction of the Sun Road through this area had partially obliterated the old trail from the Lewis Hotel to Granite Park Chalet, so a new 16-mile trail was constructed on the opposite (north) site of Upper McDonald Creek. To link this new trail with existing routes to Lake McDonald, the Park Service in 1925 constructed a connecting route that included a new trail bridge over McDonald Creek and a rustic log overpass spanning the Sun Road. This distinctive feature was replaced by a tall reinforced concrete slab "horse underpass" with masonry arch facades in 1936 or 1937. It was built as an underpass because of the increased roadway width and the relocation of the Road in that area. Another horse underpass is located just above the Jackson Glacier overlook. This is a concrete-box underpass with headwalls of large, uncoursed ashlar blocks.[273]

Figure 67. Log "horse overpass" across the Sun Road near McDonald Falls, ca. 1925. GNHA photo 91.

Numerous other hiking trails also originate on the Sun Road or intersect the Road at grade. These include the Snyder Ridge, Sperry Chalet-Gunsight Pass, Avalanche Lake, Granite Park Chalet-Swiftcurrent Pass, Highline, Hidden Lake, Piegan/Siyeh passes, Virginia Falls, and

Otokomi Lake trails. In addition, several abandoned trails are visible from the Sun Road. These include the old route from Logan Pass to Lunch Creek (visible on the south face of Mount Pollock) and the Alder trail that went from the Sun Road along the Garden Wall up to the Highline trail above it.

2.3.13 Work on Masonry Features Since the 1950s

As designed and constructed, the Sun Road originally had over 41,000 linear feet of stone guardwall. These masonry guardwalls began to suffer damage almost immediately after each section was completed. Recurrent avalanches have destroyed guardwalls in certain areas along the western ascent to the pass. Snow-removal equipment also damaged the guardwalls. Loss of footing support, subsidence, stone deterioration due to exposure to weather (particularly where capstones are lacking), tipping outwards, and deteriorated mortar joints have also been problems. Overlays of asphalt have raised the height of the pavement so that the walls are shorter than their designed heights. Many of the guardwalls were poorly designed in that they were built on unstable fill and were extended a foot or less below grade, with no significant footing to increase lateral stability. The roadbed has sunk in several places, causing cracking and movement in the retaining walls. Dry-laid stone retaining walls in some locations are slowly creeping downslope or have collapsed. To respond to all of these problems, over the years Glacier has used both NPS road maintenance employees and contractors to repair and replace the masonry features along the Sun Road. During the 1980s and early 1990s, the park had its own in-house masonry crew.[274]

In the spring of 1929, a large rock fell from the half-tunnel about one mile above the Loop, destroying about 180 linear feet of masonry guardwall plus some retaining wall. The NPS did the repairs. This marked the first known such repair in what has since been an annual cycle of repairing damage that occurred over the previous winter. In the early years of road maintenance, NPS employees probably did the necessary repairs. They could not keep up with the work, however, and many deferred repairs were included under the 1934 Yonlick contract.[275]

In 1940, a heavy rainstorm brought down boulders and debris along the Garden Wall section of the Road. Plugged culverts forced the water to the road surface, and roadside drains and shoulders were eroded. Masonry guardwalls washed over the edge in several places.[276]

Over the years, masonry guardwalls and retaining walls have been replaced both in-kind (using similar materials and design) and with structures of altered design. The latter include removable wood guardrail; masonry guardwall with a concrete stem and non-native stone facing; concrete retaining walls both with and without stone facing; and isolated barrier rocks. Some masonry guardwalls have not been replaced at all. Some guardwalls have evidence of damage from rockfalls throughout their length and are missing sections or top courses. Some have been repaired with blocks of Minnesota granite under the 1950-52

Morrison-Knudsen contract or with other non-native rock. Many of the historic guardwalls have been repaired in scattered areas with modern rubble material, primarily along the top courses. It is estimated that approximately 4,000 linear feet of guardwall has been lost and has not been rebuilt.[277]

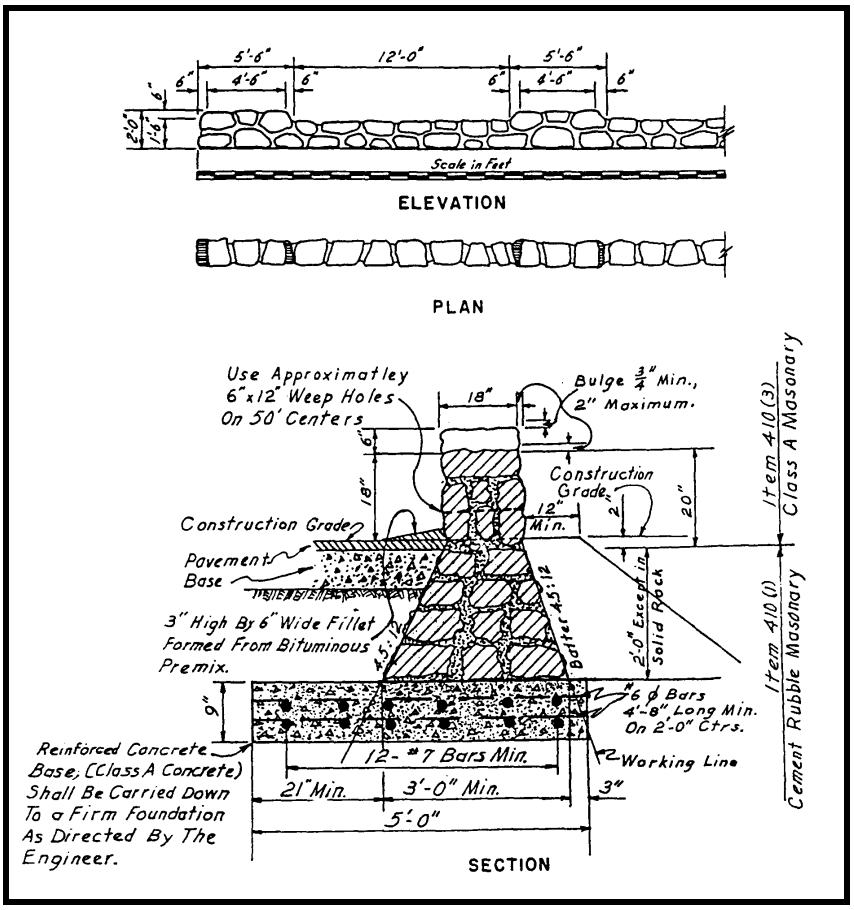

Figure 68. Design, dated 1967, for a reconstructed stone Sun Road on a new concrete base. While illustrative of period repair projects, this design is not historically accurate and not representative of current practice. TIC drawing 9572, no. 3.

During the 1930s and 1940s, the NPS hired contract stonemasons for at least a week or two each summer to repair masonry guardwalls along the Sun Road. Stonemasons blasted out new rock and cut it as needed. Between 1953 and 1967, NPS crews apparently did all the repair work on the guardwalls. Each summer, the road crew spent a week working on the masonry, once the weather got dry enough for the work. They scavenged for rock above and below the Road, using a winch truck with a cable to skid cut rock up to the Road. They also retrieved some rock from a slide on the road to Many Glacier. Over the years, the crew became increasingly careful about matching colors.[278]

The source of the stone for masonry work has been an ongoing problem since the 1950s. NPS landscape architects carefully inspected any non-native stone being considered for use along the Road. In 1969, an approved quarry located 100 miles southwest of Glacier in the Rainbow Lake area provided some of the stone for contract masonry work. The rock was a gray quartzite of the Ravalli group, similar to rock found in another location outside the park that had previously been used on the Road. The contractor was also allowed to use stones that he scavenged from alongside the Road, plus rock discarded in the Logan Pit. The 1969 work evidently involved building parapets and also "rock facing work." In one location, the canyon side of a parapet appeared gray from the Road, and the landscape architect suggested

that the "bare-faced concrete wall" be painted with concrete paint to blend better with the surroundings.[279] The stone from the Rainbow Lake area is probably the light-gray non-native rock seen today in various places along the Road.

By the 1970s, the park was hiring a masonry contractor on bid every few years to repair the masonry along the Road. J. A. Brasch Masonry Company out of Spokane was awarded the contracts in the late 1970s. The contractor gathered rocks, replaced missing pieces, and reset loose stones. One year, major repairs were completed on 7,900 feet of guardwall. But, according to former road crew member Bill Dakin, "there was no standard there for matching any kind of masonry configuration."[280]

Figure 69. Modern removable guardrail, 2000 photo.

In the late 1970s, Glacier's west-side road crew built some dry-laid retaining walls. This was done in the area of the Road below the Loop, where the shoulder was eroding after the 1967 Garden Wall fire had burned the vegetation. Today, this work is hidden by vegetation. This work was done out of operating funds.[281]

In 1980, after a season as an apprentice with the Brasch Masonry Company, NPS road crew worker Bill Dakin became the leader of an in-house masonry crew of five or six people. The crew first worked on guardwall segments that were tipping outwards; they poured footings under the guardwalls and then reconstructed them. During the decade that followed, the park's masonry crew worked on both sides of the Sun Road. The random-rubble guardwall could be repaired fairly easily with stones gathered from talus slopes and eroded rock formations. For these walls, the rock did not have to be worked to particular dimensions. The ashlar style of guardwall, on the other hand, was easy to disassemble and rebuild, but it was almost impossible to replicate because the crew lacked the specialized tools and skills to cut rock to the right dimensions. Much of the rock they used was salvaged; they winched handcut blocks that had fallen off the Road up to the road surface and then stockpiled the valuable dressed stones. The crew advanced to building stone guardwall in places where it had been taken out. Finding sources of course sand to create a mortar similar in appearance to the original proved to be a challenge.[282]

The masonry crew's last season was ca. 1992, when several of the crew members left Glacier to work elsewhere. Since the masonry crew was disbanded, Glacier's road crew has not done any repairs on the masonry along the Sun Road.[283]

Finding a source of workable stone that is similar in appearance to that used on the Sun Road's masonry features continues to be a challenge. In 1999, Glacier let a contract to quarry Siyeh limestone from the Wounded Buck quarry on Flathead National Forest land. This rock has a similar appearance to the Siyeh limestone used in the original masonry work on the Sun Road, and although the freshly cut faces were gray, it was felt the rock would weather well. But when contractor Anderson Masonry of Kalispell started to work the rock, the masons found that the subsurface stone from the quarry was not workable. Starting in 2000, the park has returned to using stone from a private source near Elmo that was also used for repairs along the Road in the 1970s. Contractors mix the Elmo stone with salvaged native stone.[284]

Two 50-foot sections of an experimental type of guardwall were installed in the mid-1990s on the west side of the Road between the West Side Tunnel and the Loop. Concrete was molded to simulate stone, using forms made from existing walls at the Loop and at Bird Woman Falls overlook (one is ashlar, and one is random rubble).[285]

Today, much of the historic stone guardwall along the Sun Road is still the original materials in the original location. Close to 3,000 feet of the total 41,000 feet of guardwall is built with non-native stone or of concrete faced with non-native stone. Substantial segments of historic wall remain in need of repair, or have been incompletely repaired; not all of the visible repair work reflects the workmanship found in the historic walls.[286]

Some areas of historic stone guardwall, particularly in locations that historically suffered avalanche damage, have been replaced with other types of protective barriers. A project in the early 1950s saw contractors install removable guardrail on a few such locations on the west side of Logan Pass. These were replaced between the 1960s and 1984 with wooden guardrails on concrete footings. The standardized guardrail has 10-foot timber rails resting on short I-beam verticals that are pinned or bolted into the footings. This rail sometimes failed due to avalanches, flooding, inadequate footing, or fill subsidence and slumping. On the higher sections of the road, movable precast concrete "Jersey barriers" see temporary use in areas where the original wall has been damaged and protection is still needed.[287]

2.3.14 Drainage

The engineers who designed the Sun Road provided ditches, spillways, culverts, drainage weepholes in the guardwalls, and gutters to aid in drainage along the Road. Inadequate and infrequent cleaning of drainage features have led to many of the drainage problems along the Road today. Poor drainage has led to the erosion of surfacing and fills and has damaged and even washed away masonry structures such as guardwalls. This problem increased under the

1933-36 Yonlick contract on the east side, when long stretches of guardwalls were built on unstable fills. The road was not yet paved, and the erosion was often severe. Problems with water are also caused by other factors. For example, the road base may become saturated, and then freeze and expand in the winter, breaking up the roadbed. Approximately 1,000 linear feet of concrete slabs were installed on the road surface near the Weeping Wall in the 1960s to reduce moisture intrusion. These have settled differentially, and drainage is now a problem in this area.[288]

Figure 70. Sections of guardwall damaged or destroyed by slides, 1948. Photo by M. E. Beatty, GNPA #4930.

Along the Garden Wall, where ditches were filled in and paved during the 1950s, water often runs along the surface for hundreds of feet before reaching a drain. Some of this water seeps into the road base through cracks and pores in the surfacing, leading to structural problems. In the 1970s, concrete-box cross-road drains with metal grate inlets along the road surface were installed at many places along the Sun Road in order to catch water that flowed in sheets down the road. Two types of drains were built: one was poured in place, and the other was pre-cast. The road crews also tried to prevent erosion caused by sheeting water by moving rubble and other fill to areas known to be vulnerable to undercutting.[289]

The road crew has routinely replaced culverts as needed along the road, particularly concrete ones that had pulled apart. During high water, the road crew often used heavy equipment such as a backhoe to keep the culverts flowing. Sometimes a stone or two in the masonry headwall would be dislodged, and the crew would later repair it; sometimes the damage would be left unrepaired.[290]

Stone-lined spillways drain water and reduce erosion on hillsides. These historic features have not survived the years well because rushing water has often undercut the spillways. In addition, dislodged rocks would knock out others as they washed down the spillway. The road crew repaired these spillways by digging out a hole to match the shape of the rock and then laying the stones on the surface and anchoring them with cement.[291]

Slumping of the roadway in recent decades has been more of a problem on the east side than on the west (in earlier years, mud slides were a significant problem along Lake McDonald). In the mid-1990s, the park contracted with a barge drilling outfit that worked on many small slumps between Rising Sun and St. Mary. The barge floated on St. Mary Lake and drilled horizontal drains underneath the Road to catch water on the upslope side and then move water to the lake. But the slopes are still moving, and in some cases the drainage pipes have been pinched off and no longer work properly.[292]

2.3.15 Pullouts

When the Sun Road was built in the 1920s and 1930s, pullouts, overlooks, and parking areas formed an integral part of its design. Areas for visitors to park and admire the view were considered an important feature that distinguished this and other park roads from standard highways. Over the years since then, some pullouts and parking areas have been created, enlarged, or surfaced, while others have been obliterated. The Type 7 log guardrails that defined many of the lower parking areas in earlier years have been removed. Today, log guardrail of a different design serves the same purpose. Some pullouts have asphalt sidewalks bounded by log curbs.

During the 1930s, the road crew did little work on the existing pullouts. Between 1958 and 1961, as a Mission 66 project, day laborers built twelve new parking areas along the Sun Road at points that were already being used by park visitors. Eleven were completely new, and one was an existing area that the crew reconstructed and enlarged. The fill slopes were given topsoil and fertilizer and were seeded with a native grass mixture, and barrier rocks were installed. This project created spaces for 55 cars.[293]

Once they had better machinery, road crews routinely used fill material from slides or from ditching work to expand or create new pullouts. In the 1960s or 1970s, for example, new pullouts were created such as the one right below Road Camp and the one at the head of Lake McDonald (the latter was established at the winter road closure location to provide parking for cross-country skiers). The pullout at Siyeh Bend was enlarged using fill that otherwise would have been hauled to St. Mary. In those days, the road crews designed the pullouts; they were not designed by engineers.[294]

As part of the 1990-92 FHWA work on the Lake McDonald stretch of the Sun Road, 20 out of 41 pullouts were obliterated. They were removed largely because of concerns about sight distance and other safety issues. Some could have been made safer by widening, but it was felt at the time that retaining walls should not be built where they had not been in the past, even in cases where they would not have been visible from the Road itself.[295]

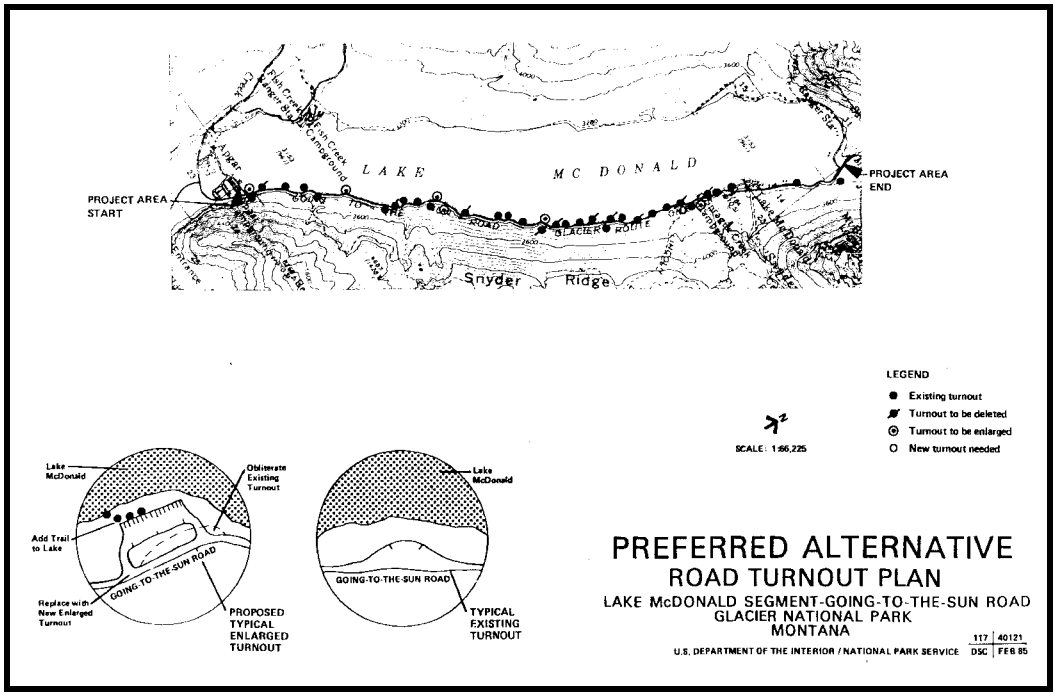

Figure 71. NPS drawing (dated 1985) of the "Road Turnout Plan" for the Lake McDonald section of the Sun Road. TIC drawing 40121.

A few overlooks were extensively reworked in the 1990s. The overlook at Oberlin Bend now has a paved parking area and a hardened trail leading to a nearby vista point. The new rock walls there were built with rock that came mostly from the talus slopes above the overlook. Two new parking lots along St. Mary Lake, also built in recent years, use rock from Many Glacier in the guardwalls (these are in areas that historically did not have masonry walls).[296]

Areas that are short of parking space, forcing people to park along the Road, have received much attention over the years. A "Draft Transportation Plan" prepared for Glacier in 1984 showed that parking was at or above capacity at Apgar Village, the Loop, Logan Pass, Jackson Glacier overlook, and Sunrift Gorge. On peak days at Logan Pass, a park employee has to direct traffic and parking.[297]

In 1989, the Sun Road had 130 pullouts. The road rehabilitation projects of the 1990s reduced this number somewhat, by eliminating some pullouts in the rehabilitated road segments. Today, the parking capacity along the Road is 1,476 spaces, with an additional 500 spaces at Lake McDonald Lodge, Rising Sun, and other developments.[298]

2.3.16 Maintenance of the Sun Road, 1920s to the Present

Until 1982, funding for routine park road repairs in Glacier came from the park's annual operating budget. From the 1920s until the present, maintenance funding for the Sun Road has been inadequate for all but minimal work such as snow plowing and rock removal and other light maintenance. For example, the funding for snow removal and maintenance of the Sun Road in 2000 was approximately $200,000, but it is estimated that annual appropriations of $1.5 to $2.0 million will be needed to maintain the Road once it has been rehabilitated.[299] Inadequate funding has forced Glacier's road maintenance workers to be reactive rather than proactive.

Maintenance work on the Sun Road began as soon as the first segment was constructed. Some of the biggest challenges have been inadequate funding, heavy traffic on the Road, rock falls, and snow removal. The maintenance season is usually less than twenty-two weeks per year, and much of the work can only be done during dry weather. The road crews in Glacier have traditionally been divided into an east side and a west side crew. Each of the two road crews takes care of its stretch of the Sun Road plus all the park roads on its side of the park.[300]

The maintenance tasks along the Sun Road over the years are typical for mountain roads but also include work related to the extensive historic masonry features along the Road. Primary maintenance issues have included inadequate drainage; damaged, settled, and tipped guardwalls; eroded shoulders; unstable retaining walls; base and subgrade failure; deteriorating asphalt surfaces; clearing the Road of snow each spring; and damage due to avalanches, spring high waters, rockfalls, and mudslides. Glacier's road crews perform the light maintenance on the Road; contractors do heavy maintenance, reconstruction, and rehabilitation, under the Federal Lands Highway Division. As the Road ages and visitor traffic increases, the rate of deterioration increasingly outpaces the maintenance work that is accomplished each year.

The machinery available to the road crews has improved greatly over the decades. In the mid-1930s, the east-side road crew consisted of a road foreman, four truck drivers, a shovel operator, and an oiler. Their equipment consisted of four dump trucks, an old tractor-mounted shovel, and a trailer for hauling the shovel. By 1950, the machinery was "beaten-up," and the road crew still had to do all the loading by hand. More seasonal workers were hired in some years than funding allows today, however. In 1966, for example, the west-side road crew had twenty-eight people; today there are only six or seven.[301]

As early as 1929, NPS road crew employees lived seasonally at the site of construction camp 5, later known as Garden Wall Road Camp and now known as Road Camp 9. The camp was perched on the edge of cliffs below a pullout just before Bird Woman Falls overlook;

flagstone steps still lead to the site. The workers stayed in a wood-frame bunkhouse. Other buildings at the site included a mess hall, a dynamite shed, and wall tents. All but a small storage building in a turnout across the Road were demolished in the early 1960s.[302]

During the 1950s, the road maintenance season began the first week in April with the initiation of snow removal operations throughout the park. Seasonal work peaked from mid-June until September, and in December all seasonal personnel were laid off. The handful of permanent employees spent the winter months plowing snow, repairing and reconditioning hand tools, conditioning and storing equipment, construction and repair of removable guardrail, and the construction, reconstruction, routing, and painting of signs.[303]

Generally, the road crews managed to do their work with traffic flowing around them, despite large machinery and the narrow roadway. The 1950 Morrison-Knudsen contract included a provision that visitors should not experience more than fifteen-minute road construction delays. Even as early as 1952, a contractor oiling the Road was hindered by as many as 2,500 cars a day on the road. When more extended closure of the Road was necessary, the work was sometimes done at night to minimize the disruption to visitor traffic. In 1955, for example, paving work on the Sun Road was conducted at night, reportedly the first time that was ever done in the region.[304]

Routine Maintenance Work on the Sun Road

Clearing debris from the Road (pebbles, large rocks, mudslides)
Repairing washouts
Doing asphalt overlays and chip and seal treatment
Patching potholes
Cleaning drainage ditches and culverts
Repairing masonry
Cleaning parking lots
Removing weeds from masonry features
Clearing vegetation for sight distance
Vista clearing
Constructing road signs

Landscape considerations have continued to play a part in decisions regarding road maintenance. For example, a contractor in 1969 was directed to paint the exposed concrete areas on cross-drains, parapets, and retaining walls with sealer and paint to make the concrete blend in better with the environment. Sometimes landscape considerations took second place to safety considerations. NPS Director Arno Cammerer did not like center stripes on park roads, but he left the decision up to the park engineers and landscape architects. The Sun Road, like all major paved roads in national parks, did receive center striping.[305]

Over the years, some of the older features along the Road were removed and replaced with more modern substitutes. In 1950, asphalt curbs (instead of log curbs) were built along the Sun Road by day laborers. Again, 880 linear feet of asphalt curb replaced existing log curbing in 1961 with the aid of an automatic curbing machine.[306]

Perhaps the biggest safety concern of park administration on the Sun Road is rock falls. A number of visitors have been killed by falling rock while driving on the Sun Road. At one time, the road crew tried to prevent such accidents by removing rocks before they fell, but they found that this loosened nearby rocks and so was counter-productive. Perceived safety concerns led the NPS to blast off some of the rock overhangs that projected over the roadway between Logan Pass and the Loop.[307]

In some ways, the autonomy of Glacier's road crews has lessened over the years. As former east-side road foreman Earl Armstrong commented, "Years ago, in the 1950s, we could kind of do anything we wantedÿIt just seemed natural when you seen something wrong, then you fixed it. That soon changed."[308] This work climate did begin to change by the 1970s, partly as a result of federal laws designed to protect the Nation's cultural and natural resources.

The National Historic Preservation Act of 1966 required the NPS and other federal agencies to inventory, evaluate, and protect historic properties within their boundaries. The National Environmental Policy Act of 1969 strengthened the ecological basis of park management and established procedures for environmental impact assessment and for compliance with related federal laws. Park planners and landscape designers began to shift their emphasis away from scenery preservation towards environmental planning.[309]

The Sun Road was officially recognized as a significant historic resource beginning in the 1980s. It was listed in the National Register of Historic Places in 1983. In 1985 it was designated a National Historic Civil Engineering Landmark, and in 1997 it became a National Historic Landmark. Historic districts adjacent to the Road also exist; both the Headquarters area the the Rising Sun Auto Camp are listed in the National Register, and Lake McDonald Lodge is a National Historic Landmark. Starting in the 1980s, park staff began to attend trainings on historic preservation. The passing of these laws and the training required of NPS employees led to a greater appreciation for the historical significance of the Sun Road and its historic resources.

Beginning in the 1980s, compliance with historic preservation laws and with other federal laws related to natural resources had to be factored into all treatment decisions. Consultations with specialists on Glacier's staff and with regional staff and experts from other agencies became a necessary part of the NPS planning process, including the development of road maintenance procedures and projects. The park completed a set of roadside maintenance guidelines in 1993 that incorporates practices designed to maintain the Road in a way that protects both the Road itself and its associated cultural resources.

In addition, ecological concerns led to a philosophy within the NPS that emphasized traffic management rather than upgrading and expanding park roads to meet the demands of increasing visitor use. Borrow pits and quarrying within parks was prohibited unless either economic factors made it completely impractical to import road materials or unless the scars would be erased through natural processes. Parks were encouraged to construct turnouts,

overlooks, and trail connections along their roads.[310] As early as 1964, quarrying of native materials for development within parks was restricted to that available within a construction site.

Many members of the road crews over the years have cared deeply about the facilities entrusted to their care. According to former road crew member Bill Dakin, long-time employees like Claude Tesmer and Dick Smith would do all they could to avoid doing damage, such as leaving a cleated track from a caterpillar tractor in the asphalt road surface: "It was absolutely humiliating to those guys; it just wasn't done." Clarence Bengston worked on Glacier's road crew from 1929 until 1975. He urged his crews to complete a job before leaving for the day, even if meant working a few minutes late, so that they would never leave a job looking as if they did not care. He often said, "I like to make it look like somebody's home." [311]

2.3.17 Vista Clearing and Other Vegetation-Related Issues

The concept of planned vistas and overlooks along park roads dates from the early years of the NPS. An influential 1917 textbook on the theory of landscape gardening, written by Henry Vincent Hubbard and Theodora Kimball, inspired national park design in the 1920s and 1930s. Hubbard and Kimball recommended that developed vistas have a central focal point and that they be framed by trees and other vegetation along the sides, from above, and at the base.[312]

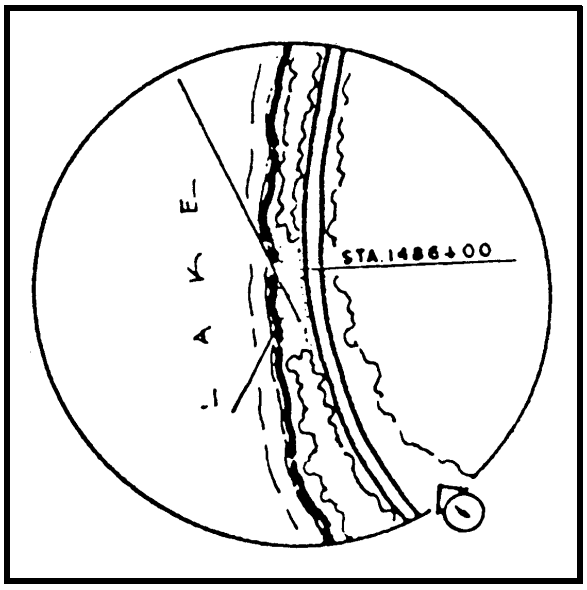

Figure 72. One of several proposed vista clearings along the east shore of Lake McDonald, 1951. Notice that the views are not designed to be perpendicular to the roadway. TIC drawing 2060A.

The construction of the Sun Road cleared brush and trees from a 30- to 60-foot-wide corridor. This opened up many views along the Road in areas that have since grown in. Park employees have kept some views open through vista clearing, particularly those at pullouts and other identified vista points. This is particularly the case at the lower elevations along the lakeshores, where alders and brush can rapidly fill in views.[313]

Many vistas that today appear to be natural were actually carefully designed. Glacier Superintendent Emmert began a vista clearing program in 1951 along Lake McDonald in order to provide automobile travelers along the Sun Road with "beautiful and outstanding views of the lake and mountain background." Some were located at existing small parking areas, and others at sites of proposed parking areas, often at curves in the Road. Some vistas then and today provide drivers just a narrow window through the trees,

and others offer completely open views. In 1957, a similar project for vista clearing on the east side of the Sun Road was initiated, concentrating during the first year on the Rising Sun area.[314]

Vista clearing activities on both sides of Logan Pass, have continued effatically at several lower-elevation locations. Along the lakeshores, some trees (particularly cedars) have been limbed up, which has allowed their trunks to frame views. The landscape architect sometimes has marked out the area to be cleared or even flagged which bushes the road crew should leave untouched. During the 1990s, maintenance crews brushed out many miles of the Sun Road, removing vegetation that, according to Landscape Architect Jack Gordon, had "created sort of a visual wall to the lakes." In addition to the visual obstructions caused by uncontrolled vegetation growth, there is the potential for damage to cultural features in some locations.[315]

Some carefully designed overlooks are today partially blocked by vegetation. Examples include the Loop and the Jackson Glacier overlook. Because trees block the views from the parking area at the Loop, visitors now walk onto the roadbed itself to enjoy the panoramic vistas available from that point.

Several wildfires have dramatically changed the vegetation along certain stretches of the Road. The 1936 and 1967 fires left much of the west side above Logan Creek almost treeless. Lodgepole pine and western larch have tended to come in after these fires, replacing other tree species that now remain in some areas only as snags.[316]

Reflecting changing concerns about vegetation within national parks, Glacier now has a native plant nursery. Seeds and vegetative materials are collected from sites that are to be disturbed, and then the sites are revegetated with these native materials. This program is partially funded by the Federal Lands Highway Program.

Fires in the Vicinity of Today's Going-to-the-Sun Road

1885 unnamed fire (Roes Creek to foot of St. Mary Lake)
1910 many fires throughout the park
1929 Half Moon fire (Apgar and lower end of Lake McDonald)
1936 Heavens Peak fire (Loop area and over the Divide to Many Glacier)
1967 Garden Wall fire (up the west side of the Garden Wall)
1969 fire on Going-to-the-Sun Mountain

2.3.18 Spring Plowing Operations

The highlight for many workers on Glacier's road crews has traditionally been the spring opening of the Road, which typically begins in early April. The crews remove an average of more than 100,000 cubic yards of snow each year. Sometimes they have to replow the same areas when slides bring down more snow onto an already cleared section of road.[317]

Figure 73. Overhanging snow and narrow roadway on the Sun Road west of Logan Pass, 1930s or 1940s. GNPA photo #4824.

In 1929, when the Sun Road was opened to Logan Pass on the west side, Glacier received the funds to buy a ¾-yard gasoline shovel. The shovel was used for three weeks for snow removal that year in order to have the road open by June 15. The crew of six worked ten-hour shifts on this first spring road opening. The shovel also removed dirt and rock slides and cleaned ditches on the west side of the Road from May throughout the summer. In 1933, the park's gas shovel had to be worked double shifts in order to get the snow and slides cleared in time for the targeted June 15 opening. The crews removed approximately 15,000 cubic yards of snow, and they encountered drifts that were 30 feet high.[318]

In the late 1920s, the NPS did not have the equipment to keep the park roads open to traffic through the winter. For example, the park tried unsuccessfully to keep the road between Belton and the foot of Lake McDonald open in the winter of 1927-28. From the 1930s until at least the 1950s, the park kept the west end of the Sun Road open up to Lake McDonald Lodge for the use of residents of Apgar, CCC camp enrollees, and the park's administration and maintenance personnel. For the past fifty or so years, the park has generally kept the Road on the west side open in the winter to the head of Lake McDonald. Starting with the winter of 2000-2001, the Road was once again closed at Lake McDonald Lodge instead of the head of the lake. This allowed the park to provide a larger parking area for winter visitors than was possible at the head of the lake. On the east side, the road has traditionally been closed at St. Mary's Campground.[319]

The park has always tried to open the Sun Road as early as possible each spring, despite criticism from some quarters that the work was wasteful and perhaps foolhardy. By the 1950s, local businesspeople increasingly pressured the NPS administration to open the Sun Road early; allowing a natural snowmelt was not considered feasible. In the early years, June 15 was the targeted opening date, although park staff would open the Road earlier if possible in order to encourage increased visitation. Local newspaper editor Mel Ruder suggested in 1953 that the NPS construct snow sheds in areas prone to slides, but this idea was not seriously considered because sheds would harm the scenic values of the Road. Until at least the 1950s, the Road was opened as soon as one 8-foot-wide cut had been made. Then the policy changed, and both lanes had to be open the length of the Road before it could open to the public.[320]

Park workers have experimented over the years with a variety of approaches for completing the annual plowing job. In the 1930s, the plowing started on the west side and then the crew moved to the east side. In 1954, the park experimented with plowing the stretch from Logan Creek to Logan Pass after the plowing was finished on the east side. The road was opened from Headquarters to Logan Creek by mid-April, and then the Chief Mountain and Many Glacier highways on the east side were opened. On May 10, the crews began plowing from St. Mary to Logan Pass. When they got to the west side, they found that water runoff damage on the Garden Wall section was less than in the past because the snowpack was left in place longer. In 1960, the road crews switched back to starting on the west side again because of a steep face on the Big Drift. A few years later the road crews tried starting on the east side again, but they found that it was difficult to get supplies when based out of St. Mary (the logistics were a challenge, not the plowing). In more recent years, the west-side and east-side crews work towards Logan Pass from both sides of the Road.[321]

The Road must be relocated each year during the spring plowing operations to ensure that the dozer operator making the first cut through the snow is close to the inside wall. To open the road, a dozer establishes a level roadbed for the equipment that follows (in the 1930s, a power shovel followed the bulldozer and worked the high overhangs that the dozers could not reach). Each successive cut comes down closer to the roadbed. When about three or four feet above the road's surface, rubber-tired equipment moves in, such as a rotary snow plow that blows snow off the road or an end-loader that removes snow one bucket at a time down to the pavement. This method protects the road surface and the guardwalls from damage by caterpillar tractors as much as possible. After one lane is open, the sun melts out the rest of the snow.[322]

The job of the avalanche lookout has always been critical for the safety of the crew. It can also be a tedious job; there might be no threatening slides for days or weeks at a time. A number of methods have been tried over the years for warning equipment operators of avalanches. In the 1930s, the lookout stayed close to the equipment operator and warned him of slides by waving an orange flag. By the 1950s, the preferred method was throwing snowballs across the operator's line of vision to get him to back out. The crew also used hand signals to communicate. The spring opening crew began to use radios to communicate in the late 1960s or early 1970s. Radios gave the lookouts more mobility, so they could go as far as half a mile from the equipment in order to get the best view of the potential avalanche areas. This is still the method used to warn operators of avalanches.[323]

The danger to the workers during the spring plowing varies with the season. Most of the big avalanches take place earlier in the spring, before the spring opening crew started its work, although there are a few places along the Road that do sometimes get dangerous avalanches later in the season. Some years, no slides would come down in the areas where the crews were working, and other years there could be several in one day. The crews have always taken sensible precautions, such as not going under avalanche chutes when the visibility was less than 500 hundred feet above the roadway (in fact, in the 1930s a person was stationed at the Loop who told the crew not to come up when the visibility was poor).[324]

Several serious accidents have occurred during the spring opening of the Sun Road. In 1953, an avalanche at the "Alps of America" (about a mile above Haystack Creek) buried four people, killing two of them (pieces of the rotary plow are still scattered down the slope). In 1964, a caterpillar tractor and its operator, Chuck Siderius, went over the edge when the snow broke out from under the machine. The caterpillor rolled down the steep hillside below the Big Drift, but both Siderius and the machine survived the long tumble.[325]

In the early 1960s, Glacier experimented with having U.S. Air Force jet planes fly past the Garden Wall and break the sound barrier in order to set off avalanches. This multi-year effort to cut down on the number of delayed slides that came down across the already cleared road was unsuccessful.[326]

The equipment used to open the Road has changed over the years. In 1936, the park used a new Snow-Go rotary plow, a gas shovel, a bulldozer, hand shovels, and dynamite. In more recent decades, there have been two dozers, one rotary snowplow, and a loader. The opening crews have consisted of six or seven people: three watchmen and three or four operators.[327]

Damage to guardwalls during the plowing operation is an annual occurrence, mostly because it is difficult to know exactly where the guardwalls are as the machinery cuts its way down through some 30 feet of snow. Even in the earliest plowing operations, in the 1930s, dozers knocked into guardwalls. The random-rubble guardwalls withstand being hit by a dozer blade better than the ashlar, because pieces would break off but the wall itself would stay in place. The ashlar walls, on the other hand, often are knocked off their original location when hit by a piece of snow removal equipment. Guardwalls of both types also were damaged by slides that came down after the snow had been cleared off the roadbed because the snow no longer protected the walls. The skill, experience, and care of the operator are critical factors in reducing this kind of damage.[328]

Various methods to locate the guardwalls and thus limit the damage done to the historic walls by heavy machinery have been tried over the years. In the 1930s, men walked on top of the snow and probed with sharp bars to find the guardwall and keep the dozers inside of the walls (this was done primarily for safety reasons). Watchmen also warned the dozer operators whenever they got close to the walls. Operating equipment such as dozers below the level of the top of the guardwalls greatly increases the chance of hitting the stone walls. This method was favored by at least one supervisor during recent years, resulting in significant damage. In 1989, road crew member Gerald Yates formally suggested that end loaders rather than dozers remove the last "lift" of snow along the guardwall side of the Road. His suggestion was implemented that year and resulted in immediate savings in the cost of repairing guardwalls damaged by dozers. Metal snow marker poles and brightly painted iron rebar were installed in the fall along the inside edge of retaining walls and guardwalls in certain areas along the Road in order to help locate these features (this was another of Yates' suggestions). In the late 1990s, a cable tracing system was installed in the

shoulder of the Road in the 0.7-mile stretch between Logan Pass and Rimrock. When the plowing operation starts in that area, the cable is charged, and a road crew member uses a hand-held piece of equipment to detect the cable and guide the dozer operator.[329]

Until 1992, the park kept the Road open as late into the fall as possible. The latest the Road was ever open to the public was November 21. Now, the third Monday in October is the official closing date.[330]

2.3.19 Interpretation

Glacier's interpretive program for park visitors was inaugurated in 1921 with walking tours and lectures provided by a concessionaire on a fee basis. The following year, the program expanded with help from the NPS, Glacier Park Hotel Company, and the University of Montana, and it was provided to park visitors without charge. Soon, "nature guides" became known as ranger naturalists. By 1927, naturalists were stationed at Lake McDonald Lodge, Going-to-the-Sun Chalets, and Many Glacier Hotel, and in 1930 programs were expanded to the campgrounds.[331]

The interpretation along the Sun Road has traditionally been focused on the park's natural resources. By 1930, the park had installed several bronze markers in rocks that gave the elevation (one was located at Logan Pass). A self-guided loop trail was completed at Logan Pass in 1949. The first roadside exhibits along the Sun Road were plaques embedded in rock bases. They interpreted natural features such as Jackson Glacier, Sunrift Gorge, Triple Divide Mountain, the Garden Wall, and the blister-rust epidemic. Some of the wayside exhibits were aimed at helping visitors identify the peaks that they could see from where they were standing. Park administrators hoped both to inform travelers and to slow their trips through the park.[332]

Personal interpretive services changed too in response to the construction of the Sun Road. In the 1930s, for example, Glacier's administration began emphasizing organized group hikes led by park naturalists. Naturalists at Logan Pass led daily walks to Hidden Lake and to Clements Glacier. The park also catered to automobile travelers. By 1934, a naturalist-guided automobile caravan traveled up the west side of the Sun Road to Logan Pass, stopping at points of interest. In 1940, the park stationed naturalists at the auto campgrounds. And in 1948, park information services on the east side were transferred from Rising Sun to Sun Point, where a temporary information center was established. Eventually, the area had an exhibit, viewfinders, a self-guided trail, pit toilets, and picnic tables.[333]

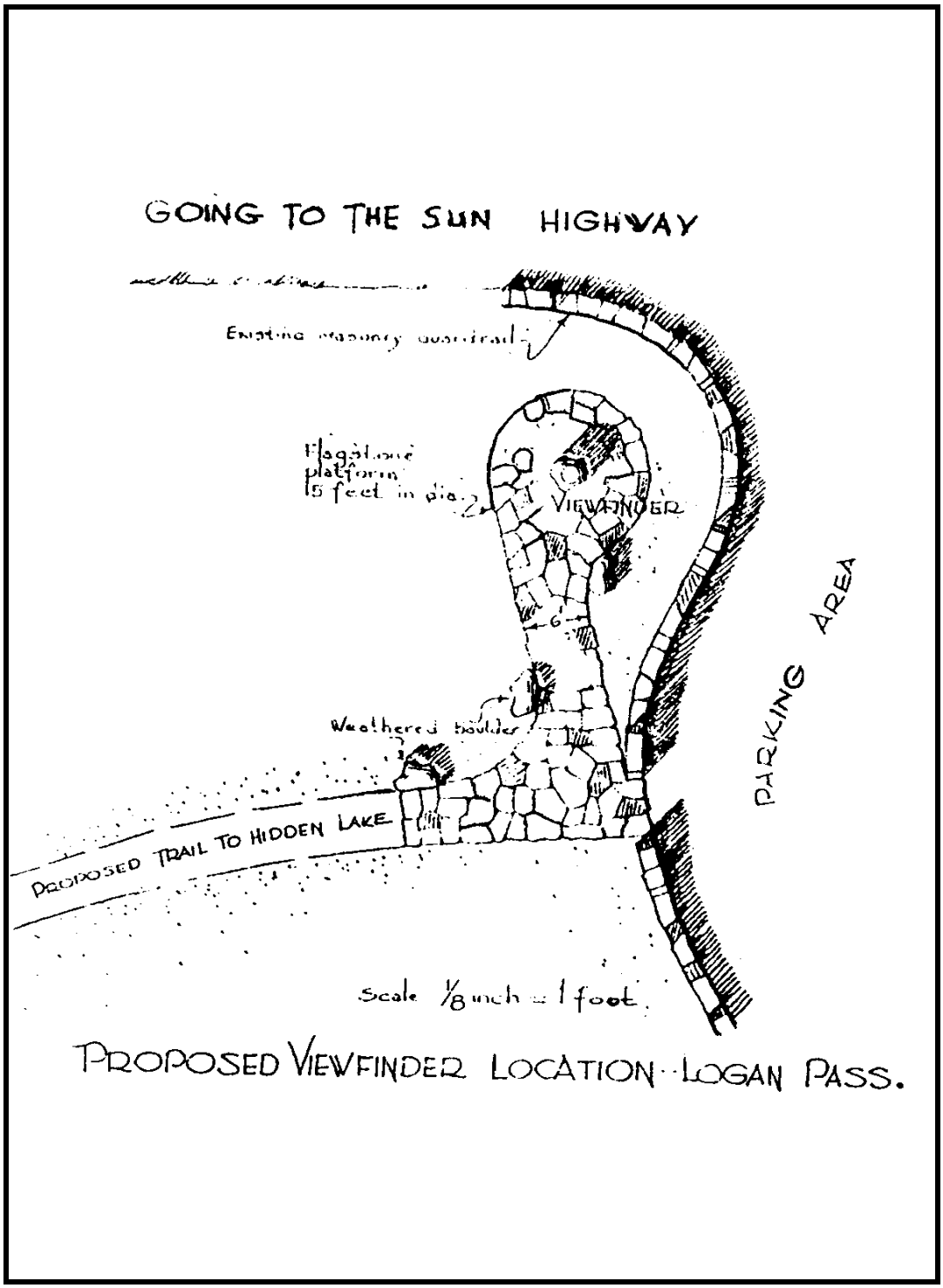

Figure 74. Viewfinders were proposed in 1936 for Apgar, Logan Pass, and St. Mary. Circular metal plates mounted on weathered boulders allowed visitors to identify the peaks they could see from where they were standing. TIC drawing 3135.

Through the 1950s, park superintendents emphasized the need for increased and improved interpretive activities. As of 1956, the park had three permanent and nineteen seasonal employees in interpretation. The main interpretive programs were guided trips, information services, self-guided nature trails, and evening talks at major campgrounds and concessionaire facilities.[334]

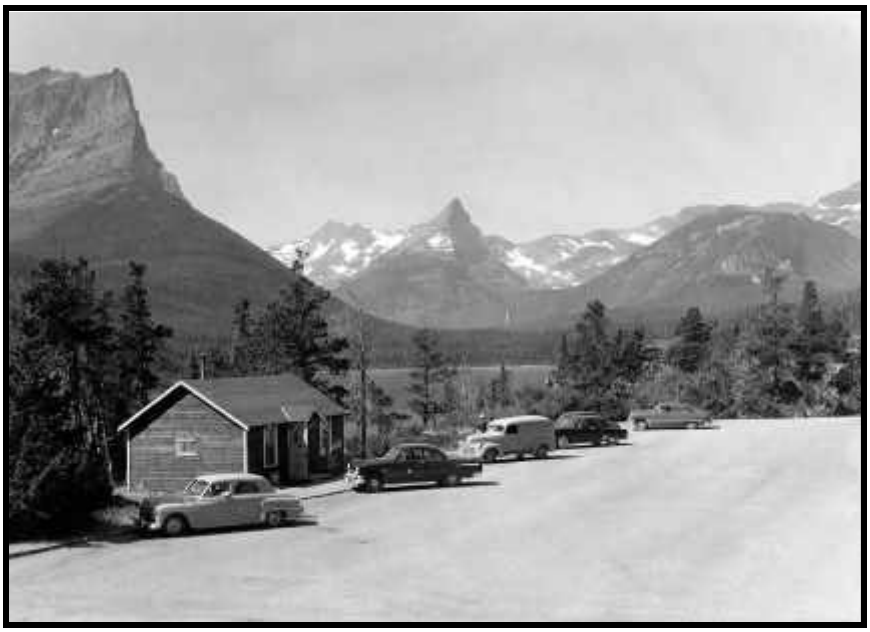

Figure 75. Information station at Sun Point, August 1951. Photo by D. H. Robinson, GNPA #5882.

Small roadside features such as signs are important aids to visitors and also convey an image of the park itself. Early NPS signs varied in design and were often crude and nailed to trees. The agency adopted its first system of uniform signs in 1920. These metal signs were mounted on posts and had green letters on a white background. The signs along Glacier's roads were redone in 1958. These included entrance signs, campground signs, destination signs for the Rising Sun area, and signs to draw visitors' attention to features visible from the roads. These signs were partly intended to orient visitors to the park. The routed wooden signs along the Road were replaced in the 1970s with metal signs employing symbols, standard letters and colors, and metric measurements.[335]

Many sites of geologic interest are visible from the Sun Road. The Road itself passes through eight different formations of rock. Other sites include a pullout to look at Jackson Glacier and another to see the ancient fossil structures known as stromatolites. A guide to the geology along the Sun Road was prepared in 1983. The publication introduced visitors to a variety of geologic features in Glacier at twenty-one stops.[336]

In the 1950s, the only "interpretation" of the spring road opening was provided each year by the *Hungry Horse News,* a weekly newspaper out of Columbia Falls. Editor Mel Ruder arranged to join the plowing crew one day each spring, take photographs, and write an article about the operation. The park began offering an annual "Show-Me Day" in the 1960s. These were advertised days for visitors to come up and watch the snow-plowing operations on either side of the Sun Road, with a naturalist or road crew member explaining the operation. This program was discontinued by the early 1970s and was reintroduced in the early 1980s; it continues today.[337]

Roadside markers and exhibits became a standard feature of roads in national parks by the early 1950s, and they were promoted as an important part of the interpretive program for roads and trails during the Mission 66 period. As of 1956, Glacier had six glass-enclosed roadside exhibits along the Sun Road. The park's Mission 66 prospectus proposed four others along the Road, all interpreting natural features. The nature trail at Trail of the Cedars (Avalanche Creek) had already been established, and the prospectus (only partially implemented) proposed others for the lower Lake McDonald Valley, Logan Pass, Rising Sun, and Sun Point.[338]

During the 1970s and 1980s, the exhibits along the Sun Road were redone to integrate photographs and to introduce ecological concepts into the interpretation. Some exhibits have been removed for management reasons, such as the Moose Country sign. The park's 1992 *Wayside Exhibit Proposal* gives more weight to cultural resource topics than had previously been the case. This proposal's recommendations include wayside exhibits about the history of Apgar Village, early park transportation, the evolution of Lake McDonald Lodge, historic boat transportation, the construction of the Sun Road, and the historic St. Mary River.[339] As of 2000, the park had twelve roadside exhibits along the Sun Road, including some of those listed in the 1992 proposal. Most are in pullouts, but a few are located a short distance from a pullout. Besides roadside exhibits, interpretive messages are also conveyed through talks, walks, hikes, campfire programs, visitor centers, brochures, the media, and the Internet.

2.3.20 Conclusion

Stephen Mather, the first director of the NPS, promoted and successfully sought funding for the east-west road through Glacier that eventually became known as the Going-to-the-Sun Road. Mather was closely involved with the planning for the Road, and he lived to see it completed to Logan Pass from the west side. The extraordinary qualities of the Sun Road strengthened the belief of Mather and others that only one major road should be built through each national park. The opening of the Road also fulfilled Mather's goal of an interstate highway system linking the national parks. This shift in policy within the NPS to favor one major scenic road rather than a network of roads throughout parks strongly influenced subsequent national park planning and development.

The Sun Road was the first product of the 1925 NPS/BPR interagency agreement prepared to facilitate cooperative construction of park roads. This original agreement was in effect until 1983 and has been only slightly modified since that time. The experience of building the Sun Road shaped subsequent mountain road construction standards and cooperative administrative procedures between the two agencies. Surveying the Road's route was challenging both technically and aesthetically. Tons of explosives blasted the roadbed out of the sides of mountains. Hundreds of workers dedicated years of their lives to the project; three men lost their lives. Skilled masons constructed guardwalls, retaining walls, bridges, tunnels, culvert headwalls, and underpasses to exacting specifications. The design for the Road (and for associated features such as turnouts and cleared vistas) combined techniques

and principles drawn from landscape architecture with state-of-the-art highway engineering. Innovative road engineering techniques, standards, and policies were developed during the construction of the Sun Road, particularly between 1925 and 1928 when the challenging section between Logan Creek and Logan Pass was constructed under the Williams & Douglas contract. The lessons learned from the Sun Road shaped future mountain road construction projects, both in national parks and other federal lands and in state parks.

The construction of the Sun Road across the Continental Divide and through the heart of Glacier encouraged the use of private automobiles as the primary means to see the park. Since the entire road opened to the public in 1933, driving the Road has been one of the primary ways that visitors see and experience the park. The popularity of automobiles has changed the activities preferred by park visitors and also the accommodations they require. Since the 1920s, park administrators have had to consider the needs and desires of automobile travelers in planning for visitor enjoyment of the park and for the protection of its resources. The Road itself provides access to the park's scenic wonders. The sites of new visitor facilities in the area have generally been selected on the basis of their location in relation to the Road rather than to scenic vistas. The design of these facilities changed from elaborate hotels and chalets to more economical and efficient cabin camps and auto campgrounds. Local and even regional economies now depend on the 1.7 million or so visitors who come to Glacier each year. Since its initial construction, the Sun Road has required much administrative attention, from snow removal to road maintenance and repair.

The Sun Road has suffered over the decades from a combination of factors, some of them typical of national parks in general. First, the funding for maintenance of the Road and its associated historic features has been far from adequate since the very beginning. Second, park staff's appreciation of the historical significance of the Road has not been deep and broad-based until the 1980s, when the significance of the Road was recognized on a national level. Third, extreme weather conditions and heavy visitation take their toll on the Road every year. And finally, some of the maintenance work itself, particularly the spring snowplowing, causes damage every year to features such as the historic masonry guardwalls.

In July 1983, the NPS organized a fiftieth-anniversary rededication ceremony of the Road. The ceremony was held at Logan Pass and was designed to be strongly reminiscent of the 1933 dedication ceremony. Many people who had helped build the Road in the 1920s and 1930s attended, along with others who had worked to maintain, repair, and manage the Road over subsequent decades. Of those who participated in the ceremony, many expressed their belief that the Sun Road is an extraordinary national treasure that has changed relatively little over the decades. Many might agree with Margaret Black's assessment of the Road. She first came to St. Mary in 1929, and she and her husband Hugh built the resort facility that is still run by family members at that location. In a recent interview, Black commented, "I think [the Sun Road] was a work of art. It was just a gorgeous road."[340]

The original design and construction of the Sun Road some seventy-five years ago set the direction for park road planning policies for subsequent decades. Similarly, the rehabilitation and restoration work now being planned for the Sun Road may set the standards for the reconstruction and management of historic park roads for years to come.

2.4 Historic Contexts Discussion

The historic significance of Going-to-the-Sun Road has been recognized by its listing in the National Register of Historic Places in 1983; its designation as a National Historic Civil Engineering Landmark by the American Society of Civil Engineers in 1985; its documentation by the Historic American Engineering Record in 1990; and its designation as a National Historic Landmark in 1997. Prior to these designations, the historic significance and context of the road was treated in the *Historic Resources Study* prepared by Historical Research Associates for Glacier National Park in 1980.

The 1983 National Register of Historic Places nomination listed 48.7 miles of the Sun Road as a historic district, beginning at the T-junction at the foot of Lake McDonald and ending at Divide Creek. The two miles of the road between West Glacier and Lake McDonald were not included because that portion has been significantly realigned after the period of significance. The historic district extended 15 feet in either direction from the centerline of the road, with an additional 5 feet at the West Side Tunnel. Besides the road itself and the associated historic masonry walls, eight bridges and two tunnels were listed as contributing to the road's significance. The nomination identified two areas of significance under Criteria A and C: "park development" and "engineering," both at the state and local level. The nomination notes that the Road reflects the increased importance of automobile tourism and the changing nature of park accommodations.[341]

The 1985 nomination of the Sun Road as a National Historic Civil Engineering Landmark discussed the contribution of the road to the development of the civil engineering profession and noted that it reflected the commitment of the NPS to provide access to the national parks for all Americans. The nomination form pointed out that the Sun Road set a precedent for the location and construction of park roads and was instrumental in establishing the 1925 interagency agreement between the NPS and the BPR. The nomination form also noted features and characteristics that set the road apart from other civil engineering projects, calling it one of the world's most scenic mountain roads.[342]

The 1990 Historic American Engineering Record documentation emphasized the significance of the Road as a unique engineering accomplishment of the period and as the first product of an interagency cooperation between the NPS and the BPR that continues today. The documentation included eighteen reports on individually significant structures associated with the road, including bridges, culverts, a horse trail underpass, tunnels, and a retaining wall.[343]

The 1997 designation of the Sun Road as a National Historic Landmark encompassed the same 48.7 miles as the 1983 National Register nomination, from 30 feet east of the T-junction (the foot of Lake McDonald) on the west to the park boundary on the east. The boundaries were widened to 30 feet from the centerline in either direction to include all of the retaining walls, culverts, pullouts, and other historic structures and features associated with the road; they extend wider if necessary to encompass pullout areas, extending 10 feet from all paved areas or masonry construction. The nomination describes and analyzes the road's contributing resources within the parameters of five categories: spatial organization, circulation, topography, vegetation, and structures. The nomination lists fourteen principle structures in addition to the road itself (bridges, tunnels, horse trail underpass, and culverts). Eleven of these were previously listed in the National Register. The historic district contains the original road, bridges, tunnels, culverts, retaining walls, and almost 40,000 feet of guardwalls, all built between 1922 and 1937. The period of significance is defined as 1921-52.[344]

According to the National Historic Landmark nomination, the Sun Road meets National Historic Landmark Criterion 1 for its association with the American park movement. It also meets Criterion 4 as an "exceptionally valuable example" of American landscape engineering, a discipline that blended the practices of civil engineering and landscape architecture. The Going-to-the-Sun Road Historic District is also nationally significant in the history of technology (transportation) because of its unprecedented engineering and because it completed the Park-to-Park Highway, first advocated by Stephen Mather in 1915. The nomination also notes that the Sun Road is significant under National Register Criterion A for its association with the American park movement and under Criterion C as an example of American landscape architecture and of transportation engineering.[345]

Several historic districts, two sections of historic trails, and a number of properties such as patrol cabins and entrance stations in the vicinity of the Sun Road are listed in the National Register of Historic Places. The Lewis Glacier Hotel (Lake McDonald Lodge) Historic District was listed in 1978 and amended in 1995, with a period of significance extending from 1909 to 1945. (Lake McDonald Lodge was also listed as a National Historic Landmark in 1987, with amendments in 1996.). The 1913 St. Mary Ranger Station was listed in the National Register in 1986. The Headquarters Historic District was listed in 1995 with a total of 85 buildings, and the Rising Sun Auto Camp Historic District was listed in 1996. Finally, the Logan Pass visitor center was determined eligible for listing in 1999. (The significance of the St. Mary visitor center has not been established.)[346]

2.5 Summary of Design Guidelines

Historic site plans, maps, photographs, and drawings, along with narrative documents, help clarify the evolving design intent of the NPS and BPR staff who created the cultural landscape we know as the Sun Road. An understanding of the design intent provides a

context for evaluating change in the landscape. The design intent for the Sun Road has been discussed in some detail in the historic context section of this report. Below is a summary of the points made in some of the critical primary documents.

- In 1918, Secretary of the Interior Franklin Lane signed a letter that set out official policy for the NPS and that guided development and management of the National Park System for years to come. The letter underlined the importance of planned park development and stated, "In the construction of roads, trails, buildings, and other improvements, particular attention must be devoted always to the harmonizing of these improvements with the landscape." Lane urged the agency to hire trained engineers with knowledge of landscape architecture or appreciation of the "esthetic value of park lands." All improvements (including roads, trails, and buildings) were supposed to be constructed in accordance with a preconceived plan developed "with special reference to the preservation of the landscape." He also noted that trained engineers should be hired to design roads and that forests could be thinned or vistas cleared to improve scenic features or to eliminate insect infestations or disease.[347]

- NPS landscape architect Thomas Vint provided detailed comments on the 1924 proposed route over Logan Pass. The following points he made in a memo to Daniel Hull outline his design intent for the Sun Road:

1. "That the purpose of the road is primarily for the use of tourists and is a means to display to them the park scenery.
2. Its alignment or route should include both the practical means of making this grandeur accessible and the dramatic values in displaying it.
3. The finished road should minimize the effects of the work of the hand of man that the effects of the work of nature will predominate in the picture.
4. Construction details such as bridges, tunnels, retaining walls, parapets, culverts, etc., should not be monumental or stylistic but native, simple in line and retiring.
5. The strips of land immediately adjacent to the actual strip of roadway should be left clean free from stumps, borrow pits, piles of broken rock, etc., and not show the marks of the process of construction."[348]

- Daniel Hull wrote the first standards for park roads in 1925. The basic principle was to achieve maximum scenic beauty with the least scarring of the landscape. Topography – including the possibility of scenic vantage points - should determine road location, he wrote. Native materials should be used so that features such as bridges and guardwalls harmonized with the landscape rather than appeared monumental or stylistic. Landscape architects should consider the view from the road and the view of the road itself in their designs. By 1930, NPS landscape architects were preparing for BPR engineers detailed designs for structures such as parking areas, guardwalls, the treatment of road banks, and bridge masonry. Masonry techniques using standardized construction principles but adapted to local stone evolved. A concept of park planning also evolved that allowed park

superintendents to program park developments over a several-year period. The review procedure for park Master Plans ensured that designs would harmonize with nature and support the agency's mandate for stewardship and visitor use.[349]

- NPS Director Stephen Mather, who was very influential in the planning and design of the Sun Road until his death in 1930, described NPS ideas about park roads in a 1928 article. He wrote the article when the west side approach to Logan Pass was being constructed. He noted, "the scenery must be conserved and at all costs left as little scarred as possible." He continued, "straight alignments must be sacrificed for graceful curves where trees or other beauty spots should be savedÿBridges must fit into the landscape. Where construction must be carried along sheer mountain sidesÿthe excavated material cannot be dumped over to scar the whole terrainÿTrees must be protected, and side-hill cuts must be made with a consideration as to whether they will become covered with fern, or flower, or shrub. Parapets and rock walls must be designed to harmonize and yet give a feeling of safety in high places."[350] To summarize, park roads should allow visitors access but also protect the surrounding vegetation and natural features. Built improvements should be harmonized with the natural setting. To some extent, as NPS historian Linda McClelland notes, this design intent "created the illusion in the minds of visitors that the landscape had never been disturbed."[351]

- Writing twenty-five years after he completed the survey that located the Sun Road's route over Logan Pass, Frank Kittredge noted that he chose the route that "would adequately show to the public the tremendous spectacle of mountains and canyons, forests and streamsÿandÿwould be capable of improvement of allignment [sic] and width of roadway if and when traffic should require improvement."[352]

- Based on the experience of the previous several years, in 1929 the Landscape Engineering division of the NPS prepared a list of standard general provisions for landscape protection. These included the removal or restoration of any trees or other natural features scarred or damaged by the contractor; removal of rocks that fell outside finished slopes; limited development of temporary trails and roads; leaving uncut trees and bushes along the shoulders within the right-of-way during blasting to protect adjacent vegetation from damage; backfilling of all holes; and location of borrow pits in areas not visible from the road. One provision resulted from unsatisfactory excavations that had been done on the Sun Road. This was the introduction of Type B excavation, developed in consultation with BPR engineers and the DuPont Powder Company, which required careful rock excavation and minimal casting of debris. Block holing (drilling large holes for explosives, resulting in extensive rock falls and scarring) was prohibited. Type B was only required in specified areas identified during the preliminary road surveys.[353]

- The 1929 contract specifications for the Colonial contract on the east side of the Sun Road listed many requirements aimed at improving the aesthetics of the masonry work along the Road. These had evolved during the work on the west side of Logan Pass. The specifications included required ranges of dimensions, including ratios of length to height; no nesting or bunching rocks of the same size, shape, or color; required the use of extra-large stones at all corners and of large stones at the base of walls; specified that mortar joints should be at least 1 inch wide and raked to a depth of at least 1 inch; prohibited any continuous joint betweens retaining walls and guardwalls; provided for drainage openings ("weep holes"); required the laying of stones in courses with the major axis horizontal and so that no four corners were contiguous (giving a random, irregular appearance); prohibited longitudinal joints in the top courses; specified that pilaster (parapet) dimensions be 3 feet 6 inches in length and that the distance between pilasters be 12 feet; stated that the use of weathered rocks covered with moss, lichens, or traces of color was preferable for exposed surfaces; and required that all pipe culverts have masonry headwalls on the upstream ends and on the downstream ends as designated by the plans or the engineer.[354] These specifications were used for the Type 2a guardwall constructed by the various contractors of the 1930s.

- After the full length of the Sun Road opened to the public in 1933, park staff continued to plan for reconstruction of sections of the road that still did not meet current BPR Forest Highway standards. In the fall of 1934, representatives of the NPS Landscape Engineering division, the resident BPR project engineer, and Superintendent Scoyen agreed on guidelines for reconstruction of the Lake McDonald section. These were: reduce curvature, hold centerline of new road on present roadway width wherever possible; eliminate a number of short vertical curves; retain long vertical curves where no traffic hazard was involved; obtain additional width by filling present grade with borrow materials from the lake; cut back slopes to obtain width only when no other method is practicable; and depart from conventional balanced cut-and-fill practice by using lake borrow (this idea was later replaced with using borrow material from the Jackson Creek pit). Ernest Davidson, the resident Landscape Architect, strongly recommended making a safe road "without destroying the charm of the present roadway, its winding, woods-road atmosphere."[355]

- In the mid-1960s, the NPS assembled a team to prepare the first formal guidelines for park road standards. The 1967 *Park Roads Standards* established an ethic for road design, emphasizing the blending of roads with the natural setting and controlling soil erosion. Instead of emphasizing the protection of scenic values, they were designed to effect overall environmental protection. The standards included recommendations such as rounding cut-and-fill slopes and then seeding, fertilizing, and mulching to encourage revegetation. Clearing timber was to be selective cutting

only, to allow a naturalistic treeline along the road. The standards acknowledged the need to manipulate visitor use of park roads. They suggested that the NPS consider reducing speed limits, convert some to one-way, limit automobile use in certain areas, and exclude larger vehicles rather than building roads to higher standards.[356]

- In 1969, Glacier let a contract to repair masonry guardwall along the Sun Road. According to the specifications, the contractor was allowed to use stones that had fallen from the guardwall on the mountainside, those discarded in the Logan Creek storage area, or those from sources outside the park, so long as the stones were sound, shaped to the proper dimensions, and had a color that would blend with the existing wall.[357]

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Chapter 3: The Landscape of the Sun Road

3.1 Past Research

One of the best sources for detailed contemporary information about the construction of the Sun Road is the series of construction reports prepared by engineers working on the project over the years. This archival material, complete with original photographs, is available at the GNPA. Other excellent primary sources that were consulted for the historic context include landscape architect Ernest Davidson's 1929 report on features of "landscape interest" related to the construction of the Sun Road 1925-28; the annual GNP Superintendent reports; BPR engineer Frank Kittredge's report on his 1924 survey of several routes to complete the Sun Road over Logan Pass; and the park's correspondence files in the category of Development and Maintenance: Roads and Trails.

The collection of historic photographs at GNPA is a tremendous asset when researching the appearance of the Sun Road over the decades. The authors of this report looked at several hundred photographs in the collection. The GNPA files also contain a large number of maps, plans, and technical drawings, some of which are not found in other NPS repositories.

Dennis Holden, a long-time employee of Glacier National Park, assembled extensive research material and prepared detailed manuscripts on various aspects of the history of the Sun Road. His research material is now housed in the GNPA in four large boxes. The boxes contain photocopies of material housed in the GNPA, the NARA, miscellaneous reports, newspaper articles, and other primary documentation, plus copies of sections of published works related to some aspect of the Sun Road (generally the source is indicated, but this is not always the case). The manuscripts authored by Holden reflect the great depth of his understanding of the Road's history.

The Technical Information Center at the NPS Denver Service Center contains an invaluable collection of interior and exterior blueprints, site maps, and technical reports related to the Sun Road, buildings, and sites. Many of these were examined for this report.

Ethan Carr's 1998 book, *Wilderness by Design: Landscape Architecture and the National Park Service*, contains a lengthy chapter on the Sun Road. This is an excellent source of information on the Road and its historical significance, particularly its significance to the development of visitor facilities in Glacier and to the professions of landscape architecture and engineering within the NPS. Other secondary works on the history of the NPS were also consulted, including Linda McClelland's very helpful *Building the National Parks: Historic Landscape Design and Construction.*

Kathryn Steen's various reports prepared for the Historic American Engineering Record provide excellent information on the history of the road and many of the principal features along the route.

Numerous planning documents related to the Road have been prepared by and for the NPS over the years, including cultural resource plans, environmental assessments, historic resource studies, and National Register nominations. Many of these contain useful information related to the Road and to buildings and structures associated with the Road. The Cultural Landscape Inventory prepared by Mark Hufstetler in 2001 is particularly useful because it provides a detailed description of the visible cultural features along the Sun Road as they existed in 2000, with locational data. The inventory also provided a condition assessment and an evaluation of integrity for each feature.

Contemporary newspapers were not consulted in preparing the historic context for this report except for articles that had already been located and copied by other researchers. Newspaper articles would undoubtedly provide fascinating details and stories about the Road, but this very time-consuming research was not considered critical for the purposes of this report. The rich photograph collection of the *Hungry Horse News* also was not examined.

Several former and current Glacier employees were interviewed to help fill in details about the history of the Road, particularly concerning its maintenance by NPS road crews and contractors since the 1950s.

3.2 Applicable Historic Preservation Law

The Going-to-the-Sun Road is among America's most significant cultural resources and has been recognized as such through a series of Federal designations. The Road is listed in the National Register of Historic Places; it is a National Historic Landmark; and a National Civil Engineering Landmark. While the Road, at its completion in 1933, was immediately considered to be among the most scenic highways in the world, these special designations afford it special honor and protection. More specifically, those activities which may have an impact on this very significant resource are regulated under federal historic preservation legislation. Chief among the laws that govern the management of historic properties is the National Historic Preservation Act of 1966. In addition, the Antiquities Act of 1906, the Historic Sites Act of 1935, and the 1969 National Environmental Protection Act (NEPA) all have bearing on management decisions that affect historic resources. Following is a brief description of each of the laws and regulations which apply and their specific implication for the management of historic resources.[358]

3.2.1 The Antiquities Act of 1906

The Antiquities Act of 1906 allows the President to designate historic and natural resources of national significance and provides criminal sanctions against excavation, injury, or destruction of antiquities.

3.2.2 The Historic Sites Act of 1935

This Act gives the Secretary of the Interior the power to make surveys, and to document, evaluate, acquire and preserve archeological and historic sites across the country. This legislation, fostered the creation of the Historic American Building Survey (HABS), the Historic American Engineering Record (HAER), and the Historic Sites Survey in the National Park Service to identify National Historic Landmarks.

