



Lake Mead National Recreation Area
Nevada • Arizona

General Management Plan Amendment/ Low-Water Plan/ Environmental Assessment

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CHAPTER 1: PURPOSE AND NEED

Lake Mead National Recreation Area (NRA) encompasses 142 miles of the Colorado River in northwestern Arizona (Mohave County) and southern Nevada (Clark County) (see figure 1). Lake Mead, created by Hoover Dam, is 76 miles long and consists of four large sub-basins, the Boulder, Virgin, Temple, and Gregg Basins. Portions of the recreation area, including a 300-foot zone around the shoreline of the lake, are jointly administered by the National Park Service (NPS) and US Bureau of Reclamation. The National Park Service manages the lake for recreation and resource protection and the Bureau of Reclamation manages water operations. Lake Mead National Recreation Area hosts approximately 8 million visitors annually and provides \$336 million to the regional economy, supporting nearly 4,200 jobs.

Lake Mead provides plentiful opportunities for water-based recreation, with millions of visitors arriving at the national recreation area to enjoy boating, swimming, sailing, kayaking, fishing, and other activities. These abundant opportunities are one of the recreation area's fundamental values (National Park Service 2015). As identified in the park's enabling legislation, Lake Mead National Recreation Area was established for the general purposes of public recreation, benefit, and use, including bathing (swimming), boating, camping, and picnicking. However, access to the lake is limited due to the rugged topography of the area. Marinas are present at Callville Bay (Nevada), Hemenway Harbor (Nevada), and Temple Bar (Arizona); major boat ramps are available at Echo Bay (Nevada), Boulder Harbor (Nevada) and South Cove (Arizona). There is also a Grand Canyon take-out site at Pearce Ferry (Arizona). These facilities enable visitors to enjoy the recreation area, support commercial operators, and contribute to the economy of the region.

The park has moved and/or reconfigured marina facilities for many years and is proposing to continue to do so at Hemenway Harbor, Callville Bay, and Temple Bar as the lake elevation drops below 1,050 feet. The park will also need to make a management decision for the South Cove, Government Wash, Stewarts Point, and Kingman Wash areas as lake levels continue to fluctuate.

PURPOSE AND NEED FOR GENERAL MANAGEMENT PLAN AMENDMENT

The purpose of this Lake Mead National Recreation Area General Management Plan (GMP) Amendment / Low-Water Plan / Environmental Assessment (EA) is to provide a long-term strategy for addressing operational needs to maintain lake access and provide safe and diverse recreational opportunities at lake elevations above 950 feet. The plan will lead to decision-making regarding the suitability/feasibility of the continued use of existing marinas, launch ramps, and other water-based visitor facilities, and identify steps necessary for their continued operation, if possible. The National Park Service is proposing to maintain existing facilities and services at or near their current locations to the maximum extent possible as site conditions allow as lake levels change; to maintain current marina capacity spread across their locations; and to maintain overall opportunities for visitors to access the lake even if some specific facilities may change.

Persistent drought conditions in the west and reduced snowpack in the Rocky Mountains has caused Lake Mead's water level (elevation) to drop substantially over the past couple of decades. In 2005, the elevation of Lake Mead was 1,147 feet above mean sea level; in 2017 it was 1,082 feet above mean sea level. The park has been operating under the *Lake Mead National Recreation Area General*

Management Plan Amendment / Environmental Assessment, a 2005 low-water amendment to its general management plan (NPS 2005). Although current projections of the lake level have not dropped below the 1,050-foot levels considered in the 2005 Lake Mead GMP Amendment / EA, these projections are subject to change and only extend for 2 years. Lake levels may fluctuate due to changes in watershed conditions, downstream demands, and the allocation of appropriated water rights. A new plan is needed to proactively guide operations should the lake elevation drop below 1,050 feet. Low water could make many existing shoreline facilities unusable in their current design and location, impacting the economic viability of private concession operations and visitor access to and use of the lake.

SCOPE OF THE GENERAL MANAGEMENT PLAN AMENDMENT / LOW-WATER PLAN / ENVIRONMENTAL ASSESSMENT

Project Area

The project area for this plan is Lake Mead. Specifically, the project area covers four major areas of the lake where NPS visitor shoreline facilities are threatened by lowering lake level—Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar—and four smaller areas that face management challenges due to changing visitor uses with the lowering lake level—South Cove, Government Wash, Kingman Wash, and Stewarts Point (see figure 1). The project area also covers backcountry road access to the lake.

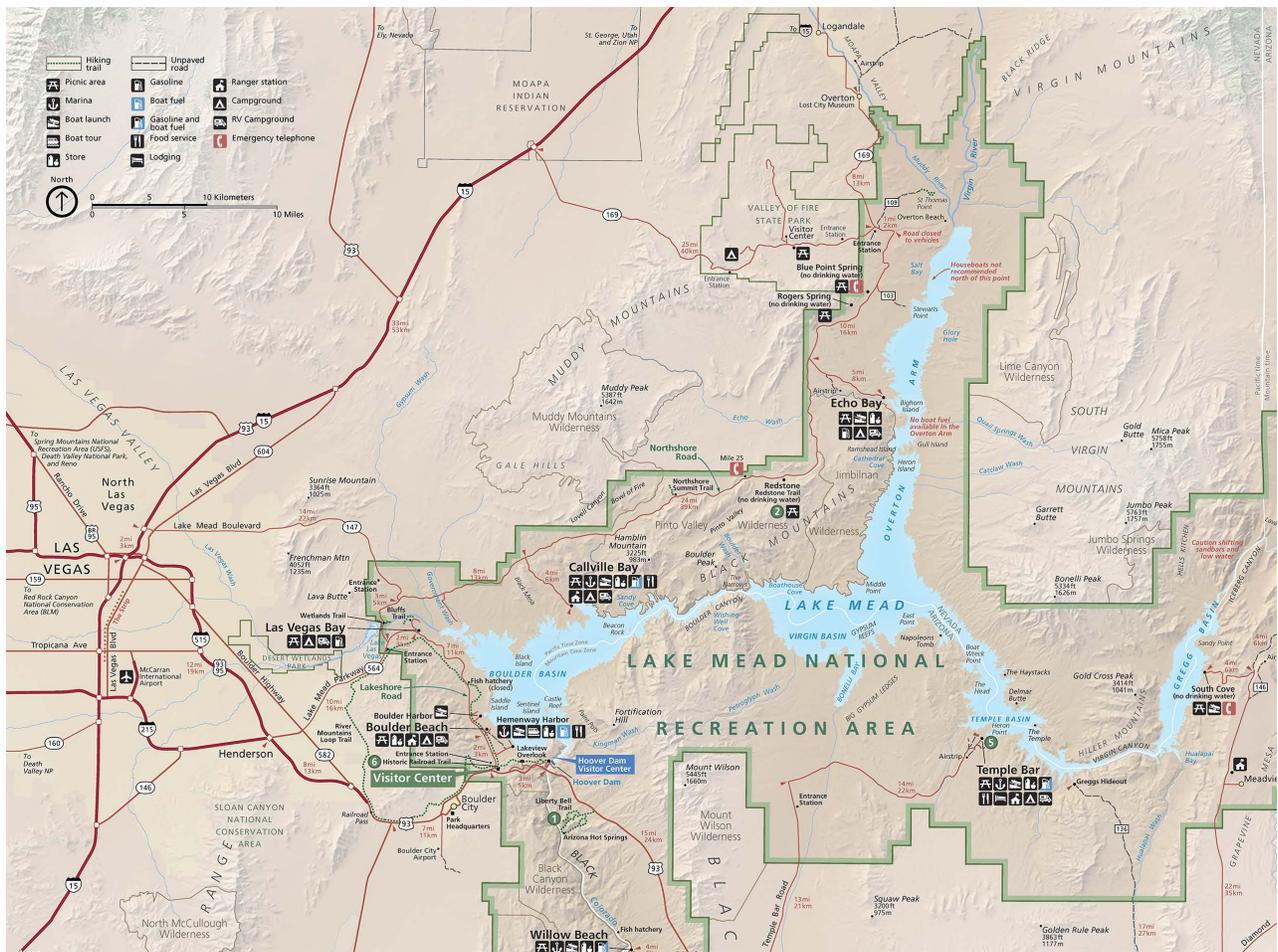


FIGURE 1. PROJECT AREA

Environmental Issues and Impact Topics Analyzed

An important part of effective planning is understanding the consequences of making one decision over another. Environmental assessments, such as this document, identify the anticipated impacts of possible actions on resources, park visitors, and neighbors. This section summarizes the key environmental issues and impact topics identified through scoping and which are discussed in “Chapter 3: Affected Environment” and analyzed in “Chapter 4: Environmental Consequences.”

As defined by the NPS 2015 National Environmental Policy Act (NEPA) handbook, “issues” can be problems, concerns, conflicts, obstacles, or benefits that would result if the proposed action or alternatives, including the no-action alternative, are implemented. Issues may be raised by the National Park Service, other agencies, tribal governments, or the public.

The analysis focuses on pivotal issues, or issues of critical importance. During scoping for this plan, the interdisciplinary team identified several management issues for this Lake Mead GMP Amendment / Low-Water Plan / EA. The issues were retained for more detailed analysis in this plan if any of the following occurred:

- the environmental impacts associated with the issue are central to the proposal or are of critical importance,
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives,
- the environmental impacts associated with the issue are a major point of contention among the public or other agencies, or
- there are potentially significant impacts to resources associated with the issue.

For each of the retained environmental issues, various impacts are analyzed. Impacts are organized by topic. Impact topics focus the environmental analysis and ensure the relevance of impact evaluation. Impact topics were identified based on federal laws and other legal requirements, Council on Environmental Quality guidelines, NPS management policies, staff subject-matter expertise, and issues and concerns expressed by the public and other agencies early in the planning process. The alternatives in this plan have the potential to affect these topics.

The following issues and impact topics are addressed in this environmental assessment. They are not listed in any order of priority.

Lake Access. One of the fundamental resources and values at Lake Mead National Recreation Area is abundant land and water resources. Water recreation is also referred to as part of the park’s enabling legislation and purpose. For most visitors, access to Lake Mead depends on marinas, docks, and boat ramps. Most of the infrastructure in the park was designed to operate optimally at lake levels between 1,180 and 1,220 feet—levels typically seen prior to 2000. As the lake has dropped below these levels, the National Park Service and concessioners have spent millions of dollars extending launch ramps, utilities, and roads; creating new parking areas; relocating docks; and moving marinas to continue providing access to the lake. Some facilities have closed.

Impact topics: recreation use and lake access

Visitor Use and Experience. Lake Mead National Recreation Area is considered one of America’s most diverse water-based recreation areas in the nation. As noted above, many park visitors pursuing water-based recreational activities (e.g., swimming, diving, sailing, boating, fishing, kayaking) are supported by marina, dock, and launch areas. If the lake levels continue to drop and no actions are taken to move or alter shoreline facilities, many visitors will no longer be able to safely access the lake. Some visitors may be displaced or inconvenienced by changes in the location of access facilities. Visitor use patterns may be altered. Changes in visitor facilities and circulation patterns, along with lowering lake levels, could increase congestion in some areas. Conflicts may occur between boaters and shoreline users and between motorized and non-motorized boaters depending on changes to marinas and launch facilities. Changes in park facilities, such as backcountry roads, could confuse visitors on where they can access the lake and may stretch emergency-response resources.

Impact topics: recreation use and lake access

Protection of Natural and Cultural Resources. Lake Mead and its shoreline contain many natural and cultural resources. The lake is critical habitat for the endangered razorback sucker (*Xyrauchen texanus*). Echo Bay supports a spawning area for the fish. Construction and use of new marinas could affect the sucker and its habitat. Possible relocation of marinas, launch ramps, and other facilities may damage or degrade sensitive cultural resources.

Impact topics: federal threatened and endangered species - razorback sucker, archeological resources, historic structures

Socioeconomic Environment. Reconfiguring, relocating, or closing visitor-access facilities would have economic implications for commercial businesses operating in the park and possibly businesses in nearby communities. Actions such as extending utility systems, moving anchoring systems at marinas, or extending walkways and reconfiguring marinas, would affect concessioners' operating costs and possibly the economic feasibility of continued marina operations. If marinas and/or launch facilities were closed, it would affect concessioner revenues and jobs.

Impact topics: socioeconomic environment

Issues Not Addressed

Other Effects of the Dropping Lake Level. Lowering and fluctuating levels of Lake Mead are having many effects on park resources and visitors, as well as on the drinking supply of Las Vegas and adjacent cities. Lowering lake levels exposes new shoreline, which is susceptible to the spread of weeds and invasive nonnative plants. Low water also exacerbates conditions that degrade water quality, increase the potential spread of invasive aquatic plant species, and increase the potential for harmful algal blooms. The exposed lakebed poses a threat to air quality from dust. The appearance of mineral deposits, mudflats, denuded shorelines, and abandoned high-grounded facilities detract from the scenery of the lake. All of these effects are not due to actions being taken or proposed by the National Park Service and are not addressed here; this Lake Mead GMP Amendment / Low-Water Plan / EA is focused only on the effects of altering and moving NPS and concessions facilities in response to dropping lake levels.

Impact Topics Considered but Dismissed from Further Analysis

Some impact topics have been eliminated from further analysis because the resources do not occur in the project area, the topics are not an issue for this project, or the anticipated impacts would have no effect or an inconsequential effect on the topic. The following impact topics were considered and dismissed from further analysis for the reasons outlined below.

Environmental Justice. Environmental justice was considered and dismissed from further analysis for the following reasons:

- While local residents include minority and low-income populations, these populations would not be disproportionately affected by activities associated with construction or implementation of the alternatives.
- The park staff and planning team solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- Implementation of the alternatives would not result in any identifiable adverse human-health effects. Therefore, there would be no direct or indirect adverse effects on any minority or low-income population.
- Implementation of the alternatives would not result in any identified effects that would be specific to any minority or low-income community.

Indian Trust Resources. No Indian Trust resources are located in the project area for the Lake Mead GMP Amendment / Low-Water Plan / EA, and the lands comprising the area are not held in trust by the Secretary of the Interior for the benefit of Indians. Therefore, Indian Trust resources was dismissed from further analysis.

Sacred Sites. No known sacred sites are located in the project area for this plan; therefore, this topic was dismissed from further analysis.

Air Quality. Construction of new facilities—including roads, parking areas, marinas, and docks—would result in local and temporary fugitive dust and vehicle emissions. Use of dust-control measures would minimize these impacts. Standard mitigation measures used at the park, such as use of low sulfur fuel (when available) and proper tuning of construction equipment, would reduce air-quality impacts related to construction machinery. Graded areas would periodically generate dust in a localized area from vehicle use and wind. However, implementing dust-control measures—including watering areas during grading operations and applying a dust palliative to control dust—would minimize this impact. Because none of the facilities being replaced would be expanded beyond their current sizes, no changes in air quality would occur from increased numbers of motorized vehicles using the facilities. Any impacts to air quality from the alternatives would be transient and minimal compared to air pollution emanating from the Las Vegas metropolitan area. Thus, this impact topic was dismissed.

Lightscape. The actions proposed in the alternatives could result in new locations of some facilities that could necessitate nighttime lighting. However, the effects of this lighting would be localized and minimized by mitigation techniques (e.g., limiting the use of artificial outdoor lighting to basic safety requirements, shielding lights, using minimal-impact lighting techniques). Only a small area would be affected by the facility changes. It is expected that these few developments would have a slight adverse impact on the night sky. If facilities are moved from one place to another, there should be no net increase in light levels.

Acoustic Resources and Soundscapes. Construction activities would have a noticeable adverse effect on the soundscape, but the impacts would be in small areas and transient. Mitigation measures would be employed to minimize these impacts, such as requiring noise abatement technology to dampen sound from machinery, phasing construction to minimize impacts on visitors, and providing information to visitors to avoid areas where construction is occurring. Noise also would be generated by motor boats and vehicles using park facilities, but noise levels would not be expected to increase since facility capacities would not be increased. Thus, adverse impacts from construction and use of shoreline facilities in the alternatives would be expected to be slight and transient. Therefore, this impact topic was dismissed.

Water Quality. Lake Mead generally has very good water quality. Testing to date of selected high-use areas, including marinas, have shown that while pollutants are present, they generally do not exceed water quality standards. Construction activities and paving associated with the extension of launch ramps and grading for parking areas and roads could result in runoff of contaminants (e.g., oil from vehicles and construction equipment) and erosion, leading to increased turbidity and sedimentation of nearby waters. However, such pollution would be highly localized and temporary, ceasing after construction is finished. Furthermore, the use of best management practices, such as the placement of berms or silt fencing, would minimize runoff of sediments into the lake. Any activities involving dredging or the placement of fill material below the ordinary high-water line of

the lake would comply with the requirements of sections 404 and 301 of the Clean Water Act and other applicable state permit programs. The National Park Service would also work with the Nevada Division of Environmental Protection and Arizona Department of Environmental Quality to ensure wastewater does not adversely affect the lake's water quality.

Continued operation and movement of marinas to follow lowering lake levels, as well as the relocation of marinas, is not expected to result in new water-quality impacts. The National Park Service would continue to provide guidance on best management practices for the operation of fueling areas and boat maintenance for the concessioners and the boating public to minimize pollutants entering the lake. Enforcement of regulations covering discharges from boats and the marinas is also expected to help minimize hydrocarbon and other chemical and bacteriological pollutants originating from boats and marina operations. Therefore, water quality was dismissed as an impact topic.

Floodplains and Wetlands. The alternatives are all functionally dependent upon being located in the floodplain of Lake Mead and non-floodplain locations are not practicable. However, no permanent support facilities would be placed below the high-water elevation, and any potential adverse impacts on the natural resources and functions of the lake's floodplain would be minimal. Flood mitigation for the developed areas—as identified and approved in the 1986 *Lake Mead National Recreation Area General Management Plan and Final Environmental Impact Statement* (FEIS) (NPS 1986) and accompanying floodplains statement of findings—is still applicable. No wetlands occur within areas that would be affected by the alternatives.

Soil and Vegetation. Soil and vegetation would be disturbed and lost due to construction of new shoreline facilities, including roads, parking areas, marinas, and docks. However, in most cases the areas affected by new facilities were once covered by the lake and are composed of bare ground, rock, and are covered by little to no vegetation or by exotic vegetation (e.g., tamarisk [*Tamarix* spp.]). Soils in the inundation zone of the lake have been through repeated flooding and drying cycles as the lake rose and fell, which limits their integrity for sustaining native Mojave Desert vegetation. Some soils and Mojave Desert vegetation would be lost or altered due to construction of a segment of new road above the high-water line from Callville Bay to Swallow Bay under one alternative, but loss of these resources would be kept to a minimum with the salvage of desert soil where possible; use of best management practices for erosion control (e.g., placement of silt fences, retention and replacement of topsoil), salvage of seeds or plants; and revegetation of sites with native species. All construction areas would be surveyed prior to construction to ensure areas with rare or special plant populations are avoided. Altogether, less than 6 acres of the park would be affected by new construction due to facility relocation, and approximately 2 acres of this total would be below the high-water line. None of the areas affected would be expected to have rare soils or vegetation, or support a high plant diversity. Any vegetation impacts that do occur as a result of the alternatives would not noticeably alter the distribution or abundance of native vegetative plant communities or species. Therefore, this impact topic was dismissed.

Wildlife. The Lake Mead shoreline generally provides only low-quality habitat for wildlife due to the lack of vegetative cover, forage, and food sources (NPS 2005). Small mammals and reptiles generally use these areas for access to water. If vegetation is present, birds (e.g., Gambel's quail [*Callipepla gambelii*], rock pigeon [*Columba livia*]) use the areas. Common ravens (*Corvus corax*) and coyotes (*Canis latrans*) frequent the developed areas due to the presence of humans and food. Waterfowl, such as mallards (*Anas platyrhynchos*) and American coots (*Fulica americana*), also can be found on the lake around developed areas. Other game, nongame, and endemic fish species also occur in the lake. Relocation of facilities proposed in the alternatives would likely have minimal effects on wildlife populations and habitats because construction would mostly occur in small localized areas already used by people, and wildlife populations and habitats have already been altered. There would be no major increases in visitation that would affect existing wildlife populations. None of the actions being proposed would affect important wildlife breeding, nesting, foraging, or migration areas. As a result, the new shoreline developments being proposed would be expected to have a minimal effect on existing wildlife populations and habitats. Therefore, this impact topic was dismissed.

Other Federal Threatened and Endangered Species. Potential habitat for the federally threatened desert tortoise (*Gopherus agassizii*) occurs throughout Lake Mead National Recreation Area. The shoreline areas below the high-water line are typically considered unsuitable habitat for the desert tortoise. With the exception of the new road segment from Callville Bay to Swallow Bay in one alternative, all of the relocation of facilities in the alternatives would occur below the high-water line, and thus would not affect the recreation area's desert tortoise population or habitat. A small amount of potential non-critical desert tortoise habitat (about 32,000 square feet) would be lost as a result of construction of the new road segment above the high-water line; however, this would not substantially change the desert tortoise's habitat or the tortoise population. The National Park Service would follow the programmatic-level measures to minimize potential effects, as described in the US Fish and Wildlife Service's (USFWS's) programmatic biological opinion for activities in Lake Mead National Recreation Area (USFWS 2017). With application of protective measures, the new road construction would still fall within the terms and conditions of the programmatic biological opinion and would not exceed the amount or extent of anticipated new habitat disturbance and incidental take. The National Park Service would reinitiate consultation with the US Fish and Wildlife Service when it is in the pre-planning stage of building the road to make sure the road does not result in unacceptable impacts to the desert tortoise and its habitat. Therefore, the desert tortoise was dropped from further analysis.

