CULTURAL LANDSCAPE REPORT • HISTORIC STRUCTURE REPORT

Apostle Islands National Lakeshore – Bayfield, Wisconsin

VOLUME VI OF VI: SAND ISLAND CLR/HSR

APOSTLE ISLANDS NATIONAL LAKESHORE

LIGHT STATIONS OF MICHIGAN ISLAND, OUTER ISLAND, DEVILS ISLAND, LONG ISLAND AND SAND ISLAND

JULY 2011

CULTURAL LANDSCAPE REPORT, HISTORIC STRUCTURE REPORT AND ENVIRONMENTAL ASSESSMENT

VOLUME VI

APOSTLE ISLANDS NATIONAL LAKESHORE

BAYFIELD, WISCONSIN

LIGHT STATIONS OF MICHIGAN ISLAND, OUTER ISLAND, DEVILS ISLAND, LONG ISLAND AND SAND ISLAND

JULY 2011
UNITED STATES DEPARTMENT OF THE INTERIOR

prepared for the
National Park Service

prepared by
Anderson Hallas Architects, PC
Golden, Colorado

RECOMMENDED:

Nancy Baker, PMP — July, 2011
Project Manager, Denver Service Center

CONCURRED:

Bob Krumenaker — July, 2011
Park Superintendent, APIS

APPROVED:

Michael Reynolds — July, 2011
Regional Director, Midwest Regional Office

CULTURAL LANDSCAPE REPORT AND HISTORIC STRUCTURE REPORT

LIGHT STATIONS OF MICHIGAN ISLAND, OUTER ISLAND, DEVILS ISLAND,
LONG ISLAND AND SAND ISLAND

APOSTLE ISLANDS NATIONAL LAKESHORE

NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

RECOMMENDED:

Nancy Baker — 22 June.

Nancy Baker
Project Manager, Denver Service Center

Date

CONCURRED:

6/22/2011

Bob Krumenaker
Superintendent, Apostle Islands National Lakeshore

Date

APPROVED:

7/22/2011

Michael T. Reynolds
Regional Director, Midwest Regional Office

Date

CONTENTS

FIGURES AND PHOTOGRAPHS

CHAPTER 1: INTRODUCTION

ORGANIZATION OF THE VOLUME

This volume presents the overall Light Station History, the Cultural Landscape Report (CLR), and the Historic Structure Report (HSR) for the Sand Island Light Station. This document is one of six volumes that present the comprehensive CLR/HSR for five of the six light stations in Apostle Islands National Lakeshore (park or APIS). The five light stations are Michigan Island, Outer Island, Devils Island, Long Island, and Sand Island. The light station at Raspberry Island was addressed previously in a separate report.

This volume presents detailed documentation of the light station's physical evolution and historical development; an evaluation of existing conditions for associated buildings, structures, features and vegetation; an analysis of the cultural landscape and historic structures; and the recommended treatment for the Sand Island Light Station. Supplemental information applicable to all of the light stations, including Sand Island, is presented in Volume I, *Introduction and Overall Development History*.

The island history is presented first, followed by the CLR and finally the HSR. Together, the combined CLR/HSR will guide the treatment of the significant resources associated with the Sand Island Light Station and provide guidance for the continued management of these resources consistent with the park's General Management Plan (GMP).

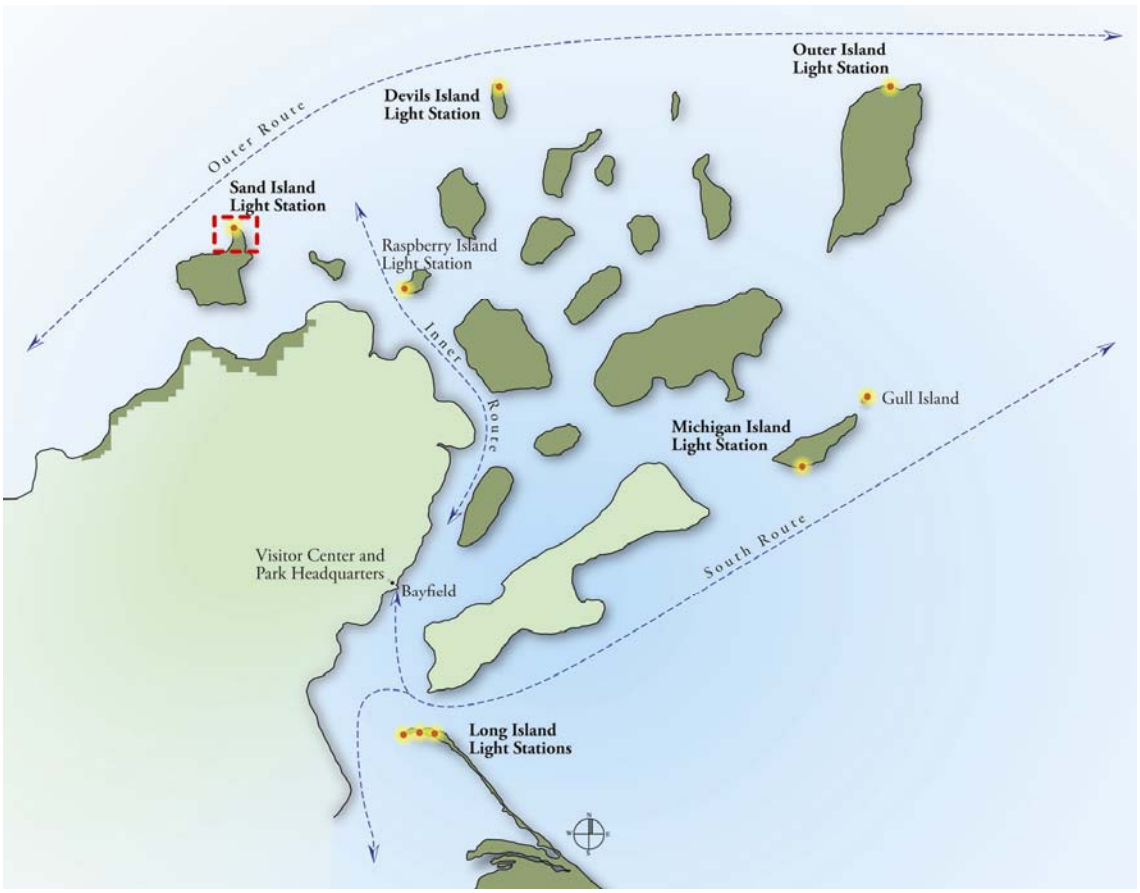
STUDY AREA

Sand Island is one of seven islands within the park, which includes the six light stations and Gull Island, and provides navigational aid for Lake Superior. The study area encompasses the Sand Island Light Station Reservation, light station grounds and Boathouse site. Sand Island is 2.8 miles long, 2.8 miles wide, 2,949 acres, and is located at the western edge of the park, approximately 19 miles from Bayfield, Wisconsin. The island is 3 miles from Little Sand Bay, and the lighthouse is 6 miles from Little Sand Bay. The Sand Island Light Station Reservation is on the northern end of the island and originally occupied 110 acres. [1] In 1936, the reservation was reduced to two smaller areas; one area for the light station, and one area of two acres for the boathouse site.[2] Both the light station reservation and the remainder of the island are a part of APIS. Sand Island, along with Long Island and Basswood Island, is not included in the Gaylord Nelson Wilderness that was designated in 2004.

The Sand Island Light Station Quarters is the first navigational aid encountered on the outer route when traveling east from western Lake Superior and Duluth. The light station is located on a bluff above Lake Superior and is surrounded by maturing second-growth northern hardwood forest. The light station grounds consist of historic clearings, buildings, structures, features and vegetation.

Today, the island's land use is classified as the Apostle Islands National Lakeshore under the jurisdiction of the National Park Service (NPS). The light station continues to serve as an aid to navigation with the automated light operated and maintained by the United States Coast Guard (USCG). The NPS maintains the site and buildings, and the light station is frequented by visitors and park staff for its cultural and natural resources.

[1] Wisner Drawing
[2] USCG Drawing, 1936



Sand Island Light Station Context Map (Source: MBD 2010)

SIGNIFICANCE OF SAND ISLAND

The Sand Island Light Station is located along the outer shipping route and is unique to the system of light stations in the Apostle Islands in several ways. Sand Island was a residential community and unlike other light stations the Sand Island Light Station and the lighthouse keepers were part of the community. In 1921, the Sand Island Light Station was the first light station automated within the archipelago. After automation the lighthouse was leased as summer residence. The lighthouse itself was constructed of locally quarried brownstone. The period of significance is 1881 to 1921, beginning with the initial development of the light station and continuing until automation of the Light Station Quarters. The entire original 110 acres of the Sand Island Light Station Reservation comprises its cultural landscape. The majority of its contributing features occur on a core area of 1.5 acres associated with the light station grounds on the northern end of the island.

Contributing features of the cultural landscape include the historic clearings, vegetation, organization of buildings and structures, concrete walks, small scale features, and the bluff. Contributing buildings include three buildings on the List of Classified Structures: the Light Station Quarters, Oil Building, and Privy.

With many of its original features intact and in good condition, the Sand Island Light Station Reservation portrays the history of the light station as an aid to navigation. It continues to convey the development of navigational technology, the story of the people who resided at the light station and its management.

TREATMENT RECOMMENDATIONS SUMMARY

The treatment recommendations for the Sand Island Light Station are focused on revealing the role that the light station had in the navigational history of the Apostle Islands, and in conveying the historical significance of the light station's cultural landscape and historic structures.

Rehabilitation has been identified as the general overall treatment approach for the Sand Island Light Station, as it is a holistic approach that addresses the island's extant cultural resources and the relationships between those resources. This approach protects those characteristics and features that convey the island's full historical and cultural significance, while allowing for those repairs, alterations, and additions necessary for the compatible use of the island.[3]

Rehabilitation also allows for noncontributing, compatible features to remain, the removal or relocation of noncontributing, noncompatible features, and the restoration of historic structures. While the overall treatment intent of the cultural landscape is one of rehabilitation many individual treatment recommendations focus on preservation of existing features. Treatment recommendations include the following:[4]

1) Reestablish a portion of the historically cleared area of the light station;
2) Maintain views from Lake Superior to the light station;
3) Repair circulation features including the concrete walks;
4) Reestablish missing landscape plantings;
5) Remove noncompatible features;
6) Restore the Light Station Quarters;
7) Preserve the Oil Building and Privy.

The recommendations for treatment are comprehensive and are intended to address all aspects of the cultural landscape and historic structures. To achieve full implementation of these recommendations a phased approach for construction activities will be required. Initial actions may include basic preservation measures to protect and stabilize contributing features followed by more detailed repair measures as park resources allow.

In addition to recommendations for physical improvements, actions are proposed to provide improved efficiency of park operation and maintenance activities, and improved protection of the light station's natural systems.

[3] Page et al 1998
[4] A glossary of terms used to describe treatment recommendations is included in the appendix of this volume.

CHAPTER 2: LIGHT STATION HISTORY

LIGHT STATION HISTORY

In the 1870s, as more and more ships entered Chequamegon Bay, concerns mounted over the safety of the route around Sand Island. In 1871 Major Orlando Poe, the Lighthouse Board's District Engineer, formally initiated the movement for a lighthouse on Sand Island. Poe requested and obtained a survey of the proposed reservation. An executive order designated the lighthouse reservation in 1871.[5] Major Poe also requested $18,000 to fund lighthouse construction in 1871, but was turned down.

Following Poe's 1871 request, the Lighthouse Board repeatedly petitioned Congress for funding for the new light. The Board's 1877 Annual Report stated that the lack of a navigational aid on the island "…causes much distress and danger to the increasing commerce of the west end of Lake Superior."[6] After nine years of requests, Congress finally acquiesced in 1880.

The new lighthouse design would replicate an attractive and popular design already in place in many other locations on the Great Lakes. The design had been executed in brick at the following locations:

McGulpin's Point, Mackinac Straits	1869
Eagle Harbor, Lake Superior	1871
Chambers Island, Lake Michigan	1868
Eagle Bluff, Lake Michigan	1868
White River, Lake Michigan	1875

Unlike all of its brick predecessors, Sand Island's lighthouse was constructed of locally available brownstone, which is a quartzite sandstone containing iron oxide, calcite and silica. The material was popular between 1870 and 1900, and was used on many prominent buildings. The Cincinnati City Hall and the Chicago Tribune building are built of Lake Superior brownstone. The local stone, which was quarried on the island, added distinction to the Sand Island lighthouse.[7] It also cost substantially less money than imported bricks.

The Passage Island Light at Isle Royale, an identical design to Sand Island, was constructed of brownstone a year after Sand Island. Passage Island had been originally approved in 1874 with an $18,000 appropriation, but Congress set a condition that this northernmost United States lighthouse could not be built until Canada completed a station on Colchester Reef near the mouth of the Detroit River. The conditional approval delayed the construction, resulting in Sand Island's designation as the first to be built with the brownstone.

Work on Sand Island began on June 6, 1881.[8] Louis Charles Lederle supervised construction, as he had done previously at Outer Island. Lederle's crew members installed an 8 x 80 foot timber crib to protect the boat landing site. The crew cleared about eight acres of land and constructed the Lighthouse (LCS ID

[5] Map of an 1884 survey of the Sand Island Reservation on file at the Apostle Islands National Lakeshore Administrative Offices indicates July 21, 1871 reservation date. Snyder, David L. "A Compendium of Written Communication of the Lighthouse Board for the Twelve Light Stations of the Midwest Region, the National Park Service, 1839-1881." Pages 128-133.
[6] Transcribed reports of the Lighthouse Board; available at the Apostle Islands National Lakeshore Administrative Offices.
[7] Personal communication from Jane Busch on December 20, 2009.
[8] Some historical summaries suggest this work was done in 1880 but the 11th District Engineers status report dated July 9, 1881 clearly indicates the June 6, 1881 date. See Snyder, David L. "A Compendium of Written Communication of the Lighthouse Board for the Twelve Light Stations of the Midwest Region, the National Park Service, 1839-1881."

6381), a Privy (LCS ID 6383) and a woodshed. The 44-foot tall Lighthouse Tower contained a fourth order Fresnel fixed lens casting a white light that could be seen for 15 miles. The light was lit on September 25, 1881.

Although the lighthouse district engineers recommended a fog signal at Sand Island, the request was never approved. The keeper's life settled into a fairly routine existence at Sand, focusing solely on the light, without the distractions of operating a fog signal. The single-purpose work routine (without the complications of operating a fog signal) may be why there were only two keepers between 1881 and 1921, and why an assistant keeper position was not created until 1902. Lederle, who had first arrived as the construction superintendent, worked as the keeper until he transferred to another station. Emmanuel Luick replaced Lederle. He arrived with his wife Ella in 1892. Luick remained on the job until the station was automated, partly because of the extraordinary efforts of Ella while he was extremely sick and incapacitated in 1901, and partly with the support of his second wife, Oramill.

Minor changes and repairs characterize the work at Sand Island. A boathouse was built in 1886. Plank walks were replaced, probably with concrete, in 1893. John A. Jaffray oversaw a work crew in 1901 that replaced the boat landing cribs, built a 16-foot long walkway from the landing and constructed a brick Oil House (LCS ID 6382) with a capacity of 360 gallons. Historic photographs indicate a barn building was located behind the privy but written records related to the barn's construction could not be found.

The keeper had chickens and ducks. One incident in the keeper's log described how the keeper had to kill a hawk that was killing his ducks. The log entries also note the work done in the garden and reference the potatoes and onions that were planted in the garden. Since other people lived on the island, the trail leading from the light station to the rest of the island was well maintained. It is clear from the keeper's logs that a number of people visited the station on a regular basis. Unlike the other Apostle Islands light stations, the Sand Island Station seemed to function as part of a community, albeit a remote element of the Sand Island populace.

In 1921 Sand Island became the first automated light station in the Apostle Islands, when a new acetylene gas fueling apparatus was installed. Since the gas tank had an automatic valve to turn the gas off and on, the light no longer required an on-site keeper. The keepers at nearby Raspberry Island monitored the Light and made periodic visits to check on the equipment. In 1933 a 48-foot tall steel skeletal tower was installed in front of the Lighthouse.

With no need for a keeper, the Lighthouse Board decided to lease the property. Minnesota school teacher Gertrude Wellisch rented the lighthouse for a summer home from 1925 to 1942.[9] John B. Chapple, editor of the Ashland Daily Press, was a tenant after Wellisch moved out. The Sand Island lighthouse was also leased by A.D. Hulings from 1953 to 1975. A 1972 letter from a U.S. Forest Service official to an Apostle Islands official noted, "…the interior of the building had thoroughly deteriorated or been destroyed by vandals at the time a permit was issued to Mr. Hulings... He installed new floor joists, new floors, plasterboard on walls and ceilings, painted..."[10]

The United States Coast Guard (USCG) assumed responsibility for America's lighthouses in 1939. Since the Sand Island Light had already been automated, the USCG never took residence at the Light Station and consequently did not alter the interior of the lighthouse.

In 1985, the USCG removed the steel tower and returned the light to the original Tower. In August 2010, a Sealite (SL-125-4-W) LED marine lantern was installed in the Tower.

[9] Personal communication from Jane Busch in December of 2009 provided the information on tenants.
[10] Information about this letter provided by Susan MacKreth of Apostle Islands National Lakeshore staff in February, 2010.

HISTORIC EVIDENCE

The historic photos date back to 1890 and show the no longer extant well, boathouse and dock, wood shed, and metal tower. For more detailed descriptions of the photos, see the CLR and each building's Chronology of Alterations and Use in the HSR.

The 1880 construction drawings for the Light Station Quarters illustrate much the same structure that exists today, other than the Kitchen Vestibule, which appears in historic photos and is extant but was not in the original plans. (HSR Historic Drawing SI-01) An undated drawing notes that the "Tank House" was installed August 1931. It appears to be located at the foundation level off of the tower's south wall, made with a concrete foundation. A 1910 site plan that was used at an unknown date to mark the changes in the site, states that the tank house was moved to under the steel tower. The steel tower was installed to the northwest of the Light Station in 1933 and is labeled on the plan, "40 Ft Steel Tower." The site plan also shows a wood shed and tool shed with a garden plot in-between located behind the existing Privy and Oil Building. These images appear to be original to the plan, so it can be assumed they existed in 1910 until at least 1933. (HSR Historic Drawing SI-02) A boathouse, dock, and sea wall were located to the south of the complex and there are extant ruins of a dock in the same or nearby location.

OVERVIEW OF DEVELOPMENT AND USE

Date	Work Described
Annual Report of 1871	"*Sand Island, Lake Superior*. – The through commerce to and from the western end of Lake Superior, increasing so rapidly as the railroads having their termini at Du Luth are extended to the westward, all passes outside the Apostle Islands, and is greatly in need of a Light-house on the northern end of Outer Island. This should be respectfully recommended to be appropriated. For reasons given in the preceding case, a Light (of a lower order, however) is demanded on the northern end of Sand Island, the most westerly of the group, for which purpose an appropriation of $18,000 is recommended." (Four more requests were made until 1881; "1871 Annual Report of the Lighthouse Board," Sand Island Light in annual reports 1870-1910)
Annual Report of 1881	"*Sand Island, Lake Superior, Wisconsin*. – Work was commenced on June 6, and at the close of the year all the materials had been landed at the site of the work; the shanties for the workmen were erected, and protection-cribs, 80 ' long and 8 ' wide, sunk in 8 ' of water and raised 4 ' above water, were constructed. The cribs also form a good harbor for the light-keeper's boats. About 8 acres of thickly wooded land, around the site, were cleared, and the excavation for the cellar begun. All of the dimension-stones for the station were quarried, and on June 27 the work of cutting them was commenced." ("1881 Annual Report of the Lighthouse Board," Sand Island Light in annual reports 1870-1910)
1899, Oct 5	"These new lampes [kerosene lamps] are just a nuisance and a lot of trouble and a lamp that can not be trusted." (E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1899-1920	Documented whitewashed buildings five times; including at times the following buildings: Tower and Quarters (specifically mentioned the kitchen) (E. Luick, SI Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1899-1920	Documented painting of the interior of buildings three times; including at times the following buildings: Quarters (specifically mentioned the bedroom and kitchen floors) and the Privy (specifically mentioned the floor) (E. Luick, SI Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1899-1920	Documented painting of the exterior of buildings four times; including at times the following buildings: Tower Lantern, Tower railing, Privy, and Quarters (specifically mentioned the "blindes," aka shutters, painted green) (E. Luick, SI Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1901	Oil Building built (LCS, 2009) Sept 11: "At 11:30 AM Raspberry Island Light Keeper C. Hendrickson brought the work men over to build the Oil House." Sept 21: "There are 600 brick left of the Oil house." (E. Luick, SI Log, Oct1, 1898 - Nov 17,

Date	Work Described
	1907 and June 1, 1914- July 31, 1920)
1904, July 27	"At 4:00 PM the Str Bon Mia came down from Duluth and landed Mr. Anderson Bennett and four workmen to repair the Breakwater & Boat house & house." (E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1905, Sept 11	"Keeper repaired the roof, replaced the tin shingles that the wind tore off Sept. 2nd." (E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1916, Sept 2	"The mason got through with the chimney …" Brick chimney extended on Quarters. (E. Luick, SI Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1916-1919	Documented painting of the roofs of buildings three times; mentioned roofs in general and Quarters specifically (E. Luick, SI Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1920	Documented varnishing of floors one time; mentioned Quarters (specifically kitchen floor) (E. Luick, SI Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920)
1921	Acetylene gas burner installed in the Light Station tower (LCS, 2009)
1925-1942	Light Station Quarters leased by Gertrude Wellisch (APIS Records)
1933	New steel tower built, Fresnel lens removed from the Light Station tower (J. Busch, 2008)
1953-1975	Light Station Quarters leased by A.D. Hulings; in 1953, the interior of the building was in poor condition due to vandals and Mr. Hulings "installed new floor joists, new floors, plasterboard on walls and ceilings, painted…" (1972 letter from U.S. Forest Service official to the APIS superintendent, from S. Mackreth)
1970	Apostle Islands National Lakeshore authorized
1977	Stabilization of Light Station Quarters and Privy (NPS/APIS Business Office Records D3423 for Sand Island)
1978	Repoint brick, basement, foundation, and tower and paint buildings; installed drainage rain gutters (NPS/APIS Business Office Records D3423 for Sand Island)
1979	Paint and repair metal roof of Light Station Quarters (NPS/APIS Business Office Records D3423 for Sand Island)
1981	Retuckpoint stonework and paint trim on Light Station Quarters and Privy (NPS/APIS Business Office Records D3423 for Sand Island)
1985	Steel tower removed (S. Mackreth, 2010)
1988	Light Station Quarters reroofed with metal shingles; main gable of Quarters roof replaced (HSPT Reports, 2009; NPS/APIS Business Office Records D3423 and photos for Sand Island)
2008-2009	Replaced all window shutters with newly fabricated copies of the removed green shutters. Only one shutter, which is on the tower, not the housing unit, is not new material. New shutters painted white. New hardware installed to replicate old fasteners. Black buttress caps on tower painted white. (S. Mackreth, 2010)

CHAPTER 3: CULTURAL LANDSCAPE REPORT

SAND ISLAND EXISTING CONDITION

Introduction

The cultural landscape of the Sand Island Light Station is a composition of features that remain from its development over the last 130 years as a light station and aid to navigation. As one of six light stations in the Apostle Islands, the Sand Island Light Station played in important role in the development of the system. The intent of the Cultural Landscape Report (CLR), in conjunction with the Historic Structures Report (HSR) is to guide the treatment and use of the aboveground resources associated with the light station. The CLR provides park managers with a comprehensive understanding of the physical evolution of the cultural landscape and provides guidance for its management.

The CLR was conducted at a limited level of research, investigation and documentation. This level of research uses select documentation of known and presumed relevance, including primary and secondary sources that are readily available. The periods of landscape change are described using narrative text, historic photographs, annotated historic drawings and maps. Archeological investigations are not included.[11] A more detailed description of the CLR methodology is included in Volume I, Chapter 2: *Methodology*.

The CLR begins with a description of the site development of the Sand Island Light Station that documents the physical changes that have occurred on the light station reservation and light station grounds. The light station reservation is the land initially set aside for the development of the light station. In the CLR the portion of the reservation that contains structures and buildings is referred to as the grounds. These in total are referred to as a light station. The site development is presented by the five periods of landscape change.

The second section presents the existing condition and analysis of the cultural landscape. This section is organized by cultural landscape characteristics. In September 2009, field investigations were conducted to document the existing condition of the cultural landscape characteristics: spatial organization, topography, views and vistas, circulation, buildings, structures, small scale features and vegetation. The documentation of the island's existing condition is illustrated with existing condition plans, diagrams and photographs that document its cultural landscape.

The analysis compares the island's history with its existing condition, and identifies those landscape characteristics that retain integrity and contribute to the significance and integrity of the Sand Island Light Station.

The existing condition plans were created in AutoCAD using a variety of sources including: historic and current maps and photographs provided by the NPS APIS archives, field work conducted in September 2009, and additional information was provided by park staff.

[11] Page et al. 1998.

SITE DEVELOPMENT

A period of significance of 1852 to 1972 is recommended for the light stations of the Apostle Islands as a whole. This timeframe recognizes the role of the light at each island as part of a connected system of navigational aids for Lake Superior. The period beginning date is the initial act of Congress authorizing construction of the first lighthouse in the Apostle Islands in 1852. The period of significance for the Sand Island Light Station begins with the construction of the Light Station Quarters in1881, and ends with the light tower's automation in 1921. Five periods of landscape change document the evolution of the light station's cultural landscape. Of these, one period is within the Sand Island Light Station's period of significance this period is noted by italics.

- Pre-Lighthouse (1852 – 1880)
- *Light Station (1881 – 1921)*
- Summer Home (1922 – 1975)
- Coast Guard (1939-1969)
- National Park Service (1970 to present)

The beginning and end of each period of landscape change corresponds to major physical changes related to the site's use, technological advances, and/or governmental control of the island. The periods consider the social history of the island, however there are instances where the social history differs since physical change in the cultural landscape is the primary rationale in defining the beginning and end of each period.

Brief narrative text, graphic illustrations (where applicable), and historic maps and photographs where available, describe each period of landscape change. Additional information regarding the period of significance for the Apostle Islands light stations is presented in Volume I, Chapter 3: *Context, Current Designations, and Park Significance*.

Pre-Lighthouse (1852 – 1880)

In 1852 Congress authorized the construction of the first lighthouse in the Apostle Islands, to be built at La Pointe Harbor on Madeline Island. The location was later revised to Long Island and ultimately the lighthouse was built on Michigan Island in 1856.[12] In 1871 at the recommendation of Major Orlando Poe, the District Engineer of the Lighthouse Board at the time, a lighthouse reservation was established for Sand Island.[13] No physical improvements related to the light station were built on Sand Island during this period.

Light Station (1881 – 1921)

Construction of the Light Station Quarters began in June 1881. A large area of the northern end of Sand Island, approximately eight acres, was cleared of forest vegetation for the light station grounds, its associated buildings and structures, and to maintain an open view towards the light from Lake Superior. The Light Tower, located in the Light Station Quarters, was placed into service in September 1881.[14] The Light Station Quarters was built of local brownstone from stone quarried on the island. The building included the 44' tower and keeper's residence. On the grounds, a Privy and Wood Shed were built in the cleared area just south of the Light Station Quarters.

[12] Busch, Jane C. "People and Places: A Human History of the Apostle Islands; Historic Resource Study of Apostle Islands National Lakeshore" Bayfield: Apostle Islands National Lakeshore. 2008. Page 127.
[13] Ibid, page 128.
[14] Ibid, page 128.

A boat landing was also built in 1881, located about one-half mile south of the light station at the north end of Lighthouse Bay, a sheltered area on the west side of the northernmost tip of the island. Work began in 1880 with the construction of an 80-foot long timber and rubble crib to protect the landing site. In 1886, a Boathouse and dock were built at the landing site.[15] In 1901, the landing crib was modified and expanded. Two other natural rock boat landings were also used. Historic documents note a wooden boat hauling ramp was located east of the Light Station Quarters. The rock ledge just to the north of the Light Station Quarters was historically used as a boat landing and is still in use today. A footpath was cleared through the thickly wooded forest to connect the boathouse with the light station. The footpath was well travelled by the light keepers and other Sand Island residents.

In 1881, along with the construction of the Light Station Quarters, a brick Privy was built and connected to the Light Station Quarters with a wooden plank walk. In 1901, the brick Oil Building was built on the grounds, and also connected to the Light Station Quarters by a wooden plank walk.[16] Wooden plank walks were built as the initial circulation for the light station grounds. Historic photographs indicate these were replaced by concrete walks by 1913. Many of the concrete walks remain today; no wooden plank walks are extant.

Emmanuel Luick was the keeper at Sand Island from 1892 to 1921. Emmanuel and his first wife Ella annually planted and harvested crops on the light station grounds.[17] They were known for their tomatoes, corn, lettuce, peas, and potatoes. The Luicks also raised chickens and ducks. Historic drawings indicate that by 1910 a garden was established south of the Light Station Quarters.[18] The south of the building included a fenced garden, Wood Shed, Tool Shed and a walk connecting the Tool Shed with the Light Station Quarters.

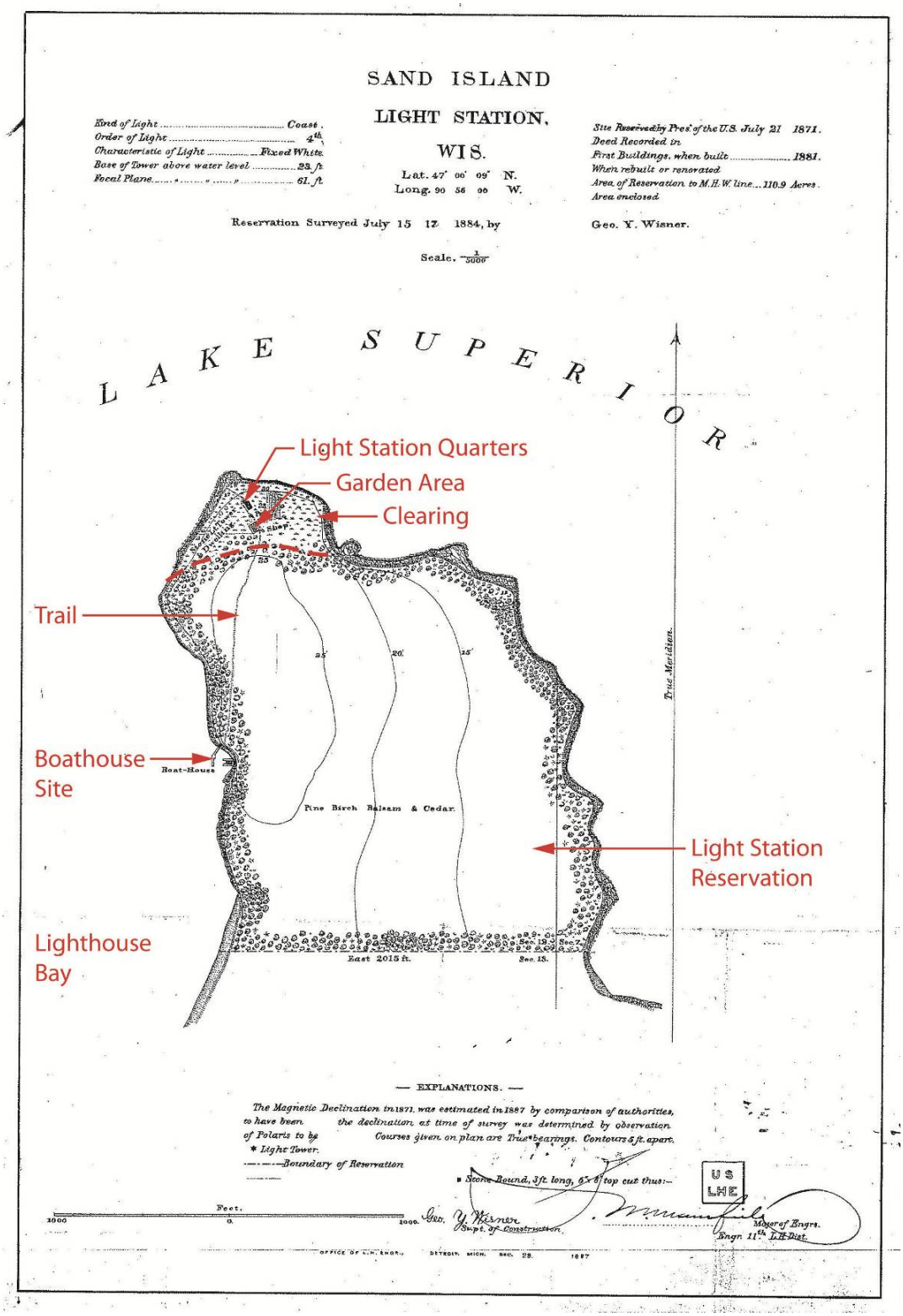
The Sand Island Light Station was not as isolated as some of the other light stations in the Apostle Islands. The island had a community of year round residents, who primarily farmed on the island and fished the waters of Lake Superior. During this period, the year-round population of the island reached approximately 70 people. Sand Island supported a school, post office, cooperative store, and briefly a telephone service to the mainland.[19] A tourist resort, Camp Stella, was also opened on the Island in 1886 and operated until 1915.[20] Keeper's logs indicate that regular visitors were common at the light station.

This period of landscape change ends in 1921 with the automation of the Sand Island Light Station, the first automated light in the Apostle Islands.

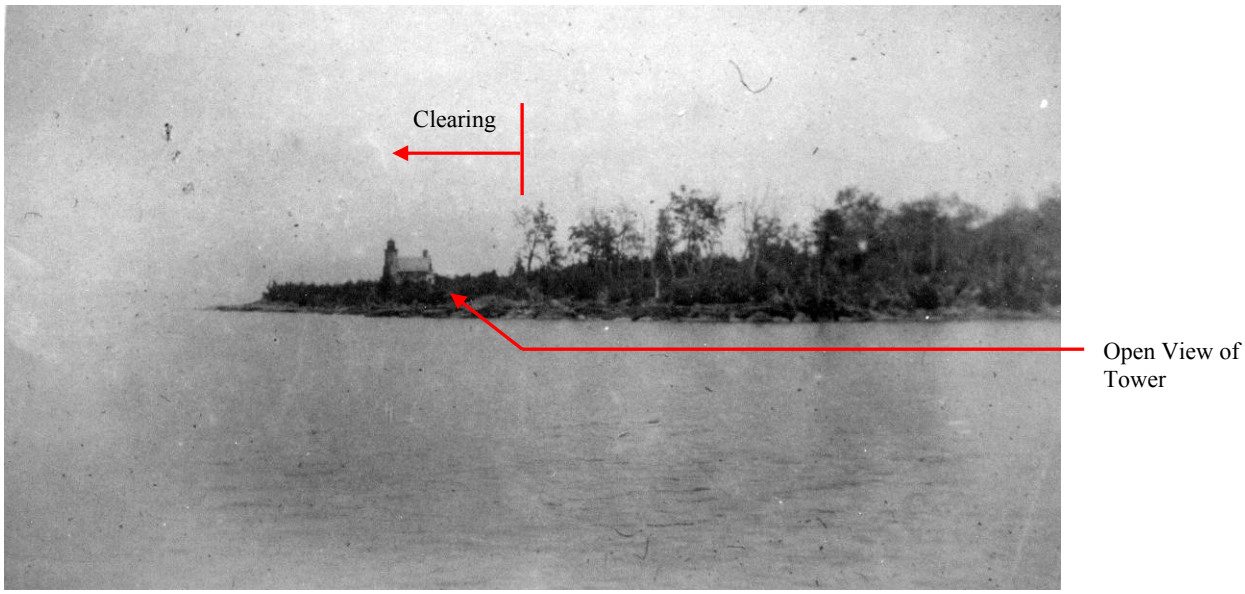
[15] Annual Report of the Lighthouse Board, 1880, 1896
[16] Lighthouse Log
[17] Lighthouse Log
[18] (Drawing Reference, OG Brown. Sand Island Light Station, Wisconsin Location of Buildings and Walks, Drawing No. RHL 1005610, 1910)

[19] (People and Places: A Human History of the Apostle Islands; Historic Resource Study of Apostle Islands National Lakeshore, page 24).
[20] (ibid)

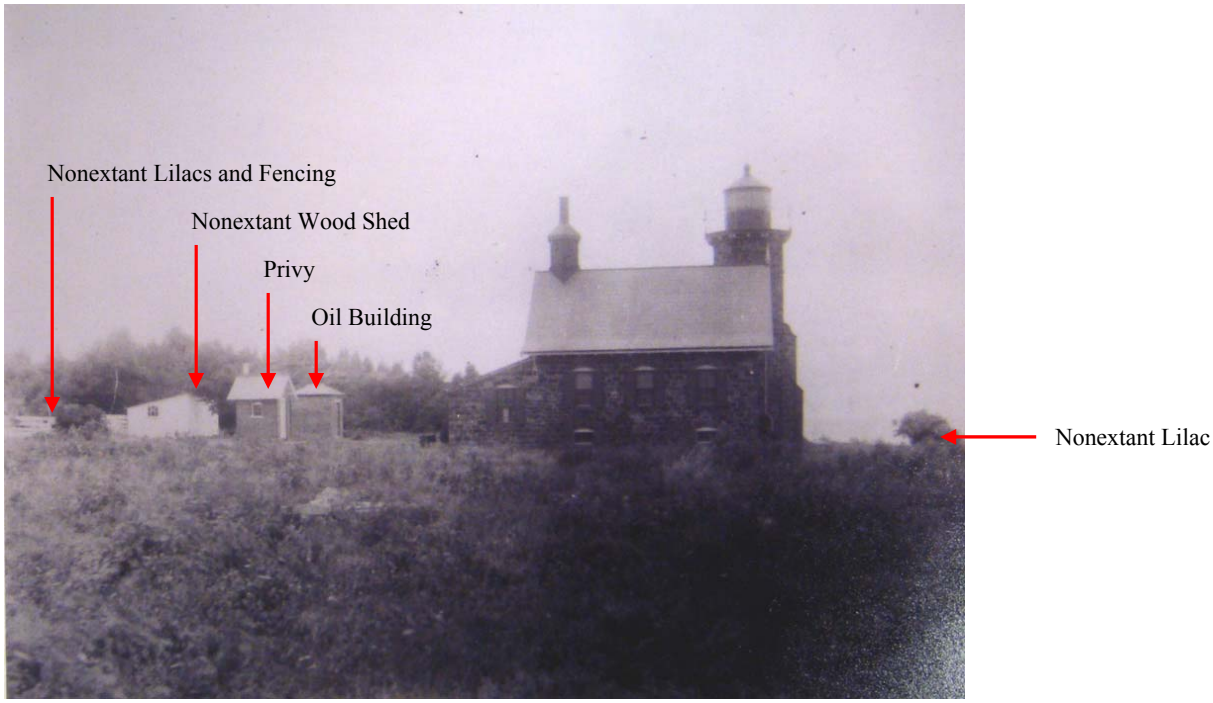
Pre-Lighthouse and Light Station Historic Survey and Photographs



Site Image SI-01: Survey of Sand Island Light Station Reservation, c. 1887 (Source: NPS APIS Archives)

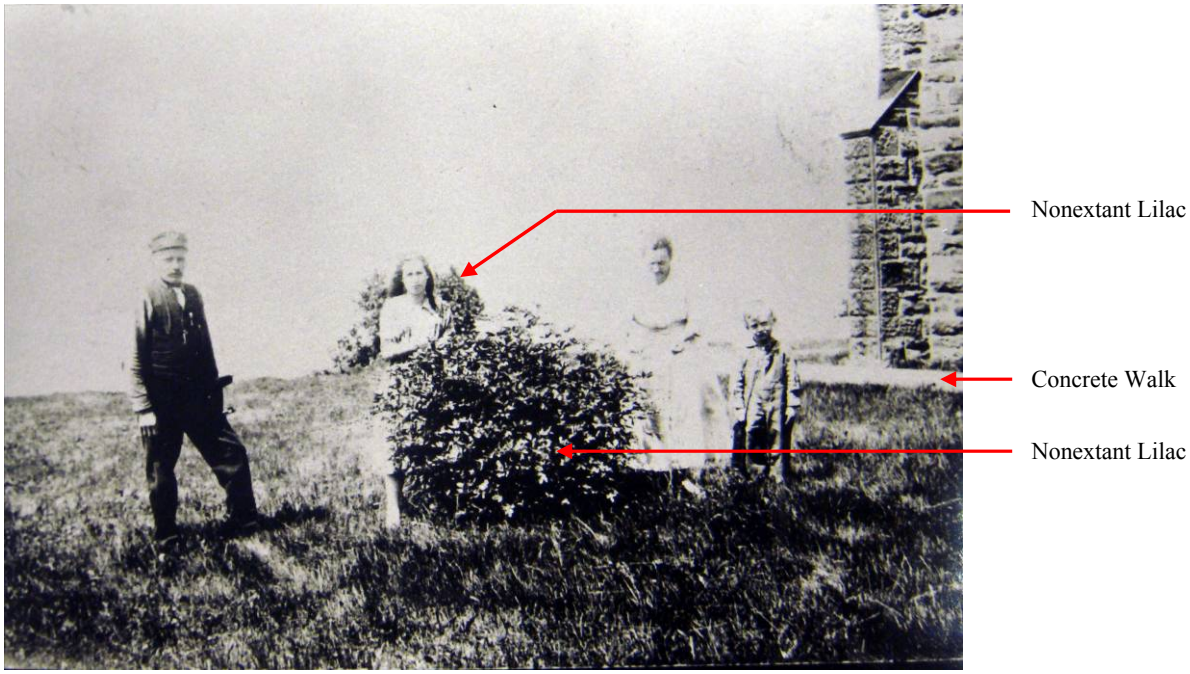


Site Image SI-02: Sand Island Light Station from Lake Superior, c. 1891 (Source: NPS APIS Archives)

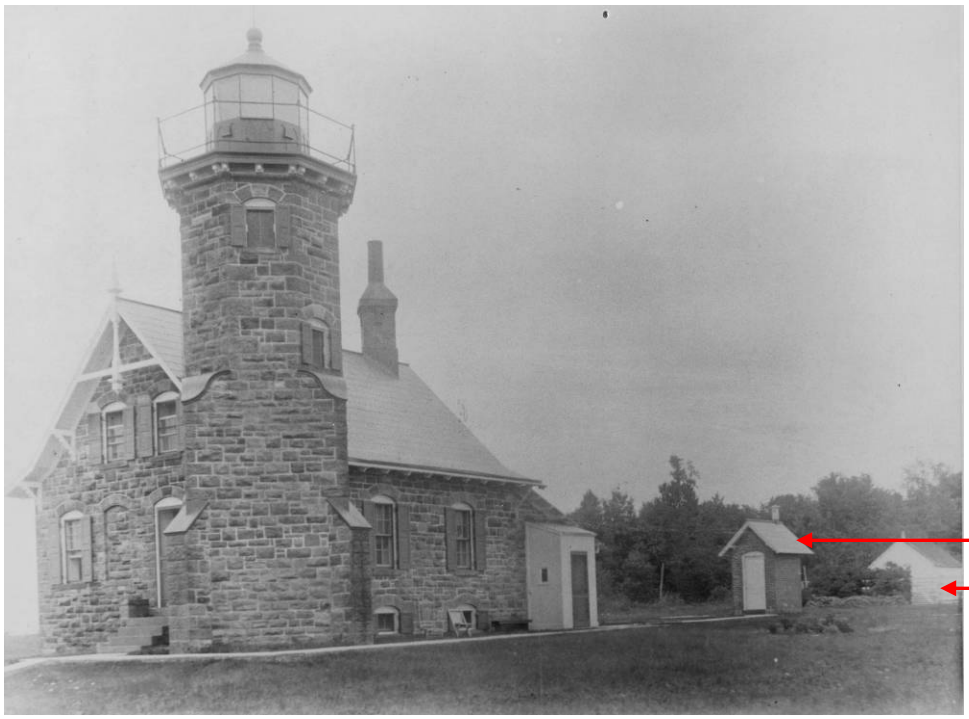


Site Image SI-03: Sand Island Light Station showing, from left, the fenced garden, Shed, Privy, Oil Building and Light Station Quarters. Note the extent of the clearing, c. 1913 (Source: NPS APIS Archives)

Site Image SI-04: Sand Island Light Station Quarters showing north entry steps and wooden plank walk, c. 1905-1909 (Source: NPS APIS Archives)