3.2.3 The National Historic Preservation Act of 1966 as Amended (NHPA)

NHPA has a number of components which are used by historic preservation professionals, government agency personnel, and property owners in addressing the management and preservation of historic properties. These include:

- **The National Register of Historic Places**. The National Register is the official list of the nation's cultural resources worthy of preservation. The Register includes all historic areas in the National Park System, National Historic Landmarks, and properties that have been nominated by the states, federal agencies, and others, and approved by the National Park Service.

- **Rehabilitation Standards, Secretary of the Interior**. The Standards set forth guidelines to be used in the rehabilitation of properties which are on or eligible for listing on the National Register of Historic Places. The Standards are to be applied to specific projects in a reasonable manner taking into consideration economic and technical feasibility.

- **Sections 106 and 110 of the NHPA** . These sections specifically address the responsibilities of Federal agencies regarding historic properties management. Section 106 requires that every federal agency evaluate how an undertaking might affect historic properties. The State Historic Preservation Office reviews most routine actions with some input from the National Advisory Council on Historic Preservation, depending on the nature of the undertaking and the resource at stake. Section 110 requires federal agencies to emphasize the preservation and enhancement of cultural resources whether directly under their jurisdiction or affected directly or indirectly by their plans and programs.

All of the above provisions effect the Sun Road and significant resources related to it. Section 110(f) of the NHPA is perhaps of the greatest relevance, however, since it outlines specific guidelines and requirements for federally-owned National Historic Landmarks. Appendix 2 of this report contains additional information about the requirements of Section 110.

3.2.4 The National Environmental Policy (NEPA)

The National Environmental Policy Act calls on the federal government to use all practicable means, to improve and coordinate federal plans, functions, programs and resources so that the nation may preserve important historic, cultural, and natural aspects of our national heritage, and maintain, whenever possible, an environment which supports diversity and variety of individual choice.

In addition to these specific Acts, there are other Federal laws governing National Historic Landmarks, specifically Section 1a of the National Park Service Organic Act and Section 9 of the Mining in the National Parks Act of 1976.

When taken as a whole, this body of law requires Federal managers to consider the affects of its actions on those cultural resources under its stewardship. Historic and prehistoric sites, archeological sites, and cultural landscapes must be carefully inventoried and documented to determine their significance. Proposed actions must be planned in a manner that takes into account any potential impacts on these important resources. When actions, such as the restoration of the Going-to-the-Sun Road, must be undertaken, the Secretary (of the Interior) Standards for Rehabilitation must be followed to the greatest extent possible. Those Standards that are particularly germane to the preservation and treatment of Going-to-the-Sun Road include:

- The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property must be avoided.

- Most properties change over time. Those changes that have acquired historic significance in their own right should be retained and preserved.

- Distinctive features, finishes and construction technique, or examples of craftsmanship that characterizes a property, should be preserved.

- Deteriorated historic features should be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature should match the old in design, color, texture, and other visual qualities, and where possible, materials. Replacement of missing features must be substantiated by documentary, physical, or pictorial evidence.

The planning and design of projects which will affect or potentially affect cultural resources should be undertaken in consultation with preservation professionals, the State Historic Preservation Office, and the National Advisory Council on Historic Preservation. Involving these persons and entities early in project development will help assure that nationally significant resources such as Going-to-the-Sun Road are well protected and continue to honor the architects, engineers and craftsmen who created them.

3.3 The Landscape of the Sun Road

3.3.1 Introduction

The dramatic landscape of Glacier National Park is the result of ongoing geologic forces, of mountain building, erosion and glaciation over more than a billion years. The terrain created by these forces presented a significant challenge to the designers and builders of the Going-to-the-Sun Road. It is clearly the interaction between the Road and the landscape – the engineering of the Road across Logan Pass – that has resulted in its magnificence.

The following sections of the Sun Road Cultural Landscape Report address the existing conditions of the Road with respect to a number of characteristics – its physical attributes, natural setting, associated structures, and other improvements. Key to this discussion is the visitor experience on the Road – both in terms of the Road's ability to exhibit Glacier Park's exquisite resources and as a cultural resource in its own right. The Road not only reveals the landscape, it becomes part of it, visually and structurally.

Because of the diverse engineering, landscape and cultural qualities found across the length of the Sun Road, information in these sections is presented both for the Road as a single entity and as a sequence of seven linear landscape segments. Each segment displays unique geographic and landscape characteristics – physical, cultural, and experiential. In presenting each of the seven linear segments, these characteristics are identified and described to provide information in a consistent and comprehensive manner.

Landscape characteristics include both natural and man-made features. Natural features include terrain, vegetation and wildlife of Glacier National Park – its mountains, glacial valleys, waterfalls and dense forests. Man-made features encompass various buildings adjacent to the road, visitor use areas and structural elements of the Road itself – bridges, retaining walls and tunnels. In many cases, the natural and manufactured elements are intertwined, notably in the use of natural materials in construction. When taken together, the defining elements create a visitor experience that is unique to that segment, even though there may be some characteristics which are common to more than one segment of the roadway.

3.3.2 The Road as a Whole

Going to the Sun Road, is, in its own right, a national treasure. Like the mountains, wildlife, cascading waterfalls and glaciers, it draws travelers to Glacier National Park because of its significance as a visual and cultural resource. The Road is simply magnificent. Whether in recalling the "white-knuckle" experience of riding along the narrow roadway, or the spectacular scenery which the Road arrays, Park visitors remember their motor trip over Logan Pass. In fact, for many, the Road and Park are one and the same. The interaction between the Road and the visitor is akin to the experience that a hiker might have in reaching a high summit – characterized, perhaps, by less exertion, but with no less exhilaration. Or, put another way, the road is the ultimate trail through the Park and as such provides the visitor with a series of recreational, interpretive, and scenic experiences.

Following are descriptions of each of the defining elements identified in this study for the Sun Road. Here they are presented to provide a context for the entire Road. The information will then be used in a more specific manner to describe the character of each of the linear segments.

Topography – Mountain Building and Glaciation

The spectacular landscape of Glacier National Park – the mountains, hanging valleys, and dramatic rock walls provide the overall setting for Going to the Sun Road. Although most visible on the east side of Logan Pass, the upper portions of the Road west of the Pass, and at Logan Pass itself, the high alpine peaks and glaciated landforms dominate the overall visitor experience on the Road.

Glacier's Rocky Mountains have undergone a series of mountain building and erosion episodes. The story begins billions of years ago when sands, muds, and lime-based flows were laid down layer upon layer in ancient oceans and on coastal plains which once spread entirely across this region. These sedimentary rocks, later to become sandstone, shale and limestone, extended for hundreds of miles and ranged from two to eight miles in thickness. It is these sedimentary rocks, together with intrusions and extrusions of rocks which had once been liquid (igneous rock) which compose the mountains.[359]

About 65 to 50 million years ago, great compressive forces squeezed these sediments into huge folds, miles in width and scores of miles in length. Pressure, heat, and chemical changes eventually solidified the sediment into argillites, quartzites and limestones, forming the multicolored strata so distinctive in the Park. Eventually, as pressures continued, the strata of sediment broke along the lines of the folds and great segments of earth moved along slipping planes upward and easterly, over-riding other masses of rock, in some places for a distance of many miles. The height of these uplifts could have been 5 to 10 miles in some places. The most famous of these uplifts is known as the Lewis Overthrust. In Glacier, the Lewis Overthrust is very distinctive, and the Park is often mentioned in geology texts. Due to the slowness of the processes, however, the uplifted areas were eroded away

by streams and running water and ice almost as fast as they were uplifted. Erosion during the last 60 million years stripped away the upper part of the original surface of the mountains, revealing the rocks and structures that help define Glacier's beautiful and rugged mountain landscape.[360] Today, the western range of mountains in the park is known as the Livingston Range and the main mountain range, which follows the Continental Divide, is the Lewis.

Valley and mountain glaciation, occurring during the last few million years, has further sculpted the landscape of Glacier National Park . The great ice ages began about three million years ago. The last of these, the *Wisconsin*, sent great sheets of ice – some to depths of over four thousand feet, surging down the valleys of what is now Glacier Park. Even though the Wisconsin Ice Age was the last major glacial activity, studies in the Many Glacier area have revealed at least twelve additional periods of lesser glacial activity. During the period between the Wisconsin Ice Age and the present, valleys were deepened and widened and the mountain peaks were polished and sculptured.[361]

The last glaciers of any major consequence retreated about ten to twelve thousand years ago. It was these glaciers, rather than those visible in Glacier today, that give the Park its sheer cliffs, aretes – knife shaped edges, cirques – glacial amphitheaters or basins quarried out of a mountain wall by ice[362], U-shaped and hanging valleys, glacial moraines and countless cascading waterfalls. Most dramatic among these are the U-shaped valleys that were formed by great rivers of ice that scraped away the headwalls and sides of valleys. The approach to Logan Pass from the west provides the traveler with a view of one of the most beautiful examples of a U-shaped valley, framed by Mount Oberlin and Cannon on the south and the Garden Wall and Pollock Mountain on the north. Aretes, such as the Garden Wall, are formed when back to back glaciers move against the adjacent valley headwalls. If they break through, a "col" or saddle is formed. Examples of cols include Logan Pass and the Hanging Gardens between the St. Mary and McDonald Valleys. Matterhorn peaks or horns are the result of glaciers grinding on three sides of a mountain.[363] Mount Reynolds at Logan Pass and the Little Matterhorn, visible from the lower McDonald Valley, are both good examples of this phenomenon.

Hanging valleys and their cirques lie high on the northern exposures of many mountains. These were formed from tributary ice masses moving from small side valleys located above the main valley ice flow. As the great valley glaciers melted, they left small hanging glaciers isolated in cirques suspended on the mountain sides. The numerous waterfalls in the Park exist, in part, due to the glaciers, snowfields and cirque lakes. Several towering falls, like Bird Woman, between Mt. Oberlin and Cannon, visible from Sun Road, originate in hanging valleys, dropping hundreds of feet over sheer cliffs.[364]

Moraines form at the sides and front of a glacier, from the rock and debris or glacial till which is trapped in the ice as it flows. As the ice melts and recedes, this trapped material is released forming large piles called moraines. Moraines from the present glaciers are visible as mounds of rock and gravel along the sides and front of the ice. Plants soon colonize this

new soil. Forests and meadows cover many ancient moraines making them harder to spot. Most of Sun Road between Siyeh Creek and the head of St. Mary Lake is built on a lateral moraine plastered onto the north valley wall of Reynolds Creek and glacial till can be seen in the road cuts.[365]

While the mountains of Glacier National Park do not alone define terrain, they are the most dominant aspect. They not only relay the story of the distant geologic past, they reveal the work of the Glaciers which give the Park its name. Sun Road provides glimpses of Glaciers, both active ones, such as on Mount Jackson and Heaven's Peak and those which have become quiet permanent snow fields.

Topography – The Continental Divide

The Sun Road crosses the Continental Divide at Logan Pass. The Continental Divide is that series of geographical points running through the Rocky Mountains wherein water from storm tracts coming from the west is shed either to the west (and ultimately the Pacific Ocean) or to the east (and eventually the Atlantic Ocean, Hudson Bay, or the Gulf of Mexico). The present location of this apex-and-planes hydrologic barrier is the result of the long term structural and erosive processes occurring throughout the Rocky Mountains including Glacier National Park.[366] The Divide also marks the dividing point between the east and west sides of the Park, each with its own sub-climate and vegetative characteristics. These changes are evident along the Road as it travels through the dense forests on the west side of the Park and the open, wind swept valleys on the east.

3.3.3 Geology – The Rocks[367]

The beauty of Glacier's landscapes are enhanced by the intense and varied colors of the rocks – red, green, tan, white and gray. The sedimentary rocks found in Glacier Park are some of the oldest and best preserved in the world, giving the visitor a unique opportunity to glimpse at our geologic past. The Sun Road provides an opportunity for the visitor to see a variety of rocky formations, beautiful and dramatic. Further the retaining and guard walls along Sun Road have been constructed of this colorful rock quarried from road-side source tying the visual character of the Road to the landscape through which it traverses.

There are four easily distinguishable rock formations in the Park. While the rocks were laid down in sediments in a succession of seas that covered the area in the geologic past, the rocks have broken and folded along great faults, but the sequence is still evident[368]. The oldest of these formations is the *Altyn*, visible in outcroppings at the base of the mountains on the east side of the Park. About 2,000 feet thick, it is gray and weathers to a light tan or cream color. The Altyn formation sediments were deposited in a shallow, warm sea, evident in the presence of fossil algae called *stromatolites* in the rock. The Altyn is composed largely of sandy limestone with some dolomoite. This formation exhibits prominent sedimentary features, such as ripple marks – wavy surfaces resulting from the action of water or wind

currents, are accentuated by layers and inclusions of sand in the rock. The buff-colored Altyn Formation is visible from the Sun Road as it winds its way between Sunrift Gorge and Rising Sun Campground, along the north shore of St. Mary Lake at the narrows.[369]

On top of the Altyn limestone is a 2,000 to 5,000 foot layer of *Appekunny argillite.* Appekunny argillite is predominantly green color, but layers of red mudstone do exist near the top of the formation. In addition, the formation contains beds of white sandstone which are thick enough in some places to form white stripes, evident on mountainsides at various locations. The next formation is the bright red to purple *Grinnell argillite* which at nearly 3,000 feet thick, is the most colorful formations in Glacier Park. Named for George Bird Grinnell, an early park researcher and promoter, the formation was deposited on tidal flats. Gentler waves and currents produced wavy ripple marks. As in the case of the Appekunny Formation, layers of green mudstone and white sandstone also occur in the Grinnell. Both the Appekunny and Grinnell argillites are found along Sun Road on both the west and east sides of Logan Pass. The Appekunny is evident at McDonald Falls and for several miles east of Sun Point. The Grinnell can be viewed near Avalanche Creek and near Baring Creek.[370]

The *Siyeh (Helena) Formation* ranges from 1,800 to 5000 feet thick and sits above the Grinnell and is composed primarily of dolomite and some limestone.[371] It is a dark, bluish-gray formation weathering to buff. Siyeh limestone is very strong and it forms the rocky cliffs that top many of the mountains, dominating the landscape in the higher reaches of the Park. From Sun Road, the Siyeh formation is visible on a number of peaks, including Little Chief, Jackson, Gunsight, Fusillade, Cannon and Heaven's Peak, among others. The visitor center at Logan Pass sits on top of a thick ledge of Siyeh Limestone containing numerous blue-green algae believed to have grown where waves agitated the water.[372] Shortly after the last bed of Siyeh sediments had been deposited, molten magma rose from deep within the earth and inserted itself between the sediments. Some of it cooled very slowly to form igneous sills (parallel to the sediments) and dikes (running across the sediments) of corse-grained black material called diabase. One of the largest of these is the Purcell Sill which is approximately 100 feet thick and forms a black band in the upper part of the Siyeh Limestone. The Purcell Sill is most evident along the Garden Wall and at Logan Pass and is about 100 feet thick.

The geology and topography of the Park are the key defining elements in the design and structure of Sun Road. The limestones and argillites which constitute the mountainous terrain are also clearly visible in the various structural elements of the Road itself. For example, the green Appekunny formation is visible in the guard walls along Avalanche Creek and near St. Mary's Lake.

3.3.4 Water

The Park's glaciers and mountain climate provide the visitor with a landscape rich with water resources – lakes, spectacular waterfalls, creeks, and rivers, many of which are visible from the Road. Visitors are drawn to the water, much of it a milky blue from the glacial silt washed down the mountain sides. The Sun Road follows the drainages, both east and west of Logan Pass as they wind their way to the waters' source. The larger bodies of water – the lakes and creeks which follow Sun Road provide much of the setting for the Road at lower elevations. Waterfalls occur all along the road, cascading down the mountains with great force, or, as tiny droplets along the "Weeping" Wall, between the Loop and Logan Pass.

Most of the water in Glacier National Park is linked to glaciation. Lake McDonald, at 450 feet deep, was created by glacial carving action and is held in place by natural dams of gravel washed out from former glaciers when they extended down into the valleys. St. Mary Lake, created by an alluvial dam, was once one lake, seventeen miles long, subsequently divided by gravel deposits from side streams to create the Upper and Lower Lakes. Waterfalls occur either where streams drop over the "risers on what is sometimes called the "glacial staircase", or at the point where a hanging valley sits high above a main valley floor, resulting in an extraordinary drop by the tributary stream pouring out of the hanging valley. On Sun Road, Lunch Creek, just west of Logan Pass, Baring Creek at Sunrift Gorge and McDonald Falls are examples of staircase falls. Bird Woman Falls, visible from Sun Road at Big Bend, emanate from the hanging valley surrounded by Oberlin, Clements and Cannon mountains and provide an example of the hanging tributary type of falls.[373]

Figure 76. St. Mary Lake, 2000 photo.

3.3.5 Climate

The climate changes from west to east are evident along Sun Road as it travels along the moist floor of the McDonald Valley, through the wind swept aspen groves near Rising Sun, to the open, nearly treeless Two Dog Flats area at St. Mary. The variance in climate from east to west creates two distinctive driving experiences. Traveling on the west side, the visitor is impressed by the dense forests which are only occasionally interrupted by fleeting views of mountain and lake scenery, until one reaches the Garden Wall. In contrast, travelers on the east are often provided with unobstructed views along miles of roadway.

Temperatures in Glacier are variable and can range from well below 0° Fahrenheit to 90+° Fahrenheit. Most of Glacier Park's annual precipitation falls as snow. West Glacier, at 3,200 feet, gets 30-plus inches of moisture a year, while the cirques along the Continental Divide receive more than100 inches of precipitation annually – which translates to more than 80 feet of snow. While the snow is removed from the Sun Road for its annual opening in early to mid-June, the big snow piles and drifts are visible along the road at the higher elevations for most of the year.

Although the majority of Glacier Park lies within the Canadian Life Zone (see Vegetation, below), the heavier forests are concentrated on the western slopes. Annual precipitation figures show that the east side of Glacier Park is only slightly drier than the west side. Twenty-six inches falls on St. Mary in a year. Yet the east side appears far drier than the west. Dense western red cedar and hemlock forest grow along McDonald Creek and Avalanche Creek, reminiscent of the rain forests of the Pacific Northwest, while on the east side, the Park appears more arid and the vegetation more sparse, supporting mostly Douglas-fir lodgepole, limber pine, or no trees at all. This is due, in part to wind, which blows year round on the east side of the Park.[374]

Because of its latitude and elevation, Glacier National Park typically experiences rather abbreviated spring, summer and fall seasons. Visitors to the Park in June and early July experience a late spring, and by mid to late August, early snows announce the coming of fall and winter. While heavy snowfall limits the number of months which the entire length of Sun Road is open to vehicular travel, the Road exhibits a number seasonal changes in the months that it is open. Travelers observe early and late snowfalls, spring and summer flowers and autumn colors within a span of 3 or 4 months. In describing those segments of the road that remain open all year – the entrance at St. Mary's to the St. Mary campground and West Glacier to Lake McDonald, the characteristic landscape elements can be observed through all four seasons. Those portions of the Road at lower elevations which close during the winter, often remain open from late spring to late fall and visitors can see changes in vegetation, snow cover and wildlife patterns. Even when the Road or portions of it are closed to vehicles, visitors can cross-country ski and snow shoe along Sun Road and are able to experience portions of the Road as a winter trail.

3.3.6 Vegetation

Along the edges of Sun Road and high on the mountainsides, the visitor is treated to a wide variety of plant species. Everywhere along the Road there are flowers – white beargrass, bright red Indian paintbrush, purple and white daisies, yellow Glacier lilies, and a myriad of others. Even in areas of dense forests, the flowers flourish. The forests tower over the road on the west side, while on the east, aspen groves are perpetually bent in the direction of the prevailing winds.

The Road travels through a series of life zones providing a wide variety of plant environments, both west and east of the Continental Divide at Logan Pass. The various zones, combined with changing seasons produce an ever-changing vegetative landscape. Within Glacier Park, four life zones have been identified – the Transition or Prairie, the Canadian, the Hudsonian and the Arctic-Alpine.[375] The lowest of these is the Transition Zone with a temperate climate resembling that found in the Great Plains area. It is covered by ponderosa pine forests and is the "transition" between the hotter semi-arid regions and the cool moist timbered regions of the Canadian Zone.[376] The Transition Zone is primarily seen on the eastern edge of the Park and in a few isolated areas west of the Continental Divide, but there are generally no significant stands of ponderosa pine along Sun Road. Flowers associated with this zone include geraniums, wild onions, lupine, wild rose, cinquefoil and paintbrush. Although the West Side of the Park lies below the 4,000 foot level, the heavy snowfall and dense forests preclude any significant areas from being characteristically described within this zone.[377]

The Canadian Zone extends roughly from 4,000 to 6,000 feet above sea level. The greater part of the Park lies within this zone which features dense forests of Engelmann spruce, lodgepole pine, western red cedar, western hemlock, western white pine, Douglas fir, western larch, and black cottonwood poplar. Examples of these species are seen at various points on Sun Road, although western hemlocks and red cedars are limited almost entirely to the McDonald Valley. Douglas fir grows on both sides of the Continental Divide. A typical stand may be seen along Sun Road on the rock point overlooking St. Mary Lake, just west of the Rising Sun Campground in the area known as the Golden Staircase. Flowers associated with this zone include the early-blooming glacier lily, followed by the yellow arnicas, purple phacelia, mariposa lily, columbine, fireweed and the many colored Indian paintbrush.

The Hudsonian Zone, also referred to as the Timberline Zone, is a narrow belt ranging from 7,000 to 7,500 feet above sea level where climatic conditions prevent trees from exceeding 10 to 15 feet in height. Yet, in Glacier the upper limit of tree growth is regulated, not by the altitude or climatic factors, but by the limited amount of soil on the high talus slopes and wind buffeting on the high ridges. The zone is characterized by open alpine meadows, gnarled trees and dwarf plants. In midsummer, the meadows are covered with brilliant flowers appearing in late July or early August and include monkey flowers, shooting stars, beargrass, and blue gentians, followed later in the summer by St. John's Wort. The most

common flower of this zone is the glacier lily. The predominant tree species is the sub-alpine fir, but the whitebark pine or limber pine trees are also present. Vegetation associated with this zone is visible from Sun Road in the Logan Pass area.

The Arctic-Alpine Zone extends from the Mountain tops to the 7,000 to 8,000 foot level, depending on climatic conditions at particular locations. This area includes most of the glaciers and large snow fields in the Park and is above the last of the timber and dwarf trees. For most of the year, this region is buried in snow, but during its short summer the small niches in the rocks support some dwarf versions of lowland plants as well as alpine and subalpine species including true forget-me-nots, shooting stars, alpine bistort and mountain dryad. Sun Road never reaches the Arctic-Alpine Zone but its flowers are visible from the higher reaches of the Road, on both sides of Logan Pass as splashes of color on the peaks. Siyeh Bend, just below the east side tunnel affords an excellent view of the vegetation on the higher mountain cliffs in late summer.

Figure 77. Logan Pass area, 2000 photo.

3.3.7 Wildlife

While much of Glacier's wildlife prefers the backcountry, well away from the bulk of the visitors, travelers often can observe birds and animals along the Road. Glacier National Park is home to 57 species of mammals and more than 210 species of birds. The Park's larger mammals include both grizzly and black bears, mountain goats, bighorn sheep, elk, whitetail and mule deer, moose, coyotes, red foxes and gray wolves. Beaver, hoary marmots, ground squirrels, river otters, martens, and pika also make Glacier their home. Locally prevalent birds include osprey, gray jays, ptarmigan, golden eagles, Clark's nutcrackers, and Harlequin ducks. The endangered bald eagle also nests and fishes in the Park. Many of the bird species are summer residents only, but some of the species including the grouse, hawks, owls, and woodpeckers, jays, ravens, juncos, kingfishers and nutcrackers never leave the Park.[378]

Visitors are occasionally afforded a glimpse of a bear at various points along the Road – in the forests along McDonald Creek and in the alpine meadows visible above the road. Mountain Goats are often found at Oberlin Bend, just west of Logan Pass, clinging to the cliffs above Big Bend and in the declivities on Mount Cannon above the Avalanche campground.[379] Animals are more likely to be seen in the early morning and at dusk. For example, an occasional moose can be observed from Sun Road, along Lake McDonald and in the St. Mary Valley in the hours just before and after sunrise and just after sunset. It is not uncommon to encounter ground squirrels or gray jays along the Road at pullouts and picnic areas. While birds and mammals can not be associated with a particular linear segment of the Road, there are a series of spots along the road where they are more likely to appear. Nonetheless, animals can be encountered at any point and therefore the potential for wildlife viewing exists along the entire length of Sun Road.

3.3.8 Key Resources – Features, Buildings, and Structures

Critical to the character of Sun Road are the series of distinguishing natural and cultural features linked to the Road and its setting. Visually, these key resources help in remembering a place or experience and defining what is unique about it. Important or distinctive features and structures along Sun Road also provide a descriptive reference to a particular roadway segment. Key natural features can include scenic vistas and landforms – waterfalls, mountain groupings, lakes, glaciers. Important man-made resources could include buildings near the road and structural elements associated with the road, such as bridges, tunnels and switchbacks.

Specific examples of key natural features include the Garden Wall which is visible from the upper McDonald Creek portion of the Road, Wild Goose Island on St. Mary Lake, and Bird Woman Falls. Among the most characteristic natural features along Sun Road is the U-shaped valley which frames the east bound approach to Logan Pass. Another is Logan Pass itself, where Mount Reynolds and Mount Clements appear almost as bookends on either side of the Continental Divide. Examples of visually important man-made resources include the Triple Arches west of Logan Pass, the East Side and West Side tunnels, and the dramatic switchback at the "Loop." The long parallel roadways above and below the Loop are sometimes visible at a distance from both the McDonald Valley and Logan Pass as distinctive features in the landscape. Important buildings along the route include the visitor centers at Logan Pass and St. Mary, concession properties at Lake McDonald and Rising Sun Motor Inn and other sites such as the historic West Entrance facility.

Sometimes natural and man-made elements combine to create a key feature. For example, an opening inside the West Side Tunnel provides a perfectly-framed view of Heaven's Peak. Both of these individual elements – the Tunnel and the mountain – are stunning parts of the landscape. Together they create a visual impression that is more forceful and more memorable.

3.3.9 Interpretive Sites, Viewpoints, Recreational Access and Service Areas

One of the primary themes that defines the historical significance of Sun Road is the role that transportation has played in the development of our national parks. National parks have been created to preserve important natural and cultural resources while providing for their enjoyment by the public. Transportation systems and methods provide the connection for the joining of these two goals: preservation and enjoyment. It is how visitors have traveled to and through Glacier National Park that has determined the nature, location and orientation of visitor services. Landscape design and architecture have been employed to guide development of transportation systems and associated improvements in the Park in a manner that enhances the visitor experience while showcasing and interpreting the Park. These improvements – service and access areas, interpretive sites and viewpoints – are part and parcel of the Sun Road cultural landscape. While not all of these places are key to understanding the history of transportation in Sun Road, they are associated with the role that the Road plays in the overall visitor experience.

Figure 78. Typical Sun Road wayside exhibit. 2001 photo.

Examples of these sites include vehicle turnouts and parking areas; recreational access points such as trail heads; interpretive displays; road-side rest areas; and entrances to picnic areas, campgrounds and lodging facilities. These areas are located along the entire length of Sun Road and help define the character of each of the linear segments. In some cases, these sites have changed over time to achieve a variety of management goals or to mitigate inappropriate use of a specific area. For example, the signage for "Moose Country", an interpretive area along Sun Road between the head of Lake McDonald and Avalanche Campground, has been removed in recent years.

3.3.10 The Visitor Experience on the Road

The Driving Experience

When asked to recount their drive across Sun Road, Park visitors often relate their experience in terms of both fear and exhilaration. Even veteran mountain drivers are awed by the narrow road width along the Garden Wall and the sheer drops above the McDonald Valley. The Road provides drivers with a variety of experiences from the wider straightaways along the St. Mary and McDonald valley floors to the spectacular grades as the Road winds its way up to Logan Pass. Drivers are often hesitant to take their eyes off the Road for fear of plunging down a mountain side or heading into oncoming traffic, some of which edges over the center line to avoid overhanging rocks or a seemingly abrupt edge. Pullouts along Sun Road provide the driver with an opportunity to rest and enjoy the views. Many of the pullouts are placed to afford the visitor an opportunity to take in a picturesque or dramatic vista. Each of the linear roadway segments can be described in terms of the driving experience associated with that particular piece of road and it is often that experience that leaves the most lasting impression.

The character of the traffic on the Sun Road has changed over time, as car styles and sizes have changed – from Model "A" Fords to large recreational vehicles to today's ubiquitous sports utility vehicles. Through the years, the NPS has grappled with the issue of restricting larger vehicles from the upper reaches of the Road, in light of the narrowness, tight curves, and restricted clearance of the Logan Pass traverse. Currently, vehicles longer than 21 feet and/or wider than 8 feet may not travel over the central portion of the Sun Road. These restrictions have varied over time. During the 1970s, for example, it was not uncommon to witness large motor homes inching their way along the Garden Wall, barely able to make the narrow turns and encroaching regularly into the opposing lane of traffic.

Travelers caught behind a slower-moving, larger vehicle will inevitably experience a certain level of frustration. More importantly, however, larger vehicles can obstruct the views, particularly for the unfortunate driver of the car caught behind. Unlike a vehicle's passengers, who can view the Park scenery from a variety of directions, the driver's ability to enjoy the scenery from the Road is limited to the view ahead and occasional glances in the rear view mirror.

Landscapes and Vistas

The Going-to-the-Sun Road can provide travelers with two distinct driving and scenic experiences, depending on the direction of travel – from east to west, and from west to east. Each direction provides the visitor with a unique set of views and perspectives. For example, the visitor traveling eastbound along McDonald Creek is treated to exceptional views of the Garden Wall, as well as the mountains which lead to Logan Pass – Brown, Cannon, Oberlin, and Clements. Westbound travelers, however, enjoy better views of McDonald Creek, and those who know where to look are rewarded with a quick glimpse of

Sperry Glacier on the approach to Avalanche Campground. Similarly, to the east of Logan Pass the best views of the mountains surrounding the pass are reserved for westbound travelers.

Travelers who make frequent stops along the way will, of course, have ample opportunities for viewing in all directions. However, the overwhelming impression of the Road is often the result of what can be seen while driving. In considering each of the linear segments, vistas and landscapes will be described from both driving perspectives as well as from specific viewpoints available to visitors traveling in either direction.

3.3.11 On the Road – Special Encounters

Figure 79. Red busses at Lake McDonald Lodge, 1993. Author photo.

While scenic vistas and hairpin turns are primary factors shaping the driving experience on the Sun Road, other sights and encounters are also memorable for many travelers. Included in this category are the historic red busses, the concessionaire-operated coaches which carry travelers across the Road. The 65-year-old "Reds" display classic 1930s-era styling and feature removable canvas tops for sightseeing. The busses provide exceptional viewing opportunities for their passengers, and lend a distinctive historic character to the overall experience of the road. They are clearly an integral component of the broader Sun Road travel experience, and the recent absence of the busses from the Road pending their refurbishment has been a noticeable loss.

The trip along the Sun Road may also include encounters with non-motorized park inhabitants including an occasional bear or deer and of course, other human visitors. Pedestrians are encountered at roadside pullouts and interpretive sites, as well as at seemingly-random stopping points along the length of the roadway. Another car-stopping event is the presence of snow along the Road. Visitors are often surprised to find large snowdrifts – such as the famous "Big Drift" just east of Logan Pass – even in mid-summer. Others come from places where snow is a rarity, and simply cannot resist the temptation to make a snowball or take a slide.

3.4 Linear Segments

3.4.1 Introduction

The Going-to-the-Sun Road travels through an ever-changing landscape as it carries visitors across the Continental Divide at Logan Pass. Not only does the scenery vary from low lying stream valleys to high, subalpine, rocky cliffs, the character of the Road itself changes to accommodate the shifting terrain. The alignment follows long, level straightaways as well as steep, breathtaking grades, and roadway widths become narrower as the Road climbs. The structural elements including bridges, guard walls, and retaining walls, are built of rock and other materials quarried form sites adjacent to the Road, and display a variety of textures and colors, mirroring their surroundings. The Sun Road changes with the topography and geology of Glacier National Park, helping to shape the overall visitor experience. Like other "designed landscapes" in the National Park system, Going to the Sun Road "choreographs visitors' movements and defines the pace and sequence of much of their experience. The designed landscape mediates between the individual and the vast terrain of the backcountry."[380]

To fully describe the spectacular, complex, and varied cultural landscape of the Sun Road, the following sections of this report consider the Road as a series of seven "linear segments." The boundaries of these segments are defined through the identification of the key physical and experiential attributes which characterize the segment. These defining elements include qualities of both the roadway itself and the areas of the Park through which it travels. In some cases, a particular characteristic or set of attributes may be shared by more than one linear segment. However, the characteristics of each segment when taken together provide a distinctive identity for that section of the Road.

The defining elements used in describing each of the segments have been identified and described in the section of this Report which addresses the Road as a whole. In summary, they are:

The Natural Setting

- Geology
  - Mountain Building and Glaciation
  - The Rocks
- Water
- Climate
- Vegetation
- Wildlife

The Human Setting

- Key Resources – Features, Buildings, and Structures
- Interpretive Sites, Viewpoints, Recreational Access and Service Areas

The Visitor Experience

- The Driving Experience
  - Landscapes and Vistas
  - Encounters
  - The Visual Impacts of Key Resources and Features

The segments are presented from west to east, from West Glacier to St. Mary. However, within each descriptive discussion, where appropriate, specific key resources, characteristics and vistas will be presented as both eastbound and west bound travelers experience them. The "primary visitor experience" is presented west to east for each segment, with a description of the east to west experience following the primary discussion. Each segment has been given a name, reflective of its distinctive characteristics. The segments, from west to east, are presented in Table 2, below, and are outlined on the map on the following page. In addition to the seven linear segments, brief discussions of the two "gateways" to the Sun Road, West Glacier and St. Mary, are included.

Table 2. Going to the Sun Road – Linear Segments

Segment Name	Description	Length (miles)
[the West Glacier Gateway]		
Apgar Flats	West Glacier to the Apgar Loop Road	2.9
Lake McDonald	Apgar Loop Road to Lake McDonald Lodge	7.9
Mountain Streams and Forests	Lake McDonald Lodge to Lower Haystack Creek	10.7
The Rock Ledge	Lower Haystack Creek to Logan Pass	10.6
Timberline	Logan Pass to Siyeh Bend	2.7
The Staircase	Siyeh Bend to Rising Sun	9.2
Aspen Grasslands	Rising Sun to St. Mary	6.0
[the St. Mary Gateway]		

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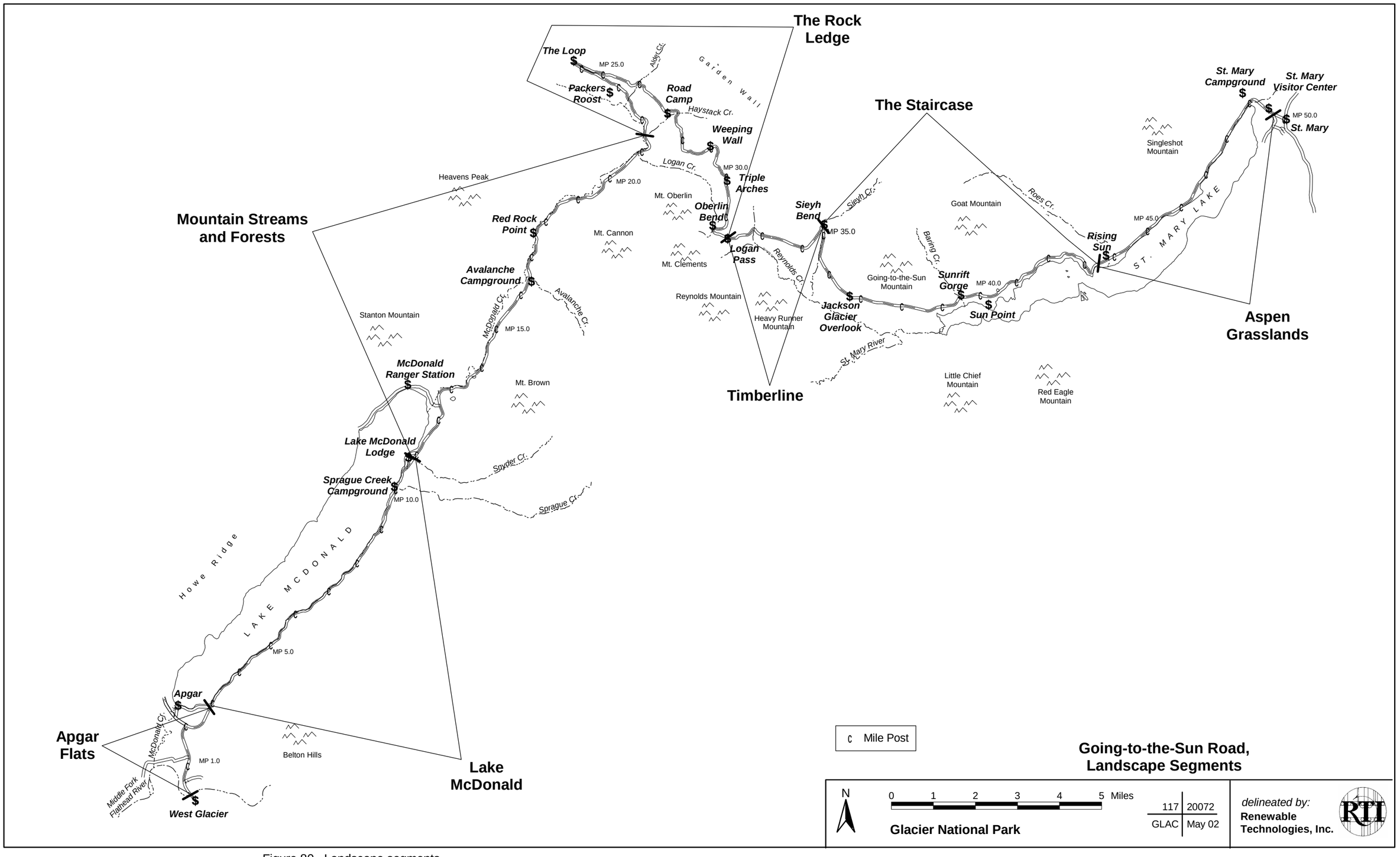

Figure 80. Landscape segments.

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3.4.2 The West Glacier Gateway

Visitors entering Glacier through the Park's West Entrance first travel through the small gateway community of West Glacier (historically known as Belton). Approaching West Glacier on U.S. Highway 2, auto travelers begin their Sun Road journey by passing under a 1930s-era railway underpass emblazoned with a sign reading "Gateway – Glacier National Park." The underpass, though located well outside the park, provides visitors with a symbolic gateway to the Going-to-the-Sun Road and Glacier Park. (A similar underpass near U.S. 2 in East Glacier – brightly painted and framing a view of Glacier Park Lodge – gives a comparable experience for motorists arriving from the east.)

The West Glacier community itself also serves as a visual and experiential gateway for park visitors. South of the railway underpass, the historic Belton depot building and the Belton Chalet complex evoke the historic experience of railway-based travel to Glacier. Beyond the underpass to the north, the streetscape of historic visitor services buildings in West Glacier provides an appealing, automotive-era counterpart to the older Belton buildings. The overall appearance of the West Glacier townsite is architecturally cohesive and visually inviting, giving the visitor a strong sense of arrival in Glacier.

Figure 81. Railway underpass at West Glacier, 2001 photo

The current arrangement of roadways and visitor services in Glacier dates largely from the mid-1930s, when the railway underpass was constructed and the park entrance road relocated to its current alignment. Most of the West Glacier commercial buildings were constructed soon thereafter, creating a setting that survived little-changed until the 1990s.

Recent developments (such as the construction of the new West Glacier Post Office building) have largely been in keeping with the historic architectural character of the community. More significant was the construction by the Canadian government of a large visitor center facility at the West Glacier townsite. (This replaced a much smaller Travel Alberta information center at St. Mary.) While architecturally impressive, the new visitor center is not compatible with the character of the community's older buildings. It is also a source of confusion for some Glacier visitors, who mistakenly assume that the building is an NPS facility.

Today, visitors driving through West Glacier immediately arrive at a modern bridge over the Middle Fork of the Flathead River, which marks the park boundary and the "official" entrance to Glacier. This differs greatly from the experience enjoyed by pre-1930s auto travelers traveling into Glacier's West Entrance. The original entrance road crossed the railroad tracks at grade, and then wandered eastward through the old Belton townsite for about half a mile before slowly approaching the park boundary and the river. Entry to the park was accomplished via a handsome concrete-arch bridge over the Middle Fork; the narrow roadway then proceeded back downstream along the river before ascending into the park headquarters complex. The historic roadway to the old bridge remains accessible today, a quiet counterpoint to the busy West Glacier development; a rebuilt version of the bridge is now a pedestrian crossing, and is a favorite spot for knowledgeable fishermen, swimmers, and sunbathers. (For additional information about the original West Entrance, see the cultural landscape discussion of the Headquarters/Apgar area in Section 4.2 of this document.)

Figure 82. Visitor service buildings at West Glacier, 2000 photo.

3.4.3 Segment 1. – Apgar Flats

Overview

The Apgar Flats segment of the Sun Road begins at the Middle Fork Bridge near West Glacier. The segment takes the visitor through the West Entrance station, past access points 0to Park Headquarters, the Camas Road, and Apgar, and ends at the Apgar Loop Road near the foot of Lake McDonald. The segment length is approximately 2.9 miles. The Apgar Flats Segment, a mixture of historic and non-historic alignments, is not included in the boundaries of either the National Register or National Historic Landmark designations for the Sun Road.

Key Characteristics of the Apgar Flats Segment

Roadway Qualities & Features:

- *Broad, relatively unobstructed roadway with gentle curves*
- *Virtually level*
- *No significant structures or engineering features*

Cultural Resource Qualities & Features:

- *Segment is a mixture of design and construction projects from the 1930s and 1960s*
- *Segment is outside the current NRHP and NHL boundaries*
- *Historic significance of the roadway segment has not been determined – such an evaluation is recommended*
- *The West Entrance Station is the only NRHP-eligible resource visible from the roadway corridor*

Visual/Experiential Qualities & Features:

- *Vistas are short-range, of the roadway and of lodgepole pine forest; almost no expansive views are available*
- *Available views generally do not reflect the significant historic or engineering qualities of the Road*
- *Views of noteworthy scenic or cultural resources are largely absent*
- *Several administrative and visitor service locations are accessed from the segment, but visitor attractions and facilities are largely absent from the roadway corridor itself*

Unlike the other segments of the Sun Road, there is little in the Apgar Flats area to remind the casual visitor of the historic travel experience. Virtually the entire current route is a realignment, constructed in the 1930s and the 1960s, and the roadway is uncharacteristically wide, with long straightaways and gentle, broad curves. Even the natural setting has changed: the current lodgepole pine forest is regrowth following a 1929 forest fire. While Glacier's spectacular mountain scenery is not generally visible from this segment, wildlife are occasionally seen in the area, grazing in the trees just off the Road.

The segment contains the West Entrance Station, a primary NPS contact point for visitors to the Park, and includes access points to a number of administrative and interpretive locations. A paved bicycle path roughly parallels part of the segment, and spur roads lead to Park Headquarters,

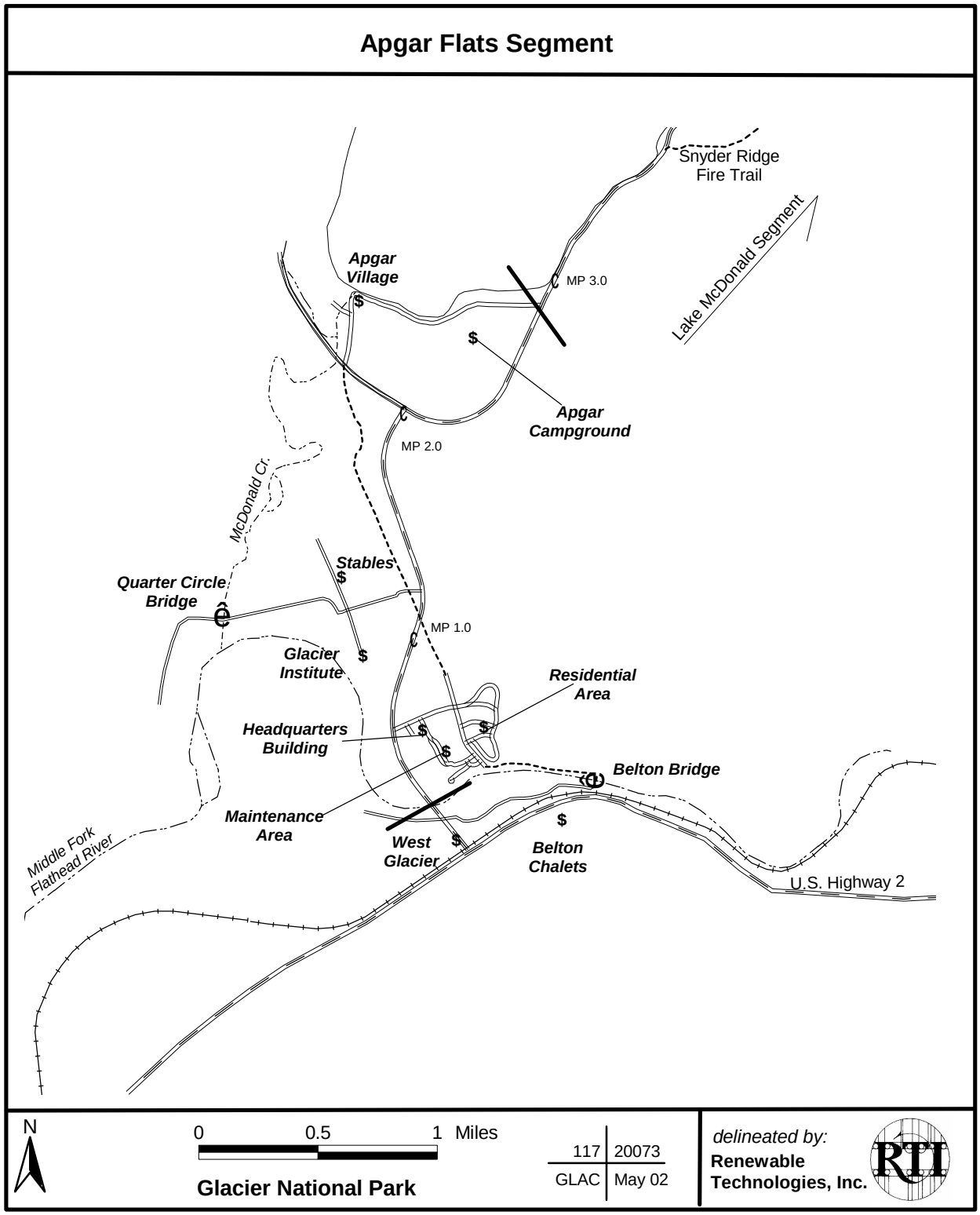


Figure 83. Locator map of the Apgar Flats Segment, Going-to-the-Sun Road

the Glacier Institute and the Quarter Circle Bridge area. About 2 miles from the Park boundary visitors encounter a "T" intersection which marks the beginning of the Camas Road and provides access to Apgar Village, the site of a number of NPS and private visitor services facilities. The Apgar Flats segment ends 2.9 miles from the Park boundary at the intersection of the Sun Road and the Apgar Loop Road, a paved road leading to the Apgar Picnic Area and Campground.

Figure 84. Going-to-the-Sun Road, just south of the "T" intersection at Apgar. 2000 photo.

The name Apgar is strongly associated with this part of Glacier Park. Milo B. Apgar was among the first settlers who came to the west side of what would become Glacier National Park, following the arrival of the Great Northern Railway at Belton, in 1891. Apgar and his partner, Charles Howe settled on a spot at the foot of Lake McDonald where they built cabins to attract overnight visitors to the area.[381] The Apgar Village townsite and associated visitor services, as well as the mountain range to the northwest of Lake McDonald all take their name from this early entrepreneur.

Figure 85. West Entrance Station, 2001 photo.

The Natural Setting

Geology. West Glacier and Apgar lie at opposite ends of the short valley between the Apgar Mountains to the northwest and the Belton Hills to the southeast, through which the Sun Road passes. Immediately south of the West Glacier Entrance Station, on the east side of the Road, a small, rounded hill is visible. The hill is part of a glacial moraine, now nearly buried by the sand and gravel deposited by the meltwaters from the glacier that scooped out the basin of McDonald Lake. Material exposed in the roadcut at that point is glacial till.[382] The dense forests that line the Road are growing on this glacial till along the south shore of Lake McDonald. Where the Road passes close to the base of the Belton Hills, just beyond the T, strata of limestone rock belonging to the Siyeh and Shepard Formations are visible for a brief time.[383]

Water. The body of water in closest proximity to the Apgar Flats segment of Going-to-the-Sun Road is lower McDonald Creek. The Creek runs parallel to the Road at a distance of .2 to .4 miles, west of the Road, between the entrance station and the T junction, but is not visible from the Road. Near the end of this segment the Road moves closer to Lake McDonald, but again, the water is not visible. In order for the traveler to view the Lake, it is necessary to take a small detour along the Camas Road to Apgar Village.

Climate. The Apgar Flats enjoys the moist climate associated with the Park's west side. West Glacier receives 30+ inches of precipitation per year, which is slightly higher than the average rainfall for the Rocky Mountains in general[384]. In addition, Lake McDonald, at 10 miles long, helps to moderate the weather, keeping temperatures somewhat cooler than at the same elevations on the east side of the Park during the summer months, and warmer during the winter. The area often experiences low lying clouds which obliterate the alpine views. Clouds and fog along Lake McDonald and at Apgar are typically localized and travelers along the Road may "rise above" the clouds as they make their way up the Road to Logan Pass.

Vegetation. Along both sides of the Road, the most prevalent species of tree is the "dog-hair" lodgepole pine which flourished in this area following fires in 1927 and 1929, which swept along Lake McDonald and through the Apgar Mountains and the Belton Hills destroying the western red-cedar and hemlock forest.[385] The original cedar-hemlock forest was dense, concealing Lake McDonald behind a thick barrier of trees. The view of the Lake, as one emerged from the trees, was dramatic and unexpected. The following are the words of Genevieve Walsh Gudger, a visitor to the Park in 1900, describing the Apgar Flats segment of the Road at that time:

> "Half asleep, we were pushed off the train at Belton. The road to the Foot of the Lake was a slender ribbon, the trees so close that my father, standing in the open coach, pulled white and brown moss from the trees for me. The wagon trip was so deep with needles and moss that the hooves of the horses made only a gentle clop-clop as they sped along."

After the fires, the Lake became more visible from a distance, creating a somewhat less surprising first view. Lodgepole pine live only about 80 years and do not germinate in the shade. Shade tolerant Douglas-fir, white pine, Engelmann spruce and western red cedar seedlings are now slowly replacing the dog-hair lodgepole. However, the characteristics of this area – climate, terrain, and soil – are best suited to the western red cedar-hemlock forests which grow further north along the Road, and will ultimately re-establish themselves in the Apgar Flats region.[386]

During late September and early October, the western larches, which can be seen along the ridges above the Road, turn a bright yellow. The larch is a deciduous conifer, losing some of its needles each autumn. The trees turn a vivid yellow in sharp contrast to the deep green of the surrounding lodgepole forest. In addition to the various species of trees, during the spring and early summer, the Road is bordered by a variety of flowers including the bright, white daisies, pinkish-purple blooms of the erect fireweed and white strawberry blossoms.[387]

Wildlife. Along the Road, between the entrance station and the T intersection, visitors may see white-tailed deer, cow elk and coyotes which frequent the area in the early morning or evening hours.[388] These animals are often grazing quietly in the trees and are barely disturbed by the constant traffic. Black bears are sometimes observed along the road edge foraging for berries that grow in the open areas. Occasionally a moose may be spotted along the west shore of Lake McDonald or taking a swim in the Lake's deep glacial waters and on rare occasions, mountain lions have also been observed in this area. While there are many varieties of birds in the area, among the most common are the stellar and gray jays, various woodpeckers, owls, red-winged blackbirds, sparrows and an occasional bald eagle.

The Human Setting

The Evolution and Character of the Roadway. As noted above, both the alignment and the visual character of the Apgar Flats segment have changed considerably over the years. The first primitive wagon roads through the Apgar Flats area predated the establishment of the park, and formed the basis for the first park auto routes to the foot of Lake McDonald. As described in "West Glacier Gateway" (above), the original entrance road entered the park about one-half mile upstream

Figure 86. Belton Bridge, 2001 photo.

from the current vehicle bridge. The route then followed the river several hundred yards downstream before ascending to Apgar Flats and meandering northeasterly towards Apgar Village. This alignment, in part, dictated the placement of Glacier's Park Headquarters complex, which flanked the original roadway as it entered Apgar Flats. NPS-sponsored improvement work took place on this route throughout the 1910s and 1920s; the most notable such project was the construction of the handsome concrete-arch Belton Bridge in 1920. Still, the original road retained the visual character of a rural country lane, narrow and wooded. Portions of this original alignment survive intact along the river and in the Headquarters area, and much of the original route is now used by the Headquarters - Apgar bicycle path.

The Apgar Flats segment saw a near-total realignment beginning in 1936, in a project that culminated in the 1938 completion of the first Middle Fork bridge at the current location. The road's 1936 alignment was wide, with few curves, more closely resembling a state highway of the period than a National Park motorway. The realigned road also bypassed Apgar Village entirely, heading directly for the south shoreline of Lake McDonald. This reduced travel time and congestion, but it deprived visitors of the spectacular Lake McDonald vista for which Apgar is famous. The 1936 alignment was further modified in 1964, when the current "T" intersection was constructed to facilitate access to the newly-built Camas Road. Previous alignments of the Sun Road (and other local routes) remain visible to the astute observer today, as open corridors where trees are uniformly smaller.

As noted above, the current roadway corridor through Apgar Flats is not included in the NRHP or NHL designations for the Sun Road as a whole. Much of the current Road alignment, however, dates from 1936 and is within the Sun Road's recognized period of significance. The remaining portion of the segment dates from 1964, and could potentially be found significant for an association with the NPS "Mission 66" program. In addition, the disused former Sun Road alignments through Apgar Flats may also possess historical significance. The completion of formal NRHP eligibility determinations for both current and former road alignments through Apgar Flats is recommended.

Figure 87. Bypassed segment of the original park entrance road, just north of Park Headquarters. 2000 photo.

Additional information on the Apgar Flats area is found in the cultural landscape discussion of the Headquarters/Apgar area, located elsewhere in this document.

Key Resources, Attractions, and Facilities. From West Glacier, the visitor crosses the Middle Fork of the Flathead River over a steel bridge, constructed in 1965, replacing a 1938 span. This non-historic structure is popular with pedestrians, who enjoy relatively unobstructed views of the river and of occasional raft parties floating the Middle Fork below. Just beyond the bridge, a small pullout hosts the Glacier Park entrance sign, a well-known stone-and-wood creation shaped in the outline of a mountain range. This spot is a favorite photo opportunity for first-time park visitors. The West Entrance Station (0.89 miles), constructed in 1941, serves as the gateway to the Park from the West, where visitors pay entrance fees and are provided with Park information and current conditions. The T intersection, approximately 2 miles from the Park boundary, is a defining roadway feature. Although a short distance from the Park entrance it is the first demarcation and destination along Going-to-the-Sun Road. It is a point which visitors are required to make their first travel decision – whether to avail themselves of visitor services at Apgar or continue up the Road to Lake McDonald and points beyond.

There are two interpretive/service areas located within this segment – the Park Headquarters complex, accessible from the Sun Road at the 0.6 mile mark, and the entrance station at 0.89 miles. The entrance station provides general park information, park maps, campground status, road conditions, park passes and fee receipts Park Headquarters is primarily dedicated to administrative functions. Trails which intersect the Road along this segment include the Headquarters-West Glacier footpath, located at the 0.3 mile marker and the asphalt-surfaced Headquarters-Apgar bicycle trail (which occupies in part the pre-1936 Sun Road alignment), crossing the Sun Road at the 1.07 mile mark. Just north of this crossing, the Quarter Circle Bridge Road heads west from the Sun Road, leading to the horse stables, the Glacier Institute, the Apgar Lookout trailhead, and various NPS service facilities.

Prior to the 1936-38 realignment of this portion of the Sun Road, the Apgar Flats segment culminated in Apgar Village itself, where travelers were treated to a sudden, spectacular view of Lake McDonald and the mountains beyond. This vista provided the traveler with a strong visual sense of "arrival" in Glacier, and was a dramatic introduction to the scenic opportunities yet to come along the road. Today, however, this view is available only to travelers making the detour to Apgar Village, and the first views of the lake – much less spectacular than the vista from Apgar – appear later and only incidentally as the Road travels along the Lake McDonald shoreline.

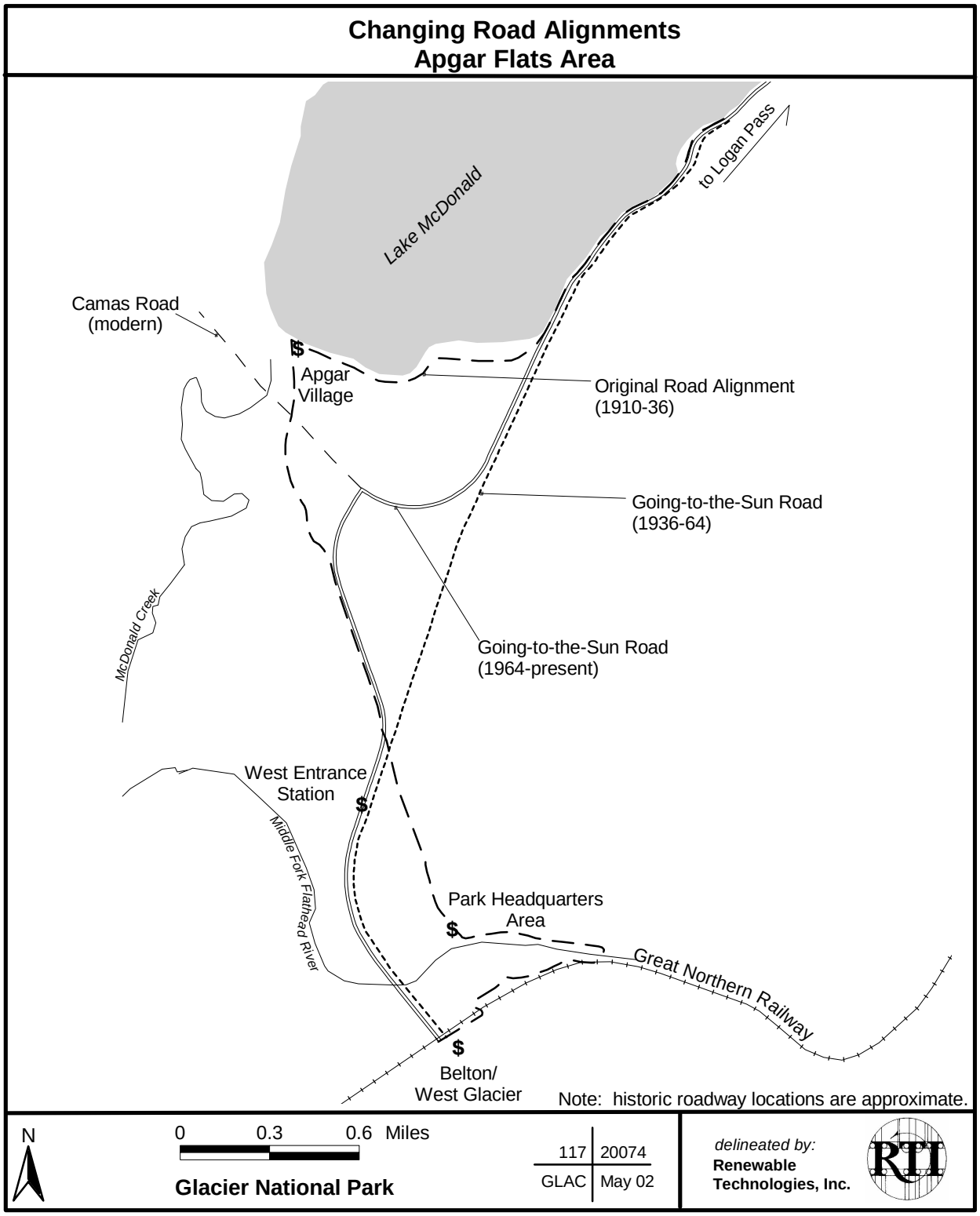


Figure 88. Sketch map of the Going-to-the-Sun Road in the Apgar Flats area, showing changing road alignments over time.

The Visitor Experience on the Road (Primary)

The Apgar Flats segment of the Road charts a level, gently-curving course through the dense Lodgepole Pine forest, offering only brief glimpses of high, snow covered peaks, notably Mount Vaught, in the distance. While the section provides little in the way of scenic opportunities, it does impart a sense of anticipation of what is to come. As the road approaches the "T" intersection, this sense of excitement increases as the sign directing visitors to both Logan Pass via the Sun Road and to the visitor center at Apgar via the Camas Road comes into view. For first time visitors the intersection can be confusing. Those unfamiliar with the Park may be uncertain as to which way to turn. A brief side trip to Apgar Village, however, brings travelers to the foot of Lake McDonald where they are rewarded with a spectacular view of the mountains which surround the Lake and the Garden Wall. While not along Going-to-the-Sun Road, this viewpoint is often the first stop before the journey to Logan Pass. It provides an opportunity to see the Road in relationship to the Lake and to imagine the Road ahead, traversing the Garden Wall, visible in the distance. Visitors may also gain access to Lake McDonald via the Apgar Campground and Picnic Area road at its intersection with the Sun Road.

East to West. While eastbound visitors experience the Apgar Flats as the Sun Road's beginning, for westbound travelers the Apgar Flats marks the completion of their journey across the Park. The segment of the Road moves away from Lake McDonald and the majestic peaks to the north and the West Glacier entrance station becomes a point of departure, rather than arrival. Few westbound travelers see the Apgar Flats segment as more than a utilitarian corridor marking an anticlimactic completion to their Glacier Park visit.

Figure 89. Going-to-the-Sun Road near the West Entrance Station. 2000 photo.

3.4.4 Segment 2 -- Lake McDonald

Overview

This segment begins at the Apgar Loop Road and ends at Lake McDonald Lodge, a distance of 8 miles. The Sun Road is characterized, for the majority of this segment, by a near-continual series of gentle curves which take the traveler along the south shore of Lake McDonald. The curves lend a rhythmic experience to the drive, in sync with the picturesque lakeshore and occasional views of the mountains to the north and east – Mount Brown, Edwards, Gunsight and Lincoln Peaks, as well as those to the west, above the lake – Stanton, Vaught and McPartland. Although the Road follows the lakeshore, the lake and surrounding landscape are visible only intermittently. Because of the dense forest that grows on either side of the Road, travelers can generally catch only occasional glimpses of the lake and Howe Ridge, which rises above the shore to the north. However, eastbound visitors are afforded a spectacular view of the Lake and the Garden Wall at a scenic turn-out and exhibit about .5 miles before Lake McDonald Lodge. Westbound travelers may catch a quick view of the lake at Sprague Creek, just south of the Lodge and again at a point about 1.5 miles before the Apgar Picnic Area Road, where the Lake and the surrounding Apgar Mountains are visible. In addition, scenic pullouts along this segment of the Sun Road, provide access to unobstructed views of the Lake and to areas adjacent to the Road where visitors may take short walks along the Lake's shoreline.

Key Characteristics of the Lake McDonald Segment

Roadway Qualities & Features:

- *Standard 22-foot roadway width, with heavy curvature and restricted visibility*
- *Nearly level*
- *No large-scale structures or engineering features; bridges at Snyder Creek and numerous culverts*
- *Roadway was rehabilitated in 1990-92*

Cultural Resource Qualities & Features:

- *Segment largely reflects design and construction activities from the early and mid-1930s*
- *Historic stone/concrete bridges at Snyder Creek; numerous historic stone culvert headwalls*
- *Segment is a part of the Sun Road NRHP and NHL nominations*
- *The Lewis Glacier Hotel (Lake McDonald Lodge) NRHP and NHL districts are at the north end of the segment*

Visual/Experiential Qualities & Features:

- *Vistas are primarily short-range, of the twisting roadway and close-in forest; almost no expansive views are available*
- *Short-duration views of Lake McDonald and surrounding mountains are available at limited locations, primarily due to NPS vista-clearing activities*
- *Views of other specific scenic or cultural resources are limited; little of the Lake McDonald Lodge area is visible from the Road*
- *Visitor attractions include Sprague Creek Campground, Lake McDonald Lodge, and trailheads near the Lodge area*

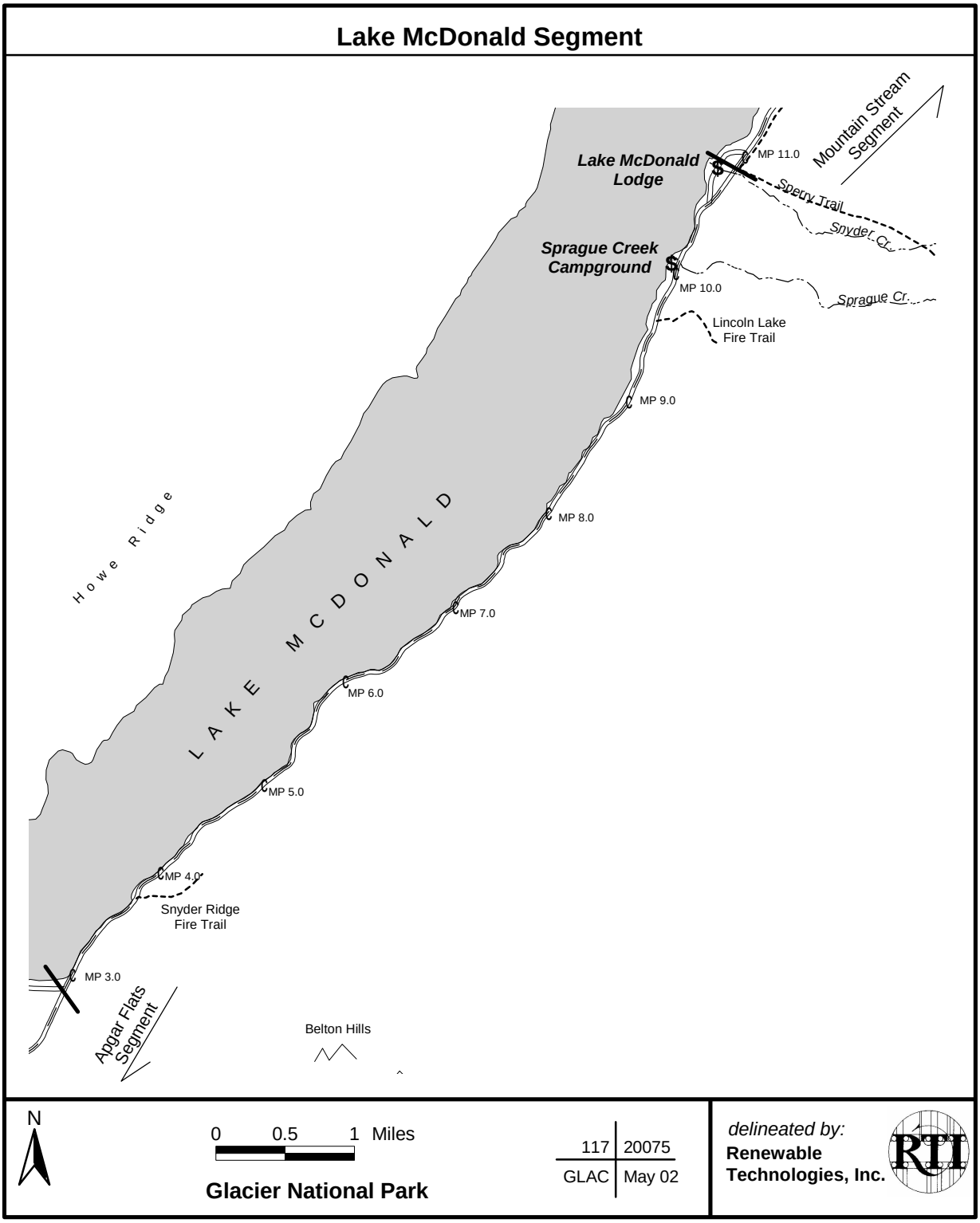


Figure 90. Locator map of the Lake McDonald segment, Going-to-the-Sun Road

Lake McDonald was once known as "Lake of the Sacred Dancing Waters" by the region's Native Americans; the first white explorers, settlers, and cartographers called it "Terry Lake." In about 1878, Duncan McDonald, who in the early 1870's had been in charge of the Hudson Bay trading post south of Flathead Lake, camped at the shore of the Lake at a site that is now Apgar. It is said that Mr. McDonald carved his name in a hardwood tree which remained standing for many years. Over time, visitors to the area associated the tree and its carving with the lake and gradually it gained its present moniker, Lake McDonald.[389]

The Natural Setting

Geology – Ice and Water. For the entire length of this segment, Going-to-the-Sun Road closely follows the shore line of Lake McDonald. The Lake sits in a classic glacial U-shaped valley, visible most clearly from the vantage point at Apgar. The terrain around Lake McDonald is gentle in contrast to the more rugged landscape found at the center of the Park. The area is characterized by rounded hills and tree covered ridges, composed of younger, softer rocks from the Tertiary period and loose glacial gravels.[390] The Lake is ten miles long, approximately one and one half miles wide, and 472 feet deep. The Lake itself is most likely a product of both glacial erosion which carved the basin, and of damming by glacial moraine deposits at the lower end of the valley.[391] The Road also intersects a number of small streams which cascade down the ridges above on their way to the Lake. These are fed by mountain snow fields, above the Road, hidden from view.

Figure 91. Going-to-the-Sun Road along Lake McDonald, with Mt. Stanton and Mt. Vaught in the background. 2000 photo.