The federally endangered humpback chub (*Gila cypha*) has not been documented as occurring in the lake, although they are present in the riverine sections of the Colorado River within the park. The closest this species has been seen to South Cove is approximately 0.6 to 1.2 miles upstream. Surveys would be conducted before construction to ensure the chub is not present. If the species was found to be present, the National Park Service would consult with the US Fish and Wildlife Service to ensure its actions do not adversely affect the chub.

RELATIONSHIP OF OTHER PLANNING EFFORTS TO THIS GENERAL MANAGEMENT PLAN AMENDMENT / LOW-WATER PLAN / ENVIRONMENTAL ASSESSMENT

General Management Plan and Final Environmental Impact Statement (1986)

The 1986 Lake Mead GMP/FEIS provides the overall management direction for the recreation area. The plan emphasizes long-term protection of park resources while accommodating increasing visitor use. It allows for increasing use through a combination of providing new developed areas, improved access points, and acceptable levels of expansion in existing developed areas. It establishes land-based management zones and strategies for meeting the goals and general purposes of the recreation area. Although much of the 1986 Lake Mead GMP/FEIS is still applicable, this Lake Mead GMP Amendment / Low-Water Plan / EA re-evaluates NPS visitor shoreline facilities (including marinas and launch ramps) at several locations on Lake Mead while considering low-water conditions not accounted for in the 1986 Lake Mead GMP/FEIS. This Lake Mead GMP Amendment / Low-Water Plan / EA proposes changes to maintain visitor access to the lake. These changes are consistent with the overall direction of the 1986 Lake Mead GMP/FEIS.

Lake Management Plan and Final Environmental Impact Statement (2003)

The *Lake Mead National Recreation Area Lake Management Plan and Final Environmental Impact Statement* tiered from the 1986 Lake Mead GMP/FEIS. It provided additional and more specific guidance for the long-term management of Lakes Mead and Mohave, the associated shoreline, and the development areas within Lake Mead National Recreation Area to ensure the protection of park resources while allowing a range of recreational opportunities. The 2003 Lake Mead Lake Management Plan / FEIS provided for an increase in boating capacity targeted at areas where growth can be accommodated within the physical, environmental, and social carrying capacity of the lakes. It identified facility improvements, capacities, locations, and expansions for the developments that control access on Lake Mead, with facility development based on the lake's carrying capacity. The 2003 Lake Mead Lake Management Plan / FEIS called for the continued operation of the six existing marinas on Lake Mead, with authorized expansion of facilities at Callville Bay, Echo Bay, Overton Beach, and Temple Bar. The plan also identified the continued operation of the nine existing public launch ramps and approved the addition of another public boat ramp at Stewarts Point.

All of the alternatives considered in this Lake Mead GMP Amendment / Low-Water Plan / EA are consistent with and contribute to fulfilling the management intent and direction established in the 2003 Lake Mead Lake Management Plan / FEIS to the extent practicable. The identified recreational opportunities and types and capacities of commercial marina services and public launch ramps were used to guide the development of the alternatives presented in this 2018 plan. This Lake Mead GMP Amendment / Low-Water Plan / EA identifies alternative locations for lake-access facilities in accord with the carrying capacities and water management zones set in the 2003 Lake Mead Lake Management Plan / FEIS; the number of boats within the lake basins and general distribution of boats would remain consistent with the 2003 Lake Mead Lake Management Plan / FEIS. Although there would be a shrinking area of water surface to accommodate boaters, the boating capacity for Lake Mead set in the 2003 Lake Mead Lake Management Plan / FEIS is still considered valid. Likewise, the primitive and semi-primitive management zones that were designated in the 2003 Lake Mead Lake Management Plan / FEIS for certain bays and inflow areas to protect sensitive aquatic resources and to provide areas where visitors could find opportunities to experience a sense of

solitude and quiet (free of personal watercraft) would not be modified by this Lake Mead GMP Amendment / Low-Water Plan / EA. Finally, the chemical-pollutant monitoring program identified in the 2003 Lake Mead Lake Management Plan / FEIS to address the concern of increasing boat pollutants, particularly in areas of high boat traffic, would continue under this Lake Mead GMP Amendment / Low-Water Plan / EA. If monitoring determines that water quality standards are being violated, specific areas in the recreation area could require temporal closures.

General Management Plan Amendment / Environmental Assessment (2005)

The 2005 Lake Mead GMP Amendment / EA amended the 1986 Lake Mead GMP/FEIS, providing guidance on a long-term strategy for addressing low-water conditions on Lake Mead that affect lake access. Although elements of the 2005 Lake Mead GMP Amendment / EA are still valid, that plan—like the 1986 Lake Mead GMP/FEIS and the 2003 Lake Mead Lake Management Plan / FEIS—did not foresee the continued drop and fluctuations in lake levels and current and predicted drought. Once the lake level drops below 1,050 feet, none of the 2005 Lake Mead GMP Amendment / EA will be applicable. The 2005 Lake Mead GMP Amendment / EA called for launch ramps and landings to be extended at Hemenway Harbor, Lake Mead Marina, Temple Bar, and Echo Bay at their existing locations, and for new ramps for launching at lower lake levels at Callville Bay, South Cove, Echo Bay, and Government Wash near the existing ramps. A new ramp at Stewarts Point was proposed in order to maintain capacity lost at Overton Beach due to low-water ramp closure. The plan called for closure of the Overton Beach marina in anticipation of lower lake levels, and expansion of boating capacity and marina services at Echo Bay. In addition, part of the Lake Mead marina was to be moved to Hemenway Harbor. (All of the marina was subsequently moved after the 2005 Lake Mead GMP Amendment / EA was completed.) Backcountry roads were proposed to be extended to maintain access to the lake shoreline. This Lake Mead GMP Amendment / Low-Water Plan / EA will amend the 1986 Lake Mead GMP/FEIS and replace the 2005 Lake Mead GMP Amendment / EA when the lake level drops below 1,050 feet, extending and/or moving facilities at Hemenway Harbor, Echo Bay, and South Cove, among other locations.

CHAPTER 2: ALTERNATIVES

INTRODUCTION

This chapter presents the range of alternatives for managing public and commercial lake-access facilities on Lake Mead. All of the alternatives considered in this Lake Mead GMP Amendment / Low-Water Plan / EA are consistent with and contribute to fulfilling the management intent and direction established in the 1986 Lake Mead GMP/FEIS, the 2003 Lake Mead Lake Management Plan / FEIS, and the 2005 Lake Mead GMP Amendment / EA to the extent practicable. The identified recreational opportunities, types and capacities of commercial marina services, and public launch ramps were used to guide development of the alternatives presented in this Lake Mead GMP Amendment / Low-Water Plan / EA. This Lake Mead GMP Amendment / Low-Water Plan / EA identifies alternative locations for lake-access facilities in accord with the visitor capacities and water-management zones set in the 2003 Lake Mead Lake Management Plan / FEIS; the number of boats within the lake basins and general distribution of boats would remain consistent with this plan. An alternatives comparison table follows the alternative text. It should be noted that the elevations cited in the alternatives are approximate and assume that approximately 5 feet of water depth is needed for launching and approximately 10 feet is needed for marina operation.

A no-action alternative is presented for all access facilities. An examination of the no-action alternative for each facility is useful to understand why certain changes may or may not be needed or advisable. The no-action alternative describes a continuation of the existing management direction and actions. Marina operations would be reconfigured and/or moved farther into the lake and launch ramps would be extended as site conditions allow at their existing locations on the lake. For the purpose of defining the no-action alternative, it was assumed that no further relocation of lake-access facilities would be authorized. Closure of facilities would occur when site conditions result in insufficient water depth for marinas to operate or insufficient ramp grades for boat launching. The chapter also describes the factors and assumptions used in developing the alternatives; the actions that would be common to all alternatives; and the alternatives considered but eliminated from further consideration and the rationale for dismissal. The narratives for each alternative are found in this chapter. Graphics for each marina and various lake elevation can be found in appendix A. A summary of alternatives can be found in table 2 at the end of this chapter.

DEVELOPMENT OF THE ALTERNATIVES

The alternatives were developed based on a number of factors. An evaluation of site conditions included water levels and underwater gradients, availability of utilities, access to the site, amount of available space on the land and water, potential flood risk, exposure to wind and wave action, and the level of land-based construction and site preparation that would be necessary to accommodate the facility. Other considerations included the range of public expectations and concerns identified during scoping, and the results of resource data analysis.

The Bureau of Reclamation has been directed to establish strategies for managing water deliveries during low-water conditions in the Colorado Basin. It can reasonably be predicted that Lake Mead elevations, on average, will be lower in the future than they have been in the past due to future anticipated development in the Upper Basin. Projections of the Colorado River Simulation System (CRSS) in August 2018 indicated the probability of Lake Mead's elevation dropping below 1,050 feet

is 44% by the year 2022 and 62% by the year 2028. Unexpected high-water years and conservation measures may influence the timeline for reaching these predicted lake-level drops. For planning purposes, existing and alternative locations for facilities were evaluated based on their operational viability down to the elevation of 950 feet above mean sea level. Decisions on marina and launch relocations would need to be made before this elevation was reached.

ELEMENTS COMMON TO ALL ALTERNATIVES

Marinas and Launch Ramps

Several management actions are integral to the effective and safe operation of lake-access facilities to address fluctuating water levels. Examples of these actions are as follows:

- Move anchoring systems, extend walkways, extend courtesy docks, and reconfigure and adjust marina positions.
- Reconfigure or add breakwaters for protection.
- Provide government boat docks at each of the developed areas.
- Provide fire-suppression capabilities for all floating facilities.
- Conduct ramp inspections with cleanup or repairs made on a continuous basis.

Where site conditions would accommodate extension of existing launch ramps, extend and pave ramps to the water line as lake elevations fall, even though paved portions of the ramps would not be operational until water levels begin rising and provide adequate water depths for launching. Place temporary structures or surfaces such as concrete planks, rock and gravel, or pipe sections beyond the base of the pavement to extend the use of existing launch ramps where feasible (i.e., where adequate launch grades can be achieved). Temporary cofferdams may also be used to allow extension of ramps below the water line.

Parking and Traffic Circulation

Many of the lake-access facilities depend on graded areas for circulation and parking. These areas would be maintained. Parking, access roads, and circulation for launch ramps and marinas would be adjusted as water levels fall. Areas below the high-water line would continue to be graded to provide parking closer to the access facilities where practicable. If lakebed soil conditions are unsuitable to support traffic and parking, a stabilizing base material may be imported and placed if needed. Marina and launch ramp access roads would be extended and paved.

Accessible parking would continue to be provided at developed areas throughout the park and near the launch ramps. It would be neither practical nor safe to authorize parking on the launch ramps because the 9% to 14% grades make it difficult to exit a vehicle and open and close doors. Additional actions such as grading and paving of walkways, walkway entrances, and bus and individual vehicle pads would be undertaken to ensure that ramps and marinas are accessible for all visitors. All new recreational facilities would be developed in accordance with the Architectural Barriers Act accessibility guidelines for federal facilities (Recreation Facilities, 36 Code of Federal Regulations [CFR] part 1191).

Utilities

As lake levels recede, utilities (i.e., water, sewer, power, telephone, cable, fuel service) would be extended below the high-water line to maintain service at each marina. The National Park Service would be responsible for providing utilities to the high-water line at each developed area. The concessioner would be responsible for the construction and operation of utility systems that support their operation below the high-water line. At certain lake levels, natural and logistical constraints—such as elevation thresholds, topography, or distance—would be encountered at some marina locations and would require modification or reconfiguration of utility system designs (e.g., addition of sewage lift stations, upgrade of transformers). Floating water intake barges would be periodically relocated farther into deeper water. Fuel docks would be maintained and fuel lines extended, or fuel would be provided by tanker truck operations. Where roads are extended, additional management actions (e.g., roadway grading, signing, barricades) would be undertaken to maintain park infrastructure and provide for visitor services.

Other Shoreline Facilities

No permanent facilities that could be damaged by reservoir flooding are located below the high-water elevation. With greater fluctuations in the lake water levels, visitor facilities can become increasingly removed from the high-water elevation. To enhance the availability of facilities to visitors along the shoreline, portable shoreline amenities (e.g., restrooms, shade shelters, picnic facilities, fish cleaning stations, informational kiosks) would be provided at each developed area, as needed.

Backcountry Road Access

Lake Mead National Recreation Area has more than 800 miles of approved backcountry roads; most are approved for public use. A few roads are for management purposes and are usually posted “Recommended 4x4 only.” Extension of backcountry roads to maintain access to the lake shoreline would also continue. Where roads are extended, additional management actions (e.g., roadway grading, signing, barricades) would be undertaken to direct traffic and discourage vehicle use outside the designated road corridors to enhance visitor safety and resource protection.

Other Areas of Lake Access

Stewarts Point, Government Wash, Kingman Wash, Boulder Harbor, and South Cove are also frequently used as access to the lake. The park would continue to allow access to these areas but would also continue to follow these management strategies for the areas:

- When park-approved roads end at the undeveloped shoreline of Lake Mead, launching would be authorized. Some of these locations include Stewarts Point, Government Wash, and Kingman Wash.
- South Cove and Boulder Harbor are expected to have developed ramp access down to a water elevation of 1,070 feet. Below this elevation there would be no further launch-ramp development.

MITIGATING MEASURES

Mitigation measures are specific actions designed to minimize, reduce, or eliminate impacts of alternatives and to protect national recreation area resources and visitors. The following mitigation measures related to construction activities and facility operation would be implemented under each alternative and are assumed in the analysis of effects for each alternative.

Soils, Vegetation, and Wildlife

Any new or relocated facilities sited above the high-water line would use previously disturbed sites to the extent practicable. In undisturbed habitats, construction limits would be delineated for all construction, such as road grading or utility extension. Best management practices for controlling soil erosion—such as placement of silt fences, retention and replacement of topsoil, salvage of seeds or plants, and revegetation of sites with native species—would be implemented to reduce runoff and soil loss from construction sites and facilitate reestablishment of native vegetation. Necessary measures would be determined by the park resource management restoration specialist.

Special Status Species

Lake Mead is designated critical habitat for the razorback sucker. There are known spawning areas in Echo Bay. Management practices to protect the razorback sucker and its spawning habitat would continue to be implemented. These practices include clearly marking mooring and boating areas from adjoining spawning areas via buoys and signing, maintaining a public-awareness campaign, maintaining a flat-wake zone near spawning areas, and requiring the implementation of best management practices at marinas to protect water quality. Monitoring of spawning areas would continue, and temporary closures of areas used for spawning would be implemented if determined to be necessary.

Potential habitat for the desert tortoise occurs throughout the recreation area. Generally, the shoreline areas below the high-water line (i.e., maximum pool elevation) are considered unsuitable habitat for the desert tortoise. Areas below the high-water line are typically composed of bare ground, rock, or nonnative tamarisk. Upland areas and desert washes provide better habitat for this species. Any development proposed outside previously disturbed areas above the high-water line would be surveyed for desert tortoises and burrows prior to construction. The National Park Service has worked with the US Fish and Wildlife Service to develop mitigation to reduce or eliminate potential adverse impacts on desert tortoises from construction activities. Examples of such mitigation include clearly marking construction limits, surveying construction areas, relocating tortoises outside the construction area, educating construction personnel about tortoises, instituting a litter-control program, and surveying or handling of tortoises by a qualified biologist.

Formal consultation with the US Fish and Wildlife Service continues and will determine actions necessary to ensure the conservation of the federally listed razorback sucker. The conservation measures and reasonable and prudent measures are fully described in the biological opinion (USFWS 2005).

Water and Air Resources

Best management practices, such as the use of silt fences, would be implemented to ensure that construction-related effects would be minimal and to prevent long-term impacts on water quality and aquatic species. Best management practices would be incorporated into all marina operations. Any activities involving dredging or the placement of fill material below the ordinary high-water line of the lake would comply with requirements of sections 404 and 401 of the Clean Water Act and with other applicable state permit programs. Dust-control measures would include watering the road and parking areas during grading operations and could include applying a dust palliative to control dust. Low-sulfur fuel (0.05% by weight) would be used when available, and construction equipment would be properly tuned.

The concessioner and the National Park Service would consult with the Nevada Division of Environmental Protection to determine wastewater requirements and provisions. The concessioner and the National Park Service would work with the Nevada State Health Division for the water line requirements.

Cultural Resources

All activities, including ground or offshore disturbances, would be assessed for potential disturbance to archeological or historic resources. If significant resources were identified and determined eligible for the National Register of Historic Places, all necessary steps would be taken to avoid the resources during project activities. The National Park Service would prepare a programmatic agreement in consultation with the Nevada or Arizona state historic preservation officers to identify historic properties and to mitigate any adverse effects.

The National Park Service would consult with the appropriate American Indian groups as required by laws, regulations, and executive orders. Should unknown cultural resources be uncovered during construction, work would be halted in the discovery area, the site would be secured, and the National Park Service would consult according to 36 CFR 800.13 and, as appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990. In compliance with the Native American Graves Protection and Repatriation Act of 1990, the National Park Service would also notify and consult concerned tribal representatives for the proper treatment of human remains, funerary objects, and sacred objects, should these be discovered during the project.

Visitor Use and Experience

Whenever possible, the National Park Service would adjust work schedules, particularly the timing of construction activities, to minimize impacts on park visitors. Facility construction would be prioritized and phased wherever possible to minimize disruption of park and concession operations and visitor use.

Navigational markers and no-wake areas would be established around lake-access facilities if they are extended or relocated. Security, public notification, and a park ranger would assist with the actual move of any facilities to protect the public. Facilities would be accessible to visitors, including those with disabilities, in compliance with federal standards.

ALTERNATIVES

No Action

Under the no-action alternative, existing marina operations would be reconfigured and launch ramps would extend farther into the lake, as site conditions allow, at their existing locations on the lake. Visitor services would discontinue when site conditions result in insufficient water depth for marinas to operate or insufficient ramp grades for boat launching. Efforts would be consistent with maintaining current marina capacity with associated roads, parking, and utilities.

Alternative A (Preferred)

Under alternative A, existing marina operations would be reconfigured and launch ramps would extend farther into the lake, as site conditions allow, at or near their existing locations on the lake. Current marina capacity would be maintained with associated roads, parking, and utilities spread across those locations. Maps for the preferred alternative can be found in appendix A.

Alternative B

Under alternative B, existing marina operations would be modified and launch ramps would extend, as site conditions allow, at or near their existing locations on the lake. Some new services could be implemented, such as services accessible only by water (e.g., fuel, water, food). Marina capacity, associated roads, parking, and utilities would be reduced. Mooring—which includes wet and dry storage via marina slips—buoys, buoy fields, and parking areas, could be modified.

Alternative C

Under alternative C, existing marina operations would be discontinued. Launch ramps would extend, as site conditions allow, at or near their existing locations on the lake.

ALTERNATIVES BY DEVELOPED AREA

Hemenway Harbor

No Action.

Marina operations and launch ramps would extend to an elevation of 1,000 feet when site conditions would result in insufficient water depth for marinas to operate or insufficient ramp grades for boat launching.

Alternative A (Preferred).

Marina operations and launch ramps would extend to an elevation of 950 feet. At elevations below 1,000 feet, the launch ramp and marina facilities would be relocated to deeper water closer to Hemenway Wall with associated new roads and utilities.

Alternative B.

Marina operations would be modified and launch ramps would extend to an elevation of 950 feet. Modifications may include amenities such as limited mooring and boat rentals, and facilities only accessible by water. At elevations below 1,000 feet, the launch ramp and marina facilities would be relocated to deeper water closer to Hemenway Wall with associated new roads and utilities.

Alternative C.

Marina operations would be discontinued. Launch ramps would extend to an elevation of 950 feet. At elevations below 1,000 feet, the launch ramps would be relocated to deeper water closer to Hemenway Wall.

Callville Bay

No Action.

Marina operations and launch ramps would extend to an elevation of 1,065 feet when site conditions would result in insufficient water depth for marinas to operate or insufficient ramp grades for boat launching.

Alternative A (Preferred).

Marina operations and launch ramps would extend to an elevation of 950 feet. At elevations below 1,065 feet, the launch ramp and marina facilities would be extended farther into the lake or relocated to Swallow Bay with associated new roads and utilities.

Alternative B.

Marina operations would be modified and launch ramps would extend to an elevation of 950 feet. Modifications may include amenities such as limited mooring and boat rentals, and facilities only accessible by water. At elevations below 1,065 feet, the launch ramp and marina facilities would be extended farther into the lake or relocated to Swallow Bay with associated new roads and utilities.

Alternative C.

Marina operations would be discontinued. Launch ramps would extend to an elevation of 950 feet. At elevations below 1,065 feet, the launch ramps would be extended farther into the lake or relocated to Swallow Bay.

Echo Bay

No Action.

