Every line on this page contains proprietary information that Solazyme, Inc. requests not be released to persons outside the Government, except for purposes of review and evaluation.

Overview

Solazyme's proprietary platform utilizes non-photosynthetic cultivation of oil-bearing microalgae and other microbes for the production of non-alcohol based fuels and other hydrocarbon or lipid compositions on a large scale for use in transportation fuels. The platform includes: (1) microalgae strain selection; (2) feedstock selection and processing; (3) genetic engineering of microalgae strain(s) and other microbes; (4) scale up and optimization of fermentation processes; (5) oil extraction; and (6) oil to fuel conversion.

REDACTED
EXEMPTION 4

Strain/Feedstock Selection, Cultivation and Genetic Engineering

Some microalgae strains can be cultured under heterotrophic conditions (non-photosynthetic process using fermentation tanks) in which a fixed carbon source or feedstock provides energy for growth and lipid accumulation. These microalgae strains can utilize a variety of fixed carbon sources including sucrose, glycerol and cellulosic materials.

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EXEMPTION 4

Listed below are patent applications filed and owned by Solazyme regarding microalgae strain selection, feedstock selection and genetic engineering of microalgae strains and cultivation of these microalgae strains for the production of biomass and oils.

REDACTED
EXEMPTION 4

Oil Extraction Process

Once the oil-bearing microalgal biomass has been produced, the oil contained within the microalgal cells, typically in the form of triacylglycerides (TAGs), need to be extracted or separated from the cells. Part of Solazyme's platform technology includes several processes to extract the oil from the microalgal cells. The oil extraction process also include filtration, separation or purification steps needed before the crude algal oil (TAGs) can be subjected to chemical modifications to produce fuels. Listed below are patent applications filed and owned by Solazyme regarding oil extraction from oil-bearing microalgal biomass.

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REDACTED
EXEMPTION 4

Oil to Fuel Conversion

Because the crude oil produced by microalgae strains is in the form of TAGs, chemical modification of the crude oil needs to be performed in order to generate fuels. These chemical modifications include transesterification to produce biodiesel (fatty acid methyl esters, FAMEs), hydrotreating to produce renewable diesel and a combination of hydrotreating and hydrocracking to produce aviation/jet fuel. Listed below are patent applications filed and owned by Solazyme regarding the conversion of crude microalgal oil/high oil-bearing microalgal biomass into transportation fuels such as biodiesel (FAMEs), renewable diesel, and aviation/jet fuel.

REDACTED
EXEMPTION 4

Solazyme may own additional intellectual property in various forms that covers methods and compositions useful in the proposed project that are not listed above, including inventions conceived but not yet reduced to practice and inventions reduced to practice but not yet described in a filed patent application, as well as trade secrets. Also included in Solazyme's intellectual property are foreign-filed patent applications that correspond to the applications listed above.

Solazyme, Inc. 561 Eccles Avenue S San Francisco CA 94080

650 780 4777
650 989 6700 fax
solazyme.com

February 10, 2010

Ms. Julia Moody
US Department of Energy
Golden Field Office, MS 1501
1617 Cole Boulevard
Golden, Colorado 80401

Re: DE-FOA 0000096 – IP Recertification
Applicant Name: Solazyme, Inc. ("Solazyme")
Project Title: Solazyme Integrated Biorefinery (SzIBR):
Diesel Fuels from Heterotrophic Algae

Dear Ms. Moody:

The IP Recertification submitted on February 10, 2010 contains updated patent application information from the original IP Certification submitted on June 29, 2009 as part of Solazyme's response to Funding Opportunity Announcement Number: DE-FOA 0000096. The information that is contained in the February 10, 2010 IP Recertification is current and accurate as of the date of submission.

Best regards,

Harrison F. Dillon
President and CTO

SOLAZYME CONTACTS – DE-FOA-0000096

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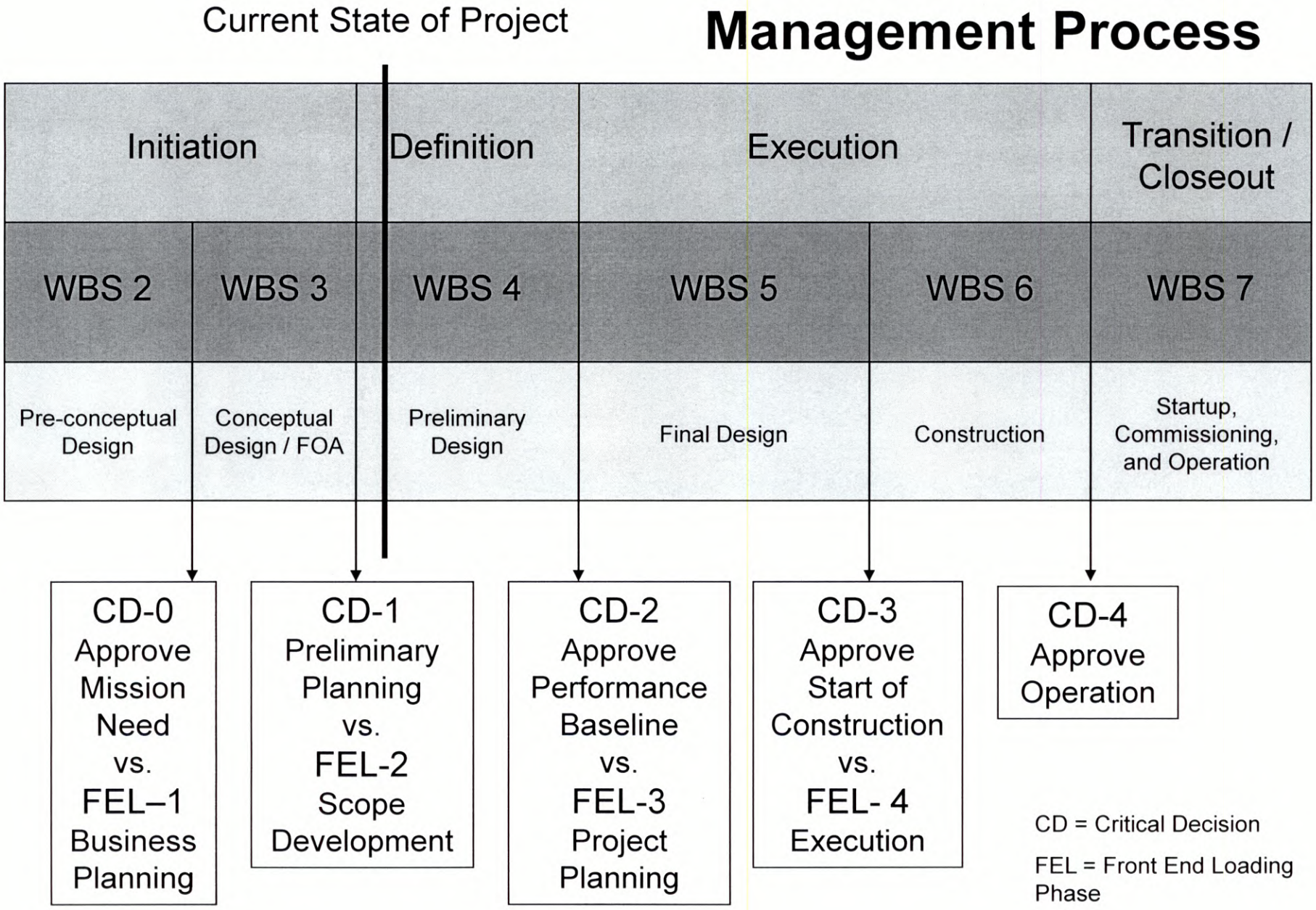
Biorefinery Project Management Process