Howe Ridge on the west side of the lake, and Snyder Ridge, along which the Sun Road follows, are great piles of glacial debris from lateral moraines, rising to a height of 2,000 feet above the lake. The depth of the Lake and the height of the ridges indicate that the minimum ice thickness at the Lake was 2,122, reaching this thickness about 20,000 years ago[392]. Because of the thick deposits of glacial debris, there are no good exposures of sedimentary rock visible from the Road. The only outcrops are a few beds of sticky clay, visible near the northeast end of the Lake when water levels are low.[393] Closer to the Lake, visitors observe red and green pebbles along the beach and just below the surface of the water. These colorful rocks – mudstones and argillites – are part of the glacial debris carried from the rocks above by the great sheets of ice.[394]

Climate and Seasons. The Lake McDonald segment of Going-to-the-Sun Road, like Apgar Flats, is in the wet, cool, more moderate climate of the Park's west side. The McDonald Valley, through which the Sun Road travels, is subject to the flows of wet, Pacific air. The combination of the moist air, the lower elevation and the large lake moderates both winter and summer temperatures, creating a climate similar to the coastal areas of Washington and Oregon.[395] The Sun Road, from West Glacier to Lake McDonald Lodge remains open all year long, giving visitors to the Park an opportunity to enjoy the changing seasons. The growing season is somewhat longer in the McDonald Valley than at higher elevations in the Park which is covered with snow for three fourths of the year. During the winter months, visitors experience a serene, hushed environment, quite different from the hustle and bustle of the summer season. As the Road winds its way towards Lake McDonald Lodge, the snow depths increase slightly, further intensifying the exquisite quiet along the Lake. The absence of vehicles on the road during the winter and the deeper snow at higher elevations bring more animals to winter in the Lake McDonald region. Snow along the Road reveals the tracks of deer, moose and elk traveling out of the woods to graze along the shore of the Lake. In her 1938 book, *High Trails of Glacier National Park*, Margaret Thompson wrote:

Figure 92. Lake McDonald, viewed from a pullout along the Sun Road. 2000 photo.

> "One is struck with the contrast between the western slope of the mountains and the eastern. Since the western is the slope of greatest precipitation it exhibits the best forest development. The forests on the east side do not compare with these, all the trees found there are here; and in addition the great silver fir, hemlock, western white pine, larch, giant cedar and canoe birch. While winds buffet the east slope almost continually, here it is almost always quiet. On the east side snow is soon whipped into drifts, leaving bare ground between; here it lies where it falls until dissipated by the sun. But the eastern slope has much more sunshine; while this side may be shrouded in clouds for days and weeks in winter, over there are blue skies and dazzling sunshine."[396]

Vegetation. After the first mile, the Sun Road leaves the 1929 burn area and enters the deep cedar-hemlock forest common to most of the west side of Glacier Park. With each curve, the visitor enjoys a renewed view of the large and stately hemlocks, western red cedars and larches, draped with light-green goatsbeard lichen.[397] The forest creates a dense canopy, limiting the understory of vegetation to a few shrubs and herbs. Those that are able to tolerate the shade include the Pacific yew, coolwort-foamflower, queen's cub bead lily, and devil's club. More akin to the coastal rain forests, than the drier forests typically found in Montana, the stands of trees provide a cool, quiet refuge.[398] Along the Road, where sunlight reaches the valley floor, there is greater diversity of wildflowers including the white trillium, beargrass, fireweed, and dogwood.[399]

Wildlife. A variety of small mammals are found in the forest around Lake McDonald. These include the coyote, red fox, badger and mink. However, the red squirrel is probably the most familiar inhabitant. With the exception of the black bear, and white-tailed deer, few large animals inhabit the deep forest. Grizzlies prefer the open meadows or the forest edge to look for food. On rare occasions, mountain lions have been seen in the area, and, as stated above, moose may be observed both along the shore and in Lake McDonald, itself. The birds of the cedar-hemlock forest include numerous varied thrushes, Townsend's solitaires, pileated woodpeckers, Swainson's thrushes, and great horned owls, although they remain generally quiet and elusive.[400]

The Human Setting

The Evolution and Character of the Roadway. The first roadway constructed along the south shore of Lake McDonald was primitive and narrow, with an alignment dictated nearly exclusively by the topography of the lakeshore. Both horizontal and vertical curvature could be sharp and irregular, visibility was limited, and problem with drainage, slumping, and subsidence were not unknown. This first route allowed access to the upper Lake McDonald area, and the road construction projects nearer Logan Pass, but it was not intended as a permanent alignment.

A major reconstruction of the Sun Road along Lake McDonald in the early 1930s resulted in the alignment that exists today. The reconstruction project widened the roadway corridor, reduced vertical and horizontal curvature, and eased curve radii. Drainage was improved, and cutslope cribbing and regrading helped reduce the problems of earth movement. Stone slope armoring was also added at locations with unstable cutslopes. Numerous culverts with small, mortared stone headwalls were added, and turnouts were improved; Type 7 guardrail was also used in some locations. Stone slope armoring When the Lake McDonald segment was reconstructed by the NPS in the 1990s, most of these original design qualities survived intact, although many of the turnouts were reconstructed and improved. A form of Type 7 guardrail was reintroduced at some of these turnout locations.

Key Resources, Attractions, and Facilities. The path which the Road takes, with its gentle, regular curves, constitutes an important feature of this segment. The curves not only enhance the driving experience, but they provide the visitor with the ever-changing encounters with the Forest through which the Road travels. The road alignment of the Lake McDonald segment exemplifies the way in which the Road relates to its setting, meandering along the Lake's shore.

Lake McDonald Lodge, near the northeast end of the Lake is the most historically significant resource along this segment, and perhaps along the entire road. Of particular note is how the evolution of the means of travel to and through the park is reflected in the Lodge itself. As noted elsewhere, the Lodge is a National Historic Landmark; this is the only location where two National Historic Landmarks (the road and the hotel) meet. Lake McDonald Lodge and its history with respect to Going-to-the-Sun Road are addressed in greater detail as a Cultural Landscape discussion in Section 4.3 of this Report.

Figure 93. Lake McDonald Lodge. 2000 photo.

Figure 94. View of Lake McDonald, from pullout near Sprague Creek. 2000 photo.

The Lake McDonald Segment of Going-to-the-Sun Road includes frequent pullouts, which offer a variety of views of Lake McDonald and the surrounding mountains.

Figure 95. Pullout on the Lake McDonald segment of the Going-to-the-Sun Road. 2000 photo.

The pullouts offer access to the lakeshore via informal footpaths, and the turnouts near mileposts 8.1 and 10.4 include Park Service wayside exhibits.[401] The largest pullout (mile 10.4) provides a striking, first view of the lake for westbound travelers. As elsewhere on the road, the pullouts are used both as viewpoints and as locations to overtake slow-moving vehicles.

There are three trail access points along this segment of the Road. Approximately one mile from the Apgar Picnic Area Road, the Snyder Ridge Fire Trail takes off from the Sun Road in a northeasterly direction. The Lincoln Lake Fire Trail begins at a point on the Road, about 9 ½ miles from the West entrance. Finally, the Gunsight Pass Trail begins its journey across the Park at a point across from the Lake McDonald Lodge parking lot. The trail, used by hikers and equestrians, leads to Sperry Chalet and then over Lincoln and Gunsight Passes to the Jackson Glacier Overlook and to Sun Point on the east side of Logan Pass. It also links with other Park trails to the Mount Brown lookout, Snyder Lakes, Sperry Glacier, and elsewhere.

Visitor accommodations and service areas are located at Lake McDonald Lodge and at Sprague Creek Campground. Primary access to the Lodge is from the parking lot at milepost 10.9. Originally, however, the Going-to-the-Sun Road alignment turned toward the Lodge and associated facilities about a third of a mile before the current parking lot entrance and ran along the rear of the main lodge, and past the Lake McDonald campstore, rejoining the current alignment of the Sun Road at milepost 11. (The present alignment dates from the mid-1930s.) The Lodge accommodations include a total of 100 guest rooms located in the main lodge, 13 cabins, and a motel structure. The facilities also include a dining room in the main lodge, a detached coffee shop, camp store, post office, infirmary, employee dormitories, caretakers cabin, and a variety of service and maintenance buildings. There are also a number of privately held inholdings, occupied by seasonal residents, located on the both sides of the main complex of lodge buildings, generally near the original alignment of the Sun Road. Sprague Creek Campground is located at milepost 10 and provides 45 overnight camping sites and picnic facilities. The campground is restricted to vehicles without trailers because of the short turning radius associated with each campsite.

The Visitor Experience on the Road (Primary)

For the first few miles of the Lake McDonald Segment, the mountains to the northwest are visible from the Road. "Paul Bunyan's Cabin", the square-shaped rock formation on the top of Longfellow Peak, Anaconda Peak and Wolf Gun Mountain loom on the horizon above the softer slopes of Howe Ridge. Edwards Mountain is directly ahead, a prominent visual element, seen from the roadway above the lodge pole pine growing on either side. As the Road continues to the northeast, the mountains which appear to surround Lake McDonald at its upper end are intermittently visible through the trees – the Garden Wall at the center, with Stanton, Vaught, and McPartland Mountains to the north and west, and Edwards, Lincoln, Gunsight, and the Little Matterhorn to the north and east. Mount Edwards moves out of sight mid-way through the segment, and Mount Brown which rises above Lake McDonald Lodge to the northeast takes its place. On sunny days, the light sparkles brightly as it bounces off the waters of the Lake and shimmers through the trees. The gentle curves of the Road's alignment imbue this segment with a country lane character. Periodically, the Lake is clearly visible from the Road, where short spans of the forest have been cleared to provide vistas for motorists. These cleared vistas provide only momentary glimpses of the lake to those in moving vehicles, but the visual link they provide between roadway and lakeshore is key to the visitor experience on this roadway segment.

While there are numerous pullouts along the way, the wayside exhibit on glaciation, just before Lake McDonald Lodge, provides an excellent place to view the upper end of the Lake and the mountains beyond. Lake McDonald Lodge provides the first destination point along the Going-to-the-Sun Road. While not visible from the Road, the Lodge and associated buildings form the most important cultural feature of the Lake McDonald segment, and are a primary stopping point for travelers along the Sun Road.

East to West. Leaving Lake McDonald Lodge, travelers are provided with their first view of the Lake from the Road at the wayside exhibit, located .5 miles beyond the Lodge. Beyond the wayside viewpoint and the campground at Snyder Creek, the Roadway cuts its way through the forests of lower Snyder Ridge and the Lake McDonald Valley, the Belton Hills visible ahead and the Apgar Mountains to the right. Indian paintbrush and beargrass bloom along the Road's edge and the occasional cleared vista of the lake (as described above) greatly enhance the driving experience. The segment lacks the spectacular views associated with the upper reaches of the Road or those provided to the east-bound visitor. However, the gently curving roadway of the Lake McDonald segment provides a relaxing drive after the sometimes harrowing trip across Logan Pass.

3.4.5 Segment 3 – Mountain Streams and Forests

Overview

Segment 3 of Going-to-the-Sun Road begins at the main entryway to Lake McDonald Lodge and continues for about 10.6 miles to the road's lower crossing of Haystack Creek -- the base of the steady 6 percent grade leading to Logan Pass. For the first one and one half miles the road continues along Lake McDonald, through an area that historically was developed for tourists. While the clusters of visitor accommodations to the north of the Lodge complex are largely gone, there are remnants of small dirt roads that lead to cabin and motel sites and scattered, remaining inholder cabins. The road intersects a number of trails, part of the network of horse and foot paths that interconnect with trails to Avalanche Campground, Sperry Chalet, Fish Lake, Johns Lake and Snyder Ridge. Some of these are no longer in regular use, but remain for the adventuresome to explore. At the head of Lake McDonald, the Road crosses the Kelly Camp Road, to the Lake McDonald Ranger station and to inholder properties and trail access points on the north and west side of the Lake. Beyond the intersection, the Road travels through a the narrow valley, along McDonald Creek, past the Sacred Dancing Cascades, through the swampy area known as Moose Creek to Avalanche Campground. The first of the Road's characteristic stone retaining walls and guardwalls are found where the Road traverses rock outcroppings along McDonald Creek.

Key Characteristics of the Mountain Streams and Forests Segment

Roadway Qualities & Features:

- *Primarily 22-foot roadway width, with varied curvature and sight lines*
- *Largely level overall, but with intermittent minor grades*
- *Few large-scale structures or engineering features; retaining walls/guardwalls along McDonald Creek, and bridge at Avalanche and Logan Creeks*
- *Roadway south of Avalanche was rehabilitated in 1998-99; remainder of roadway has not been rehabilitated*

Cultural Resource Qualities & Features:

- *Segment largely reflects design and construction activities from the early and mid-1930s*
- *Extremely well-crafted historic stone walls along McDonald Creek, and historic stone/concrete bridges at Avalanche and Logan Creeks*
- *Segment is a part of the Sun Road NRHP and NHL nominations*
- *The Lewis Glacier Hotel (Lake McDonald Lodge) NRHP and NHL districts are at the south end of the segment; the Logan Creek cabin is briefly visible near the northern end*

Visual/Experiential Qualities & Features:

- *Both short and long-range vistas are available, including panoramic mountain views for eastbound travelers*
- *Attractive short-range views of McDonald Creek and its waterfalls are also present nearly throughout*
- *Views of other specific cultural resources are limited; little of the Lake McDonald Lodge area is visible from the Road*
- *Visitor attractions include viewpoints and footpaths accessing McDonald Creek, and varied camping, picnicking, and trail facilities at Avalanche*

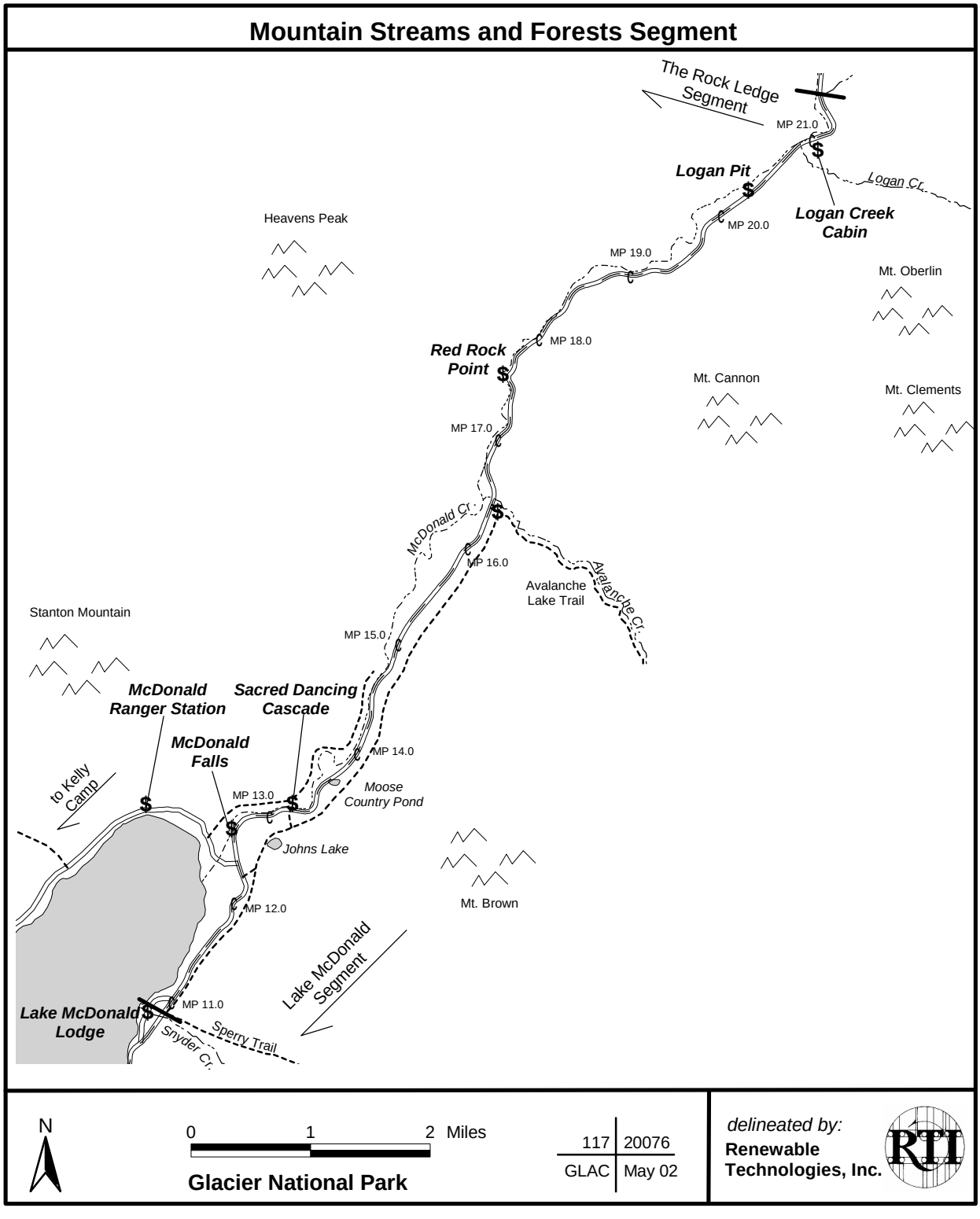


Figure 96. Locator map of the Mountain Streams and Forests segment, Going-to-the-Sun Road.

Figure 97. McDonald Creek at Red Rock Point, 2001 photo.

While densely forested on the McDonald Creek valley floor, the mountains rise on both sides of the Road and are visible from the roadway. Waterfalls tumble down the faces of Mount Vaught and McPartland Mountain across the valley, above the Creek to the west. To the east and north, the rocky cliffs of Mount Brown and Mount Cannon are visible through the trees. The Road travels generally close to the Creek, affording frequent constant views of the stream as it cascades over colorful rocks and a series of small waterfalls. Approximately 1 mile beyond Avalanche Campground, the Road passes Red Rock Point, "perhaps the most beautiful water course that can be found along the Park's roads", where turquoise blue waters flow, in a zig zag fashion over tilting red mudstone rocks.[402] Beyond Red Rock Point, the Garden Wall comes into view, in breathtaking splendor, framing the McDonald Creek Valley like a fortress, its rocky cliffs covered in soft colors that change with the seasons.

The Mountain Streams and Forests Segment of the Sun Road ends about one-half mile past the Logan Creek Bridge, near the road's first lower crossing of Haystack Creek. This is the point where the Sun Road leaves the valley floor and begins its long, steady ascent across the Garden Wall and to Logan pass. At Logan Creek, a patrol cabin sits a little south of the road, along the stream which drains the Garden Wall, Bird Woman Falls, Mt. Oberlin, and the Logan Pass area[403].

The Natural Setting

Geology. From the head of Lake McDonald to Avalanche Campground, McDonald Creek flows alternately across hard Precambrian bedrock and loose deposits of glacial debris, left behind as the glacial ice melted back up the valley at the end of the last ice age. Greenish mudstones of the Appekunny Argillite formation are seen as outcrops along the lower course of the Creek to about one mile south of Avalanche. At that point, red and green mudstones form alternating patterns are visible, indicating a transition to the red mudstones of the overlying Grinnell Argillite. For several miles upstream from Avalanche Campground, the Road follows the floodplain of McDonald Creek which flows over

bedrock and glacial gravels of colorful red and green mudstone pebbles.[404] Approximately, one half mile to the north of Avalanche at milepost 16.9, Sperry Glacier can be seen, in its cirque on Gunsight Mountain above Avalanche Basin, by west-bound travelers on the Road. The Little Matterhorn is visible as a sharp spire to the right of the glacier.[405]

At Red Rock Point, located at milepost 17.5, McDonald Creek meanders through and tumbles over the titled red ledges of the Grinnell Argillite Formation. Ripple marks and mud cracks formed when the layers of the Grinnell Formation were deposited, are visible. The bright red Grinnell Argillite derives its color from hematite, an iron oxide.[406]

Water. McDonald Creek is the principal body of water associated with the Mountain Streams and Forests segment of Going-to-the-Sun Road. As stated above, the Creek flows alternately over easily erodible glacial gravel and bedrock. In places, where it flows freely, old meanders have been cut off as the stream finds new courses. Long, narrow ponds, south of the road at milepost 14, are typical segments of abandoned steam channels.[407] At milepost 13, the Creek tumbles over a rocky ledge in a beautiful water fall, Sacred Dancing Cascades. Across the Creek, at milepost 13.9, beautiful waterfalls plunge over the rock ledges in deep forests on Mount Vaught, while several small streams drain snowfields from Mount Cannon, closer to the Logan Creek Bridge.[408]

Figure 98. McDonald Creek and Heavens Peak, 2001 photo.

Climate and Seasons. The Mountains Streams and Forests Segment of Going-to-the-Sun Road enjoys the wet, temperate weather of the west side of the Park. The dense vegetation and moist forest floor are reminiscent of the forest environment of the coastal rain forests in the Pacific Northwest. While generally level, the Road climbs just slightly, so spring comes a bit later to this segment of the Road. The surrounding mountain peaks and the Garden Wall are often covered with snow well into the summer season. As seen from the Road, the streams are perhaps the best indicator of the changing seasons. During the spring, they swell with snow melt, turning a milky blue as they carry glacial silt downstream. The waterfalls explode with great force and the waters swirl around the large rocks lying in the streambed. During the summer and fall, they slow to a calm, steady flow, and water levels decrease, but an occasional downpour can create a renewed, but short-lived torrent of energy.

Vegetation. This segment of the road travels through a changing forest. The trees near Avalanche Creek – the giant Western red cedars and hemlocks, and the huge black cottonwoods, with deep furrowed bark, are unique to this area of the Park.[409] During the fall season, the cottonwood trees provide rich yellow color along the Road, in sharp contrast to the green coniferous vegetation and the new snow on the surrounding peaks. The floor of the forest is covered with devils club, meadow rue, yew, and a variety of ferns. Leaving Avalanche Campground, the vegetation gradually changes to a spruce-fir forest with a scattering of larches. The trees form a less dense canopy and more sunlight reaches the depths of the forest floor where a thin alder type scrub replaces the ferns and yews of the cedar-hemlock forest. In comparison to the dense forest growth, McDonald Creek and other area streams run clear due to the absence of algae and other types of vegetation.[410] Closer to the Road, wildflowers grow in profusion, but bloom slightly later than their counterparts in Lake McDonald Area.

Wildlife. The forests along the Mountain Streams and Forests segment are home to many of the same mammals and birds found in along the Apgar Flats and Lake McDonald segments. Approximately 2 miles beyond the head of Lake McDonald, at milepost 13.7, swampy ponds adjacent to Going-to-the-Sun Road provide ideal habitat for the large Shiras moose which eat moss and algae that grow in the area. White tail deer rely on the deep forest for protection from predators, but will appear along the banks of McDonald Creek in the evening.[411] Black bears may be seen along the Road at various points, along the drainages and moist areas that support berry bushes. Occasionally, bears may be spotted near the Logan Creek patrol cabin foraging for food. Water ouzels, slate gray birds about the size of a robin, fish for caddis fly larvae under rocks at the bottom of the cold streams. Wood ducks, harlequins and goldeneyes also frequent this area. Few fish can be found in McDonald Creek because of the lack of food in its clear waters.[412]

The Human Setting

The Evolution and Character of the Roadway. As with the Lake McDonald segment, the earliest road construction along upper McDonald Creek was underfunded and expedient, resulting in a primitive, narrow road that required significant rebuilding in the 1930s. This reconstruction project eased the roadway's curvature, increased the roadway to standard width, and improved drainage. Although the 1964 flood damaged some portions of this segment, and the road west of Avalanche was resurfaced and partially reconstructed in the 1990s, much of the 1930s character of the route remains clearly evident today.

The mid-1930s reconstruction of this segment saw the creation of a nearly-new alignment following the general overall route of the original roadway. The 1922-23 roadway closely followed the irregular contours of the canyon's edge, avoiding the necessity for expensive bridges, cuts, and fills. This resulted in a alignment, however, with difficult curvature, uneven gradients, and limited scenic views. The reconstruction project eliminated many of these design problems, using judicious cut-and-fill work to reduce vertical and horizontal curvature. The widened roadway was also nearer to McDonald Creek in places, improving

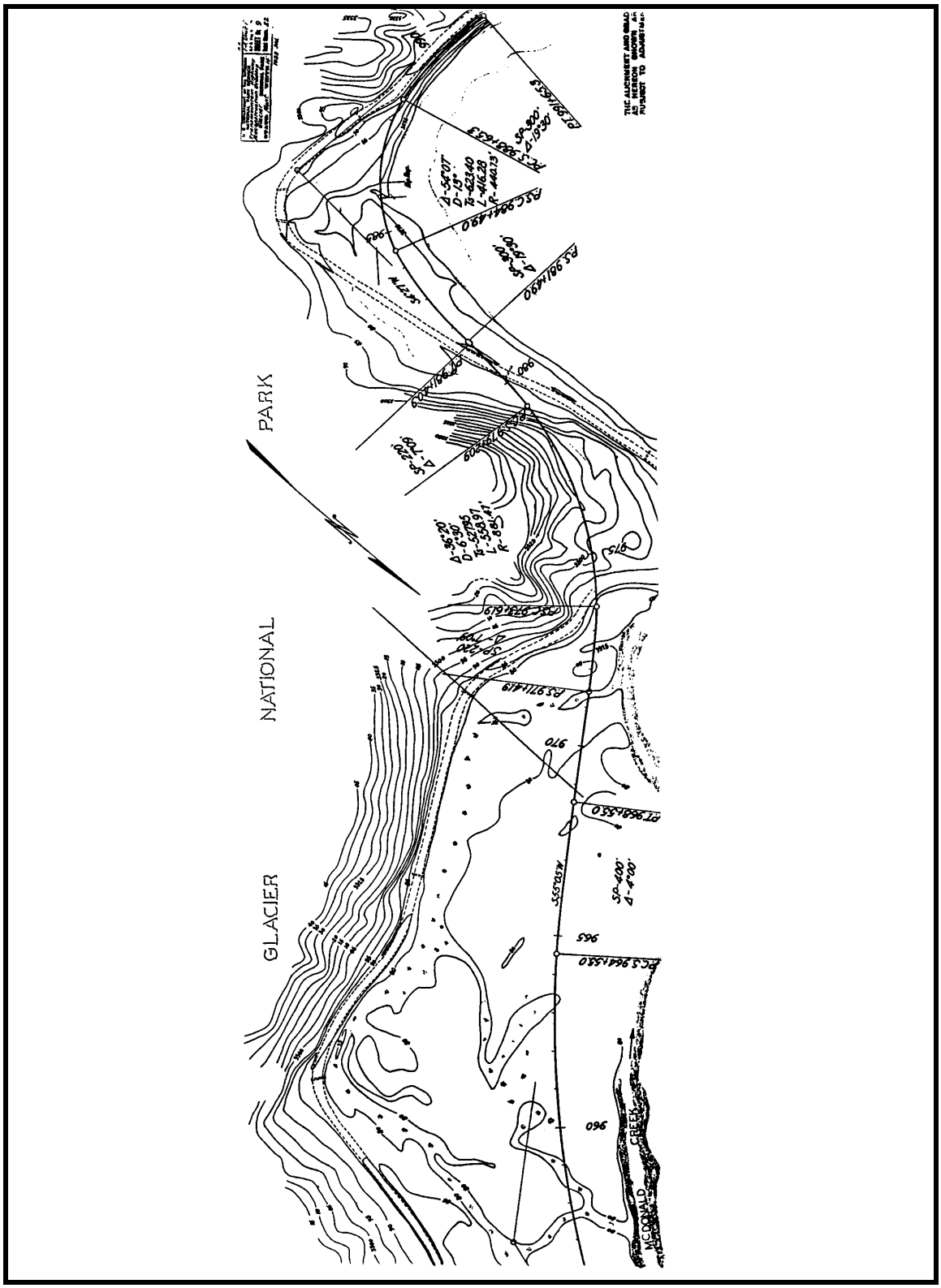


Figure 99. Reduced-size reproduction of part of a 1933 map showing the planned reconstruction of the Going-to-the-Sun Road in the upper McDonald valley. Paired dashed lines indicate the original road alignment, and the heavier solid line shows the 1930s realignment. Moose Country pond is near the center left of the map. TIC drawing 9394.

vistas for the park traveler. In all, at least eight roadway segments in the area were realigned during the period.

Figure 100. Guardwalls near McDonald Falls, 2000 photo.

Much of the bypassed 1922 Sun Road alignment along McDonald Creek is now overgrown and largely invisible, but at least two significant reminders of the original roadway remain apparent today. At the McDonald Falls overlook (milepost 12.6), the current pedestrian pathway to the viewpoint partially follows an old road alignment, and is protected by an historic guardwall that was built for the old road. The former alignment – steeper and with sharper curves than the current road – continues westward beyond the end of the modern footpath. Near Moose Country Pond (milepost 13.7 - 14.1) a segment of the 1922 roadway survives as an access lane to the Moose Country Pit.

Figure 101. Log "horse overpass" near McDonald Falls, soon after its completion in 1926. GNHA photo #91.

Bridges and other structures related to this segment of the road primarily date from the 1930s. The oldest significant resource is the Logan Creek bridge (1926-28), a well-crafted example of a multi-span, stone-faced stream crossing. The current concrete-and-stone Avalanche Creek bridge (1935-36) replaced a primitive earlier structure on a slightly different alignment. Most of the other stonework along this part of the road dates from the Wunderlich contract (1936-37). The Wunderlich walls are among the finest examples of stonework on the road, and they display an excellent level of integrity. The lower portion of the segment was also home to one of the most unique structures every built along the road – a handsome log overpass designed to carry horse parties along the road. The overpass, completed in 1926, was removed during the road reconstruction work of the following decade.

Key Resources, Attractions, and Facilities. The Mountain Streams and Forests segment of the Going-to-the-Sun Road features a number of access points to trails, view points, wayside exhibits, and visitor services. Access points are provided at McDonald Falls (milepost 12.7), Sacred Dancing Cascades (milepost 13.0), near the "moose country" ponds (milepost 13.7), McDonald Creek Overlook and wayside exhibit (milepost 14.5), Red Rock Point (milepost 17.6), and the Avalanche Chutes wayside exhibit (milepost 18.7). Pullouts along the road also provide opportunities to view Mount Cannon, the Garden Wall and Mount Gould.

From the McDonald Falls viewpoint, Stanton Mountain and Mount Vaught are visible, towering above the valley floor. A footbridge spans McDonald Creek at the Sacred Dancing Cascades, connecting to a trail on the far side of the Creek that leads downstream to McDonald Falls. The McDonald Creek Overlook exhibit provides information about the varying seasonal water levels, glacial melt and the force of the water as it scours rocks and shapes valleys. The Avalanche Chutes wayside exhibit interprets the effects of avalanches on vegetation and wildlife habitat.[413]

This segment of Going-to-the-Sun Road includes three historic bridges and a horse underpass. The underpass, located near milepost 12.9 was built in 1936-37 and provides a route under the Road for horse parties on the McDonald Creek cut-off trail. The Avalanche Creek bridge is an historic three-span concrete-slab bridge and the bridge at Logan Creek is an historic two-span concrete-slab bridge. Both are listed as contributing resources in the National Register and National Historic Landmark nominations for the Sun Road. The third concrete bridge spans an unnamed creek near milepost 19.9.

Figure 102. Horse underpass near McDonald Falls, 2001 photo.

The primary visitor service area on the Mountain Streams and Forests segment is at Avalanche Creek. Avalanche has been a favorite camping and stopover spot since the earliest days of the Sun Road, although the current camp and picnic facilities here date from the late Mission 66 era. The area is also a very popular day-use destination, and is home to two of the park's most heavily-used trails. The Trail of the Cedars is a .8 mile, wheelchair accessible loop through the ancient cedar-hemlock forest and crosses Avalanche gorge, an exquisite falls on Avalanche Creek that cuts through a narrow canyon. At the gorge, a second trailhead marks the beginning of the two-mile walk to Avalanche Lake.

Additional trails to Johns Lake, McDonald Falls and the Avalanche Creek Campground cross the Road at a number of points between milepost 12.2 and Sacred Dancing Cascades. At milepost 12.4, the Road intersects with the Kelly Camp road which provides access to the Lake McDonald Ranger District and inholder properties located at the northernmost end of the lake. The Kelly Camp road also provides access to the McDonald Creek trail system and the West Lakes trail system on the far side of the Lake.

The Visitor Experience on the Road (Primary)

The Mountain Streams and Forests segment of Going-to-the-Sun Road follows a gently meandering route through the McDonald Creek Valley. Leaving Lake McDonald Lodge, Mount Vaught dominates the view ahead, soon replaced by Mount Cannon. Buttercups, blue lupine, thimble berries, and false dandelions bloom along the Road's edge as it cuts its way through the forest, past the Johns Lake trail head and the road to the Lake McDonald Ranger Station and Kelly's Camp. Just past the intersection, the Road joins McDonald Creek as it winds its way towards Lake McDonald, through a narrow river valley with mountains towering on both sides. Across the valley, water can be seen pouring off the cliffs of Mount Vaught, and to the right waterfalls tumble down the steep slopes of Mount Brown and Mount Cannon. A series of pullouts and a wayside exhibit at McDonald Falls enable travelers to stop along the Road and watch the Sacred Dancing Cascade, the name Indians gave McDonald Creek. The dense forest forms a canopy over the Road beyond McDonald Falls and again near Avalanche. As the Road approaches Avalanche Creek campground and picnic area, traffic slows to accommodate both vehicular and pedestrian congestion at the site.

Figure 103. Sun Road approaching the Garden Wall, 2000 photo.

Approximately 1.5 miles beyond Avalanche, the Garden Wall comes into view, framed by the tall cedars and hemlock trees. A mile beyond, a pullout and wayside exhibit provides an unobstructed view of the Wall for visitors traveling in both directions.

Leaving the exhibit area, the upper portion of the Road is visible ahead on Haystack Butte. Near the end of the segment, the Road crosses Logan Creek and begins its turn to the north in preparation of its ascent of the Garden Wall.

Figure 104. 1950s postcard view of the Sun Road in the upper McDonald Valley. Author's collection.

East to West. West-bound travelers catch a last glimpse of Mount Oberlin and Bird Woman Falls as the Road concludes its descent of the Garden Wall. Where the Road joins McDonald Creek, Heaven's Peak is seen ahead and Mount Cannon's cliffs are visible on the left. The Road travels through dense forests, with the Creek ever-present, crashing over the rocks in its course, debris from flooding evident on its banks. At Red Rock Point the Little Matterhorn, to the east of Mount Brown, can be seen and a mile further downstream, just before Avalanche campground, travelers along the Road can catch a glimpse of Sperry Glacier, nestled between the Little Matterhorn and Gunsight Mountain. Past Avalanche, the Road continues its journey along the Creek, through the cedar-hemlock-cottonwood forest, to Lake McDonald Lodge.

3.4.6 Segment 4. – The Rock Ledge

Overview

This magnificent segment of Going-to-the-Sun Road begins at Lower Haystack Creek and travels a distance of 10.6 miles to Logan Pass. The roadway narrows as it climbs through the West Side tunnel, beginning its traverse of the Garden Wall. After a sharp hairpin turn at the Loop, the Road makes a grand ascent, providing spectacular views of Heaven's Peak and the U-shape valley that frames Logan Pass. The Rock Ledge segment, which is at once both beautiful and daunting, evokes a combination of emotions, rendering the driving experience unforgettable. The Road's juxtaposition to the towering Garden Wall and the wide expanse

of the McDonald and Logan Creek Valleys imparts a sense of being on "top of the world" as the Road and the scenery become one and the same. At the beginning of the segment the downhill side of the Road is forested, while the rocky walls, displaying ancient algal colonies, border the Road on the opposite side. At milepost 23.61 the Road cuts through the West Side Tunnel where galleries, cut in the tunnel wall, provide views of Heaven's Peak and the mountain ranges to the northwest. At the Loop, the Road bends back on itself heading directly to Logan Pass. Beyond the Loop, subalpine forests on both sides of the Road become less dense than those in the valley below and provide unobstructed views of the Pass and Bird Woman Falls cascading from the hanging valley between Mount Oberlin and Mount Cannon.

Key Characteristics of the Rock Ledge Segment

Roadway Qualities & Features:

- *Narrow roadway (22 feet and less), with extremely heavy curvature and restricted visibility*
- *Stady 6 percent grade up to Logan Pass*
- *Numerous historic structures and engineering features throughout, including the West Side Tunnel, many stone retaining walls, and stone guardwalls*
- *Roadway has not been rehabilitated, except for a 0.75-mile section between Oberlin Bend and Logan Pass (1995-96)*

Cultural Resource Qualities & Features:

- *Segment largely reflects design and construction activities from the mid-1920s*
- *Extensive historic stonework along much of the segment, including retaining walls, guardwalls, and culvert headwalls; some (such as the Triple Arches and the Loop) are key visual reflections of the Road's historic character*
- *Many historic features (primarily guardwalls) are in need of rehabilitation*
- *Segment is a part of the Sun Road NRHP and NHL nominations*

Visual/Experiential Qualities & Features:

- *The segment is noted for its exceptional long-range scenic vistas, including views of the Logan Pass area; the upper McDonald valley; the Garden Wall; and distant mountains to the north and northwest*
- *Short-distance views of the twisting roadway, cliff faces, and guardwalls are also prominent*
- *Views of specific scenic and cultural resources are frequent, and include the West Side Tunnel; the Loop; Bird Woman Falls; the Weeping Wall; the Triple Arches, and Logan Pass*
- *Visitor attractions include the West Side Tunnel; the Loop; the Weeping Wall; Oberlin Bend; and Logan Pass*

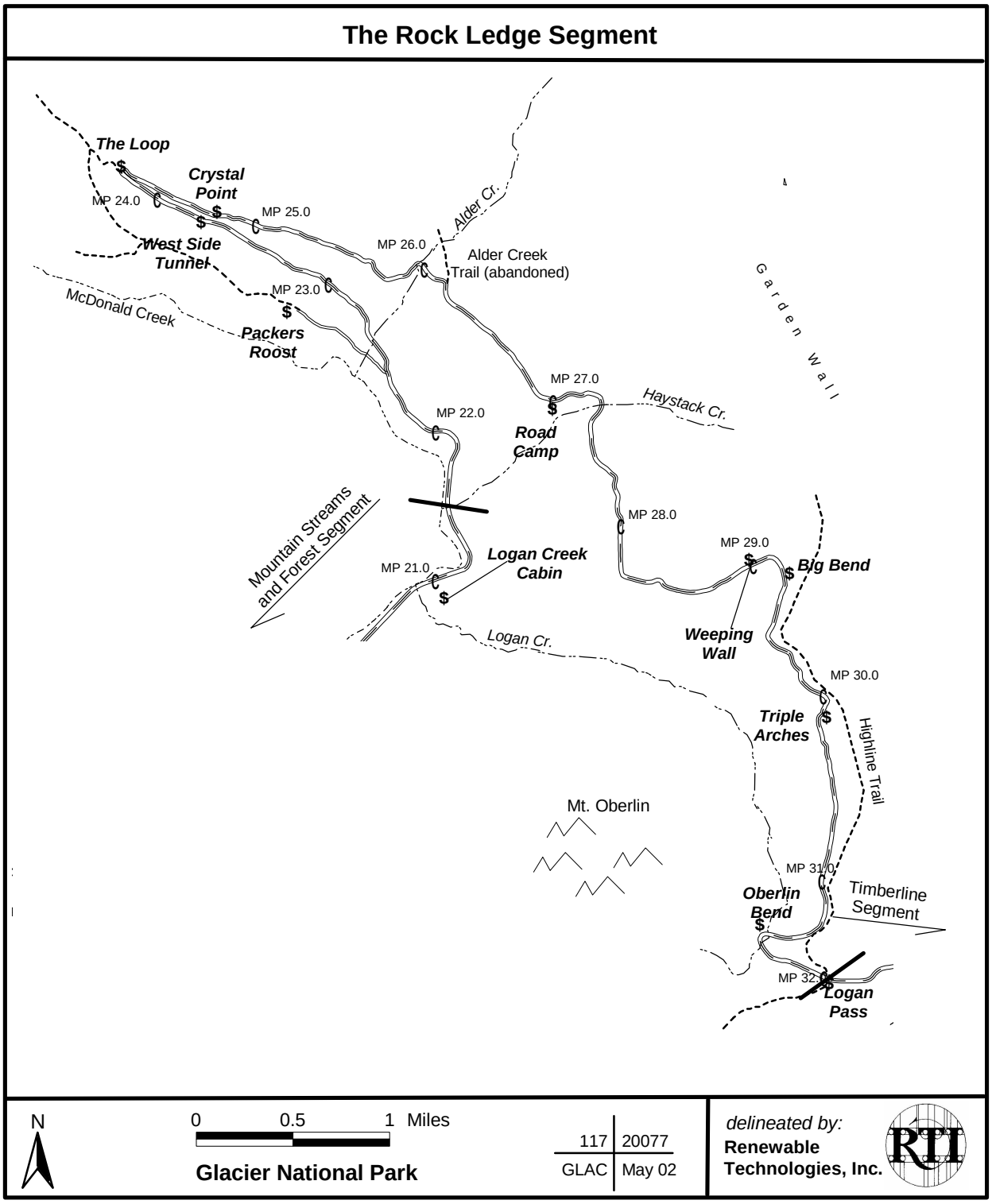


Figure 105. Locator map of the Rock Ledge segment, Going-to-the-Sun Road.

Figure 106. Skiers in a galley of the West Side Tunnel, Heavens Peak in background.

As the Road makes its precarious way up the Garden Wall, the vegetation becomes even more sparse and the sheer cliffs more dramatic. Beautiful waterfalls tumble down the Wall on the uphill side of the Road and meadows, full of wildflowers, are visible above and below the roadway. Here Going-to-the-Sun Road appears to emerge from the Wall itself, as it winds its way to the Pass. All along the segment, the key elements of the historic Road's unique design are clearly evident -- rock retaining walls, guard rails, and other structures, including the famous Triple Arches. Frequent turnouts provide opportunities to stop and enjoy the landscape and to take a break from the sometimes nerve wracking drive. At a number of locations, the McDonald Valley portion of the Road is visible from above. At milepost 28.9, the Road passes by the Weeping Wall, where in June and July, tiny water falls "weep" out of cracks in the wall, splashing on the roadway. Beyond the Weeping Wall, the Road makes two large curves. The first, the "Big Bend", provides a spectacular view of Bird Woman Falls, surrounded by Mt. Cannon, Mt. Oberlin, and Clements Mountain. The second, Oberlin Bend, occurs just before the Pass and is often frequented by Mountain Goats. Closer to the Pass it is not uncommon to see snow drifts in June, many of which tower over passing automobiles. In his book, *Roads and Trails of Waterton-Glacier National Parks,* George Ruhle writes:

> "The road curves around the amphitheater between Haystack Butte and Bishops Cap. So much snow accumulates in the col every winter that it is a major task to clear the highway by June 15. When snow

Figure 107. Sun Road, Crystal Point area.

plows have finished their job, they leave a gorge deeper in early season than the height of a car so travelers from warmer climes may perhaps get the first thrill of something they have seen previously only at a distance and known only from a photograph or an imperfect description in words."[414]

The segment ends at the alpine meadows of Logan Pass, where the Road crosses the Continental Divide and begins its descent to the east. At Logan Pass, spectacular alpine vistas are seen in nearly all directions. Clements and Reynolds Mountains rise on either side of the meadow, their rocky summits towering over the landscape. Directly across from the Pass is Pollock Mountain, the highest point at the southern end of the Garden Wall. Behind Pollock, Mount Gould and Haystack Butte are visible, as is the fire lookout on Swiftcurrent Mountain above Granite Park Chalet. Beyond where the Road can be seen as it climbs to the Pass, the high peaks of the Livingston Range appear to go forever towards the northwest. To the north and east, Piegan and Going to the Sun Mountains are visible, while to the southeast, the ridges of Heavy Runner and Citadel appear as mirror images, rising above the yet unseen St. Mary Lake.

Figure 108. View of the western ascent to Logan Pass, photographed from near Crystal Point. Note the path of the Going-to-the-Sun Road ascending the Garden Wall on the left. 2001 photograph.

The Natural Setting

Geology. Along the grade between McDonald Creek and Logan Pass, outcrops of Siyeh Limestone are visible. The limestones are interspersed with red and green argillites, giving the cliffs a striped appearance. Nearly every bed contains fossil algae, formed over a billion years ago. Cross sections of the fossil algae colonies resemble cabbage heads, with their concentric rings.[415] From the Loop, across the McDonald Creek Valley, a large landslide scar can be seen on the valley wall. This was apparently caused by glacial till as it slid down into the valley, unable to remain stable on the steep slope.[416] The Garden Wall, which sits along the Continental Divide, is a classic example of an arete, or knife-edged ridge. It not only separates the east and west watersheds, it is the demarcation of the Park's two climates – the warm, wet Pacific Northwest climate of the west and the dryer, cooler, Great Plains

climate of the east.[417] The Garden Wall was formed by ancient glaciers, working on both sides of the mountains, the ice plucking away at the headwalls. Today the wall is very thin and is only a few feet thick at the top. Points where glaciers cut through, creating continuous ice sheets are called "cols", which in turn formed passes of which Logan Pass is an example.[418] Two mountains – Haystack Butte on the west and Mount Gould on the east, abut the Garden Wall approximately halfway between the Loop and the Pass.

Figure 109. Garden Wall From Oberlin Bend, 2001 photo.

From the Loop, the Road rises at an almost constant 6 percent grade, while the rock strata appear to rise at a sharper angle, pushed upward at an angle of 10 degrees by the Lewis Overthrust. As a result, the Road appears to be going down through the layers of sediments that pitch up to the east. A pullout at milepost 27 provides an excellent vantage point to view Bird Woman Falls and Cirque, a perfectly formed, bowl-shaped hanging valley. [419]

Water. As the Road leaves the McDonald Creek Valley floor it encounters numerous streams and waterfalls along its journey to Logan Pass. McDonald Creek glistens below while waterfalls tumble down the Garden Wall and continue under, and sometimes across the roadway. The falls emanate from snow fields high above the Road and their volume and force change with the seasons. As the Road makes its way up the Garden Wall, it often crosses and re-crosses the same streams. Alder Creek crosses the Road at milepost 22.45 below the Loop and again at milepost 25.95, tumbling down on the uphill side of the road just beyond where Haystack Butte comes into view. Haystack Creek which is found at the beginning of the Rock Ledge segment, cascades down the Garden Wall in an exquisite falls at milepost 27.3. Logan Creek meets the Road just north of Oberlin Bend on its way down to the valley floor.

Climate. Much of the precipitation on the west side of the Park falls as snow in the higher elevations. Along the Continental Divide, the average annual snowfall is 800 to 1000 inches, or more than 80 feet.[420] The deep snows present a challenge every year to crews who work to get the Road open over Logan Pass for travel, typically by mid-June. The earliest the Pass has opened was May 16, 1987, and the latest it has opened was June 23, 1991 and 1995.[421]

The heavy snows and higher elevations result in shorter seasons than at lower elevations on the west side. While the McDonald Creek Valley may be enjoying early spring, the upper reaches of the Rock Ledge Segment are typically in throes of winter. Low lying clouds sometimes drift through Logan Pass obscuring the mountains. Visitors who wait patiently for the clouds to clear are often rewarded as the high peaks re-emerge from the thick fog.

Vegetation. The lower elevations of the Rock Ledge Segment cut through a forest of Engelmann spruce, subalpine fir, and occasional larches.[422] As the Road begins its climb to the Loop, the remains of the Glacier Wall fire of 1967, that burned over 3000 acres, can be seen on the slope of Mount McPartland. Immediately after the fire, the area was covered with fireweed and wild hollyhocks, followed by lodge pole pine which are slowly reclaiming the area. The re-vegetation process is further along at the site of the 1936 fire, adjacent to the 1967 burn. The 1936 blaze began on Heavens Peak, crossed the McDonald Creek Valley, and burned up and over the Garden Wall. As the Road climbs further, the trees of the spruce-fir forest become less common and are replaced by less dense vegetation. Along avalanche chutes, in moist areas, alder is more common. Alder is a small tree or shrub, ranging from 3 to 16 feet in height, with smooth reddish-brown bark. A variety of wildflowers including purple silky phacelia, forget-me-nots, yellow arnicas, and red Indian Paintbrush, cling resolutely to the rocky crevices along the sides of the rock ledges and along the sides of the Road.[423] Beyond the Weeping Wall, the Road cuts through a meadow carpeted with yellow glacier lilies in early summer, followed by mountain parnassia and blue gentians.[424]

Having climbed over 3,000 feet from Lake McDonald, Going-to-the-Sun Road reaches timberline at Logan Pass. Timberline, at this latitude, is between six and seven thousand feet but the landscape gives the illusion of greater elevation.[425] The Logan Pass area lies within the Hudsonian or Subalpine Zone, characterized by very small and dwarf species, as well as plants whose growth is limited at higher elevations by the short summer season. Some of the typical tree species found in this area include the subalpine larch, white bark pine and Douglas fir. St. John's Wort, globe flowers, red mimulus and blue gentian also grow in this zone.[426] Margaret Thompson, in her book, *The High Trails of Glacier National Park*, describes Logan Pass as "a wide-spreading, beautifully terraced flower garden, offering a superb view in all directions."[427]

Wildlife. The Rock Ledge segment of the Road travels through the habitat of a number of the Park's larger mammals. Rocky Mountain Goats, distinguished by their white shaggy coat and slender black horns are known to frequent the area around Logan Pass, foraging the small plants that grow out of the rock crevices at Oberlin Bend. Big Horn Sheep are often in the saddle between the Garden Wall and Haystack Butte. They are typically a gray brown color with a characteristic creamy-white rump. The rams have long, curled, dark horns while the ewes' horns are much smaller and only slightly curved. Both grizzlies and black bears may be occasionally observed eating berries both above and below the roadway. Alpine rockslides and meadows are home to a number of smaller mammals. Among these are the

Columbian Ground Squirrel and the Hoary Marmot, a bushy-tailed, silver gray animal with a white stripe around the nose in front of the eyes. Visitors to Logan Pass often encounter these two rodents along walking paths and adjacent to the visitors' center.

There are fewer bird species found above timber line than in the valleys and mountain slopes below. There are three characteristic birds found in the subalpine zone in Glacier. These include the gray-crowned rosy finch, the water pipit, and the white-ptarmigan, which changes colors with the season and is sometimes spotted in the Logan Pass area. [428]

The Human Setting

The Evolution and Character of the Roadway. As much as any portion of the Sun Road, the Rock Ledge segment continues to reflect the designs and intent of its original designers. The roadway retains its original alignment throughout the segment, and most major structures are also original; well-crafted historic stone guardwalls and retaining walls are evident along much of the segment's length, and contribute substantially to the visual character of the roadway and the experience of driving it. Some historic guardwalls and retaining walls have been replaced using modern materials, however, (primarily concrete); these installations have degraded the visual character of select portions of the Road.

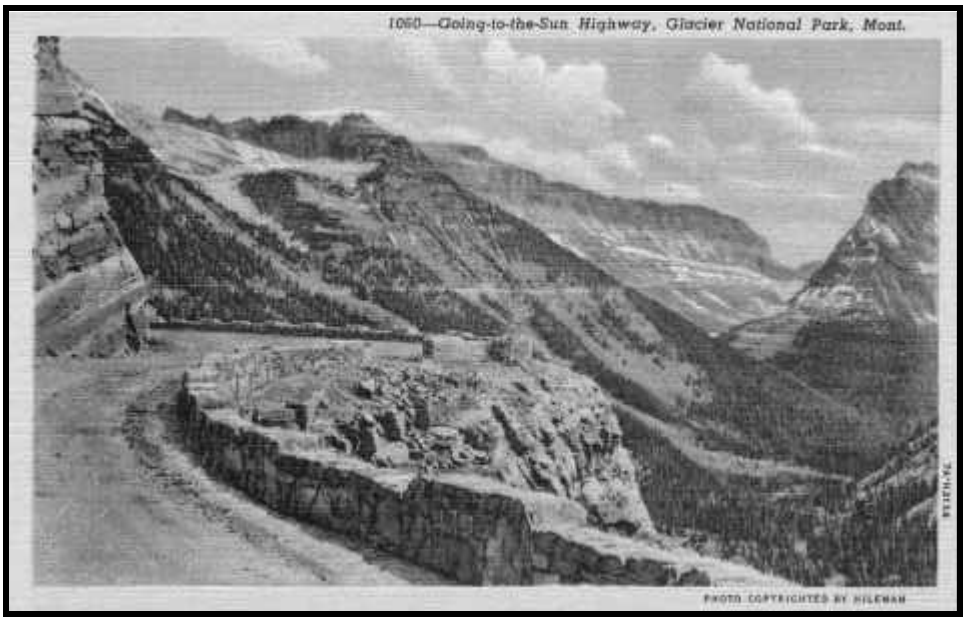


Figure 110. Early postcard view of the Going-to-the-Sun Road, near Crystal Point. Author's collection.

This segment of the Road remained unpaved into the early 1950s, and much of the segment originally had drainage channels along one or both sides of the road. These disappeared when (or after) the roadway was paved, effectively widening the road surface and changing its original appearance. Additional widening has taken place in locations where rockfall and other debris has been pushed to the side by maintenance crews over the years.

Figure 111. Early postcard view of the Going-to-the-Sun Road, west of Logan Pass. Author's collection.

The most significant change to the Rock Ledge segment was the enlargement of the West Side Tunnel during the winter of 1966-67. Originally, the tunnel was a curved, rock-lined bore, little more than one lane wide and displaying an irregular section. It was a handsome, well-crafted example of the NPS design philosophy of the period. The enlargement project destroyed much of the bore's original character, creating a straight, two-lane tunnel lined with concrete and with replacement concrete portals faced with stones.

Figure 112. 1960s-era postcard view of the lower portal of the West Side Tunnel, prior to its enlargement. Author's collection.

Key Resources, Attractions, and Facilities. The Going-to-the-Sun Road is itself perhaps the primary visual feature of the Rock Ledge Segment. In her 1938 book, Margaret Thompson lauds the roadway and its principal designer, Thomas Vint:

> "It was he (Vint) who ferreted out the present remarkable grade, which makes but one switch back in all that climb. In places it is literally hung to the Garden Wall"[429]

The structural elements of the road – the stone retaining walls, guardwalls, tunnels, and bridges, have been beautifully crafted, and remain as a tribute to the work crews that painstakingly built them. The West Side Tunnel, at milepost 23.65, was constructed in 1926 by H.W. Bennett and Phil Segolia, subcontractors to William & Douglas. Crews used 6000 pounds of dynamite to move 3764 cubic yards of rock in its construction. The original tunnel was enlarged and lined with concrete during the winter of 1966-67 (see above).[430]

The Loop, where the Road makes its remarkable switchback at milepost 24.22, is a well-known attraction for travelers and a major engineering feature of the Rock Ledge segment. Historically, the single switchback at the Loop is a reflection of the chosen design philosophy of the Road, and of the alignment uncertainties which preceded its construction. The high, battered retaining wall of dry-laid stone supporting the switchback is largest dry-laid wall on the Road, measuring 135 feet across. The Loop also boasts the largest historic viewpoint on the entire alpine section, designed as such by Thomas Vint, and features 600 feet of handsomely crafted stone guardwalls at the parking and overlook areas. Beautiful stone stairs take pedestrians from the upper to lower switchback and to the viewpoint where Heaven's Peak and the northwest mountain ranges are exquisitely arrayed. Travelers over the Road experience an instant and dramatic change in the viewshed as the Road turns and climbs directly toward Logan Pass.

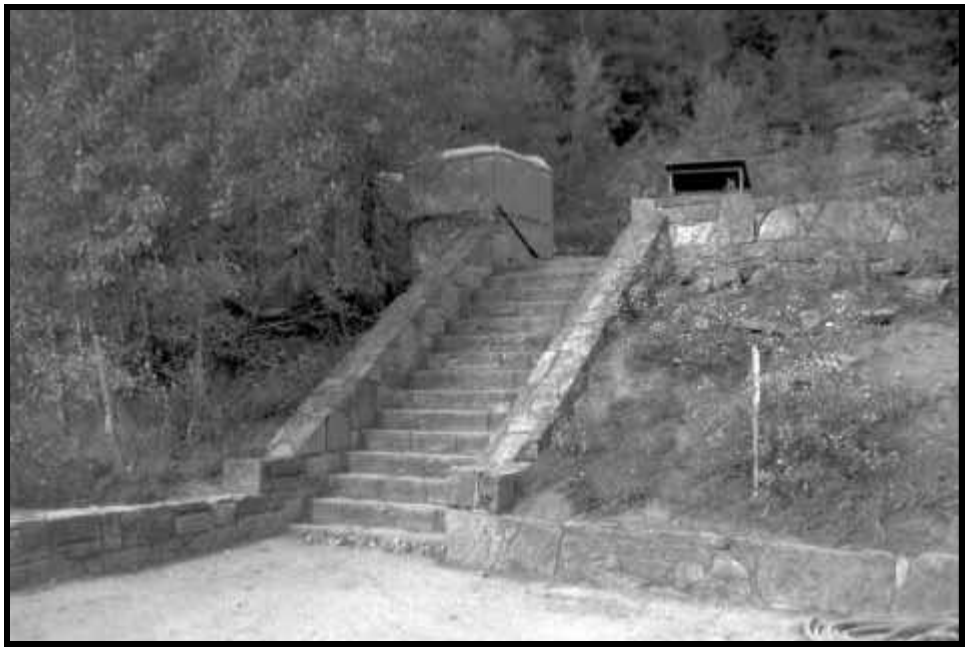


Figure 113. Pedestrian staircase at the Loop, 2001 photo.

Crystal Point (milepost 24.9), named for the iron pyrite crystals embedded in the red quartzite vein in the rock wall on the right, is the site where, during the initial stages of construction, workers were lowered over the face in belays secured to trees above. For years afterwards bits of telltale rope remained as reminders of their hazardous endeavors.[431] The well-crafted stone-arch bridge at the upper Alder Creek crossing (milepost 25.96), is a fine example of the road's stone engineering. Near milepost 27 is the site of Road Camp #9, a staging area and lodging facility for road workers and maintenance crews dating from the 1920s and in use until at least the 1950s (see Figure 32, page 71). The primary surviving feature is a rustic, well-crafted set of flagstone steps which leads to the former camp area and observation point. The wood-framed storage building and heavy equipment parking area on the uphill side of the Road remains to mark the spot.[432] (The building, however, is not original to the site.)

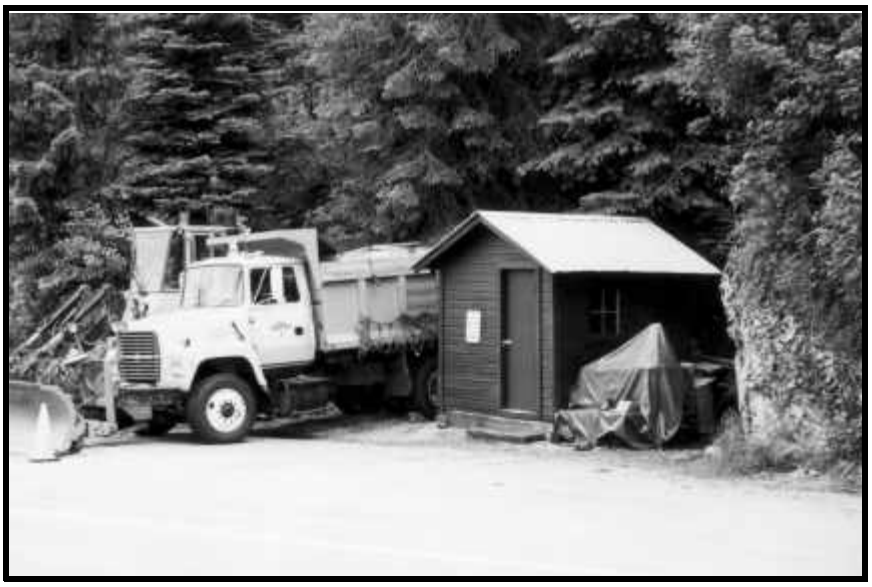
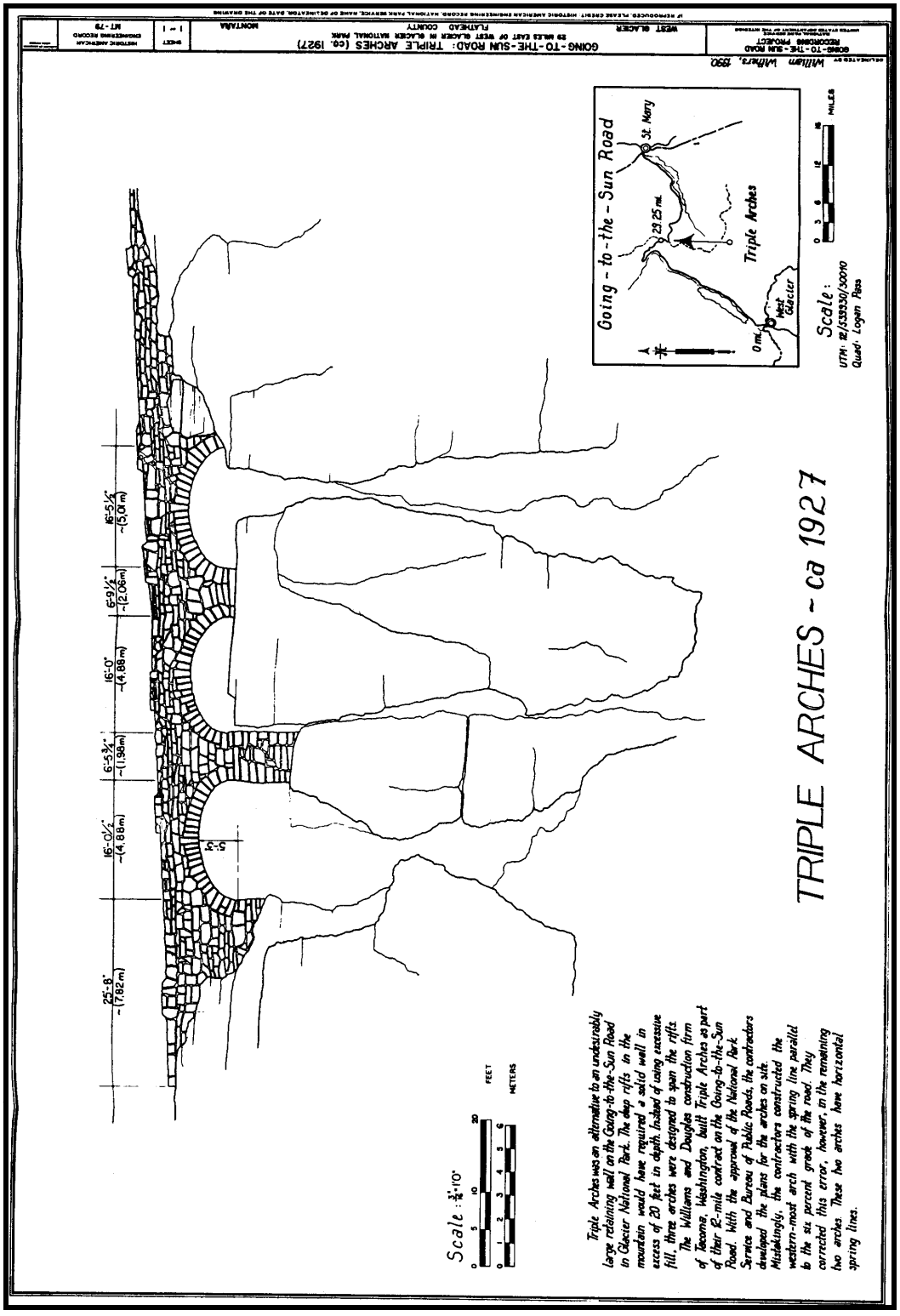


Figure 114. Maintenance area at Road Camp site, 2001 photo.

Figure 115. Westbound view of the Going-to-the-Sun Road at Road Camp. 2001 photograph.

Triple Arches, a three span masonry arch half-bridge located two miles west of Logan Pass, is one of the most distinctive structural elements of the entire Going-to-the-Sun Road.[433] Finally, the Road as a whole exhibits itself. At various points along the Rock Ledge Segment it is possible to observe the roadway from above or below.


GOING-TO-THE-SUN ROAD: TRIPLE ARCHES (GG. 1927)
29 MILES EAST OF WEST GLACIER IN GLACIER NATIONAL PARK
FLATHEAD COUNTY
MONTANA
WEST GLACIER
GOING-TO-THE-SUN ROAD
RECONNAISSANCE PROJECT
HISTORIC AMERICAN ENGINEERING RECORD
HAER-79
SHEET 1 - 1
MT-79
delineated by William Withers, 1990
TRIPLE ARCHES - ca 1927
Triple Arches was an alternative to an undesirably large retaining wall on the Going-to-the-Sun Road in Glacier National Park. The deep rifts in the mountain would have required a solid wall in excess of 20 feet in depth. Instead of using excessive fill, three arches were designed to span the rifts.
The Williams and Douglas construction firm of Tacoma, Washington, built Triple Arches as part of their 12-mile contract on the Going-to-the-Sun Road. With the approval of the National Park Service and Bureau of Public Roads, the contractors developed the plans for the arches on site. Mistakingly, the contractors constructed the western-most arch with the spring line parallel to the six percent grade of the road. They corrected this error, however, in the remaining two arches. These two arches have horizontal spring lines.
Scale: 1/4"=1'0"
FEET
METERS
25'-8" (7.82m)
16'-0½" (4.88m)
6'-3½" (1.90m)
16'-0" (4.88m)
6'-9½" (2.06m)
16'-5½" (5.0m)
Going-to-the-Sun Road
St. Mary
23.25 mi.
Triple Arches
Mt. Clements
Mt. Edwards
Mt. Reynolds
Mt. Oberlin
Mt. Jackson
Mt. Cannon
Mt. Siyeh
Mt. Gould
Mt. Wilbur
Mt. Matahpi
Mt. Merritt
Mt. Grinnell
Mt. Allen
Mt. Henkel
Mt. Brown
Mt. Logan
Mt. Kipp
Mt. Vaught
Mt. Stimson
Mt. Going-to-the-Sun

A number of trails intersect the Road along this segment. A short road spur (.7 miles) at milepost 22.8 leads to Packers Roost, a trailhead below the Sun Road where pack trains embark and terminate. From this point, the Flattop Mountain Trail climbs to Fifty Mountain and connects with trails to Granite Park, Many Glacier and Waterton Lake. A Civilian Conservation Corps (CCC) camp was located near the trailhead and the old road to the camp is still clearly evident just beyond Packers Roost. The Loop Trail at milepost 24.24 connects hikers to Granite Park Chalet, the Highline trail and Swiftcurrent Pass. Slightly less than two miles east of the Loop, the abandoned Alder trail climbs the Garden Wall in a series of switchbacks. Built as a fire trail in 1936, the trail connects with the Highline Trail at a point approximately 1 mile east of the Granite Park Chalet. At Oberlin Bend a modern boardwalk allows visitors to enjoy the subalpine meadow and get a closer look at the Rocky Mountain Goats that are often found there. The Highline Trail, which leads to Granite Park Chalet, Fifty Mountain, and eventually to Waterton Lakes National Park in Canada, with spurs over the Garden Wall to the Many Glacier area, begins at Logan Pass. The Hidden Lake Trail, which takes hikers to an overlook and down to the lake, leaves from just behind the Visitor Center.

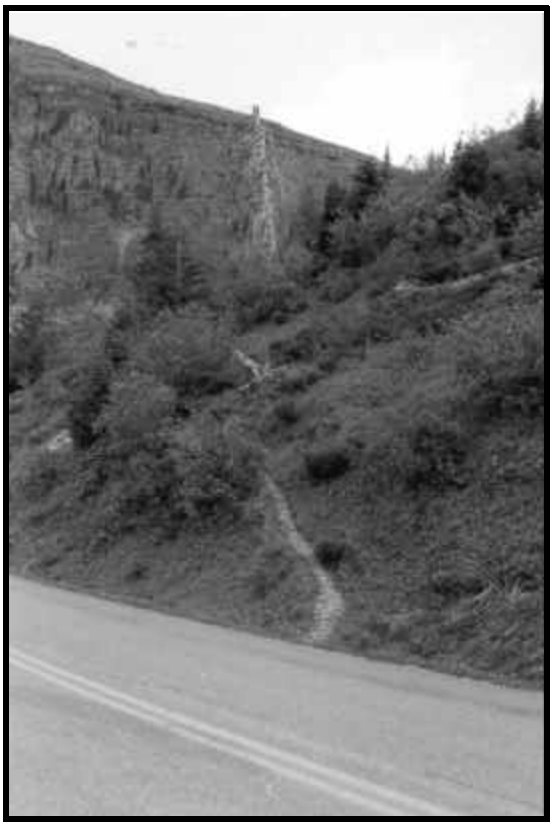


Figure 117. View of the now-abandoned Alder Trail heading uphill from the Sun Road. 2001 photo.

Figure 118. Going-to-the-Sun Road wayside exhibit at Big Bend, 2001 photo.

The Rock Ledge segment hosts a number of viewpoints and wayside exhibits that provide interpretive information about glaciation, the role of fire in the park, Going-to-the-Sun Road construction and animal habitat.

The primary visitor facilities associated with this segment are located at Logan Pass. The Logan Pass Visitor Center was constructed in 1966 and first opened to visitors in 1967. The stone masonry and glass structure replaced a stone comfort station built in the rustic style.

Figure 119. Logan Pass Visitor Center, 2001 photo.

