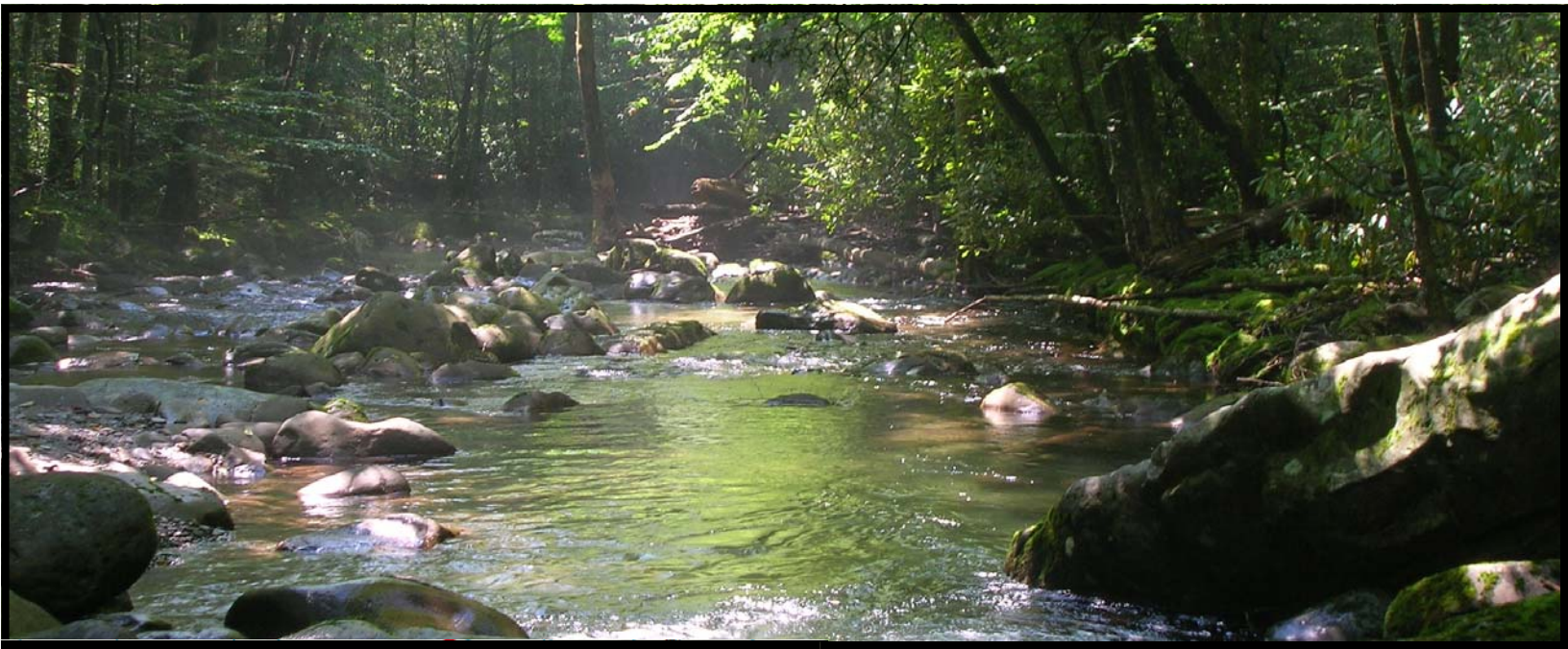
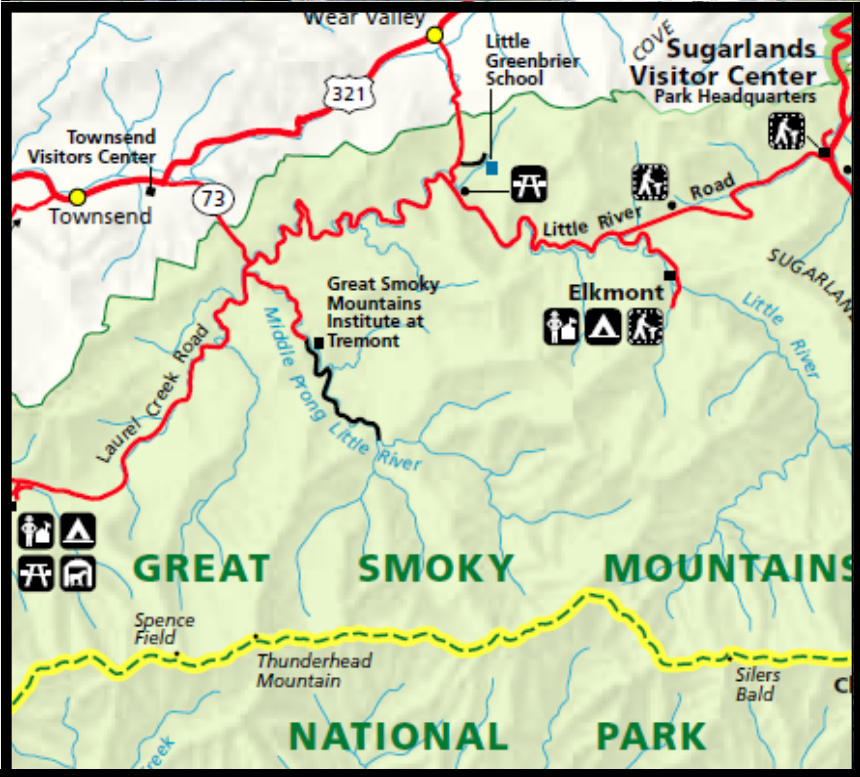
National Park Service
U.S. Department of Interior

Great Smoky Mountains National Park
North Carolina and Tennessee

Elkmont Wastewater Treatment Plant Upgrade
Draft Environmental Assessment





May 2018

ELKMONT WASTEWATER TREATMENT PLANT UPGRADE
DRAFT ENVIRONMENTAL ASSESSMENT

SUMMARY

The National Park Service (NPS) is proposing to upgrade the Elkmont Wastewater Treatment Plant (WWTP) to provide a modern, efficient, and sustainable wastewater treatment system for the Elkmont Developed Area within Great Smoky Mountains National Park. This environmental assessment (EA) evaluates three alternatives:

- Alternative A – The No Action Alternative provides a basis for comparing environmental impacts of the action alternatives.
- Alternative B – Upgrade WWTP and continue discharging to the Little River.
- Alternative C (Preferred Alternative) – Upgrade WWTP and install subsurface effluent dispersal system.

This EA has been prepared in accordance with the National Environmental Policy Act to assess the alternatives and their impacts on the environment. The EA also facilitates compliance with the National Historic Preservation Act by providing the public an opportunity to review and comment on the cultural resources analysis. The following impacts topics are analyzed in detail: surface water, floodplains, aquatic life, vegetation, wildlife, wilderness, and archeology. Other impacts topics were considered, but not carried forward for detailed analysis based on the limited anticipated impacts.

PUBLIC COMMENT

If you wish to comment on this EA, you may post comments online at http://parkplanning.nps.gov/grsm or mail comments to:

Great Smoky Mountains National Park
Environmental Planning and Compliance
107 Park Headquarters Road
Gatlinburg, TN 37738

The EA will be available for public review through May 31, 2018. Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that the entire comment, including your personal identifying information, may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Table of Contents

Chapter 1: Purpose and Need 1-1
1.1 Introduction 1-1
1.2 Purpose and Need 1-1
1.3 Purpose and Significance of the Park 1-2
1.4 Relationship of the Proposed Action to Other Plans 1-2
Chapter 2: Alternatives 2-1
2.1 Introduction 2-1
2.2 Alternative A – No Action Alternative 2-1
2.3 Alternative B – Upgrade and Continue Discharging to Little 2-2
2.4 Alternative C – Upgrade and Install Subsurface Drip Dispersal 2-3
2.5 Alternatives Considered but Dismissed from Detailed Analysis 2-7
2.6 Mitigation Measures 2-8
Chapter 3: Affected Environment and Environmental Consequences 3-1
3.1 Approach to Analysis 3-1
3.2 Surface Water and Floodplains 3-6
3.3 Aquatic Life 3-11
3.4 Vegetation 3-13
3.5 Wildlife 3-24
3.6 Wilderness 3-28
3.7 Archeology 3-31
Chapter 4: Consultation and Coordination 4-1
4.1 Internal Scoping 4-1
4.2 Public Scoping 4-1
4.3 National Historic Preservation Act Section 106 and Tribal Consultation 4-1
4.4 Endangered Species Act Section 7 Consultation 4-1
4.5 Tennessee Department of the Environment Consultation 4-2

Table of Contents (continued)

Chapter 5: References **5-1**

List of Figures

1-1: Elkmont Wastewater Treatment Plant upgrade project location 1-1

2-1: Location of the effluent drip dispersal study area for the Elkmont Wastewater Treatment Plant upgrade (Alternative C). 2-5

3-1: 100-year floodplain for the Elkmont Wastewater Treatment Plant project area. 3-8

3-2: Natural ecological systems for the Elkmont Wastewater Treatment Plant project area. 3-15

3-3: Current vegetation communities for the Elkmont Wastewater Treatment Plant project area 3-16

3-4: Photographs of forests in Elkmont Wastewater Treatment Plant drip dispersal study area 3-17

List of Tables

2-1: Elkmont Wastewater Treatment Plant – No Action Alternative Existing Effluent Quality, Monitoring Requirements, and Permit Limits 2-2

2-2 Elkmont Wastewater Treatment Plant – Alternative B Anticipated Effluent Quality, Monitoring Requirements, and Permit Limits 2-3

2-3 Elkmont Wastewater Treatment Plant – Alternative C Anticipated Effluent Quality, Monitoring Requirements, and Permit Limits 2-7

3-1 Vegetation Community Types within the Elkmont Wastewater Treatment Plant Project Area 3-14

Appendices

Appendix A – Draft Floodplains Statement of Findings

Appendix B – National Historic Preservation Action and Tribal Correspondence

Appendix C – Endangered Species Act Correspondence

Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
cfs	cubic feet per second
EIS	Environmental Impact Statement
ft	feet
GMP	General Management Plan
gpd	gallons per day
GRSM	Great Smoky Mountains National Park
km	kilometer
km^2	square kilometers
m	meter
mg/L	milligrams per liter
mL	milliliter
MPN	most probable number
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
SHPO	State Historic Preservation Office
TDEC	Tennessee Department of Environment and Conservation
WWTP	wastewater treatment plant

CHAPTER 1
PURPOSE AND NEED

1.1 INTRODUCTION

The National Park Service (NPS) is proposing upgrades at the Elkmont Wastewater Treatment Plant (WWTP) in Great Smoky Mountains National Park (GRSM or park), Sevier County, Tennessee (Figure 1-1). The WWTP serves the Elkmont Developed Area, including the Elkmont Campground, six NPS staff housing units, four facility management buildings, and two day use facilities in the Elkmont Historic District. Located east of campground loop H, the WWTP discharges treated effluent to the East Prong Little River (Little River) downstream of the campground as authorized by National Pollutant Discharge Elimination System (NPDES) permit number TN0022349 issued by the Tennessee Department of Environment and Conservation (TDEC).

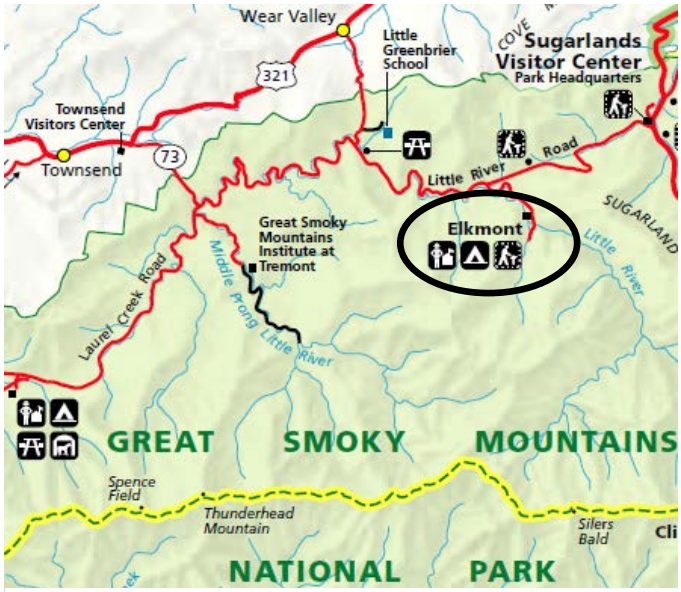


Figure 1-1: Elkmont Wastewater Treatment Plant upgrade project location.

The WWTP operates seasonally for about nine months from March through November based on the campground schedule. The treatment process includes biological treatment (extended aeration activated sludge), filtration, chlorination (disinfection), and dechlorination. The permitted design flow is 35,000 gallons per day (gpd), but the actual maximum flow for 2007 – 2013 was 23,900 gpd (NPS 2013). Flows vary substantially based on campground use and are typically highest during the summer and on weekends. Average daily flows for 2007 - 2013 ranged from 2,230 gpd in November to 8,260 gpd in July (NPS 2013). The Elkmont WWTP effluent consistently complies with all NPDES effluent limitations and the Little River meets water quality criteria for protection of its designated uses, which include propagation of fish and aquatic life, recreation, wildlife uses, and natural reproduction of trout (TDEC Rules Chapter 0400-40-04 Use *Classifications for Surface Waters*).

1.2 PURPOSE AND NEED

The purpose of the proposal is to provide a modern, efficient, and sustainable wastewater treatment system for the Elkmont Developed Area, ensure continued NPDES permit compliance, and maintain or enhance water quality in the Little River. The action is needed because the existing WWTP, which was originally built in 1959 and modified in 1969 and 2008, has exceeded its expected service life. In addition, the highly variable wastewater flows and the lack of automated system controls create operational challenges for the existing activated sludge treatment process. As a result, the level of effort required to operate the plant is relatively high.

NPS Management Policies 2006 states that the NPS will "take all necessary actions to maintain or restore the quality of surface water and groundwater within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations." The Tennessee Board of Water Quality, Oil, and Gas has designated Little River within GRSM as an Outstanding National Resource Water (TDEC Rules Chapter 0400-40-03 *General Water Quality Criteria*). No new discharges, expansions of existing discharges (beyond permitted design flow), water withdrawals, or mixing zones are permitted in Outstanding National Resource Water unless such activity will not result in either measurable degradation or discernible effect. Based on this designation, the NPS is considering alternatives to reduce or eliminate discharges to the Little River (see Chapter 2 – Alternatives).

Specific objectives of the proposed action include the following:

- Comply with NPDES permit limits and maintain or enhance water quality in the Little River;
- Avoid and minimize impacts on park resources, visitors, and operations;
- Minimize energy consumption; and
- Minimize operational and maintenance demands.

1.3 PURPOSE AND SIGNIFICANCE OF THE PARK

The purpose of GRSM is to preserve a vast expanse of the southern Appalachian Mountains ecosystem including its scenic beauty, extraordinary diversity of natural resources, and rich human history, and provide opportunities for the enjoyment and inspiration of present and future generations. Great Smoky Mountains National Park is the largest mountainous park east of the Mississippi River and is one of the most visited national park units. The Great Smoky Mountains exhibit the finest example of the ruggedness, magnitude, height, and scenic grandeur of the southern Appalachian Mountains, including 16 peaks over 6,000 feet. The Great Smoky Mountains are world-renowned for the diversity of plant and animal species found in the park due to the variety of elevations, landforms, climates, and vegetation communities—representing forest types such as those that exist from North Georgia to Maine. This makes it an exemplary outdoor laboratory for the study of and education about the ecosystem processes of the southern Appalachian Mountains. Consequently, the park is one of the most researched in the national park system. The park preserves a significant number of archeological sites, historic structures, and other vestiges of human interaction with the land. The park was established through the efforts of private philanthropists, local residents, and community leaders. The park was stitched together through the sacrifices of families from North Carolina and Tennessee whose private lands were acquired to create a new kind of "National Park in the East." Their connections to the land endure and are demonstrated by strong advocacy and stewardship of the park today (NPS 2016a).

1.4 RELATIONSHIP OF THE PROPOSED ACTION TO OTHER PLANS

The *General Management Plan, Great Smoky Mountains National Park* (NPS 1982) established the overall direction for management and use of the park. This plan was amended in 2009 by the *Elkmont Historic District Final Environmental Impact Assessment and General Management Plan Amendment* (NPS 2009). Part of the project area for the Proposed Action is within the boundary of the Elkmont Historic District. The *General Management Plan Amendment* includes both broad and specific direction

management of resources within the Elkmont Historic District. Established management objectives most relevant to the proposed action include:

- Identify, evaluate, protect, and preserve the park's cultural resources in a manner consistent with legislative and executive requirements and NPS historic preservation policies.
- Protect and perpetuate the significant and diverse natural resources and ecosystems (including forest communities and water resources), keeping them as free as possible from the adverse influences of human intrusion.
- Protect and, where possible, restore the natural processes as they would proceed if they had never been influenced by non-Indian society.
- Minimize, to the extent possible, the adverse impact of exotic plants and on the park's natural resources and processes.
- Provide water resource management methods consistent with responsibilities outlined for Outstanding National Resource Waters.
- Protect montane alluvial forest and its ability to regenerate.
- Avoid loss of habitat for the synchronous firefly population.
- Minimize areas of disturbance and maximize the use of previously disturbed areas.
- Ensure that "traditional" recreational opportunities, including support facilities that are currently enjoyed by the public are provided for adequately.
- Demonstrate by actions the NPS' concern for park resources and the environment beyond park boundaries, and show that low-impact activities can be practical and pleasant.

CHAPTER 2
ALTERNATIVES

2.1 INTRODUCTION

Alternatives represent different means of solving the problems and meeting the goals articulated in the purpose and need for action. The NPS considered a full range of alternatives based on information obtained through internal and external scoping, and identified two reasonable action alternatives to be carried forward for detailed analysis in this EA. Reasonable alternatives are those alternatives that meet the purpose and need for action and are technically and economically feasible. An alternative is not considered reasonable if technical, economic, or jurisdictional obstacles make the ability to implement the alternative remote and speculative. Alternatives considered but dismissed from further analysis are discussed in Section 2.5. Alternatives carried forward for analysis in this EA include:

- Alternative A – The No Action Alternative provides a basis for comparing environmental impacts of the action alternatives.
- Alternative B – Upgrade WWTP and continue discharging to the Little River.
- Alternative C (Proposed Action and Preferred Alternative) – Upgrade WWTP and install subsurface effluent dispersal system.

2.2 ALTERNATIVE A – NO ACTION ALTERNATIVE

Alternative A, the No Action Alternative, provides a basis for comparing the environmental impacts of the action alternatives. Under Alternative A, NPS would continue to operate the existing Elkmont WWTP and discharge treated effluent to the Little River. NPS would respond to future needs and conditions associated with the park's objectives without major actions or changes from the present course. Routine maintenance and repairs would continue to be performed as needed. The WWTP would continue to meet NDPES permit limits (Table 2-1), but the risk of component failure would increase over time as the system continues to age. It is possible that the WWTP would need to be shut down temporarily for repairs to prevent impacts on water quality in the event of equipment failure. The National Park Service would initiate necessary closures in the Elkmont Developed Area, including the campground, to temporarily eliminate wastewater generation if the WWTP were shut down for repairs.

Table 2-1
Elkmont Wastewater Treatment Plant – No Action Alternative
Existing Effluent Quality, Monitoring Requirements, and Permit Limits

Parameter	Monitoring Frequency	Monthly Average Concentration		Maximum Concentration	
		Permit Limit	Effluent[(1)]	Permit Limit	Effluent[(2)]
Biochemical Oxygen Demand (mg/L)	2x/month	30	2.1	45	2.8
Total Suspended Solids (mg/L)	2x/month	30	5.0	45	5.0
Dissolved Oxygen (mg/L)	5x/week	3.0 (min.)	>3.0	-	-
Total Residual Chlorine (mg/L)	5x/week	-	0.18	2.0 (max.)	1.96
E.coli (MPN/100 mL)	2x/month	126	1	487	2
pH (standard units)	2x/week	6.0 – 9.0	6.7 – 7.9	-	-

mg/L = milligrams per liter, mL = milliliters, MPN = most probable number
[(1)]Average daily value for 2016 taken from NPS 2017.
[(2)]Maximum daily value for 2016 taken from NPS 2017.

2.3 ALTERNATIVE B – UPGRADE AND CONTINUE DISCHARGING TO LITTLE RIVER

2.3.1 Overview

Under Alternative B, the Elkmont WWTP would be upgraded to include new treatment processes and controls. The plant would be modernized and would continue to comply with NPDES permit limits. Effluent quality would be similar to that of the existing WWTP. Portions of the existing plant would be rehabilitated and new systems would be constructed or installed, as appropriate, within the existing WWTP site. The new treatment process would include pre-treatment, secondary biological treatment, tertiary treatment, and disinfection. If Alternative B were selected, a preliminary engineering study would be conducted to select specific treatment technologies to achieve the effluent quality and operational objectives.

All construction activity would take place within or adjacent to the previously disturbed existing WWTP site, which consists of approximately 1.6 acres of infrastructure, buildings, and gravel parking areas. The estimated area of disturbance for the project would be less than 1.6 acres. Most of the construction work would be planned for the winter season to minimize disruption to campground users. However, it is anticipated that an early seasonal closure (late October to early November) and late opening (late April to late May) of Elkmont Campground would be required to complete the construction.

2.3.2 Effluent Quality, Monitoring Requirements, and Permit Limits

The new WWTP would be designed to produce effluent of similar or better quality than the existing WWTP (Table 2-1). Based on available information, monitoring requirements and permit limits are expected to be the same as the existing permit (Table 2-2). However, it should be noted that TDEC is in the process of developing and implementing the Tennessee Nutrient Reduction Framework (TDEC 2015), which could result in additional nitrogen and phosphorus monitoring requirements and limits being placed in some NPDES permits in the future.