IP Recertification Acceptance

From: Moody, Julia
Sent: Thursday, February 25, 2010 8:08 AM
To: 'Gypsy Achong'
Cc: Sterner, Christy; Lindeman, Chris
Subject: RE: Cover letter for Solazyme's IP recertification

All:

These are acceptable for my purposes.

Julia Cook Moody
Deputy Chief Counsel
for Intellectual Property
U.S. Department of Energy
Golden Field Office
303-275-4867

-----Original Message-----
From: Gypsy Achong [mailto:gachong@solazyme.com]
Sent: Tuesday, February 23, 2010 7:18 PM
To: Moody, Julia
Cc: Sterner, Christy; Lindeman, Chris
Subject: Cover letter for Solazyme's IP recertification

Dear Julia,

Following up on our conversation at Solazyme's Initial Planning Conference in Golden, Colorado on February 11, 2010, attached is a cover letter for the IP recertification that we submitted on February 10, 2010. Also attached is a copy of the February 10, 2010 IP recertification document. The cover letter is from our President and CTO, Harrison Dillon, confirming that the information in the IP recertification is accurate. Please let me know if you require anything further for IP certification.

Best wishes,

Gypsy

Gypsy Achong

Email: gachong@solazyme.com

Phone: 650 780 4777 x5273

Solazyme, Inc.

561 Eccles Avenue

South San Francisco, CA 94080

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NATIONAL ENVIRONMENTAL POLICY ACT DETERMINATION INFORMATION

DE-EE0002877
Solazyme Integrated Biorefinery (SzIBR): Diesel Fuels from Heterotrophic Algae

March 2011

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NATIONAL ENVIRONMENTAL POLICY ACT
DETERMINATION INFORMATION

DE-EE0002877
Solazyme Integrated Biorefinery (SzIBR): Diesel Fuels from Heterotrophic Algae

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NATIONAL ENVIRONMENTAL POLICY ACT
DETERMINATION INFORMATION

DE-EE0002877
Solazyme Integrated Biorefinery (SzIBR): Diesel Fuels from Heterotrophic Algae

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NATIONAL ENVIRONMENTAL POLICY ACT
DETERMINATION INFORMATION

DE-EE0002877
Solazyme Integrated Biorefinery (SzIBR): Diesel Fuels from Heterotrophic Algae

1.0 INTRODUCTION

Solazyme is proposing to build, operate and optimize a pilot-scale Solazyme Integrated Biorefinery (SzIBR). The SzIBR project will demonstrate integrated scale-up of Solazyme's novel heterotrophic algal oil manufacturing process, validate the projected commercial-scale economics of producing multiple advanced biofuels, and enable Solazyme to collect the data necessary to complete the design of the first commercial-scale facility.

The SzIBR project will be based on Solazyme's innovative process where algae are grown efficiently in the dark, i.e. heterotrophically, in industrial fermentation vessels to very high cell densities. The algae ingest and metabolize carbon substrates provided in the growth media and convert them into triglycerides. The algal triglyceride oil can then be processed by transesterification to yield biodiesel, or hydrotreated to yield renewable diesel or jet fuels.

The scope of the proposed project encompasses (i) building, operating and optimizing a pilot-scale integrated biorefinery, (ii) growing oil-producing algae in fermentation vessels on sugars derived from a range of feedstocks, (iii) extracting and purifying oil from the algae, (iv) refining the algal oil to standard liquid transportation fuels including biodiesel and renewable diesel, (v) optimizing parameters at both laboratory and pilot scale, and (vi) gathering data to assist in the design of subsequent demonstration and commercial facilities.

The primary objectives of the SzIBR project are to integrate all pre-refining process unit operations successfully into a unified biorefinery, to show that the SzIBR process can be used to produce with current industrial biomanufacturing technology inexpensive, high-quality, renewable oil usable by the existing petroleum refining, distribution, and retail infrastructure grid, and to accelerate development of high-impact lignocellulosic feedstocks. The project advances the goals of the DOE Biomass Program and accelerates the nation's ability to achieve the advanced biofuels production targets mandated by the new federal Renewable Fuel Standard (RFS2).

The SzIBR project will be located at 900 N.E. Adams Street, Peoria, Illinois, 61603 in the EN portion of the PMP Fermentation Products, LLC (PMP) existing commercial manufacturing facility. Solazyme will acquire Parcel 2 of the existing PMP site as shown in Appendix A ("Parcel 2"). The acquisition includes the EN process building and contents, utility building and contents, and 3 wells.