The Logan Pass center is typical of the buildings which the Park Service built under Mission 66, a program initiated in conjunction with the 50th anniversary of the National Park system. The building's design is reflective of post World War II architectural theory that emphasized its primary function– to facilitate better visitor circulation through the Park. While the design departs from earlier efforts to create Park facilities that emanated from the landscape, the Logan Pass Visitor Center does make use of earth-toned colors and stone facades in an attempt to harmonize with its surroundings.[434] The center houses an information center, book store, interpretive displays and public restrooms. Logan Pass was named for Major William R. Logan, first superintendent of Glacier National Park (1910-1912).[435]

The Visitor Experience on the Road (Primary)

As the Road begins its climb out of the McDonald Creek Valley, the cliffs of the Garden Wall are visible on the right, while the snow covered peaks of the Livingston Range can be seen to the northwest. The quality of the driving experience on Going-to-the-Sun Road changes noticeably at this point. The roadway appears narrower and the sheer cliffs along the inside lane and the sharp drop off on the outside require greater driver attention and slower speeds. Pullouts are narrower and generally have space for fewer cars than those on the valley floors. At milepost 23, Heaven's Peak comes into view and a short distance beyond, the Road passes through the West Side Tunnel. A pullout on the downhill side of the tunnel enables pedestrian access where two observation galleries cut through the tunnel wall frame Heaven's Peak across the valley. Where the Rock Ledge segment winds its way around the Loop, the beautifully crafted stone work along the sides is more conspicuous, seeming to separate the pavement from the thin air beyond. Above the Loop, Mount

Cannon and Oberlin come into view, appearing to move out behind Heaven's Peak, which itself seems to be getting larger. The Road is clearly visible ahead along the Garden Wall to Mount Pollock.

Figure 120. Heavens Peak, 2001 photo.

At milepost 26.6, a wayside exhibit provides information about the role of fire in forest health. McDonald Creek and the Road are seen below, while ahead Bird Woman Falls cascades out of the hanging valley surrounded by Mount Oberlin and Mount Cannon. Mountain Goats graze on the cliffs above the Road and ground squirrels may loiter near the fire exhibit pullout. The larger trees disappear as the Road climbs, clinging to the cliffs above and below, while alder bushes flourish along the streams and wildflowers grow in profusion at the Road's edge. On the uphill side of the Road, waterfalls stream down natural stair steps, make their way under the pavement, and then continue down to Logan and McDonald Creeks below. The Road takes travelers past Road Camp and to wayside exhibits which interpret Bird Woman Falls (milepost 27), and hanging valleys (milepost 27.8). At the Weeping Wall (milepost 29), tiny water falls shower the Road in early summer, slowing to a trickle later in the season. Beyond the Weeping Wall, the Road makes a wide sweep at Big Bend where a large snow drift often remains well into the summer, towering over passing cars on either side of the roadway.

Figure 121. Snowdrift at Big Bend, 2001 photo.

Figure 122. Triple Arches, 2000 photo.

Exhibits near the drift provide information on the construction of Going-to-the-Sun Road and mountain goat habitat. At milepost 29.8 Mount Clements, the matterhorn-shaped peak at Logan Pass, comes into view and a short distance beyond, the distinctive Triple Arches can be seen. In the final two miles of this segment, the Road is difficult to distinguish from the massive rock walls that rise ahead and to the left.

Pieces of rock, brought down by late spring snows often litter the roadway as it curves around Mount Pollock at Oberlin Bend, between the Garden Wall and Oberlin Falls. At this point an elevated walkway provides spectacular views of the Garden Wall as it makes its way north to Canada. Going-to-the-Sun Road and the Highline Trail, traversing the Wall above, are clearly evident from this viewpoint. Mountain Goats are frequently found at Oberlin Bend, as well as ground squirrels and hoary marmots. As the Road reaches the Continental Divide, Going-to-the-Sun and Citadel Mountains emerge ahead. At Logan Pass, a large, often congested parking lot and visitor center mark the major destination point for travelers across the Road. Views in all directions are spectacular and the Road is plainly visible ahead as it makes its way towards Going-to-the-Sun Mountain and points east.

Figure 123. View of the Garden Wall, with the Sun Road descending westward from Logan Pass. The higher scar along the mountainside marks the location of the Highline Trail. 2001 photo.

East to West. The Road swings down from the Pass to Oberlin Bend where the Garden Wall dominates the view ahead. Swiftcurrent Mountain and fire lookout can be seen above Granite Park and in the distance, far to the north, Mount Kipp, Cathedral Peak, Mount Cleveland and the Stoney Indian Peaks are visible. Above, "Bishop's Cap", a stony formation along the top of the Garden Wall, is a prominent feature and Gem Glacier can be seen peaking out of the notch next to Mount Gould, rising on the other side of the Wall. Ahead and to the right, Heaven's Peak comes into view and increasingly dominates the landscape. Traveling along the inside lane, the Road seems more curvy and narrow than from the uphill perspective. At various points, the Road appears to aim directly at the cliffs ahead before turning, the view of oncoming traffic obstructed in the deep curves. Indian paintbrush grows along the roadside and as the Road descends, alder, spruce, and aspen trees begin to appear. Bird Woman Falls, Mount Oberlin, and Mount Cannon are visible on the left and at Road Camp the McDonald Creek Valley can be seen below.

Below Road Camp, the Road continues past the abandoned Alder Trail and a variety of small pullouts, surrounded by stone guard walls, offer views from Logan Pass to Heavens Peak and northward. After making the hairpin turn at the Loop, Logan Pass is visible directly ahead as the roadway enters the West Side Tunnel. At the Packers Roost intersection, Mount Pollock, Mount Oberlin, Mount Clements and Mount Cannon are still visible through the trees which form a canopy over the Road as it crosses Haystack Creek.

3.4.7 Segment 5. Timberline

Overview

The Timberline segment begins at Logan Pass (milepost 32) and continues a distance of 2.7 miles to Siyeh Bend. Between Logan Pass and Siyeh Creek, Going-to-the-Sun Road traverses the southern and eastern faces of Piegan Mountain while Reynolds Creek, a tributary of the St. Mary River, winds its way along the floor of valley, 1500 feet below.[436] Aptly named, the segment stays at timberline while the east side of the Park opens up below. As the Road descends from Logan Pass to the east, the decline is at first imperceptible. Leaving Logan Pass, the Road cuts through the Big Drift (milepost 32.3), a large mass of snow that can grow to 80 feet in depth during the winter, lingering well in to the summer months. Just below the Big Drift, Lunch Creek plunges down a natural rock staircase on the upper side of the Road in the small cirque between Pollock and Piegan Mountains. On the right, to the south, the massive peaks of Heavy Runner, Citadel, Little Chief, Mahtotopa, and Red Eagle Mountains dominate the landscape. In the bright sunshine they appear reddish in tone, and, while each has a distinctive ridge line at the top, they seem to be set at the same angle, one after another, creating a landscape that is immense and seemingly limitless.

At milepost 33.1 the roadway reaches the East Side Tunnel, a 400+ foot tunnel through Piegan Mountain. As the traveler emerges from the downhill portal, Going to the Sun Mountain is directly ahead, one of the most extraordinary peaks in the Park. In his book,

Montana's *Many-Splendored Glacierland*, Warren Hanna describes Going-to-the-Sun as a mountain with personality:

> "But if Glacier has one mountain which, more than any other, may be said to be endowed with personality, it is Going-to-the-Sun, overwhelming in its magnificence. From its 9,594-foot summit one may look almost straight down, nearly a mile, into Lake St. Mary. Its impressiveness stems from the massive and cathedral-like symmetry, and the man who named it (George Willard Schultz) says he did so 'because of its imposing uplift into the blue.' The beauty of this majestic peak has inspired more than one writer to lyric expression. The poet, Vachel Lindsay , who spent part of a summer tramping through the Park, told of his experiences in a little book he called 'Going-to-the-Sun.' In it he wrote: 'The mountain peak called "Going-To-the-Sun" in Glacier Park is the most gorgeous one, and when the sun comes down to it, it glows with emerald and rose.' "[437]

As the Road sweeps around the lower slopes of Piegan Mountain, the upper reaches of the St. Mary Valley are visible across the Reynolds Creek drainage. Waterfalls, with origins high in the mountains above St. Mary Lake, drop over 1000 feet to the valley floor.[438] At Siyeh Bend (milepost 34.75), the Road descends below timberline more rapidly, in a sharp curve through a transition zone from the scrubby subalpine vegetation of Glacier's higher elevations to the forests of the Park's east side.[439] Mount Siyeh, stands at the apex of the curve, flanked to the left by Piegan and Cataract Mountains and on the right by Going-to-the-Sun, the hiking trail over Siyeh Pass to Many Glacier visible from the roadway.

Key Characteristics of the Timberline Segment

Roadway Qualities & Features:

- *Primarily standard (22-foot) roadway width, with straightaways and broad curves*
- *Steady 6 percent grade up to Logan Pass*
- *A relatively small number of structures and engineering features; the East Side Tunnel is prominent, but most other walls are not readily apparent*
- *Roadway has not been rehabilitated*

Cultural Resource Qualities & Features:

- *Segment largely reflects design and construction activities from the early 1930s*
- *The stone headwalls of the historic Siyeh Creek Culvert are readily visible; retaining walls near the East side tunnel and scattered guardwalls also exist*
- *Substantial historic guardwall in this segment has been damaged or destroyed*
- *Segment is a part of the Sun Road NRHP and NHL nominations*

Visual/Experiential Qualities & Features:

- *The segment is noted for its exceptional long-range scenic vistas, primarily of Logan Pass (westbound) and the upper St. Mary Valley (eastbound)*
- *The steep, open mountainside around this segment increases the sense of "exposure"*
- *Specific scenic and cultural views include Logan Pass; the East Side Tunnel; and Siyeh Bend*
- *Visitor attractions include Logan Pass and the trailhead at Siyeh Bend*

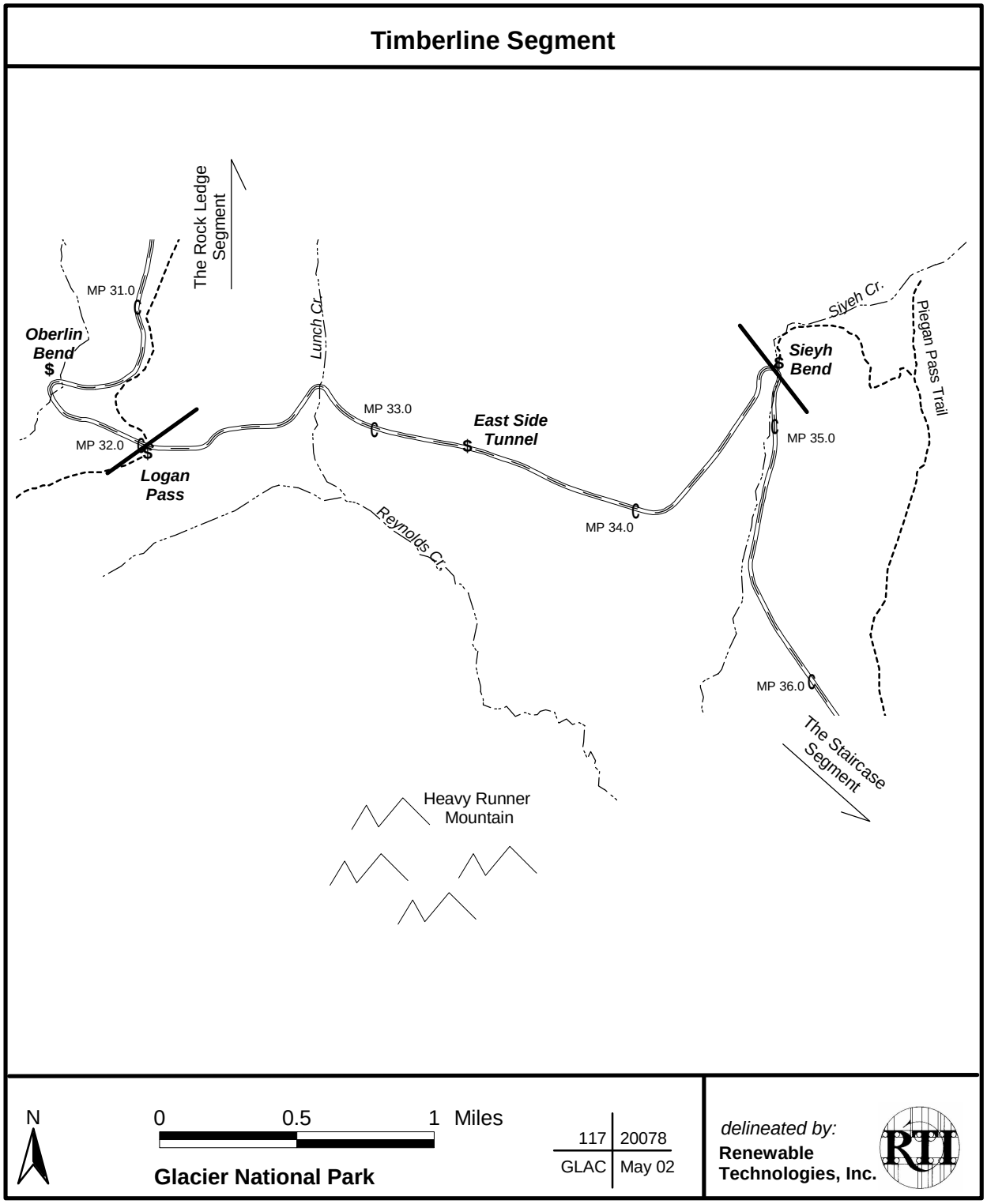


Figure 124. Locator map of the Timberline segment, Going-to-the-Sun Road.

The Natural Setting

Figure 125. Going-to-the-Sun Mountain, 2001 photo.

Geology. At a point just above the East Side Tunnel, the Park's upper rock formations, consisting of Siyeh limestone, are clearly visible. The Siyeh formation, comprised of dolomite and limestone weathers to a buff color and is evident on Little Chief and Going to the Sun Mountains as well as along the Garden Wall. Also, just above the east side tunnel, the Road crosses a dark-colored igneous intrusion of dark igneous rock called diorite, appearing as a striking dark band on many of mountains at Logan Pass and on both sides of the Continental Divide.[440] The sill is also visible at the site of the Big Drift, after the snow has melted away, in early August. At the shoulder of Piegan Mountain, on the downhill side of the East Side Tunnel, west bound visitors can observe Heavy Runner Mountain across the valley, and a beautiful hanging valley to the right. From this vantage point, Reynolds Mountain, with its classic matterhorn shape, towers above the valley. Matterhorns are sharp, pyramid-shaped peaks carved by glaciers on three or more sides.

Water. The Road intersects a number of streams as it makes its way east from Logan Pass. In the subalpine meadows near the summit, tiny streams and rivulets crisscross between the tiny plants that grow there, in late spring and early summer. Snow remains well into the summer season, providing a constant supply of melt water, keeping the meadows spongy and moist. The primary streams in the Timberline segment are Lunch Creek which finds its headwaters high on Pollock Mountain, and Siyeh Creek which originates above Preston Park on Mount Siyeh, which rises 10,014 feet above sea level.

Climate. As the Road makes its way across the Continental Divide, it leaves the temperate, moist climate of the west side and enters the drier, and typically more changeable weather of the eastern slopes. While this side of the Park enjoys a fair amount of precipitation (about 26 inches per year at St. Mary and more at higher elevations), the nearly constant wind, influenced by Continental air flows, creates a more arid climate. Elevations on this side of the Park are generally higher. The entrance station at St. Mary is about 4500 feet above sea level, while the West Entrance is at approximately 3200 feet, so the seasons are shorter, and often more harsh. Exposed to Arctic air masses flowing down from Canada, locations east of the Divide also suffer more severe winter conditions than do protected western valleys.[441]

The contrasts in climatic conditions are not immediately apparent in the first few miles to the east of Logan Pass, where the Road travels through the arctic alpine zone associated with the Pass and the areas on either side. However, the mountains, seen to the east appear generally drier and less densely forested than those on the west.

Vegetation. This segment, as its moniker suggests, stays at timberline until Siyeh Bend. The species here are subject to the short growing season imposed by the environment. Only a few weeks separate the last freeze of spring and the first frosts of the autumn season. The arctic alpine zone is interspersed with small subalpine fur with tops that exhibit a "flag" appearance, their top branches growing on the leeward side for only a few inches and then are bare to a point just a few feet above the ground. This effect, known as the "krumholtz", is caused by constant winds which assault them from one side. Glacial lilies and pasqueflowers or crocus are the first to appear in June, often sprouting right out of the snow. They are soon replaced by monkey flowers which are found close to streams and St. John's wort, buttercups and Indian paintbrush, and later in the summer, by alpine gentian.[442] At Siyeh Bend, beargrass can be seen above the Road, along with purple penstemon.[443]

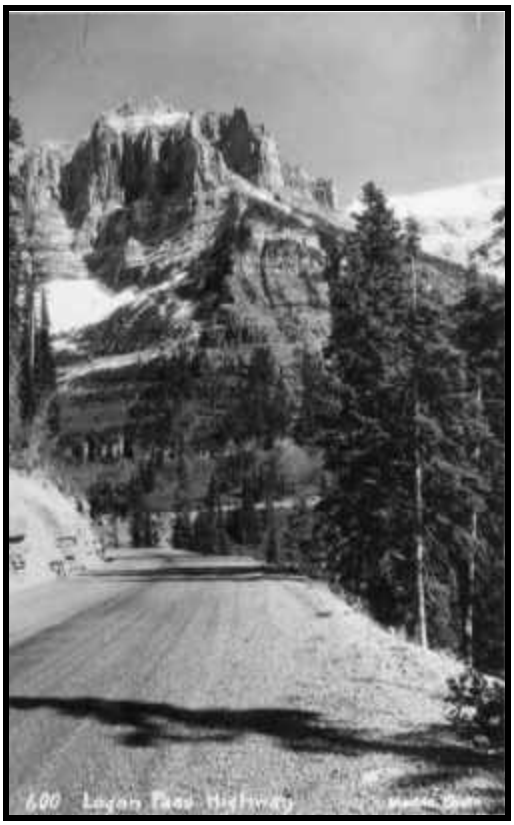


Figure 126. Early postcard view of the Sun Road, with Going-to-the-Sun Mountain in the background. Author's collection.

Figure 127. Mt. Reynolds-distant view, 2001 photo.

Wildlife. An amazing variety of animals inhabit areas above timberline where existence is cold and bleak for all but about four months each year. In this zone are mountain goats, bighorn sheep, pikas and marmots, and the birds of the subalpine zone – ptarmigans, water pipits, and rosy finches.[444] A number of the Park's larger mammals can be seen along the Timberline Segment of Going-

to-the-Sun Road. Occasionally mule deer and elk can be spotted in tree-less areas, and have been observed by hikers on the Piegan-Siyeh Pass Trail, above Siyeh Bend. Bears are sometimes visible in the alpine meadows near Logan Pass and on the mountain peaks above. Mountain goats are often spotted on the cliffs above the Road – on Pollock and Going-to-the-Sun Mountains, and at Siyeh Bend.

The Human Setting

The Evolution and Character of the Roadway. As with the Rock Ledge segment, the Timberline segment has seen relatively few changes since its construction. The road remains in its original alignment here, and most roadside structures are historic. Some historic guardwall segments have been lost to rockslides and erosion, and the East Side Tunnel has been concrete-lined and given new portals. These changes are less visually prominent than similar alterations to the Rock Ledge segment.

Figure 128. Early postcard view of the Going-to-the-Sun Road, below the East Side Tunnel. Author's collection.

Key Resources, Attractions, and Facilities. The most notable structural element of Going-to-the-Sun Road in the Timberline Segment is the East Side Tunnel. Located at milepost 33.12, the two-lane tunnel is about 408 feet long, built by Ed Holm and Company a subcontractor to Colonial Building Company of Spokane Washington. The sheer cliffs along Piegan Mountain made access to the tunnel difficult.[445] In her book, *High Trails of Glacier National Park*, Margaret Thompson describes the effort:

> "The east side tunnel was built under the most trying conditions. In order to bring in construction material a new trail had to be hewn and benched along the rock cliffs for one mile from the summit of the pass to a point above the tunnel site. From here material, equipment, and supplies were packed by man power down the footpath to the hundred-foot ladder which dangled perpendicularly against a cliff, then down another ladder to the tunnel at an average rate of one round trip per half hour per man."[446]

Well-crafted stone guardwalls and retaining walls, although not always visually prominent, exist along the Timberline Segment, primarily near the East Side Tunnel. The ashlar stone guardwall at Siyeh Bend, along with the nearby culvert headwalls, display quality workmanship and are highly visible to travelers.[447]

Figure 129. Circa 1950s postcard view of the Sun Road at Siyeh Bend. Author's collection.

The Timberline segment features a number of viewpoints and a major trail head and small parking area at Siyeh Bend. At this point hikers may join the Piegan Pass Trail which leads to Piegan and Siyeh Passes. The Piegan spur terminates in the Many Glacier area while the trail to Siyeh Pass takes hikers down to Sunrift Gorge, along Going-to-the-Sun Road (see below in the Staircase Segment). To the south, the Trail connects with the Gunsight Pass trail to points south and west.

The Visitor Experience on the Road (Primary)

Leaving Logan Pass, the Road gently descends past Reynolds and Heavy Runner Mountains on the right and Pollock and Piegan Mountains on the left. Immediately south of the Pass, the Road cuts through the Big Drift which lingers well into the summer season. At that point the big mountains that rise above St. Mary Lake – Citadel, Little Chief, Mahtotopa, and Red Eagle loom ahead in fortress-like grandeur. Above the Road on the South face of Mount Pollock, the abandoned Logan Pass trail is still visible on the hillside. At milepost 32.74, Lunch Creek, among the most beautiful waterfalls in the Park, flows down from Pollock Mountain. A pullout adjacent to the waterfall provides access.

The Road cuts its way through the East Side Tunnel at milepost 33.12, the downhill portal providing a perfect frame for the spectacular Going-to-the-Sun Mountain directly ahead. To the left, trails to Piegan and Siyeh Passes are visible as they wind their way up the saddle between Mount Piegan, Cataract Mountain and Mount Siyeh. As the Road approaches Siyeh Bend, it makes a long hairpin turn and descends more sharply towards Siyeh Creek. At the Creek, the Piegan Pass Trail begins its journey up to the saddle. The peaks of Heavy Runner and Dusty Star (to the north and of Citadel) rise across the Road, while ahead to the south, Jackson Glacier and Gunsight Mountain can be seen in the distance as the Road turns down to the St. Mary Lake valley ahead.

While both the Timberline and the Rock Ledge Segments traverse high, exposed mountain slopes and cliff faces, variations in topography and road designs result in markedly different driving experiences for the two segments. The Rock Ledge Segment features heavy curvature and consequent slow driving speeds, and the nearly-ubiquitous guardwalls there help reinforce the narrowness of the road and the steepness of the surroundings. In contrast, the Timberline Segment has far less curvature, allowing traffic to travel faster. This, combined with the smaller number of guardwalls, also results in a greater feeling of "exposure" when traveling the Timberline Segment.

Figure 130. Mt. Reynolds, 2001 photo.

East to West. The mountains in the vicinity of Logan Pass dominate the viewshed of the Timberline Segment from Siyeh Bend to the Pass. Little Chief and Citadel Mountains are visible off to the left while Heavy Runner and Reynolds Mountain are directly ahead. Waterfalls can be seen tumbling from Reynolds into the sub-alpine meadow below. As the Road approaches the East Side Tunnel, Clements Mountain can be seen ahead and to the left. The Tunnel, itself, appears as though it comes right out of Mount Piegan which rises above, sending waterfalls down across the downhill portal. More small waterfalls stream down at the uphill entrance. As the Road turns through the Big Drift area, the visitor center at Logan Pass is visible at the base of Mount Clements.

Figure 131. East Side Tunnel and Mt. Clements, 2001 photo.

3.4.8 Segment 6. The Staircase

Overview

The Staircase segment of Going-to-the-Sun Road starts at Siyeh Bend and continues for 9.2 miles to Rising Sun. Beginning in a subalpine environment just below Logan Pass, the Road makes a wide turn at Siyeh Bend and continues its descent into the forested St. Mary Valley. The overall change in elevation between Logan Pass and Rising Sun is 2,135 feet over a distance of 11.9 miles (of which a third occurs in the Timberline Segment). This is considerably less than the 3060 foot gain along the 10.6 mile Rock Ledge Segment between Haystack Creek and Logan Pass. As a result, the Staircase is a gentler, more easily driven portion of the Road. As the roadway curves downward through the lower tier of Siyeh Bend, the sense of being at the "top of the world" diminishes while the mountains rising to the south and east of St. Mary Lake dominate the landscape. The Road sweeps around the base of Going-to-the-Sun Mountain following the lower portion of the Piegan Pass Trail to the Jackson Glacier Overlook. From this vantage point it is possible to see the blue ice of the glacier that sits between the slopes of Mt. Jackson and Blackfoot Mountain.[448] Beyond the Overlook, the Road continues its gradual descent into the spruce-pine forest which offers occasional views of the mountains ahead and to the right.

Key Characteristics of the Staircase Segment

Roadway Qualities & Features:

- *Primarily standard (22-foot) roadway width, with straightaways and broad curves; tighter curves along the shore of St. Mary Lake*
- *Varied grades on much of the segment, primarily to the west*
- *Relatively few structures and engineering features; the Baring Creek Bridge is a primary feature, and large retaining walls exist along St. Mary Lake*
- *Roadway has not been rehabilitated*

Cultural Resource Qualities & Features:

- *Segment largely reflects design and construction activities from the early 1930s*
- *Large, well-crafted stone retaining walls and guardwalls exist at Dead Horse Point and the Golden Staircase; the historic Baring Creek Bridge is a major historic feature*
- *Segment is a part of the Sun Road NRHP and NHL nominations*

Visual/Experiential Qualities & Features:

- *Long-range scenic vistas of the upper St. Mary Valley are frequently limited by topography and forest cover*
- *Striking, medium-distance views of St. Mary Lake are available in the western part of the segment*
- *Specific scenic and cultural views include Jackson Glacier Overlook and the Wild Goose Island viewpoint*
- *Visitor attractions include Jackson Glacier Overlook; Sunrift Gorge; Sun Point; Wild Goose Island viewpoint; and Rising Sun*

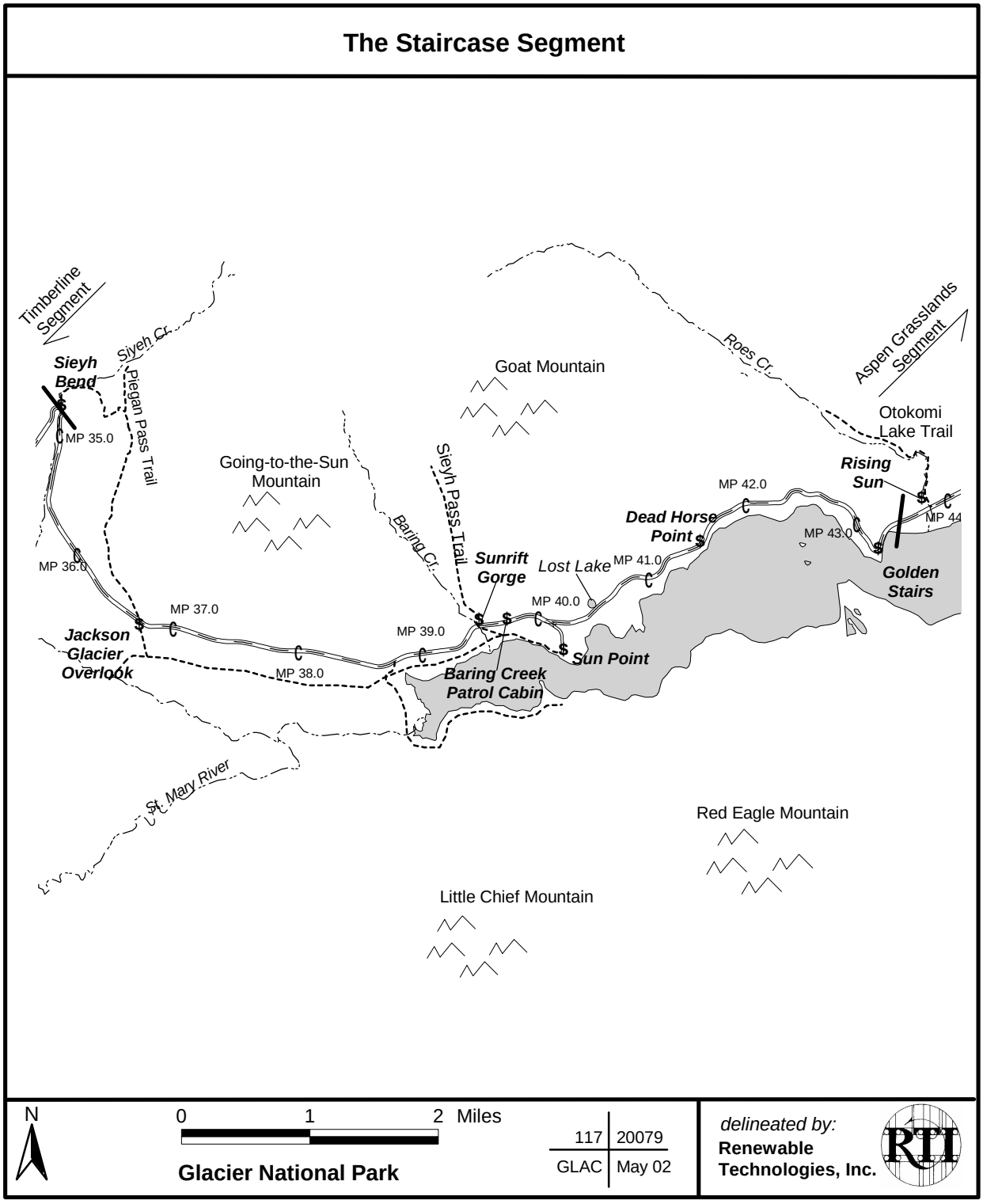


Figure 132. Locator map of the Staircase segment, Going-to-the-Sun Road.

Figure 133. Sun Road at Dead Horse Point, 2000 photo.

Beginning at about milepost 38, the Road is bordered on the uphill side by the vividly red rocks of the Grinnell Argillite formation. A few tenths of a mile beyond, the Road joins St. Mary Lake and continues through increasingly level terrain to Sunrift Gorge where Baring Creek makes its way down to the roadway from Siyeh Pass. Beyond Sunrift Gorge, the Road continues through a mixed forest of deciduous and coniferous trees, to the Sun Point road intersection. A short spur off the main Road, takes travelers to a parking and picnic area and to the former location of the Going-to-the-Sun Chalets which were part of the system of back country chalets built for visitors by the Great Northern Railroad. Sun Point offers a magnificent view up St. Mary Lake to Fusillade Mountain. Although not on the main Road, this vantage point, like the one at Apgar, provides the visitor with a spectacular view of the Park's high country. Continuing from Sun Point the Road passes Lost Lake on the left, barely visible through the trees, beyond which the more-arid ecosystem associated with the eastern slopes of the Continental Divide and the Great Plains becomes more evident. At Dead Horse Point, located at milepost 41.5, visitors are treated to the view across St. Mary Lake extending from Divide Mountain to Little Chief. Wild Goose Island Overlook, located at milepost 43, provides an exquisite view of Fusillade Mountain, framed by Citadel on the left and Goat Mountain on the right. Midway up the Lake projecting spurs of Altyn Limestone mark the spot called the Narrows. The Road follows the shoreline as it projects into the Lake and then makes a sharp turn around the grayish-white rock, known as the Golden Stairs, to Rising Sun.[449]

The Natural Setting

Geology. Most of the Road between Siyeh Bend and the head of St. Mary Lake is built on a lateral moraine plastered onto the north valley wall of Reynolds Creek and glacial till can be seen in the road cuts. Between Siyeh Creek and Sunrift Gorge, bedrock outcrops in the Grinnell Formation can be seen along the Road. While most of these are red, there are occasional layers of green and white and display a number of interesting features including mudcracks, ripple marks, and raindrop impressions. The guard wall at Sunrift Gorge

contains excellent specimens of nearly every important rock type in the Park. Between Sunrift Gorge and Rising Sun, the Road winds past large outcrops of green Appekunny argillites, and near the Narrows of the Lake, buff-colored Altyn Limestone.[450] In *High Trials of Glacier National Park,* Margaret Thompson describes this beautiful formation:

> "Midway up the upper St. Mary Lake are projecting spurs of rock, called The Narrows. These mark the fault line at this point. Geologists tell us that at one time there was a falls here, with the lake confined behind the rock ledge over which they dropped. Finally this ledge wore through, letting the waters out into the lower valley. The remaining spurs are wether-beaten layers of limestone upturned toward the northeast at about a forty-five degree angle, thus showing plainly the direction of displacement of the overthrust area. [451]

Water. St. Mary Lake is the major body of water associated with the Staircase Segment. At 11 miles long, a half a mile wide in some places, and 285 feet deep, it is the second largest lake in the Park and occupies a large glacier-carved trough. The Lake is not impounded by a moraine. Instead evidence indicates that the Lake is dammed behind large fan-shaped deposits of glacial outwash swept into the St. Mary valley from tributary creeks on both sides of the valley.[452] The Lake is subject to sudden storms and high winds and is rarely calm. In addition to the Lake, a number of glacial fed streams make their way down the mountain sides along the Staircase segment including Siyeh and Baring Creek as well as a number of un-named smaller streams.

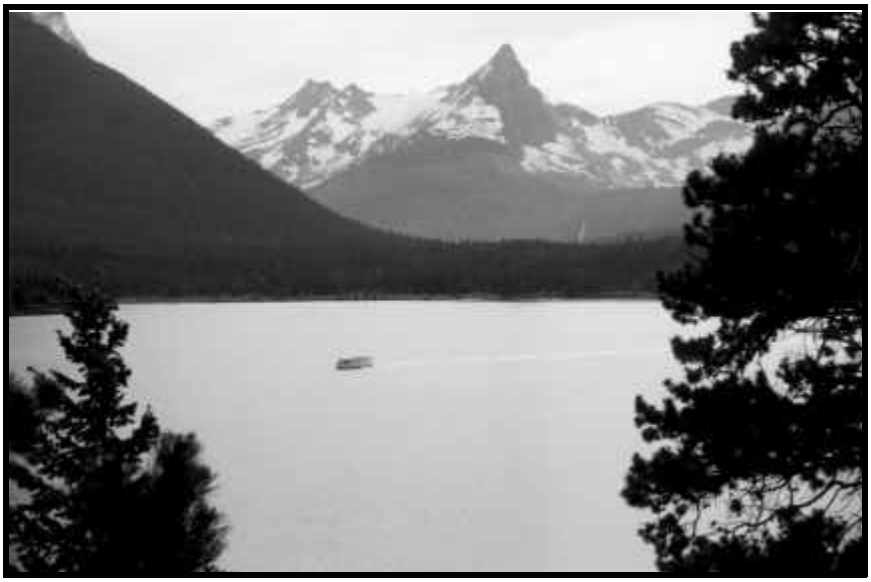


Figure 134. View from Sun Point (St. Mary Lake and Fusillade Mountain), 2001 photo.

Climate. The upper reaches of the Staircase segment are subject to the same climatic forces of Logan Pass and the Timberline segment. As the Road descends into the St. Mary Valley, the environment becomes drier and windier. Many of the trees are perpetually bent by the constant prevailing winds. Temperatures are less moderate than on the west side, although there are fewer overcast days. While the western side of the Park enjoys a climate more akin to that of the Pacific Northwest, the eastern slopes of Glacier Park are more similar to the drier, more arid climate found farther south along the Rocky Mountains.[453]

Vegetation. Many of the same tree species occur on both the eastern and western slopes of Glacier's mountains. However, they form differing communities at different elevations. Because of the drier conditions, upper tree line is about 655 feet lower on the east side than the west.[454] At the upper reaches of the Staircase segment, the vegetation zone is subalpine. As the Road descends it enters a forest of subalpine fir and Engelmann Spruce and, as it rounds Going-to-the-Sun Mountain, groves of Douglas Fir become more prominent. Along the Road's edge the brilliant colors of the paintbrush, beargrass and a variety of other flowers provide a beautiful contrast to the dark green of the Douglas Fir.[455] Beyond Sunrift gorge, quaking aspen trees become more common and alder shrubs grow in the creek drainages, notably at Rose Creek in the vicinity of Rising Sun.

Wildlife. A variety of species can be found in proximity to the upper St. Mary valley. Big Horn Sheep often graze on Curly Bear Mountain above the Lake. Black Bears occur below the upper limits of tree growth, and sometimes can be found close to the Road. Grizzlies are more likely to wander higher into the alpine meadows. Elk are often hidden in the forested areas, but have been observed in the meadows above Siyeh Bend, grazing in Preston Park. Skunks are relatively rare but are occasionally seen in the lower valleys on the east side of the Continental Divide and visitors have reported seeing them at Sun Point over the years. Porcupines often wander the Road area at night while hoary marmots and Columbian Ground Squirrels are all commonly seen during the daylight hours. A great deal of the bird life centers around the willow and alder thickets found close to area lakes and streams. A number of the 210 species of birds found in the Park frequent the eastern slopes including a variety of grouses, woodpeckers and sparrows. The primary fish species found in St. Mary Lake is the Lake Trout or Mackinaw: a gray to dark grayish-green in color with light spots.[456]

The Human Setting

The Evolution and Character of the Roadway. The Staircase segment remains on its original alignment, and has seen very few changes since the completion of the Sun Road's 1930s-era improvement projects. Nearly all walls and other structures along the road are historic. The western portion of this segment – following the shore of St. Mary Lake – was opened to traffic a few years before the large retaining walls at the Golden Stairs and Dead Horse Point were completed, but the initial design of the road at those locations was always considered to be temporary.

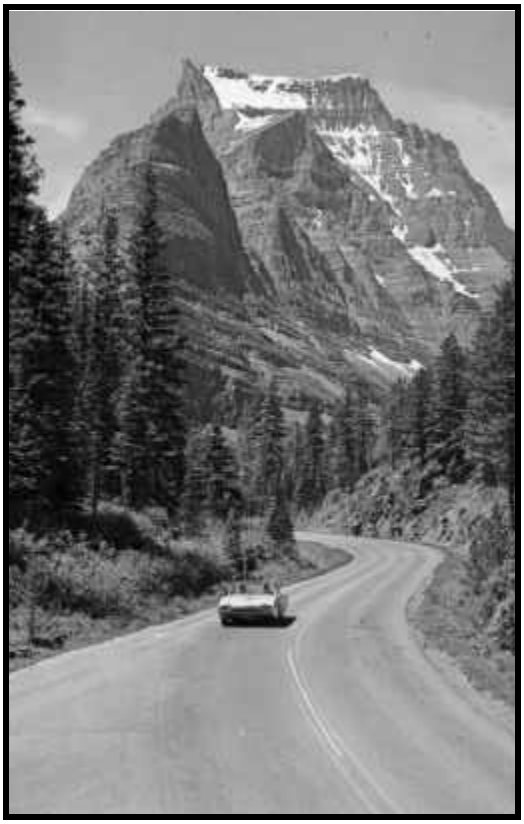


Figure 135. Circa 1960s postcard view of the Sun Road below Going-to-the-Sun Mountain. Author's collection.

Key Resources, Attractions, and Facilities. The Staircase Segment of Going-to-the-Sun Road includes a number of significant locations which help draw attention to the Park's magnificent resources. These include the Jackson Glacier Overlook, Sunrift Gorge, Sun Point and the Wild Goose Island overlook. As the Road makes its way from Siyeh Bend there are a variety of opportunities to stop and view some of the most spectacular landscapes visible from the Road. The wider, less-steep roadway allows for larger pullouts and parking areas which encourage more visitor stops along the segment. Wayside exhibits interpreting Park features are located at Siyeh Bend, Jackson Glacier Overlook, Sun Point and at the base of Going-to-the-Sun Mountain. The Road intersects a number of trails, part of an intricate system which takes hikers to destinations throughout the Park. Additional parking facilities associated with trailheads are located at Siyeh Bend, Jackson Glacier Overlook, Sunrift Gorge, St. Mary Falls, and Sun Point. A concrete underpass (now almost unused) at Jackson Glacier Overlook (milepost 36.61) historically allowed hikers and horseback parties to pass beneath the Road. The underpass is associated with the Piegan Pass trail, a major hiker thoroughfare which follows a route from Sun Point over Piegan Pass to Many Glacier and Granite Park, and also connects to the Gunsight Pass trail to Sperry Chalet.[457]

At Sunrift Gorge, where Baring Creek crosses the Road, a handsome single-span filled-spandrel concrete-arch bridge was constructed in 1931. Listed as a contributing resource in the National Register and National Landmark nominations for the Sun Road, the bridge features arches accentuated by a keystone pattern in the stonework, and is perhaps the most significant bridge structure along the Road corridor.[458] Beyond the bridge , a gated, unpaved lane provides access to the Baring Creek patrol cabin. Near milepost 40, a turnoff leads to Sun Point. This historic intersection provides access to a spectacular lakeside view at the former Chalet site, as well as to a series of trailheads, parking and picnic facilities. At milepost 41.5, an un-named pullout on St. Mary Lake marks the spot known as Dead Horse Point where the beautiful stone guardwall is made up largely of the green Appekunny argillite.[459] At milepost 43 a series of pullouts and short trails lead visitors to the Wild Goose Island overlook and shortly beyond an un-named pullout provides views from

Figure 136. Baring Creek Bridge, 2000 photo.

the Golden Stairs at the St. Mary Lake Narrows. Finally as the Road rounds the final curve of the segment, the facilities associated with Rising Sun – including a campground, boat dock, picnic area, restaurant, and lodging facilities – come into view.

The Visitor Experience on the Road (Primary)

Leaving Siyeh Bend, the Road follows the gently sloping terrain down into the St. Mary Valley. Mountain streams flow down the rocks and blue and white flowers bloom along the Road's edge. Reynolds Mountain and Mount Clements are visible behind while Little Chief and Citadel Mountains appear to the front and to the right. Beyond Going to the Sun Mountain, the forests become more dense and Mahtotopa Mountain is directly ahead, framed by trees on both sides of the roadway. At Jackson Glacier Overlook, Mount Jackson is visible across the valley in the distance, the huge glacier appearing even larger in the early summer when heavy snows linger on the deep crevasses in the thick glacial ice.

Figure 137. Pullout at Siyeh Bend, 2001 photo.

Beyond the Overlook, the roadway levels out significantly and driving becomes more relaxed. Along the side of the Road, the bright red rocks of the Grinnell Argillite formation, thrust at an angle, remind the visitor of the great forces which created the Park's beautiful landscapes. Just beyond milepost 38, St. Mary Lake comes into view far below the Road and the flowers along the way become more diverse. Driving slows at Sunrift Gorge where visitors leave their cars and walk across the Road to view Baring Creek as it comes through the Gorge or stop to watch the creek flow under the bridge. Leaving the Gorge, the makeup of the forest begins to change as more deciduous trees – aspens and cottonwoods – appear. Along the Road, the solid line of trees is frequently interrupted by outcrops of Grinnell Argillite. At Sun Point, the surrounding countryside appears to become drier and as the Road rounds Goat Mountain, Otokomi Mountain is visible on the left. While the forest allows glimpses of the mountains above St. Mary Lake to the right, the trees dominate the viewshed just beyond Sun Point. As the Road approaches Dead Horse Point at milepost

41.5, Divide Peak comes into view. A stop at the pullout provides a spectacular vista of the mountains across St. Mary Lake from Divide Peak back to Logan Pass. Beyond the Dead Horse Point pullout, Wild Goose Island is visible ahead near the Narrows of the Lake and the county beyond flattens out considerably. Indian Paintbrush grows in great profusion along the Roadside in the vicinity of the Wild Goose Island Overlook. As the Road curves down the Golden Stairs to Rising Sun, Divide Peak and Red Eagle Mountain are straight ahead.

Figure 138. View westward from Dead Horse Point, 2001 photo.

East to West. Leaving Rising Sun, the white cliffs of Otokomi Mountain are visible on the right, with purple flowers growing out of the crevices in the rock. The forest slowly becomes more dense beyond the Golden Stair. However, while the forest blocks the scenery for those traveling towards St. Mary, west-bound travelers are able to enjoy more constant views of Fusillade Mountain, St. Mary Lake, and the mountains which rise on the opposite shore, notably Red Eagle, Citadel, and Little Chief. The rock adjacent to the Road is black and buff colored limestone, turning more red as the Road ascends. Clouds often are trapped in the valleys of Goat Mountain on the right and Citadel on the left, making them appear somewhat ethereal, emphasizing their dramatic height. Past Sun Point, Mount Fusillade remains prominent and Reynolds and Heavy Runner Mountains comes into view ahead, with Mount Jackson to the left. Beyond the Jackson Glacier Overlook, Mount Piegan looms straight ahead as the Road rounds Going-to-the-Sun Mountain to Siyeh Bend, Piegan and Siyeh Pass trails visible above.

Figure 139. View of the Sun Road at the Golden Staircase pullout. 2000 photo.

Figure 140. Going-to-the-Sun Mountain, 2001 photo.

3.4.9 Segment 7. Aspen Grasslands

Overview

The final segment of Going-to-the-Sun Road begins at Rising Sun and travels a distance of six miles to St. Mary, the east entrance to Glacier National Park. The Road follows a generally level, straight course along St. Mary Lake through intermittent groves of quaking aspen trees, making a wide turn as it ends its journey at the Park's visitor Center. Otokomi and Singleshot Mountains rise to the west and north of the Road, their exposed, vividly colored rock outcroppings, a sharp contrast to the forested slopes on the Park's western mountains. Where the trees are more sparse, huge meadows, full of wildflowers can be seen as they stretch from the Road across the base of the mountains. The meadows are home to a large variety of wildlife and hum with activity throughout the summer months. The Aspen Grasslands segment provides two very different driving experiences. For those traveling towards St. Mary, the "big sky" of Montana dominates, foretelling of the Northern Great Plains that extend across hundreds of miles to the east. To visitors traveling west, towards Rising Sun and Logan Pass, it appears as if Glacier National Park, in its entirety can be seen ahead. Going-to-the-Sun Road reaches the end of its journey as it passes the St. Mary Visitor Center and crosses Divide Creek, meeting Highway 89 at a "T" intersection taking visitors north to Babb and the Many Glacier Spur Road and south to East Glacier and Two Medicine.

Key Characteristics of the Aspen Grasslands Segment

Roadway Qualities & Features:

- *Standard (22-foot) roadway width, with straightaways and a few broad curves*
- *Some gentle grades, but largely level overall*
- *Bridges across St. Mary River and Divide Creek are the only major structures*
- *Most of the segment was rehabilitated in 1991-93*

Cultural Resource Qualities & Features:

- *Segment largely reflects design and construction activities from the early 1930s*
- *The stone bridge across the St. Mary River is a key historic feature along the Road; the Divide Creek bridge is also historic*
- *The St. Mary Visitor Center is representative of NPS Mission 66 architecture*
- *Segment is a part of the Sun Road NRHP and NHL nominations*

Visual/Experiential Qualities & Features:

- *The segment features medium and long-range views of St. Mary Lake and the mountains beyond (eastbound)*
- *Shorter views emphasize the hilly grasslands surrounding the Road*

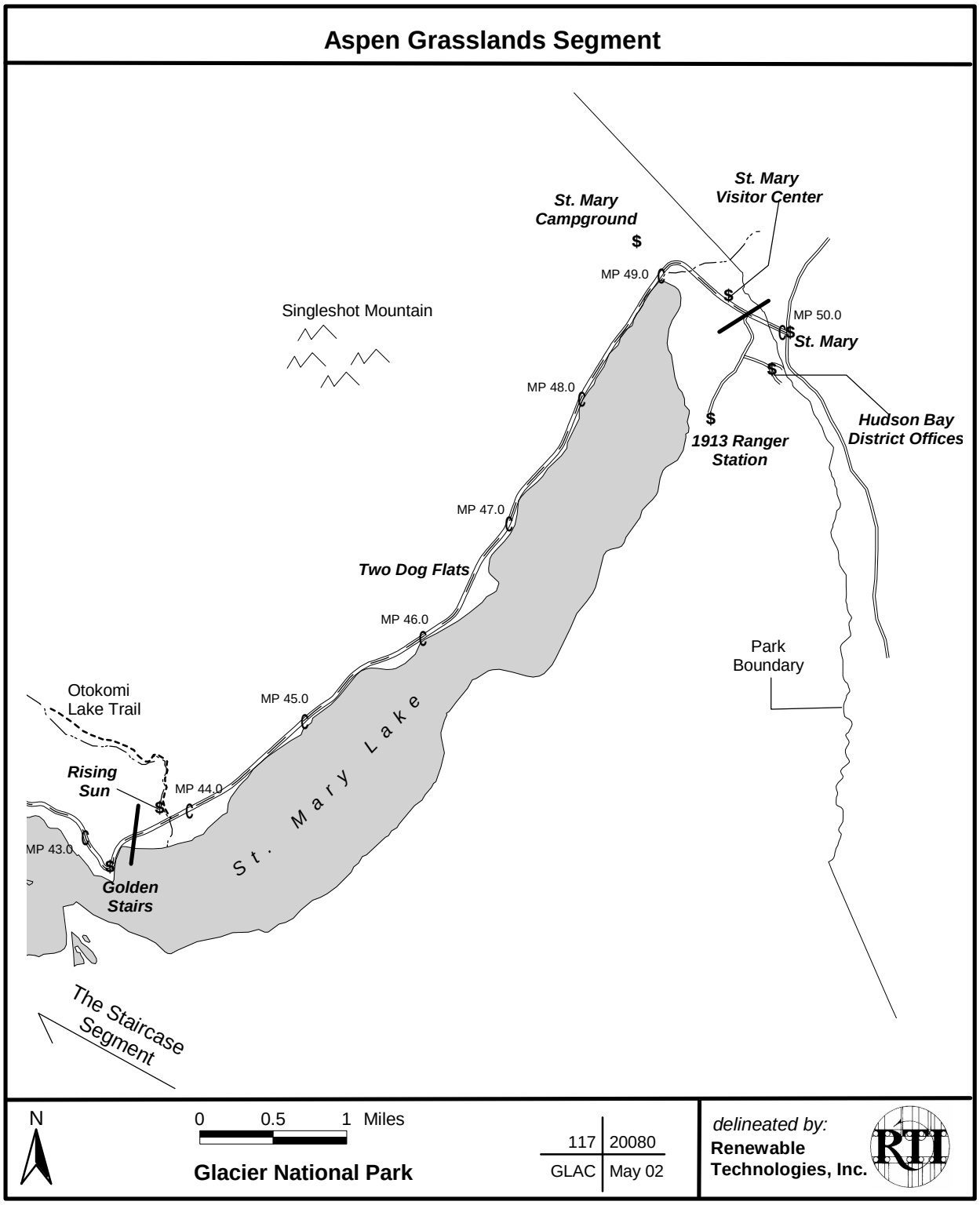


Figure 141. Locator map of the Aspen Grasslands segment, Going-to-the-Sun Road.

The Natural Setting

Geology. From the Rising Sun Campground east, the bedrock underlying the Road is made up of Cretaceous sandstones and mudstones heavily plastered with glacial debris. The rocks form rounded hills very different in appearance from the more dramatic peaks above the Lewis Overthrust Fault between Rising Sun and Sunrift Gorge. A hummocky, forest ridge which rises about 500 feet above the south side of St. Mary Lake, is a large lateral glacial moraine that extends almost to the community of St. Mary. Singleshot Mountain, rising to the west of the Road, is made up of rock of both the Appekunny and Altyn formations, and sits directly on the Lewis Overthrust Fault.[460] Visible from the overlook at milepost 45.7, Triple Divide Peak is one of the most significant geologic features associated with this segment. Water falling on its summit flows in three directions, to the watersheds of the Pacific and Atlantic Oceans and to Hudson Bay.

Figure 142. Sun Road westbound near Two Dog Flats, 2000 photo.

Water. As with the Staircase Segment, the predominant body of water along the Road is St. Mary Lake. While not always visible, the roadway follows along its shore all the way to the St. Mary townsite. The Road intersects with a number of streams including Two Dog Creek and near the Park's edge, the Road crosses St. Mary River (milepost 49.25). Divide Creek, which drains Divide Mountain to the south and provided the outwash plain that dams upper St Mary Lake, marks the boundary of the Park at its east entrance.[461]

Vegetation. The Aspen Grasslands segment of Going-to-the-Sun Road follows a course through a prairie landscape. Grasses and wildflowers cover the broad meadows that extend from the mountains to the shore of St. Mary Lake. Along the Road's edge, aspen trees, endlessly blown by the wind, provide habitat for a number of bird species. As elsewhere along the Road, flowers bloom at the edges, a profusion of changing colors through the season.

Wildlife. The prairie is full of life. Shrews, coyotes, hawks, snakes, meadow voles, mice, badgers, and gophers make the meadow their home. Bull Elk and Big Horn Sheep are among the larger animals that live in this region of the Park.[462] One of the most popular inhabitants is the prairie dog, often seen standing at the entrance to its den scouting the area for food and predators. A number of bird species live in the trees and along the creeks. It is not uncommon to see a grouse emerge from an aspen grove and dart across the Road.

The Human Setting

The Evolution and Character of the Roadway. The current alignment of this section of the Going-to-the-Sun Road dates from the 1930s, and is little-changed since that time. Only a few historic features, however, exist along this section of the road. The one significant exception to this characterization is the St. Mary River bridge, just west of the entrance station and visitor center. This structure is an outstanding example of period stonework and bridge design, and is one of the most noteworthy structures along the length of the Sun Road.

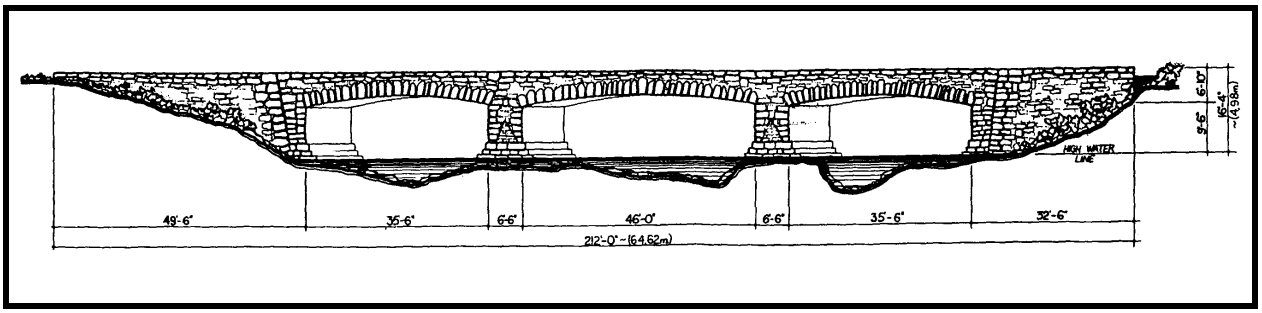


Figure 143. Elevation drawing of the St. Mary River bridge. Historic American Engineering Record.

Elsewhere, the segment is almost wholly devoid of historic features. Some pullouts are partially defined by non-historic stone walls; such walls were not historically used in gently-rolling terrain such as this. The only other historic structure formerly in the segment – the Roes Creek Bridge at Rising Sun – was destroyed by the 1964 flood and replaced by a modern structure displaying a non-historic design.

The route of the current roadway largely follows the alignment of a primitive dirt road established by the Great Northern Railway in the 1910s. The far eastern end of the roadway, however, was significantly realigned in the 1930s. The original railway-built roadway network in the area included a route from East Glacier to Many Glacier that passed through the St. Mary area. As built, this road apparently entered the park near the Hudson Bay Divide (south of St. Mary), traveled westward for nearly a mile, and then headed north to St. Mary Chalets and the southern shore of St. Mary Lake. From the Chalets, the road proceeded northeasterly and exited the park near Divide Creek. By the 1930s, the road

(which became U.S. 89) had been relocated to avoid entering the park, and a realigned connecting road was established between the highway and the newly-built Sun Road. The original roadway through the St. Mary Chalet area has now been abandoned for decades. (See Figure 47 for a map of this roadway evolution.)

The "Mission 66" program at Glacier significantly changed the visitor experience at the far eastern end of the Aspen Grasslands segment, although the roadway alignment itself was not significantly altered. Prior to the mid-1960s, NPS visitor services at St. Mary were limited to a small log entrance station located midway between the Divide Creek and St. Mary River bridges. Mission 66 construction saw the entrance station replaced with the current St. Mary Visitor Center, a far larger and more visually-prominent facility. Simultaneously, the location's first formal NPS campground was developed, on a wooded hillside just north of the St. Mary River. These changes provided visitors with the first reasons to linger in the park portion of the St. Mary area since the final closure of St. Mary Chalets some 25 years earlier.

Key Resources, Attractions, and Facilities. The Aspen Grasslands Segment features two wayside exhibits, one at the Triple Divide Peak overlook and a second at the area called "Two Dog Flats" which describes the Prairie Dog and its habitat. Access to the Park's trail system is provided at Rising Sun where a trail takes hikers to Otokomi Lake and near the entrance at St. Mary, where a trail leads to Red Eagle Lake and Triple Divide Pass. The road to St. Mary Campground, with 100 sites, is located at milepost 49.1. The primary visitor facility along this segment is the St. Mary Visitor Center which features interpretive exhibits and provides Park information, campground permits, and performs a variety of administrative functions.

Figure 144. View from Triple Divide wayside exhibit, 2001 photo.

This section of the Road also features two historic bridges. The St. Mary River bride is a three-span filled-spandrel concrete-arch bridge at milepost 49.2. The arches are accentuated by a keystone pattern in the stonework and demonstrate excellent craftsmanship and integrity.

Figure 145. St. Mary River Bridge, 2000 photo.

The second is at Divide Creek (milepost 49.9) and is a three-span concrete-slab bride with concrete abutments and solid concrete piers. The structure is primarily utilitarian in design, but shows quality workmanship. Both bridges are listed as contributing resources in the National Register and National Historic Landmark nominations for the Sun Road.[463]

Figure 146. Divide Creek bridge. 2000 photo.

The Visitor Experience on the Road (Primary)

Beyond Rising Sun, the countryside is flat and open, the rocky cliffs of Otokomi and Singleshot mountain appearing dry and barren across the prairie. This easily driven segment passes through thick aspen groves, where birds can be heard singing in the trees. A short distance from Rising Sun, the aspen groves disappear and the only trees visible are the conifers which border St. Mary Lake on the opposite shore. For some distance, the grasslands and the endless sky dominate the landscape. As one nears the edge of the Park, the St. Mary Visitor Center and entrance station come into view. The small town of St. Mary can be seen, nestled along the southeast shore of the Lake. Aspens reappear along the Road's edge, bent over from constant battering by incessant winds. As the Road makes its final curve, past St. Mary Campground, the Park, in all of its magnificence is visible to the right. The Road crosses the St. Mary River and Divide Creek, exiting the Park.

More than anywhere else along Going-to-the-Sun Road, the immensity of the landscape dominates this segment completely, and the Road is rendered nearly immaterial to the visitor experience from either direction. Unlike the anticlimactic characteristics of the Apgar Flats segment for those exiting the Park, the Aspen Grasslands Segment arrays the magnificence of the Park, providing a lasting impression of its majesty.

Figure 147. Eastbound view of the Going-to-the-Sun Road just west of St. Mary. 2000 photo.

East to West. Entering the Park at St. Mary is a strikingly different experience then for those who enter by way of West Glacier. Glacier National Park, in its splendor occupies the entire viewshed. The impression is indescribable and unforgettable. Pullouts at the Park's entrance enable the visitor to enjoy a landscape that extends nearly 360 degrees from Divide Mountain to Logan Pass and back to Singleshot and East Flattop Mountains. Two ranges of Mountains can be seen towering over St. Mary Lake. Red Eagle, Mahtotopa, Little Chief and Citadel are in the foreground, while Curly Bear, Kakitos and White Calf Mountains rise behind. As the Road winds away from St. Mary and heads for Rising Sun, the sharply pointed peak of Split Mountain can be seen straight ahead for some distance above the aspen trees. Ahead, to the right of Rising Sun, the jagged peaks of Goat Mountain are visible. Traveling west, the mountains seem to rise above you forever, their craggy cliffs touching the sky. As the Road approaches Rising Sun, Fusillade Mountain and Jackson Glacier replace Split Mountain in the view ahead.

Figure 148. St. Mary Visitor Center, 2001 photo.

3.4.10 The St. Mary Gateway

Situated strategically at the eastern end of the Going-to-the-Sun Road, the small community of St. Mary may be seen as the "east side's" functional and visual counterpoint to the gateway community of West Glacier. Like West Glacier, St. Mary represents both an historical "jumping-off" point for those heading for the park's interior, and a contemporary gateway community for auto travelers embarking on their Sun Road journey. The current landscape and atmosphere of St. Mary, however, is unlike that of West Glacier, reflecting both the distinct physical settings of the two communities and their differing evolution over time.

Almost from the park's initial establishment, Glacier visitors were served by a pair of eastern and western gateways that introduced travelers to their respective halves of the park. Prior to the construction of the Sun Road, the towns now known as East Glacier and West Glacier filled those roles, and both evolved similarly; each community boasted a railway

Figure 149. Park entrance sign, St. Mary. 2001 photo.

station, concessionaire-operated hotel, large NPS administrative facility, and roadways and trailheads heading to other park destinations. St. Mary, in contrast, was a relatively minor stopping-off point for in-progress tours of the park's east side. The St. Mary Chalets, built by the Great Northern at the foot of the lake, served as a transfer point between auto, boat, and trail travel, but few travelers lingered in the area.

The construction of the Going-to-the-Sun Road dramatically altered park travel patterns and significantly increased the importance of the St. Mary location. An NPS administrative facility gradually developed at St. Mary, largely supplanting the East Glacier site, and a variety of tourist-related businesses began to appear on the privately-owned and reservation land just beyond the park boundary. Unlike at West Glacier, most of these visitor facilities were oriented to the Blackfeet Highway (U.S. 89) rather than the Sun Road, and the variety of builders, operators, and construction dates gave the community a far less cohesive appearance than that which characterizes West Glacier. The relatively haphazard relationships among the St. Mary buildings, and between the buildings and their landscape, perhaps make the town a less visually distinctive gateway community than West Glacier.

The relative openness of the terrain around St. Mary, however, allows arriving travelers spectacular views of some of Glacier's most striking mountain peaks, and these memorable vistas impart a strong sense of arrival at the park. The views at St. Mary are outward and upward, towards the mountains and valleys of Glacier, while the heavy forests at West Glacier direct views inward, to the road and the buildings of the town. The sense of "arrival" provided by St. Mary's tremendous views continues for travelers beginning their Sun Road journey, and is reinforced by the presence of an NPS visitor center and other facilities located adjacent to the Sun Road just beyond the park boundary. Together, these qualities form an effective counterbalance to the somewhat non-cohesive appearance of the St. Mary community itself.

Chapter 4: The Landscapes of Adjacent Developed Areas

4.1 Introduction

The development of visitor accommodations and administrative facilities in Glacier National Park has been directly influenced by the way in which visitors have traveled to and through the Park over time. The construction of Going-to-the-Sun Road has had, in many cases, a significant impact on these facilities' setting, function, location and design – for those built both before and after the Road was dedicated in 1933. This report examines the landscapes of three developed areas in direct proximity to the Road, with particular attention to their interaction with and response to Going-to-the-Sun Road and growth of automobile based tourism. These include the Park Headquarters / Apgar Village area, and the visitor accommodations at Lake McDonald Lodge and Rising Sun. The narrative addresses the dynamic relationship between the built environment that characterizes these areas and the Road. It also considers how the original and subsequent intent of building design and orientation were affected and in some cases, altered as a consequence of this relationship.

4.2 Headquarters/Apgar Area

4.2.1 Introduction and Overview

The Glacier National Park Headquarters complex at West Glacier, is characterized by its neighborhood setting. Nestled in the trees, on a bench above the Middle Fork of the Flathead River, the area has the appearance of being a community unto itself. Its homes, administrative buildings, and utility buildings display a variety of architectural styles reflecting the period in which they were built. The various buildings sit along a series of streets that wind their way through the complex in a series of loops, the residential properties generally set apart from the Park maintenance and administrative areas. Apgar Village, the site of the first Park Headquarters, located at the foot of Lake McDonald is a picturesque summer resort community. The Village is comfortable, built at a human scale, where all services and recreational opportunities are within walking distance.

The history of the Headquarters/Apgar region is closely tied to the early development of the Lake McDonald Valley. Milo B. Apgar was among the first settlers who came to the west side of what would become Glacier National Park, following the arrival of the Great

Figure 150. Former entrance road, Belton Bridge in background, 2001 photo.

Northern Railway at Belton, late in 1891. Apgar and his partner, Charles Howe settled at the foot of Lake McDonald where they built cabins to attract overnight visitors.[464] The first road in the interior of the Park was constructed in 1892 and extended from Belton (now the town of West Glacier) to the foot of Lake McDonald at Apgar on what was then Forest Service Land. The road brought visitors from the train at Belton to Apgar where they had access to the head of the Lake by boat. The proximity to transportation services spurred the development of visitor services at Apgar which became a center of activity in the McDonald Valley.

When Glacier was declared a National Park in 1910, its first Headquarters was located at Apgar in a tent camp. For the next three years, the Park's offices alternatively occupied rented cabins at Apgar during the summer and the Great Northern's newly built Belton Chalets in the town of Belton during the winter until they moved to Fish Creek in 1913.[465] The Fish Creek site soon proved inconvenient for the growing administrative infrastructure at Glacier, and the Headquarters was moved to its current location, bordering the western boundary of the Park, along the original Park entrance road in 1917. [466] Over the years, additional buildings were constructed on or moved to the "West Glacier" site. The West Entrance Station, completed in 1941 by the Civilian Conservation Corps, is located near the Glacier National Park Headquarters, on Going-to-the-Sun Road.[467]

Figure 151. Belton Bridge. 2001 photo.

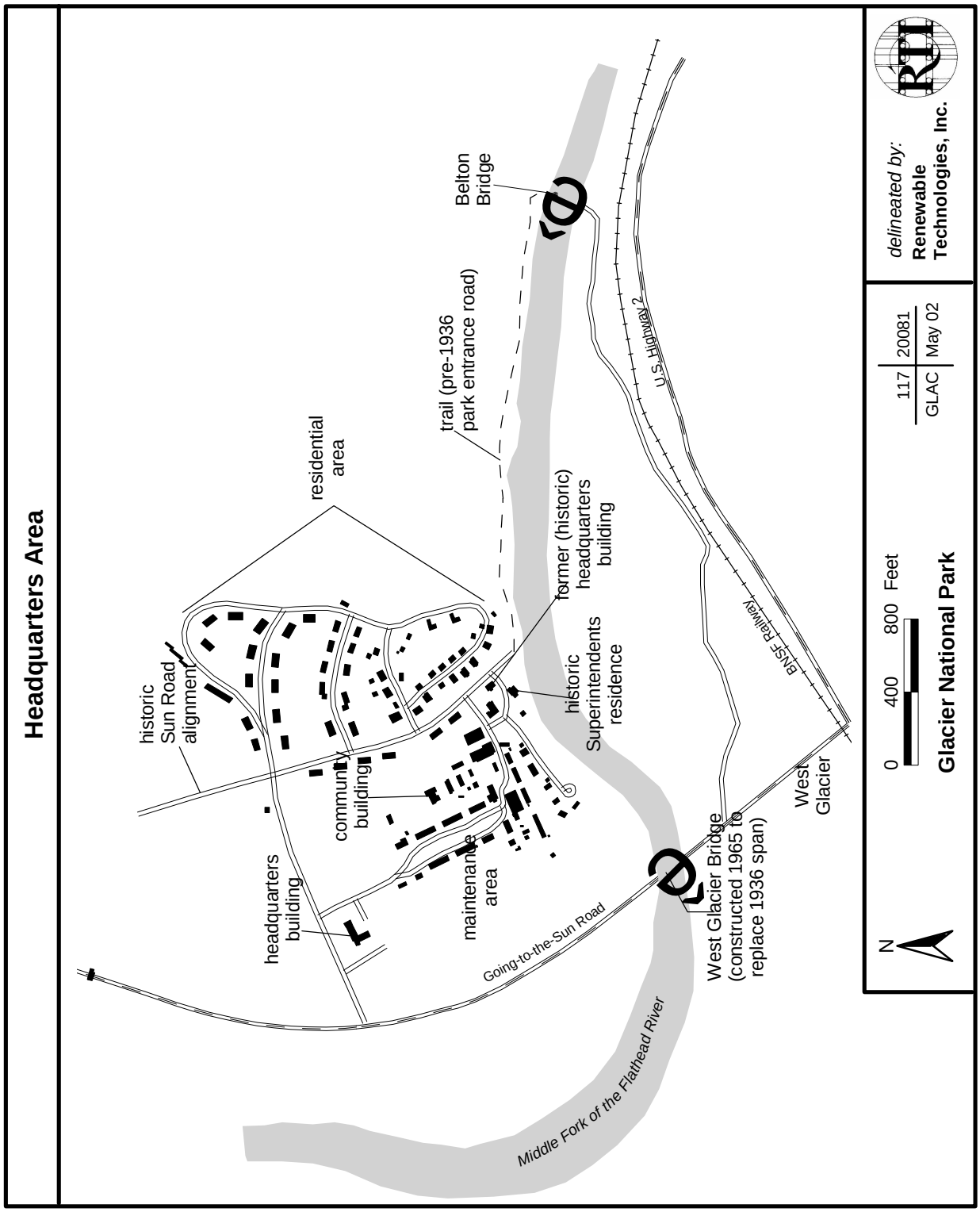


Figure 152. Sketch map of the Headquarters area.

Apgar has continued to function as a tourist camp with only limited Park Service presence. The Half Moon Fire that devastated much of the Apgar Flats area in 1929, destroyed many of the summer homes and cabins near the foot of Lake McDonald, but many buildings were spared, including much of Apgar village. Following the fire, the Park Service purchased many of the inholdings along the lakeshore and beyond. In addition to the motels, shops and restaurants that can be found in Apgar today, the Village is also home to the Apgar visitor center, campground, picnic area, and associated recreational facilities.[468]

4.2.2 The Natural Setting

West Glacier and Apgar lie at opposite ends of the short valley between the Apgar Mountains to the northwest and the Belton Hills to the southeast. Immediately south of the West Glacier Entrance Station, on the east side of the Going-to-the-Sun Road, a small, rounded hill is visible. The hill is part of a glacial moraine, now nearly buried by the sand and gravel deposited by the meltwaters from the glacier that scooped out the basin of McDonald Lake.[469] The area enjoys the moist climate associated with the Park's west side. West Glacier receives 30+ inches of precipitation per year, which is slightly higher than the average rainfall for the Rocky Mountains in general.[470] In addition, Lake McDonald, at 10 miles long, helps to moderate the weather, keeping temperatures somewhat cooler than at the same elevations on the east side of the Park during the summer months, and warmer during the winter.