Table 2-2
Elkmont Wastewater Treatment Plant – Alternative B
Anticipated Effluent Quality, Monitoring Requirements, and Permit Limits[(1)]

Parameter	Monitoring Frequency	Monthly Average Concentration		Maximum Concentration	
		Permit Limit	Effluent	Permit Limit	Effluent
Biochemical Oxygen Demand (mg/L)	2x/month	30	<10	45	<10
Total Suspended Solids (mg/L)	2x/month	30	<10	45	<10
Dissolved Oxygen (mg/L)	5x/week	3.0 (min.)	>3	-	-
Total Residual Chlorine (mg/L)	5x/week	-	0	-	0
E.coli (MPN/100 mL)	2x/month	126	<126	487	<487
pH (standard units)	2x/week	6.0 – 9.0	6.0 – 9.0	-	-

mg/L = milligrams per liter, mL = milliliters, MPN = most probable number

[(1)]Anticipated monitoring frequency and effluent limits are based on the existing NPDES Permit for the Elkmont WWTP.

2.4 ALTERNATIVE C (PROPOSED ACTION AND PREFERRED ALTERNATIVE) – UPGRADE AND INSTALL SUBSURFACE EFFLUENT DRIP DISPERSAL SYSTEM

2.4.1 Overview

Under Alternative C, the Elkmont WWTP would be upgraded to include new treatment processes and controls, a subsurface (land) effluent drip dispersal system, and a force main to supply the drip dispersal system. The effluent dispersal system would be installed on up to 5 acres of forested land near the WWTP and would allow for elimination of surface water discharges under normal flow conditions. Wastewater would receive pretreatment, secondary biological treatment (recirculating sand filter, textile filter, or similar), and disinfection prior to being discharged to a 40,000 gallon holding tank. Effluent from the holding tank would be disposed of through the drip dispersal system under normal wastewater flow conditions. After multiple days of unusually high wastewater flows, the capacity of the drip dispersal system could be exceeded and discharge to the Little River may be necessary.

Construction activity associated with Alternative C would take place within or adjacent to the previously disturbed existing WWTP site, which consists of approximately 1.6 acres of infrastructure, buildings, and gravel parking areas. The estimated area of disturbance for the project would be approximately 7 acres, which includes work on the WWTP itself (1.6 acres) and installation of a drip dispersal system and force main (5-6 acres). Most of the construction work would be planned for the winter season to minimize disruption to campground users. However, it is anticipated that an early seasonal closure (late October to early November) and late opening (late April to late May) of Elkmont Campground would be required to complete the construction.

2.4.2 Subsurface Effluent Drip Dispersal System

Drip systems consist of a network of small-diameter (approximately 0.5-inch) tubing and emitters designed to uniformly disperse treated wastewater over a large area beneath the soil surface. A small volume of wastewater is dosed at predetermined time intervals throughout the day to the soil through a pressurized piping network. The design objective is to minimize or preclude soil saturation while still achieving equal distribution. This optimizes wastewater dispersal through the soil, plant uptake of the

wastewater through their root systems, and attenuation of any remaining pollutants (EPRI and TVA 2004). The proposed Elkmont drip dispersal system would be designed and installed in accordance with the TDEC *Design Criteria for Sewage Works* (TDEC 2016). The design would be reviewed and approved by TDEC as part of the permit application process for the system.

A preliminary soil survey was conducted in 2013 to help identify potential locations for a drip dispersal system near the Elkmont WWTP. The results indicated that well-drained, sandy loam soils in the area appear to be suitable for drip dispersal and up to 5 acres would be required for the dispersal area (NPS 2013). The drip system would include several zones with associated drip tubing, valves, pumps, and controllers to regulate effluent dosing and achieve equal distribution over the dispersal area. Generally, drip lines would have emitters at 2-foot intervals and would be installed 2 feet apart, 6 to 10 inches below the surface. Emitter intervals, line spacing, and depth could vary depending on site soils, slope, and presence of large trees. The type of equipment used to install the drip system would vary based on terrain and vegetation. For example, conventional machinery such as a tractor equipped with a vibratory plow or trencher could be used in less steep, relatively open areas. Smaller equipment such as a walk-behind vibratory plow or trencher could be used in steeper, more densely vegetated areas. Specifics would be defined during the project design phase.

The preferred location for the proposed drip dispersal system is a 27-acre forested area west and southwest of the Elkmont WWTP (Figure 2-1). Other locations in the general area were considered, but dismissed from further analysis based on constraints such as recommended wilderness areas, steep slopes, archeological resources, proximity to the campground, and distance from the WWTP. The preferred location consists of forested lands with slopes ranging from about 10 to greater than 50 percent. The area is accessible from the WWTP area by gravel road.

Specific locations for drip dispersal zones within the preferred site would be identified during the project design phase. These areas would be selected to minimize impacts on park resources, and facilitate efficient installation and maintenance of the system. Based on TDEC design guidelines (TDEC 2016), areas with any of the following characteristics are considered unsuitable and should be avoided:

- Unsuitable soils;
- Slopes greater than 50 percent;
- Areas within 50 feet of springs; and
- Areas within 25 feet of streams, gullies, ravines, drainways, cutbanks, and sinkholes.

The Little River floodplain would also be avoided. Topographic and vegetation surveys would be conducted as part of the design process to develop a drip system layout that minimizes vegetation clearing and tree damage. The drip system design would be developed using the following framework:

- Suitability would be ranked based on soils, slope, and vegetation type and density, as well as pumping distances, infrastructure needs, and maintenance and energy requirements. In general, areas with moderate slopes, minimal understory vegetation, and scattered mature trees would be identified as being most suitable for system installation, while steeper areas with dense large tree growth would be identified as least suitable.

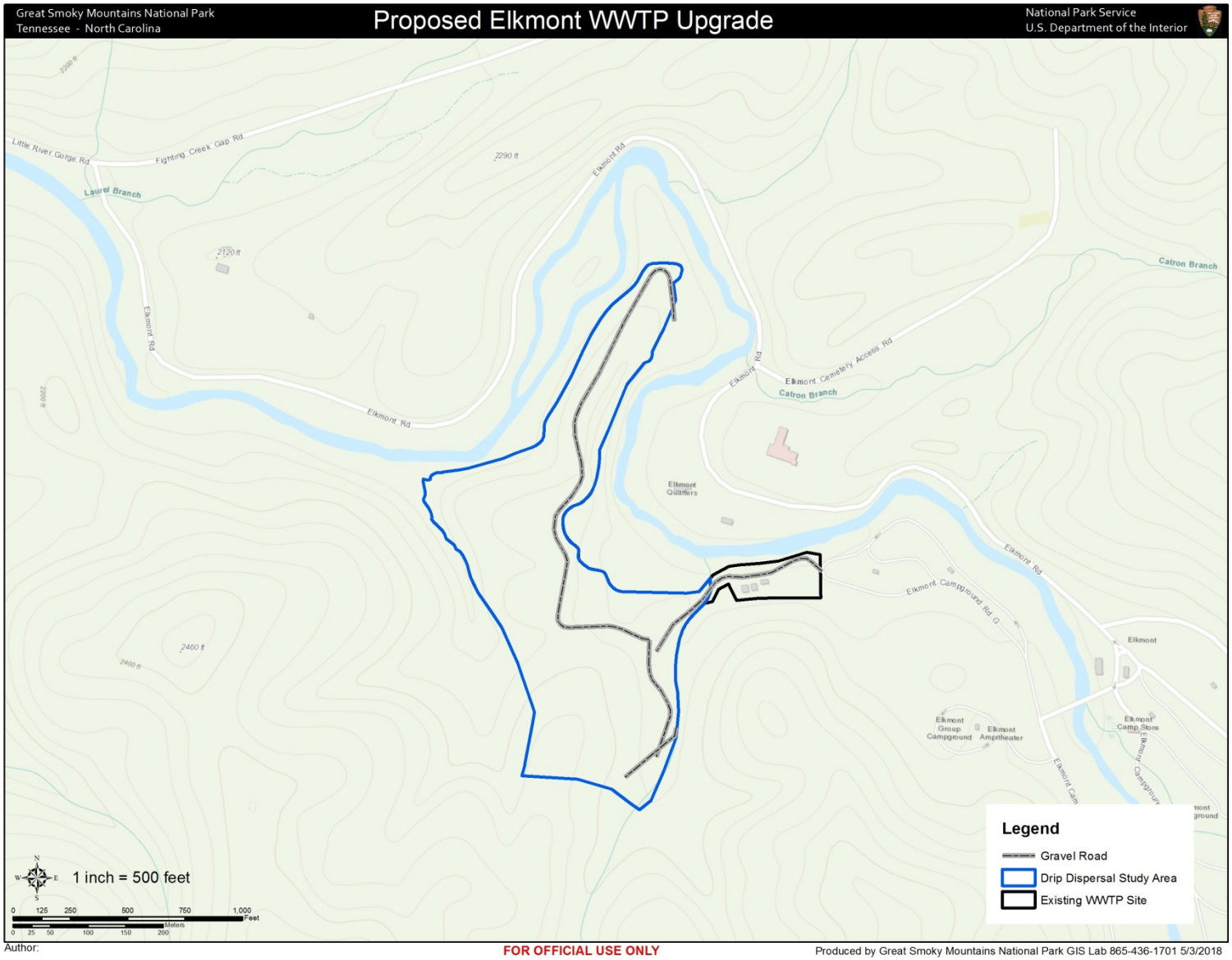


Figure 2-1: Location of the effluent drip dispersal study area for the Elkmont Wastewater Treatment Plant upgrade (Alternative C).

- The drip system would be installed, to the extent possible, in areas where minimal understory clearing would be necessary.
- Measures would be taken during construction to minimized damage to the roots of canopy trees retained in the drip dispersal area.

Given existing vegetation at the site, it is likely that clearing of canopy trees would be necessary to achieve the system design requirements. For planning and analysis purposes, it is assumed that about 25 to 50 percent of the canopy trees within the 5-acre drip dispersal area would be need to be removed. All clearing and grubbing (if determined appropriate) would be performed based on site-specific plans coordinated between the designer, soil scientist, and installer to minimize disturbance and protect the soil profile to the extent possible.

In accordance with TDEC requirements, signs identifying the boundary of the drip dispersal would be posted. A long-term vegetation management program would also be developed and implemented to maintain early successional vegetation in the drip zones. It is anticipated that vegetation maintenance would be conducted at 5-year intervals.

Up to 5 acres would also be identified as a reserve drip dispersal area. All or part of the reserve area could be used in the future if soils in the primary drip area can no longer function properly. With good design, installation, operation, and maintenance, drip systems are expected to have a useful life span of at least 20 years and some systems could have unlimited life expectancy when hydraulic and organic loading rates are optimized based on actual site conditions (EPRI and TVA 2006). Specifics regarding whether the reserve area would need to be used in the future and the exact size of the area that might need to be used are unknown at this time. For analysis purposes, it is assumed that the reserve area would not be used for at least 20 years. Any future use of the reserve area would be subject to further analysis in accordance with NPS policies and the National Environmental Policy Act.

2.4.3 Force Main for Drip Dispersal System

Effluent would be pumped from the WWTP holding tank to the drip dispersal area via a 6-inch force main. Piping would be installed in a trench 24 inches below ground. The force main alignment would be determined during the design phase based on locations of the drip zones. Factors considered during design would include length of piping required, pumping distance, and existing site conditions such a slope, rock, and vegetative cover. For analysis purposes, it has been assumed that the force main would be installed along the existing gravel roadbed. The length is expected to range from 875 to 1,600 feet.

2.4.4 Effluent Quality, Monitoring Requirements, and Permit Limits

Under Alternative C, NPS would hold a TDEC-issued NPDES permit regulating discharges from the Elkmont WWTP to the drip dispersal area and the Little River. As outlined in Table 2-3, the effluent limits and monitoring requirements for discharges to the drip dispersal system are less stringent than those for discharges to the Little River.

Table 2-3
Elkmont Wastewater Treatment Plant – Alternative C
Anticipated Effluent Quality, Monitoring Requirements, and Permit Limits

Parameter	Monitoring Frequency	Monthly Average Concentration		Maximum Concentration	
		Permit Limit	Effluent	Permit Limit	Effluent
State Operating Permit – Discharge to Drip Dispersal Area[(1)]					
Biochemical Oxygen Demand (mg/L)	1x/year	-	-	45	<45
Ammonia as Nitrogen (mg/L)	1x/quarter	-	-	Report only	<15
E.coli (MPN/100 mL)	1x/quarter	-	-	941	<941
NPDES Permit – Discharge to Little River[(2)]					
Biochemical Oxygen Demand (mg/L)	2x/month	30	<30	45	<45
Total Suspended Solids (mg/L)	2x/month	30	<30	45	<45
Dissolved Oxygen (mg/L)	5x/week	3.0 (min.)	>3	-	-
Total Residual Chlorine (mg/L)	5x/week	-	0	-	0
E.coli (MPN/100 mL)	2x/month	126	<126	487	<487
pH (standard units)	2x/week	6.0 – 9.0	6.0 – 9.0	-	-

mg/L = milligrams per liter, mL = milliliters, MPN = most probable number

[(1)]Anticipated monitoring frequency and effluent limits are based on the existing State Operating Permit for the drip dispersal system at the Great Smoky Mountains Institute at Tremont.

[(2)]Anticipated monitoring frequency and effluent limits are based on the existing NPDES Permit for the Elkmont WWTP. Monitoring under Alternative C only required if and when WWTP discharges to Little River.

2.5 ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

The following alternatives were considered, but dismissed from further analysis because they were not considered reasonable alternatives (e.g., did not meet purpose and need or were determined not to be technically or economically feasible):

- Construct a land-based treatment and disposal system – Under this approach wastewater would receive primary treatment before being discharge to a land-based system where most of the pollutant removal would occur. A large land area of about 40 acres would be required. This approach was dismissed from further analysis based on the lack of a suitable land disposal area near the Elkmont WWTP.
- Construct a sewer main to convey wastewater from Elkmont to the Gatlinburg municipal sewer system – Under this approach, a sewer system would be constructed and the Elkmont WWTP would be removed. The sewer system would be about 7 miles long and would need to include pump stations to move the wastewater over Sugarland Mountain. This approach could create a substantial environmental impact depending on the route selected. A cross country route would cause extensive soil disturbance, removal of trees and other vegetation, and fragmentation of wildlife habitat. In some places, the road shoulder could be used for burying the pipeline to minimize environmental damage by using previously disturbed ground, but this approach would result in traffic disturbances, including partial road closures along the Little River Road and the road into Elkmont. This would substantially disrupt visitor access to this part of the Park during construction. In areas not adjacent to roads, there would be a relatively high probability for impacting cultural resources, including archeological and historic sites. This approach was dismissed based on potential environmental impacts.

- Pump and haul wastewater to a local treatment facility – Under this option for wastewater management, NPS would construct a gravity system to collect and convey wastewater to holding basins. Tank trucks would periodically pump the sewage and transport it offsite to a regional wastewater treatment facility for treatment and disposal. The closest treatment facility is in Gatlinburg, Tennessee, approximately 10 miles from Elkmont. This strategy would increase commercial truck traffic on park roads and is typically used when site conditions do not allow onsite treatment and disposal. Because the stored wastewater normally turns septic (anaerobic), the holding basins would require odor control measures such as chemical treatment or aeration. They also would have to be located in an area easily accessible by the sewage hauler. The TDEC has indicated that it would only permit pump-and-haul installations as a last resort and usually for a temporary period until other onsite wastewater treatment options could be implemented (NPS 2009). For these reasons, this treatment option has been dismissed from further consideration.
- Install conventional septic tanks and drain fields – Conventional septic tanks and conventional subsurface infiltration drain field technology was considered to serve comfort stations and buildings within the campground. The use of conventional septic systems would not be desirable because of the generally poor suitability of the soils throughout the campground for these purposes. Installation of conventional septic drain fields could result in a substantial ground disturbance and removal of trees within the campground. In addition, because woody vegetation over the drain field areas would be detrimental to the long-term effectiveness of the systems, the area would have to be maintained as grassland. For these reasons, this treatment option was dismissed from further consideration.
- Install composting toilets – Installation of composting toilets would reduce the volume of wastewater generated, but would not eliminate the need for wastewater treatment services in the Elkmont Developed Area. This option does not fully meet the purpose of and need for the Proposed Action, but could be considered in the future if the need arises to rehabilitate or replace the existing Elkmont Campground comfort stations.

2.6 MITIGATION MEASURES

The NPS places a strong emphasis on avoiding, minimizing, and mitigating potentially adverse environmental impacts. To protect natural resources and the quality of the visitor experience, the mitigation measures outlined below would be implemented. The analysis of impacts (Chapter 3) considers these mitigation measures as part of Alternatives B and C.

2.6.1 Mitigation Measures Applicable to Both Action Alternatives (Alternatives B and C)

1. Schedule construction during the Elkmont Campground closed season (November-March) to the extent possible. If an early campground closure or late campground opening is necessary, inform the public at least 6 months in advance through the reservation website (www.recreation.gov), news releases, and social media.
2. Conduct tree and vegetation clearing between November 15 and March 31 to avoid impacts to federally listed bats and nesting birds.

3. Implement sediment and erosion control measures consistent with the requirements and recommendations contained in the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012). File Notice of Intent with TDEC to obtain coverage under the General NPDES Permit for Discharges of Stormwater Associated with Construction Activities (Permit Number TNR100000). Develop site-specific stormwater pollution prevention plan in accordance with Part 3 of the General Permit and submit with the Notice of Intent.
4. In the event that archeological materials are inadvertently discovered, all work in the immediate area of the find shall cease and Park Dispatch (865-436-1230) shall be notified immediately. Work will not proceed until authorized by the Superintendent, in consultation with the Park Archeologist.
5. Prior to starting work, contractors shall be familiar with and follow Federal regulations covering all NPS lands (Code of Federal Regulations, Title 36, Chapter 1) and regulations contained in the GRSM Compendium of Regulations, including those for food storage and sanitation. All contractor personnel will be notified that it is illegal to possess, destroy, injure, deface, remove, dig, or disturb historic structures, archaeological resources, other cultural resources, and natural resources.
6. Pressure or steam wash all construction equipment to ensure it is free of soil, seed, or other materials prior to entering the park to avoid introduction of pests and non-native invasive plants (weeds). Maintain records of cleaning and inspections.
7. Inspect all construction materials (soils, gravel, sand etc.) or material source (borrow pit, quarry, supplier) to ensure they are clean and free of non-native invasive plants and seeds. Weed-free status may be ensured by pressure washing, steam washing, fumigation, heat sterilization, or certification from the supplier. Hay and straw may not be used.
8. Survey project area for non-native invasive plants prior to construction, and two times per year for 3 years after construction. Apply appropriate treatments to control invasive plants.
9. Incorporate noise reduction measures into the WWTP upgrade design, where practicable, to minimize impacts on visitor experience in the campground and wilderness character in surrounding areas.

2.6.1 Mitigation Measures Applicable to Alternative C Only

10. Conduct vegetation surveys as part of the design process to develop a drip system layout that minimizes vegetation clearing and tree damage.
11. Map all trees (live or dead) greater than or equal to 16 inches diameter at breast height (DBH) with loose bark, crevices, cavities, or cracks.
12. Avoid removing trees greater than or equal to 16 inches DBH with loose bark, crevices, cavities, or cracks to the extent possible, unless a tree poses a safety hazard.
13. Retained trees should include a mix of sizes, age classes, and species to the extent possible.
14. Conduct special status plant survey during the 2018 growing season to determine presence or probable absence of special status plant species. Develop and implement mitigation measures, as appropriate.

15. Conduct synchronous firefly survey in May-June 2018 to determine if suitable habitat within the drip dispersal area is occupied by fireflies. Develop and implement mitigation measures, as appropriate.
16. Use construction methods and equipment that protect the natural soil profile and retained trees within the drip dispersal area to ensure that soils and vegetation function as intended for effluent dispersal and treatment.
    a. Avoid compaction by using low-ground pressure equipment, preferably equipment with rubber tracks.
    b. Park equipment on access road vs. drip area. Avoid equipment operation and parking on critical root zone of retained trees.
    c. Remove tree trunks, larger diameter limbs, and tree tops with a grapple bucket, highline and winch, or other low-impact methods. Elevate tree ends above the ground surface to limit plowing or trenching of duff and soil from pulling logs.
17. Disperse wood chips generated during site preparation to a depth not to exceed 2 inches to minimize suppression of herbaceous vegetation regrowth in the drip dispersal area or dispose of wood chips and woody debris at an appropriate facility outside of the park.
18. Avoid impacts to Slick Limb Branch and associated wetlands during force main installation by spanning the stream in the existing roadbed or using trenchless construction methods to install pipe under the stream.
19. Do not clear vegetation, install drip system, or operate equipment on slopes greater than 50 percent or in areas within 50 feet of springs and 25 feet of streams, gullies, ravines, drainways, cutbanks, and sinkholes.
20. Install exclusion fencing in areas identified as cultural resources avoidance areas to help ensure cultural resources are not inadvertently damage by equipment. Fencing will be installed with oversight by the Park Archeologist.
21. Archeological monitoring is required for Alternative C construction phases when ground disturbance is occurring near archeological site GRSM 375/40SV124. Monitoring will be conducted by the Park Archeologist or another qualified professional under supervision of the Park Archeologist.

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 APPROACH TO ANALYSIS

3.1.1 Overview

This chapter describes the affected environment and analyzes potential environmental impacts of each alternative for the resource topics identified below in Section 3.1.2 – Issues and Impact Topics. In accordance with Council on Environmental Quality regulations, direct, indirect, and cumulative impacts are described (40 CFR 1502.16) and the impacts are assessed in terms of context and intensity (40 CFR 1508.27). Where appropriate, mitigation measures for adverse impacts are described and incorporated into the impacts analysis.

3.1.2 Issues and Impact Topics

In accordance with NEPA and the *NPS NEPA Handbook 2015*, the discussions and analysis in this EA focus on pivotal issues. Issues and impact topics that are not meaningful to the decision were not carried forward for detailed analysis. The issues and impact topics analyzed in this EA are based on internal and external scoping, as well as laws, regulations, executive orders, *NPS Management Policies 2006*, and NPS knowledge of resources at GRSM. Issues were retained for consideration and discussed in detail if:

- The environmental impacts associated with the issue are central to the proposal or of critical importance;
- A detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- The environmental or operational impacts associated with the issue are of substantial interest to the public or other agencies; or
- Potentially significant impacts to resources associated with the issue exist.