The SzIBR project will use existing utility hookups (including the Greater Peoria Sanitary District (GPSD) sewer and city water). Ex 4 and Ex 4 are available within the utility building on Parcel 2. Parcel 2 also includes ancillary

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process equipment such as process and storage tanks as well as other process equipment that are currently idle. Solazyme at this time does not intend to use all of this ancillary equipment. If Solazyme chooses to use any or all of this equipment at a later date, Solazyme will obtain any of the necessary permits from the Illinois Environmental Protection Agency (IEPA) and other agencies, as required, prior to use. Additionally, Solazyme will obtain its own water use contract with the City of Peoria, waste water contract with GPSD, and NPDES permit for the SzIBR. Construction will involve installation of equipment to recover oil from the algae once fermentation is complete. All required equipment is commercially available. Minor remodeling of the interior space will be required to install the equipment necessary for the SzIBR project.

Solazyme will utilize feedstock supplies delivered to it's preexisting and fully permitted laboratory facilities in South San Francisco, California to optimize fermentation processes during set up of the pilot-scale equipment. Work at this facility will only include ordinary, on-going laboratory activities and no algal oil refining will occur at this location.

The SzIBR project will use domestically-sourced sucrose as a transitional feedstock. During the later phases of the pilot-scale project, Solazyme intends to run a single demonstration batch of cellulosic sugars. An existing and fully permitted facility in York, Nebraska operated by a Solazyme sub-contractor will convert lignocellulosic biomass to cellulosic sugars via enzymatic hydrolysis and deliver them to either the SzIBR facility or to the Solazyme laboratory facilities. No new equipment or construction is required at this Solazyme partner's facility. Additionally, an existing and fully permitted pilot manufacturing facility located in EX 4 and operated by a Solazyme sub-contractor will convert EX 4 and deliver them to either the SzIBR facility or to the Solazyme laboratory facilities. All new equipment related to the SzIBR project, except for the process dryer, will be located within the existing EN process building on Parcel 2 of the PMP site (i.e., the SzIBR Facility).

The SzIBR project will utilize existing biorefineries to refine the purified algal oil into biodiesel and renewable diesel. Solazyme will transport a portion of the purified algal oil produced at the SzIBR facility to a transesterification refining facility in Newton, Iowa where it will be transesterified into ASTM D6751 standard biodiesel. Another portion of the algal oil produced at the SzIBR will be transported to a refining facility in Pasadena, Texas for conversion to renewable diesel. No new equipment or construction is required to support the SzIBR project at either refining facility.

The project schedule includes:

- Budget Period 1 (21 months) will be limited to preparation and validation of the SzIBR risk management plan, completion of the NEPA process, submission of DOE application documents, completion of preliminary engineering drawings, submission of applicable regulatory permit applications, finalization of equipment specifications with vendors, generating facility safety plans at the SzIBR and at Solazyme in South San Francisco, definition of the commissioning criteria for the SzIBR, submission of required reports, procurement of long lead equipment

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items (dryer and evaporator systems), and commitment of all process plant equipment.

- Budget Period 2 (23 months) consists of a detailed engineering design, balance of plant procurement, and construction phase to assemble and qualify SzIBR, and an operational phase when Solazyme shall conduct a series of campaigns through the entire integrated process flow at the SzIBR, collect extensive process data, and optimize the process parameters. This budget period also includes procurement of sugars derived from lignocellulosic feedstocks via EX 4 EX 4 from partner organizations, optimization of fermentation performance at laboratory scale in support of operations at the SzIBR, refining of algal oil from the SzIBR to standard liquid transportation fuels, and submission of reports.

- Budget Period 3 (15 months) will continue optimization on cellulosic-derived sugar streams.

At the conclusion of the SzIBR project, Solazyme anticipates transforming the pilot-scale SzIBR in place into a demonstration-scale SzIBR as part of an accelerated pathway to commercialization. It is anticipated that the equipment purchased for the SzIBR project will continue to be used as part of that facility upgrade.

1.1 Recommended NEPA Determination

Solazyme retained the services of an experienced independent consulting firm that has **recommended that the SzIBR project be categorically excluded from further NEPA review for both Budget Period 1 and Budget Period 2.** A Categorical Exclusion under 10 CFR 1021, Subpart D, Appendix A9 and B3.6 is warranted because the SzIBR project comprises information gathering, data analysis, conceptual design, laboratory- and pilot- scale research and development activities. Although the project is split between Budget Period 1 and Budget Period 2, this recommended determination evaluates all tasks under both budget periods.

Detailed reasoning for this determination includes:

- The SzIBR project will be sited at an existing and operational commercial manufacturing facility that will be operated and under the complete control of Solazyme.

- All equipment, except the dryer, will be installed within pre-existing buildings. Further, all equipment will be installed on the existing industrial site located at 900 N.E. Adams Street Peoria, IL 61603.

- No environmental surveys will be needed to proceed with the SzIBR project because it will not involve any ground disturbing activities that could potentially

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disturb sensitive resources such as wetlands, cultural resources, threatened and endangered species, or sensitive ground water areas.

- A solid waste permit is not likely to be required for the SzIBR project.
- Waste water from SzIBR will be handled within a contract with GPSD.
- A National Pollution Discharge Elimination System (NPDES) discharge permit for surface water runoff and non-contact cooling water will be obtained for the facilities associated with the SzIBR project.
- A state air quality construction and operating permit from the IEPA will be required for emissions generated from the new equipment associated with the SzIBR. The SzIBR will emit a relatively small amount of air emissions, which would not present a significant environmental impact.
- No new permits or modification of existing permits will be required at Solazyme's laboratory facilities in South San Francisco, CA, and at the facilities of Solazyme's partners, as noted above. Furthermore, all locations can properly handle and treat all wastes generated in the SzIBR project with existing facilities under current permits, where required.
- An R&D questionnaire (Form PMC 111.1) has been completed and provided to the DOE for the project which addresses the established safety protocols, chemical handling and waste stream disposal protocols applicable to the SzIBR work.