The area is located within a forest of "dog-hair" lodgepole pine that flourished following fires in 1927 and 1929, which swept along Lake McDonald and through the Apgar Mountains and the Belton Hills destroying the dense western red-cedar and hemlock forest at the foot of the Lake.[471] Lodgepole pine live only about 80 years and do not germinate in the shade. Shade tolerant Douglas-fir, white pine, Engelmann spruce and western red cedar seedlings are now slowly replacing the dog-hair lodgepole. However, the characteristics of this area – climate, terrain, and soil – are best suited to the western red cedar-hemlock forests which grow further north along the Lake, and will ultimately re-establish themselves in the region.[472] During late September and early October, the western larches, which can be seen along the ridges turn a bright yellow. The larch is a deciduous conifer, losing some of its needles each autumn and turning a vivid yellow. In addition, during the spring and early summer, the less densely shaded areas on the forest floor support a variety of flowers including the bright, white daisies, pinkish-purple blooms of the erect fireweed and white strawberry blossoms.[473]

Area wildlife includes white-tailed deer, cow elk and coyotes which frequent the area in the early morning or evening hours.[474] Black bears are sometimes observed along the Going-to-the-Sun Road foraging for berries that grow in the open areas. Occasionally a moose may be spotted along the west shore of Lake McDonald and have even been seen foraging for food amongst the buildings at Park Headquarters. On rare occasions, mountain lions have also

been observed in this area. While there are many varieties of birds in the area, among the most common are the stellar and gray jays, various woodpeckers, owls, red-winged blackbirds, sparrows and an occasional bald eagle.

4.2.3 Development of Facilities

Early Years – Apgar and Fish Creek. Following the creation of Glacier National Park, on August 8th, 1910, the U.S. Secretary of the Interior commissioned Major William R. Logan as "Superintendent of Road and Trail Construction" for the Park. Logan faced significant challenges when he arrived in the Park in the summer of 1910. There were only two passable trails through the Park at the time, over Gunsight and Swiftcurrent Passes. In addition, 1910 was a year of terrible forest fires in the Northwest, burning over 100,000 acres of forested land within the Park. There were no residential or administrative facilities within the Park for Logan and his staff, so they lived and worked in tents at Apgar, returning in the fall to the Fort Belknap Indian Reservation near Harlem, Montana where Logan had served previously. Upon his return in 1911, Logan undertook a number of activities. Between 1911 and 1912 the road between Belton and the foot of Lake McDonald was rebuilt, a telephone system was extended to Fish Creek, and construction of a new road between Apgar and Fish Creek had been started. By 1912 the ranger force had swelled from 6 to 16 and patrol cabins had been constructed at various locations along the Park's boundary.[475]

In the summer of 1911 Logan and his crew rented cabins from Milo Apgar at the foot of Lake McDonald for offices and living quarters, moving into the Belton Chalet for the winter months. This seasonal arrangement continued until 1913 when a new Headquarters complex was ready at Fish Creek, although during the winter of 1913-1914, Logan made use of the Belton Chalet while the residences at Fish Creek were completed. The complex at Fish Creek included six buildings – one cottage, two cabins, a Forest Service Ranger Station that had been previously constructed, and a sawmill. The Ranger Station was used as an administrative office and one of the cabins served as a cookhouse. Tents provided additional residences. As the ranger force was expanded, however, the Fish Creek facilities proved inconvenient.[476]

A New Headquarters Site. In 1916, Stephen Mather, the first Director of the National Park Service, purchased land near Belton, bordering the Park's western boundary. The site had been previously owned by Edwin E. Snyder who had operated a hotel and saloon on the site. Its location near the train station and its immediate proximity to the road to Lake McDonald made it an ideal site. Mather was so convinced of its suitability, he proceeded with the purchase using his own funds. Superintendent Logan had favored Fish Creek for a permanent Headquarters site, while other sites including Midvale (East Glacier), St. Mary, and Two Medicine had also been considered. However, the purchase of the "West Glacier" site put the matter to rest. An initial federal appropriation providing funding for four cottages, a warehouse, stable and water and sewer systems. Construction began in the fall of

Figure 153. Example of original park employee housing, Headquarters area, 2001 photo.

1917 and was completed in the following summer.[477] The four cottages, with identical basic floor plans were constructed along the right (east) side of the entry road, above the Middle Fork. The location of the first four cottages established a "residential street" in the Glacier Headquarters area. For the next 11 years, the majority of residential construction took place on that street.[478]

Funding was not available, however, for the Park Superintendent's residence or Administration Building until 1923. The Superintendent, in the meantime, continued to live in temporary housing at Fish Creek, Apgar and elsewhere. Construction on the two buildings was begun early in 1923 and undertaken largely by National Park Service employees, working on the two buildings simultaneously. The residence was completed in October of 1923 and the Administration Building was ready for occupation on May 15th, 1924. Park Superintendent Charles J. Kraebel praised the new facility, noting that, "This is a very comfortable building, light and convenient and it is very well-liked by all the employees and visitors who has called to see it." Both are built of saddle-notched logs and are excellent examples of National Park Service rustic architecture. The buildings blend well with their setting, along the Middle Fork of the Flathead River and with the adjacent employee residences constructed in 1917-1918.[479]

Figure 154. Historic Superintendent's Residence, Headquarters area, 2001 photo.

Housing for single, seasonal workers was constructed in a separate residential area in 1927. Replacing earlier dormitory and eating facilities located in the old on-site Snyder Hotel, the new facilities contained a bunkhouse and mess hall. The bunkhouse was constructed in an open room style and later (in 1949-50) converted to individual sleeping rooms with a kitchen attached. A second bunkhouse, using the same design as the 1927 building, was constructed under the Public Works Project program in 1933-34. [480]

Figure 155. Historic Administration Building (now the West Lakes District Office), 2001 photo.

Until 1928, the Chief Ranger for Glacier was stationed at Glacier Park Station (East Glacier). This arrangement was deemed necessary in light of the difficulty in traveling across the Park. This practice ended when Superintendent John Ross Eakin ordered that the position be transferred to Belton. A residence for the Chief Ranger, a single story frame building, was completed in June, 1928. The home was one of three residences constructed on a newly-laid out residential street across the Sun Road from earlier homes. The houses were built overlooking the Middle Fork. Over time, however, erosion of the river's banks made the home sites unstable and the residences were moved across the street, a distance of 100 feet in 1964. A fourth building was built about the same

Figure 156. Former mess hall building, Park Headquarters. 2001 photo.

Figure 157. Former CCC-era dormitory building, Headquarters area, 2001 photo.

time after a fire of unknown origin had destroyed a residence and a number of other buildings. While it, too, was built along the banks of the Middle Fork, it was not relocated and remains in its original location.[481] A home for the U.S. Commissioner, a 1½ story wood-framed building, located along the Park entry road, was completed in 1929. The Commissioner, William H. Lindsay, served as the judicial authority of the federal government in the Park and was responsible for trying criminal cases and handling other legal matters until his death in 1953. His wife, Margaret, served as Commissioner until her death in 1968.[482]

During the Great Depression there were several Civilian Conservation Corps (CCC) projects undertaken to reduce the long-standing employee housing shortage in Glacier. The largest such project involved the construction of five three room homes in 1936. Altogether there were eight CCC built residences, the final one completed in 1940.[483] Additional residences were constructed during the World War II era by the Civilian Public Service (CPS) workers, who built the homes using prefabricated wooden wall panels salvaged from CCC camp facilities in the park.[484]

In addition to the Administration Building, there were a number of other non-residential buildings constructed at the site – for Park and infrastructure maintenance, emergency services support and for the employee community itself. Most of the maintenance buildings are located in close proximity to each other. Constructed primarily in the 1920s and 30s, they include a main shop, sign shop, oil and gas house, fire cache, plumbing and electrical shop, hay storage barn, warehouse, various garages, and a hose tower, where fire hoses could be dried before they were re-stored. They are largely wood sided buildings, painted brown, and many still display their original architectural detail and craftsmanship, blending well with their environment.

During the 1930s, Park administrators identified the need for a "community building" for the headquarters housing area. Such a facility could provide space for employee social events and staff meetings. Limited funds required an innovative approach to meeting this

need. In 1923 the Gold Brothers of Apgar had built a bungalow which functioned as a dance hall and entertainment center for their cabin camp. After the 1929 Half Moon Fire the Golds sold their inholding to the government. "Gold's Bungalow" had survived the fire and was used as a chapel by CCC workers and was considered, for a time, as a component of a proposed, Park Service sponsored Apgar "tourist camp". In 1938, the Park's administrators directed a CCC work party to dismantle the building and move it to headquarters where it continues to function as a community center. [485]

Figure 158. Employee housing at Park Headquarters constructed from recycled CCC building materials. 2001 photo.

The West Entrance Station, although situated along Going-to-the-Sun Road, rather than in the main Headquarters complex, is part of the Park administrative facilities at West Glacier. It is also the first National Park facility encountered by the east-bound Glacier Park visitor. Before the realignment of Going-to-the-Sun Road in 1936, a series of makeshift facilities functioned as the entrance station to the Park. The first permanent facility was built in the Headquarters area in 1924 and consisted of a log employee residence connected to a small roadside checking building by a covered passageway. When the new Road alignment was completed a shack was moved to the new entryway until a permanent building could be completed. In 1941, the CCC constructed a handsome single story stone building which remains today as the Park's west entrance station. Additional cubicles were added in the porches of the original facility in 1963 to accommodate increasing traffic, but the building retains much of its original appearance after 60 years of service.[486]

Headquarters / Apgar Area and Going-to-the-Sun Road. As was the case for many of the visitor and administrative facilities in the Park, the changes in transportation, particularly the construction and subsequent changes to Going-to-the-Sun Road had a significant effect on the properties at Headquarters and at Apgar. The 1918 complex was originally located along the original Park entrance road. The road crossed the Great Northern's tracks and meandered its way through the Belton townsite, crossing over a concrete arch bridge spanning the Middle Fork River, and then traveled downstream along the River, before entering the Park Headquarters complex. The park's entrance station, superintendent's house and other residential and administrative buildings were located in close proximity to this entry point.

From 1921 until 1936 Going-to-the-Sun Road followed this early entry road alignment, through Park Headquarters, and along the three mile road to the foot of the Lake at Apgar, before heading to Logan Pass via Lake McDonald and the McDonald Creek Valley. However, in 1936, the Road's alignment was changed significantly when a railroad overpass was constructed at Belton. The new Roadway now bordered the Headquarters complex on the east. The 1936 realignment of Going-to-the-Sun Road also by-passed Apgar. Originally, the Road had taken a course from Park Headquarters to Apgar, emerging through the cedar hemlock forest to Lake McDonald. The view of the Lake, as one emerged from the trees, was dramatic and unexpected. The 1929 forest fire, coupled with the realignment of the Road significantly changed the way in which motorists experienced the Park in the Headquarters/Apgar area. Today, the original alignment, between Park Headquarters and Apgar Village is used as a bicycle path.

Mission 66 Building Era at Park Headquarters. Following World War II, in 1949, Newton Drury, National Park Service Director called for a new investment in the nation's national parks which had deteriorated dramatically during the War years. Lack of funding stalled his efforts and it wasn't until Conrad Wirth became Director in 1951 that the program began to gain momentum. In 1956, "Mission 66", which called for a decade of improvements to the parks, received budget approval from President Eisenhower. Plans called for new road and trail construction, thousands of residential, maintenance, and administrative facilities, the installation of uniform park entrance markers, and the introduction of new methods for resource management.[487] A number of buildings at Glacier's Headquarters, primarily the 1963 Administration Building and a series of single and multi-family residences were constructed under the Mission 66 program. Unlike the earlier buildings which had made use of dark colors and log construction, the buildings constructed under this program displayed lighter colors and ranch-style designs.

Figure 159. Typical "Mission 66" employee house, Headquarters area, 2001 photo.

In contrast to the rustic national park architecture of the original Administration Building, the 1963 Headquarters is a large, two story, office building similar in style and design to office buildings and schools constructed throughout the United States in the 1960s. Mission 66 homes are scattered throughout the Headquarters area but are generally concentrated along Mather Drive (the original Going-to-the-Sun Road). Multi-family residences are located on Grinnell Road, on the easternmost side of the complex.

Park Headquarters Today. While the majority of buildings built over the years at Glacier's Headquarters remain, many have been put to new uses. The 1927 mess hall now serves as the Park archives. The 1941 accounting annex to the original Administration Building is a science center. Most of the original shop and maintenance buildings are still being used as originally intended. In 1963, the 1923 Administration Building became the West Lake Ranger District Office when it was replaced under the Mission 66 Program.[488] In the 1980s, the Inwood Motel near Lake McDonald Lodge was dismantled and the main building was relocated to Park Headquarters for use as a residence. While few of the Park's year-round employees live at the Headquarters site today than in years past, the area retains its overall sense of community and neighborhood, nestled in the trees above the Middle Fork.

Figure 160. Headquarters Building, 2001 photo.

Figure 161. Building from the former Inwood Motel at Lake McDonald, now at Park Headquarters. 2001 photo.

Apgar Village Today. Apgar Village is accessible from the Camas Road, to the west of the T intersection with Going-to-the-Sun Road. Much of the tourist related development in the community occurs along the road which connects the Camas Road with Lake McDonald. There are also a number of buildings located along the road to the Apgar Campground including the 1940s Greenwalt Motel, now in use as park employee housing, a series of inholder cabins, and various campground and picnic service buildings which date from the Mission 66 era.. The site of the Greenwalt gas station, across the street from the Motel, is now occupied by a Mission 66 public restroom facility. Additional inholder cabins, including the art studio and summer home of artist Charlie Russell are located along the Lake shore to the west of the Apgar townsite. The original Apgar School House is the only building located on the east side of the main Apgar road. Historically, Apgar functioned as a fairly self-contained community with a school and post office. The school house is now used as a gift shop but retains the character of its original use. On the left (west) side of the road, across from the school house, is an inholder cabin which was purchased by the Park Service for employee housing. It now serves as a backcountry permit station.

Figure 162. Former house converted to NPS use, Apgar Village, 2001 photo.

A non-historic gift shop building is north of the backcountry permit station. Adjacent to this property is the Apgar Visitor Center.

Figure 163. Former Apgar schoolhouse, 2001 photo.

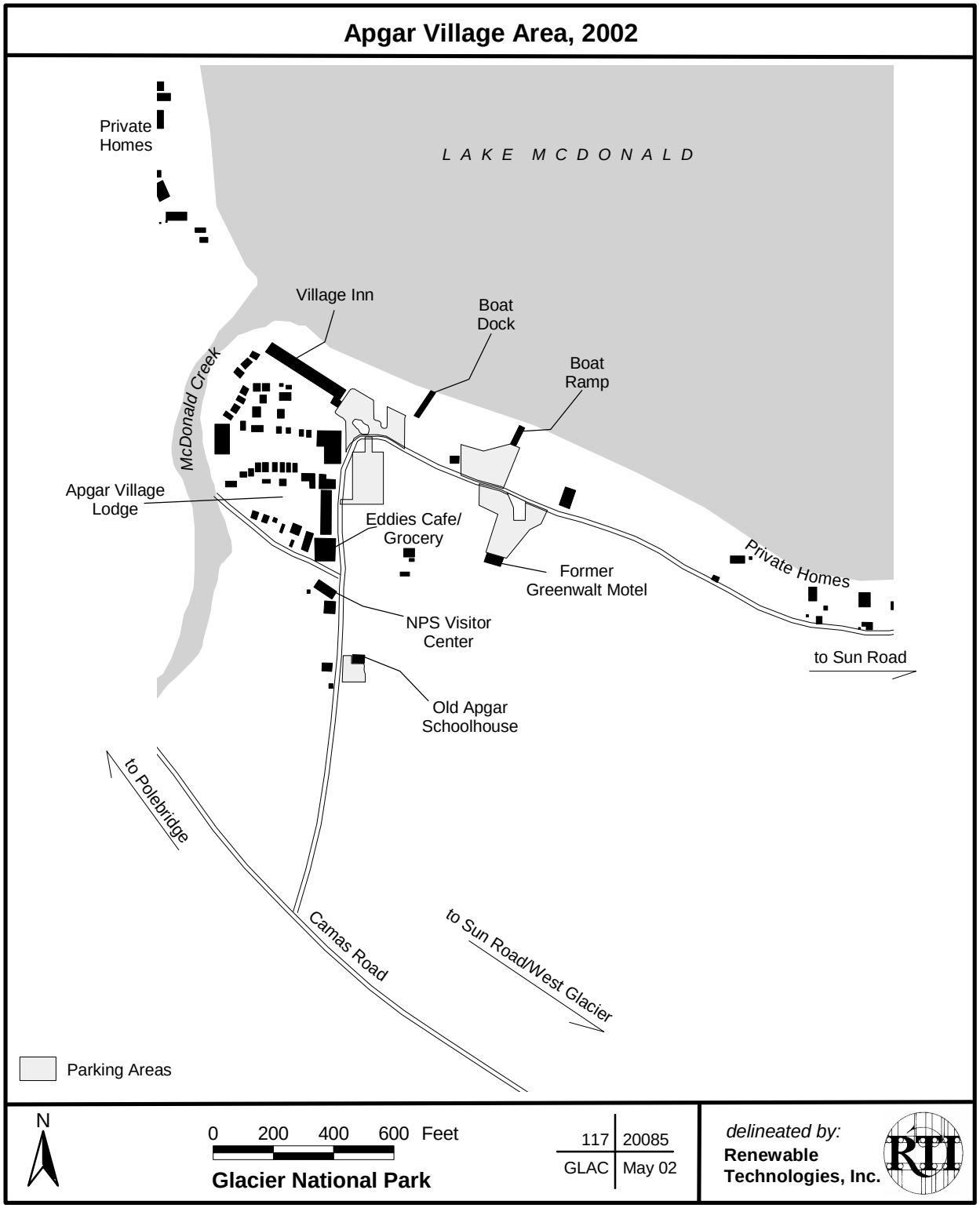


Figure 164. Sketch map of the Apgar Village area, 2002.

Figure 165. Apgar Village streetscape. 2000 photo.

Built in the mid 1950s as an inholder residence, it has been in Park Service ownership since the 1960s. A small parking lot and driveway separates the visitor center from a group of privately held shops, restaurants and motels including the 1940s Eddies store, the Apgar Village Lodge and Motel, motel office and manager's house, and the Village Inn. Along the driveway which separates Eddies from the visitor center are two private residences. The Village Inn, built in 1956 is located along the shore of Lake McDonald on the west side of the Apgar road. The motel, originally built by William Mackin was purchased by the National Park Service in the 1960s and is currently managed by Glacier Park Incorporated under its concession agreement. A small, historic log cabin is located adjacent to the parking area across from the Apgar Village Lodge. The building is owned by the NPS and is used by the Park's interpretive division.

One of the most significant features of the Apgar townsite is the magnificent view, seen from the Lake front at the end of the Main Apgar Road. The whole of Lake McDonald can be seen from this vantage point as well as the high mountain peaks from Gunsight Mountain on the east to Mount Stanton on the west. The panorama is one of the most spectacular in the Park and visitors entering or leaving the Park find themselves drawn to this quiet spot to enjoy the beautiful landscape.

Figure 166. 1950's postcard view of the Village Inn, Apgar. Author's collection.

Figure 167. View of Lake McDonald from Apgar Village. 2000 photo.

4.3 Lake McDonald Lodge

4.3.1 Introduction

Lake McDonald Lodge is located in a picturesque setting, approximately 10 miles from the west entrance to Glacier National Park, near the head of Lake McDonald on its eastern shore. The complex has the appearance of a small village, with the Lodge at the center, nestled in the trees along the Lake. The site currently includes the main Lodge and dining room building, guest cabins, auditorium and employee recreation hall, a coffee shop, motel, camp store, post office, and a variety of auxiliary buildings. In addition to the Lodge facilities, there are also a number of privately held properties to the north and south of the complex. These "inholder" sites were homesteaded prior to the establishment of Glacier National Park, some as early as 1892.[489] Unlike the majority of the visitor facilities in the Park, the Lewis Glacier Hotel (its original name) was built by John E. Lewis, a private entrepreneur with no connections to the Great Northern Railway. Lewis built the current hotel in 1914, and owned the property until 1930, when the process of transferring it to public ownership began. Today the Lodge is owned by the federal government and managed by Glacier Park Incorporated, along with its other accommodations throughout the Park.

At the time of its construction and until 1921, the Lewis Glacier Hotel was not accessible by automobile. Visitors arrived at the impressive facility by boat from Apgar and entered the building by way of it front door which faced Lake McDonald. It was not until work began

Figure 168. Lake McDonald Lodge, 2001 photo.

on the lower sections of Going-to-the-Sun Road in the summer of 1921, that motorists could drive to the Lewis Hotel. Over time, the advent of the automobile resulted in a series of changes to the Lake McDonald Lodge complex. These included the addition of parking facilities, the creation of access roads, and the use of the "rear" of the hotel as the primary entrance. A campstore and ultimately a coffee shop, motel, and gas station were added. While the original buildings remain largely in place, the overall face of the complex has been significantly altered as the facilities have been revamped to meet the needs of the automobile-based tourist.

4.3.2 The Natural Setting

The Lake McDonald Lodge area, located on the eastern shore of the Lake near its head at an elevation of 3184 feet above sea level, enjoys the moderate, wet climate of the west side of Glacier National Park. The area is characterized by rounded hills and tree covered ridges, composed of younger, softer rocks from the Tertiary period and loose glacial gravels.[490] Snyder Ridge to the east and Howe Ridge to the northwest, were formed by two lateral glacial moraines and rise about 2,000 feet above the Lake's surface. Lake McDonald, the largest lake within the Park, sits in a classic U-shaped valley and is ten miles long, approximately one and one half miles wide, and 472 feet deep. It is most likely a product of both glacial erosion which carved the Lake's basin, and of damming by glacial moraine deposits at the lower end of the valley.[491] Snyder Creek, which drains the snow fields from the ridges above the Lodge to the east, empties into Lake McDonald at an outlet located between the main Lodge building and the auditorium.

Mount Brown, directly northwest of the Lodge complex, rises to an elevation of 8,565 feet, providing more than a mile of dramatic relief. A fire lookout tower on one of its high ridges, about 1,000 feet below the summit, is visible on clear days. Along the shore of Lake McDonald, just below the Lodge are rocky beach paths which provide an unobstructed view of the mountains that rise across the Lake – Stanton Mountain, Mount Vaught and McPartland Mountain. Peaking out behind McPartland, the lower ridges of Heaven's Peak

are visible. Directly to the north and east the Garden Wall and Mount Cannon, at 8,952 feet, can be seen. The complex is situated in a forest of western larch, hemlock, and red cedar, a species of the Pacific coast whose eastern limit is found in Glacier. [492] The dense forest creates a thick canopy, barely penetrable by light and few plant species grow on the valley floor. Those that are able to tolerate the shade include the Pacific yew, coolwort-foamflower, queen's cub bead lily, and devil's club.[493] Red squirrels, white-tail deer, black bears, and moose are among the animal species found in the Lake McDonald area.

4.3.3 Development of Visitor Facilities at Lake McDonald

Early Development. Completion of the Great Northern Railway to the Flathead area late in1891, provided settlers, adventurers and early sightseers access to the McDonald Valley by way of a station at Belton (the present site of West Glacier). The first settlers provided modest overnight accommodations to visitors, primarily at the foot of the Lake. Travelers would depart from the train at Belton and take a horse drawn conveyance to Apgar, a distance of about 3 miles where they could they rent cabins built by the homesteaders. While settlement was largely concentrated in the West Glacier and Apgar areas, development also began to occur at the head of the Lake at well.

In 1895, George Snyder established a stopping place on Lake McDonald at the site of the present Lake McDonald Lodge. The demand for accommodations at the site resulted in the construction of the Snyder Hotel, a two-story frame building that was a key destination for visitors to the west side of the Park for nearly 20 years.[494] In order to provide a means of transportation from Apgar, Snyder purchased a 40-foot steamboat and begun a launch service from Apgar to the head of the Lake.[495] Ed Dow, an entrepreneur who had built a hotel at Belton a year earlier, started a stage line from Belton to Apgar over a haul road constructed by Snyder to bring his boat to the Lake. Visitors electing to travel to the new Snyder Hotel were obliged to walk a quarter of a mile from the train station at Belton to the Middle Fork of the Flathead River where they were taken across in a row boat. On the opposite bank, they took Dow's buckboard to Apgar where they boarded the steam ship to the head of Lake McDonald.[496]

In 1896, Denny Comeau and Ernest Christensen began taking saddle horse parties on trips into the back country near the head of Lake McDonald. Frank Geduhn, another local entrepreneur, built a resort boasting eight sleeping cabins near the McDonald Creek inlet in 1899 and a log hotel a year later. Following the completion of the Geduhn hotel, the available visitor services remained relatively unchanged until 1906 when a gas operated boat made its appearance on Lake McDonald, owned by Frank Kelly.[497]

The Lewis Glacier Hotel. The year 1906 also saw the arrival to the McDonald Valley of John E. Lewis, a business man from Kalispell and Columbia Falls. He purchased a number of tracks of land around the lake including the homestead and hotel belonging to Snyder. He added 11 guest cabins, constructed of cedar and larch to the hotel in 1907[498] and was becoming the Valley's most prominent hotel proprietor when the U.S. Congress made Glacier a National Park in 1910.[499]

Figure 169. Lewis Glacier Hotel (Lake McDonald Lodge), ca. 1920.
Photo by R. E. Marble, GNPA #2981.

Glacier's new status required Park administrators to take an active interest in the operations of the proprietors operating in the McDonald Valley. The Park Service recognized the need for adequate visitor services but were concerned with the sometimes haphazard and often poorly delivered services provided by the early entrepreneurs. When visitation in the McDonald Valley topped 5,500 in 1913, however, the government happily welcomed an application from John Lewis to cut timber near his hotel for the construction of a larger facility at that site – the new Lewis Glacier Hotel. Construction commenced in November of 1913, and the hotel was completed in just ten months. Lewis was intent that he not be outdone by the Great Northern Railway, as they simultaneously constructed their chains of hotels and chalets on the Park's east side. His use of materials, including 5,000 board feet of dead cedar, assured that his new hotel would be "far superior" to the railway's properties.[500] Ironically, the Railway had rejected an earlier invitation by Lewis to build a Company hotel at the Lake McDonald site in 1912 although they intended to use the site as a stopping place for visitors traveling through the Park.[501]

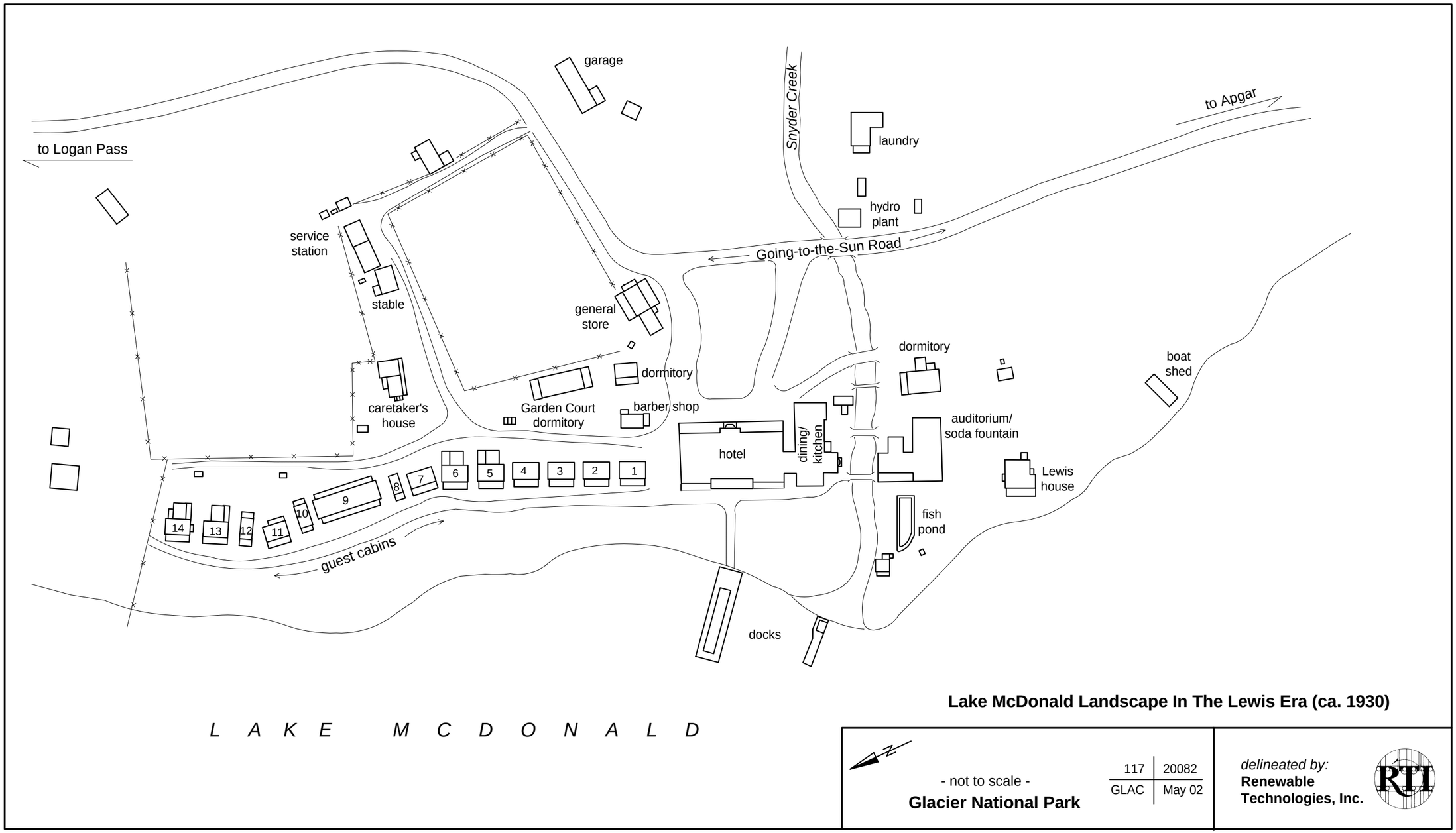


Figure 170. Sketch map of Lake McDonald Hotel area, ca. 1930.

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Lewis enlisted Cutter and Malmgram, a large Spokane, Washington firm, and provided them with an unlimited budget in order that they might construct "something worthy of the park".[502] The construction feat required the freighting of fixtures, furnishings, and other materials across the ice of Lake McDonald during the winter months and by boat in the spring. The three-story hotel which featured steam heat, electric lighting and running water, contained 100 guest rooms (some of which were located in the adjacent cabins). There was an elegant lobby on the first floor as well as eight 2-room suites. The dining room, attached to the southwest side of the lodge, was housed in a 1910 log building[503] and a kitchen was attached to the rear of the dining room sometime after the hotel was built. An elevator brought guests up to a roof garden overlooking the Lake. Guests arrived at the hotel by boat, climbing a long set of steps that led from the dock, under the lakeside balcony to the entrance. No expense was spared in providing visitors with first-class accommodations and ambiance, although Lewis also made sure that his long-time friends and acquaintances from the Flathead Valley were made welcome in the grand facility.[504] Beyond the hotel, to the north, the string of 1907 cabins, as well as three others constructed in 1918,[505] offered additional lodging. (One of the cabins [#9] was replaced with a newer building in 1934).

Figure 171. Guest Cabin 8, Lake McDonald Lodge, 2001 photo.

In addition to the Lewis Glacier Hotel and cabin facilities, a large number of other buildings were constructed at Lake McDonald – to provide housing for employees, special services for guests and other auxiliary functions. The hotel's isolated location required that many of these services be provided on site.[506] In 1909, Lewis built a barber shop, a single-story frame building, located to the north and west of the main hotel.[507] Snyder Hall, a two story log building was built in 1911 as a public assembly room and featured a stone fireplace and seven bedrooms upstairs. A laundry was constructed at the southeast corner of the Lake McDonald complex in about 1918. The site, located some distance from the main hotel, housed a complete commercial laundry facility and a steam and power plant in a shed addition. The operation enabled the hotel to clean its linens on site as well as provide a laundry valet service for guests.[508] A private home for John and Olive Lewis, designed by

Fred Brinkman of Kalispell, was constructed to the south of the lodge, across Snyder Creek, in 1918. (The Lewis home later became known as "Cobb Cabin," for the author Irvin S. Cobb, who stayed in the house for a time.) A caretaker's house was constructed in 1922 and a girls' dormitory, Garden Court, in 1927, both to the northeast of the main hotel. A log soda fountain and dance hall building, across Snyder Creek, to the northeast of Cobb Cabin, was added in 1927.[509] The complex of buildings was characterized by rustic architecture which blended well with its surroundings.

Figure 172. Snyder dormitory, Lake McDonald Lodge, 2001 photo.

Lewis also developed the property to the north of the hotel complex for sale to families for summer homes. In 1916, he and Diamond Apgar formed the Glacier Park Land Company to pursue this endeavor, but ultimately, lacking the endorsement of the Park Service, it was largely abandoned.[510] However, a number of inholder properties, to the north and south of the hotel remain today.

Public Ownership – Lake McDonald Hotel. The Glacier Hotel flourished through the 1920s. Glacier's Superintendent Eakin called the hotel "one of the most popular hotels in the country". As was true for the hotels and chalets throughout Glacier Park, the hotel at Lake McDonald was full to capacity. Contributing to this success was the increasing number of private automobiles in the Park after the completion of the lower portion of Going-to-the-Sun Road from Belton to the Lewis Hotel in 1921. By 1929, the Road was open to Logan Pass. In the 1923 season alone, the number of visitors increased 35.36% from the previous season while the number of motorists entering the park increased 70.11%.[511] However, families arriving in the Park by car were increasingly seeking lower-priced rental cottages and cabin resorts and the Park Service was eager to see construction of automobile oriented accommodations.

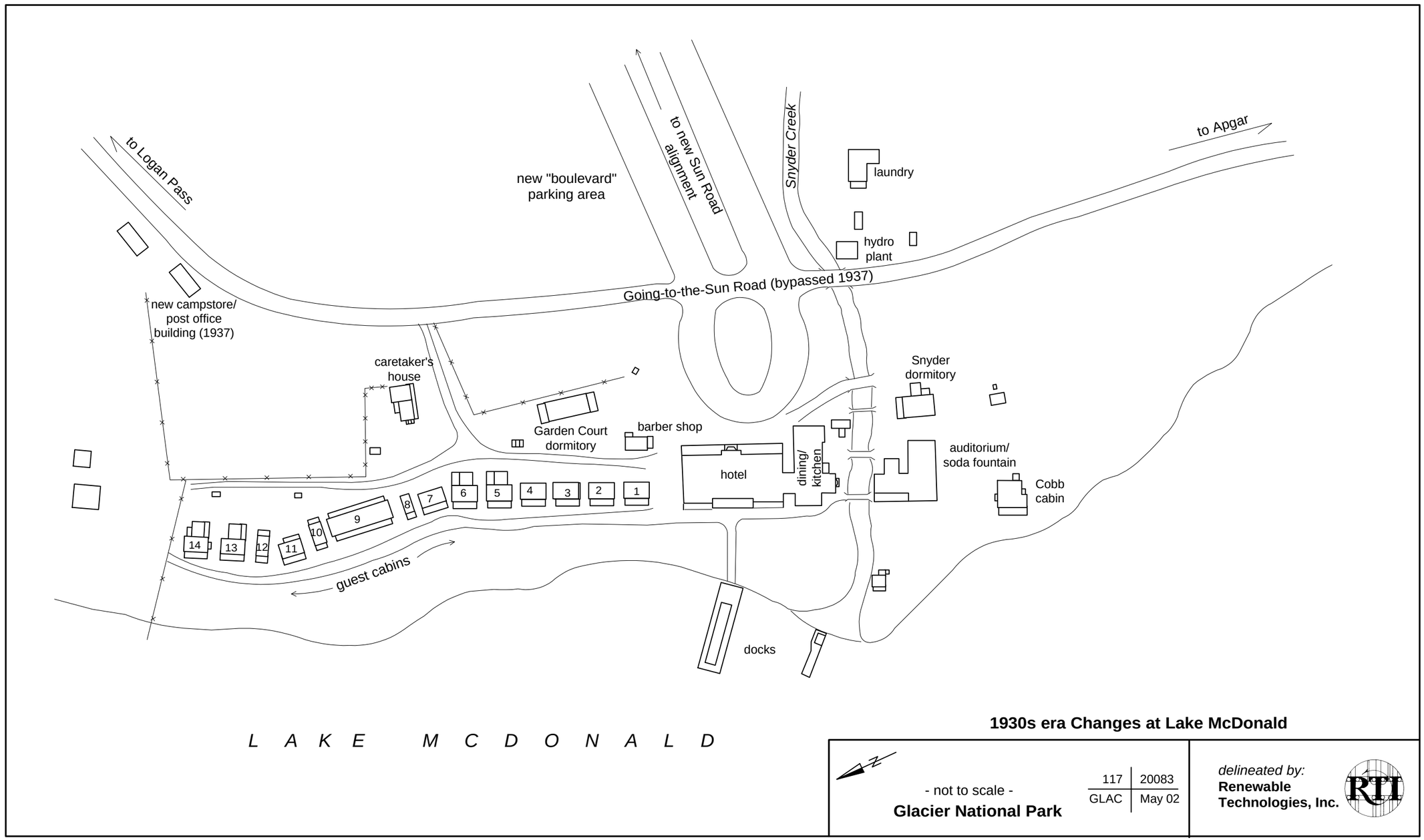

Figure 173. Sketch map showing 1930s-era changes at Lake McDonald.

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Lewis was hesitant to make this investment and resisted the government's requests to build more tourist facilities even though he had himself lobbied for the speedy construction of a road to his hotel and had constructed three miles of the road himself.[512] In August of 1929, the Half Moon Forest Fire swept through the Apgar-Belton area, destroying fifty thousand acres of cedar-hemlock forest including the stately trees at the foot of Lake McDonald before it could be controlled. Although none of the buildings at Lewis' Lake McDonald complex were affected he began to seriously consider selling his properties. He estimated that he would have to add 100 guest rooms in response to the completion of the Roosevelt highway along the southern boundary of the Park, an investment he could ill-afford. The National Park Service and the Great Northern Railway's Glacier Park Hotel Company placed additional pressure on Lewis to sell, proposing the construction of a hotel adjacent to his properties on Lake McDonald. Lewis felt he had no choice and in 1930 he sold the entire complex. Through a Glacier Park Hotel Company-financed purchase, the Lewis Glacier Hotel became the Lake McDonald Hotel, in government ownership and managed by the Great Northern Railway. The transaction had enabled the Park Service to address two of its primary management objectives: the elimination of privately held land within the Park and the further consolidation of visitor support services under one concessioner.[513]

The DeSmet. In 1930, Howard Hays, owner of the Glacier Park Transport Company commissioned a new excursion boat for Lake McDonald. The boat, piloted by Captain William Swanson was named the DeSmet in memory of Father Pierre DeSmet who is believed to be among the first non-Indian visitors to Glacier Park. Hays continued to operate the DeSmet on Lake McDonald until 1953 when it was sold to Arthur M. Burch, whose family continues to operate the historic tour boat on the Lake.

The Automobile Comes to Glacier. The arrival of the automobile in Glacier Park in 1921 and the completion of Going-to-the-Sun Road more than a decade later, continued to have profound impacts on the Lake McDonald Hotel complex. Not the least of these was the change in the hotel's primary entrance from the west (lake) side to the east side of the building in order to accommodate visitors arriving via Going-to-the-Sun Road. The abandonment of the lakeside as the primary entrance and the change in the Road's alignment meant that the hotel was no longer visible to visitors as they approached the site, diminishing its role as a primary destination.

In 1936 -37 a turnabout for vehicles and flagstone steps were also added to what had been the rear entrance of the hotel.[514] At about the same time the alignment of Going-to-the-Sun Road was altered and the new roadway by-passed the hotel property. The original alignment remained as an inside access road, while a parking lot and new entry road into the hotel complex, built in a cul-de-sac arrangement, was added between the turnabout and the new Roadway. The new entry road/parking area featured a central boulevard, with angle parking

Figure 174. Northward view of the current secondary access lane to Lake McDonald Lodge, a former alignment of the Sun Road. 2000 photo.

adjacent to both of the travel lanes (see Figure 176, page 259). The new road system in the Lake McDonald Hotel complex was constructed by William and Douglas in Kalispell. Construction began on August 27th of 1936 and rough grading of the surfaces was completed by the fall. The project was completed on June 15th, 1937 in time for the opening of the Park that year.[515]

On August 27th, 1936, two beautifully crafted stone bridges spanning Snyder Creek were completed, one on the new Going-to-the-Sun Road alignment and one near the Lodge, close to the laundry. The bridges were designed by W.K. Trippit of Whitefish, Montana, and constructed using both skilled and unskilled laborers from the Flathead Valley through the National Re-employment Service.[516]

In 1937, Thomas Mahon, an architect for the Glacier Park Hotel Company, designed a new camp store for Lake McDonald. The store was intended to replace an earlier general store located near cabin #6 which was removed in anticipation of a road construction proposal for the Sun Road (a proposal that was never realized).[517] Completed sometime before July of 1938, the new store, located on a portion of the old Road

Figure 175. Highway bridge across Snyder Creek, near Lake McDonald Lodge. 2000 photo.

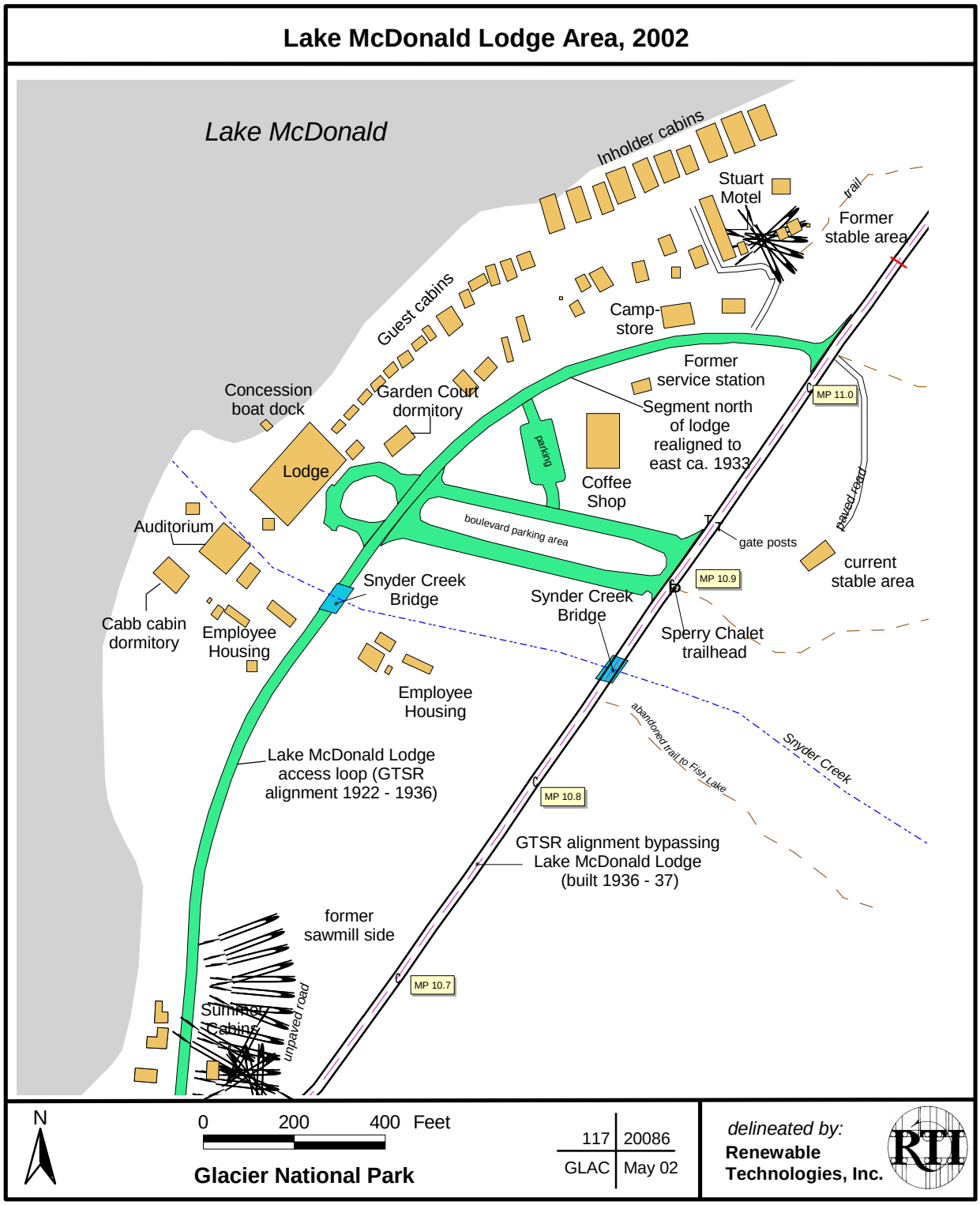

Figure 176. Sketch map of the Lake McDonald area, 2002. Note the "boulevard" parking Area added in 1936-37, tying the lodge building to the relocated roadway.

Figure 177. Lake McDonald Campstore building, 2001 photo.

alignment to the north and east of the hotel, sold groceries and camping supplies and housed the Lake McDonald, Montana post office. It is interesting to note that the hotel functioned not only as a tourist accommodation, but provided certain amenities to the private property owners that lived in the area. The post office served the hotel complex and the inholders adjacent to the hotel and beyond to the head of the Lake. When phone service was made available in the Park, the hotel switchboard in the main lobby provided phone connections for many of the Lake McDonald's permanent summer residents as well as hotel guests.

The Modern Era. The hotel itself was altered somewhat during the late 1930s. Private bathrooms and showers were added to some of the rooms and other rooms (including some in the cabin units) were reconfigured. A report filed by the Glacier Park Company in June of 1943 indicated that there were now 72 guest rooms (rather than the original 100) at the Lake McDonald Hotel and Cabins with a capacity of 135.[518] During World War II, the Lake McDonald Hotel was closed along with most of the hotels and chalets in Glacier Park (only the East Glacier Auto Camp remained open during the War years). At the conclusion of the War, visitors returned to the Park and the concessions re-opened. In ca. 1955, inholders Frank and Laura Stuart built a two-story motel to the north of the Lake McDonald campstore. At about the same time, the hotel laundry suffered a fire which gutted its interior and damaged the building's second story which was subsequently removed. The Hotel Company decided to close the laundry, along with a similar facility at the Many Glacier Hotel and centralize these services at Glacier Park Lodge. The former Lake McDonald laundry became an employee dormitory, named Martin Johnson in honor of an elderly gentleman who had managed the laundry for a number of years. The former hydroelectric plant was converted into additional dormitory space, and named "hydro."[519] Other changes that occurred included the conversion of Cobb Cabin to an employee dormitory and the barber shop to an employee dispensary.

Figure 178. Martin Johnson dormitory, Lake McDonald Lodge, 2001 photo.

In the years following the War and well into the 1950s, the Park Service renewed its efforts to increase the number of lower cost accommodation units in the Park. Many in the government recommended the abandonment of the facilities at the Lake McDonald Hotel site in favor of a new cabin development at Apgar, not unlike earlier Park Service requests voiced in the 1930s. However, planners for the Railway disagreed and maintained that the Hotel was in the right location and could be refurbished to meet the needs of the modern traveler.[520] The refurbishing of the Lake McDonald Hotel was undertaken by the Knutson Corporation of Minneapolis, a management company hired by the Great Northern Railway in 1956. The effort was part of an ambitious building program undertaken at the Company's Glacier facilities in the last few years of the Railway's association with the Glacier Park concession. Improvements to the Lake McDonald Hotel included the addition of a cocktail lounge and gift shop in 1958 (in the location of the original luggage check room); reconfiguration of the public bathrooms; conversion of some of the first floor guest rooms to the managers office; and a new front desk. The facility received the new appellation "Lake McDonald Lodge" during the period of Knudson management.[521]

1960 marked the final year of operations in Glacier National Park by the Great Northern Railway. The efforts of the Knutson Corporation had been successful in making the concession attractive to a perspective buyer. In January of 1961, Don Hummel, an Arizona capitalist who owned concession facilities in Lassen and Mt. McKinley National Parks, purchased the Glacier Park Company, renaming it Glacier Park Incorporated. [522]

Glacier Park Incorporated and Lake McDonald Lodge. While Lake McDonald Lodge remained in public ownership after 1960, it was managed under a new concession agreement with Glacier Park Incorporated. During Hummel's 20-year tenure in the Park, a number of changes were made to the Lodge complex, most of them rather minor. In 1961, toilets, showers and electric heaters were added to most of the cabins.[523] Snyder Hall became an employee dormitory and the soda fountain and dance hall were slightly modified to serve as an employee recreation facility and public auditorium. Hummel privately purchased the Lake McDonald Motel from the Stuart family, and began operating it as part of the lodge property. A gas station was built near the campstore in 1962.

Figure 179. Lake McDonald post office (former gas station), 2001 photo.

The most dramatic change at Lake McDonald was the construction of a coffee shop building and associated parking lot in 1965 [524]. While mimicking some of the general building lines of the main lodge, its general architectural design, materials and colors do not blend well with the general building landscape of the Lake McDonald Lodge complex. Unlike the majority of the buildings, the coffee shop sits in an open area, away from the trees. Where the older buildings were designed to reflect their surroundings, the coffee shop sits in sharp contrast to its environment. However, like the auto camps and gas stations, it's primary purpose was to serve motorists with quick, convenient, lower priced meals as they made their way across the Park.

Figure 180. Lake McDonald Lodge coffee shop, with Mt. Brown in the background. 2000 photo.

The 1964 Flood. In 1964 torrential rains fell in the Park causing disastrous flooding on both the east and west sides of the Continental Divide. At Lake McDonald Hotel, Snyder Creek swelled, flooding its banks and Lake McDonald rose significantly as up to eight inches of precipitation fell on the southern portions of the Park on June 7th and 8th. The warm rain fell on heavy accumulations of snow which melted at an accelerated rate further increasing the volume of water. The flooding ruined portions of the Lake McDonald Lodge dining room and the grill in the employee recreation hall, across the creek, and completely destroyed the footbridge that crossed the Creek.[525]

In ca.1968, 10 cabins from the Swiftcurrent auto camp were moved to Lake McDonald and in combination with new structural elements were used to create 5 employee dormitory facilities.[526] These included Girls Dorms One and Two located between the caretakers cabin and the camp store; Boys Dorms One and Two on the south side of Snyder Creek between the Lodge area road and the Lake; and the "jammer" dorm for tour bus drivers, located behind Martin Johnson and Hydro. A fire truck garage was constructed between the campstore and the cabins in 1978. [527] In ca. 1980, the post office was moved from the camp store to the gas station building, across the street. The gas station's pumps and underground tanks were removed in the fall of 1996, but the building continues to house the Lake McDonald post office as well as public restrooms.[528]

Lake McDonald Lodge Today. Ownership of Glacier Park Incorporated was transferred in 1981 to Viad Corporation. In 1988-89, the Park Service undertook a $1.2 million dollar renovation of Lake McDonald Lodge, restoring the lobby to its original flavor and general configuration. The gift shop, which had encroached into the lobby space was moved back towards the dining room. The front desk was moved into an area that was previously occupied by the managers office and public bathrooms. A totem pole was placed on the lodges' lakeside, replacing one that had been removed earlier. Other improvements included the restoration of the lobby fireplace, the addition of public bathrooms near the dining room, an upgrade to the lounge and the replacement of the 1950s era dining room and lounge windows. The dining room fireplace which had been destroyed in the 1964 flood was restored. The turnabout at the front of the Lodge was also modified, as was the landscaping surrounding the Lodge building. While most of the architectural improvements were appropriate to the Lodge's character and original design, the new exterior landscaping and changed entrance drive were not particularly sensitive to the historic character of the building or its setting.

Today, Lake McDonald Lodge enjoys full bookings virtually throughout its season of operation. Visitors, in the same fashion as their predecessors in 1914, enjoy its lovely grounds and setting along the shore of Lake McDonald, eat in its log dining room, and gaze up at the summit of Mount Brown, more than a mile above them. And, like the first guests that arrived at the Lodge via George Snyder's steam ship, they can catch a glimpse of its lakeside entrance from the deck of the DeSmet and imagine arriving at the Lewis Glacier Hotel at the beginning of the last century.

Figure 181. Lakeside facade of Lake McDonald Lodge, showing the revamped landscaping and footpaths added in 1989. 2000 photo.

Figure 182. Reconstructed fireplace, Lake McDonald Lodge dining room, 2001 photo.

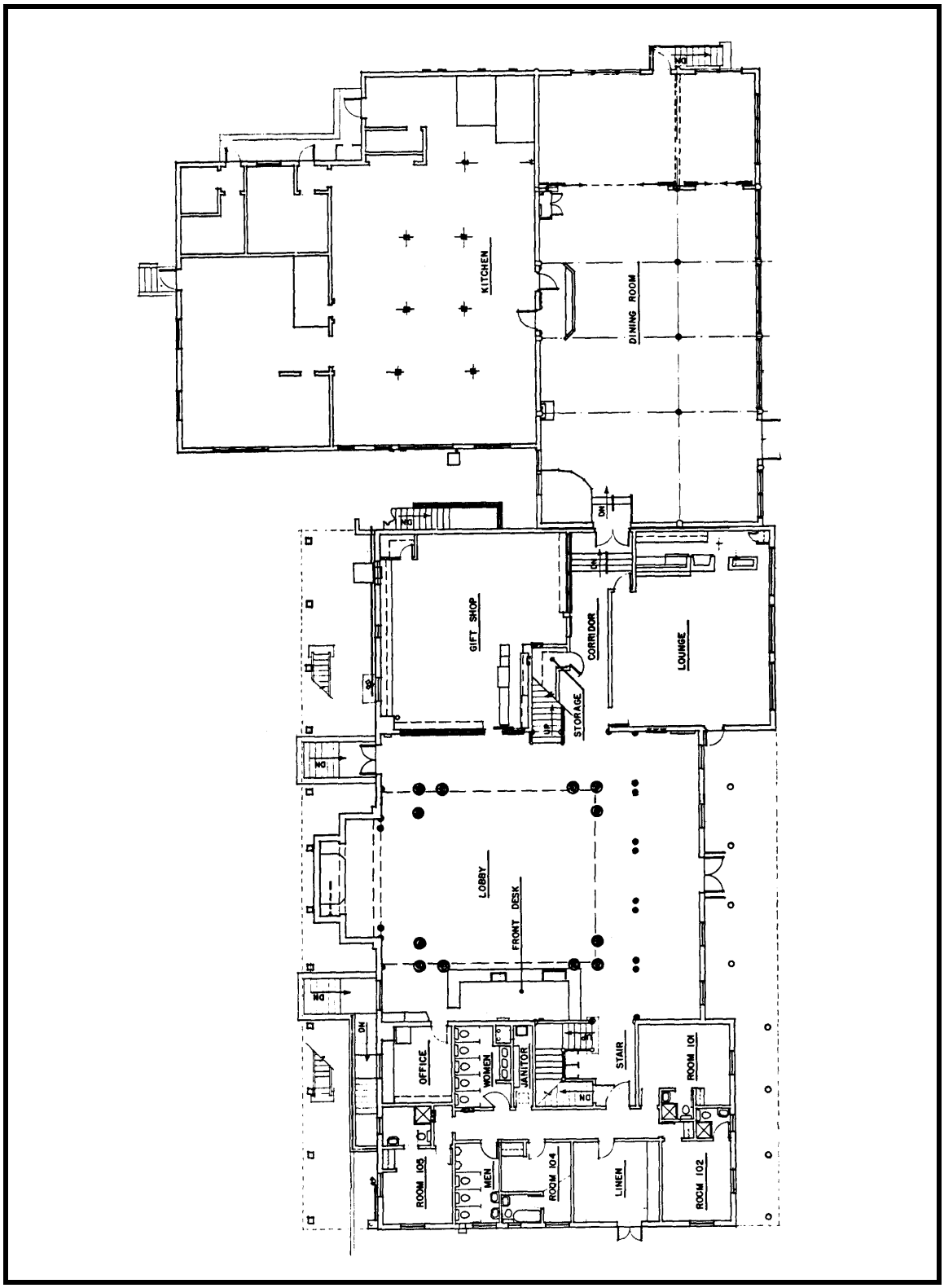

Figure 183. Architectural plan of the first floor of Lake McDonald Lodge, before the 1989 renovation.

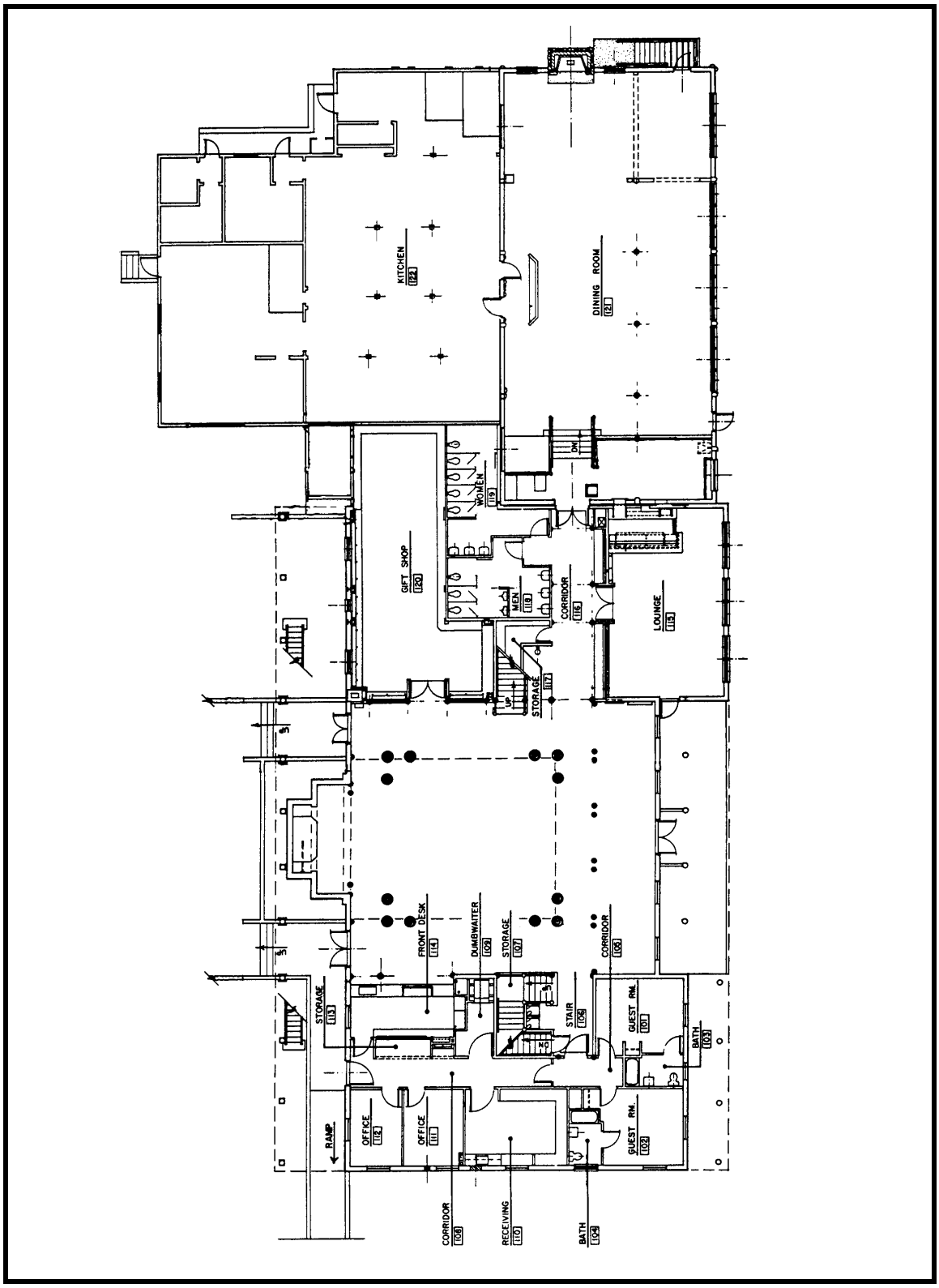

Figure 184. Architectural plans of the first floor of Lake McDonald Lodge, following the 1989 renovation. Note the reconfigured gift shop area (upper center).

4.4 Rising Sun

4.2.1 Introduction

Rising Sun is a complex of buildings and associated facilities providing a variety of visitor accommodations and food service, located along Going-to-the-Sun Road, on the east side of Logan Pass, approximately six miles from the town of St. Mary. The majority of the buildings at this site were constructed during 1940 and 1941, while some additional facilities were added during the 1950s and 1960s. Briefly called the Roes Creek Auto Camp, it became known as the East Glacier Auto Cabin Camp, until renamed Rising Sun in 1950 [529]. Today, the Rising Sun complex includes 37 motel rooms, 35 cabin units, a restaurant, boat dock on St. Mary Lake, campstore, public showers, and employee housing.[530] The lodging and food service facilities are owned and operated under a concession agreement between the National Park Service and Glacier Park, Incorporated. Adjacent to the concession-operated facilities, across Roes Creek[531], the Park Service maintains an 82-site campground which includes a series of loops for tent and trailer camping, a Camptender's cabin and other auxiliary buildings. The Rising Sun campground predates the concession development – it opened in the 1930s, and the Camptender's cabin was completed in 1937.[532]

Figure 185. Camptender's Cabin, Rising Sun Campground, 2001 photo.

The development of visitor services at this site was in direct response to the increasing number of visitors who traveled to the park via automobile after the completion of Going-to-the-Sun Road. By the late 1930's, the Road was handling the bulk of the Park's visitors and the Park Service was very interested in gearing support facilities toward this new type of traveler.[533] Rising Sun owes its existence to the desire of the Park Service to build accommodations to suit automobile travelers who preferred simple, affordable, family oriented lodging over the more expensive lodges and chalets built earlier in the century.

4.4.2 The Natural Setting

Rising Sun is located on the east side of the Continental Divide, near the north shore of St. Mary Lake, a bow-shaped lake approximately 10 miles long and up to 300 feet deep.[534] The St. Mary valley is generally dry, averaging approximately 20 inches of rain per year. The wind blows nearly constantly across the Lake and sudden storms are not uncommon.

Otokomi Mountain (7935 feet) and Goat Mountain (8826 feet) surround Rising Sun on the northeast and southwest respectively. Roes Creek drains Otokomi Lake, 5 miles above the site, and flows into St. Mary Lake adjacent to the campground. The Lake's Narrows at the Golden Stair is located just above Rising Sun at a point where Going-to-the-Sun Road makes a wide turn past protruding grayish rock. Just beyond the Golden Stair, at the Wild Goose Island overlook, the mountains rise ahead, across the Lake and towards Logan Pass. To the east of Rising Sun, beyond the St. Mary Valley, the mountains gradually disappear as the terrain becomes more level, joining the seemingly infinite landscape of the Northern Great Plains.

The Rising Sun Area is home to a variety of wildlife species including some of the largest of the Park's mammals – grizzly bears, black bears and elk, as well as the smaller inhabitants of the prairie adjacent to the site to the northeast. Prairie dogs, field mice and a variety of bird species including grouse, Mallard ducks, sandpiper, and pygmy owls can be found in the area.[535] Aspen trees and western larch grow along the Roes Creek drainage and a prominent stand of Douglas Fir can be seen just west of the Campground.[536] A variety of wild flowers bloom at the site, and provide a spectacular array of color, particularly in the prairie to the east.

4.4.3 Development of Visitor Facilities at Rising Sun

The Great Northern Railroad and Glacier Park. The history of tourist facility development in Glacier National Park has its roots, largely, in the alliance between railroad interests and National Park advocates. As early as 1871, railroad interests joined preservation activists in efforts to create Yellowstone Park. The promoters and financiers of the railroads saw the great economic benefit that could be derived from transporting visitors from all over the continental United States to Yellowstone. Other railroads followed suit and within the first 15 years of the 20th century there were railroad connections to most of the major western parks. Popularizing the national park idea was essential to assure the parks' establishment and survival. The railroads served to muster public support of the park idea through scenic tours and thus contributed significantly in assuring a future for the park concept. Bounded on the south by the tracks of the Great Northern Railway, this has been especially true for Glacier, where the Great Northern was the key player in the construction and operations of tourist accommodations and transport services within the park.[537]

Beginning in 1910 and continuing for almost two decades, the Great Northern built a magnificent chain of hotels and chalets throughout Glacier National Park. A number of visitor accommodations in the vicinity of Lake McDonald and the town of St. Mary were built by other, smaller companies and individuals. However, the Great Northern Railway-owned concession, the Glacier Park Hotel Company, (it became simply the Glacier Park Company in 1943[538]) was by far the largest developer-operator.[539] The railroad promoted all-expense paid tours which included rail tickets, hotels, meals, park tours and outfitting services. However, while the guest accommodations in the Park were oriented toward those travelers that arrived via rail, it was clear that the Great Northern required a road system to provide access from its railway stations to major hotel and chalet sites. In 1914, a primitive road, constructed by the railroad, was completed between Midvale (East Glacier) and the Many Glacier valley, via St. Mary. By that time, the Great Northern had constructed two chalet groups at St. Mary Lake. St. Mary Chalets, with a 60 guest capacity, was located to the south of the St. Mary Ranger Station on the east side of the Lake. The second was Going-to-the-Sun Chalets with a capacity of 120, located approximately 4 miles west of the present location of Rising Sun. Also during this time, the railroad established the first telephone communication system on the east side of the Park and they placed tour and rental boats in service on St. Mary, Swiftcurrent and Two Medicine Lakes. In 1917 the Road on the east side of Glacier was improved by government crews and access to the St. Mary Lake area was significantly improved.

The Automobile comes to Glacier. While the level of visitor services remained fairly consistent throughout the 1920s, the Great Depression of 1929 limited the number of visitors that could afford to participate in the railroad's all-expense paid tours through the Park. During the 1930s, increasing numbers of families arrived in their own vehicles in search of less expensive cabin camps and campgrounds, and the NPS began urging the Glacier Park Hotel Company to provide affordable accommodations oriented towards this new type of traveler. Indeed, the changing patterns of travel, coupled with the impact of the Depression had already dictated the closing of the St. Mary Chalet in 1932.[540] Yet, the Great Northern was reluctant to respond to the government's request. The development of cabin camps for automobile travelers did not meet their need to focus on larger destination facilities for rail passengers. The Glacier Park Hotel Company had engaged in some limited testing of the market for auto based tourist accommodations and installed several low cost auto cabins at Swiftcurrent (adjacent to Many Glacier) in 1931. Decreased visitation due to the Depression, however, provided little incentive for further development. [541]

With construction completed on Going-to-the-Sun Road, the Park Service accelerated the development of free automobile campgrounds, similar to those established in the McDonald Valley and a year after the Road opened the Park had five major and seven minor campgrounds open to the public. Campgrounds at Roes Creek and Swiftcurrent were constructed with water and sewer infrastructure in place which could also support auto camp development. Aware that they could no longer remain intransigent, the railroad acquiesced and in 1933 began construction of an additional 27 two and three-room cabin units at

Swiftcurrent. W.P. Kenney, president of the Glacier Park Hotel Company was considerably pleased with the result when the cabins received a surprising amount of patronage after they opened for business in 1934.[542] Although the site suffered considerable damage from the lightning fire of 1936, when all but 12 cabins were destroyed, the auto camp endured. Due to the popularity of the area, the Park Service rebuilt most of the cabins in 1938, added a coffee shop in 1940, and a 62-unit motor inn in 1955.

Despite the apparent success at Swiftcurrent, a specific request by the Park Service to develop a cabin camp at Roes Creek (the Rising Sun location) was rejected at first on the basis that such a facility would be in direct competition with the Going-to-the-Sun Chalets. In 1939, however, F. J. Gavin became President of the Great Northern Railway. Gavin, who was interested in improving relations with the Park Service, successfully obtained funds for the construction of auto camps at Roes Creek and at Apgar (at the lower end of Lake McDonald on the Park's west side). Ultimately, funding availability dictated that only one of the auto camps be built and the Glacier Park Hotel Company chose to concentrate its efforts on the new units at Roes Creek and additional work at the cabins at Swiftcurrent.

Figure 186. Former registration building at Rising Sun (now employee dormitory), 2001 photo.

