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REVISED DRAFT ENVIRONMENTAL ASSESSMENT

FOR THE

OLD TOWN FUEL AND FIBER PROPOSED DEMONSTRATION-SCALE INTEGRATED BIOREFINERY, OLD TOWN, MAINE

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Golden Field Office
Golden, Colorado

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ACRONYMS AND ABBREVIATIONS

ºF	degrees Fahrenheit
BOD	biochemical oxygen demand
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted sound level
DNL	day-night average sound level
DOE	U.S. Department of Energy
DPS	Distinct Population Segment
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FOA	Funding Opportunity Announcement
FR	Federal Register
HRSG	heat recovery steam generator
L_{eq}	equivalent noise level
L_{max}	maximum noise level
MBTA	Migratory Bird Treaty Act
MEDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MEPDES	Maine Pollutant Discharge Elimination System
NAAQS	National Ambient Air Quality Standards
NBHK	Northern Bleached Hardwood Kraft
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
OSHA	Occupational Safety and Health Administration
OTFF	Old Town Fuel and Fiber
PM_{10}	particulate matter with a diameter equal to or greater than 10 microns
RSE	Red Shield Environmental Pulp & Chemical, LLC
SPCC	spill prevention control and countermeasures
SWPPP	stormwater pollution prevention plan
U.S.C.	United States Code
WET	whole effluent toxicity
USFWS	U.S. Fish and Wildlife Service

1. INTRODUCTION

Under the Energy Policy Act of 2005, as amended (EPAct 2005; 42 U.S.C. [United States Code] 13201 et seq.), the U.S. Congress authorized the U.S. Department of Energy (DOE) to "conduct a program of research, development, demonstration, and commercial application for bioenergy, including…integrated biorefineries that may produce biopower, biofuels, and bioproducts (42 U.S.C. 13201.932(b))" for the production of transportation fuel from lignocellulosic (wood) feedstocks. Federal funding for wood fuel production facilities is intended to further the government's goal of rendering wood fuel cost-competitive with fossil fuel by 2012 and, along with increased automobile fuel efficiency, reducing fossil fuel consumption in the United States by 20 percent within 10 years.

In May 2007, pursuant to Section 932 of EPAct 2005, DOE issued a Funding Opportunity Announcement (FOA) for applications to design, construct, build, and operate/validate an integrated biorefinery demonstration employing terrestrial wood feedstocks for the production of some combination of (1) liquid transportation fuel(s) that is a fungible replacement for liquid transportation fuels currently used in the existing infrastructure, (2) biobased chemicals, and (3) substitutes for petroleum-based feedstocks and products. The objective of this FOA was to support demonstrations that would validate key process metrics and provide the kinds of continuous operational data at the scale needed to lower the technical risks associated with financing a future commercial plant. Red Shield Environmental Pulp & Chemical, LLC (RSE), applied to the FOA, and was selected to negotiate for an award of financial assistance to help design, construct, and operate a demonstration-scale biorefinery at the existing pulp mill in Old Town, Maine. In November 2008, the private investment firm Patriarch Partners purchased RSE out of bankruptcy and renamed it Red Shield Acquisition, which is doing business as Old Town Fuel & Fiber (OTFF). OTFF became owner of the Old Town facility and resumed negotiations with DOE.

DOE has authorized OTFF to expend federal funding for preliminary activities, including engineering design, the completion of this Environmental Assessment (EA), permitting, and pilot-scale testing. These activities are associated with the proposed project and do not significantly impact the environment or represent an irreversible or irretrievable commitment of federal funds in advance of the conclusion of this EA. DOE is currently proposing to authorize the expenditure of federal funding for OTFF to complete final design, construct, and initially operate the OTFF demonstration-scale integrated biorefinery.

DOE is proposing to authorize the expenditure of up to $30 million of federal cost-shared funding to OTFF to support the final design, construction, and startup of a demonstration-scale biorefinery to complete a demonstration-scale clarified sugar process, followed by a limited-scale fermentation process of between 1,500 liters and 100,000 liters (400 and 26,000 gallons) capacity, with which sugar conversion technologies can be tested and evaluated. After testing and evaluation, OTFF is proposing to extract cellulosic sugars (C6) as a slipstream from its brownstock pulp washing process unit, followed by clarification and concentration of the sugars to remove acids and salts to place them in a potentially marketable condition for fermentation to biofuels and biochemicals by other technology suppliers (hereinafter referred to as the biorefinery). The biorefinery would produce algal-based green oil from wood extract. The green oil would be sold to an offsite refinery for processing into a biobased fuel. When operating, the facility would annually produce 555,681 gallons of green oil. In addition to the green oil, the project would produce approximately 56,195,832 pounds per year of sugar, 36,190,000 pounds of which would be sold and shipped offsite for further processing; the rest would be used to produce green oil. This project would be used to demonstrate the technical and economic feasibility of converting wood extract to sugars to be used as a feedstock to produce green oil, which can be converted to biofuels either on or off the site. The proposed project would be contained entirely within the boundaries of the existing pulp mill on approximately 180 acres, with most of the proposed project infrastructure in the former tissue mill. The proposed project also includes use of the OTFF wastewater treatment plant, which is on approximately 23 acres of OTFF-owned land adjacent to the pulp mill. The

wastewater treatment system consists of an aeration pond, spill pond, four clarifiers, and a control building. The total anticipated cost to complete the proposed project is approximately $55 million, and if DOE were to authorize expenditure of the $30 million federal cost share, OTFF would be responsible for the remaining project costs.

Federal funding of projects requires compliance with the National Environmental Policy Act of 1969, as amended (NEPA; 42 U.S.C. 4321 et seq.); Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508); and DOE NEPA implementing procedures (10 CFR Parts 1021–1022). Therefore, DOE prepared this EA to evaluate the potential environmental consequences of authorizing expenditure of federal funds.

1.1 Purpose and Need for Agency Action

In compliance with the statutory mandate of EPAct 2005 Section 932, DOE has implemented a program to demonstrate the commercial application of integrated biorefineries that produce biofuels from cellulosic feedstocks. The facility that would be constructed and operated as a result of the Proposed Action would meet the requirements of Section 932 by using renewable supplies of biomass, primarily wood and wood waste to produce sugar for use as a feedstock to produce biofuels. DOE selected the proposed project as part of funding opportunity announcement No. DE-PS36-07GO97003, which was issued for research and development, design, construction, and operation of a one-tenth scale biorefinery facility employing wood feedstocks that would be a prototype of a full-scale commercial operation.

The Proposed Action would support the DOE mission to reduce dependency on fossil fuels and commercialize cellulosic technologies. By providing financial assistance to support construction of the proposed biorefinery, DOE would support national energy needs and the development of alternative fuel sources.

1.2 National Environmental Policy Act and Related Procedures

In accordance with CEQ NEPA implementing regulations and DOE implementing regulations, DOE is required to evaluate the potential environmental impacts of DOE facilities and operations, and related funding decisions. The proposal to use federal funds to support the OTFF proposed demonstration-scale biorefinery project requires that DOE address NEPA requirements and related environmental documentation and permitting requirements. In compliance with NEPA, CEQ NEPA implementing regulations, and DOE implementing regulations, this EA examines the potential environmental impacts of the DOE Proposed Action and the No-Action Alternative. This EA also addresses the requirements of Section 106 of the National Historic Preservation Act of 1966 (NHPA) revised regulations, Protection of Historic Properties (36 CFR Part 800).

Although this project could proceed if DOE decided not to provide financial assistance, DOE has assumed, for purposes of comparison in this EA, that the project would not proceed without DOE assistance. If the project proceeded without DOE assistance, the potential impacts would be essentially identical to those under the DOE Proposed Action (that is, providing assistance that enables the project to proceed). This EA analyzes the potential environmental and socioeconomic impacts that would result from implementing the Proposed Action (with DOE funding) and the No-Action Alternative (without DOE funding and no project), and evaluates the potential individual and cumulative effects of the Proposed Action.

1.3 Public Scoping

In accordance with applicable regulations and procedures, DOE sent scoping letters describing the Proposed Action and requesting help with identifying issues the EA might evaluate to potentially interested local, state, and federal agencies, including the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the Maine Department of Environmental Protection (MEDEP), the Maine Department of Conservation, the Maine Department of Transportation, and the Maine Historic Preservation Commission. DOE also sent scoping letters to other potentially interested individuals and organizations, including the Penobscot River Restoration Trust (hereinafter Penobscot Trust). DOE published the scoping letter on line at the Reading Room of its Golden, Colorado, Field Office (http://www.eere.energy.gov/golden/Reading_Room.aspx). Appendix A includes a copy of the scoping letter distribution list and Notice of Scoping. DOE did not receive any comments during the public scoping period.

In addition, DOE initiated consultations with the USFWS, the NMFS, the Maine Historic Preservation Commission, the Penobscot Indian Nation, the Aroostook Band of Micmac Indians, the Houlton Band of Maliseet Indians, the Passamaquoddy Tribe, and the Pleasant Point Reservation of the Passamaquoddy. Appendix B contains a copy of the consultation letters and responses.

The proposed project has undergone a Site Plan Review under the City of Old Town Zoning Ordinance. As part of this process, there was a public meeting on August 9, 2011, at the City of Old Town Planning Board meeting. Residents adjacent to the pulp mill were notified of this public meeting. No members of the public attended the meeting, nor did any member of the public provide comments for submittal to DOE at the meeting. The City of Old Town Planning Board approved OTFF's Site Location application for the demonstration-scale biorefinery at their August 9, 2011, meeting.

In July 2011, DOE published the Draft EA on the DOE Golden Field Office Public Reading Room website and sent Notices of Availability to interested agencies and individuals. DOE did not receive any comments from the public or other stakeholders during the Draft EA comment period. Appendix A also includes the Notice of Availability of the Draft EA and the Notice of Availability Distribution List.

Since DOE published the Draft EA, the proposed project scope has changed. This Revised Draft EA describes those scope changes. Although the project scope has changed, the environmental impacts remain the same or are less than reported in the Draft EA, except for two areas – (1) the need for additional feedstock and (2) a major modification to the existing air permit or a new air permit resulting from the addition of 100 bone-dried short tons per day (18 percent) in the quantity of woodchips that would be required and processed for the proposed project. The energy required to process the additional woodchips would increase the emissions associated with facility operations. The formerly proposed project did not require additional feedstock and required only a minor modification to the pulp mill's air permit. However, because the formerly proposed project and the revised proposed project are both biorefineries, the basic functions would be similar; therefore the scope of analysis and potential environmental impacts are also similar. Information related to modifications to the air permit and feedstock use increase are summarized below. Section 3.4.2 provides details about the air permit modifications and Section 2.2.1.1 describes feedstock increases. The primary changes to the proposed project are as follows:

- The revised project scope requires an additional 183 dry metric tons per day of woodchips, whereas the former scope did not require any additional woodchips other than the amount the pulp mill currently uses.

- The hydrolysis process has changed from a chemical-based hydrolysis to an enzymatic hydrolysis. This does not represent a change from an environmental perspective.
- The revised project scope would use a heterotrophic algae fermentation process to convert the extracted cellulosic sugars to green oil. The former project scope proposed using the acetone-butanol-ethanol fermentation process to produce n-butanol as the primary product, and ethanol and acetone. The former project scope also included an acid-recovery phase to separate and purify acetic acid and formic acid. The proposed change to an algal fermentation process, which produces green oil, would result in a reduction in the amount of wastewater reported in the Draft EA for the formerly proposed project. Section 3.2.2.4 provides details about wastewater.
- The former project scope required a minor air permit modification, but the revised project scope requires a major modification to the air permit due to the increase in feedstock processing for the biorefinery.
- The exterior tanks needed as part of the former project scope are not needed under the revised project scope. All tanks required as part of the new project scope would be housed inside the former tissue machine building.
- The gas turbine, which OTFF was considering using in the future, is not needed as part of the revised project scope.
- Gypsum (waste product) would not be produced as part of the revised project scope.

  Thirteen towers and columns (ranging in diameter from 20 inches to 7.5 feet and varying in height from 25 feet to 100 feet, extending up to 70 feet beyond the roofline) necessary under the former project scope are no longer needed. Under the revised project scope, the evaporator would extend 20 feet beyond the roofline.

In addition, the City of Old Town has been advised of the changes to the biorefinery project and has indicated that the proposed green-oil biorefinery would not require site plan review by the City of Old Town Planning Board. Based on the foregoing, DOE is reissuing the Draft EA to keep the public informed of changes and providing a 15-day comment period to allow the public to comment on the revised project scope.

1.4 Content

Chapter 2 of this EA describes the DOE Proposed Action, provides details about the proposed project, and describes the No-Action Alternative. Chapter 3 details the affected environment and potential environmental consequences of the Proposed Action and the No-Action Alternative, and Chapter 4 addresses cumulative impacts. Chapter 5 lists the references for this document.

Chapter 3 examines the following environmental resource areas:

- Land use
- Water resources
- Biological resources
- Air quality
- Aesthetics
- Safety and occupational health
- Waste management and hazardous materials
- Utilities
- Cultural resources
- Traffic

- Noise
- Socioeconomics and environmental justice

In addition, DOE EAs commonly address the environmental resource area of geology and soils. However, in an effort to streamline the NEPA process, DOE did not evaluate potential impacts to geology and soils because onsite soils are already disturbed and there would be no actions that would result in impacts to geology or that would be unduly affected by geological instabilities. The proposed project would be installed in an existing building and would not result in any change to the topography of the site.

Under the No-Action Alternative, there would be no impacts because DOE assumes the proposed project would not proceed.

2. PROPOSED ACTION AND ALTERNATIVES

As required by federal regulation, this EA addresses the possible environmental impacts of the Proposed Action and the No-Action Alternative. Section 2.1 discusses the Proposed Action. Section 2.2 describes the No Action Alternative activities that would occur if DOE does not authorize the expenditure of federal funds for the proposed project.

2.1 Proposed Action

The DOE Proposed Action is to authorize the expenditure of up to $30 million in federal funding for OTFF to design, construct, and initially operate an integrated biorefinery in Old Town, Maine.

DOE has authorized OTFF to expend federal funding for preliminary activities, including engineering design, the completion of this EA, permitting, and pilot-scale testing. These activities are associated with the proposed project and do not significantly impact the environment or represent an irreversible or irretrievable commitment of federal funds in advance of the completion of this EA. DOE's Proposed Action is to authorize the expenditure of up to $30 million in federal funding for OTFF for their proposed project. The proposed project is to design, construct, and initially operate an integrated biorefinery in Old Town, Maine.

The proposed project consists of final design, construction, commissioning, startup, and limited operations of a demonstration-scale biorefinery to initially test its sugars for use by potential fermentation technology providers and then produce green oil from wood extract at the existing OTFF pulp mill in Old Town, Maine (see Figure 2-1). When operating, the facility would annually produce 555,681 gallons of green oil. The oil would be sold to an offsite refinery for processing into a biobased fuel. The proposed project would be used to demonstrate the technical and economic feasibility of converting woodchips to sugars, followed initially by a limited-scale fermentation process of between 1,500 liters and 100,000 liters (400 and 26,000 gallons) capacity with which the sugar conversion technology(ies) can be tested and evaluated. Following testing and evaluation, OTFF would produce an algal-based green oil to be used as a feedstock to be sold to refiners to produce biofuels. The proposed project would produce approximately 56,195,832 pounds per year of sugar, 36,190,000 pounds of which would be sold and shipped offsite for further processing. The proposed project would be housed entirely within the boundaries of the existing pulp mill, which is on approximately 180 acres; most of the proposed project infrastructure would be in the former tissue mill (see Figure 2-2). It should be noted that the existing pulp mill design would allow for tissue production in the future, even if the proposed project were installed and operating at the site.

The pulp mill currently converts woodchips into pulp in the form of thick fiber boards using a common method called the Kraft pulping process. The pulp is then sold to paper manufacturers for further processing. The pulp mill has been operating since the mid 1960s. Before use as a Kraft mill, the pulp mill had been operated as a chemical pulp mill since 1882. From the early 1970s until 2005, the mill site also operated a tissue mill.

The proposed biorefinery, in addition to equipment needed for the sugar clarification and sugar conversion to algal oil processes, would utilize portions of the existing Kraft process and onsite pulp mill infrastructure and utilities to produce green oil from woodchips. The objectives of the proposed project are to operate the biorefinery systems to:

- Validate the technology for future commercial-scale applications
- Validate the economics for future commercial-scale applications
- Establish the metrics for replication of the technology at other locations

Figure 2-1. Site Location Map

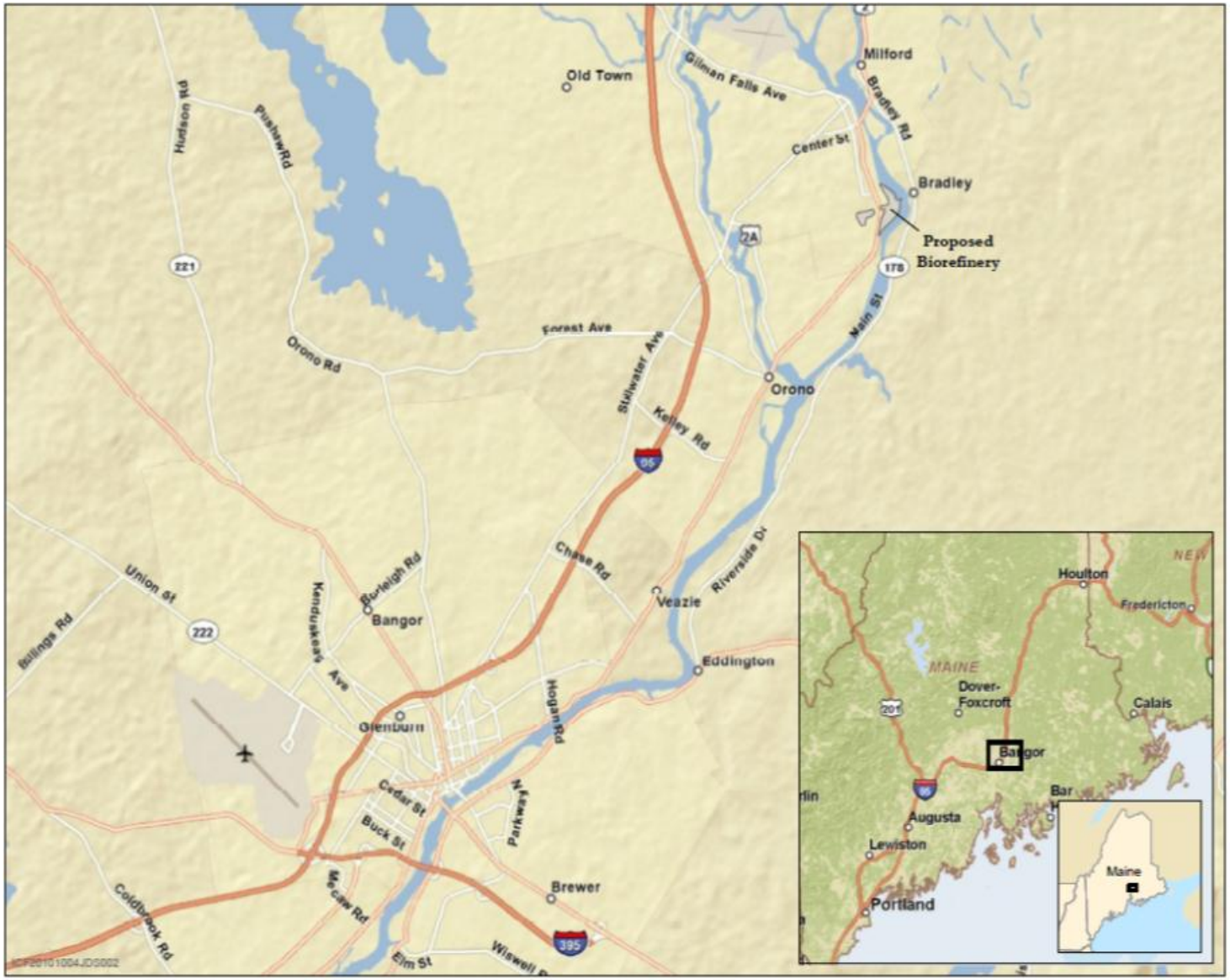
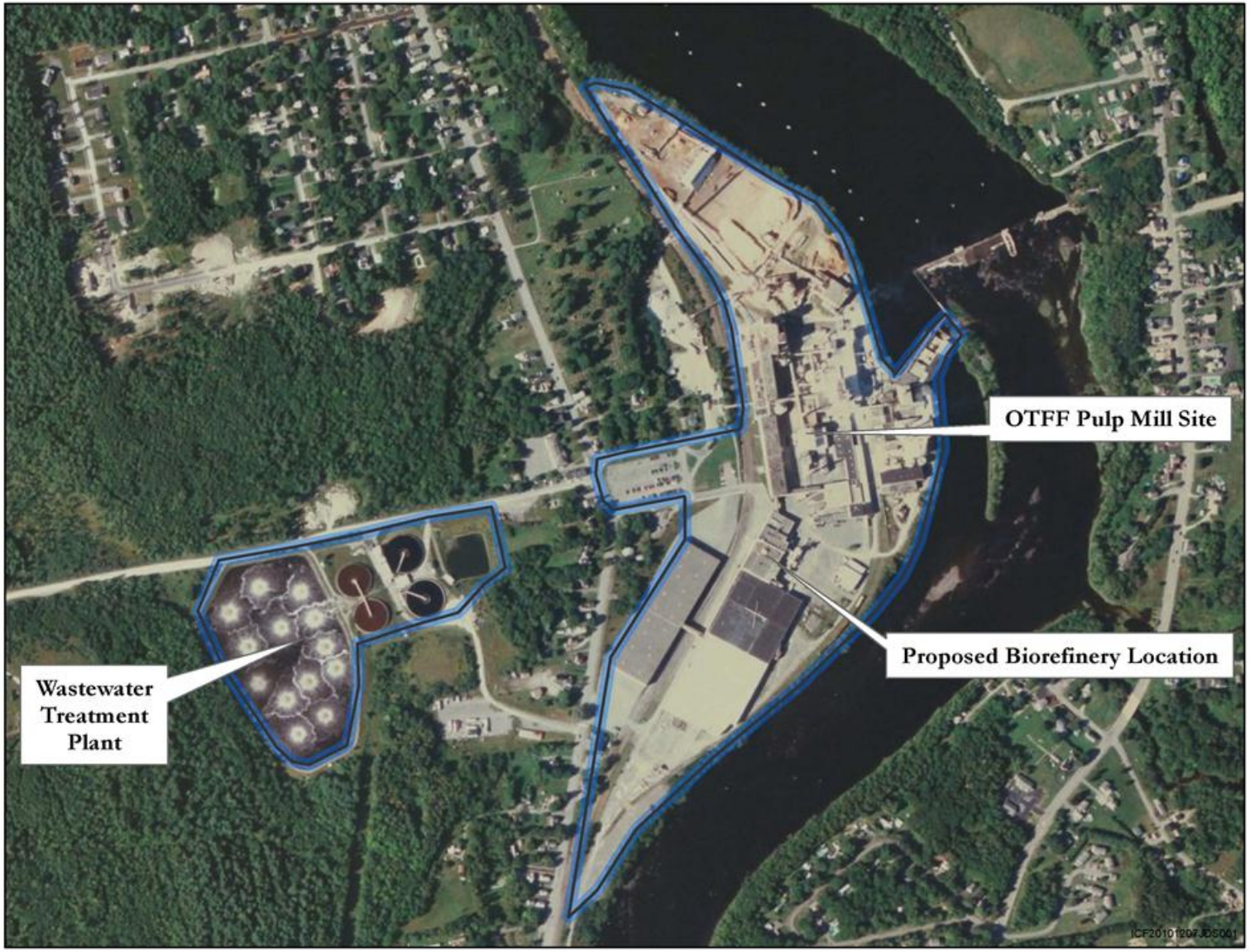


Figure 2-2. Old Town Fuel and Fiber Aerial Photo



2.2 Proposed Project Location and Site Plan

The proposed project site is within the boundaries of the existing pulp mill at 24 Portland Street, Old Town, Penobscot County, Maine (approximately 120 miles northeast of Portland and 15 miles north of Bangor) (see Figure 2-1). OTFF owns the property, which is currently zoned for industrial use.

OTFF operates the pulp mill, which is on a bend on the western side of Penobscot River (see Figure 2-2). The site is approximately 180 acres that extends from the chip storage and conveying facility at the northern end to the former tissue converting and warehouse facilities at the southern end. The property is bounded on the east by Penobscot River and on the west by South Main Street. Current operations at this property include chip storage and handling, pulping, bleaching, drying, pulp manufacturing, maintenance, warehousing, fuel storage, and black-liquor storage. The OTFF wastewater treatment plant is directly west of the pulp mill across South Main Street along Penny Road on approximately 23 acres of OTFF-owned land. The wastewater treatment system consists of an aeration pond, a spill pond, four clarifiers, and a control building (see Figure 2-2).