In summary, Solazyme's SzIBR project will not violate applicable environmental safety and health requirements; will not require siting of waste storage, disposal, recovery facilities or treatment facilities; will not disturb hazardous substances, will not disturb any new or sensitive designated soils, nor adversely affect environmentally sensitive resources. Furthermore, the SzIBR project will not present any extraordinary circumstances such that the action might have a significant impact upon the human environment; nor is it connected to other actions with potentially significant impacts. Additionally, the SzIBR project is not related to other actions with cumulatively significant impacts.

2.0 PROPOSED ACTION

2.1 Construction

Solazyme proposes to construct the SzIBR on Parcel 2 of the existing PMP site in Peoria, Illinois. The construction phase of the project is anticipated to take 9- 12 months and will involve the specification and procurement of equipment specific to the SzIBR with the purpose of recovering oil from the algae once fermentation is complete, and installation of that equipment within existing structures on Parcel 2. Most equipment will be installed within the existing

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building with the exception of the dryer, which will be installed immediately outside the building on existing attached concrete pads. No new soil will be disturbed during installation of SzIBR.

In order to accommodate the installation of equipment into the existing structures, removal and/or modification of existing equipment, structure, and piping may be required. All materials removed will be properly characterized. During the characterization process, all materials will be identified as either recyclable materials, waste materials, or saved for re-use or sale. Recyclable materials will be properly cleaned and transferred to a local recycling facility. Waste material will be transferred to permitted waste disposal facilities in accordance with state and federal regulations. Re-used or for-sale materials will be stored in the process building on Parcel 2.

The construction phase is short because the SzIBR extensively leverages existing buildings and infrastructure, and the additional equipment and auxiliaries will be provided with the maximum pre-assembly practical. In addition to the equipment being installed on Parcel 2, equipment will also be installed at a pilot manufacturing facility located in REDACTED EXEMPTION 4 The equipment installed at REDACTED EXEMPTION 4 will be located within existing structures.

2.2 Operation

During operation of the SzIBR, Solazyme will (i) grow oil-producing algae on sugars derived from a range of feedstocks, (ii) concentrate and extract oil from the algae (without the use of solvents), (iii) purify the algal oil, and, (iv) refine the algal oil to standard liquid transportation fuels including biodiesel and renewable diesel. The purified algal oil will be refined by two third-party facilities (i) a biodiesel plant, which will process the algal oil into biodiesel, and (ii) an oil refinery, which will yield renewable diesel. The maximum potential purified algal oil produced by the SzIBR project will be approximately REDACTED EXEMPTION 4 standard liquid transportation fuels to interested parties under a material transfer agreement for evaluation purposes.

Operation of the SzIBR will require review and/or permitting as described by resource below.

2.2.1 Air

The PMP facility is currently operating under a Clean Air Act Permitting Process (CAAPP) permit. However, preliminary discussions with IEPA have confirmed that the construction and initial operation of the proposed SzIBR project will be authorized through a separate state air quality construction and operating permit from the IEPA to be issued prior to construction and operation. This project will not trigger the need for Prevention of Significant Deterioration (PSD) permitting due to the low levels of air emissions. It is expected to take from 2 to 6 months to receive air permit approval once a complete air application is submitted to the IEPA. The SzIBR project will emit a relatively small amount of air emissions from natural gas combustion as well as small amounts of volatile organic compound (VOC) and particulate emissions from the process operations. The emissions from the entire process will not present a significant environmental impact.

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No new air permits or modifications of existing air permits will be required at the existing facilities of Solazyme's partners.

2.2.2 Waste

Solazyme will establish a process for characterizing and disposing of all waste generated at the SzIBR facility. All wastes will be characterized and manifested as necessary prior to leaving the facility. The solid waste stream from the algal oil process at the SzIBR project is estimated to be REDACTED EXEMPTION 4. Based on the current regulations regarding hazardous waste (Title 10 CFR § 261.31-33) no materials used or produced by the SzIBR project are classified as hazardous waste.

No permits or modifications will be required for solid waste streams associated with the SzIBR project, as all residual waste will be shipped off-site to permitted waste disposal facilities. Additionally, Solazyme is EX 4 to determine the feasibility of using EX 4, which would further reduce the waste generated by the project.

The transesterification of algal oil into biodiesel at a refining partner's facility will involve the use of methanol. The methanol is contained within a closed loop system for the refining process and only trace amounts are present in the glycerin byproduct. This partner facility is currently permitted as a small quantity hazardous waste generator and will not need to modify its existing coverage under its small quantity hazardous waste permit to refine the algal oil associated with the SzIBR project. No partners will need to modify their existing permits to participate in the SzIBR project.

2.2.3 Water

The post processing waste water effluent discharges, generated from the pilot-scale activities at the SzIBR will amount to approximately REDACTED EXEMPTION 4. This is less than of the maximum PMP facility permitted discharge of waste water treatment facility. Even though the PMP facility is currently operating well below this discharge limit, the SzIBR will be under separate control and ownership; therefore, SzIBR will enter into a separate contract for discharge to the GPSD waste water treatment system. Similarly, the SzIBR will obtain authorization to use water from the City of Peoria municipal water system.

The post processing waste water from activities at the Solazyme laboratory facilities will be less than EX 4. This will be disposed of in the municipal sanitary wastewater treatment system. All water use at the laboratory will come from municipal water sources and be disposed of into the public treatment system. No permit modifications or applications will be necessary for water use or disposal at the Solazyme laboratory facilities.

The process associated with refining algal oil to biodiesel and renewable diesel at the refining partner's facilities will not require the approval or modification of any NPDES permits. The non-contact waste water at the biodiesel refining facility will be discharged to the municipal treatment

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system through an existing permit and the contact waste water will be discharged to a permitted waste water treatment facility designed to handle Biological Oxygen Demand (BOD) loading. The renewable diesel refining partner stated that it will not require any modifications to its NPDES permits.