The launch ramp would extend to an elevation of 1,050 feet when site conditions would result in an insufficient ramp grade for boat launching.

Alternative A (Preferred).

The park would analyze reestablishing full-service marina operations at this location based on public safety, utilities, and commercial interest. The marina, along with the launch ramp, would extend to an elevation of 1,000 feet. At elevations below 1,050 feet, the launch ramp and marina operations would be relocated north to Pumphouse Bay with associated new roads and utilities.

Alternative B.

The park would analyze adding modified marina operations at this location. The marina, along with the launch ramp, would extend to an elevation of 1,000 feet. At elevations below 1,050 feet, the launch ramp and modified marina operations would be relocated north to Pumphouse Bay with associated new roads and utilities.

Alternative C.

Marina operations would not be restored. The launch ramp would extend to an elevation of 1,000 feet. At elevations below 1,050 feet, the launch ramp would be relocated north to Pumphouse Bay.

Temple Bar

No Action.

Marina operations and launch ramps would extend to an elevation of 1,050 feet when site conditions would result in insufficient water depth for marinas to operate or insufficient ramp grades for boat launching.

Alternative A (Preferred).

Marina operations and launch ramp would extend to an elevation of 950 feet. At elevations below 1,050 feet, the launch ramp would be relocated farther into the lake to the northeast with associated new roads and utilities.

Alternative B.

Marina operations would be modified and launch ramps would extend to an elevation of 950 feet. Modifications may include amenities such as limited mooring and boat rentals and facilities only accessible by water. At elevations below 1,050 feet, the launch ramp and marina facilities would be relocated farther into the lake to the northeast with associated new roads and utilities.

Alternative C.

Marina operations would be discontinued. Launch ramp would extend to an elevation of 950 feet. At elevations below 1,050 feet, the launch ramp would be relocated farther into the lake to the northeast.

ESTIMATED COSTS

Relative costs for the alternatives are in 2017 dollars and are general estimates for the cost of constructing and moving facilities to provide access to an elevation of approximately 950 feet. These estimates are general and are intended for use in comparing the alternatives and are not intended to replace more detailed consideration of costs for construction or moving/reconfiguring of marinas. The marina facilities of Lake Mead National Recreation Area are wholly owned by concessioners under contract with the National Park Service; therefore, the following cost-estimate table (table 1) is broken out between anticipated NPS costs and costs to commercial operators. Major private investments include extending and/or relocating commercially operated marinas and extending utility systems below an elevation of 1,221 feet (high-water mark). Major NPS investments include extending and constructing public launch ramps, extending backcountry roads, extending water-intake barges, and upgrading utility systems above an elevation of 1,221 feet (high-water mark).

Life cycle costs for all action alternatives would be higher than the no-action alternative, primarily because additional infrastructure would be required to maintain marina services and public access at lower lake levels. Increases in maintenance costs are also expected to follow. The tradeoff in the increase of expenses to the National Park Service and commercial operators is the continuation of marina services and public access to the lake.

Full implementation of any action alternative depends entirely on future reservoir levels. It is difficult to project the timing for even incremental implementation. Each month, the Bureau of Reclamation publishes 2-year projections for monthly lake levels. These predictions would continue to be used as a planning guide for implementing incremental responses to forecasted conditions.

As the plan is implemented, a final decision on alternatives, modifications to services, and cost sharing would be made at the discretion of NPS management with input from concessions partners.

TABLE 1. COST ESTIMATES

Alternative	Concessions Cost^a (\$ M)	Federal Cost^a (\$ M)	Total Cost^a (\$ M)
No-Action Alternative	\$0.7	\$2.1	\$2.8
Alternative A (preferred)	\$8	\$24-26	\$30-32
Alternative B	\$9 ^b	\$24-26	\$31-33 ^b
Alternative C	\$0	\$24-26	\$24

^a Cost estimate over the life of the plan to an elevation of 950 feet.

^b The total cost of alternative B could vary based on the visitor services provided by a floating facility and could be up to an additional 25% to 50%.

Major federal (NPS) investments include:

Repair/replace existing launch ramps, extend and construct new public launch ramps, extend backcountry roads, extend water-intake barges, and upgrade utility systems above lake elevation of

1,229 (high-water mark). Under the no-action alternative, costs include concession contract compensation.

Major private investments include:

Extend and/or relocate commercially operated marinas and extend utility systems below lake elevation of 1,229 (high-water mark).

Alternatives Dismissed from Further Consideration

Relocation of marina facilities within Callville Bay was considered and dismissed. As the water level recedes, the width of the bay narrows. Facilities are pushed out into more open, unprotected waters and lack natural protection from wind and wave action. Construction and relocation of facilities to Swallow Bay allows for more protection and viability of operations down to lake levels of 950 feet.

Extending the Echo Bay launch ramp to 950 feet was dismissed. The water level returns to that of the Virgin River and the Overton Arm becomes cut off from Lake Mead as passage at Rams Head Island becomes too narrow.

Identification of the Preferred Alternative

To develop the preferred alternative, draft alternatives were evaluated by a group of subject-matter experts based on a set of criteria. Alternatives were evaluated on how well they would

- meet the purpose and need for taking action,
- meet the NPS statutory mission and management responsibility for Lake Mead,
- align with US Department of Interior / NPS priorities,
- be financially viable and reasonably and feasibly implementable,
- be sensitive to environmental impacts to natural and cultural resources, and
- provide for visitor use and experience.

The decision of the group was that alternative A best met the criteria at all locations.

TABLE 2. SUMMARY OF ALTERNATIVES

Marina/Launch Ramp	No Action (Continue Existing Management Direction)	Alternative A (Preferred)	Alternative B	Alternative C
Hemenway	Extend marina operations to 1,000 feet. Extend launch ramp to 1,000 feet.	Extend marina operations to 950 feet. At 1,000 feet, relocate toward Hemenway Wall with associated roads and utilities. Extend launch ramp to 950 feet, relocating toward Hemenway Wall at 1,000 feet with associated roads and parking.	Modify marina operations and extend to 950 feet. At 1,000 feet, relocate toward Hemenway Wall with associated roads and utilities. Same as A	Discontinue marina operations. Same as A
Callville Bay	Extend marina operations to 1,065 feet. Extend launch ramp to 1,065 feet.	Extend marina operations to 950 feet. At 1,065 feet, relocate farther into the lake or to Swallow Bay with associated roads and utilities. Extend launch ramp to 950 feet, relocating farther into the lake or to Swallow Bay at 1,065 feet with associated roads and parking.	Modify marina operations and extend to 950 feet. At 1,065 feet, relocate farther into the lake or to Swallow Bay with associated roads and utilities. Same as A	Discontinue marina operations. Same as A
Echo Bay	Extend launch ramp to 1,065 feet.	Analyze reestablishing full-service marina operations and extend to an elevation of 1,000 feet. At 1,050 feet, relocate north to Pumphouse Bay with associated roads and utilities.	Analyze adding modified marina operations and extend to 1,000 feet. At 1,050 feet, relocate north to Pumphouse Bay with associated roads and utilities.	Marina operations would not be restored.

Marina/Launch Ramp	No Action (Continue Existing Management Direction)	Alternative A (Preferred)	Alternative B	Alternative C
		Extend launch ramp to 1,000 feet, relocating north to Pumphouse Bay at 1,050 feet with associated roads and parking.	Same as A	Same as A
Temple Bar	<p>Extend marina operations to 1,050 feet.</p> <p>Extend launch ramp to 1,050 feet.</p>	<p>Extend marina operations to 950 feet. At 1,050 feet, relocate farther into the lake to the northeast with associated roads and utilities.</p> <p>Extend launch ramp to 950 feet, relocating farther into the lake to the northeast at 1,050 feet with associated roads and parking.</p>	<p>Modify marina operations and extend to 950 feet. At 1,050 feet, relocate farther into the lake to the northeast with associated roads and utilities.</p> <p>Same as A</p>	<p>Discontinue marina operations.</p> <p>Same as A</p>

CHAPTER 3: AFFECTED ENVIRONMENT

INTRODUCTION

This chapter provides a description of the existing environment that may be affected by the alternatives under consideration. This chapter includes the specific topics that are analyzed to determine the environmental impacts of the alternatives. These topics were selected based on federal law, regulations, executive orders, NPS expertise, and concerns expressed by other agencies or members of the public during scoping. The conditions described establishes the baseline for the analyses of effects found in “Chapter 4: Environmental Consequences.”

A complete and detailed description of the environment and existing uses at Lake Mead National Recreation Area can be found in the 2003 Lake Mead Lake Management Plan / FEIS (NPS 2003), *Lake Mead National Recreation Area Resource Management Plan* (NPS 1999), and the 1986 Lake Mead GMP/FEIS (NPS 1986).

Natural Resources

Federal Threatened and Endangered Species - Razorback Sucker.

The razorback sucker is endemic to the Colorado River Basin. The abundance and distribution of the razorback sucker is greatly reduced from historical levels, primarily due to the construction of mainstem dams and introduction of nonnative sport fish. It is listed as a federally endangered species and all of Lake Mead is designated as critical habitat for this species, although how much of the lake is actual potential habitat is unknown. The Lake Mead population appears to be the only one to reproduce successfully in the lower Colorado River Basin and is one of the few populations on the Colorado River that continues to have recruitment solely from naturally spawning adults (Rosen et al. 2012). The abundance and distribution of razorback suckers in the lake is not well known, although recent surveys indicate that the Lake Mead population is young and resilient (Rogers et al. 2017). The adult population in Lake Mead remains small; based on modeling in 2017, the population was estimated to be 421 fish, with a range of between 305 and 615 fish (Rogers et al. 2017).

The continuing drought and resulting drop of the lake elevation continues to affect the habitat and population of the razorback sucker. Sites previously used for spawning are now dry. In the past, the fish adapted to the lowering water and found new areas in which to spawn. But it is unclear how long this will continue.

Surveys have identified two known locations for razorback spawning, one of which is an area in Echo Bay. (The other area in Las Vegas Bay would not be affected by actions proposed in this plan.) No spawning is known to occur in other areas along the shoreline that may be affected by the alternatives. As one of the largest or most active spawning areas in Lake Mead, Echo Bay is of particular importance for the razorback sucker. However, the number of larvae collected at Echo Bay has been declining. In 2017, 275 larvae were collected, compared to 552 in 2003 and 1,022 in 2002 (Rogers et al. 2017, NPS 2005). Although there is no definite explanation for the decline, it may be that the declining lake elevation has reduced the available spawning area and forced some fish to use other areas that have not yet been identified. Rogers et al. (2017) noted that for many years the primary spawning location was in the western part of the bay; however, in 2016 and 2017 the

spawning area was in the south side of the bay, near the mouth of Echo Bay over patches of cobble and gravel. In 2017, the highest concentration of larvae was on the southern shoreline of Echo Bay across from the boat ramp; some larvae were also collected on the northern shore near the boat ramp. Rogers et al. (2017) observed the primary spawning location is in a shallow area, adjacent to a steep edge where the fish may retreat during daytime hours. The authors noted this demonstrates that the razorback sucker can find suitable spawning habitat as the reservoir elevation fluctuates.

Cultural Resources

Archeological Resources.

Only a small portion of the recreation area has been archeologically surveyed. Despite the lack of comprehensive data, significant prehistoric and historic resources are known to occur in the park. More than 1,200 archeological sites are known to occur in the recreation area. Most of these sites are unevaluated and are considered potentially eligible for the National Register of Historic Places. Recent archeological investigations carried out to current professional standards have focused on the developed areas. Most of the archeological sites located during these surveys are related to the making of stone tools. One site near the high-water line close to Hemenway Harbor is associated with turquoise mining. Much of the land submerged by the lake has not been surveyed and additional submerged sites may exist.

Historic Structures.

Historic resources related to settlement, ranching, mining, exploration, and the construction of Hoover Dam are in the recreation area. Some historic structures in or adjacent to the marinas constructed during the NPS Mission 66 era between 1945 and 1962 are eligible or potentially eligible for the National Register of Historic Places. Known historic structures occur near the project areas at Boulder Beach and Callville Bay. Submerged historic resources at Boulder Beach include the railroad grade and aggregate facility associated with the construction of Hoover Dam. These structures are west of the Boulder Islands offshore from Hemenway Harbor. A spur off the main railroad grade may lie offshore from the Boulder swim beach and a historic road to Fort Callville potentially exists in the project area of Callville Bay, although the specific route is unknown.

Recreation Use and Lake Access

Lake Mead National Recreation Area is in one of the fastest growing regions of the United States. Los Angeles, San Diego, and San Bernardino, California are within a half-day drive, as is Phoenix, Arizona's largest metropolitan area. Many of Lake Mead's visitors reside in southern Nevada, Arizona, southern California, and southern Utah. However, nearby Las Vegas draws more than 40 million national and international visitors; many visit Lake Mead National Recreation Area while they are in the vicinity.

The recreation area is considered one of the premier water-based recreation areas in the nation. Many of the 8 to 10 million yearly visitors to the recreation area are involved in water-based recreational activities, primarily between May and September, which are supported at the developed marina and launch-ramp areas. These activities include motor boating, houseboating, sailboarding, sailing, canoeing, kayaking, rafting, waterskiing, wakeboarding, fishing, swimming, diving, use of personal watercraft, picnicking, boat touring, nature study, and camping along the lakeshore.

Concession-operated facilities at the developed areas provide numerous services to visitors such as boat rentals, marina-slip rentals, dry boat storage, fuel, general store merchandise, restaurants and snack bars, campgrounds, and lodging. NPS visitor facilities include campgrounds, picnic areas, fish-cleaning stations, restrooms, and ranger/visitor contact facilities.

Three marinas and six paved launch ramps are part of the developed areas on Lake Mead. The marinas are Hemenway Harbor, Callville Bay, and Temple Bar. The boat ramps are located in these same areas as well as at Echo Bay, Boulder Harbor, and South Cove.

Hemenway Harbor.

The Hemenway Harbor public launch ramp is located north of the marinas. It is built on one of the old roads used to access the river during the construction of Hoover Dam. It follows the uniform natural terrain with a 5% gradient and has been extended to a length of approximately 2,700 feet to just above the current water elevation of about 1,080 feet. On its present alignment, the existing launch ramp could be extended more than 0.5 mile, with a continuation of the 5% grade, down to an elevation of 950 feet.

Lake Mead Cruises was relocated in 2003 from Boulder Harbor to its current location at Hemenway Harbor. This operation provides sightseeing and educational tour-boat service to and from Hoover Dam, brunch and dinner cruises, and charter-boat service. This concessioner has a small store, an operations facility, restrooms, and a waiting area at their marina.

The Las Vegas Boat Harbor was located at the inflow of Las Vegas Wash before it relocated in 2002 to its current location on the north side of the cove in Hemenway Harbor. This area is responsible for providing a large part of the water-based services available to visitors at Lake Mead National Recreation Area. Marina operations consist of leased slips and small-boat, pontoon, and personal-watercraft rentals. A store at the marina sells boating parts, food, and alcohol; there is also a restaurant and bar on site. This marina provides a floating fuel dock and on-land dry storage.

Lake Mead Marina is owned and operated by Las Vegas Boat Harbor and is located on the south side of the cove. It was relocated from the Boulder Harbor area in 2003. Marina operations consist of leased slips and boat repair and sales. A store at the marina sells boating parts, food, and alcohol; there is also a restaurant and bar on site.

Callville Bay.

Callville Bay has two existing launch ramps. The upper launch ramp, located at the west end of the bay, has a length of about 1,100 feet and a bottom elevation of about 1,090 feet. It closed in 2014. The lower launch ramp, located on the south shore of the bay about 1,700 feet from the upper launch ramp, has a length of about 300 feet and a bottom elevation of about 1,077 feet. At its present location, it could only be extended down to an elevation of 1,065 feet with an approximately 10% gradient before the bottom flattens out.

The Callville Bay marina concessioner provides services both on land and at the marina. Marina operations consist of leased slips and houseboat, small-boat, pontoon, and personal-watercraft rentals. A seasonal cafe and store at the marina sell food and beverages. The land-side operations include an RV park, a restaurant, a store, employee housing, dry-boat storage, boat repair, and seasonal trailer-park leases. The concessioner also sells fuel on land and at the marina.

Echo Bay.

Echo Bay has two existing launch ramps. The original launch ramp, located at the end of the bay, has a length of about 1,270 feet and a bottom elevation of about 1,105 feet. It closed in 2014. The launch ramp, located north of the bay, has a length of about 330 feet and a bottom elevation of about 1,077 feet. At its present location, it could only be extended down to an elevation of 1,025 feet before the bay bottoms out.

Echo Bay Marina closed in 2013 after a 3-year temporary contract expired. The park solicited for a concessioner to operate the full-service marina, food service facility, retailer, RV park, campground, long-term trailer village, fuel station, and other business operations at Echo Bay; however, no bids were submitted. Under a revised contract, a concessioner continues to manage land-based visitor services.

Temple Bar.

The existing public launch ramp is located in an inlet at the southwest end of the cove. The existing launch ramp has a gradient of about 8% and has been extended to a length of about 1,700 feet. At present, the launch ramp extends down nearly to the water level at 1,077 feet. Below an elevation of 1,050 feet, the bottom of the inlet flattens out, so the existing ramp cannot be extended more than about 400 feet at an 8% grade.

A concessioner provides services both on land and at the marina at Temple Bar. Marina operations consist of a fuel dock, leased slips, and watercraft rentals consisting of personal watercraft and small boats. The landside operations include a motel, a campground, a restaurant, a store, a fuel station, employee housing, and seasonal trailer-park leases.

Socioeconomic Environment

Lake Mead National Recreation Area is located in Clark County, Nevada and Mohave County, Arizona. Communities adjacent to the recreation area include the greater Las Vegas area, which includes the cities of Las Vegas, North Las Vegas, Henderson, Boulder City, Overton, Searchlight, and Laughlin, Nevada, and Bullhead City and Meadview, Arizona. Visitors to the national recreation area come from the local Las Vegas metropolitan area, across the United States, and throughout the world.

In 2016, the population of Clark County, Nevada was 2,155,664 and Mohave County's population was 205,249. Between 2000 and 2016, the average annual population grew by 2.8% and 1.8%, respectively, for Clark County and Mohave County (US Census Bureau 2000, 2016). Employment in Mohave and Clark Counties is highly concentrated in tourism and related industries, underscoring the important role that Lake Mead plays in the local economy. The largest industries—by employment—include accommodation and food services, and retail trade. Other important industries include health care, administrative and support, and real estate and rental and leasing (Bureau of Economic Analysis 2016).

In 2016, the National Park Service reported 7.2 million visitors at Lake Mead National Recreation Area. These visitors spent an estimated \$312.7 million in local gateway regions, with an estimated \$43.42 in per-visitor spending (unadjusted 2016 dollars) (table 3) (NPS 2016).

TABLE 3. VISITOR SPENDING EFFECTS AT LAKE MEAD NATIONAL RECREATION AREA

Sector	Per-Visitor Spending	Percentage
Hotels	\$12.33	28.4
Restaurants	\$9.61	22.1
Gas	\$6.43	14.8
Groceries	\$5.98	13.8
Retail	\$3.42	7.9
Recreation Industries	\$3.16	7.3
Camping	\$1.68	3.9
Transportation	\$0.81	1.9

Source: NPS 2016.

Existing lake-access facilities operating on Lake Mead include three marinas, one launch ramp, and one cruise operation. These five operations are the following:

- Temple Bar Marina
- Callville Bay Marina
- Lake Mead Cruises
- Las Vegas Boat Harbor Marina / Lake Mead Marina
- Echo Bay launch ramp

Temple Bar Marina and Callville Bay Marina are operated by a privately held company. Lake Mead Marina and Las Vegas Boat Harbor are operated by the Las Vegas Boat Harbor LLC, based in Las Vegas. Lake Mead Cruises is operated by Aramark, a publicly traded Philadelphia-based corporation that specializes in food, facilities, and uniforms.

Lake Mead Cruises and Las Vegas Boat Harbor Marina / Lake Mead Marina operate out of Hemenway Harbor. These concessions are located relatively near each other. Callville Bay is on the north side of the lake opposite the two Hemenway concessions, and Temple Bar is approximately 25 miles directly east of Hemenway and Boulder Harbors. Echo Bay is located on the Overton Arm of Lake Mead, and the National Park Service operates the launch ramp at this location. No marina or floating services (e.g., water, gas, pump outs) are available at Echo Bay.

Since 1990, the average annual lake elevation has declined by 9.0%, dropping more than 100 feet from 1,183.2 feet in 1990 to 1,077.2 feet in 2016—a 39.0% decline in the lake’s volume over this period. Revenues at all marina operations and Lake Mead Cruises have generally declined over the past 10 years at a rate similar to changes in elevation at Lake Mead; since the recession, revenues have increased slightly. Over the last 10 years, visitation at the park generally decreased until 2013, but since then has nearly recovered to pre-recession levels. Additionally, marina operators report that there have been decreases in the vacation preferences of visitors, particularly houseboat rentals. Concessioners indicate this change in preferences, combined with the negative perception of declining lake elevations, continues to adversely impact revenues at facilities located on Lake Mead.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The National Environmental Policy Act requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided if a proposed action is implemented. In addition, the effects on historic properties are considered in accordance with the National Historic Preservation Act. The following portion of this document analyzes the environmental impacts of the alternatives on natural resources, cultural resources, the visitor experience, national recreation area operations, and the socioeconomic environment. The analysis is the basis for comparing the beneficial and adverse effects of implementing the alternatives.