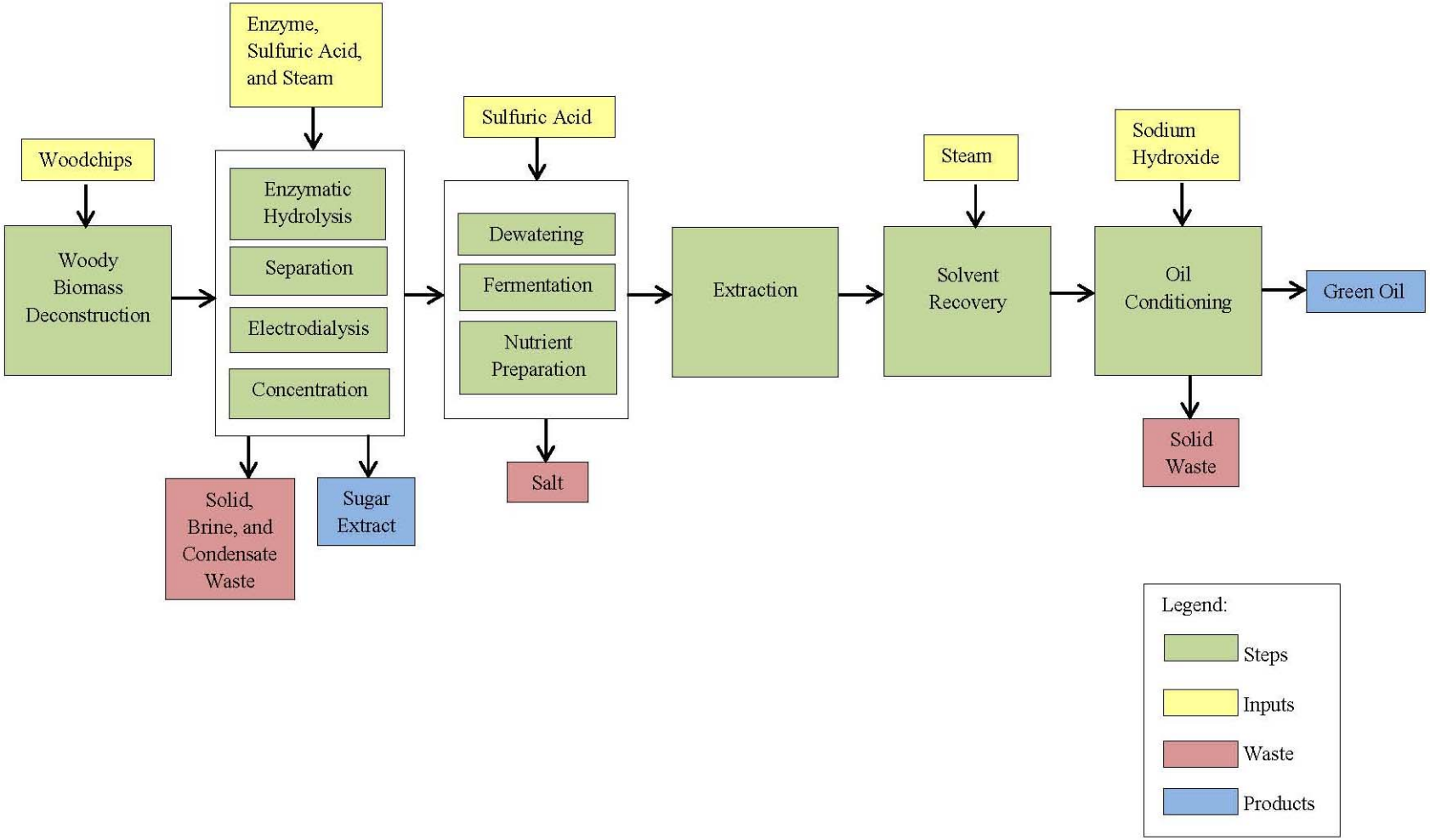
2.2.1 Process Description

The proposed biorefinery would use a number of different unit operations to produce green oil. The basic components of the process would be as follows:

- Woody biomass deconstruction
- Sugar production and clarification
  - Enzymatic hydrolysis
  - Separation
  - Electrodialysis
  - Concentration
- Fermentation
  - Hydrolyzate preparation
  - Fermentation
- Oil extraction and solvent recovery
  - Oil extraction
  - Solvent recovery
  - Oil conditioning

See Figure 2-3 for the process flow chart.

Figure 2-3. Process Flow Chart



2.2.1.1 Woody Biomass Deconstruction

The feedstock for the biorefinery would be commercial mixed northeast deciduous woodchips (birch, beech, and maple). One-hundred-eighty-three dry metric tons per day of woodchips would be purchased for the biorefinery in addition to the amount the pulp mill currently uses. This increase would require minimal modifications to current chip processing. As part of the existing Kraft pulping process, the woodchips are delivered in chip trucks and conveyed to one of two storage silos. The chips are then sent to the continuous digester system, where they are cooked at an elevated temperature and pressure in "white liquor" (a water solution of sodium sulfide and sodium hydroxide). The purpose of the white liquor is to chemically dissolve the lignin that binds the cellulose fibers (EPA 2011a). Lignin is a glue-like substance that keeps plant cell walls from falling apart; it needs to be removed so that long chains of sugars can be extracted from the woodchips to form simple sugars. The chips are cooked for several hours in the digester and are transformed into a thick porridge-like consistency. Once cooking is complete, the contents of the digester are transferred to the blow tank. In the blow tank, the thick porridge-like substance is "blown," which separates the fibers and results in a water solution called "brown stock." One-hundred oven dry short tons of brown stock needed for the proposed biorefinery would be removed from the final stage of washing just before the pulp bleaching process.

2.2.1.2 Sugar Production and Clarification

2.2.1.2.1 Enzymatic Hydrolysis

The purpose of enzymatic hydrolysis is to convert cellulose (the basic structural component of plant cell walls) and hemicellulose (a long molecule of connected sugars that is part of the plant cell wall) within the brown stock to cellulosic sugars. Hydrolysis occurs when the long molecule is broken and a water molecule is added.

The brown stock would be pumped from the existing brown stock decker via a new pipeline to the biorefinery for further processing. This pipeline would be part of a series of new aboveground pipelines that deliver products to and from the biorefinery. The pipelines would be housed in the existing pipe bridge. The brown stock would then be sent to a chemical mixer where the enzyme would be added. The enzyme is a mixture of cellulase and xylase (a sugar extracted from wood) designed to metabolize, deconstruct, and convert the brownstock into glucose (a simple sugar) and xylose (a sugar extracted from wood). The enzyme/brown stock mixture (enzymatic hydrolyzate) would be pumped to the existing two brown stock storage towers, which have a combined 425,000 gallon capacity.

With the addition of the biorefinery, the pulp mill would modify its operation as follows: for 7 out of every 48 hours, the brown stock would be diverted from the normal pulping operation to the biorefinery, where it would undergo enzymatic hydrolysis for sugar production. The pulp mill would continue to operate using brown stock from storage tanks while the brown stock is being diverted to the biorefinery. The reaction to convert cellulose to sugars would be 90 percent complete after 60 hours. The resulting enzymatic hydrolyzate would be sent to the sugar clarification process.

2.2.1.2.2 Separation

The hydrolyzate would be pumped from the storage tank to up to six centrifuges. The centrifuges would remove suspended solids, lignin, and unconverted fiber. Lignin and the other materials would be removed from the hydrolyzate because they are fermentation inhibitors. The lignin and other solids, representing a small volume, would be sewered in the mill wastewater system.

2.2.1.2.3 Electrodialysis

To remove the remaining fermentation inhibitors, a final processing step would remove the remaining salts and residual organic acids before fermentation. Membrane electrodialysis would be used to remove these materials. Following electrodialysis, the treated sugar hydrolyzate would be pumped to the 40,000-gallon storage tanks.

2.2.1.2.4 Concentration

The sugar hydrolyzate would be concentrated in a mechanical vapor recompression evaporator. Approximately one-third of the finished product would be pumped to storage tank(s) before fermentation. The remaining two-thirds would be transferred, in solution, from the storage tank at the southeast corner of the proposed biorefinery directly into rail cars that for transport offsite to the customer for further processing.

2.2.1.2.5 Hydrolyzate Preparation

The sterile cellulosic sugar hydrolyzate would be added directly to fermentors. Water and nutrients would be added to the heating tank in the nutrient preparation area. The contents of the heating tank would be heated to sterilize the hydrolyzate and then cooled.

2.2.1.2.6 Fermentation

Inoculum (a substance injected into a specimen to create resistance to a disease) for use in seed reactors would be provided from an onsite inoculum laboratory. The inoculum is a small batch of microalgae cells of only the desired species (e.g., *Dunaliella salina* or *Schizochytrium sp.)* suspended in a sugar-rich media. The inoculum starts as a commercially available product and contains viable, pure, and standardized algae cell stocks. Inoculum is subsequently grown (cultured) in the laboratory to the required volume. Because a seed ratio of 1 to 10 is desired, the inoculum will be grown to approximately 20 gallons before transfer. Sealed 20-gallon containers of inoculum would be manually carried to the fermentation area and docked into each seed vessel on a cycled schedule. The seeds would be allowed to grow (propagate) for approximately 4.6 days to reach peak cell concentration. Additional sugars and nutrients could be added during the batch. The contents would be transferred to one of the pre-fermentors. The seed tank would then be refilled with fresh media to begin its next growth cycle. Each fermentor, in turn, would be filled with hydrolyzate and nutrients prior to inoculation. The fermentors would be allowed to grow for approximately 3.5 to 4 days to reach peak cell concentration. Additional sugars and nutrients could be added during the batch. After that, the nutrient balance would be restricted, which would encourage production of lipids within the algae cells. After a total 4.6-day cycle, the vessel would be pumped to the algae harvest tank. The fermentors would then refilled with fresh media to begin the next growth cycle.

All vapors and gases produced in the fermentation trains would be vented to the vent scrubber for conditioning before exiting to the atmosphere. Chilled mill water would be fed to the top of the packed tower to reduce odors.

2.2.1.2.7 De-Watering

The purpose of this step is to separate algae from water, which is done in a centrifuge. The de-watered algae are collected in the de-watering algae tank and water in the reject water tank.

2.2.1.3 Oil Extraction

The purpose of this step is to separate lipids from the algae cell mass and water. First, cells would be homogenized. Solvent would then be added to the broth, mixed, and sent through a heat exchanger. Heating speeds the extraction of the lipids from the algae so that it can subsequently be distilled into a raw oil product. The first step utilizes a homogenizer, which ruptures the lipid cells to release their oil content. The disrupted algae cells would then be combined with solvent and n-butanol, and heated to 180 degrees Fahrenheit (°F). Heating speeds the extraction rate. Approximately 2 pounds of butanol would be added for each pound of oil-bearing algae. This mixture would be sent to the Extractor. The butanol is mutually soluble with the oil and with water. This enables the butanol to penetrate into the oil droplets to absorb the oil into the butanol/water mixture. After extraction, the butanol/water/oil mixture would be processed by a centrifuge to separate the butanol-rich and water-rich phases. The butanol-rich phase, containing most of the oil, would subsequently be distilled to recover the raw oil and to recycle the butanol.

2.2.1.4 Solvent Recovery

The solvent recovery process is used to reclaim solvent for reuse in lipid extraction, and to separate the raw oil. The butanol-rich extraction stream, containing most of the algal oil, would first be sent to a flash evaporator where it would be heated and flashed under vacuum to vaporize most of the butanol, leaving a more concentrated oil/water/solvent stream to be sent to the distillation tower. During distillation, the stream would be heated, which would cause vapors containing butanol solvent and water to rise up the distillation tower to a condenser. The oil would move to the bottom of the distillation tower. In the condenser, the vapor would be cooled back to a liquid state and be sent to a decanter vessel. The composition of the condensed vapors would be in a range that would result in two liquid phases – one butanol-rich and the other water-rich. The decanter would separate the two liquid layers. The lighter, butanol layer would go to the solvent-use tank for reuse in extraction. The heavier, aqueous layer would be reused in the solvent recovery process. The result would be that most of the water and virtually all of the oil would be removed as tower bottom product, while virtually all of the butanol solvent with some water would leave as distillate product. The bottom oil and water product would be sent to the raw oil decanter, where the oil and water would be separated. The lighter layer would be raw oil product, and the heavier layer would be water sent to disposal. The bottom product, containing mostly water along with some oil and biomass solids, would be sent to disposal. In the future, this biomass could be harvested and sold separately.

2.2.1.5 Oil Conditioning

2.2.1.5.1 Acid Treatment

The oil/water product would be pumped from the raw oil tank through a plate heat exchanger, where the oil would pick up heat from oil that was “de-watered” by dehydration or “dried.” The dry oil would go to the check tank after additional cooling and filtering. Fifty percent phosphoric acid solution from the acid dosing tank would then be pumped and metered into the oil stream. The acid-treated oil would then go to the hydration tank.

2.2.1.5.2 Hydration and Caustic Treatment

Acid-treated oil would enter the hydration tank, where the non-hydratable phosphatides would be converted to hydrated gums. Non-hydratable phosphatides are calcium and magnesium salts of phosphatic acid. Once the calcium and magnesium were removed from the non-hydratable phosphatides complex, the phosphatides would become hydratable gums that can be removed, which would allow the

oil to meet certain downstream specifications. The temperature of the oil would then be adjusted to 165 ºF with the oil cooler. Fifty percent sodium hydroxide solution from the caustic dosing tank would then be pumped and metered into the oil stream and mixed. The caustic would neutralize the acids, including the fatty acids. The oil would then pass to the neutralizing centrifuge, which would remove gums and soaps.

2.2.1.5.3 Neutralizing Centrifuge

The purpose of this step is to separate the soaps and hydrated gums from the oil. This would be accomplished with a centrifuge. The hydration tank pump would pump oil to the centrifuge. The centrifuge would separate the gums (heavy phase) from the oil (light phase). The gums would be collected in the soaps tank. The neutralized oil would pump the oil out of the neutralized oil surge tank to the wash centrifuge.

2.2.1.5.4 Wash Centrifuge

The purpose of the wash centrifuge is to reduce the residual soaps and gums in the oil. Oil from the neutralized oil surge tank would be heated to 185 ºF using the neutralized oil heater with steam. Water would be added to the oil and mixed with a static mixer. The wash water and the residual soaps and gums would be separated from the oil with the water-wash centrifuge. The washed oil would be sent to the washed-oil surge tank. The spent wash water would flow by gravity to the oil/water separator, where oil would be recovered and pumped back to extraction, and water would be pumped to the reject water tank. Wash water would be pumped from the hot-water tank and metered into the oil stream before entering the static mixer. The washed-oil pump would pump washed oil from the washed-oil surge tank to the dryer system.

2.2.1.5.5 Drying

The purpose of the oil drying step is to reduce the moisture content of the oil coming from the wash centrifuge step. This would be accomplished by drying the oil under vacuum. The dry oil leaving the bottom of the dryer would be pumped to the feedstock heat exchanger, where it would transfer heat to the incoming feedstock. The vapors would be sent to a vent condenser. The non-condensable vapors and gases from the condenser would discharge into a liquid ring vacuum pump. The condensed vapors would flow by gravity to a hotwell to the reject water tank. After drying, cooling, and filtering, the finished oil would be sent to the finished oil check tank and then pumped to the product oil tank, which is sized for approximately 1 week of production.

2.2.2 Supporting Infrastructure

The proposed biorefinery would require electricity, steam, potable water, domestic wastewater treatment, process water, process cooling water, process wastewater treatment, and exterior storage tanks. Except for the storage tanks, all supporting infrastructure is already present on the site, as described below.

2.2.2.1 Electricity

Electricity for the pulp mill is generated from biomass and recovery boilers currently in operation at the site. With added pulp generation, black-liquor flow would increase to 2.37 million pounds per day from 1.95 million pounds per day to fuel the recovery boiler. With the added steam generated, additional power would be generated to meet the needs of the proposed biorefinery.

2.2.2.2 Steam

The biomass and recovery boilers currently in operation at the pulp mill would generate steam. The steam would be used primarily in the hydrolysis, concentration, and distillation processes.

2.2.2.3 Potable Water

OTFF is connected to the City of Old Town municipal water system. Potable water would be used in the biorefinery for employee needs.

2.2.2.4 Domestic Wastewater

Domestic wastewater from the biorefinery would go to the domestic wastewater system, which discharges to the City of Old Town sanitary sewer. The sanitary sewer discharges to the City of Old Town municipal wastewater treatment plant. Domestic water use and wastewater generated by the 26 new employees is estimated to be approximately 520 gallons per day based on a use rate of 20 gallons per day per employee (State of Maine, Chapter 241, Subsurface Wastewater Disposal Rules, Table 4C, Design Flows for Other Facilities).

2.2.2.5 Process Water

Process water would be supplied from the pulp mill process water system, which previously fed the former tissue mill. Process water is currently derived from Penobscot River and is treated through coagulation and filtration. The pulp mill currently is permitted to withdraw 28 million gallons per day from Penobscot River, but uses approximately 13 million gallons per day under current operation. It is anticipated that an additional 965,000 gallons per day would be necessary for biorefinery process and cooling water.

2.2.2.6 Process Cooling Water

For services (i.e., fermentation) requiring a more constant temperature and to reduce overall water use, a closed-loop cooling circuit would be utilized at an estimated flow rate of 400 gallons per minute. This would equate to 20 gallons per minute of additional mill water use, which would fit within current use and capability levels.

2.2.2.7 Process Wastewater

All process wastewater would discharge to the existing OTFF wastewater treatment plant. The pulp mill operates an on-site wastewater treatment plant under Maine Pollutant Discharge Elimination System (MEPDES) Permit No. ME0002020 and No. W002226-5N-H-R. A letter will be submitted to MEDEP in summer 2012 advising them of the change in proposed project scope (as reflected in this EA) and advising them that wastewater effluent from the revised project scope would be less. No modifications to the existing license are needed.

OTFF currently produces approximately 12 million gallons per day of wastewater that is treated in the pulp mill's existing wastewater treatment facility. The system is permitted to treat 24.4 million gallons per day of treated process waters (including landfill leachate). The proposed project would generate approximately 150,000 gallons of wastewater per day (48 million gallons per year) and 10,000 gallons per day of wash water. Wastewater would be transported via existing pipes and treated at the existing wastewater treatment facility. The wastewater treatment plant has adequate capacity to treat this wastewater within the limits of the existing permit.

2.2.3 Construction

OTFF would obtain all appropriate environmental and building permits (see Table 2-2 in Section 2.2.7). Following receipt of the required permits, construction time for the proposed project would be 14 months. Construction of the biorefinery is projected to commence in the fourth quarter of 2012, and the biorefinery is expected to be operational in December 2013.

OTFF would have full-time construction management on the site throughout the duration of construction activities. OTFF would designate an area on the site near the former tissue mill for placement of temporary job trailers and storage areas during construction. OTFF would use subcontracted labor. The biorefinery construction contractor would establish an office on the site where all people and equipment entering the construction work zones would report. Contractor employees would park their vehicles in the pulp mill parking lot. As a safety precaution, only construction equipment and subcontractor and supervisor vehicles would have access to the construction zones. OTFF would assign an on-site manager to monitor installation and safety. At the peak of construction, approximately 80 construction contractor personnel would be needed.

2.2.4 Roads and Facility Access

Most trucks would come from Interstate 95, taking the Stillwater Avenue exit, turning right at Center Street and right onto U.S. Highway 2 (South Main Street), and enter the site using the current access to OTFF property on Portland Street off South Main Street. No additional roads would need to be constructed and no road improvements would be necessary for the proposed project. During the construction period, approximately 50 trucks per week and 400 passenger vehicles per week would enter and exit the site.

2.2.5 Major Equipment

Although the pulp mill is on approximately 180 acres, the proposed biorefinery would require approximately 2.7 acres (120,000 square feet) in the 5.7-acre (250,000-square-foot) former tissue mill (now vacant). No exterior modifications would be necessary. Activities that would not be in the former tissue mill are as follows:

- The proposed biorefinery would make use of existing equipment in the pulp mill, including the extraction vessel, the blow tank, the brown-stock decker, and the brown-stock storage towers.
- A series of aboveground pipelines would be installed between the pulp mill and the biorefinery to facilitate the movement of products to and from the biorefinery. These would be housed in an existing pipe bridge that currently contains pipelines similar in size to the new pipelines.

OTFF would not need to construct new buildings because the biorefinery would be housed in the existing former tissue mill and all storage tanks would be housed in the existing buildings. Because the biorefinery would be integrated into the existing pulp mill, an additional pipeline would need to be installed to transport enzymatic hydrolyze from the pulp mill to the biorefinery. This pipeline would follow a direct route from the pulp mill to the biorefinery in the existing aboveground pipe bridge at the pulp mill. At present, there are numerous existing aboveground pipelines in the pipe bridge that transport materials throughout the pulp mill. The new pipeline would be approximately 6 inches in diameter and approximately 1,000 feet long.

Changes to the interior of the building would include the following:

- Removing existing equipment. Existing equipment would be kept for spare parts or scrapped for salvage value.
- Installing the biorefinery equipment.
- The operating floor would be demolished to make room for new tanks, where necessary. This would also require the removal of some floor columns and footings. Existing steel mezzanines would also largely be demolished where they would conflict with new evaporators or other equipment. Where possible, existing mezzanine steel would be reused as supports for platforms around new evaporators.
- The roof would be demolished and reframed around the evaporators and associated ducts because they would extend above the existing roof line by approximately 20 feet.

2.2.6 Operations

The biorefinery would operate 24 hours per day, 7 days per week, 316 days per year. There would be an annual shutdown of approximately 10 days for facility maintenance, and regularly scheduled shutdowns. Operations would include two 12-hour shifts.

2.2.6.1 Materials Balance

Table 2-1 summarizes and Figure 2-4 shows the biorefinery inputs, products, and major waste streams. OTFF would utilize rail to transport saleable products, green oil, and sugar extract. This would require six rail cars per month to be transported off the site. Sulfuric acid would be delivered to the site via truck at a rate of 1 truck per month, woodchips at a rate of 14 trucks per day, enzymes at a rate of 7 trucks per year, sodium hydroxide at a rate of 3 trucks per year, and ammonia at a rate of 3 trucks per month. Trucks would enter the site from Interstate 95, taking the Stillwater Avenue exit, turning right at Center Street and right onto South Main Street, and use the current access to OTFF property on Portland Street off South Main Street. Pan Am Railways owns and operates a rail line that runs adjacent to the pulp mill. At present, the pulp mill receives approximately 555 trucks, 910 passenger vehicles, and 42 rail cars per week.

2.2.6.2 Materials Handling

OTFF would handle the materials described below on the site as part of the proposed biorefinery project.

2.2.6.2.1 Feedstock

Feedstock (woodchips) would be used in the woody biomass deconstruction step. Feedstock usage is anticipated to be approximately 183 dry metric tons per day. The existing mill handling systems are adequately sized to handle this increase in tonnage (as described in detail in Section 2.2.6.5).

2.2.6.2.2 Enzymes

Enzymes would be used in the sugar clarification step. Enzyme usage is anticipated to be approximately 25,175,240 pounds per year. Enzymes would be stored in a tank inside the biorefinery.

Table 2-1. Materials Balance

Material Description	Amount	Associated Process
Biorefinery Inputs		
Feedstock	183 metric tons per day	Woody biomass deconstruction
Sulfuric acid	89,352 gallons per year	Sugar clarification
Enzymes	25,176,240 pounds per year	Sugar clarification
Steam for evaporation	43,428,000 pounds per year	Sugar clarification
Sulfuric acid (93 percent sulfuric acid)	851.6 gallons per year	Fermentation
Sodium hydroxide (50 percent sodium hydroxide)	26,682 gallons per year	Oil conditioning
Steam	3,118,920 pounds per year	Solvent recovery
Water	2,196,119 gallons per year	Nutrient preparation, de-watering, and oil conditioning
Ammonia	2,147,712 pounds per year	Fermentation
Biorefinery Products		
Green oil	555,681 gallons per year	
Sugar	36,190,000 pounds per year	
Biorefinery By-Products and Waste		
Solid waste	12.4 tons per day (dry weight) 252,700 pounds per year (0.4 ton per day, wet)	Sugar clarification Produced from de-watering and oil conditioning
Brine waste	93,962,400 pounds per year (35,420 gallons per day)	Sugar clarification
Condensate waste	237,211,000 pounds per year (88,400 gallons per day)	Sugar extract evaporation
Wastewater	150,000 gallons per day (47,400,000 gallons per	Produced from oil extraction, solvent recovery, and oil
Salt	1,576,800 pounds per year	Hydrolyzate preparation

Figure 2-4. Materials Balance

OLDTOWN FUEL & FIBER
Project No 11304

Material Balance
BioRefinery Project
Issued for Review
2/10/2012

BSI
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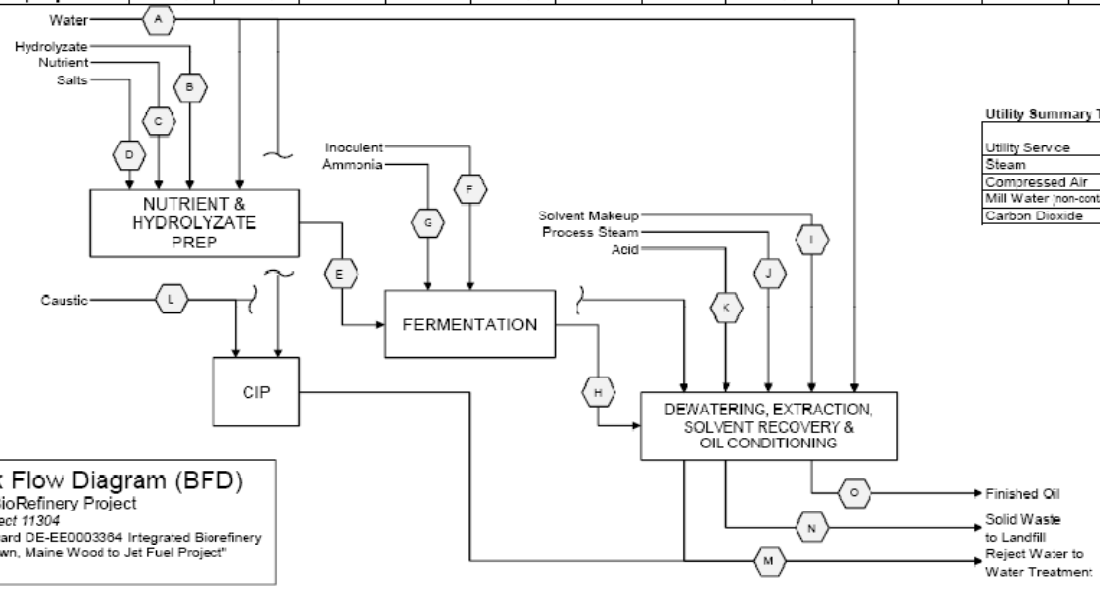
Stream Number (corresponds to BFD below)		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Process Service		Water	Hydrolyzate	Nutrient	Salts	Nutrient & Hydrolyzate	Inoculant	Ammonia	Fermentation Broth	Solvent Makeup	Process Steam	Acid	Caustic	Reject Water	Solid Waste	Finished Oil
Description	From	Mill Water Supply	Hydrolyzate Feed from Pulp Mill	Nutrient Truck Unloading	Salts Bag Unloading	Nutrient & Hydrolyzate	Seed Lab	Ammonia Storage	Fermentation	Solvent Unloading	Mill Steam	Acid Storage	Caustic Storage	Vent Scrubber/ Dewatering/ Extraction Solvent Recovery/ Oil Conditioning	Dewatering/ Oil Conditioning	Oil Conditioning
	To	Nutrient Prep/CIP/ Dewatering/ Oil Conditioning	Nutrient & Hydrolyzate Prep	Nutrient & Hydrolyzate Prep	Nutrient & Hydrolyzate Prep	Fermentation	Fermentation	Fermentation	Dewatering	Extraction	Solvent Recovery	Oil Conditioning	Oil Conditioning	Reject Water Tank	Landfill	Finished Oil Tank
Total Flow Rate [lb/hr]		42,905	4,035	3,978	2.5	8,015	44	272	7,420	3	395	0.90	0.21	7,562	32	528



Utility Summary Table

Utility Service	Flow Rate [lb/hr]
Steam	4,950
Compressed Air	10,000
Mill Water (non-contacting)	195,000
Carbon Dioxide	1.08

2.2.6.2.3 Ammonia

Aqueous ammonia would be used in the fermentation step. Ammonia usage is anticipated to be approximately 2,147,712 pounds per year. Ammonia would be stored in a tank inside the biorefinery until needed.