If none of the considerations above apply to an issue or impact topic, it was dismissed from detailed analysis.

Resource Topics Retained for Further Analysis

- Surface water and floodplains;
- Aquatic life;
- Vegetation;
- Wildlife;
- Wilderness; and
- Archeology.

Resource Topics Dismissed from Further Analysis

Resource topics considered and dismissed from further analysis, and the reasons for dismissing them are discussed below.

Air Quality. Air pollutant emissions associated with construction of the Elkmont WWTP upgrades would include exhaust from construction equipment and vehicles. Construction emissions would be temporary (up to 8 hours per day for about 5 months) and negligible for Alternatives B and C. Long-term air pollutant emissions from operation of the Elkmont WWTP under Alternatives B and C would be similar to the No Action Alternative.

Geological Features and Processes. The project area does not contain unique or sensitive geological features and the Proposed Action would not affect geological processes. Site geological conditions would be evaluated and accounted for during the design process.

Soils. Proposed construction would result in ground disturbance and the potential for increased soil erosion, which would be minimized through the use of sediment and erosion control measures consistent with the requirements and recommendations contained in the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012). Site soils are a vital component of the effluent drip dispersal system proposed under Alternative C. Therefore, site soils would be evaluated and accounted for during the design and construction processes. Construction methods for Alternative C would ensure protection of the soil profile for use as an effluent drip dispersal area. Increased soil moisture and nutrient loading under Alternative C could affect soil microorganisms that benefit plants. However, initial vegetation thinning and long-term vegetation maintenance of the drip area is expected to have more of an effect on vegetation community structure and composition than potential changes in soil microorganisms.

Wetlands. A wetland determination conducted by GRSM Resource Management and Science Division biologists indicates that wetlands are within two section of the project area. One is associated with Slick Limb Branch near the existing WWTP and the other is a small spring-fed drainage near the southeastern corner of the project area. Under Alternative C, the force main for the drip dispersal system would need to cross Slick Limb Branch near the WWTP. Impacts to wetlands here would be avoided by: 1) spanning the stream via the existing road crossing or 2) using trenchless construction methods such as directional drilling. A minimum 50-foot buffer would be established around the spring-fed wetland to avoid impacts.

Special Status Species – Animals. Special status animals that may occur in the project area include the federally endangered Indiana bat (*Myotis sodalis*) and the threatened northern long-eared bat (*Myotis septentrionalis*). These bats roost under loose bark and in crevices of trees during summer and hibernate in caves during winter. Selective tree clearing for the drip dispersal area (Alternative C) would occur between November 15 and March 31, when bats are hibernating in caves. Therefore, tree clearing would have no direct effect on bats. Tree removal would be minimized to the extent possible to minimize habitat impacts. In accordance with Section 7 of the Endangered Species Act, NPS has requested concurrence from U.S. Fish and Wildlife Service that the Preferred Alternative may affect, but is not likely to adversely affect Indiana bats and northern long-eared bats (see correspondence in

Appendix C). The park will complete the Section 7 consultation process prior to finalizing the NPS decision document for this EA.

The hellbender (*Cryptobranchus alleganiensis*) is located in the Little River near the project site. Though the hellbender is not currently federally endangered or threatened, it is an at-risk species that has been petitioned for listing. As an at-risk species, the hellbender does not receive any formal protection under the Endangered Species Act; however, it may become federally protected in the future. Tennessee considers the hellbender in need of management. Based on historic and anticipated future effluent quality data, instream water quality data, and biological monitoring data, the No Action Alternative would have no effect on the hellbender. Compared to the No Action Alternative, effluent volume discharged to the Little River would not change under Alternatives B and would decrease substantially under Alternative C. Effluent quality would be the same or better than the No Action Alternative under Alternatives B. The proposed action would have no impact on hellbenders.

Special Status Species – Plants. Special status plant species are not expected to occur in the project area based on a review of known occurrences, existing vegetation communities, and preliminary site surveys conducted by GRSM Resource Management and Science Division biologists. Additional surveys of the proposed area of disturbance, which will be defined by the design process, are planned for the 2018 growing season to determine presence or probable absence of special status plant species. Mitigation measures would be recommended, as appropriate.

Prehistoric/Historic Structures, Cultural Landscapes, and Museum Collections. No potentially eligible prehistoric/historic structures or cultural landscapes are known to exist in the area of potential effect based on the *Great Smoky Mountains National Park Historic Resource Study* (NPS 2016b). Artifacts collected during the archeological survey conducted for the proposed drip dispersal area (Alternative C) would become part of GRSM's museum collections, but the Proposed Action would have no effect on existing museum collections.

Ethnographic Resources. The NPS initiated consultation with federally recognized Indian tribes in November 2017 to determine if ethnographic resources exist in the project area. If additional information on ethnographic resources or traditional uses is provided by the tribes, the park will work with concerned parties to avoid any potential impacts associated with the Proposed Action.

Lightscapes. Artificial lighting requirements for the upgraded WWTP under Alternatives B and C would be minimal and similar to the No Action Alternative. Night sky friendly outdoor lighting would be used to meet necessary safety and security requirements. Lighting would not be required for the drip dispersal area proposed under Alternative C.

Soundscapes. Ambient sound levels would temporarily increase in the immediate vicinity of the WWTP from noise associated with construction equipment. Impacts on visitors would be minimized because the Elkmont Campground would be closed during construction. Some wildlife species in the immediate area may react to or be startled by the construction noise. Construction would be conducted from November through March; therefore, it is unlikely that nesting birds would be disturbed by the

construction noise. Potential impacts of noise on the soundscape of recommended wilderness near the project area is analyzed in Section 3.6 – Wilderness.

Socioeconomics and Environmental Justice. The proposed project could result in short-term, changes in local spending associated with construction and campground visitation. Construction work is expected to result in increased spending, while reduced campground visitation could result in lower visitor spending. To accommodate construction, the campground may be closed earlier and opened later in the season than normal, which would reduce campground visitation for about 4 to 6 weeks. Over the long-term, the Proposed Action is not expected to result in changes to the local economy and would not alter the physical or social structure of nearby communities. The Proposed Action would not result in any identifiable health or environmental effects to minority or low income populations, and would not disproportionately affect these populations.

Visitor Use and Experience and Recreation. Under the No Action Alternative, the aging Elkmont WWTP could experience mechanical failures that require a shutdown of the system for emergency repairs. Without wastewater treatment service, Elkmont Campground would also need to be shut down until repairs were completed. The timing, frequency, and duration of any shutdowns under the No Action Alternative would be unpredictable and any shutdown of the campground could affect a relatively high number of visitors. Under Alternative B or C most construction would take place when the campground is normally closed (late November through early March) to minimize visitor impacts. However, the campground season would be shortened 4 to 6 weeks by closing earlier than normal and opening later. The construction closure would affect visitors during the shoulder seasons, which are less busy than peak season. Relatively few visitors would be affected by construction as compared to a potential emergency shutdown under the No Action Alternative. Visitors would be made aware of any changes to the campground season or temporary closures through the reservation website (www.recreation.gov), news releases, and social media.

No designated trails or backcountry campsites exist within or near the existing WWTP or proposed dispersal area, but some abandoned roads in the area are used for hiking. The project area would be temporarily closed to visitors during construction to ensure visitor safety. Under Alternative C, the drip dispersal system would occupy up to 5 acres of forested land and signs would be installed identifying the effluent disposal area. The area would not be formally closed, but it would no longer be suitable for visitor entry.

Installation of the drip dispersal area for Alternative C would require selective vegetation clearing and ongoing maintenance, which would change the visual character of the area. Areas that currently support relatively mature trees would be converted to more open early successional vegetation. Visitors hiking along the old roads in the area would likely notice a change in the landscape, but it is unlikely these changes would be noticed from the campground, designated trails, Little River, or Elkmont Road.

3.1.3 Analyzing Cumulative Impacts

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions,

regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative impacts are considered for each resource topic by combining the impacts of the alternative being analyzed and other past, present, and reasonably foreseeable actions that would also result in beneficial or adverse impacts. The geographic scope for the cumulative impacts analysis is the Little River watershed within the park boundaries. A majority of the watershed is classified as Natural Environment – Type 1 in the GRSM *General Management Plan* (NPS 1982). Natural Environment – Type 1 areas are also recommended for designation as wilderness. Development within the watershed includes the Elkmont Developed Area, Metcalf Bottoms Picnic Area, Great Smoky Mountains Institute at Tremont (Tremont), and paved and gravel roads accessing these areas. Projects considered in the cumulative impact analysis are briefly described below.

Past Actions

- Great Smoky Mountains Institute at Tremont Development Concept Plan/Environmental Assessment and a Finding of No Significant Impact was completed in 2010. The selected alternative (Alternative C - Modifications to Existing Facilities) included moderate upgrades, modifications, additions, and spatial reconfiguration to the infrastructure and existing facilities, and an option to reconstruct the dormitory. This project included upgrades to the Tremont WWTP and installation of a 1.25-acre effluent drip dispersal system in a forested area adjacent to the Middle Prong Little River in 2012.
- Elkmont Historic District Final Environmental Impact Statement and General Management Plan Amendment (March 2009). This project included preservation of 19 buildings in the Elkmont Historic District, construction of new visitor parking areas, removal of buildings, and restoration of native plant communities. Building removal was completed in spring 2018.
- Water tank and water line replacement in the Elkmont Developed Area.
- Installation of fiber optic cable to Tremont.
- Invasive plant and forest pest management.
- Routine maintenance of developed areas, roads, and trails

Present Actions

- Invasive plant and forest pest management.
- Routine maintenance of developed areas, roads, and trails.

Reasonably Foreseeable Future Actions

- Invasive plant and forest pest management.
- Routine maintenance of developed areas, roads, and trails.
- Proposed replacement of camp store at Elkmont Campground. The new store of approximately 1,200 square feet would be constructed near the campground entrance.

3.2 SURFACE WATER AND FLOODPLAINS

3.2.1 Existing Conditions

Description of Surface Waters

Surface waters within the project area include the East Prong of the Little River (Little River) and Slick Limb Branch. Headwaters of the Little River begin at elevations of roughly 5,600 ft (1,707 m) and continue downstream eventually becoming a 5th order stream at the confluence of Little River and Fish Camp Prong. Little River joins the Middle Prong of the Little River at the Townsend Wye and then flows out of the park. Mean annual flow of the Little River at the WWTP is estimated to be is 74.3 cubic feet per second (cfs) and the 7Q10, or lowest 7-day average flow that occurs on average once every 10 years, is 8.2 cfs. The 30Q5, or lowest 30-day average flow that occurs once every 5 years, is 12.3 cfs (USGS 2018; TDEC 2017).

The portion of Little River that is within GRSM is designated as an Outstanding National Resource Water. This designation is given to high-quality waters that constitute an outstanding national resource, such as waters of national and state parks, wildlife refuges, and waters of exceptional recreational or ecological significance (TDEC Rules Chapter 0400-40-03 *General Water Quality Criteria*). The Little River near the WWTP is considered fully supportive of its designated use classifications (TDEC 2017), which include propagation of fish and aquatic life, recreation, wildlife uses, and natural reproduction of trout (TDEC Rules Chapter 0400-40-04 Use *Classifications for Surface Waters*).

Slick Limb Branch is a 1st order stream that flows into the Little River about 100 ft (30 m) downstream of the WWTP. It has a channel length of 0.8 miles (1.3 km), a drainage area of 0.24 square miles (0.62 km^2), and a channel width of about 1 to 3 ft (0.3 to 1 m) in its lower reaches. Mean annual flow is estimated to be 0.45 cfs, with a 7Q10 of 0.05 cfs, and a 30Q5 of 0.08 cfs (USGS 2018). Slick Limb Branch is designated as an Exceptional Tennessee Water (TDEC Rules Chapter 0400-40-03 *General Water Quality Criteria*).

Water Quality

The Little River is minimally disturbed, with dilute and weakly buffered water. Median pH near the treatment plant is 6.5. A water quality monitoring station established by TDEC upstream of the Elkmont Developed Area serves as a Southeast Monitoring Network reference site for Ecoregion 66g. Potential influences on water quality include precipitation and atmospheric deposition, discharge from the Elkmont WWTP, existing septic systems within the Elkmont Developed Area, stormwater runoff from roads and trails, and human waste from backcountry users.

Under low stream flow (i.e., 7Q10 8.2 cfs) and the WWTP's permitted design flow (35,000 gpd), the instream waste concentration would be 0.7%. Under mean annual flow for Little River (74.3 cfs) and typical effluent flows (2,230 to 8,260 gpd), the instream waste concentration ranges from about 0.005 to 0.017%. The Elkmont WWTP effluent does not appear to have a discernable effect on water quality of the Little River based upon the low instream waste concentration, WWTP discharge chemistry data, and instream water chemistry data (NPS unpublished data).

Floodplains

The Elkmont WWTP is within the 100-year floodplain (Zone A) of the Little River, as identified on the Federal Emergency Management Agency Flood Insurance Rate Map Panel 47155C0340E (effective May 18, 2009). The drip dispersal system proposed under Alternative C would be outside the 100-year floodplain (Figure 3-1). Executive Order 11988, *Floodplain Management*; Director's Order 77-2: *Floodplain Management*; and the NPS Procedural Manual 77-2: *Floodplain Management* require NPS to protect floodplain values and minimize flood risks. The NPS Procedural Manual requires that parks develop a Statement of Findings to: (1) provide an understanding of risks to human health and safety, (2) analyze risks to property, and (3) describe the effects of the proposed action on floodplain values. The Floodplains Draft Statement of Findings is provided in Appendix A.

3.2.2 Impacts of Alternative A – No Action

The quality and quantity of effluent discharged from the Elkmont WWTP would not change under Alternative A and construction associated with a WWTP upgrade would not take place. Routine WWTP maintenance and repairs would continue to be performed under Alternative A, but the risk of mechanical failure would increase over time as the system continues to age. Mechanical failure could lead to an unintended discharge of untreated pollutants, which could adversely affect water quality. It is possible that the WWTP would need to be shut down temporarily for repairs to minimize impacts on water quality in the event of equipment failure. The National Park Service would initiate necessary closures in the Elkmont Developed Area to temporarily eliminate wastewater generation if the WWTP were shut down for repairs. Based on data presented in the existing conditions section above, the WWTP effluent is not expected to have a discernable effect on water quality of the Little River under the No Action Alternative. The No Action Alternative would not result in changes to the floodplain.

Cumulative Impacts. Past and present actions identified in Section 3.1.3 that potentially affect water quality include the Development Concept Plan for Tremont, installation of fiber optic cable to Tremont, the Elkmont Historic District General Management Plan Amendment (also future action), and various routine infrastructure maintenance projects. These actions included temporary ground disturbance and the potential for increased erosion and sediment transport to surface waters. Areas temporarily disturbed by past actions have recovered and are not expected to contribute to future cumulative impacts.

Projects at Tremont and Elkmont included construction of new impervious surface, which can increase stormwater runoff and adversely affect water quality. However, the long-term adverse impacts to surface water were offset by improvements to stormwater drainage at Tremont, and removal of impervious surfaces (building demolition) and habitat restoration at Elkmont. Upgrades to the Tremont WWTP in 2012 resulted in long-term, beneficial impacts on water quality.

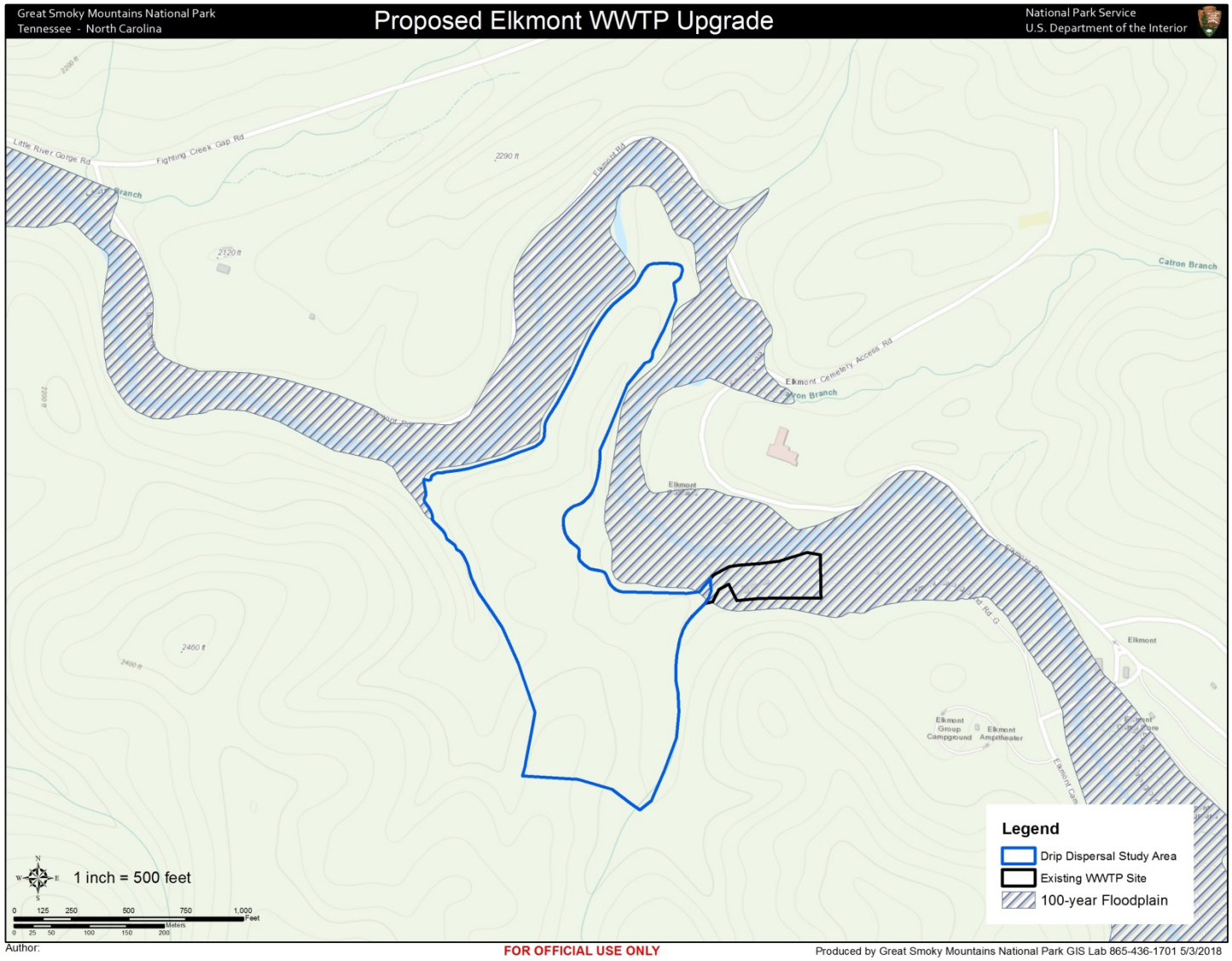


Figure 3-1: 100-year floodplain for the Elkmont Wastewater Treatment Plant project area (source: Federal Emergency Management Agency Flood Insurance Rate Map Panel 47155C0340E, effective May 18, 2009).

Reasonably foreseeable future actions that could impact water quality include proposed construction of a new store at Elkmont Campground. Sediment transport to surface waters during construction could result in short-term adverse impacts. Conversion of vegetated areas to impervious surfaces for the building and parking area could result in long-term adverse impacts.

In summary, the contribution of impacts on surface water from Alternative A to those of past, present, and reasonably foreseeable future actions would be negligible. The cumulative impacts on surface water would also be negligible when impacts from Alternative A and other actions are combined.

3.2.2 Impacts of Alternative B – Upgrade and Continue Discharging to Little River

Under Alternative B, effluent quality and quantity would be similar to that of the existing plant. Effluent discharged from the WWTP under Alternative B is not expected to have a discernable adverse effect on water quality in the Little River. The upgraded plant would have long-term, beneficial impacts on surface water because it would be more reliable and less susceptible to unpredictable operational complications compared to Alternative A. As is the case with any surface water discharge, there is some risk of at least temporary water quality impacts under Alternative B from an unintended discharge of untreated pollutants due to mechanical failure or human error. This risk would be higher under Alternative B compared to Alternative C based on the frequency and volume of discharges to surface water.

Ground disturbance associated with construction of the WWTP upgrades would temporarily increase the potential for soil erosion and runoff of sediments to the Little River. The area of disturbance would be limited to the existing WWTP site (less than 1.6 acres). Potential impacts would be minimized through the use of sediment and erosion control measures consistent with the requirements and recommendations contained in the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012). A Notice of Intent would be filed with TDEC to obtain coverage under the *General NPDES Permit for Discharges of Stormwater Associated with Construction Activities* (Permit Number TNR100000). A site-specific stormwater pollution prevention plan would be developed in accordance with Part 3 of the General Permit and submitted with the Notice of Intent. These mitigation measures have a high likelihood of successfully minimizing sediment runoff based on the relatively small area of disturbance and flat terrain of the existing WWTP site. Impacts from construction on surface water would be short-term and negligible under Alternative B.

Construction of new WWTP components under Alternative B would result in a small increase in impervious surface within the floodplain. Creation of new impervious surfaces would be minimized to the extent possible during the design process. Opportunities for removal of existing impervious surfaces that are no longer needed would also be considered during design. Existing vehicle parking areas would remain gravel. The net increase in impervious surface is expected to be less than 0.25 acres based on preliminary design information. Alternative B would result in minimal changes to the floodplain compared to existing conditions. Risks to floodplain functions and values would be negligible. The Draft Floodplain Statement of Findings is provided in Appendix A.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions are the same as those discussed under the No Action Alternative and would have long-term, adverse and beneficial impacts on

surface water. Short-term impacts of other actions and Alternative B would not overlap in time. The contribution of impacts on surface water from Alternative B to those of past, present, and reasonably foreseeable future actions would be beneficial. The cumulative impacts on surface water would also be beneficial when impacts from Alternative B and other actions are combined.