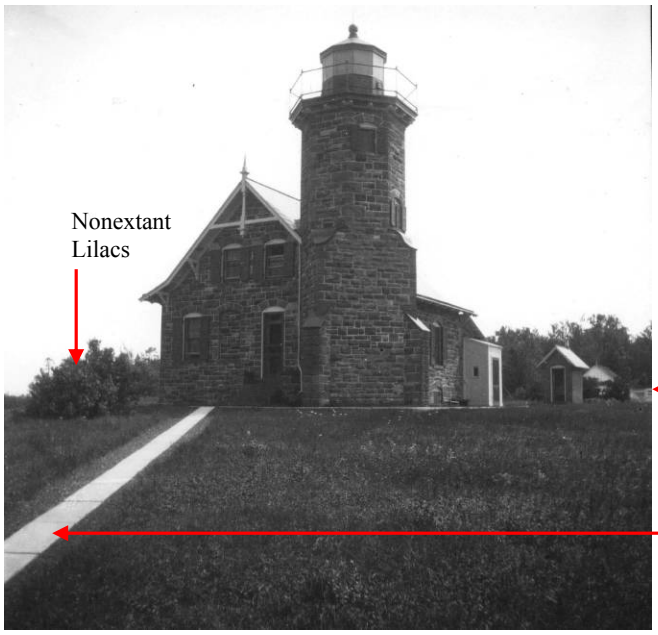


Site Image SI-05: Sand Island Light Station showing from right, northwest corner of Light Station Quarters, concrete walk, and two lilac bushes, one in the foreground, and one in the background along shoreline, c. 1913 (Source: NPS APIS Archives)

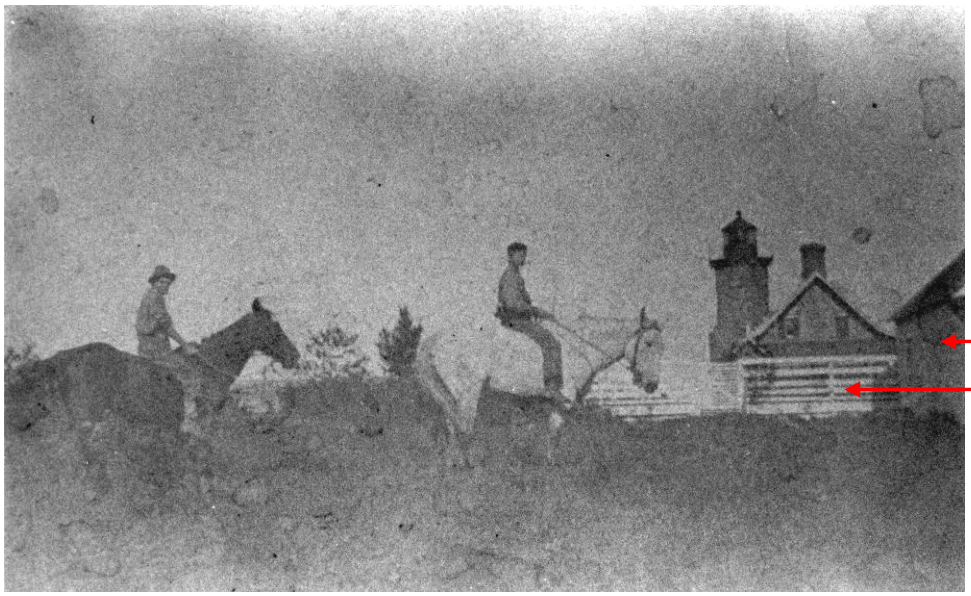


Site Image SI-06: Sand Island Light Station viewed from the northwest, c. 1913 (Source: NPS APIS Archives)

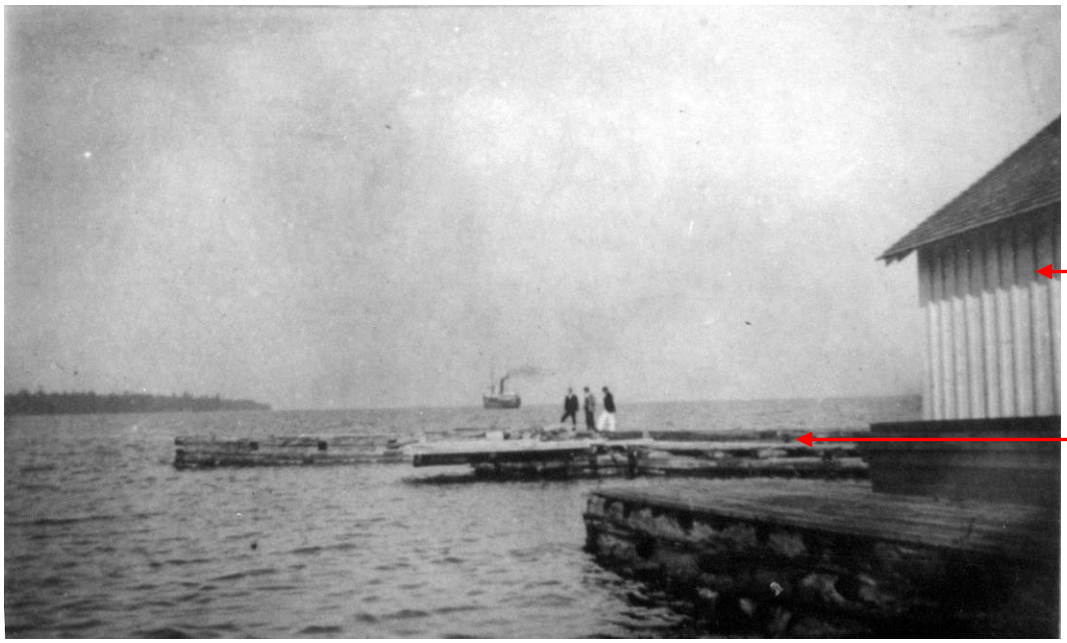
Site Image SI-07: Enlargement of SI-06, above; Sand Island Light Station viewed from the northwest, c. 1913 (Source: NPS APIS Archives)



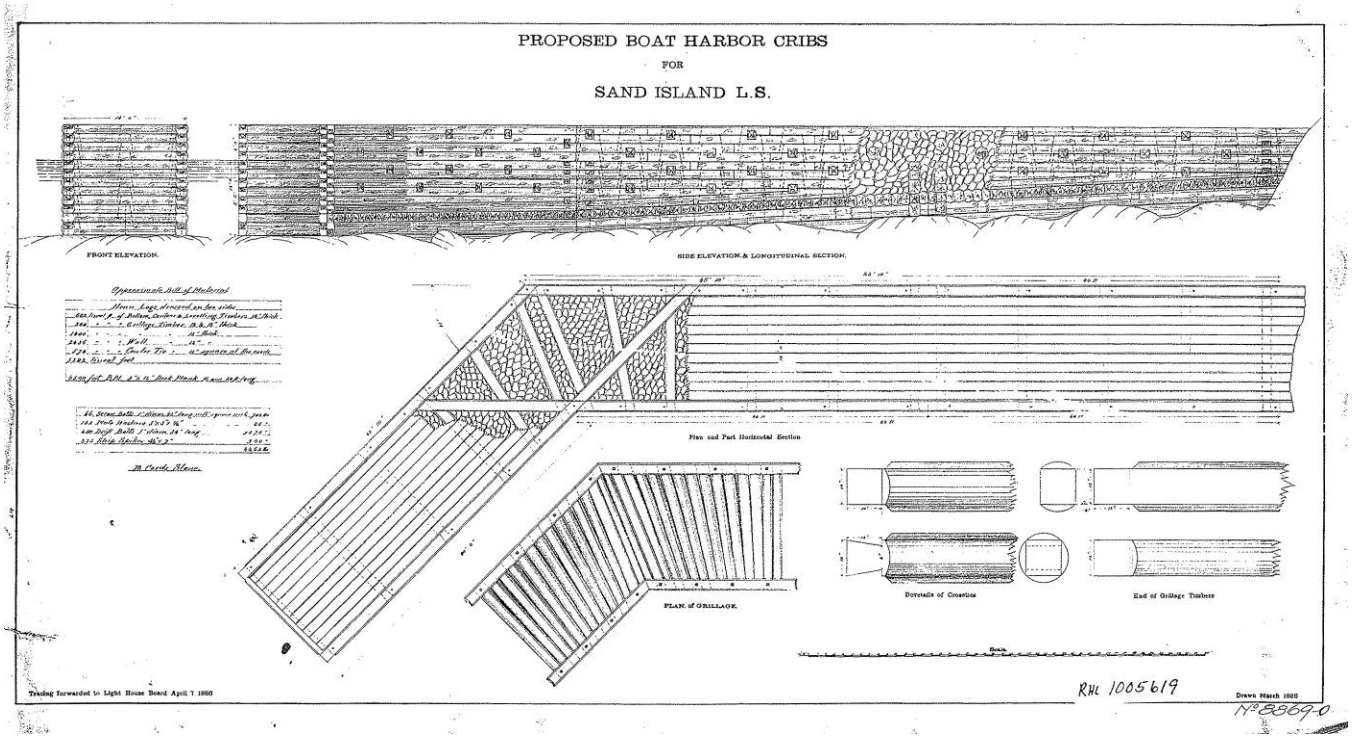
Site Image SI-08: Sand Island Light Quarters from the north, date unknown (Source: NPS APIS Archives)



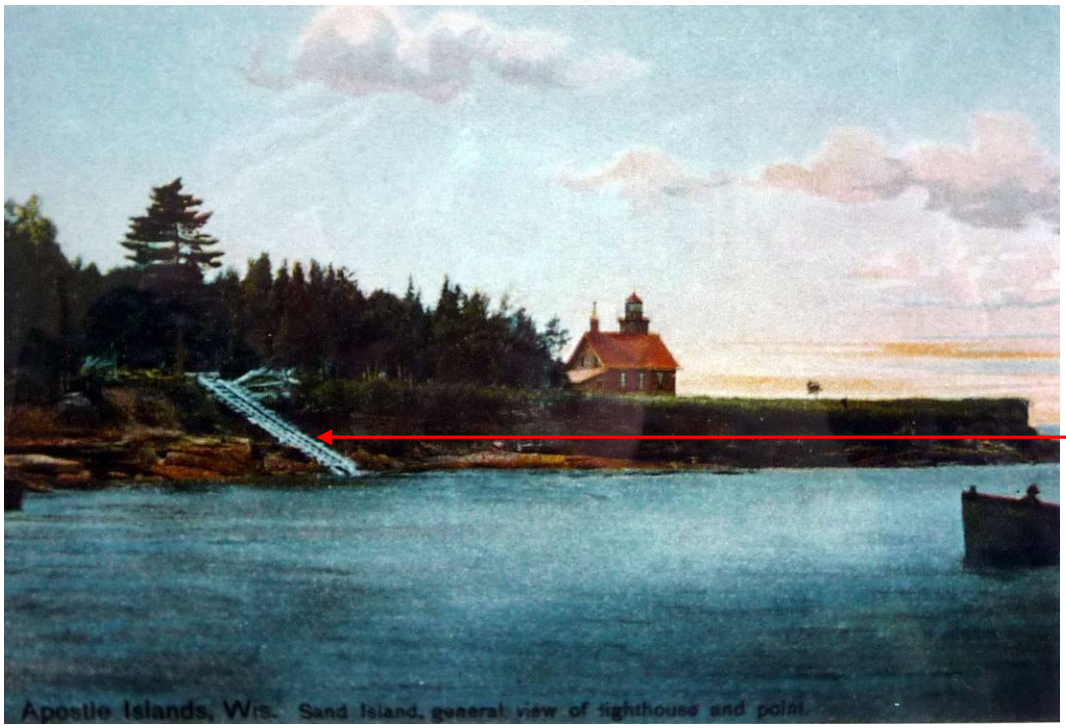
Site Image SI-09: Clearing south of Light Station Quarters, note fencing and Tool Shed to right, date unknown (Source: NPS APIS Archives)



Site Image SI-10: Boat harbor showing the Boathouse and Dock, c. 1904 (Source: NPS APIS Archives)



Site Image SI-11: Proposed Boat Harbor Cribs and Dock (pictured above in Site Image SI-10), 1886 (Source: NPS APIS Archives)



Site Image SI-12: Illustration showing wooden boat ramp landing southeast of Light Station Quarters, date unknown (Source: NPS APIS Archives)

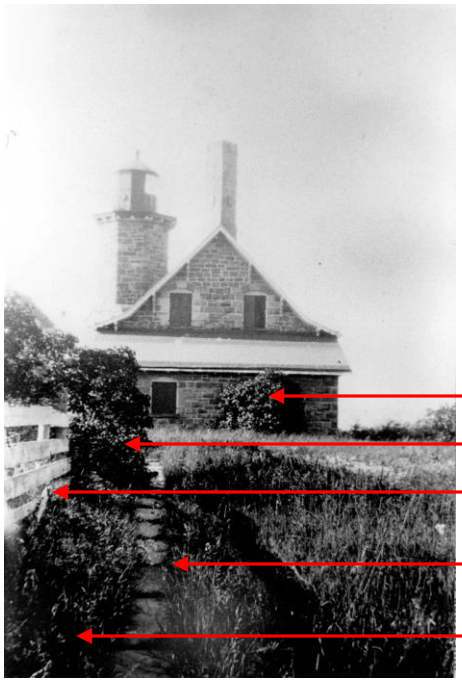
Summer Home Period (1922-1975)

After automation of the light in 1921, the need for a full time keeper on the island was eliminated and the keeper was transferred to another light station.[21] The light station at Sand Island was monitored and periodically serviced by the Raspberry Island light keeper. However, the light station was not left vacant. After a few years, the Light Station Quarters was annually leased as a summer residence until 1975.[22] Between 1925 and 1945, the property was leased by Gertrude Wellisch as a summer home.

During this period, the primary physical changes were deterioration of the boathouse site and garden area features of the light station, as well as the encroachment of the forest into formerly cleared areas of the grounds. Drawings from around 1936 note that the Boathouse and breakwater were considered 'ruins,' as was the garden area, Wood Shed and Tool Shed.[23] Historic photographs indicate that the cleared areas of the light station grounds began to fill in with forest vegetation after automation of the light in 1921. The garden area remained somewhat clear of forest vegetation during this period as noted in a 1938 aerial photograph.

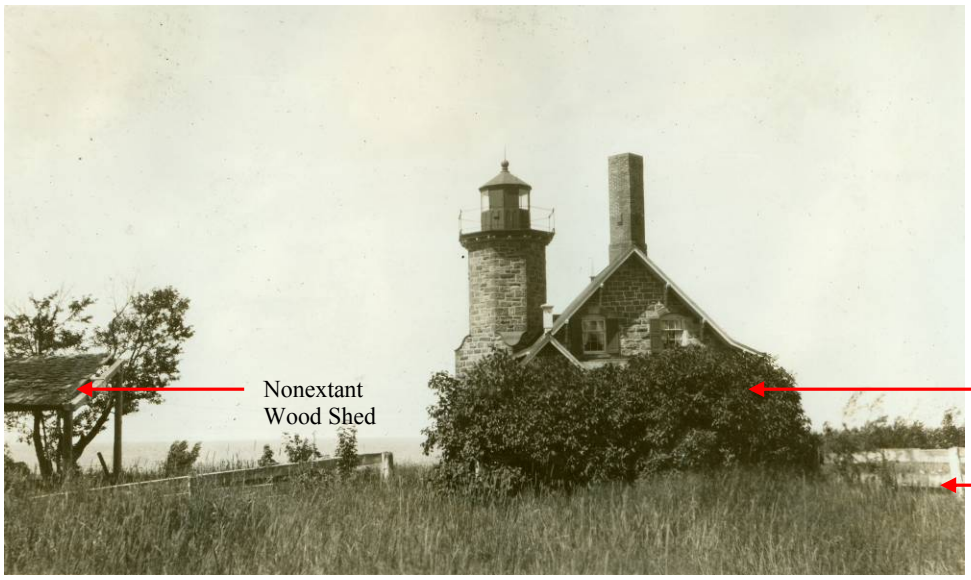
The most notable physical change was the addition in 1933 of a 40-foot tall steel frame light tower in the front of the Light Station Quarters. The light was removed from the original tower in the Light Station Quarters, and a new light was placed onto the steel frame tower (Sand Island Light Tower).

Summer Home Photographs

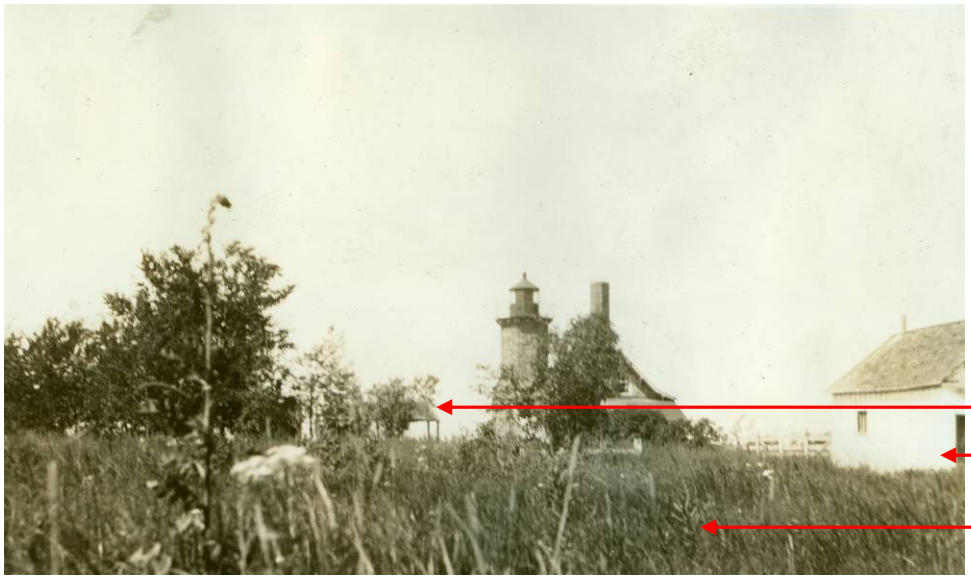


Site Image SI-13: Sand Island Light Quarters from the south, c. 1921 (Source: NPS APIS Archives)

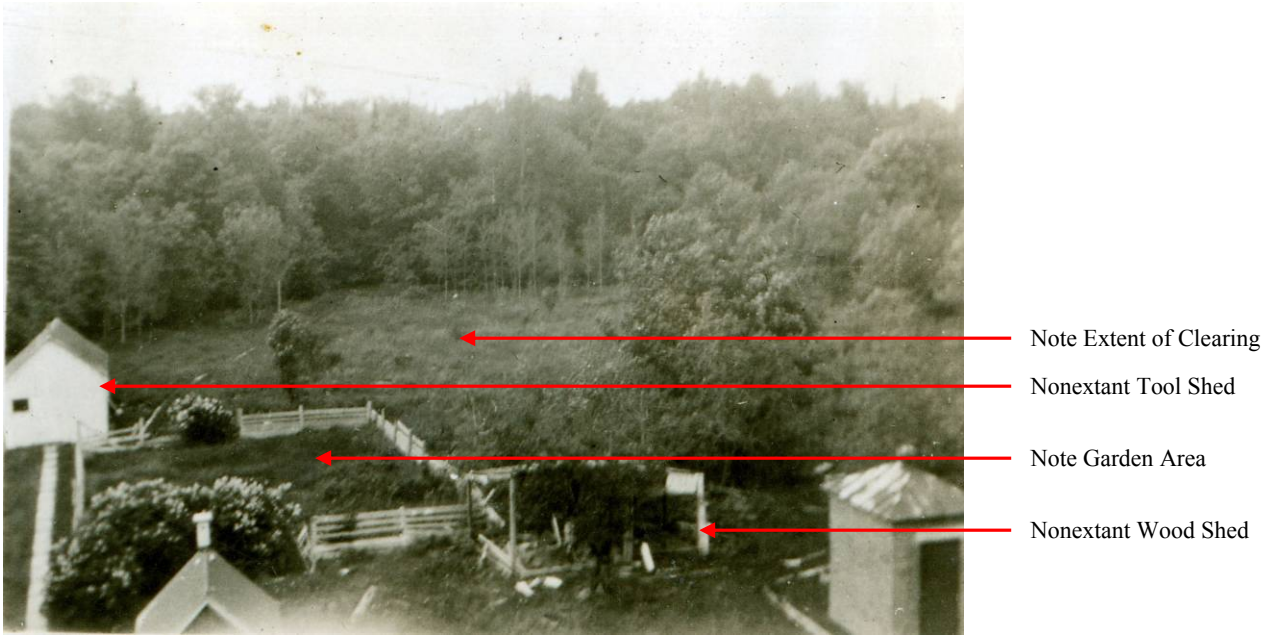
[21] (ibid, page 132)
[22] (ibid, page 25)
[23] (Drawing Reference, USCG, Sand Island Light Station Plot Plan, c. 1936)



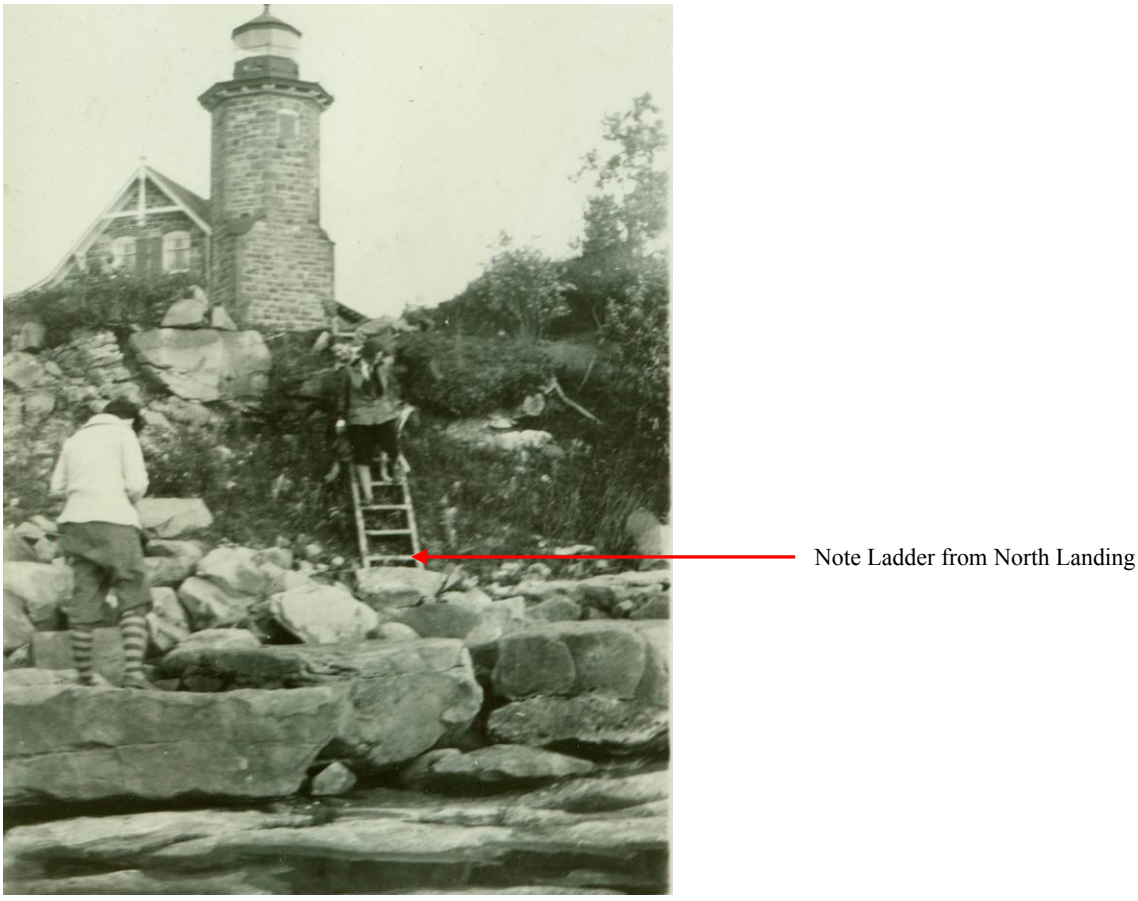
Site Image SI-14: Sand Island Light Quarters from the south. Note lilacs, fencing and Wood Shed (remnant by this period), c. 1925-1939 (Source: Gertrude Wellisch Collection)



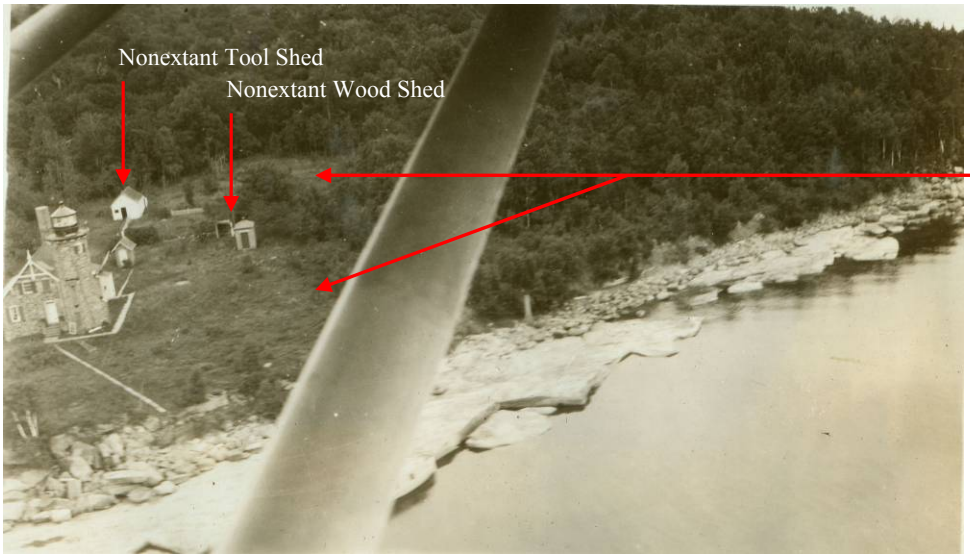
Site Image SI-15: Sand Island Light Quarters from the south. Note clearing and Tool Shed at right, and Wood Shed (remnant by this period), c. 1925-1939 (Source: Gertrude Wellisch Collection)



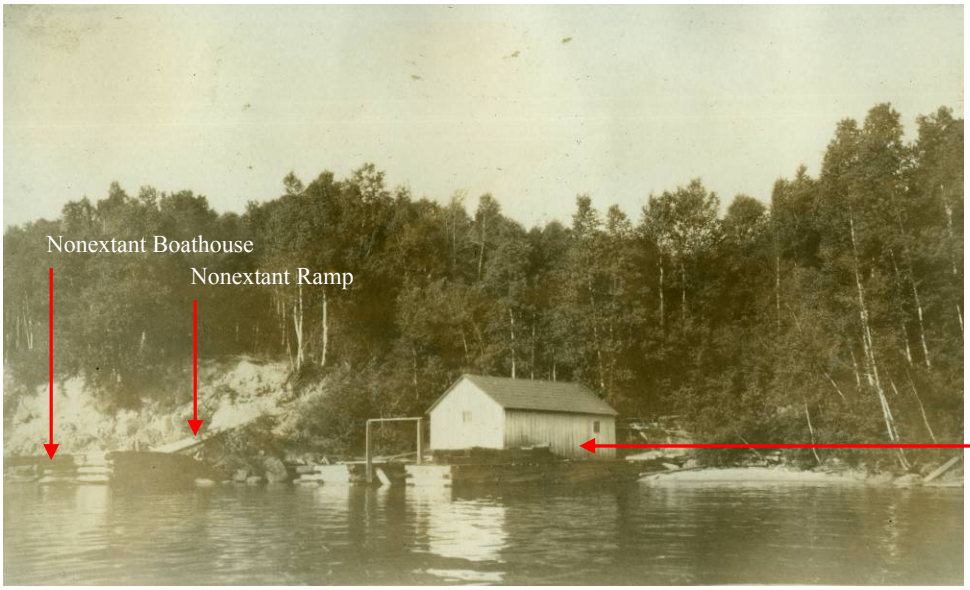
Site Image SI-16: Sand Island Light Quarters from the Light Station Quarters Tower. Note clearing, Tool Shed, Garden Area, Lilacs, Fencing and Wood Shed (remnant by this period), c. 1925-1939 (Source: Walton Wellisch Collection)



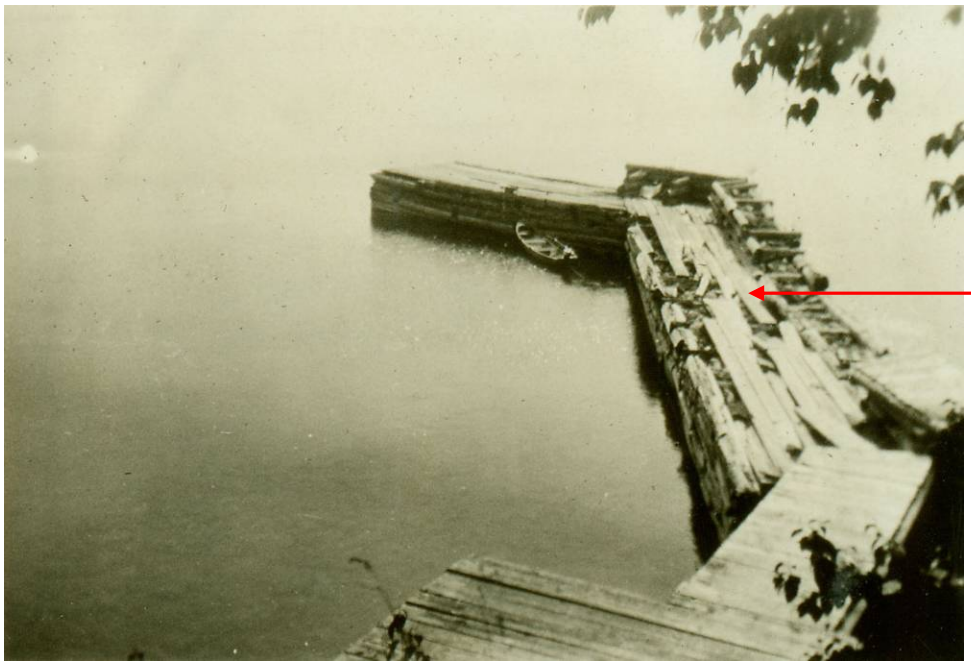
Site Image SI-17: North Landing, c. 1925-1939 (Source: Gertrude Wellisch Collection)



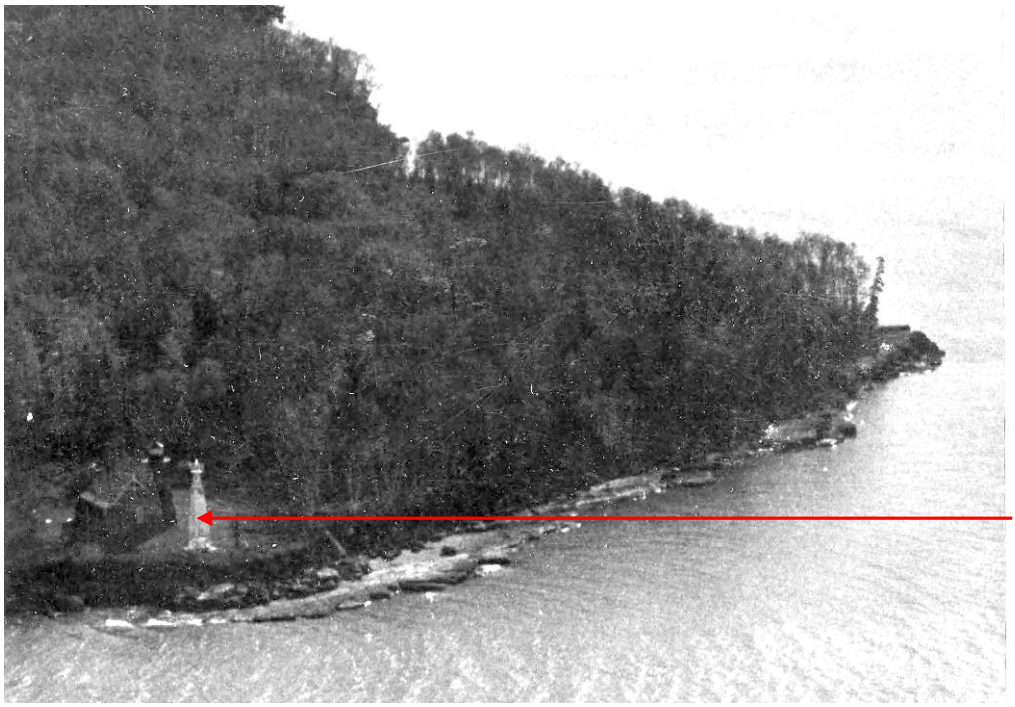
Site Image SI-18: Sand Island Light Quarters from north. Note clearing to the south, Tool Shed, and Wood Shed, c. 1925-1939 (Source: Walton Wellisch Collection)



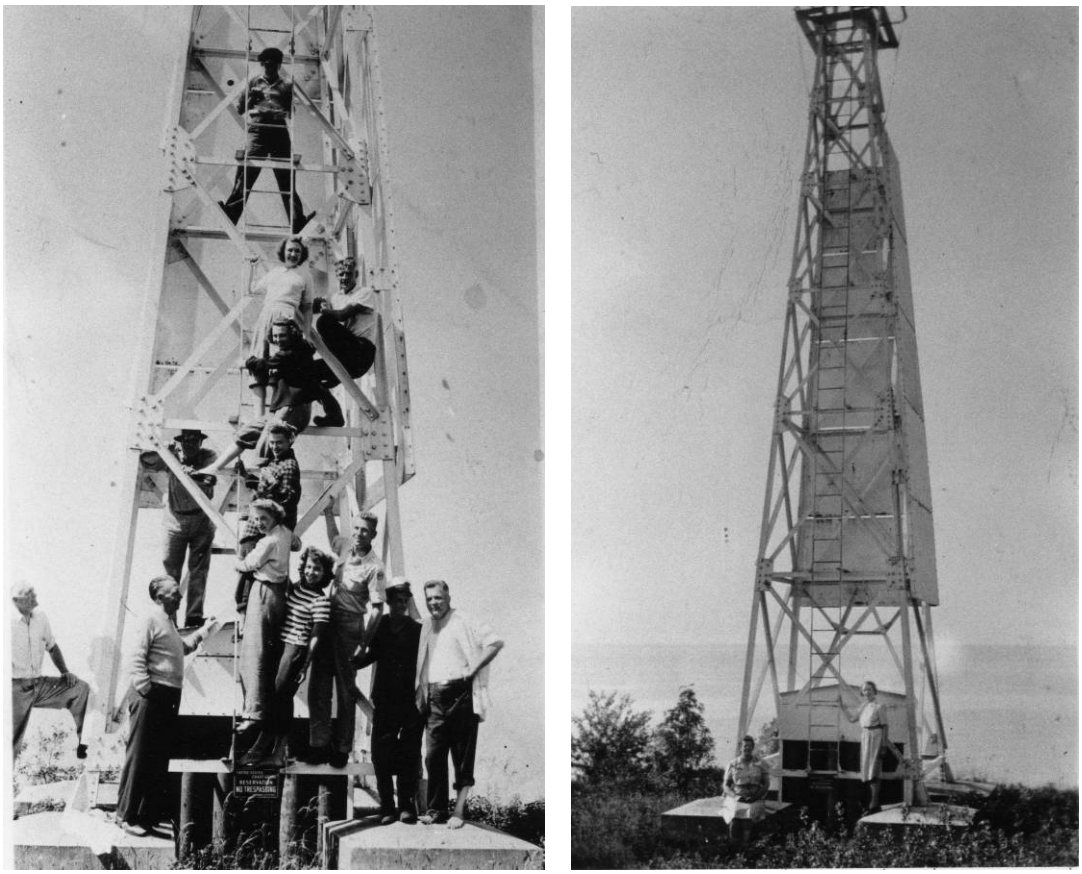
Site Image SI-19: Nonextant boat dock and boathouse from west, 1925-1939 (Source: Gertrude Wellisch Collection)



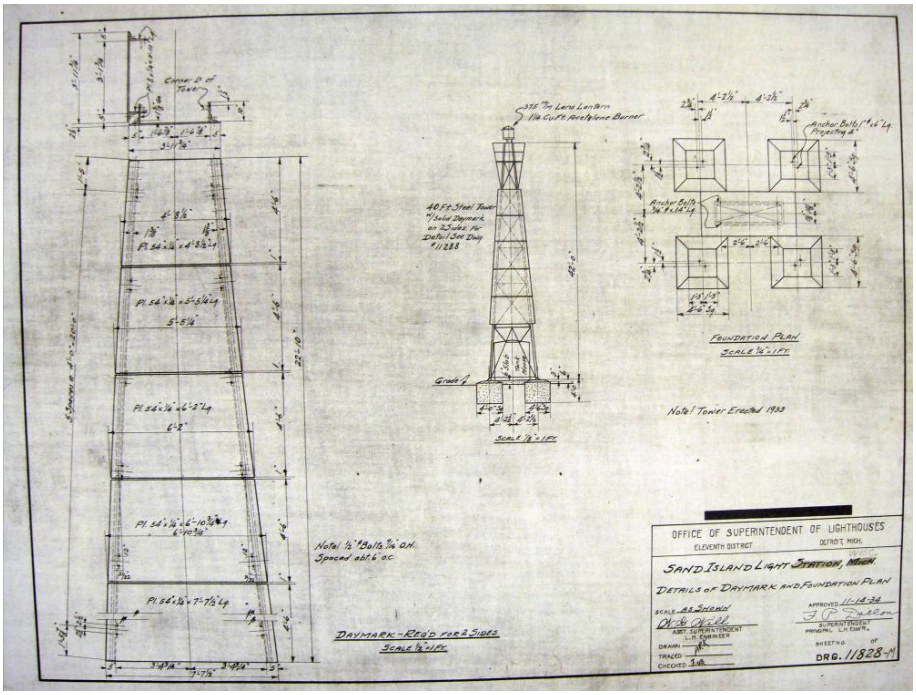
Site Image SI-20: Boat dock at Boathouse site from east, 1925-1939 (Source: Walton Wellisch Collection)



Site Image SI-21: Sand Island Light Station showing, from left, Light Station Quarters, and Sand Island Light Tower, date unknown (Source: NPS APIS Archives)



Site Image SI-22: Sand Island Light Tower, date unknown (Source: NPS APIS Archives)



Site Image SI-23: Sand Island Light Tower drawings, 1934 (Source: NPS APIS Archives)

Coast Guard (1939 – 1969)

In 1939, the United States Bureau of Lighthouses was eliminated and the United States Coast Guard (USCG) assumed responsibility for navigation management of the light stations. The Sand Island Light Station had been automated in 1921, and its management stayed consistent with the station remaining un-manned during this period. Leasing of the Light Station Quarters as a summer residence continued through this period. Between 1953 and 1975, the property was once again leased by a single entity, A.D. Hulings.

Limited additions occurred on the light station grounds during this period. The primary physical changes were associated with the loss or deterioration of features including garden fences, and the Wood and Tool Sheds, which were remnant structures by this time. The light station grounds, which were previously open clearings of brush and mown lawn, began to infill with encroaching forest vegetation. This began when the station was automated in 1921. Historic photographs show that in 1939 forest encroachment had occurred, but the garden area south behind the Light Station Quarters remained generally clear.[24]

The population of Sand Island changed during this period. Farming on the island became less profitable and more difficult in the 1940s. By 1944, the last year-round residents left Sand Island, and it was occupied only in the summer by fishermen and vacationers. [25]

National Park Service (1970 to present)

In 1970, the Apostle Islands National Lakeshore was established. This is the beginning of the NPS period that continues to present day. This period opened the island to additional visitors and brought about changes that primarily related to island access, recreation and visitor use. Leasing of the Light Station Quarters as a summer residence was discontinued in 1975.

Changes during this period include the construction of the wooden staircase from the light station grounds down to the rocky ledge of the North Landing. The steel frame tower was removed in 1985; the footprint of its concrete footings can be seen today. The NPS cleared a portion of the areas west and east of the Light Station Quarters in 1992, removing the trees that obscured the vistas towards the light station grounds. The vegetation removal was repeated to a lesser extent in 2005. The lawn adjacent to the Light Station Quarters was regraded to prevent flooding. Additions included park signage, a solar panel, an NPS vault toilet and minor maintenance on the buildings and structures. The NPS continues installation of and improvements to the footpath that begins at the south edge of the extant historic concrete walk and extends to a point overlooking the boathouse site, and continuing to the East Bay Landing.

[24] 1938 Aerial Photographs, APIS Archives
[25] (People and Places: A Human History of the Apostle Islands; Historic Resource Study of Apostle Islands National Lakeshore, page 27).

ENVIRONMENTAL CONTEXT

Sand Island is 2.8 miles long and 2.8 miles wide and is 2,949 acres. The maximum elevation above the lake is 58'.[26] The presettlement forest on Sand Island was balsam fir, birch, sugar maple, white pine, white cedar, spruce, and hemlock.[27] Presently, the most common trees are yellow birch, balsam fir, white birch, white cedar, and red maple. Canada yew and mountain maple are abundant in the understory. The light station reservation on Sand Island escaped commercial logging, and is one of several old growth forests in the park. The old growth remnant at the northern tip of Sand Island is notable for its extremely large white pine trees. Elements of boreal forest also occur on Sand Island. Wetlands are associated with bogs in the interior of the island. Sand Island did not have a resident deer population until recent years. Deer browsing on Sand Island is now threatening the Canada yew plant community on the island. The lighthouse grounds have been maintained for decades, and several exotic species are present including common periwinkle and gill-over-the-ground (*Glechoma hederacea*).[28] A lawn is still present, but most vegetation clearing activities around the light station were last conducted in the early 1990s, and the area has revegetated with balsam fir.[29] A number of uncommon plants are found on the Orienta formation brownstone ledges southeast of the lighthouse, including bird's eye primrose, harebell, ninebark, red osier dogwood, and long-beaked willow (*Salix bebbiana*).[30]

As with the other islands, wildlife on Sand Island is not as diverse or abundant as that on the mainland.[31] Common mammal species include red squirrel (*Tamiasciurus vulgaris*), snowshoe hare (*Lepus americanus*), deer mouse (*Peromyscus maniculatus*), masked shrew (*Sorax cinereus*), beaver (*Castor canandensis*), and boreal redback vole (*Clethrionomys gapperi*). White tailed deer have become common following the recent establishment of the population on Sand Island. River otter is a less common species found on Sand Island.[32] Sand Island is also one of three islands with reproducing populations of black bear.[33] A variety of migratory birds use the island for foraging, nesting, and as a stop-over during migration.

[26] National Park Service (NPS). 2006. Apostle Islands National Lakeshore Website. Island Statistics. Last updated August 23, 2006. Available at http://www.nps.gov/apis/parkmgmt/upload/island%20statistics.PDF. Accessed December 7, 2009.

[27] Judziewicz and Koch 1993
[28] Judziewicz and Koch 1993
[29] NPS 2009
[30] Judziewicz and Koch 1993
[31] ibid
[32] ibid
[33] ibid

EXISTING CONDITION ASSESSMENT AND LANDSCAPE ANALYSIS

The existing condition assessment and landscape analysis for the Sand Island Light Station are presented in this section. The light station reservation and grounds are documented as one entity through those landscape characteristics that together comprise its cultural landscape. The presentation of the existing conditions assessment and analysis is organized by landscape characteristics: spatial organization, topography, views and vistas, and circulation/accessibility; and identifies those buildings, structures, small scale features and vegetation that contribute to the cultural landscape. An overview of the CLR methodology is presented in Volume I, Chapter 2: *Methodology*.

The landscape characteristics for the Sand Island Light Station are as follows. Their associated character-defining features contribute to the overall integrity of location, design, materials, workmanship, setting, association, and feeling.

- Spatial Organization - is the arrangement of elements creating the ground, vertical and overhead planes that define and create space, including the arrangement of topography and buildings.
- Topography – is the three-dimensional configuration of the landscape surface characterized by features and orientation; includes bluffs, cliffs, slopes and drainages.
- Views and Vistas – are features that create or allow a range of vision which can be natural or designed and controlled; these include views of the light stations from Lake Superior and views from the light towers and lighthouses.
- Circulation – are spaces, features, and materials that constitute systems of movement.
- Buildings - buildings that are either currently or were historically habitable are presented in the Historic Structure Report.
- Structures - are smaller non-habitable buildings or significant features (now or historically) such as privies, tramways, and outbuildings.
- Small Scale Features – are elements that provide detail and diversity combined with function and aesthetics; including paving, structural remnants, site walls, signs, and walls of building ruins.
- Vegetation – are indigenous or introduced trees, shrubs, vines, ground covers, and herbaceous materials; including lawns, shrubs and landscape garden areas.

The existing condition of the Sand Island Light Station is presented first as a paragraph description. Annotated photographs support the condition assessment. The following criteria were used to evaluate condition:

- **GOOD –** Those features of the landscape that do not require intervention; only minor or routine maintenance is needed at this time.
- **FAIR –** Some deterioration, decline, or damage is noticeable; the feature may require immediate intervention; if intervention is deferred, the feature will require extensive attention in a few years.
- **POOR** – Deterioration, decline, or damage is serious; the feature is seriously deteriorated or damaged, or presents a hazardous condition; due to the level of deterioration, damage, or danger the feature requires extensive and immediate attention.