2.2.6.2.4 Sulfuric Acid

Sulfuric acid (93 percent) would be used in the acid hydrolysis step to remove lignin from the extract. Sulfuric acid usage is anticipated to be approximately 89,352 gallons per year. The sulfuric acid storage tank is proposed to be located in the biorefinery and would include concrete secondary containment.

2.2.6.2.5 Sodium Hydroxide

Sodium hydroxide (50 percent), also known as caustic soda, is a key component that would be used to raise pH levels of extract before concentration. The pulp mill currently uses sodium hydroxide for a variety of purposes, and the biorefinery would use sodium hydroxide during the extraction stage. It is expected that 26,682 gallons per year would be used in this process.

2.2.6.2.6 Green Oil

Green oil would be the primary product of the refinery process. Green oil production is anticipated to be approximately 555,681 gallons per year. Green oil would be stored in the product oil tank for up to 1 week.

Sugar extract: Sugar extract would be another product of the refinery process. Sugar production is anticipated to be approximately 56,195,832 pounds per year, of which 36,190,000 pounds would be sold and shipped offsite for further processing. Sugar extract to be shipped offsite would be pumped directly into rail cars at a rate of four rail cars per month.

Solid waste: Solid waste would be a waste product from the separation process during sugar clarification and from the solvent recovery, oil extraction, and oil conditioning processes. These processes are expected to generate approximately 12.4 tons per day (dry weight) solid waste. This waste would be sent to a properly licensed, Maine special waste landfill for disposal.

Brine waste: Brine waste would be a waste product from the electrodialysis process during sugar clarification. Brine waste generation is anticipated to be approximately 35,420 gallons per day (99,962,400 pounds per year), which would be sent to the sewer.

Condensate waste: Condensate waste would be a waste product from the concentration process during sugar clarification. Condensate waste generation is anticipated to be approximately 88,400 gallons per day (237,000,000 pounds per year).

Wastewater: Wastewater would be a waste product from the vent scrubber, de-watering, extraction, solvent recovery, and oil conditioning processes, and from periodic cleaning of process equipment and storage vessels. Wastewater generation is anticipated to be approximately 150,000 gallons per day (47,400,000 gallons per year). This waste would be treated in the existing mill wastewater treatment plant.

Salt: Salt would be a waste product from the hydrolyzate preparation process. Salt generation is anticipated to be approximately 3 pounds per minute (1,421,000 pounds per year), which would be sent to the sewer.

2.2.6.3 Startup, Shutdown, Maintenance, and Emergency Processes

OTFF anticipates that the biorefinery would operate for a minimum of 10 years and would normally operate 24 hours per day, 7 days per week. The facility would operate approximately 316 days per year which accounts for minor maintenance activities regularly throughout the operating year and annual shutdown for facility maintenance.

OTFF would develop standard operating procedures for each operating system and the associated pollution control systems, as follows:

- Woody biomass deconstruction
- Sugar production and clarification
- Fermentation
- Extraction
- Solvent recovery
- Oil conditioning

The proposed project would shut down under emergency conditions such as loss of power or process water. The proposed project would use existing emergency services from the City of Old Town in the event of a fire. The pollution control systems would be interconnected with motor controls on the process equipment. Shutdown of the pollution control device would automatically shut down the associated process.

2.2.6.4 Operations Workforce

During operations, the proposed biorefinery project would require a permanent workforce of approximately 26, which the surrounding area's population and skilled personnel could support. OTFF expects to hire the necessary people from existing local and regional resources. Biorefinery employees would park in existing parking areas at the pulp mill.

2.2.6.5 Feedstock Availability

At present, the pulp mill consumes 1,800 to 2,000 green tons of hardwood chips daily. This quantity varies due to mill operation and seasonal influences. The addition of the proposed biorefinery project would add 337 green tons of hardwood chips per day to this consumption (or 183 bone dry metric tons per day). This increase would require minimal modifications to the chip processing process and would not create a negative growth/drain rate in the area. Feedstock for the biorefinery would be commercial mixed northeast deciduous woodchips (birch, beech, and maple).

The pulp mill process is limited to use of hardwood. Species blend must be maintained to label the pulp product as "Northern Bleached Hardwood Kraft" (NBHK). The NBHK blend specification is preset, but accounts for seasonal cutting influences and allows a range of final blend percentages of different members of the same family (e.g., silver maple, red maple, and sugar maple). No softwood is permitted in the blend (see Appendix D).

OTFF would manage the additional 337 tons per day of green hardwood chips the same way it manages the current feedstock for the pulp mill. The supply chain would remain unchanged; OTFF would purchase the hardwood chips from the same suppliers and the suppliers would deliver the hardwood chips in the same trucks (see Appendix D). The existing mill handling systems are adequately sized to handle the increase in feedstock tonnage that would support the biorefinery. OTFF participates in the Forest Stewardship Council Well Managed Forest Program and has received Forest Stewardship Council certification under this program from the Maine Pulp and Paper Association and the American Forest & Paper Association; the certification is valid through March 2014 (see Appendix D).

Costs associated with procuring additional feedstock for the biorefinery are incremental at prevailing rates per ton of hardwood chips delivered to OTFF. For pulp mill operations, the feedstock costs range from $65 to $75 per ton. On an annual basis of 350 operating days (a conservative high estimate), this would range from $7.6 million to $8.8 million. The addition of 337 green tons would only nominally increase procurement costs over existing conditions.

2.2.7 Permits, Approvals, and Applicant-Committed Measures

The proposed project would require a number of environmental permits, approvals, and plans for construction and operation, as summarized in Table 2-2.

Table 2-2. Potentially Applicable Permits, Approvals, and OTFF-Committed Measures

Activity	Permit, Plan or Approval	Parties Involved	Completed by	Status
Federal				
Endangered Species Act compliance	Informal Section 7 Consultation	U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)	Operations	Informal consultation ongoing with agencies. In letters sent on May 11, 2011, DOE asked for concurrence that the proposed project is not likely to adversely affect listed species. Letters of concurrence received from the USFWS and NMFS on July 21, 2011, and June 30, 2011, respectively. In May 2012, DOE determined that the revised project scope would not change the May 11, 2011, determination and provided the USFWS and NMFS with information regarding the changes to the proposed action and indication that no new or increased impacts would occur as a result. The USFWS and NMFS concluded that re-initiation of consultation was not necessary for the revised project (May 16 and May 17, 2012, respectively).

Table 2-2. Potentially Applicable Permits, Approvals, and OTFF-Committed Measures (continued)

Activity	Permit, Plan or Approval	Parties Involved	Completed by	Status
State				
Stormwater	Stormwater Pollution Prevention Plan	MEDEP	Operations	A new Maine Multi Sector General Permit went into effect on April 26, 2011. The Stormwater Pollution Prevention Plan was updated under the new Multi Sector Permit on May 25, 2011.
National Historic Preservation Act compliance	Section 106 approval	Maine Historic Preservation Commission	Construction	Letter sent to the Maine Historic Preservation Commission on June 10, 2011. Letter of concurrence received from the Maine Historic Preservation Commission on June 17, 2011. In May 2012, DOE determined that the revised project scope would not change the June 10, 2011, determination.
Pollutant Discharge	Maine Pollutant Discharge Elimination System No. ME0002020	Maine Department of Environmental Protection (MEDEP)	Operations	On May 19, 2011, a Final Wastewater Discharge License was issued for the pulp mill (Maine Waste Discharge License No. W002226-5N-H-R). No changes would be needed as a result of the proposed biorefinery.
Air Emissions	Title V Air Permit No. A-180-70-AI	MEDEP	Operations	An application for a Minor Permit Modification was submitted to MEDEP in August 2011 for the proposed biorefinery. OTFF is in the process of securing a major modification to their existing Air Permit. The new permit is anticipated to be issued in the fall of 2012.

Table 2-2. Potentially Applicable Permits, Approvals, and OTFF-Committed Measures (continued)

Activity	Permit, Plan or Approval	Parties Involved	Completed by	Status
Local				
Zoning	Plan Review under the City of Old Town Zoning Ordinance	City of Old Town	Construction and operations	The City of Old Town Planning Board approved OTFF's Site Location application for the demonstration-scale biorefinery at their August 9, 2011, meeting. The Old Town Planning Board has indicated that additional site plan review for the changed project is not necessary
Building	City of Old Town Building Permit	City of Old Town	Construction	OTFF would apply for the City of Old Town Building Permit once final design is completed and construction is ready to begin.

2.2.8 Proposed Project Design Features to Minimize the Threat of Intentionally Destructive Acts

The proposed project design would include measures to minimize potential threats or damage from intentionally destructive acts (acts of sabotage or terrorism). The facility design would include additional security lighting and communications procedures with the local 911 emergency response system. In addition, OTFF would staff the facility 24 hours per day.

2.3 No-Action Alternative

CEQ NEPA implementing regulations at 40 CFR 1502.14(d) and DOE NEPA implementing regulations at 10 CFR 1021.321(c) require an evaluation of a No-Action Alternative. Under the No-Action Alternative, DOE would not authorize expenditure of federal funds for the proposed project and OTFF would not design, construct, or start up the OTFF proposed demonstration-scale integrated biorefinery project. Although this proposed project could proceed if DOE decided not to provide financial assistance, DOE has assumed, for purposes of comparison in this EA, that the proposed project would not proceed without DOE assistance. If the proposed project proceeded without DOE assistance, the potential impacts would be essentially identical to those under the DOE Proposed Action (that is, providing assistance that enables the proposed project to proceed).

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

In this chapter, DOE assesses the following resource areas: land use; water resources; biological resources; air quality; aesthetics; noise; safety and occupational health; waste management and hazardous materials; utilities; traffic; and socioeconomics and environmental justice. Each of the resource sections first describes the affected environment for the subject resource area, and then assesses potential impacts under the Proposed Action and the No-Action Alternative. Section 1.5 discusses the environmental resource area DOE did not consider in this EA.

3.1 Land Use

This section describes existing land use conditions on and surrounding the site of the proposed project, and the potential for the Proposed Action and No-Action Alternative to impact these existing conditions.

3.1.1 Affected Environment

At present, OTFF operates a pulp mill located on a bend on the western side of Penobscot River (see Figure 2-2). The site is approximately 180 acres that extends from the chip storage and conveying facility at the northern end of the proposed project site to the former tissue converting and tissue warehouse facilities at the southern end of the proposed project site. The property is bounded to the east by Penobscot River and to the west by U.S. Highway 2 (South Main Street). Existing operations on this property include woodchip storage and handling, pulping, bleaching, drying, maintenance, warehousing, fuel storage, and black-liquor storage. Pulp has been produced at this site for more than 100 years. The OTFF wastewater treatment plant is directly west of the pulp mill across South Main Street along Penny Road on approximately 23 acres of OTFF-owned land. The treatment system consists of an aeration pond, a spill pond, four clarifiers, and a control building.

The property is located in the City of Old Town Industrial (I-1) Zone, although a portion of the property along the Penobscot River is in the city's Shoreland Zoning Overlay (Industrial-Shoreland [I-1S]). Adjacent properties are primarily zoned residential, and homes are primarily located along South Main Street. The nearest residence is on South Main Street, more than 300 feet from the proposed biorefinery. Forest Hills Cemetery is to the northwest, also along South Main Street. Across the river to the east of the site there are residences along Main Street in Bradley, Maine. The City of Old Town's developed area is chiefly located on a relatively large island (Marsh Island) of Penobscot River, although boundaries extend beyond that on both sides of the river. Marsh Island is surrounded by Penobscot River to the east and Stillwater River to the west. French Island is approximately 1 mile north of the pulp mill and is a densely populated residential area in Old Town. Downtown Old Town consists of various commercial businesses south of South Main Street Bridge and a public park north of South Main Street. Riverfront Park is a relatively new public waterfront park area, the primary component of the redevelopment of the 4.5-acre abandoned Lily Tulip factory site.

The immediate project area contains industrial infrastructure used in previous mill operations and includes a main office, pulp mill, pulp warehouse, pulp dryer, lime kiln, bleach plant maintenance workshop, cooling tower, biomass burner, pump house, turbine, pipelines, and the former tissue mill.

Feedstock for the biorefinery would be commercial mixed northeast deciduous woodchips (birch, beech, and maple), which would come from existing sources that currently supply the pulp mill. These sources are throughout the State of Maine and the four adjacent New Hampshire counties.

3.1.2 Environmental Consequences of the Proposed Action

The proposed project would be on an active industrial site adjacent to industrial and residential properties. Although the existing pulp mill is on approximately 180 acres, the proposed biorefinery would only require 0.9 acre in the 5.7-acre former tissue mill. The biorefinery would not require any structure other than the existing buildings.

The City of Old Town Planning Board approved OTFF's Site Location application for the demonstration-scale biorefinery at their August 9, 2011, meeting. The City of Old Town has been advised of the changes to the proposed biorefinery project and has indicated that additional site plan review is not necessary.

The biorefinery would need 183 dry metric tons per day of woodchips in addition to the amount the pulp mill uses. This increase would require minimal modifications to the chip processing process and would not create a negative growth/drain rate in the area. There is enough hardwood fiber in the State of Maine and the four adjacent New Hampshire counties to supply all pulp mills. The current growth/drain practice is positive for the area, which means that more trees are being grown than cut. Growth/drain ratios for the study area in 2008 ranged from 0.4 to 5.2, with an average of 1.06 (Sewall 2012) for the State of Maine as a whole.

There would be a very small impact on land use because the intended industrial use of the property would not change and growth/drain rates are positive. Therefore, biorefinery construction and operations would not change or affect current adjacent land uses.

3.1.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery. There would be no changes in land use under this alternative.

3.2 Water Resources

This section describes groundwater, surface water, floodplains, wastewater, stormwater, and wetlands on and surrounding the site of the proposed project, and the potential for impacts to these resources as a result of the Proposed Action and No-Action Alternative.

3.2.1 Affected Environment

3.2.1.1 Groundwater

According to the U.S. Geological Survey, Old Town, Maine, 7.5-minute series topographic map, the elevation of the pulp mill is approximately 90 to 150 feet above mean sea level. Regional topography in the area slopes downward toward Penobscot River. Based on surface topography, and assuming that groundwater piezometric surface mimics the surface topography, groundwater beneath the pulp mill is expected to flow in a generally easterly direction, toward Penobscot River (MEDEP 2006).

The existing pulp mill does not use groundwater, and there is no existing EPA-designated sole-source aquifer (an underground water source that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer; EPA 2011b) at the pulp mill site. The only EPA-designated sole source aquifers are on islands off the coast of Maine. In addition, there are no mapped significant sand and gravel aquifers on or near the proposed project site, as mapped by the Maine Geological Survey (MEDEP 2006).

3.2.1.2 Surface Water

The Penobscot River borders the proposed project property to the east; see Figure 2-1. The Penobscot River is New England's second largest river system, and has a drainage basin area of approximately 8,750 square miles, a maximum length (from north to south) of approximately 125 miles. This river is not categorized as a wild and scenic river.

Penobscot River waters in the vicinity of the pulp mill are Class B, which means they are of sufficient quality for a drinking water supply (following treatment), fishing, and contact recreation, and as unimpaired habitat for fish and other aquatic life (FERC 2010).

At present, the pulp mill draws approximately 28 million gallons per day of process water from Penobscot River, and treats it through an existing coagulation and filtration system.

3.2.1.3 Floodplains

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, the property site along Penobscot River is in Zone B, which indicates an area of moderate flood hazard, usually the areas between the limits of 100-year and 500-year floods (see Figure 3-1). Areas designated as Zone B are also floodplains of lesser hazard, such as those with levees that protect against the 100-year flood, or are shallow flooding areas with average depths of less than 1 foot or drainage areas smaller than 1 mile. The existing pulp mill total services pump house, the lower portion of the sandfilter building, lower portions of the recovery boiler utilities building, parts of the dam/powerhouse structure, a corner of the north woodroom, and part of the biomass storage building are in the 100-year floodplain.

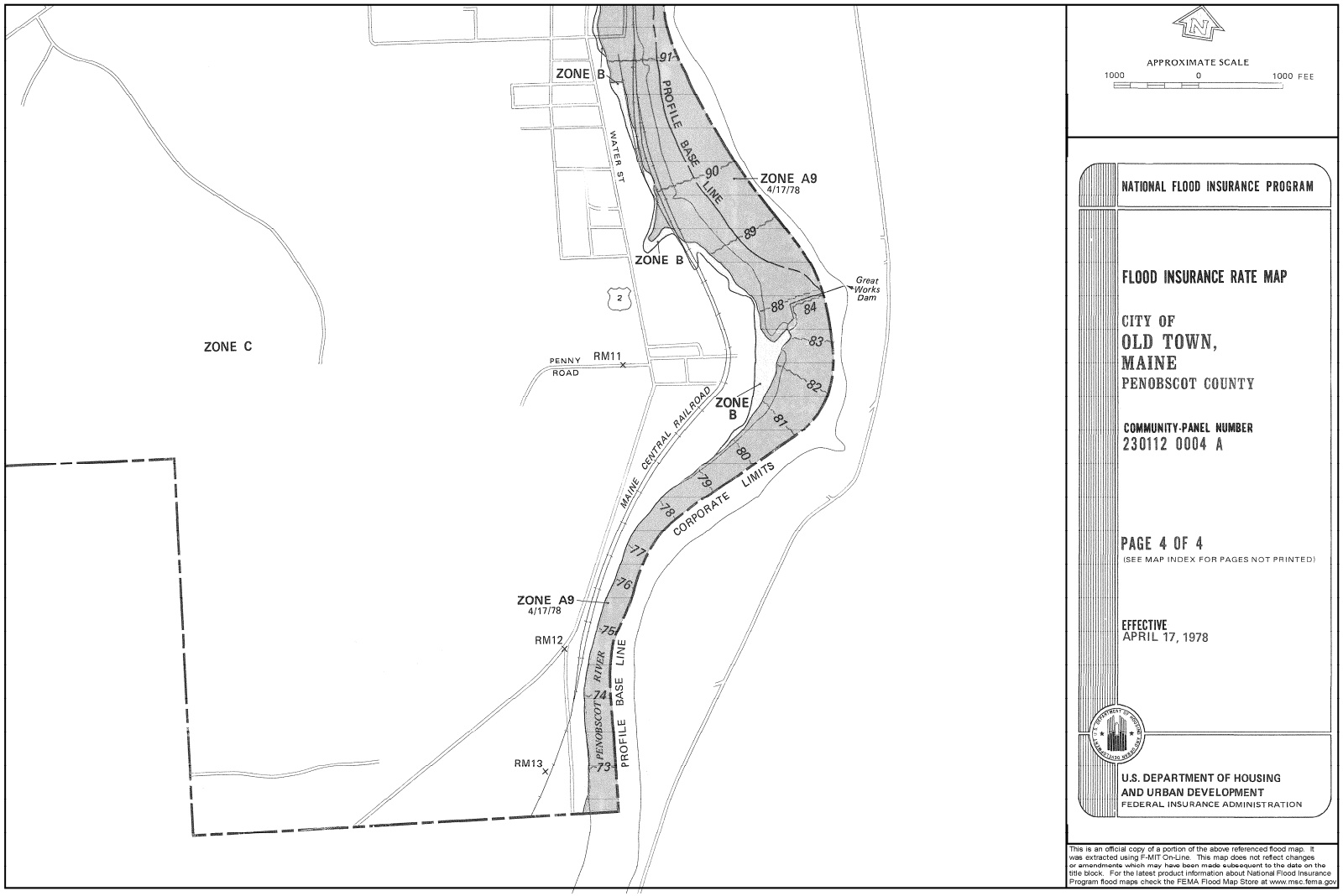
3.2.1.4 Wastewater

OTFF domestic wastewater is discharged to the City of Old Town sanitary sewer system, which discharges to the city's wastewater treatment plant.

The federal National Pollutant Discharge Elimination System program was delegated to the State of Maine on January 12, 2001. Subsequently, the State of Maine developed its MEPDES program. The pulp mill operates an onsite wastewater treatment plant under MEPDES Permit No. ME0002020. The permit expired on August 6, 2007, and OTFF continued to operate under this permit, which the regulations allow when a suitable application has been filed with the State of Maine. OTFF submitted such an application on July 26, 2007, and the MEDEP accepted the application on that date. On February 22, 2011, OTFF submitted an amendment to their pending wastewater discharge application to reflect the loadings from the proposed biorefinery. On March 8, 2011, the MEDEP issued a Preliminary Draft Permit for the pulp mill that included the wastewater loadings from the proposed biorefinery. On May 19, 2011, a Final Wastewater Discharge License (No. W002226-5N-H-R) was issued for the pulp mill (see Appendix C).

The OTFF wastewater treatment plant occupies approximately 23 acres along Penny Road and consists of a bar screen, two primary clarifiers, an aerated lagoon with nutrient addition for secondary treatment, and two secondary clarifiers. OTFF adds polymer to the primary and secondary sludge and then de-waters the sludge in a screw press. A belt press is available if the screw press is down for maintenance. The sludge is disposed of in a State of Maine licensed special waste landfill.

Figure 3-1. Federal Emergency Management Agency Flood Insurance Rate Map



The pulp mill currently produces approximately 12 to 13 million gallons per day of wastewater, which is treated in the mill's existing wastewater treatment facility. The system is permitted to treat 24.4 million gallons per day of treated process waters (including landfill leachate). OTFF is authorized to discharge from four outfalls in accordance with their MEPDES permit. Secondary treated process wastewater is discharged from Outfall No. 001. The bleach plant effluent (internal waste stream) is waste discharged from Outfall No. 100 that ultimately goes to the wastewater treatment system. Non-contact cooling waters are discharged to Penobscot Rive from Outfall No. 002, and filter backwash is discharged to the river from Outfall No. 003.

3.2.1.5 Stormwater

The pulp mill is operating under the Multi-Sector General Permit for Stormwater,[1] and a Storm Water Pollution Prevention Plan (SWPPP) is in place. The Multi-Sector General Permit provides stormwater standards for industrial activities, including requirements for preparation of a Spill Prevention, Control, and Countermeasures (SPCC) Plan. The EPA has developed regulations for stormwater discharges associated with many industrial activities. As part of the MEPDES permitting process, industrial operators are required to manage and monitor their stormwater runoff. The SWPPP and the SPCC Plan for OTFF were developed to assist in complying with the requirements of the Multi-Sector General Permit for Stormwater Discharges associated with industrial activity, and MEPDES requirements.

3.2.1.6 Wetlands

According to site investigations for a U. S. Army Corps of Engineers permit for a separate project (Milone & MacBroom, Inc. 2010), the only jurisdictional wetland or water identified in the proposed project area is the Penobscot River channel. The boundaries of inland wetlands and watercourses on the site were delineated in accordance with the 1987 *Corps of Engineers Wetland Delineation Manual*, as modified by technical guidance from the Corps of Engineers. Federal wetlands under Corps of Engineers jurisdiction were delineated using the three-parameter approach (hydric soils, hydrophytic vegetation, and hydrologic support) documented by submittal of perpendicular transect forms. The site investigation of April 28, 2010, revealed that there are no wetlands close to the pulp mill site apart from the river itself (Milone & MacBroom, Inc. 2010). In addition, the National Wetland Inventory Maps shown in Figure 3-2 did not indicate the presence of wetlands within the boundaries of the proposed project site.

3.2.2 Environmental Consequences of the Proposed Action

3.2.2.1 Groundwater

The proposed project would not use groundwater resources as a source of potable or process water. Therefore, there would be no impacts to groundwater.

OTFF would develop several measures to prevent soil and groundwater contamination, including both a construction SWPPP and operations SWPPP, and an SPCC Plan, as required by the MEPDES and the Maine Multi-Sector General Permit for Stormwater. The proposed project would use facility designs that include secondary containment and have operations policies and procedures to manage and store hazardous materials, so there should be no releases. In the unlikely event of an accidental release, the facility would follow the updated SPCC Plan to contain, manage, and clean up the release. These procedures would minimize, to the extent practicable, potential impacts to any surficial aquifer.

[1] Renewal of the Maine Multi-Sector General Permit for Stormwater Discharge Associated with Industrial Activity was signed and in effect on April 26, 2011 (MEDEP 2011a).

Figure 3-2. Wetland Inventory

3.2.2.2 Surface Water

The existing OTFF process water system would supply process water. This system previously fed the former tissue mill where the biorefinery would be housed. OTFF expects to use 965,000 gallons per day of process and cooling water for the biorefinery facility,

3.2.2.3 Floodplains

The proposed project would be outside the 100-year floodplain. Therefore, there would be no impacts related to locating a structure within the 100-year floodplain.

3.2.2.4 Wastewater

The proposed project would continue the use of the municipal wastewater treatment facility for all sanitary sewer discharges. No impacts to the municipal wastewater treatment facility would be anticipated from the addition of 26 workers to operate the proposed biorefinery.

The existing OTFF wastewater treatment system has a licensed capacity of 24.4 million gallons per day. Based on pulp mill operating data for 2010, the treatment system is currently processing approximately 12

to 13 million gallons per day. The proposed project would generate approximately 150,000 gallons of wastewater per day, which would be transported via existing pipelines and treated at the existing wastewater treatment plant. The wastewater treatment plant has adequate capacity to treat this wastewater within the limits of the existing permit. Table 3-1 lists wastewater volumes and characteristics the proposed biorefinery project would generate.