3.2.3 Impacts of Alternative C – Upgrade and Install Effluent Drip Dispersal System

The effluent drip dispersal system installed under Alternative C would allow for substantial reduction of discharges to the Little River. After multiple days of unusually high wastewater flows, the capacity of the drip dispersal system could be exceeded and discharge to the Little River may be necessary. The quality of effluent discharged under Alternative C would meet NPDES permit requirements. The volume of effluent discharged under Alternative C would be substantially lower than Alternatives A and B. Effluent discharged from the WWTP under Alternative C is not expected to have a discernable effect on water quality in the Little River based on infrequent discharge and effluent quality that meets NPDES permit limits. The upgraded plant would have long-term, beneficial impacts on surface water because less effluent would be discharged to the river, and the new WWTP would be more reliable and less susceptible to operational complications compared to Alternative A. The risk of water quality impacts from an unintended discharge of untreated pollutants due to mechanical failure or human error would be lower under Alternative C compared to Alternative B based on the frequency and volume of discharges to surface water.

Ground disturbance associated with construction of the WWTP upgrades and installation of the effluent drip dispersal system would temporarily increase the potential for soil erosion and runoff of sediments to the Little River and Slick Limb Branch. The area of disturbance would be about 7 acres compared to less than 1.6 acres for Alternative B. Potential impacts would be minimized through the use of sediment and erosion control measures as described above for Alternative B. These mitigation measures have a high likelihood of successfully minimizing sediment runoff, but the potential for erosion is higher than Alternative B based on the larger area of disturbance (7 vs. 1.6 acres) and steeper terrain of the proposed drip dispersal area (up to 50% slope).

Construction of new WWTP components under Alternative C would result in a small increase in impervious surface within the floodplain. Creation of new impervious surfaces would be minimized to the extent possible during the design process. Opportunities for removal of existing impervious surfaces that are no longer needed would also be considered during design. Existing vehicle parking areas would remain gravel. The net increase in impervious surface is expected to be less than 0.25 acres based on preliminary design information. The proposed drip dispersal system would be outside the 100-year floodplain. Alternative C would result in minimal changes to the floodplain compared to existing conditions. Risks to floodplain functions and values would be negligible. The Draft Floodplain Statement of Findings is provided in Appendix A.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions are the same as those discussed under the No Action Alternative and would have long-term, adverse and beneficial impacts on surface water. Short-term impacts of other actions and Alternative C would not overlap in time. The

contribution of impacts on surface water from Alternative C to those of past, present, and reasonably foreseeable future actions would be beneficial. The cumulative impacts on surface water would also be beneficial when impacts from Alternative C and other actions are combined.

3.3 AQUATIC LIFE

3.3.1 Existing Conditions

Fish

Over 70 species of fish inhabit GRSM. Common fish species found in the Little River include the mottled sculpin (*Cottus bairdii*), longnose dace (*Rhinichthys cataractae*), northern hogsucker (*Hypentelium nigricans*), river chub (*Nocomis micropogon*), stone roller (*Campostoma anomalum*), saffron shiner (*Notropis rubricroceus*), rainbow trout (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*). Rainbow and brown trout are non-native game species that support a popular recreational fishery on the Little River. Fish populations of the 5th order segment of Little River are typical of Blue Ridge physiographic province coolwater streams, with productivity, species diversity, and biomass increasing as you move downstream in the watershed. Analysis of fish population data collected upstream and downstream of the Elkmont WWTP suggest that the effluent does not have an impact on fish populations (NPS unpublished data).

Benthic Macroinvertebrates

Aquatic macroinvertebrates are monitored throughout the park as part of the Vital Signs program to serve as an early warning of potential negative influences within the watershed. Within the Little River watershed, aquatic macroinvertebrates are monitored at a site 2.8 mi (4.5 km) upstream of the Elkmont WWTP (ELLR02), and at a site 6.1 mi (9.8 km) downstream of the WWTP (ELLR01). For both sites, species richness values typically have rated “excellent” (i.e., >41 species on a bioclassification scale) throughout the sampled years, and these values are quite consistent between the two sites. During one year (2000), the richness value was only in the “good-fair” category at the downstream site, and two years (2003, 2016) were in the “good” category at the upstream site. These anomalies were most likely due to low flow situations during drought years. The EPT (Ephemeroptera, Plecoptera, and Trichoptera) values for most years have been in the “excellent” and “good” categories (i.e., >35 EPT species, and 28-35 species, respectively); however, these values have fluctuated over time, with some years only rating as “fair” (2000). This could be due to local conditions such as low flow due to drought or spates due to heavy rainfall. Overall, conditions remain similar upstream as compared to downstream, which would indicate that there currently is no measureable impact from the WWTP (NPS unpublished data).

3.3.2 Impacts of Alternative A – No Action

The quality and quantity of effluent discharged from the Elkmont WWTP would not change under Alternative A and construction associated with a WWTP upgrade would not take place. As discussed in Section 3.2 – Surface Water, the WWTP effluent is not expected to have a discernable effect on water quality of the Little River based on the low instream waste concentration, effluent quality data, and

instream water chemistry data. The fish and macroinvertebrate data presented in the existing conditions section above also suggest that the WWTP has no adverse impact on aquatic life. However, the risk of mechanical failure would increase over time under Alternative A as the system continues to age. Mechanical failure could lead to an unintended discharge of untreated pollutants, which could adversely affect water quality and aquatic life.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions potentially affecting aquatic life are the same as those discussed for surface water under the No Action Alternative. These actions would have long-term, adverse and beneficial impacts on aquatic life. Short-term impacts of other actions and Alternative A would not overlap in time. The contribution of impacts on aquatic life from Alternative A to those of past, present, and reasonably foreseeable future actions would be negligible. The cumulative impacts on aquatic life would also be negligible when impacts from Alternative A and other actions are combined.

3.3.3 Impacts of Alternative B – Upgrade and Continue Discharging to Little River

Under Alternative B, effluent quality and quantity would be similar to that of the existing plant. Effluent discharged from the WWTP under Alternative B is not expected to have a discernable adverse effect on aquatic life in the Little River. The upgraded plant would have long-term, beneficial impacts on aquatic life because it would be more reliable and less susceptible to unpredictable operational complications compared to Alternative A. As is the case with any surface water discharge, there is some risk of at least temporary aquatic life impacts under Alternative B from an unintended discharge of untreated pollutants due to mechanical failure or human error. This risk would be higher under Alternative B compared to Alternative C based on the frequency and volume of discharges to surface water.

Ground disturbance associated with construction of the WWTP upgrades would temporarily increase the potential for soil erosion and runoff of sediments to the Little River, which could affect aquatic life. Potential instream impacts of sedimentation include degradation of benthic macroinvertebrate habitat and fish spawning habitat. The area of disturbance would be less than 1.6 acres. As discussed above in the analysis for surface water, potential impacts of sediment runoff on aquatic life would be minimized through the use of sediment and erosion control measures. Impacts from construction on aquatic life would be short-term and negligible under Alternative B.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions are the same as those discussed under the No Action Alternative and would have long-term, adverse and beneficial impacts on aquatic life. Short-term impacts of other actions and Alternative B would not overlap in time. The contribution of impacts on aquatic life from Alternative B to those of past, present, and reasonably foreseeable future actions would be beneficial. The cumulative impacts on aquatic life would also be beneficial when impacts from Alternative B and other actions are combined.

3.3.4 Impacts of Alternative C – Upgrade and Install Effluent Drip Dispersal System

As discussed in the analysis of surface water, effluent quality under Alternative C would be similar to Alternatives A and B, but the volume discharged would be substantially lower. Effluent discharged from the WWTP under Alternative C is not expected to have a discernable effect on water quality or aquatic life in the Little River. The upgraded plant would have long-term, beneficial impacts on aquatic life because less effluent would be discharged to the river, and the new WWTP would be more reliable and less susceptible to operational complications compared to Alternative A. The risk of aquatic life impacts from an unintended discharge of untreated pollutants due to mechanical failure or human error would be lower under Alternative C compared to Alternatives A and B based on the frequency and volume of discharges to surface water.

Ground disturbance associated with construction of the WWTP upgrades and installation of the effluent drip dispersal system would temporarily increase the potential for soil erosion and runoff of sediments to the Little River and Slick Limb Branch. The area of disturbance would be about 7 acres compared to less than 1.6 acres for Alternative B. Potential instream impacts of sedimentation include degradation of benthic macroinvertebrate habitat and fish spawning habitat, which would be minimized through the use of sediment and erosion control. These mitigation measures have a high likelihood of successfully minimizing sediment runoff, but the potential for erosion is higher than Alternative B based on the larger area of disturbance (7 vs. 1.6 acres) and steeper terrain of the proposed drip dispersal area (up to 50% slope). Any instream sediment would likely be flushed during storm events and affected benthic organisms would reestablish quickly from organisms drifting downstream. Adverse impacts from construction on aquatic life would be short-term under Alternative C.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions are the same as those discussed under the No Action Alternative and would have long-term, adverse and beneficial impacts on aquatic life. Short-term impacts of other actions and Alternative C would not overlap in time. The contribution of impacts on aquatic life from Alternative C to those of past, present, and reasonably foreseeable future actions would be beneficial. The cumulative impacts on aquatic life would also be beneficial when impacts from Alternative C and other actions are combined.

3.4 VEGETATION

3.4.1 Existing Conditions

Historic Vegetation

Pre-park and pre-settlement conditions in the project area are predicted using ecological modeling data that approximates likely natural vegetation of a site based on a variety of environmental factors. A recent 2017 model for natural ecological systems of the park classifies much of the project area as dry oak and low elevation pine, with a small area of acidic cove in the eastern portion. Dry oak stands would likely have been dominated by a mixture of xeric oak species, including white oak, southern red oak, scarlet oak, and chestnut oak. American chestnut may have been an important species here. Low

elevation pine sites would have been dominated by various mixtures of pitch pine, table mountain pine, and Virginia pine (Low et al 2017, Figure 3-2).

When the Great Smoky Mountains became a National Park in 1934, up to 80 percent of the landscape had been clearcut. Forest cover has since rebounded dramatically through natural processes. These once disturbed, but substantially recovered lands contribute significantly to the Great Smoky Mountains world-renowned diversity of plant and animal species.

Like much of GRSM, the project area was disturbed prior to creation of the park. The WWTP site remains developed, but the proposed drip dispersal area (Alternative C) has recovered through natural processes. Fred Miller, who assessed and mapped vegetation communities of GRSM in the 1930's, classified much of the vegetation of the project area as "grassland" and "cove forest - 1-20 years old", with some areas on the steeper, northwestern side mapped as "cove hardwoods - all ages" (Miller 1938, Griggs 2009). Miller's vegetation classification of grassland and young cove forest provide evidence that this site was beginning to succeed from an open condition to forested around the time of park creation.

Current Vegetation

The existing Elkmont WWTP site consists of infrastructure, buildings, and gravel parking areas surrounded by forested areas. The drip dispersal study area proposed under Alternative C was disturbed prior to establishment of the park, but has substantially recovered through natural processes over the past 85 years and currently consists of eight vegetation communities (Table 3-1, Figure 3-3). The vegetation communities and natural process that currently exist within the proposed drip dispersal area contribute to the park's outstanding biodiversity, which is recognized as a fundamental resource and value of GRSM (NPS 2016a).

Table 3-1
Vegetation Community Types within the Elkmont Wastewater Treatment Plant Project Area

Vegetation Community Type	**Acres**	**Tree Density** (live stems per acre)	**Average Richness** (species)	**Herbaceous Cover** (percent)
Successional Tuliptree Forest	13.29	200	60	13 to 80
Southern Appalachian Acidic Cove Forest	2.82	120	30	10
Chestnut Oak Forest (Mesic Slope Type)	2.35	190	37	6
Appalachian White Pine/Sub-Xeric Oak Forest	4.92	240	41	13
Successional Eastern White Pine Forest	1.19	280	40	1 to 2
Appalachian Montane Oak-Hickory Forest (Red Oak Type)	1.10	220	54	23
Successional Black Walnut Forest	1.35	100-150	60	80
Cultivated Meadow	0.06	na	na	na
Total	**27.08**			

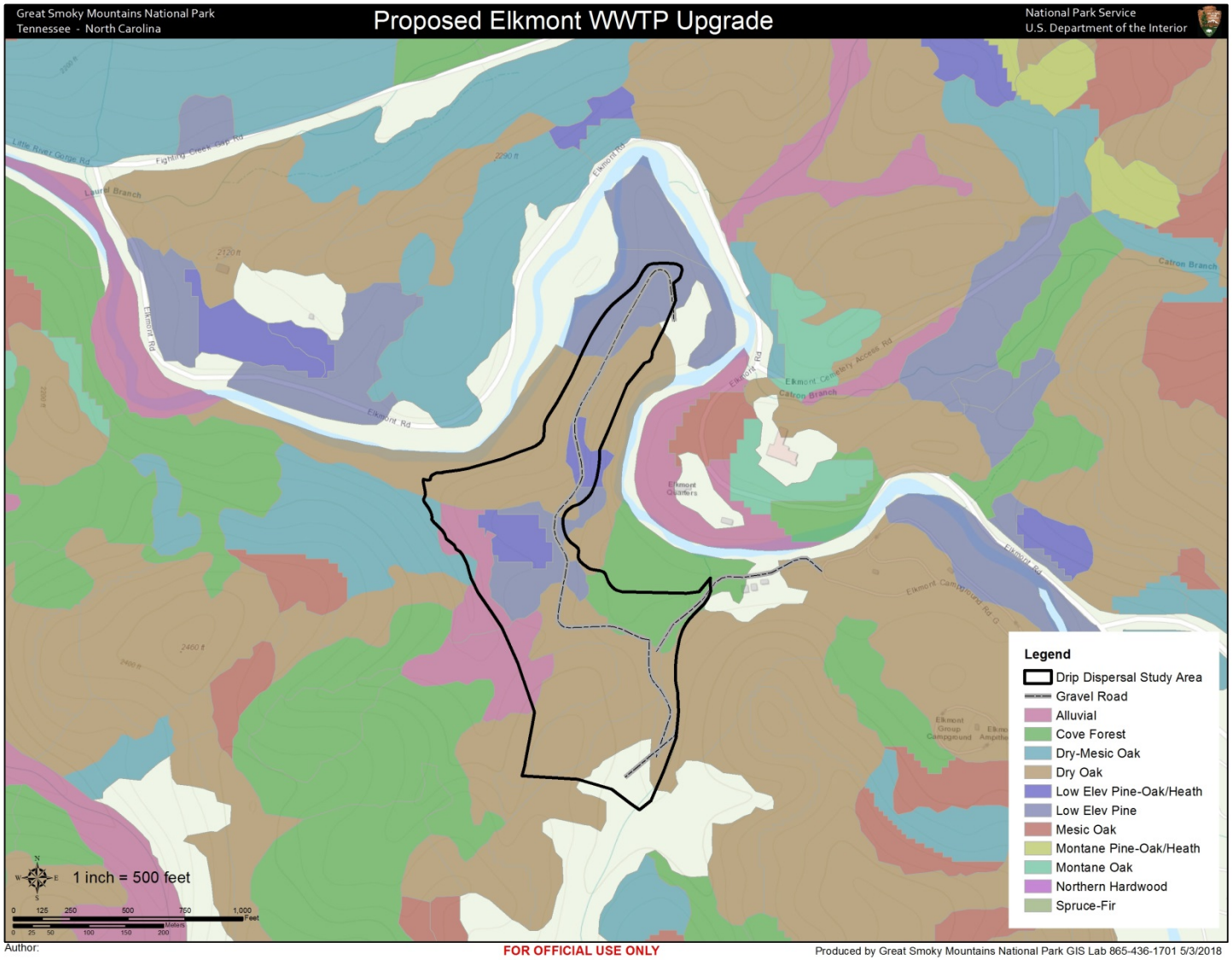


Figure 3-2: Natural ecological systems for the Elkmont Wastewater Treatment Plant project area, which are modeled vegetation types that would occur naturally based on environmental factors. Here, they are used as a proxy for pre-European vegetation communities.

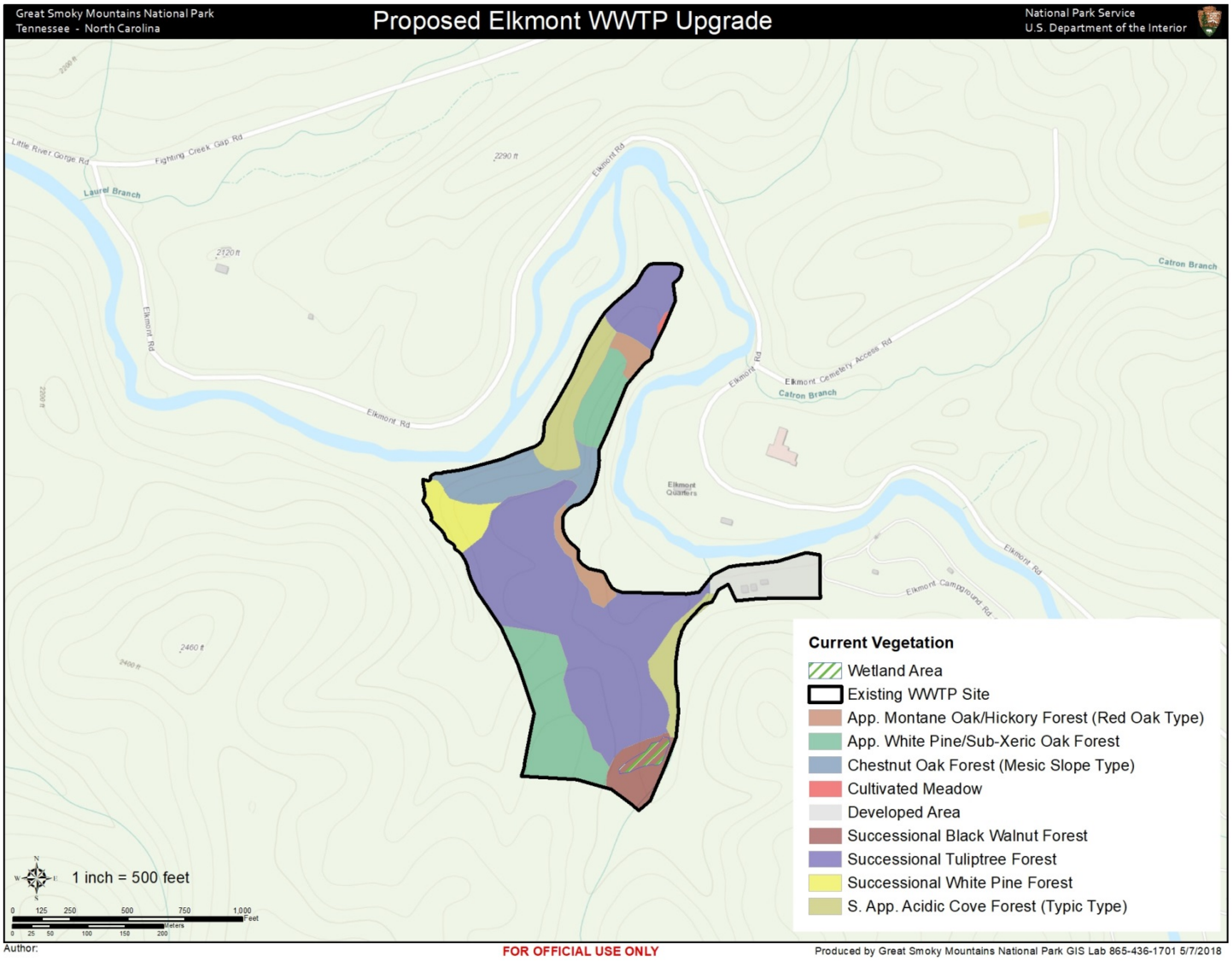


Figure 3-3: Current vegetation communities for the Elkmont Wastewater Treatment Plant project area, based on aerial photography interpretation and field evaluation.

Successional tuliptree forest covers about half of the area. This deciduous community type covers most of the gentle sloped areas, which are more conducive to drip system installation. Successional white pine forest, Appalachian white pine/subxeric oak forest, and Appalachian montane oak-hickory forest (red oak type) are also located in geographic locations here that are generally conducive to drip system installation. The majority of southern Appalachian acidic cove forest and chestnut oak forest (mesic slope type) is on steep slopes. The study area also includes a sliver of maintained grass. Each forest type mapped in Figure 3-3 is briefly described below.

Successional Tuliptree Forest. Successional tuliptree forests (Figure 3-4) are the result of past land use, usually arising from clearcutting or former agricultural land. They represent a successional stage, eventually converting to an oak-dominated stand under natural conditions. These stands can contain over 50 percent canopy cover of tulip poplar (*Liriodendorn tulipifera*), mixed with typical successional hardwood species (White et al 2003).

Based on GRSM vegetation monitoring plot data, successional tuliptree forests in the park generally have a live tree density of 200 stems/acre. Tulip poplar accounts for 30 percent of all stems and red maple another 20 percent. The next most important species are sweet birch and yellow birch (*Betula alleghaniensis*) in mid-elevations, then mountain silverbell.

Figure 3-4: Photographs of successional tuliptree (left) and southern Appalachian acidic cove (right) forests in the Elkmont Wastewater Treatment Plant proposed drip dispersal study area.

Southern Appalachian Acidic Cover Forest. Acidic cove forests (Figure 3-4) are defined by cove-oriented species, such as tulip poplar and eastern hemlock, growing over a dense layer of acidic shrubs, such as rosebay rhododendron (*Rhododendron maximum*) and dog hobble (*Leucothoe fontanesiana*). This type can be of variable age. These stands would likely be stable into the future with dominant cove species.

Historically, acid coves in GRSM had a high percentage of eastern hemlock in the canopy. In areas where hemlocks have been lost due to hemlock woolly adelgid (*Adelges tsugae*), they now may have large canopy gaps and low stand densities.