The landscape analysis, presented as narrative text, follows and provides an evaluation of the significance and integrity of each characteristic. The landscape analysis compares the site history with its existing condition to identify and evaluate those landscape characteristics that retain integrity and contribute to the significance of the light station.

The Sand Island Light Station has integrity as it retains the majority of its character-defining features and buildings that depict its role in the development of navigational aids in the Apostle Islands. The most important features include the buildings, concrete walks, and cleared areas as these defined the composition and setting for the navigational aids and the landscape created by the keepers and residents.

Spatial Organization

The spatial organization of the Sand Island Light Station occurs at two distinct but related scales: the organization of the larger reservation and that of the light station grounds.

Existing Condition. The spatial organization of the light station reservation is defined by the prominent location of the light station at the northern end of the island and the relationship of the cleared areas to the surrounding forested areas. The light station grounds are located on the northern-most peninsula of Sand Island on a bluff approximately 20 feet above Lake Superior.

The light station grounds are arranged around the Light Station Quarters which is located close to the edge of the bluff, commanding the view from the water. The southern edge of the grounds is defined by the forest while the cliffs of the bluff define the north, east and west sides of the grounds. The 44-foot tall Light Station Quarters is the dominant feature of the grounds with walks and structures radiating out from it in an organized, asymmetrical arrangement. This arrangement reflects the functional need to reach specific features on the grounds and to connect with the trail leading south to other parts of the island.

Approximately one-half mile south of the light station grounds is the former location of the Boathouse and dock. The trail leads to a clearing at the top of the bank, overlooking a small bay.

The spatial organization of the light station, reservation and grounds is in fair condition.

Analysis. The spatial composition of the light station reservation has changed from the island's early history. While the spatial organization of the prominent buildings and small scale features at the light station grounds remain in place from the period of significance, the cleared area of the light station and former Boathouse area has been greatly reduced due to forest encroachment (Site Image SI-24, SI -26).

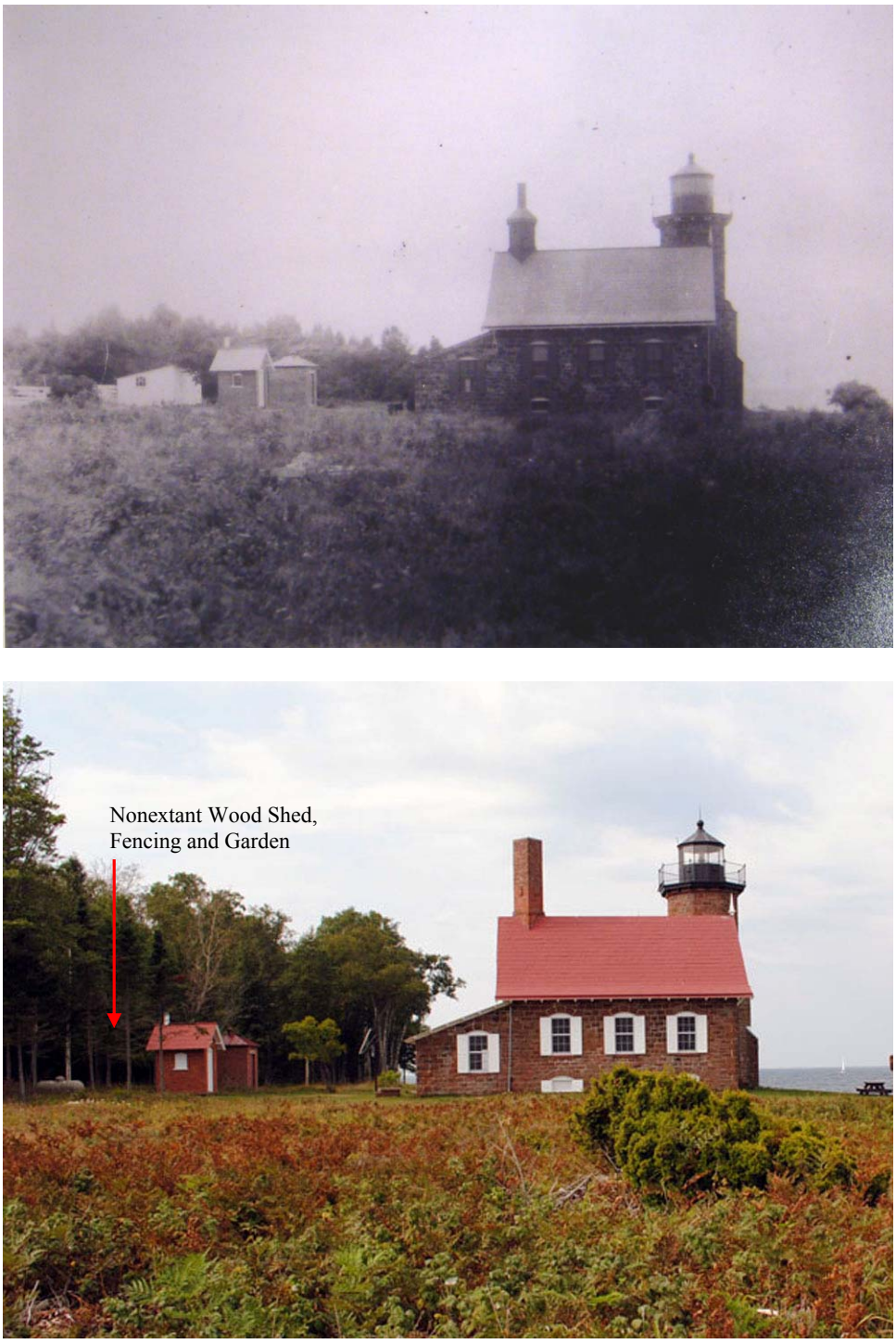
The loss of buildings and structures has diminished the integrity of the spatial organization of the light station grounds. This includes the loss of the Tool Shed, Wood Shed and fenced garden area behind the Light Station Quarters. At the boathouse site, the Boathouse and dock have been lost and the cleared area has filled in with forest vegetation. Remnants of stone landing cribs are extant under the water. The total loss of structures at the Boathouse site diminishes the integrity of the cultural landscape.

Spatial composition is an important contributing feature and the encroachment of the forest and loss of buildings and structures has diminished the integrity of this feature and the light station.

Spatial Organization Photographs

Site Image SI-24: Arrangement of Privy and Oil Building to the south of the Light Station Quarters with path to a nonextant Tool Shed, 2009 (Source: MBD P1020414.JPG)

Site Image SI-25: Light station grounds between Oil Building and Light Station Quarters, 2009 (Source: MBD DSC_0294.JPG)



Site Image SI-26: View of Light Station from the east – note reduction in cleared area to left and growth of forest; top, c. 1913 (Source: NPS APIS Archives); below, 2009 (Source: MBD DSC_0250.JPG)

Topography

Existing Condition. Sand Island's overall topography consists of gently rolling, forested hills with steep banks or rocky cliffs at the water's edge, with areas of rocky or sandy beaches. The highest point of the island is approximately 58 feet above Lake Superior. The light station grounds on Sand Island are set on a bluff, rising approximately 20 feet above Lake Superior. The light station grounds are generally level, sloping gently toward the rocky cliffs along the northern shoreline. The topography of the light station is in good condition.

Analysis. At Sand Island, the level topography at the light station location provided a good building location requiring few modifications. Today, the topography remains as it was historically, since the development of the light station. Modifications to the topography are minor and include regrading the lawn adjacent to the Light Station Quarters to provide drainage away from the building. The topography of the reservation and light station grounds retains its integrity and contributes to its significance.

Topography Photographs

Site Image SI-27: Light station grounds sloping gently to rocky cliffs along the shoreline, looking west, 2009 (Source: MBD DSC_0277.JPG)

Site Image SI-28: North Landing rocky outcropping northwest of the light station grounds, 2009 (Source: MBD DSC_0248.JPG)

Site Image SI-29: Rocky cliff at the eastern edge of the light station grounds, 2009 (Source: MBD DSC_0249.JPG)

Views and Vistas

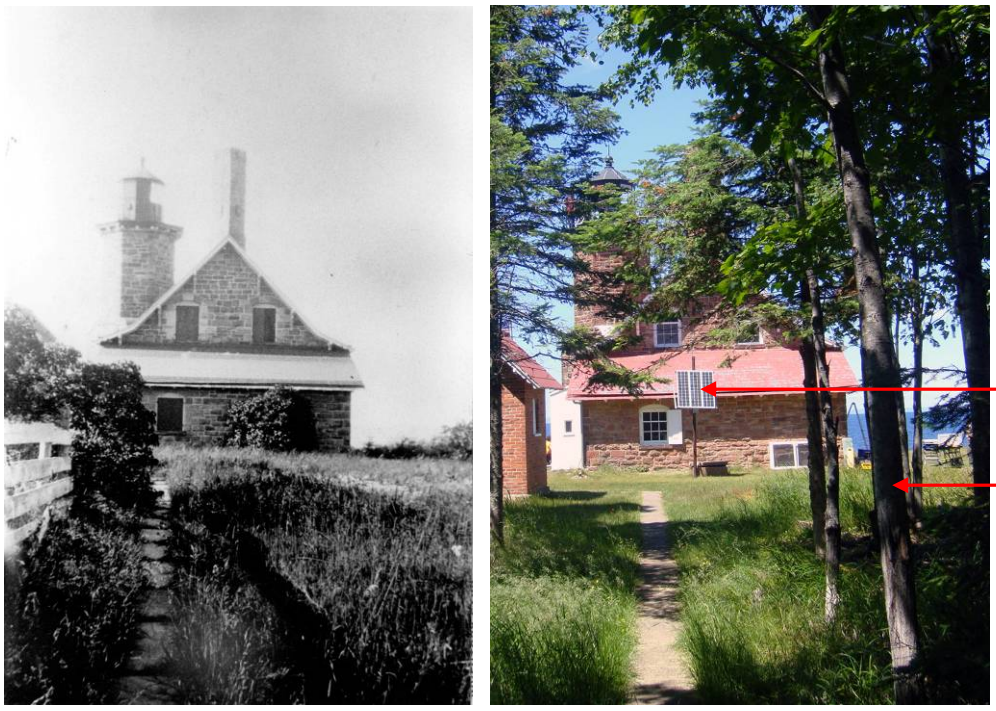
Existing Condition. The light station grounds are located on Sand Island's northernmost tip, on a bluff immediately adjacent to Lake Superior. The Light Station Quarters is visible to passing ships and pleasure boats on Lake Superior as they navigate around the island. From the light station grounds notable views include those from the top of the Light Tower to the north over Lake Superior and to the south across the island. Clearing projects have been undertaken to maintain views to the light station from the water. The view from the trail approaching the light station from the south is important, as many visitors approach the station from this trail. Currently this view is obscured by forest vegetation. Views and vistas are generally in fair condition.

Analysis. This setting provides a clear view to the light which is essential for the island to function as a navigational aid. Today, the extent of views to the light station grounds has been reduced from the clear open views which existed during the period of significance. This is due to the encroachment of forest vegetation across the entire northern peninsula, filling in what had historically been clearings of low brush. While the current cleared area reflects only a portion of the historically cleared area during the period of significance, the views to the Sand Island Light Station are the best of the light stations in this study. In 1992, and again in 2005 clearing projects partially removed some forest vegetation and restored the open views to light station. Views from the south trail to the Light Station Quarters have been diminished by the encroachment of forest vegetation into the historically cleared area of the garden and sheds. The placement of the solar panel and battery storage unit immediately south of the building detracts from the view towards the building.

Views and vistas are a contributing feature. The reduction of the historically cleared area and obscuring of views from the lake and hiking trail has diminished the integrity of the light station.

Views and Vistas Photographs

Site Image SI-30: View of Light Station Quarters from Lake Superior; top, c. 1891 (Source: NPS APIS Archives); below, 2009 (Source: MBD P1020458.JPG)



Site Image SI-31: View to Light Station Quarters from the south; top, c. 1920 (Source: NPS APIS Archives); below, 2009 (Source: MBD DSC00708.JPG)

Circulation/Accessibility

The circulation feature addresses overall access and patterns of circulation in the cultural landscape. Individual features such as concrete walks are presented in the small scale features section.

Existing Condition. Circulation at the Sand Island Light Station is directly related to the boat landings on the island. The two primary landings are: the North Landing, a rock landing directly adjacent to the light station, and the East Bay Landing Dock (Site Image SI-32) located two miles south of the light station. The East Bay Landing Dock is the only formal public boat dock on the island. The East Bay Landing Dock is used by NPS staff and visitors in small pleasure boats. The dock is not accessed by large day-cruise boats.

An approximately two mile-long trail provides pedestrian circulation through the forest from the East Bay Landing Dock north to the light station. This hiking trail is composed of natural surface trail and boardwalks in low and frequently wet areas. At an opening in the forest along Lighthouse Bay, the hiking trail provides a view towards the site of the nonextant Boathouse, a former boat landing that serviced the light station.

On the light station grounds, footpaths connect the grounds to the boat landing areas on the rocky shore east and west of the station. At these points, pedestrians climb the rock outcrops to reach the rocky landings. At the North Landing a wooden staircase connects the rock outcrops to the light station grounds above. East of the light station grounds the rock outcrops are connected to the light station with a wooden ladder.

Concrete walks connect the buildings and features of the light station grounds, including the Light Station Quarters, Oil Building, and Privy. One leads southeast from the Privy approximately 85 feet to the area of the nonextant Tool Shed. The trail from the East Bay Landing Dock connects to the end of this concrete walk with a wood plank walk (Site Image SI-34).

The wooden staircase is described under the Structures section. The concrete walks are described under the Small Scale Features section.

In general, circulation on the light station is in good condition and retains integrity.

Analysis. Circulation on Sand Island remains similar to the original routes that were developed during the period of significance with the exception of the primary landing site's location. The non-extant Boathouse and dock, located about one-half mile south of the light station at the north end of Lighthouse Bay served as the primary landing location for the Sand Island Light Station from the 1880s until the features fell into disrepair beginning in the 1920s. Historic photographs indicate that a wooden ramp was used to ascend the bank from the dock. Today, the primary landing location is the East Bay Landing Dock, an area much further south of the light station (approximately 2 miles), and on the east side of the island. The existing trail is thought to follow the route of the original footpath between the light station grounds and East Bay Landing. This route also served as part of the island's overall circulation system, when there was a community of farmers, loggers, and miners on Sand Island.

A historic illustration indicates a secondary landing existed one-quarter mile southeast of the Light Station Quarters, the drawing shows a wooden boat ramp used to haul boats up the cliff to the light station. Historic photographs from the 1920s and 30s show a ladder/staircase from the North Landing to the light station grounds, near the location of the extant wooden staircase. Together, these historic images indicate that boat access during the period of significance occurred much as it does today, at the rocky ledges along the light station's immediate shoreline. Multiple boat landing locations along the light station's shore are needed due to the heavy wave action and unpredictability of Lake Superior.

Concrete walks installed during the period of significance, remain in their historic locations. Typical to the Apostle Islands light stations, the concrete walks were precast units placed in straight lines connecting buildings and other site features. Concrete walks connected the Light Station Quarters with the Oil Building and Privy, as well as to the North Landing and south to the former location of the Tool Shed. Many of the concrete walks were preceded by wooden plank walks laid on the ground surface.

Today, the historic circulation system, consisting of the concrete walks on the light station grounds and the trail to the former Boathouse site and East Bay Landing Dock are contributing features. The loss of the Boathouse and dock diminishes the integrity of the cultural landscape. The wooden staircase at the North Landing is a contemporary feature that is located very close to the historic ladder/staircase site.

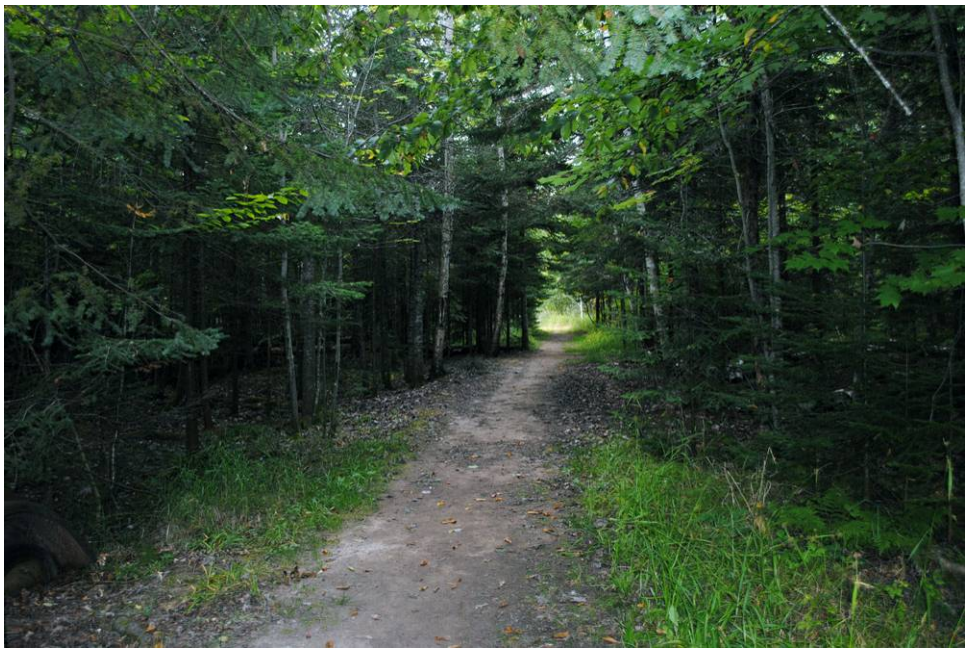
Accessibility (ABAAS). Accessibility on the light station, including its buildings and structures, is limited due to physical barriers and a lack of ABAAS compliant improvements. Barriers to universal accessibility include: the two mile trail from the East Bay Landing Dock to the light station; 22 steps on the North Landing wooden staircase; steps leading into and through buildings and structures; narrow width of site walks (18”-30”) and isolated areas of site walk settlement that present tripping hazards (>1/2”). The light station grounds present few barriers to accessibility as the terrain is generally flat. The buildings present individual accessibility barriers and are presented in the HSR. The Park Service is currently developing a park-wide Accessibility Self Evaluation and Transition Plan separate from this project to address visitor accessibility requirements related to ABAAS and Section 504 of the Rehabilitation Act. At the time of this report the plan is in progress.

Circulation Photographs

Site Image SI-32: East Bay Landing Dock, 2009 (Source: MBD DSC00740.JPG)

Site Image SI-33: Boardwalk section of trail corridor between the Light Station and East Bay Landing Dock, 2009 (Source: MBD DSC00697.JPG)

Site Image SI-34: Wood plank walk section of trail corridor between the Light Station and East Bay Landing Dock, 2009 (Source: MBD DSC00698.JPG)



Site Image SI-35: Trail corridor, natural surface, between the Light Station and Boathouse, 2009 (Source: MBD DSC_0228.JPG)

Site Image SI-36: Connection between concrete walk and hiking trail south of Light Station Quarters, 2011 (Source: MBD DSC00851.JPG)

Site Image SI-37: Footpath leading from Light Station Quarters to east shoreline, 2009 (Source: MBD P1020416.JPG)

Site Image SI-38: Wooden staircase at north landing offset from historic concrete walk, 2009 (Source: MBD DSC_0263.JPG)

Buildings

The Sand Island Light Station buildings include the Light Station Quarters, Oil Building, and Privy. For information, refer to the Historic Structure Report for Sand Island.

Structures

The structures on Sand Island provide a human scale and many convey important history and use of the light station. The structures include a wooden staircase at the North Landing, a nonextant boat dock south of the light station at the boathouse site, and an NPS vault toilet (non-accessible).

Staircase

Existing Condition. A wooden staircase connects the light station grounds to a natural rock outcrop (approximately 18' high) used as a boat landing. The staircase is built of dimension lumber, is 4' wide with railing on both sides, and approximately 3' high. There is a 1' x 4' step on the light station grounds leading up to a 6'x 4' landing. There are 22 steps leading from the landing to the rocky ledge. The alignment of the staircase is offset from the historic concrete walks above by approximately 20'. The staircase is showing signs of disrepair and is in poor condition. A 30"x48" precast concrete slab, from the walk above, has been placed at the bottom of the staircase.

Analysis. The wooden staircase is used for accessing the North Landing rock ledge. Following a review of historic photographs and drawings, the first depiction of the staircase appears in the 1989 HABS drawings.

The staircase is from the NPS period and is a noncontributing, compatible feature.

Boathouse Site

Existing Condition. No readily visible features of the Boathouse exist. Remnant materials from the landing cribs exist under the water.

Analysis. The boathouse site formerly consisted of a Boathouse, landing crib and boat dock. Serving as the primary landing point during the period of significance, the site of the harbor is important to the history and cultural landscape of the Sand Island Light Station and is a contributing feature. The loss of these resources has diminished the integrity of the light station.

Nonextant Tool Shed and Wood Shed

The Tool Shed and Wood Shed are nonextant and no readily visible traces remain. A concrete walk leads to the site of the former Tool Shed from the Privy (Site Image SI-36). The area of the Wood Shed is now covered with forest vegetation.

NPS Vault Toilet

Existing Condition. The NPS Vault Toilet is a wood-framed structure and vault located south of the Oil Building. The NPS Vault Toilet is not an accessible structure.

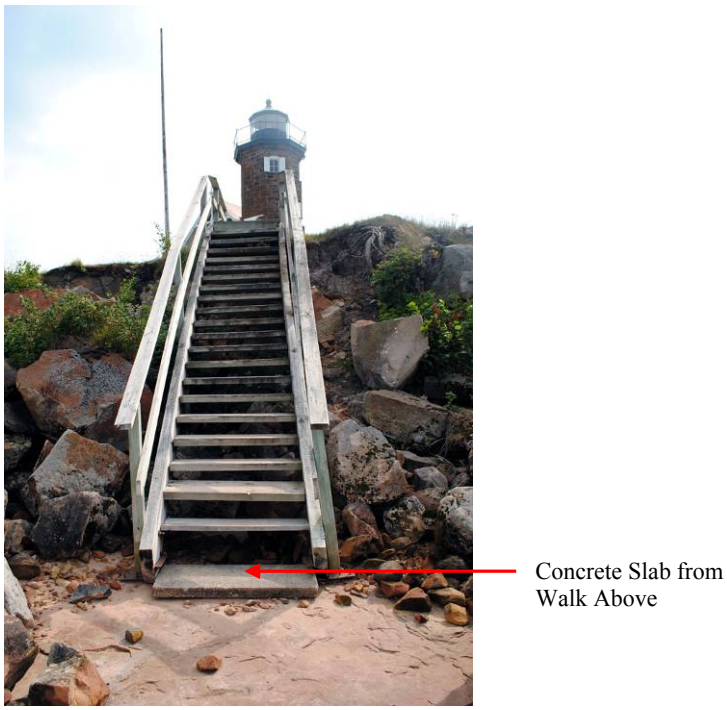
Analysis. The NPS vault toilet is a recent addition and is a noncontributing feature. The current location of the NPS vault toilet, though surrounded by encroaching forest, is 40' west of the former garden site in an area that was historically cleared.

East Bay Landing Dock and Trail to Station

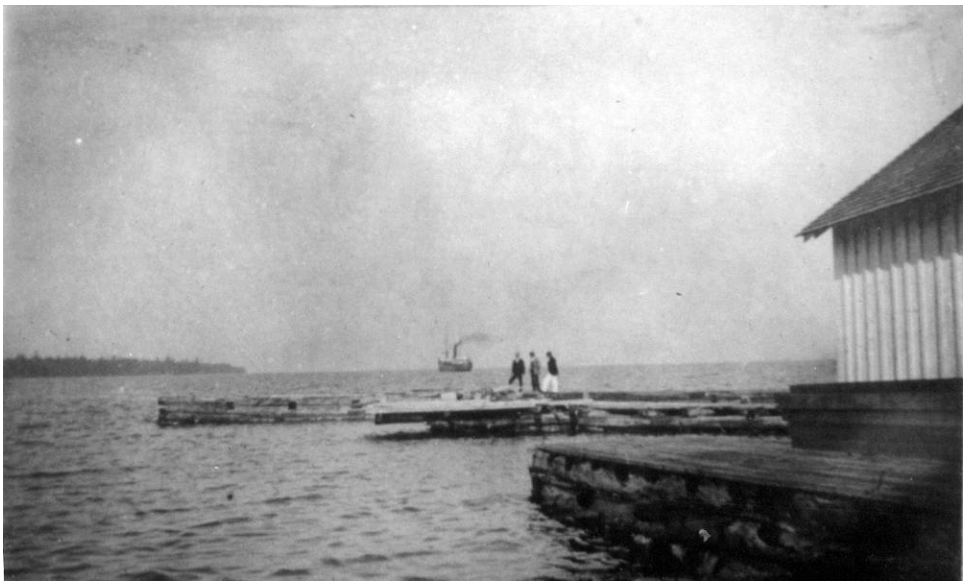
The East Bay Landing Dock and trail to the light station are presented in the Circulation portion of the CLR. They are not included and described in detail (with dimensions and materials) under Structures as they were not included in the original scope of work for this report. The Circulation assessment for the Sand Island Reservation was expanded through the course of this project to examine possibilities for future ABAAS compliant trails from the East Bay Landing Dock to the Sand Island Light Station. At the time of this report the park is preparing an Accessibility Self Evaluation and Transition Plan that may address further accessibility improvements to the dock and trail. Also, boat dock planning work is currently under study by the NPS under separate but related projects, including the Great Lakes Restoration Initiative.

Site Structure Photographs

Site Image SI-39: View of the wooden stairway at the North Landing, 2009 (Source: MBD DSC00711.JPG)



Site Image SI-40: View of the staircase from the North Landing, 2009 (Source: MBD DSC_0274.JPG)



Site Image SI-41: Former Boathouse area; top (c. 1904) (Source: NPS APIS Archives); below (2009) (Source: MBD DSC00705.JPG)

Small Scale Features

The small scale features at Sand Island Light Station include concrete walks, a flagpole, signs, and other small site elements. The small scale features range in condition from good to poor. The following describes the contributing small scale features that are important to the light station's history of navigation. They are the features that convey the development of navigational technology at the light station and influenced the manner in which the station operated. At the Sand Island Light Station these features include concrete walks and dump sites. In addition to these features there are signs, a solar panel, and other site features that have been added to the site outside the period of significance. Descriptions of other individual features, many of which are contributing, and their respective condition are included in Table SI-1.

Concrete Walks

Existing Condition. The concrete walks were installed during the period of significance, many of them following the earlier alignment of wood planks as was typical of the Apostle Islands. Common to several Apostle Islands light stations, the walks are composed of individual 4' thick precast units. The slabs are of two sizes, 30" x 48" and 18" x 48". The units have a fine aggregate finish and tooled edges (Site Image SI-42). Historic photographs indicate that the concrete units were installed on top of the ground surface without excavation. Small portions of the concrete walks appear to have been poured in place to fill odd shapes and address building edges. Overall the concrete walks are in good condition with only one area that appears to require replacement of broken concrete.

Analysis. The concrete walks are significant to the light station as their installation occurred during the period when the light station was at its most active. The walks are also important because they were produced and installed as precast units, common to this and other light stations. This construction technique conveys the interrelationship of the light stations and the means and methods of construction on the light station. The concrete walks are contributing features.

Dump Sites

Existing Condition. Three dump sites and a site containing brick rubble exist in the forest vegetation in the area surrounding the Sand Island Light Station. The sites were located at varying distances from the light station, one at 60 feet away and another at 220 feet. The sites contain various materials Dump Site 1 is primarily glass bottles and soda cans, Dump Site 2 consists of what appears to be fuel containers, and Dump Site 3 has remnant wood panels and other materials, possibly remnants of a building interior.

Analysis. The locations and materials within the dump sites indicate they are from different historic periods, the closer dump sites being newer as the encroaching vegetation reduced the size of the clearing. Very little is known about these sites and they may contain potential archeological features that will further tell the story of the Sand Island Light Station. The dump sites are contributing features.

Nonextant Wood Fencing

The wood fencing enclosing the nonextant garden area, and is nonextant with no remnants remaining. The area is now filled in by encroaching forest vegetation.

Table SI-1: Small Scale Features

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Concrete Walks (c.1890)	SI-42 SI-43	Concrete walks (30" wide) connecting site buildings and structures, primarily precast concrete slabs set on grade	Good	Contributing; See text
Stone Foundation (1881 - 1969)	SI-44	Stone foundation located east of Light Station Quarters – use unknown, possible well location	Poor	Contributing
Dump Site – 1 (1881 - 1969)	SI-45	Dump site of household items, bottles, tins, etc. – appears to be from period of significance	Fair	Contributing; See text
Dump Site – 2 (1881 - 1969)	SI-46	Dump site – appears to be from the period of significance	Fair	Contributing; See text
Dump Site – 3 (1881 - 1969)	SI-47	Dump site – appears to be from the period of significance	Fair	Contributing; See text
Concrete Cleanout with Steel Plate (1939 - 1969)	SI-48	Three, 18" square concrete cleanout collars with square metal plate, Possible cleanout for waste water system of Light Station Quarters	Fair	Noncontributing; Compatible
Tank House Foundation, 1931	SI-49	Concrete foundation, immediately south of Light Tower at Light Station Quarters. Approximately 30" x 6'. Foundation for nonextant Tank House installed in 1931	Fair	Noncontributing; Compatible
Sign (1970 – 2009)	SI-50	NPS wooden interpretive sign	Fair	Noncontributing – contemporary; Compatible
Trail Sign (1970 – 2009)		NPS trail sign	Good	Noncontributing – contemporary Compatible
Fire Pit (1970 – 2009)	SI-51	Steel fire pit – located away from Light Station Quarters	Good	Noncontributing – contemporary; Compatible
Flagpole (1970 – 2009)	SI-52	Wooden flagpole similar in design to flagpoles at Michigan and Outer. As it is not pictured in any of the historic photographs, it appears that it is an NPS addition.	Good	Noncontributing – contemporary; Compatible
Bench	SI-54	Wooden, rough cut log bench	Fair	Noncontributing – contemporary; Compatible
Wood Headwall (c. 1980)	SI-55	Wood headwall for drain outlet. Part of 1980s drainage system from the basement from the Light Station Quarters.	Good	Noncontributing – contemporary; Noncompatible
Stone North Arrow (c. 1983 - 2009)	SI-56	Arrow and 'N' composed of stones placed in landscape flush with adjacent grade.	Fair	Noncontributing – contemporary; Noncompatible

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Footprint of Steel Frame Tower Foundations	SI-56	Four footprints near stone north arrow.	Poor	Noncontributing; Compatible
Solar Panel (1970 – 2009)	SI-57	Solar panel on steel post with electric line	Poor	Noncontributing – contemporary; Noncompatible
Modern Fiberglass Battery Storage Unit (1970 – 2009)	SI-53	Fiberglass battery storage unit at rear of Light Station Quarters	Fair	Noncontributing – contemporary; Compatible

Small Scale Feature Photographs

Site Image SI-42: Typical concrete walk of precast slabs, 2009 (Source: MBD DSC_0290.JPG)

Site Image SI-43: Typical concrete walk of precast slabs, and center, area of replacement concrete, 2009 (Source: MBD DSC_0288.JPG)

Site Image SI-44: Stone foundation east of Light Station Quarters, 2009 (Source: MBD DSC_0253.JPG)

Site Image SI-45: Dump site No. 1, 2009 (Source: MBD P1020382.JPG)

Site Image SI-46: Dump site No. 2, 2009 (Source: MBD P1020387.JPG)

Site Image SI-47: Dump site No. 3, 2009 (Source: MBD DSC_0227.JPG)

Site Image SI-48: Concrete pad with steel plate, 2009 (Source: MBD DSC_0280.JPG)

Site Image SI-49: Concrete Foundation south of Light Tower at Light Station Quarters, 2009 (Source: MBD DSC01439.jpg)

Site Image SI-50: Park interpretive sign, 2009 (Source: MBD P1020387.jpg)

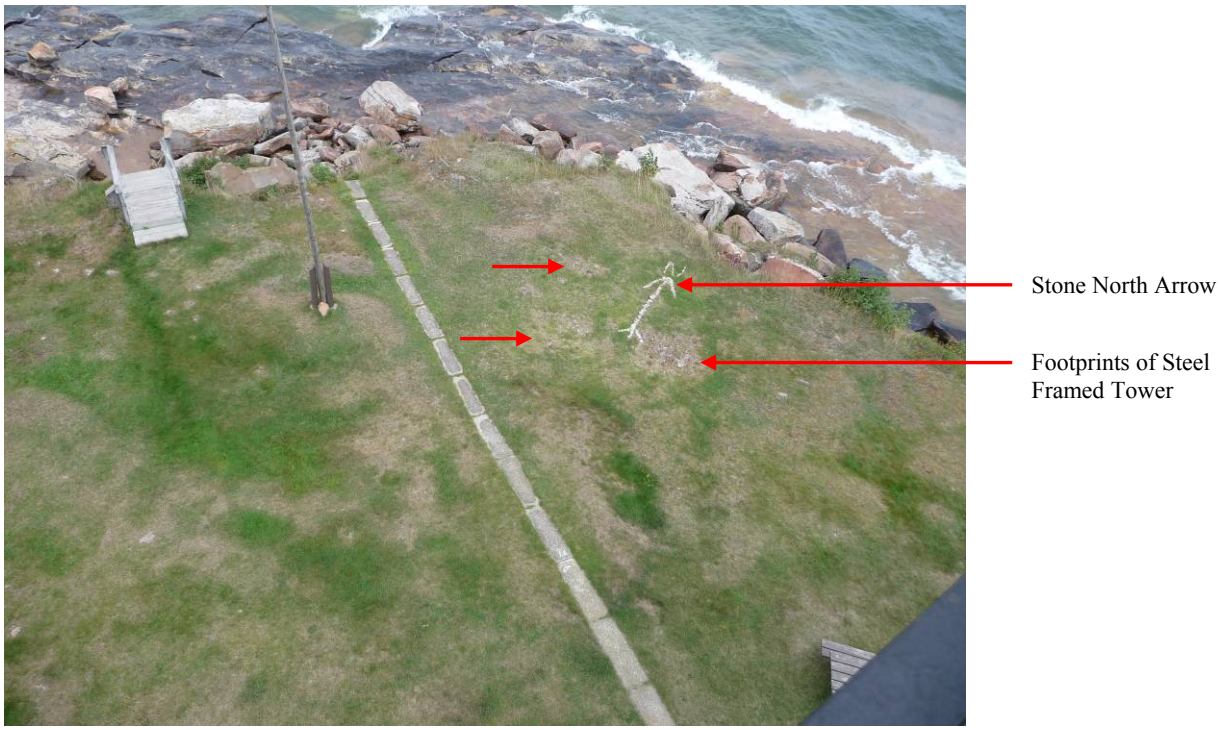
Site Image SI-51: Fire pit, 2009 (Source: MBD P1020454.JPG)

Site Image SI-52: Flagpole, 2009 (Source: MBD DSC01438.JPG)

Site Image SI-53: Fiberglass battery storage unit at rear of Light Station Quarters, 2009 (Source: MBD DSC_0286.JPG)

Site Image SI-54: Bench along trail west of Light Station Quarters, 2009 (Source: MBD DSC_0320.JPG)

Site Image SI-55: Wood headwall for drainage pipe, 2009 (Source: DSC_0259.JPG)



Site Image SI-56: Footprints of steel framed tower (indicated by arrows above) and stone north arrow, 2009 (Source: MBD P1020412.JPG)

Site Image SI-57: Solar panel and battery unit before and after recent damage: left, 2009 (Source: MBD P1020383.JPG); right, 2011 (Source: MBD DSC00849.JPG)

Vegetation

Existing Conditions. Sand Island's vegetation includes forested areas, cleared and maintained areas, and domestic plantings. The forest area is a mixed northern hardwood forest and is the predominant vegetation of the island. The light station grounds include historically cleared areas that are now predominantly brush, with some areas that have encroaching forest vegetation including trees. The grounds immediately surrounding the Light Station Quarters is a maintained lawn of mown grasses.

Very few remnants of landscape and garden plantings exist on the site. Purple and white lilacs (*Syringa* sp.) exist at the southwest corner of the Light Station Quarters and northwest of the Oil Building, respectively. A small Mountain Ash (*Sorbus* sp.) exists between the Oil Building and Privy and a Balsam Fir (*Abies balsamea*) tree west of the Light Station Quarters. Areas of Sweet William (*Dianthus* sp.) are found between the Quarters and Privy.

The ground cover Periwinkle (*Vinca minor*), was introduced to the island (likely during the period of significance) and has spread into the forest area. Periwinkle is an invasive plant species. Periwinkle was planted along the north, south and east fence lines enclosing the garden. Today, it exists along the concrete walk to the nonextant Tool Shed and in the forest covering the historic garden area.

The condition of the vegetation on the light station grounds is fair. The historically cleared area of the light station is in poor condition.

Analysis: Reservation. Historic drawings and photographs indicate that a larger cleared area existed on the north edge of the reservation than exists today. The cleared area has continued to reduce from approximately 3.7 acres at the end of the period of significance to approximately 1.8 acres in 2009. During the Light Station period the grounds were maintained as low vegetation. The original larger clearing provided the necessary openness to allow for the light to be seen clearly from Lake Superior. The clearing also provided a protected area south of the Light Station Quarters for livestock and a garden. The area south of the Light Station Quarters was maintained as an open clearing and contained a fenced garden area and two sheds. Today, the majority of this clearing has been filled by encroaching forest and the garden area is nonextant. Clearing work done during the NPS period has reduced the amount of forest encroachment from its peak in the 1960s. Brush piles remain from this work. The cleared area of the light station is a contributing feature. The relationship between the extent of the cleared area and forest vegetation on the reservation has changed since the period of significance. Vegetation in the former boathouse area has also encroached into the historic clearing at that location. The extensive encroachment of forest vegetation diminishes the integrity of the light station.

Analysis: Light Station Grounds. Sand Island has a history of landscape and garden planting installed by the lighthouse keepers and their families during the period of significance. Historic photographs indicate the light station included a garden area south of the Light Station Quarters and Keeper Luick (1892-1921) was known for growing vegetables. This area is discernable on-site but no remnant features remain. Common vegetables grown at the light stations include onion, lettuce, cucumber, beans, squash, peas, rutabaga, pumpkin, asparagus, tomato, cabbage, beets and potatoes.

Historic photographs indicate that lilacs were a prevalent landscape planting at the Sand Island Light Station. Lilacs grew along the north, south, and east sides of the fence line enclosing the garden area. Bordering the lilacs was Periwinkle (*Vinca minor*). Historic photographs indicate two additional lilacs existed northwest of the Light Station Quarters as well as a small planting bed located southwest of the Light Station Quarters, none of which remain today. The extant white lilacs northwest of the Oil Building and the purple lilac growing along the south wall of the Light Station Quarters are contributing features. Vegetation features present on the site are described and analyzed in table SI-2.

Table SI-2: Vegetation

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Cleared Area		Areas of forest vegetation cleared for reservation and light station	Fair	Contributing; present during period of significance
Lawn Area	SI-58	Maintained lawn area of light station grounds-mown grass landscape	Fair	Contributing; present during the period of significance
Purple Lilacs (*Syringa sp.*)	SI-59	Purple lilac growing at southwest corner of Light Station Quarters, west of Solar Panel	Fair	Contributing; planted during period of significance
White Lilac (*Syringa sp.*)	SI-60, SI-61	White lilac growing northwest of the Oil Building	Fair	Contributing; planted during period of significance
Mountain Ash (*Sorbus sp.*)	SI-61	On Light Station grounds between Privy and Oil Building	Fair	Noncontributing; planted after period of significance
Deciduous Tree	SI-61	Deciduous tree south of Mountain Ash between Oil Building and Privy	Fair	Noncontributing; encroaching forest vegetation
Evergreen	SI-51	Evergreen (Balsam Fir) tree west of light station	Good	Noncontributing; planted after period of significance
Boathouse Cleared Area		Areas of forest vegetation cleared for reservation and light station	Poor	Contributing; present during period of significance

Vegetation Photographs

Site Image SI-58: Lawn area; evergreen tree at right, 2009 (Source: MBD DSC_0265.JPG)

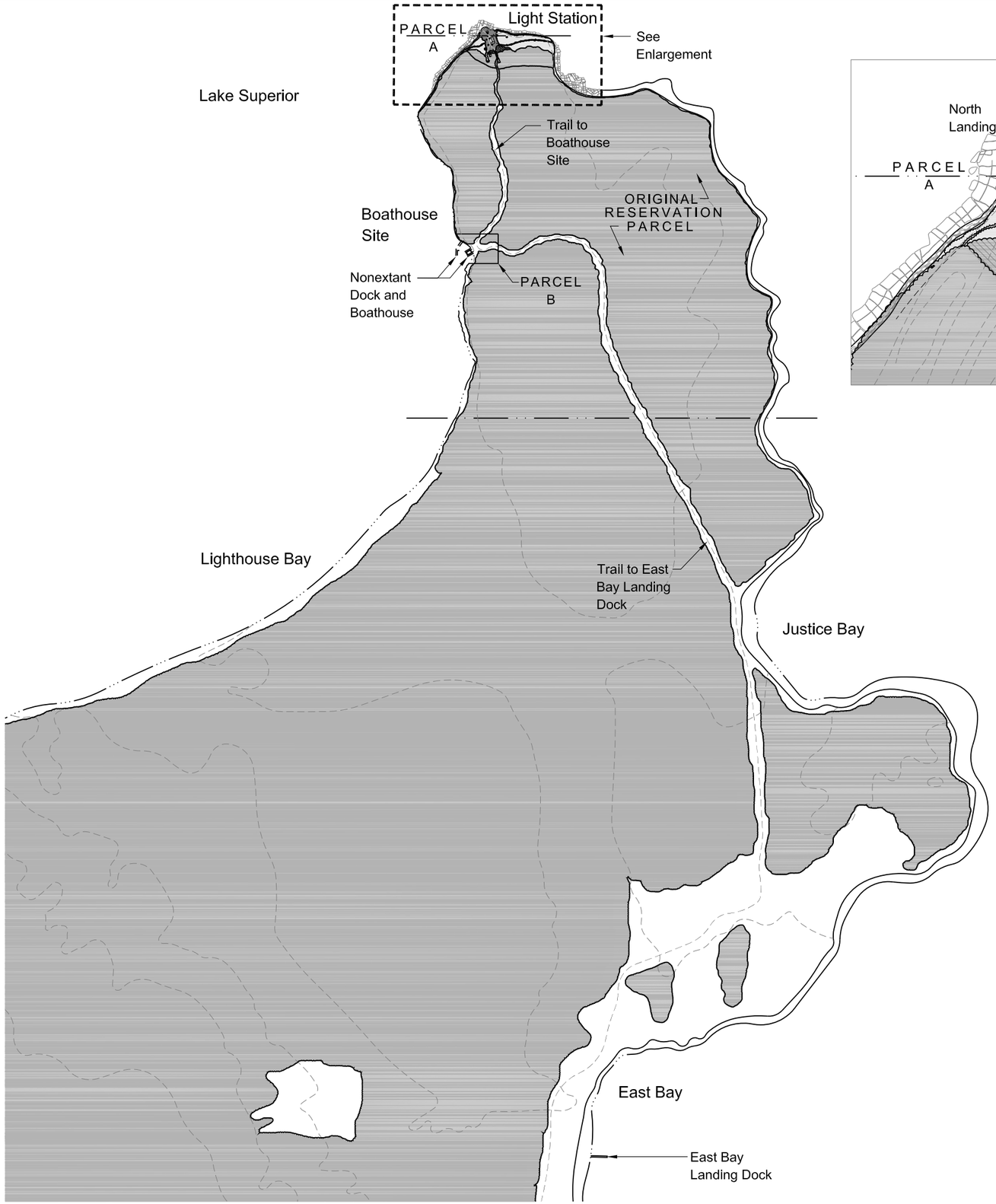
Site Image SI-59: Purple lilac at southwest corner of Light Station Quarters, 2005 (Source: Photo courtesy of Susan Mackreth)

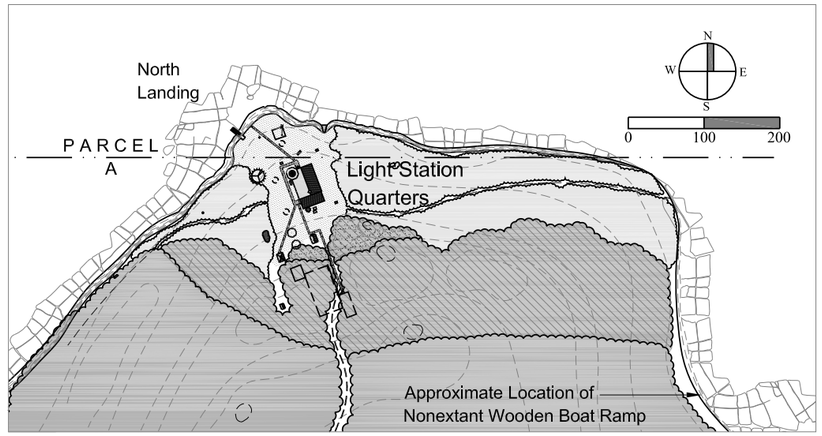
Site Image SI-60: White lilac at northwest of Oil Building, 2005 (Source: Photo courtesy of Susan Mackreth)

Site Image SI-61: Mountain Ash, deciduous tree and white lilac viewed from Light Station Quarters Tower looking southwest, 2009 (Source: MBD P1020418.JPG)

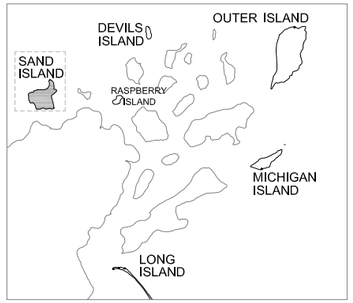
Site Image SI-62: Forest encroachment into former garden area, 2009 (Source: MBD DSC01436.JPG)

Site Image SI-63: Older trees at historic clearing line, 2009 (Source: MBD DSC_0299.JPG)

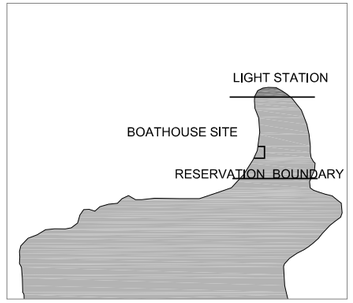




ENLARGEMENT



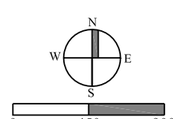
ISLAND KEY



SAND ISLAND

LEGEND

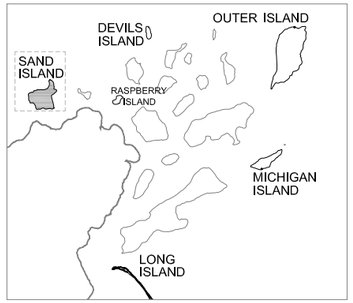
- Forest
- Encroaching Forest
- Newest Growth / Encroaching Forest
- Brush
- Lawn
- Cliff
- Nonextant Building or Landscape Feature
- Reservation Boundary



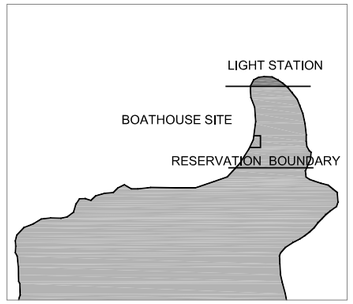
SITE IMAGE SI-64

UNITED STATES DEPARTMENT OF THE INTERIOR APOSTLE ISLANDS NATIONAL LAKESHORE	TITLE OF PROJECT CULTURAL LANDSCAPE REPORT EXISTING CONDITIONS TITLE OF DRAWING SAND ISLAND - RESERVATION BOUNDARY NAME OF PARK APOSTLE ISLANDS NATIONAL LAKESHORE
JUNE 2011	REGION: MIDWEST COUNTY: BAYFIELD STATE: WISCONSIN

North Landing
Headwall
Wooden Staircase
Nonextant Tower
Stone Arrow
Flagpole
Nonextant Lilac
Concrete Cleanout
Interpretive Sign
Concrete Cleanout
Light Station Quarters
Foundation
Yew
Balsam Fir
Nonextant Lilac
Tank House Fdn
Fire Pit
Nonextant Bed
Purple Lilac
Concrete Cleanout
Footpath
Solar Panel
Battery Storage Unit
Brick Rubble
Mountain Ash
White Lilac
Privy
Oil Building
Dump Site - 1
Nonextant Fence
Nonextant Wood Shed
Former Garden Site
Nonextant Tool Shed
Bench
Footpath
NPS Vault Toilet
Dump Site - 3
Boardwalk / Trail
Dump Site - 2



ISLAND KEY



SAND ISLAND

LEGEND

- Forest
- Encroaching Forest
- Newest Growth / Encroaching Forest
- Brush
- Lawn
- Cliff
- Deciduous Tree
- Evergreen Tree
- Nonextant Building or Landscape Feature

N W E S

0 30 60

SITE IMAGE SI-65

UNITED STATES
DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE

JUNE 2011

TITLE OF PROJECT
CULTURAL LANDSCAPE REPORT
EXISTING CONDITIONS

TITLE OF DRAWING
SAND ISLAND LIGHT STATION

NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE

REGION	COUNTY	STATE
MIDWEST	BAYFIELD	WISCONSIN

SAND ISLAND CLR TREATMENT

Introduction

In conjunction with the HSR the treatment section of the CLR recommends a strategy for the long-term management of the cultural landscape and historic structures of the Sand Island Light Station. The strategy is based on the analysis of the cultural landscape's characteristics, the history and period of significance for the light station, the existing condition of the historic features, and contemporary use of the light station.