Table 3-1. Old Town Fuel and Fiber Biorefinery Wastewater Summary[a]

Waste Streams to Wastewater Treatment Plant	Sugar Production and Clarification	Oil Extraction and Solvent Recovery	Fermentation	Total Wastewater Flow
Total flow (gallons per day)	122,000	24,000	Less than 1,000	150,000
Component Flows				
Dissolved sugars (pounds per hour)	618	0	0	
Bio-cell mass (pounds per hour)	0	267	0	267
Lipids (pounds per hour)	0	90	0	90
Butanol (pounds per hour)	0	2.5	0	2.5
Ammonia (pounds per hour)	0	0	0	0
Salts (pounds per hour)	180	0	0	0
Acids[b] (pounds per hour)	0	0	0	0
Caustic (pounds per hour)	0	0	0	
BOD[c]5 (pounds per hour)	8,000	1,000	Less than 100	9,000
Temperature (°F)	140	Less than 180		

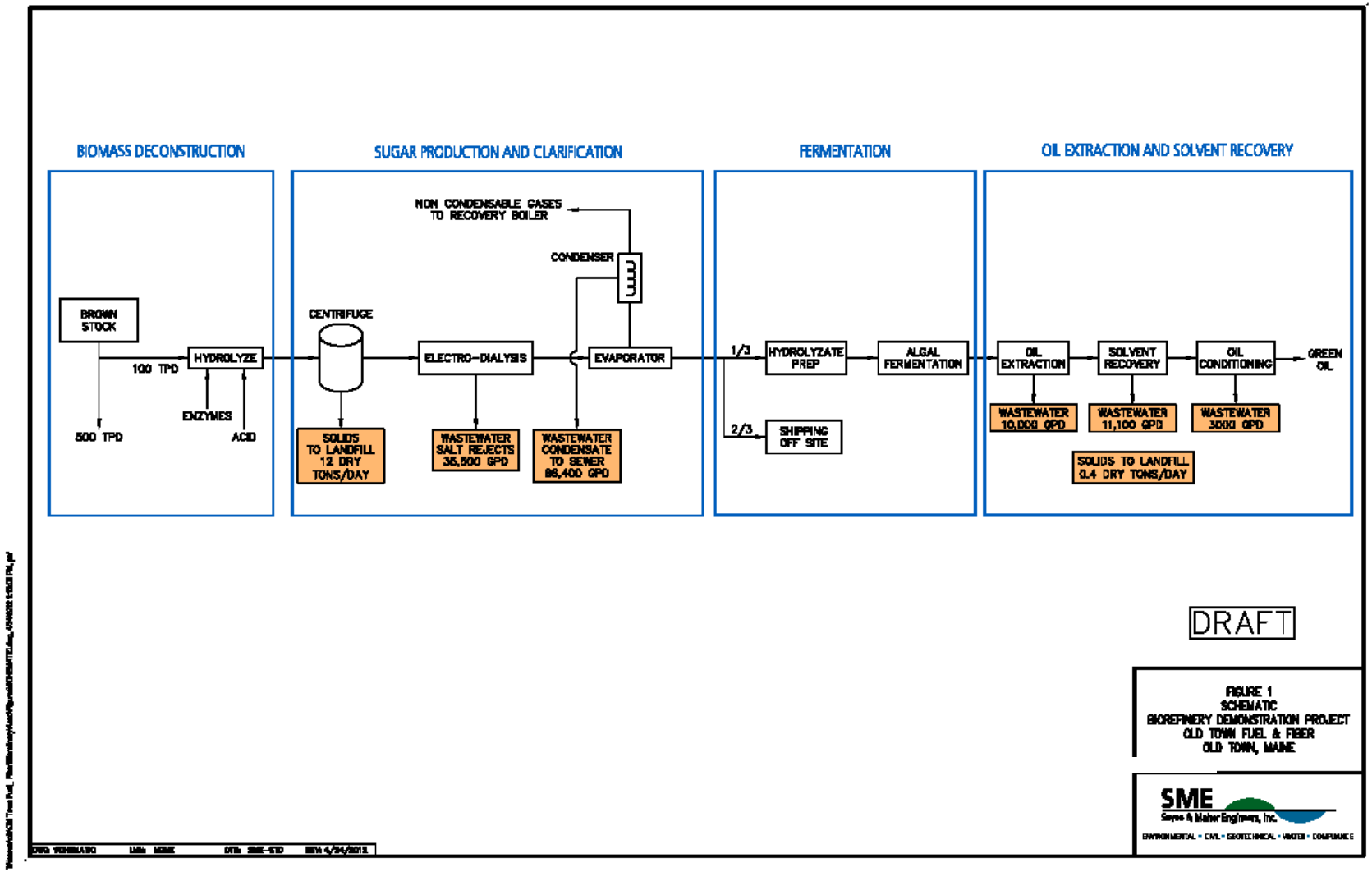
a. All numeric values have been rounded up to ensure the most conservative estimate was used to analyze potential impacts.
b. Intermittent flows consisting of spent cleaning fluids, hydrolyzer drains, and product storage tank residuals will be sent to the wastewater treatment system. When these flows do occur, they would represent less than 10,000 gallons per day.
c. BOD = biochemical oxygen demand.

The continuous wastewater discharges (described below) from the biorefinery would come from three unit processes, as shown in Figure 3-3 – sugar production/clarification, fermentation, and oil extraction and solvent recovery.

The total wastewater flow from the biorefinery would be approximately 150,000 gallons per day (104 gallons per minute). This flow is divided as follows: sugar production/clarification, 122,000 gallons per day; fermentation, less than 1,000 gallons per day; and oil extraction and solvent recovery, 24,000 gallons per day.

In addition, small quantities of water used for system cleaning would be discharged intermittently. These flows would represent less than 10,000 gallons per day and would not represent a significant loading to the 24-million-gallon wastewater treatment system.

Figure 3-3. Process Wastewater Streams



The total biochemical oxygen demand (BOD) loading from the biorefinery is estimated to be approximately 9,000 pounds per day, as follows: sugar production/clarification, 8,000 pounds per day; fermentation, less than 100 pounds per day; and oil extraction and solvent recovery, 1,000 pounds per day. No heavy metals would be added to the biorefinery process; therefore, no heavy metals (other than naturally occurring trace levels) are anticipated to contribute to the waste stream from biorefinery operations. Nutrient loading in the wastewater from biorefinery operations would be minimal. MEPDES Permit No. ME0002020 includes a phosphorous limit of 0.5 milligram per liter. With the proposed biorefinery, it is expected that the treatment system would remain in compliance with the seasonal monthly average mass limitation of 102 pounds per day for total phosphorus.

On May 19, 2011, the MEDEP issued a new Wastewater Discharge License for the pulp mill, which includes anticipated flows from the proposed biorefinery. In the permit, the MEDEP determined that the addition of the biorefinery to the operation of the pulp mill would not result in impacts to water quality or violations of water regulations, and authorized OTFF to utilize the existing wastewater treatment facility for the proposed project. Appendix C includes a copy of the permit.

Since MEDEP issued the Wastewater Discharge License on May 19, 2011, OTFF has modified the proposed biorefinery process. The revised process would produce much less wastewater (150,000 gallons per day). That wastewater would have lower concentrations of water pollutants, and in some cases none of the wastewater would contain certain pollutants (e.g., ammonia and acids; see Table 3-1) compared to wastewater from the originally proposed biorefinery process covered under the MEDEP license. As shown in Table 3-1, the revised process would produce much less wastewater, and that wastewater would have lower concentrations of water pollutants than wastewater from the originally proposed biorefinery process covered under the MEDEP license (see Appendix C). OTFF has discussed the changes to the biorefinery process and the reduction in wastewater loadings to the treatment plant with MEDEP. MEDEP has indicated that no additional OTFF permitting action is required. However, MEDEP agreed that it would be appropriate for OTFF to advise MEDEP of the changes in the biorefinery process and the reduction in wastewater loadings. MEDEP has been advised of these changes.

Based on the foregoing, there would be no impacts to water quality as result of the proposed project.

3.2.2.5 Stormwater

OTFF does not propose new developed areas or impervious surfaces as part of the proposed project. With no increase in developed or impervious areas and no changes in drainage patterns, there would be no impacts to surface water resulting from construction or operation of the proposed project.

Impacts to surface-water quality could occur from accidental releases of hazardous materials from facility operations. The proposed project would use facility designs that include secondary containment of tanks and chemical loading areas and have operations policies and procedures to manage and store such materials; therefore, there should be no releases. Before beginning construction of the proposed project, OTFF would update the SWPPP to include the interior storage tanks and other similar changes. The SPCC Plan would also be updated to include the biorefinery in accordance with applicable regulations. If an accidental release occurred, the SPCC Plan would be followed to contain, manage, and clean up the release. These procedures should minimize, to the extent practicable, potential impacts to surface-water quality.

3.2.2.6 Wetlands

There are no wetlands in the proposed project area, and there would be no impacts to wetlands as a result of the proposed project.

3.2.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, OTFF would not construct the proposed biorefinery, and the pulp mill would continue to operate under its existing MEPDES permit. The MEDEP has determined that the pulp mill effluent does not impair water quality in Penobscot River.

3.3 Biological Resources

This section describes biological resources in terms of upland and aquatic habitats and special status species, and the impacts to these species and their habitats as a result of the Proposed Action and No-Action Alternative.

3.3.1 Affected Environment

3.3.1.1 Upland Areas and Vegetation

Upland areas on the approximately 180-acre proposed project site have been developed for many years. Areas that do not have structures are generally characterized by asphalt for roadways or pads, or disturbed dirt with little to no vegetation. Adjacent to the Penobscot River in the southern portion of the proposed project site there are some areas of native and nonnative grasses where riparian-associated trees are also present. Generally, the proposed project site does not have upland habitat suitable for wildlife, although some bird and mammal species could be present in the area, especially along the river bank.

In 2010, as part of the Penobscot Trust dam removal project, the Federal Energy Regulatory Commission (FERC) released the Final EA for Application for Surrender of License, Veazie, Great Works, and Howland Projects, FERC Project Nos. 2403-056, 2312-019, and 2721-020 (hereinafter the Dam Removal EA) (FERC 2010). This dam removal project includes the removal of two dams – Great Works Dam, which is adjacent to the proposed project site, and Veazie Dam, which is approximately 7 miles downstream of the pulp mill.

As part of dam removal preparation, extensive biological analyses and surveys were performed in and around Great Works Dam. Biological surveys of the western bank (the location of the pulp mill site) near the Great Works impoundment were performed by Santec in 2008. These surveys identified mainly common grasses, weeds, and typical landscape species (FERC 2010). Species observed include Kentucky bluegrass (*Poa pratensis)*, ragweed (*Ambrosia artemisiifolia*), common St. Johnswort (*Hypericum perfoliatum*), Queen Anne's lace (*Daucus carota*), meadowsweet (*Filipendula ulmaria*), staghorn sumac (*Rhus typhina*), gray birch (*Betula populifolia*), and pin cherry (*Prunus pennsylvanica*). Upland habitats on the eastern shore of the Penobscot River offer more diversity and provide more suitable habitat for upland-associated species. The dominant community was identified as alder shrub thicket, which consists of dense shrub cover on the river shoreline, and belongs to the palustrine scrub-shrub wetland class (Cowardin et al. 1979 as reported in FERC 2010). Typical shrubs consist of speckled alder (*Alnus incana*), northern arrowwood (*Viburnum recognitum*), box elder (*Acer negundo*), white birch (*Betula papyrifera*), steeple-bush (*Spiraea tomentosa*), and meadow sweet. In some areas honeysuckle (genus *Lonicera*) comprises portions of the understory. Virgin's bower (*Clematis virginiana*) was also found in several locations. Dominant herbs (although somewhat limited) in the community include sensitive fern (*Onoclea sensibilis*), bluejoint (*Calamagrostis canadensis*), timothy (*Phleum pratense*), tall meadow-rue (*Thalictrum pubescens*), and royal fern (*Osmunda regalis*) (FERC 2010).

Although there is very limited vegetation along the west river bank adjacent to the pulp mill property, more-dense vegetation is present up- and downstream of the pulp mill and on the eastern bank of the

river. In these areas, there is heavy tree cover. Dominant forested wetland communities within the Great Works impoundment were classified as Silver Maple Floodplain Forests (FERC 2010). Silver maple (*Acer saccharinum*) was the dominant species, accounting for approximately 70 percent of the canopy. Additional subdominant trees present include green ash (*Fraxinus pennsylvanica*) and red maple (*Acer rubrum*). The shrub layer was not well developed, but includes species such as meadowsweet, green ash, and red maple.

Upland bird species with potential to occur in the vicinity of the proposed project include the downy woodpecker (*Picoides pubescens*), the black-capped chickadee (*Poecile atricapillus*), and the American goldfinch (*Carduelis tristas*). In addition, woodland rodents such as the eastern chipmunk (*Tamias striatus*), gray squirrel *(Sciurus cardimensus*), and snowshoe hare (*Lepus americanus*) are expected to be present in the forested and shrub areas of the proposed project area. Larger mammals, including white tailed deer (*Odocoilus virginianus)* and moose (*Alces alces*) might also be present in the vicinity of Penobscot River (FERC 2010).

3.3.1.2 Aquatic Habitats

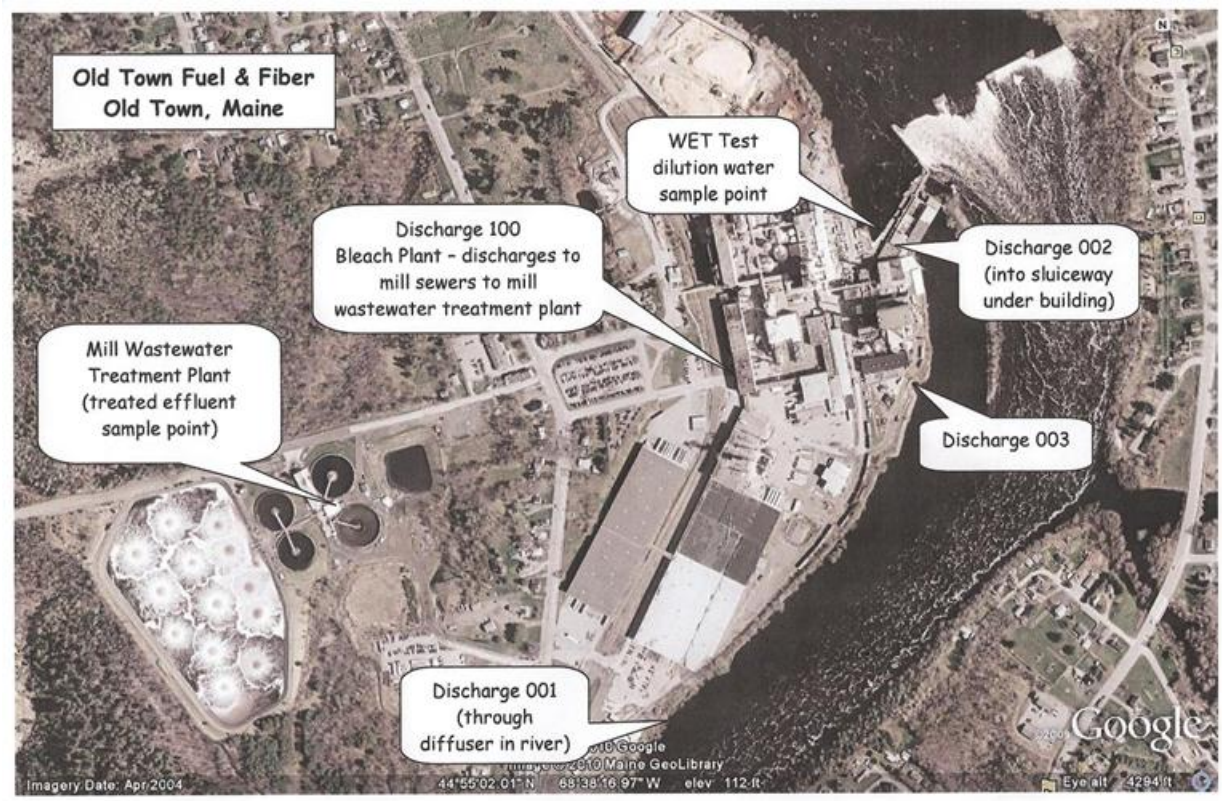
OTFF owns and operates an existing wastewater treatment plant on the site. The wastewater treatment plant discharges its effluent to the Penobscot River under MEPDES Permit No. ME0002020 (see Appendix C), which specifies allowed effluent discharge rates and characteristics to safeguard water quality in the Penobscot River and to protect aquatic life. OTFF is authorized to discharge from four outfalls in accordance with their current MEPDES permit (see Figure 3-4). Secondary treated process wastewaters are discharged into the Penobscot River via Outfall No. 001. Bleach plant effluent (an internal waste stream) is discharged from Outfall No. 100 and routed to the wastewater treatment system. Non-contact cooling waters are discharged to the Penobscot River from Outfall No. 002, which is not currently used. Filter backwash is discharged to the Penobscot River from Outfall No. 003 (see Figure 3-4). The permit specifies limits on the discharge rates and characteristics of the effluent for each outfall that discharges to the Penobscot River, including:

- Seasonal daily maximum and monthly average mass limits for BOD and total suspended solids from the outfalls
- Daily maximum temperature, thermal loading, and pH range limits for the outfalls
- Limits for chemical contaminants, including metals and organic pollutants (e.g., dioxins and furans)
- Requirements for whole effluent toxicity (WET) and chemical specific (priority pollutant) testing for Outfall No. 001.

A MEDEP 2007 survey indicated adequate dissolved oxygen for salmon, and that under baseline conditions, the pulp mill effluent does not impair the functioning of the Penobscot River for adult Atlantic salmon migration or other fisheries.

Great Works and Veazie dams are slated for removal to provide upstream passage to fish as part of a public and private effort led by the Penobscot Trust. After the two dams are removed, the federally listed endangered Gulf of Maine Distinct Population Segment (DPS) of Atlantic salmon (*Salmo salar*), and the endangered shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) (a candidate species for listing), will have access to portions of Penobscot River upstream of the dam locations, including the reach of the river adjacent to the pulp mill and its wastewater treatment effluent discharge pipe. Section 3.3.1.3 provides a complete discussion of special status fish.

Figure 3-4. Wastewater Treatment Plant and Outfall Locations



3.3.1.2.1 Reptiles and Amphibians

As part of the Great Works Dam removal project, it will be necessary to move the OTFF water supply intake downstream from its current location behind the impoundment. In 2010, the Penobscot Trust applied to the Corps of Engineers for a permit to move the water supply intake. A site investigation in April 2010 as part of the proposed move of the water supply intake found that there are no wetlands close to the pulp mill site apart from the Penobscot River itself (Milone & MacBroom, Inc. 2010). Aquatic-associated wildlife species found in the vicinity of the proposed project include several species of reptiles and amphibians, such as the gray tree frog (*Hyla versicolor*), wood frog (*Rana sylvatica*), green frog (*Rana clamitans*), spotted salamander (*Ambystoma maculatum*), redback salamander (*Plethodon cinereus*), American toad (*Bufo americanus*), common snapping turtle (*Chelydra serpentina*), and eastern garter snake (*Thamnophis sirtalis*) (FERC 2010).

3.3.1.2.2 Avian and Mammal Species

Bird species typical of open water and emergent and scrub-shrub wetlands can include the red winged black bird (*Agelaius phoeniceus*), belted king fisher (*Ceryle alcyon*), wood duck (*Aix sponsa*), hooded merganser (*Lophodytes cucullatus*), double-crested cormorant (*Phalacrocorax vociferous*), great blue heron (*Ardea herodius*), tree swallow (*Tachycineta bicolor*), and yellow warbler (*Dendroicapetechia*) (FERC 2010). Barrow's goldeneye (*Bucephala islandica*), a species of waterfowl identified as a state species of special concern, has been reported in the vicinity as part of its winter range (PPL Great Works, LLC. 2000 as reported in Milone & MacBroom 2010). Aquatic and semi-aquatic mammals such as beaver (*Castor canadensis*), river otter (*Lutra canadensis*), and raccoon (*Procyon lotor*) could also be present in the Penobscot River or the surrounding area.

3.3.1.2.3 Fisheries and Mussels

The lower Penobscot River supports resident, anadromous (live in the ocean and breed in fresh water), and catadromous (breed in the ocean), together often referred to as diadromous fish resources. Table 3-2 lists species that could be found in the Penobscot River adjacent to the proposed project site (FERC 2010).

Table 3-2. Species with Potential to be Present in the Penobscot River Adjacent to the Proposed Project Site

Common name	Scientific name	Habit[a]	Origin
Alewife	*Alosa pseudoharengus*	D	Native
American eel	*Anguilla rostrata*	D	Native
American shad	*Alosa sapidissima*	D	Native
Atlantic salmon	*Salmo salar*	D	Native
Atlantic sturgeon	*Acipenser oxyrinchus*	D	Native
Atlantic tomcod	*Microgadus tomcod*	D	Native
Blueback herring	*Alosa aestivalis*	D	Native
Brook trout	*Salvelinus fontinalis*	D	Native
Rainbow smelt	*Osmerus mordax*	D	Native
Sea lamprey	*Petromyzon marinus*	D	Native
Shortnose sturgeon	*Acipenser brevirostrum*	D	Native
Striped bass	*Morone saxatilis*	D	Native
Arctic char	*Salvelinus alpines*	F	Native
Black crappie	*Pomoxis nigromaculatus*	F	Introduced-intracontinental
Eastern blacknose dace	*Rhinichthys atratulus*	F	Native
Bridle shiner	*Notropis bifrenatus*	F	Native
Brook stickleback	*Culaea inconstans*	F	Native
Brown bullhead	*Ameiurus nebulosus*	F	Native
Brown trout	*Salmo trutta*	F	Exotic-intercontinental
Burbot	*Lota lota*	F	Native
Chain pickerel	*Esox niger*	F	Introduced
Common shiner	*Luxilus cornutus*	F	Native
Creek chub	*Semotilus atromaculatus*	F	Native
Creek chubsucker	*Erimyzon oblongus*	F	Native
Emerald shiner	*Notropis atherinoides*	F	Introduced
Fallfish	*Semotilus corporalis*	F	Native
Fathead minnow	*Pimphales promelas*	F	Native
Finescale dace	*Phoxinus neogaeus*	F	Native
Golden shiner	*Notemigonus crysoleucas*	F	Native
Green sunfish	*Lepomis cyanellus*	F	Introduced-intracontinental
Lake trout	*Salvelinus namaycush*	F	Native
Lake whitefish	*Coregonus clupeaformis*	F	Native
Largemouth bass	*Micropterus salmoides*	F	Introduced-intracontinental
Longnose dace	*Rhinichthys cataractae*	F	Native
Longnose sucker	*Catostomus catostomus*	F	Native
Northern pike	*Esox lucius*	F	Introduced-intracontinental
Northern redbelly dace	*Phoxinus eos*	F	Native
Pearl dace	*Margariscus margarita*	F	Native
Pumpkinseed	*Lepomis gibbosus*	F	Native
Redbreast sunfish	*Lepomis auritus*	F	Native
Slimy sculpin	*Cottus cognatus*	F	Native
Smallmouth bass	*Micropterus dolomieui*	F	Introduced-intracontinental
Shortnose sturgeon	*Acipenser brevirostrum*	D	Native
White perch	*Morone americana*	F	Native
White sucker	*Catostomus commersonii*	F	Native
Yellow perch	*Perca flavescens*	F	Native

a. D = diadromous; F = freshwater; M = marine.

Fish surveys in 2004 and 2005 in the tailwater behind Great Works Dam identified smallmouth bass as the most abundant species (FERC 2010). Other fish species identified during these surveys include white sucker, American eel, redburst sunfish, fallfish, and common shiner. In 2004 and 2005, one federally and state-listed endangered Atlantic salmon was identified.

Several species of mussels are also known to occur in Penobscot River. Table 3-3 lists mussels commonly found in the vicinity of the proposed project site and results of the survey by Normandeau in 2007 as part of the Dam Removal EA (FERC 2010).

Table 3-3. Mussels Commonly Found in the Vicinity of the Proposed Project Site

Species	Present During 2007 Survey?
	Great Works Dam
Yellow lampmussel (*Lampsilis cariosa*)	Yes
Tidewater mucket (*Leptodea ochracea*)	No
Creeper (*Strophitus undulatesi*)	Yes
Brook floater (*Alasmidonta varicosa*)	No
Eastern elliptio (*Elliptio complanata*)	Yes
Eastern lampmussel (*Lampsilis radiata*)	Yes
Triangle floater (*Alasmidonata undulata*)	Yes
Eastern floater (*Pyganodon cataracta*)	Yes

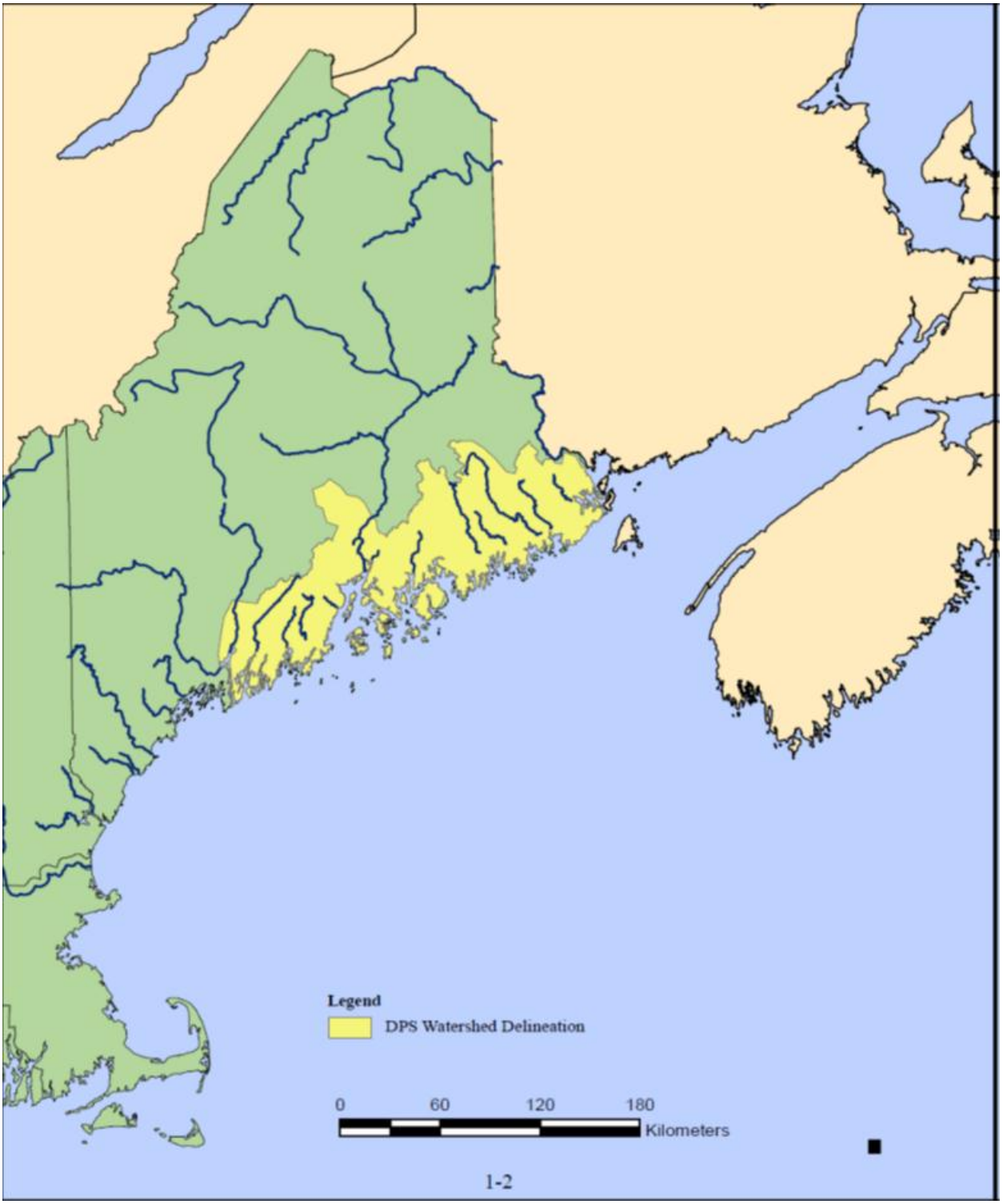
The 2007 survey identified a total of six mussel species in areas of Great Works Dam (FERC 2010). Most were identified as eastern elliptio, accounting for more than 97 percent of all mussel observations in the 7 areas surveyed. Other species observed were substantially less abundant than the eastern elliptio and included (in decreasing order of abundance) eastern lampmussel, eastern floater, triangle floater, the state-listed threatened yellow lampmussel, and the state-listed species of special concern creeper. Section 3.3.1.3 provides more discussion on special-status mussel species.