This chapter begins with a description of the methods and assumptions for each topic. Impact analysis discussions are organized by alternative and then by impact topic under each alternative. Each alternative discussion also details cumulative impacts and presents a conclusion.

Impact analysis and conclusions are based on NPS staff knowledge of resources and effects from past similar activities; current regulations; review of existing literature, studies, and other available information; and professional judgment. Mitigating actions would be taken during implementation of the alternatives. All impacts have been assessed assuming that mitigating measures have already been implemented.

Cumulative Impacts

A cumulative impact is described in the Council on Environmental Quality's regulation 1508.7 as follows: "Cumulative impacts are incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other action."

Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time. Cumulative impacts were determined by combining the impacts of each alternative with impacts of other past, present, and reasonably foreseeable future actions within the national recreation area and surrounding lands.

Specific projects and plans with the potential to cumulatively affect the resources (impact topics) are identified below. Some impact topics would be affected by several or all of the described activities, while others could be affected very little or not at all. How each alternative would incrementally contribute to potential impacts for a resource is included in the cumulative effects discussion for each impact topic.

Currently, treated effluent and urban run-off from the Las Vegas Valley is discharged into Las Vegas Wash at various points, from which it flows into Lake Mead at Las Vegas Bay. Channel erosion from the constant flow of reclaimed water has become a significant factor within the wash. Erosion caused a drop in channel grade of more than 100 feet since 2002. Multiple weirs have been constructed in the wash, including four inside the park, to slow water flow and reduce scouring. Due to persistent drought and the resultant lower lake levels, additional weirs need to be constructed farther downstream.

Lowering water levels at Lake Mead exposed sections of ramps that were under water for almost 40 years. This caused crumbling and deterioration of the asphalt. Visitors needed to show caution at all launch ramps, being alert for holes, mud, silt, and debris. A large-scale launch-ramp improvement project involving the lower section of ramps down to the water was initiated in the summer of 2003. Work on the launch ramps significantly improved conditions for boaters using these Lake Mead facilities. The work at the ramps included removal of the existing asphalt surface and replacement with a 6-inch v-groove concrete surface for improved traction. Park service staff will continue to conduct ramp inspections with cleanup or repairs made on a continuous basis.

Development-related impacts—such as the construction, rehabilitation, and maintenance of roads, parking areas, buildings, and utility corridors—have disturbed park resources. Past and current activities, such as feral burros and illegal off-road vehicle use, have also disturbed areas of the park, including soils, vegetation, and cultural sites. The priority for natural-resource protection is to intensively manage these activities to prevent further disturbance, or to limit disturbance from authorized activities to the extent possible.

The Clark County Multiple Species Habitat Conservation Plan was completed in 2000 and identified protection strategies for sensitive, threatened, and endangered plant and animal species in southern Nevada. This provided the park with support for the active preservation of these species and their habitat or potential habitat. The Native Fish Work Group is working to preserve endemic fish species and their habitat in Lakes Mead and Mohave. In addition, the Colorado River Multiple Species Habitat Conservation Plan was completed in 2005 and provides additional support for the protection of sensitive, threatened, and endangered species along the Colorado River corridor.

Methodology

Federal Threatened and Endangered Species - Razorback Sucker.

The following analysis was based on the best available information on the razorback sucker, including past documents that were completed on the biology of the fish, impacts of other similar past actions in the Lake Mead area when applicable, and the knowledge and best professional judgment of resource specialists and planners. The planning team qualitatively evaluated potential impacts of the alternatives on the razorback sucker. A separate more detailed biological assessment was also prepared and provided to the US Fish and Wildlife Service for its review.

This analysis focuses on impacts of construction of new developments on the razorback sucker and its habitat. Because boat-use levels would remain at or below current levels under all of the alternatives, there would be no new boating-related impacts to razorback suckers.

In analyzing environmental impacts, federal agencies are required to assess cumulative impacts. Past, present, and reasonably foreseeable future actions need to be considered—cumulative impacts result from the incremental impact of an action when added to actions taken by others. In the case of the razorback sucker, past actions—including the damming of the Colorado River and creation of Lake Mead, and the introduction of nonnative sport fish—have considerably altered the habitat, leading to a substantial decline of the razorback. The continuing drought and resulting drop of the lake elevation is also affecting the fish habitat, including its spawning locations, threatening the survival of the fish; however, this is not due to a specific action of the National Park Service or other agencies. Other past actions that have affected the razorback sucker include the listing of the species as

endangered in 1991, designation of critical habitat in 1994, and development of a recovery plan for the fish in 1998 and subsequent recovery program. However, no ongoing present actions or reasonably foreseeable actions are being taken by the National Park Service or other agencies at Lake Mead—including the Bureau of Reclamation (which operates the dam at Lake Mead) or the Southern Nevada Water Authority—that would affect the razorback sucker. Because no other actions were identified that would result in cumulative impacts when added to the actions being considered in this plan, cumulative impacts are not included in this impact analysis.

Assumptions: The lake level will continue to drop over time due to an ongoing drought and increased demand for water in the Lake Mead reservoir.

Cultural Resources.

The methodology used for assessing impacts to cultural resources is based on how the proposed action would affect the characteristics for which the site, structure, or landscape is considered historically significant, and therefore eligible for, or listed in, the National Register of Historic Places. Actions under the alternatives that have the potential to impact the integrity of location, design, setting, materials, workmanship, feeling, or association of a cultural resource are considered (NPS 1997).

Recreational Use and Lake Access.

Visitor use in parks is authorized in national park units and managed under the NPS Management Policies in “Chapter 8: Use of Parks,” that includes commercial as well as public use. Recreational purposes and activities authorized at Lake Mead National Recreation Area are more specifically defined in section 4 of the area’s enabling legislation, Public Law 88-639.

Socioeconomic Environment.

Socioeconomic impacts that could occur from implementation of the alternatives, including impacts to commercial operators in the park and economic impacts to nearby communities, are considered below. A quantitative description of impacts to employment and total revenue supported by marina operations is provided in this analysis along with a qualitative description of local economic impacts that could occur as a result of these alternatives. These qualitative impacts are expressed in terms of changes to local jobs, labor income, sales, and fiscal revenues. Note that all employment impacts to operations below are expressed in terms of impacts that could occur to peak-season employees, which provides the maximum employment that may be impacted at each operation. Impacts for this resource topic were analyzed using information on population, employment, and key regional industry sectors provided by the US Census Bureau; information on the economic contribution of national park visitation in the area provided by the National Park Service; and information on marina and cruise operations and employment provided by marinas at Lake Mead and Lake Mead Cruises.

The region of influence for this project includes Clark County, Nevada and Mohave County, Arizona—the two counties that contain Lake Mead National Recreation Area and the two counties where the majority of visitor spending takes place. Furthermore, most of the local workforce at Lake Mead live and spend their earnings in one of these two counties.

IMPACTS OF ALTERNATIVES

No Action

Natural Resources.

Federal Threatened and Endangered Species - Razorback Sucker

Analysis

The effect of the no-action alternative would depend on what changes are made to the lake marinas and launch ramps in response to the changing lake level. The chief concern of any of the actions being considered in all of the alternatives is the potential for altering the razorback's spawning areas. The primary change that could affect the razorback suckers under the no-action alternative would be extending the boat ramps farther into the lake at Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar up until the point it is no longer feasible to do so. Construction activities would likely increase sediments and water turbidity during construction. This could have a slight beneficial effect because turbidity may be important for the recruitment of razorbacks, providing cover from nonnative predators during the early life stages of the fish (Mohn et al. 2017). Increased turbidity may result in more razorback larvae surviving. However, this beneficial effect would likely be offset by the potential adverse impacts of construction equipment disturbing the spawning areas (as discussed below).

In addition, existing marinas would move farther out in the lake as topographic conditions allow, so anchoring systems would be placed in different positions along the lake bottom. However, given that these systems are temporary at any given location, the likelihood of long-term disruption or disturbance to any particular area of the lake bed, including substrates suitable for spawning, would be minimal.

The locations of razorback sucker spawning areas are not fully known, and may change from year to year. If the boat ramps are extended as the lake level lowers, there would be the potential that the ramps could extend into gravel-bottom areas where the razorback suckers spawn at Echo Bay and other potential areas. It is possible that the ramps may permanently remove existing or potential spawning habitat by replacing the natural substrate with concrete or other material. If this occurred, it is expected the fish would likely be able to find alternative locations to spawn, given the small area affected by the ramps and the potential for other suitable gravel areas to exist in Lake Mead.

If construction were to occur during the razorback's spawning season, it is possible the construction equipment could disturb and stress the fish, which could affect spawning. Also, there would be the chance of physical harm to larvae, which could not easily evade construction equipment. However, by limiting construction to outside the spawning period (i.e., from December 1 to May 1), these impacts would be avoided.

Although the lake's boating capacity is set by the 2003 Lake Mead Lake Management Plan / FEIS, the presence of marinas and boat ramps affects the level of recreational boating in specific parts of the lake. Impacts to razorbacks from recreational boating are not well documented (NPS 2005). It is possible that the noise of boat engines could disturb the fish and result in their displacement from areas where there is a high level of boat activity, such as the marinas and boat launches. In shallow

areas, motorized vessels also create wave action and disturb substrates, which could be detrimental to the fish, especially during spawning. Fuel discharges and other pollutants could reduce water quality, but it is not known if this impacts razorback suckers. All of these potential impacts would be lessened because boating activity is reduced on Lake Mead during the razorback's January-to-April spawning season.

Conclusion

Under the no-action alternative, the extension of boat ramps in response to the lowering lake level could affect razorback suckers. It is possible that extending the ramps could remove some existing or potential razorback spawning habitat. Continuing motorboat use at the marinas and launch ramps also may be affecting some razorbacks, although there is no documentation of adverse impacts occurring in Lake Mead. No actions would occur under the no-action alternative that would reduce the viability of the overall population of razorbacks in the lake, and only a very small area of the lake would be affected by the ramp extensions. Overall, the no-action alternative may affect, but is not likely to adversely affect, the razorback sucker and its critical habitat.

Cultural Resources.

Archeological Resources

Analysis

Construction activities associated with extending launch ramps and marina facilities at Hemenway, Callville Bay, Echo Bay, and Temple Bar under the existing management direction would have the potential to adversely impact submerged cultural resources. As appropriate, archeological surveys and/or monitoring would precede any construction, as described in a programmatic agreement. Known archeological resources would be avoided to the greatest extent possible. If national-register eligible or listed archeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Archeological and historic resources in the park have been adversely impacted from past development, vandalism, illegal activities, and natural processes. Lowering lake levels would continue to expose formerly submerged resources, which could result in adverse impacts from visitor use or vandalism. The National Park Service would continue to undertake measures to minimize or mitigate potential impacts through monitoring, educating the public, and restricting use in sensitive areas. Because significant archeological resources would be avoided to the greatest extent possible during implementation of the no-action alternative, the actions associated with the alternative would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to archeological resources resulting from implementation of the no-action alternative would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed archeological resources during excavation, construction, and demolition would result in no adverse impacts to archeological resources. If national-register eligible or listed historic properties could not be avoided, the impacts would be adverse, but an appropriate mitigation strategy would be developed under a memorandum of agreement.

Historic Structures

Analysis

Extension of launch ramps and movement of marinas and other associated actions under the no-action alternative would have adverse impacts to historic materials and the setting of the park's marina facilities constructed during the Mission 66 era at Temple Bar. Movement of the Las Vegas Boat Harbor and Lake Mead Cruises would place these facilities closer to a known submerged resource site—railroad grade and aggregate sorting and storage facility—as lake elevations approached 1,050 feet. The design of the marina facilities would be adjusted to avoid these resources. If national-register eligible or listed historic structures could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Some Mission 66 facilities in the park (mainly boat ramps) have been previously altered. The actions associated with the no-action alternative would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to historic structures resulting from implementation of the no-action alternative would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed historic structures during excavation, construction, and demolition would result in no adverse impacts. If national-register eligible or listed historic structures could not be avoided, the impacts would be adverse, but an appropriate mitigation strategy would be developed under a memorandum of agreement.

Recreation Use and Lake Access.

Analysis

Under the no-action alternative, extension of existing launch ramps at Hemenway Harbor would maintain public boat access down to an elevation near 1,000 feet as lake levels recede. Launch ramps at Echo Bay and Temple Bar would be extended in their existing locations to provide boat access down to a lake level of 1,050 feet. Extension of the ramp at Callville Bay is feasible in its current location to a lake level of 1,065 feet. After these depths, site conditions would result in insufficient ramp grades for boat launching at these locations. Successive closure of launch ramps would adversely affect the boating public who use these ramps. Visitor opportunities associated with boat

access, such as cruising, fishing, diving, and shoreline camping, would be reduced. Boaters who rely on these ramps would experience displacement from their desired location and competition for the remaining launch ramps that would be subject to increased launch and retrieval wait times, congestion, and safety concerns. Boaters may also seek access to the lake via backcountry roads, which would likely lead to more stuck vehicles, tows, and emergency callouts.

If boaters look elsewhere for their recreational experiences, this could have impacts to visitor use in Arizona, Utah, Nevada, and California as displaced boaters seek other opportunities for water-based recreation. The results of these impacts would depend on the extent of displacement and the degree to which adverse effects such as congestion, wait times, and safety concerns increase at other locations. The displacement would likely divert boaters to Lake Mohave, which is also located within the park. This would require the park to monitor shifts in visitor use patterns and adapt operational needs. Nonmotorized users seeking a primitive water experience could have an improved experience due to less noise, less wake from vessels, and fewer hazards associated with motorized use. However, the park's general management plan allocated primitive experiences for this user group, providing a balance of opportunities throughout the park.

Cumulative Impacts

Past, present, and reasonably foreseeable future projects within the recreation area and surrounding areas have the potential to affect recreation use and lake access. Past facility development, including ramp improvements and the boater safety building, currently provide benefit to visitors. The no-action alternative would result in limited lake access to the largest reservoir in the United States and the sixth-most-visited national park. It would also contradict the park's purpose as outlined in its enabling legislation. This would have an adverse impact on recreational boaters on Lake Mead.

Conclusion

The no-action alternative would result in adverse effects on most recreational users due to successive closure of all developed launch ramps and lost recreational opportunities.

Socioeconomic Environment.

Analysis

Under the no-action alternative, marina operations would be reconfigured and launch ramps would extend farther into the lake, as site conditions allow, at their existing locations on the lake. Marina configurations would add to operators' expenses as payment for utility line extensions and subsurface anchors would increase. These costs would be incurred gradually over a period of years. They represent a continuation of the existing condition of gradually adjusting for changes in the elevation of the reservoir over time. Ramp extensions would support local jobs, labor income, sales, and fiscal revenues in the study area during construction. Once site conditions no longer support marina operations or launch ramps, visitor services would be discontinued, resulting in the loss of more than \$20 million in concession revenue and nearly 250 peak-season employees, with corresponding losses in jobs, labor income, sales, and fiscal revenues. Additionally, the removal of these operations would likely lead to reduced visitation, further reducing spending that supports local jobs, labor income, sales, and fiscal revenues.

Cumulative Impacts

As lake levels decline below 1,050 feet, marina operations would be significantly reduced, dispersing boaters to one marina complex. This would shift economic spending patterns away from smaller gateway cities, such as Overton, Nevada, and Meadview, Arizona. These cities depend on lake visitors as a part of their economy. This shift could increase visitor spending in Boulder City, Nevada, however, the current marina and launch ramp would not be able to operationally absorb all dispersed visitors. As lake elevations decline below 1,000 feet, no marinas would remain on Lake Mead, dramatically changing visitation and visitor spending. Any reduction in boating participation could result in negative impacts to operators' revenue, adversely impacting local jobs, labor income, sales, and fiscal revenues.

Conclusion

There would be increased costs to all of the operators on Lake Mead as a result of declining lake elevations. As the lake reaches 1,050 feet in elevation, boat ramps and marina operations at all locations on the lake (with the exception of Hemenway Harbor) would begin to close. Operations at Hemenway Harbor would continue to a lake elevation of 1,000 feet. Closure of boat ramps, marinas, and Lake Mead Cruises would result in a reduction in local spending by these operations and likely reduction in staff. Any direct loss of jobs or local spending by these operations would result in further rounds of adverse indirect impacts from the reduction in spending by suppliers. Reductions in the number of employees would lead to adverse induced effects by employees, who would reduce spending for household items. Reductions in the number of visitors would also adversely impact local economic activity, including negative impacts to jobs, labor income, sales, and fiscal revenues. While the exact degree of impact on the local economy from closure of these operations is not known, it is likely to have some impact on the local economy of Boulder City, Nevada and the smaller towns around Lake Mead.

Alternative A – Preferred

Natural Resources.

Federal Threatened and Endangered Species - Razorback Sucker

Analysis

Alternative A would have many of the same effects on razorback suckers as the no-action alternative. Extending the boat ramps farther into the lake at Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar would result in increased sedimentation and turbidity during construction. This could have a slight beneficial effect on the survival of early life stages of razorback suckers, making them less vulnerable to predation. But this beneficial effect would likely be offset by the potential adverse impacts of construction equipment disturbing the spawning area (as discussed below).

As noted under the no-action alternative, if construction activities occurred during the spawning season it is possible that the construction equipment could disturb and stress the fish, which could affect spawning. Also, there would be the chance of physical harm to larvae, which could not easily evade construction equipment. However, if construction activities occurred outside of the spawning period, these adverse impacts would be avoided.

Although spawning is not known to occur in the areas where the boat ramps would be extended, with the exception of Echo Bay, it is possible that some spawning could be occurring in these areas. If the launch ramps were extended into spawning areas, the ramps may permanently remove existing or potential spawning habitat by replacing the natural substrate with concrete or other material. If this occurred, it is expected the fish would likely be able to find alternative locations to spawn, given the small area affected by the ramps and the potential for other suitable gravel areas to exist in Lake Mead.

Under alternative A, the movement of marina facilities farther into Hemenway Harbor, the relocation of the marina facilities and boat launch from Callville Bay to Swallow Bay, and the movement of the Temple Bar marina facilities farther into the lake are not expected to affect known razorback spawning areas, although there would be a possibility of these actions removing existing or potential spawning areas.

Continuing recreational boat use could also disturb the fish in the above areas, although these potential impacts are not well documented (please see the no-action alternative impact analysis).

Conclusion

Alternative A could affect razorbacks due to the extension of boat ramps and the movement of marina facilities. It is possible that the extension of the boat launches and marina facilities could alter existing or potential razorback spawning areas (although it is unknown if spawning actually occurs in most of these areas). No actions are being proposed under alternative A that would be expected to reduce the viability of the overall population of razorback suckers in the lake, and only a very small area of the lake would be affected by the ramp extensions and marina relocations. Overall, alternative A would have the potential to affect the razorback sucker but would not likely adversely affect it and its critical habitat.

Cultural Resources.

Archeological Resources

Analysis

As appropriate, archeological surveys and/or monitoring would precede any construction, as described in a programmatic agreement. Known archeological resources would be avoided to the greatest extent possible. If national-register eligible or listed archeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Archeological and historic resources in the park have been adversely impacted from past development, vandalism, illegal activities, and natural processes. Lowering lake levels would continue to expose formerly submerged resources, which could result in adverse impacts from visitor use or vandalism. The National Park Service would continue to undertake measures to minimize or mitigate potential impacts through monitoring, educating the public, and restricting use in sensitive areas. Because significant archeological resources would be avoided to the greatest extent

possible during implementation of alternative A, the actions associated with the alternative would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to archeological resources resulting from implementation of alternative A would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed archeological resources during excavation, construction, and demolition would result in no adverse impacts to archeological resources. If national-register eligible or listed historic properties could not be avoided, the impacts would be adverse, but an appropriate mitigation strategy would be developed under a memorandum of agreement.

Historic Structures

Analysis

Extension of launch ramps, construction of new roads, and movement of marinas and other associated actions under alternative A would have adverse impacts to historic materials and the setting of the park's marina facilities constructed during the Mission 66 era at Temple Bar. Movement of the Las Vegas Boat Harbor and Lake Mead Cruises would place these facilities closer to a known submerged resource site—railroad grade and aggregate sorting and storage facility—as lake elevations approached 1,050 feet. The design of the marina facilities would be adjusted to avoid these resources. If national-register eligible or listed historic structures could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Some Mission 66 facilities in the park (mainly boat ramps) have been previously altered. The actions associated with alternative A would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to historic structures resulting from implementation of alternative A would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed historic structures during excavation, construction, and demolition would result in no adverse impacts. If national-register eligible or listed historic structures could not be avoided, an appropriate mitigation strategy would be developed under a memorandum of agreement.

Recreation Use and Lake Access.

Analysis

Under alternative A, extension of existing launch ramps and construction of new access roads and low-water ramps would maintain public boat access and adjacent marina facilities on the lake down to an elevation near 950 feet in most areas. Echo Bay currently provides launch access only where it becomes impracticable to continue this access below 1,000 feet. Compared to the no-action alternative, this alternative would provide more access options for a longer term, resulting in greater benefit to visitors, consistent with the park's enabling legislation. Visitor opportunities associated with boat access, such as cruising, fishing, diving, and shoreline camping, would be maintained for visitors. During construction of launch ramps and relocation of facilities, visitors may experience some delays in launching. This is consistent with construction that has occurred over the past decade. Short-term adverse impacts would be managed by keeping at least one launch lane open at each developed area during construction, when possible.