A general management philosophy of rehabilitation has been identified as the appropriate approach for the treatment of the cultural landscape. Rehabilitation will allow for repairs, alterations, and additions that will be necessary for the compatible use of the light station, and will preserve the characteristics and features that convey the light station's historical, cultural and architectural values.[34] The recommended treatment will enable the park to preserve the contributing features of the cultural landscape, while allowing for specific alterations to accommodate contemporary use and interpretation of its history.

TREATMENT GOALS

- Preserve extant contributing cultural resources
- Reestablish missing resources
- Reveal the cultural landscape by representing the important characteristics from the period of significance
- Improve understanding of the overall system of light stations in the Apostle Islands for both visitors and park staff by incorporating interpretation of landscape resources that have been repaired or reestablished
- Aid in preserving the natural resources of the light station reservation by monitoring and controlling invasive plant material and directing visitor use

TREATMENT TERMINOLOGY

The following terms are used frequently in the CLR for actions that address the cultural landscape and its features, and are defined below. A more detailed glossary is presented in the Glossary of Terms at the end of this volume.

Maintain. Maintain includes the standard maintenance practices (mowing, pruning, thinning of vegetation, painting and cleaning of small scale features) that are necessary to retain a feature or area as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included.

Plant. Plant or planting includes the planting or removal and replanting of landscape material and vegetation as part of maintenance activities, or the restoration of missing landscape planting features.

Reestablish. The measures necessary to depict a feature or area as it occurred historically. Reestablish may include replacement of missing features (such as replacement of a pattern of planting) or a missing quality (e.g., reestablishment of a view).

[34] Landscape Lines.

Relocate. Relocate includes the removal and resetting of features in new locations. This is usually associated with noncontributing features.

Remove. The actions required to remove nonhistoric or noncontributing features. This is usually associated with noncompatible features in the landscape.

Repair. Repair includes the measures necessary to maintain features, components of features, and materials that require additional work. These may include repairing declining structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired shall match the original in design, color, texture, and where possible, material.

Restore. The measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically.

Retain. These are actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its current configuration and condition.

Stabilize. Stabilize refers to immediate measures (more extensive than standard maintenance practices) that are needed to prevent deterioration, failure, or loss of features.

PREFERRED TREATMENT ALTERNATIVE

Three treatment alternatives were considered during the development of the CLR/HSR. The CLR/HSR presents only the Preferred Treatment Alternative. The other treatment alternatives considered are presented in the Environmental Assessment.

Intent of Preferred Treatment Alternative

The Sand Island Light Station is significant to the Apostle Islands system of light stations because of: 1) its representation of the development of navigational aids along the outer shipping route to Duluth, 2) its clear depiction of improvements in navigational and light station technology, and 3) its status as the first automated light station in the archipelago. The lives of the keepers and their families were impacted by the progression of new navigational technologies, made evident by the historic features of the cultural landscape. By preserving, rehabilitating, or restoring these features, the treatment approach of the CLR/HSR strives to clearly depict the story of the Sand Island Light Station.

The intent of the preferred treatment is to rehabilitate the cultural landscape of the Sand Island Light Station to portray the period of navigational history that the light station best represents within the Apostle Island system. The period of significance for the Sand Island Light Station (1881 –1921) begins with the establishment of the Light Station Quarters, and ends with automation of its Light Tower. The treatment approach for extant contributing features emphasizes this period when the light station was in its most active state. Recommendations also include the restoration of landscape features lost since the period of significance.

Preferred Treatment Alternative (Site Image SI-50, Site Image SI-51)

The treatment measures are intended to preserve and rehabilitate the cultural landscape features. This requires a variety of actions that may be accomplished by either a series of preservation steps implemented over time or as a one-time action paired with future maintenance. Emphasis should be placed on the

preservation and/or rehabilitation of the contributing features that most strongly define the character of the landscape as outlined above.

Specific treatment measures are depicted in a series of plan drawings and are accompanied by detailed narrative descriptions, organized by landscape characteristics and presented as follows.

SPATIAL ORGANIZATION/VIEWS AND VISTAS

Spatial organization is a key feature of the cultural landscape and is primarily defined by the location of the light station grounds at the edge of Lake Superior, and the relationship between the buildings, structures, and circulation features within the cleared area of the light station grounds. While the arrangement of buildings, structures and circulation features have remained intact, the cleared area of the light station grounds and the larger reservation has been substantially reduced from the period of significance. The incremental encroachment of forest vegetation into the historically cleared areas of the reservation has reduced the cleared area immediately around the light station grounds and changed the open character of the light station.

Views from the waters of Lake Superior to the light station are also an important component of the cultural landscape. The growth and encroachment of forest vegetation, specifically trees, has diminished these views and if clearings are not maintained the views will continue to be reduced. This encroachment of forest vegetation has diminished the integrity of the cultural landscape.

Additional information regarding the means and methods of clearing forest vegetation are included in Volume I, Chapter 5: *Management Issues*.

The treatment recommendations include: 1) preserving the existing organization of buildings, structures, and site features; 2) restoring the cleared area of the landscape to better depict its condition during the period of significance; and 3) maintaining views from the lake to the light station by removal of trees near the light station. Individual treatment measures are presented as follows:

Light Station Clearing (General)

This measure is intended to reestablish the cleared area of the light station to a condition that better represents the period of significance, specifically the Light Station period (1881-1921). Clearing to reestablish portions of the historic cleared area may be undertaken on an incremental approach addressing the most critical and beneficial areas first. Emphasis should be placed on areas that most strongly define the character of the landscape listed below in order of priority:

- Clearing for fire protection adjacent to existing buildings and structures;
- Clearing to reestablish the spatial qualities of the garden area;
- Clearing to reestablish historic cleared area of the light station;

Light Station Clearing (Low Brush)

The cleared area of the light station will be restored to a condition that represents the period of significance. Clearing includes the removal of forest trees and shrubs in historically cleared areas and the establishment of a low brush ecotype similar to that which exists east of the Light Station Quarters. The clearing will open views towards light station from the water and from trail to the south. Cleared areas shall be maintained as low brush vegetation by mechanical brushing or manual removal of trees and large shrubs on a three to five year schedule.

Light Station Clearing (Garden Area)

The cleared area south of the Light Station Quarters will be restored to a condition that represents the period of significance. The existing cleared lawn area will be moderately expanded into non-extant garden area to the south of the Sand Island Lighthouse. The measure includes clearing of forest trees, shrubs and ground covers. Lawn grasses and a garden will be established in the newly cleared area.

CIRCULATION/ SITE ACCESSIBILITY/STRUCTURES

The circulation patterns and features on the site remain and are important elements of the cultural landscape. The basic circulation patterns on the site were established during the Light Station Period (1881-1921) with the addition of the Boathouse and dock, trail to the light station, and concrete walks. All of these improvements were installed to support the navigational and day-to-day operations of the light station. The trail and concrete walks remain much the same as they were during the Light Station period (1881–1921). The Boathouse and dock are no longer extant. The circulation features help to define the arrangement of the site and are important to the integrity of the cultural landscape. The treatment measures focus on retaining the circulation patterns and rehabilitating or preserving the circulation features. Features important to maintaining the integrity of the light station include the retention of the Boathouse site, trail, and concrete walks.

Boathouse Site

The area of the nonextant boathouse and dock, south of the light station should be maintained as a cleared opening on the trail so the potential to interpret this area remains. Any stone remnants from the dock and boathouse should remain in place and the trail should be maintained to allow visitor access. This site was a primary landing point for the light station during the period of significance and remains an important part of the history of the light station.

Concrete Walks

A detailed description of treatment measures for concrete walks can be found in small scale features.

Trails and Paths

Maintain the trail corridor from the East Bay Landing Dock to the Light Station at a width of 10’.

Accessibility (ABAAS)

An Accessibility Self Evaluation and Transition Plan separate from the CLR/HSR is being developed to provide an overall plan for the six light stations in the Apostle Islands – Raspberry, Michigan, Outer, Devils, Long, and Sand islands. This work is intended to address the park as a whole and the accessibility requirements related to visitor services to be achieved at each individual light station. At the time of this report the plan is in progress. The CLR/HSR incorporates several standard recommendations into each of the light station’s plans to prepare the light station grounds and buildings for the implementation of recommendations from the Transition Plan. Recommendations for the Sand Island Light Station are:

- Provide an outdoor accessible route (minimum 36” width) to a new accessible NPS restroom (under a separate project)

- Provide an accessible entrance to the west entry of the Light Station Quarters (see HSR)
- Widen concrete walks on the light station to minimum width of 36" in the areas indicated on the drawings. Widening shall be accomplished by adding new, precast concrete stones (18" x 48"), installed adjacent to the historic material.
- Provide programmatic access to the Sand Island story at the light station and APIS Visitor Center in Bayfield.

Outdoor accessible routes shall meet the requirements of the ABAAS for width (36" minimum), slopes (less than 4.75%), and include passing areas. These requirements are readily achievable on the light station grounds. Further discussion regarding the overall accessibility approach for the system of light stations is included in Volume I, Chapter 5: *Management Issues*.

SMALL SCALE FEATURES

The small scale features on the light station provide a human scale while conveying important details regarding the history and use of the light station. Treatment recommendations are described in detail for contributing small scale features, and noncontributing features are presented in Table SI-3. In general the recommendations for these features are focused on preservation and include:

- Retain all contributing small scale features;
- Retain noncontributing, compatible features including park and trail signs;
- Remove noncontributing, noncompatible features.

Concrete Walks

Repair and maintain all concrete walks in the current, historic locations. Repair includes the removal and replacement of several severely cracked sections. Replacement of damaged sections shall be completed with precast units matching the various dimensions of the existing concrete slabs, poured and finished prior to installation. New materials shall reflect existing materials in size, form, texture and color but be distinguished as a contemporary improvement. Maintenance includes vegetation removal and minor leveling to eliminate trip hazards.

Wooden Staircase

Repair the wooden staircase leading down the rock outcrop north of the Light Station Quarters. Alter the staircase to meet current ABAAS standards.

Dump Sites

Retain and protect all dump sites. See Areas of Further Investigation - Archeological Features for additional information.

Fencing at Garden Area

Reestablish fencing at Garden Area. Fencing shall be rough cut lumber, with horizontal rails, approximately 48" tall, painted white. Coordinate this work with interpretive planning work undertaken by the Park.

Drainage System

Maintain the sub-drainage system from the Sand Island Light Station Quarters north to the headwall outlet.

Wooden Headwall

Remove the wooden headwall and replace with a compatible material (concrete or stone).

Flagpole

Maintain the flagpole by repainting (white) and replacing the hardware and halyard as necessary.

Park and Interpretive Signs

Measures related to park signage is not included in the CLR. Interpretive signage on the light station is addressed under the *Parks Long Range Interpretive Plan* and other studies. Additional discussion regarding interpretation is included in Volume I, Chapter 5: *Management Issues*.

The following table (Table SI-3) provides recommendations for small scale features identified as noncontributing.

Table SI-3. Small Scale Features (Noncontributing)

Feature	Compatible?	Status
Park Sign	Noncontributing Compatible	Not addressed in CLR
Fire Pit	Noncontributing Noncompatible	Relocate fire pit
Stone North Arrow	Noncontributing Compatible	Remove stone north arrow
Solar Panel and Battery Unit	Noncontributing Compatible	Replace and relocate solar panel and battery unit

VEGETATION

Reservation Vegetation

As previously presented under Spatial Organization the cleared area of the light station reservation and immediate light station grounds has been substantially reduced from the period of significance. This action includes the removal of forest vegetation (approximately 1 acre) that has encroached into the historic cleared area of the light station, specifically the historically cleared area south of the Light Station Quarters. Further discussion on means and methods of clearing are discussed in Volume I, Chapter 5: *Management Issues*.

Areas of the light station reservation that are to remain forested should be monitored for invasive plants. The most apparent invasive plant is Periwinkle (*Vinca minor*). Care should be taken when using this plant in the area it existed historically, near the garden area. Do not introduce potentially invasive plant material into the light station reservation.

Isolated wetland areas occur in many areas along the trail to the East Bay Landing Dock. Care should be taken to protect wetland areas when maintaining the trail and boardwalk sections.

Station Vegetation

Historically domestic landscape and garden plantings played a significant role in the cultural landscape of the Sand Island Light Station. Many of these features have been lost and under this treatment are recommended to be reestablished. The intent of this treatment is to rehabilitate the landscape by restoring missing features of the landscape and maintaining extant features to better depict the landscape during the period of significance, specifically the Light Station period (1881-1921), when the landscape planting features were most intact.

Tree and Shrub Plantings

The light station grounds historically contained several types of domestic tree and shrub plantings that were planted and maintained by the lighthouse keepers and their families. This treatment measure includes planting missing lilacs (*Syringa sp*.) on the grounds, and the removal of noncontributing trees in cleared area of the light station.

Garden Plantings

The light station grounds historically contained a fenced vegetable garden to the south of the Light Station Quarters which was planted and maintained by the lighthouse keepers and other residents. This treatment measure includes reestablishing the garden area including fencing and plantings in the landscape.

AREAS OF FURTHER INVESTIGATION

Archeological Investigations

Complete an archeological survey for all known resources in the light station (including dump sites described earlier in this section) using non-destructive investigations to document the extent of buried or non-visible cultural resources that exist across the island. Consider using ground penetrating radar and other non-invasive measures to assist in locating resources. If a comprehensive survey for the entire Island is not possible, complete archeological investigations for proposed projects in advance of any other work on the project, including demolition. In compliance with the National Historic Preservation Act, and in consultation with the NPS Midwest Archeological Center, undertake archeological investigations for all projects, as appropriate to their scale, impacts, and extent of ground disturbance.

Treatment Images

Site Image SI-66: Historic view of the Sand Island Light Station showing the low brush clearing, c. 1913 (Source: NPS APIS Archives)

Site Image SI-67: ABAAS Option - Widen walks by retaining existing historic walks in place and installing new precast concrete material to achieve an accessible width. (Source: MBD P1020420_annotated.JPG)

Sand Island Reservation Preferred Treatment Alternative

Preserve Open View of Light Station

Light Station

PARCEL A

Edge of Historic Cleared Area

Lake Superior

Maintain Trail Corridor (10' width)

ORIGINAL RESERVATION PARCEL

Boathouse Site

Maintain Boathouse Site

Nonextant Dock and Boathouse

PARCEL B

Maintain Trail Corridor (10' width)

HISTORIC RESERVATION BOUNDARY

Lighthouse Bay

Justice Bay

Maintain Trail Corridor (10' width)

East Bay

East Bay Landing Dock

N
W E
S

0 450 900

Legend

- Cleared Area
- Forest
- Edge of Historic Cleared Area

SITE IMAGE SI-68

UNITED STATES
DEPARTMENT OF THE INTERIOR

APOSTLE ISLANDS NATIONAL LAKESHORE

JUNE 2011

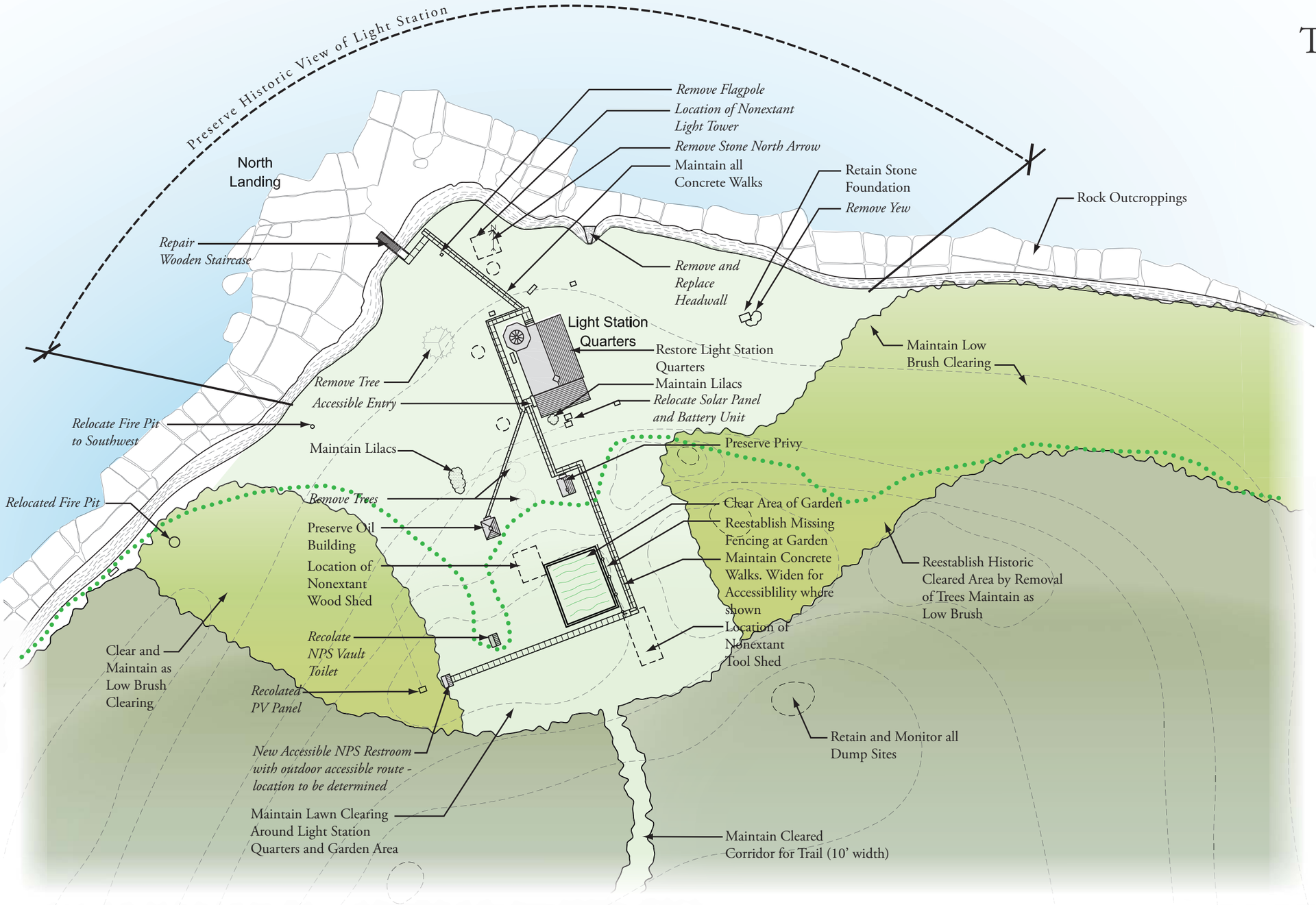
TITLE OF PROJECT
HISTORIC STRUCTURE REPORT, CULTURAL LANDSCAPE REPORT & ENVIRONMENTAL ASSESSMENT TREATMENT ALTERNATIVES

TITLE OF DRAWING
SAND ISLAND - RESERVATION BOUNDARY

NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE

REGION	COUNTY	STATE
MIDWEST	BAYFIELD	WISCONSIN

Sand Island Preferred Treatment Alternative

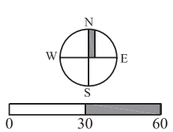


Sand Island

Legend

- Lawn Clearing
- Forest
- Low Brush Clearing
- Existing Edge of Forest
- Former location of Lilacs/Garden Bed

Note: Features in *italics* are Noncontributing



SITE IMAGE SI-69

UNITED STATES
DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE

JUNE 2011

TITLE OF PROJECT
HISTORIC STRUCTURE REPORT, CULTURAL LANDSCAPE REPORT & ENVIRONMENTAL ASSESSMENT
TREATMENT ALTERNATIVES

TITLE OF DRAWING
SAND ISLAND LIGHT STATION

NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE

REGION	COUNTY	STATE
MIDWEST	BAYFIELD	WISCONSIN

CHAPTER 4: HISTORIC STRUCTURE REPORT

SAND ISLAND INTRODUCTION

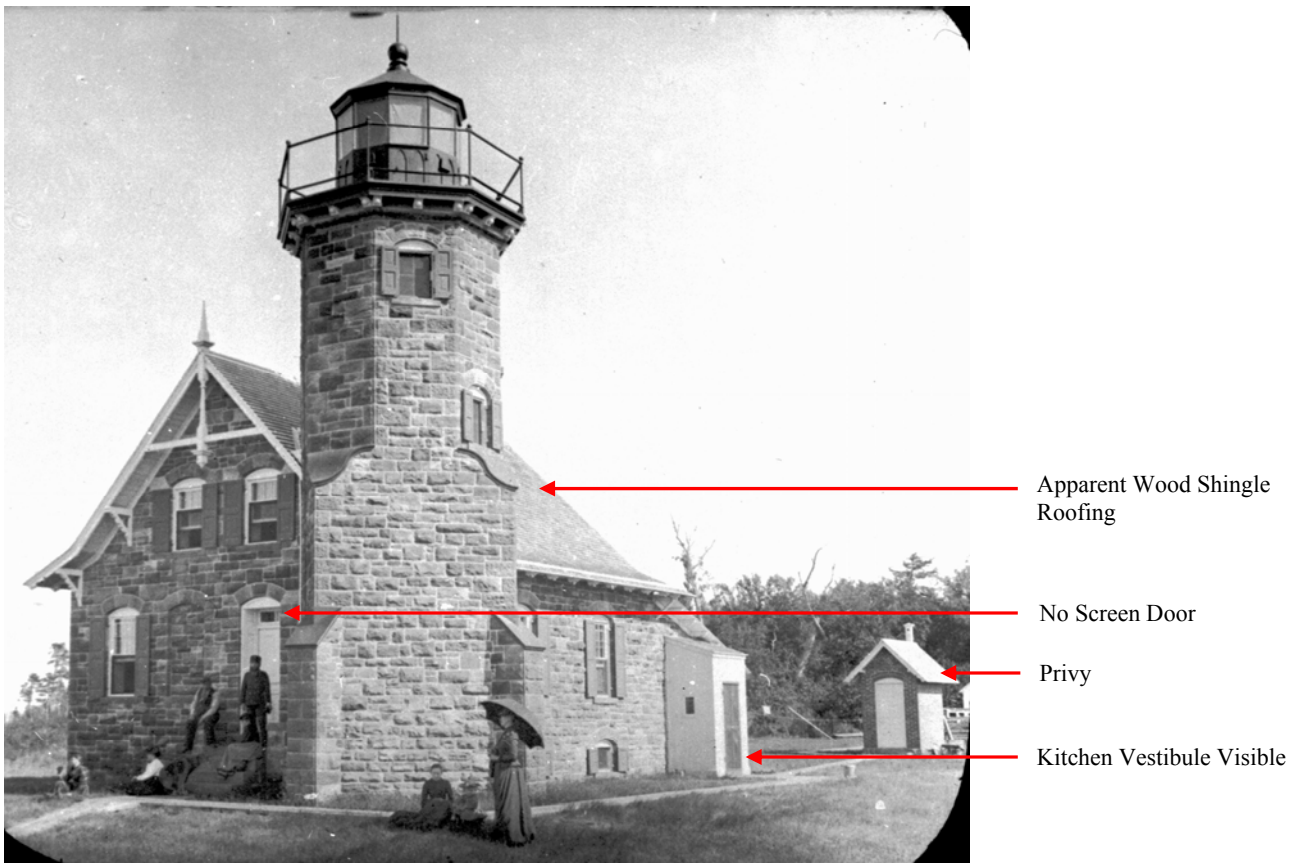
The following sections commence the HSR for Sand Island. Architectural, Structural, Mechanical (HVAC and plumbing), Electrical and Environmental systems and component parts are evaluated by the Study Team. Assessed buildings include:

- Sand Island Light Station Quarters
- Oil Building
- Privy

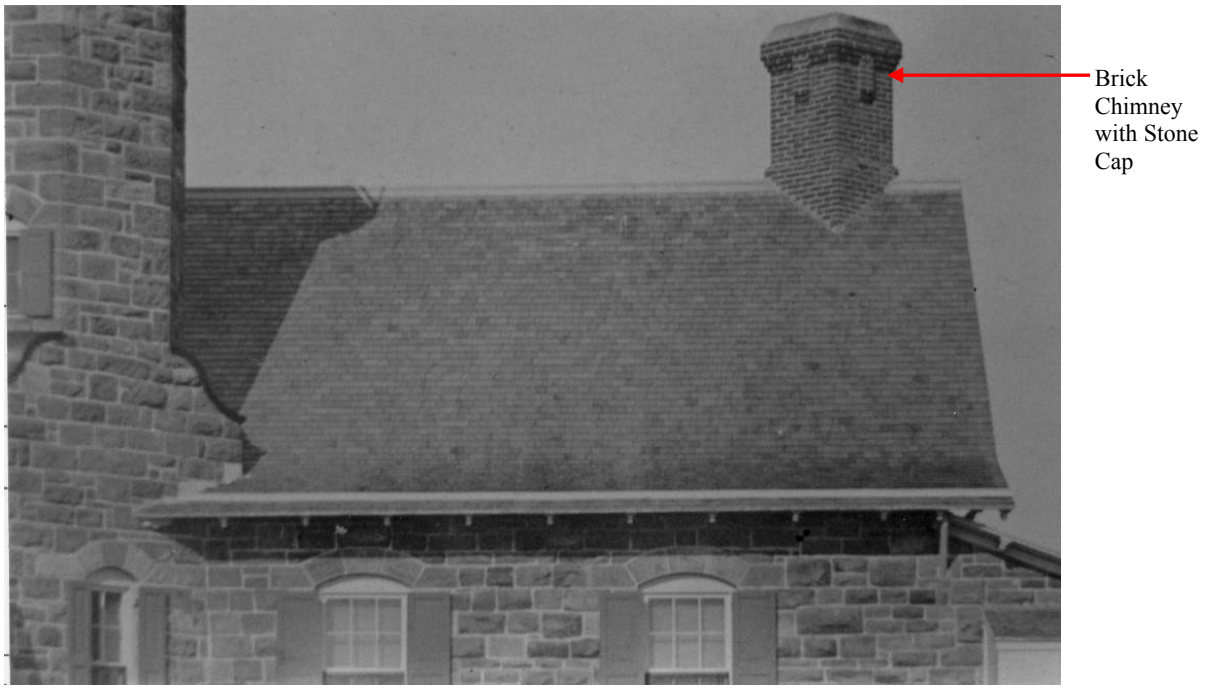
Original construction of each building is discussed, followed by its history/chronology of alterations (determined by studying historic photos, historic drawings, examining park records and archives and on site investigations and observations by the Study Team).

The Physical Description section describes the current conditions of building features and systems, as observed during the September 2009 site visit. Each component was given a condition rating (as outlined in Volume I, Chapter 2: Methodology). Treatment Recommendations were provided based on the Preferred Alternative, selected in the May 2010 Value Analysis/CBA conducted at the park.

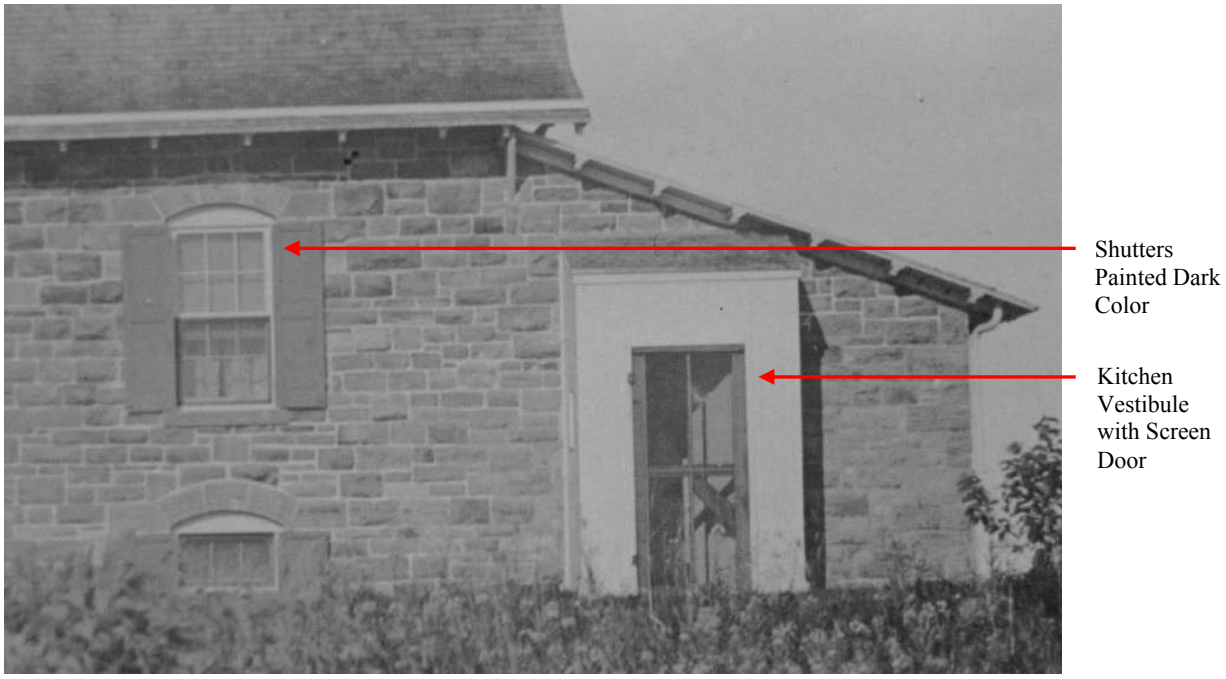
Historic Photographs



Historic Image SI-01: Keepers Quarters, looking southeast, 1890 (Source: NPS APIS Archives)

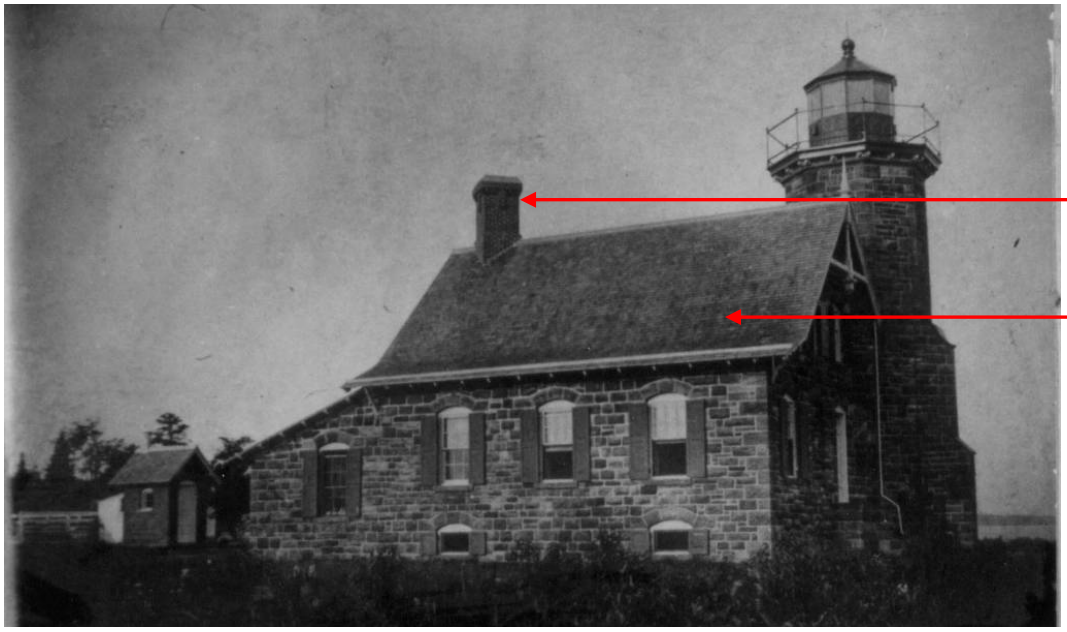


Historic Image SI-02: West elevation of the Keepers Quarters and chimney, c. 1900 (Source: NPS APIS Archives)



Historic Image SI-03: West elevation of the Keepers Quarters kitchen vestibule, c. 1900 (Source: NPS APIS Archives)

Historic Image SI-04: Keepers Quarters and Privy, looking southeast, c. 1900 (Source: NPS APIS Archives)



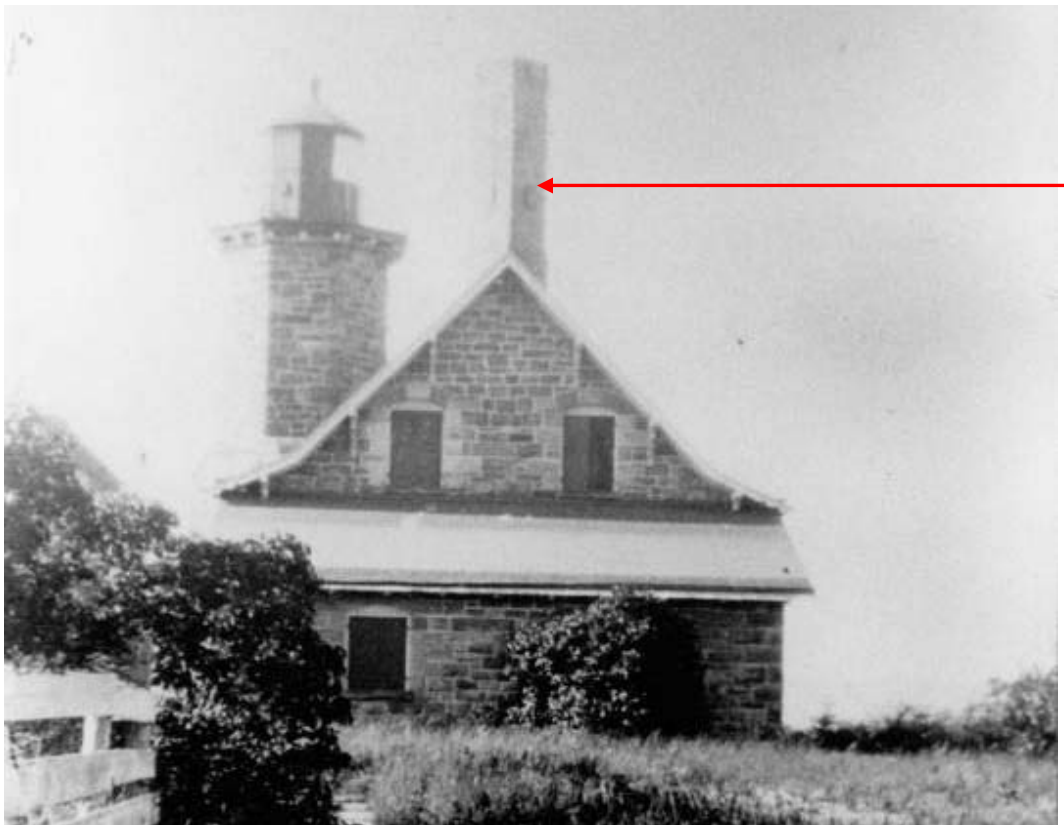
Historic Image SI-05: East elevation of the Keepers Quarters, 1904 (Source: NPS APIS Archives)

Historic Image SI-06: Main entry, 1905-1909 (Source: NPS APIS Archives)

Historic Image SI-07: Keepers Quarters, looking southeast from the lake, 1909 (Source: NPS APIS Archives)

Historic Image SI-08: Keepers Quarters and Privy, looking southeast, post 1911 (Source: NPS APIS Archives)

Historic Image SI-09: West elevation of the Keepers Quarters, 1911 (Source: NPS APIS Archives)



Historic Image SI-10: South elevation of the Keepers Quarters, 1921 (Source: NPS APIS Archives)

Historic Image SI-11: Keepers Quarters and barn, looking north, 1925-1939 (Source: NPS APIS Archives, Gertrude Wellisch Collection)

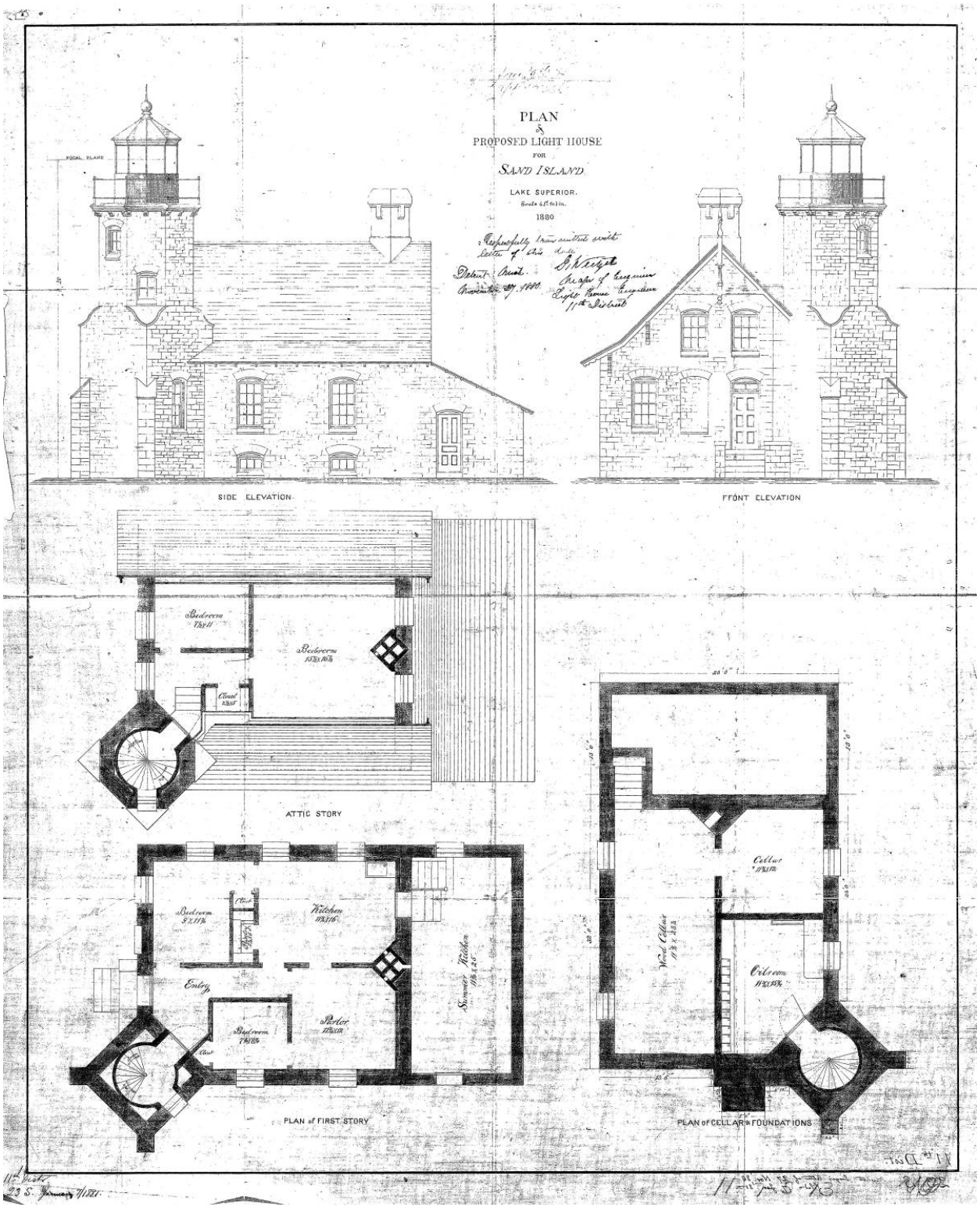
Historic Image SI-12: Steel light tower constructed in 1933, unknown date (Source: NPS APIS Archives)

Historic Image SI-13: Steel light tower in 1984, removed in 1985 (Source: NPS APIS Archives)