The East Glacier Auto Camp. The railroad opened the East Glacier Auto Cabins at Roes Creek, on June 15th, 1940. The complex, completed in 1941, included a combination store, lobby, and coffee shop facility, a registration building, and 19 double tourist cabins with a capacity of 70 guests.[543] The lobby adjoining the coffee shop had a fireplace and a soda fountain and the camp store offered a wide variety of goods.[544] The facilities were simple and utilitarian in design and in sharp contrast to the more ornate lodges and hotels built 25 years earlier. The cabins were designed in an irregular pattern along the natural topographical lines of the wooded area. They were placed in a manner so as to be unobtrusive per Park Service design criteria and their intentionally rustic design and enclosed surroundings kept them well-hidden from the Road. (One of the 19 cabins, however, was intentionally sited in an exposed location in front of the Registration Building, so perspective guests could see the type of accommodations offered.) As such the cabins blended with

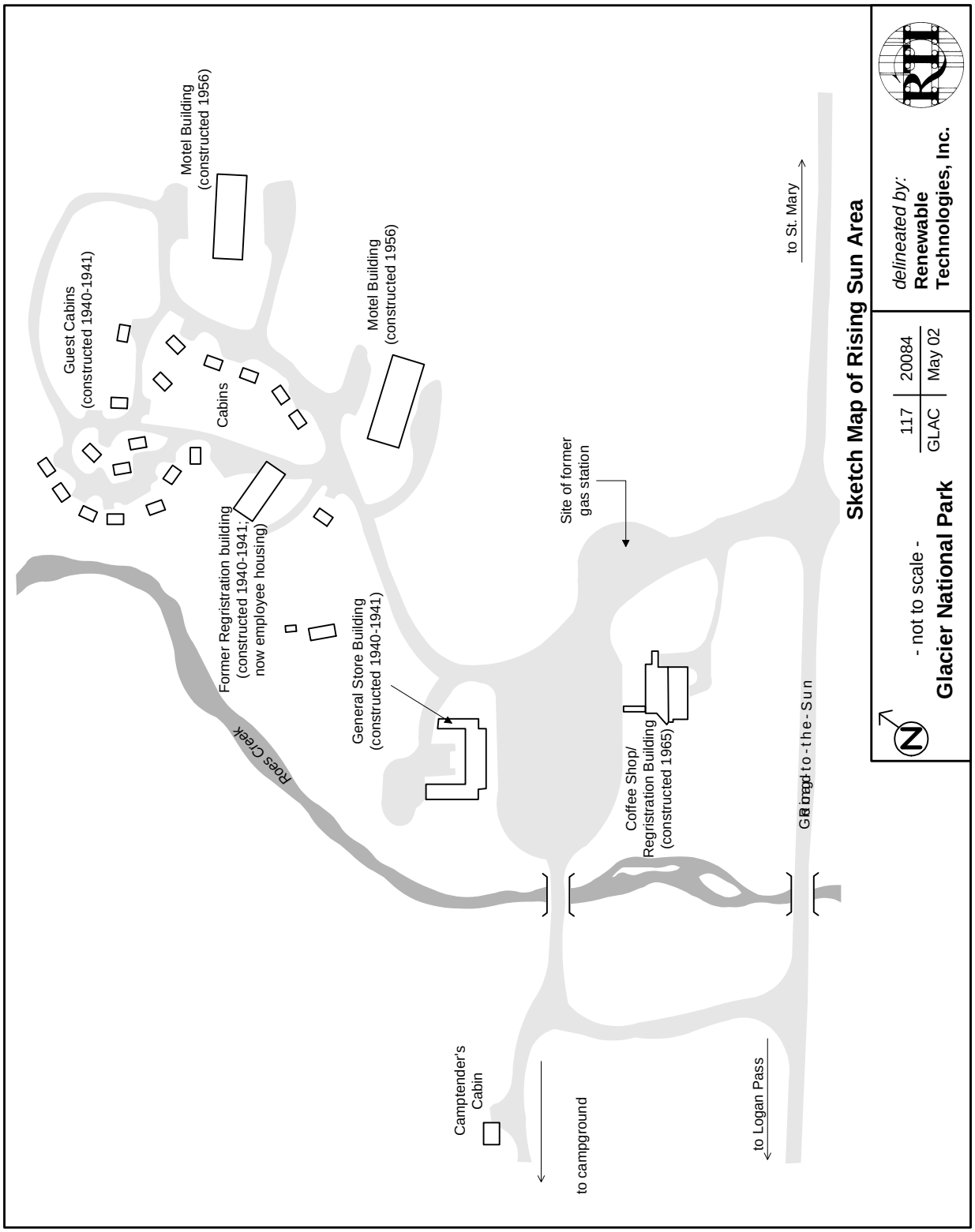

Figure 187. Sketch map of concession facilities at Rising Sun, 2002.

Figure 188. Interior of cabin at Rising Sun, n.d. Photo by T. J. Hileman.

their environment and the view for motorists on Going-to-the-Sun Road was not diminished. In planning the construction of the cabin camp at Roes Creek the Park Service had contemplated another cabin arrangement design, similar to the circular "teepee" arrangement employed at Swiftcurrent. However, this was ultimately rejected in favor of the more scattered, less ordered approach. (One early plan actually carried the "tepee" concept one step farther, by designing octagonal cabin units with a peaked roof and a teepee-like appearance.)

Visitors residing within the cabin units were afforded only occasional and incidental views of the mountains. Per the original design, each cabin unit contained two non-connecting rooms, one with a full bath and the other with a toilet and sink. A one-room cabin unit was also designed, but never constructed.[545] As the Park did not receive commercial electric service until the 1950s, each location required its own power generator. The generator for the East Glacier Auto Camp was housed in its own building (later converted to employee housing).[546]

Despite the developments at Swiftcurrent and Roes Creek, services at those locations were inadequate to meet the needs of the growing number of motorized visitors.

Figure 189. Campstore building at Rising Sun, as viewed from the Sun Road. 2000 photo.

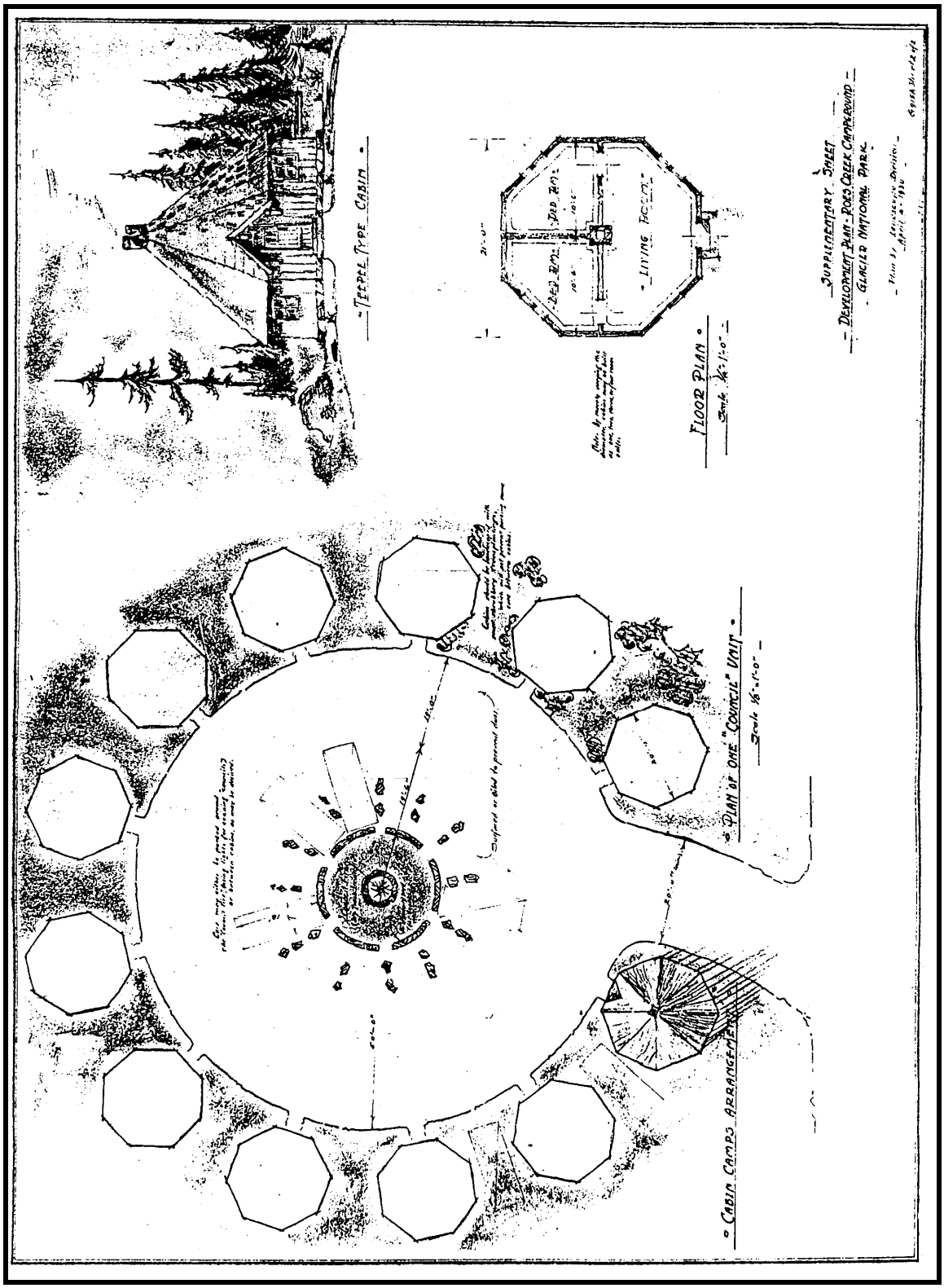

Figure 190. Circa 1930 NPS drawing for a proposed circle of "teepee type cabins" at Roes Creek (Rising Sun).

In August of 1941, Park Superintendent Libbey provided figures showing that 95% of the Park's visitors were arriving by automobile but were forced to leave the Park to find cabin accommodations. Therefore, only months after the opening of the auto camp at Roes Creek, the Park Service suggested the installation of 40 additional rooms at Swiftcurrent and 80 at the East Glacier Auto Camp. However, the Glacier Park Hotel Company noted that such an endeavor would be infeasible considering the lack of available resources associated with the effort being mounted by the nation as it entered the War and the additional units were never constructed.[547]

Figure 191. Guest cabins at Rising Sun, 2001 photo.

Rising Sun – The Modern Era. The onset of World War II and the consequent decline in pleasure travel necessitated the reduction of services provided at Glacier. The Hotel Company facilities were closed during 1942, 43 and 45 with the exception of the East Glacier Auto Cabins which remained open to visitors. In 1946, as the war concluded, visitors returned to the Park. However, in the intervening years the remaining chalets throughout the Park had fallen into disrepair. It was deemed infeasible to rehabilitate them and all but two were removed. This left the auto camp as the only concession on the east side of the Going-to-the-Sun Road.[548] In 1950 the site was renamed Rising Sun in order to avoid confusion when Glacier Park Station (formerly Midvale) was changed to East Glacier.

In the years following World War II, it was clear that automobiles had supplanted rail as the primary means of transportation to the Parks. By 1950, in the Park's 40th season 485,950 people visited the Park, of which only 9,072 arrived by rail and the remaining 465,545 by automobile.[549] The Park Service increasingly focused on the needs of auto travelers in planning for visitor services infrastructure. The developments at Rising Sun were well suited to this popular mode of travel and continued to thrive. In 1956, during the last years of the Great Northern Railway's operation of the Glacier Park Company, two new motel units were built at Rising Sun.

Figure 192. Rising Sun motel building, 2001 photo.

In 1961, the railway ended its 50-year relationship with the National Park Service by selling its interest in the concessions operations to Don Hummel, an Arizona capitalist who owned concession facilities in Lassen and Mt. McKinley National Parks. Hummel operated the business as Glacier Park Incorporated (GPI). Hummel's 20-year tenure at the helm of GPI saw relatively few major changes at most of the concession sites, but two improvements at Rising Sun did receive early attention. A wooden gas station building was added near the south end of the site in 1962, duplicating a contemporary building located at Lake McDonald Lodge. Three years later, GPI erected a new coffee shop building along the south side of the main Rising Sun parking lot. The 1965 coffee shop displays a modern, angular design slightly suggestive of the Logan Pass and St. Mary visitor center buildings, but very different in character from the older buildings at the site. The coffee shop's vertical massing and prominent location were likely chosen to make the building readily visible to Sun Road travelers; while perhaps appropriate from a business standpoint, this effectively negated the historic philosophy of unobtrusive development at the Rising Sun location.[550]

Figure 193. Rising Sun Coffee Shop, 2001 photo.

Rising Sun Today. In the ensuing 40 years, the facilities at Rising Sun have undergone only relatively minor changes. Following the completion of the new coffee shop, the original lobby and dining room areas were converted into additional motel units. In doing so, the fireplace and hearth were removed and the original bathrooms were adapted as public showers with entrances at the rear of the building.[551] The registration building became an employee dormitory and the room reservation desk was moved to the new coffee shop building. The St. Mary Lake boat dock, originally located near the site of Going-to-the-Sun Chalets, was moved to a site across the Sun Road from Rising Sun as part of the Park Service Mission 66 Building Program. A new picnic area was added near the lakeshore, east of the dock The gas station at Rising Sun was removed in 1992 and is currently in use as a pro shop at the East Glacier Lodge golf course.[552] An NPS contractor reconfigured the main parking area and undertook other improvements in 1994-95. The cabins, registration building, and 1956 motel units retain much of their original appearance today, and remain largely hidden from view.

Rising Sun remains a popular destination for motorists traveling on Going-to-the-Sun Road, providing meals, supplies, and showers for campers. It's overnight accommodations are typically full throughout its season of operation, attracting visitors who are seeking convenient, affordable lodging, just as their predecessors were, more than 60 years ago.

Chapter 5: Treatment Recommendations

5.1 Introduction

5.1.1 Background

Viewed as a single entity, the Going-to-the-Sun Road includes a surprising variety of diverse, individual components -- all of which contribute in some way to the overall character of the roadway. The primary component, of course, is the highway alignment itself, with numerous quantifiable characteristics that include location, width, gradient, curvature, and surfacing. Less obvious, but equally important, are the myriad of distinct structural features which help support the road surface, protect the roadway or its users from hazards, or provide drainage to the road structure. The extreme topography through which the Sun Road passes lends these ancillary features an unusual importance, and the historic design philosophies embodied in their construction add significant character to an already unique highway corridor. Collectively -- and often individually -- the historic engineering features of the Going-to-the-Sun Road are primary markers of the Road's historic and engineering significance, as well as its contemporary visual appeal.

This chapter provides descriptive, contemporary summaries of the primary historic feature types found along the Going-to-the-Sun Road corridor. Broad-based treatment recommendations for these feature types are given, as are suggestions for future research and evaluation. The development of appropriate treatment procedures for historically significant resources is an important part of the Park planning process; the information below, based on the background information synthesized in the remainder of this document, is meant to provide the Park with the information necessary to make informed planning decisions on these topics.

5.1.2 Significance and Integrity Issues

Since the historic significance and visual character of the Sun Road is tied both to the roadway itself and the myriad of individual structural features associated with it, it is important that historically-sensitive maintenance and rehabilitation designs and procedures be developed for the variety of historic resource types on the Road. This is true both to aid in the protection of individual historic resources, and to assist in the preservation of the overall historic character of the entire roadway corridor.

Recognizing the need to observe historically appropriate design philosophies throughout the Sun Road's NRHP and NHL districts, it is also important to note that only some of the individual features within the roadway corridor display the *significance* and retain the *integrity* necessary to contribute to the overall significance of the Road. The NRHP nomination for the Sun Road identifies the Road's period of significance as the years 1921-52; individual resources constructed outside that period do not, therefore, contribute to the Road's significance as it is currently established. (Resources constructed after the 1952 cutoff date may later be found NRHP eligible, however, for historic, architectural, or engineering associations that have not yet been documented to National Register standards, such as "Mission 66" development activities in Glacier.)

Road-related resources constructed during the period of significance must also retain integrity in order to contribute to the Road's NRHP significance. The National Register program recognizes seven "aspects" of integrity, including location, design, setting, workmanship, materials, feeling, and association. While a feature does not need to fully retain all seven aspects of integrity to contribute to an NRHP resource, substantial losses of integrity will render a feature non-contributing.

These significance and integrity factors should be considered in the planning for rehabilitation work on the Road. It is important that Road rehabilitation projects emphasize the retention of contributing features, and limit losses of integrity to those features. Conversely, rehabilitation-related changes to resources which are non-contributing or have lost integrity are less likely to degrade the overall historic character of the Road. (Historically-appropriate rehabilitation of some such features may, however, benefit the visual character of the overall roadway corridor.) Finally, it is important to note that the use of the treatment recommendations in this chapter may be limited by engineering or other constraints.

Additional information about significance and integrity evaluations for resources in the GTSR corridor is provided in the "Cultural Landscape Inventory" (CLI) published as Volume 2 of this report. The CLI also contains comprehensive locational mapping of the Road's cultural resources; brief descriptive and historic information for each feature; and evaluations of the integrity and significance of each resource.

5.2 The Roadway Itself

5.2.1 Introduction

Although the historic stonework of the Going-to-the-Sun Road is frequently considered its most important feature, the overall character of the roadway is perhaps more strongly defined by the overall width and alignment of the roadway itself. In particular, the narrow width of the Road – 22 to 24 feet in lower elevations, and as little as 16 feet on the west approach to Logan Pass – is seen as a cardinal characteristic of the historic resource.

Figure 194. The Sun Road near Crystal Point, displaying its characteristic narrow profile. 2000 photo.

In addition to width, other visual characteristics of the roadway exist, as well: location, surfacing, crown, superelevation, and others. In general, though, these qualities are subject to less non-historic variation than roadway width, and were not considered by this report.

5.2.2 Historic Design and Locations

Detailed information on the historic design and width of the Sun Road is provided in Chapter 2 of this document.

5.2.3 Modifications to Historic Designs

Today, portions of the Going-to-the-Sun Road – especially parts of the western Alpine section – still retain their as-built travel width, but many short segments of the road have been widened. Changes have occurred both during and after the historic era, due to planned reconstruction projects, large and small damage repair contracts, and small ad hoc improvement jobs. Although most of these changes have been relatively minor, the result is a roadway that, in places at least, has been widened enough to alter its historic narrow, winding character.

Relatively expansive sections of widened and straightened roadway are most apparent in the Apgar Flats area and along McDonald Creek. Some of these visual changes occurred as early as the mid-1930s, and are therefore considered historic; these include the bypass around Lake McDonald Lodge and the approach alignment to the 1930 West Glacier bridge.

Both of these projects resulted in roadway segments that were less evocative of a National Park Road than of a contemporary, state-funded highway. That design philosophy was continued and expanded in the mid-1960s as the result of two projects: the reconstruction of roadway segments damaged by the 1964 flood, and the reconfiguring of the Apgar Flats segment to accommodate the new Camas Road. While the Camas Road project impacted only a section of roadway that already appeared "modern," the flood repair work saw the noticeable widening of several sections of historic roadway along upper McDonald Creek. (This included segments near Moose Country, Logan Creek, and elsewhere.)

Figure 195. This section of the Sun Road below Road Camp is wider than the historic design. 2000 photo.

Shorter, but equally noticeable changes have taken place on the Alpine section of the road. Although the documentation of these changes is limited, it is apparent that numerous short sections of roadway have been widened as part of paving contracts, guardwall removal projects, and other efforts. Much of the upper roadway that is not bounded by historic guardwall may have been impacted by these projects, although in most cases the amount of widening was not substantial. In some cases, base material for the added roadway width may have come from rockfall that was simply pushed to the downhill side of the road.

5.2.4 Modern Designs and Implementations

In general, the 1990s reconstruction projects on the Sun Road have worked to maintain the Road's historic width, and to eliminate the non-historic width inconsistencies that have been introduced. In general, this has been very successful, although in a few cases excess roadway embankment material remains visible. This is most apparent on the reconstructed section of road between Oberlin Bend and Logan Pass, where a series of large boulders has been placed on the fill material to prevent vehicle parking.

5.2.5 Recommendations

The narrow width of the Going-to-the-Sun Road is a major component of its historic visual character, and it is crucial that this be preserved. In general, recent construction projects along the Road have reflected an appreciation of this fact, and this philosophy should continue during future work. The following specific guidelines are recommended:

- The standard historic roadway widths for the lower and Alpine sections of the Road should be maintained, and no future widening should be allowed;
- Roadway segments that were widened in recent years (such as after the 1964 flood) should be returned to their earlier width during reconstruction;
- Consideration should be given to re-designing the Apgar Flats segment of the Road to produce a visual character more consistent with that of the rest of the Road;
- Consideration should be given to correcting the problem of irregular roadway widths along the Alpine section caused by the paving over of uphill drainage channels;
- All rockfall material should be removed from the roadway corridor, rather than deposited alongside the road. This is especially critical along the Alpine section. Existing areas of such fill material should be removed to the extent that it is technically feasible.
- Layers of built-up asphalt on the Alpine section should be milled away, especially in locations where the asphalt has altered the Road's superelevation or is obscuring an historic guardwall;
- Non-asphalt roadway surfacing should be introduced only when absolutely necessary from an engineering standpoint. Added concrete surfacing should either be topped with asphalt, or should be tinted to reduce visual impact;
- The roadway segment between Oberlin Bend and Logan Pass should be redesigned (through the removal of excess fill material) to allow for the removal of the rows of non-historic barrier stones that now exist there.

5.3 Turnouts

5.3.1 Introduction

As a low-speed roadway designed to introduce travelers to spectacular scenic views, automobile turnouts (pullouts) are among the most important features of the Going-to-the-Sun Road. Historically and today, the road's many turnouts serve at least three unrelated but important functions: as pullouts where visitors may briefly pause to snap a photograph or admire a view; as locations where slow-moving vehicles can stop to allow others to pass; and as parking areas for hikers and others. At many locations, the three functions take place simultaneously.

While roadway designers were undoubtedly aware of all of these needs, relatively few of the road's historic turnouts were formally-designed sites – the Loop, of course, being the most notable exception to this rule. Most turnouts appeared informally, with roadbuilders taking advantage of convenient fill areas or natural landforms. This resulted in a hodgepodge of turnout locations, sizes, and designs, which recent transportation planners are now trying to make more uniform.

5.3.2 Historic Design and Locations

Turnouts – both historic and modern – may be seen along nearly the entire length of the Going-to-the-Sun Road. Only the short Apgar Flats segment of the Road, with it's relatively high-speed design and limited scenic opportunities, is lacking in turnouts. Elsewhere, turnouts appear at nearly constant, but irregular intervals. Along Lake McDonald, numerous small pullouts provide locations for slow-moving vehicles to pull over, while larger pullouts provide parking for those taking a brief stroll to the lakeshore. Along upper McDonald Creek, turnouts are less frequent but larger, and generally coincide with locations offering views of the Creek. The Alpine portion of the Road features the formal observation point at the Loop, large informal pullouts at the Big Bend and Siyeh Bend, and dozens of small observation points. The eastern end of the road also has significantly fewer pullouts than the Alpine section, primarily at locations of scenic importance.

Figure 196. A pullout at Sunrift Gorge, protected by historic ashlar guardwall. 2000 photo.

Almost without exception, the size and configuration of historic pullouts were dictated at least partially by geography. The most common historic location for a turnout was where the Road curved around a projection in the mountainside. Engineers frequently cut into the uphill face to reduce roadway curvature, thus providing space for a pullout in the toe of the former projection. The largest examples of this process are at Dead Horse Point and the Golden Staircase along St. Mary Lake, but the design is most frequent along the Road's Alpine segments. Many of the pullouts along Lake McDonald are of similar origin.

Many of the road's other pullouts appeared over time as a result of maintenance and construction projects along the Road. In a few locations (particularly the Alpine segment), rockfall pushed to the side of the Road gradually created or enlarged turnouts. Elsewhere, small individual turnouts appeared during paving projects or other construction work. Especially on the Alpine section, small turnouts appeared during the process of paving the Road, when former drainage areas were infilled and asphalted.

Figure 197. A small historic pullout on the west side of Logan Pass. 2000 photo.

With the exception of the formal viewing area created at the Loop, improvements at historic turnout locations were minimal. The outer edges of turnouts were bounded by stone guardwalls at those locations where geography demanded it; nearly always, the turnout guardwall is a continuation of the guardwall protecting the adjacent roadway. A small number of historic turnouts (at Siyeh Bend and elsewhere) may have been edged by rows of large, uncut boulders, and log guardrails also saw some use. Elsewhere, only the edge of the roadway berm marked the turnout boundary. Turnouts, initially unpaved, are nearly all now hard-surfaced.

Figure 198. An irregularly-shaped pullout on the western ascent to Logan Pass, bounded with a non-historic placement of barrier rocks. 2000 photo.

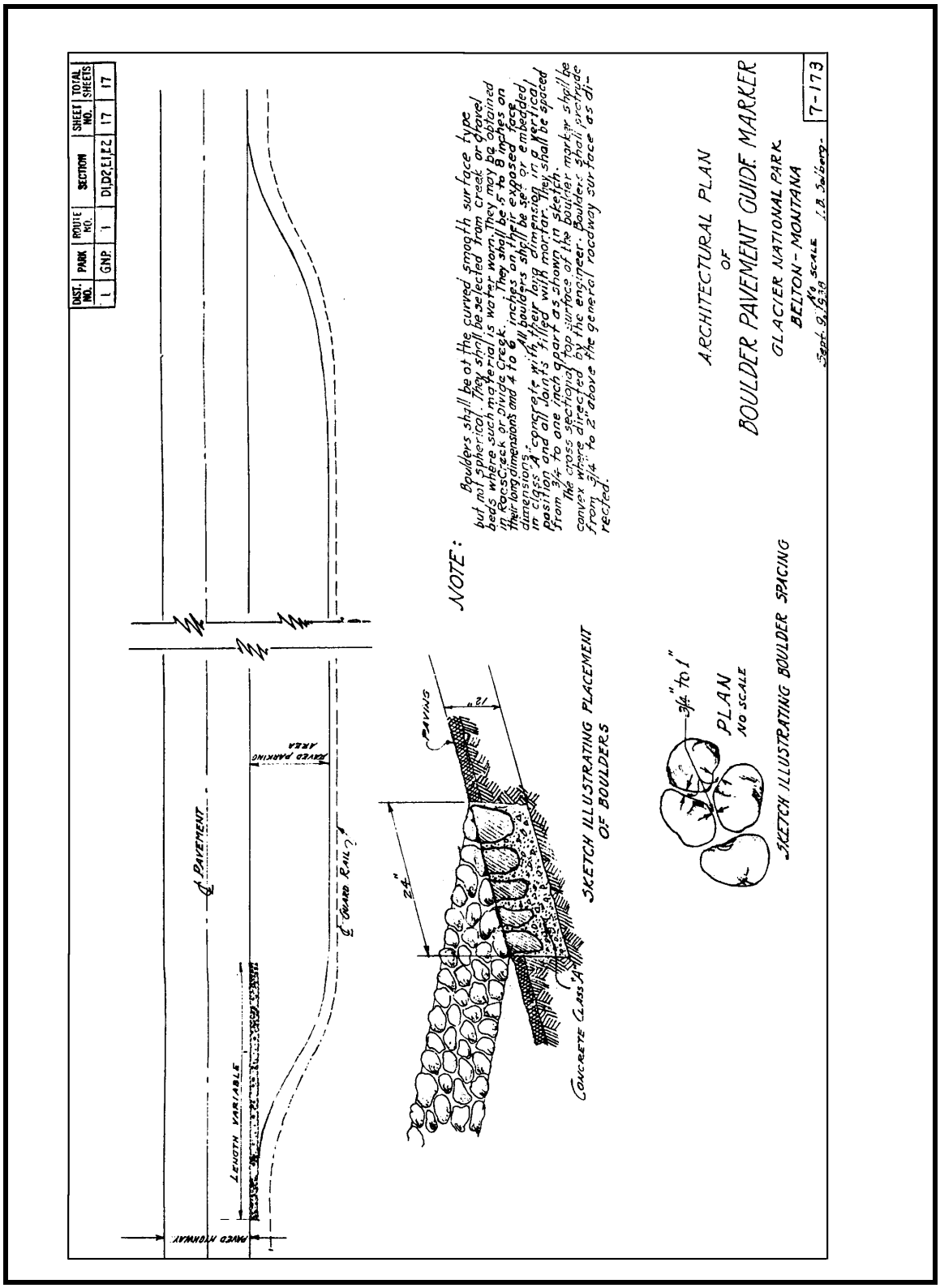

Figure 199. NPS plan (dated 1938) for the use of embedded boulders to delineate turnouts.

Interpretive or informational signs were common at major turnouts, more so than today. Locations such as Dead Horse Point featured place-name signs, and signs at other locations identified distant mountains and other geographic features. Sidewalks and other pedestrian-friendly improvements were absent, as were asphalt surfacing and most traffic control measures. (An historic drawing for strips of embedded stone to delineate turnouts exists, but it is not known whether the design was historically used at Glacier.)

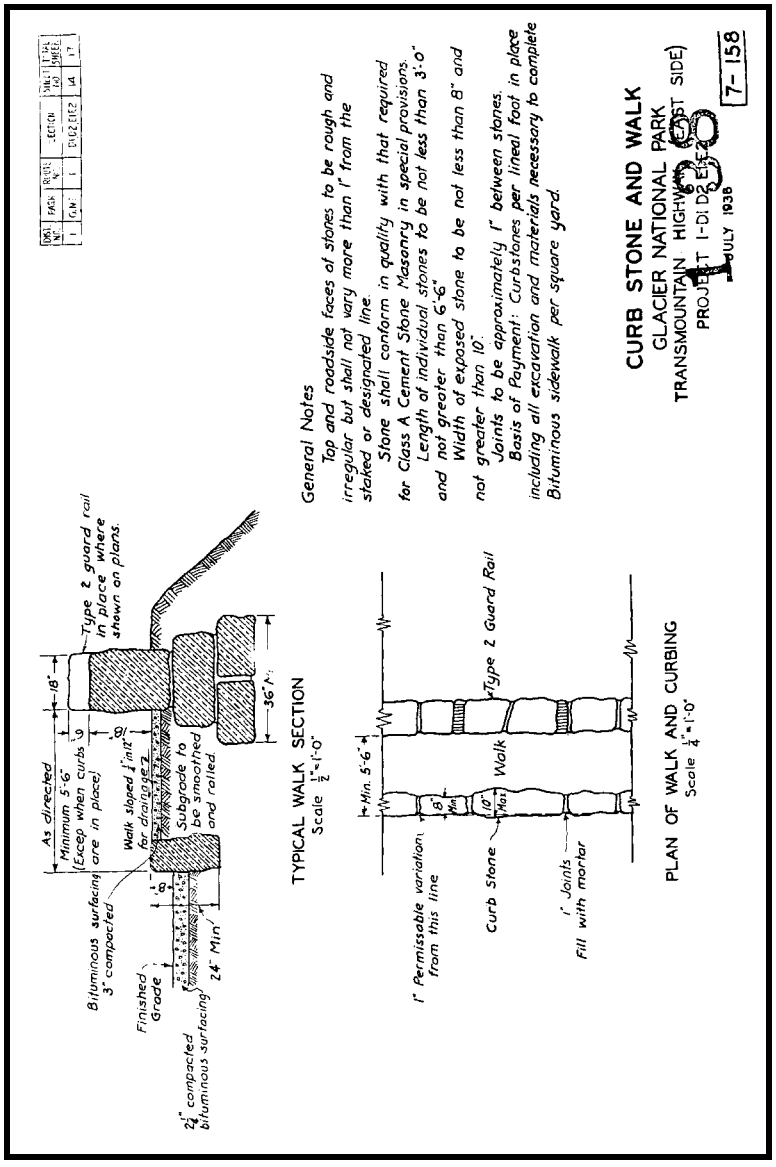

Figure 200. NPS plan (dated 1938) for sidewalks and stone curbing on the Sun Road. This design was probably used at the large parking area at Going-to-the-Sun Point.

5.3.3 Modern Designs and Implementations

As noted in Chapter 2, the major 1990s reconstruction projects along the Sun Road have included the redevelopment of turnouts. Although the designs for these reconstructed turnouts are site-specific, in general the projects have seen a reduction in the overall number of turnouts and physical improvements at the pullouts chosen for retention. Typically, turnouts chosen for removal have been smaller, and/or have limited sight distances for vehicles on the Road.

Figure 201. The reconstructed turnout at Oberlin Bend. 2000 photo.

Improvements on the road's rebuilt turnouts typically include log curb stops in front of sidewalks; pavement striping to delineate parking spaces; and timber guardrails or stone guardwalls to help identify the pullout and visually delineate it. Timber guardrails (based on the historic Type 7 design) have been used along Lake McDonald and McDonald Creek, and are similar to historic styles and usage. The heavy, modern stone walls seen at McDonald Falls, Oberlin Bend, and Two Dog Flats, however, contrast with historic stonework designs.

Figure 202. Rehabilitated pullout area near Lake McDonald. 2001 photo.

5.3.4 Recommendations

In designing turnouts along the Road, the relatively informal nature of the Road's original turnouts should be used as a guide. While reconciling this early appearance with modern traffic and safety needs will inevitably require compromises, the following general guidelines are recommended:

- Historic turnout locations that are bounded by historic guardwalls should be retained;
- In general, turnouts should not be bounded by guardwalls unless the wall is mandated by geography. Careful consideration should be given prior to the addition of modern stone guardwalls to reconfigured turnout sites.
- If turnouts in a particular area are to be removed, priority for removal should go to non-original turnouts created by paving projects or rockfall deposits. If such a turnout is removed, the deposited material at the location should also be removed, and the ground recontoured.
- Locational and interpretive signage should be restored to selected turnout locations;
- Non-historic sidewalks and pathways should be visually unobtrusive, especially from the roadway.

5.4 Guardwalls

5.4.1 Introduction

The stone guardwalls along the Going-to-the-Sun Road are among the most important and visible landscape characteristics of the roadway. Long segments of well-crafted, historic stone guardwall are prominent at several key locations along the lower segments of the Road, and provide a near-constant enhancement to the cultural landscape of much of the Road's Alpine section. In many of these locations, the wall is the most visible and characteristic man-made feature in view, nearly as noteworthy as the roadway itself.

Figure 203. The historic guardwall produced by the Wunderlich contract along upper McDonald Creek represents some of the finest stonework along the Sun Road. 2000 photo.

The historic and modern guardwalls and rails which have bordered the Sun Road have utilized a variety of designs, and an assortment of materials -- stone, log, sawn timber, steel, and concrete. By far the majority of these features, however, were built of native stone during the historic period, and those walls add substantial visual character to the Road. Other historic guardwall and rail types no longer exist along the road; their modern replacements utilize contemporary designs, may include non-historic materials (concrete or steel), and in some cases are incompatible with the historic character of the Road.

5.4.2 Historic Design and Locations

Historic stone guardwalls were constructed along major portions of the Going-to-the-Sun Road, between the head of Lake McDonald and Rising Sun. (No historic guardwalls existed between West Glacier and the McDonald Falls area, or between Rising Sun and St. Mary.) On the lower segments of the Road, guardwalls were installed at locations where the Road was built alongside upper McDonald Creek or St. Mary Lake; these locations are typically intermittent and scattered, interspersed by long sections of unprotected roadway. In contrast, the Alpine roadway featured extensive guardwall construction along much of its length, to protect travelers from the sheer dropoffs beyond the edge of the roadway.

A variety of design standards for stone guardwalls were historically considered for the Going-to-the-Sun Road, and several design styles remain visually apparent today. For the historic walls, it is perhaps most straightforward to categorize them into two broad groups, based on the shape of material used in their construction, as follows:

Figure 204. Random rubble guardwall atop an historic retaining wall near the West Side Tunnel. 2000 photo.

- *Random Rubble* guardwalls were built using stones in a variety of sizes and shapes. The stones may have been shaped prior to use, but were generally not worked into a rectangular shape. In the walls, the stones were placed in seemingly-random arrangements, with the natural plane of the rock running both vertically and horizontally. In many of these walls, the stones are varied in color, and the stones overall are generally smaller than

Figure 205. Random rubble guardwall on the west approach to Logan Pass. 2000 photo.

those found in other walls. Because of the smaller size and irregular placement of the stones, mortared areas are relatively prominent in this type of wall, and longitudinal jointing is common along the upper surface of the wall. This general wall type is referred to as "Type 2" wall in some historic documentation.

C *Ashlar* guardwalls are assembled from stones that are shaped into rectangular blocks, similar to large bricks. Ashlar stones are larger than those used in rubble walls, typically extending the full width of the wall, and there is less overall variation in color. The stones are usually assembled into walls using a rough "running bond" configuration. While mortar is used, it is less visually apparent, and longitudinal jointing is uncommon. These walls are referred to as "Type 2a" wall in some historic materials. Overall, the ashlar wall type is more common.

Figure 206. Ashlar guardwall near Dead Horse Point. 2000 photo.

A unifying visual characteristic of nearly all the Sun Road guardwalls is the presence of battlements (or "castellations"). These regularly-spaced projections add significant visual character to the wall, providing a sense of rhythm to the stonework. Battlements on the ashlar walls are typically rectangular, while those on the rubble walls are usually "canted" (with angled sides). Battlements on the rubble walls are smaller and more closely spaced than those on the ashlar walls. A further characteristic is the use of large, full-height "bookend" stones at the ends of a wall segment.

Figure 207. The parking area at Sun Point is delineated by well-crafted ashlar guardwall. 2000 photo.

Locally quarried or collected stone was used for the construction of historic guardwalls. In some cases, stone was acquired from a source immediately adjacent to the wall; this is visually evident at locations such as The Golden Stairs and Dead Horse Point. Elsewhere, rock was quarried or salvaged from one Sun Road construction site for use in wall construction at another location along the road. This practice was common during the construction of walls on the west approach to Logan Pass. In particular, the cliff face at Bird Woman Falls overlook (just east of Road Camp) was the source of a large amount of building material for the walls.

The western approach to Logan Pass features the largest concentration of guardwalls, and the walls which are perhaps best-remembered by travelers. Most of the historic walls in this area were built as part of two construction and improvement contracts in the 1920s and 1930s. The Williams & Douglas contract (1925-28) saw the construction of most of the random rubble walls on the western approach to the pass. These walls, often displaying exceptional craftsmanship, were the first to be constructed on the road. They are often atop historic stone retaining walls, and appear integral to those walls. The historic ashlar walls which intersperse the Williams & Douglas walls were constructed during the Yonlick contract (1934-36).

Most of the historic walls elsewhere on the road were built during the early to mid-1930s during road construction or improvement projects. Some of these walls display visual characteristics of both the primary types described above. Walls built along McDonald Creek during the Wunderlich contract (1936-37), for example, display the irregular shaping

of the Road's rubble walls, but have size and width characteristics common to the ashlar design. The Wunderlich walls are among the most outstanding examples of wall construction along the road; in addition, many of the other lower-elevation walls are also of unusually high quality.

5.4.3 Modifications to Historic Designs

Most of the lower-elevation guardwalls on the Sun Road survive today, wholly unaltered. In contrast, many of the wall segments on the road's Alpine section have suffered significant damage from rockfall, avalanches, slides, and other environmental factors. Snow removal activities, and inadequate and inappropriate maintenance practices over the years have also resulted in damage and decay to these walls.

Damage to the Road's alpine walls began to be apparent soon after the construction of the Road, and the damage has been ongoing and almost continual ever since. In response, over the years the Park Service has instigated numerous repair and replacement projects for the historic walls. Until recent years, however, few of these projects have displayed either the level of craftsmanship or design sensitivity that characterized original wall construction.

Figure 208. Reconstructed stone guardwall east of Logan Pass, damaged by ground movement below. 2001 photo.

In addition to a lowered level of craftsmanship, the introduction of non-native stone has affected the design integrity of the walls. Non-native stone has been utilized in wall repair since the 1950s; and most of it differs in color, texture, and often size from the native used historically. The most evident example of this practice took place in the early 1950s, when the Morrison Kundson Company imported ashlar granite blocks from Minnesota for use in Sun Road guardwall construction.

Figure 209. Stone guardwall below Oberlin Bend, reconstructed (probably in the 1970s) with non-native stone. Note the visual differences between this wall and the historic designs illustrated above. 2001 photo.

Figure 210. Reconstructed stone wall below Logan Pass. Contrast the design and workmanship of this wall with those of historic construction, 2001 Photo.

Other design changes in some guardwalls that were repaired or reconstructed between the 1950s and 1980s included the removal of some stone castellations, and the installation of concrete footings beneath segments of stone wall. The use of such a footing can greatly enhance the stability and potential longevity of a stone guardwall, but a footing design which leaves exposed concrete visible significantly detracts from the wall's overall appearance.

Figure 211. Reconstructed stone guardwall on the west approach to Logan Pass, displaying an exposed concrete foot and non-historic mortar work. 2001 photo.

5.4.4 Modern Designs and Implementations

A variety of modern designs for replacement guardwalls have been employed along the Alpine segment of the Going-to-the-Sun Road since the 1960s. While the appearance of these designs varies greatly, none are compatible with the historic design characteristics of the roadway. In brief, the following modern guardwall and guardrail designs are present:

- *Stone-veneered concrete guardwalls* have been used on the Road for at least three decades, and are common on the upper western approach to Logan Pass. Some of these guardwall segments were constructed as part of larger projects that also included the installation of modern concrete retaining walls. Many of these walls are without castellations. The stone veneer of these walls is almost always non-native material, and is usually flagstone rubble of inappropriate size, shape, and placement. Many of these walls include exposed concrete footings that are not veneered.

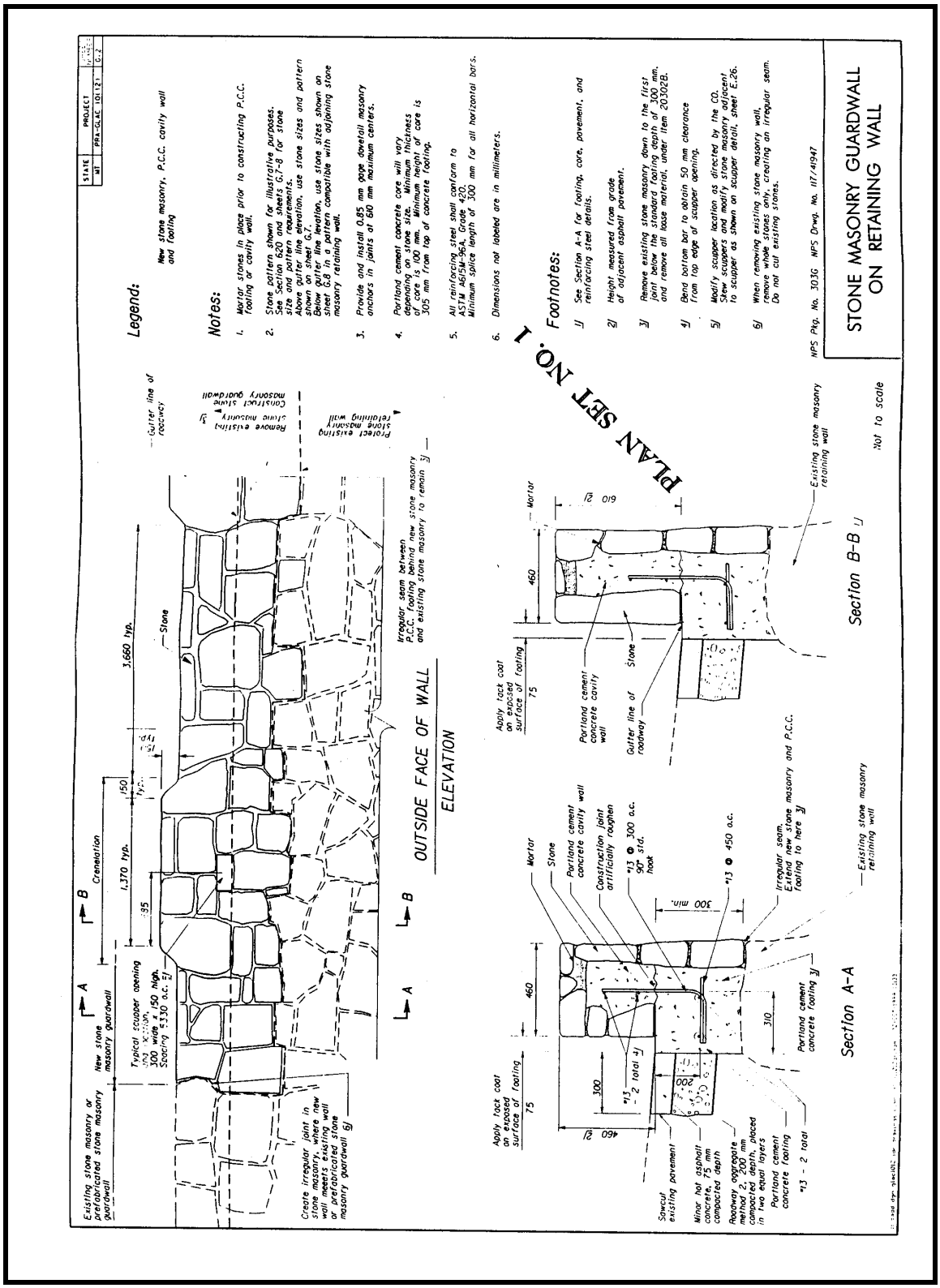

Figure 212. Modern NPS specifications for a concrete-stem stone guardwall atop a stone retaining wall.

In addition to the visual difficulties caused by the use of inappropriate stone material and its incorrect placement, some of these walls include large surfaces that have never been veneered at all. On some wall construction projects, only the inner and upper faces of the concrete were intended to be veneered, leaving the outer concrete face permanently exposed. Other projects were intended to be fully veneered, but the work was never completed. These exposed concrete guardwall surfaces are often found in association with modern concrete retaining walls, and together they are a very significant visual distraction. The modern, exposed concrete near Haystack Creek, for example, can be clearly seen from the McDonald Creek area of the road, several miles away.

In general, these visually-incompatible projects date from the 1960s through the 1980s; more recent efforts have generally shown a far greater sensitivity towards historic design philosophies. Since 2000, some projects have utilized a new concrete-stem guardwall design that is intended to be avalanche-resistant. This design is much more visually compatible with the historic walls than most other non-historic repair attempts.

Figure 213. Concrete-stem guardwall under construction west of Logan Pass, October 2000.

- *Removable guardrail* has also been used on the western approach to Logan Pass for decades; the current design dates from the 1960s. This modern guardrail utilizes ten-foot lengths of timber rail supported by pairs of I-beam verticals. The verticals are pinned or bolted into a cast concrete footing/curb. The timbers are square with chamfered corners, and are painted green. This design allows for the rails to be removed from the road in the winter, thus protecting them from potential avalanche damage. (Much of this rail actually remains in place year-round, however.) The modern removable is not visually compatible with historic designs for the road; this visual incompatibility is particularly evident in locations where such rail has been installed atop historic stone guardwalls.

Figure 214. Modern removable guardrail on the west approach to Logan Pass. 2001 photo.

Log guardrail was used on the Sun Road during the historic period. The historic design ("Type 7" rail) featured brown-painted round logs supported by timber verticals; while no original examples of this rail survive, the rehabilitation projects undertaken in the 1990s reintroduced this type of rail to the Road corridor.

Figure 215. Modern type 7 guardrail installation near the head of Lake McDonald. 2001 photo.

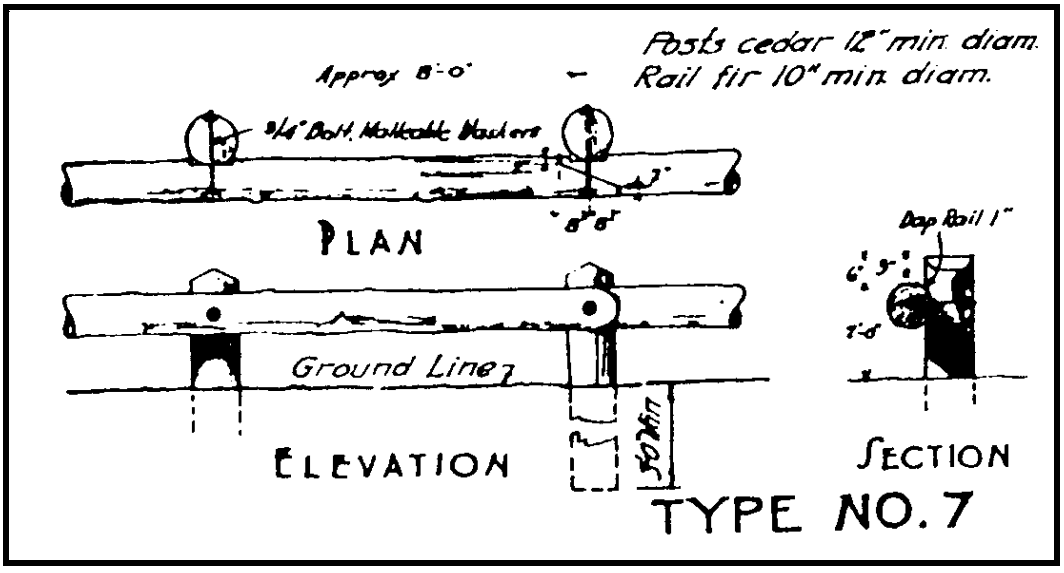

Figure 216. Historic NPS plan for "Type 7" log guardrail, as used in Glacier.

- *Concrete "Jersey Barriers"* are lengths of precast concrete barricades of the type used on Interstate Highways and at construction sites. Intended for use as temporary protection at locations where former guardwalls have been destroyed, a number of Sun Road locations have utilized Jersey barriers for several years now. These barriers detract from the historic character of the Road and should only be used on a limited, temporary basis.

5.4.5 Recommendations

The historic stone guardwalls are one of the hallmarks of the Going-to-the-Sun Road, and their preservation should be ensured. In addition, it is important to develop and implement appropriate designs for replacement guardwall and guardrail. While the development of specific guardwall designs is beyond the scope of this report, the following specifications are recommended:

- The road should retain a mixture of ashlar and random rubble walls;
- When possible, stone guardwall should be restored to locations which originally had such guardwall;
- Guardwalls which are atop historic retaining walls should be designed to match the retaining wall (virtually all of these guardwalls were historically random rubble);
- When feasible, stone used in future wall construction should be collected from local (in-park) sources, and should match (in color and geology) the stone originally used at that location;
- No visible concrete should be allowed;
- Both historic design specifications (such as the use of castellations) and unwritten historic design philosophies (qualities such as texture, curvature, and rock sizing) should be used as guidance for wall construction and repair projects;
- When repointing, or in new designs, the historic mortar should be duplicated in strength, composition, color, texture, and tooling;
- The use of removable guardrail should be limited. Removable guardrail should be constructed of round-log timbers, with no visible concrete or steel members;
- Careful consideration should be given before adding a wall to a location that did not historically have a wall, or to introducing stone guardwalls at locations where they are not needed for safety or engineering reasons.

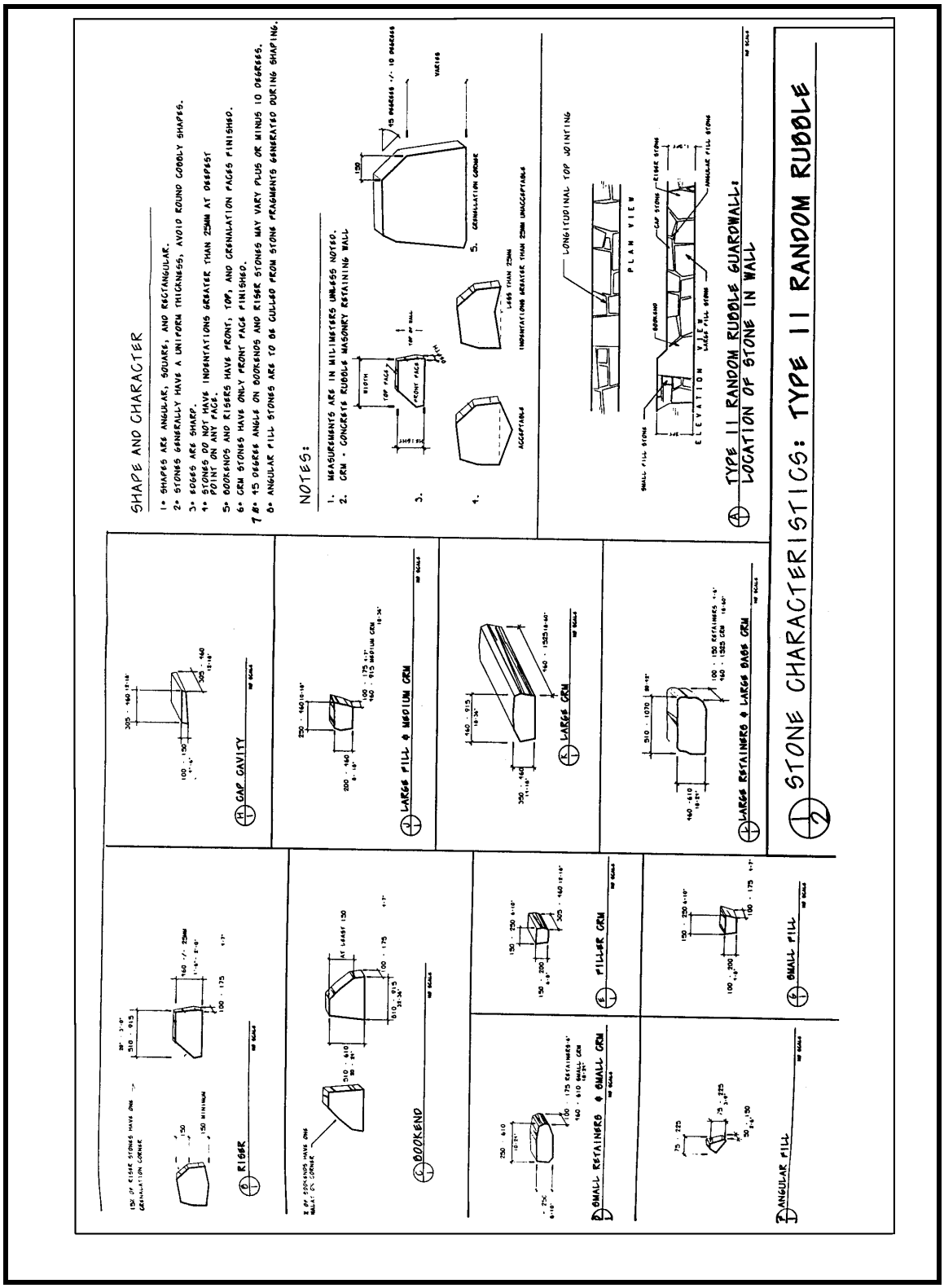

Figure 217. Contemporary NPS stone specifications for random rubble (Type II) guardwall.

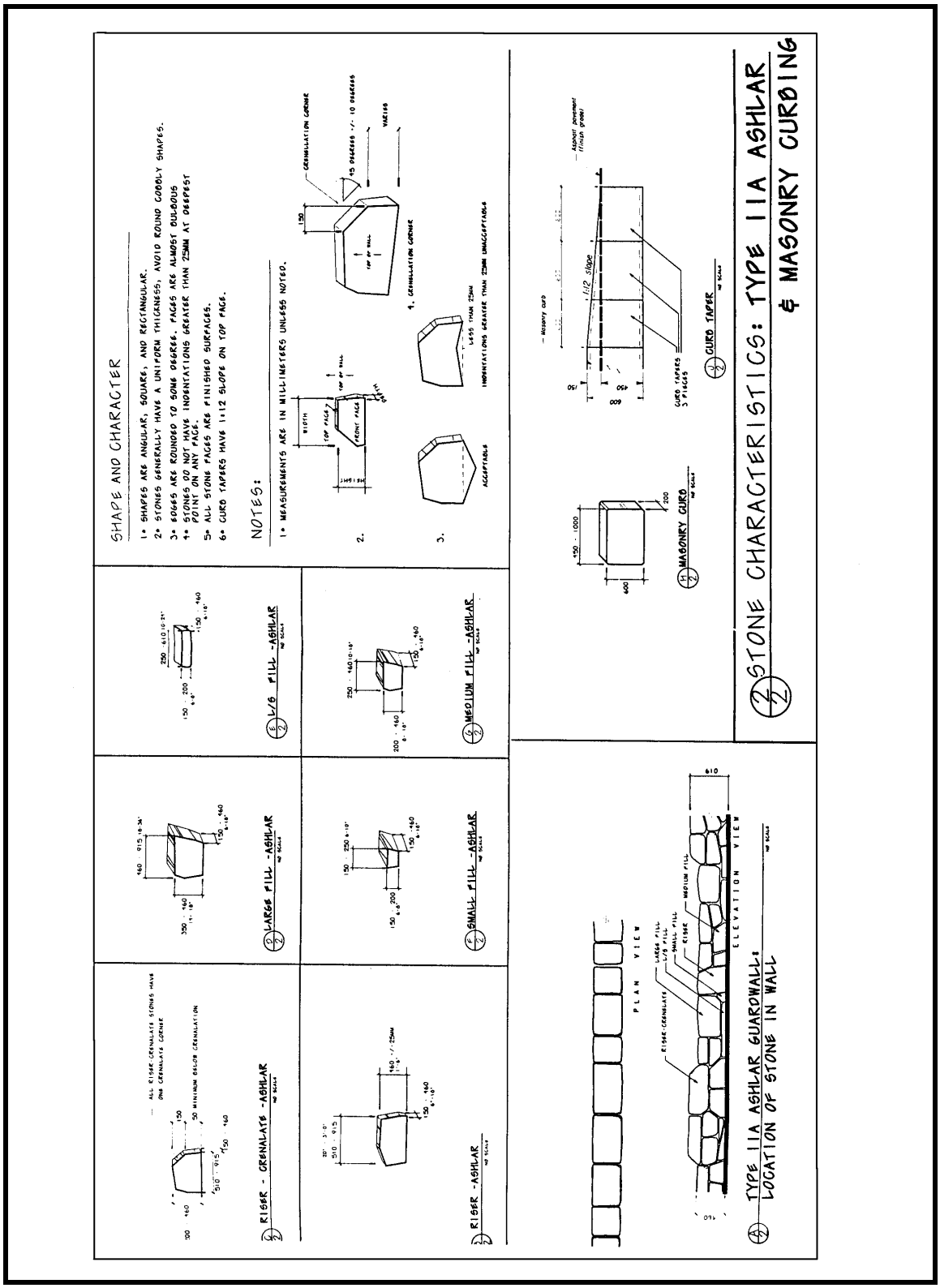

Figure 218. Contemporary NPS stone specifications for ashlar (Type IIA) guardwall.

5.5 Retaining Walls

5.5.1 Introduction

The Going-to-the-Sun Road's stone retaining walls are essential to the survival of the roadway, but the design and visual character of many of the walls also strongly contributes to the historic significance and visual character of the road as a whole. Especially on the western approach to Logan Pass, many of the retaining walls are highly visible to motorists, and their well-crafted "organic" appearance adds greatly to the road's travel experience. Most of the retaining walls were historically incorporated with matching stone guardwalls, and many feature extremely well-crafted arches and other attractive design elements.

All of the historic retaining walls on the Sun Road were constructed of stone, and – unlike the guardwalls – most share at least a basic commonality of design. Most of the road's modern retaining walls, in contrast, are of concrete; some, but not all of these walls have a flagstone veneer. These modern walls are not compatible with the historic characteristics of the Road, due both to their design and level of craftsmanship.

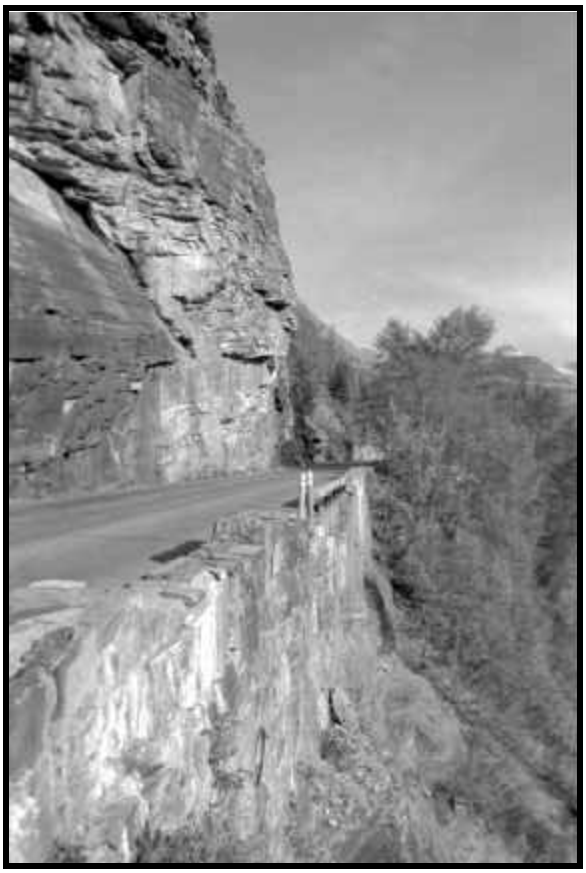

Figure 219. A stone retaining wall near Crystal Point, showing the effects of slide damage and incompatible modern repair. 2000 photo.

5.5.2 Historic Design and Locations

As with the stone guardwalls on the Going-to-the-Sun Road, the placement of historic stone retaining walls was mandated by topography. Most were constructed along the approaches to Logan Pass, particularly between McDonald Creek and the Pass. A smaller number of retaining walls exist along upper McDonald Creek and St. Mary Lake, but no walls are present between West Glacier and the McDonald Falls area, or between Rising Sun and St. Mary. For most of the length of the Road, retaining wall locations are intermittent and scattered. Construction of the western approach to Logan Pass, however, required very extensive retaining wall construction; by far the greatest number of retaining walls exists in that section.

Two general types of retaining walls exist on the Sun Road:

Figure 220. The retaining wall at Crystal Point, with its well-crafted stone-arch detailing. 2000 photo.

- *Mortared stone retaining walls* are by far the most common, and all of the readily-visible historic walls on the road are of this type. These walls are constructed of rubblestone boulders, some of which are minimally shaped. The rocks are generally larger than those used for random-rubble guardwalls and typically exhibit at least some uniformity in color. Locally-gathered stone was nearly always used. The outer face of the wall is nearly vertical, although the inner face (hidden beneath the road) is typically battered. most of the walls are curved.

  A number of these walls feature subtle yet well-crafted arched openings as decorative elements. The smallest of these openings shelter recessed culvert outlets; larger ones are half-bridges over watercourses or in locations of difficult geology. The "Triple Arches" is the most famous and visible of these locations; most are far less prominent. Nearly all, however, display exceptional craftsmanship, and are important additions to the visual character of the Road.

- *Dry-stack retaining walls* are far less common, and none are visible to the casual motorist. They are assembled of large, unworked boulders, generally in a roughly-coursed placement. The walls have a visible exterior batter. The largest of these walls is the large curved structure supporting the roadway at the Loop. Smaller walls, most of which are straight, exist near the Weeping Wall and elsewhere. Decades of rockfall and vegetation growth have made some of these walls hard to spot.

Figure 221. Historic random rubble guardwall tops the massive dry stack retaining wall at The Loop. 2000 photo.

Most of the walls on the western ascent to Logan Pass were constructed between 1925 and 1928 as part of the Williams & Douglas contract. The other walls on the Road were generally built during the early to mid-1930s, by a variety of contractors.

5.5.3 Modifications to Historic Designs

Nearly all of the historic retaining walls on the Sun Road have survived the decades remarkably well, and continue to display a very high level of historic integrity. All of the walls in the non-Alpine portions of the Road fall into this category. A relatively small number of Alpine-section walls have seen modern concrete reinforcement, and concrete grout was recently injected into the wall at the Loop to improve its stability. One small historic wall (near the West Side Tunnel) was rebuilt (using Minnesota granite) during the Morrison-Knudson contract of the early 1950s.

5.5.4 Modern Designs and Implementations

A small number of historic stone retaining walls on the west side of Logan Pass have been partially or wholly replaced by concrete walls; most of this work has taken place since the 1970s. The overall appearance of these walls varies. A few smaller projects resulted in a new wall that was very near the historic wall location, and was surfaced with a subtle stone veneer, and these walls are almost unnoticeable today. Most of the modern concrete walls, however – including all of the major ones – are of contemporary designs that do not reflect the Sun Road's historic character. These incompatible walls typically project outward from the original wall location – effectively changing the roadway width -- and display a harsh, angular massing that starkly contrasts with the gently-curving designs of the historic stonework.

Most of these modern walls have no stone veneer, or display only a partial flagstone veneer. (In at least two cases, partially-completed NPS veneer projects have lain abandoned for close to a decade.) Those walls that are veneered are typically clad with poorly-placed non-native stone. Exposed concrete footers are often visible at the base of the veneer. The overall

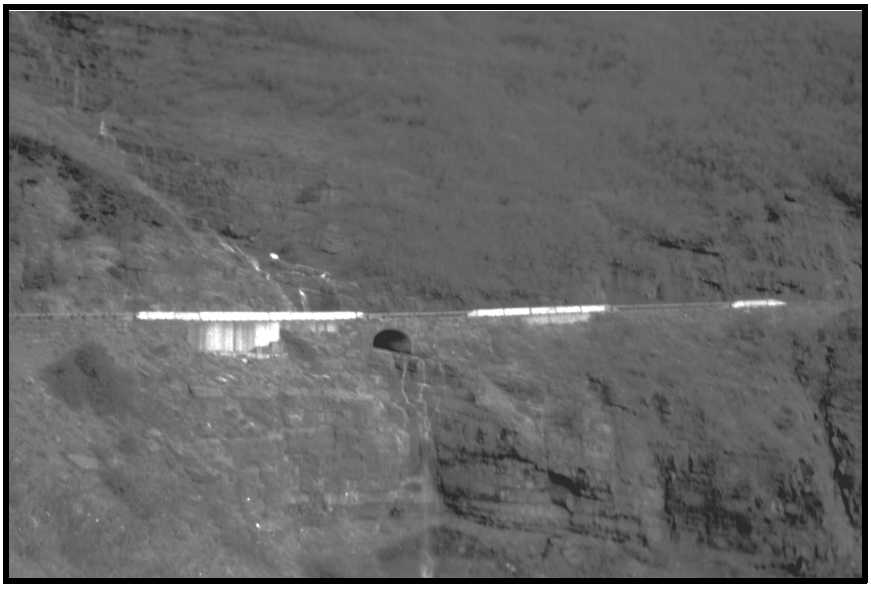

Figure 222. Modern exposed concrete retaining walls at Haystack Creek. 2000 photo.

Figure 223. Modern concrete retaining wall near Triple Arches, with partially-complete stone veneer. 2001 photo.

appearance of these walls is poor, and the addition of a full stone veneer would only partially ameliorate the problem. It is particularly unfortunate that the two worst examples of this situation are at two of the most spectacular and highly-visible locations on the Road – at the Triple Arches and the upper crossing of Haystack Creek. (The historic stone wall reportedly survives intact behind the new concrete wall at Triple Arches.)

5.5.5 Recommendations

As with the historic guardwalls on the Sun Road, it is vital that the Road's remaining historic walls be preserved in place. Additionally, a plan for improving the appearance of the currently-existing concrete walls should be prepared and implemented. The ideal historic solution for those walls would be to plan for their eventual removal and replacement with reconstructed stonework. (Hidden concrete reinforcement could be provided behind the reconstructed stonework if necessary.) In situations where this is not practical, covering the concrete walls with replacement stone veneer, designed for visual compatibility with historic walls, may be an appropriate alternative. If technologically feasible, consideration should be given to removing the modern concrete retaining wall below Triple Arches, and rehabilitating the historic wall beneath.

The following additional specifications are recommended:

- Stone used in future retaining wall construction should be collected from local (in-park) sources, and should match (in color and geology) the stone originally used at that location;
- No exposed concrete should be used. Existing concrete footings should be removed or covered;

- Both historic design specifications (such as the use of castellations) and unwritten historic design philosophies (qualities such as texture, curvature, and rock sizing) should be used as a guide when designing new walls;
- When repointing, or in new designs, the historic mortar should be duplicated in strength, composition, color, texture, and tooling.

5.6 Tunnels

5.6.1 Introduction

There are two tunnels along the Going-to-the-Sun Road; both are historic structures that have undergone significant modernization. The West Side Tunnel is near the western base of the Logan Pass grade, while the longer East Side Tunnel is relatively high on the eastern ascent of the Pass. Both were designed and built as part of the original road construction process, and both are considered historically significant engineering features on the Road. The West Side Tunnel (opened in 1926) is especially noteworthy, due to the two observation galleries contained in the bore. The East Side Tunnel, one of the last major projects completed prior to the opening of the Road, was finished in 1931.

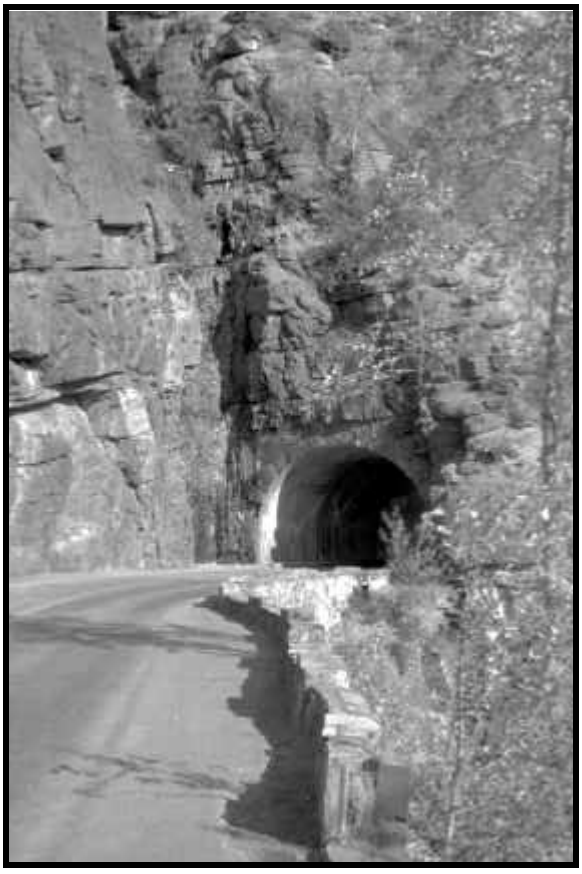

Figure 224. Upper portal of the West Side Tunnel. 2000 photo.

5.6.2 Historic Design

Both the East Side and West Side Tunnels were originally designed with a sensitive eye towards the rustic and natural design philosophies embodied in the entire Going-to-the-Sun Road. The original tunnels were unlined, and were asymmetrical in cross-section. Portals were similarly unadorned.

The East Side Tunnel was constructed on a tangent, and was designed without intentional ornamentation. In contrast, the West Side Tunnel displayed a unique configuration that clearly reflected "scenic parkway" design philosophies of the era. The tunnel bore was curved (not out of necessity), and displayed an irregular cross-

section that was large enough for only a single lane of traffic. Two observation galleries were also blasted in the cliff face through which the tunnel passed, providing those using the tunnel with spectacular views of Heavens Peak. When built, the West tunnel was perhaps the most significant engineering structure on the Sun Road.

In addition to the two "true" tunnels on the Sun Road, the route's original engineers envisioned the creation of a number of "half tunnel" sections along the Alpine section of the roadway. The Sun Road's half tunnels were planned for locations where the road was to be blasted into high faces of relatively solid rock; in such locations, rock faces would be allowed to overhang the roadway surface to a degree. Not all of these intended half-tunnel sections actually appeared in the completed roadway, but clearly-visible half-tunnel locations remain evident today in the Crystal Point area of the Alpine section.