Cumulative Impacts

Alternative A, in conjunction with past, present, and reasonably foreseeable actions, would result in beneficial long-term impacts on visitor experience, primarily due to maintaining recreational boating access on the lake.

Conclusion

Alternative A would beneficially impact long-term recreational use and lake access by providing launch ramps at the lowest elevations possible and relocating marina facilities for continued recreational boating, which is the primary visitor activity on the lake.

Socioeconomic Environment.

Analysis

Under alternative A, existing marina operations would be reconfigured and launch ramps would extend farther into the lake, as site conditions allow, at or near their existing locations on the lake. Marina configurations would add to operators' expenses as payment for utility line extensions and subsurface anchors would increase. Expenses would be greater than the no-action alternative because relocation to other bays may be necessary and utilities would be extended farther. These costs would be incurred gradually over a period of years. They represent a continuation of the existing condition of gradually adjusting for changes in the elevation of the reservoir over time. Ramp extensions would support local jobs, labor income, sales, and fiscal revenues in the study area during construction. These positive impacts would be greater than the no-action alternative because the ramps would be extended farther. The park would analyze reestablishing full-service marina operations at Echo Bay based on public safety, utilities, and commercial interest. A return of services would create jobs and concession revenue. Additionally, it could have a positive impact on visitor spending in gateway communities located at the north end of the park. All ramps and marinas would remain operational throughout the scope of this plan, with the exception of Echo Bay. Once the lake elevation reaches 1,000 feet, the Echo Bay launch ramp would be inoperable. This would result in a reduction in visitation and subsequent visitor spending in the Overton Arm of Lake Mead. At lake

elevations of 1,000 feet, impacts would be similar to those described under the no-action alternative, resulting in reduced support of local jobs, labor income, sales, and fiscal revenues.

Cumulative

Implementing this alternative would not contribute substantially to overall cumulative impacts. Visitor vacation preferences, public perception of recreation opportunities, and unrelated economic factors would drive a majority of the adverse cumulative impacts.

Conclusion

There would be increased operating costs to all of the marinas on Lake Mead and to Lake Mead Cruises as a result of lake elevations declining to 950 feet. Park authorities at Lake Mead National Recreation Area would primarily pay for construction of new roadways, boat ramp access, and parking facilities; any construction would temporarily support local jobs, labor income, sales, and fiscal revenues in the study area during construction. Spending by the marina operations, Lake Mead Cruises, and Lake Mead National Recreation Area on services to maintain operation of these facilities would support local jobs, labor income, sales, and fiscal revenues. Any direct support of jobs or local spending by these operations or their visitors would result in further rounds of beneficial induced impacts from the reduction in spending by suppliers of marinas and their employees who would see continued demand for their goods and services. At 1,000 feet in elevation of the lake, the launch ramp at Echo Bay would cease and impacts would be similar to those described under the no-action alternative resulting a reduction in support for local jobs, labor income, sales, and fiscal revenues in the local economy. No significant adverse impacts to the region of influence are expected under this alternative through 950 feet in elevation of the lake.

Alternative B

Natural Resources.

Federal Threatened and Endangered Species - Razorback Sucker

Analysis

Alternative B would have many of the same effects on razorback suckers as the previous alternatives. Extending the boat ramps farther into the lake at Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar would result in increased sedimentation and turbidity during construction. This could have a slight beneficial effect on the survival of early life stages of razorback, making them less vulnerable to predation. But this beneficial effect would likely be offset by the potential adverse impacts of construction equipment disturbing the spawning area (as discussed below).

As noted in the previous alternatives, if construction activities occurred during the spawning season, it is possible the construction equipment could disturb and stress the fish, which could affect spawning. Also, there would be the chance of physical harm to larvae, which could not easily evade construction equipment. However, if construction activities occurred outside of the spawning period, these adverse impacts would be avoided.

Although spawning is not known to occur in the areas where the boat ramps would be extended, with the exception of Echo Bay, it is possible that some spawning could be occurring in these areas. If

the launch ramps were extended into spawning areas, the ramps may permanently remove existing or potential spawning habitat by replacing the natural substrate with concrete or other material. If this occurred, it is expected the fish would likely be able to find alternative locations to spawn, given the small area affected by the ramps and the potential for other suitable gravel areas to exist in Lake Mead.

Under alternative B, floating barges could be placed to provide services on the lake at locations such as Callville Bay and Temple Bar. Although the entire lake is designated critical habitat, the floating barges should not affect razorback habitat. If a survey were conducted to identify potential spawning areas prior to anchoring the barges, the barges could be located at points where razorback sucker spawning is not likely to be present, avoiding potential impacts to larvae and adult fish.

Continuing recreational boat use in the other areas with access facilities could disturb the fish, although these potential impacts are not well documented (see the no-action impact analysis).

Conclusion

Alternative B could affect razorback spawning due to the extension of boat ramps at Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar. It is possible that extension of the boat launches could affect existing or potential razorback spawning areas (although it is unknown if spawning actually occurs in three of these areas). No actions are being proposed under alternative B that would reduce the viability of the overall population of razorbacks in the lake and only a very small area of the lake would be affected by the ramp extensions and marina relocation. Overall, alternative B would have the potential to affect the razorback sucker but would not likely adversely affect it and its critical habitat.

Cultural Resources.

Archeological Resources

Analysis

As appropriate, archeological surveys and/or monitoring would precede any construction, as described in a programmatic agreement. Known archeological resources would be avoided to the greatest extent possible. If national-register eligible or listed archeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Archeological and historic resources in the park have been adversely impacted from past development, vandalism, illegal activities, and natural processes. Lowering lake levels would continue to expose formerly submerged resources, which could result in adverse impacts from visitor use or vandalism. The National Park Service would continue to undertake measures to minimize or mitigate potential impacts through monitoring, educating the public, and restricting use in sensitive areas. Because significant archeological resources would be avoided to the greatest extent possible during implementation of alternative B, actions associated with the alternative would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably

foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to archeological resources resulting from implementation of alternative B would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed archeological resources during excavation, construction, and demolition would result in no adverse impacts to archeological resources. If national-register eligible or listed historic properties could not be avoided, the impacts would be adverse, but an appropriate mitigation strategy would be developed under a memorandum of agreement.

Historic Structures

Analysis

Extension of launch ramps, construction of new roads, and movement of marinas and other associated actions under alternative B would have adverse impacts to historic materials and the setting of the park's marina facilities constructed during the Mission 66 era at Temple Bar. Movement of the Las Vegas Boat Harbor and Lake Mead Cruises would place these facilities closer to a known submerged resource site—railroad grade and aggregate sorting and storage facility—as lake elevations approached 1,050 feet. The design of the marina facilities would be adjusted to avoid these resources. If national-register eligible or listed historic structures could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Some Mission 66 facilities in the park (mainly boat ramps) have been previously altered. The actions associated with alternative B would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to historic structures resulting from implementation of alternative B would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed historic structures during excavation, construction, and demolition would result in no adverse impacts. If national-register eligible or listed historic structures could not be avoided, the impacts would be adverse, but an appropriate mitigation strategy would be developed under a memorandum of agreement.

Recreation Use and Lake Access.

Analysis

Under alternative B, marina operations would be modified. This could mean a reduction in services such as mooring and boat rentals. Facilities could transition from being accessible by land to being accessible only by water. The park would maintain existing launch ramps and construct new access

roads and ramps at some locations, maintaining public boat access on the lake and visitor services down to an elevation near 950 feet. Compared to the no-action alternative, this would provide some increased benefit. Visitor opportunities associated with marina operations and boat access, such as cruising, fishing, diving, and shoreline camping, would be maintained for visitors. During construction of launch ramps, visitors may experience some delays in launching. Short-term adverse impacts would be managed by keeping at least one launch lane open at each developed area during construction, when possible.

Cumulative Impacts

Alternative B, in conjunction with past, present, and reasonably foreseeable actions, would result in beneficial long-term impacts on visitor experience, primarily due to maintaining recreational boating access on the lake. Although water-based visitor services would be modified compared to alternative A, services would still exist compared to the no-action alternative. These services are especially valuable for visitors who do not own boats and who rely on marina services to have on-the-water experiences.

Conclusion

Alternative B would generally have beneficial long-term impacts on visitor experience. Modified marina operations would maintain essential services to visitors. New launch ramps would provide for continued recreational boating on the lake, which is the primary visitor activity on the lake.

Socioeconomic Environment.

Analysis

Under alternative B, impacts would be similar to alternative A; however, marina operations would be modified. This could mean a reduction in services such as mooring and boat rentals. Facilities could transition from being accessible by land to being accessible only by water. Reduced services could result in reduced revenue for concessioners; however, offering flexibility in services could also result in reduced expenses. As an example, maintaining floating utilities could be more cost efficient compared to extending utility lines. Total cost for these modified services would vary based on the types of visitor services provided.

Cumulative

Cumulative impacts would be similar to those described under alternative A. This alternative affords the concessioner the opportunity to reduce or modify services, which could reduce expenses; however, it may also reduce revenue.

Conclusion

There would be increased operating costs to all of the marinas on Lake Mead and to Lake Mead Cruises as a result of lake elevations declining to 950 feet. Park authorities at Lake Mead National Recreation Area would primarily pay for construction of new roadways, boat ramp access, and parking facilities; any construction would temporarily support local jobs, labor income, sales, and fiscal revenues in the study area during construction. Modified marina operations would result in a reduction in jobs and subsequent spending by the marinas as a result of their reduction in size, slip

space, and rental boats. The reductions in jobs and services at these locations would result in reduced support of local jobs, labor income, sales, and fiscal revenues. Any direct loss of jobs or local spending by these operations or their visitors would result in further reduced indirect and induced impacts from the reduction in spending by suppliers of marinas and their employees in the region of influence. While the exact degree of impact from the redesign and/or reduction of operations is not known, the adverse economic impacts described above are not likely to be felt in the larger region of influence. However, they are likely to have some greater impact on the local economy of smaller communities located near these operations that rely on visitor spending. At the elevations when operations would cease, impacts would be similar to those described under the no-action alternative, resulting a reduction in support for local jobs, labor income, sales, and fiscal revenues in the local economy.

Alternative C

Natural Resources.

Federal Threatened and Endangered Species - Razorback Sucker

Analysis

Alternative C would have many of the same effects on razorback suckers as the previous alternatives. Extending the boat ramps farther into the lake at Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar would result in increased sedimentation and turbidity during construction. This could have a slight beneficial effect on the survival of early life stages of razorback, making them less vulnerable to predation. But this beneficial effect would likely be offset by the potential adverse impacts of construction equipment disturbing the spawning area (as discussed below).

As noted under the no-action alternative, if construction activities occurred during the spawning season, it is possible the construction equipment could disturb and stress the fish, which could affect spawning. Also, there would be the chance of physical harm to larvae, which could not easily evade construction equipment. However, if construction activities occurred outside of the spawning period, these adverse impacts would be avoided.

Although spawning is not known to occur in the areas where the boat ramps would be extended, with the exception of Echo Bay, it is possible that some spawning could be occurring in these areas. If the launch ramps were extended into spawning areas, the ramps may permanently remove existing or potential spawning habitat by replacing the natural substrate with concrete or other material. If this occurred, it is expected the fish would likely be able to find alternative locations to spawn, given the small area affected by the ramps and the potential for other suitable gravel areas to exist in Lake Mead.

As in the other alternatives, continuing recreational boat use in the areas with launch ramps could disturb the fish, although these potential impacts are not well documented (see the no-action impact analysis). However, with the removal of marina services, there likely would be fewer boats in these areas, reducing the potential for boats affecting razorback spawning.

Conclusion

Alternative C could affect razorback spawning due to the extension of boat ramps at Hemenway Harbor, Callville Bay, Echo Bay, and Temple Bar. It is possible that extension of the boat launches could alter existing or potential razorback spawning areas (although it is unknown if spawning actually occurs in three of these areas). No actions are being proposed under alternative C that would reduce the viability of the overall population of razorbacks in the lake and only a very small area of the lake would be affected by the ramp extensions and the marina relocation. Overall, alternative C would have the potential to affect the razorback sucker but would not likely adversely affect it and its critical habitat.

Cultural Resources.

Archeological Resources

Analysis

As appropriate, archeological surveys and/or monitoring would precede any construction, as described in a programmatic agreement. Known archeological resources would be avoided to the greatest extent possible. If national-register eligible or listed archeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Archeological and historic resources in the park have been adversely impacted from past development, vandalism, illegal activities, and natural processes. Lowering lake levels would continue to expose formerly submerged resources, which could result in adverse impacts from visitor use or vandalism. The National Park Service would continue to undertake measures to minimize or mitigate potential impacts through monitoring, educating the public, and restricting use in sensitive areas. Because significant archeological resources would be avoided to the greatest extent possible during implementation of alternative C, the actions associated with the alternative would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to archeological resources resulting from implementation of alternative C would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed archeological resources during excavation, construction, and demolition would result in no adverse impacts to archeological resources. If national-register eligible or listed historic properties could not be avoided, the impacts would be adverse, but an appropriate mitigation strategy would be developed under a memorandum of agreement.

Historic Structures

Analysis

Extension of the launch ramp at Temple Bar (alternative C) may have adverse impacts to historic materials and the area's Mission 66 setting. If national-register eligible or listed historic structures could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes under a memorandum of agreement.

Cumulative Impacts

Some Mission 66 facilities in the park (mainly boat ramps) have been previously altered. The actions associated with the alternative C would be expected to contribute only minimally to the adverse impacts of other past, present, or reasonably foreseeable actions. Although the overall cumulative impact would be adverse, any adverse impacts to historic structures resulting from implementation of alternative C would be a very small component of that cumulative impact.

Conclusion

Avoidance of national-register eligible or listed historic structures during excavation, construction, and demolition would result in no adverse impacts. If national-register eligible or listed historic structures could not be avoided, the impacts would be adverse, but an appropriate mitigation strategy would be developed under memorandum of agreement.

Recreation Use and Lake Access.

Analysis

Under alternative C, marina operations would discontinue when site conditions result in insufficient water depths. This would have an adverse impact on boat owners who prefer to keep their boats stored on the lake and on those who rely on marina services, such as fuel and supplies. Without on-the-water fuel, more boats would likely find themselves stranded, creating additional safety hazards for visitors and park personnel. Additionally, marinas provide boat rentals for visitors, allowing more visitors to enjoy the lake. The park would maintain public boat access on the lake down to an elevation near 950 feet, except at Echo Bay where ramp use would be discontinued as the lake level drops below 1,000 feet due to insufficient grades. Compared to the no-action alternative, maintaining longer-term ramp access to more areas would provide more benefit to visitors. Visitor opportunities associated with boat access, such as cruising, fishing, diving, and shoreline camping, would be maintained for many visitors. During construction of launch ramps, visitors may experience some delays in launching. Short-term adverse impacts would be managed by keeping at least one launch lane open at each developed area during construction, when possible.

Cumulative Impacts

Alternative C, in conjunction with past, present, and reasonably foreseeable actions, would result in beneficial long-term impacts on visitor experience, primarily due to maintaining recreational boating access on the lake. However, the experience would lack necessities associated with boating that are available under alternatives A and B.

Conclusion

Alternative C would allow visitors to continue to access the lake, but it lacks visitor services that help provide a safe, enjoyable experience, such as mooring, fuel, and supplies.

Socioeconomic Environment.

Analysis

All marina operations would be discontinued, resulting in the loss of more than \$20 million in concessions revenue and nearly 250 peak-season employees, with corresponding losses in jobs, labor income, sales, and fiscal revenues. Additionally, the removal of these operations would likely lead to reduced visitation, further reducing spending that supports local jobs, labor income, sales, and fiscal revenues. The park would continue to extend launch ramps, which would support local jobs, labor income, sales, and fiscal revenues in the study area during construction. Without marina operations, boaters may relocate to other bodies of water, shifting visitor spending patterns to Lake Mohave or other nearby lakes, negatively impacting gateway communities surrounding Lake Mead.

Cumulative

Cumulative impacts would be the same as those described under the no-action alternative concerning marina operations. However, by maintaining launch ramps, the impacts may be reduced compared to the no-action alternative because boaters would still be able to access the water. There would likely be a decline in visitation and visitor spending as a result of the reduction in amenities.

Conclusion

Closure of marinas, and Lake Mead Cruises would result in a reduction in local spending by these operations and a reduction in staff. Any direct loss of jobs or local spending by these operations would result in further rounds of adverse indirect impacts from the reduction in spending by suppliers. Reductions in the number of employees would lead to adverse effects by employees, who would reduce spending for household items. Reductions in the number of visitors would also adversely impact local economic activity, including negative impacts to jobs, labor income, sales, and fiscal revenues. While the exact degree of impact on the local economy from closure of these operations is not known, they are likely to have some impact on the local economy of Boulder City, Nevada and the smaller towns around Lake Mead.

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CHAPTER 5: CONSULTATION AND COORDINATION

A news release was published in October 2017 announcing initiation of the planning effort and seeking public input. Public meetings were held on October 11 in Kingman, Arizona and on October 12 in Henderson, Nevada. While some of the comments received were outside the scope of this project, there was generally support for efforts to maintain recreational access on the lake.

Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effect of an undertaking on historic properties. To that end, the National Park Service is working to develop a Programmatic Agreement with both the Nevada and Arizona State Historic Preservation Offices. Since redesign or relocation of visitor facilities is likely to be a phased process and full designs are not yet available, effects to historic properties cannot be fully determined at this time. The Programmatic Agreement will serve as a framework with which the NPS can consult on specific undertakings as they are implemented. In addition, the park has notified 18 tribes about the project and invited them to participate in the planning process.

Section 7 of the Endangered Species Act requires federal agencies to take into account the effect of an undertaking on species federally listed as threatened or endangered. In 2002, the US Fish and Wildlife Service issued a biological opinion for the park's Lake Management Plan. The National Park Service is currently consulting with the US Fish and Wildlife Service to amend that opinion to address impacts associated with this Low Water Plan.