3.3.1.3 Special Status Species

OTFF contacted the USFWS and the NMFS on July 13, 2010, via letter, regarding the presence of threatened, endangered, or listed species at the pulp mill. The NMFS responded via letter on July 30, 2010 (see Appendix B), stating that two species of fish are listed under the Endangered Species Act as endangered; Atlantic salmon (*Salmo salar*) and shortnose sturgeon (*Acipenser brevirostrum*) are present in the Penobscot River near the pulp mill. On May 11, 2012, OTFF provided follow-up information via e-mail to the USFWS and NMFS regarding the proposed changes to the biorefinery (see Appendix D).

The USFWS and the NMFS initially listed the Gulf of Maine DPS of anadromous Atlantic salmon as endangered on November 17, 2000 (65 *Federal Register* [FR] 69459). A subsequent listing as an endangered species on June 19, 2009, expanded the range of the Gulf of Maine DPS of Atlantic salmon (74 FR 29344) (see Figure 3-5). The USFWS and the NMFS jointly manage the listed Atlantic salmon, and consultations under Endangered Species Act Section 7 for Atlantic salmon are conducted with both agencies. The Gulf of Maine DPS of Atlantic salmon includes freshwater watersheds from Androscoggin River north along the Maine coast to Dennys River; this area includes Penobscot River. There are natural and conservation hatchery populations of Atlantic salmon within this distribution and both are protected under the Endangered Species Act.

Figure 3-5. Geographic Range of Gulf of Maine Distinct Population Segment Salmon



Critical habitat in accordance with Endangered Species Act Section 4(b)(2) has been designated for Atlantic salmon and includes the portion of the Penobscot River adjacent to the pulp mill, which is identified as the Great Works Stream-Penobscot River HUC-10 watershed.

The primary constituent elements of Atlantic salmon critical habitat are (1) spawning and rearing habitat and (2) migration habitat. According to information provided in the Letter of Concurrence issued for the pulp mill water supply intake relocation (USFWS 2010), Atlantic salmon could be present in the Penobscot River adjacent to the pulp mill, primarily because:

1. Atlantic salmon spawn and rear infrequently and in limited numbers in Great Works Stream, a tributary of the Penobscot River approximately 500 feet downstream of the proposed project area on the left bank of the river.
2. Approximately 13,500 fry were stocked in Great Works Stream in 2008 as part of a study, and these fish are now rearing in Great Works Stream or Penobscot River.
3. Adults migrate through the reach of the river adjacent to the proposed project from May through November during their upstream migration period.
4. Downstream migrating post-spawned adults pass through the proposed project area, primarily in spring during runoff.
5. Downstream migrating smolts pass through the proposed project area, typically in May as high flows recede.

Shortnose sturgeon were initially listed as endangered on March 11, 1967 (32 FR 4001), prior to enactment of the Endangered Species Act in 1973. The NMFS has sole jurisdiction over shortnose sturgeon; therefore, Section 7 consultation for this species would be under NMFS purview only. It is currently believed that a population of approximately 1,049 individual shortnose sturgeon is present in the Penobscot River downstream of Veazie Dam, which is approximately 7 miles downstream of the pulp mill (see NMFS July 2010 letter in Appendix B). Great Works Dam is directly adjacent to the pulp mill, and this area is the site of the pulp mill's current water supply intake pipe. FERC has authorized Great Works and Veazie dams for decommissioning and removal. The Penobscot Trust is leading the dam decommissioning and removal effort. In December 2009, the NMFS issued its Biological Opinion for decommissioning the Great Works Project (FERC No. 2312) and Veazie Project (FERC No. 2403) and surrender license and authorization to construct a fish bypass at the Howland Project (FERC No. 2721). The Biological Opinion has paved the way for dam removal, which is anticipated to occur in the next 1 to 2 years. Removing the Great Works and Veazie dams will provide shortnose sturgeon unimpeded access to the portions of the Penobscot River adjacent to the pulp mill site.

Atlantic sturgeon has been petitioned as a candidate species for listing under the Endangered Species Act. In 2006, the NMFS initiated a status review for Atlantic sturgeon to determine if listing as threatened or endangered is warranted for this species. The NMFS published a Status Review Report on February 23, 2007 (NMFS 2007). On October 6, 2010, the NMFS published a Proposed Rule that stated the agency has determined that a listing of threatened is warranted for the Gulf of Maine DPS of Atlantic sturgeon. The public had until January 4, 2011, to comment on the Proposed Rule. On January 12, 2012, NMFS announced that it would list the Gulf of Maine DPS of Atlantic sturgeon as threatened (77 FR 5880, February 6, 2012).

OTFF contacted the Maine Department of Inland Fisheries and Wildlife (MDIFW) via letter on July 13, 2010, regarding the presence of state threatened, endangered, or listed species at the pulp mill site. The MDIFW responded via e-mail on July 21, 2010, stating that occurrences of four freshwater mussels, the state threatened yellow lampmussel, tidewater mucket, brook floater, and the creeper, a state species of special concern, have been identified in the adjacent segment of Penobscot River. In the e-mail

correspondence, the MDIFW also stated that no other significant wildlife habitats (as defined under the Maine Natural Resources Protection Act) have been identified at the pulp mill.

The Migratory Bird Treaty Act (MBTA; 16 U.S.C. 703-7012) implements four treaties that provide for international protection of migratory birds. The MBTA prohibits taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the U.S. Department of the Interior. Bald eagles are included under the MBTA, and are afforded additional legal protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). On August 8, 2007, the bald eagle was removed from the list of threatened and endangered wildlife (72 FR 37345, July 9, 2007). Bald eagles have also been removed from the state's list of endangered or threatened species. There is one known bald eagle nest site approximately 1 mile from the pulp mill.

3.3.2 Environmental Consequences of the Proposed Action

3.3.2.1 Upland Areas

Proposed project construction and operations would occur entirely within the boundaries of the existing pulp mill site. Most of the infrastructure would be housed in the existing former tissue mill; therefore, there would be no impacts to upland plant or wildlife species. The storage tanks would be constructed adjacent to the former tissue mill in an area of existing asphalt. Based on the foregoing, there would be no impacts on upland areas or species that could be found in these areas.

3.3.2.2 Aquatic Habitats

In February 2011, OTFF applied for an amendment to the MEPDES permit to include operation of the biorefinery. The submission includes a complete analysis of the addition of the biorefinery to the wastewater treatment plant and its ability to continue to operate within permit limits. Based on this and the 2007 analysis (sec Section 3.3.1.2), it was determined that the existing system has adequate capacity to treat the additional wastewater from the biorefinery while maintaining the system's effluent well within the limits of the existing wastewater discharge permit (see Appendix C). Section 3.2.2.4 provides a complete discussion of wastewater and wastewater treatment as a result of the proposed project.

3.3.2.3 Special Status Species

In July 2010, OTFF received an e-mail response from MDIFW indicating that they do not anticipate any inland fisheries or wildlife concerns associated with the proposed project. Because no alterations of mussel habitat or changes to water-use quantity or quality are proposed, MDIFW anticipates no effects on freshwater mussels. In addition, proposed project construction and operations are not expected to result in disturbance to eagles (see Appendix B). OTFF did not follow up with MDIFW regarding the changes to the proposed biorefinery because the revised project would not result in changes in water-use quantity or quality.

As part of the OTFF request to the USFWS and the NMFS for technical assistance in July 2010, OTFF was asked to prepare an analysis of the effluent discharges from the wastewater treatment plant for existing conditions and with the addition of the biorefinery. In February 2011, OTFF submitted to the USFWS and the NMFS the *Old Town Fuel and Fiber Proposed Biorefinery Effluent Analysis* (hereinafter, Effluent Report; ICF 2011). On April 4, 2011, the NMFS responded via e-mail and requested some additional analysis be provided, and suggested that DOE initiate informal consultation with submission of the revised Effluent Report. In May 2011, DOE submitted the revised Effluent Report with a request for informal consultation to the USFWS and the NMFS via regular mail (see Appendix B).

The analysis in the Effluent Report was based on the former proposed biorefinery, and it determined that the anticipated discharge from the OTFF wastewater treatment plant would not alter the pH of the water adjacent to the pulp mill. The reach of the river adjacent to the mill was identified as essential for juvenile migration of Atlantic salmon. Normal pH levels are critical to maintaining this essential feature. The available estimates of effluent composition for the proposed biorefinery suggest that, in general, the change in temperature attributable to the biorefinery would be in proportion to the increase in discharged effluent (5 percent), and therefore considerably less than 0.1 degree Celsius (0.18 °F). That level of thermal loading, as with current conditions, is arguably of little biological significance. Sevee & Mahar Engineers completed a subsequent analysis for the proposed biorefinery on April 23, 2012 (see Appendix D). The subsequent analysis concluded that neither pH levels nor temperature would be altered from existing pulp mill conditions with inclusion of the biorefinery process. Although all of the surveyed reaches of Penobscot River did not attain designated-use numeric dissolved oxygen criteria[2] during the most recent ambient monitoring, it is likely that the adult migration primary constituent elements for adult salmon would remain fully functioning regardless of the increase in BOD attributable to the change in OTFF wastewater treatment plant effluent following addition of the biorefinery. The dissolved oxygen measured along Penobscot River is relatively consistent along the full length of the stations assessed in 2007 (see Figure 3-6). The nonattainment of dissolved oxygen, upriver and downriver of the pulp mill, indicates that nonattainment of the numeric dissolved oxygen does not originate with the pulp mill in the middle of the segment.

Although OTFF does not believe the addition of proposed biorefinery operations would result in increased BOD (it is anticipated to remain about the same as it is under current pulp mill operations (SME 2012), the effluent would be monitored in accordance with the MEPDES permit issued in May 2011, and dissolved oxygen levels would be examined.

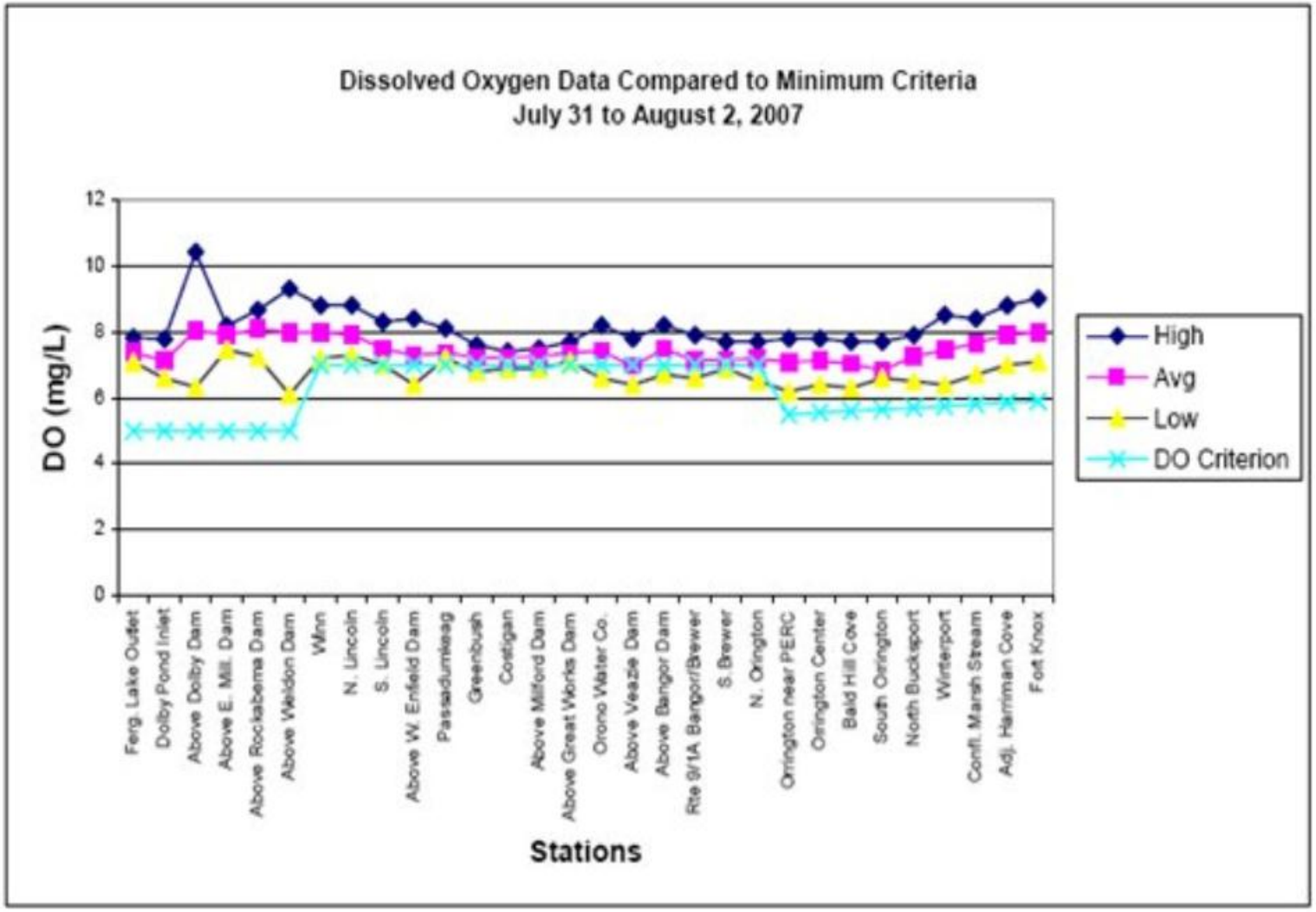
The MEPDES permit indicates that proposed project operations would comply with applicable water quality laws and regulations, and provides requirements for continued monitoring of the effluent discharge for temperature, pH, and BOD loading, and continued WET testing.

Based on the Effluent Report and foregoing analysis, DOE determined that the proposed project would not be likely to adversely affect listed fish species or other aquatic species with the addition of the biorefinery to the existing wastewater treatment facility. On June 30, 2011, the NMFS concurred with the DOE determination that the proposed project would not be likely to adversely affect listed or candidate species (see Appendix B). The NMFS made this determination based on current conditions because neither listed shortnose sturgeon nor candidate species Atlantic sturgeon have access to the waterway in the vicinity of the proposed project. On July 21, 2011, the USFWS concurred with the DOE determination that the proposed project would not be likely to adversely affect the endangered Atlantic salmon nor would it destroy or result in adverse modification of Atlantic salmon critical habitat (see Appendix B).

Based on the updated effluent analysis (see Appendix D) and its conclusion that all effects would be the same or less than the originally proposed project, DOE concluded that the revised biorefinery project would not be likely to affect listed fish species or other aquatic resources. On May 16, 2012, the NMFS responded to the updated analysis sent to them in April 2012 via e-mail, and stated it would not be necessary to reinitiate consultation (see Appendix D). On May 17, 2012, the USFWS also responded to the updated analysis, and stated it would not be necessary to reinitiate Section 7 consultation (see Appendix D)

[2] These values are given based on the identified uses in that reach of the waterway.

Figure 3-6. Dissolved Oxygen Data Compared to Minimum Criteria in Penobscot River



3.3.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, OTFF would not construct the biorefinery, and the pulp mill would continue to operate under its existing MEPDES permit. The MEPDES has determined that the pulp mill effluent discharge does not impair the functioning of Penobscot River for adult Atlantic salmon migration or other fisheries.

3.4 Air Quality

This section describes air quality in terms of ambient air quality, odor, and greenhouse gases.

3.4.1 Affected Environment

3.4.1.1 Ambient Air Quality

The Clean Air Act of 1970, as amended (42 U.S.C. 7401 et seq.), allowed the EPA to regulate emissions from stationary, mobile, and area (small stationary) sources, and established National Ambient Air Quality Standards (NAAQS) for "criteria" pollutants that can harm human health or the environment. Some NAAQS include both primary and secondary standards, and others include only a primary standard. Primary standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. State air quality agencies enforce the NAAQS. States may choose to adopt their own air quality standards, but state standards must be at least as stringent as the NAAQS. Table 3-4 lists the NAAQS.

Table 3-4. National Ambient Air Quality Standards[a]

Pollutant	Averaging Periods	Ambient Concentration Standard[b]	Primary or Secondary Standard[c]
Ozone	8 hours	0.075 ppm (147 µg/m^3)	P, S
Carbon monoxide	1 hour	35 ppm (40 mg/m^3)	P
	8 hours	9 ppm (10 mg/m^3)	P
Particulate matter – 10 microns (PM_{10})	24 hours	150 µg/m^3	P, S
Particulate matter – 2.5 microns ($PM_{2.5}$)	24 hours	35 µg/m^3	P, S
	Annual	15 µg/m^3	P, S
Nitrogen dioxide	1 Hour	0.100 ppm (190 µg/m^3)	P
	Annual	0.053 ppm (100 µg/m^3)	P, S
Sulfur dioxide	1 Hour	0.075 ppm (200 µg/m^3)	P
	3 hours	0.5 ppm (1,300 µg/m^3)	S
Lead	Rolling 3-month average	0.15 µg/m^3	P, S
	Quarterly average[d]	1.5 µg/m^3	P, S

a. Source: 40 Code of Federal Regulations 50.
b. ppm = parts per million; mg/m^3= milligrams per cubic meter; µg/m^3 = micrograms per cubic meter.
c. P = primary standard (health-based); S = secondary standard (welfare-based).
d. The EPA has revoked the quarterly average lead standard except in areas that have not demonstrated compliance with the standard.

Table 3-5 lists the Maine Ambient Air Quality Standards. In addition to the six criteria pollutants designated by the EPA, Maine also has established a standard for chromium.

Table 3-5. Maine Ambient Air Quality Standards[a]

Pollutant	Averaging Periods	Ambient Concentration Standard[b]
Photochemical oxidants (ozone)	1 hour	160 µg/m^3
Hydrocarbons (ozone)	3 hour	160 µg/m^3
Carbon monoxide	1 hour	40 mg/m^3
	8 hours	10 mg/m^3
Particulate matter – 10 microns (PM_{10})	24 hours	150 µg/m^3
	Annual	40 µg/m^3
Nitrogen dioxide	Annual	100 µg/m^3
Sulfur dioxide	3 hours	1,150 µg/m^3
	24 hours	230 µg/m^3
	Annual	57 µg/m^3
Lead	24 hours	1.5 µg/m^3
Total Chromium	24 hours	0.3 µg/m^3
	Annual	0.05 µg/m^3

a. Source: MEDEP 2011b.
b. mg/m^3 = milligrams per cubic meter; µg/m^3 = micrograms per cubic meter.

The EPA evaluates whether the criteria air pollutant levels in a geographic area meet the NAAQS. Areas that violate air quality standards are designated as nonattainment areas for the relevant pollutants. Nonattainment areas are sometimes further classified by degree (marginal, moderate, serious, severe, and extreme for ozone, and moderate and serious for carbon monoxide and particulate matter with an aerodynamic diameter equal to or greater than 10 microns [PM_{10}]). Areas that comply with air quality standards are designated as attainment areas for the relevant pollutants. Areas that have achieved attainment after a period of nonattainment are designated as maintenance areas.

At present, there are no designated nonattainment areas in Maine. Penobscot County, including the pulp mill and proposed project site, is in attainment for all criteria air pollutants (EPA 2011c) and meets the Maine Ambient Air Quality Standards. The City of Millinocket in Penobscot County is designated as a maintenance area for sulfur dioxide. Two regions in Maine are designated as maintenance areas for 8-hour ozone: Portland (Cumberland, Sagadahoc, and York counties, and the Town of Durham in Androscoggin County) and the Midcoast (Hancock, Knox, and Lincoln counties, and the Town of Islesboro in Waldo County). One small area, downtown Presque Isle in Aroostook County, is designated as a maintenance area for PM_{10} (EPA 2011d). The proposed biorefinery would not be in or near any of these maintenance areas.

3.4.1.2 Current Facility Emissions

Under Title V of the Clean Air Act (42 U.S.C. 7661), large industrial facilities such as the pulp mill are required to hold an operating permit for all of their equipment that emits air pollutants. The pulp mill is operating under existing Title V Air Permit No. A-180-70-AI, December 2, 2009, through December 9, 2014. The pulp mill previously submitted a refined air quality modeling analysis demonstrating that emissions from the facility, in conjunction with all other sources, do not lead to a violation of the ambient air quality standards. The analysis was approved on May 6, 2005. The permit was amended in September 2010 and October 2011. Air quality modeling for carbon monoxide that was submitted for the 2011 amendment confirmed that the facility would continue to comply with the ambient air quality standards for carbon monoxide. Table 3-6 lists the emissions units the permit addresses. An additional permit amendment and air quality modeling will be submitted to account for changes in the proposed project.

Table 3-6. OTFF Emission Units Permitted under 2009 Title V Permit

Emission Unit	Unit Capacity[a]	Unit Type
No. 5 power boiler	249 MMBtu per hour	Fuel burning, No. 6 fuel oil (0.5 percent sulfur), No. 2 fuel oil for start-up
Biomass boiler	265.2 MMBtu per hour with 16 megawatt condensing turbine	Fuel burning, biomass, construction and demolition wood, supplemental natural gas
Riley power boiler	245 MMBtu per hour	Fuel burning, diesel 0.05 percent sulfur
Gas turbine (Note: This turbine has not operated since 2002. It will not be retained in the permit modifications for the proposed project. If at some future time OTFF decides to restore operation of the gas turbine, then OTFF will process all required permitting to meet regulatory requirements needed for operation at that time.)	9.5 megawatt (115 MMBtu per hour)	Fuel burning, natural gas
Chip handling operations	Not applicable	Process equipment
Digester system – impregnation vessel, blow tank, and condensers chip steaming vessel	Supporting pulp production for 2.57 MMlb per day black-liquor solids	Process equipment
Brownstock washer line	Supporting pulp production for 2.57 MMlb per day black-liquor solids	Process equipment
Zaremba multiple effect evaporator	Supporting pulp production for 2.57 MMlb per day black-liquor solids	Process equipment
Unitech multiple effect evaporator	Supporting pulp production for 2.57 MMlb per day black-liquor solids	Process equipment
No. 4 recovery boiler	2.57 MMlb per day black-liquor solids, 375 MMBtu per hour firing No. 6 fuel oil, No. 2 fuel oil, diesel fuel and natural gas	Fuel burning
No. 4 smelt dissolving tank	Supporting pulp production for 2.57 MMlb per day black-liquor solids	Process equipment
Recausticizer slaker system	Not applicable	Process equipment
Lime kiln system	64 MMBtu per hour kiln burner	Process equipment
Two fresh lime silos	Not applicable	Process equipment
Reburned lime silo	Not applicable	Process equipment
Salt cake storage silo	Not applicable	Process equipment

Table 3-6. OTFF Emission Units Permitted Under 2009 Title V Permit (continued)

Emission Unit	Unit Capacity[a]	Unit Type
Bleach plant system	Not applicable	Process equipment
Chlorine dioxide plant	Not applicable	Process equipment
Pulp Kraft dryer	Not applicable	Process equipment
No. 6 fuel oil tank	30,000 gallons	Process equipment
Miscellaneous liquor tanks	Not applicable	Process equipment
Wastewater treatment	Not applicable	Process equipment
Backup diesel engine	1.3 MMBtu per hour	Fuel burning, diesel 0.05 percent sulfur
Backup diesel engine	1.45 MMBtu per hour	Fuel burning, diesel 0.05 percent sulfur
Backup generator for No. 4 turbine	1.2 MMBtu per hour	Fuel burning, diesel 0.05 percent sulfur
Backup diesel fire pump for power house	1.33 MMBtu per hour	Fuel burning, diesel 0.05 percent sulfur
Generator for screw press	4.2 MMBtu per hour	Fuel burning, No. 2 fuel/diesel 0.3 percent sulfur
Backup generator for biomass boiler/condensing turbine	3.52 MMBtu per hour	Fuel burning, diesel, 0.05 percent sulfur

a. MMBtu = million British thermal units; MMlb = million pounds.

To control emissions from the process equipment listed in Table 3-6, the pulp mill captures these emissions in the non-condensing gas system rather than venting them. The non-condensing gas system directs these gases to the lime kiln or biomass boiler, where they are burned to recover their heat value. Accordingly, air pollutant emissions from process equipment are very small.

The Title V permit sets limits on the allowable emissions from the fuel-burning equipment listed in Table 3-6. Table 3-7 lists the total annual emissions from fuel-burning equipment allowed under the permit.

3.4.1.3 Conformity

Clean Air Act Section 176(c) (42 U.S.C. 7506(c)) requires any entity of the Federal Government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable State Implementation Plan required under Clean Air Act Section 110(a) (42 U.S.C. 7401(a)) before the action is otherwise approved. The purpose of this conformity requirement is to ensure that activities do not interfere with meeting the emissions targets in State Implementation Plans, do not cause or contribute to new violations of NAAQS, and do not impede the ability to attain or maintain NAAQS or delay any interim milestones. The EPA has issued two sets of regulations to implement Clean Air Act Section 176(c): the Transportation Conformity Rules (40 CFR Part 93, Subpart A) and the General Conformity Rules (40 CFR Part 93, Subpart B). The proposed project would be in Penobscot County, which is an attainment area, and would not be in the Millinocket sulfur dioxide maintenance area. Therefore, the conformity requirements and these EPA regulations would not apply to the proposed project.