No permit modifications or applications will be necessary for water use or disposal at any other Solazyme partners' facilities.

2.2.4 Import, Manufacture, or Processing of Toxic Substances

The production microorganism used in the SzIBR project is an intergenic microorganism subject to the Toxic Substance Control Act (TSCA). The microorganism is exempt from the Microbial Commercial Activity Notice (MCAN) requirements of TSCA under the research and development exemption (40 CFR 725.234 and 40 CFR 725.235).

2.2.5 Chemical Storage, Use, and Disposal

REDACTED
EXEMPTION 4

Chemicals for the SzIBR project, including
will be stored, used, and disposed of at the SzIBR project facility on Parcel 2. Chemical handling activities will be managed according to Hazard Communication, Biosafety, and Emergency Planning (Tier II) programs, as applicable. These procedures will require that every material be reviewed by the site Safety & Environmental department prior to use. Once approved, material safety data sheets will be entered into the facility's electronic Material Safety Data Sheets system and hazard warning briefs will be developed for use in the facility's Standard Operating Procedures to communicate hazards to the employees. If required, notifications will be made to local and state emergency planning organizations. Additionally, training on chemical hazards and proper handling will be provided during periodic hazard communication and process specifics training.

Specific storage and use volumes of chemicals will be submitted for in-person review.

Work supporting the SzIBR project at Solazyme's laboratory facilities involves usage, storage an disposal of very small amounts of chemicals, including EX 4
Solazyme utilizes protocols outlined in their Laboratory Chemical Hygiene Plan and Hazardous Materials Business Plan to properly handle, store, and dispose of these chemicals.

2.2.6 Biological Materials

The SzIBR project will involve the fermentation and use of genetically modified algae to produce refined algal oil. The algae will be transported, stored, handled and disposed of in accordance with federal, state, and local laws. Algae will be transported from the Solazyme laboratory to the SzIBR facility contained within biological grade vials on dry ice. Genetically modified organisms used for the SzIBR project are classified as Biosafety Level I (no or negligible risk).

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Operation of the SzIBR project will not use, disturb, or produce any Polychlorinated Biphenyls (PCBs), pesticides, radioactive waste, or radioactive mixed waste. The SzIBR project will not generate any radiation exposure, nor will it involve underground extraction or injection of hazardous substances, or use of any underground storage tanks.

2.3 Material Balance

A detailed material balance for the SzIBR project will be available for in-person review.

2.4 Visual Representation

A visual representation of the process flow diagrams for the SzIBR project will be available for in-person review.

2.5 Process Description

SzIBR will integrate the following operations:

- Fermentation: The algae will be grown heterotrophically, from an inoculum, in industrial fermentation vessels with conditions and media formulation optimized to promote rapid cell division, oil production and oil accumulation. This unit operation will use fermentation tanks currently installed in the process building on Parcel 2.
- EX 4 The EX 4 will be EX 4 using equipment standard in the industry. This unit operation will be accomplished by commercially available equipment purchased and installed on Parcel 2.
- EX 4 The oil in the algal biomass will be extracted and then EX 4 to EX 4 . This unit operation will be accomplished by commercially available equipment purchased and installed on Parcel 2.
- REDACTED EXEMPTION 4

The input to the SzIBR project will be EX 4 he primary output will be EX 4 . Purified algal oil will be transported to existing industrial oil refineries to be processed into fuel products by transesterification or hydrotreatment.

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2.6 Major Plant Components

2.6.1 Algae Fermentation

Existing industrial fermentation vessels and ancillary equipment will be used to grow algae heterophically. The fermentation vessels and ancillary equipment are already installed within the process building on Parcel 2.

Data collection systems include REDACTED EXEMPTION 4 n-site laboratory and analytical support capabilities include freezers, drying ovens, laminar flow hoods, centrifuges, autoclaves, incubators, microscopes, pH meters, a spectrophotometer for optical density analysis, a mass spectrometer for continuous off-gas analysis, and other miscellaneous analytical and laboratory equipment

2.6.2 Algae REDACTED EXEMPTION 4

The SzIBR includes a prior to . A will be located REDACTED EXEMPTION 4 discharged to GPSD waste water treatment facility via sewer. At commercial scale, the condensate will be recycled to media prep for the fermentation. The ılgae cake will be discharged to the drying system.

2.6.3 Algae Drying REDACTED EXEMPTION 4

A will be used to .REDACTED EXEMPTION 4 before further processing. The key requirements for this process are

Essentially no biomass is lost in this operation, as into the process stream. A REDACTED EXEMPTION 4

2.6.4 Oil Extraction

Solazyme has adapted an extraction process that does not require . After the oil is extracted, the oil is REDACTED EXEMPTION 4

2.6.5 Oil Purification

REDACTED EXEMPTION 4

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REDACTED
EXEMPTION 4

2.7 Logistics

Because the SzIBR project will leverage existing infrastructure from across the country, transportation of materials and products will be required. Table 2.7-1 outlines the transportation plan for the SzIBR. The SzIBR project will utilize a relatively small number of truck and rail trips and no significant impacts on traffic or road infrastructure are anticipated. No construction of transportation infrastructure is required to support the SzIBR project.

TABLE 2.7-1

Solazyme SzIBR Project
Project Logistics

Product	Source Location	Facility Destination	Quantity	Method	Frequency
Inputs					
REDACTED EXEMPTION 4		Illinois	8 rail car tankers	Rail	1 trip per month
	Nebraska		~ 0.5 ton / 4 barrels	Over the Road Truck	1 trip per project
		Illinois	1 tanker truck (~ 2.5 to 3 tons)	Over the Road Truck	1 trip per project
	California	California	~ 1 ton / 5 barrels	Over the Road Truck	1 trip per project
		Illinois	1 tanker truck (~2.5 – 3 tons)	Over the Road Truck	2 trips per project
Outputs					
Algal Oil	Illinois	Texas	1 rail car tanker	Rail	1 trip per 12 months
		Iowa	1 rail car tanker or 1 tanker truck	Rail or Over the Road Truck	Up to 1 trip per month for rail or 3 trips per month by truck

The solid waste stream from the algal oil process at the SzIBR project is estimated to be algal biomass, REDACTED byproduct, and of based on EXEMPTION 4 . No permits or modifications will be required for waste streams associated with the SzIBR. Additionally, Solazyme

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EX4 to determine the feasibility of use of EX4 lgal biomass EX4 , which will further reduce the waste generated by the project.