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CHAPTER 6: SOURCES

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APPENDIX A: PROJECT MAPS

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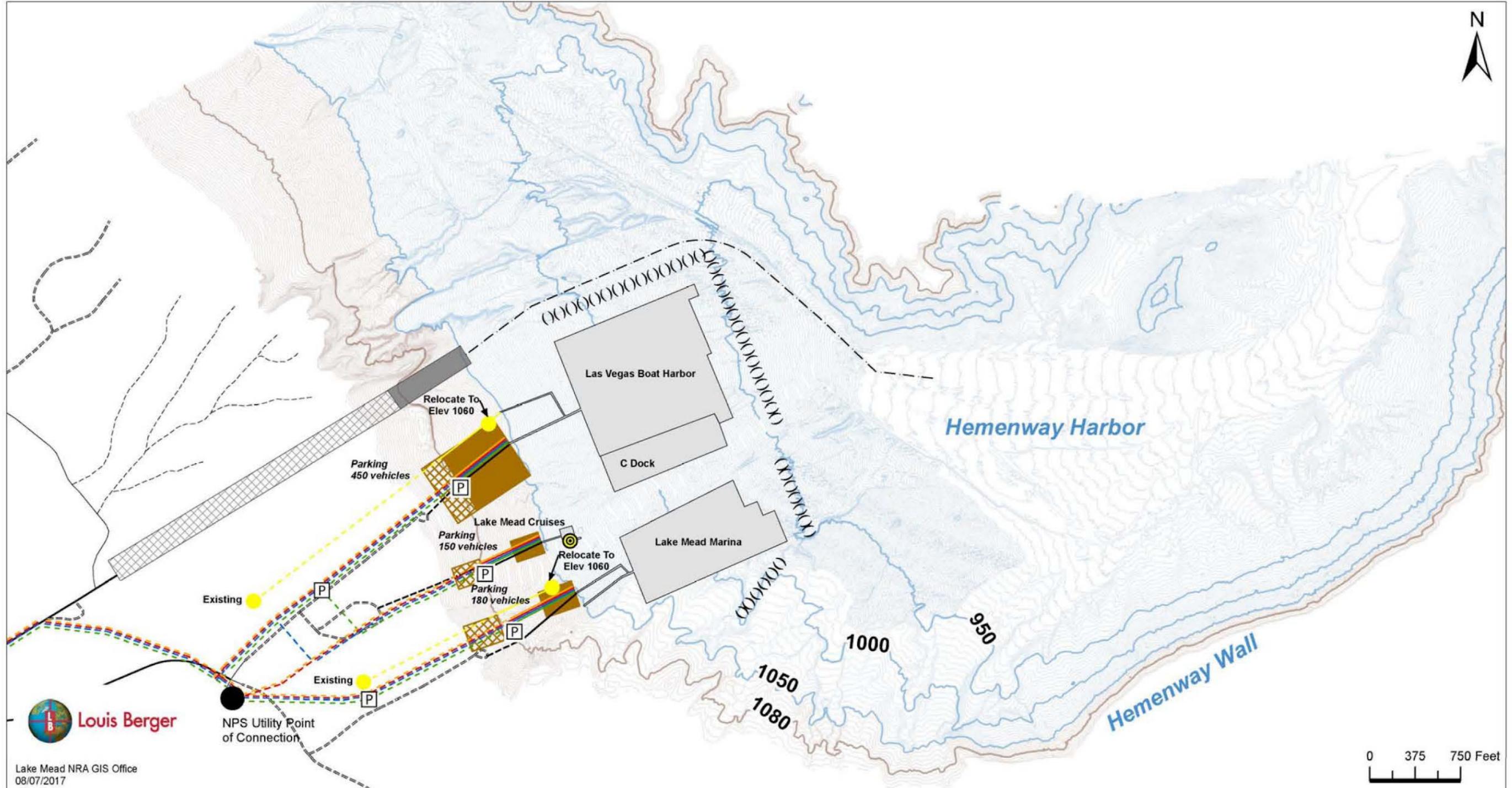
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Hemenway Harbor, Lake Elevation 1050 ft

National Park Service
U.S. Department of the Interior



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|-----------------|-------------------------------------------------|------------------------------------|------------------------------------|-----------------------------------------|-----------------------------------|-------------------------------------------------------------|------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------------------|----------------------------------------|
| Wastewater Pump | Telecommunications line
Proposed
Existing | Power line
Proposed
Existing | Water line
Proposed
Existing | Wastewater line
Proposed
Existing | Fuel line
Proposed
Existing | Access
Proposed
Existing
() Breakwater
Fairway | Marina
Existing Parking
Proposed Parking | Launch Ramp
Proposed
Existing | Roads open to the public
Major road
Local road
Maintained unpaved road
4WD road | Terrestrial Index Contours | Bathymetric Index Contours | Terrestrial 1 and 2 ft Contours (2008) | Bathymetric 1 and 2 ft Contours (2008) |
|-----------------|-------------------------------------------------|------------------------------------|------------------------------------|-----------------------------------------|-----------------------------------|-------------------------------------------------------------|------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------------------|----------------------------------------|



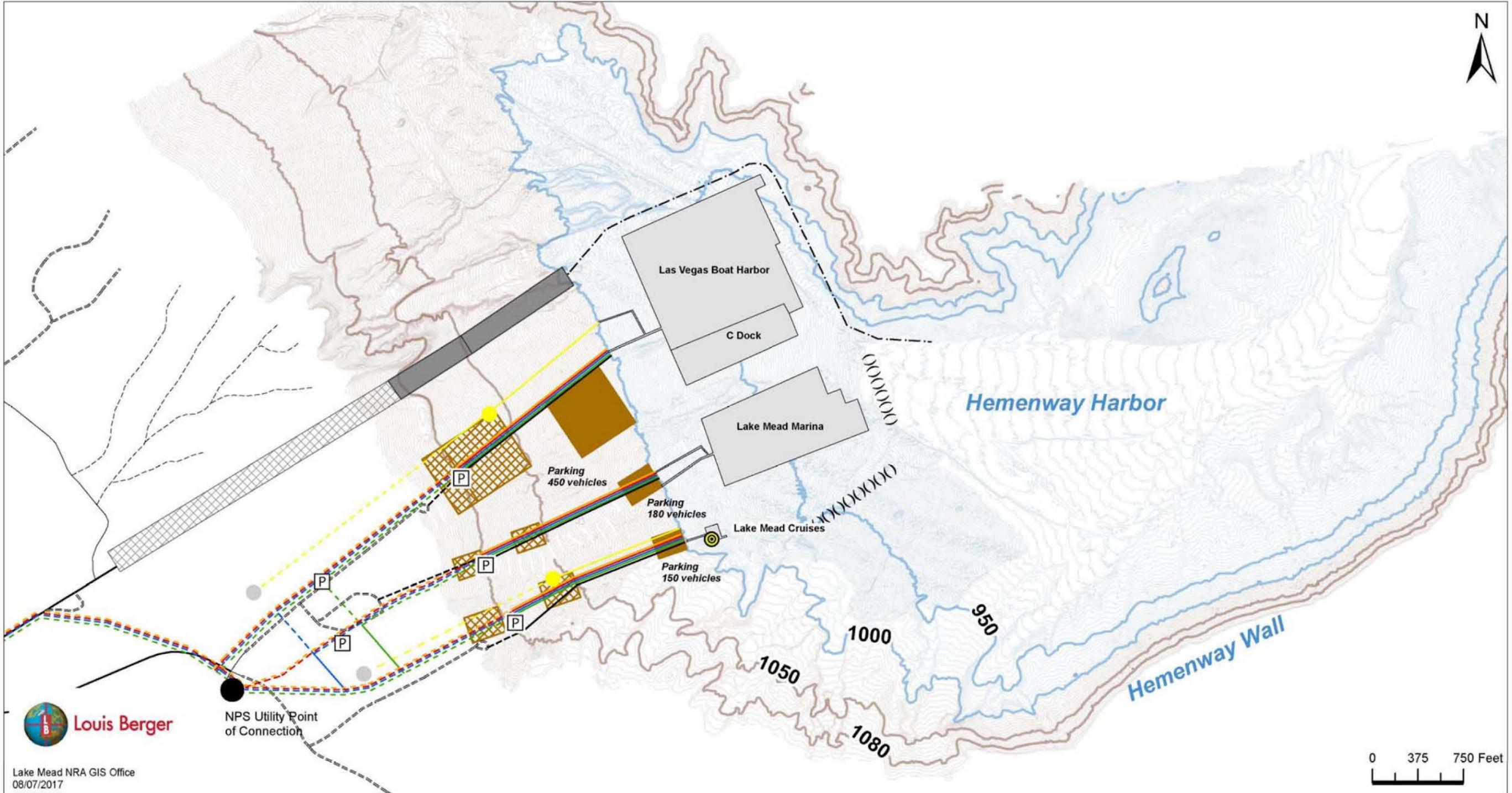
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Hemenway Harbor, Lake Elevation 1000 ft

National Park Service
U.S. Department of the Interior



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| Wastewater Pump | Access | Telecommunications line | Power line | Water line | Wastewater line | Fuel line | Roads open to the public | Marina | Launch Ramp | Terrestrial Index Contours |
| Floating Fuel Dock | - - - Existing | - - - Existing | - - - Existing | - - - Existing | - - - Existing | - - - Existing | — Major road | Existing Marina | Proposed Launch Ramp | Terrestrial Index Contours |
| Fuel Farm | — Proposed | — Proposed | — Proposed | — Proposed | — Proposed | — Proposed | — Local road | Proposed Marina | Existing Launch Ramp | Bathymetric Index Contours |
| Fairway | | | | | | | - - - Maintained unpaved road | | | Terrestrial 1 and 2 ft Contours (2008) |
| Breakwater | | | | | | | - - - 4WD road | | | Bathymetric 1 and 2 ft Contours (2008) |



NPS Utility Point of Connection

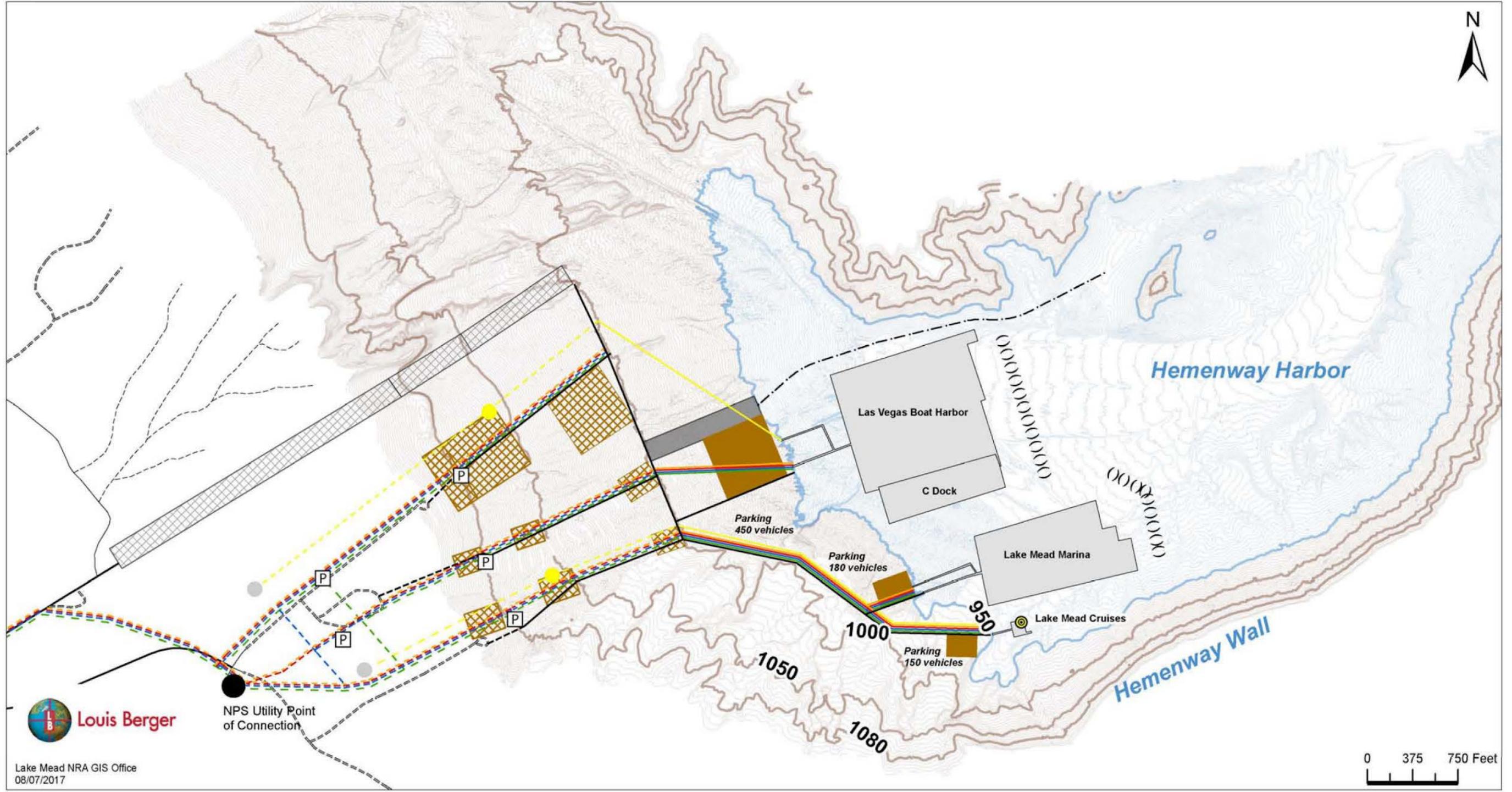
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Hemenway Harbor, Lake Elevation 950 ft

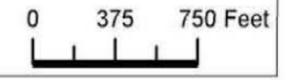
National Park Service
U.S. Department of the Interior



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|--------------------|---------------|--------------------------------|-------------------|-------------------|-----------------|------------------|---------------------------------|----------------------|----------------------------------------|
| Wastewater Pump | Access | Telecommunications line | Power line | Water line | Existing | Fuel line | Roads open to the public | Marina | Terrestrial Index Contours |
| Floating Fuel Dock | Existing | Existing | Existing | Existing | Existing | Existing | Major road | Existing Parking | Bathymetric Index Contours |
| Fuel Farm | Proposed | Proposed | Proposed | Proposed | Proposed | Proposed | Local road | Proposed Parking | Terrestrial 1 and 2 ft Contours (2008) |
| Fairway | | | | | | | Maintained unpaved road | Existing Launch Ramp | Bathymetric 1 and 2 ft Contours (2008) |
| Breakwater | | | | | | | 4WD road | Proposed Launch Ramp | |



NPS Utility Point of Connection



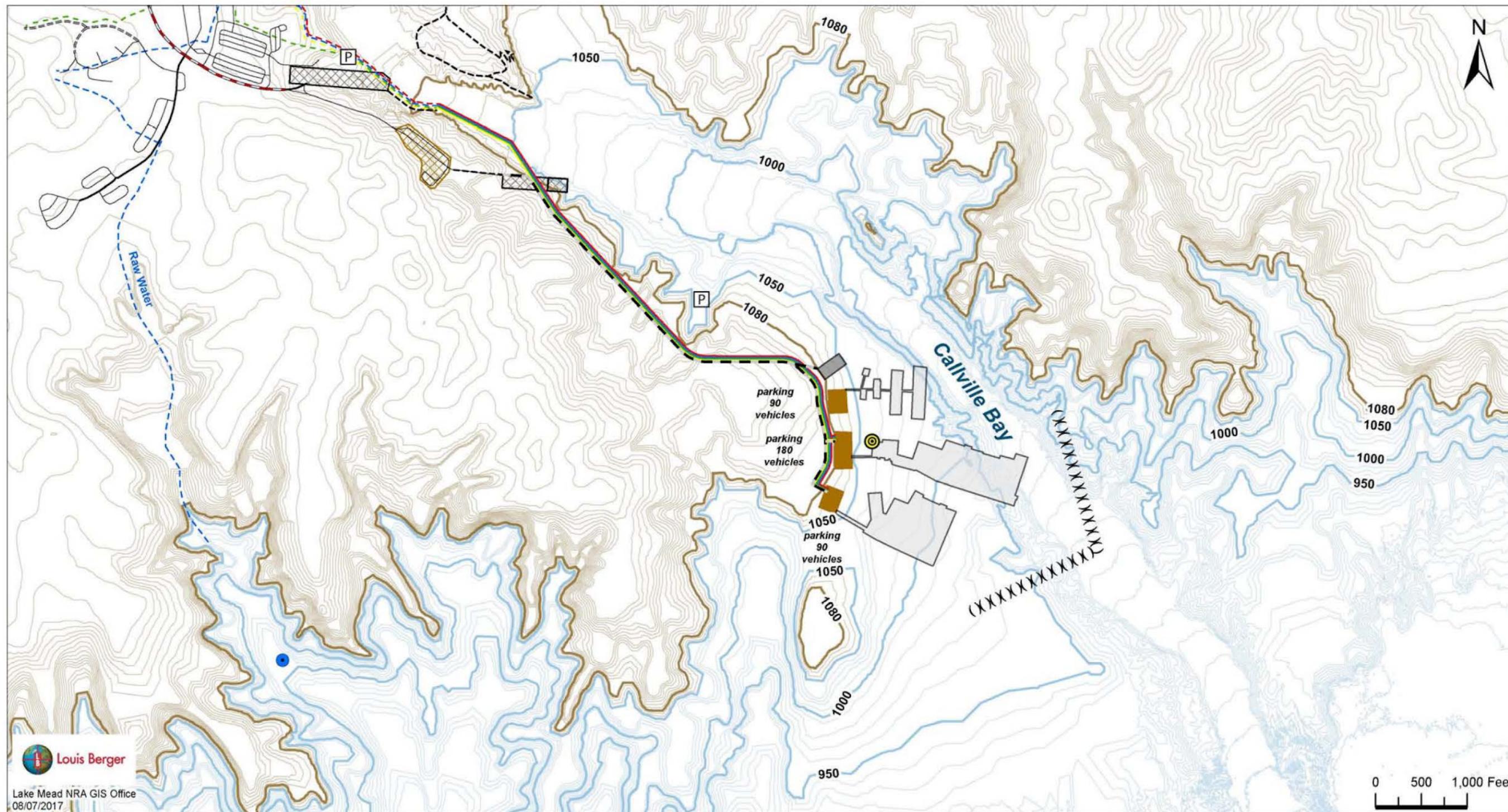
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Callville Bay, Lake Elevation 1050 ft

National Park Service
U.S. Department of the Interior



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| Wastewater Pump | Secondary highway | Existing Access | Proposed Sewer Line | Existing Launch Ramp | Terrestrial Index Contour |
| Water Intake Barge | Major road | Proposed Fuel Line | Existing Sewer Line | Marina | Bathymetric Index Contour |
| Floating Fuel Dock | Local road | Existing Fuel Line | Proposed Water Line | Existing Parking | Terrestrial Contour (10 ft) |
| Breakwater | Maintained unpaved road | Proposed Power Line | Existing Water Line | Proposed Launch Ramp | Bathymetric Contour (10 ft) |
| | Proposed Access | Existing Power Line | | | |



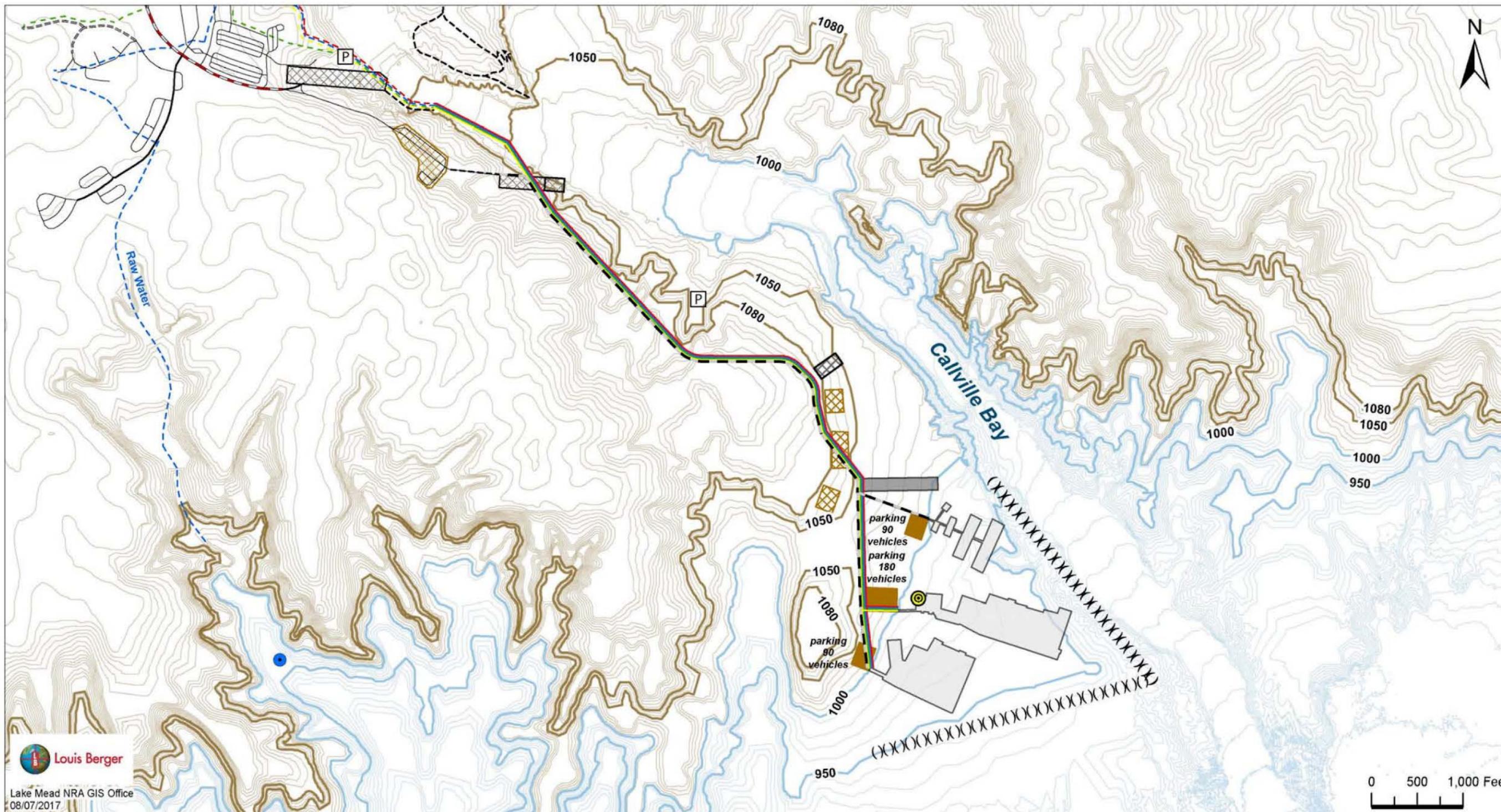
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Callville Bay, Lake Elevation 1000 ft

National Park Service
U.S. Department of the Interior



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| Wastewater Pump | Secondary highway | Existing Access | Proposed Sewer Line | Proposed Launch Ramp | Terrestrial Index Contour |
| Water Intake Barge | Major road | Proposed Fuel Line | Existing Sewer Line | Existing Launch Ramp | Bathymetric Index Contour |
| Floating Fuel Dock | Local road | Existing Fuel Line | Proposed Water Line | Marina | Terrestrial Contour (10 ft) |
| Breakwater | Maintained unpaved road | Proposed Power Line | Existing Water Line | Proposed Parking | Bathymetric Contour (10 ft) |
| | Proposed Access | Existing Power Line | | Existing Parking | |