Table 3-7. Facility Total Licensed Annual Emissions from Combustion[a,b,c] (short tons/year)

Equipment	PM	PM_{10}	SO_2	NO_x	CO	VOCs
Boiler No. 5	87	87	556.2	306	120	55
Biomass boiler	35.0	35.0	110.7	290.3	1,045.4	19.7
(Nitrogen oxides when firing non-condensable gases in either No. 5 or biomass boiler)	–	–	–	343.4	–	–
Riley power boiler	3.22	3.22	5.64	21.46	3.97	0.2
Gas turbine (Note: This turbine has not operated since 2002. It will not be retained in the permit modifications for the proposed project. If at some future time OTFF decides to restore operation of the gas turbine, then OTFF will process all required permitting to meet regulatory requirements needed for operation at that time.)	1.1	1.1	0.5	20.9	12.8	5.7
No. 4 recovery boiler[e]	177.2	177.2	768.3	812.3	1,396.6	92.4
No. 4 smelt tank	33.07	33.07	14.61	0.28	0.28	0.28
Lime kiln	144.1	144.1	31.1	157.7	357.8	5.3
Total services backup sump pump	0.1	0.1	0.02	1.4	0.3	0.1
Boiler building fire water backup	0.1	0.1	0.02	1.6	0.3	0.1
Pump power house fire backup pump	0.1	0.1	0.02	1.5	0.3	0.1
No. 4 turbine backup generator	0.09	0.09	0.02	1.3	0.3	0.1
Backup generator for biomass boiler	0.1	0.1	0.14	5.1	1.4	0.3
Screw press steam generator	2.2	2.2	5.5	81.1	17.5	6.6
Total licensed emissions	483.4	483.4	1,836.2	1,700.9	2,957.0	185.9
Actual emissions (average of 2010 and 2011)	36.4	32.7	50.8	555.4	563.4	56.2

a. Source: Title V Permit, December 2, 2009, as amended.
b. Table does not include process emission units or insignificant activities that have no licensed emission units.
c. CO = carbon monoxide, NO_x = nitrogen oxides; PM = particulate matter; PM_{10} = particulate matter with a diameter equal to or greater than 10 microns; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.
d. No. 4 recovery boiler annual emissions were based on adding the annual emissions from firing oil only to the annual emissions from firing black liquor only.

3.4.1.4 Odor

The pulp mill uses the Kraft process, which converts wood into pulp. In the Kraft process, woodchips are cooked under pressure in a solution containing sodium hydroxide, sodium sulfide, and sodium carbonate. An unavoidable consequence of this cooking is the production of reduced sulfur gases (typically dimethyl disulfide, dimethyl sulfide, and methyl mercaptan), which can have an offensive odor often perceived as that of “rotting.” These reduced sulfur gases from the pulping process (typical of the Kraft pulping process) are currently captured and burnt off in either the lime kiln or boiler at the pulp mill. Odors from these sources vary depending on an individual’s smell sensitivity, changes in wind direction, temperature, and mill processing techniques.

3.4.1.5 Greenhouse Gases

The burning of fossil fuels such as diesel, gasoline, and natural gas emits carbon dioxide, methane, and nitrous oxide, which are greenhouse gases. Greenhouse gases can trap heat in the atmosphere and have been associated with global climate change. The Intergovernmental Panel on Climate Change (IPCC), in its Fourth Assessment Report issued in 2007, stated that warming of Earth's climate system is unequivocal, and that most of the observed increase in globally averaged temperatures since the mid 20th Century is very likely due to the observed increase in concentrations of greenhouse gases from human activities (IPCC 2007). Greenhouse gases are well mixed throughout the lower atmosphere, so any man-made emissions would add to cumulative regional carbon dioxide emissions and to global concentrations of carbon dioxide. The effects from any individual source of greenhouse gases, therefore, cannot be determined. Existing businesses and residences in the Old Town region use fossil fuels, primarily fuel oil, for process operations and space heat. A greenhouse gas inventory has not been developed for the City of Old Town or Penobscot County.

Biogenic carbon dioxide emissions are produced when carbon is released from a source that was created by biological activity that captured carbon dioxide from the atmosphere. Examples of biogenic sources include manufactured biofuels, such as biodiesel and ethanol, and landfill gas, wood, and wood waste. Biogenic sources are considered to be carbon neutral because they return to the atmosphere carbon that originated there and do not cause a net addition to the carbon dioxide levels in the atmosphere. Biogenic sources may not be considered carbon neutral if the rate of consumption of the underlying resource (e.g., tree cutting) exceeds the rate of replenishment (e.g., tree growth). Petroleum fuels and natural gas are not considered biogenic. The feedstock for the pulp mill and the proposed biorefinery consists of wood and wood waste, and the forest sources of the facility's feedstock are managed so that the overall rate of tree growth exceeds the rate of tree cutting. Therefore, the carbon dioxide emissions associated with the pulp mill, the biorefinery, and its products are considered biogenic. Because of the distinction between biogenic and anthropogenic (human-caused) emissions, biogenic emissions normally are not included in the impact assessment for projects that use biogenic fuels or feedstocks.

Based on the information in the Title V permit, DOE estimated the existing emissions of greenhouse gases from the pulp mill due to fossil fuel combustion. These emissions are typical of a large-scale facility in the pulp and paper industry. Table 3-8 lists these estimates.

3.4.2 Environmental Consequences of the Proposed Action

The biorefinery would utilize some of the existing equipment (described in Section 2.1.6) at the pulp mill. Additional process equipment would be installed that could emit air pollutants and would be permitted as a minor modification to the existing Title V air permit. Emissions sources for this proposed modification are limited to the acid hydrolysis, fermentation, distillation, product storage, and transfer to transportation operations. Chip handling and pre-processing occur as part of the existing pulp mill operations. All steam requirements would be met either through the heat recovery steam generator (which operates off waste heat from the natural gas turbine and does not generate any air emissions) or from currently permitted combustion sources. The proposed increase in the volume of woodchips processed at the pulp mill would result in an increase in emissions from the currently permitted combustion sources. These emissions would be permitted as a major modification to the existing Title V air permit. Air quality modeling would be performed as part of the application for the major modification to demonstrate that the proposed project would comply with ambient air quality standards.

Table 3-8. Annual Greenhouse Gas Emissions from Fossil Fuel Combustion at Existing Facility[a,b,c] (metric tons per year)

Equipment	CO_2	CH_4	N_2O	CO_2e[d]
Boiler No. 5	171,882	107	426	172,416
Biomass boiler	10,458	29	6	10,493
Riley power boiler	16,192	12	48	16,252
Gas turbine[e] (Note: Gas turbine emissions are included to provide an upper bound to the facility emissions estimate. This turbine has not operated since 2002. It will not be retained in the permit modifications for the proposed project. If at some future time OTFF decides to restore operation of the gas turbine, then OTFF will process all required permitting to meet regulatory requirements needed for operation at that time.)	15,079	29	123	15,231
No. 4 recovery boiler	43,487	27	108	43,622
Lime kiln	44,178	28	110	44,316
Total services backup sump pump	47.55	0.03	0.14	47.72
Boiler building fire water backup	53.03	0.04	0.15	53.23
Pump power house fire backup pump	48.64	0.04	0.14	48.82
No. 4 turbine backup generator	43.89	0.03	0.13	44.05
Backup generator for biomass boiler	128.74	0.09	0.38	129.21
Screw press steam generator	2,755	2	8	2,765
Totals	304,354	235	829	305,418

a. Source: Calculated from data in Title V Permit, December 2, 2009. All data have been rounded; therefore, totals might not equal sums of the values.
b. CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide.
c. Table does not include biogenic emissions (e.g., biomass burning); emissions from firing black liquor or non-condensable process gases because insufficient data are available; or process emission units or insignificant activities that have no licensed emission units.
d. CO_2e = carbon dioxide equivalent; calculated by multiplying the emissions of carbon dioxide, methane, and nitrous oxide by their global warming potentials of 1, 25, and 298, respectively (IPCC 2007), and summing the results.
e. Gas turbine emissions were calculated with the existing operating-hour restriction and the pounds-per-hour emission rates given in the Title V permit.

3.4.2.1 Biorefinery Process Emissions

No additional fuel-burning equipment would be installed for the biorefinery. However, there would be minor emissions of volatile organic compounds and carbon dioxide as a result of biorefinery operations. One area of the biorefinery would use butanol as a solvent as part of the oil extraction process. Although most of the butanol releases would be in the water stream, there would be times when butanol emissions cannot be directed to the header that leads to a scrubber before discharge. Process emissions of carbon dioxide would occur from sparge gases, which are composed mainly of nitrogen and carbon dioxide. All carbon dioxide emissions are assumed to be discharged from the vent header. The estimated emissions solely from the biorefinery process are 300 pounds per year of volatile organic compounds and 1,290 pounds per hour (5,650 short tons per year) of carbon dioxide.

In the pulp mill, most process (non-combustion) emissions currently are collected and directed to the non-condensing gas collection system and burned in the lime kiln or biomass boiler to recover their heat value. There would be very small quantities of emissions from the biorefinery that also would be directed to the non-condensing gas collection system.

3.4.2.2 Increased Emissions from Existing Pulp Mill

As part of the proposed project, there will be an increase of 100 bone-dried short tons per day (18 percent) in the quantity of woodchips processed by the existing pulp mill. The energy required to process the additional woodchips will increase the emissions associated with facility operations.

Table 3-9 lists the estimated total emissions from proposed project operations, for both biorefinery process emissions and the increased emissions from existing mill sources.

Table 3-9. Estimated Total Emissions from Operation of the Proposed Project[a]

Pollutant	Source Operations	Net Emissions Increase (short tons per year)
Sulfur dioxide	Existing mill sources	9.1
Nitrogen dioxide	Existing mill sources	100.0
Carbon monoxide	Existing mill sources	101.4
Total suspended particulates	Existing mill sources	6.5
Particulate matter – 10 microns (PM_{10})	Existing mill sources	5.9
Particulate matter – 2.5 microns ($PM_{2.5}$)	Existing mill sources	5.5
Volatile organic compounds (VOCs)	Existing mill sources.	10.1
	Venting of butanol emissions in the biorefinery (rounded)	0.2
	Total VOC increase (rounded)	10.3
Carbon dioxide equivalent (CO_2e)	Existing mill sources	101,688
	Biorefinery sparging and fermentation	5,650
	Total CO_2e increase	107,338

a. The net emissions increase for existing mill sources is based on the increased pulp production of 100 tons per day for biorefinery operations, where the average annual emissions are based on reported emissions during 2010 and 2011. The increase in emissions from existing mill sources is estimated to increase proportionally with pulp production by 18 percent. The existing mill sources include the Recovery Boiler, Smelt Dissolving Tank, #5 Power Boiler, Biomass Boiler, Lime Kiln, Biomass Emergency Generator, Riley Fire Pump, Dam Fire Pump, #4 Turbine Diesel Generator, and Total Services Emergency Pump.

3.4.2.3 Motor Vehicle Emissions

The increased deliveries of woodchips would require an estimated 14 heavy trucks per day. The products of the biorefinery would be shipped by rail from the facility and would require an estimated six rail cars per month. Delivery of chemicals for biorefinery operations is estimated to require 58 trucks per year, or an average of less than 1 truck per day. The biorefinery would require 26 workers in addition to the existing mill workforce, and these workers would likely commute to the facility using their personal vehicles. Emissions from motor vehicle and rail locomotive operations have not been quantified, but are unlikely to lead to any violation of ambient air quality standards. See Section 3.10 for more details on vehicle traffic associated with operation of the proposed project.

3.4.2.4 Construction Emissions

Emissions from proposed project construction would be minor because most of the proposed project would be in the former tissue paper machine building. Minimal excavation would be required. Emissions of fugitive dust during construction would be minimized through standard practices, such as minimizing the size of exposed soil areas and the duration of exposure, watering or chemically treating exposed soil surfaces and roadways, and seeding or mulching exposed soil surfaces.

Construction truck traffic is estimated to be an average of approximately 10 trucks per day visiting the site. Construction would require a workforce of approximately 80 contractor workers, who likely would commute to the facility using their personal vehicles. Emissions from construction-related vehicle traffic and construction equipment have not been quantified, but would be unlikely to lead to any violation of ambient air quality standards. See Section 3.10 for more detail on vehicle traffic associated with construction of the proposed project.

3.4.2.5 Conformity

The proposed project is in Penobscot County, which is an attainment area, and is not in the Millinocket sulfur dioxide maintenance area. Therefore, the conformity requirements would not apply to the proposed project.

3.4.2.6 Odor

Under normal operating conditions the proposed project would not produce odors beyond those that currently exist at the pulp mill. Under process upset conditions, the potential odor sources from the proposed project would be in the fermentation system, the pressed lignin and gypsum, and the wastewater treatment plant. Potential odors from the fermentation system would be caused by volatile organic compounds or reduced sulfur compounds. The sulfur compounds that typically might cause these odors are those such as dimethyl disulfide, dimethyl sulfide, and methyl mercaptan. Wastewater treatment can generate volatile organic compounds and hydrogen sulfide. Carbon dioxide is emitted from combustion processes, pretreatment and refining processes (e.g., fermentation and distillation), and molecular sieves units. The biorefinery could produce certain vented emissions that might or might not create an odor; these would be individually addressed. Hydrogen sulfide gas (which has a foul smell like rotten eggs) or butyric acid (which also has an unpleasant smell) could occur intermittently under upset conditions or when maintenance or cleaning procedures are initiated. Hydrogen sulfide has a defined permissible exposure limit threshold for personnel exposure (20 parts per million ceiling limit; OSHA 1910.1000, Table Z-2) and would be managed to this level. Butyric acid, although known to cause irritation when inhaled, has no Occupational Safety and Health Administration (OSHA) permissible exposure limit.

Preventive maintenance and best operations practices would be the primary methods to control these compounds and related odors. Compounds that are vented from the proposed project process through vents, including those that might cause odor, are managed by using either a wet scrubber or destruction by burning in the boiler. Volatile organic compounds, which are soluble in water, would be controlled by the wet scrubber. Wastewater treatment odors would be controlled through following OTFF operating procedures and maintaining an adequate dissolved oxygen content in the system. The addition of the biorefinery would not be anticipated to require additional treatment for odor or result in impacts from additional odors. No impacts from odor are expected in the remainder of the pulp mill site or surrounding community.

3.4.2.7 Greenhouse Gases

Increased production from the existing pulp mill would generate most of the proposed project-related greenhouse gases. The proposed biorefinery would generate greenhouse gases, primarily from the fermentation process. Fermentation is a biogenic source of carbon dioxide emissions. Biogenic sources are natural sources of carbon dioxide in which living organisms or biological processes produce emissions. As shown in Table 3-9, proposed project operations are estimated to produce 97,376 metric tons (107,339 short tons) of carbon dioxide per year. This represents a 19 percent increase in greenhouse gas emissions compared to current operations at the existing pulp mill. Emissions of greenhouse gases

from motor vehicle and rail locomotive operations have not been quantified, but would be small compared the facility's existing greenhouse gas emissions and the increase due to the proposed project.

The increase in woodchip processing would necessitate an increase in tree harvesting. As discussed in Sections 2.2.6.5 and 3.1.2, this increase would not create a negative growth/drain rate in the area. The supply chain would remain unchanged. OTFF would purchase the hardwood chips from the same suppliers as at present. OTFF would continue to participate in the Forest Stewardship Council Well Managed Forest Program and maintain its Forest Stewardship Council certification under this program from the Maine Pulp and Paper Association and the American Forest & Paper Association. Accordingly, the impact on greenhouse gas emissions from increased use of woodchips would be minimal.

Greenhouse gas emissions from proposed project construction would be minimal because the biorefinery would be in an existing building, and little excavation would be required.

The CEQ has issued draft guidance on when and how federal agencies should consider greenhouse gas emissions and climate change under NEPA (CEQ 2010). The CEQ draft guidance includes a presumptive effects indicator level of 25,000 metric tons (approximately 27,600 short tons) per year of carbon dioxide-equivalent emissions from an action. The CEQ draft guidance states, "[If] a proposed action would be reasonably anticipated to cause direct emissions of 25,000 metric tons or more of CO_2-equivalent GHG [greenhouse gas] emissions on an annual basis, agencies should consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public… CEQ does not propose this as an indicator of a threshold of significant effects, but rather as an indicator of a minimum level of GHG emissions that may warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of GHGs."

Greenhouse gas emissions for the proposed project would be 97,376 metric tons (107,339 short tons) per year of carbon dioxide equivalent. This increase would exceed the CEQ indicator level. For comparison, total U.S. emissions of greenhouse gases in 2010 were estimated at 6,822 million metric tons of carbon dioxide equivalent (EPA 2012), and total global emissions of greenhouse gases in 2005 were estimated at 44,117 million metric tons of carbon dioxide equivalent (WRI 2012). (These are the latest years for which data for all greenhouse gases are available.) The greenhouse gas emissions increase due to the proposed project would represent an extremely small fraction of national and global emissions, and in this context, would have a negligible impact on global climate change.

3.4.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery and associated facilities. There would be no impacts to air quality from proposed project construction and operations, and the pulp mill would continue its current operations.

3.5 Aesthetics

This section describes the visual/aesthetic resources in the vicinity of the proposed project and the potential impacts to these resources from the Proposed Action and No-Action Alternative.

3.5.1 Affected Environment

The proposed project site is within the boundaries of the existing pulp mill site at 24 Portland Street in Old Town, Maine, and is on a bend on the western side of Penobscot River. The City of Old Town has zoned the area for industrial use, and the area has several large industrial buildings to the east of South

Main Street along the western banks of Penobscot River. Adjacent properties are primarily zoned residential, and homes are present primarily along South Main Street and face the pulp mill. There are also residences to the north and south of the proposed project site along South Main Street. Directly opposite the pulp mill along the eastern bank of Penobscot River there are residences present primarily on Main Street in Bradley, Maine. Forest Hills Cemetery is to the northwest on South Main Street.

Because the proposed project site has a historical use as an industrial facility, it is heavily developed with existing buildings, paved/gravel access and circulation areas, and areas for materials storage. Current operations on this property include woodchip storage and handling, pulping, bleaching, drying, maintenance, warehousing, fuel storage, and black-liquor storage.

The OTFF wastewater treatment plant is on approximately 23 acres directly west of the pulp mill across South Main Street along Penny Road. The treatment system consists of an aeration pond, a spill pond, four clarifiers, and a control building.

3.5.2 Environmental Consequences of the Proposed Action

The proposed biorefinery would require 0.9 acre in the 5.7-acre former tissue mill, and 1 evaporator would extend 20 feet beyond the roofline.

The buildings surrounding the proposed biorefinery building would function to minimize the visibility of the proposed project; however, the proposed evaporator would be visible to drivers on both sides of the river. Trucks and vehicles entering and leaving the site associated with construction activities would result in short-term visual impacts to residents and drivers. However, given the industrial nature of the proposed project site and surrounding land, and the temporary duration of construction activities, there would be no adverse effects on the visual/aesthetic quality of the proposed project site and surrounding area.

3.5.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery and associated facilities. There would be no short-term impacts to visual/aesthetic resources, surrounding residences, or drivers from construction activity, and the pulp mill would continue its current operations.

3.6 Safety and Occupational Health

This section describes safety and occupational health at the pulp mill, available emergency and medical services, and potential impacts to safety and occupational health from the proposed project.

3.6.1 Affected Environment

Potential hazards present at the pulp mill are those common to industrial activities, including trip-and-fall hazards, hazardous materials spills, worker exposure to hazardous materials, fire, industrial and vehicle accidents, drowning, and confined spaces. The existing pulp mill operates within established health and safety plans and procedures, which comply with applicable OSHA, EPA, and State of Maine regulations. The Emergency Response Plan, SPCC Plan, Health and Safety Plan, and OTFF Wastewater Treatment Plant Operation and Maintenance Manual contain sections on safety considerations, which outline potential safety hazards that could be present and precautions to ensure worker safety. Some of the hazards include personal injury; electrical, mechanical, and chemical handling; drowning; and confined spaces.

The City of Old Town Police Department and Old Town Fire Rescue provide emergency services for the pulp mill. The policy and fire departments are at the City of Old Town Public Safety Facility at 150 Brunswick Street, approximately 1.4 miles northwest of the pulp mill. Old Town Fire Rescue services include confined-space rescue and hazardous materials mitigation response.

Hospitals in the City of Bangor, approximately 15 miles from Old Town, provide medical services, including a 24-hour emergency department with ambulance and air transportation. Medical centers in Bangor also have rehabilitation services that provide occupational and physical therapy.

3.6.2 Environmental Consequences of the Proposed Action

The chemicals and chemical processes used to produce sugar and green oil create a potential for health and safety hazards. Section 3.7 describes the hazards related to hazardous materials storage and handling. In summary, hazardous materials generally fall into one of two categories: flammable or reactive. Most of the chemicals proposed to be used in the biorefinery are already being used on the site at the pulp mill; the sole exception is ethyl acetate. Green oil is flammable, and many of the process chemicals are reactive (i.e., acids or bases). Storing and handling hazardous materials have the potential for releases to the environment. A catastrophic release of hazardous materials could affect the public. A spill of green oil could catch fire. A spill of acid or caustic material could present a hazard if a member of the public came into contact with the liquid.

The most likely hazardous material release at the proposed biorefinery would be an accidental release at a bulk storage (tank) location. Tanks inside the building that contain regulated material (for example sulfuric acid) would have secondary containment. As appropriate, the proposed biorefinery would comply with the standards in the National Fire Protection Association 30, Flammable and Combustible Liquids code.

River modeling with and without Great Works Dam shows that the impacts of removing the dam cease at approximately 471 feet downstream of the dam location, and there would be no impact beyond that point. Containments included in the proposed project would be more than 471 feet downstream, and would not be affected by dam removal. Storage tanks would be outside the 100-year floodplain for the site, with or without removal of the Great Works Dam.

Secondary containment would limit the movement of a spilled liquid. OTFF would develop or update appropriate spill response, pollution prevention, emergency action, and emergency response plans to address the medical and environmental hazards that could affect the public, employees, and the environment. The plans would include, at a minimum, a hazard communication plan, an SPCC Plan, an SWPPP, an Emergency Action Plan, and an Emergency Response Plan. OTFF would complete the plans in accordance with federal and Maine Occupational Safety and Health Administration, MEDEP, and EPA regulations and guidance. These plans would:

- Analyze the potential for spills or releases of green oil and other hazardous materials. This analysis would include spills or releases from equipment failures, human error, natural disasters, and intentionally destructive acts.
- Outline steps to prevent releases or spills.
- Evaluate the potential impacts of releases if they occurred.
- Describe response actions OTFF would take in the event of a release.
- Describe procedures to follow in the event of fires or explosions, tornados, severe weather, medical emergencies, or bomb threats.

- OTFF would adhere to the hazard mitigation protocol in the OTFF Wastewater Treatment Plant Operation and Maintenance Manual.
- OTFF would meet with local fire- and emergency-response providers to discuss potential emergencies, determine capabilities, and establish communications protocols and responsibilities. In addition, OTFF would establish safety and emergency response procedures for construction activities, electrical, hazardous chemicals, hot-work permits, fall prevention, proper equipment usage, confined space entry, fire protection and prevention, and hearing and respiratory protection for employees, contractors, and visitors. OTFF would design the fire protection systems for the proposed project to protect the public, limit personal injury to employees, and limit property loss and plant downtime from a fire or explosion. Storage tanks that would contain flammable materials would be designed and constructed in accordance with the National Fire Protection Association standards.

The proposed project would have the following fire protection systems:

- Fire hydrant/hose stations – The facility would have adequate numbers of fire hydrants and hose stations to ensure sufficient coverage of the process areas as designated by National Fire Protection Association standards and City of Old Town building codes. There are several yard hydrants throughout the pulp mill site, and the nearest hydrants are less than 500 feet from the proposed site improvements.
- Local Fire Protection Service – OTFF would rely on the local fire department or emergency response teams in the event of a serious fire. These authorities would be familiar with the layout of the proposed biorefinery, the hazards of materials handled on the premises, places where personnel would normally work, and possible evacuation routes. OTFF would develop a Fire Protection Plan for the plant and update it to detail the proposed project information necessary to ensure the use of safe and effective firefighting measures at the plant.

In addition to fire hydrants and foam systems, the plant has hand-held fire extinguishers, temperature detectors, smoke detectors, and other fire-detection devices required by local fire codes or the Office of the State Fire Marshal. DOE expects the existing emergency response capabilities of the City of Old Town and Penobscot County to remain in place and available to OTFF, if needed.

As part of the application process for amendment of the OTFF Site Location Development Act Permit, the City of Old Town requested that the city's Fire Chief review and comment on the fire protection adequacy at the site and on the OTFF Emergency Response Plan. Further, a fire protection engineer retained by the City of Old Town would perform a peer review of the OTFF amendment application.

3.6.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery. The potential hazards related to the industrial activity on OTFF property would not change. The No-Action Alternative would have no effect on existing emergency response capabilities of the City of Old Town or Penobscot County.

3.7 Waste Management and Hazardous Materials

This section describes current OTFF practices for solid and hazardous waste management and hazardous materials handling.

3.7.1 Affected Environment

3.7.1.1 Solid and Hazardous Waste Management

The primary waste materials from the pulp mill consist of wastewater sludge (20 dry tons per day), knots and pulping rejects (4 to 5 wet tons per day), and small amounts of miscellaneous mill trash. The wastewater sludge and the ash are disposed of at the Juniper Ridge Landfill and miscellaneous trash is transported to the Penobscot Energy Recovery Company. The pulp mill is a small-quantity generator (i.e., it generates 100 kilograms [220 pounds], but less than 1,000 kilograms [2,200 pounds] of hazardous waste per month). Hazardous wastes are limited to small amounts of laboratory waste, aerosol cans, and paint products. Occasional pulping process upsets result in the release of hazardous waste that is collected and managed in accordance with applicable regulations. The disposal of such wastes depends on the type of waste generated; it would be hauled off the site by a contractor and disposed of in accordance with applicable regulations.

The Juniper Ridge Landfill, a state-owned construction and demolition debris landfill at 2828 Bennoch Road, Old Town, has a total permitted capacity of 10.28 million cubic yards and a tonnage rate of approximately 50,000 tons per month (SME 2011, *Bangor Daily News* 2010, City of Old Town 2011a). Juniper Ridge Landfill received a total of 708,198 tons of waste in 2010 (Maine State Planning Office 2012b). At projected fill rates, the present licensed capacity should provide 9 years of disposal capacity, consuming that capacity in 2018 (Maine State Planning Office 2011).