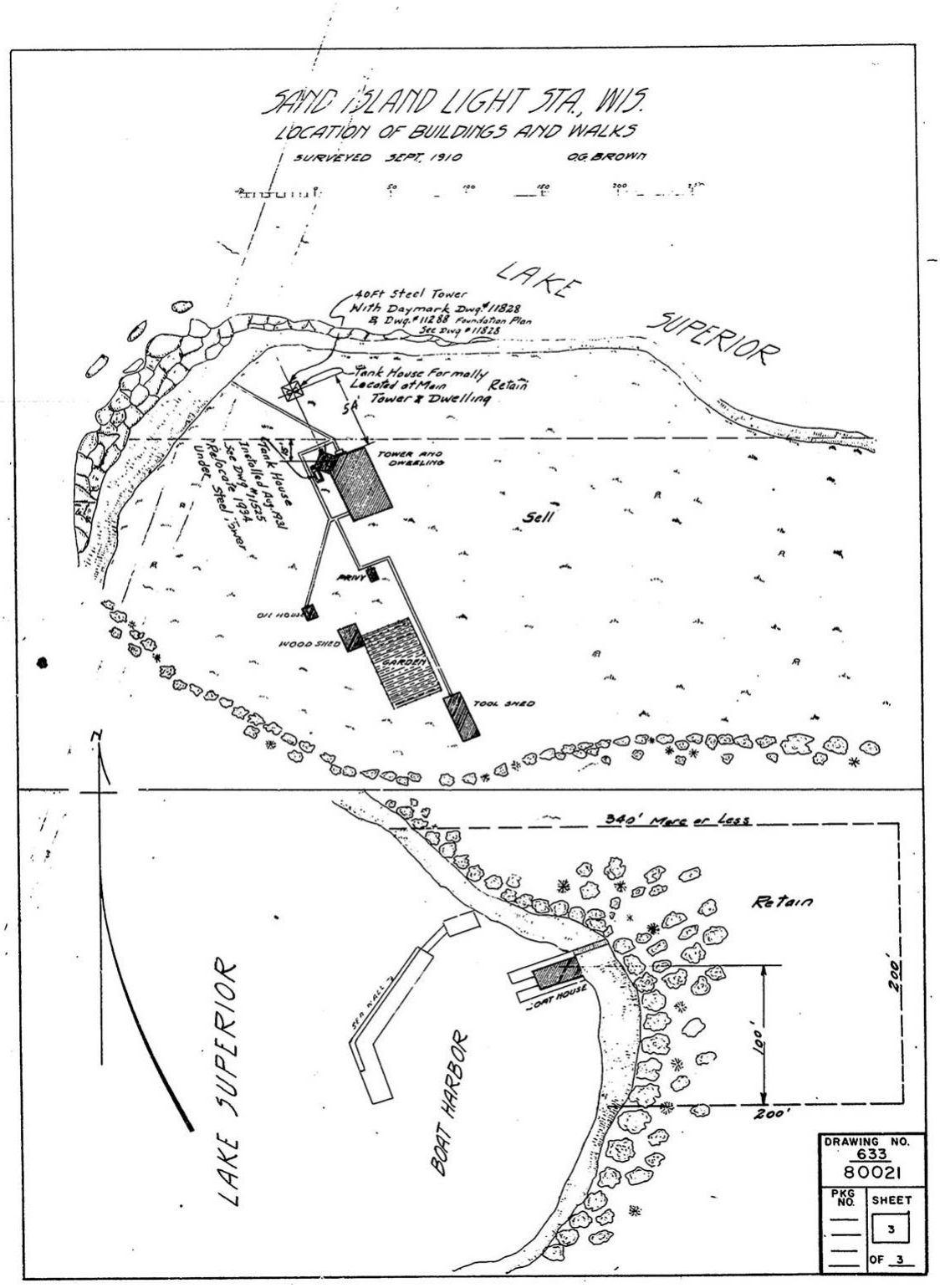
Historic Image SI-14: North elevation of the Oil Building, 1978 (Source: NPS APIS Archives)

Historic Image SI-15: Privy, looking southeast, 1978 (Source: NPS APIS Archives)

Historic Drawings



Historic Drawing SI-01: 1880 plans and elevations of the Keepers Quarters and Tower

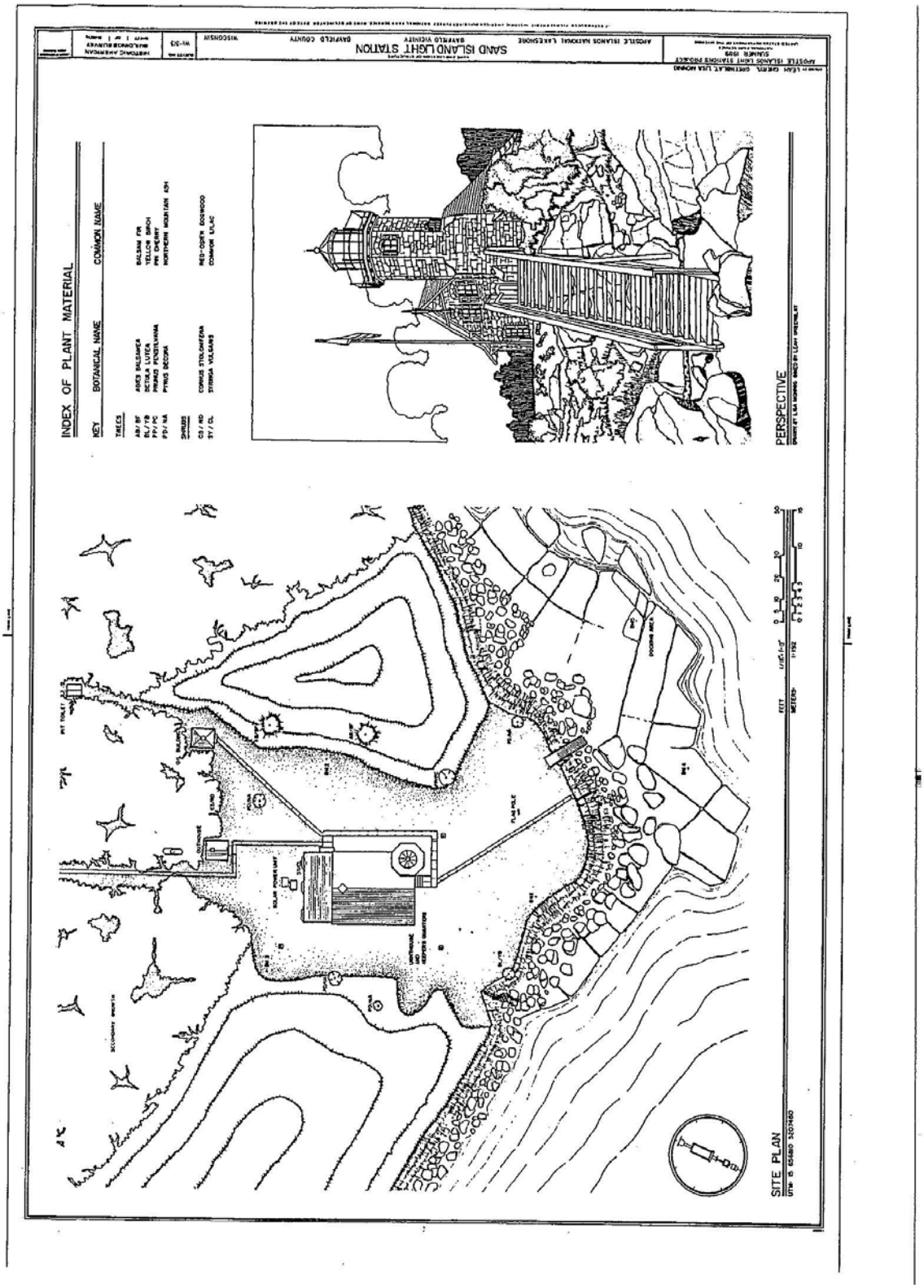


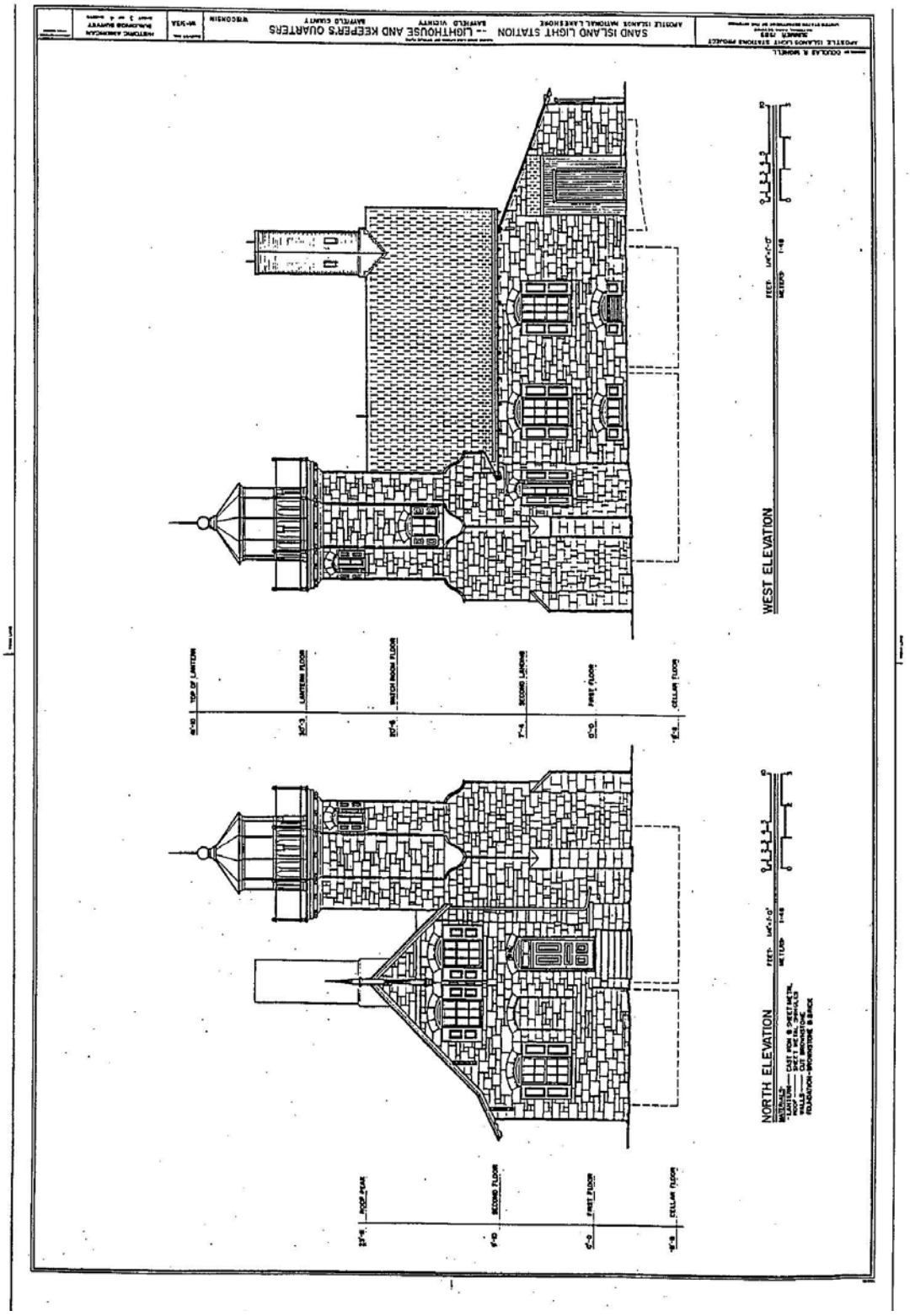
Historic Drawing SI-02: 1910 Site plan with notes

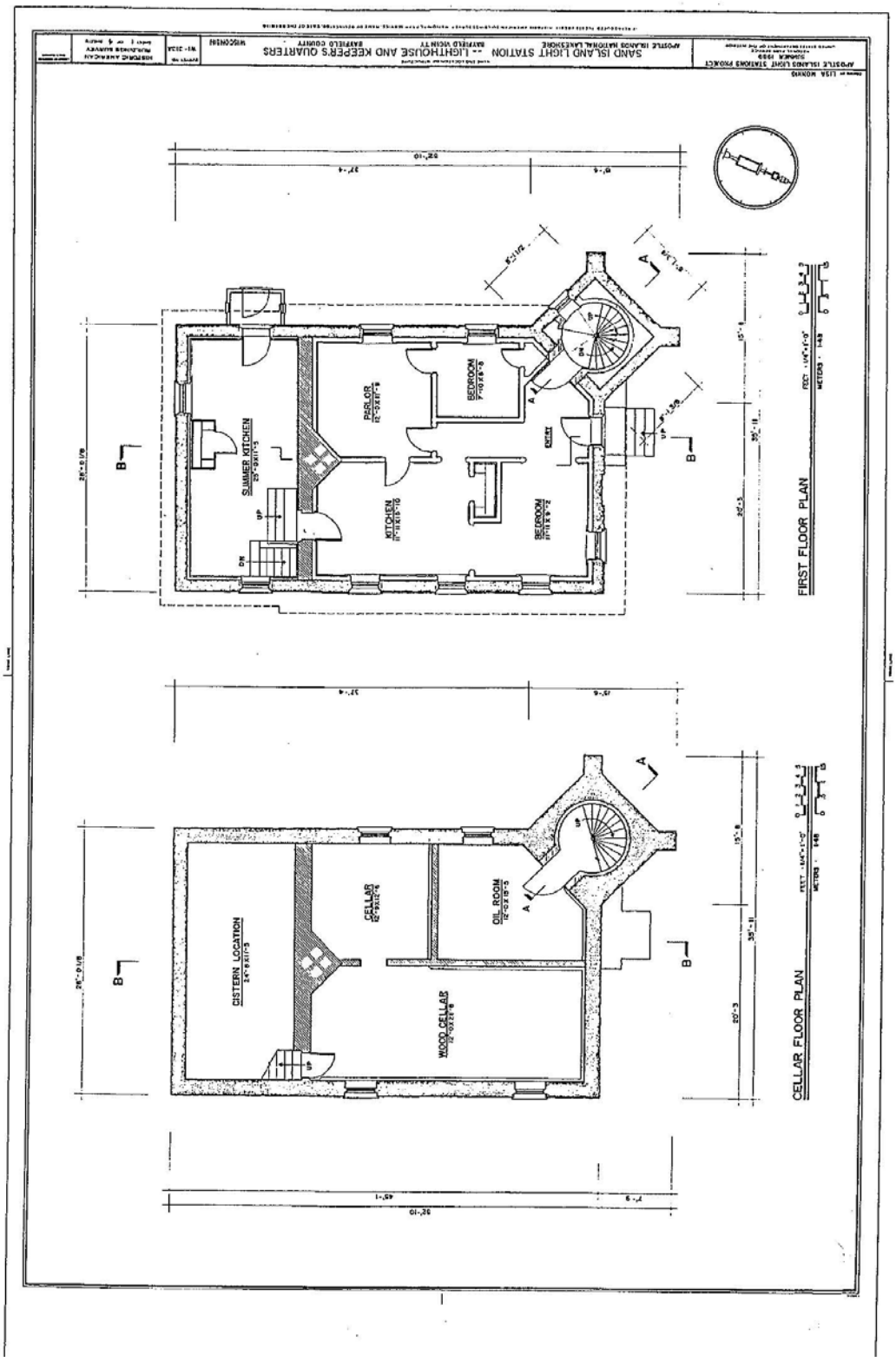
Existing Condition Drawings

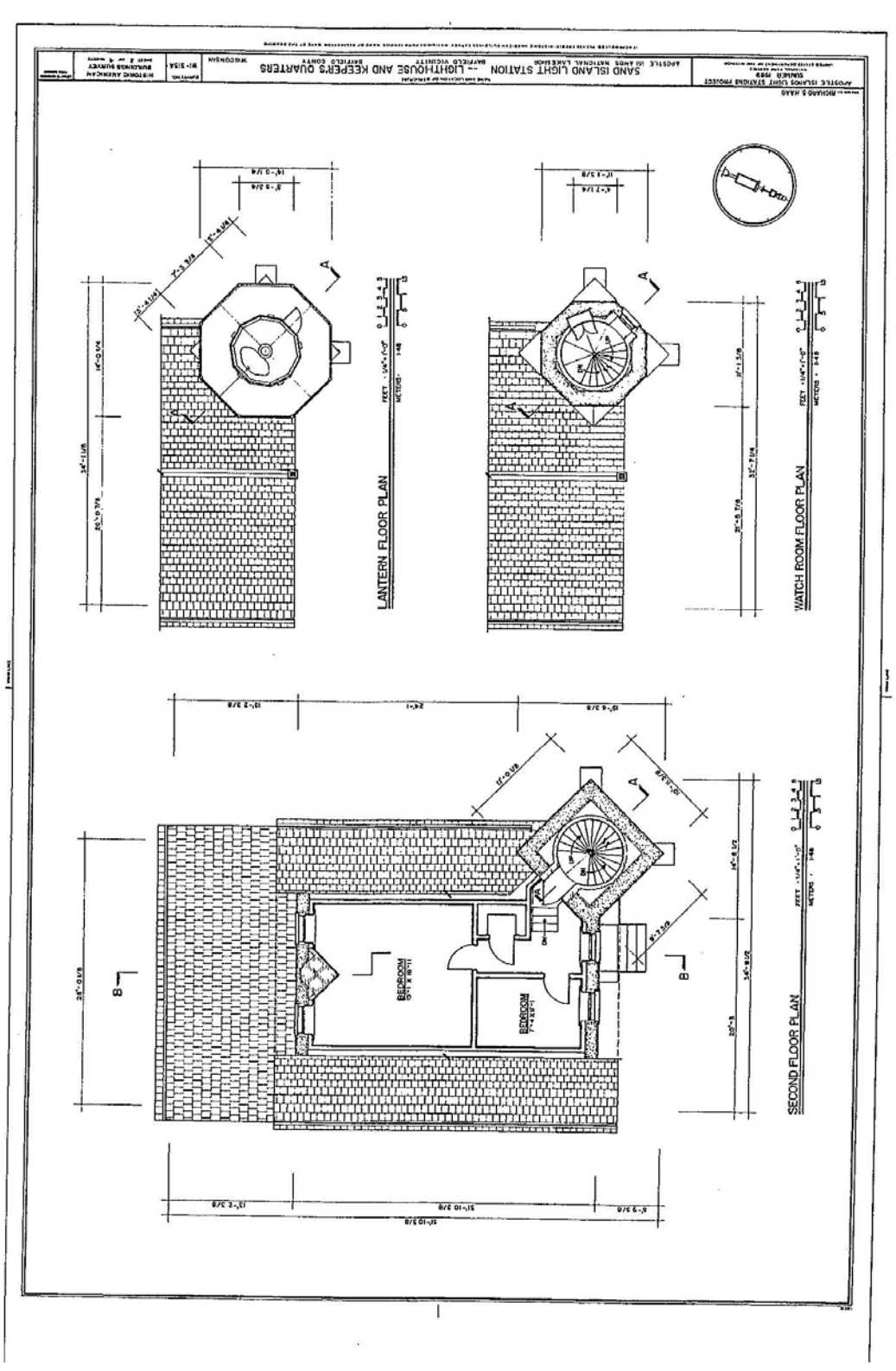
The primary and secondary buildings on Outer Island were documented in the summer of 1990 by a team from the Historic American Buildings Survey (HABS). Since 1933, multiformat surveys in cooperation with government agencies have recorded the built environment in the United States. Measured drawings, large-format photographs and written histories have defined the survey technique for historic structures. The HABS collection currently contains detailed surveys on more than 38,600 historic structures. The following eleven drawings contain the measured drawings produced by the HABS survey from 1990.

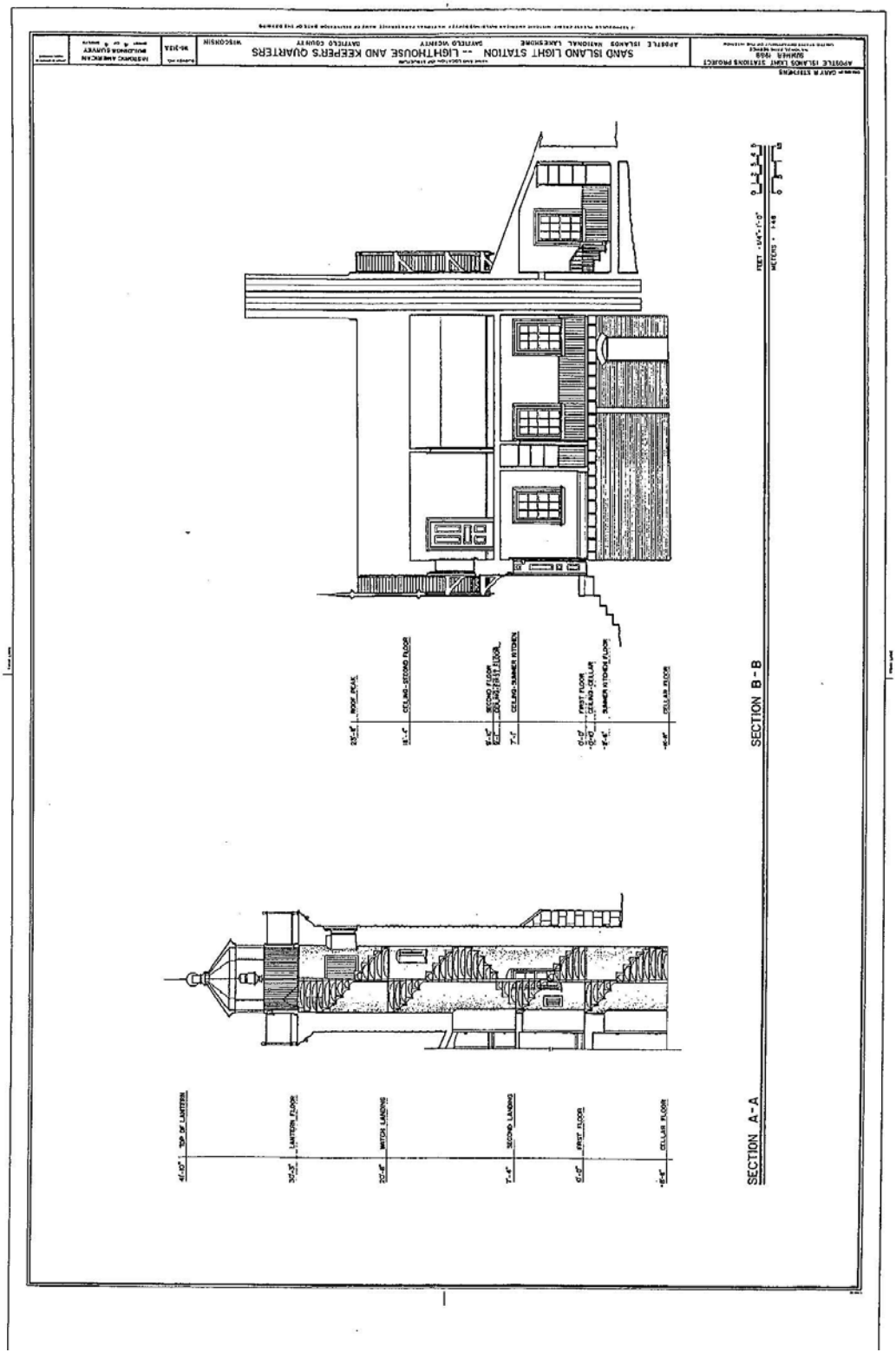
Typically, utilitarian buildings are not included in the HABS survey. In September of 2009, the architects and historic preservation specialists from Anderson Hallas Architects, PC surveyed the Oil Building and Privy on Sand Island. These measured drawings have been included following the HABS drawings.

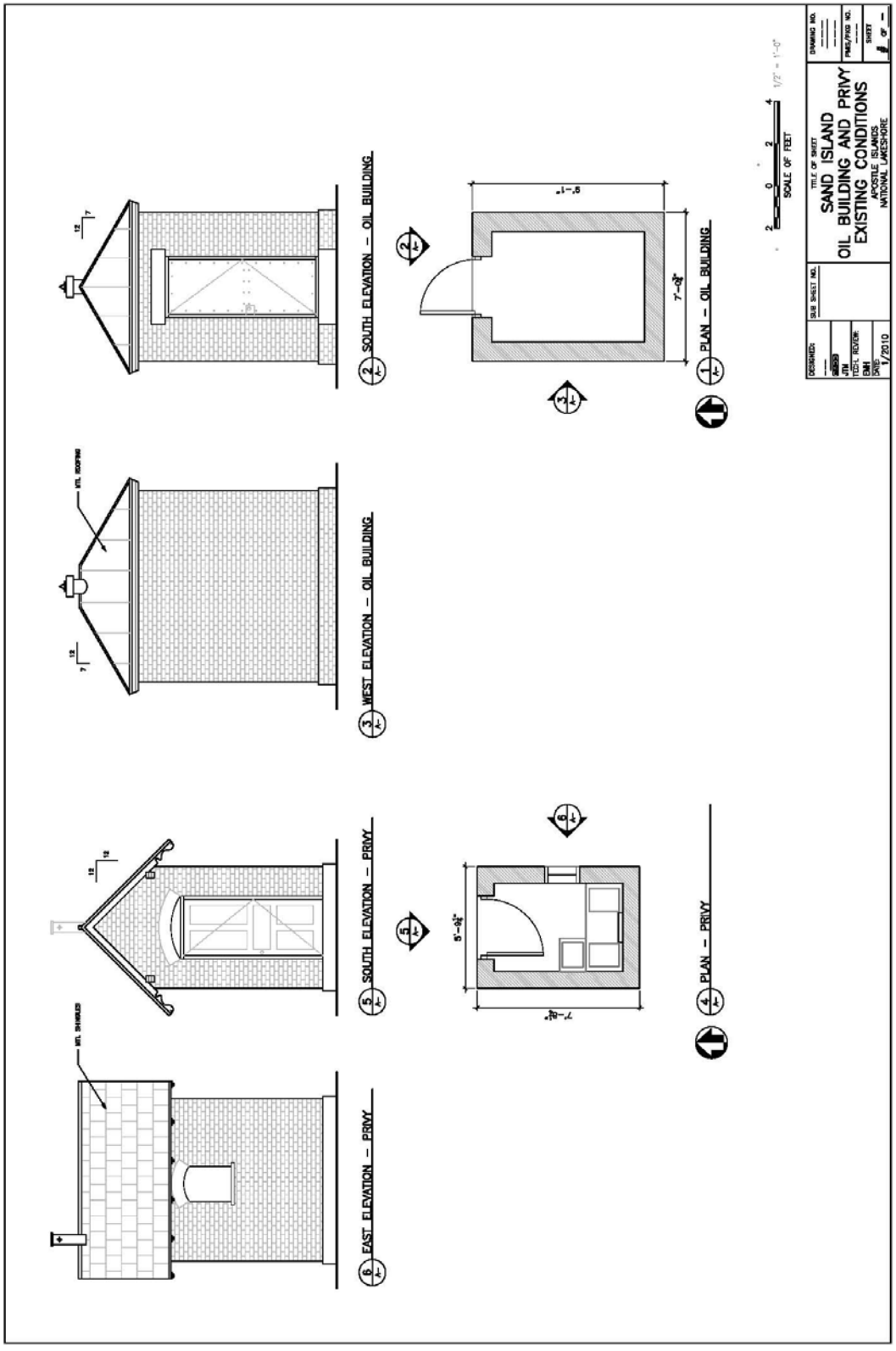

SAND ISLAND LIGHT STATION
APOSTLE ISLANDS LIGHT STATIONS PROJECT
INDEX OF PLANT MATERIAL
KEY
BOTANICAL NAME
COMMON NAME
TREES
SHRUBS
PERSPECTIVE
SITE PLAN


SAND ISLAND LIGHT STATION
-- LIGHTHOUSE AND KEEPER'S QUARTERS
WEST ELEVATION
NORTH ELEVATION
TOP OF LANTERN
LANTERN FLOOR
WATCH ROOM FLOOR
SECOND LANDING
FIRST FLOOR
CELLAR FLOOR
ROOF PEAK
SECOND FLOOR
FIRST FLOOR
CELLAR FLOOR


SAND ISLAND LIGHT STATION -- LIGHTHOUSE AND KEEPER'S QUARTERS
APOSTLE ISLANDS NATIONAL LAKESHORE
BAYFIELD COUNTY
WISCONSIN
APOSTLE ISLANDS LIGHT STATIONS PROJECT
SUMMER 1989
HISTORIC AMERICAN BUILDINGS SURVEY
NATIONAL PARK SERVICE
WI-312A
SHEET 4 OF 4 SHEETS
SUMMER KITCHEN
PARLOR
BEDROOM
KITCHEN
BEDROOM
DN
UP
FIRST FLOOR PLAN
CISTERN LOCATION
CELLAR
OIL ROOM
WOOD CELLAR
CELLAR FLOOR PLAN


SAND ISLAND LIGHT STATION -- LIGHTHOUSE AND KEEPER'S QUARTERS
LANTERN FLOOR PLAN
WATCH ROOM FLOOR PLAN
SECOND FLOOR PLAN
BEDROOM
BEDROOM


SAND ISLAND LIGHT STATION -- LIGHTHOUSE AND KEEPER'S QUARTERS
SECTION B-B
SECTION A-A


SOUTH ELEVATION – OIL BUILDING
WEST ELEVATION – OIL BUILDING
PLAN – OIL BUILDING
SOUTH ELEVATION – PRIVY
EAST ELEVATION – PRIVY
PLAN – PRIVY
SCALE OF FEET
SAND ISLAND
OIL BUILDING AND PRIVY
EXISTING CONDITIONS
APOSTLE ISLANDS
NATIONAL LAKESHORE

SAND ISLAND LIGHT STATION QUARTERS

Chronology of Alterations and Use

Original Construction

The Sand Island Light Station Quarters was constructed in 1881. The tower and quarters were constructed of local brownstone in the Gothic Revival style (steeply pitched roof, wooden trim on the quarters, buttresses on the tower). In 1921, an acetylene gas burner was installed, making Sand Island Light Station the first automated light in the Apostle Islands. In 1933, a steel tower was built on the island and the historic Fresnel lens (with a focal plane of 52' above Lake Superior) was removed from the Light Station. (Historic Image SI-12) The steel tower remained on Sand Island for 50 years before it was removed in 1985.[35] (Historic Image SI-13)

Significant Alterations / Current Condition

Few intentional alterations have affected the building. In the late 1940s, early 1950s, lightning struck and broke through the roof. The roof went unrepaired for some time resulting in rain water damage to the wood floors. The occupant tried to dry out the floors by building a fire in the basement. What actually occurred was that the walls and ceiling caught fire, not only further damaging the floors but also damaging the walls and ceiling in the basement. In 1953, the Huling family took occupancy of the light station and hired a carpenter to gut and replace the first and second floors and walls at their own expense. The Hulings also had to replace the main door due to the moisture infiltration from the roof leak. The door was custom made in Minneapolis at Anderson Windows Wall.[36]

Minor Observations of Alterations Include:

The 1890 photo illustrates the front door without a screen door and a glimpse of the wall of the kitchen vestibule. Therefore, the vestibule was either original to the structure or added to the house by 1890. (Historic Image S1-01) A photo from c. 1900 reveals the full vestibule with the structure as it appears currently. (Historic Image S1-03) The Quarters, in 1904, had a brick chimney with a stone chimney cap. (Historic Image S1-05) In 1909, a winter picture shows a "chimney pot" constructed of sheet metal atop the chimney. Chimney pots were used as inexpensive ways to extend the chimney, thus improving the draft. (Historic Image S1-07) In 1916, the chimney was extended to its current height and topped with a concrete cap. The 1921 historic image captures the new chimney structure. (Historic Image SI-10)

Historic drawings from the 1880 construction drawings indicate that the original design for the lighthouse incorporated the Tower and living quarters, connecting them through the Tower stair, which provided the only access to the basement and second floor bedrooms. The kitchen vestibule is not included on the original drawings. (Historic Drawing SI-01)

The roof was reroofed with metal shingles around 1988 by the NPS. New roofing shingles were chosen for their close match to the original metal shingles and the roof's original yankee gutter were retained or rebuilt but were not reconnected to the cistern system. Between 1998 and 2009, the Historic Structure Preservation Team of the NPS completed the tasks of reglazing the windows, replacing the broken glass, rehabilitating the windows, repointing the masonry, painting the exterior woodwork, rehabilitating the basement ventilation louvers, repairing the roof and flashings, and resloping the exterior lawn areas and leveled

[35] Busch, Jane, "People and Places: A Human History of the Apostle Islands," 2008, and, S. Mackreth, 2010.
[36] First-hand account from Warren Jensch

walkways. The shutters and the four caps on the brick buttresses were painted white in 2008-2009. The shutters had previously been dark green and the caps had been painted black, matching the lantern trim.[37]

A few of the mechanical systems in the Quarters have been upgraded to allow for seasonal housing of park employees and volunteers. Portions of the original water and drain system remain in place, but are no longer functional.

There are no alternating current electrical systems in the Light Station Quarters, as none were ever installed prior to the automation of the Lighthouse and departure of the keeper in 1921.

The Light Station Quarters are in fair to good condition.

[37] S. Mackreth recollections, January 2010

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1901, July 31	"At 2:30 PM the Raspberry Island Light Keeper with a party of Laborers arrived, to repair the dock and put tile down around the house."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1904, July 27	"At 4:00 PM the Str Bon Mia came down from Duluth and landed Mr. Anderson Bennett and four workmen to repair the Breakwater and Boat house and house."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1905, September 11	"Keeper repaired the roof, replaced the tin shingles that the wind tore off Sept. second."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
c.1909-1916	Chimney extended via sheet metal cap	Historic Image SI-07, 1909
1914, September 11	Sept 11: "The Assist C. Vanalstion reported to me that the tender Amaranth was here at 9:00 A.M. and landed a pump and sink and fittings while he was to the east side getting milk."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1916, August	Aug 18: "At 11:00am Mr. B. Hinckley and crew arrived to build the chimney higher. At 3:30pm they left to get a mason, as the one failed to arrive on the boat." Aug 21: "The Storm wrecked the Skaffold and falling planks drove two holes through the kitchen roof."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1916, September 2	"The mason got through with the chimney …" The chimney extension was completed.	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1920, June	June 19: "Keeper repaired screens and steps and painted them and the Toilet."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1921	Installation of acetylene gas burner	LCS, 2009
1925-1942	Light Station Quarters leased by Gertrude Wellisch for a summer home	APIS Records
1931	Tank house installed near Tower base	1931 Historic Drawings, TIC 633/80021
1933	New steel tower built, Fresnel lens removed from Light Station lantern	LCS, 2009
c. 1933	Tank house moved to under the steel tower	1933 Historic Drawings
1953-1975	Light Station Quarters leased by A.D. Hulings; in 1953, the interior of the building was in poor condition due to vandals and Mr. Hulings "installed new floor joists, new floors, plasterboard on walls and ceilings, painted…"	1972 letter from U.S. Forest Service official to the APIS superintendent, from S. Mackreth
1977	Stabilization of Light Station Quarters and Privy	NPS/APIS Business Office Records D3423 for Sand Island
1978	Repoint brick, basement, foundation, and tower and paint buildings; installed drainage rain gutters	NPS/APIS Business Office Records D3423 for Sand Island

Date	Work Described	Source of Information
1979	Paint and repair metal roof of Light Station Quarters	NPS/APIS Business Office Records D3423 for Sand Island
1981	Retuckpoint stonework and paint trim on Light Station Quarters and Privy	NPS/APIS Business Office Records D3423 for Sand Island
1985	Steel tower removed	S. Mackreth, 2010
1988	Light Station Quarters reroofed with metal shingles, painted on-site; main gable of Quarters roof replaced	HSPT Reports, 2009; NPS/APIS Business Office Records D3423 and photos for Sand Island
2000	Kitchen repainted	HSPT Reports, 2009
2008-2009	Replaced all window shutters with newly fabricated copies of the removed green shutters. Only one shutter, which is on the tower, not the housing unit, is not new material. New shutters painted white. New hardware installed to replicate old fasteners. Black buttress caps on tower painted white.	S. Mackreth, 2010

Notable Actions with Unknown Dates

Date Range	Work Described
Unknown	Overflow for cistern installed at basement (9/2009 on-site observations)
Unknown	Opening between the Entry and west Bedroom appears to have been enlarged at some point, difference in molding and historic floor plan
By 1925-1930	Wood shingle roofing replaced with metal shingles, Keeper's log from September 11, 1905 says keeper was replacing tin shingles the wind tore off September second (Sand Island Keepers Log Book , G. Wellisch Photo Collection)
1953-1972	Huling family occupancy- replaced portions of first floor framing, walls, and possibly ceiling as well as replaced main door at own expense
1998-2009	Reglazed windows and replaced broken glazing
1998-2009	Rehabilitated windows
1998-2009	Repointed masonry
1998-2009	Painted exterior woodwork
1998-2009	Rehabilitated basement ventilation louvers
1998-2009	Repaired roof and flashings
1998-2009	Resloped exterior lawn areas and leveled walkways

General Physical Description

The building is a 1½-story brownstone structure facing north on the point of the island. It has a gable roof with carved brackets, decorative gable drop and finial, and exposed rafter tails with decorative carvings. The octagonal Light Tower is located at the northwest corner of the building. A one-story shed-roofed kitchen extends to the rear of the building with a wood frame vestibule extending to the southwest. The main rectangular plan of the Quarters contains three rooms at the cellar, four room at the first floor, and two rooms at the second floor. The main quarters, kitchen shed and Tower are all per the original construction. The kitchen's vestibule shed was a very early addition; by 1890 it can be seen in Historic Image SI-01.

Physical Description -- Architecture

Architecture – Roof

The roof consists of painted metal shingles on the main roof (shingle exposure is 9" wide by 12" long). These shingles were installed in 1988-1989 and photos indicate the red paint was applied after installation. The south (kitchen) and west (kitchen vestibule) shed roofs have historic galvanized metal shingles, painted. Both the historic and the 1988 shingles have a stamped decorative double-curve patterns, indicating the shingle style's contemporary availability. Tie-off rings reside at the main ridge, though they do not appear to comply with OSHA requirements. Step flashings are historic except at the Tower, where the roof is uneven, and newer, taller, 8" prefinished step flashing is evident. (SI-LSQ-05) There is no attic hatch so the sheathing was not visible, but could be spaced, board sheathing, consistent with the original wood shingles. The flared soffit, extends +/- 1'-6" from the wall, and has 1x6 tongue and groove sheathing over exposed, shaped rafter tails and trim, but it is likely not the same as the overall roof sheathing since the soffit is more of a finish material. The south shed's tongue and groove soffit boards change direction from east-west to north-south as evident at the corners of the soffit. The Light Station Quarters also has a gable end finial, decorative wood brackets on the north and south gables, and wood fascia with scrolled detailing to match the "rafter tails."

Historic photos indicate that the original roofing was wood shingle but reveal metal shingles by +/- 1925. Due to the highly exposed site, it can be assumed that the wood shingles deteriorated quickly and were replaced by metal shingles as a longer term maintenance solution.

The Tower roof is made of cast iron with early flashing exposed. (SI-LSQ-33 and 34)

Architecture – Gutters and Downspouts

The gutter system for this building appears to be the original type, a shallow yankee gutter as visible in historic photos and evident at the original wood shingle roof. The yankee gutter detail is a difficult flashing assembly often plagued by loose joints and poor drainage. It was not observed under rainy conditions so the tightness of the joints is unknown. However, standing water at the south gutter within 24" of the western downspout and at the far (high) end of the west gutter was observed. A minimal amount was also observed at the east gutter. The east and west gutters were replaced in-kind with the 1988 reroofing work. The south shed appears to be a historic gutter, dating to the same era as the metal shingle roof.

The downspouts (located on the east and west) originally drained into an interior cast iron fill system for the cistern under the kitchen. Later, a split drain was installed to 3" diameter fluted downspouts located on the exterior. Currently, the downspouts only drain to the exterior – not the cistern, though it does have standing water. The downspouts utilize both older pieces and have been supplemented by a newer, galvanized fluted downspout to match. An older downspout is also found at the north elevation at the roof to Tower intersection. Historic photos show this as early as 1890. (SI-LSQ-11) Historic photos do not show the exterior downspouts at the east and west, only the cistern inlet at the wall. Historic photos do show a downspout on the south shed's west side that appears to drain to grade as early as c. 1915.

Architecture – Chimney
The original red brick chimney was extended to more than double its height in 1916, according to the Keepers Logs. The brick of the original chimney appears to match the Privy. Beginning around 1909 until 1916 (when the chimney was permanently extended), a sheet metal extension flu was attached to the earliest chimney. The brick, detailing, mortar tooling and color all differ between the two eras of the chimney. Historic photos indicate the earliest chimney had a stone cap but currently there is a 4" concrete cap at the top of the 1916 extension. (SI-LSQ-07 and 08)

Architecture – Exterior Walls
The exterior walls are rough ashlar brownstone blocks. The corner pieces are tooled, as seen by their bottom edges' markings. Several iterations of previous repointing work are evident with both a lighter and greyer mortar visible. The mortar and tooling that are visible in the protected kitchen entry are likely to represent the original and appear to be a light grey with lightly tooled joints.

A mortar sample taken at an area of repointing had a standard composition of lime, Portland cement, and sand used for restoration purposes. The mortar is tan in color, hard and brittle, and has average coarseness sand. Another mortar sample at an area of repointing indicates a mixture of lime, Portland cement, and sand used for restoration purposes (like the above sample). However, this mortar is grayish-tan in color, moderately hard, and has fine sand.

Architecture – Windows
Painted six- over six-, four- over four-, and three- over six-lite are the three primary types of windows in the Light Station Quarters. All are wood, double-hung, have stone sills with segmented arch stone headers, and operate with spring pin sash locks. Muntins have an inset curve profile. The sash cords and pulley hardware are extant. The interior trim is 1x 5 ¼" built-up with a decorative ogee profile. The sills are 1x wood with an ogee profile, and the apron is built-up 1x material with a bead edge. Exterior trim is 1 1/8" x 2 3/8", and each window has paired wood shutters and one-over-one wood screens held in place with clips. The shutters are raised panel (one-over-one), on long-throw hinges (two per shutter). Only one shutter was not replaced with fabricated copies of the original shutters and hardware in 2008-2009, and this shutter is located on the Tower. The replacement shutters are painted white, the older shutter is painted green. (SI-LSQ-10) The six- over six-lite windows are 2'-10" x 5'-1"; the four- over four-lite are 2'-0" x 5'-1"; and the three- over six-lite are 2'-10" x 4'-0". A paint sample taken from the interior window trim reveals that the oldest color is the same as the oldest color revealed from the sample taken of the kitchen stairs. Historic photos and the Sand Island Log Book during 1920 indicate wood screens at the lower sash, suggesting that only the lower sash were operated. [38]

Tower Windows. The Tower has one, four-lite casement window and one, four- over four-lite, double-hung window. The casement has two hinges and a knob slider latch. Both windows have quarter round interior trim, wood sill with an ogee profile and no stool. (SI-LSQ-30) exterior trim is similar to that of the living quarters. All of the window elements are painted. The one remaining older shutter, painted green (see description in paragraph above) is located on the Tower.

Architecture – Exterior Doors
Main Entry and Kitchen Vestibule Doors. The main entry and kitchen vestibule doors are two vertical panels over one horizontal panel over two vertical panels (raised panel) wood doors. The main entry door has a two-lite, 1'-0" tall transom. Both doors have a stone sill, wood threshold, ceramic knob with separate skeleton key, and three steeple tip hinges. The exterior trim for both doors is 7/8" x 3" with bead edge

[38] Keeper E. Luick, Sand Island Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920

(similar to the windows). All of the door elements are painted. The main entry door is 3'-0" x 6'-6" x 1 ¾" and the kitchen door is 3'-0" x 7'-0" x 1 ¾". (SI-LSQ-12 and 13)

Screen Doors. These doors are modern, stained wood, located at the main and kitchen vestibule entries. Both doors have a lever catch and spring, three modern hinges, and appear to be contemporary reconstructions (difficult to tell from the historic photos). The main entry's screen door is 3'-0" x 7'-0" x 1 1/8" while the kitchen vestibule's screen door is 3'-0" x 7'-10" x 1 1/8".

Plank Door. This door is located at the kitchen vestibule and is made of 3 ½" tongue and groove wood, painted. The door has a knob mortise, strap hinges, and cross bracing. Trim is simple 1x, painted.

Architecture – Exterior Trim
The exterior trim is comprised of decorative gable drop and finial, decorative wood brackets at the gable ends and curved wood "buttress caps" at the top of the stepped stone buttresses of the Tower. All are painted white. (SI-LSQ-06, 07 and 09)

Architecture – Tower Walk and Railing
The deck, sidewalls, and railings of the Tower are painted cast iron. The walk is 3'-3" wide with an upper railing that is 1 ¾" x ¾" bar stock (located 3'-3 ½" from deck) and a lower railing that is 2 ¼" x ¾" bar stock (located 8" from deck). There are 1 ¼" posts with ball finials at 5'-7" on center. A coated metal screening infills the open spaces. (SI-LSQ-36)

Architecture – Tower Lantern
The lantern is ten-sided with cast plates at the exterior (a pair of recessed Gothic arches is cast into each panel). The interior is 1x 3 3/8" wood tongue and groove with bead edge, oriented vertically, across the 2'-1½" wide segments. From the lantern floor to the top of the wall is 3'-7". The glazing height is 2'-11". The glazing is secured by triangular (1 ¼" x 1 ¼") metal stops with a 1 ¼" x 2" triangular metal frame at the interior. There are five vents (5 ½" diameter), each with a brass ring securing screening. The ceiling has a +/- 1'-0" diameter exhaust vent. A door to the exterior walk is integral to the lantern. It is 1'-11 ½" x 2'-10" and is hung on heavy-duty brass hinges with a throw bolt latch. The hatch in the lantern floor is 3'-10" x 2'-0". All of the lantern components, other than the glazing, are painted. (SI-LSQ-31, 32 and 35)

Architecture – Kitchen Vestibule
The kitchen vestibule is a painted wood frame structure attached to the west elevation of the Light Station Quarters. The original base trim has been replaced in the interior. A paint sample taken reveals that the structure has always been painted white and that the wood beneath the paint is sound.