2.8 Environmental Considerations

The SzIBR project will not involve any of the following:

- Clearing or excavation activities (except for the installation of the dryer and associated equipment, as described in Section 2.1);
- Dredge and/or fill activities, which would potentially require U.S. Corps of Engineers Section 401 and 404 permits;
- Production or disturbance of asbestos;
- Location within or near any Class I Air Quality Control Regions;
- Location in or interference with any navigable air space;
- Location within or near any special designation areas including National Forests, National Parks, or trail systems;
- Disturbance of any prime, unique, or important farmland;
- Impact of known archeological or cultural resources;
- Modification of any structures listed on the National Register of Historic Places;
- Impact to threatened/endangered species, critical habitat, or other protected species (e.g., migratory birds);
- Impact to floodplains, special sources of groundwater (e.g., a sole source aquifer), or wetlands; and
- Underground extraction/injection.

2.9 Alternatives to Proposed Action

Due to the highly proprietary nature of the SzIBR project, alternatives have not been proposed by Solazyme. Solazyme has designed the SzIBR project in such a way, however, that any of the sub-contractors can be easily replaced. Additionally, Solazyme will compare the results of this pilot SzIBR project on fair metrics with competing renewable energy approaches that have been proposed or currently commercialized. These include use of autotrophic algae, vegetable oil diesel, and ethanol/alcohols.

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Solazyme proposes to create SzIBR on Parcel 2 in Peoria, Illinois. To the extent feasible, Solazyme will use existing support infrastructure (such as utility hookups and interior workspace) available in Parcel 2. Other equipment (identified and described above) will be installed within the existing building or immediately outside the building on existing attached concrete pads. Because the SzIBR project will be developed on an existing, industrial site, minimal environmental impacts will occur as a result of the project.

Under a no-action alternative, the SzIBR project will not be constructed and any environmental impacts described in this document will not occur. Under the no-action alternative, however, the objectives of the SzIBR project will not be met and the United States will continue to rely on diminishing traditional sources of transportation fossil fuels. Considering the minimal to non-existent environmental impact of construction and operation of the proposed SzIBR project and the plausible reduction in new oil drilling projects domestically resulting from a successful commercial deployment of the SzIBR project, the no-action alternative may create more significant environmental impacts than the proposed project.

3.0 BASELINE CONDITIONS

3.1 Location

As described above, the SzIBR will utilize existing laboratory, industrial, and manufacturing facilities as well as commercially available equipment to demonstrate the feasibility of an integrated biorefinery. The majority of project activities will occur at the Solazyme laboratory facilities in South San Francisco, California and on Parcel 2 in Peoria, Illinois. The following is a complete listing of facility locations and a description of the activities to be completed at each location.

Solazyme, Inc. (Solazyme)
225 Gateway Boulevard, South San Francisco, CA 94080

This is existing office and laboratory space that the company has been using. No modifications to these facilities will be required to implement the proposed SzIBR project. Activities to occur at the facility, as part of this project, will involve growth of algae in small flasks and 7L vessels and will be identical in nature to activities carried out in the past. An aerial photograph depicting the location of the Solazyme laboratory facility is included in Appendix A.

PMP Fermentation Products, Inc. (PMP), Parcel 2, being acquired by Solazyme.
900 North East Adams Street, Peoria, Illinois, 61603

Parcel 2 is an existing commercial, manufacturing facility. Activities to occur at Parcel 2 comprise assembly and start-up of the SzIBR including installation of new equipment into and adjacent to an existing building. An aerial photograph showing the location of Parcel 2 as well as a facility map depicting the building to be used by the SzIBR project is provided in Appendix A.

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Abengoa Bioenergy New Technology Inc - York (Abengoa)
1414 Road O, York, NE 68467

This is an existing pilot plant facility that will produce fermentable sugars from biomass for use in the production of lipid oils from algae. No modifications to this facility will be required to support the SzIBR project. An aerial photograph of the Abengoa facility is included in Appendix A.

BlueFire Renewables Inc. (BlueFire)
31 Musick, Irvine, CA 92618

REDACTED
EXEMPTION 4

Renewable Energy Group (REG)
3426 East 28th St. N, Newton, IA 50208

This is an existing refinery facility. The SzIBR project will not require additional equipment to be installed at this facility nor will modifications to existing permits be required to support this work. REG produces and markets REG - 9000TM biodiesel, which exceeds ASTM quality specifications, and is utilized by on-highway fleets, municipalities, power generators, mining, military, home heating, and agriculture applications. REG network production facilities consist of state-of-the-art, proprietary multiple feedstock technology. An aerial photograph of the REG refinery facility is included in Appendix A.

UOP, LLC (UOP)
5200 Underwood Rd., Pasadena, TX 77507

This is an existing refinery facility used by UOP. The SzIBR project will not require additional equipment to be installed at this facility, nor will modifications to existing permits be required to support this work. UOP is a leading international supplier and licensor of process technology, catalysts, adsorbents, process plants, and consulting services to the petroleum refining, petrochemical, and gas processing industries. UOP is developing and commercializing

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technology to produce transportation fuels and chemicals from biological feedstocks. An aerial photograph of the UOP facility is included in Appendix A.

Although the SzIBR project activities are being conducted at all of the previously mentioned facilities, the potential for environmental impacts is limited to Parcel 2. As a result, this NEPA document focuses on the impacts to the environment from operations at Parcel 2. All other facilities associated with the SzIBR project will utilize existing buildings and infrastructure. Because no ground disturbing activities will occur at these other facilities, impacts from these facilities are not described further in this document.