Based on monitoring plot data, GRSM acidic cove stands have an average tree density of 120 live stems/acre, with these stems divided between various hardwood species. The most abundant species

are sweet and yellow birch, Fraser magnolia, American beech (*Fagus grandifolia*), tulip poplar, and mountain silverbell.

Chestnut Oak Forest (Mesic Slope Type). Chestnut oak forests (mesic slope type) are generally found on steep, protected drainages and are defined as oak-dominated forests growing over moderate to dense rosebay rhododendron cover. This forest type is typically dominated by chestnut oak (*Quercus montana*), but in the Elkmont area much of the mesic slope forest consists of red oak (*Quercus rubra*) and red maple co-dominating. The subcanopy is generally sparse. Rosebay rhododendron is the dominant shrub (White et al 2003). Like many of the other heavily acidic associations, the herb layer is sparse and consists of few acidic-loving species.

In GRSM, mesic slope oak forests have an average tree density of 190 live stems/acre, with oak species accounting for 20 percent of stems (but 65 percent of basal area, due to their larger diameter in most of these stands).

Appalachian White Pine/Subxeric Oak Forest. The Appalachian White Pine/Subxeric Oak forest is a mixed evergreen/deciduous forest with dominant species being eastern white pine (*Pinus strobus*) and dry-site oaks such as chestnut oak, black oak (*Quercus velutina*), and scarlet oak (*Quercus coccinea*) (White et al 2003). The subcanopy is generally open. The shrub stratum is variable, but often dense, with huckleberry, blueberry, and mountain laurel being the common species (White et al 2003). The herbaceous layer is generally sparse and usually consists of acid-loving species.

Based on plot data, white pine/subxeric oak forests in the park are generally very dense, averaging 240 live stems/acre for tree density. Much of the stem density is driven by shade tolerant midstory species, such as red maple and sourwood, but about 70 percent of the basal area is from the much larger oaks and pines in these sites.

Successional Eastern White Pine Forest. Successional eastern white pine forests are successional in nature, and arise from anthropogenic disturbances, such as agriculture, grazing, and clear-cutting. These stands can have a highly variable mix of successional-oriented species, but always have a high coverage of eastern white pine (White et al 2003). Other common species can include Virginia pine (*Pinus virginiana*), tulip poplar, sweet gum (*Liquidambar styraciflua*), red maple, black locust, and eastern hemlock, with these species often forming the subcanopy. The shrub layer is variable, in some instances non-existent. The herbaceous layer is generally sparse and can have species indicative of the former vegetation type there (White et al 2003).

Within GRSM, plot data shows these stands as having a high tree density, with around 280 stems/acre. Like many of the successional community types, much of this stem density is driven by small, subcanopy hardwood species, with white pine accounting for only 15 percent of stem density, but about 30 percent of stand basal area.

Appalachian Montane Oak-Hickory Forest (Red Oak Type). The Appalachian montane oak-hickory forest (red oak type) consists of a canopy dominated or co-dominated by northern red oak mixed with a variety of other mesic hardwood tree species. The shrub layer is sparse to moderate, usually dominated

by deciduous species such as buffalonut, huckleberry, flame azalea (*Rhododendron calendulaceum*), and American chestnut (*Castanea dentate*) sprouts. The herbaceous layer is variable, but at times may be abundant and diverse, including many species of sedge (*Carex spp.*), New York fern, wood ferns (*Dryopteris spp.*), along with a variety of aster (*Symphyotrichum/Oclemena/Eurybia*) and goldenrod species.

Based on GRSM plot data, oak-hickory (red oak type) forests in GRSM average 220 stems/acre for tree density. Oak species account for about 15 percent of stem density, and about 35 percent of stand basal area. Other species with high densities include eastern hemlock, red maple, tulip poplar, and pignut hickory.

Successional Black Walnut Forest. The successional black walnut forest is a successional forest type, usually associated with homesites, or other long-term, high impact disturbance. They typically occur in small isolated pockets, with individual stands being 1-2 acres in size. The dominant tree in these communities is black walnut (*Julgans nigra*), often with other successional species present, such as tulip poplar, sweetgum (*Liquidambar styraciflua*), and red maple. The shrub layer is intermediate to sparse, typically containing spicebush (*Lindera benzoin*) as a major component. The herbaceous layer is dense and can be diverse, containing various forest sedges and grasses, and almost always containing wingstem (*Verbesina alternifolia*).

Due to the relatively small size of individual stands and their association with homesites, no previous plot data on this community type has been collected in GRSM. Looking at data from outside of the park, it appears that average tree density is around 100-150 stems/acre, with an average species richness of 60 species. The herbaceous cover can approach 100 percent in some instances, but averages around 80 percent.

3.4.2 Impacts of Alternative A – No Action

Construction and vegetation clearing would not take place under the No Action Alternative and there would be no impacts to vegetation. Forested communities in the proposed drip dispersal area (Alternative C) would continue to recover from pre-park disturbances through natural ecological succession. The successional tuliptree forest would eventually convert to an oak-dominated stand and the successional eastern white pine forest would convert to an oak-dominated stand.

Cumulative Impacts. Past and present actions identified in Section 3.1.3 – Analyzing Cumulative Impacts would have some short-term impacts on vegetation, but would have long-term beneficial impacts overall. The Elkmont Historic District EIS (NPS 2009) concluded that the selected alternative would have long-term, major beneficial impacts on biotic communities within the Elkmont Historic District. This was primarily attributed to recovery of vegetation communities following building removal. Buildings have been removed in phases and the final removals were completed in spring 2018. Vegetation community recovery will occur over decades. The EIS estimated a net reduction of 0.58 acres of impervious surface and up to 22 acres that could eventually be restored to montane alluvial forest, which is a globally imperiled community.

Reasonably foreseeable future actions that would affect vegetation include construction of a new Elkmont Campground store. Alternatives sites are being considered and impacts on vegetation would vary based on identification of a preferred site. One of the sites being considered is forested, while others consist of existing development or maintained lawn. Based on preliminary estimates, less than an acre would be affected by construction of the store. This project would result in negligible impacts on vegetation if sited in an existing developed area or maintained lawn, and long-term adverse impacts if sited in a forested area.

Alternative A would not contribute to cumulative impacts on vegetation. Combining impacts of Alterative A with those of past, present, and reasonably foreseeable future actions would result in long-term, beneficial impacts on vegetation.

3.4.3 Impacts of Alternative B – Upgrade and Continue Discharging to Little River

Construction activities under Alternative B would be confined to the existing WWTP site, which is developed and generally lacks vegetation. A few trees along the edge of the site could be removed or trimmed, but major clearing is not proposed. Impacts to vegetation under Alternative B would be negligible. As discussed for the No Action Alternative, natural ecological succession would continue in forested communities surrounding the WWTP.

Cumulative Impacts. Alternative B would not contribute to cumulative impacts on vegetation and impacts of past present and reasonably foreseeable future action would be the same as those discussed for Alternative A. Combining impacts of Alterative B with those of past, present, and reasonably foreseeable future actions would result in long-term, beneficial impacts on vegetation.

3.4.4 Impacts of Alternative C – Upgrade and Install Effluent Drip Dispersal System

Impacts to vegetation at the WWTP site would be similar to those described for Alternative B, with some additional tree removal potentially being required for installation of a 40,000 gallon effluent holding tank. Vegetation would also be impacted by installation of the drip dispersal system and associated 6-inch diameter force main. The drip dispersal system would cover up to 5 acres of land and the force main would be up to 1,600 feet long. Construction activities that would potentially impact vegetation communities include trenching/boring for force main installation, overstory thinning and understory clearing in the drip dispersal area, removal of woody debris from thinning operations, and installation of drip dispersal system (drip lines, small-diameter effluent distribution piping, and value boxes).

All or part of the reserve drip dispersal area could be used in the future (minimum of 20 years) if soils in the primary drip area can no longer function properly. Impacts to vegetation in the reserve area would be similar to those described below for the primary dispersal area. Although specifics regarding when and how much of the reserve area would be used are unknown, up to an additional 5 acres (up to 10 acres total) of natural forest vegetation could be impacted. If all or part of the reserve area were put into service, future use of the primary drip area would depend on conditions at that time. For example, all or part of the primary drip area could be temporarily shut down, continue to be used at a lower capacity, or permanently taken out of service. Ecological succession would resume in areas permanently

taken out of service and vegetation communities in these areas would be expected to recover to existing conditions in about 85 years. Any future use of the reserve area would be subject to further analysis in accordance with NPS policies and the National Environmental Policy Act.

Force Main Installation

The 6-inch diameter force main supplying the drip system would be buried about 24 inches underground using trenching methods. The force main would be installed along the existing gravel road. This placement would reduce impacts to vegetation, as the roadway lacks woody vegetation growth on it and is generally elevated enough, or has enough compaction, to limit significant root growth in the road corridor. Some herbaceous growth along the roadway would likely be eradicated from the trenching work. The highest potential impact would be the introduction of non-native exotic plant species on work equipment or through opportunistic establishment in the exposed and disturbed soil caused by the trenching.

Overstory Thinning for Drip Dispersal System

Within the 5-acre drip dispersal area, it is estimated that 25-50 percent of overstory trees would be removed during site preparation to facilitate equipment access for system installation and to remove trees that would likely be damaged during installation. As discussed in Section 2.4.2, topographic and vegetation surveys would be conducted as part of the design process to develop a drip system layout that minimizes vegetation clearing and tree damage. With the mean tree density of likely areas for drip system installation being 213 trees/acre, a 25-50 percent reduction of overstory trees would amount to 50-100 trees/acre removed, or 250-500 trees total for the project. It is currently unknown whether midstory or canopy trees would be selected more often for removal, so most impacted tree species are unknown. Based on community type and species density, it is likely that tulip poplar and red maple would account for a large percentage of the removals.

Selective removal of overstory trees would create several openings in the tree canopy, allowing additional sunlight to reach the forest floor and creating a flush of vegetative growth. Heavy tree seedling recruitment is expected within the first year of system installation along with growth of herbaceous species and some woody shrubs. As with any larger canopy disturbance, there is a high likelihood of invasive plant recruitment.

Trees would be felled with chainsaws. Trunks, larger diameter limbs, and tree tops would be removed using low-impact techniques to avoid damaging the soil profile. Tree ends would be elevated above the ground surface to limit plowing or trenching of soil from pulling logs. Possible impacts from woody material removal include damage to roots and trunks of remaining trees due to contact with moving logs, which could result in delayed mortality of trees that were not intended for removal. Dragging logs and tops would also disturb the duff layer (organic material) and uppermost mineral soil layer, which would increase the likelihood of invasive plant recruitment. As discussed in Section 2.6, Alternative C includes several mitigation measures to protect the drip area soil profile and minimize ground disturbance, soil compaction, and tree damage, as well as monitor and control invasive plants.

Understory Woody Vegetation Clearing for Drip Dispersal System

All understory woody vegetation would be cleared from the 5-acre drip dispersal area during site preparation. Most likely areas for installation have a thin-moderate shrub layer, with most abundant species being rosebay rhododendron, mountain laurel, bear huckleberry, eastern white pine regeneration, eastern hemlock regeneration, and buffalonut. Average stem density for woody understory shrubs and tree sapling over 1.4 meters tall in these community types is about 2 stems/square meter or roughly 8,000 stems/acre. Shrubs and woody saplings would be removed with a masticator head mounted on a skid-steer or cut with a chainsaw. The masticator would grind and shred the vegetation, and disperse the shredded material on the ground. Material cut by chainsaw would be chipped and dispersed on the ground or disposed of at an appropriate facility outside the park. Shredded and chipped material would be dispersed so the depth of material is less than 2 inches to minimize suppression of herbaceous vegetation regrowth.

Understory clearing would allow sunlight to reach the forest floor, creating a flush of vegetative growth and increasing the likelihood of invasive plant recruitment. Dispersed shredded and chipped material would temporarily suppress herbaceous plant growth until the material decomposes.

Installation of Drip Dispersal System

As discussed in Section 2.4.2, the drip system would include several zones with associated drip tubing, values, pumps, and controllers to regulate effluent dosing and achieve equal distribution over the dispersal area. Generally, drip lines would have emitters at 2-foot intervals and would be installed 2 feet apart, 6 to 10 inches below the surface. Drip lines would be installed using a vibratory plow attached to a skid steer or similar rubber-tracked machine. The vibratory plow cuts a clean incision in the soil, and widens a gap below the soil surface through which piping is pulled. Above ground disturbance is minimal with this implement, and above ground vegetation impacts beyond the overstory and understory removals are expected to be low. Rubber-tracked vehicles generally cause little soil compaction.

The vibratory plow would cut through tree roots within the upper 6 to 10 inches of soil, which could adversely impact the long-term health of some overstory trees. Affected trees could be more susceptible to being uprooted by winds, which would in turn damage the soil profile and drip tubing. As discussed in Section 2.4.2, drip system design would include measures to avoid tree root damage. Trees that could not be protected from extensive root damage would be identified for removal during site preparation to minimize the potential for blowdown and drip system damage.

Operation and Maintenance of Drip Dispersal System

Vegetation within the drip dispersal area would be managed to support sustainable operation of the system, while minimizing impacts on park resources. Immediately following drip system installation, vegetation would consist of a native tree overstory with varying age classes and gaps in the canopy; no shrub layer; and a disturbed or absent herbaceous layer. Work would be completed in winter or early spring. Increased light to the forest floor is expected to result in a flush of new vegetative growth starting in late spring. As a result, reseeding for site stabilization is not planned. Heavy recruitment of

tree seedlings is expected after installation of the drip system, along with growth of herbaceous species and some woody shrubs. This vegetative growth would stabilize site soils and contribute to attenuation of any remaining pollutants in the effluent.

Three to five years after installation, portions of the drip area are expected to support a dense shrub layer primarily consisting of tree saplings and some woody shrubs. This woody regrowth would be managed as necessary to maintain access for drip system inspection, maintenance, and repairs. Vegetation maintenance would include removal of tree saplings at approximately 5-year intervals. Woody shrubs would be retained unless they interfere with a specific maintenance task. About one third of the drip area would be treated during a given year to avoid drastic fluctuations in vegetative cover and to minimize resource impacts. Herbaceous growth would not be managed, except to control non-native invasive plants as necessary.

Operation of the drip dispersal system would result in increased soil moisture and nutrient (e.g., nitrogen and phosphorus) loading, which would alter natural processes and affect plant growth in the dispersal area. The system would be designed and operated to deliver small volumes of treated wastewater to each zone at predetermined time intervals throughout the day. The objective is to minimize or preclude soil saturation while still achieving equal distribution. This optimizes wastewater dispersal through the soil, plant uptake of the wastewater through their root systems, and attenuation of any remaining pollutants (EPRI and TVA 2004).

The vegetation communities most likely affected by the drip dispersal system naturally occur on dry (xeric) to moderately moist (mesic) sites. In natural systems, vegetation community composition would be expected to change in response to additional moisture and nutrients. However, initial vegetation thinning and long-term vegetation maintenance of the drip area is expected to have more of an effect on vegetation community structure and composition than the addition of moisture and nutrients. A primary concern for the managed vegetation within the drip dispersal area is avoiding soil saturation, which could lead to tree mortality or root system instability in large trees. Under overly moist conditions large trees would be susceptible to being blown over by wind, particularly on steeper slopes. Up rooted trees could cause substantial damage to the soil profile and drip tubing, which would require immediate repair in accordance with the NPDES Permit. These concerns would be addressed by following TDEC design guidelines, monitoring soil saturation during operations, and adjusting effluent dosing to each drip dispersal zone based on observations.

Summary

Installation, operation, and maintenance of the drip dispersal system under Alternative C would permanently convert up to 5 acres of natural forest vegetation to a maintained landscape. If the reserve area needs to be used in the future, an additional 5 acres or up to a total of 10 acres could be impacted. The affected area was disturbed prior to establishment of the park, but has substantially recovered through natural processes over the past 85 years. The vegetation communities and natural processes that currently exist within the proposed drip dispersal area are common throughout much of the park. These forested communities are considered important resources particularly in the context of a National

Park, which is designated as a World Heritage Site and is the core unit of an International Biosphere Reserve. These forests are also important in the local context of the Elkmont Developed Area, most of which was heavily altered prior to establishment of the park. The 384-acre Elkmont Developed Area currently consists of about 54 percent natural forest communities and about 46 percent human influenced, maintained, and developed landscapes. Alternative C would result in a 2 percent decrease in natural forest cover in the Elkmont Developed Area. This decrease could be as high as 4 percent, if the entire reserve area needs to be used in the future. If all or part of the reserve area were put into service, future use of the primary drip area would depend on conditions at that time. For example, all or part of the primary drip area could be temporarily shut down, continue to be used at a lower capacity, or permanently taken out of service. Ecological succession would resume in areas permanently taken out of service and vegetation communities in these areas would be expected to recover to existing conditions in about 85 years.

Cumulative Impacts. Impacts of past present and reasonably foreseeable future actions would be the same as those discussed for Alternative A. Up to 5 acres of natural vegetation would be permanently converted to a maintained landscape under Alternative C, resulting in long-term adverse impacts. Benefits of restoring vegetation communities in the Elkmont Developed Area would be diminished to some degree by the adverse impacts of Alternative C. This could also be true for the Elkmont Campground store if a forested site were selected. Much of the benefit from the Elkmont Historic District project is attributable to restoration of montane alluvial forest, which would not be impacted by Alternative C or the proposed store. The contribution of impacts on vegetation from Alternative C to those of past, present, and reasonably foreseeable future actions would be adverse. The cumulative impacts on vegetation would be beneficial when impacts from Alternative C and other actions are combined, but the benefits would be diminished compared to Alternatives A and B.

3.5 WILDLIFE

3.5.1 Existing Conditions

Amphibians

There are 31 salamander species documented in GRSM and 14 species of frogs and toads. Amphibians are the most numerous vertebrate in GRSM, with some salamander density estimates of $1/m^2$ over extensive areas. This number is probably higher along streams and lower on dry slopes, but if accepted as a rough estimate, could indicate roughly 20 million salamanders park-wide. For its size, the park is one of the most species-rich sites in the world for this group (NPS 2016c). Woodland salamanders potentially occurring in the project area include: slimy salamander (*Plethodon glutinosus*), southern Appalachian slimy salamander (*Plethodon teyahalee*), southern red-backed salamander (*Plethodon serratus*), seal salamander (*Desmognathus monticola*), Blue Ridge two-lined salamander (*Eurycea wilderae*), and red-spotted new (*Notophthalmus viridescens*).

Salamander density is expected to be highest in relatively moist areas such as the Southern Appalachian Acidic Cover Forest and along Slick Limb Branch. The likely areas for drip dispersal system installation are relatively dry and salamander density is expected to be relatively low (less than $1/m^2$).

Birds

GRSM contains some of the largest and most biologically complex tracts of protected forest in the eastern U.S., and breeding bird distribution patterns reflect this complexity. There are 246 species of birds documented as occurring in GRSM, which is more species than any other vertebrate group in the park. Of this number, 121 species are believed to have breeding populations in the park, 56 are permanent residents, and 71 species are migrants and/or wintering species. Another 54 species are considered accidental occurrences. About 150 species, both breeding and migratory, are neo-tropical migrants, spending the winter in the Caribbean, and Central and South America (NPS 2016c). Common breeding birds likely to occur in the project areas include: wild turkey (*Meleagris gallopavo*), Carolina chickadee (*Poecile carolinensis*), hooded warbler (*Setophaga citrina*), black-throated green warbler (*S. virens*), northern parula (*S. americana*), Acadian flycatcher (*Empidonax virescens*), red-eyed vireo (*Vireo olivaceus*), and wood thrush (*Hylocichla mustelina*).

Mammals

About 63 species of native mammals occur in the park, including shews, moles, bats, rabbits, rodents, and carnivores. Some of the species expected to commonly occur in the project area include Virginia opossum (*Didelphis virginiana*), northern short-tailed shrew (*Sorex brevicauda*), hairy-tailed mole (*Parascalops breweri*), grey squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), striped skunk (*Mephitus mephitis*), raccoon (*Procyon lotor*), American black bear (*Ursus americanus*), and white-tailed deer (*Odocoileus virginianus*). Wild hog (*Sus scrofa*), which are non-native, also occur in the area. These opportunistic feeders root up the ground and can damage native plant communities. Wild hogs are actively controlled in the park.

Reptiles

Snakes, lizards, and turtles are far less abundant in GRSM and there are fewer species than amphibians; 23 species of snakes, nine species of lizards, and eight species of turtles are currently documented (NPS 2016c). Snakes and lizards perform an especially significant role in drier sites, where they exert some control over rodent and insect populations. Reptile species likely to occur in the project area include eastern box turtle (*Terepene c. carolina*), black rat snake (*Pantherophis alleghaniensis*), northern watersnake (*Nerodia sipedon*), eastern garter snake (*Thamnophis sirtalis*), copperhead (*Agkistrodon contortrix*), timber rattlesnake (*Crotalus horridus*), five-lined skink (*Plestiodon fasciatus*), and broad-headed skink (*Plestiodon laticeps*).

Synchronous Fireflies

There are 19 species of fireflies in the park. None of these species are federally or state-listed. However, synchronous flashing is exhibited by one species, *Photinus carolinus*. Large numbers of male fireflies gather in late May or June and fly over the ground searching for mates. As they fly, the group simultaneously emits flashes of light for six to eight seconds with breaks of up to 10 seconds. Females may counter with a less intense flash from the ground (Omara-Otunnu 2003). *Photinus carolinus* appears to occur at elevations of at least 2,000 feet in the Great Smoky Mountains and north into

Pennsylvania (Milius 1999). Elkmont contains some of the sites in the park where *Photinus carolinus* has been observed. Viewing synchronous fireflies light displays is a popular activity in Elkmont. The Elkmont Historic District EIS and GMP Amendment established a goal to avoid loss of habitat for synchronous fireflies. Whether this species occurs in the project area is currently unknown. A preliminary survey of the proposed drip dispersal area by the Park Entomologist indicates that potentially suitable habitat for this species is present. The most likely habitat occurs in relatively moist areas such as drainages and ravines, which are not suitable for drip system installation per TDEC guidelines. Additional surveys to determine the presence or probable absence of this species in the project area are planned for May-June 2018.