Architecture – Interior Doors
Tower to Quarters Doors. These doors are located in the basement, first floor and second floor and are made of riveted steel, painted. The doors have strap hinges, jack arch top, steel frame, and a knob mortised passage set. The typical dimension for this door type is 2'-7" x 6'-6" x 1/4" frame with 1/8" plate. (SI-LSQ-14, 23 and 26)

Typical Interior Doors. This type of door is two vertical panels over one horizontal panel over two vertical panels (raised panel), wood. The doors have steeple tip hinges, ceramic knob hardware, and an ogee profile at panel edges. The kitchen door is 1 ¾" thick and has bead-edge trim (similar to the exterior

windows) and ¾" round trim at the kitchen face. The typical size for these doors is 2'-8" x 6'-6" (second floor), 7'-0" (first floor) x 1 3/8".

Architecture – Wall Finishes

Basement (Cistern Room not Accessible). The oil room, wood cellar, and cellar have brownstone ashlar blocks for the exterior walls and whitewashed red brick for the interior walls.

Entry and East Bedroom. These two front rooms have a mix of wall finishes. The entry's west wall attached to the Tower has original plaster over masonry, while the north and south walls have original plaster over lath, and the east wall has modern gypsum board painted blue. A paint sample of the entry west wall could either suggest a very thin coat of plaster or a layer of whitewash with a layer of yellow calcimine paint over the masonry wall. The east Bedroom has modern gypsum board on the south and west walls but the north and east walls are the original plaster over lath. The gypsum board wall finishes were most likely installed between 1953 and 1975 when A.D. Hulings leased the Light Station Quarters.

Kitchen, Summer Kitchen, Parlor, Floor West Bedroom, and Associated Closets. These rooms have the original plaster over lath wall finishes. The kitchen's plaster is covered by wallpaper, which covers a coat of green paint. The wall paper is not original but may be historic. The kitchen, kitchen closet, and summer kitchen have wood beadboard wainscot, painted, that is 3 ½" wide.

Second Floor Hall and Closet and Second Floor Bedrooms (Two). These four rooms have the original plaster over lath as their wall finishes, except the hall's west wall attached to the Tower, which is plaster over masonry. A paint sample from the hall reveals that the light blue paint visible is the only layer of paint on the plaster. A plaster sample from the closet indicates that the skim coat (thin white layer that is painted) was pure lime while the thicker, brownish-tan colored finish is probably gypsum.

Architecture – Ceiling Finishes

Basement (Cistern Room Not Accessible). The oil room has no ceiling finish as the framing is exposed. The wood cellar has the same exposed framing as the oil room, but the cellar has an older framing system (based on the wood joist size and finish) with remnants of a lath and plaster ceiling. It can be assumed that the cellar and possibly the wood cellar once had lath and plaster ceiling finishes that were removed when joist stabilization work was performed during the Huling family occupancy (1953-1972). (SI-LSQ-16)

Entry, Kitchen Closet, West Bedroom Closet, Second Floor Hall and Closet and Second Floor North Bedroom. These six rooms have the original plaster over lath ceiling finishes.

East Bedroom, Kitchen, Summer Kitchen, Parlor, West Bedroom and Second Floor South Bedroom. These six rooms have a gypsum board ceiling finish that was most likely installed by A.D. Hulings, who leased the property from 1953 to 1975.

Architecture – Interior Trim

Entry, East Bedroom, Parlor, West Bedroom and Closet, Second Floor Hall and Second Floor Bedrooms. These eight rooms have 11" tall wood base trim, simple ogee profile at the top, with a 2 ¼" base shoe. The wood is painted. The east bedroom, parlor, and west bedroom also have the same cove molding seen at Long Island and Outer Island. The molding is painted wood.

Kitchen. The kitchen has a simple rounded wood base trim, 2 ½" tall, painted white, with no base shoe. The kitchen also has cove molding.

Summer Kitchen and Kitchen Closet. These two rooms have a simple wood base shoe, painted, at the base of the wood wainscot. The summer kitchen also has cove molding.

Architecture – Floor

Basement. The three basement room's floors are concrete slab-on-grade. The oil room, wood cellar, and cellar have integral concrete drainage gutters along two of their walls, connected through interior walls by holes in the northeast corners of the cellar and oil room. The gutters allow water passage through all rooms. They are 4 ½" wide, 2" deep, and connect to a metal pipe inserted into the bottom north-east corner of the wood cellar that leads to the exterior. It appears there is also a hole (now covered by debris) at the southeast corner of the cellar connecting to the cistern. This system of gutters and pipe was used to control over-flow from the cistern and redirect it to the exterior of the building.

Entry, East Bedroom, and Kitchen and Closet. These four rooms have 7" wide wood plank flooring, painted blue. The flooring is not original to the building as it was most likely installed by A.D. Hulings, who leased the property from 1953 to 1975.

Summer Kitchen. This room has original 3 ¼" wide wood flooring, tongue and groove, painted blue, with modern resilient sheet flooring covering the wood.

Parlor, West Bedroom and Closet, Second Floor Hall and Closet, Second Floor Bedrooms (Two). These seven rooms have the original 3 ½" wood board flooring, painted. A paint sample was taken in the second floor south bedroom that reveals many more layers than the wall and baseboard samples due to the heavy wear floors accumulate. This floor was originally painted gray.

Architecture – Stairs

Exterior Stairs, North Elevation. These stone stairs have five risers, 8" high, with treads that are 1'-0" deep by 5'-0" wide. (SI-LSQ-11)

Circular Stair to Lantern, Oil Room, and Second Floor Quarters. This stair is integral to the Tower and Quarters. It is cast iron on a 3 ¾" center post (stacked treads) with an 8" rise. The treads are 1 ½" to 11 ½" deep and 3'-3" wide. This stair not only acts as the access to the lantern, it also is the only method of accessing the basement oil room and the second floor living quarters. (SI-LSQ-29)

Basement Stairs. These stairs are stone, have eight risers at 9" high, and have treads that are 10" deep and 2'-11 ½" wide. The stairs do not have a handrail and are heavily worn from foot traffic, as evidenced by the bowl-shaped center of the treads. (SI-LSQ-17)

Summer Kitchen to Kitchen Stairs. These stairs are painted wood and the top step is stone. The three wood risers are 7 ½" high, and the one stone riser is 8" high. The bottom two treads are 1'-0" deep, the third tread from the bottom is 1'-3" deep, and the top stone tread is 1'-7" deep (includes door opening). The treads have a 1 ½" nosing. The wood balustrade has six simple octagonal balusters that are 1 ¾" at the base and ¾" at the top. They are 5 ½" on center. The handrail is rectangular, 4" x 2 ½", and the newel is 5" x 5" at the base. The distances from the nosings to the top of the handrail are between 2'-1 5/8" x 2'-5". A paint sample taken from a stair riser reveals that all of the paint layers beneath the current paint are oil-based and range from white to gray to navy blue, gray being the most common and the oldest color. (SI-LSQ-19)

Second Floor to Tower Stairs. These wood stairs, painted blue, connect the Tower stairs with the second floor living quarters. There are four risers at 7 ½" and the treads are 11 ¼" deep and 2'-9" wide. The nosing overhang is 1 ¼". There is no handrail. (SI-LSQ-25)

Architecture – Casework
Entry and Kitchen. These rooms both have 2 ½" wood wall-mounted doorstops, painted, for entry, Tower entry, and interior doors.

Kitchen Closet. This closet has three, wrap-around, built-in wood shelves on the west, north, and east walls. There is one lower shelving system with supports for three shelves, only one of which is extant. All shelves are contemporary, unpainted wood, shelving units.

Summer Kitchen. The summer kitchen has a large, detached pantry constructed of 3 ½" beadboard, painted white, with 3 1/3" wood boards painted yellow on the interior. The pantry does not have a built-in floor. It is 2'-2 ½" deep, 4'-7" wide, and it has a 2'-7" door, centered. There are four, wrap-around, built-in shelves, which are 6" deep. It has an elaborate top molding and a simple base molding that is 8 ½" tall. The historic lockset has porcelain knobs. (SI-LSQ-20)

West Bedroom Closet. This closet has wrap-around wood shelves forming triangular shapes along the three walls, painted white. There are wood hook boards on the three walls below the shelves with four historic metal hooks extant. The shelving is historic. (SI-LSQ-24)

Second Floor Hall Closet. This closet has four built-in, painted wood shelves, wrapped-around the north, west, and east walls.

Second Floor North Bedroom. This room has two painted wood hook boards that line-up end to end along the west wall. The boards are 3 ½" wide with six historic metal hooks and one partial historic metal hook.

Second Floor South Bedroom. There is a painted wood hook board along the northwest wall that has several historic metal hooks.

Architecture – Accessibility
This building is currently not accessible. The north main entry door opening is 3'-0" clear with a grade to finished floor elevation change of 3'-8 ½". The kitchen vestibule entry door opening is 3'-0" clear with a grade to finished floor elevation change of 2 ¼". The kitchen door opening is also 3'-0" clear but with a grade to finished floor elevation change of 5".

Physical Description -- Structural

Structural – Foundation
The perimeter foundation system consists of stone masonry. The foundations below the perimeter walls and the brick interior wall are covered by a concrete slab-on-grade in the basement and could not be observed.

Structural – Floor Framing
The first floor framing below the living room was measured to be full-sawn (FS) 2x10 joists spaced at about 16". The joists span approximately 12' and are sheathed with two layers of solid wood flooring. The balance of the first floor framing was measured to be newer 2x10 joists spaced at about 16" that were installed in the mid 1900's after a fire. The joists span approximately 12' and are sheathed with one layer of solid wood subflooring. The joists are supported on the perimeter foundation walls and interior brick walls.

The stepped down floor framing of the kitchen was measured at the cistern access point to be newer 2x10 joists spaced at about 16" that were installed in mid-1900's. The joists span approximately 11.5'. The joists

are supported on the perimeter foundation walls and a brick interior wall. The joists are sheathed with 1x solid wood subflooring.

The second floor framing was not accessible and could not be observed. The joists span approximately 12'. The joists are supported on wood-framed partition walls and the exterior masonry walls.

The floors of the watch room and lantern are constructed of cast iron plates that are bolted together. The plates are supported on the masonry walls of the Tower. The floor is accessed via a spiral cast iron stair that extends to the basement.

Structural – Roof Framing
The roof framing of the main building was not accessible and could not be measured, although the rafters at the eaves were measured to be FS 2x6 joists spaced at about 32". The rafters span approximately 7'. The rafters are supported on the exterior masonry walls and interior partition walls on the second floor. The rafters are sheathed with 1x tongue and groove solid wood underlayment at the eaves.

The roof framing of the kitchen was not accessible and could not be measured, although the rafters at the eaves were measured to be FS 2x4's spaced at about 32". The rafters span approximately 11.5'. The rafters are supported on the exterior masonry walls and the masonry wall between the main building and the kitchen. The rafters are sheathed by 1x tongue and groove solid wood underlayment at the eaves.

The roof of the Tower lantern is constructed of cast iron panels that are bolted together. The panels are supported on the walls of the lantern.

Structural – Ceiling Framing
The ceiling framing of the second floor was not accessible and could not be measured. The joists span approximately 15'. The ceiling joists are supported on the interior partition walls.

The ceiling framing of the kitchen was not accessible and could not be measured. The joists span approximately 11.5'. The joists are supported on the exterior masonry walls and the masonry wall between the main building and the kitchen.

Structural – Wall Framing
The exterior walls are constructed of stone masonry. The original interior walls were not accessible and could not be measured.

The basement partition walls are constructed of brick masonry.

The walls of the lantern are cast iron panels that are bolted together. The panels bear directly on the floor of the lantern.

Structural – Lateral System
Lateral stability for the building is provided by the exterior masonry walls.

Structural – Load Requirements
The required watch room floor load capacity is 40 psf, the required lantern floor load capacity is 100 psf and the required roof snow load capacity is 40 psf.

Physical Description -- Mechanical

Mechanical – Plumbing Systems
There is currently no domestic water service to the building. A 24'x11' cistern is built into the basement under the summer kitchen. The cistern still contains water. (SI-LSQ-39) Several sections of a rainwater capture system remain in place with 1½" black steel piping from the second floor to the basement. The rainwater capture piping from the roof gutters has been disconnected and the runoff is now channeled into downspouts on the east and west side of the building. The original piping included a fill line for the cistern and an overflow line to divert excess runoff once the cistern was full. Sections of the overflow piping have been removed but a majority of both piping systems remain intact.

There is no active sewer system serving the building. The original waste piping drained to the lake. This drain system has been abandoned.

The only plumbing fixture in the building is an enameled cast iron sink with drain board located in the summer kitchen. The kitchen sink does not have water service, faucets, or an active drain connection. There are no other plumbing fixtures in the building.

Mechanical – HVAC
The original heating for the building would likely have been wood burning stoves. All that remains from this era is a brick chimney stack from the basement up through the roof. A new Empire 25,000 btuh (British thermal unit per hour) console type propane room heater has been installed in the first floor living room. The 4" aluminum flue pipe has been installed inside the original chimney stack. A single propane tank is located to the south of the building behind the Privy. The copper propane piping enters the building on the west side with a pressure regulator and copper distribution piping through the basement up to the first floor. The propane piping serves the heater and kitchen stove.

Basement ventilation consists of a 24"x24" wood slat ground level louver on the east side of the building.

Mechanical – Fire Suppression
None in the building.

Mechanical – Other
In 1931, a tank house for kerosene storage was built on the southeast side of the Tower. All that remains of this structure is the concrete foundation.

Physical Description -- Electrical

Electrical – System Configuration
Battery operated single station security alarms were observed at windows on the lower level of the building.

A photovoltaic system consisting of a freestanding flat plate photovoltaic array approximately 60" x 42", a charge controller and a single 100 ampere hour storage battery provides power for fluorescent lighting and small loads in the building's kitchen. Wiring for lighting is housed in surface mounted raceway. No inverter exists, therefore only small DC loads such as flashlights, walkie-talkie chargers etc. are able to be served.

Electrical – Wiring Devices
None in the building.

Electrical – Conductor Insulation
None in the building.

Electrical – Overcurrent Protection
None in the building.

Electrical – Lighting Systems
None except for photovoltaic system indicated.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in the building.

Electrical – Lightning Protection
Lightning protection consists of brass air terminals and brass or copper down- cables that appear to be terminated on buried ground rods. Air terminals are located along the peak of the roof, at the peak of each dormer, and on each chimney. One very interesting aspect of the lightning protection system is the existence of a very old lightning grounding system on the east side of the Tower. (SI-LSQ-40) Unlike more modern systems consisting of braided cable, this grounding system consists of a wrought iron rod extending from the lantern-level walkway down to the ground. The remnants of a glass insulator system to support the rod are also unusual. This system may very well date back to the original construction of the lighthouse in 1881 when lightning systems varied widely depending on the "lightning practitioner" that manufactured the system.

Physical Description -- Hazardous Materials

Landmark Environmental collected four bulk samples from a total of four different types of suspected asbestos containing materials (ACMs) at Sand Island. Of the four suspect ACMs that were sampled and analyzed, none of the sampled suspect ACMs resulted in concentrations of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
Sheet flooring, backing materials and flooring adhesives at the Light Station Quarters were sampled and were found to be non-ACM. White wall plaster wall texture and white plaster over brick were also sampled and found to be non-ACM.

The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding potential for damage to structures. Asbestos is assumed to be present at the following locations:

1. Wall and Ceiling Plaster,

2. Ceiling Insulation (Black matting or felt paper observed above ceilings, this suspect ACM may also be present in wall interiors),
3. Adhesives (Multiple varieties of miscellaneous adhesives were seen on heater components, under remnant flooring applications, and around windows),
4. Thermal System Insulation (TSI) (Was not observed. Asbestos is commonly present in insulation on water pipes, metal ducting for heating systems, behind floor registers, steam piping, etc.),
5. Roofing Materials (Roofing felt, tar, and shingles were observed that may contain asbestos),
6. Sub-Flooring (Suspect ACMs in flooring applications were not observed. Asbestos is commonly present in vapor barrier felts and tar-papers used in sub-flooring applications),
7. Brick and Block Filler (The exterior of the structure is stone and has the potential to have a block filler or grout that is potentially asbestos containing),
8. Caulk (Caulking was observed around window and door penetrations, which can also include gasket applications between the window assembly and the structure), and,
9. Asbestos-cement (Piping, wall-board, wall interior panels, roof flashing and roofing applications can be constructed of asbestos-cement. This type of application was not observed at the structure but may be present).

The assumed asbestos containing materials were observed to be in fair condition with localized areas of wall and ceiling systems observed to be in poor condition.

Hazardous Materials – Lead Containing Paint

The Lead Containing Paint (LCP) inspection included a visual inspection of the structure. A previous inspection and testing for LCP was conducted using an x-ray florescence (XRF) detector coupled with bulk paint sampling and laboratory analysis.

The XRF inspection was conducted by the NPS Staff in 1993. The findings of this study are incorporated into this report by reference.

Detectable lead in paint was confirmed for the following testing combinations:

1. Window Sash,
2. Window Trims,
3. Doors,
4. Painted Walls,
5. Ceilings, and,
6. Tower.

Detectable lead is assumed to be present at the following locations:

1. Interior Painted Surfaces, and,
2. Exterior Painted Surfaces.

Based on the estimated dates of construction of the various structures lead containing paint is assumed to be present throughout the structures. The confirmed LCP was observed to be in fair condition and the assumed LCP was observed to be in fair condition.

Paint chip debris was not observed on the ground surface.

Hazardous Materials – Lead Dust

Wipe sampling for lead dust was conducted in the Light Station Quarters. A three wipe composite sample was collected from both levels of the structure. On the first floor the composite was collected from the living room, bedroom, and main hall floors. On the second floor the composite wipe was collected from the

hall and bedrooms. It should be noted that the structure was occupied by Park staff temporarily while conducting historical preservation work on Sand Island.

1. Analysis of the first floor composite resulted in 273 micrograms of lead dust per square foot of floor (ug/SF).
2. Analysis of the second floor composite resulted in 1000 ug/SF.

Hazardous Materials – Lead in Soils

The historical paint maintenance activities may have the potential to impact the surrounding soil. The surface soils adjacent to the structure were not observed to have lead paint debris. Preliminary lead-in-soil sampling was performed to assess whether these soils contain lead concentrations above applicable soil standards.

One four-aliquot soil sample was collected from ground surface at the roof drip line, approximately three ‘ from the foundation of the structure. One four-aliquot soil sample was collected from ground surface approximately five ‘ out from the structure.

1. Analysis of the drip line composite soil sample resulted in 18.8 milligrams of lead per kilogram of soil (mg/kg).
2. Analysis of the sample collected from five ‘ from the foundation resulted in 139 mg/kg.

Hazardous Materials – Petroleum Hydrocarbons

Remnant piping systems were observed in the basement that may have been associated with historical heating oil tank(s) or the acetylene gas system for the light. No areas of staining were observed on concrete floors in the basement and remnant piping appeared to be empty and dry. *(L.E. Note – these were likely cistern drain piping)*

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of the mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis.

Mold was identified visually in:

1. Keepers Quarters Basement,
2. Tower Basement, and,
3. Kitchen floor above Cistern.
    a. The hatch to the Cistern was opened during the assessment. The wood panel removed to gain visual access to the Cistern was wet and degrading so much that it began to disintegrate when removed.

Character Defining Features

Mass/Form. A one-and-a-half story brownstone flared gable roof structure with an octagonal tower attached and a one-story shed structure on the opposite end.

Layout of Spaces. Small, discrete rooms accessed from minimal hallways; one single stair for both Tower and quarters use; openings between rooms allow direct communication.

Exterior Materials. Ashlar brownstone, decorative wood trim work including exposed rafter tails, brackets and decorative gable drop trim, all painted white. The roof is covered with red metal shingles.

Openings. Arched window openings with divided-lite wood double-hung windows with wood shutters, painted white.

Interior Materials. Plaster, painted woodwork and wood flooring.

General Condition Assessment

In general, the Sand Island Light Station Quarters are in fair to good condition. Some of the ceiling and wall finishes on the first floor are covering up, or have replaced, the historic ceilings and walls, but the historic finishes that are extant in the building vary from fair to poor condition, depending upon the location. It appears the second floor has suffered the most from moisture issues, especially the south bedroom.

Structurally, the building is in good condition. The basement needs to be dried out to reduce moisture content of the first floor framing. The high moisture content promotes decay of the wood.

Mechanically, the upgraded systems in the Keepers Quarters are generally in good condition. The extant, historical mechanical components are in fair to poor condition.

Electrically, there are no alternating current electrical systems in the Light Station Quarters.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment -- Architecture

Architecture – Roof
Condition: *Poor*
The main roof is in poor condition with peeling of the metal shingles' red finish evident. The south and west shed roofs are in fair condition with paint peeling on the shingles, gutters, and flashing. Park staff reports poor flashing interfaces. The tie offs on the roof should not be used for life safety anchors until they can be certified as meeting OSHA requirements.

The Tower roof is in fair condition as the joint at the east panel is punctured, there are small amounts of delamination, and there are previous patches evident.

Architecture – Gutters and Downspouts
Condition: *Poor*
The gutter system is in poor condition given the standing water evident.

Architecture – Chimney
Condition: *Fair*
The chimney is in fair condition.

Architecture – Exterior Walls
Condition: *Good*
The exterior walls generally appear to be in good condition with past repointing evident.

Architecture – Windows
Condition: *Good to Fair*
The exterior of each window has been recently and thoroughly restored, including the original sash with repainting, wood restoration, and new glazing compound. Shutters were reconstructed based off of extant shutter components. Shutter hinges, where missing, were reconstructed and new shutter hardware was installed. The interior faces of the windows have not been restored as is evident by the peeling paint and missing latching hardware.

Architecture – Exterior Doors
Condition: *Good*
The doors are in good condition as they have been recently restored and repainted on the exterior faces. They generally have rusty hinges and the trim at the kitchen vestibule door is discontinuous.

Architecture – Exterior Trim
Condition: *Good*
All of the wood trim is in good condition.

Architecture – Tower Walk and Railing
Condition: *Good to Fair*
The cast iron deck and railings of the Tower are overall in fair condition with spot rusting and peeling paint. The deck is in good condition with some instances of rust where peeling paint is exposed.

Architecture – Tower Lantern
Condition: *Fair*
Overall, the lantern is in fair condition. The base of the lantern wall appears to have minor moisture damage, the paint at the sill is peeling, and there's minor rusting at the glazing frame. Within the glazing, one pane is cracked and two have been replaced with steel panels. Also, the intake vents, most likely configured like other lighthouse vents, are missing brass control caps. The access door to the walk is difficult to operate as the throw bolt is bent. There are also circular imprints from a metal object struck against the door on the interior face. This damage occurred in 2009 and it is believed the object may have been a 100-pound propane cylinder.[39] (SI-LSQ-35)

Architecture – Kitchen Vestibule
Condition: *Good*
The kitchen vestibule is generally in good condition. The bottom of the door casing is fairly weathered.

[39] Information from Randy Ross, 2010.

Architecture – Interior Doors
Condition: *Good to Fair*
Tower to Quarters Doors. The plate steel doors at both levels have some rust on their surfaces and their knobs do not operate their catches.

Typical Interior Doors. These general interior doors are in good condition with some loose knobs, paint chipping, and peeling paint.

Architecture – Wall Finishes
Condition: *Good to Fair to Poor*
The basement rooms' ashlar blocks are in fair condition as in the oil room there is visible mold along the west wall, the wood cellar has moisture issues along the north wall and the northeast and southwest corners and the cellar has efflorescence up to 2'-0" on the stone block walls. The interior brick walls are also in fair condition as the oil room has visible mold at the southwest corner. The wood cellar and the cellar have peeling paint at the base of their brick walls.

The original plaster wall finishes (over masonry and lath) in the entry and east bedroom are generally in fair to good condition. There are deep cracks in the plaster in the east bedroom's walls and there are holes in the plaster over masonry at the entry. The modern gypsum board that was installed during A.D. Hulings lease of the property from 1953 to 1975 is in good condition. The kitchen's wallpaper and wainscot are in fair condition as the wallpaper shows wear and tear and the wainscot has some separation of bead and board. The kitchen's closet is in poor condition as the plaster has cracks and separation at wall junctures. The summer kitchen's plaster is in fair condition except at the southwest corner above the sink as the plaster there has been badly damaged. The wainscot in this room is in fair condition as the east wall has warped wainscot. The plaster in the parlor and the west bedroom's closet are in poor condition as the plaster is cracking and the paint is alligatored and peeling. The west bedroom has wall plaster in fair condition with some cracks and peeling paint, mostly along the south wall. The plaster in the second floor hall and the second floor bedrooms (two) is in poor condition, while the hall's closet has plaster in fair condition. The north bedroom has a stress crack along the east wall and deflection around the crack. The south bedroom has cracks and deflection in the plaster as well as staining. (SI-LSQ-27 and 28)

Architecture – Ceiling Finishes
Condition: *Good to Fair to Poor*
The oil room has a high moisture reading (see structural assessment) but visually appears to be in fair condition. The wood cellar and cellar appear to have good ceiling finishes. The entry's plaster ceiling is in good condition with cracks on the west sloped ceiling. Both closets' plaster ceiling finishes are in poor condition as the kitchen closet's ceiling plaster is almost all missing and the lath is visible and the bedroom closet's ceiling is peeling away at the junctures with the walls. The gypsum board ceiling finishes installed between 1953 and 1975 are generally in good condition in the east bedroom, kitchen, summer kitchen, parlor, and west bedroom, but have some visible seams and stains and holes from absent nails/metal hardware. The second floor hall and closet have plaster ceilings in poor condition as there are cracks in the plaster causing them to deflect and separate in areas from the walls and the other portions of the ceiling. The north bedroom has a plaster ceiling in fair condition with cracks along the north wall that may worsen in the future. The south bedroom's gypsum board ceiling is in poor condition with stains and deflection along the south wall, especially around the south seam in the gypsum board.

Architecture – Interior Trim
Condition: *Good to Fair to Poor*
The 11" tall base trim and shoe in the entry, east bedroom, parlor, and west bedroom and its closet are generally in good condition. The second floor hall and second floor bedrooms' trim is in fair to poor condition as there are vertical stress fractures at the wall corners that carry into the base trim and cause horizontal stress cracks in the base trim. There are some instances of misalignment as well. The cove molding in the east and west bedrooms and the parlor are in fair condition as there are instances of separation from the ceiling and walls. The kitchen's base trim is in good condition and the cove molding is in fair condition as there is separation from the ceiling at the corners. The summer kitchen and kitchen closet's base shoes are in fair condition as in the summer kitchen, the shoe is partially missing on the east wall and in the kitchen closet, the base shoe only exists on the east wall. The summer kitchen's cove molding is in fair condition.

Architecture – Floor
Condition: *Good to Fair to Poor*
The concrete floors for the wood cellar and cellar are in good condition while the concrete floor for the oil room is in fair to poor condition with flaking and crumbling concrete at the west wall. The drainage gutter system has debris collected in it, but otherwise is in good condition. The pipe in the wood cellar leading to the exterior is in fair condition as it is rusty. The entry, east bedroom, and kitchen and its closet wood flooring is overall in good condition. There is some wear, especially around the entry door, and some shallow scratches in the wood. The wood flooring in these rooms was most likely installed between 1953 and 1975 when A.D. Hulings leased the property. The summer kitchen's resilient flooring is in poor condition, while the visible wood is in fair condition with some paint peeling and wood splitting. The parlor, west bedroom and its closet, and second floor hall closet have wood flooring in good condition, with minor wear and separation of boards. The second floor hall and north bedroom are in fair condition as these wood floors are heavily worn and have deeper gouges and scratches. The south bedroom's wood floor is in poor condition as it is heavily worn, has water stains, and possible previous water damage at the southeast corner (this section of flooring feels bouncy).

Architecture – Stairs
Condition: *Good to Fair*
Exterior Stairs, North Elevation. The stair is in fair condition. It is rusted and does not have a handrail.

Circular Stair to Tower, Oil Room, and Second Floor Quarters. This stair does not have a handrail.

Basement Stairs. These stairs are in good condition but they do not have a handrail.

Summer Kitchen to Kitchen Stairs. The wood stairs with the top stone step are in good condition. The balustrade is on one side only, and the paint is peeling on the risers.

Second Floor to Tower Stairs. These stairs are in good condition, although there is no handrail and the paint is peeling.

Architecture – Casework
Condition: *Good to Fair to Poor*
The wood doorstops in the entry and kitchen are in good condition except for minor peeling paint. The wrap-around shelving unit in the kitchen closet is in good condition while the lower shelving unit is in poor condition as there are two missing shelves. The summer kitchen's pantry is in good condition with peeling paint and rusty hinges. The two-door wood cabinet is in poor condition as one of its doors is missing and it

has peeling paint and is stained. The west bedroom closet's shelving unit and hook boards are in good condition. The hook boards do have scars from missing hooks. The second floor hall closet's shelving unit is in poor condition as it is incomplete. The bottom two shelves on the west wall are missing. The second floor north bedroom hook boards along the west wall are in fair condition as they have hook scars and the boards themselves do not match. The second floor south bedroom's hook board is in fair condition with rust stains and partial hooks.

Architecture – Accessibility
Condition: *Poor*
This building is currently not accessible.

Condition Assessment -- Structural

Structural – Foundation
Condition: *Good*
The perimeter foundation walls are in good condition. The footings are covered by a concrete slab-on-grade and could not be observed, thus their condition is unknown. No obvious signs of distress or damage were observed.

Structural – Floor Framing
Condition: *Good*
The first floor framing in the Quarters is in good condition. Floor joists that are headed off above windows are not properly supported. (SI-LSQ-37) The moisture levels in the framing were above 18% and this can lead to deterioration of the wood. Two basement windows have been replaced with louvers to increase the ventilation but this does not appear to be enough. The newer stepped floor framing of the Kitchen could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed. The second floor framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed. The floor of the lantern is in good condition.

Structural – Roof Framing
Condition: *Unknown*
The wood roof framing of the quarters and kitchen could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed. The roof of the lantern could not be observed, thus its condition is unknown. The joints between the roof panels had been sealed but not painted which indicates rust jacking between the cast iron panels. (SI-LSQ-38) The extent of the damage should be checked at least annually and corrective action taken if the damage continues.

Structural – Ceiling Framing
Condition: *Unknown*
The ceiling framing of the second floor and kitchen could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Wall Framing
Condition: *Good*
The basement and exterior walls are in good condition. The interior wall framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Lateral System
Condition: *Good*
Lateral stability of the building is good.

Structural – Load Requirements
Condition: *Fair*
The roof and floor framing have adequate capacity to support the required loads with the exception of the kitchen roof framing. The kitchen roof framing could not be directly observed, but the framing exposed at the eaves does not have the required snow load capacity even if the spacing of the joists is half of what can be measured.

Condition Assessment -- Mechanical

Mechanical – Plumbing Systems
Condition: *Fair to Poor*
The cistern located in the basement under the summer kitchen is in fair condition and still contains water. However, the water in the cistern is stagnant. The rainwater capture piping from the second floor to the basement is in fair to poor condition with portions of the piping no longer in place.

There is no active sewer system serving the building.

The enameled cast iron sink located in the summer kitchen is in poor condition with large chips in the enamel and rust damage.

Mechanical – HVAC
Condition: *Good; Severe (Chimney Stack)*
No wood burning stoves remain in the building. The original brick chimney stack from the basement up through the roof is in fair condition. All unused vent openings have been sealed off. The new propane heater in the first floor living room is in good condition. The new propane heater and associated flue vent are in good condition. However, the existing chimney stack is not adequately lined and does not meet current mechanical and building codes. The propane building entry, pressure regulator, and copper distribution piping through the basement up to the first floor are also in good condition.

The ground level basement ventilation louver is in good condition, but does not provide adequate ventilation for the space.

Mechanical – Fire Suppression
Condition: *N/A*

Condition Assessment -- Electrical

Electrical – System Configuration
Condition: *Poor and Fair*
Battery operated security alarms are in poor condition and are non-functional. Batteries have been removed. There is no connection to a central station.

The photovoltaic system is in fair condition. There is evidence that water occasionally covers the batteries and charge controller, which reside in an underground cabinet.

Electrical – Wiring Devices
Condition: *N/A*

Electrical – Conductor Insulation, Overcurrent Protection, Telecommunications, and Fire Alarm System
Condition: *N/A*

Electrical – Lighting Systems
Condition: *Good*
Lighting in the kitchen, which is powered by a PV system, is in good condition.

Electrical – Lightning Protection
Condition: *Poor*
Lightning protection is old and there is no evidence that any maintenance has been performed.

Condition Assessment -- Hazardous Materials

Refer to 'Physical Description -- Hazardous Materials' for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as a lighthouse and primary residence from 1881 to 1921 when it became automated; the earliest automated lighthouse in the Apostle Islands. The Light Station Quarters were then rented out seasonally for private use until the 1950s.

The building is currently used as guided visitor access with no remaining furnishings or Fresnel lens in the tower. The preferred alternative is to restore the building to its pre-1921 condition and interpret the first and second floors for visitors with possible staff housing (with no new or improved utility services) on portions of the second floor. Further study on the interior finishes will be required for restoration, however the openings of the front bedroom are noted in the Treatment Recommendation Notes on page 126.

Restoration is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the Preferred Alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatment and work recommendations proposed for the restoration of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations -- Architecture

Architecture – Roof
Priority: *Severe*
Reroof the main and shed roof using prefinished metal shingles to match existing historic in situ at the shed. Coordinate roof installation with the gutter repair work. Verify/provide proper blocking for roof tie offs. Verify/ provide proper flashings, underlayment and slip sheet.

Repair the punctured cast panel and delamination. Scrape, sand and repaint.

Architecture – Gutters and Downspouts
Priority: *Severe*
Replace the existing prefinished metal yankee gutter system in kind and repair/shim to allow for proper slope for drainage. Coordinate with roofing repair work. Reuse existing 3” fluted downspouts as possible. Verify provide proper drainage away from the building.

Architecture – Chimney
Priority: *Low*
No recommendations at this time.

Architecture – Exterior Walls
Priority: *Low*
No recommendations at this time.

Architecture – Windows
Priority: *Moderate*
Scrape, sand and repaint the interior of the windows and replace missing latching hardware.

Architecture – Exterior Doors
Priority: *Moderate*
Replace hardware at the kitchen to allow for accessibility through the vestibule. Monitor rusty hinges. The trim at the kitchen vestibule door is discontinuous.

Architecture – Exterior Trim
Priority: *Low*
No recommendations at this time.

Architecture – Tower Walk and Railing
Priority: *Moderate; Severe (Railing)*
Repair spot rusting and peeling paint at walk and deck. Scrape sand and repaint. Investigate alternatives to discretely upgrade the existing railing to become a code compliant guard rail.

Architecture – Tower Lantern
Priority: *Moderate*
Repair patches of peeling paint and rust. Scrape, sand and repaint. Monitor the rust at the glazing frame. Replace cracked pane and reglaze. Replace missing brass control caps at the intake vents. Repair the throw bolt at the access door to the walk. Enhance ventilation throughout the lighthouse: basement atmosphere. Replacement glass shall be clear, non-reflective and with a visual light transmittance of not less than 72%.

Architecture – Kitchen Vestibule
Priority: *Low*
Repair the bottom of the door casing with epoxy stabilization. Scrape, sand and repaint.

Architecture – Interior Doors
Priority: *Moderate*
Scrape areas of rust at steel doors, prep and repaint. Repair hardware to assure knobs and catches are operational. Scrape, sand and repaint wood doors and repair loose hardware.

Architecture – Wall Finishes
Priority: *Moderate*
No recommendations at this time for the basement exposed stone other than to enhance the overall ventilation of the building.

Further on site investigation is needed to determine extent of wall/opening and trim modifications from original layout at the front bedroom. Repair damaged plaster. Coordinate work with enhanced ventilation throughout the building. Patch, sand and paint all plaster and gypsum board. Repair separation, scrape, sand and repaint wainscot and bead board.

Architecture – Ceiling Finishes
Priority: *Moderate*
Repair damaged plaster. Coordinate work with enhanced ventilation throughout the building. Patch, sand and paint all plaster and gypsum board.

Architecture – Interior Trim
Priority: *Low*
Further on site investigation is needed to determine extent of wall/opening and trim modifications from original layout at the front bedroom. Scrape, sand and repaint all interior trim.

Architecture – Floor
Priority: *Low*
Further on site investigation is needed to determine the extent of wood flooring alterations and whether original materials are extant to consider uncovering them. Otherwise refinish existing wood floors. Remove the resilient flooring at the kitchen and refinish the wood floor below.

Architecture – Stairs
Priority: *Moderate*
Install code compliant handrails at all stairs. Scrape, sand and repaint the kitchen and second floor to Tower stairs.

Architecture – Casework
Priority: *Low*
Further on site investigation is needed to determine if the extant casework is original. Scrape, sand and repaint all casework if previously painted (i.e. do not paint underside of shelves that have never been painted.)

Architecture – Accessibility
Priority: *Moderate*
Retrofit the hardware of the series of doors at the kitchen to allow for accessibility into the kitchen area. Freestanding ramping on the exterior would be required to mitigate the 7 ¼" elevation change. Provide accessible path and ramp to kitchen. Add exhibits in kitchen to make the rest of the floor, second floor and Tower programmatically accessible.

Treatment Recommendations -- Structural

Structural – Foundation
Priority: *Low*
No recommendations at this time.

Structural – Floor Framing
Priority: *Low*
The moisture levels in the first floor framing should be reduced below 15%. The basement should be dried out. The framing of the headers for the first floor joists above doors and windows should be strengthened to meet IEBC and NPS requirements.

Structural – Roof Framing
Priority: *Unknown*
The roof framing of the kitchen needs to be investigated further. The snow load capacity could not be verified or adequately inferred from field measurements. Current data indicates that the roof has inadequate snow load capacity.

Rust-jacking is causing the roof panels of the lantern to separate. Further investigation is required to determine the extent of the corrosion to the cast iron panels or fasteners.

Structural – Ceiling Framing
Priority: *Low*
No recommendations at this time.

Structural – Wall Framing
Priority: *Low*
No recommendations at this time.

Structural – Lateral System
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Mechanical

Mechanical – Plumbing Systems
Priority: *Moderate (Cistern); Low (Rainwater Capture)*
The cistern located at the basement level under the summer kitchen is in fair condition, but contains stagnant water. It is recommended that the cistern be pumped out and sealed to prevent possible water and moisture damage to the building structure.

It is recommended that the rainwater capture system piping from the second floor to the basement be cleaned and repainted for purposes of historic preservation.

Mechanical – HVAC
Priority: *Severe (Chimney Liner); Moderate (Ventilation and Piping)*
The existing chimney stack is not adequately lined and does not meet current mechanical and building codes. Installation of a chimney liner for the heater flue vent is highly recommended.

The existing basement ventilation louver does not provide adequate ventilation to prevent condensation and high humidity levels. The addition of mechanical and passive ventilation is recommended to prevent damage to the building structure.

It is recommended that rusted propane piping at the pressure regulator be replaced and that all unused propane piping be removed.

Mechanical – Fire Suppression
Priority: *N/A*

Treatment Recommendations -- Electrical

Electrical – System Configuration
Priority: *Moderate*
Existing wiring in the building for PV powered systems is limited. It is recommended to expand the existing system with new wiring to provide power for new ventilation systems, new refrigerator and stove. All new electrical wiring shall be in accordance with the National Electrical Code.

Electrical – Wiring Devices
Priority: *N/A*

Electrical – Conductor Insulation
Priority: *Moderate*
It is recommended that new conductor insulation be consistent with wiring methods for proposed PV systems. Conductor insulation shall be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Overcurrent Protection
Priority: *Moderate*
It is recommended that overcurrent protection for new PV system wiring be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Lighting Systems
Priority: *Low*
Lighting systems in the building are limited to one PV powered fixture in the kitchen. No recommendations at this time.

Electrical – Fire Alarm System
Priority: *Moderate*
It is recommended that battery operated smoke detectors be added inside and outside rooms intended for sleeping and that carbon monoxide detectors be added as required.

Electrical – Telecommunications
Priority: *N/A*

Electrical – Lightning Protection
Priority: *Moderate*
Existing lightning protection is old and its effectiveness has not been established. It is recommended that the existing lightning protection system be removed prior to roof replacement. It is recommended that a new LPI-175 compliant lightning protection system be installed after roof replacement.

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Moderate*
Recommend sampling of suspect asbestos containing materials, including, wall and ceiling plaster, ceiling insulations, adhesives, Thermal Systems Insulation, roofing materials, sub-flooring, brick and block filler, asbestos cement, and caulking.

Hazardous Materials – Lead-Containing Paint and Lead Dust
Priority: *Moderate*
Recommend stabilization or abatement of Lead-Containing Paint.

Hazardous Materials – Lead In Soils
Priority: *Moderate*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Moderate*
Recommend water intrusion and mold mitigation.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
No recommendations at this time.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

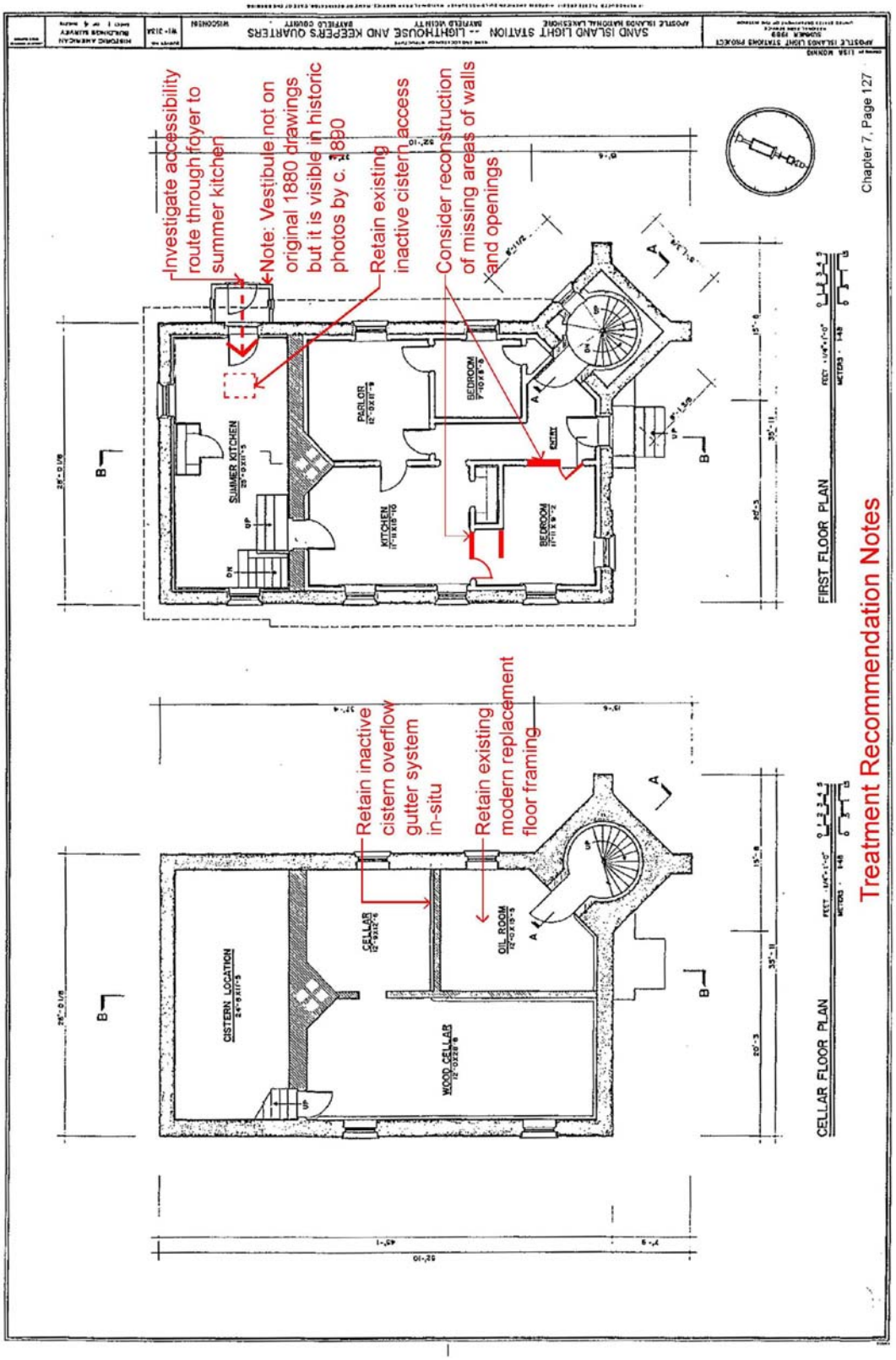
1. Careful study is needed for introducing a code compliant guard rail at the Tower walk that will not be visually disruptive to the historic character nor be a long term maintenance burden for park staff.
2. Consideration should be given of the possible reconstruction required to "restore" the walls and openings at the northeast bedroom. An alternative could include leaving the walls in situ and calling out the change of material(s) to the visitors. (See following Treatment Recommendation Notes)
3. Regarding the repair of the (yankee) gutter required, due to negative slope as evident with standing water, an alternative would be to forego the reintroduction of this challenging detail and roofing the eave without the yankee gutter.
4. Consideration might also be given to alter the interior stair from the kitchen level to the main floor level by way of adding a landing and mechanical lift due to the concern that if one were to make the 2 mile hike across the island would one want to access more of the building?