3.2 General Physical Characteristics

Parcel 2 at the PMP site is located in an industrial area along the Illinois River in the city of Peoria, which is approximately 130 miles southwest of Chicago. Peoria is within Peoria County in east central Illinois with a population of approximately 114,000 people. Peoria was settled in the late seventeenth century, incorporated as a village in 1835, and incorporated as a city in 1845. Today, it has a total incorporated area of approximately 46.6 square miles. Common industries in the city include: trade, manufacturing, transportation, and utilities; government; education and health services; and professional and business services. Well known businesses operating within the city include Ameren Illinois (utility), Archer Daniel Midlands (ADM) Caterpillar, Inc., Komatsu America Corporation, and RLI Corporation.

Parcel 2 at the PMP site is located at the intersection of the Bloomington Ridge Plain, Galesburg Plain, and Ancient Illinois Floodplain Subsections of the Till Plains Section of the Central Lowland Province. Topographically, the province is characterized by rolling hills and narrow valleys created from glaciers during the last Ice Age. Common features with the Central Lowlands include areas of glacial till, outwash plains, glacial lake plains, and ridges formed by moraines. Surface features are underlain by bedrock dating from the Paleozoic era.

Although Parcel 2 of the PMP site is located within the floodplain of the Illinois River, the SzIBR project will not involve ground disturbing activities or installation of new facilities which would affect the floodplain.

3.3 Air Quality and Meteorology

Air emissions from the SzIBR project are regulated under the federal Clean Air Act (CAA) and state laws administered by the IEPA. The United States Environmental Protection Agency (US EPA) has promulgated ambient air quality standards to protect the public health and welfare. The National Ambient Air Quality Standards (NAAQS) are set at levels the US EPA believes are necessary to protect public health (primary standards) and public welfare (secondary standards). NAAQS exist for the following seven criteria pollutants: particulate matter with a nominal aerodynamic diameter of less than or equal to 10 microns (PM_{10}); particulate matter with a nominal aerodynamic diameter of less than or equal to 2.5 microns ($PM_{2.5}$); sulfur dioxide (SO_2); nitrogen dioxide (NO_2); carbon monoxide (CO); ozone (O_3); and lead (Pb). The NAAQS and Illinois ambient air quality standards (IL AAQS) for these pollutants are summarized in Table 3.3-1.

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TABLE 3.3-1

Solazyme SzIBR Project
Ambient Air Quality – Peoria County, IL

Air Pollutant	Averaging Period	Background Level [a] ($\mu g/m^3$)	NAAQS [b] ($\mu g/m^3$)	IL AAQS ($\mu g/m^3$)
Sulfur Dioxide	1-Hour	0.058 ppm (2H)	0.075 ppm	---
	3-Hour	0.046 ppm (2H)	1,300 (0.5 ppm)	0.5 ppm
	24-Hour	0.025 ppm (2H)	0.14 ppm	0.14 ppm
	Annual	0.002 ppm (1H)	0.03 ppm	0.03 ppm
Carbon Monoxide	1-Hour	3.2 ppm (2H)	35 ppm	35 ppm
	8-Hour	2.1 ppm (2H)	9 ppm	9 ppm
Nitrogen Dioxide	1-Hour	ND	0.100 ppm	---
	Annual	ND	100	100
Ozone	1-Hour	0.075 ppm (2H)	---	0.12 ppm
	8-Hour	0.067 ppm (4H)	0.075 ppm	---
PM_{10}	24-Hour	40 (2H)	150	150
	Annual	16 (Mean)	---	50
$PM_{2.5}$	24-Hour	27.0 (98Pt)	35	---
	Annual	11.19 (Mean)	15	---
Lead (Pb)	Rolling 3-Month Average	ND	0.15	---
	Quarterly Average	ND	1.5	1.5

[a] Background level data are based on values in the EPA Airdata system for 2008. PM2.5 and PM10 data are from Site ID 171430037 at 613 NE Jefferson, Peoria, IL. Ozone data from Site ID 171431001 – 508 Glen Avenue E., Peoria Heights, IL. Carbon monoxide data from Site ID 171430036 – 1005 N. University, Peoria, IL. SO2 data from Site ID 171430024 at Hurlburt and Macarthur, Peoria, IL.

[b] National Ambient Air Quality Standards (NAAQS) values presented in micrograms per cubic meter unless otherwise stated. Background concentrations are based on the average reported concentration most applicable to the NAAQS compliance method.

PM_{10} = Particulate matter having an aerodynamic diameter less than or equal to 10 microns.
$PM_{2.5}$ = Particulate matter having an aerodynamic diameter less than or equal to 2.5 microns.
ppm - parts per million
ND = No Data Available
2H = 2nd High Values for 2008
4H = 4th High Value for 2008
98Pt = 98th Percentile
Mean = Annual arithmetic mean for 2008

Title V of the CAA created the federal operating permit program. These permitting requirements are codified in 40 CFR Part 70. The operating permits required under these rules are referred to as a "CAAPP" permit in Illinois. In general, these permits are required for major sources with a potential to emit (PTE) (considering federally enforceable limitations) equal to or greater than 100 tons per year (tpy) for any criteria pollutant, 25 tpy for all Hazardous Air Pollutants (HAPs) in aggregate, or 10 tpy of any single HAP. Under Title V, EPA requires aggregation of emissions

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when nearby facilities have common ownership, belong to the same standard industrial classification code, and are located on adjacent or contiguous property.

The PMP facility is currently operating under a CAAPP Permit. However, preliminary discussions with IEPA have confirmed that the construction and initial operation of the proposed SzIBR project will be authorized through a separate state air quality construction and operating permit rather than a modification to the existing PMP CAAPP Permit. This is because the SzIBR will be a source separate from the PMP facility. This is not a PSD permitting process; therefore, it will take 2 to 6 months, once a complete application is submitted to the IEPA. Solazyme has estimated the potential air emissions that will be generated from the pilot-scale SzIBR. The SzIBR project would have the potential to emit a relatively small amount of air emissions. The estimated emissions are summarized in table 3.3-2 below.