3.5.2 Impacts of Alternative A – No Action

Construction would not take place under the No Action Alternative. Continued operation of the Elkmont WWTP under Alternative A would have negligible impacts on wildlife.

Cumulative Impacts. Past and present actions identified in Section 3.1.3 would have some short-term impacts on wildlife, but would have long-term beneficial impacts overall. The Elkmont Historic District EIS (NPS 2009) concluded that the selected alternative would have long-term, major beneficial impacts on biotic communities within the Elkmont Historic District. Reasonably foreseeable future actions that would affect wildlife and their habitat include construction of a new Elkmont Campground store. Based on preliminary estimates, less than an acre would be affected by construction of the store. The store project would result in short- and long-term adverse impact on wildlife and wildlife habitat, but impacts would be localized.

Alternative A would not contribute to cumulative impacts on wildlife. Combining impacts of Alterative A with those of past, present, and reasonably foreseeable future actions would result in long-term, beneficial impacts on wildlife.

3.5.3 Impacts of Alternative B – Upgrade and Continue Discharging to Little River

Construction activities under Alternative B would be confined to the existing WWTP site, which is developed and provides limited habitat for wildlife. Wildlife using habitats nearby could be temporarily disturbed during construction, but long-term changes in habitat would not occur. Impacts to wildlife under Alternative B would be negligible.

Cumulative Impacts. Alternative B would not contribute to cumulative impacts on wildlife and impacts of past present and reasonably foreseeable future action would be the same as those discussed for Alternative A. Combining impacts of Alterative B with those of past, present, and reasonably foreseeable future actions would result in long-term, beneficial impacts on wildlife.

3.5.4 Impacts of Alternative C – Upgrade and Install Effluent Drip Dispersal System

Potential impacts of Alternative C on wildlife would primarily be associated with installation, operation, and maintenance of the drip dispersal system. As discussed in the analysis for vegetation, Alternative C would permanently convert up to 5 acres of natural forest vegetation to a maintained landscape (up to

10 acres if the reserve area needs to be used in the future), which would also result in long-term changes in wildlife habitat. Wildlife could also be directly affected during site preparation and construction. Site preparation and construction would take place from November through March, which would avoid direct impacts on nesting birds and roosting bats.

Highly mobile species such as birds and many mammals may change their behavior during construction activities by avoiding the area. Injury or mortality of highly mobile species during construction is not likely. Less mobile or burrowing species would be more susceptible to injury or mortality during ground-disturbing activities such as equipment operation, woody material removal, trenching, and drip line installation with a vibratory plow. Wildlife that would likely be affected includes woodland salamanders, overwintering reptiles, shews, and moles. If present, synchronous firefly larvae could also be impacted, but the most likely habitat for this species is along drainages and ravines that would not be directly impacted during drip system installation. Over the short-term, a local decrease in abundance of some species would be expected as a result of mortality during construction, but no long-term, population-level impacts are expected.

Immediately following drip system installation, vegetation would consist of a native tree overstory with varying age classes and gaps in the canopy; no shrub layer; and a disturbed or absent herbaceous layer. These changes in vegetation represent a local, short-term, adverse impact on wildlife habitat.

Three to five years after installation, portions of the drip area are expected to support a dense shrub layer primarily consisting of tree saplings and some woody shrubs. This woody regrowth would be managed as necessary to maintain access for drip system inspection, maintenance, and repairs. Vegetation maintenance would include removal of tree saplings with a gas-powered trimmer equipped with a brush cutting blade at approximately 5-year intervals. Woody shrubs would be retained unless they interfere with a specific maintenance task. About one third of the drip area would be treated during a given year to avoid drastic fluctuations in vegetative cover and to minimize resource impacts. Herbaceous growth would not be managed, except to control non-native invasive plants as necessary. These permanent changes in vegetation represent permanent changes in wildlife habitat, which could cause a shift in the types of wildlife that use the drip dispersal area. Habitat for some species would be adversely affected, while habitat for other species could be created. Overall, the changes in wildlife habitat are considered adverse impacts because they signify a departure from existing natural conditions. However, the habitat changes are not expected to result in population-level impacts or changes in the types of species using the Elkmont Developed Area.

In summary, construction of the drip dispersal system under Alternative C would have local, short-term adverse impacts on wildlife and wildlife habitat. Operation and maintenance of the drip dispersal system would have local, long-term adverse impacts on wildlife habitat.

Cumulative Impacts. Impacts of past present and reasonably foreseeable future actions would be the same as those discussed for Alternative A. Up to 5 acres of forested habitat would be permanently converted to a maintained landscape under Alternative C, resulting in local, long-term, adverse impacts. Benefits of restoring vegetation communities and wildlife habitat in the Elkmont Historic District would

be diminished to some degree by the adverse impacts of Alternative C. This could also be true for the Elkmont Campground store if a forested site were selected. Much of the benefit from the Elkmont Historic District project is attributable to restoration of montane alluvial forest, which would not be impacted by Alternative C or the proposed store. The contribution of impacts on wildlife from Alternative C to those of past, present, and reasonably foreseeable future actions would be adverse. The cumulative impacts on wildlife would be beneficial when impacts from Alternative C and other actions are combined, but the cumulative benefits would be diminished compared to Alternatives A and B.

3.6 WILDERNESS

3.6.1 Existing Conditions

The Wilderness Act of 1964 created the National Wilderness Preservation System and recognized wilderness as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Large portions of GRSM have been recommended and proposed for wilderness designation over the years, but no congressionally designated wilderness presently exists at the park. *NPS Management Policies 2006* state: "The National Park Service will take no action that would diminish the wilderness eligibility of an area possessing wilderness characteristics until the legislative process of wilderness designation has been completed. Until that time, management decisions will be made in expectation of eventual wilderness designation." Accordingly, the National Park Service currently manages 464,544 acres of recommended and proposed wilderness at GRSM as wilderness, pending action by Congress. This area represents about 89 percent of the park's 522,000 acres (NPS 2016a).

The Elkmont WWTP and the proposed drip dispersal area (Alternative C) are within the Elkmont Developed Area, which was excluded from the area recommended for wilderness designation. The southern portion of the proposed drip dispersal study area is adjacent to recommended wilderness. Accordingly, this section considers how the Proposed Action could impact wilderness character, which is defined in terms of five qualities:

- Natural: Wilderness maintains ecological systems that are substantially free from the effects of modern civilization.
- Undeveloped: Wilderness retains its primeval character and influence, and is essentially without permanent improvements or modern human occupation.
- Untrammeled: Wilderness is essentially unhindered and free from modern human control or manipulation.
- Solitude or Primitive and Unconfined Recreation: Wilderness provides outstanding opportunities for solitude or a primitive and unconfined type of recreation.
- Other features: Ecological, geological, or other features of scientific, educational, scenic, or historical value unique to an individual wilderness based on the features that are inside that wilderness. These features typically occur only in specific locations within a wilderness.

Like most of GRSM, the recommended wilderness adjacent to the proposed drip dispersal area has been subjected to historic disturbance and has been recovering through natural processes since

establishment of the park in 1934. Signs of human influence are evident in the recommended wilderness adjacent to the proposed drip dispersal area, but these lands have substantially recovered over time and currently exhibit natural, undeveloped, and untrammeled qualities that are representative of recommended wilderness throughout the park. The Wilderness Character Narrative found in Appendix C of the *Foundation Document* (NPS 2016a) describes the park's wilderness character qualities in more detail.

3.6.2 Impacts of Alternative A – No Action

The existing Elkmont WWTP is outside of recommended wilderness and is not visible from the nearby wilderness because of terrain and surrounding forest cover. Noise from routine WWTP operations and vehicles accessing the site is the primary factor that could affect wilderness character under Alternative A. Noise would dissipate with distance from the source, but could be audible along the wilderness edge. Alternative A would not result in any changes in noise.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions identified in Section 3.1.3 are in developed areas outside of recommended wilderness. Noise associated with construction, demolition, and maintenance activities within the Elkmont Developed Area has local, short-term, adverse impacts on wilderness character. The contribution of impacts on wilderness from Alternative A to those of past, present, and reasonably foreseeable future actions would be negligible. The cumulative impacts on wilderness would also be negligible when impacts from Alternative A and other actions are combined.

3.6.3 Impacts of Alternative B – Upgrade and Continue Discharging to Little River

The proposed WWTP upgrades under Alternative B would be outside of recommended wilderness and would not be visible from nearby wilderness because of terrain and surrounding forest. Noise from construction activities, routine WWTP operations, and vehicles accessing the site is the primary factor that could affect wilderness character under Alternative B. Noise associated with routine operations would be similar to the No Action Alternative and would have local, long-term, adverse impacts on wilderness character. Noise levels associated with construction would be higher than routine operations and would be expected to extend farther into recommended wilderness. Construction would last about 5 months and the adverse impacts from noise on wilderness character would be local and short-term. Noise impacts of Alternative B would be greater than Alternative A over the short-term, but similar over the long-term.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions identified in Section 3.1.3 are in developed areas outside of recommended wilderness. Noise associated with construction, demolition, and maintenance activities within the Elkmont Developed Area has local, short-term, adverse impacts on wilderness character. The short-term noise impacts from construction under Alternative B would not overlap in time with any reasonably foreseeable future actions. The contribution of impacts on wilderness character from Alternative B to those of past, present, and reasonably foreseeable future actions would be negligible. The cumulative impacts on wilderness character would also be negligible when impacts from Alternative B and other actions are combined.

3.6.4 Impacts of Alternative C – Upgrade and Install Effluent Drip Dispersal System

The proposed WWTP upgrades and drip dispersal system proposed under Alternative C would be outside of recommended wilderness. The WWTP site would not be visible from the nearby wilderness, but some of the drip dispersal area would be visible. The southernmost part of the drip dispersal study area is adjacent to recommended wilderness. Vegetation patterns within the maintained drip area would be noticeably different than the surrounding natural landscape. The viewshed would be small based on terrain and forest cover, but the presence of a managed landscape would have indirect, local, long-term adverse impacts on the natural, undeveloped, and untrammeled qualities of wilderness character.

Noise associated with construction at the WWTP site and operation of the upgraded WWTP would be similar to that described for Alternative B. Installation of the drip dispersal system would also generate construction noise, which would extend farther into the wilderness than noise from the WWTP site based on proximity. The overall construction schedule would be about 5 months. Noise sources during operation and maintenance of the drip dispersal system include effluent delivery pumps and gas-powered chainsaws, trimmers, etc. Pumps would run near continuously while the WWTP is operating, but noise minimization would be considered in the design and pump selection process. Gas-powered tools would be used to maintain woody regrowth 3 years out of every 5-year maintenance cycle, and to occasionally remove trees downed by wind. Under Alternative C, noise would have indirect, local, short- and long-term adverse impacts on solitude, as well as the natural and untrammeled qualities of wilderness character.

As discussed in the vegetation section, installation of the drip dispersal system would create conditions favorable for the recruitment of non-native invasive plants. If invasive plants become established in the drip area they could spread into adjacent recommended wilderness. Potential impacts from invasive plants are considered negligible because appropriate monitoring and control measures would be implemented (see Section 2.6 – Mitigation Measures).

In summary, Alternative C would have indirect, local, short- and long-term adverse impacts on wilderness character. All impacts would originate outside of wilderness and would be limited to a relatively small area along the developed area-wilderness interface. Impacts of Alternative C on wilderness character would higher than those of Alternatives A and B.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions identified in Section 3.1.3 are in developed areas outside of recommended wilderness. Noise associated with construction, demolition, and maintenance activities within the Elkmont Developed Area has indirect, local, short-term, adverse impacts on wilderness character. The short-term noise impacts from construction under Alternative C would not overlap in time with any reasonably foreseeable future actions. The contribution of impacts on wilderness character from Alternative C to those of past, present, and reasonably foreseeable future actions would be adverse. The cumulative impacts on wilderness character would also be adverse when impacts from Alternative C and other actions are combined.

3.7 ARCHEOLOGICAL RESOURCES

3.7.1 Existing Conditions

Human History and Historical Overview

Archeological evidence places Native American occupation in the Elkmont area without interruption from the Archaic Period (10,000-3,000 BP) through the Cherokee-Qualla Protohistoric Phase (1450-1838 CE). After the treaties of Dumplin Creek and Coyatee in 1785 and 1786, respectively, portions of what is now GRSM were open for settlement by European-Americans. It would not be until the mid-nineteenth century that European-American settlers began to establish homes and farms in what is now the Elkmont area.

The old growth timber of the Smoky Mountains attracted logging interest to the region, including the Little River Lumber Company. Elkmont was the Little River Lumber Company's largest logging community in the Smoky Mountains, operating from 1901-1939. The company's rail lines also provided transportation for the Appalachian Club and Wonderland Park resort communities during the 1910s and 1920s.

With the establishment of the GRSM, the Tennessee Park Commission purchased many of the resort properties at half their value with the stipulation that landowners lease and use the properties for only their lifetime. The NPS extended the leases, first to 1972 and then to 1992. In 1982, the GRSM *General Management Plan* (GMP) (NPS 1982) called for the removal of all buildings at Elkmont under private lease upon the expiration of those leases and for the building sites to be returned to a natural state. After 1992, most leases expired and the resort cabins stood empty. A few lifetime leases continued until the end of 2001.

In 1993, a number of resort era buildings within Elkmont were determined eligible for inclusion on the National Register of Historic Places (NRHP); and in 1994, the Elkmont Historic District was listed on the NRHP, with 49 of the 74 remaining buildings considered as contributing to the District. The significance of the Elkmont Historic District as an example of a summer resort community in the Smoky Mountains of east Tennessee consisting of a clubhouse, hotel, and individual cabins warranted its NRHP inclusion.

The Tennessee State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP) determined that the action of removing all Elkmont buildings as called for in the 1982 GMP would constitute an adverse effect. After years of consultation with the SHPO and ACHP, an Environmental Impact Statement (EIS) and GMP amendment was initiated to investigate alternatives to the 1982 plan. The final EIS and GMP amendment and a Memorandum of Agreement were issued in 2009 to implement Alternative C that stipulated eighteen contributing and one noncontributing structure be retained.

The Wonderland Hotel was removed in 2006 before the conclusion of the 2009 EIS process. The Wonderland Annex was consumed by fire in 2016. Other Elkmont Historic District buildings to be removed as part of implementation of EIS Alternative C were removed in 2017 and 2018. Of the

nineteen buildings being retained, six have already been rehabilitated or preserved. Some of the other actions called for under the 2009 EIS have been implemented including improvements to parking and utilities.

Elkmont Historic District

A portion of the study area for proposed upgrades to the Elkmont WWTP intersects with portions of the Elkmont Historic District. There are no extant features and/or structures identified as contributing to the District within the project area (Cleveland 2004, Thomason et al 1993).

Archeological Site GRSM 375/40SV124

Portions of the study area for proposed upgrades to the Elkmont WWTP intersect archeological site GRSM 375/40SV124, a prehistoric Native American and historic period site. In total, the approximately 30-acre Alternative C project study area intersects 10.66 acres of archeological site GRSM 375/40SV124. A comprehensive phase I survey of the project area and adjacent landforms, specifically within archeological site GRSM 375/40SV124, was conducted in 2017-2018 under supervisor of the Park Archeologist. This work expanded one of two artifact concentrations and/or feature locations previously documented by TRC Garrow Associates Inc., and identified four additional artifact concentrations and/or feature locations. The site contains six artifact and/or feature concentrations. Portions of three of those artifact and/or feature concentrations fall within the project study area. Archeological Site GRSM 375/40SV124 remains unevaluated for NRHP eligibility, as additional survey and evaluation is needed (Bailey 2018, Webb and Benyshek 2005).

Archeological Site GRSM 376/40SV125

Portions of the study area for proposed upgrades to the Elkmont WWTP intersect archeological site GRSM 376/40SV125, a prehistoric Native American and historic period site. The site contains nine known artifact and/or feature concentrations, none of which lie within the project area. The extent of the site potentially affected by the proposed upgrades lies either within the footprint of the existing WWTP and related disturbances or has yielded no potential to contribute cultural information important in prehistory or history. Archeological Site GRSM 376/40SV125 remains unevaluated for NRHP eligibility, as additional survey and evaluation is needed (Webb and Benyshek 2005).

3.7.2 Impacts of Alternative A – No Action

No major actions or changes from the present course of operations would take place under Alternative A. There would be no direct or indirect impacts to archeological resources under Alternative A.

Cumulative Impacts. Mitigation measures have been or would be used to ensure that past, present, and reasonably foreseeable future actions identified in Section 3.1.3 did not or would not have an adverse effect on archeological resources. Likewise, Alternative A would have no adverse effect on archeological resources. Cumulative impacts are not a concern.

3.7.3 Impacts of Alternative B – Upgrade and Continue Discharging to Little River

All actions under Alternative B would occur within the limits of disturbance already associated with existing Elkmont WWTP. Alternative B would impact areas within the boundaries of the Elkmont Historic District and archeological site GRSM 376/40SV125. Areas of the Elkmont Historic District impacted by Alternative B are considered as not contributing to the District. Areas of archeological site GRSM 376/40SV125 are either previously disturbed by construction of the existing Elkmont WWTP or have been surveyed, assessed, and yielded no potential to contribute cultural information important in prehistory or history. No further archeological work is recommended and no mitigation measures are proposed for Alternative B.

Cumulative Impacts. Mitigation measures have been or would be used to ensure that past, present, and reasonably foreseeable future actions identified in Section 3.1.3 did not or would not have an adverse effect on archeological resources. Likewise, Alternative B would have no adverse effect on archeological resources. Cumulative impacts are not a concern.

3.7.4 Impacts of Alternative C – Upgrade and Install Effluent Drip Dispersal System

Similar to Alternative B, Alternative C would also impact areas within the boundaries of the Elkmont Historic District and archeological site GRSM 376/40SV125. Areas of the Elkmont Historic District impacted by Alternative C are considered as not contributing to the District. Areas of archeological site GRSM 376/40SV125 are either previously disturbed by construction of the existing Elkmont WWTP or have been surveyed, assessed, and yielded no potential to contribute cultural information important in prehistory or history. Areas of GRSM 376/40SV125 would not be affected by the drip dispersal system under Alternative C. No further archeological work is recommended and no mitigation measures are proposed for Alternative C activities at the existing Elkmont WWTP.

Ground disturbance during construction of the drip dispersal has the potential to adversely impact intact archeological deposits identified during the phase 1 survey (GRSM 375/40SV124). Accordingly, 3.1 acres of the drip dispersal area have been identified by the Park Archeologist for avoidance to project archeological resources. These avoidance areas would be fenced, under supervision of the Park Archeologist, prior to the start of site preparation work to ensure construction equipment does not inadvertently enter the area.

The avoidance areas include appropriate buffers to prevent disturbance of archeological sites during construction, as well as avoid potential contact between subsurface Native American prehistoric deposits and dispersed effluent. Movement of effluent through soils has potential to negatively impact the preservation of archeological materials and organic content of the effluent has potential to negatively impact absolute dating techniques often employed in archeological data recoveries. In addition, introduction of effluent originating from human waste within intact archeological contexts is a practice NPS wants to avoid because those archeological contexts represent the ancestral heritage of the park's contemporary Tribal partners.

In addition to the impact avoidance measures discussed above, archeological monitoring would be conducted under supervision of the Park Archeologist during ground disturbing activities upon archeological site GRSM 375/40SV124. In the event of inadvertent discovery of archeological resources during construction, the contractor would be required to stop work until the Park Archeologist evaluates the find and determines the appropriate next steps.

Based on implementation of the mitigation measures outlined above, NPS has made a preliminary determination that Alternative C would have no adverse effect on historic properties listed or eligible for listing on the NRHP. A final determination of effect is pending consultation with Tennessee SHPO and federally recognized Indian tribes, which is ongoing (see Appendix B).

Cumulative Impacts. Mitigation measures have been or would be used to ensure that past, present, and reasonably foreseeable future actions identified in Section 3.1.3 did not or would not have an adverse effect on archeological resources. Likewise, Alternative C would have no adverse effect on archeological resources. Cumulative impacts are not a concern.

CHAPTER 4
CONSULTATION AND COORDINATION

4.1 INTERNAL SCOPING

Internal scoping was conducted by an interdisciplinary team of professionals from NPS. Team members met to discuss purpose and need for the project, alternatives, issues, impact topics, and potential environmental impacts. The team also considered public scoping comments, collected background information, and conducted impact analyses.

4.2 PUBLIC SCOPING

A scoping newsletter summarizing the purpose and need for the action and providing a preliminary list of alternatives was posted on the NPS Planning, Environment, and Public Comment (PEPC) website. A 21-day public scoping period was held from November 20 through December 10, 2017. The scoping period was announced through PEPC, a press release to news media, and email notifications to GRSM partners and stakeholders. During the public scoping period, the park received four correspondences via PEPC, including comments about alternatives and resources that should be considered in the EA. All comments received during the scoping period were duly considered and are now part of the decision file for this project.

4.3 NATIONAL HISTORIC PRESERVATION ACT SECTION 106 AND TRIBAL CONSULTATION

The NHPA Section 106 consultation process was initiated with the Tennessee SHPO and four Native American tribes via letters dated November 2017 (Appendix B). These tribes included: Eastern Band of the Cherokee Indians, Cherokee Nation, United Keetoowah Band of Cherokee Indians in Oklahoma, and Chickasaw Nation. A request for additional information was received from Cherokee Nation in December 2017 and the requested information was provided to each tribe. Tennessee SHPO concurred with the proposed area of potential effect in a letter dated December 5, 2017.

Based on findings of the archeological survey (see Section 3.8 – Archeological Resources) and implementation of impact avoidance measures, NPS has made a preliminary determination that the Preferred Alternative (Alternative C) would have no adverse effect on historic properties listed or eligible for listing on the NRHP. A final determination of effect is pending completion of the Section 106 process, including consideration of any public comments on this Draft EA and ongoing consultation with Tennessee SHPO and traditionally associated Native American tribes. The park will complete the Section 106 consultation process prior to finalizing the NPS decision document for this EA. Furthermore, if additional information on ethnographic resources or traditional uses is provided by the tribes, the park will work with concerned parties to avoid any potential impacts associated with the Proposed Action.