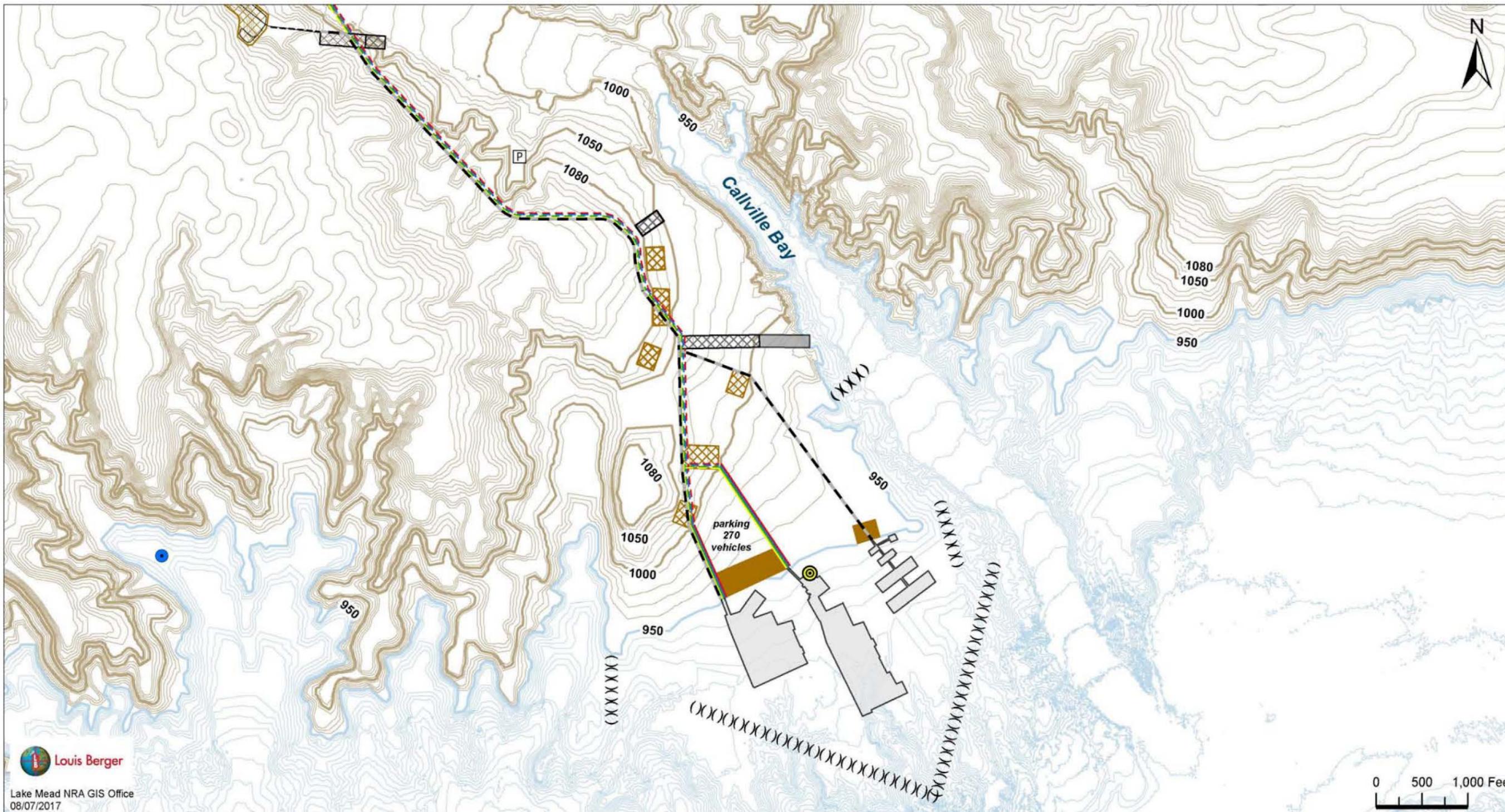
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Callville Bay, Lake Elevation 950 ft

National Park Service
U.S. Department of the Interior



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|-------|--------------------|-----|---------------------|-----|---------------------|---|----------------------|---|------------------|---|-----------------------------|
| (XXX) | Breakwater | --- | Existing Access | --- | Existing Sewer Line | ■ | Proposed Launch Ramp | ■ | Proposed Parking | — | Terrestrial Index Contour |
| P | Wastewater Pump | --- | Existing Fuel Line | --- | Proposed Sewer Line | ■ | Existing Launch Ramp | ■ | Existing Parking | — | Bathymetric Index Contour |
| ⊙ | Floating Fuel Dock | --- | Proposed Fuel Line | --- | Existing Water Line | ■ | Marina | | | — | Terrestrial Contour (10 ft) |
| --- | Proposed Access | --- | Existing Power Line | --- | Proposed Water Line | | | | | — | Bathymetric Contour (10 ft) |
| | | --- | Proposed Power Line | | | | | | | | |



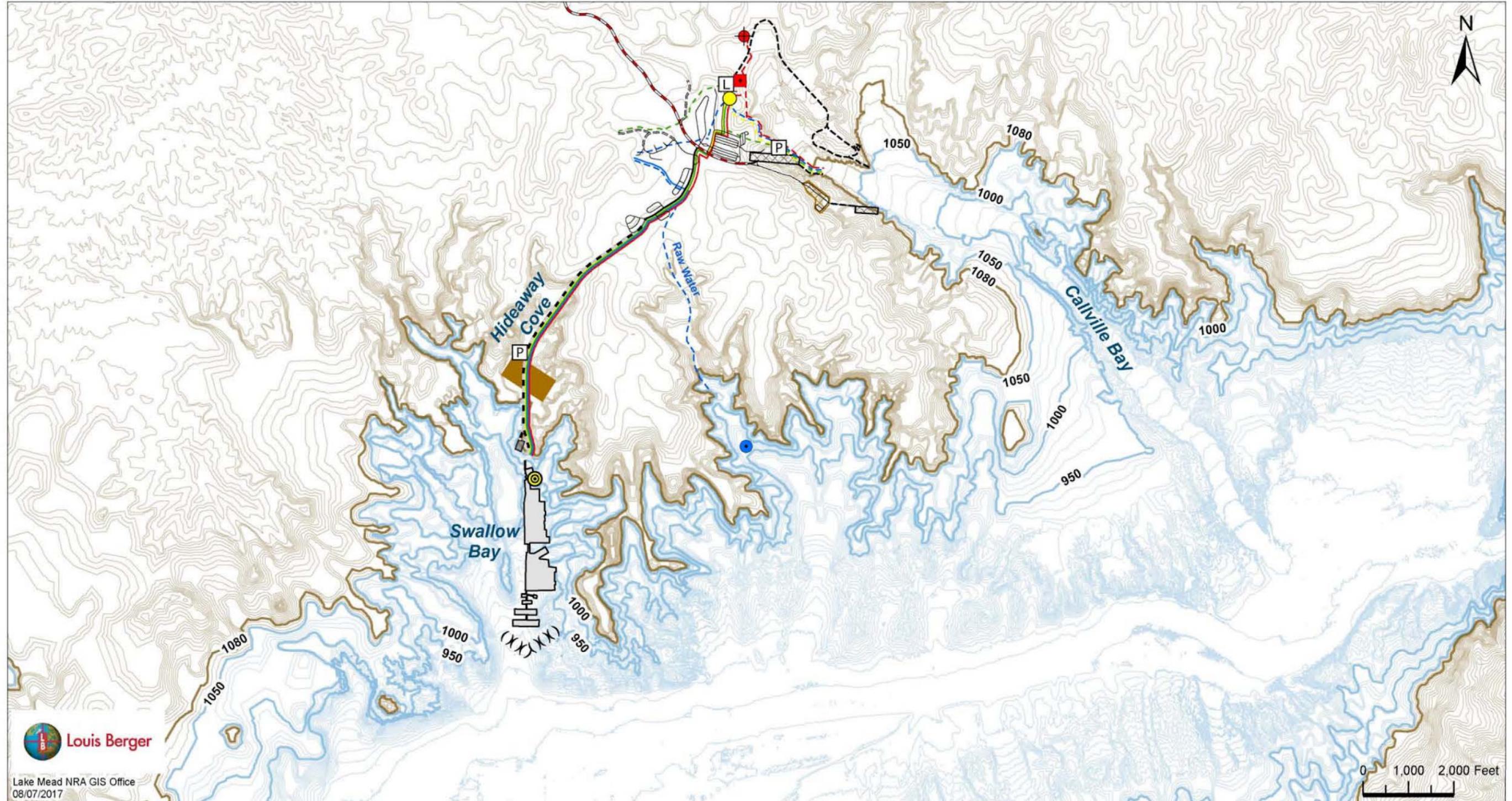
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Callville Bay, Lake Elevation 1050 ft Swallow Bay Option

National Park Service
U.S. Department of the Interior



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| Floating Fuel Dock | Wastewater Pump | Secondary highway | Existing Access | Existing Sewer Line | Marina | Terrestrial Index Contour |
| Underground Fuel Storage | Wastewater Lift Station | Major road | Proposed Fuel | Proposed Water | Proposed Launch Ramp | Bathymetric Index Contour |
| Power Pole | Water Intake Barge | Local road | Existing Fuel Line | Existing Water Line | Existing Launch Ramp | Terrestrial Contour (10 ft) |
| Substation | Breakwater | Maintained unpaved road | Proposed Power | Existing Power Line | Proposed Parking | Bathymetric Contour (10 ft) |
| | | Proposed Access | Proposed Sewer | | Existing Parking | |



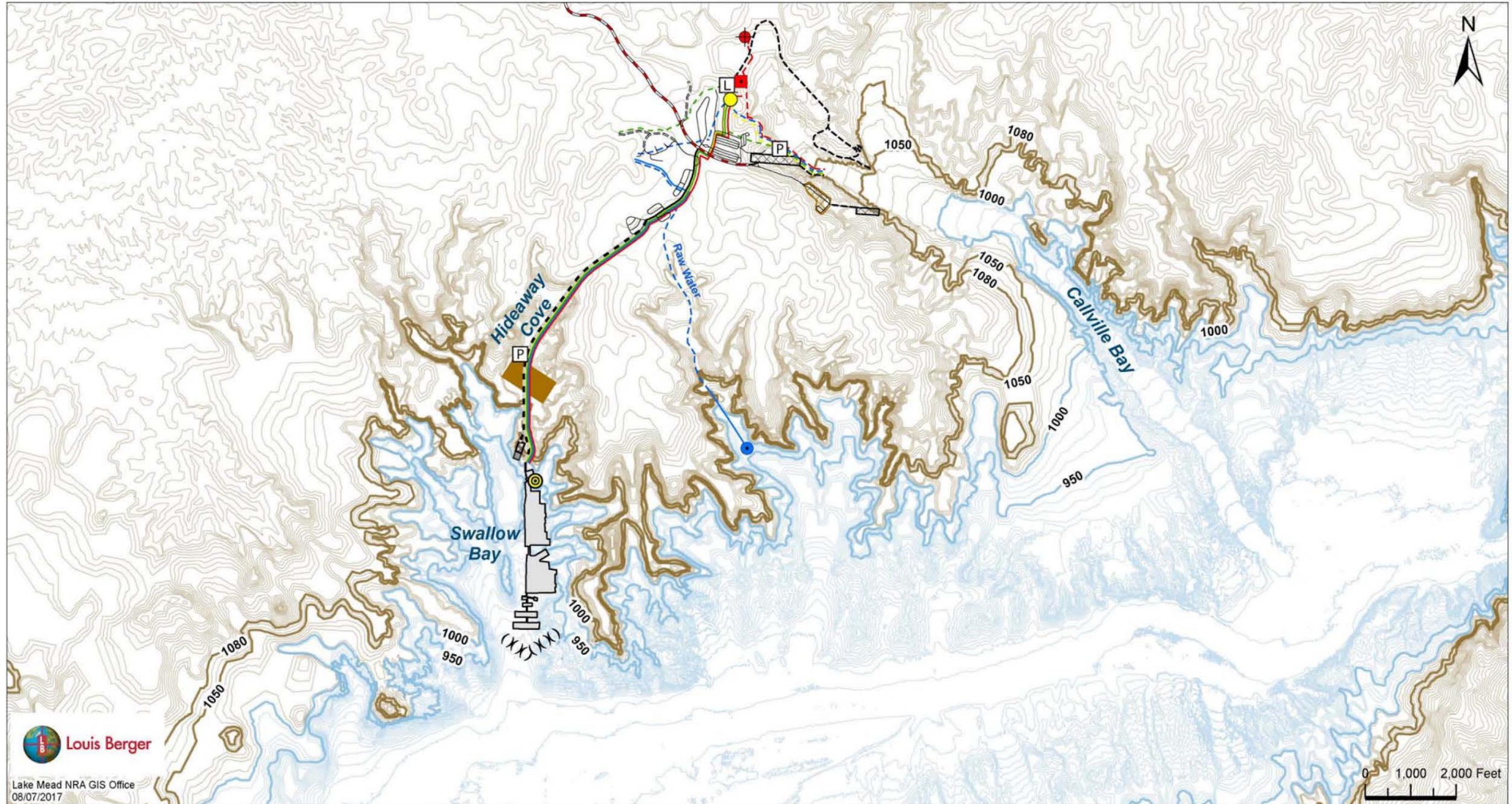
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Callville Bay, Lake Elevation 1000 ft Swallow Bay Option

National Park Service
U.S. Department of the Interior



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| Floating Fuel Dock | Wastewater Pump | Secondary highway | Existing Access | Existing Fuel Line | Existing Sewer Line | Marina | Terrestrial Index Contour |
| Underground Fuel Storage | Wastewater Lift Station | Major road | Proposed Fuel | Proposed Power | Proposed Water | Proposed Launch Ramp | Bathymetric Index Contour |
| Power Pole | Water Intake Barge | Local road | Existing Power Line | Existing Water Line | Existing Launch Ramp | Existing Parking | Terrestrial Contour (10 ft) |
| Substation | Breakwater | Maintained unpaved road | Proposed Sewer | | | | Bathymetric Contour (10 ft) |



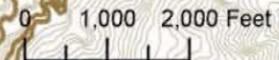
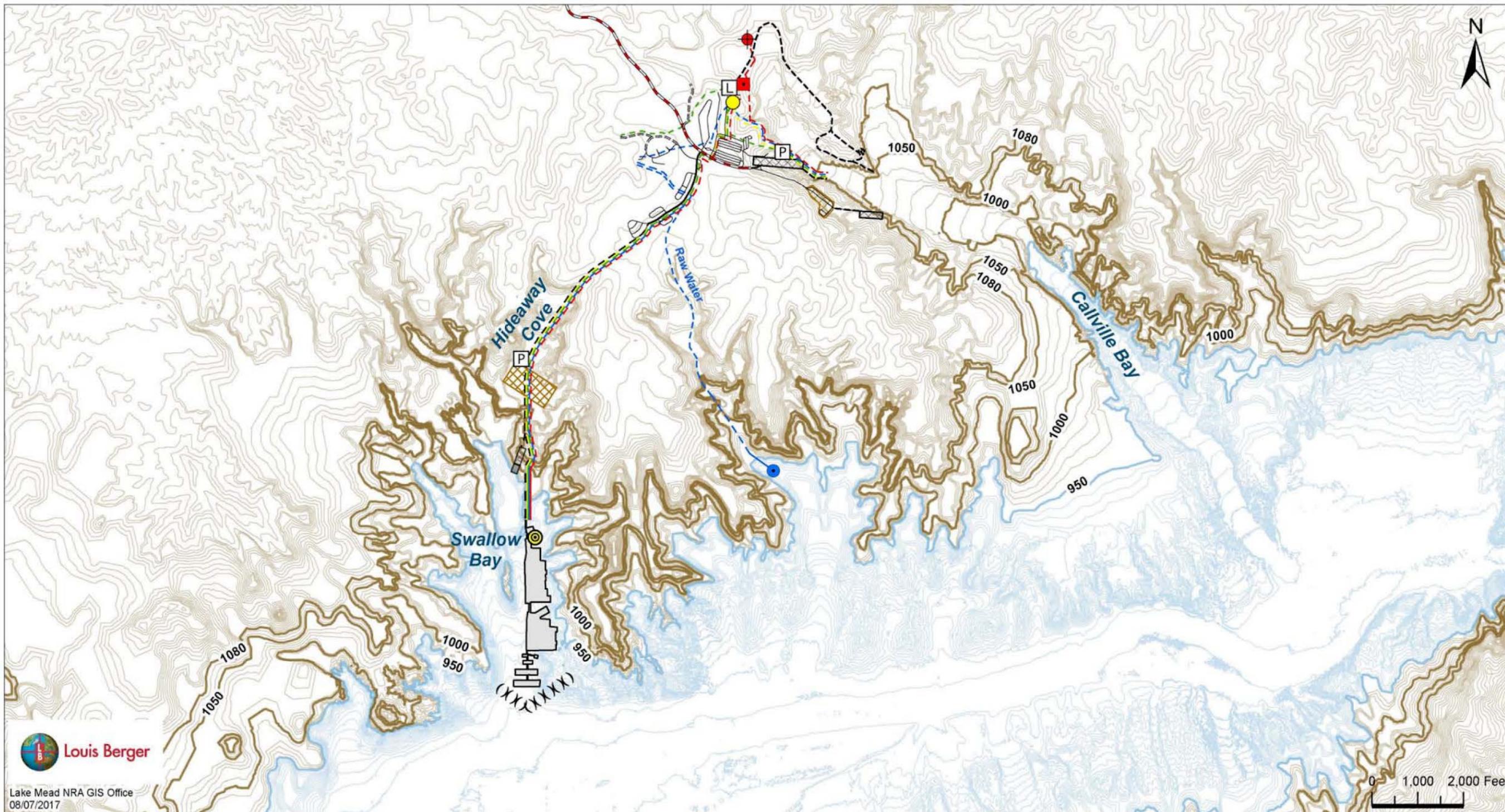
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Callville Bay, Lake Elevation 950 ft Swallow Bay Option

National Park Service
U.S. Department of the Interior



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| Floating Fuel Dock | Wastewater Pump | Secondary highway | Existing Access | Proposed Sewer Line | Marina | Terrestrial Index Contour |
| Underground Fuel Storage | Wastewater Lift Station | Major road | Proposed Fuel Line | Existing Sewer Line | Proposed Launch Ramp | Bathymetric Index Contour |
| Power Pole | Water Intake Barge | Local road | Existing Fuel Line | Proposed Water Line | Existing Launch Ramp | Terrestrial Contour (10 ft) |
| Substation | Breakwater | Maintained unpaved road | Proposed Power Line | Existing Water Line | Existing Parking | Bathymetric Contour (10 ft) |
| | | Proposed Access | Existing Power Line | | | |



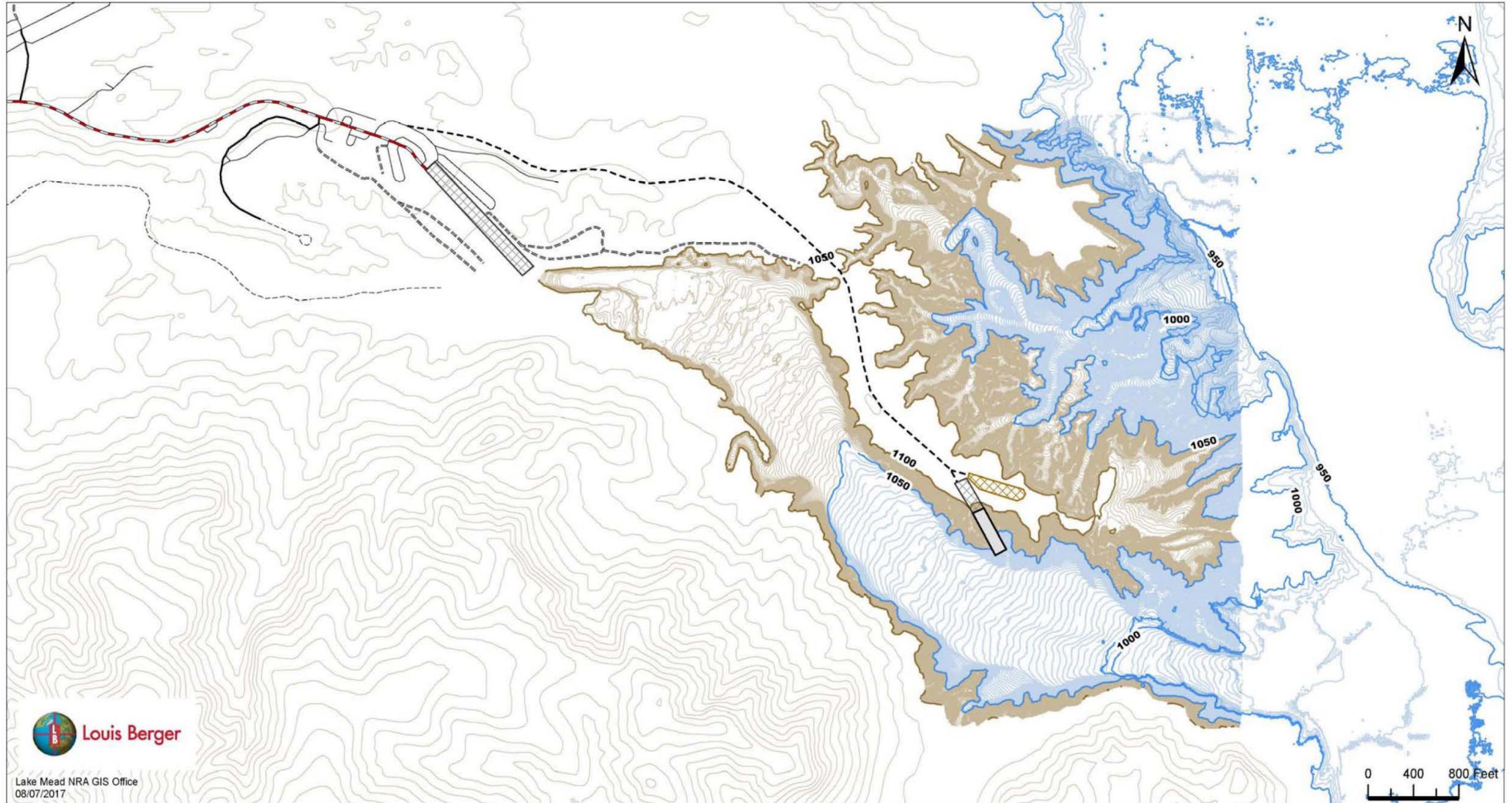
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Echo Bay, Lake Elevation 1050 ft