In late 2006, the Juniper Ridge Landfill operator began its initial investigation into expanding the landfill to provide an additional 21.9 million cubic yards of disposal capacity, which would provide capacity for approximately 20 years based on projected disposal needs. In late 2009, the State Planning Office submitted an application to the MEDEP for a public benefit determination as part of the expansion process. In 2010, the MEDEP issued a draft denial decision on that application, and the State Planning Office withdrew the application, stopping the planned expansion process. In September 2011, the State Planning Office resubmitted an application for a public benefit determination. In January 2012, the MEDEP issued a partial approval of the public benefit determination. The MEDEP concluded that the expansion would be a substantial public benefit, provided the expansion is limited to 9.35 million cubic yards (Maine State Planning Office 2012a).

There is a commercial landfill (Crossroads Landfill) that could also be used if Juniper Ridge were to close in the future. Crossroads Landfill is approximately 50 miles from Old Town. Based on 2010 data, Crossroads Landfill has an estimated remaining capacity of 3,907,064 cubic yards, which corresponds to approximately 13 years of remaining life at the current fill rate (Maine State Planning Office 2012b).

3.7.1.2 Hazardous Materials Handling

Table 3-10 lists hazardous materials OTFF currently uses on the site.

Table 3-10. Hazardous Materials OTFF Currently Uses on the Site[a]

Hazardous Chemical	Maximum Quantity on the Site (pounds)	Primary Storage/Use Location
No. 2 fuel oil	31,000	No. 2 boiler/No. 5 boiler
No. 6 fuel oil	829,000	Bulk storage tank, fuel for recovery furnace, No. 5 boiler
Black liquor	2,097,000	Digester, recovery furnace
Eco-Brite 1400	22,400	Bleachery
Lime mud	3,600,000	Liquor preparation
Calcium oxide	400,000	Liquor preparation
Chlorine dioxide	19,900	Oxides of chlorine plant, bleachery

Table 3-10. Hazardous Materials OTFF Currently Uses on the Site[a] (continued)

Hazardous Chemical	Maximum Quantity on the Site (pounds)	Primary Storage/Use Location
CC 265	17,100	Bleachery
CC 270	12,700	Bleachery
Chutebrite J	13,500	Kraft machine
Diesel fuel	100,000	Vehicle fuel
Gasoline	12,500	Vehicle fuel
Gencoag 100N	62,500	Wastewater treatment plant
Green liquor	7,500,000	Recovery furnace, liquor preparation
Hydrochloric acid	10,100	Liquor preparation
Hydrogen peroxide	95,000	Bleachery, oxides of chlorine plant
Aerotech 4218	15,800	Kraft machine
Aerotech 6016	91,700	Digester
Mistron 100	83,600	Bleachery
Nalco 1826	32,000	Boiler feedwater
Nalco 71315	48,700	Wastewater treatment plant
Nalco 7191 Plus	73,800	Wastewater treatment plant
Nalco 8158	53,000	Boiler feedwater
Nalco Nexguard 22312	15,100	Boiler feedwater
Nalco PP07-3803	28,000	Wastewater treatment plant
Oxygen	72,200	Bleachery
Propane	20,000	Forklifts
Silicone Transformer Oil	142,000	Mill transformers
Sodium chlorate	1,291,000	Oxides of chlorine plant
Sodium chloride	99,000	Boiler feedwater
Sodium Hydroxide	525,000	Liquor preparation, oxides of chlorine plant, digester
Sodium sulfate	51,000	Oxides of chlorine plant
Sulfuric acid	288,000	Oxides of chlorine plant, Kraft machine, wastewater treatment plant
Urea-APP Solution	91,700	Wastewater treatment plant
Weak Wash	623,000	Liquor prep
White liquor	8,900,000	Liquor preparation, digester

a. Source: Tibbets 2011.

3.7.2 Environmental Consequences of the Proposed Action

3.7.2.1 Solid and Hazardous Waste Management

OTFF would remove the existing tissue mill first-floor composite concrete slab for the installation of new tanks and would remove and reframe the roof. The concrete debris mixed with rebar (approximately 1,200 cubic feet) would be transported to the Juniper Ridge Landfill. During biorefinery operations, the wastewater treatment plant would generate approximately 12.4 tons per day (dry weight) per day of solid waste. Like the current disposal practice, this would be disposed of at the State of Maine licensed special waste landfill. Given the existing capacity at and the approved expansion of Juniper Ridge Landfill, and the presence of the nearby Crossroads Landfill, impacts are expected to be minimal over the operational life (approximately 10 years) of the biorefinery.

The proposed project and the existing pulp mill would share administrative offices. Administrative operations for the proposed project would generate very little additional paper waste and very little additional nonhazardous solid wastes, such as scrap metal, wood, plastic products, paper from plant operations, and empty containers (drums, totes, and boxes). As it does now, OTFF would recycle its

waste paper to the extent practicable, and would dispose of nonhazardous solid waste in the Juniper Ridge Landfill.

Under normal operations, the biorefinery would not generate any hazardous wastes. Occasional biorefinery upsets could result in the release of hazardous waste that would be collected and managed in accordance with existing mill procedures. The OTFF biorefinery would generate universal wastes, including used oil, fluorescent and high-intensity discharge light bulbs, and batteries. Depending on the types of universal wastes generated, a licensed universal waste transportation company for that particular type of waste would transport such materials to a licensed disposal facility.

3.7.2.2 Hazardous Materials Handling

The proposed project would store and use various hazardous materials. OTFF would use materials compatible with the contents being stored to build each storage tank. Any tanks that contain regulated material (for example sulfuric acid) would also be in secondary containment.

Section 3.6.2 discusses the plans OTFF would develop to address environmental hazards associated with the proposed project. OTFF would provide spill prevention and response training to employees working with hazardous materials. These measures would reduce the likelihood of spills of such materials. Therefore, DOE anticipates the measures would minimize the potential impacts as a result of the proposed project.

3.7.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery. There would be no generation of new waste and no on-site use of new hazardous materials. OTFF would continue to generate solid and hazardous waste in the same quantities it does now.

3.8 Utilities

This section describes the utilities in place and municipal systems used, including electricity, natural gas, potable water, process water, process wastewater, and domestic wastewater, for the existing pulp mill. It also describes potential impacts to utilities resulting from the Proposed Action and No-Action Alternative.

3.8.1 Affected Environment

OTFF uses approximately 15 megawatts of electricity generated from biomass and recovery boilers currently in operation at the site. When OTFF is unable to generate sufficient quantities of electricity, the balance is made up from Bangor Hydro Electric Company.

Bangor Gas Company, LLC, provides natural gas for the City of Old Town and OTFF. There is an existing on-site connection that provides OTFF with natural gas, which is used for the lime kiln and the boilers. OTFF gas usage ranges from 1,200 decatherms in summer to 1,600 decatherms in winter.

Process water is currently supplied from the pulp mill process water system and is treated through coagulation and filtration. The water is derived from Penobscot River, and the pulp mill currently removes and uses 28 million gallons per day from the river.

OTFF is connected to the City of Old Town municipal water system, which provides OTFF with potable water. OTFF domestic wastewater discharges to the City of Old Town sanitary sewer. The sanitary

sewer discharges to the City of Old Town municipal wastewater treatment plant. The present municipal wastewater treatment plant capacity is 4.6 million gallons per day at peak flow. The average daily production is 1.5 million gallons per day (City of Old Town 2011b). The plant discharges secondary treated wastewater to Penobscot River, and an unspecified quantity of untreated combined sanitary and stormwater from combined sewer overflow outfalls to Penobscot River and Stillwater River under permit No. ME01000471 (MEDEP 2011a).

3.8.2 Environmental Consequences of the Proposed Action

The proposed biorefinery production process would send additional materials to the biomass and recovery boilers currently in operation at the site. This would generate power for the biorefinery. No changes to the existing mill power supply would be required for the proposed biorefinery.

Process water would be supplied from the pulp mill process water system, which previously fed the building where the biorefinery would be housed. Expected consumption of process water for the biorefinery facility would be approximately 965,000 gallons per day. For services (e.g., fermentation) requiring a more constant temperature and to reduce overall water consumption, a closed-loop cooling circuit would be utilized, at an estimated flow rate of 400 gallons per minute. This would equate to an additional mill water consumption rate of 20 gallons per minute, which would fit within current consumption and capability levels. All process wastewater would discharge to the existing OTFF wastewater treatment plant.

Potable water provided by the City of Old Town municipal water system would be used in the biorefinery for employee needs. The biorefinery would use approximately 520 gallons per day of domestic water and wastewater generated, based on 26 full-time employees and the average daily water consumption and wastewater use (20 gallons per day per employee). Impacts to the City of Old Town municipal water system would be very small, because this would represent a very small increase compared to current usage. The Old Town Water District serves the communities of Old Town, Bradley, and Milford for residential and business customers, with an annual distribution of 378,546,000 gallons. This averages to a little more than 1,000,000 gallons per day.

3.8.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery. There would be no generation of steam-powered electricity and no additional use of process water and potable water. OTFF would continue to use electricity and water in the same quantities it does now.

3.9 Cultural Resources

This section describes cultural resources in the vicinity of the proposed project and potential impacts to those resources from the Proposed Action and the No-Action Alternative. The National Historic Preservation Act of 1966 (NHPA; 36 CFR 800), as amended, is the primary federal law protecting cultural, historic, Native American, and Native Hawaiian resources. Per 36 CFR 800.3, federal agencies that have lead jurisdiction over a federal undertaking (i.e., a project, activity, or program that is funded by a federal agency or that requires a federal permit, license, or approval) must assess and determine the potential effects of their proposed undertakings on historic properties. The term historic properties means any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the *National Register of Historic Places* maintained by the Secretary of the Interior. Historic properties also include artifacts, records, and remains related to and located within such properties, and

properties of traditional religious and cultural importance to a Native American tribe or organization that meet the National Register listing criteria (36 CFR Part 60).

The intent of NHPA Section 106 is for federal agencies to consider the effects of a proposed undertaking on historic properties through a consultation process that includes the identification of historic properties and consultation with State Historic Preservation Officers, federally recognized Native American tribes, the Advisory Council on Historic Preservation, applicants for federal assistance, local governments, and any other interested parties.

3.9.1 Affected Environment

DOE reviewed the National Register for listed historic properties in Penobscot County. There are 102 historic properties in the county, six of which are in Old Town. There are no listed historic properties within a 1-mile radius of the pulp mill (NRHP 2010). There are 107 identified archaeological sites in the City of Old Town, primarily associated with the Penobscot Indian Nation (FERC 2008). All of these sites are situated along the banks of Penobscot and Stillwater rivers and their tributary streams.

The pulp mill was originally a sawmill that began producing pulp in 1882, and by 1883, expanded into a sulfite pulp mill. The pulp mill has largely been in operation since that time and is currently owned and operated as the pulp mill. Most of the pulp mill buildings and structures that comprise the pulp mill site are post-1970 industrial structures and warehouses.

3.9.2 Environmental Consequences of the Proposed Action

There are no National Register-listed sites within the construction footprint of the proposed project or near the pulp mill. Most of the mill buildings and structures that comprise the pulp mill are circa 1970 industrial structures and warehouses with no architectural distinction. As a continuously operating mill, there have been numerous modern additions to the mill, and the mill as it exists today does not retain the features of the original late 19th Century mill. There are some extant buildings more than 50 years of age; however, the mill site itself does not retain the historic integrity needed to be considered for inclusion on the National Register.

All of the proposed construction would be within the existing former tissue mill. There would be no ground disturbance associated with the proposed project, and staging and equipment access would be in areas subject to previous and ongoing ground disturbance from extensive activities related to pulp manufacturing. The potential for significant archaeological sites is limited given the extensive previous soil disturbance.

The former tissue mill in which the proposed biorefinery would be constructed is a modern addition to the mill complex. The mill complex itself has undergone extensive changes over the past century and the addition of a biorefinery, which would not alter the size or scale of the complex, would have no effect on the setting of the area or create visual effects that could impact cultural resources.

The nearest National Register-listed historic property is more than 1 mile from the pulp mill, and the pulp mill itself is not likely to be considered eligible for National Register listing. The proposed project would not affect any historic properties. DOE initiated Section 106 consultation with the Maine Historic Preservation Commission (which is the State Historic Preservation Office), the Penobscot Indian Nation, the Aroostook Band of Micmac Indians, the Houlton Band of Maliseet Indians, the Passamaquoddy Tribe, and the Pleasant Point Reservation of the Passamaquoddy in a letter dated June 10, 2011 (see Appendix B). The letter included a proposed finding of “No Historic Properties Affected” for the Proposed Action. On June 17, 2010, DOE received a letter of concurrence on this finding from the Maine Historic Preservation Commission, which concludes DOE obligations under Section 106.

3.9.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build and operate the proposed biorefinery. There would be no new construction at the proposed site. Under this alternative, there would be no impacts to cultural resources at the proposed site.

3.10 Traffic

3.10.1 Affected Environment

Currently the pulp mill receives approximately 555 trucks, 910 passenger vehicles, and 42 rail cars per week (OTFF 2011c). Figure 3-7 shows the regional road and rail network in and near Old Town, Maine. Figure 3-8 shows the local transportation network in the immediate vicinity of the pulp mill. There is one main access to the pulp mill via Portland Street, which connects to U.S. Route 2 (South Main Street) approximately 5 miles east of Interstate 95. The nearest entrance to Interstate 95 is at Stillwater Avenue, 3 miles from the pulp mill.

Pan Am Railways owns and operates a rail line that runs from Mattawamkeag in Penobscot County, through Old Town to Portland, and then continues into Massachusetts. This rail line runs adjacent to the pulp mill.

Truck traffic to the pulp mill predominantly uses Interstate 95, exiting at Stillwater Avenue in Orono. Trucks then travel northeast on Stillwater Avenue, a two-lane arterial that connects Orono and Old Town, and crosses Penobscot River. On portions of Stillwater Avenue traveling through commercial areas in Orono and Old Town, the road has a center turn lane. There are two traffic signals on Stillwater Avenue providing access to commercial developments within 0.2 mile northeast of the Interstate 95/Stillwater Avenue interchange. Other traffic signals on the primary truck route on Stillwater Avenue include signals at the intersections of Benoch Road, College Avenue/Old Mill Road, at Old Mill Elementary School, and near Sanford Avenue (providing access to commercial development). Trucks travel northeast approximately 2.5 miles on Stillwater Avenue until it reaches the unsignalized intersection of Stillwater Avenue and Center Street. Trucks turn right on Center Street and travel approximately 0.5 mile east to the intersection with South Main Street, a signalized intersection. Center Street is a two-lane road without a center turn lane. Once trucks turn right on South Main Street, they travel approximately 1.25 miles south to Portland Street. South Main Street is a two-lane arterial. There are no signals or stop signs between the intersection of Center Street and the pulp mill. Trucks make a left turn onto Portland Street, a local access road that ends at the pulp mill site, less than 0.1 mile east of the intersection with South Main Street. Table 3-11 identifies the average annual daily traffic on roadway segments between Interstate 95 and the pulp mill.

Roadway capacity is defined as the maximum number of vehicles that can be served by the roadway section. In this case for South Maine Street (a two-lane arterial), the capacity is estimated at approximately 800 vehicles per hour per lane using industry standard methods (Florida DOT 2009).

Figure 3-7. Regional Road and Rail Network in and Near Old Town, Maine

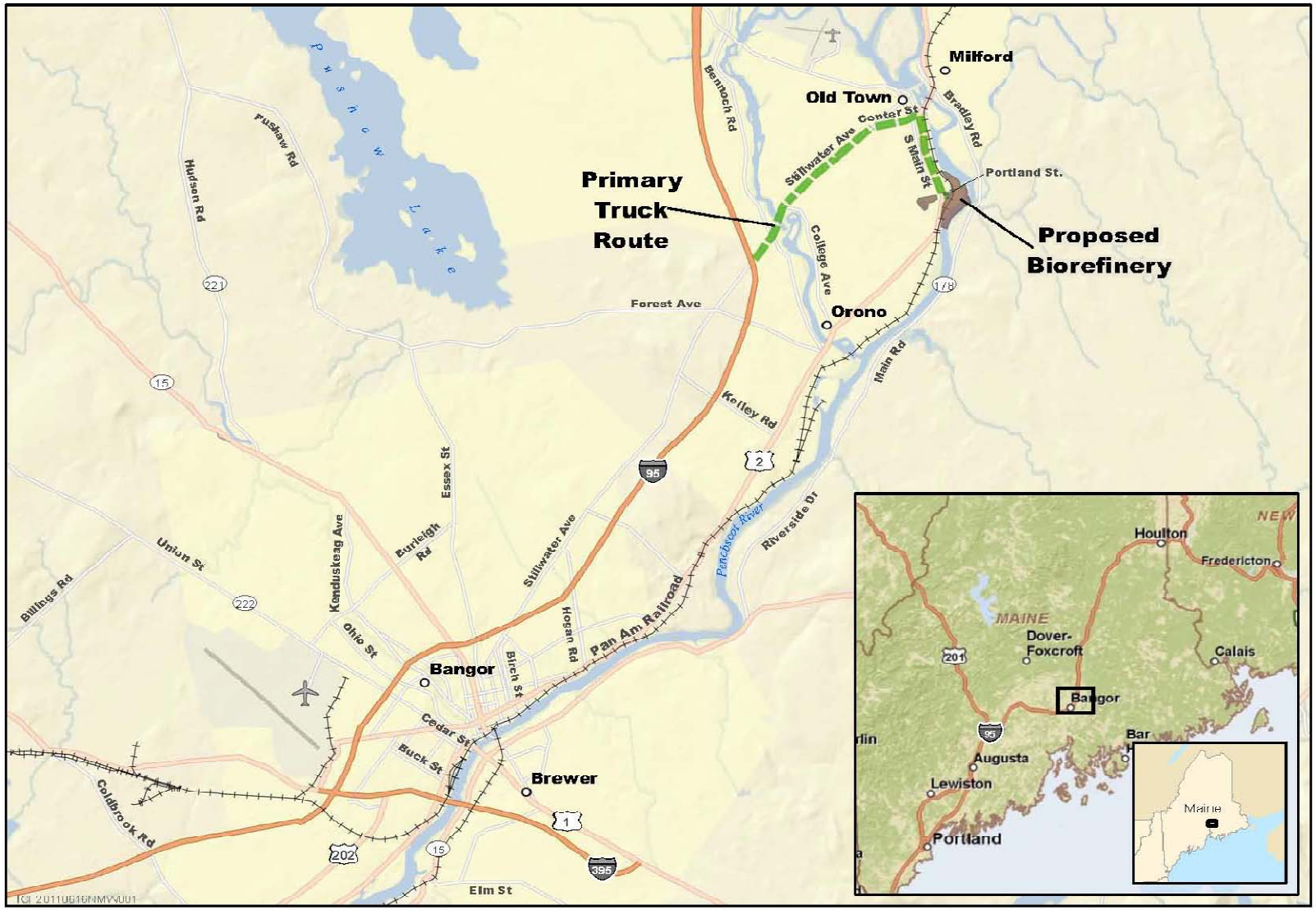


Figure 3-8. Local Transportation Network in the Immediate Vicinity of OTFF

Table 3-11. Existing Condition Traffic Volumes[a]

Location	Average Annual Daily Traffic in Both Directions	Year
Stillwater Avenue northeast of Interstate 95 Northbound Ramps (Orono)	19,340	2009
Stillwater Avenue at Orono/Old Town City Limits	18,100	2008
U.S. 2A (Stillwater Avenue) southwest of U.S. 2A (Center Street)	16,430	2008
U.S. 2A (Center Street) west of Main Street	11,720	2009
U.S. 2 (South Main Street) south of U.S. 2A (Center Street)	6,820	2009
U.S. 2 (South Main Street) south of Bowdoin Avenue	7,290	2008

a. Source: Maine Department of Transportation, 2009 Transportation Count Book.

3.10.2 Environmental Consequences of the Proposed Action

3.10.2.1 Construction Impacts

Construction trucks would transport materials used to construct the biorefinery at the pulp mill site. These materials would include concrete, steel, piping, rebar, construction equipment, and building materials such as siding, roofing, and windows. Although these materials can be obtained from a variety of locations, it is likely most construction trucks would arrive at the Interstate 95/Stillwater Avenue interchange from the south, coming from the Bangor metropolitan area, which is south of the Interstate 95/Stillwater Avenue interchange.

Proposed project construction would temporarily increase the amount of automobile and truck traffic due to construction workers and deliveries to the facility. No new roads would need to be constructed for construction trucks to access the site.

Construction trucks would predominantly use the truck route from Interstate 95 to the pulp mill site described in Section 3.10.1 for delivery of construction materials. For the approximately 14-month construction period, there would be approximately 100 truck trips per week, or 20 truck trips per day, to and from the pulp mill site on this truck route.[3] This level of additional truck traffic on the Stillwater Avenue portion of the truck route represents a 0.1 percent increase in traffic on this corridor based on a review of traffic volumes listed in Table 3-11. Construction truck traffic would represent an estimated 0.2 percent increase in truck traffic to the proposed project site compared to existing conditions on the South Main Street segment of the truck route. This level of traffic increase would not generate any traffic operations issues, because the roadway would continue to operate well below the estimated capacity of 800 vehicles per hour per lane.

OTFF estimates that the approximately 80 construction workers hired locally would generate an additional 800 passenger vehicle trips[4] per week at the pulp mill site during the 14-month construction period. This translates to 160 construction worker vehicle trips per day generated during the duration of the construction period (assuming a 5-day construction work week). Construction workers would arrive at the pulp mill site from a variety of locations. However, because the major population center in the region surrounding the pulp mill site is in Bangor, south of the proposed project site, it is assumed that most construction worker traffic would come from the south using Interstate 95 or arterials such as South Main Street to reach the pulp mill site. Assuming all construction worker traffic used the same truck route described in Section 3.10.1, as a worst-case scenario, construction worker traffic would generate an estimated increase of 0.8 percent in average daily traffic volume on the Stillwater Avenue portion of the truck route, and approximately 2.2 percent increase on the South Main Street portion of the route using traffic volumes identified in Table 3-11. Again, this level of traffic increase would not generate any traffic operations issues, because the roadway would continue to operate well below the estimated capacity of 800 vehicles per hour per lane.

[3] Based on the OTFF estimate of 50 trucks per week (OTFF 2011c). Assuming an average 5-day per week construction work week would equal 10 construction-related trucks visiting the site each day. Fifty trucks per week equals 100 truck trips per week (1 trip entering the site and 1 trip leaving the site), or 20 truck trips per day.
[4] Based on the OTFF estimate of 400 construction worker vehicle trips per week (OTFF 2011c). Four hundred vehicles per week equals 800 vehicle trips per week (1 trip entering the site and 1 trip leaving the site).

3.10.2.2 Operations Impacts

Biorefinery operations would generate additional truck and rail traffic to provide raw materials for the biorefinery and to transport green oil and sugar extract out of the pulp mill site. During the operational life of the biorefinery, woodchips would be delivered to the site via truck at a rate of 14 trucks per day (or 28 truck trips per day), enzymes at a rate of 7 trucks per year (or 14 truck trips per year), sulfuric acid at a rate of 1 truck per month (or 2 truck trips per month), sodium hydroxide at a rate of 3 trucks per year (or 6 truck trips per year), and ammonia at a rate of 3 trucks per month (or 6 truck trips per month).[5] Trucks would access the site from Interstate 95, taking the Stillwater Avenue exit, turning right at Center Street and right onto South Main Street, and entering the site using the current access to OTFF property on Portland Street off South Main Street. This level of traffic increase would not generate any traffic operations issues, because the roadway would continue to operate well below the estimated capacity of 800 vehicles per hour per lane. During operations, the biorefinery would require a permanent work force of approximately 26 employees, which the surrounding area's population and skilled personnel could support. Biorefinery operations would result in an estimated increase to the site of 364 vehicle trips per week, or 52 vehicle trips per day. The additional work force would likely be hired from the local area, and would arrive at the site from a variety of locations. However, because most of the Bangor metropolitan area population is south of the pulp mill site, it is likely that most of this traffic would arrive at the pulp mill from the south. Assuming that all employees operating the biorefinery traveled on the truck route described in Section 3.10.1, average daily traffic volumes on the Stillwater Avenue portion of the truck corridor would increase by 0.3 percent, and on the South Main Street portion of the truck corridor by 0.8 percent compared to existing conditions. For South Main Street, this level of traffic increase would not generate any traffic operations issues, because the roadway would continue to operate well below the estimated capacity of 800 vehicles per hour per lane. An 0.3 percent increase in traffic should have little impact on the Stillwater Avenue level of service. The transport of by-products, green oil, and sugar extract would require 6 rail cars per month, creating 12 rail car trips per month (6 inbound and 6 outbound). Rail transportation would be via the Pan Am Railways rail line that runs between Mattawamkeag through Old Town, to Portland, Maine, to the south. Pan Am Railways, the owner and operator of the rail infrastructure on and near the proposed project site, indicates that this increase in rail traffic would not create rail yard or rail line capacity issues (Personal Communication, Doug Steward, Pan Am Railways, June 16, 2011). The rail line generally parallels roads with few rail crossings in Old Town, south of the proposed project site. Existing rail crossings are gated with rail signals. An additional 12 rail car trips per month would not be anticipated to greatly increase rail crossing delays compared to existing conditions or to create any safety issues (Personal Communication, Doug Steward, Pan Am Railways, June 16, 2011).

3.10.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery. There would be no increase in vehicle or rail traffic under the No-Action Alternative.

3.11 Noise

Noise is defined by the American National Standards Institute as unwanted sound. It has the potential to interfere with communication, at sufficiently high levels could damage hearing, and in some cases, is

[5] Based on OTFF estimates. Similar to the estimates calculated for construction, the number of truck trips is calculated by doubling the number of truck visits (one trip entering the site and one trip leaving the site).

viewed as an annoyance. Noise can occur at different levels and frequencies, depending on the source and the distance away from the listener.

The standard unit for measuring sound pressure levels is the decibel (dB). A decibel is a unit that describes the amplitude (or difference between levels) of sound. Typically, environmental and occupational sound pressure levels are measured in decibels on an A-weighted scale (dBA). The A-weighted scale de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear. Figure 3-9 shows some example sound levels associated with common indoor and outdoor sources measured in dBA.