4.4 ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

The NPS obtained an “official species list” for the project area from the U.S. Fish and Wildlife Service Information for Planning and Conservation System in November 2017. A scoping letter was also sent in November, which U.S. Fish and Wildlife Service responded to in December 2017. In accordance with

Section 7 of the Endangered Species Act, NPS has requested concurrence from U.S. Fish and Wildlife Service that the Preferred Alternative may affect, but is not likely to adversely affect Indiana bats and northern long-eared bats (see correspondence in Appendix C). The park will complete the Section 7 consultation process prior to finalizing the NPS decision document for this EA.

4.5 TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION COORDINATION

A scoping letter requesting comments on the Proposed Action and preliminary alternatives was sent to the TDEC Knoxville Field Office in November 2017 and a pre-application meeting was held at Park Headquarters in March 2018. Coordination with TDEC will continue throughout the project design, permitting, and construction processes.

CHAPTER 5
REFERENCES

Bailey, R. Heath. 2018. *Phase I Archeological Investigations of site GRSM 375/40SV124, Great Smoky Mountains National Park, Tennessee.* Great Smoky Mountains National Park, Gatlinburg, TN.

Cleveland, M. Todd. 2004. *Cultural and Historical Landscape Assessment for the Elkmont Historic District, Great Smoky Mountains National Park, Sevier County, Tennessee*. Prepared by TRC Garrow Associates, Inc., Atlanta, GA for Great Smoky Mountains National Park, Gatlinburg, TN.

Electric Power Research Institute and Tennessee Valley Authority (EPRI and TVA). *Wastewater Subsurface Drip Distribution: Peer Reviewed Guidelines for Design, Operation, and Maintenance*. EPRI, Palo Alto, CA and TVA, Chattanooga, TN. 1007406.

Griggs, D. 2009. Frank Miller Vegetation and Disturbance History Map 1938 Raster Image. National Park Service, Great Smoky Mountains National Park, Resource Management and Science. https://irma.nps.gov/DataStore/Reference/Profile/1048442

Kanno, Y., M.A. Kulp, S.E. Moore and G.D. Grossman. 2017. Native brook trout and invasive rainbow trout respond differently to seasonal weather variation: Spawning timing matters. *Freshwater Biology*, 62(5): 868-879.

LANDFIRE 2018. BioPhysical Settings Models and Descriptions. US Department of Agriculture and US Department of Interior. Accessed 26 February 2018 at https://www.landfire.gov/national_veg_models_op2.php.

Low, G., Klein, R., and K. Medlock. 2017. *Landscape Conservation Forecasting – Great Smoky Mountains National Park*. Unpublished Report. National Park Service, Great Smoky Mountains National Park, Gatlinburg, TN.

Milius, S. 1999. U.S. Fireflies Flashing in Unison. *Science News*. March 13, 1999.

Miller, F.H. 1938. *Brief Narrative Descriptions of the Vegetation Types in the Great Smoky Mountains National Park*. Unpublished Report. National Park Service, Gatlinburg, TN.

Miller, F.H. 1942. Vegetation Successional Status Map. National Park Service. Gatlinburg, TN.

National Park Service (NPS). 1982. *General Management Plan, Great Smoky Mountains National Park, North Carolina and Tennessee*. U.S. Department of Interior, National Park Service, Gatlinburg, TN.

NPS. 2009. *Elkmont Historic District Final Environmental Impact Assessment and General Management Plan Amendment*. U.S. Department of Interior, National Park Service, Great Smoky Mountains National Park, North Carolina and Tennessee.

NPS. 2013. *Rehabilitate Elkmont Wastewater Systems - Existing Conditions Assessment*. Prepared by AMEC for Great Smoky Mountains National Park, Gatlinburg, TN.

NPS. 2016a. *Foundation Document, Great Smoky Mountains National Park, North Carolina and Tennessee*. U.S. Department of Interior, National Park Service, Gatlinburg, TN.

NPS. 2016b. *Great Smoky Mountains National Park Historic Resource Study.* U.S. Department of Interior, National Park Service, Gatlinburg, TN.

NPS. 2016c. Natural Resources Condition Assessment for Great Smoky Mountains National Park. U.S. Department of Interior, National Park Service, Gatlinburg, TN.

NPS. 2017. Elkmont Campground NPDES Permit Renewal Application. Submitted to Tennessee Department of Environment and Conservation by Great Smoky Mountains National Park, Gatlinburg, TN.

Omara-Otunnu, E. 2003. Neurobiologist Unraveling Mysteries OF Fireflies' Flash. Accessed at: http://www.advance.uconn.edu/2003/030623/03062315.htm.

Pyle, C. 1985. *Vegetation Disturbance History of Great Smoky Mountains National Park: An Analysis of Archival Maps and Records*. Great Smoky Mountains National Park, TN. Research/Resources Management Report. SER-77. Uplands Field Research Lab, U.S. Department of Interior, National Park Service. Atlanta.

TDEC. 2012. *Tennessee Erosion and Sediment Control Handbook, 4th Edition.* Tennessee Department of Environment and Conservation, Nashville, TN.

Tennessee Department of Environment and Conservation (TDEC). 2016. *Design Criteria for Sewage Works*. State of Tennessee, Department of Environment and Conservation, Division of Water Pollution Control. Nashville, TN.

TDEC. 2017. National Pollutant Discharge Elimination System Permit No. TN0022349, Elkmont Campground Great Smoky Mountains National Park. Issued by Tennessee, Department of Environment and Conservation.

Thomason, P., M. A. Williams, and L. Brown. 1993. *Elkmont Historic District, Great Smoky Mountains National Park, National Register of Historic Places Registration Form*. Tennessee Historical Commission Nashville, TN.

U.S. Geological Survey (USGS). 2018. Little River at Elkmont WWTP StreamStats Report. Accessed 5 February 2018 at https://streamstats.usgs.gov/ss/.

Webb, Paul and Tasha Benyshek. 2005. *Archeological Investigations in the Elkmont Historic District, Great Smoky Mountains National Park, Sevier County, Tennessee*. Prepared by TRC Garrow Associates, Inc. Chapel Hill, NC for Great Smoky Mountains National Park, Gatlinburg, TN.

APPENDIX A - DRAFT FLOODPLAINS STATEMENT OF FINDINGS
ELKMONT WASTEWATER TREATMENT PLANT UPGRADE
NATIONAL PARK SERVICE, GREAT SMOKY MOUNTAINS NATIONAL

Recommended:
Cassius M. Cash

Superintendent	Date

Certification of Technical Adequacy and Servicewide Consistency:
Ed Harvey, PG

Chief, Water Resources Division	Date

Approved:
Stanley J. Austin

Regional Director, Southeast Region	Date

INTRODUCTION

The National Park Service (NPS) is proposing to upgrade the Elkmont Wastewater Treatment Plant (WWTP) to provide a modern, efficient, and sustainable wastewater treatment system for the Elkmont Developed Area within Great Smoky Mountains National Park. The Preferred Alternative (Alternative C) analyzed in the environmental assessment (EA) prepared for the project would involve upgrading the existing WWTP and installing a land-based, subsurface effluent drip dispersal system. The existing 35,000 gallon per day WWTP is within the 100-year floodplain (Zone A) of the Little River, as identified on the Federal Emergency Management Agency Flood Insurance Rate Map Panel 47155C0340E (effective May 18, 2009). The proposed drip dispersal system is located outside the 100-year floodplain. This Floodplain Statement of Findings was prepared in accordance with *Executive Order 11988 – Floodplain Management* and *NPS Director's Order 77-2 – Floodplain Management*.

JUSTIFICATION FOR USE OF THE FLOODPLAIN

The existing Elkmont WWTP was constructed in its current location in 1959. Under the Preferred Alternative, the WWTP would be upgraded to include new treatment processes and controls. Portions of the existing plant would be rehabilitated and new systems would be constructed or installed, as appropriate, within the existing WWTP site. Relocation of the WWTP to an alternative site outside the floodplain is not feasible because:

- Areas outside the floodplain are constrained by steep terrain that is not suitable for WWTP construction.
- Selection of an alternative site would not take advantage of existing WWTP components that can be rehabilitated and reused.
- Selection of a new site would likely require extensive changes to existing wastewater collection system within the Elkmont Campground.

Other alternatives for eliminating the need for the WWTP, such as hauling or piping wastewater to a WWTP outside the park, are not feasible for the reasons discussed in Section 2.5 of the Elkmont WWTP Upgrade Draft EA.

DESCRIPTION OF SITE-SPECIFIC FLOOD RISK

Elkmont WWTP is mapped within Zone A on the most recent Flood Insurance Rate Map. Zone A is defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year (100-year floodplain), but is generally determined using approximate methodologies. No base flood elevations or flood depths are shown because detailed hydraulic analyses have not been performed.

Site-specific stream flow data are not available for the Elkmont WWTP site, but a U.S. Geological Survey stream gauge station (03497300) is about 14 miles downstream on Little River above Townsend, Tennessee. The National Weather Service flood stage for this station is 8 feet. Flood stage is an established gage height for a given location above which a rise in water surface level begins to create a hazard to lives, property, or commerce. It does not correspond to the 100-year flood elevation.

Annual peak gauge height at station 03497300 exceeded 8 feet 21 out of 54 years for the period 1964 through 2017. All but two of these annual peak flow events occurred from December through May, with the most (7) occurring in March. The highest annual peak gauge height was recorded in March 1994 at 15.75 feet. Streamflow patterns are expected to be similar at Elkmont, but specific data are not available. The Little River is subject to rapidly rising water levels in response to intense rainfall events in the watershed. For example, gauge height at station 03497300 increased over 6 feet in 8 hours during a January 2013 storm. In May 2003 the river peaked at 12 feet in about 26 hours.

The Little River at the WWTP site is contained within an incised stream channel that is not subject to frequent or drastic migration. The WWTP is approximately 10 feet above the streambed. No specific records of flooding or flood damage exist for the Elkmont WWTP and current park staff members have no recollection of flood waters inundating the WWTP. The Elkmont Campground, which is immediately upstream of the WWTP, has occasionally been evacuated as a precaution during heavy rain events. The campground sustained flood damage during the March 1994 flood.

POTENTIAL RISKS TO HUMAN HEALTH AND SAFETY

The Elkmont WWTP is typically staffed by one person 7 days a week during normal business hours when the campground is open (March – November). Floods of potential consequence at Elkmont are expected to occur with some warning. In general, a prolonged period of intense rain for about 12 to 24 hours could create extreme flood conditions. The NPS and other agencies have a comprehensive monitoring system in place to provide an early warning system for major flooding, which provides sufficient time for evacuation. When necessary, the NPS has and will continue to close areas within the park to mitigate risks to human life due to flooding. Early warning, evacuation, and closure of the area would mitigate risks to humans at the Elkmont WWTP.

POTENTIAL RISKS TO PROPERTY

The NPS categorizes buildings and facilities into the following three categories to evaluate floodplain risks (per NPS Director's Order 77-2 and Procedural Manual 77-2):

- Class I Actions include the location or construction of administrative, residential, warehouse, and maintenance buildings and non-excepted (overnight) parking lots, if they lie within the 100-year floodplain.
- Class II Actions create "an added disastrous dimension to the flood event." Class II actions include the location or construction of schools, clinics, emergency services, fuel storage facilities, large sewage treatment plants, and structures such as museums that store irreplaceable records and artifacts, if they lie within the 500-year floodplain.
- Class III Actions include Class I or Class II Actions that are located in high hazard areas such as those subject to flash flooding.

The Elkmont WWTP is not considered a "large sewage treatment plant" based on its design flow of 35,000 gallons per day. Therefore, the proposed upgrades to the WWTP under the Preferred Alternative constitute a Class I Action. The proposed effluent drip dispersal system is considered an excepted action and does not require evaluation in this Statement of Findings because it is outside the floodplain. There are no Class II or Class III actions proposed under any of the alternatives. Specific new capital investments within the floodplain under the Preferred Alternative would include a secondary treatment unit, effluent holding basin, disinfection system, granular activated carbon filter, sludge handling equipment, and various pumps, piping, and systems controls. All of the new investment within the floodplain would be within the existing WWTP site and integrated with retained components of the existing plant.

POTENTIAL RISKS TO FLOODPLAIN VALUES

Floodplains provide an array of natural and physical resource values within Great Smoky Mountains National Park. These values include natural flood control, erosion control, groundwater recharge, habitat for vegetation and wildlife, and recreational opportunities. Construction of the WWTP upgrades under the Preferred Alternative would take place within or adjacent to the previously disturbed existing WWTP site, which consists of approximately 1.6 acres of infrastructure, buildings, and gravel parking areas. The estimated area of disturbance for the project would be less than 1.6 acres. Minimal or no vegetation clearing would be required.

Construction of new WWTP components such as the effluent holding basin and granular activated carbon filter would result in a small increase in impervious surface within the floodplain. Creation of new impervious surfaces would be minimized to the extent possible during the design process. Opportunities for removal of existing impervious surfaces that are no longer needed would also be considered during design. Existing vehicle parking areas would remain gravel. The net increase in impervious surface is expected to be less than 0.25 acres based on preliminary design information.

The preferred alternative would result in minimal changes to the floodplain compared to existing conditions. Risks to floodplain functions and values would be negligible.

FLOODPLAIN RISK MITIGATION

The following floodplain risk mitigation measures would be implemented under the Preferred Alternative:

- Potential risks to human health and safety would continue to be mitigated through existing NPS early warning, evacuation, and area procedures.
- Potential risks to property would be mitigated by incorporating applicable flood-related design guidelines contained in the TDEC *Design Criteria for Sewage Works* (TDEC 2016). New facilities would also be designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60).
- Potential risks to floodplain values would be mitigated during the design process by siting new WWTP components with the existing WWTP site, minimizing new impervious surfaces to the extent possible, and implementing the mitigation measures outlined in Section 2.6 of the Elkmont WWTP Draft EA.

SUMMARY

Implementation of the Preferred Alternative in the Elkmont WWTP Upgrade Draft EA would take place in compliance with regulations and policies to prevent impacts to floodplain values and loss of human life or property. The park and contractors would adhere to mitigation measures during and after construction activities. Individual permits with other agencies would be obtained prior to construction activities. The NPS concludes that there would be no unacceptable risks to human health and safety, unacceptable impacts to property, or substantial long-term adverse impacts to floodplain values. Therefore, the NPS finds the Preferred Alternative to be acceptable under Executive Order 11988 and NPS Directors Order 77-2 for the protection of floodplains.

APPENDIX B

NATIONAL HISTORIC PRESERVATION ACT SECTION 106 AND TRIBAL CONSULTATION

Letters containing the same content were also sent to:

Bill Anoatubby, Governor
The Chickasaw Nation

Bill John Baker, Principal Chief
Cherokee Nation

Joe Bunch, Chief
United Keetoowah Band of Cherokee Indians in Oklahoma

Richard Sneed, Principal Chief
Eastern Band of Cherokee Indians

United States Department of the Interior

NATIONAL PARK SERVICE
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, Tennessee 37738

IN REPLY REFER TO:

1.A.2

NOV 2 2 2017

E. Patrick McIntyre, Jr. Executive Director
Tennessee Historical Commission
Department of Environment and Conservation
2941 Lebanon Road
Nashville, Tennessee 37243

Re: Section 106 Consultation and Request for Scoping Comments, Elkmont Wastewater Treatment Plant Upgrade, Great Smoky Mountains National Park, Sevier County, Tennessee (PEPC 76297)

Dear Mr. McIntyre:

Introduction

In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, we are requesting consultation regarding proposed upgrades to the Elkmont Wastewater Treatment Plant, Sevier County, Tennessee. Great Smoky Mountains National Park (Park) has initiated the National Environmental Policy Act and National Historic Preservation Act scoping processes and invites the Tennessee Historical Commission to provide comments on the proposed action and alternatives described in the enclosed newsletter.

Recommended Area of Potential Effect (APE)

The recommended APE (attached map) includes the existing wastewater treatment plant (WWTP) site (Alternatives B and C) and the 15-acre drip dispersal study area described under Alternative C. This APE excludes all of the Elkmont Campground with the exception of the point where the access road to the WWTP connects to a campground roadway. It also excludes all 19 of the Elkmont cabins included in the Elkmont Historic District that the park is preserving.

Preliminary Assessment of Cultural Resources

No known, potentially eligible historic structures or cultural landscape resources are known to exist in the recommended APE. This assessment is based on a review of the 2016 Historic Resource Study for the Park.

Alternative C would include a land based, sub surface effluent dispersal system. Park Archeologists Heath Bailey and Nathaniel Cordle conducted a preliminary assessment of the proposed effluent drip dispersal area in September 2017. Preliminary findings show the proposed project area includes portions of the Elkmont Historic District, listed on the National Register of Historic Places, as well as portions of archeological sites GRSM 375/40SV124 and GRSM 376/40SV125. Through their 2003-2004 investigations of the Elkmont Historic District, the cultural resource management firm TRC Solutions evidenced prehistoric and historic human use at site GRSM 375/40SV124. It is of note that TRC Solutions recommended "this area be protected from impact or evaluated further" (Webb and Benyshek 2005).

While the existing WWTP site falls within the boundaries of archeological site GRSM 376/40SV125, TRC Solutions recommended no further work for that area (Webb and Benyshek 2005). Parts of the area were disturbed by WWTP construction and undisturbed areas were extensively tested by TRC Solutions, without significant findings.

In conducting their cursory assessment of unsurveyed space within the proposed project area, Bailey and Cordle identified two distinct historic archeological resources (structural ruins), and identified a probable third prehistoric archeological site through the identification of lithic raw materials (remnants of Native American tool-making, referred to as a lithic scatter) within disturbed ground surface contexts.

Recommended Phase I Archeological Survey

The extent to which ground disturbance would be experienced within the project area is not fully defined at this preliminary stage; however, landforms 0-25% grade are considered optimal for wastewater drip dispersal use and could be disturbed by the project. From an archeological resource perspective, these gentle landforms are likewise optimal for prehistoric use within GRSM. Applying a survey model that optimizes high probability landforms within GRSM and the Appalachian Summit region, Archeologists Bailey and Cordle identified 550 meters of linear survey transect (attached map) and 27 shovel test pits for Phase I reconnaissance investigations within the project area. Additional shovel test pits may be excavated at the time of survey if additional high probability areas are identified. The existing WWTP site would be excluded from shovel testing based on previous survey findings and past construction disturbance. The Park is proposing to conduct the Phase 1 assessment with in-house cultural resources staff under direction of the Park Archaeologist, Heath Bailey.

Request for Comment

We invite your office to provide comments on the proposed action and request that written comments be submitted by December 20, 2017. We also request the Historical Commission's concurrence on the recommended APE and proposed Phase 1 survey approach. Should you have any questions, feel free to contact Dianne Flaugh, Cultural Resources Program Manager at (865) 436-0339 or dianne_flaugh@nps.gov.

Sincerely,

Dianne Flaugh acting for

Jeff Troutman
Chief, Resource Management and Science Division

Enclosure

TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

December 5, 2017

Mr. Jeff Troutman
National Park Service
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, TN 37737

RE: NPS / National Park Service, Elkmont Wastewater Treatment Plan Upgrade, GSMNP, Sevier County, TN

Dear Mr. Troutman:

At your request, and in accordance with the signed memorandum of agreement with your agency, our office has reviewed documentation regarding the proposed Elkmont Wastewater Treatment Plant Upgrade. This review is a requirement of Section 106 of the National Historic Preservation Act for compliance by the participating federal agency. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Based on the information provided, we concur with your agency's definition of the area of potential effect and proposed archaeological survey methodology for the above-referenced undertaking.

Upon finalization of project plans please submit the full archaeological survey proposal to our office for our continued review and comment. Questions and comments may be addressed to Jennifer M. Barnett (615-687-4780).

Your continued cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb

United States Department of the Interior
NATIONAL PARK SERVICE
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, Tennessee 37738

IN REPLY REFER TO:

1.A.2.

MAY 0 2 2018

E. Patrick McIntyre, Jr. Executive Director
Tennessee Historical Commission
Department of Environment and Conservation
2941 Lebanon Road
Nashville, Tennessee 37243

Dear Mr. McIntyre:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, this letter seeks concurrence with the recommendations for the treatment of cultural resources within the project area for a project to upgrade the Elkmont Wastewater Treatment Plant (WWTP). The project area is located within Great Smoky Mountains National Park (GRSM, Park) in Sevier County, Tennessee.

This project was first discussed with your office in a project scoping letter dated November 2017. An update on the proposed action and the preferred alternative is provided here.

The November Scoping Letter also described a recommended phase I reconnaissance survey approach. The field survey work has now been completed and a summary of the findings of that work is provided here.

Description of the Proposed Action

The National Park Service (NPS) is proposing to upgrade the Elkmont WWTP to provide a modern, efficient, and sustainable wastewater treatment system for the Elkmont Developed Area within GRSM. Alternative C described in the November 2017 Project Scoping Newsletter has been identified as NPS' preferred alternative. The Elkmont WWTP would be upgraded to include new treatment processes and controls, a subsurface (land) effluent drip dispersal system, and a 6-inch force main to supply the drip dispersal system. The effluent dispersal system would be installed on up to 5 acres of forested land within the 30-acre drip dispersal study area and would allow for elimination of effluent discharges to the Little River under normal WWTP flow conditions. The total area of disturbance would be up to 7 acres, all of which is within the area of potential affect identified in our November 2017 letter.

Up to 5 acres within the drip dispersal study area would also be set-aside as a reserve drip dispersal area. All or part of the reserve area could be used in the future if soils in the primary

drip area can no longer function properly. With good design, installation, operation, and maintenance, drip systems are expected to have a useful life span of at least 20 years and some systems could have unlimited life expectancy when hydraulic and organic loading rates are optimized based on actual site conditions. Specifics regarding whether the reserve area would need to be used in the future and the exact size of the area that might need to be used are unknown at this time. For analysis purposes, it is assumed that the reserve area would not be used for at least 20 years. Any future use of the reserve area would be subject to further analysis in accordance with the National Environmental Policy Act and National Historic Preservation Act.