TABLE 3.3-2

Solazyme SzIBR Project
Estimated Potential Emissions (tons/year)

Pollutant	Emissions (tons/year)
PM	3.61
$PM_{2.5}$	3.61
PM_{10}	3.61
SO_2	0.02
VOC	1.68
NO_x	2.97
CO	2.45
NH_3	0.01
Combustion HAPs	0.06

The table above provides the estimated potential emissions from the SzIBR based on a combination of EPA emission estimation methods, manufacturer specifications, and engineering test data for a EX 4 The emissions from the entire process would not present a significant environmental impact because the project will not result in a significant air emission increase. No new air permits or modifications of existing air permits will be required to operate the refining units at the existing REG and UOP commercial facilities.

The specific characterization of the local weather in the SzIBR project area, which is located in central Illinois, was obtained from a weather station at the Greater Peoria Regional Airport. These data indicate an average annual temperature of 50.8 degrees Fahrenheit, an average annual maximum temperature of 60.7 degrees Fahrenheit, an average annual minimum temperature of 40.9 degrees Fahrenheit, and an average annual precipitation of 36 inches.

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Peoria County is currently designated attainment or unclassifiable with respect to all criteria pollutants. The existing air quality of the air is evidenced by the background values listed in table 3.3-1 above.

3.4 Geology and Soils

Ground disturbing activities associated with the SzIBR project will be limited to a developed, industrial site; therefore, no sensitive soils (including prime farmland or hydric soils) or extractable mineral resources will be impacted.

Based on historical seismic activity in the project area, the U.S. Geological Survey estimates a 10 percent probability of an earthquake exceeding peak ground acceleration of approximately 2 to 3 percent force of gravity (g) over a period of 50 years. Based on this information, the PMP facility is located in an area that represents a low seismic hazard risk. A map depicting the seismic risk (in percent force of gravity) in relation to the project is shown in Appendix B. These conditions are already taken into account in Solazyme's construction specifications.

3.5 Biological Resources

Based on desktop review, development of the SzIBR project will not involve any activities that could potentially impact biological resources. Although the U.S. Fish & Wildlife Service (FWS) has identified three sensitive species known to occur in Peoria County (i.e., Indiana bat, Decurrent false aster, and Eastern prairie fringed orchid), the project area does not contain habitat suitable for any of these species. The Indiana bat occupies caves, mines, small stream corridors with well developed riparian woods, and upland forests; Decurrent false aster is found on disturbed alluvial soils; and the Eastern prairie fringed orchid occupies mesic to wet prairies. None of these habitat types is present in the project area, which consists of a developed, industrial site. Additionally, no structures or overhead transmission lines, which could lead to impacts on migratory birds, will be built in association with the project. Lastly, the project will not be located within any wetland areas.

3.6 Water Resources

Parcel 2 at the PMP site is located along the Illinois River in Peoria County. The river meanders about 273 miles from its source at the confluence of the Des Plaines and Kankakee Rivers near Joliet, to its confluence with the Mississippi River about 25 miles northwest of St. Louis. In Peoria near the site of the project, the river broadens from a width of about 900 feet to a lake-like area (called Peoria Lake) measuring about 6,300 feet across. Peoria Lake is an important tourist attraction for the city for a variety of water sports.

As discussed in Section 2.2, even though the PMP facility has significant capacity under its current water use permit, Parcel 2 will be under separate ownership and operation and therefore will obtain a separate municipal water use permit.

Similarly, with respect to the industrial waste water discharge permit, the existing PMP facility is contracted with GPSD for industrial waste water. Parcel 2 will be under separate ownership and

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operation and therefore will execute a separate contract to discharge its waste water to the GPSD.

The Illinois River in the vicinity of Peoria is currently listed on the EPA's 303(d) impaired waterbodies list for polychlorinated biphenyl (PCB), mercury, fecal coliform, atrazine, manganese, and total dissolved solids; however, Total Maximum Daily Load (TMDL) limits have not been established for discharges of any of these contaminants. Regardless, the SzIBR project will not produce or discharge any of the listed contaminants to the river.

Parcel 2 at the PMP site is located above the Sankoty Aquifer. Although the project will not involve installation of groundwater wells, the SzIBR will draw water from the three existing wells it is acquiring from PMP.

3.7 Waste Management

The solid waste stream from the SzIBR algal oil process is estimated to be REDACTED EXEMPTION 4 algal biomass, byproduct, and , based on . No permits will be required for waste streams associated with the SzIBR because the material will not be hazardous. Additionally, Solazyme is conducting trials to determine the feasibility of use of delipidated algal biomass as an animal feed, which will further reduce the waste generated by the project.

3.8 Infrastructure

One of Solazyme's main purposes is to demonstrate that the SzIBR process, using current industrial biomanufacturing technology, can produce inexpensive, high-quality renewable oil usable by the existing petroleum refining, distribution, and retail infrastructure grid. In order to demonstrate this concept, Solazyme will be utilizing multiple facilities for the feedstock, bench-scale fermentation optimization, processing of algae biomass into algal oil, and refining of algal oil into diesel fuels.

To the extent feasible, the SzIBR project will use existing support infrastructure such as utility hookups and interior workspace available at Parcel 2. Construction of the SzIBR project will involve installation of equipment to implement Solazyme's heterotrophic algal oil manufacturing process as described in Section 2.0 above.

3.9 Cultural Resources

Based on desktop review, development of the SzIBR project will not affect known cultural resource sites. Solazyme reviewed the National Register of Historic Places (NRHP) and found that the planned facility modifications and equipment installation will not occur in a structure that is listed in the NRHP. Solazyme also reviewed the Historic Architectural and Archaeology Resources Geographic Information System (HAARGIS) maintained by the Illinois Historic Preservation Agency, and similarly found that the project will not occur in any recorded site. Further, there is limited potential for the project to affect unrecorded archaeological sites

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