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Visitor access into the former light tower and quarters	Change in use: Upgrades for code safety and ABAAS will be required which will alter the historic fabric.	Integrate the upgrades to minimize damage to historic fabric and visual disruption. Study whether partial building access would suffice.	- Improves safety for visitors and staff. - Allows visitors to experience the Light Station Quarters first hand.
2. Accessibility Upgrades	Altering the kitchen vestibule entry (ramp) to accommodate a 7 ¼" elevation change will alter the landscape with the extension of a ramp where there is none currently, nor historically.	Study all of the various accessibility alternatives.	- Allows universal access to the cultural resource.
3. Possible use of the second floor as overflow housing with non-potable water	Reduces area for interpretive program and where visitors are allowed.	Examine the other housing options on Sand and how often this overflow space would be needed compared to its importance as a cultural resource for visitors.	- Provides overflow housing for staff and volunteers.

Sand Island Light Station Quarters Treatment Recommendation Notes



Sand Island Light Station Quarters Photographs, 2009

SI-LSQ-01: North elevation, 2009 (Source: AH DSC01353)

SI-LSQ-02: East elevation, 2009 (Source: AH DSC01342)

SI-LSQ-03: South elevation, 2009 (Source: AH DSC01343)

SI-LSQ-04: West elevation, 2009 (Source: AH DSC01264)

SI-LSQ-05: Roof shingles, view from Tower to south shed roof (Source: AH IMGP3047)

SI-LSQ-06: Roof finial and trim, north elevation (Source: AH IMGP3067)

SI-LSQ-07: Trim, wall, and chimney detail, south elevation (Source: AH IMGP3036)

SI-LSQ-08: Chimney and roof detail, looking south from Tower (Source: AH IMGP3049)

SI-LSQ-09: Trim and downspout detail, west elevation (Source: AH IMGP3041)

SI-LSQ-10: Window shutter hardware (Source: AH 100_9865)

SI-LSQ-11: Entry stairs and downspout, north elevation (Source: AH DSC01301)

SI-LSQ-12: North entry doors (Source: AH 100_9866)

SI-LSQ-13: Doors to summer kitchen from kitchen vestibule, west elevation (Source: AH 100_9863)

SI-LSQ-14: Oil room in basement and Tower stairs, looking northwest (Source: AH CIMG4327)

SI-LSQ-15: Basement wood cellar, looking southwest (Source: AH CIMG4299)

SI-LSQ-16: Basement cellar ceiling and remnants of lath and plaster, looking east (Source: AH CIMG4320)

SI-LSQ-17: Basement stairs to summer kitchen (Source: AH CIMG4293)

SI-LSQ-18: Summer kitchen, west elevation (Source: AH CIMG4249)

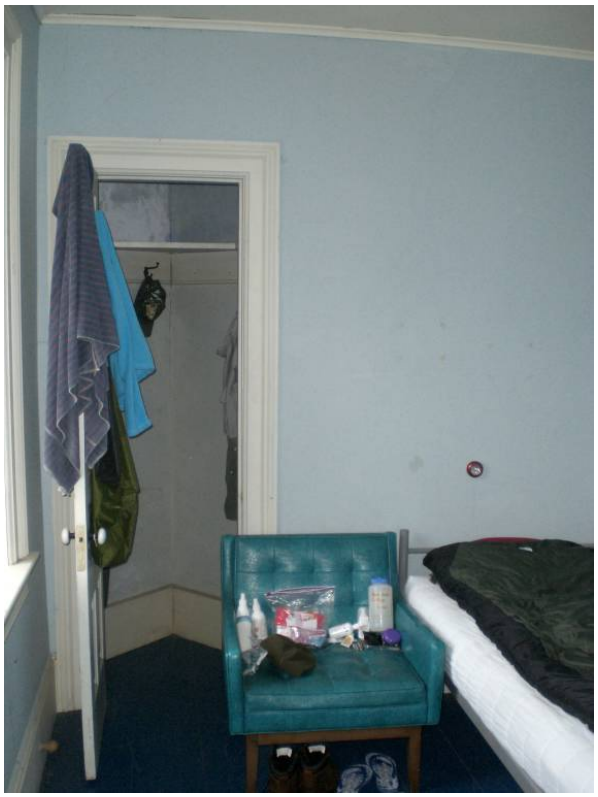
SI-LSQ-19: Summer kitchen and stairs, east elevation (Source: AH CIMG4252)

SI-LSQ-20: Summer kitchen built-in pantry and stair to kitchen, north elevation (Source: AH CIMG4254)

SI-LSQ-21: Kitchen, looking southwest (Source: AH CIMG4230)

SI-LSQ-22: First floor east bedroom, west elevation (Source: AH CIMG4222)

SI-LSQ-23: Entry to Tower from entry hall, west elevation (Source: AH CIMG4213)



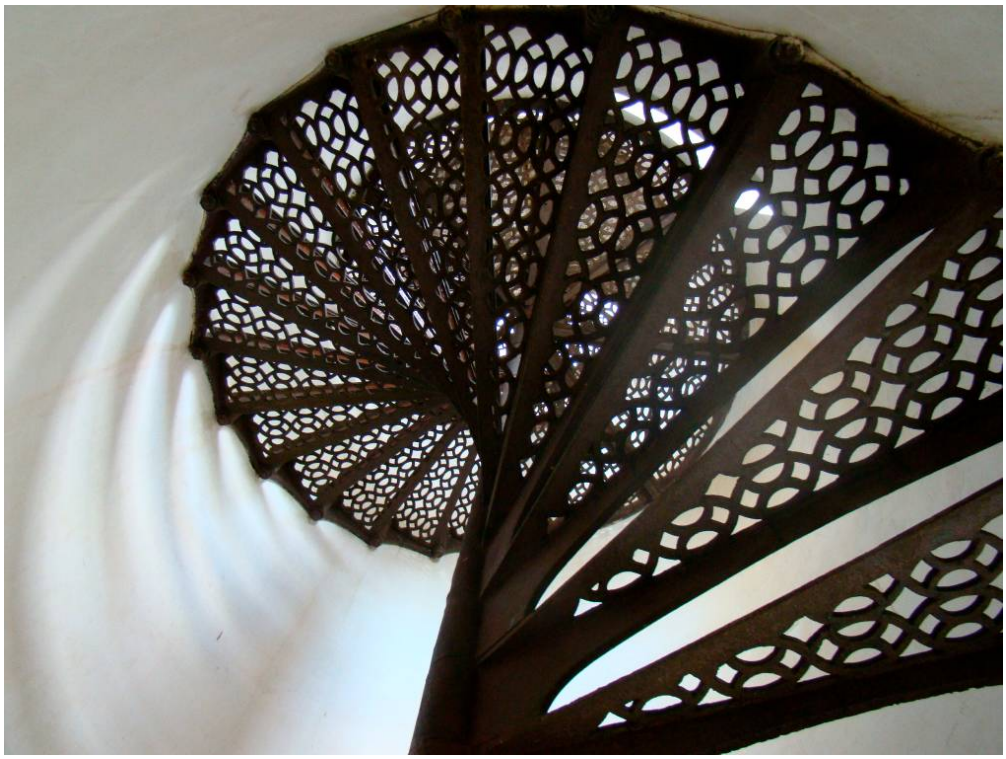
SI-LSQ-24: First floor west bedroom and corner closet, north elevation (Source: AH CIMG4278)

SI-LSQ-25: Second floor stairs to Quarters from Tower stairs (Source: AH DSC01327)

SI-LSQ-26: Second floor hall and door, looking west towards Tower stairs (Source: AH CIMG4347)

SI-LSQ-27: Second floor south bedroom, south elevation (Source: AH CIMG4364)

SI-LSQ-28: Second floor south bedroom ceiling detail, looking southeast (Source: AH CIMG4373)



SI-LSQ-29: Tower stairs looking up from second floor access (Source: AH DSC01335)

SI-LSQ-30: Light Tower window (Source: AH 100_9834)

SI-LSQ-31: Lantern interior and floor hatch to stairs (Source: AH 100_9840)

SI-LSQ-32: Lantern ceiling vent (Source: AH 100_9839)

SI-LSQ-33: Lantern roof and lightning rod (Source: AH IMGP3055)

SI-LSQ-34: Lantern trim and glazing detail (Source: AH IMGP3053)

SI-LSQ-35: Lantern door to walkway with circular imprints (Source: AH 100_9836)

SI-LSQ-36: Lantern walkway and railing (Source: AH 100_9835)

SI-LSQ-37: Joist header above window at basement (Source: Martin/Martin)

SI-LSQ-38: Sealed joints in roof (Source: Martin/Martin)

SI-LSQ-39: Cistern opening in summer kitchen floor (Source: Martin/Martin)

SI-LSQ-40: Lightning protection, historic grounding conductor with insulator (Source: RMH)

OIL BUILDING

Chronology of Alterations and Use

Original Construction

The Sand Island Oil Building was built in 1901. According to the Log Book, on September 11, 1901, "Raspberry Island Light Keeper C. Hendrickson brought the work men over to build the oil house." By November 2, 1901, oil was being stored in the completed building.[40]

The Oil Building is seen in a 1978 photo, much in its current condition. (Historic Image S1-14)

There are no available historic drawings for this building.

Significant Alterations / Current condition

No significant alterations have occurred to the Oil Building. Work completed by the Historic Structure Preservation Team from the NPS between 1998 and 2009 consisted of repointing the masonry, painting the exterior woodwork, repairing the roof, and rehabilitating the brass door latch.

The building is now used for storage and contains no active mechanical systems. The original circular metal gravity vent has a roof cap that renders the vent inoperable.

There are no and were never any electrical systems in the Oil Building.

The Sand Island Oil Storage is in good condition.

[40] E. Luick, Sand Island Log, Oct 1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1901, August 17	"At 7:30 AM the Amaranth crew came a Shore with a load of Brick for the oil house."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1901, September	Sept 11: "At 11:30 AM Raspberry Island Light Keeper C. Hendrickson brought the work men over to build the Oil House." Sept 21: "There are 600 brick left of the Oil house."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1901, November 2	"Keeper finished putting the Oil House in shape and put the Oil in the House.	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
Annual Report of 1901, Fiscal Year	"*Sand Island, Lake Superior. Wisconsin*. – A crib 16 ' wide, 32 ' long, and 7 ' high was built, placed at the shore line, filled with stones, and connected to the landing wharf by a log bridge, 25 ' long. A walk 16 ' long was built leading from the crib to the top of the bluff. A brick oil house was built, with a capacity for storing 360 gallons of oil."	"1901 Annual Report of the Lighthouse Board," Sand Island Light in annual reports 1870-1910

Notable Actions with Unknown Dates

Date Range	Work Described
1998-2009	Repointed masonry
1998-2009	Painted the exterior woodwork
1998-2009	Repaired the roof
1998-2009	Rehabilitated the brass door latch

General Physical Description

The building is a small, one-story, one room, rectangular brick utilitarian structure with a brick foundation. It has a metal hip roof with a circular metal ridge vent in the center and a metal door located on the north façade.

Physical Description -- Architecture

Architecture – Roof
The roofing is standing seam metal with a metal vent, red color. It was assumed to be prefinished due to the quality of the paint adherence. The ogee cornice trim of the eave extends +/- 6" and is painted wood trim.

Architecture – Exterior Walls
The exterior walls are common bond red brick walls. A mortar sample taken indicates that the composition of the mortar is roughly one part lime to two parts sand, by volume, has a dark tan color, and is moderately hard with fine sand. A mortar sample of a repointing area shows that the mortar contains lime, a small amount of Portland cement, and sand, which is a typical restoration mixture. The mortar is dark tan in color, moderately soft, and made with relatively coarse sand.

Architecture – Exterior Door
The exterior door is made of plate steel, has the original knob mortise hardware and two surface mounted hinges. It is 2'-7" x 7'-0" x ¼" with 1/8" plate and is original to the building. Its header is cast stone. A sample of the paint of the door trim reveals that the original orange-red layer is a typical color for red lead primer paint. (SI-OB-05 and 06)

Architecture – Wall Finish
The wall finish for this building is the original common bond brick painted white.

Architecture – Ceiling Finish
The ceiling finish is plywood, painted red and supported by metal brackets.

Architecture – Floor
The floor is concrete slab-on-grade, once painted green and is original to the building.

Architecture – Casework
There is a contemporary cabinet, shelving unit, and wood boards for hanging equipment on the south and east walls.

Architecture – Accessibility
This building is currently not accessible. The entry door opening is 2'-7" clear with a grade to finished floor elevation change of 11 ½".

Physical Description -- Structural

Structural – Foundation
The perimeter foundation system consists of brick masonry walls.

Structural – Floor Framing
The floor is a concrete slab-on-grade.

Structural – Roof Framing
The roof framing was metal angles that were not accessible and could not be measured. The angles are covered by metal roof sheathing.

Structural – Wall Framing
The exterior walls are constructed of brick masonry.

Structural – Lateral System
Lateral stability for the building is provided by the brick masonry walls.

Structural – Load Requirements
The required floor load capacity is 125 psf and the required roof snow load capacity is 40 psf.

Physical Description -- Mechanical

Mechanical – Plumbing Systems
None in the building.

Mechanical – HVAC
The original circular metal gravity vent remains on the roof. A roof cap has been put in place above the storage area rendering the vent inoperable.

Mechanical – Fire Suppression
None in the building.

Physical Description -- Electrical

Electrical – System Configuration
None in the building.

Electrical – Wiring Devices
None in the building.

Electrical – Conductor Insulation
None in the building.

Electrical – Overcurrent Protection
None in the building.

Electrical – Lighting Systems
None in the building.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in building.

Electrical – Lightning Protection
None on the building.

Physical Description -- Hazardous Materials

Landmark Environmental collected four bulk samples from a total of four different types of suspected asbestos containing materials (ACMs) at Sand Island. Of the four suspect ACMs that were sampled and analyzed, none of the sampled suspect ACMs resulted in concentrations of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding potential for damage to structures. Asbestos is assumed to be present in:

1. Block Filler,
2. Wall Interiors, and,
3. Adhesives.

The assumed asbestos containing materials were observed to be in good condition.

Hazardous Materials – Lead Containing Paint
Detectable lead is assumed to be present at the following locations:

1. Interior Painted Surfaces, and,
2. Exterior Painted Surfaces.

Based on the estimated dates of construction of the various structures, intact lead containing paint is assumed to be present throughout the structure. The assumed LCP was observed to be in poor condition.

Paint chip debris was not seen on the ground surface.

Hazardous Materials – Lead Dust
Wipe sampling for lead dust was not conducted in the Oil Building because it is not a residential structure.

Hazardous Materials – Lead in Soils
The historical paint maintenance activities may have the potential to impact the surrounding soil. The surface soils adjacent to the structure were not observed to have lead paint debris. Preliminary lead-in-soil sampling was not performed to assess whether these soils contain lead concentrations above applicable residential soil standards.

Soil Sampling was not conducted around the Oil Building.

Hazardous Materials – Mold
Inspections of the structure were performed to identify the readily ascertainable visual extent of the mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was not visually identified.

Hazardous Materials – Petroleum Hydrocarbons
Localized areas of staining were observed on concrete floors in the Oil Building. Stained areas are likely associated with fuel oil, diesel or other petroleum hydrocarbons. Tank and piping systems may also contain petroleum hydrocarbons.

Character Defining Features

Mass/Form. A simple utilitarian hipped roof masonry structure.

Exterior Materials. Red brick, wood trim painted red and red metal roofing standing seam panels.

Openings. Steel plate door painted red.

Interior Materials. Exposed masonry painted white and concrete slab.

General Condition Assessment

In general, the Sand Island Oil Building is in good condition.

Structurally, the Oil Building is in good condition.

Mechanically, the circular gravity vent is in good condition but it is not functional. No other mechanical systems exist.

Electrically, the Oil Building has no system.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment -- Architecture

Architecture – Roof
Condition: *Good*
The roof and trim are in good condition.

Architecture – Exterior Walls
Condition: *Good*
The exterior walls are in good condition, though there are areas where previous repointing is evident due to variation of color in the mortar joints.

Architecture – Exterior Door
Condition: *Fair to Poor*
The door knob is damaged and does not function.

Architecture – Wall Finish
Condition: *Fair*
The brick is in fair condition with peeling paint.

Architecture – Ceiling Finish
Condition: *Good*
The plywood and metal angles are in good condition.

Architecture – Floor
Condition: *Good*
The floor is in good condition. There are minor cracks from a slight deformation of the floor. The floor also has stains and wear associated with its use as a storage building.

Architecture – Casework
Condition: *Good*
The modern cabinet, shelving unit, and wood boards are in good condition.

Architecture – Accessibility
Condition: *Poor*
This building is currently not accessible.

Condition Assessment -- Structural

Structural – Foundation
Condition: *Good*
The visible portion of the foundation system appears to be in good condition. No obvious signs of distress or damage were observed.

Structural – Floor Framing
Condition: *Good*
The concrete slab-on-grade is in good condition.

Structural – Roof Framing
Condition: *Unknown*
The roof framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Wall Framing
Condition: *Good*
The walls are in good condition.

Structural – Lateral System
Condition: *Good*
Lateral stability of the building is good.

Structural – Load Requirements
Condition: *Good*
The slab-on-grade has adequate capacity. The roof framing could not be observed, thus its capacity is unknown.

Condition Assessment -- Mechanical

Mechanical – Plumbing Systems and Fire Suppression
Condition: *N/A*

Mechanical – HVAC
Condition: *Good*
The circular gravity vent on the roof is in good condition. A roof cap has been put in place above the storage area rendering the vent inoperable.

Condition Assessment -- Electrical

N/A

Condition Assessment -- Hazardous Materials

Refer to 'Physical Description -- Hazardous Materials' for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as the original oil storage building from 1901 until the Light Station was automated in 1921.

The building is currently used as secure park storage. The use of the Oil Building is proposed to remain as secure park storage.

Preservation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the Preferred Alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the preservation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations -- Architecture

Architecture – Roof
Priority: *Low*
No recommendations at this time.

Architecture – Exterior Walls
Priority: *Low*
No recommendations at this time.

Architecture – Exterior Door
Priority: *Moderate*
Repair the knob and provide operability.

Architecture – Wall Finish
Priority: *Low*
Scrape, sand and repaint interior walls.

Architecture – Ceiling Finish
Priority: *Low*
Scrape, sand and repaint the ceiling.

Architecture – Floor
Priority: *Low*
No recommendations at this time.

Architecture – Casework
Priority: *Low*
No recommendations at this time.

Architecture – Accessibility
Priority: *Low*
Provide program access through interpretive waysides (site map).

Treatment Recommendations -- Structural

Structural – Foundation
Priority: *Low*
No recommendations at this time.

Structural – Floor Framing
Priority: *Low*
No recommendations at this time.

Structural – Roof Framing
Priority: *Low*
No recommendations at this time.

Structural – Wall Framing
Priority: *Low*
No recommendations at this time.

Structural – Lateral System
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Mechanical

Mechanical – Plumbing Systems and Fire Suppression
Priority: *N/A*

Mechanical – HVAC
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Electrical

N/A

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Low*
Recommend sampling of suspect asbestos containing materials, including adhesives, wall interiors, brick and block filler, and asbestos cement.

Hazardous Materials – Lead-Containing Paint and Lead Dust
Priority: *Moderate*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
Priority: *Low*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Low*
No action recommended.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
Recommend further investigation and sampling.

Alternatives for Treatment

One alternative treatment for consideration could be for the use by the park to include this building for interpretive use on the interior as opposed to continued use as park storage. However, due to the limited options for the necessary maintenance functions' storage at this remote site, retaining the storage use on the interior is deemed appropriate.

A second and more extreme alternative would be to remove the structure entirely. This action would be dependent on further definition of the light station's restoration period which has been to date only been defined as pre-1921. Prior to 1901, oil was stored at the separately accessed basement area. However, this alternative is not recommended due to the removal of current historic fabric.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials and affect the adjacent landscape/fabric.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource

Oil Building Photographs, 2009

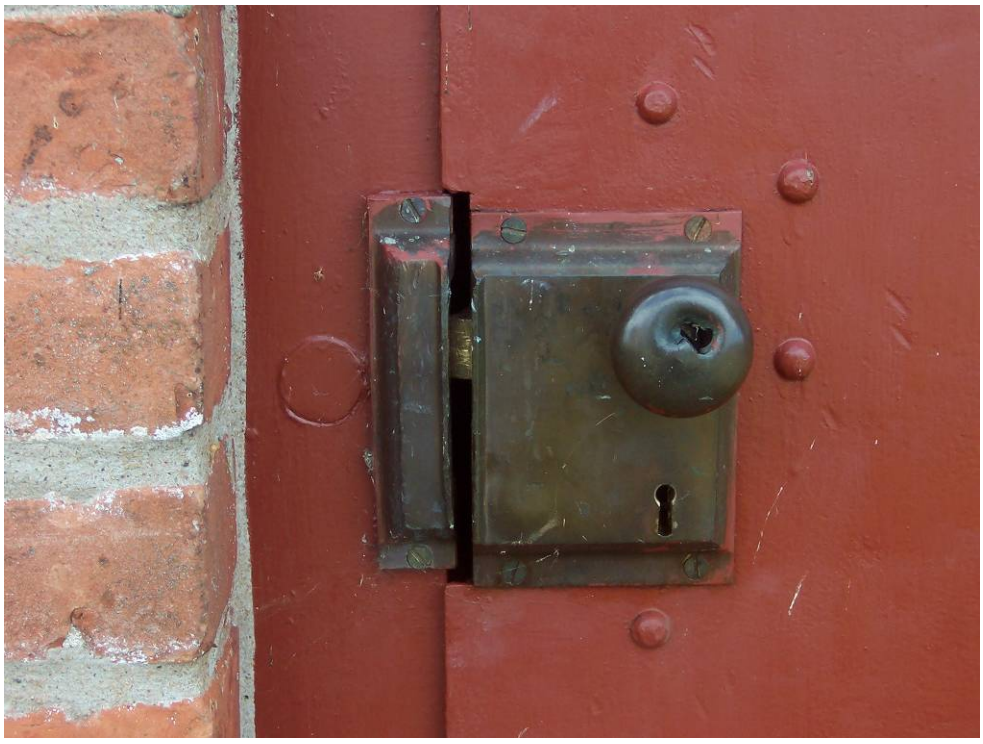
SI-OB-01: North elevation, 2009 (Source: AH DSC01244)

SI-OB-02: West elevation, 2009 (Source: AH DSC01245)

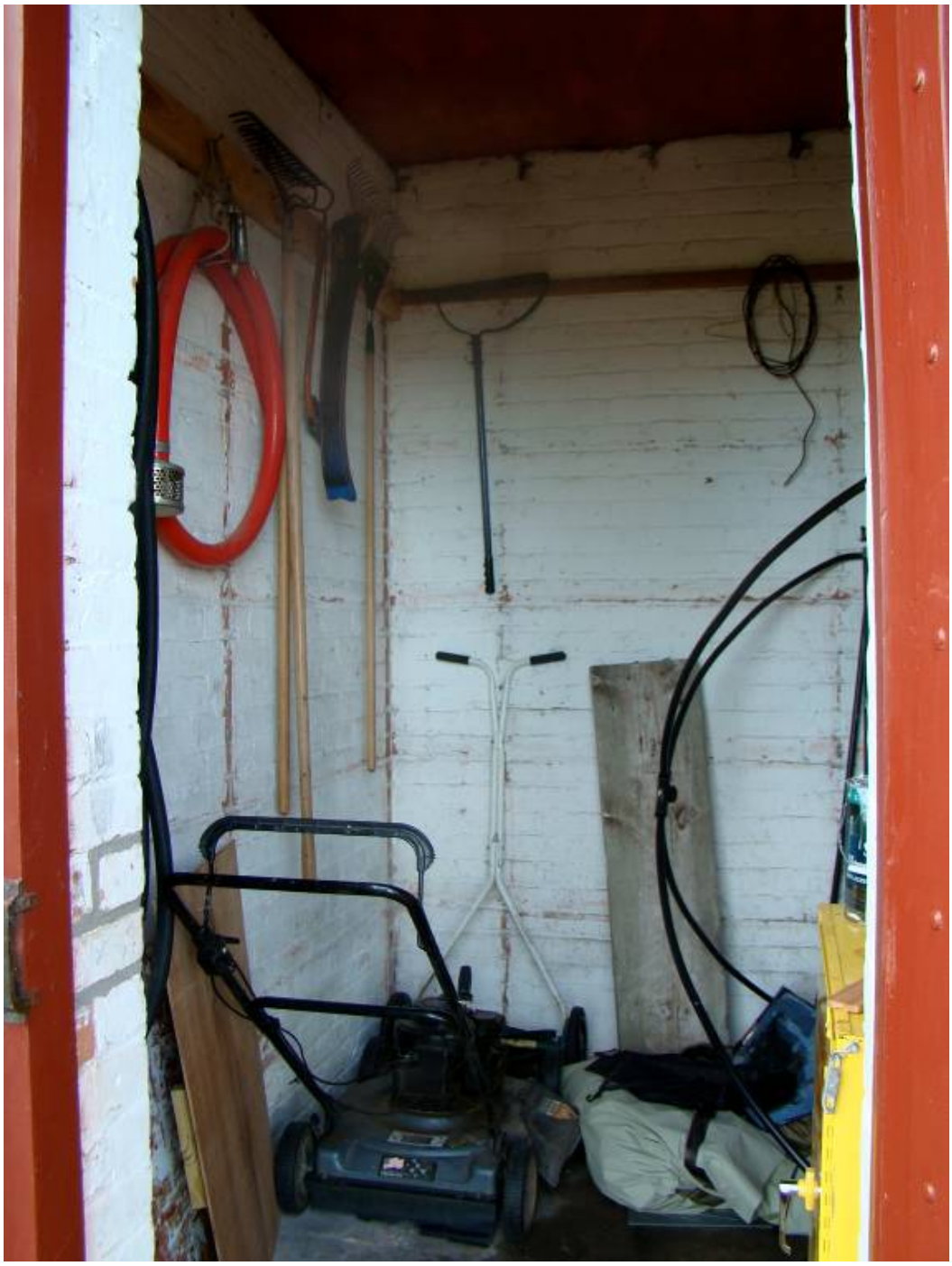
SI-OB-03: South elevation, 2009 (Source: AH DSC01246)

SI-OB-04: East elevation, 2009 (Source: AH DSC01247)

SI-OB-05: North entry door (Source: AH 100_9876)



SI-OB-06: Entry door hardware detail (Source: AH 100_9880)



SI-OB-07: South elevation, 2009 (Source: AH CIMG4205)

PRIVY

Chronology of Alterations and Use

Original Construction

The Sand Island Privy was constructed in 1881 along with the Light Station.

The existing Privy is seen in a photo c. 1900, a photo from 1904, an undated photo, a photo from 1978, and a photo from 1979. It is located south of the kitchen and does not appear to have changed significantly, especially from the 1978 photo. (Historic Image S1-15)

There are no available historic drawings for this building.

Significant Alterations / Current condition

No significant alterations have occurred to the Privy. Work completed by the Historic Structure Preservation Team from the NPS between 1998 and 2009 consisted of repointing the masonry, rehabilitating and painting the exterior woodwork, and sanding and refinishing the flooring.

The original decorative gravity vent remains on the roof. There are no other mechanical systems in the building.

There are no and were never any electrical systems in the Privy.

The Sand Island Privy is in good condition.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1920, June	June 19: "Keeper repaired screens & steps & painted them & the Toilet."	E. Luick, SI Log, Oct1, 1898 - Nov 17, 1907 and June 1, 1914- July 31, 1920
1977	Stabilization of Light Station Quarters and Privy	NPS/APIS Business Office Records D3423 for Sand Island
1978	Repoint brick and paint buildings	NPS/APIS Business Office Records D3423 for Sand Island
1981	Retuckpoint stonework and paint trim on Light Station Quarters and Privy	NPS/APIS Business Office Records D3423 for Sand Island

Notable Actions with Unknown Dates

Date Range	Work Described
1998-2009	Repointed masonry
1998-2009	Rehabilitated and painted the exterior woodwork
1998-2009	Sanded and refinished the flooring

General Physical Description

The building is a small, one-story, one room, rectangular brick utilitarian structure with a brownstone foundation. It has a simple metal gable roof with carved brackets and exposed rafter tails. The Privy is a three-seater (2 adult, 1 child). The door faces north towards the Quarters.

Physical Description -- Architecture

Architecture – Roof
The roofing is red metal shingles (the same used in the main portion of the Light Station Quarters), with a curved trim ridge cap. The roof has decorative rafter tails, gable end fascia board and barge boards similar to the style and era of the Light Station Quarters roof details. (SI-P-01)

Architecture – Exterior Walls
The exterior walls are made of two-wythe red brick running bond with rowlocks every sixth course. The walls have a brownstone foundation and are original to the building.

Architecture – Window
The window is a four-lite casement with a knob slider like the Tower casement. Trim on both the interior and exterior is simple 1x casing. The window is 1'-8" x 2'-0". (SI-P-06 and 07)

Architecture – Exterior Door
The door is two vertical over one horizontal over two vertical wood panels (same look and trim as other exterior doors). The door has a historic ceramic knob, wood threshold, and stone sill. Trim is 1x casing. Above the door is a segmented brick arch. The door measures 2'-8" x 6'-7" x 1 ¾".

Architecture – Exterior Trim
The exterior trim consists of a wood vent that appears to be original. (SI-P-05)

Architecture – Wall Finish
The wall finish is plaster on masonry, painted green, with 1 ¾" wide board wainscot on the east wall and 3 ½" beadboard on the north, south, and west walls. The wall finishes are historic.

Architecture – Ceiling Finish
The ceiling finish is original plaster over lath.

Architecture – Interior Trim
The interior trim consists of a chair rail edge at the top of the wainscot, wood, painted white.

Architecture – Floor
The floor is covered by one sheet of plywood, not original to the building.

Architecture – Casework
The Privy contains two adult (1'-5" tall) and one child (10" tall) wood privy seats, painted gray and white. (SI-P-08)

Architecture – Accessibility
This building is currently not accessible. The main door opening is 2'-8" clear with a grade to finished floor elevation change of 8" due to the stone sill.

Physical Description -- Structural

Structural – Foundation
The foundation of the Privy appears to be stone masonry but was not accessible.

Structural – Floor Framing
The floor appears to be wood framed but was not accessible.

Structural – Roof Framing
The roof framing was measured to be full-sawn (FS) 2x4 rafters spaced at about 24". The rafters span approximately three '. The rafters are supported on the exterior masonry walls. The rafters are sheathed by 1x solid wood underlayment.

Structural – Wall Framing
The walls are brick masonry.

Structural – Lateral System
Lateral stability for the building is provided by the exterior masonry walls.

Structural – Load Requirements
The required floor and roof snow load capacities are 40 psf.

Physical Description -- Mechanical

Mechanical – Plumbing Systems
None in the building.

Mechanical – HVAC
The original decorative gravity vent remains on the roof.

Mechanical – Fire Suppression
None in the building.

Physical Description -- Electrical

Electrical – System Configuration
None in the building.

Electrical – Wiring Devices
None in the building.

Electrical – Conductor Insulation
None in the building.

Electrical – Overcurrent Protection
None in the building.

Electrical – Lighting Systems
None in the building.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in the building.

Electrical – Lightning Protection
None on the building.

Physical Description -- Hazardous Materials

Landmark Environmental collected four bulk samples from a total of four different types of suspected asbestos containing materials (ACMs) at Sand Island. Of the four suspect ACMs that were sampled and analyzed, none of the sampled suspect ACMs resulted in concentrations of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding potential for damage to structures. Asbestos is assumed to be present in:

1. Plaster,
2. Wall Interiors, and,
3. Adhesives.

The assumed asbestos containing materials were observed to be in good condition.

Hazardous Materials – Lead Containing Paint
Detectable lead is assumed to be present at the following locations:

1. Interior Painted Surfaces, and,
2. Exterior Painted Surfaces.

Based on the estimated dates of construction of the various structures, intact lead containing paint is assumed to be present throughout the structure. The assumed LCP was observed to be in poor condition.

Paint chip debris was not seen on the ground surface.

Hazardous Materials – Lead Dust
Wipe sampling for lead dust was not conducted in the Privy because it is an un-inhabited structure.

Hazardous Materials – Lead in Soils
The historical paint maintenance activities may have the potential to impact the surrounding soil. The surface soils adjacent to the structure were not observed to have lead paint debris. Preliminary lead-in-soil sampling was not performed to assess whether these soils contain lead concentrations above applicable residential soil standards.

Soil Sampling was not conducted around the Privy.

Hazardous Materials – Mold
Inspections of the structure were performed to identify the readily ascertainable visual extent of the mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was not visually identified.

Character Defining Features

Mass/Form. A simple utilitarian gabled masonry structure with decorative exposed rafter tails that match those at the house.

Exterior Materials. Red brick, wood trim painted white and red metal roofing shingles.

Openings. One covered arched window opening and one five panel wood door, both painted white.

Interior Materials. Plaster, painted wood wainscot and trim.

General Condition Assessment

In general, the Sand Island Privy is in good condition on the exterior and fair condition on the interior. It is a three-seater privy, two adult seats and one child seat. The ceiling and wall finishes made of plaster are in poor condition as pieces of plaster are missing or about to fall off. The original floor is covered or has been removed and a sheet of plywood now covers the floor. The window is blocked on the exterior, but from the interior, it is a good representation of the era. The door is also in good condition.

Structurally, the Privy is in good condition.

Mechanically, the only attribute in the Privy is the decorative gravity vent, which is in good condition.

Electrically, there is no system in the Privy.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment -- Architecture

Architecture – Roof
Condition: *Good to Fair*
The shingles have been recently refinished, though there is still a rough edge at the eaves. Also, the ball closures are missing at both ends of the ridge.

Architecture – Exterior Walls
Condition: *Good*
The exterior walls are in good condition.

Architecture – Window
Condition: *Good*
The window is currently boarded up on the exterior. The interior appears to be in good condition.

Architecture – Exterior Door
Condition: *Good to Fair*
This door is in good condition, although the knob is loose and there is no escutcheon.

Architecture – Exterior Trim
Condition: *Good*
The exterior trim is in good condition.

Architecture – Wall Finish
Condition: *Good to Fair to Poor*
The plaster wall finish is in poor condition with pieces missing and large cracks. The east wall wainscot is in fair condition as one board has a large hole, most likely animal made. The beadboard wainscot on the other three walls is in good condition.

Architecture – Ceiling Finish
Condition: *Poor*
The ceiling finish is in poor condition as over half of the plaster is missing and the lath is visible. (SI-P-09)

Architecture – Interior Trim
Condition: *Good*
The trim is in good condition.

Architecture – Floor
Condition: *Good*
The modern plywood is in good condition.

Architecture – Casework
Condition: *Fair*
The privy seats are in fair condition as they have paint peeling and some splitting wood.

Architecture – Accessibility
Condition: *Poor*
This building is currently not accessible.

Condition Assessment -- Structural

Structural – Foundation
Condition: *Good*
The visible portion of the foundation appeared to be in good condition. No obvious signs of distress or damage were observed.

Structural – Floor Framing
Condition: *Unknown*
The floor framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Roof Framing
Condition: *Unknown*
The roof framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Ceiling Framing
Condition: *Good*
The ceiling framing is in good condition.

Structural – Wall Framing
Condition: *Good*
The wall framing is in good condition.

Structural – Lateral System
Condition: *Good*
Lateral stability of the building is good.

Structural – Load Requirements
Condition: *Unknown*
The floor and roof framing could not be observed, thus their capacity is unknown.

Condition Assessment -- Mechanical

Mechanical – Plumbing Systems and Fire Suppression
Condition: *N/A*

Mechanical – HVAC
Condition: *Good*
The decorative gravity vent on the roof is in good condition.

Condition Assessment -- Electrical

N/A

Condition Assessment -- Hazardous Materials

Refer to 'Physical Description -- Hazardous Materials' for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as the original privy from 1881 until 1921 when the light was automated. It was most likely still used throughout the tenant years.

The building is currently vacant. The use of the Privy is proposed as passive visitor access by means of visual access only to the interior as seen from the exterior. Various methods of allowing this could be studied and may include a Plexiglas panel (or similar product) that can be in place when the exterior door is open.

Preservation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the Preferred Alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the preservation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations -- Architecture

Architecture – Roof
Priority: *Low*
Replace the missing metal ball closures at both ends of the ridge.

Architecture – Exterior Walls
Priority: *Low*
No recommendations at this time.

Architecture – Window
Priority: *Moderate*
Remove the board at the window, scrape, sand and repaint.

Architecture – Exterior Door
Priority: *Low*
Repair the loose knob replace the missing escutcheon. Scrape, sand and repaint. Investigate installing a Plexiglas panel (or similar product) inside the door.

Architecture – Exterior Trim
Priority: *Low*
No recommendations at this time.

Architecture – Wall Finish
Priority: *Moderate*
Repair the damaged plaster, repair the east wall wainscot hole and repaint.

Architecture – Ceiling Finish
Priority: *Moderate*
Repair the damaged plaster and repaint.

Architecture – Interior Trim
Priority: *Low*
Repair as needed with wall and finish plaster work. Scrape, sand and repaint.

Architecture – Floor
Priority: *Low*
Remove the modern plywood which may be covering a recently refinished floor per park records.

Architecture – Casework
Priority: *Low*
Scrape, sand and repaint the casework.

Architecture – Accessibility
Priority: *Low*
Provide program access through interpretive waysides (site map).

Treatment Recommendations -- Structural

Structural – Foundation
Priority: *Low*
No recommendations at this time.

Structural – Floor Framing
Priority: *Low*
No recommendations at this time.

Structural – Roof Framing
Priority: *Low*
No recommendations at this time.

Structural – Ceiling Framing
Priority: *Low*
No recommendations at this time.

Structural – Wall Framing
Priority: *Low*
No recommendations at this time.

Structural – Lateral System
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Mechanical

Mechanical – Plumbing Systems and Fire Suppression
Priority: *N/A*

Mechanical – HVAC
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Electrical

N/A

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Low*
Recommend sampling of suspect asbestos containing materials, including adhesives, caulk, and asbestos-cement.

Hazardous Materials – Lead-Containing Paint and Lead Dust
Priority: *Low*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
Priority: *Low*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Low*
No recommendations at this time.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
No recommendations at this time.

Alternatives for Treatment

Although a secondary interior door (Plexiglas panel or similar product) has been proposed, consideration should be given if a physical barrier is required in allowing the Privy to be open to the public during the time of guided use at the light station. Such an addition might be more of a maintenance burden than the risk of the public entering the Privy.

Another alternative could be for the public to only experience the Privy from the exterior.

And finally, reintroducing the glass at the window could be seen as a potential risk. If the glass were to break (either by nature or vandal) it could allow the elements into the interior for a period of time before park staff were able to visit and identify the damage.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Introduce a Plexiglas panel or similar product for visual access by visitors.	- Creates a false atmospheric division at structure. - Installation methods may damage historic fabric.	Study alternative methods for allowing visitors visual access to the structure.	- Improves visitor experience
2. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials and affect the adjacent landscape/fabric.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource

Privy Photographs, 2009

SI-P-01: North elevation aerial, 2009 (Source: AH IMGP3061)

SI-P-02: West elevation, 2009 (Source: AH DSC01258)

SI-P-03: South elevation, 2009 (Source: AH DSC01259)

SI-P-04: East elevation, 2009 (Source: AH DSC01260)

SI-P-05: North elevation trim, roof and vent details (Source: AH IMGP3081)

SI-P-06: East wall and window (Source: AH 100_9873)

SI-P-07: Window hardware (Source: AH 100_9874)

SI-P-08: Interior, south elevation (Source: AH CIMG4191)

SI-P-09: Ceiling and vent detail, looking south (Source: AH CIMG4203)

GLOSSARY OF TERMS

PRIMARY TREATMENT APPROACH – PRESERVATION

Preservation standards include measures necessary to sustain the existing form, integrity, and materials of a historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. Preservation requires the retention of the greatest amount of historic fabric, including the landscape's historic form, features, and details as they have evolved over time. Limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work is permitted.

HOW TERMINOLOGY IS USED IN THE PRESERVATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities

Protect – short term and minimal measures used to stabilize and protect features, such as fencing around landscape features

Relocate – the removal and resetting of noncontributing features

Remove – the removal of nonhistoric features

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material. Replacement work will only occur when historic fabric is deteriorated beyond repair. Evaluation of restoration and low-impact options must be exhausted before replacement is considered feasible.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition. Retention of historic fabric is the primary tenet for preservation treatment of historic properties. The extent of historic fabric represents historic integrity which is fundamental to the recognition and status of historical development.

Stabilize – immediate measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

PRIMARY TREATMENT APPROACH – REHABILITATION

Rehabilitation in intended to return a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values. Rehabilitation allows for repairs, alterations, restoration of missing features, and additions necessary to enable a compatible use for a property as long as

the portions or features which convey the historical, cultural, or architectural values are preserved. Limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work is permitted.

HOW TERMINOLOGY IS USED IN THE REHABILITATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities or the restoration of missing features.

Reestablish – are those measures necessary to depict a landscape feature as it occurred historically. Reestablishment may include the replacement of missing landscape features such as views, planting patterns, spatial relationships, or small scale features.

Relocate – remove and reset noncontributing features

Remove – removal of nonhistoric features

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material. Replacement work will only occur when historic fabric is deteriorated beyond repair. Evaluation of restoration and low-impact options must be exhausted before replacement is considered feasible.

Restore – are those measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically or it may include replacement of missing features or qualities. Restoration is undertaken when a "period of significance" is determined and that period of significance (original construction or a succeeding period representing a continuum of change for the property) becomes a project goal. Restoration is only recommended when restorative details can be substantiated by documentary and physical evidence. Without indisputable evidence restorative work risks conjectural decision making, leading to inaccurate and inappropriate historical appearance. Restoration must avoid the creation of a false sense of historical development.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition. Retention of historic fabric is the primary tenet for preservation treatment of historic properties. The extent of historic fabric represents historic integrity which is fundamental to the recognition and status of historical development.

Stabilize – immediate, more extensive measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

PRIMARY TREATMENT APPROACH – RESTORATION

Restoration standards allow for the accurate depiction of a property as it appeared at a particular time in its history by means of the removal of features from other periods in its history and reconstruction of missing

features from the period of significance. The limited and sensitive upgrading of systems (mechanical, electrical, plumbing) and other code related work is appropriate.

HOW TERMINOLOGY IS USED IN THE RESTORATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities or the restoration of missing features

Relocate – remove and reset noncontributing features

Remove – removal of nonhistoric features

Reestablish – are those measures necessary to depict a landscape feature as it occurred historically. Reestablishment may include the replacement of missing landscape features such as views, planting patterns, spatial relationships, or small scale features.

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material. Replacement work will only occur when historic fabric is deteriorated beyond repair. Evaluation of restoration and low-impact options must be exhausted before replacement is considered feasible.

Restore – are those measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically or it may include replacement of missing features or qualities. Restoration is undertaken when a "period of significance" is determined and that period of significance (original construction or a succeeding period representing a continuum of change for the property) becomes a project goal. Restoration is only recommended when restorative details can be substantiated by documentary and physical evidence. Without indisputable evidence restorative work risks conjectural decision making, leading to inaccurate and inappropriate historical appearance. Restoration must avoid the creation of a false sense of historical development.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition. Retention of historic fabric is the primary tenet for preservation treatment of historic properties. The extent of historic fabric represents historic integrity which is fundamental to the recognition and status of historical development.

Stabilize – immediate, more extensive measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

CONDITION ASSESSMENT DESCRIPTION LEVELS
Feature Condition Definitions
(Note: These terms are also applied to the overall structure/building.)

GOOD The feature is intact, structurally sound and performing its intended purpose. The feature needs no repair or rehabilitation, but only routine or preventive maintenance.

FAIR The feature is in fair condition if either of the following conditions is present:
- There are early signs of wear, failure or deterioration though the feature is generally structurally sound and performing its intended purpose – or –
- There is failure of a portion of the feature.