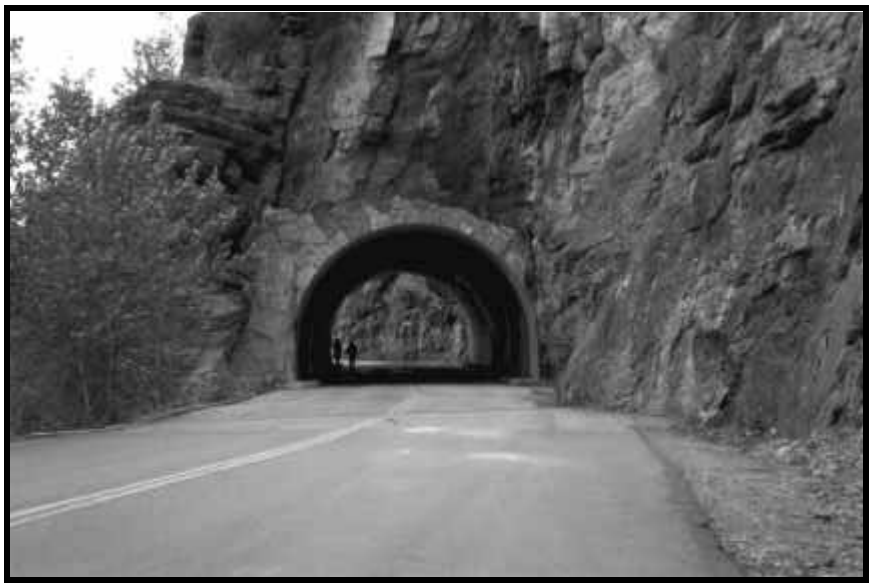

Figure 225. West Side Tunnel. 2001 photo.

5.6.3 Modifications to Historic Designs

Both the East Side and West Side Tunnels have seen significant modification since their construction. The East Side Tunnel was enlarged somewhat and lined with concrete in 1941-42; this project also provided new stone-and-concrete portals for the tunnel. These changes somewhat diminished the overall visual character of the tunnel, but the design and construction of the new portals reflected a sensitivity both to the natural environment and the design philosophies of the Road.

The West Side Tunnel has been far more heavily altered. During the winter of 1966-67, the tunnel bore was significantly enlarged, given a symmetrical section, and converted to a tangent. The tunnel was fully lined with concrete, and new concrete portals (with flagstone veneer) were added. These changes cost the tunnel much of its original period character. The portals are of a non-historic design, and exposed concrete is visible beyond the lining of the tunnel (from the observation galleries, for example).

5.6.4 Recommendations

Future repair or rehabilitation work on the West Side Tunnel should specify the refacing of the portals with stonework placed in a more historically-appropriate pattern. The overall design philosophies embodied in the East Side Tunnel portals could be used as a guide in this work. Areas of exposed concrete beyond the tunnel lining should be obscured with native stone.

Figure 226. Western portal of the East Side Tunnel. 2001 photo.

5.7 Bridges

5.7.1 Introduction

In its 50-mile route, the Sun Road crosses literally hundreds of watercourses, both permanent and ephemeral. Historic and modern highway engineers have implemented a surprising variety of structural designs to carry water beneath the road, including a large number of culverts and a smaller but far more diverse assortment of bridges. The structural and engineering distinction between these two types of structures is often ambiguous; in this document, a "culvert" is defined as a small-diameter precast or manufactured structure, usually of concrete or metal. A "bridge" is a larger structure, assembled or constructed on site, and with structurally-distinct abutments and decking.

The bridges on the Sun Road are concentrated on the lower sections of the route, between West Glacier and Logan Creek, and between Baring Creek and St. Mary. All of the Road's major bridges were custom-designed for their site, but most share a series of basic design characteristics: concrete floor system, stone abutments, stone-veneered portals, and a stone balustrade or guardrail. Little if any exposed concrete is visible, and the stonework is generally of very high quality. These qualities make most of the Sun Road bridges strong contributing resources in the overall designed landscape of the Road.

5.7.2 Historic Design and Locations

The existing historic bridges on the Going-to-the-Sun Road were all built between the mid-1920s and late 1930s. A few of these structures – such as the Logan Creek and Baring Creek spans – were the original bridges at there locations; other bridges were constructed as part of early road improvement projects to replace temporary spans. All bridges were built by the holders of large Sun Road construction/reconstruction contracts, or subcontractors working for them. Historic bridges of two primary design types are found on the Sun Road:

- *Concrete slab bridges* are the more common type, and are used for smaller-span structures. On the Sun Road, these bridges include a decking system supported by a flat concrete floor. Abutments and piers may be concrete, mortared stone, or a combination of concrete and stone. The stonework used in the abutments is typically extended along the sides of the bridge to serve as a veneer for the concrete floor system, and these veneers also extend upward to form guardrails for the roadway. On some bridges (such as Avalanche Creek) this stonework is relatively simple, and some concrete structural members remain visible on the side elevations of the structure. Other bridges (such as Snyder Creek) feature more elaborate and carefully-detailed stonework. On these

bridges, the stone veneer at the stream portal openings is usually arched, completely hiding the concrete decking and giving the visual impression of a stone-arch bridge. All bridges have an asphalt deck. Sidewalks, when present, are separated from the roadway by a curb of ashlar stone.

Figure 227. The concrete slab bridge at Divide Creek. 2000 photo.

Figure 228. Logan Creek Bridge. 2000 photo.

Figure 229. Highway bridge across Snyder Creek, near Lake McDonald Lodge. 2000 photo.

- *Concrete arch bridges* were historically utilized for longer-span structures, and are found at two locations on the current roadway: Baring Creek and St. Mary River. Both bridges utilize a filled-spandrel concrete flooring and deck system, with stone or stone-veneered abutments and piers. Stream portals are fully veneered with stone, and other characteristics are similar to the Road's concrete slab structures. These two bridges are high-quality examples of bridge engineering, display outstanding craftsmanship, and are among the Road's finest representations of period NPS design philosophy.

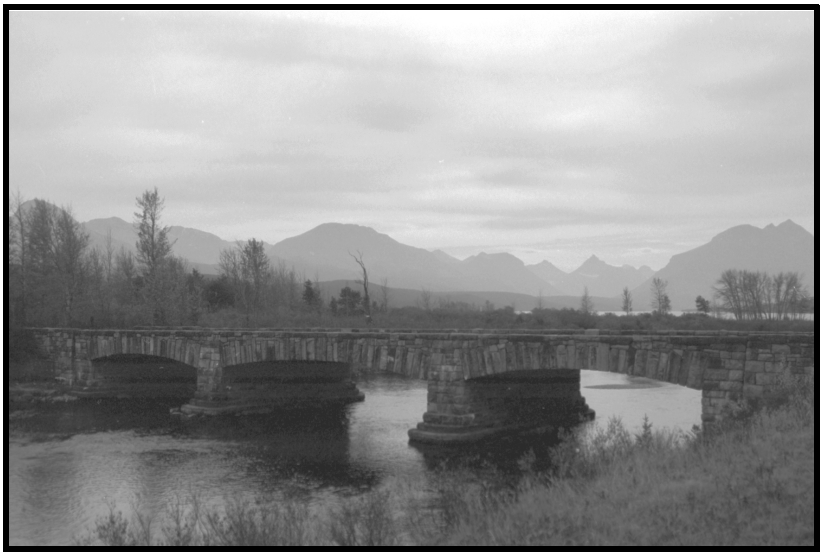

Figure 230. St. Mary River Bridge. 2000 photo.

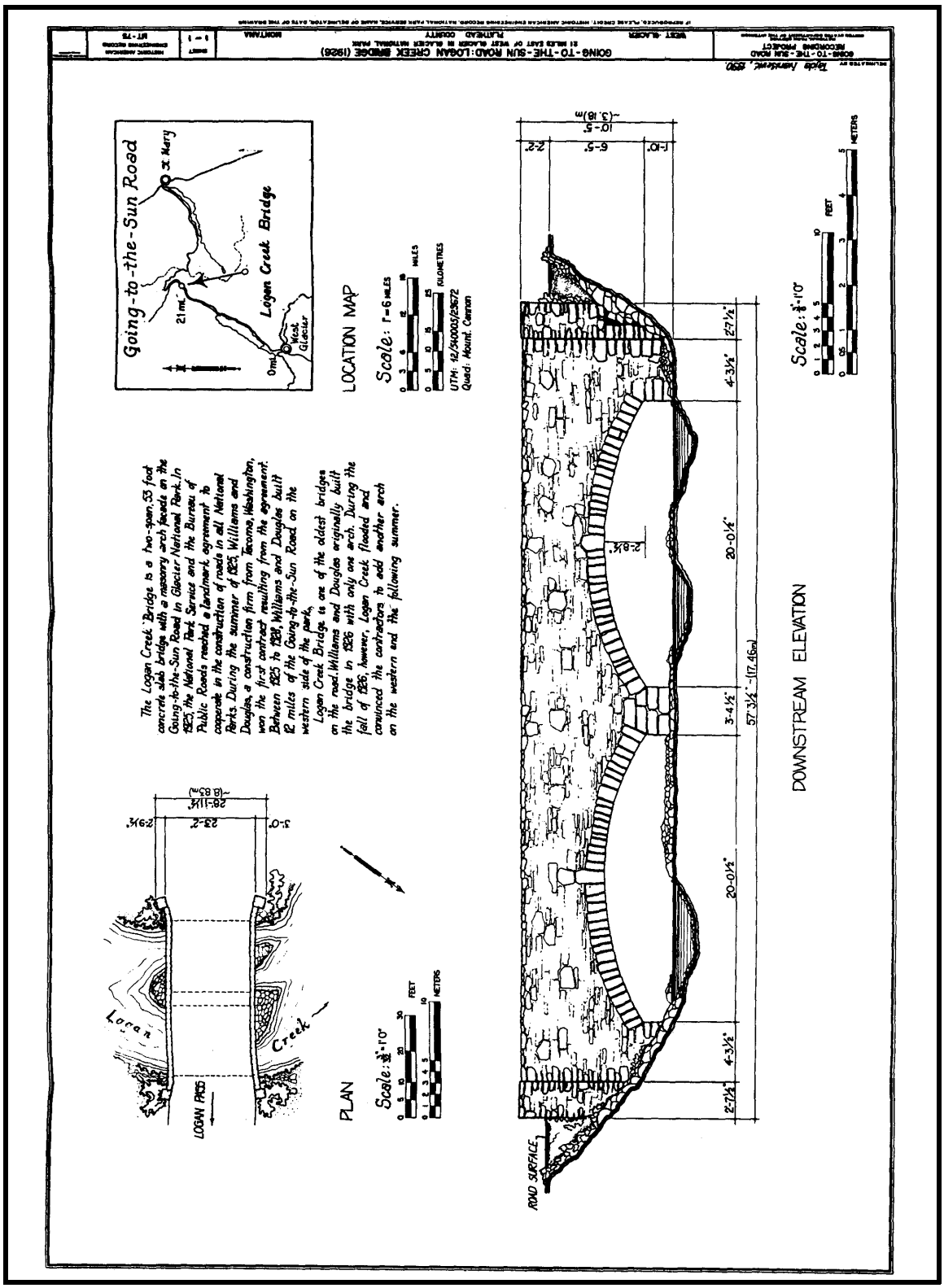

Figure 231. Historic American Engineering Record elevation drawing of the Logan Creek Bridge. Note the darefully-outlined and well-detailed segmental-arch stonework at the span portals.

Figure 232. Baring Creek Bridge. 2000 photo.

One other historic bridge formerly used by the Sun Road survives today as a pedestrian structure. The Belton Bridge near West Glacier was constructed by the NPS in 1920 over the Middle Fork of the Flathead River. As built, this was a filled-spandrel concrete-arch bridge, displaying limited classical (rather than rustic) detailing. Bypassed by a 1930s realignment of the Sun Road, much of the bridge superstructure was destroyed during the 1964 flood. The arch itself remained, however, and a new timber-trestle superstructure was placed atop the arch that year to allow temporary use of the bridge that summer. Today, this hybrid bridge is significant both for its early Sun Road associations and as a reminder of Glacier's 1964 flooding.

5.7.3 Modifications to Historic Designs

As a group, the surviving historic bridges on the Sun Road display an outstanding level of historic integrity. No significant repairs or alterations are visible on any of the structures. Some structural work has taken place, however, including drainage and masonry repairs to the Baring Creek Bridge, which were completed during 2000 and 2001.

5.7.4 Modern Designs and Implementations

Two non-historic bridges exist in the Sun Road corridor, both constructed to replace structures destroyed by the June 1964 floods. The Roes Creek Bridge near Rising Sun is a concrete slab bridge with concrete abutments. A concrete sidewalk and modern metal guardrails are present, but there is no stone detailing. The bridge is not reflective of the historic visual character of the Sun Road. At West Glacier, the bridge spanning the Middle Fork of the Flathead River is a large steel structure, also with metal railings and concrete sidewalks. The Middle Fork bridge is outside the current GTSR National Register boundaries, and the bridge is not wholly within Glacier National Park.

5.7.5 Recommendations

The surviving historic bridges on the Sun Road are important resources which contribute to the historic character and significance of the roadway as a whole. As such, these structures should be preserved without visible future modification.

Both the Middle Fork and Roes Creek bridges are less than fifty years old, and their National Register significance has not been evaluated. Their National Register status should be determined prior to the beginning of any undertaking which would effect the structures, or when the bridges meet the National Register's fifty-year age threshold. (Both bridges may be significant as examples of a design type, or for their association with the 1964 flood and its aftermath.) If the Roes Creek bridge is found not to be NRHP-eligible and should require major repair or replacement, consideration should be giving to using a stone-veneered structure more in keeping with the historic design philosophy of the Road.

The Belton Bridge is a significant historic resource in need of structural rehabilitation or restoration. (Initial work – on the abutments – was undertaken in 2001 and 2002.) In planning for future work on this structure, the Park should determine whether the bridge should be restored to its 1920 appearance, or rehabilitated to its 1964 appearance. Future work on the bridge should be geared towards replicating one of those two significant dates.

5.8 Culverts/Drainage Features

5.8.1 Introduction

As noted above, for the purposes of this study culverts are defined as premade, standardized structures designed to carry relatively small amounts of water beneath the roadway. There are literally hundreds of culverts on the Sun Road, spread across the entire length of the road corridor. Culverts are used for relatively small permanent streams, but on the Sun Road most carry water only intermittently, during spring runoff or after a significant storm.

Figure 233. The road fill at Siyeh Bend, with its arched stone culvert portal. 2000 photo.

Because of their ubiquity, relatively small scale, and subsurface placement, most culverts probably go wholly unnoticed by park motorists. Only the carefully detailed stone portal headwalls are usually visible, many of which display design qualities similar to the larger stone features found elsewhere on the Road.

5.8.2 Historic Design and Locations

Culvert piping. The earliest culverts on the lower portions of the Going-to-the-Sun Road were made of lumber, but no wooden culverts remain on the Road. Most of the culverts currently beneath the road are historic, and are constructed of metal or concrete. In general, the surviving historic culverts date from either the initial construction of the road (in the Alpine section), or from 1930s-era reconstruction projects (in the lower sections). The following culvert designs are present:

- *Corrugated metal pipe culverts* are by far the most common. (This term is commonly abbreviated "CMP.") CPM culverts have been used on the road since the 1920s, and are generally used in locations where relatively small amounts of water need to be discharged. Both historic and modern CMP pipes are present. A small number of locations employ multiple pipes.

- *Concrete pipe culverts* are fewer in number, and are used for small to medium-volume crossings. They have apparently been used on the Road since the early 1930s. Both historic and modern concrete pipes also exist along the road.

- *Concrete box culverts* are used at locations requiring significant water discharge. These have also been used since at least the 1930s, and may be seen in single- and multiple-box configurations. While most are historic, a few of these structures may be modern.

- *Stone* culvert-type crossings are found at a few locations on the Alpine section of the Road, typically in conjunction with historic stone retaining walls. All are historic, and many display excellent craftsmanship and quality detailing. The water passages are usually uncut rubblestone, heavily mortared with concrete. These structures are typically classified as culverts locally, although their method of construction and non-standard appearance suggests stronger design commonalities with the Road's bridges.

Headwalls. In most cases on the road, these standardized culverts are detailed with mortared stone headwalls, most of which are at least partially historic. Many display a high level of craftsmanship, although the caliber of work varies. Stone headwalls are present on nearly all pipe culvert inlets, the primary exceptions being some of the culverts along the eastern portion of the road. In contrast, most pipe outlets do not feature headwalls, although a significant minority do. Inlets headwalls also occasionally include stone wingwalls; these are most common along the Alpine portion of the Road.

Figure 234. Stone culvert outlet headwall just below Logan Pass. 2001 photo.

Figure 235. Stone culvert inlet headwall on the western approach to Logan Pass. 2001 photo.

Figure 236. Arched headwalls for concrete box culverts, upper McDonald Creek area. 2001 photo.

Box culverts typically include both inlet and outlet headwalls, some of which share design features with the stream portals of the road's bridges. These generally display a somewhat-higher level of detail, and some are curved.

A small number of culverts are associated with the presence of other historic or modern features. A few culverts in the Alpine section have CMP discharge chutes, and a smaller number have stone-lined inlet pools or channels. The most prominent of these is just below Siyeh Bend.

Figure 237. Stone-lined inlet chute above a Sun Road culvert, near the Loop. 2001 photo.

5.8.3 Modifications to Historic Designs

Nearly all of the Sun Road's historic culverts and headwalls retain a high level of historic integrity, although many are plugged with debris or are otherwise nonfunctional. Some culverts, particularly in the Alpine section, have been lengthened in response to road-widening or material dumping; this was usually accomplished by adding a length of concrete or metal pipe to the outlet of the original culvert. Along the western ascent to Logan Pass, stone wingwalls have been added to many of the stone inlet headwalls, and the height of some of the headwalls has been increased. Both of these actions were in response to the paving (and repaving) of the road, and the increasing of the travel surface width. In general, these alterations do not significantly alter the historic character of the culverts.

5.8.4 Modern Designs and Implementations

A relatively small number of non-historic culverts are present on the Going-to-the-Sun Road. Most modern concrete and metal pipe culverts are similar in appearance to their historic counterparts, and are visually unobtrusive. A small number of modern culvert placements (such as between Logan Pass and Oberlin Bend) include prominent modern stone headwalls which are placed significantly farther away from the road than historic headwalls were.

5.8.5 Recommendations

Surviving historic culverts should be preserved and maintained, if possible. Because of the near-invisibility of most culverts, however, their in-kind replacement will not adversely effect the historic character of the Road, provided the historic headwall is retained. All replacement culverts in historic locations should therefore be designed to make use of historic headwalls. Additional modern culvert installations should incorporate new stone headwalls when needed for hydraulic reasons, or if the modern pipe would otherwise be visible to travelers. Added headwalls should be visually unobtrusive, and should replicate the placement and design philosophies of historic walls.

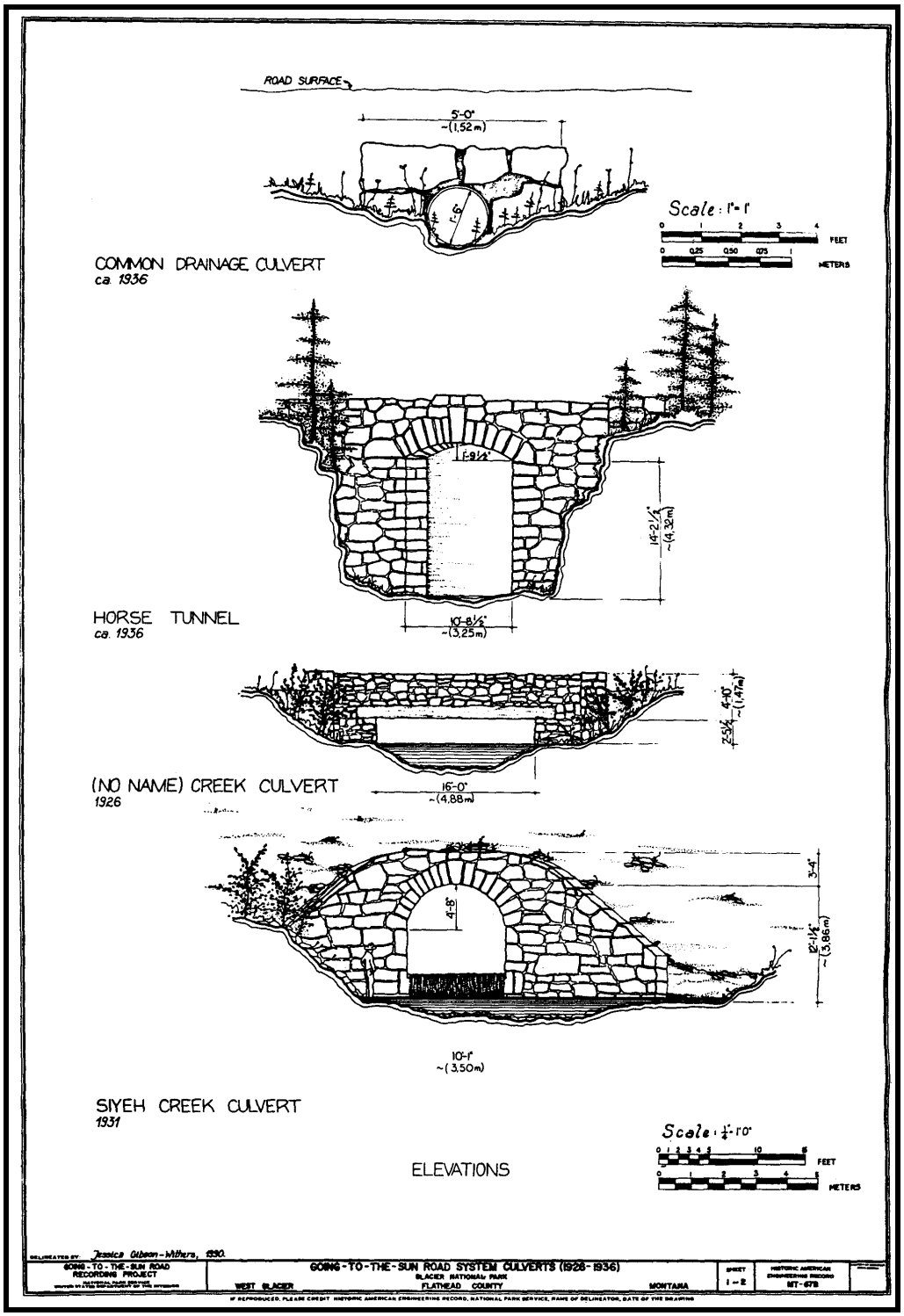

Figure 238. Historic American Engineering Record drawing of representative culvert headwalls along the Going-to-the-Sun Road.

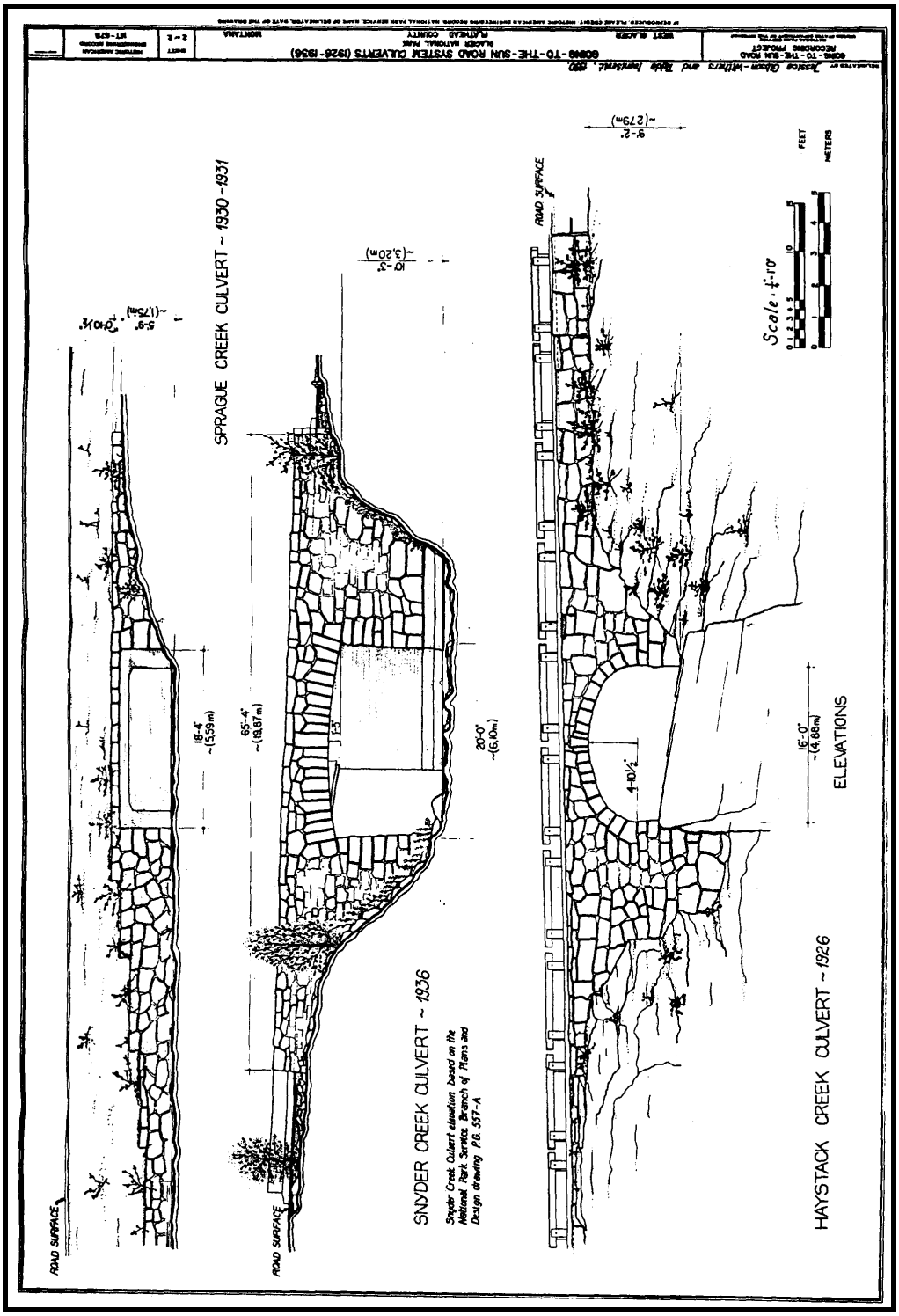

Figure 239. Historic American Engineering Record Drawing of additional Sun Road culverts. Note the modern removable wooden guardrail atop the Haystack Creek culvert, in place of historic stonework.

5.9 Minor Features

5.9.1 Horse Underpasses

The Going-to-the-Sun Road includes two concrete-box underpass structures, designed and placed to allow horseback trail parties to pass beneath the road. One such underpass is located near McDonald Falls, and remains in daily summer use by horseback parties; the other, at Jackson Glacier Overlook, sees little if any modern use. Both underpasses have decorative stone-veneered portals and stone wingwalls. The underpasses are significant historic resources, evocative of Glacier's early years as a "trail park," and both should be preserved.

Figure 240. The horse underpass at Jackson Glacier Overlook. 2000 photo.

5.9.2 Barrier Stones

This term is used to describe rows of large boulders placed along the roadway shoulder, either to prevent roadside parking or to serve a protective function. Barrier stones saw limited use in select locations of the Sun Road during the historic era; some were historically placed near Siyeh Bend, for example.

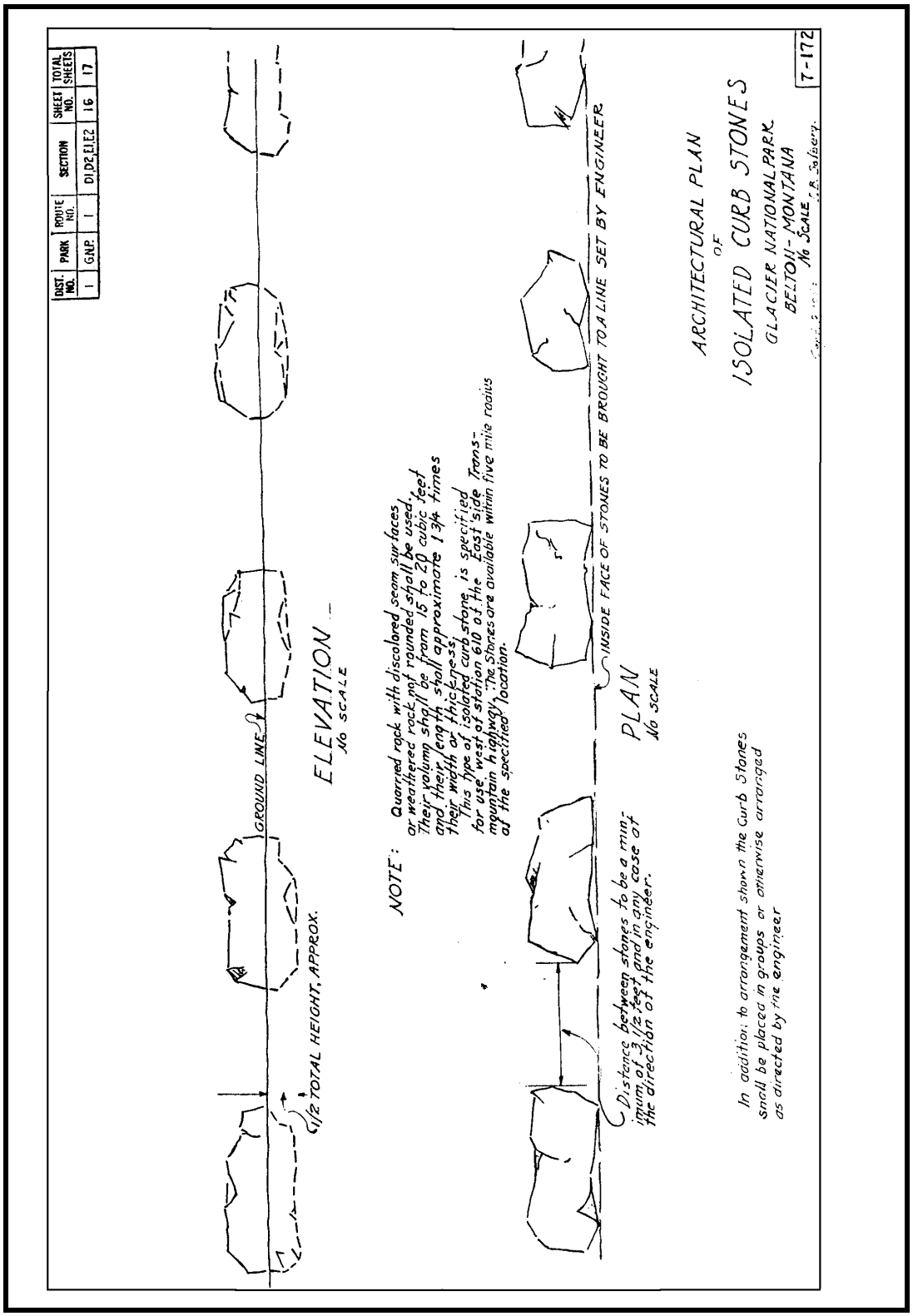

Figure 241. Historic NPS drawing specifying placement guidelines for barrier rocks along the Going-to-the-Sun Road.

The use of barrier stones has increased in recent years, and nearly all the current barrier stone locations are modern. They now see use in locations where historic guardwall has been removed or destroyed, and the stones are frequently seen in areas where landslides or maintenance activities have caused an inadvertent widening of the roadway. Some modern reconstruction projects have used barrier stones as part of an effort to artificially narrow the roadway prism. These uses introduce modern elements into the Road's historic landscape.

Consideration should be given to reducing the use of barrier stones along the Sun Road; in general, the use of historic guardrail or guardwall designs should be preferred. If barrier stones are retained in select locations, the sizing and placement of the stones should follow historic NPS guidelines. In areas where modern barrier stones are atop modern fill deposits, or where the rocks are used to narrow the roadway corridor, it may be appropriate to remove the excess fill material at the site.

Figure 242. Boulders used as guardrail on the east side of the Sun Road, 1939.
Photo by Solberg, GNPA #1835.

5.9.3 Cross-road Drains

Portions of the Sun Road's Alpine section suffer from significant drainage problems during periods of heavy precipitation and/or snowmelt. Since the 1970s, a number of concrete cross-road drains have been added to the west approach to Logan Pass in an effort to reduce this problem. While they are non-historic, these drains are not a significant visual distraction to the historic road. The outlets of a few drains, however, pierce historic retaining walls or guardwalls, and it would be appropriate to redesign those outlets to reduce their visual impact.

Figure 243. the outlet of a modern cross-road drain, below a length of reconstructed guardwall. Note outlet damage caused by erosion. 2001 photo.

5.9.4 Signs and Interpretive Waysides

Directional and regulatory signs are integral components of any roadway, and numerous signs exist along the length of the Sun Road. All current signage is non-historic. Current signs are generally metal, with reflective lettering, and are on metal posts.

Historically, informational signage along the Sun Road was wood, with routed lettering. The last generation of these signboards were painted black, and the lettering was yellow. The last of these signs (in the North Fork area) were removed from Glacier in the late 1980s, although similarly-designed signs still see use in Yellowstone and other National Parks. It would be very appropriate to restore wooden informational signage to the Sun Road.

Figure 244. Wooden viewpoint sign near Avalanche, 1963. GNPA photo 8484.

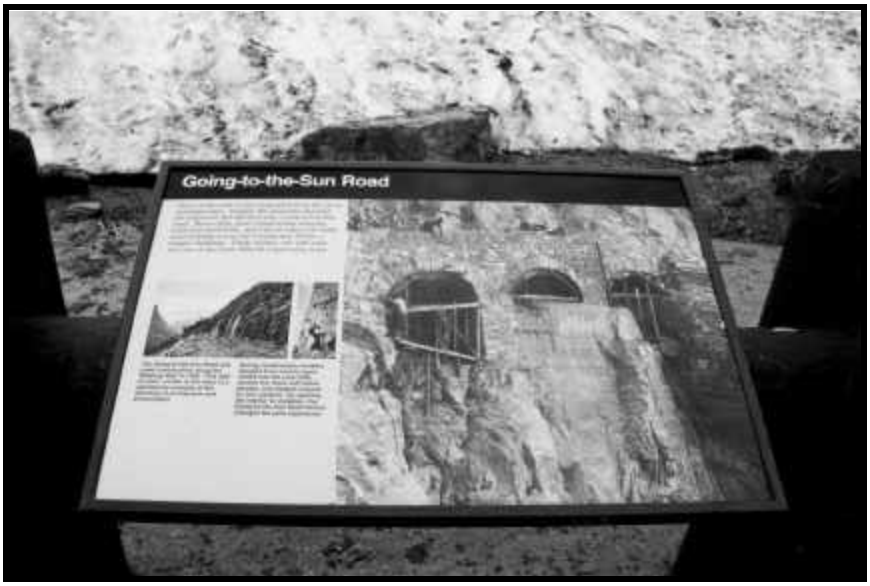

Figure 245. Example of current-style interpretive signing on the Sun Road. 2001 photo.

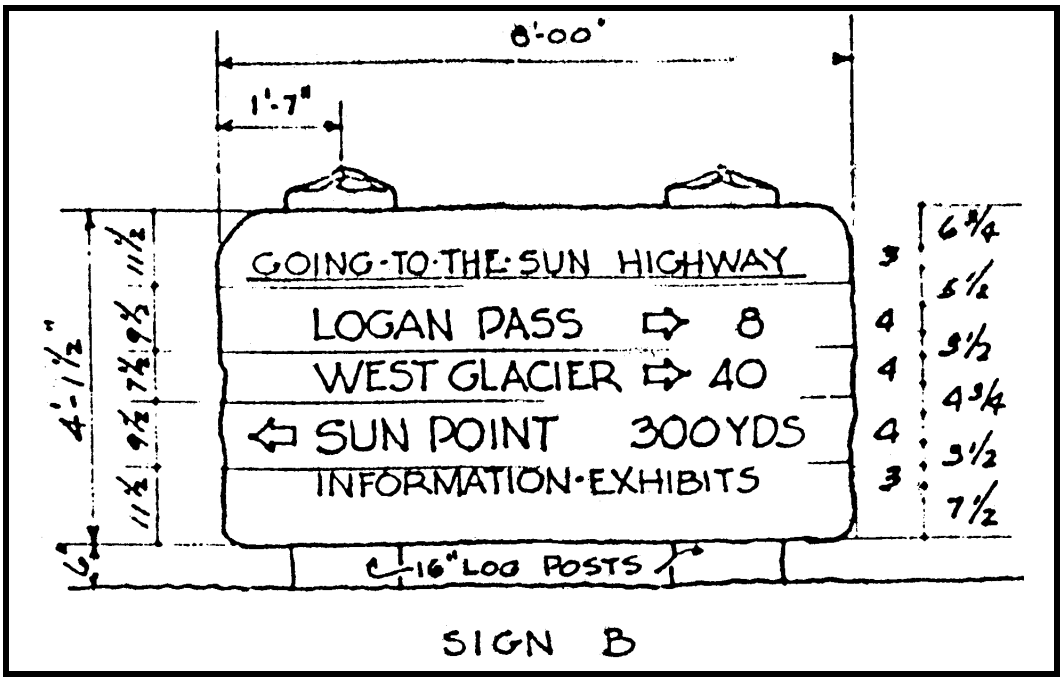

Figure 246. NPS drawing showing the type of signage used on the Sun Road in the mid-twentieth century. The signs were painted wood, with routed lettering.

The number of informational signs along the road has declined significantly in recent years. Numerous signs identifying nearby mountains or on-road place names formerly existed along the road, but have now almost wholly disappeared. A program to restore such signage should be implemented.

While the current park entrance signs are non-historic (and incorporates some non-native materials), the entrance sign at West Glacier has a distinctive, design that has been a visual milestone to park visitors for decades. The retention of this sign may therefore be appropriate.

Figure 247. Modern trailhead sign at the Loop. 2000 photo.

5.10 Viewsheds and Vistas

5.10.1 Introduction

The Going-to-the-Sun Road was constructed primarily as a mechanism for viewing Glacier's exceptional scenery, and key elements of the Road's design reflect this intent. The lower portions of the Road continually interact with nearby scenic features without overwhelming them, and the dramatic alignment and near-constant exposure of the Road's Alpine alignment was chosen in large part for its scenic opportunities. In addition, the availability of expansive vistas from locations such as the Loop was of primary importance to the Road's designers, and has always been a key visual characteristic of the experience of driving the Road.

While travelers on the highest portions of the Road enjoy nearly-uninterrupted and expansive vistas, the availability of such views at other locations is often dependent on breaks in the vegetative cover adjacent to the Road. In many locations, the amount of this cover has been increasing over the years, with a consequent degradation of the vistas available from the Road. On the western approach to Logan Pass, the forest fires of 1936 and 1967 resulted in relatively open vistas for most of the Road's history; the visible effects of the 1967 fire are now fading, however, resulting in a diminished viewshed from several Road vista points, including the Loop.

Recognizing this issue, the NPS over the years has conducted vista clearing operations at a variety of important viewpoints along the Road, including Jackson Glacier Overlook, several Lake McDonald locations, and elsewhere. This work has generally been intermittent and sporadic, however, and no comprehensive vista clearing program for the Road has been established. Consequently, some characteristic traditional vistas from the Road are being obscured, including views that were seen as pivotal by the Road's designers.

5.10.2 Recommendations

To preserve the key vistas that are an integral part of the Going-to-the-Sun Road's historic character, it is recommended that the NPS develop and implement a comprehensive vista clearing plan for the Road. Such a document should identify and map important vista locations throughout the Road's length, and outline clearing schedules and techniques for the preservation of those vistas. This program should be an ongoing process.

5.11 Further Research and Documentation

As noted elsewhere in this report, the Going-to-the-Sun Road has been the subject of a variety of historical studies, resulting in the documentation of the historic significance of

nearly the entire immediate roadway corridor. While these materials firmly establish the significance of the road itself, and the major structures along it, some aspects of the Road's probable significance remain unevaluated, and former road alignments and other associated resources are also unevaluated. These documentation gaps have the potential to complicate or hinder the effective management of the significant cultural resources associated with the Road.

The following research and documentation activities are recommended:

- The existing NRHP nomination for the Road dates from 1983, and does not include an evaluation of the Apgar Flats area. The document also does not address the significance of the roadway corridor as a cultural landscape. This document should be updated to reflect current documentation standards, and to evaluate these significance issues.
- Former alignments of the Sun Road remain evident at several locations in the Apgar Flats area, and between Lake McDonald Lodge and Avalanche. These former alignments should be mapped and documented, and their National Register eligibility determined.
- Pedestrian archaeological survey has been completed along most of the length of the road, with the exception of the upper western approach to Logan Pass. Although the topography of much of this segment precludes the completion of a fully-comprehensive archaeological survey, an inventory should be completed for those portions of the segment which are accessible.
- Historic archaeological sites related to the construction, reconstruction, and early maintenance of the Road are known to exist. A context for these locations should be developed, with guidelines for evaluating significance. The precise locations of former Road construction camps should be verified, and those locations subjected to intensive archaeological survey. NRHP nominations should be prepared for any sites that are found eligible.

Finally, it is vital to ensure that the Park's knowledge of Road's the historic design and significance be reflected in the maintenance, repair, and rehabilitation procedures employed on the roadway corridor. To that end, it is recommended that the Park develop a series of comprehensive written guidelines for the maintenance of the Road as a cultural resource. These guidelines should include procedures for cyclical maintenance of walls and other structural features, as well as design standards and construction procedures for repair projects to be carried out by Park maintenance crews. Other related issues – such as damage to cultural features caused by plowing activities – should also be addressed. Funding, staffing, and training requirements should also be outlined. More than any other effort, the development, implementation, and funding of historically-appropriate maintenance policies and procedures will help ensure that the national significance of the Going-to-the-Sun Road is preserved for future generations.

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Endnotes

1. George Goodwin to A,J, Breitenstein, August 17, 1921, quoted in Kathryn Steen, "Going-to-the-Sun Road: HAER MT-67," (Historic American Engineering Record, Library of Congress, Washington, D.C., 1992), 20; Thomas Vint to D.R. Hull, undated memorandum, quoted in Steen, "Going-to-the-Sun Road," 38.

2. Ethan Carr, *Wilderness by Design: Landscape Architecture and the National Park Service* (Lincoln: University of Nebraska Press, 1998), 5; Laura E. Soulliere, *Special History Study: Historic Roads in the National Park System* (NPS, Denver Service Center, 1995), 8; Linda Flint McClelland, *Building the National Parks: Historic Landscape Design and Construction* (Baltimore: Johns Hopkins University Press, 1998), 3, 26, 28.

3. Carr, *Wilderness by Design*, 78-79.

4. Carr, *Wilderness by Design*, 81; Soulliere, *Historic Roads*, 32; McClelland, *Building the National Parks*, 134.

5. McClelland, *Building the National Parks*, 136-137, 160, 162; Carr, *Wilderness by Design*, 88-90, 92, 139, 148.

6. McClelland, *Building the National Parks*, 1; Carr, *Wilderness by Design*, 1.

7. McClelland, *Building the National Parks*, 124; Curtis W. Buchholtz, "The Historical Dichotomy of Use and Preservation in Glacier National Park" (M.A. thesis, University of Montana, 1969), 22; Susan Begley and Ethan Carr, "Going-to-the-Sun Road National Historic Landmark Nomination," Washington, D.C.: NPS, 1996: 16.

8. McClelland, *Building the National Parks*, 2, 160-161, 182-183.

9. Carr, *Wilderness by Design*, 77.

10. GNP, *Final General Management Plan and Environmental Impact Statement* (1999), 1: 146-147; Jerry DeSanto, *Logan Pass: Alpine Splendor in Glacier National Park* (Helena, Montana: Falcon Press, 1995); Alan S. Newell, et al., *Historic Resources Study, Glacier National Park and Historic Structures Survey* (Denver, Colo.: NPS, Denver Service Center, 1980), 16; C. W. Buchholtz, *Man In Glacier* (West Glacier, Montana: Glacier Natural History Association, 1976), 5; Warren L. Hanna, *Montana's Many Splendored Glacier Land* (Seattle: Superior Publishing Co., 1976), 118; Adolph Hungry Wolf, *Good Medicine in Glacier National Park: Inspirational Photos and Stories* (Golden, B. C.: Good Medicine Books, 1971), 30; Rebecca Williams, ed., *The Ruhle Handbook: Roads and Trails of Waterton-Glacier International Peace Park* (Helena, Montana: Falcon Press Publishing Co., 1986), 16.

11. Buchholtz, *Man In Glacier*, 31; William Veach, Sr., "An Early Trip into Glacier Park," 2-22-39, in "Prehistory" folder, box 1, Holden Collection, GNPA.

12. Hanna, *Glacier Land,* 85.

13. Newell et al., *Historic Resources Study, Glacier,* 309-310.

14. Hubber et al., "Historical Context and National Register Guidelines for Concession Operations, Glacier National Park, Montana" (Missoula, Montana: Historical Research Associates, Inc., 1992), 11-12; Newell et al., *Historic Resources Study, Glacier,* 27-28, 346.

15. Hanna, *Glacier Land,* 94, 119; Newell et al., *Historic Resources Study, Glacier,* 32. Explorer George Grinnell had built a rough trail to the head of St. Mary Lake in 1885 (Hanna, *Glacier Land,* 19).

16. Bridget E. Moylan, *Glacier's Grandest: A Pictorial History of the Hotels and Chalets of Glacier National Park* (Missoula, Montana: Pictorial Histories Publishing Co., 1995), 30; Newell et al., *Historic Resources Study, Glacier,* 346-347; Ann Hubber, "National Register Nomination (Addendum): Lake McDonald Lodge Historic District" (prepared by Historical Research Associates for the NPS, 1995), 1.

17. Bruce Fladmark, "Determination of Eligibility of Older St. Mary Buildings in Glacier National Park," prepared for Glacier National Park, draft, 1991, p. 12.

18. Kathryn L. McKay, *Trails of the Past: Historical Overview of the Flathead National Forest, Montana, 1800-1960* (prepared for the Flathead National Forest, 1994), 50-51, 59, 77.

19. Fladmark, "Older St. Mary Buildings," 12.

20. Newell et al., *Historic Resources Study, Glacier,* 27; Leona Harrington, ed., *The History of Apgar, Montana* (West Glacier, Montana: Apgar School, ca. 1959), 27 (quote is by Genevieve Walsh Gudger, whose family later built a home at the head of the lake).

21. Newell et al., *Historic Resources Study, Glacier,* 310.

22. Hubber et al., "Concession Operations," 12; Donald H. Robinson, *Through the Years in Glacier National Park* (West Glacier, Montana: Glacier Natural History Association, 1980), 63.

23. Buchholtz, *Man In Glacier,* 46-49; Robinson, *Through the Years,* 56-57; Newell et al., *Historic Resources Study, Glacier,* 94; Ann Hubber, "National Register Nomination Form: Headquarters Historic District," 1995, summary.

24. Newell et al., *Historic Resources Study, Glacier,*46-47, 65.

25. Dennis Holden, "The Challenge," 4-5, in *Hungry Horse News* [Columbia Falls, Montana] "Sun Road Golden Anniversary" insert, 21 July 1983.

26. *Daily Inter Lake* (Kalispell, Montana), 8 May 1911; Michael Ober, "Enmity and Alliance: Park Service-Concessioner Relations in Glacier National Park, 1892-1961" (M.A. thesis, University of Montana, 1973), 39; Buchholtz, *Man In Glacier,* 52, 57.

27. Glacier National Park, *1911 Glacier National Park Superintendent's Report,* 6, GNPA; Newell et al., *Historic Resources Study, Glacier,* 65.

28. National Park Service, *Proceedings of National Park Conference,* 1911, 165, in "1911 NPS Super. Conf" folder, box 1, Holden Collection, GNPA; Marilyn Wyss, *Roads to Romance: The Origins and Development Of The Road and Trail System In Montana* (Helena, Montana: Montana Department of Transportation, 1992), 21; Steen, "Going-to-the-Sun Road," 7-8, 74; Dennis Holden, "The Challenge," 5, in

"Sun Road Golden Anniversary."

29. Quoted in Dennis Holden, "The Challenge," 5, in "Sun Road Golden Anniversary."

30. Begley and Carr, "National Historic Landmark Nomination: Going-to-the-Sun Road," 17; Soulliere, *Historic Roads,* 17; Carr, *Wilderness by Design,* 157. Yellowstone National Park did not open to automobiles until 1915 (Soulliere, *Historic Roads,* 18).

31. Carr, *Wilderness by Design,* 149, 160; Rose Houk, *Going-to-the-Sun: The Story of the Highway Across Glacier National Park* (Englewood, Colo.: Woodlands Press, 1984), 5; GNP, *1924 Glacier National Park Superintendent's Report,* 4.

32. Robinson, *Through the Years,* 89; Ann Hubber, "National Register Nomination: Headquarters Historic District" (prepared by Historical Research Associates for GNP, 1995), 47; Fladmark, "Older St. Mary Buildings," 28-29.

33. Hubber, "Headquarters Historic District," 44, 50.

34. Mary Roberts Rinehart, *Through Glacier Park in 1915* (Roberts Rinehart, Inc., 1916), 8. Rinehart did acknowledge that it was impossible to see the park properly from an automobile (p. 72).

35. Hanna, *Stars Over Montana,* 162.

36. Steen, "Going-to-the-Sun Road," 10; Newell et al., *Historic Resources Study, Glacier,* 68-69; Ober, "Enmity and Alliance," 78; M. A. Butler, Great Northern Railway Assistant Engineer, to A. H. Hogeland, Great Northern Railway Chief Engineer, 12 August 1912, in "1912" folder, box 1, Holden Collection, GNPA; L. B. Sperry to P. N. Bernard, Secretary, Kalispell Chamber of Commerce, 5 June 1915, in "1915" folder, box 1, Holden Collection, GNPA. The railroad had considered building roads in the area even before the park was created. James J. Hill, president of the Great Northern before his son Louis took his place, asked Lyman Sperry for a cost estimate for a stagecoach road from St. Mary's Lake to Lake McDonald.

37. Newell et al., *Historic Resources Study, Glacier,* 68-69, 77.

38. Ober, "Enmity and Alliance," 75-77; Howard H. Hays, "The Glacier Park Transport Company," 49-51, in Glacier Park Transport Co., *Glacier National Park Drivers' Manual* (1949); Newell et al., *Historic Resources Study, Glacier,*79-80; Hubber et al., "Concession Operations," 26. West-side stagecoach concessionaire John Weightman, who transported visitors from the Belton depot to the boat dock at Apgar, was reportedly forced into bankruptcy in 1921 due to competition from buses (JoAnn Speelman, "Touching up the Tally Ho," *Kalispell News,* 21 March 1984).

39. Hubber et al., "Concession Operations," 17-18.

40. Ibid.

41. Mark Hufstetler, "The Auto Arrives at Glacier," *SCA Journal* (spring 1997): 6-7; Historical Research Associates, "Multiple Property Listing," E: 17.

42. McClelland, *Building the National Parks,* 3-4; Ober, "Enmity and Alliance," 69; Historical Research Associates, "Multiple Property Listing," E: 46-47.

43. Buchholz, "Historical Dichotomy," 49; Hufstetler, "Auto Arrives," 7.

44. Williams, *Ruhle Handbook*, 21; Newell et al., *Historic Resources Study, Glacier*, 78-79, 217.

45. Hubber et al., "Concession Operations," 26; Morton J. Elrod, *Elrod's Guide and Book of Information of Glacier National Park* (Missoula, Montana: Morton J. Elrod, Publisher, 1924), 30; Hanna, *Glacier Land*, 121; Steen, "Horse Trail Underpass: HAER MT-72," 4.

46. Buchholtz, "Historical Dichotomy," 39-40; "National Director of Parks Visits Kalispell," *Daily Inter Lake* (Kalispell, Montana), 5 August 1924.

47. Harrington, *History of Apgar*, 8; Newell et al., *Historic Resources Study, Glacier*, 311, 347.

48. Newell et al., *Historic Resources Study, Glacier*, 312, 348; Ann Hubber, "National Register Nomination: Headquarters Historic District," 51-52.

49. Historical Research Associates, "Multiple Property Listing," E: 45; Buchholtz, "Historical Dichotomy," 65.

50. Fladmark, "Older St. Mary Buildings," 14.

51. McClelland, *Building the National Parks*, 248-248; Harrison, *Architecture in the Parks*, 7-8.

52. Laura Soulliere Harrison, *Architecture in the Parks: National Historic Landmark Theme Study* (Washington, D.C.: Government Printing Office, 7, 18; McClelland, *Building the National Parks*, 335, 452.

53. McClelland, *Building the National Parks*, 498.

54. Hubber et al., "*Concession Operations*," 30; John Zoss, "Final Construction Report on Glacier National Park Transmountain Highway, East Side, Project 1-D2, Tunnel Lining, Paving & Portals," 1, in "1933-42 Development & Maintenance: Reports; Situation" folder 6, box 116, GNPA; Newell et al., *Historic Resources Study, Glacier*, 222.

55. GNP, *1930 Glacier National Park Superintendent's Annual Report*, 2; McClelland, *Building the National Parks*, 244; Ann Hubber and Janene Caywood, "Survey, Evaluation, and National Register Documentation of Historic Buildings and Structures at Glacier National Park, Montana: Duplex Guest Cabin" (Missoula, Montana: Historical Research Associates, 1995), 1; Hubber et al., "Concession Operations," 39; Newell et al., *Historic Resources Study, Glacier*, 151, 154. In 1934, travelers could purchase gasoline at the Going-to-the-Sun Chalets (US DOI, NPS, *Glacier National Park, Montana* (1934), 23).

56. Historical Research Associates, "Multiple Property Listing," E: 31-32, 36; Newell et al., *Historic Resources Study, Glacier*, 222.

57. Hubber and Caywood, "Survey, Evaluationÿ Duplex Guest Cabin #813," 2; Hufstetler, "Auto Arrives," 11; Historical Research Associates, "Multiple Property Listing," E: 39.

58. J. R. Eakin, GNP Superintendent, to H. E. Albright, NPS Assistant Director, 10 Oct. 1927, in "Development and Maintenance: Roads and Trails, 1927" folder 14, box 129, GNPA.

59. J. R. Eakin, "The Transmountain Road," 55, 57, in Kalispell Water Department, *Fourteenth Annual Report of the Water Department, City of Kalispell, Montana, Year Ending Dec. 31, 1927.* There is some evidence that a parking area and rough campground at Avalanche Creek was available by 1925 (W. W. Moses, "Glacier Park Logan Pass Route," *Great Falls Tribune*, 18 Oct. 1925).

60. Elrod, *Elrod's Guide,* 58, 229; Newell et al., *Historic Resources Study, Glacier,* 143-144, 152-153; Buchholz, "Historical Dichotomy of Use and Preservation," 63-64; Buchholz, *Man In Glacier,* 69.

61. Hubber, "National Register Nomination Form: West Glacier Entrance Station," 1995; John Zoss, "Final Construction Report (1945-1935) on St. Mary's River and Divide Creek Bridges with Approaches, Glacier National Park, Project 1-E2," ca. 1935, p. 36 in "1933-42 Development Maintenance; Reports: Situation" folder 6, box 116, GNPA. In later years, because of increased traffic, two checking cubicles were added to the wings of the original facility, allowing for two lanes of traffic to be processed at the same time and providing a lane that could handle oversize recreational vehicles.

62. Newell et al., *Historic Resources Study, Glacier,* 225.

63. Hufstetler, "Auto Arrives," 11; Moylan, *Glacier's Grandest,* 52; Newell et al., *Historic Resources Study, Glacier,* 169; Shaw, "Great Northern Railroad," 72.

64. Steen, "Horse Trail Underpass: HAER MT-72," 4; Hubber et al., "*Concession Operations,*" 41, 45; Newell et al., *Historic Resources Study, Glacier,* 226-227.

65. Newell et al., *Historic Resources Study, Glacier,* 168, 174, 227-228, 230-231; Buchholz, "Historical Dichotomy," 68.

66. Harold John Hoflich, *Glacier National Park Visitors in Montana, 1949* (Missoula: Montana State University, Bureau of Business and Economic Research, Regional Study No. 1, 1950), 1, 5; Montana State Highway Commission Planning Survey, *Glacier National Park Tourist Survey, 1951* (Helena, Montana: Naegele Printing, 1951), 20, GNPA; US DOI, NPS, *Glacier National Park, Montana,* 1958: 13.

67. Historical Research Associates, "Multiple Property Listing," E: 38-39; Moylan, *Glacier's Grandest,* 4, 52; Newell et al., *Historic Resources Study, Glacier,* 176, 227; Buchholtz, "Historical Dichotomy," 106. Profits from passenger rail travel no longer could offset the losses from the hotels and chalets in the park.

68. Historical Research Associates, "Multiple Property Listing," E: 37-38; Newell et al., *Historic Resources Study, Glacier,* 156.

69. Hubber, "National Register Nomination Form: Headquarters Historic District," 1995: 1-2; Historical Research Associates, "Multiple Property Listing," E: 48.

70. Hubber, "National Register Nomination Form: Headquarters Historic District," 1995: 31-32, 36-38, 40-41, 44, 53, 55, 57.

71. Hubber, "National Register Nomination Form: Headquarters Historic District," 1995: 17,21, 30, 47-48, 50.

72. Historical Research Associates, "Multiple Property Listing," E: 57; Fladmark, "Older St. Mary Buildings," 15-17.

73. Earl Armstrong, telephone interview with Kathryn L. McKay, June 4, 2001; Jim Mann, "St. Mary's matriarch," *Daily Inter Lake* [Kalispell, Montana], 22 July 2001: A1, A3.

74. McClelland, *Building the National Parks,* 452-453, 468.

75. Historical Research Associates, "Multiple Property Listing," E: 42; GNP, *Final General Management Plan,* 1999: vol. 1, p. 58; Architectural Research Consultants, *Lake McDonald Lodge,* 28-30, 37; Hubber, "National Register Nomination Form: Lake McDonald Lodge Historic District," addendum, 1995: 2-3.

76. Landt interview, 2001.

77. Hubber and Caywood, "Survey Evaluation: "Rising Sun Coffee Shop/Lobby," 1-2; GNP, *Final General Management Plan,* 1999: vol. 1, p. 58.

78. Hanna, *Glacier Land,* 143.

79. Hubber et al., "Concession Operations," 49; Historical Research Associates, "National Register Nomination: Apgar Village."

80. Buchholtz, "Historical Dichotomy," 92, 94.

81. Sarah Allaback, *Mission 66 Visitor Centers: The History of a Building Type* (Washington, D.C.: NPS, Park Historic Structures and Cultural Landscapes Program, 2000), 26; Gordon interview; Historical Research Associates, "Multiple Property Listing," E: 49.

82. Buchholtz, "Historical Dichotomy," 92; Buchholtz, *Man In Glacier*, 74; Robinson, *Through the Years,* 103.

83. Robinson, *Through the Years,* 103; GNP, "Mission 66 Prospectus," 1956, 11-13, in "Development and Maintenance: Planning Program, 1956-68" folder 4, box 104, GNPA.

84. Allaback, *Mission 66 Visitor Centers,* 23, 25, 259; McClelland, *Building the National Parks,* 464.

85. Allaback, *Mission 66 Visitor Centers,* 12, 22, 26, 35, 270.

86. Bruce Fladmark, "National Register Determination of Eligibility: Logan Pass Visitor Center," 1999: 5.

87. Bruce Fladmark, "National Register Nomination Form: Logan Pass Visitor Center," 1999, p. 3; TIC drawing, #3704-A; Gordon interview.

88. Newell et al., *Historic Resources Study, Glacier,* 179; Margaret Littlejohn, *Visitor Services Project, Glacier National Park* (Moscow, Idaho: Cooperative Park Studies Unit, 1991), summary.

89. Soulliere, *Historic Roads,* 80; Keith Neilson, GNP Superintendent, notes on phone conversation with Charles Krueger, NPS Washington Service Center, 10 July 1967, in "1960s" folder, box 3, Holden Collection, GNPA; Buchholtz, "Historical Dichotomy," 109; John Clarkeson, "Report on Road Improvement Investigation of Going-to-the-Sun Highway in Glacier National Park, Montana," 1967: 1-5, in "1960s" folder, box 3, Holden Collection, GNPA.

90. E. M. Wilson land D. S. Warder, *Glacier National Park Bicycle Path* Survey (University of Wyoming, 1978), 7; F. B. Elliott, GNP Chief of Maintenance, to GNP Superintendent, 6 Nov. 1970, in "1970's" folder, box 3, Holden Collection, GNPA.

91. GNP, *Final General Management Plan,* 1999: vol. I, p. 45 [660,000 vehicles per year figure]. Other figures provided by Jack Gordon, GNP Landscape Architect. Because of the congestion at Logan Pass, in recent years the park has added temporary comfort stations near the West Side Tunnel and modern comfort stations at a pullout on St. Mary Lake.

92. GNP, *Final General Management Plan,* 1999: vol. 1: 87, 96-97.

93. *Final Master Plan, Glacier National Park,* May 1977: 20, in "Development & Maintenance: Planning Program, 1977" folder 2, box 104, GNPA; McClelland, *Building the National Parks,* 484; GNP, *Final General Management Plan,* 1999: vol. 1, p. 46, 151.

94. Wilson and Warder, *Bicycle Path Study,* 2-3.

95. US DOI, NPS, *Proposed Oversnow Vehicle Use at Glacier National Park, Montana: Environmental Assessment* (1975): 4-5, 7-8; GNP, *Final General Management Plan,* 1999: vol. 1, p. 98.

96. Newell et al., *Historic Resources Study, Glacier,* 228.

97. Curtis W. Buchholtz, "W. R. Logan and Glacier National Park," *Montana The Magazine of Western History* 19 (summer 1969): 6.

98. Buchholtz, "Historical Dichotomy," 16; Steen, "Going-to-the-Sun Road," 5-9; Carr, *Wilderness by Design,* 156; E. A. Keys, Special Inspector, to Secretary of the Interior, 16 Dec. 1912, in "Glacier National Park Roads, Lake McDonald Shore Line Road, 12-14-9 pt 1," RG 79, NARA; Dennis Holden, "The Challenge," 4, in "Sun Road Golden Anniversary."

99. M. A. Butler, Great Northern Railway Assistant Engineer, to A. H. Hogeland, Great Northern Railway Chief Engineer, 12 August 1912, in "1912" folder, box 1, Holden Collection, GNPA.

100. Newell et al., *Historic Resources Study, Glacier,* 65; Dennis Holden, "History of Going-to-the-Sun Road" (typescript drafts, 1984-1987), n.p.

101. Glacier National Park, *1914 Glacier National Park Superintendent's Report,* GNPA; GNP Superintendent Ralston to Secretary of the Interior, 3 Oct. 1914, in "1914" folder, box 1, Holden Collection, GNPA; Glacier National Park, *1915 Glacier National Park Superintendent's Report,* cover letter, 14, GNPA.

102. L. B. Sperry to P. N. Bernard, Secretary, Kalispell Chamber of Commerce, 5 June 1915, in "1915" folder, box 1, Holden Collection, GNPA.

103. Hanna, *Glacier Land,* 120; Louis W. Hill, Great Northern Railway President, to L. B. Sperry, 10 Jan. 1916, in "1916" folder, box 1, Holden Collection, GNPA.

104. Newell et al., *Historic Resources Study, Glacier,* 110-111, 134.

105. Steen, "Going-to-the-Sun Road," 15-16.

106. Steen, "Going-to-the-Sun Road," 11-12.

107. Warren Allen, OPR General Inspector, to L. W. Page, OPR Director, 14 Nov. 1916, in "1916" folder, box 1, Holden Collection, GNPA; Steen, "Going-to-the-Sun Road," 12-14.

108. Carr, *Wilderness by Design,* 149-150, 161; Hanna, *Glacier Land,* 38. By 1918, the name "Trapper Pass" had generally been replaced with "Logan Pass," named in memory of Glacier's first superintendent. In 1917, the NPS built a six-mile trail up Logan Creek towards Logan Pass. That steep trail was built primarily for the packers bringing construction supplies and equipment to the crews working on the Logan Pass Trail (letter from unidentified person to NPS Director, 24 Sept. 1917, in "1917" folder, box 1, Holden Collection, GNPA).

109. George A. Goodwin, Chief Civil Engineer, NPS, to A. J. Breitenstein, Secretary-Treasurer, Yellowstone Glacier B-Line, 17 August 1921, in "1918 Survey" folder, box 1, Holden Collection, GNPA; Steen, "Going-to-the-Sun Road," 20; Carr, *Wilderness by Design,* 162-163. The three stages of road surveys during this period were reconnaissance, preliminary, and location. Each was increasingly precise and detailed.

110. Holden, "Going-to-the-Sun Road," n.p.; Glacier National Park, *1919 Glacier National Park Superintendent's Annual Report,* 3, GNPA; Buchholtz, "Historical Dichotomy," 37; Begley and Carr, "Going-to-the-Sun Road," 23.

111. "Park Road Planned Across the Rockies," *Daily Inter Lake* [Kalispell, Montana], 13 Nov. 1918, p. 2; J. H. Zahner, Civil Engineer, to Horace M. Albright, NPS Director, 24 Sept. 1919, in "1919" folder, box 1, Holden Collection, GNPA. Zahner, it should be noted, was hoping to be hired to do the reconnaissance and preliminary surveying for his proposed routes.

112. Margaret H. Thompson, *High Trails of Glacier National Park* (Caldwell, Idaho: Caxton Printers, 1936), 106-107.

113. "Opposed to Logan Pass," *Kalispell Times,* 25 Aug. 1921, p. 4; George Goodwin, NPS Chief Civil Engineer, to A. J. Breitenstein, Secretary-Treasurer, Yellowstone Glacier B-Line, 17 August 1921, in "1918 Survey" folder, box 1, Holden Collection, GNPA; Carr, *Wilderness by Design,* 164-65; Steen, "Going-to-the-Sun Road," 15-16; Newell et al., *Historic Resources Study, Glacier,* 143. Charles Kraebel, Glacier Superintendent beginning in 1924, noted that "extreme conservationists" also criticized the proposed road over Logan Pass (quoted in Newell et al., *Historic Resources Study, Glacier*, 157).

114. Steen, "Going-to-the-Sun Road," 15.

115. Warren Allen, OPR General Inspector, to L. W. Page, Director, OPR, 14 Nov. 1916, in "1916" folder, box 1, Holden Collection, GNPA.

116. Letter from unidentified person to NPS Director, 24 Sept. 1917, in "1917" folder, box 1, Holden Collection, GNPA; Robinson, *Through the Years,* 90-91.

117. Steen, "Going-to-the-Sun Road," 18; Begley and Carr, "Going-to-the-Sun Road," 14-16; Carr, *Wilderness by Design,* 163.

118. Glacier National Park, "The Going-to-the-Sun Highway in Glacier National Park: History and Progress," 1933, p. 2, in "Development & Maintenance, 1933" folder 20, box 129, GNPA; "Information Regarding the Transmountain Highway in Glacier National Park," ca. 1924: 2-3, in "1924" folder, box 1, Holden Collection, GNPA; Steen, "Going-to-the-Sun Road," 21-23.

119. Newell et al., *Historic Resource Study, Glacier,* 215; Dennis Holden, "The Challenge," 6, in "Sun Road Golden Anniversary"; R. E. McDonnell in Harrington, "History of Apgar," ca. 1959, p. 19.

120. Carr, *Wilderness by Design,* 165; Dennis Holden, "The Challenge," 6, in "Sun Road Golden Anniversary"; Steen, "Going-to-the-Sun Road," 24-26; Robinson, *Through the Years,* 91.

121. Stephen T. Mather, NPS Director, to George E. Goodwin, 26 April 1923, "1923" folder, box 1, Holden Collection, GNPA; Steen, "Going-to-the-Sun Road," 25, 27; Carr, *Wilderness by Design,* 158; Dennis Holden, "The Challenge," 6, in "Sun Road Golden Anniversary".

122. Holden, "Going-to-the-Sun Road," n.p.

123. Carr, *Wilderness by Design*, 166.

124. Holden, "Going-to-the-Sun Road," n.p.

125. "Final Construction Report on Transmountain Highway, Reconstruction of Cribbing and Improvements, Acct. No. 503," in "Development & Maintenance: Reports; Situation, 1932" folder 2, box 117, GNPA; Holden, "Going-to-the-Sun Road," n.p.; GNP, "Going-to-the-Sun Road: Data Inventory" (draft, 17 Feb. 2000), 52; J. R. Eakin, GNP Superintendent, to Arno Cammerer, NPS Director, 13 June 1923, in "1923" folder, box 1, Holden Collection, GNPA.

126. Holden, "Going-to-the-Sun Road," n.p.; Lewis L. Hill, GNP Assistant Engineer, to George E. Goodwin, NPS Chief Engineer, 26 Dec. 1924, in "1924" folder, box 1, Holden Collection, GNPA; Soulliere, *Historic Roads*, 25; Robinson, *Through the Years*, 91.

127. Soulliere, *Historic Roads*, 44; Steen, "Going-to-the-Sun Road," 28.

128. Carr, *Wilderness by Design*, 166.

129. W. W. Moses, "Glacier Park Logan Pass Route," *Great Falls Tribune*, 18 Oct. 1925.

130. According to Ira Stinson, Glacier's Chief Engineer beginning in 1932, the controlling factor in the decision of where to locate the road was the exposure to sun, which would help in maintenance and in the spring opening of the road (Ira S. Stinson, Interview by Susan J. Buchel, August 4, 1975: 6).

131. Thomas Vint, Interview with Herb Evison, NPS, 1960: 12-14; Carr, *Wilderness by Design*, 168.

132. Begley and Carr, "Going-to-the-Sun Road," 32; Carr, *Wilderness by Design*, 168-69; W. W. Moses, "Glacier Park Logan Pass Route," *Great Falls Tribune*, 18 Oct. 1925. Frank Kittredge had been the engineer in charge of the location and construction of the Alaska Central Railroad, worked for the Washington and Oregon state highway commissions, and since 1917 worked as a highway engineer with the BPR (Rebecca Stine, "People in Public Works: Frank Alvah Kittredge," *APWA Reporter* (Feb. 1982): 8).