The preferred alternative includes several mitigation measures to avoid and minimize potential environmental impacts. Mitigation measures specifically applicable to cultural resources include the following:

- Install exclusion fencing in areas identified as cultural resources avoidance areas to help ensure cultural resources are not inadvertently damage by equipment. Fencing will be installed with oversight by the Park Archeologist.
- Archeological monitoring is required for Alternative C construction phases when ground disturbance is occurring near archeological site GRSM 375/40SV124. Monitoring will be conducted by the Park Archeologist or another qualified professional under supervision of the Park Archeologist.
- In the event that archeological materials are inadvertently discovered, all work in the immediate area of the find shall cease and Park Dispatch (865-436-1230) shall be notified immediately. Work will not proceed until authorized by the Superintendent, in consultation with the Park Archeologist.

Archeological Study Area/Area of Potential Effect (APE)

The project area for proposed upgrades to the Elkmont WWTP intersects portions of the Elkmont Historic District, listed on the National Register of Historic Places in 1994. While proposed upgrades do encompass portions of the Elkmont Historic District, as its boundaries are drawn, there are no extant features and/or structures within the project area identified as contributing to the District and its period of significance. The project area does intersect with portions of archeological sites 40SV124/ GRSM 375 and 40SV125/GRSM 376.

Archeological site 40SV124/GRSM 375 is a prehistoric Native American and historic period site. The site contains five known artifact and/or feature concentrations (loci). Portions of three of those artifact and/or concentrations occur within the project area. Archeological Site GRSM 375/40SV124 remains unevaluated for NRHP eligibility, as additional survey and evaluation is needed (Webb and Benyshek 2005).

Archeological site 40SV125/GRSM 376 is a prehistoric Native American and historic period site. The site contains nine known artifact concentrations, none of which lie within the project area. The extent of the site potentially affected by the proposed upgrades lies either within the footprint of the existing WWTP and related disturbances or has yielded no potential to contribute cultural information important in prehistory or history. Archeological Site 40SV125/GRSM 376 remains unevaluated for NRHP eligibility, as additional survey and evaluation is needed (Ibid.).

While additional survey and evaluation is recommended at Archeological Site 40SV125/GRSM 376, previous survey within potentially affected portions of the site (Ibid.) are considered sufficient for analysis of this proposed project.

Phase I Reconnaissance Survey Methodology

With the exception of areas confidently disturbed, all landforms within the project area sloped less than 25 percent were shovel tested. For the purposes of this study, disturbed areas within the project area excluded from shovel testing were cut and fill contexts, hardened road beds, and areas visually identified as having been leveled and/or graded by heavy equipment such as a bulldozer or its equivalent. Taking into consideration the potential for indirect effects to buried cultural deposits/features/artifacts from the installation and operation of the effluent drip dispersal system, several landforms adjacent to the proposed project area were also shovel tested (see enclosed Figure). For this reason, the archeological study area/APE encompasses a 32.03 acre area; while the area considered for placement of a drip dispersal accounts for 30 acres within the archeological study area/APE.

Shovel test pits were excavated at 20-meter (m) intervals upon linear transects, as landforms within the project area allowed. Upon encountering a positive STP additional STPs were installed at 10m intervals in the cardinal directions surrounding the initial positive STP until two negative STPs were obtained, as landforms within the project area allowed. This method effectively delineates sub-site loci, assigning their boundaries either through a 20-m culturally sterile buffer surrounding positive results or through an encounter with steep terrain that exceeds the 25 percent slope threshold for shovel testing. Where observed through pedestrian visual survey, above-ground features advised the placement of STPs and STP transects. Above-ground features were mapped, documented, and assessed for their contribution to the site and any associated sub-site loci.

Excavated STPs measured 30 centimeters (cm) in diameter, and soils were screened through one-quarter-inch (0.64 cm) mesh hardware cloth to ensure consistent artifact recovery. Within each STP, the dimensions and texture of encountered soil strata were described using the Munsell color system and USDA soil texture designations. Upon completion of each STP, it was backfilled and the ground surface was returned to its original condition.

The location of all STPs were digitally mapped in the field utilizing Global Positioning System (GPS) technology within 10 cm accuracy. ArcMap geospatial data processing software, developed and maintained by Environmental Systems Research Institute (ESRI), was then utilized in the office setting to manipulate location information and field data for its eventual conversion into NPS Cultural Resources Geographic information Systems (CRGIS) databases. From those data, final renderings of archeological location information were created for analysis, interpretation, and reporting.

Methods of site documentation and the drawing of site boundaries and sub-site loci boundaries for this investigation are in keeping with the methods employed by TRC Solutions in the course of their 2002-2004 investigations (Ibid.). NRHP eligibility determinations for potentially affected sites are not sought for the purposes of this study, as future investigations are likely to

yield additional material information.

Findings

A survey crew led by Park Archeologist R. Heath Bailey excavated 49 STPs within the study area (Figure). A total of seventeen (35%) STPs produced cultural materials. Ten (20%) excavated STPs produced prehistoric artifacts, among which none were diagnostic; Five (10%) excavated STPs produced historic artifacts, ranging from the late eighteenth century to the middle twentieth century.

Within the proposed project area, two sub-site loci were previously documented upon archeological site 40SV124/GRSM 375. During 2017-2018 investigations, no further work was motivated upon Locus A, a non-diagnostic subsurface prehistoric artifact scatter and an above-ground sewage treatment facility abandoned by the Park in the 1980s. Prior recommendations for the treatment of Locus A are considered sufficient for analysis of the proposed project (Ibid.).

2017-2018 investigations upon Locus B expanded its boundaries, identified non-local prehistoric lithic debitage not previously documented, and identified the deflated remains of a historic period structural footprint not previously documented. Locus B represents a non-diagnostic subsurface prehistoric artifact scatter and the site of the former Griffin Place. The former Griffin Place was occupied in the late nineteenth and early twentieth centuries, and is presumed to have been razed by the Park after its creation in 1934.

Four additional loci were identified within the study area by the 2017-2018 survey. They are referred to as Loci C, D, E, and F, respectively. Among those distinct artifact and/or feature concentrations, only Locus C intersects with the proposed project area, or is considered as potentially affected by the undertaking (Figure). Loci C and F (Figure) represent prehistoric subsurface artifact scatters. Neither produced diagnostic artifacts; and as such, no temporal framework is associated. Given their proximity and the non-local lithic debitage shared between them, the two loci are considered as potentially related. Locus E is the site of the former Robert Ownby Place (Figure). The former Ownby Place was occupied in the late nineteenth and early twentieth centuries, and is presumed to have been razed by the Park after its creation in 1934. In addition to historic artifacts observed upon the ground surface and recovered from excavated STPs, a formalized dry-stack native stone masonry spring box remains on site and in good condition. Locus D represents a shallow exploratory mining adit on the west bank of Slick Limb Branch (Figure). The small adit modified an out-cropping of bedrock immediately adjacent to the stream; and as such, has since filled in with alluvial deposits. Given their proximity (Figure) and their shared historic use, Loci D and E are considered as potentially related.

The site boundary of archeological site 40SV124/GRSM 375 has been expanded through this study to include newly identified sub-site loci (Figure). The site boundary of archeological site 40SV125/GRSM 376 has been modified to exclude Loci D, west of Slick Limb Branch. Portions of archeological site 40SV124/GRSM 375 remain uninvestigated. It is highly likely, as in the case of this study, that future investigations will expand existing boundaries.

A draft report of investigations will follow, including updates to 40SV124 and 40SV125

Tennessee state archeological site forms reflecting the additional findings and boundary changes resultant from 2017-2018 investigations. Those changes will also be captured within the Department of Interior (DOI) NPS ASMIS database.

Isolated Finds

Within the project area, isolated finds (IFs) represent artifacts and/or features that do not meet criteria for consideration as contributing significant material information at the site or sub-site level. IFs may represent artifact(s) and/or feature(s) considered non-historic; occurring exclusively within a disturbed context; or possessing an overall lack of material information in quantity or significance. No recommendations are provided for isolated finds within the project area. Four IFs were observed within the project area (Figure):

- IF1is the deflated surface remains of a bituminous coal pile. IF1 is considered as potentially related to the former Gillespie Place, as it lies at the edge of the razed, regraded, and highly disturbed space where that former structure is presumed to have stood.
- IF2 is a positive STP, consisting of single chert flake. The single flake was recovered from the contact zone between an upper organic stratum and a secondary stratum consisting exclusively of disturbed cut and fill soils.
- IF3 is a scant surface scatter of Park-era trash, consisting of twentieth century debris associated with the campground and utility activities of Park maintenance staff.
- IF4 is a positive STP, consisting of a single nail, recovered from the upper organic stratum/duff layer.

Recommendations

Relative to proposed upgrades to the Elkmont Wastewater Treatment Plant, there are no recommendations for treatment of the NRHP-listed Elkmont Historic District. While the proposed project does intersect with the Elkmont Historic District, as its boundaries are drawn, there are no extant features and/or structures within the project area identified as contributing to the District and its period of significance. Also, the project will not encumber or alter features and/or structures contributing to the District and its period of significance, physically or visually. For this reason, the Park considers the undertaking to have *No Adverse Effect* upon the Elkmont Historic District.

Relative to proposed upgrades to the Elkmont Wastewater Treatment Plant, there are no recommendations for treatment of archeological site 40SV125/GRSM 376. Prior survey upon portions of 40SV125/GRSM 376 (Ibid.) are considered sufficient for analysis of potential effects of the proposed project. That work found no artifact and/or feature concentrations located within the project area. The extent of the site potentially affected by the proposed upgrades to the Elkmont WWTP are either within the footprint of the existing WWTP and related disturbances or have yielded no potential to contribute cultural information important in prehistory or history. For this reason, the Park considers the undertaking to have *No Adverse Effect* upon archeological site 40SV125/GRSM 376.

Relative to proposed upgrades to the Elkmont Wastewater Treatment Plant, complete avoidance of all significant archeological areas is recommended within the boundaries of archeological site 40SV124/GRSM 375. All loci will be flagged and fenced for avoidance prior to implementation. A 20-m avoidance buffer surrounds all sub-site loci boundaries, where fencing will be installed. An archeological monitor is required during all project activities within the boundaries of archeological site 40SV124/GRSM 375. With these mitigations observed, the Park considers the undertaking to have *No Adverse Effect* upon archeological site 40SV124/GRSM 375.

The Park is therefore recommending that your office consider the proposed project as described above in the proposed action description to have *no adverse effect on historic properties*.

Should you have any questions, feel free to contact Dianne Flaugh, Cultural Resource Program Manager at (865) 430-0339 or R. Heath Bailey, Park Archeologist at (865-430-0340.

Sincerely,

Thomas J. Trootman, For

Cassius M. Cash
Superintendent

Enclosure

APPENDIX C

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

United States Department of the Interior

NATIONAL PARK SERVICE
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, Tennessee 37738

IN REPLY REFER TO:

1.A.2

Mary Jennings, Field Supervisor
U.S. Fish and Wildlife Service
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, Tennessee 38501

Re: Request for Scoping Comments, Elkmont Wastewater Treatment Plant Upgrade, Great Smoky Mountains National Park, Sevier County, Tennessee

Dear Ms. Jennings:

Great Smoky Mountains National Park is proposing to upgrade the Elkmont Wastewater Treatment Plant, Sevier County, Tennessee. The Park has initiated the National Environmental Policy Act scoping process and invites the U.S. Fish and Wildlife Service to provide comments on the proposed action and alternatives described in the enclosed newsletter. Please note that and "official species list" for the project area has been obtained through the U.S. Fish and Wildlife Service, Information for Planning and Conservation System (Consultation Code: 04ET1000-2018-SLI-0101, accessed November 20, 2017).

We invite your office to provide comments on the proposed action and request that written comments be submitted by December 20, 2017. Should you have any questions, feel free to contact Mark Collins, Environmental Protection Specialist at (865) 436-1259 or mark_collins@nps.gov.

Sincerely,

acting for

Jeff Troutman
Chief, Resource Management and Science Division

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee ES Office
446 Neal Street
Cookeville, Tennessee 38501

December 7, 2017

Jeff Troutman
Chief, Resource Management and Science Division
Great Smokey Mountain National Park
107 Park Headquarters Road
Gatlinburg, Tennessee 37738

Subject: FWS# 2018-CPA-0123. Great Smoke Mountain National Park, Elkmont Wastewater Treatment Plant Upgrade, Sevier County, Tennessee.

Dear Mr. Troutman,

Thank you for your correspondence of November 24, 2017, regarding the proposed improvements to the Elkmont wastewater treatment plant (WWTP) on Great Smokey Mountain National Park (GRSM). At this time GRSM is proposing 3 alternatives. Alternative A is a no action alternative. Alternative B would be to upgrade the WWTP and continue to discharge into the Little River. Alternative C would upgrade the WWTP and install a land-based, subsurface effluent drip disposal system. U.S. Fish and Wildlife Service (Service) personnel have reviewed the information submitted, and we offer the following species list and comments.

GRSM should continue consultation with the Service in regards to section 7 of the endangered species act (ESA) once an alternative has been determined. If alternative C is chosen, GRSM would need to assess impacts to summer roosting habitat for the federally endangered Indiana bat (*Myotis sodalis*) and the threatened northern long-eared bat (*Myotis septentrionalis*). The hellbender (*Cryptobranchus alleganiensis*) is located in the Little River near the project site, and maybe impacted by all three of the alternatives. Though hellbender is not currently federally endangered or threatened, it is an at-risk species that has been petitioned for listing. As an at-risk species, the hellbender does not receive any formal protection under the ESA, however it may become federally protected in the future.

Thank you for the opportunity to comment on this proposed action. If you have any questions regarding the information which we have provided, please contact Sarah Harrison of my staff at 931/525-4991, or by email at *sarah_harrison@fws.gov*.

Sincerely,

Robert E. Sykes for

Mary E. Jennings
Field Supervisor

United States Department of the Interior

NATIONAL PARK SERVICE
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, Tennessee 37738

IN REPLY REFER TO:

1.A.2

MAY 10 2018

Mary Jennings, Field Supervisor
U.S. Fish and Wildlife Service
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, Tennessee 38501

Re: FWS# 2018-CPA-0123
Request for Informal Consultation, Elkmont Wastewater Treatment Plant Upgrade, Great Smoky Mountains National Park, Sevier County, Tennessee

Dear Ms. Jennings:

Great Smoky Mountains National Park (GRSM) is proposing to upgrade the Elkmont Wastewater Treatment Plant (WWTP), Sevier County, Tennessee. The purpose of this letter is to initiate informal consultation with the U.S. Fish and Wildlife Service (USFWS) in accordance with section 7 of the Endangered Species Act.

Consultation History

- The park obtained an "official species list" for the project area through the USFWS Information for Planning and Conservation System (Consultation Code: 04ET1000-2018-SLI-0101, accessed November 20, 2017).
- The park submitted a scoping letter and scoping newsletter to USFWS on November 24, 2017.
- In a letter dated December 7, 2017, USFWS provided scoping comments indicating that GRSM would need to assess impacts to summer roosting habitat for the federally endangered Indiana bat (*Myotis sodalis*) and the threatened northern long-eared bat (*Myotis septentrionalis*), if Alternative C were the preferred alternative.

Description of the Action

The National Park Service (NPS) is proposing to upgrade the Elkmont WWTP to provide a modern, efficient, and sustainable wastewater treatment system for the Elkmont Developed Area within GRSM. Alternative C described in the draft environmental assessment (EA) has been identified as NPS' preferred alternatives. An electronic copy of the Draft EA has been sent to Sarah Harrison of your staff via email. Under Alternative C, the Elkmont WWTP would be upgraded to include new treatment processes and controls, a subsurface (land) effluent drip dispersal system, and a 6-inch force main to supply the drip dispersal system. The effluent dispersal system would be installed on up to 5 acres of forested land within the 27-acre drip dispersal study area shown in Figure 2-1 of the Draft EA, and would allow for elimination of effluent discharges to the Little River under normal WWTP flow conditions.

The action would include clearing of understory vegetation and selective thinning of overstory vegetation on up to 5 acres of forested land to accommodate installation of the drip dispersal system. Topographic and vegetation surveys would be conducted as part of the design process to develop a drip

system layout that minimizes vegetation clearing and tree damage. For planning and analysis purposes, it is assumed that about 25 to 50 percent of the overstory trees within drip dispersal area would need to be removed.

Up to 5 acres within the drip dispersal study area would also be identified as a reserve drip dispersal area. All or part of the reserve area could be used in the future if soils in the primary drip area can no longer function properly. With good design, installation, operation, and maintenance, drip systems are expected to have a useful life span of at least 20 years and some systems could have unlimited life expectancy when hydraulic and organic loading rates are optimized based on actual site conditions (EPRI and TVA 2004). Specifics regarding whether the reserve area would need to be used in the future and the exact size of the area that might need to be used are unknown at this time. For analysis purposes, it is assumed that the reserve area would not be used for at least 20 years. Any future use of the reserve area would be subject to further analysis in accordance with the National Environmental Policy Act and Endangered Species Act.

As described in Section 2.6 of the Draft EA, the preferred alternative includes several mitigation measures to avoid and minimize potential environmental impacts. Mitigation measures specifically applicable to Indiana and northern long-eared bats include the following:

- Conduct vegetation surveys as part of the design process to develop a drip system layout that minimizes vegetation clearing and tree damage.
- Map all trees (live or dead) ≥16 inches diameter at breast height (DBH) with loose bark, crevices, cavities, or cracks.
- Avoid removing trees ≥16 inches DBH with loose bark, crevices, cavities, or cracks to the extent possible, unless a tree poses a safety hazard.
- Retained trees should include a mix of sizes, age classes, and species.
- Use construction methods that minimize root damage to retained trees.
- Conduct tree and vegetation clearing between November 15 and March 31.

A more detailed description of the preferred alternative is provided in Section 2.4 of the Draft EA.

Species Potentially Occurring in the Project Area

Based on a review by NPS biologists and input from USFWS (letter dated December 7, 2017), the Indiana bat and northern long-eared bat are the only federally listed species expected to occur in the action area. Critical habitat (White Oak Blowhole Cave) for the Indiana bat has been designated within GRSM approximately 9 miles from the action area. Critical habitat has not been designated for the northern long-eared bat.

The drip dispersal study area is considered suitable summer habitat for Indiana and northern long-eared bats and is assumed to be occupied summer habitat based on proximity to known winter habitat. The most recent bat surveys conducted in the Elkmont area were summer mist net surveys in June 2002, and no Indiana or northern long-eared bats were captured. No systematic surveys have been conducted for the drip dispersal study area. Following is a brief summary of records of bat occurrence in the vicinity of the action area:

- Northern long-eared bat within 0.3 and 1.0 miles in 1999 and within 5.6 miles in 2012 and 2014.
- Northern long-eared bat known maternity roost within 5.6 miles.

- Records for the Indiana bat at White Oak Blowhole Cave, approximately 9 miles from the action area.

As shown in Figure 1, most known maternity roosts are within the western and southern part of the park. It should be noted that survey efforts have focused on relatively high probability areas. The distribution of known roosts is likely influenced to some degree by the distribution of survey effort.

Habitat in the Action Area

The drip dispersal study area proposed under Alternative C consists of eight vegetation communities (see Section 3.4, Table 3-1, Figure 3-3 in Draft EA). Successional tuliptree forest covers about half of the area. This deciduous community type covers most of the gentle sloped areas, which are more conducive to drip system installation. Successional white pine forest, Appalachian white pine/subxeric oak forest, and Appalachian montane oak-hickory forest (red oak type) are also occur in parts of the study area that are generally conducive to drip system installation.

Effects of the Action

All vegetation clearing and tree cutting would be conducted between November 15 and March 31 when Indiana and northern long-eared bats are hibernating in caves. Therefore, vegetation clearing would have no direct effect on individual bats.

Clearing understory vegetation, selective thinning of overstory trees, and routine maintenance of regrowth vegetation in the drip dispersal area would result in long-term changes to vegetation in the drip dispersal area. With the mean tree density of likely areas for drip system installation being 213 trees/acre, a 25-50 percent reduction of overstory trees would amount to 50-100 trees/acre removed, or 250-500 trees total for the project. As specified in the mitigation measures, removal of trees $\geq$16 inches DBH with loose bark, crevices, cavities, or cracks would be avoided to the extent possible, unless a tree poses a safety hazard.

Selective removal of overstory trees would allow additional sunlight to reach the forest floor, creating a flush of vegetative growth. Heavy tree seedling recruitment is expected within the first year of system installation along with growth of herbaceous species and some woody shrubs. Three to five years after installation, portions of the drip area are expected to support a dense shrub layer primarily consisting of tree saplings and some woody shrubs. This woody regrowth would be managed as necessary to maintain access for drip system inspection, maintenance, and repairs.

Removal of some suitable roost trees, particularly smaller trees, would be unavoidable during construction, but suitable roosting, foraging, and travel/migration habitat for Indiana and northern long-eared bats would continue to be available in the drip dispersal area under the preferred alternative. Availability of individual roost trees does not appear to be a limiting factor at GRSM. Any indirect effects of habitat changes on Indiana and northern long-eared bats would be insignificant. Therefore, NPS has determined that the preferred alternative may affect, but is not likely to adversely affect Indiana bats or northern long-eared bats.

We look forward to working with your office as this consultation continues. Should you have any questions, feel free to contact Mark Collins, Environmental Protection Specialist at (865) 436-1259 or mark_collins@nps.gov.

Sincerely,

Thomas J. Trouteaux, FOR

Cassius M. Cash
Superintendent

Enclosure – *Elkmont Wastewater Treat Plant Upgrade Draft Environmental Assessment*, May 2018 (sent via email to sarah_harrison@fws.gov)

References

Electric Power Research Institute and Tennessee Valley Authority (EPRI and TVA). 2004. *Wastewater Subsurface Drip Distribution: Peer Reviewed Guidelines for Design, Operation, and Maintenance*. EPRI, Palo Alto, CA and TVA, Chattanooga, TN. 1007406.