POOR The feature is in poor condition if any of the following conditions is present:
- The feature is no longer performing its intended purpose – or –
- Significant elements of the feature are missing – or –
- Deterioration or damage affects more than 25% of the feature – or –
- The feature shows signs of imminent failure or breakdown.

UNKNOWN Not enough information is available to make an evaluation.

RATINGS OF TREATMENT SEVERITY
An impact is a detectable result of an agent or series of agents having a negative effect on the significant characteristics or integrity of a structure and for which some form of mitigation or preventative action is possible. The assessment should include only those impacts likely to affect the structure within the next five years.

The Level of Impact Severity and their definitions are given below. For all levels, except UNKNOWN, two criteria are given. At least one of the criteria must be met for the declared Level of Impact Severity.

SEVERE 1. The structure/feature will be significantly damaged or irretrievably lost if action is not taken within two (2) years.
2. There is an immediate and severe threat to visitor or staff safety.

MODERATE 1. The structure/feature will be significantly damaged or irretrievably lost if action is not taken within five (5) years.
2. The situation caused y the impact is potentially threatening to visitor or staff safety.

LOW 1. The continuing effect of the impact is known and will not result in significant damage to the structure/feature.
2. The impact and its effects are not a direct threat to visitor or staff safety.

UNKNOWN Not enough information is available to make an evaluation.

DEFINITIONS OF TERMS

A

AAS: Atomic Absorption Spectroscopy

AC: Alternating current; the movement of current through an electrical circuit that periodically reverses direction. Alternating current is the form of electric power that is delivered to businesses and residences.

ACM: Asbestos Containing Material

Accessibility: a term used to describe facilities or amenities to assist people with disabilities and can extend to Braille signage, wheelchair ramps, elevators/lifts, walkway contours, reading accessibility, etc. According to its website, the Park Service is "committed to making all practicable efforts to make NPS facilities, programs, services, employment, and meaningful work opportunities accessible and usable by all people, including those with disabilities. This policy reflects the commitment to provide access to the widest cross section of the public and to ensure compliance with the Architectural Barriers Act of 1968, the Rehabilitation Act of 1973, the Equal Employment Opportunity Act of 1972, and the Americans with Disabilities Act of 1990. The Park Service will also comply with section 507 of the Americans with Disabilities Act (42 USC 12207), which relates specifically to the operation and management of federal wilderness areas. The accessibility of commercial services within national parks are also covered under all applicable federal, state and local laws" (source: http://www.nps.gov/aboutus/eeo.htm).

AES-ICP: Atomic Emission Spectroscopy – Inductively Coupled Plasma

AIHA: American Industrial Hygiene Association

Air Terminal: A rod that extends above a surface to attract lightning strikes.

AL: Action Level

B

Beam: a structural member, usually horizontal, with a main function to carry loads cross-ways to its longitudinal axis.

Branch Circuit: Insulated conductors used to carry electricity to an associated device or devices that originate from a single circuit breaker.

BTUH: British Thermal Unit per Hour; A traditional unit of energy.

BX Cable: Cable with flexible steel armored outer tube with individual copper conductors insulated with rubber and covered with a cotton braided sheath.

C

Cantilever: refers to the part of a member that extends freely over a beam or wall, which is not supported at its end.

Cast Iron: a large group of ferrous alloys that are easily cast. Cast iron tends to be brittle and is resistant to destruction and weakening by oxidation. The amount of carbon in cast irons is 2.1 to 4 wt%.

CFR: Code of Federal Regulation

Cistern: An underground receptacle for storage of liquids, usually water.

Clay Sewer: Sewer pipe made from vitrified clay that is highly resistant to corrosion.

Column: a main vertical member that carries axial loads from beams or girders to the foundation parallel to its longitudinal axis.

D

DC: Direct current; the unidirectional flow of current through an electrical circuit. Direct current is produced through such sources as batteries, thermocouples, or photovoltaic solar cells.

Dead Load: describes the loads from the weight of the permanent components of the structure.

Deflection: the displacement of a structural member or system under a load.

DRO: Diesel-Range Organics

E

ELPAT: Environmental Lead Proficiency Analytical Testing

EMT: Electro-metallic tubing; A metallic tube raceway that is used to carry and protect current carrying conductors or cables.

EPA: Environmental Protection Agency

F

Flue Vent: A duct or pipe conveying combustion by-products from a heater or furnace.

Fluorescent: A source of light that emits light radiation at longer wavelengths and lower energy.

Footing: a slab of concrete or an assortment of stones under a column, wall, or other structural member to transfer the loads of the member into the surrounding soil.

Foundation: supports a building or structure.

FRP: Fiberglass reinforced plastic

Full Sawn (FS): Lumber cut, in the rough, to its full nominal size.

G

Gable: located above the elevation of the eave line of a double-sloped roof.

Galvanized Steel: Steel coated with zinc carbonate to resist corrosion.

GPM: Gallon per minute; a standard unit of volumetric liquid flow rate.

Grade: the ground elevation of the soil.

Gravity Vent: Openings in a roof intended to vent hot air by the action of convection.

Gray Water: Wastewater generated from domestic washing activities and not containing human waste.

GRO: Gasoline Range Organics

H

Header: a member that carries joists, rafters or beams and is placed between other joists, rafters or beams.

Hip Roof: a roof sloping from all four sides of a building.

HUD: Housing and Urban Development

HVAC: Heating, Ventilation, and Air Conditioning.

I

IAQ: Indoor Air Quality

IEUBK: Integrated Exposure Uptake Biokinetic

Incandescent: A source of light that works by incandescence, or works by a heat-driven light emission through black-body radiation.

Inverter: A device that converts electrical direct current (DC) to electrical alternating current (AC).

J

Joist: a horizontal structural load-carrying member which supports floors and ceilings.

K

kVA: Kilovolt-ampere equal to 1,000 volt-amperes. kVA is a unit to express the apparent power consumed in an electrical circuit or electrical device.

kW: Kilowatt equal to 1,000 watts. A kilowatt is typically used to express the output power consumption of large devices or electrical systems.

L

LBP: Lead-Based Paint

LCP: Lead-Containing Paint

LCS: Lead-Contaminated Soils

Leach Field: A drain field used to remove contaminants and impurities from liquid that emerges from a septic tank.

LED: Light emitting diode; a semiconductor light source that can emit light in various colors and brightness.

Live Load: nonpermanent loads on a structure created by the use of the structure.

Load: an outside force that affects the structure or its members.

Louver: An opening with horizontal slats angled to allow passage of air while keeping out rain and snow.

M

Mg/kg: Milligrams per Kilogram

N

NEC: National Electric Code.

NESHAP: National Emission Standards for Hazardous Air Pollutants

Nonpotable Water: Water that has not been approved for safe human consumption.

NVLAP: National Voluntary Laboratory Accreditation Program

O

OSHA: Occupational Safety and Health Administration

Overcurrent Protection: A fuse, circuit breaker or relay that will open the electrical circuit when the downstream electrical current exceeds the stated current rating.

P

Passive Ventilation: Ventilation of a building without the use of a fan or other mechanical system.

Pitch: the slope of a member defined as the ratio of the total rise to the total run.

PLM: Polarized Light Microscopy

PV: Photovoltaic; An array of solar modules or cells that collect solar energy and convert the energy into direct current electricity.

PVC: Polyvinyl Chloride; A biologically and chemically resistant plastic widely used for household sewage pipe.

R

Rafter: a sloped structural load-carrying member which supports the roof.

RBM: Regulated/Hazardous Material

Reaction: the force or moment developed at the points of a support.

RLM: Industrial stem mounted reflector.

Romex: Wiring with rubber insulated conductors in an overall sheath of braided cotton fiber.

S

Seismic Load: loads produced during the seismic movements of an earthquake.

Septic Tank: A sewage tank containing anaerobic bacteria which decomposed waste discharged into tank.

Shear: forces resulting in two touching parts of a material to slide in opposite directions parallel to their plane of contact.

Shelter: a structure that can be used for rustic camping in the event that staff are not able to leave the island due to weather. No utilities are provided.

Snow Load: loads produced from the accumulation of snow.

Span: the distance between supports.

Step-down Transformer: A device that converts a high voltage down to a lower voltage through a series of winding coils.

Structural Steel**:** an iron alloy with a carbon content of 0.16% to 0.29%. Steel is malleable, and easily welded.

Strut: a structural brace that resists axial forces.

Stud: a vertical wall member used to construct partitions and walls.

T

Thermal Expansion Tank: A tank used in a closed water heating system to absorb excess water pressure caused by thermal expansion.

TSI: Thermal System Insulation

Turbine Vent: Vents utilizing rotating wind vanes to create air flow.

V

Vent Stack: A vertical pipe proving ventilation.

W

WAC: Wisconsin Administrative Code

WDNR: Wisconsin Department of Natural Resources

Wrought Iron: an iron alloy with very low carbon content, in comparison to steel. Wrought iron is tough, malleable, ductile, and easily welded.

X

XRF: X-ray fluorescence analyzer

Other

30 µg/m3: 30 micrograms per cubic meter

µg/SF: Micrograms of Lead Dust per Square Foot of Floor Space

1x: Piece of dimensional lumber 1" (nominal) / ¾" (actual) thick

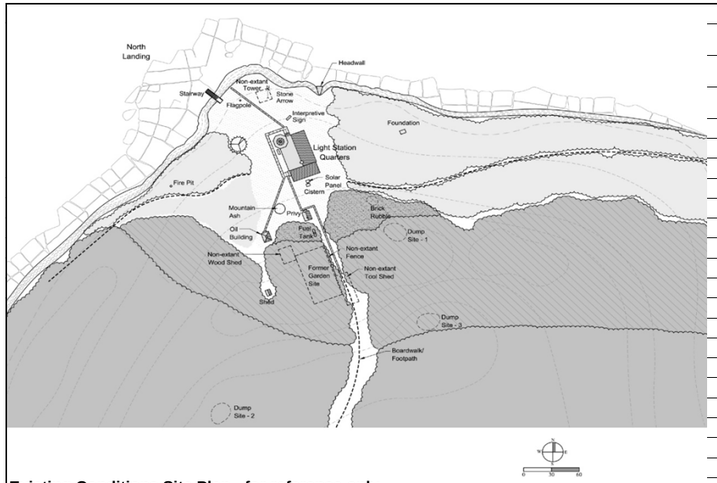
APPENDIX A: MATRIX OF TREATMENT ALTERNATIVE

SAND ISLAND

PREFERRED ALTERNATIVE: RESTORATION, LUICK PERIOD (c.1881-1921)

A NAVIGATIONAL CONTINUUM

REVISED 07.12.2011



Existing Conditions Site Plan - for reference only

General Description:
This alternative brings forward the story of navigation of Apostle Islands as a system of six light stations through the rehabilitation of the cultural landscape with an emphasis on restoration. The intent is to rehabilitate individual light stations to best convey the period that is most significant to the island and that most successfully depicts its role in navigation during the period of significance. Restoration of missing features is allowed under this treatment alternative as is removal of non-contributing features, and repair of contributing features. Restoration of missing features may occur where the significance of the feature or space outweighs the loss of extant features, and where substantial physical and documentary evidence exist for the restoration.

Period of Significance: 1881-1921

	Light Station Tower & Quarters	Oil Building	Privy		
Proposed Use of Building	Restore to pre-1921 era visitor access for both floors and Tower. "Shelter" housing at second floor.	Preserve and maintain current use as NPS storage.	Preserve; plexi panel at door to allow visitor visual access.		
Architecture	Reroof and correct existing gutter drainage problems; Increase ventilation from basement to tower; repair spot rusting at the Tower; Replace broken/missing glass at the Lantern; Repair access door to walk; add handrails at stairs; Restore openings and closet at front bedroom; Repair plaster/gyp at areas of damage on walls and ceilings; Repaint walls, ceilings, windows, doors and trim on interior; Add ramping at exterior for ABAAS access; Investigate if original flooring is in situ remove newer flooring as possible; Refinish wood floors; investigate adding a guardrail at the Tower walk without compromising historic integrity.	Repair door hardware for operability; repaint at interior	Replace missing ball closures at ridge; Repair hardware and replace missing escutcheon; install plexi panel system (operable) to allow visitor to see in but closeable to maintain security and weather tight closure		
Structural	Reduce the humidity level to reduce the moisture content of the first floor joists, properly frame the first floor joists at the windows, investigate the roof framing of the kitchen and strengthen if necessary	No action at this time	No action at this time		
Mechanical	Increase ventilation for moisture control. Replace rusted propane piping. Drain, clean, and seal cistern under kitchen. Allow for historic rainwater capture system to be interpreted. Remove propane piping to refrigerator and stove.	No action at this time.	No action at this time.		
Electrical	Provide additional PV power to facilitate running of new ventilation equipment as needed. Remove existing lightning protection system prior to re-roofing and install new lightning protection system after re-roofing.	No action at this time.	No action at this time.		
HazMat	Water intrusion mitigation; soil characterization (lead); asbestos sampling of materials to be preserved/stabilized; remove/stabilize lead paint; general clean to remove lead dust	Remove/stabilize lead paint	Asbestos sampling of materials to be stabilized, remove/stabilize lead paint		
Accessibility	Add a freestanding ramp at the kitchen door and increase the door opening width. Exhibits and media presentation in the kitchen will provide program access to the 2nd floor and tower.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.		

APPENDIX B: SUMMARY OF HAZARDOUS MATERIAL FINDINGS

SAND ISLAND LIGHT STATION QUARTERS

Building Number	LCS ID 006381
Building Name	Sand Island Light Station Quarters
>1% Asbestos Confirmed	
Asbestos Assumed[41]	Drywall, Plaster, Adhesives, Wall Interiors, Brick/Block Filler, Roofing Materials and Transite
Detectable Lead in Paint Confirmed	Window Sash and Trims, Doors and Trims, Painted Walls, Ceilings and Tower
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [42]	First Floor and Second Floor Flooring
Lead Dust on Floors >40 µg/SF Assumed [2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed [2]	
Visual Mold	Yes
Lead in Soils >50 mg/kg[43]	Roof Drip line and 5'-0" from Roof Drip line
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[41] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[42] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[43] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to non-industrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

OIL BUILDING

Building Number	LCS ID 006382
Building Name	Sand Island Oil Building
>1% Asbestos Confirmed	
Asbestos Assumed[44]	Block Filler, Adhesives and Wall Interiors
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [45]	
Lead Dust on Floors >40 µg/SF Assumed [2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed [2]	
Visual Mold	
Lead in Soils >50 mg/kg[46]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	Yes

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[44] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[45] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[46] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to non-industrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

PRIVY

Building Number	LCS ID 006383
Building Name	Sand Island Privy
>1% Asbestos Confirmed	
Asbestos Assumed[47]	Wall Plaster, Wall Interiors and Adhesives
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [48]	
Lead Dust on Floors >40 µg/SF Assumed [2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed [2]	
Visual Mold	
Lead in Soils >50 mg/kg[49]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	Yes

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[47] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[48] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[49] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to non-industrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

APPENDIX C: MATERIAL ANALYSIS REPORTS, SAND ISLAND

SAND ISLAND ACM SAMPLE CHART

Sample #	Sample Date	API ID	Sample Location	Material Description	Laboratory Result
B-SILH-MA1-01	9/17/2009	25154	Light Station Quarters – Kitchen	Yellow adhesive and Black/multi-colored resinous material	ND
B-SILH-SF1-01	9/17/2009	25154	Light Station Quarters - Kitchen	White/multi-colored sheet vinyl and Brown fibrous backing w/ red resinous material	ND
B-SILH-WT1-01	9/17/2009	25154	Light Station Quarters - Rear hallway to tower	White Plaster wall texture	ND
B-SILH-TP1-01	9/17/2009	25154	Tower	White Plaster over brick	ND

ND=None Detected
TR=Trace, <1% Visual Estimate

SAND ISLAND LEAD SAMPLE CHART

Sample ID	Sample Type	API ID	Sample Location	Sample Date	Reporting Limit (ug/sq ft)	Lead Concentration (ug/sq ft)
S-SILH-01	Soil Composite	25154	Light Station Quarters dripline	9/17/2009	15.7	18.8
S-SIKQ-01	Soil Composite	25154	Light Station Quarters – 5’-0” from dripline	9/17/2009	15.7	139

APPENDIX D: FABRIC ANALYSIS

Fabric Analysis
Sand Island Lighthouse
Apostle Island National Lakeshore
October 19, 2009

On Tuesday, October 6, 2009, David Arbogast, architectural conservator, of Davenport, Iowa, received a large box containing paint and mortar samples from Elizabeth Hallas, AIA, LEED AP, Senior Associate of Anderson Hallas Architects, PC of Golden, Colorado. She is in the process of preparing Historic Structures Reports for the historic lighthouse complexes of the Apostle Islands National Lakeshore, headquartered in Bayfield, Wisconsin. As part of the HSR's paint and mortar/plaster analysis is required in an attempt to ascertain historic finishes, mortars, and plasters for the subject structures. The samples were divided into sets contained within large manila mailing envelopes. The analysis follows the order in which the large envelopes have been arranged. The seventh set which is contained within this report was from the set of samples collected from the complex at the Sand Island Light. There were 28 samples in the set, of which 24 were paint samples and seven (nos. 1, 2, 9, 10, 11, 27, and 28) were of plaster and mortar.

During the preceding twenty or more years Mr. Arbogast has performed paint analyses for various structures at the Apostles Islands. Those samples and his reports are in the archives at the headquarters in Bayfield and may be examined in relation to the findings from this analysis.

Samples 1 and 2 from Sand Island consisted of mortar. These were analyzed on Monday, October 19, utilizing the standard testing procedure developed by E. Blaine Cliver, Regional Historical Architect of the North Atlantic Region of the National Park Service.

The first sample was collected from the mortar of the oil house. It was analyzed on Monday, October 19 using the same procedures as with the other mortar and plaster samples of the various lighthouse complexes at the Apostle Islands National Lakeshore. The sand was dark tan in color and was moderately soft. Its analysis produced a substantial quantity of fines relative to the sand. If the fines are considered to be dirt associated with the sand, then an amount of roughly two parts of sand to each part of lime, by volume, was used to produce the mortar. The sand sieve analysis revealed fine sand of which almost 28% passed all of the sieves, over 38% was trapped in the finest sieve and over 23% was trapped in the next finest sieve, #40.

The second sample was found on the mortar patch of the oil house. It was gray and was moderately soft. It created a relatively small water displacement and its fast and bubbly reaction was followed by a prolonged reaction. It appears that the patch was composed of a typical restoration mixture containing lime, a small amount of Portland cement, and sand. The sand sieve analysis produced relatively coarse sand. Although all of it easily passed the largest sieve the remainder was relatively evenly distributed among the four remaining sieves with slightly over 15% passing all of the sieves.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 1
Building: Oil House, Sand Island, Apostle Islands NL
Location: Mortar
Sample Description: Dark tan, moderately soft, fast and bubbly reaction, rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1.	187.8 Container A weight	8.	No Hair or fiber type
2.	198.5 Container A and sample	9.	3.7 Fines and paper weight
3.	761.49 Barometric pressure	10.	2.9 Filter paper weight
4.	23 Temperature	11.	194.2 Sand and Container A weight
5.	0.10 Liters of water displaced	12.	4.7 cc. of sand
6.	Yellow-green Filtrate color	13.	35.1 Weight of graduated cylinder and sand
7.	Tan Fines color	14.	28.7 Weight of graduated cylinder

Computations:

15.	10.7	Starting weight of sample: No. 2 – No. 1
16.	0.8	Weight of fines: No. 9 – No. 10
17.	6.4	Weight of sand: No. 11 – No. 1
18.	.73475	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	3.5	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.0041139	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	0 41	Gram weight of CaCO3: 100 x No. 20
22.	3.09	Gram weight of Ca(OH)2: No. 19 – No. 21
23.	.0417	Mols. of Ca(OH)2: No. 22 divided by 74
24.	3.39	Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.	0.18	Gram weight CO2: No. 20 x 44
26.	2.02	Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.	8.91	%CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	10.52	Gram weight of sample:	No. 15 – No. 25
29.	7.60	Fine parts/volume:	No. 16 divided by No. 28
30.	44.70	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.	35.45	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.		Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.		Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.		Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.7	0.1	1.54
No. 20	106.6	106.4	0.2	3.08
No. 30	99.7	99.3	0.4	6.15
No. 40	102.2	100.7	1.5	23.08
No. 50	95.7	93.2	2.5	38.46
Base	73.0	71.2	1.8	27.69

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 2
Building: Oil House, Sand Island, Apostle Islands NL
Location: Mortar patch
Sample Description: Gray, moderately soft, fast and bubbly reaction followed by prolonged reaction, rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1.	191.9 Container A weight	8.	No Hair or fiber type
2.	205.8 Container A and sample	9.	3.4 Fines and paper weight
3.	761.49 Barometric pressure	10.	3.0 Filter paper weight
4.	23 Temperature	11.	203.1 Sand and Container A weight
5.	0.20 Liters of water displaced	12.	9.9 cc. of sand
6.	Yellow-green Filtrate color	13.	39.9 Weight of graduated cylinder and sand
7.	Tan Fines color	14.	28.7 Weight of graduated cylinder

Computations:

15.	13.9	Starting weight of sample: No. 2 – No. 1
16.	0.4	Weight of fines: No. 9 – No. 10
17.	11.2	Weight of sand: No. 11 – No. 1
18.	.5893	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	2.3	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.082278	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	0 82	Gram weight of CaCO3: 100 x No. 20
22.	1.48	Gram weight of Ca(OH)2: No. 19 – No. 21
23.	.01997	Mols. of Ca(OH)2: No. 22 divided by 74
24.	7.57	Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.	0.36	Gram weight CO2: No. 20 x 44
26.	4.50	Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.	8.00	CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	13.54	Gram weight of sample:	No. 15 – No. 25
29.	2.95	Fine parts/volume:	No. 16 divided by No. 28
30.	48.75	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.		Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.		Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.		Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.	3.25	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0

No. 20	108.6	106.4	2.2	19.82
No. 30	101.5	99.3	2.2	19.82
No. 40	103.4	100.8	2.6	23.42
No. 50	95.6	93.2	2.4	21.62
Base	72.9	71.2	1.7	15.32

Analysis of the paint samples began on Monday, October 19, following the same procedures used for the previous sets of samples. Numbering of the samples began with number 3 and ended with number 28. The following results were obtained from the analysis:

Oil House

Sample 3	**Munsell**
Dark maroon	7.5R 3/4
Dark maroon	7.5R 3/4
Orange-red	10R 6/8
Charcoal	N 2.0/
Orange-red	10R 6/8

The third sample was collected from the oil house trim. Beneath the pair of dark maroon paint layers was a mixture of orange-red and charcoal paints. The orange-red is a typical color for red lead prime paint for ferrous metals.

Privy

Sample 4	**Munsell**
White	N 9.5/

The fourth sample came from the privy interior trim. It retained a single layer of stark white paint on its sound wood substrate.

Privy

Sample 5	**Munsell**
Pastel green	5G 9/2
Pastel green	5G 9/2
Gray-green	5G 6/1
Light gray-green	5G 7/1
Light gray-green	5G 7/1
Light gray-green	5G 7/1
Green	5G 6/2
Dark green	5G 4/2

The fifth sample was removed from the privy interior. It revealed a set of eight paint layers on its plaster substrate with dark green being the oldest surviving layer.

Lighthouse and Keeper's Quarters

Sample 6	**Munsell**
White	N 9.5/

White	N 9.5/
White	N 9.5/

The sixth sample was from the exterior shutter of the lighthouse and keeper's quarters. Its analysis revealed three white paint layers on a sound wood substrate.

Lighthouse and Keeper's Quarters

Sample 7	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/
Black	N 1.0/
Gray	N 6.0/

The seventh sample was found on the exterior window of the lighthouse and keeper's quarters. In addition to the three white paint layers observed in the previous sample there was an older layer of black paint with a layer of gray paint beneath it.

Lighthouse and Keeper's Quarters

Sample 8	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/

The eighth sample was collected from the exterior siding of the lighthouse and keeper's quarters. It revealed the three white layers seen in its two predecessors. The substrate was sound wood.

The ninth sample was a mortar sample taken from the exterior mortar patch of the lighthouse and keeper's quarters. It was tan in color and relatively hard and brittle. Its reaction was quite prolonged which is typically indicative of Portland cement content. Its very small water displacement is also typical of Portland cement. However, it filtered rapidly, which may be more of a factor of its small size than of lime content. It also had a very small amount of fines which is not typical of Portland cement which frequently generates gelatinous by-products which results in a large amount of fines. Thus, it may be a standard restoration mortar using lime, Portland cement, and sand. Its sand sieve analysis revealed average sand. In an interesting anomaly equal amounts were trapped in sieves #30, #40, and #50.

The tenth sample was of the mortar of the lighthouse and keeper's quarters. It was moderately hard and grayish-tan in color. A fast and bubbly reaction was followed by a prolonged reaction which produced a relatively large water displacement. Those indicators point toward a mixture of lime, Portland cement, and sand. The sand sieve analysis revealed fine sand of which all passed the largest sieve. Interestingly, equal amounts were trapped in sieves #40 and #50.

The eleventh sample was collected from the new entry mortar of the light keeper's quarters. It was gray in color and was moderately soft, but brittle. It had a fast and bubbly reaction which was followed by a prolonged reaction. There was a significant water displacement. Its filtering was quite slow, requiring over a day as opposed to an hour for samples with very rapid filtering. These aspects point toward a mortar composed of lime, Portland cement, and sand. The sand sieve analysis used a large sample weighing 35.9

grams, which provides greater statistical reliability than most of the other sand samples in this report. As such, virtually all of it passed the largest sieve and well over 11% passed all of the sieves. Almost exactly 30% was trapped in the finest sieve and almost 38% was trapped in sieve #40.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 9
Building: Lighthouse and Keeper's Quarters, Sand Island, Apostle Islands NL
Location: Exterior mortar patch
Sample Description: Tan, moderately hard and brittle, prolonged reaction, rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1.	185.5 Container A weight	8.	No Hair or fiber type
2.	192.5 Container A and sample	9.	3.1 Fines and paper weight
3.	761.75 Barometric pressure	10.	2.9 Filter paper weight
4.	23 Temperature	11.	191.2 Sand and Container A weight
5.	0.03 Liters of water displaced	12.	3.6 cc. of sand
6.	Champagne Filtrate color	13.	34.6 Weight of graduated cylinder and sand
7.	Tan Fines color	14.	28.8 Weight of graduated cylinder

Computations:

15.	7.0	Starting weight of sample: No. 2 – No. 1
16.	0.2	Weight of fines: No. 9 – No. 10
17.	5.6	Weight of sand: No. 11 – No. 1
18.	.642857	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	1.2	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.0012346	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	0.12	Gram weight of CaCO3: 100 x No. 20
22.	1.08	Gram weight of Ca(OH)2: No. 19 – No. 21
23.	.0145	Mols. of Ca(OH)2: No. 22 divided by 74
24.	1.17	Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.	0.05	Gram weight CO2: No. 20 x 44
26.	0.69	Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.	7.25	%CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	5.83	Gram weight of sample:	No. 15 – No. 25
29.	3.43	Fine parts/volume:	No. 16 divided by No. 28
30.	61.75	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.		Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.		Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.		Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.		Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0.00
No. 20	107.2	106.4	0.8	14.04
No. 30	100.6	99.3	1.3	22.81
No. 40	102.1	100.8	1.3	22.81
No. 50	94.5	93.2	1.3	22.81
Base	72.2	71.2	1.0	17.54

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 10
Building: Lighthouse and Keeper's Quarters, Sand Island, Apostle Islands NL
Location: Mortar
Sample Description: Gray-tan, moderately hard, fast and bubbly reaction followed by prolonged reaction, moderate filtering time

Test No. 1 – Soluble Fraction

Data:

1.	188.9 Container A weight	8. No	Hair or fiber type
2.	203.6 Container A and sample	9. 4.0	Fines and paper weight
3.	761.75 Barometric pressure	10. 3.0	Filter paper weight
4.	23 Temperature	11. 197.4	Sand and Container A weight
5.	0.46 Liters of water displaced	12. 7.0	cc. of sand
6.	Yellow-green Filtrate color	13. 37.3	Weight of graduated cylinder and sand
7.	Tan Fines color	14. 28.8	Weight of graduated cylinder

Computations:

15. 14.7 Starting weight of sample: No. 2 – No. 1
16. 1.0 Weight of fines: No. 9 – No. 10
17. 8.5 Weight of sand: No. 11 – No. 1
18. .82353 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 5.2 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.01893 Mols. Of CO_2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 1.89 Gram weight of $CaCO_3$: 100 x No. 20
22. 3.31 Gram weight of $Ca(OH)_2$: No. 19 – No. 21
23. .0447 Mols. of $Ca(OH)_2$: No. 22 divided by 74
24. 4.71 Gram total weight of $Ca(OH)_2$: 74 x (No. 20 + No. 23)
25. 0.83 Gram weight CO_2: No. 20 x 44
26. 2.80 Gram weight total possible CO_2: 44 x (No. 20 + No. 23)
27. 29.64 %CO_2 gain: No. 25 divided by No. 26

Conclusions:

28. 13.87 Gram weight of sample: No. 15 – No. 25

29.	7.21	Fine parts/volume:	No. 16 divided by No. 28
30.	50.47	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.		Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.		Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.		Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.	1.59	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0.00
No. 20	106.6	106.4	0.2	2.33
No. 30	100.1	99.2	0.9	10.47
No. 40	104.0	100.8	3.2	37.21
No. 50	96.4	93.2	3.2	37.21
Base	72.3	71.2	1.1	12.79

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 11
Building: Light keeper's Quarters, Sand Island, Apostle Islands NL
Location: New entry mortar
Sample Description: Light gray, brittle, moderately soft, fast and bubbly reaction followed by prolonged reaction, slow filtering time

Test No. 1 – Soluble Fraction

Data:

1.	185.1	Container A weight	8.	No	Hair or fiber type
2.	206.1	Container A and sample	9.	3.0	Fines and paper weight
3.	761.75	Barometric pressure	10.	2.9	Filter paper weight
4.	23	Temperature	11.	200.6	Sand and Container A weight
5.	0.46	Liters of water displaced	12.	9.3	cc. of sand
6.	Yellow-green	Filtrate color	13.	44.3	Weight of graduated cylinder and sand
7.	Off-white	Fines color	14.	28.8	Weight of graduated cylinder

Computations:

15.	21.0	Starting weight of sample: No. 2 – No. 1
16.	0.1	Weight of fines: No. 9 – No. 10
17.	15.5	Weight of sand: No. 11 – No. 1
18.	.60	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	5.4	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.01893	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	1.89	Gram weight of CaCO3: 100 x No. 20
22.	3.51	Gram weight of Ca(OH)2: No. 19 – No. 21

23. .0474	Mols. of Ca(OH)2: No. 22 divided by 74	
24. 4.91	Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)	
25. 0.28	Gram weight CO2: No. 20 x 44	
26. 2.92	Gram weight total possible CO2: 44 x (No. 20 + No. 23)	
27. 9.59	%CO2 gain: No. 25 divided by No. 26	

Conclusions:

28. 20.72	Gram weight of sample:	No. 15 – No. 25
29. 0.48	Fine parts/volume:	No. 16 divided by No. 28
30. 44.88	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31. 27.36	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34. 1.06	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	107.0	106.8	0.2	0.56
No. 20	108.7	106.4	2.3	6.40
No. 30	104.1	99.2	4.9	13.65
No. 40	114.4	100.8	13.6	37.88
No. 50	104.0	93.2	10.8	30.08
Base	75.3	71.2	4.1	11.42

Lighthouse and Keeper's Quarters

Sample 12	**Munsell**
White	N 9.5/
Gray	5Y 6/1
Gray-green	10G 6/1
Gray-green	10G 6/1
Gray-green	10G 6/1
Dark green	10G 5/2
Gray	5Y 7/1

The twelfth sample continued the paint sample series. It was collected from the kitchen wall. It revealed seven paint layers of which the oldest gray layer was relatively thick.

Lighthouse and Keeper's Quarters

Sample 13	**Munsell**
Navy blue	10B 3/6
Off-white	2.5Y 9/3
Cream	2.5Y 8.5/2

The thirteenth sample was from the interior side of the summer kitchen window. The navy blue top layer was easily disengaged from the off-white layer beneath it. Cream was the oldest color observed on the sound wood substrate.

Lighthouse and Keeper's Quarters

Sample 14	**Munsell**
Navy blue	10B 3/6
Navy blue	10B 3/6
Navy blue	10B 3/6
Gray	5Y 7/1
Gray	5Y 6/1
Gray	5Y 7/1
Gray	5Y 7/1
Gray	5Y 7/1
Gray	5Y 6/1
Gray	5Y 7/1
Gray	5Y 6/1
Gray	5Y 7/1
Dark gray	5Y 4/1
Dark gray	5Y 4/1
Gray	5Y 6/1
Gray	5Y 6/1
Dark gray	5Y 4/1
Dark gray	5Y 4/1
White	5Y 9/1
Warm gray	5Y 7/2

The fourteenth sample was removed from the summer kitchen stair. Its quality was quite remarkable with clearly distinguished paint layers. All the layers beneath the navy blue paint layers exhibited yellowing which is a characteristic of oil-based paints. Warm gray (probably originally just gray) is the oldest surviving color.

Lighthouse and Keeper's Quarters

Sample 15	**Munsell**
White	5Y 9/1
White	5Y 9/1
Gray	5Y 7/1

The fifteenth sample was taken from the interior door trim. It revealed three paint layers of which gray was the oldest. Its apparent oil content had caused it to yellow over time.

Lighthouse and Keeper's Quarters

Sample 16	**Munsell**
Light blue	5B 9/2
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Beige	7.5YR 7.5/3

The sixteenth sample was collected from the parlor wall. It did not retain any substrate and revealed five layers of paint with beige as the oldest of the set.

Lighthouse

Sample 17	**Munsell**
White	N 9.5/
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Warm gray	5Y 7/2

The seventeenth sample came from the interior window trim of the lighthouse. Although it revealed only five paint layers on its sound wood substrate, the oldest warm gray matched the oldest layer observed in sample 14 above.

Lighthouse and Keeper's Quarters

Sample 18	**Munsell**
Light blue	5B 8/2
White	N 9.5/

The eighteenth sample was removed from the entry. It was somewhat enigmatic. The two paint layers listed above were adhered to a thick paper layer beneath which was a relatively thick (for paint) or extremely thin (for plaster) layer of lime-based (reactive with hydrochloric acid) yellow layers (5Y 8/4) beneath which was a stark white (N 8.5/) layer of lime. These could represent either the very thin skim coat of plaster or a layer of whitewash with a layer of yellow calcimine paint on its surface.

Lighthouse and Keeper's Quarters

Sample 19	**Munsell**
Whitewash	N 9.5/

The nineteenth sample was from the light tower. It consisted of a relatively thick accumulation of whitewash layers. These dissolved entirely in hydrochloric acid.

Lighthouse and Keeper's Quarters

Sample 20	**Munsell**
White	5Y 9/1
Green	10G 6/2
Light blue	10B 9/2

The twentieth sample was found on the kitchen chase. Although it only retained three finish layers, the oldest layer appeared to be calcimine paint because it reacted with hydrochloric acid.

Lighthouse and Keeper's Quarters

Sample 21	**Munsell**
White	N 9.5/

Sample 21 was taken from the basement brick wall. It consisted of a thick accumulation of whitewash layers which reacted completely with hydrochloric acid.

Lighthouse and Keeper's Quarters

Sample 22	**Munsell**
Light green	5G 8/1
Light green	5G 8/1
Gray-green	5G 7/1
Gray-green	5G 7/1
Gray-green	5G 7/1

Sample 22 was collected from the wall of bedroom 1. It retained five distinct layers of paint on its plaster substrate of which the three oldest were all gray-green.

Lighthouse and Keeper's Quarters

Sample 23	**Munsell**
Light blue	2.5B 8/2

Sample 23 came from the wall of the second floor hallway. There was only a single layer of light blue paint on its plaster substrate.

Lighthouse and Keeper's Quarters

Sample 24	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

Sample 24 was found on the baseboard trim of bedroom 2. The four layers of white paint on its wood substrate appear to have been oil-based and to have yellowed as a result of the oil content.

Lighthouse and Keeper's Quarters

Sample 25	**Munsell**
Khaki	7.5Y 7/4

Sample 25 was taken from the closet of the second floor. There was a single finish layer on its surface which was extremely thin.

Lighthouse and Keeper's Quarters

Sample 26	**Munsell**
Navy blue	10B 3/6
Gray	N 5.0/
Dark gray	N 3.75/
Gray	N 5.0/
Dark gray	N 3.75/
Gray	N 6.5/
Charcoal	N 1.5/

Gray	N 5.0/
Charcoal	N 1.5/

Sample 26 was collected from the floor of bedroom 1 on the second floor. Relative to the wall and baseboard samples, this revealed an extraordinary number of layers. Floors tend to get painted more frequently because their finishes are more prone to abrasion and loss.

Sample 27 continued the mortar and plaster samples. It was a plaster sample taken from the second floor closet. It was tan in color with bits of stark white plaster having paint on their surface. The white bits were probably the skim coat. There was a relatively small water displacement. Interestingly, the filtrate was quite clear although the acid is has a natural yell-green color prior to filtering. The white portion completely disappeared and did not reappear as fines as was the case with gypsum plaster. The fines were quite minimal and consisted of bits of paint and a very small amount of hair. It can be assumed that the skim coat was pure lime, but the brown coat beneath it was probably gypsum. Its sand sieve analysis revealed very fine sand of which all passed the largest sieve, over 9% passed all of the sieves, well over half of it was trapped in the finest sieve and almost 30% was trapped in sieve #40.

Sample 28 was of the mortar from the west entry. It was tan in color and was moderately soft. It had a minimal reaction with a very low water displacement. The initial fast reaction was followed by a prolonged reaction. There were minimal fines produced, indicating a relatively clean sand was initially used. It appears that this mortar was composed of small amounts of lime and Portland cement relative to the sand. The sand sieve analysis revealed very fine sand of which all easily passed the largest sieve. 28% passed all of the sieves, 36% was trapped in the finest sieve and 26% was trapped in sieve #40, the second finest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 27
Building: Second Floor Closet, Sand Island, Apostle Islands NL
Location: Plaster
Sample Description: Tan with very thin white skim coat and paint coat, soft, fast reaction, extremely rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1.	187.8 Container A weight	8.	Yes Hair or fiber type
2.	196.7 Container A and sample	9.	2.9 Fines and paper weight
3.	761.75 Barometric pressure	10.	2.8 Filter paper weight
4.	23 Temperature	11.	194.4 Sand and Container A weight
5.	0.16 Liters of water displaced	12.	3.8 cc. of sand
6.	Clear Filtrate color	13.	35.3 Weight of graduated cylinder and sand
7.	Brown Fines color	14.	28.7 Weight of graduated cylinder

Computations:
15. 8.9 Starting weight of sample: No. 2 – No. 1

16. 0.1 Weight of fines: No. 9 – No. 10
17. 6.6 Weight of sand: No. 11 – No. 1
18. .5758 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 2.2 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0065845 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0.66 Gram weight of CaCO3: 100 x No. 20
22. 1.54 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0208 Mols. of Ca(OH)2: No. 22 divided by 74
24. 2.03 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.29 Gram weight CO2: No. 20 x 44
26. 1.21 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 23.97 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 8.61	Gram weight of sample:	No. 15 – No. 25
29. 1.16	Fine parts/volume:	No. 16 divided by No. 28
30. 44.13	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31. 25.93	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0.00
No. 20	106.5	106.4	0.1	1.563
No. 30	99.6	99.3	0.3	4.688
No. 40	102.7	100.8	1.9	29.688
No. 50	96.7	93.2	3.5	54.688
Base	71.8	71.2	0.6	9.375

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 28
Building: West Entry, Sand Island, Apostle Islands NL
Location: Mortar
Sample Description: Tan, moderately soft, fast reaction followed by prolonged reaction, moderate filtering time

Test No. 1 – Soluble Fraction

Data:

1. 192.0	Container A weight	8. No	Hair or fiber type
2. 199.2	Container A and sample	9. 3.2	Fines and paper weight

3.	761.75	Barometric pressure	
4.	23	Temperature	
5.	0.05	Liters of water displaced	
6.	Yellow-green	Filtrate color	
7.	Off-white	Fines color	
10.	3.1	Filter paper weight	
11.	196.9	Sand and Container A weight	
12.	3.0	cc. of sand	
13.	34.9	Weight of graduated cylinder and sand	
14.	28.8	Weight of graduated cylinder	

Computations:

15.	7.2	Starting weight of sample: No. 2 – No. 1
16.	0.1	Weight of fines: No. 9 – No. 10
17.	4.9	Weight of sand: No. 11 – No. 1
18.	.6122	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	2.2	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.002076	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	0.21	Gram weight of CaCO3: 100 x No. 20
22.	1.99	Gram weight of Ca(OH)2: No. 19 – No. 21
23.	.02695	Mols. of Ca(OH)2: No. 22 divided by 74
24.	2.15	Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.	0.09	Gram weight CO2: No. 20 x 44
26.	1.28	Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.	7.03	%CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	7.11	Gram weight of sample:	No. 15 – No. 25
29.	1.41	Fine parts/volume:	No. 16 divided by No. 28
30.	42.19	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.		Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34. 0.31	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0
No. 20	106.5	106.4	0.1	2
No. 30	99.7	99.3	0.4	8
No. 40	102.0	100.7	1.3	26
No. 50	95.0	93.2	1.8	36
Base	72.6	71.2	1.4	28

A number of conclusions can be drawn from the analysis, as follow:

1. There was a low degree of consistency between the samples, making it difficult to draw any firm conclusions.

2. A number of samples had so few layers that one of the following conclusions can be reached:

a. The oldest layers had either weathered away over time, which is probable with exterior paint.

b. They may have been stripped. This would be especially true if the older finish was a calcimine paint, which is impossible to cover with any coating, including calcimine paint itself. It was an extremely popular paint for interior plaster surfaces during the nineteenth and early twentieth centuries. In light of the use of whitewash, which is a related waterborne paint, the probability of calcimine paint here is very high.

c. The element itself had been replaced or is of recent date.

d. Other coverings such as wallpaper or calcimine paint may have preceded the paint and were removed prior to painting. Wallpaper was a popular covering, especially for damaged plaster.

e. Because very little is known today about calcimine paint a few comments are in order to explain it, as follow:

It was immensely popular throughout the nineteenth century and into the early twentieth century. It was cheap, easily applied and removed, had a very soft and lustrous sheen, and could be mixed and used by the average homeowner who could not afford a painter. In this case it could have been applied by Coast Guard personnel rather than painters. Decorative painters frequently used it because of its sheen. It is still in production to this day, although it is very rarely used.

It is waterborne glue distemper paint which, unlike its cousin, whitewash, must be entirely removed prior to repainting. The difference between calcimine paint and whitewash is in the formulation. Calcimine paint was developed for interior use only and was developed to carry a pigment whereas the high lime content of whitewash prevented it from taking on a pigment. Whitewash was primarily used for exteriors and for dark service areas of interiors.

Nothing will stick to it, including calcimine paint. Its absence, therefore, is about the only means of its detection. This is a real Catch-22. Because it was typically removed prior to repainting its presence is usually indicated either through historic documentation (which is very rare) or the very small number of layers where many would normally be found or where other, similar surfaces retain considerably more.

2. At least two of the samples (nos. 19 and 21) from the lighthouse and keeper's quarters were whitewashed as their probable original finish.

3. Of the other samples, sample 14 revealed an extraordinary number of layers which is quite amazing given its location in a relatively insignificant location. It is mere speculation as to why this sample would have so many layers and other samples from more prominent locations would have so relatively few layers.

4. As can be seen with many of the mortar sample discussions no relative ratios of sand to Portland cement or sand to Portland cement and lime has been stated. The acid reduction method which was used is better than other methods for determining lime to sand ratios. Hence, they were provided for those samples composed of sand and lime. For samples containing Portland cement, the best this form of testing can do is to indicate the presence of Portland cement and the sand itself.

The primary goal in repointing is to achieve a compatible mortar. This can be done for lime and sand samples that were analyzed. It can also be done for Portland cement samples with a bit of trial and error. If the mortar is very hard then a higher ratio of Portland cement to sand will work. One must take into consideration any deterioration of the masonry as a result of the mortar. If this has been the case it may be advisable to use a softer mortar for repointing.

The other primary mode of mortar analysis is spectrographic testing. Unfortunately, it also cannot accurately determine exact ratios of Portland cement to sand and/or to lime.

The secondary goal is to match the appearance of the mortar, which depends to a very large extent on the sand. This is where acid reduction testing shines. It provides and exact calculation of the sand grain sizes as well as a sample of the sand for matching of color. If the sand is carefully matched then the appearance will be successful. This is especially critical in partial repointing and patching.

5. There are instances where the narrative of the mortar make up refers to Portland – but the data sheet following does not include it in line #32. The reason for this is that rather than a number for lime content, the calculation is made for lime with Portland cement content. If the sample merely had Portland cement and sand there would be a number for Portland cement.

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS D-633/106,232 / July 2011