Analysts use various noise metrics to describe noise measurements. The L_{max} is the maximum noise level over the measurement period, and the L_{eq} (level equivalent) is the energy-averaged noise level over the measurement period. The day/night average sound level (DNL) is essentially a 24-hour average sound level with a 10 dB upward adjustment for nighttime sound. This adjustment is made to account for people's increased sensitivity to noise at night.

Figure 3-9. Sound Levels of Common Outdoor and Indoor Sound Sources

Common Outdoor Sound Levels	dB(A)	Common Indoor Sound Levels
Jet flyover at 1,000 feet	110	Rock Band
	100	Inside Subway Train (New York)
Gas Lawnmower at 3 feet		
Diesel Truck at 50 feet Noisy Urban Daytime	90	
		Food blender at 3 feet Garbage Disposal at 3 feet
	80	
		Very loud Speech at 3 feet
Gas Lawnmower at 100 feet		
	70	
Commercial Area Heavy Traffic at 300 feet		Normal Speech at 3 feet
	60	Large Business Office Quiet Speech at 3 feet Dishwasher Next Room
	50	Small Theater, Large Conference Room (Background)
Quiet Urban Nighttime		
	40	
Quiet Suburban Nighttime		Library
	30	Bedroom at Night Concert Hall (Background)
Quiet Rural Nighttime		
	20	
		Broadcast and Recording Studio
	10	
	0	Threshold of Hearing

3.11.1 Affected Environment

Noise sources in the study area include the existing pulp mill, vehicular traffic along U.S. Route 2 and other local roads, and freight train activity (approximately two trains per day).

3.11.1.1 Proposed Action

3.11.1.1.1 Construction Impacts

Construction of the biorefinery could involve the use of heavy construction equipment, which would temporarily result in increased noise and vibration. Table 3-12 lists typical construction equipment and typical noise levels produced by this equipment. The table lists L_{max} sound levels at 50 feet and the typical acoustical use factor. The acoustical use factor is the percentage of time each piece of construction equipment is assumed to be operating at full power (i.e., its noisiest condition) during construction and is used to estimate L_{eq} values from L_{max} values. For example, the L_{eq} value for a piece of

Table 3-12. Typical Construction Equipment and Noise Emission Levels[a]

Equipment	Typical Noise Level (L_{max})[b]	Acoustical Use Factor	Typical Noise Level (L_{eq})[b]
Compactor (ground)	83	20	76
Bulldozer	82	40	78
Dump truck	76	40	72
Excavator	81	40	77
Generator	81	50	78
Grader	85	40	81
Pickup truck	75	40	71
Warning horn	83	5	70
Crane	81	16	73

a. Source: Federal Highway Administration 2006.
b. dBA, A-weighted decibel level, measured at 50 feet.

equipment that operates at full power 50 percent of the time (acoustical use factor of 50) is 3 dB less than the L_{max} value.

The use of a bulldozer for the proposed project would result in a noise level of approximately 82 dBA (L_{eq}) at 50 feet. Assuming simple geometric attenuation of 6 dB per doubling of distance, the noise level at the nearest residence (at about 650 feet) would be 60 dBA (L_{eq}). Construction noise would be temporary (4 to 6 months for construction) and only during daytime hours. Therefore, although there would be minimal noise impacts, they would be short-term impacts during construction only.

Construction workers would not use highly dynamic equipment such as pile drivers. This and the fact that residences are more than 650 feet from the site mean there would be no adverse impacts from vibration.

3.11.1.1.2 Operations Impacts

No new major plant noise sources would be added to the site. Woodchips would be transported via trucks to the facility and re-chippers (to reduce the size of oversized chips) would be fully enclosed in buildings. Consequently, it is expected that biorefinery operation noise levels would be lower than existing plant noise levels.

Residents along U.S. Route 2 and other truck routes would experience additional truck noise. However, the incremental increase in truck traffic (approximately 14 trucks per day) would not be a noticeable change compared to existing truck traffic of 555 trucks per week, or 70 per day). Therefore, minimal increases in vehicular noise levels are expected. The addition of 12 rail car trips per month to the existing rail line would not result in a noticeable increase in rail noise.

3.11.2 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery. There would be no increase in noise levels under the No-Action Alternative.

3.12 Socioeconomics and Environmental Justice

3.12.1 Affected Environment

3.12.1.1 Environmental Justice

Executive Order 12898 (*Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations*, February 11, 1994) directs federal agencies to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." In implementing Executive Order 12898 in the context of NEPA, a lead agency must determine whether a proposed action would have any disproportionately high or adverse human health or environmental effects on low-income or minority populations compared to impacts on the general population.

CEQ guidance for implementing Executive Order 12898 in the context of NEPA (*Environmental Justice. Guidance under the National Environmental Policy Act*, December 10, 1997) identifies a minority population as an affected area where more than 50 percent of the population belongs to a minority group or where the percentage presence of minority groups is meaningfully greater than in the general population.

The proposed project site is in Census Tract 71 of Penobscot County, Maine, on the west bank of Penobscot River. Census Tract 80.01 of Penobscot County is just across Penobscot River from the proposed project site. Both census tracts are included in the affected area for purposes of this environmental justice analysis, as are the City of Old Town and Penobscot County as a whole.

Table 3-13 lists the minority presence as a share of the total population in Census Tracts 71 and 80.01, the City of Old Town, Penobscot County, and in the area of comparison, the State of Maine. The presence of Native Americans in the affected area is considerably higher than the presence of Native Americans in the

Table 3-13. Minority Presence[a]

Geography	Total Population	Percent of Total Population								
		White	Black or African American	Alaska Native or American Indian	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino[b]	Total Minority Race or Ethnicity[c]
Census Tract 71	5,054	94.3	0.7	1.7	0.8	0.1	0.2	2.2	1.2	6.4
Census Tract 80.1	4,562	96.2	0.4	1.4	0.4	0.0	0.2	1.3	0.3	3.9
Old Town	7,840	93.1	0.9	1.6	1.8	0.1	0.3	2.2	1.3	7.6
Penobscot County	153,923	95.4	0.8	1.2	0.9	0.0	0.2	1.5	1.1	5.3
Maine	1,328,361	95.2	1.2	0.6	1.0	0.0	0.3	1.6	1.3	5.6

a. Source: U.S. Census Bureau 2010a.
b. Individuals who identify as Hispanic, Latino, or Spanish may be of any race; the sum of the other percentages under the "Percent of Total Population" columns plus the "Hispanic or Latino" column therefore do not equal 100 percent.
c. Minority population, for the purposes of this analysis, is the total population for the U.S. Census designated place minus the non-Latino/Spanish/Hispanic white population.

State of Maine. There is also a higher percentage of Asians in Old Town and of individuals of two or more races in Old Town and Census Tract 71. There are slightly more individuals of any minority race or ethnicity in Census Tract 71 and in Old Town than in the State of Maine as a whole. Because the share of any specific minority in the total population in any affected area is small and the total minority presence reaches at most 7.6 percent (in Old Town city), compared to 5.6 percent in the State of Maine, DOE does not consider the minority presence in the affected area as meaningfully greater than in the area of reference for the purpose of this environmental justice analysis. No minority populations, as defined in the CEQ guidance for implementation of the Executive Order 12898, were identified.

Table 3-14 lists the presence of individuals with low income as a share of the total population in Census Tracts 71 and 80.01, the City of Old Town, Penobscot County, and in the area of comparison, the State of Maine. Low-income presence is approximately 80 percent higher in Old Town than in the State of Maine, reaching 22.7 percent of the total population of Old Town. Low-income presence in Census Tract 71, the location of the proposed project, is almost 70 percent higher than in the State of Main as a whole, and reaches 21.4 percent of the total population. These numbers are also at least 45 percent higher than in the rest of Penobscot County. Because these shares are not only considerably higher than in the State of Maine, but also are over 20 percent of the local population, DOE considers Census Tract 71 and the City of Old Town to be low-income populations for the purposes of this environmental justice analysis.

Table 3-14. Low-Income Presence[a]

Geography	Population with Income Below Poverty Level	Percent Share of Total Population
Census Tract 71	1,088	21.4
Census Tract 80.1	454	9.9
Old Town	1,745	22.7
Penobscot County	20,742	14.7
Maine	161,582	12.6

*Source: U.S. Census Bureau 2010b.

3.12.1.2 Socioeconomics

CEQ NEPA implementing regulations state that economic and social effects of alternatives should be analyzed in NEPA documents when they are interrelated with natural or physical effects, and that the human environment to be analyzed should be interpreted comprehensively to include the relationship of people with the natural and physical environment (40 CFR 1508.14).

The proposed project site is in Old Town, Penobscot County, Maine. For purposes of analyzing potential socioeconomic impacts of the Proposed Action and the No-Action Alternative, the relevant affected area is that within commuting distance of the site, because it would be the area where biorefinery construction and operations workers would likely reside and expend a considerable share of their resources. The Office of Management and Budget defines Metropolitan Statistical Areas based on commuting ties, and defines Penobscot County as constituting the Bangor Metropolitan Statistical Area, Bangor being its largest city, approximately 15 miles to the south of the proposed project site (OMB 2009). For purposes of this socioeconomics analysis, the affected area is Penobscot County (Bangor Metropolitan Statistical Area). Penobscot County has a population of 153,923 (U.S. Census Bureau 2010a) and as of 2009, per capita personal income was $33,767, compared to $36,547 in the State of Maine as a whole (BEA 2011). As of April 2011, Penobscot County had an estimated labor force of 78,334 and an unemployment rate of 8.1 percent (6,353) (BLS 2011). Approximately 5,120 workers were estimated to be employed in construction in Penobscot County in 2009, and 4,795 in manufacturing (BEA 2011).

3.12.2 Environmental Consequences of the Proposed Action

3.12.2.1 Environmental Justice

The existence of disproportionately high and adverse human health and environmental effects depends on the existence in the affected area of minority or low-income populations and on the existence of significant impacts of the proposed project.

To identify and address disproportionately high and adverse human health or environmental effects on minority or low-income populations, DOE adopted the following analytical process:

1. For purposes of the environmental justice analysis, identify the affected area.
2. Characterize the affected area regarding the presence of minority and low-income populations. In doing so, and following CEQ guidance, identify areas were where (a) minority or low-income presence exceeds 50 percent, or (b) minority or low-income presence is meaningfully greater than the percentage presence in the general population or other appropriate unit of geographic analysis.
3. Assess potentially high and adverse human health or environmental effects described in other resource sections of this EA.
4. If other resource sections identify significant impacts, determine whether there would be disproportionately high and adverse impacts to minority and/or low-income populations based on CEQ guidance.

Section 3.12.1.1 reports the results of steps 1 and 2. Several minority populations (totaling 6.4 percent combined) and two low-income populations were identified (Census Tract 71 and the City of Old Town). The analysis then proceeded to step 3.

Although some adverse impacts to resources were identified as a result of the proposed project, none were determined to be high and adverse human health or environmental effects. Because no high and adverse human health or environmental effects were identified, the analysis did not proceed to step 4. There would be no disproportionate impacts to minority or low-income populations from the proposed project.

3.12.2.2 Socioeconomics

The primary socioeconomic impacts resulting from the proposed project consist of an increase in demand for labor and non-labor inputs during construction and operations.

Proposed project construction is expected to take 14 months. At its peak, employment would reach 80 construction contractor personnel. Because this is less than 1.6 percent of those estimated to be employed in construction in Penobscot County (see Section 3.11.1.2) and because the current unemployment rate in the county is 8.1 percent, construction personnel are expected to be largely available locally. To the extent that construction materials are demanded from local or regional sources, this would also generate indirect job opportunities. Increases in demand for direct and indirect labor employed by the proposed project would also induce further employment generation through the increased labor demand that follows the increased consumption of those employed. Because direct, indirect, and induced employment would be a small share of the local labor force of 78,334 and population of 153,923, and because labor is expected to be largely available locally to satisfy this increase in demand, any migration to the area in response to increased demand for labor are expected to have no impact on local housing and infrastructure. The short-term increase in demand for labor would have a minor positive impact on the local economy.

During operations, 26 full-time employees would be hired for two 12-hour shifts. These employees are expected to be available locally or regionally, which would constitute a long-term minor positive impact on the local economy.

3.12.3 Environmental Consequences of the No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funding to OTFF, and OTFF would not build the biorefinery. There would be no impacts to low-income or minority populations in the affected area under this alternative. The minor positive impact to the local economy from the biorefinery construction and operations would not occur.

3.13 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

CEQ regulations require consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). Biorefinery construction and operations would require short-term uses of land and other resources. *Short-term use of the environment*, as used here, is use that occurs during the life of the proposed project, whereas *long-term productivity* refers to the period after proposed project decommissioning, equipment removal, and land reclamation and stabilization. Short-term use of the proposed project site for the proposed biorefinery would not affect the long-term productivity of the area. If OTFF decided that the proposed project had reached its useful life, it could decommission and remove the equipment and new infrastructure and return the building to its original condition, the site could be used for another purpose at the pulp mill.

3.14 Irreversible and Irretrievable Commitments of Resources

The proposed project would not cause an additional irretrievable commitment of land because the biorefinery would be within the operating boundaries of an existing industrial facility. There would be an irreversible commitment of energy and construction materials to build the facility. Water resources used would be returned to the environment via water treatment facilities.

Implementation of the Proposed Action would require the commitment of financial resources by OTFF, its investors and lenders, and DOE for proposed project construction and operations. However, these

commitments are consistent with the purpose of and need for the Proposed Action, as described in Chapter 1.

3.15 Unavoidable Adverse Impacts

Biorefinery construction and operations would cause unavoidable emissions of some criteria air pollutants, and use of electric power and natural gas. Water used from cooling would be discharged back into Penobscot River under an existing MEPDES permit, with little evaporative loss. The need for construction materials such as steel and concrete would be unavoidable, but would represent a small fraction of available materials.

4. CUMULATIVE IMPACTS

4.1 Introduction

CEQ NEPA implementing regulations require the consideration of cumulative impacts as part of the process (40 CFR 1508.7):

> "Cumulative impact" is 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 (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a period of time.

This chapter analyzes potential cumulative impacts to selected resource areas described throughout Chapter 3. The effects associated with the proposed project are analyzed in combination for their incremental contribution to cumulative effects when added to impacts from other planned and reasonably foreseeable actions. For an affected resource area, each reasonably foreseeable future action, including the Proposed Action, adds an increment to the total (cumulative) impact. For this analysis, the past and present effects are accounted for in the existing baseline of the affected environment sections of this EA.

4.2 Existing and Reasonably Foreseeable Projects

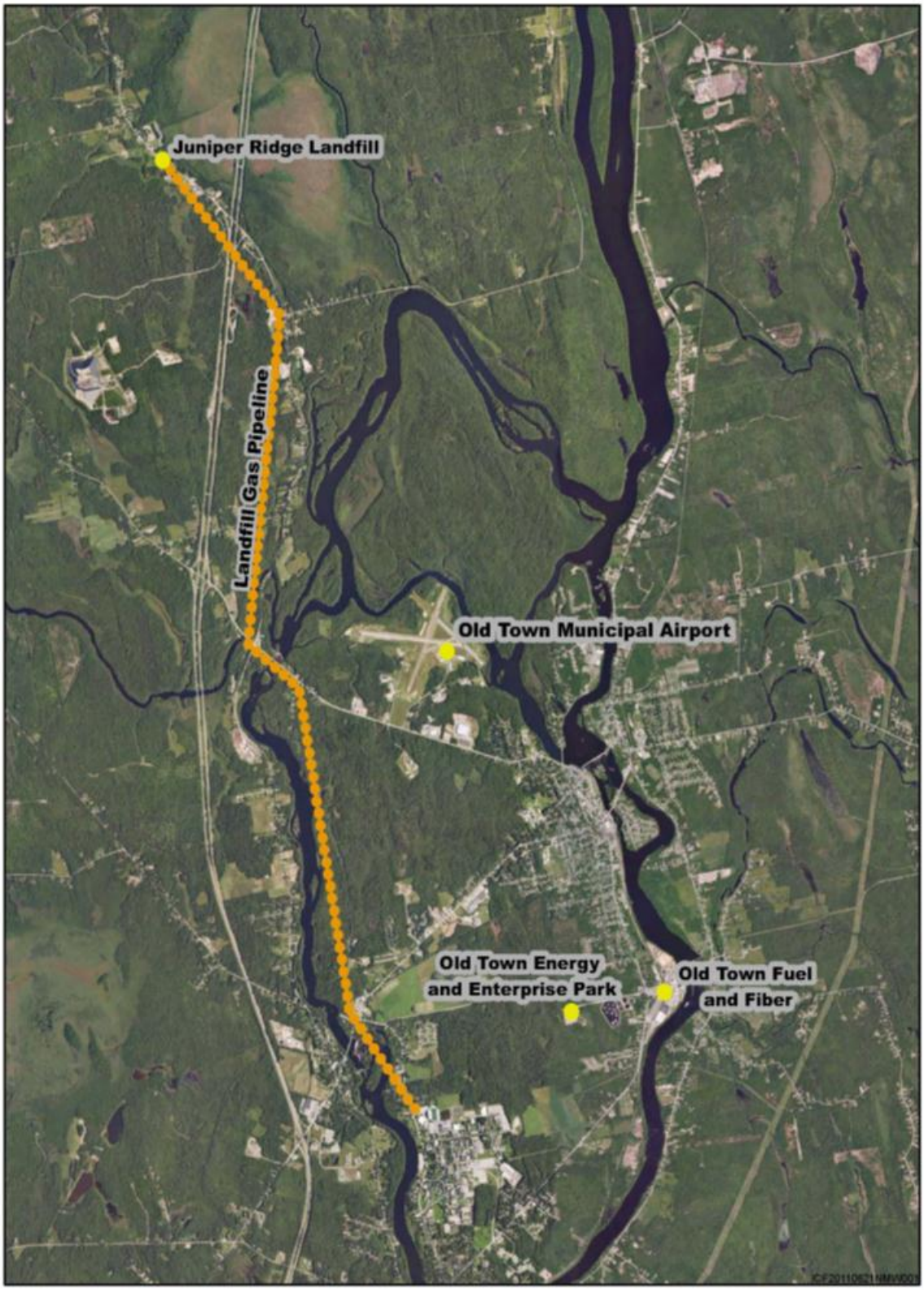
DOE reviewed information on past, present, and reasonably foreseeable future projects and actions that could result in impacts to a particular resource over the same period and in the same general location as the proposed project. DOE consulted with the City of Old Town planning departments via telephone and e-mail, and searched via the internet to identify current and future projects in the vicinity of the proposed project.

In addition, DOE spoke with OTFF regarding future plans for the biorefinery and other projects at the pulp mill. Currently there are no firm commercialization plans for the proposed project; it would continue as a demonstration-scale project for the foreseeable future. OTFF anticipates that there could be interest from other mills in adopting their wood extract process. However, there are no firm plans for marketing at this time, nor has OTFF received any expressions of interest from other mills.

Projects identified as a result of this research are shown in Figure 4-1 and described below.

- **Pulp Mill -** The pulp mill has been operating since the mid 1960s, and currently converts woodchips into pulp in the form of thick fiber boards using the Kraft pulping process. The pulp is then sold to paper manufacturers for further processing. Before use as the Kraft mill, the pulp mill had been operated as a chemical pulp mill since 1882. From the early 1970s until 2005, the mill site also operated a tissue mill. As part of the Penobscot River Restoration Project (see next project), the OTFF water supply intake was relocated in summer 2011.
- **Penobscot River Restoration Project -** The Penobscot River Restoration Project is a collaborative effort intended to restore native sea-run fish and their habitat while also providing the opportunity to maintain hydropower production. Major partners in the project include dam owner PPL Corporation; federal, state, and tribal governments; the Penobscot Trust; and six conservation groups. Through this project, the Penobscot Trust has purchased three dams from PPL Corporation and will remove the two most seaward dams, Great Works and Veazie. The Penobscot Trust intends to construct a fish bypass around the third dam, Howland, allowing it to continue its hydropower generating function. PPL Corporation received the opportunity to increase generation at six existing dams, which will

Figure 4-1. Existing and Reasonably Foreseeable Projects



maintain all of its hydropower generation in the proposed project area. PPL Corporation will also improve fish passage at four additional dams. Dam modification and removal is scheduled for completion by the end of summer 2013.

- **Old Town Energy and Enterprise Park -** The City of Old Town is in the early stages of planning the development of 120 acres of land for this industrial park off Penny Road. This site is zoned I-2 and is compatible with most industrial development. This park will incorporate the design of a limited-access parkway to the University of Maine via Penny Road. The new road access to and from the university would alleviate the traffic congestion on College Avenue and Stillwater Avenue, and would provide an alternative route for people living in Old Town, traveling to Interstate 95, or living in communities on the other side of Penobscot River.
- **Airport Improvements -** The City of Old Town prepared an update to the Airport Master Plan in 2002. This plan identified several items that need to be completed to enhance the general aviation industry at Dewitt Field Airport. Some projects have already been completed, including a new seaplane base access road. The city received a $137,750 grant from the Federal Aviation Administration and applied for $16,482.50 from the State of Maine, and will match the $16,482.50 for improvements to aircraft turnarounds at each runway. Once these initial projects are complete, the city will look at improvements to the existing facilities, new taxiways, a runway, two hangers, and apron and tie-down areas. Other improvements that will help promote use of the airport will be new fuel facilities.
- **Airport Business Park Development -** The City of Old Town has invested $100,000 in the development of land at the airport for economic development. The project is currently in the early stages of subdivision, local and MEDEP site location processes, and obtaining Federal Aviation Administration release of the land for lease in the Airport Business Park. The city will develop this property as a green, pristine business site that will be a location for technology-based businesses, aviation-related businesses, and other identified cluster businesses.
- **Juniper Landfill Gas Project -** A contract to build a gas pipeline from an Old Town landfill to the University of Maine to provide campus heating needs was signed on December 21, 2010. Several gas line routes are currently being considered, and a decision on which route to select has not been made; therefore, it is not shown on Figure 4-1. The pipeline is expected to be approximately 6 miles long**.**

4.3 Summary of Cumulative Impacts

4.3.1 Biological Resources

As a result of the Penobscot River Restoration Project dam removal, the Penobscot Trust has applied for and received authorization from the Corps of Engineers to move the pulp mill's water supply intake downstream because it currently lies behind Great Works Dam. The water supply intake move is expected to occur by the end of 2011 and OTFF would begin using it early in 2012. Dam removal is currently underway. Dam removal and fish bypass construction will result in temporary impacts to water quality and aquatic species due to the presence of heavy equipment in the waterways, turbidity associated with construction, built-up sediment behind the dams, and noise.

The June 30, 2011, NMFS letter of concurrence for the proposed project (see Appendix B) indicated that if the Veazie Dam, which is approximately 7 miles downstream of the proposed project, was removed, the NMFS would need to reassess potential effects to the endangered shortnose sturgeon and the candidate species Atlantic sturgeon. However, based on the Effluent Report prepared for the proposed project (ICF 2011), DOE determined that there would be no adverse impacts to listed or candidate species in the portion of Penobscot River adjacent to the proposed project with the addition of the biorefinery to the existing wastewater treatment facility. The proposed project would not include any in-water activities,

and changes in effluent discharge as a result of the addition of biorefinery operations would not be expected to result in adverse impacts to aquatic species. Therefore, the Proposed Action would not impact the completion of the dam removal projects or contribute to the potential impacts associated with the dam removal projects.

4.3.2 Air Quality

During construction of the proposed biorefinery there would be increased emissions from construction equipment and vehicles. However, construction impacts are by nature temporary, so cumulative air quality impacts are expected to be minor and short term (4-6 months).

Proposed biorefinery operations would lead to increases in emissions from the facility and from the additional truck, car, and rail traffic generated by the project. However, at the predicted levels of project-related emissions, any changes in air quality in the project area should be minor, thereby cumulative air quality impacts should not lead to any violation of the NAAQS or the Maine Ambient Air Quality Standards. The air quality modeling that will be performed for the Title V permit amendment will include large emission sources in the region and the proposed project, and will demonstrate that when all of these sources are considered cumulatively there would be no violation of the ambient air quality standards.

By its nature, climate change is a cumulative impact, and emissions of greenhouse gases from the proposed project would not have a direct impact on the environment in the vicinity of the proposed project. As noted above, neither would these emissions alone cause appreciable climate change. However, these emissions could increase the concentration of greenhouse gases in the atmosphere, and, in combination with past and future emissions from all other sources, contribute incrementally to global climate change. Although climate impacts of very large emissions contributions (e.g., nationwide totals) can be quantified using modeling, at present there is no methodology that would allow reliable estimation of the specific climate change impacts (if any) the relatively small greenhouse gas emissions from the proposed project would produce in the vicinity of the project or elsewhere.

4.3.3 Noise

During construction of the proposed biorefinery, there could be an increase in cumulative noise impacts in the immediate vicinity due to the dam removal project currently underway adjacent to the pulp mill. However, construction impacts are by nature temporary, so cumulative noise impacts would be only short term (4-6 months). Noise associated with proposed biorefinery operations would not result in cumulative noise impacts because all operations would be confined to the existing facility inside the former tissue building and are not expected to be louder than existing pulp mill operations. There could be a slight increase in cumulative noise impacts from truck, vehicle, and rail traffic when considered with other reasonably foreseeable projects in the vicinity of the proposed project. However, the proposed project's incremental contribution to any potential increase in cumulative noise from the increased traffic would be negligible (see Section 3.11 for details).

4.3.4 Traffic

The projects identified in Section 4.2 could increase traffic (14 trucks per day and 52 vehicle trips per day for new employees) in the vicinity of the proposed project and the on surrounding highways. However, as a result of the Old Town Energy and Enterprise Park, a new access parkway to the University of Maine via Penny Road would be created. The new access road to and from the university would alleviate traffic congestion on College Avenue and Stillwater Avenue and would provide an alternative route for people living in Old Town, traveling to Interstate 95, or living in communities on the other side of Penobscot River. As shown in Section 3.10, the various roads used by traffic that would be associated with the

proposed project have enough capacity to handle increased traffic as a result of the proposed project. Depending on the future tenants of the Old Town Energy and Enterprise Park, additional traffic volume on Penny Road and other local roads could result in the need for additional road improvements (see Section 3.4 for details). Future traffic studies would be needed to determine if future improvements are necessary to accommodate further development of the Old Town Energy and Enterprise Park when project details become available.

4.3.5 Socioeconomics

The proposed project would have a positive impact on the local economy through the creation of jobs and spending in the area. This positive impact would further enhance the net benefits related to the projects identified in Section 4.2. Local resources such as schools, hospitals, parks, and public safety agencies could also expect an increase in activity due to the population increase. However, these resources would be supported by accompanying increases in the local tax digest due to the same growth factors.

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