133. Frank Kittredge, "Transmountain Highway, Glacier National Park, Report to National Park Service" Feb. 5, 1925: 8-9, A.V. Emery Collection, GNPA; Frank A. Kittredge, "The Going-to-the-Sun Highway, Glacier National Park," 11 March 1949, p. 2, in "History & Archeology: Area & Service History; Going-to-the-Sun Road Kittredge 1949" folder 7, box 171, GNPA; Forest Farris, telephone interview with Kathryn L. McKay, June 14, 2001; Dennis Holden, "The Challenge," 6, in "Sun Road Golden Anniversary."

134. Steen, "Going-to-the-Sun Road," 31-33.

135. Steen, "Going-to-the-Sun Road," 30; Kittredge, "Transmountain Highway," 22.

136. Kittredge, "Transmountain Highway," 2.

137. Kittredge, "Transmountain Highway," 3, 6-8.

138. Kittredge, "Transmountain Highway," 4-5, 22a. The curve radius at the Loop, as constructed, is actually 75 feet rather than 100 feet (Steen, "Going-to-the-Sun Road," 42).

139. Kittredge, "Transmountain Highway," 3, 10.

140. Kittredge, "Transmountain Highway," 3.

141. Charles J. Kraebel, GNP Superintendent, to S. T. Mather, NPS Director, 8 Oct. 1924, in "Development and Maintenance: Roads and Trails, 1924" folder 10, box 129, GNPA; Charles J. Kraebel, GNP Superintendent, to S. T. Mather, NPS Director, 18 Nov. 1924, in "1924" folder, box 1, Holden Collection, GNPA.

142. T. C. Vint, NPS Assistant Landscape Engineer, memo to D. R. Hull, NPS Chief Landscape Engineer, [1925], 2-5, entry 6, box 39, RG 79, NARA; Carr, *Wilderness by Design,* 171.

143. Holden, "Going-to-the-Sun Road," 12-13.

144. Stine, "Kittredge," 9.

145. Carr, *Wilderness by Design,* 155-156; Stephen T. Mather, "Engineering Applied to National Parks," *Proceedings of the American Society of Civil Engineers* 4 (Dec. 1928): 2674-2675.

146. Begley and Carr, "Going-to-the-Sun Road," 36.

147. Carr, *Wilderness by Design,* 171, 174; T. C. Vint, Assistant Landscape Engineer, NPS, to D. R. Hull, Landscape Engineer, NPS, 1 May 1925, in "1925 Construction Program Report" folder, box 1, Holden Collection, GNPA.

148. GNP, *1927 Glacier National Park Superintendent's Report,* 2; Soulliere, *Historic Roads,* 45.

149. Carr, *Wilderness by Design,* 171-172; Soulliere, *Historic Roads,* 45.

150. Begley and Carr, "Going-to-the-Sun Road," 32; Carr, *Wilderness by Design,* 175; T. C. Vint, NPS Assistant Landscape Engineer, to D. R. Hull, NPS Landscape Engineer, 1 May 1925, in "1925 Construction Program Report" folder, box 1, Holden Collection, GNPA.

151. Carr, *Wilderness by Design,* 172, 176.

152. McClelland, *Building the National Parks,* 187, 190, 200; Carr, *Wilderness by Design,* 173, 179.

153. Charles J. Kraebel, GNP Superintendent, to NPS Director, 16 May 1925, in "1925 Construction Program Report," box 1, Holden Collection, GNPA.

154. Soulliere, *Historic Roads,* 50; McClelland, *Building the National Parks,* 2, 201.

155. Soulliere, *Historic Roads,* 53; Ernest A. Davidson, "Report to Chief of Division of Landscape Architecture Covering Features of Landscape Interest in Construction of Avalanche-Logan Pass Section of Transmountain Highway, Glacier National Park, 1925 to 1928," Jan. 24, 1929: 11, in 630 Roads, 1907-39, Central Files, Glacier National Park, RG 79, National Archives; McClelland, *Building the National Parks,* 205-206. Along the west side of the Sun Road, telephone lines were intentionally located in the woods a short distance away from the Road so they would not be visible from the Road.

156. McClelland, *Building the National Parks,* 201-202; Carr, *Wilderness by Design,* 175; Steen, "Going-to-the-Sun Road," 39.

157. Ira S. Stinson, "Roads and Trails in Glacier National Park," 90, in Glacier Park Transport Company, *Drivers' Manual.*

158. Soulliere, *Historic Roads,* 51.

159. Davidson, "Report to Chief," 1, 11.

160. McClelland, *Building the National Parks,* 202-205.

161. Carr, *Wilderness by Design,* 172; Steen, "Siyeh Creek Culvert: HAER MT-81," 3; GNP, "Data Inventory," 52.

162. Charles J. Kraebel, GNP Superintendent, to Horace M. Albright, Yellowstone National Park Superintendent, 4 Aug. 1925, in "Development and Maintenance: Roads and Trails, 1912-29" folder 2, box 122, GNPA.

163. Steen, "Going-to-the-Sun Road," 40, 44-45; Dennis Holden, "The Challenge," 7, in "Sun Road Golden Anniversary."

164. Steen, "Going-to-the-Sun Road," 42-44; Davidson, "Report to Chief," map; Scott Crandell, "Opalka: 'I didn't think they could do it," 14, in "Sun Road Golden Anniversary"; Russell Munter quoted in Jim Bruggers, "Old-time Road Workers Reminisce," 12, in "Sun Road Golden Anniversary."

165. "Special Provisions: Transmountain Hwy. Grad. Proj. No. 1-D2" [Colonial Building Co.], 1929, in "Development & Maintenance, 1929" folder 16, box 129, GNPA; A. V. Emery, "Final Construction Report (1931-32) on Transmountain Highway, East Side, Logan Pass-St. Mary's Junction Sec. Grading, Glacier National Park Project No. 1-D2, State of Montana," p. 5, in folder 17, box 7, Emery Coll., GNPA; Farris interview.

166. Houk, *Going-to-the-Sun Road,* 28; Robinson, *Through the Years,* 92; Dennis Holden, "The Challenge," 7, and Jim Bruggers, "Old-time Road Workers Reminisce," 12, in "Sun Road Golden Anniversary."

167. Jim Bruggers, "Old-time Road Workers Reminisce," 12, and "Johnson Helped Stir Chilli," 11, in "Sun Road Golden Anniversary"; Farris interview.

168. Steen, "Going-to-the-Sun Road," 41, 45; Houk, *Going-to-the-Sun,* 28, 30.

169. Dennis Holden, "The Challenge," 7, in "Sun Road Golden Anniversary."

170. Buchholtz, *Man In Glacier,* 59; GNP, *1929 Glacier National Park Superintendent's Report,* 3, GNPA; Dennis Holden, "The Challenge," 7, in "Sun Road Golden Anniversary"; "Final Construction Report, Logan Pass Landscape Protection," ca. 1929, in "Development & Maintenance Reports; Situation, 1928-31" folder 4, box 115, GNPA; Davidson, "Report to Chief," 12.

171. Steen, "Going-to-the-Sun Road," 49-50, 57-58.

172. Scott Crandell, "Opalka: 'I didn't think they could do it," 14, in "Sun Road Golden Anniversary."

173. J. R. Eakin, Glacier National Park Superintendent, "The Transmountain Road," 59, in Kalispell Water Department, *Fourteenth Annual Report of the Water Department, City of Kalispell, Montana, Year Ending Dec. 31,* 1927, Kalispell, Montana; Elrod, *Elrod's Guide,* 165.

174. Steen, "Going-to-the-Sun Road," 51-52; Carr, *Wilderness by Design,* 185.

175. Steen, "Going-to-the-Sun Road," 52-54.

176. Russell Landt, interview with Kathryn L. McKay, June 1, 2001; Steen, "Going-to-the-Sun Road," 55-56; A. V. Emery, "Final Construction Report (1931-32) on Transmountain Highway, East Side, Logan Pass-St. Mary's Junction Sec. Grading, Glacier National Park Project No. 1-D2, State of Montana," 4-7, in folder 17, box 7, Emery Coll., GNPA; Dennis Holden, "The Challenge," 7, in "Sun Road Golden Anniversary."

177. Carr, *Wilderness by Design,* 185; Dennis Holden, "The Challenge," 10, in "Sun Road Golden Anniversary."

178. Farris interview.

179. T. C. Vint, NPS Assistant Landscape Engineer, memo to D. R. Hull, NPS Chief Landscape Engineer, [1925], p. 3, entry 6, box 39, RG 79, NARA; A. V. Emery, "Final Construction Report (1931-32) on Transmountain Highway, East Side, Logan Pass-St. Mary's Junction Sec. Grading, Glacier National Park Project NO. 1-D2, State of Montana," 12-13, in folder 17, box 7, Emery Collection, GNPA.

180. Steen, "Going-to-the-Sun Road," 60; Brian Kennedy, "Montgomery had a tall order to fill," in "Sun Road Golden Anniversary"; Robinson, *Through the Years,* 92-93. The Albright letter is quoted in Carr, *Wilderness by Design,* 186.

181. US DOI, NPS, *Glacier National Park, Montana,* 1934.

182. Steen, "Going-to-the-Sun Road," 59; "Road job was dangerous task," 13, in "Sun Road Golden Anniversary"; NPS, "Memorandum for the Press: Glacier National Park Transmountain Road," Jan. 25, 1921, in "Development and Maintenance: Roads and Trails, 1921" folder 7, box 129, GNPA; GNP, "The Going-to-the-Sun Highway in Glacier National Park: History and Progress," 1993: 6, in "Development & Maintenance, 1933" folder 20, box 129, GNPA; Newell et al, *Historic Resources Study, Glacier,* 230.

183. Newell et al., *Historic Resources Study, Glacier,* 220. According to Steen ("Going-to-the-Sun Road," p. 60), Congressman Louis C. Cramton was the one who recommended the name Going-to-the-Sun Highway.

184. McClelland, *Building the National Parks,* 186, 209; Soulliere, *Historic Roads,* 55.

185. "Final Construction Report, Roadside Cleanup," ca. 1931, in "Development & Maintenance Reports; Situation, 1928-31" folder 4, box 115, GNPA; "Justification For Roadside Cleanup - $10,000," 1932, p. 1, in "Development & Maintenance, 1932" folder 19, box 129, GNPA; "Report of Constructionÿ541 Post Construction – Slide Removal, 544 – Final Construction – Roadside Cleanup," 1-3, in "Development & Maintenance Reports; Situation" folder 1, box 115, GNPA.

186. Steen, "Going-to-the-Sun Road," 61-62; Historical Research Associations, "Multiple Property Listing," E: 9; Buchholtz, *Man In Glacier,* 66; McClelland, *Building the National Parks,* 327-329.

187. Holden, "Going-to-the-Sun Road," n.p.

188. Holden, "Going-to-the-Sun Road," n.p.; "Final Construction Report – Retaining Wall on Transmountain Mountain [sic] Highway 1 ½ miles above Avalanche Creek," ca. 1931, in "Development & Maintenance Reports; Situation, 1928-31" folder 4, box 115, GNPA.

189. "Final Construction Report on Transmountain Highway, Reconstruction of Cribbing and Improvements, Acct. No. 503," 1-2, in "Development & Maintenance: Reports; Situation, 1932" folder 2, box 117, GNPA.

190. Steen, "Snyder Creek Bridge: HAER MT-71," 3.

191. Charles J. Kraebel, GNP Superintendent, to Horace M. Albright, Yellowstone National Park Superintendent, 4 Aug. 1925, in "Development and Maintenance: Roads and Trails, 1919-29" folder, 2, box 122, GNPA; Holden, "Going-to-the-Sun Road," n.p.

192. "Report of Constructionÿ541 Post Construction – Slide Removal, 544 – Final Construction – Roadside Cleanup," 1-4, in "Development & Maintenance Reports; Situation, folder 1, box 115, GNPA.

193. Holden, "Going-to-the-Sun Road," n.p.; GNP, "Data Inventory," 49.

194. McClelland, *Building the National Parks,* 207-209, 355-356; "Report of Constructionÿ541 Post Construction – Slide Removal, 544 – Final Construction – Roadside Cleanup," 3, in "Development & Maintenance Reports; Situation, folder 1, box 115, GNPA; Holden, "Going-to-the-Sun Road," n.p.

195. Holden, "Going-to-the-Sun Road," n.p.

196. Ober, "Enmity and Alliance," 44-46; Architectural Research Consultants, *Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park* (draft, Jan. 21, 2001), 23; Historical Research Associates, "Multiple Property Listing," E: 34; Hubber et al., *"Concession Operations,"* 36-38, 46; TIC drawing #2176, 1956. One reason John Lewis sold the hotel was because he was unable to build the estimated one hundred additional rooms required as a result of the opening of the Roosevelt Highway.

197. Steen, "Going-to-the-Sun Road," 68-69; TIC drawing 2060; Farris interview.

198. A. V. Emery, "Final Construction Report (1936-1937) on Glacier National Park Transmountain Highway, West Side, Project RTEC 1-A, Unit 2, Reconstruction Grading," 1938, p. 7, in "Development & Maintenance Reports; Situation, 1933-37" folder 1, box 117, GNPA; Architectural Research Consultants, *Lake McDonald Lodge,* 70, 73, 75-77; Hubber, "National Register Nomination: Lake McDonald Lodge Historic District" (addendum), 15.

199. Quoted in Hubber, "National Register Nomination: Lake McDonald Lodge Historic District" (addendum), 15.

200. A. E. Demaray, NPS Acting Director, to E. T. Scoyen, GNP Superintendent, 15 March 1935, in "Development and Maintenance: Roads and Trails, 1932-38" folder 3, box 121, GNPA; Ernest A. Davidson, NPS Landscape Architect, to Mr. Carnes, 15 April 1935, in "Development and Maintenance: Roads and Trails, 1932-38" folder 3, box 121, GNPA.

201. Newell et al., *Historic Resources Study, Glacier,* 224; A. V. Emery, "Final Construction Report (1936-1937) on Glacier National Park Transmountain Highway, West Side, Project RTEC 1-A, Unit 2, Reconstruction Grading," 1938, 2-3, in "Development & Maintenance Reports; Situation, 1933-37" folder 1, box 117, GNPA; unidentified document [Superintendent's Report?] in "1937" folder, box 3, Holden Collection, GNPA.

202. Steen, "Going-to-the-Sun Road," 68-69; Newell et al., *Historic Resources Study, Glacier,* 312-313.

203. Hubber, "National Register Nomination Form: Headquarters Historic District," 1995, p. 46.

204. A. V. Emery, "Final Construction Report (1934-1936) on Glacier National Park Transmountain Highway, West Side, Project NR-1B, 1C (portions), Reconstruction Grading and Surfacing," 1937: 1-4, in "Development & Maintenance Reports; Situation, 1933-37" folder 1, box 117, GNPA; Holden, "Going-to-the-Sun Road," n.p.; Steen, "Going-to-the-Sun Road," 66-67, 69.

205. A. V. Emery, "Final Construction Report on Glacier National Park Transmountain Highway, West Side, Project NR 1-A Unit 1, Reconstruction, Grading and Draining and Project 1-A, Unit 1, Bridges," 1939: 4, 9, 13, in "Development & Maintenance Reports; Situation, 1933-37" folder 1, box 117, GNPA; Steen, "Going-to-the-Sun Road," 70; Holden, "Going-to-the-Sun Road," n.p.

206. Steen, "Snyder Creek Bridge: HAER MT-71," 1-5; Steen, "Going-to-the-Sun Road, 71; Steen, "Avalanche Creek Bridge: HAER MT-73," 2-3.

207. Steen, "Going-to-the-Sun Road," 64-66; A. V. Emery, "Final Construction Report on Glacier National Park Highway Project NR 1-C Retaining Wall and Guard Rail, West Side Transmountain Highway, Glacier County [sic], Montana," 1937: 1-6, in "Development & Maintenance Reports; Situation, 1933-37" folder 1, box 117, GNPA.

208. Steen, "Going-to-the-Sun Road," 62-63; Holden, "Going-to-the-Sun Road," n.p. Douglas had to declare bankruptcy during this project.

209. Steen, "St. Mary River Bridge: HAER MT-84," 4.

210. Steen, "St. Mary River Bridge: HAER MT-84," 4; John Zoss, "Final Construction Report (1934-1935) on St. Mary's River and Divide Creek Bridges with Approaches, Glacier National Park, Project 1-E2," 28, 36, in "1933-42 Development & Maintenance: Reports; Situation" folder 6, box 116, GNPA.

211. Steen, "St. Mary River Bridge: HAER MT-84," 4-6; Bud Hagerty, telephone interview with Kathryn L. McKay, June 1, 2001; John Zoss, "Final Construction Report (1934-1935) on St. Mary's River and Divide Creek Bridges with Approaches, Glacier National Park, Project 1-E2," 2-3, 5, 8, 22, in "1933-42 Development & Maintenance: Reports; Situation" folder 6, box 116, GNPA.

212. Steen, "Divide Creek Bridge: HAER MT-85," 1, 4; Steen, "Going-to-the-Sun Road," 64.

213. Photo in "1934" folder, box 3, Holden Collection, GNPA; Steen, "Going-to-the-Sun Road," 63-64; Holden, "Going-to-the-Sun Road," n.p. When the Lawler contract was completed, most of the camp buildings were given to local American Indians, who removed the buildings in pieces (Hagerty interview).

214. Hagerty interview.

215. Farris interview.

216. Farris interview.

217. Jim Bruggers, "Old-time Road Workers Reminisce," 12, in "Sun Road Golden Anniversary."

218. Steen, "Going-to-the-Sun Road," 71; GNP, "Data Inventory," 52; Holden, "Going-to-the-Sun Road," n.p.

219. John Zoss, "Final Construction Report on Glacier National Park Transmountain Highway, East Side, Project 1-D2, Tunnel Lining, Paving & Portals," 2, in "1933-42 Development & Maintenance: Reports; Situation" folder 6, box 115, GNPA; A. V. Emery, "Final Post Construction Report 1936-1939, Transmountain Highway, Glacier National Park Highway Project 1-D1, D2, E1, E2, Drainage, Slide Correction & Bituminous Surface Repair, Glacier County, Montana," 1941: 1-2, in "Development and Maintenance: Report; Situation, 1936-39" folder 5, box 116, GNPA.

220. Holden, "Going-to-the-Sun Road," n.p.; F. A. Kittredge, NPS Chief Engineer, to E. T. Scoyen, GNP Superintendent, 15 Dec. 1933, in "1933" folder, box 3, Holden Collection, GNPA.

221. Kenneth R. Oviatt, "Final Construction Report, Going-to-the-Sun Highway, Glacier National Park Highway Project, 1-C (Portion), Surfacing and Bituminous Surfacing (Class 1 Park Route), Glacier National Park, Flathead County, Montana," 1-2, in "Development & Maintenance: Reports; Situation, 1952" folder 1, box 14, GNPA; Steen, "Going-to-the-Sun Road," 72; GNP, "Data Inventory," 50.

222. Kenneth R. Oviatt, "Final Construction Report, Going-to-the-Sun Highway, Glacier National Park Highway Project, 1-C (Portion), Surfacing and Bituminous Surfacing (Class 1 Park Route), Glacier National Park, Flathead County, Montana," 2, in "Development & Maintenance: Reports; Situation, 1952" folder 1, box 14, GNPA; GNP, *Going-to-the-Sun Road Cultural Resource Plan,* 1988, p. 14; Holden, "Going-to-the-Sun Road," n.p. Some, including a stonemason who worked on the Road in the 1950s, dispute the contention that the quarries along the Sun Road were overshot, saying instead that the nature of the rock changed with depth (Gordon interview).

223. Kenneth R. Oviatt, "Final Construction Report, Going-to-the-Sun Highway, Glacier National Park Highway Project, 1-C (Portion), Surfacing and Bituminous Surfacing (Class 1 Park Route), Glacier National Park, Flathead County, Montana," 2, in "Development & Maintenance: Reports; Situation, 1952" folder 1, box 14, GNPA; Holden, "Going-to-the-Sun Road," n.p.; GNP, "Data Inventory," 53.

224. Dennis Holden, "The Challenge," 7, in "Sun Road Golden Anniversary"; GNP, *1955 Glacier National Park Superintendent's Annual* Report, GNPA; GNP, *1956 Glacier National Park Superintendent's Annual Report,* section 4. Holden ("Going-to-the-Sun Road," n.p.) states that the Logan Pass section was not paved with asphalt until 1957. Other authors, such as Steen and Carr, state that the paving was completed by the Morrison-Knudsen contract in 1952. But, the final construction report for the Morrison-Knudsen project reports that the road had been oiled and that a plant mix surfacing should be placed on the 10-mile Garden Wall section (Kenneth R. Oviatt, "Final Construction Report, Going-to-the-Sun Highway, Glacier National Park Highway Project, 1-C (Portion), Surfacing and Bituminous Surfacing (Class 1 Park Route), Glacier National Park, Flathead County, Montana," 3, in "Development & Maintenance: Reports; Situation, 1952" folder 1, box 14, GNPA). And, the 1955 and 1956 Superintendent's Annual Reports refer to a "final paving" contract for the Sun Road that was completed fall 1955.

225. Steen, "West Side Tunnel: HAER MT-76," 5; Keith Neilson, GNP Superintendent, to NPS Regional Director, 13 March 1967, in "1960s" folder, box 3, Holden Collection, GNPA; TIC drawing, #351, 1966.

226. Soulliere, *Historic Roads,* 81; McClelland, *Building the National Parks,* 480. In 1966, the functions of the BPR were assigned to the Federal Highway Administration, under the Department of Transportation.

227. Soulliere, *Historic Roads,* 82; McClelland, *Building the National Parks,* 480; MK Centennial, *Draft Engineering Study,* ii.

228. Soulliere, *Historic Roads,* 82.

229. GNP, *the Sun Road Cultural Resource Plan,* 1991, p. 2; MK Centennial, *Draft Engineering Study,* 2-3.

230. GNP, *Going-to-the-Sun Road Environmental Assessment: Repairs to Critical Sections* (May 1999), 3; Gordon interview; MK Centennial, *Draft Engineering Study,* iv, 3, 70-71, 90.

231. Gordon interview.

232. Ibid.

233. Ibid.

234. Ibid.

235. Soulliere, *Historic Roads,* 3.

236. Gordon interview.

237. Gordon interview.

238. GNP, "Data Inventory," 18-19; Gordon interview.

239. GNP, *Final General Management Plan,* 1999: vol. 1, p. 51.

240. Begley and Carr, "Going-to-the-Sun Road," 8. Holden ("Going-to-the-Sun Road," n.p.) notes that the bid price for masonry guardwall and log guardrail was almost equal in 1925; if the masonry had been significantly more expensive than guardrail, the masonry guardwalls would not have been built).

241. Jack Gordon, telephone interview with Kathryn L. McKay, June 12, 2001.

242. McClelland, *Building the National Parks,* 201; Steen, "Typical Drainage Culvert: HAER MT-69," 4; Holden, "Going-to-the-Sun Road," n.p.; Hagerty interview.

243. Davidson, "Report to Chief," 3-6.

244. GNP, "Data Inventory," 53; GNP, *Going-to-the-Sun Road Cultural Resource Plan* (1991): 5, 25; Holden, "Going-to-the-Sun Road," n.p.

245. GNP, *Going-to-the-Sun Road Cultural Resource Plan,* 1991, p. 25; Holden, "Going-to-the-Sun Road," n.p.; Bill Dakin, interview with Kathryn L. McKay, June 6, 2001.

246. "Special Provisions: Transmountain Hwy. Grad. Proj. No. 1-D2" [Colonial Building Co.], 1929: 12-14, in "Development and Maintenance, 1929" folder 16, box 129, GNPA.

247. Holden, "Going-to-the-Sun Road," n.p.; Kittredge, "Transmountain Highway," 13.

248. Holden, "Going-to-the-Sun Road," n.p.

249. Holden, "Going-to-the-Sun Road," n.p.

250. McClelland, *Building the National Parks,* 217-218; GNP, *The Going-to-the-Sun Road Cultural Resource Plan* (1988), 4.

251. F. A. Kittredge, NPS Chief Engineer, to Arno B. Cammerer, NPS Director, 31 July 1934, in "1934" folder, box 3, Holden Collection, GNPA.

252. GNP, "Data Inventory," 52.

253. Holden, "Going-to-the-Sun Road," n.p.; A. V. Emery, "Final Construction Report, Transmountain Highway, Glacier National Park Highway Project 1-A, Units 1 & 2, Surfacing, Slope Stabilization and Bituminous Treatment and Glacier National Park Highway Project 1-B, 1-C (Por.), Bituminous Treatment, Flathead County, Montana," 1941, p. 5, in "Development and Maintenance: Report; Situation, 1936-39" folder 5, box 116, GNPA.

254. Holden, "Going-to-the-Sun Road," n.p.

255. GNP, "Data Inventory," 52.

256. Holden, "Going-to-the-Sun Road," n.p.; Steen, "Granite Creek Culvert: HAER MT-77," 3-4; Mark Hufstetler, *Going-to-the-Sun Road, Glacier National Park: Cultural Landscape Inventory* (prepared for GNP by Renewable technologies, Inc.), notes: 37, 65.

257. Holden, "Going-to-the-Sun," n.p.

258. Steen, "Golden Stairs Retaining Wall: HAER MT-83," 1, 3-4.

259. Soulliere, *Historic Roads,* 25; McClelland, *Building the National Parks,* 128, 220-223; Panos Kokkas, "National Historic Civil Engineering Landmark Nomination Form: Going-to-the-Sun Road" (prepared for the American Society of Civil Engineers, 1985), 4; Steen, "St. Mary River Bridge: HAER MT-84," 2-4; Begley and Carr, "Going-to-the-Sun Road," 9. Debris clogged the new Logan Creek bridge in the fall of 1926, causing about 20 feet of the roadway to wash out. The contractor added another span so the bridge could carry more water and also added a "nose" to the upstream side of the pier to prevent debris from lodging there (Kokkas, "Going-to-the-Sun Highway," 4).

260. Jon Axline, *Monuments Above the Wate: Montana's Historic Highway Bridges, 1860*-1956 (Helena, Montana: Montana Department of Transportation, 1993), 60, 63; Jon Axline, Montana Highway Department Historian, e-mail to Kathryn L. McKay, 19 July 2001.

261. Steen, "Belton Bridge: HAER MT-68," 3-6; Dennis Holden, "The Challenge," 7, in "Sun Road Golden Anniversary"; Mark Hufstetler, "Glacier's Historic Structures: Narrative Histories" (1988), 112-114.

262. Hufstetler, *Cultural Landscape Inventory,* notes, 12; Steen, "Logan Creek Bridge: HAER MT-75," 4.

263. Steen, "Baring Creek Bridge: HAER MT-82," 1-4; Hufstetler, *Cultural Landscape Inventory,* notes: 156.

264. Steen, "Triple Arches: HAER MT-79," 1, 4-5. In recent years, steel beams and rock bolts have been installed near the base of the arch supports for the Triple Arches.

265. McClelland, *Building the National Parks,* 225-226; Carr, *Wilderness by Design,* 182.

266. W. W. Moses, "Glacier Park Logan Pass Route," *Great Falls* [Montana] *Tribune,* 18 Oct. 1925; Dakin interview; Hagerty interview. According to Hagerty, the half tunnels were built not for aesthetics but because the NPS was trying to get the road built as quickly as possible with the funding they had available.

267. Steen, "West Side Tunnel: HAER MT-76," 1, 3, 5; Davidson, "Report to Chief," 9; Dakin interview; Scott Crandell, "Opalka: 'I didn't think they could do it,'" 14, in "Sun Road Golden Anniversary."

268. Steen, "East Side Tunnel: HAER MT-80," 1, 3-5; A. V. Emery, "Final Construction Report (1931-32) on Transmountain Highway, East Side, Logan Pass-St. Mary's Junction Sec. Grading, Glacier National Park Project No. 1-D2, State of Montana," 15, 18, in folder 17, box 7, Emery Collection, GNPA; Dennis Holden, "The Challenge," 7, in "Sun Road Golden Anniversary."

269. Steen, "East Side Tunnel: HAER MT-80," 5; John Zoss, "Final Construction Report on Glacier National Park Transmountain Highway, East Side, Project 1-D2, Tunnel Lining, Paving & Portals," 3-4, 8, 14, in "1933-42 Development & Maintenance: Reports; Situation" folder 6, box 116, GNPA.

270. Steen, "Typical Drainage Culvert,: HAER MT-69," 3-4; Begley and Carr, "Going-to-the-Sun Road," 4, 9; McClelland, *Building the National Parks*, 224; TIC drawing "Log Box Culverts," 1922.

271. MK Centennial, *Draft Going-to-the-Sun Road Engineering Study* (prepared for GNP, May 2001), 75-76.

272. Steen, "Sprague Creek Culvert: HAER MT-70," 1, 3, 5.

273. "Final Construction Report, Lewis Granite Park Trail," Feb. 27, 1929, p. 1, folder 8, box 118, GNPA; Hufstetler, *Cultural Landscape Inventory*, notes: 155; Steen, "Horse Trail Underpass: HAER MT-72," 1-4.

274. Holden, "Going-to-the-Sun Road," n.p. The original surfacing of the Sun Road was 4 inches of 1.5-inch minus sub-base covered by 4 inches of ¾-inch minus base course. Haul trucks compacted the material, creating fines and leading to water seeping through the surfacing. According to MK Centennial engineers, this contributed to later voids in the roadbed and settling and failure of the roadway and shoulders (MK Centennial, *Draft Engineering Study*, 13).

275. Holden, "Going-to-the-Sun Road," n.p.

276. I. S. Stinson, "Final Construction Report on Emergency Repairs – West Side Going-to-the-Sun Highway, Appropriation 134X1010, Roads and Trails, National Park Service, Account 583," 1942: 1-2, in "Development & Maintenance: Reports; Situation, 1941" folder 6, box 114, GNPA.

277. GNP, *Going-to-the-Sun Road Cultural Resource Plan*, 1991: 22. Most of the historic stone walls are located on the west side, particularly above Logan Creek. Today, much of the east side of the Road has no guardwall or guardrail to give drivers a sense of security.

278. Hagerty interview; Holden, "Going-to-the-Sun Road," n.p.; Landt interview, 2001.

279. Vernon M. Anderson, NPS Landscape Architect, memo to NPS Denver Service Center Chief, 6 August 1969, in "Development and Maintenance Reports; Situation, 1967-71" folder 7, box 114, GNPA; "Specifications, Solicitation No. 1430 7 0005," in "1970's" folder, box 3, Holden Collection, GNPA. The initial contractor for this work was Intra-Jet Engineering Company. This company went under and was replaced by the Harding Construction Company took over. A company named Waddell may also have been involved in the work.

280. GNP, *1974 Glacier National Park Superintendent's Report*, 14; handwritten sheet in "1970s" folder, box 3, Holden Collection, GNPA; Dakin interview.

281. Dakin interview.

282. handwritten sheet in "1970s" folder, box 3, Holden Collection, GNPA; Dakin interview.

283. Gordon interview.

284. Gordon interview.

285. Gordon interview.

286. GNP, *Going-to-the-Sun Road Cultural Resource Plan*, 1991: 12, 14.

287. GNP, *Going-to-the-Sun Road Cultural Resource Plan*, 13; Gordon interview; Hufstetler, *Cultural Landscape Report*, 9.

288. Holden, “Going-to-the-Sun Road,” n.p.; MK Centennial, *Draft Engineering Study*, 15, 85.

289. Landt interview, 2001; Dakin interview; GNP, *Going-to-the-Sun Road Cultural Resource Plan,* 13.

290. Landt interview, 2001.

291. Landt interview, 2001.

292. Gordon interview.

293. Hagerty interview; “Completion Report: Construct Parking Areas (12) – Various Locations, Going-to-the-Sun Road,” n.p., in “Development & Maintenance: Reports; Situation, the Sun Road Parking Areas; Completion Report 1961” folder 40, box 110, GNPA.

294. Armstrong interview; Landt interview.

295. Gordon interview.

296. Gordon interview.

297. GNP, *Draft Transportation Plan/Environmental Assessment,* 53-54.

298. GNP, *Draft Transportation Plan/Environmental Assessment,* iv; GNP, “Data Inventory,” 38.

299. MK Centennial, *Draft Engineering Study*, 31.

300. Dakin interview.

301. Hagerty interview; Armstrong interview; Farris interview; Landt interview, 2001. Glacier’s roads were first oiled to keep down dust in 1930. They were oiled each year until they were surfaced with asphalt (Holden, “Going-to-the-Sun Road,” n.p.).

302. "Halberg's Job: To Clear Snow Off the Road," in "Sun Road Golden Anniversary" insert; Landt interview, 2001.

303. GNP, “Mission 66 Prospectus,” 1956: 28, in “Development and Maintenance: Planning Program, 1956-68” folder 4, box 104, GNPA.

304. Armstrong interview; Newell et al., *Historic Resources Study, Glacier,* 169; Kenneth R. Oviatt, “Final Construction Report, Going-to-the-Sun Highway, Glacier National Park Highway Project, 1-C (Portion), Surfacing and Bituminous Surfacing (Class 1 Park Route), Glacier National Park, Flathead County, Montana,” ca. 1952, in “Development & Maintenance: Reports; Situation, 1952” folder 1, box 14, GNPA; GNP, *1956 Glacier National Park Superintendent’s Annual Report,* section 4, GNPA.

305. Soulliere, *Historic Roads*, 55; “Change Order No. 7, Contract N-14-10-7:991-222,” in “Development and Maintenance Reports; Situation, 1967-71” folder 7, box 114, GNPA.

306. GNP, *1960 Glacier National Park Superintendent’s Annual Report*, section 11; “Completion Report 1961,” in “Development & Maintenance: Reports, Situation, Going-to-the-Sun Road Asphalt Curbs” folder 37, box 110, GNPA; Dakin interview; Newell et al., *Historic Resources Study, Glacier,* 226.

307. Landt interview, 2001; Hagerty interview.

308. Armstrong interview.

309. McClelland, *Building the National Parks,* 481, 483.

310. McClelland, *Building the National Parks,* 477-480.

311. Dakin interview.

312. McClelland, *Building the National Parks,* 71, 76, 81.

313. Begley and Carr, "Going-to-the-Sun Road," 7.

314. GNP, *1951 Glacier National Park Superintendent's Annual Report,* 11, GNPA; GNP, *Fiscal Year 1957 Glacier National Park Superintendent's Annual Report,* section 10. GNPA.

315. Begley and Carr, "Going-to-the-Sun Road," 8; Dakin interview; Landt interview, 2001; Gordon interview.

316. David B. Rockwell, *Glacier National Park: A Natural History Guide* (Boston: Houghton Mifflin, 1995), 58.

317. Hanna, *Glacier Land,* 129 (footnote).

318. J. R. Eakin, GNP Superintendent, to H. E. Albright, NPS Assistant Director, 10 Oct. 1927, in "Development and Maintenance: Roads and Trails, 1927" folder 14, box 129, GNPA; GNP, *1929Glacier National Park Superintendent's Annual Report,* 6, GNPA; GNP, *1933 Glacier National Park Superintendent's Annual Report,* 10, GNPA; "Halberg' job: to clear snow off road," 18, in "Sun Road Golden Anniversary."

319. GNP, *1928 Glacier National Park Superintendent's Annual Report,* 4, GNPA; A. V. Emery, "Final Post Construction Report 1936-1939, Transmountain Highway, Glacier National Park Highway Project 1-D1, D2, E1, E2, Drainage, Slide Correction & Bituminous Surface Repair, Glacier County, Montana," 1941: 1, in "Development and Maintenance: Report; Situation, 1936-39" folder 5, box 116, GNPA; Landt interview, 2001.

320. GNP, *1957 Glacier National Park Superintendent's Annual Report,* section 10, GNPA; Buchholtz, *Man In Glacier,* 72-73; Hagerty interview; Russell Landt interview with Deirdre Shaw, Dec. 29, 1999; Landt interview, 2001; Armstrong interview. The earliest opening of the Road to date was on May 27, 1957.

321. Hagerty interview; GNP, *1954 Glacier National Park Superintendent's Annual Report,* section 7, GNPA; GNP, *1960 Glacier National Park Superintendent's Annual Report,* section 13, GNPA; Landt interview, 2001; Dakin interview.

322. Mike Mikkleson, interview with Jennifer Bottomly-O'Looney, Jan. 10, 2001; Landt interview, 1999; Dakin interview; Hagerty interview.

323. Landt interview, 1999; Mikkleson interview.

324. Dakin interview; Landt interview; Hagerty interview.

325. Landt interview, 2001; Landt interview 1999.

326. Landt interview, 1999; GNP, *1960 Glacier National Park Superintendent's Annual Report,* section 13, GNPA; GNP, *1964 Glacier National Park Superintendent's Annual Report,* 7-8, GNPA.

327. GNP, *1936 Glacier National Park Annual Superintendent's Report,* 11, GNPA; Hagerty interview; Landt interview, 1999. Dynamite was used to cause snow in avalanche chutes to slide into the road so loaders could dump it over the edge. It was also used, even in the 1930s and 1940s, to knock down steep walls of snow and to loosen hard-packed snow (Landt interview, 1999; Ira S. Stinson, "Roads and Trails in Glacier National Park," 92, in Glacier Park Transport company, *Drivers' Manual*).

328. Franklin B. Elliott, "Finding of Fact," 15 June 1973, in "1970's" folder, box 3, Holden Collection, GNPA; Dakin interview.

329. Hagerty interview; Dakin interview; Landt interview, 2001; Gordon interview; MK Centennial, *Draft Engineering Study,* 106; GNP Suggestion Form GLAC 89-06, copy loaned to author by Bill Dakin. The cost of repairing walls damaged by snow-plowing equipment could be quite high. Gerald Yates and others prepared detailed accountings of the costs associated with such damage for several years. In 1991, for example, snow-removal equipment damaged or destroyed guardwall in thirty-five locations, totaling 249 lineal feet. The repairs by the NPS masonry crew cost approximately $18,000 (Gary Yates, GNP, to Jack DeWitt, GNP Roads Foreman, 5 Oct. 1991, copy loaned to author by Bill Dakin).

330. "Going-to-the-Sun Road Openings and Closings," 1999, GNPA.

331. Buchholtz, "Historical Dichotomy," 48; Newell et al., *Historic Resources Study, Glacier,* 219.

332. Elrod, *Elrod's Guide,* 163; GNP, *1949 Glacier National Park Superintendent's Annual Report,* 3, GNPA; Newell et al., *Historic Resources Study, Glacier,* 226; Armstrong interview.

333. Buchholz, "Historical Dichotomy," 79; US DOI, NPS, *Glacier National Park, Montana,*1934: 28, 38; Newell et al., *Historic Resources Study, Glacier,* 149-150, 226; Williams, *Ruhle Handbook,* 19.

334. GNP, "Mission 66 Prospectus," 1956: 11, 13, in "Development and Maintenance: Planning Program, 1956-68" folder 4, box 104, GNPA.

335. McClelland, *Building the National Parks,* 143; GNP, *1958 Glacier National Park Superintendent's Annual Report,* section 12, GNPA; GNP, *1974 Glacier National Park Annual Superintendent's Report,* 12.

336. Rockwell, *Glacier National Park,* 50; Omer B. Raup et al., *Geology Along Going-to-the-Sun Road, Glacier National Park, Montana, a Self Guided Tour for Motorists* (West Glacier, Montana: Glacier Natural History Association, 1983), 12.

337. Armstrong interview; Dakin interview.

338. McClelland, *Building the National Parks,* 468; GNP, "Mission 66 Prospectus," 1956: 15-17, in "Development and Maintenance: Planning Program, 1956-68" folder 4, box 104, GNPA.

339. Gordon interview; Richard B. Hoffman, *Glacier National Park: Wayside Exhibit Proposal* (prepared by Harpers Ferry Center, National Park Service, 1992).

340. Jim Mann, "St. Mary's Matriarch," *Daily Inter Lake* [Kalispell, Montana], 22 July, 2001: A3.

341. Christie Amos and Alan S. Newell, "National Register Nomination: Going-to-the-Sun Road Historic District" (1983).

342. Kokkas, “Going-to-the-Sun Road.”

343. Steen, “Going-to-the-Sun Road,” 1.

344. Begley and Carr, “Going-to-the-Sun Road National Historic Landmark Nomination,” 4-5, 45.

345. Begley and Carr, “Going-to-the-Sun Road National Historic Landmark Nomination,” 13-14.

346. Glacier National Park, *Final General Management Plan*, 1999, 1: 149.

347. Carr, *Wilderness by Design*, 81; Soulliere, *Historic Roads*, 32; McClelland, *Building the National Parks*, 134.

348. T. C. Vint, NPS Assistant Landscape Engineer, memo to D. R. Hull, NPS Chief Landscape Engineer, [1925], p. 2, entry 6, box 39, RG 79, NARA.

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350. Mather, “Engineering Applied to National Parks,” 2675-2676.

351. McClelland, *Building the National Parks*, 7.

352. Frank A. Kittredge, “The Going-to-the-Sun Highway, Glacier National Park,” 11 March 1949: 3, in “History & Archeology: Area & Service History; Going-to-the-Sun Road Kittredge 1949” folder 7, box 171, GNPA.

353. McClelland, *Building the National Parks*, 202-205.

354. “Special Provisions: Transmountain Hwy. Grad. Proj. No. 1-D2” [Colonial Building Co.], 1929: 12-14, in “Development and Maintenance, 1929” folder 16, box 129, GNPA.

355. Holden, “Going-to-the-Sun Road,” n.p.; GNP, “Data Inventory,” 49.

356. Soulliere, *Historic Roads*, 81; McClelland, *Building the National Parks*, 480.

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363. Brooks, "Waterton-Glacier, A Natural History," 19.

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370. Ibid., 30.

371. Raup, et.al., *Geology Along Going-to-the-Sun Road – Glacier National Park, Montana*, 60.

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477. Ibid., 59; Hufstetler, “Glacier Historic Structures: Narrative Histories,” 5.

478. Hufstetler, “Glacier Historic Structures: Narrative Histories,” 25.

479. Ibid., 8-9, 75-76.

480. Ibid., 37-38.

481. Ibid., 13-17.

482. Ibid., 11-12.

483. Ibid., 29-33.

484. Ibid., 34, 42.

485. Ibid., 66-67.

486. Ibid., 103.

487. Sarah Allaback, "Mission 66 Visitor Centers, The History of a Building Type", unpublished document, (Washington DC: 2000), 1-5.

488. Hufstetler, "Glacier Historic Structures: Narrative Histories," 75, 76, 78.

489. Ober, "Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 14.

490. Raup, et.al., *Geology Along Going-to-the-Sun Road – Glacier National Park, Montana*, 54.

491. Brooks, "Motorist's View," 50.

492. Scharff, *Glacier National Park*, 114.

493. Rockwell, *A Natural History Guide – Glacier National Park*, 135-136.

494. Donald H. Robinson, *Through the Years in Glacier National Park, An Administrative History*, (West Glacier, Montana: Glacier Natural History Association, May, 1960), 60-61.

495. Ober, "Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 17.

496. Robinson, *Through the Years in Glacier National Park, An Administrative History*, 62.

497. Ibid., 62-63.

498. Architectural Research Consultants, Inc., "Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park", draft report, (Albuquerque, NM: unpublished, January 21, 2001), 36.

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500. Ibid., 29.

501. Architectural Research Consultants, Inc., "Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park," 23.

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503. National Park Service, “Development Concept Plan Revision, Environmental Assessment, Lake McDonald Glacier National Park, Montana”, draft document, (Glacier National Park: April, 1990), 22.

504. Ober , “Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 30-32.

505. Architectural Research Consultants, Inc., “Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park,” 36.

506. Hufstetler, “Glacier Historic Structures: Narrative Histories,” 216.

507. Architectural Research Consultants, Inc., “Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park,” 52.

508. Hufstetler, “Glacier Historic Structures: Narrative Histories,” 216.

509. Architectural Research Consultants, Inc., “Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park,” 61, 66, 68.

510. Ober, “Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 33.

511. Ibid., 38-39.

512. Architectural Research Consultants, Inc., “Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park,” 23.

513. Ober, “Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 44-47.

514. National Park Service, Construction Drawing for the Flagstone Steps and Turnabout at Lake McDonald Hotel, April, 1936; conversation with Paul Polzin, Cultural Resource Specialist, Glacier National Park, 2001.

515. Conversation with Paul Polzin, Cultural Resource Specialist, Glacier National Park, 2001.

516. Ibid.

517. Architectural Research Consultants, Inc., “Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park,” 76-77.

518. Ober, “Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 137.

519. Hufstetler, “Glacier Historic Structures: Narrative Histories,” 216-217.

520. Ober, “Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 181-182.

521. Ibid., 174; Architectural Research Consultants, Inc., "Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park," 30.

522. Ober, "Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 186.

523. Architectural Research Consultants, Inc., "Historic Structures Report for the Lake McDonald Lodge Historic District, Glacier National Park," 43.

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525. Hanna, *Montana's Many-Splendored Glacierland,* 190.

526. Hufstetler, "Glacier Historic Structures: Narrative Histories," 162.

527. National Park Service, "Development Concept Plan Revision, Environmental Assessment, Lake McDonald Glacier National Park, Montana", draft document, (Glacier National Park: April, 1990), 22.

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529. Michael J. Ober , "Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961", unpublished thesis, presented in partial fulfillment of the requirements for the degree of Master of Arts, (Missoula, Montana: University of Montana, 1973), 176-177.

530. Architectural Research Consultants, Inc., "Historic Structures Report for the Rising Sun Historic District, Glacier National Park", draft report, (Albuquerque, NM: unpublished, January 16, 2001), 19.

531. Roes Creek was named for Charlie Roes, an early visitor to the area. Uncertainties over the correct spelling of his last name have resulted in differing spellings of the creek over time: "Roes" is found in most historic sources, while recent maps often use "Rose." This report accepts the "Roes" spelling as correct.

532. Mark Hufstetler, "Glacier Historic Structures: Narrative Histories." Unpublished report prepared for Glacier National Park, 1988. File copy in GNP library.

533. Mark Hufstetler, "The Auto Arrives at Glacier." *SCA Journal* (Spring, 1997): 10.

534. Scharff, *Glacier National Park*, 44.

535. Beaumont, *Many-storied Mountains – The Life of Glacier National Park,* 130-133.

536. Scharff, *Glacier National Park*, 111-113.

537. Janet A. (Eisner) Cornish, "Public Transportation in Glacier National Park," unpublished thesis presented in partial fulfillment of the requirements for the degree of Master of Science, (Missoula, Montana: University of Montana, 1977), 1-2.

538. Ober, "Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 137.

539. Cornish, "Public Transportation in Glacier National Park," 17.

540. Ober, "Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 99, 103.

541. Ibid., 101-102.

542. Ibid., 108-109.

543. Ibid., 119, 123-125.

544. Ray Djuff and Chris Morrison, *Glacier's Historic Hotels and Chalets: View with a Room* (Helena, Montana: Far Country Press, 2001), 78.

545. Architectural Research Consultants, Inc., "Historic Structures Report for the Rising Sun Historic District, Glacier National Park," 18.

546. Ibid., 29.

547. Ober , "Enmity and Alliance: Park Service-Concession Relations in Glacier National Park, 1892-1961," 127-128.

548. Ibid., 149.

549. Ibid., 160.

550. Hufstetler, "Glacier Historic Structures," 131-134.

551. Architectural Research Consultants, Inc., "Historic Structures Report for the Rising Sun Historic District, Glacier National Park," 26.

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Appendix: Representative Sun Road Construction Contract

Contract with the Colonial Building Company, 1929. Original located in the Glacier National Park Archives, folder 16, box 129.

Glacier National Park
Transmountain Hwy. Grad. Proj.
No. 1-D2

SPECIAL PROVISIONS

These special provisions supplement and modify "Specifications for Fores Road Construction Fore F.R. 50 Revised 1929". All of the Requirements and provisions of Form F.R. 50 Revised 1929 shall apply except where modified by these Special Provisions.

1. FUNDS PROGRAMMED. The Secretary has programmed for the work on this project and Project 1-D1, E1 the sum of $800,000. In case the contract award for this work shall leave available any portion of the funds so programmed, the right is reserved to extend the contract by increasing the length of the project beyond the termini shown on the plans. Provided, that no such extension shall be made which will exceed in amount 25% of the original amount of this contract. The Secretary also reserves the right to shorten the project if necessary to keep the cost of the work within the above funds.

2. TIME EXTENSIONS. The time of performance is based on the estimated quantities appearing in the Bid Schedule. If satisfactory completion of the contract shall require the performance of work in greater quantities than those set forth in the Bid Schedule, the time allowed for performance shall be increased in the same ratio that the total cost of work to the Government actually performed shall bear to the total cost in the Bid Schedule.

3. LIQUIDATION DAMAGES. In the event of failure to complete the work within the time specified the contractor shall pay to the Government,
as fixed, agreed and liquidated damages for each calender day of delay until the work is completed of accepted the sum of $25.00 as provided in Article 9. Standard Government Form of Contract.

4. DEFINITION OF TERMS. Whenever in the specifications the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

Secretary - The Secretary of the Interior of the United States;
National Forest - National Park;
Forest - Park;
Forest Service - National Park Service;
Forest Supervisor - Park Superintendent;
Forest Officer - Park Officer.

5. TELEPHONE LINES, TRAILS, ROADS. All telephone lines in the vicinity of this project shall be protected as far as possible during construction operation and if injured shall be repaired immediately by the contractor; all trails in the vicinity whose maintenance or repair is considered necessary by the engineer, shall be repaired or reconstructed
by the contractor if injured by him and kept free from obstruction by

logs, brush, or debris, as the engineer shall require. All roads and trails in the vicinity must be kept safe and unobstructed to travel at all times.

6. DAMAGE TO TIMBER. No damage shall be done in construction operations to young growth or trees left standing. Should trees or shrubs left standing on or adjacent to the right of way be unavoidably damaged by the contractor in the construction operations such trees of shrubs shall be cut down and disposed of, as directed by the engineer, at the contractor's expense.

7. EXAMINATION OF SITE. The bidder is required to examine carefully the site of the work and it will be assumed that the bidder has investigated and is satisfied as to the conditions to be encountered.

8. TIME CHART. The successful contractor will, within ten days after notification to proceed with the work, furnish a time chart, a plan of construction and a statement of his equipment and proposed method of carrying forward the work.

LOCATION OF CAMPS AND SANITATION:

1. The location of all contractors and camps shall be decided by the Superintendent of the Park of his representative. Landscape preservation is imperative and all camps shall be placed upon the cleared right of way unless other permission is secured in writing from the Park Superintendent.

2. In all matters pertaining to sanitation the contractor shall observe the regulations of the National Park Service and the laws and regulations of the State Board of Health. These in general are as follows:

(a) Sleeping quarters shall be provided for all employees and shall have ample window and air space, and floors that can be kept clean.

(b) Cooking and dining quarters shall be well lighted and ventilated fly-proof, and kept in a clean and sanitary condition at all times. Places used for dining rooms, kitchens, or storing or preparing foods shall not be used as sleeping of living rooms and persons afflicted with communicable diseases shall not be allowed in the cooking and dining room quarters. All perishable food shall be protected from putrefaction and insects, and all food served shall be handled in a cleanly and sanitary manner.

(c) A water supply for domestic purposes shall be obtained from a source free from contamination.

(d) Sewage shall be disposed of in earth pit toilets covered with fly-proof and well ventilated buildings, or chemical toilets, or some other approved method. If pit toilets are used they shall be located at least 100 feet from streams, 75 feet from sleeping quarters, and 150 feet from kitchens or mess houses, and the pits shall be sprayed or covered with a disinfectant three times a week. Flush toilets shall not be used before plans for method of disposing of sewage have been approved by the Superintendent of the Park.

Kitchen wastes shall be discharged through vitrified or iron pipe to a covered cesspool located at least 50 feet from the kitchen.

(e) Stables and corrals shall be located at least 600 feet from kitchens and mess houses and 500 feet from sleeping quarters.

(f) Garbage and refuse shall be stored in closed containers, and shall be disposed of either by burning or by burial and covering every day.

(g) When a cap is abandoned, all tin cans, rubbish, toilet buildings and other foreign material shall be removed and disposed of to the satisfaction of the Superintendent of the Park, and all pits used for toilets, garbage, or cesspools shall be covered with chloride of lime or other disinfectant and filled with earth.

10. SPECIAL CONSTRUCTION FEATURES. The work contemplated herein is situated within a National Park and special attention must be given to the landscape features of the work and special care taken to protect natural surroundings and adjacent camp grounds. Any timber or other landscape features scarred of damaged by the contractor's operations shall be removed, trimmed up, or restored as nearly as possible to their original condition at the contractor's expense. The engineer shall decide which method is to be used.

No. rock, rubbish, or debris resulting from the work shall be left on the cleared right of way but must be deposited where indicated by the engineer. The contractor will be required to gather all unsightly rock which falls outside of the finished roadway slopes and place it in fills at his expense.

Care must be taken at all times to regulate the operations so as to protect visitors and campers and to facilitate traffic.

Blasting operations shall be conducted under the most careful supervision. The contractor shall adopt precautions in using explosives which will prevent damage to surrounding objects and the scattering of rock, stumps or other debris.

Rock blasting - side hill excavation by means of "coyote holes" or "gopher holes" will not be permitted.

Failure to observe necessary precautions to prevent damage or failure to immediately repair any damage caused will be sufficient grounds for closing down the work until the contractor has given evidence to the satisfaction of the engineer that the terms of these provisions are to be strictly complied with.

11. CAMPS, TOTE ROADS. The location of tote roads, camps, storage buildings and other construction buildings and operations off the right of way shall require the written approval of the Park Superintendent.

12. SUPPLEMENTAL CONCRETE SPECIFICATIONS. Attention is called to the supplemental specifications for concrete replacing item of same name on page 43 of the 1929 revision of FR 50 to which the supplement is bound.

13. TEMPORARY ROADS AND TRAILS. Temporary roads or trails that the contractor may require in the performance of the work, shall be confined to the limits designated for clearing, unless otherwise authorised in writing by the Park Superintendent through the engineer.

All temporary roads or trails shall be abandoned immediately when the construction of the portion of the project for which they were required is completed, and the natural surfaces disturbed by their construction and use shall be restored as nearly as possible to original condition by the contractor at his expense.

14. ADDITIONAL CLEARING. The right of way has been cleared byt additional clearing may be required in place to accommodate the roadway. This work shall be handled in the manner specified under clearing and grabbing, p. 12. Form F. R. 50, Specifications for Forest Road Construction and the Special Provisions included in the contract.

The contractor shall clear only to such limits as are designated by the engineer. Where blasting operations will be required in future grading work the full right of way width will not be cleared. The trees and brush on the lower side will be left as a protective screen for the surrounding trees and shrubbery during blasting operations.

Trees and shrubs of value to the appearance of the road and not coming within the slopes shall be left upon order of the engineer.

From the area designated for clearing, except where embankment is to be 3 feet or more in height, all stumps and roots shall be close cut or blasted, as directed by the engineer. All holes in the cleared area outside of the neat construction lines resulting from these operations shall be backfilled with rock or earth as directed by the Engineer.

The area to be measured in payment for this item shall be that included within the limits as designated for additional clearing and payment shall be made at the price per acre bid for “Additional Clearing” which price will include all equipment, tools, labor end incidentals necessary to complete the work.

Fire Provisions: The following provisions shall be supplemental to the provisions of Form F.R. 50 Revised 1929, and shall in no way cancel, alter or lesson the responsibility of the contractor as set forth therein.

In case of any fire which the contractor is obligated to suppress without expense to the United States under the provisions of th Forest Fires section one page 8 of Form F.R. 50-Revised 1929, if the amount and character of labor, subsistence, supplies and transportation which the contractor is in a position to furnish promptly for fire suppression is inadequate for that purpose in the judgement of the perk officer in charge, then such park officer is authorized to order such additional labor, subsistence, supplies, and the use of such transportation facilities as he may deem necessary for th e suppression of the fire, the cost thereof to be paid by the contractor. Tese expenses shall be billed to the contractor for payment directly by him, and if not promptly met the contractor shall be paid by the Government and deducted from the monies due the contractor under this contract; and in case there are not sufficient funds due the contractor to cover such cost of fire suppression, the additional amount due the Government shall be recovered under the contractor's bond for the faithful performance of this contract.

No clearing work of any kind will be started until the following fire fighting equipment is provided and placed as directed by the Park Service Fire Guard in charge of burning operations, or the District Engineer in charge of the territory shall grant permission in exiting.

At least 3 boxes containing the following fire fighting equipment shall be maintained on each contract. These boxed shall be marked "Fire Fighting Tools", and placed on the project as directed by the Park Ranger of Fire Guard in charge, so that they will be readily available at any time.

6 large pails	1 falling saw
6 shovels	1 sledge
3 axes	2 wedges
6 hazel hoes	

Near each box shall be kept

1 hand pump with man pack water container filled with water.

There shall also be available to each steam shovel operated at least one such box, and one hand pump with man pack water container filled with water.

There shall also be provided such portable gasoline high pressure pumps as may be required by the Chief Ranger. Each portable pump shall be of sufficient size and capacity to deliver 15 gallons of water per minute through 1500 feet of 1″ hose to an elevation of 150 feet. Each pump shall be equipped with at least 1500 feet of not less than 1 ½″ hose, with nozzles and other necessary accessories. This equipment shall be maintained at all times in readiness for immediate use, and it shall be tested as frequently as the park officer in charge of the burning may require. Pumps shall be st up, and hose laid out at all times burning operations are in progress.

A National Park Service officer will be designated as Fire Guard to take charge of all burning work on each contract. No open fires of any kind will be started without permission in writing signed by the Fire Guard in charge. When burning operations are to be stooped for any reason a written order to that effect will be issued by the Fire Guard.

The contractor, his employees, sub-contractor, his employees, shall of their own initiative and independently, do all in their power to prevent and control the escape of fire from the right of way and shall be instructed at the time of their employment of this obligation.

The Chief Park Ranger or his representative shall be notified at once by telephone, messenger, or otherwise of the escape of fire. The Chief Park Ranger or his representative may take charge of controlling such fire, and shall be furnished with such men, tools and equipment as he may require to extinguish such fire in the shortest possible time.

The contractor, his employees and equipment when requested by Park Rangers, shall be temporarily at the disposal of the National Park Service for the purpose of fighting fires in that locality, even though not caused by the contractor or his employees, provided payment for such services shall be made at not less than the current rate established in the National Park Service. Such employees and equipment of the contractor shall be released as soon as it is practicable to obtain others to replace them.

15. UNCLASSIFIED EXCAVATION TYPE B. On Sections as indicated on the plans or where designated in writing by the engineer, where damage to roadbed and slopes and surrounding objects cannot be prevented except by using extra-ordinary precautions, all blasting operations shall be so conducted that absolutely no damage will result. This may necessitate drill holes to be spaced not over two feet apart; the use of not over ½ pound of explosives, equivalent in strength to 40% dynamite, per cubic yard of material to be blasted; the shooting of only a few holes simultaneously, and possibly the use of suitable mats to smother the blasts.

Before any drilling operations are started for "Unclassified Excavation Type B", the contractor shall furnish the engineer a detailed plan of operations showing the methods proposed to prevent damage. The contractor shall not proceed with his operations until such plans have been approved by the engineer.

Roadway and drainage excavation within such designated sections will be measured in accordance with the specifications for roadway and drainage excavation, excepting that no over breakage will be allowed and no quantities beyond the neat section will be paid for by the Government. Payment of this yardage shall be made at the unit price bid per cubic yard for "Unclassified Excavation Type B", which price
shall be full compensation for formation and compaction of embankments, disposal of surplus material, preparation and completion of subgrade and shoulders, and the furnishing of all equipment, tools, labor and incidentals necessary to complete the work.

16. UNCLASSIFIED EXCAVATION CUSHION BORROW.

Description: this item shall consist of excavation from sources designated in writing by the engineer, for Cushion Borrow, loading and placing within the 500' free haul limit, selected material for cushion rock cuts which material shall conform to the specifications for "Finishing Earth Graded Roads", Form F. R. 50. The hauling of all such designated Cushion material in excess of 500' free haul will be paid for under Cushion Haul, Item 24 of the bid schedule.

Construction Methods: Material to be placed to comply with the specification for "Finishing Earth Graded Roads" Form F. R. 50.

Method of Measurement: Same as for "Borrow" F. R. 50.

Basis of Payment: The yardage measured as provided above shall be paid for at the contract unit price per cu. yd. bid for "Unclassified Excavation Cushion Borrow" which price shall be full

compensation for excavating and hauling within the 500' free haul limit, rejection of all material not complying with the specifications for "Finishing Earth Graded Roads" Form F. R. 50, spreading and the furnishing of all equipment, tools, labor and incidentals necessary to complete the work.

17. CUSHION HAUL.

Description: This item shall consist of hauling in excess of the 500' free haul limit and placing of selected material from sources designated in writing by the engineer for "Unclassified Excavation Cushion Borrow" on sections of the roadbed designated in writing by the engineer for Cushion Haul. Suitable material available from roadway excavation and within the limits of Haul specified for such roadway excavation shall be placed and paid for as Unclassified Excavation and overhaul respectively.

Construction Method: After the material has been deposited as directed by the engineer treatment shall be so as to insure compliance with the Specifications for "Finishing Earth Graded Road" Form F.R. 50.

Method of Measurement: The yardage to be paid for under this item shall be the yardage, measured in its original position by the method of average and areas, hauled ½ mile or more beyond the 500' limit of free haul including authorized overburden or stripping.

Basis of Payment: Cushion Haul shall be paid for in one-half mile yard units under item 24 of the bid schedule, a one-half mile yard being defined as a cubic yard of material hauled one-half mile or fraction thereof beyond the 500' free haul limit. This price shall be full compensation for all work necessary in loading, hauling, spreading, rejecting oversize material and for all equipment, tools, labor, and incidentals necessary to complete the work. This price shall not include the excavation which will be paid for under Item 8, "Unclassified Excavation Cushion Borrow".

18. TUNNEL. The tunnel to be constructed under this contract shall be excavated as nearly as possible to the neat cross section shown on the plans. Special care shall be exercised in blasting at the portals and in the tunnel to reduce the unavoidable overbreak to a minimum. It shall be carefully trimmed to remove all material loosened by blasting.

Method of Measurement: The length of tunnel to be paid for shall be the actual measured length of the roof along center line. All excavation for roadway outside of the tunnel section shall be measured and paid for as unclassified excavation.

Payment: Payment shall be made at the contract unit price bid per lin. ft. for tunnel complete which price shall be full compensation for all equipment, labor, tools, supplies, and incidentals necessary to complete the work.

19. CONCRETE CURB. The curbs to be constructed under this contract shall be of Portland cement concrete meeting the specifications for class "A" concrete as defined elsewhere in the Special Provisions.

20. TRAILS. Trails which must be permanently relocated because of the road construction, and new trails necessary for connections with road crossings shall be built as a part of this contract. Included in this work shall be the construction of a new trail from approximately opposite Station 37, following well above the road location through the cliffs and talus slides to a crossing of Piegan Creek about 500' above the proposed road crossing thence climbing to a connection with the Piegan Creek trail at approximately 1/3 mile east of an opposite Station 200.

Trails shall follow the lines and grades as staked by the engineer. They shall be 5 feet wide with a maximum grade of 15% and constructed by removing all brush, roots, boulders and coarse stone and finishing to a grade approximately following a grade contour but level transversely. When complete the top 2 inches of the material shall be of such wise as will pase a 2 inch ring. In each case the new trail shall be built and opened to traffic before the existing trail is blocked.

The various items of work involved shall be accomplished in accordance with the general specification s and these special provisions governing such items in the construction of the road.

Method of Measurement: Trails shall be measured horizontally along the center line of the trail as constructed.

Basis of Payment: The length of trails determined as above shall be paid for at the contract unit price bid for "Trails" which price shall be full compensation for all clearing, grubbing, excavation, finishing, and for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the item.

21. PARKING AREAS. In several places extra width and parking areas are to be constructed as a part of the road work. These shall be built according to the general and special requirements governing the road construction but no extra payment shall be made for finishing required beyond the limits of the roadbed proper.

22. CUT SLOPES IN EARTHY MATERIAL. Through earthy material inside cut slopes less than 6 feet in height shall be finished on a slope of two horizontal to one vertical and outside cut slopes less than 6 feet in height shall be finished on a slope of three horizontal to one vertical. The intersections of such slopes with the ground line shall be rounded beginning five feet back of the slope stake and extending five feet down the cut slope as shown on the cross-section. The yardage involved in rounding the slopes but will be considered a necessary part of excavating the staked roadbed quantities.

23. MASONRY.

Description: Masonry shall be composed of approved stones laid in mortar beds and shall be constructed in conformity with the plans and these special provisions or as directed in writing by the engineer.

Material:

1. The Portland cement, sand and water for the mortar shall be such as to conform with the respective requirements for these materials as continued in the specifications relating to concrete.

2. The stone for masonry shall be clean, hard, and of a kind known to be durable, obtained from sources approved by the Engineer.

3. Stones shall have wall heights between 8 and 24 inches, and wall lengths between 24 and 60 inches, except in head walls for pipe culverts individual stones shall have minimum dimensions of 6 by 15 inches, the object being to average the heights. Selections may be made with as low a ratio as 1-3/4:1 and high as 3 ½ :1.

Construction Methods:

1. All masonry shall be constructed by experienced workmen using proper tools.

All construction work shall be carried forward and all stock piling of materials shall be done upon the cleared right of way unless other permission is secured in writing from the Park Superintendent.

2. All stones shall be fully bedded in Portland cement mortar, mixed in proportions of one part cement to three parts of sand. Mortar which is not used within 30 minutes after water has been added shall be wasted. Retempering of mortar will not be permitted. The sand and cement shall first be mixed dry in a tight box until the mixture assumes a uniform color, after which the water shall be added as the mixing continues until the mortar attains a consistency such that it can be easily handled and spread with a trowel.

3. All stones shall be laid on their natural beds with the major axes horizontal. Stones shall be laid so that four corners of adjacent stones will in no case be contiguous.

4. For exposed surfaces, the use of weathered rocks covered with moss, lichens, or those which show traces of color is preferable.

5. Care shall be exercised to eliminate the nesting or bunching of rocks of the same size, shape or color. Extra large stones shall be used at all corners and large stones at the base of walls. A plentiful supply of stone to allow masons wide selective choice for laying shall always be kept on hand.

6. No masonry work shall be done in freezing weather without permission of the Engineer and the use of such precautions as he may require. In hot or dry weather the masonry shall be protected from the sun for at least three days after laying.

7. Mortar joints in the exposed surface shall generally be 1 to 1 ½ inches wide; none shall be more than 2 ½ inches wide and none less than 3/4 inches wide.

8. All mortar joints in exposed surfaces shall be raked out to a depth of one inc, or more, before mortar sets.

If required by the Engineer the joint shall be wetted and pointed with Portland cement mortar mixed in proportion to one part of cement to two parts of sand. No pointing shall be done in freezing weather and any work damaged by frost shall be removed and replaced.

9. Care shall be taken at all times to keep the face surfaces of all stones free from mortar stains. No work shall be done under rainy conditions without such shelter as will entirely prevent mortar staining. Any mortar stains shall be removed while fresh.

10. The top of exposed walls shall be made uniformly even by rough hammering if necessary with allowable veriations from a neat line of ½ inch. Small flat rocks shall not be used in the top course.

11. Masonry guard rails shall conform to drawings and plans. The stones on top of the guard rail shall generally be cut to the full width of the wall. There shall be no joints in the top of the guard rail parallel with the lines of the guard rail. Then a stone guard rail is required on the top of a stone wall, the rail and lwall shall be a unit. There shall be no continuous joint between the wall and the guard rail.

12. If any stone is loosened after the mortar is set, it shall be removed, the mortar cleaned off, and the stone relaid with fresh mortar.

13. The interior of the walls shall be so constructed that the stones of which it is composed will be bonded and no voids left.

14. Walls shall be provided with drainage openings as called for on the plans or as directed by the Engineer.

15. Headwalls of masonry shall be constructed on the upstream ends of all pipe culverts and on the downstream ends of such culverts as are so designated on the plans or by written order of the Engineer. Culverts at natural drainage or stream channels shall have inlets and outlets in natural channel beds.

24. EXTRA STRENGTH REINFORCED CONCRETE PIPE. Where specified on the plans or where directed by the engineer, extra strength reinforced concrete pipe shall be used for culverts. All such pipe shall conform to the Standard Specifications Form F.R. 50 except that when tested no crack shall appear under a load of 2000D where D is the inside diameter of the barrel in feet and it shall develop a crushing strength in pounds per linear foot of not less than 4000D.

25. HAND-LAID ROCK EMBANKMENT. Hand-laid rock embankment shall be placed along the toe of embankments constructed on steep slopes to prevent material from sloughing beyond the toe of the embankment. As large stones as are practicable shall be used to construct all hand-laid embankment and no less than 75 percent of the stone used shall be of six cu. ft. or more in volume. The location of the hand-laid embankment to be constructed wall be as determined and staked by the engineer.

Measurement and Payment. All work done under this item shall be measured and paid for as stipulated under "Hand-Laid Rock Embankment" Form F.R. 50.

26. LOGAN PASS AREA. At Logan Pass, Sta. 0 to Sta. 10, a development is contemplated in accordance with the plan attached. The stone guard rail and log type protection rail shall be built and paid for as stipulated elsewhere in these specifications. The grading work cutting off points and smoothing the surface to provide a safe parking area. On account of indeterminate amount and character of this work it will be performed under an extra work order. Such order will apply only to grading beyond the roadway limits.

27. LOG TYPE PROTECTION RAIL. Log type protection rail shall be built in accordance with the design shown on the plans. Rail logs shall be set into the block logs and fastened with 3/4" x 24" drift bolts.

Method of measurement: The footage of log type protection rail to be paid for shall be the lineal foot of rail logs placed and accepted.

Basis of Payment: The footage determined as above shall be paid for at eh contract unit price bid per lineal foot for "Log Type Protection Hall" which price shall be full compensation for all block logs, drift bolts, excavation, equipment, tools, labor, supplies and incidentals necessary to complete the work.