National Park Service
U.S. Department of the Interior



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| --- Echo_Bay_ExistingAccess_1050 | ▨ Proposed Launch Ramp | — 1 ft bathymetric contour |
| — Secondary highway | ▨ Existing Launch Ramp | — 50 ft index bathymetric contour (2008) |
| — Major road | ▨ Existing Parking | — 1 ft terrestrial contour |
| — Local road | | — Terrestrial Index contour |
| --- Maintained unpaved road | | |
| --- 4WD road | | |



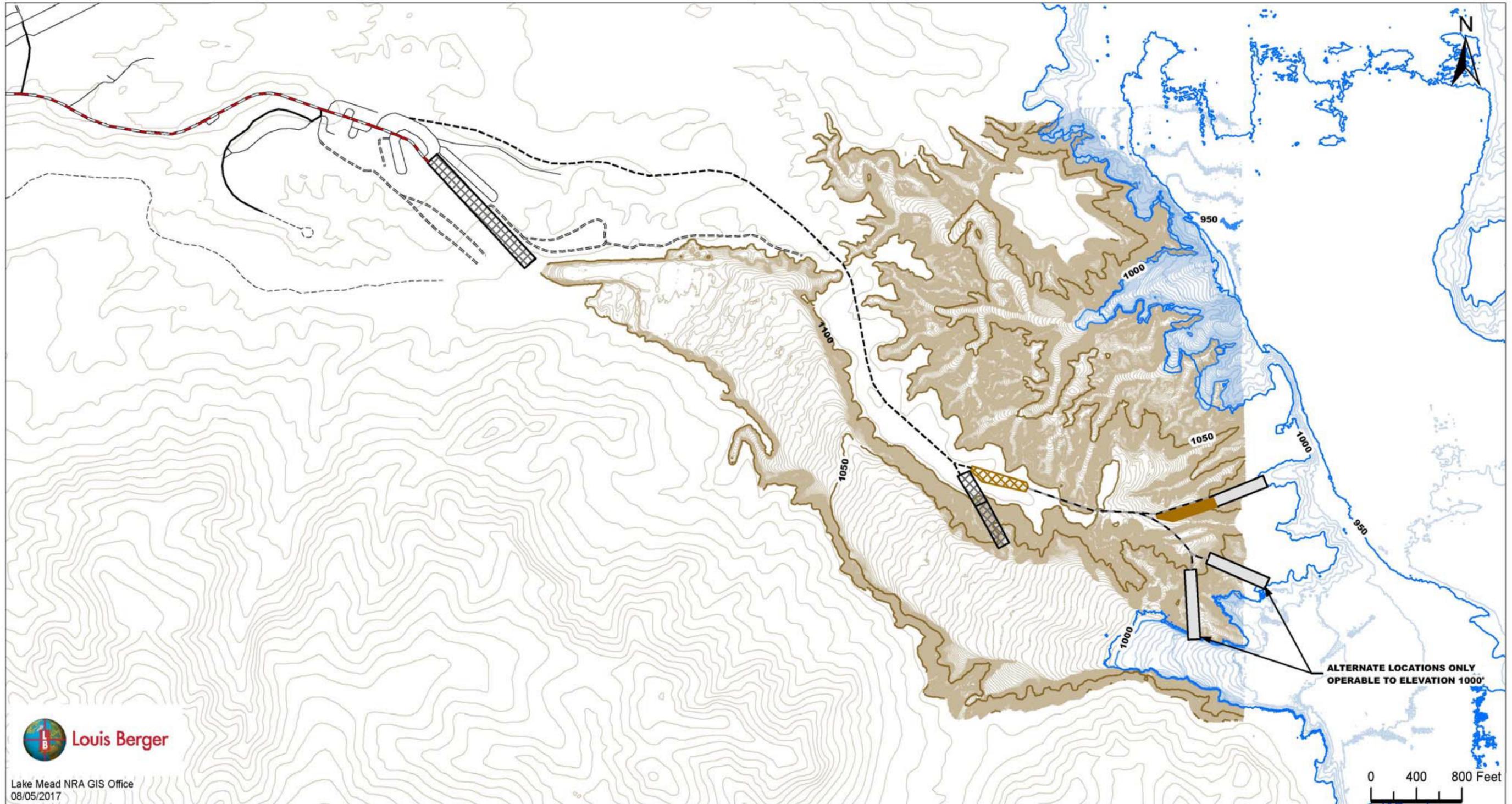
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Echo Bay, Lake Elevation 1000 ft

National Park Service
U.S. Department of the Interior



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|-------------------------|-----------------------------------|----------------------------------------|
| Secondary highway | Existing Access | Terrestrial Index contour |
| Major road | Echo_Bay_ExistingLaunchRamps_1000 | 50 ft index bathymetric contour (2008) |
| Local road | Echo_Bay_ExistingParking_1000 | 1 ft terrestrial Index contour |
| Maintained unpaved road | Echo_Bay_ProposedParking_1000 | 1 ft bathymetric contour |
| 4WD road | Echo_Bay_ProposedLaunchRamp | |
| Proposed Access | | |



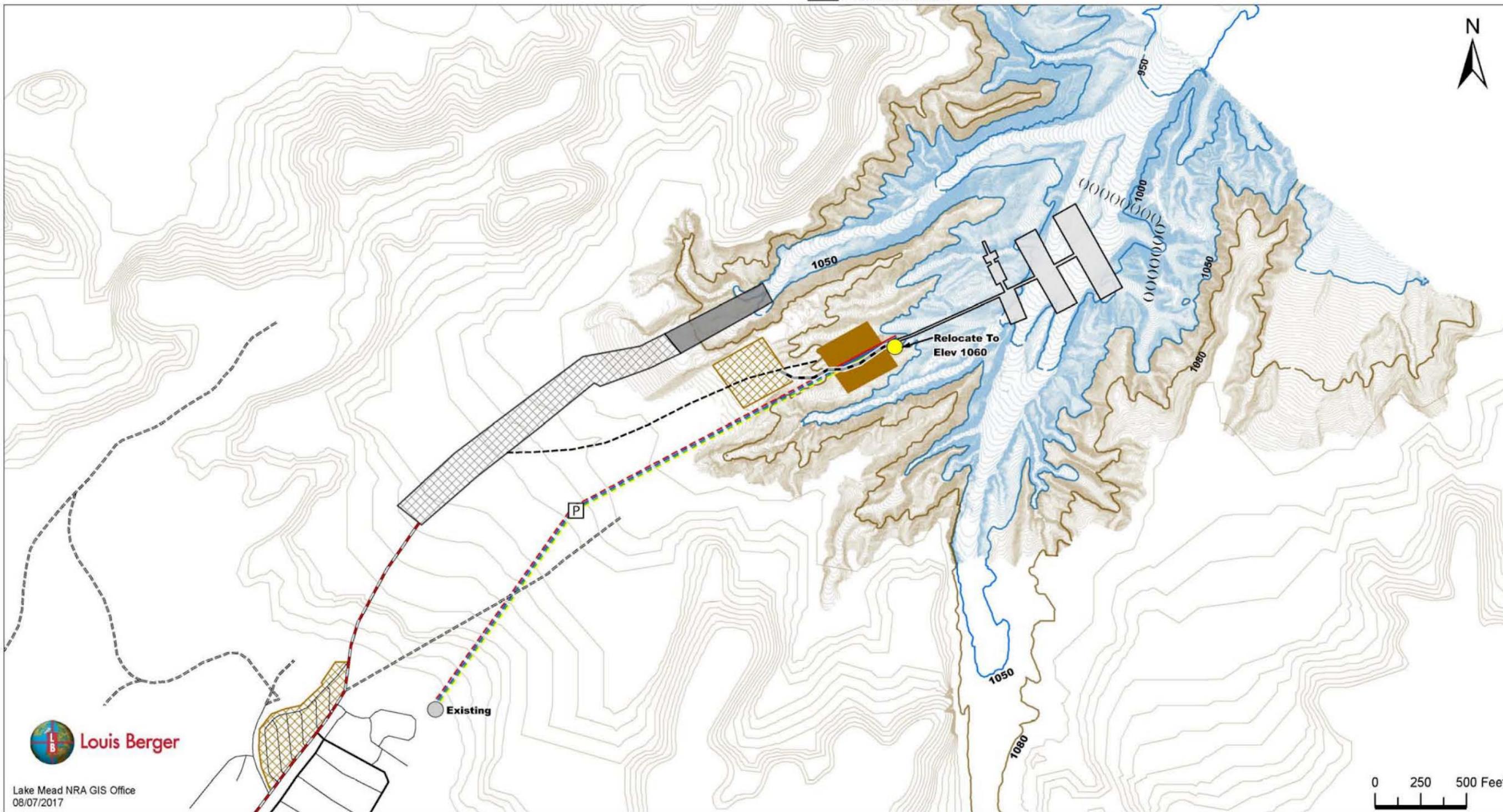
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Temple Bar, Lake Elevation 1050 ft

National Park Service
U.S. Department of the Interior



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|----------------------|---------------------------|-----------------------|-----------------------|------------------------|-----------------------|------------------------|-----------------------------------------|
| ● Existing Fuel Farm | Ⓟ Wastewater Pump | — Secondary highway | — Proposed Access | — Proposed Fuel Line | — Proposed Sewer Line | ▨ Existing Launch Ramp | — 1 ft index terrestrial contour (2008) |
| ● Proposed Fuel Farm | — Major road | — Existing Access | — Existing Fuel Line | — Existing Sewer Line | — Existing Water Line | ▨ Marina | — 1 ft terrestrial contour (2008) |
| | — Local road | — Proposed Power Line | — Existing Power Line | — Proposed Water Line | — Existing Water Line | ▨ Proposed Parking | — 1 ft index bathymetric contour (2008) |
| | — Maintained unpaved road | | | — Existing Water Line | | ▨ Existing Parking | — 1 ft bathymetric contour (2008) |
| | | | | Ⓜ Breakwater | | | — Terrestrial Contour (10 ft) |
| | | | | ▨ Proposed Launch Ramp | | | — Bathymetric Contour (10 ft) |



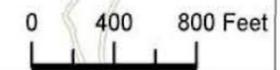
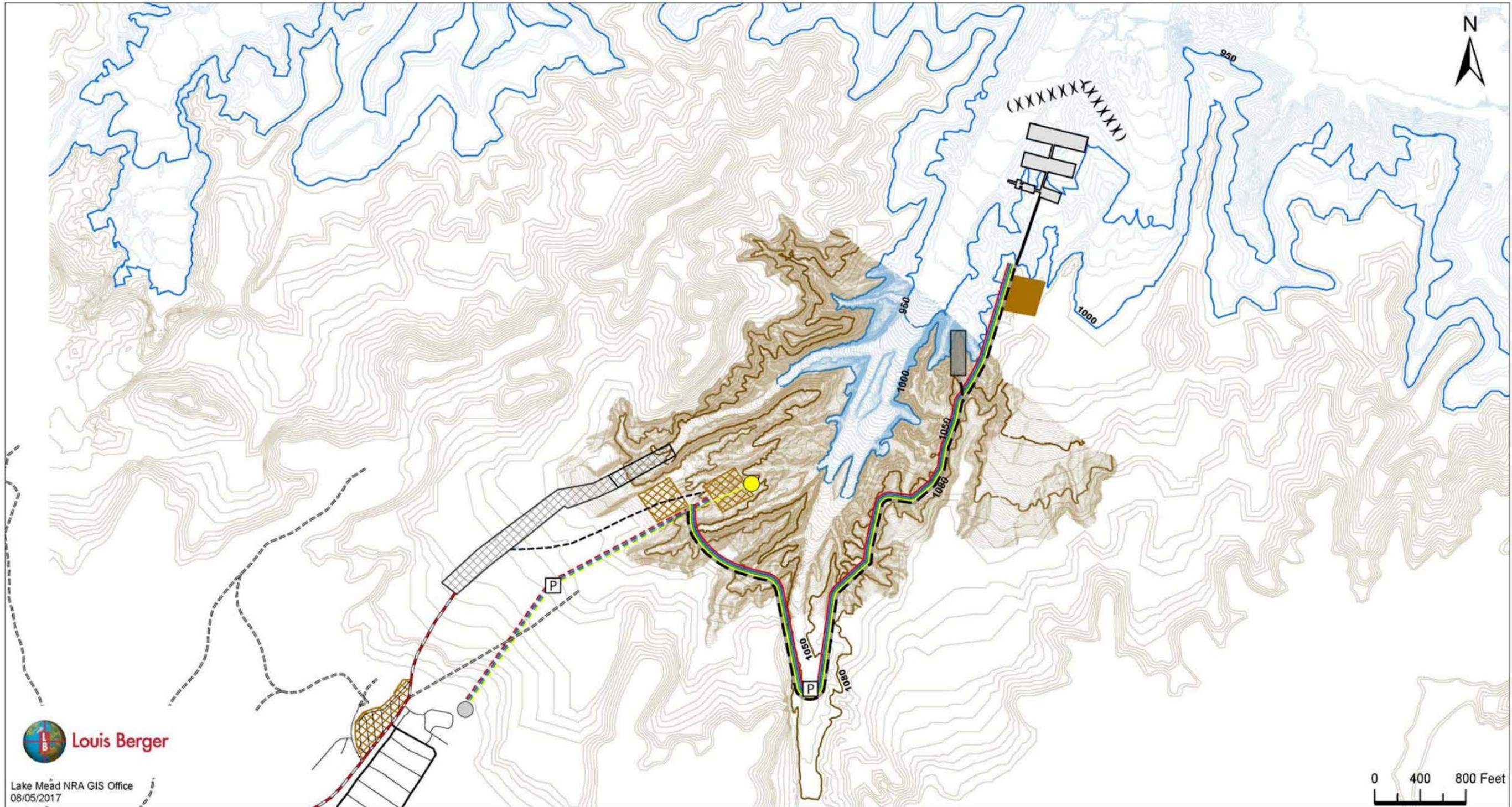
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Temple Bar, Lake Elevation 1000 ft

National Park Service
U.S. Department of the Interior



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|----------------------|-------------------|-------------------------------|------------------------------------|---------------------------|---------------------------|------------------------|-----------------------------------------|
| ● Existing Fuel Farm | Ⓟ Wastewater Pump | — Secondary highway | - - - Existing Access | — Existing Fuel Line | - - - Existing Sewer Line | ▨ Existing Launch Ramp | — 1 ft index terrestrial contour (2008) |
| ● Proposed Fuel Farm | | — Major road | — Proposed Fuel Line | — Proposed Power Line | — Proposed Water Line | ▨ Marina | — 1 ft index bathymetric contour (2008) |
| | | — Local road | — Proposed_FuelLine_Temple1050-LBG | - - - Existing Power Line | - - - Existing Water Line | ▨ Proposed Parking | — 1 ft bathymetric contour (2008) |
| | | - - - Maintained unpaved road | | — Proposed Sewer Line | (XX) Breakwater | ▨ Existing Parking | — 1 ft terrestrial contour (2008) |
| | | — Proposed Access | | | ▨ Proposed Launch Ramp | | — Terrestrial Contour (10 ft) |
| | | | | | | | — Bathymetric Contour (10 ft) |



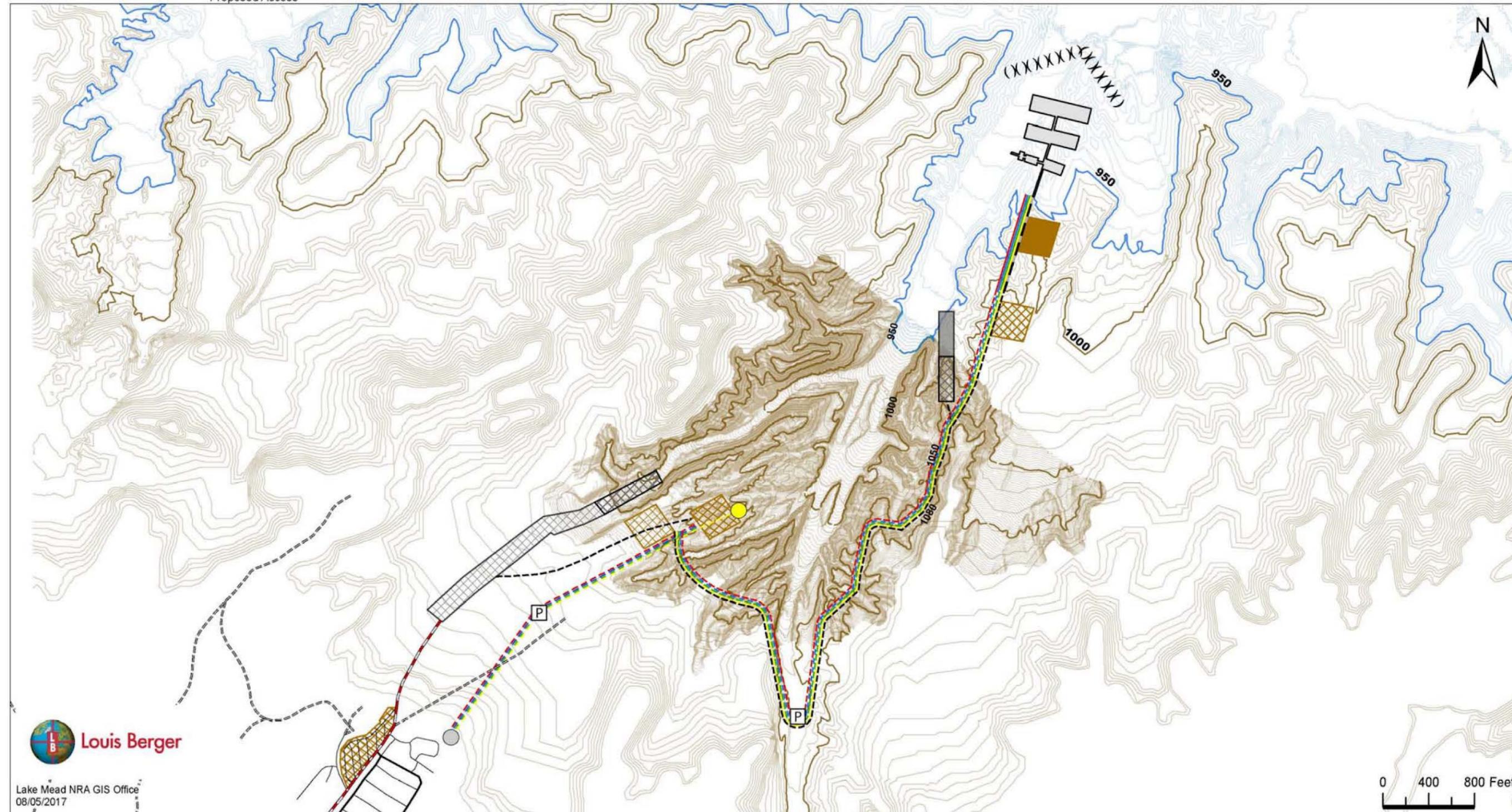
Lake Mead National Recreation Area
Arizona/Nevada

Low Water Planning: Temple Bar, Lake Elevation 950 ft

National Park Service
U.S. Department of the Interior



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|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ● Existing Fuel Farm ● Proposed Fuel Farm | <ul style="list-style-type: none"> [P] Wastewater Pump — Proposed Power Line — Proposed Water Line — Proposed Sewer Line — Proposed Fuel Line — Proposed Access | <ul style="list-style-type: none"> — Secondary highway — Major road — Local road — Maintained unpaved road | <ul style="list-style-type: none"> --- Existing Access --- Existing Fuel Line --- Existing Power Line (X X) Breakwater ■ Proposed Launch Ramp ■ Existing_Parking_Temple_1000ft_LBG | <ul style="list-style-type: none"> --- Existing Sewer Line --- Existing Water Line Existing Launch Ramp Marina Proposed Parking Existing Parking Bathymetric_1050ft_Contour | <ul style="list-style-type: none"> 1 ft index terrestrial contour (2008) 1 ft index bathymetric contour (2008) 1 ft bathymetric contour (2008) 1 ft terrestrial contour (2008) Terrestrial Contour (10 ft) Bathymetric Contour (10 ft) |
|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|





As the nation's principal conservation agency, the Department of the Interior has 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/LAKE/602/149066A DECEMBER 2018



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**Lake Mead National Recreation Area
General Management Plan Amendment/
Low-Water Plan/
Environmental Assessment**

December 2018

