Attachment 1. DOE Finding of No Significant Impact (RFSP, October 2007)

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3305

October 15, 2007

DOE/EA 1597

FINDING OF NO SIGNIFICANT IMPACT for the PROPOSED CONSTRUCTION AND OPERATION OF A CELLULOSIC ETHANOL PLANT, TREUTLEN COUNTY, GEORGIA

AGENCY: U.S. Department of Energy, Golden Field Office

ACTION: Finding of No Significant Impact

SUMMARY: The U. S. Department of Energy (DOE) conducted an environmental assessment (EA) that analyzed the potential impacts associated with the construction and operation of a proposed cellulosic ethanol plant in Treutlen County, Georgia. DOE, through its Golden Field Office, in Golden, Colorado, would provide funding to Range Fuels, Inc., a Colorado based corporation, to support the construction and initial operation of the proposed plant. All discussion, analysis and findings related to the potential impacts of construction and operation of the proposed cellulosic ethanol plant (including the applicant-committed practices presented in the Proposed Action) are contained in the Final EA. The Final EA is hereby incorporated by reference.

The proposed cellulosic ethanol plant would utilize a two-step catalytic conversion process to produce ethanol and other usable byproducts. When at peak capacity, the plant would produce up to 100,000,000 gallons of fuel-grade ethanol per year. In converting biomass to cellulosic ethanol, the amount of feedstock used in the process would be as much as 2,500 dry tons/day, consisting of a mix of forest residue and timber from Treutlen County and the surrounding area. Once produced, the ethanol would be sold as fuel for transportation. Up to 20,000,000 gallons per year of Methanol and limited quantities of higher molecular weight alcohols ranging from propanol to pentanol would be produced as by-products of the process. These by-products would either be sold to reduce the absolute cost of the ethanol produced or recycled into the process. A portion of the methanol produced would be used as denaturant for the ethanol.

In accordance with applicable regulations and policies, DOE sent scoping letters to potentially interested local, State and Federal agencies, including the U. S. Fish and Wildlife Service, the Georgia Department of Natural Resources, and the Georgia Department of Transportation. The scoping letters described the Proposed Action and requested assistance in identifying potential issues that could be evaluated in the EA. DOE also sent scoping letters to other potentially interested individuals and organizations to solicit public comment. In response to the scoping letters, DOE received no public

comments or comments from individuals or organizations raising any specific objections or concerns about the Proposed Action. Two comments from Tribal organizations were received voicing general interest in and concern about projects that produce air emissions or that have the potential to impact cultural resources in the area. On September 12, 2007, DOE transmitted letters and published a public notice in a local newspaper announcing availability of the draft EA and inviting comments on the draft. DOE received no comments on the draft EA.

Since the completion of the draft EA, the following sections were modified tc include additional information:

- Transportation
- Groundwater
- Air Quality
- Safety and Occupational Health
- Waste Management and Hazardous Materials

These changes are reflected in the Final EA, which is incorporated by reference.

DETERMINATION

DOE determines that providing funding to support the construction and initial operation of the proposed cellulosic ethanol plant in Treutlen County, Georgia, would not constitute a major Federal Action significantly affecting the quality of the human environment, as defined by the National Environmental Policy Act. The applicant-committed measures identified in the Proposed Action of the EA to obtain and comply with all required permits and minimize potential impacts through the implementation of construction and operation Best Management Practices and other identified design features shall be incorporated and enforceable through DOE's funding award documents to Range Fuels. In addition, DOE's funding award documents shall require that Range Fuels comply with all permits and associated provisions. This includes discharge monitoring and reporting, and all other conditions-of-operation specified in Range Fuels' National Pollution Discharge Elimination System Permit, federally enforceable state Air Quality Permit for construction and operation, Georgia Environmental Protection Division water withdrawal permit and U. S. Army Corps of Engineers Clean Water Act Nationwide Permit.

The preparation of an environmental impact statement is not required and DOE is issuing this Finding of No Significant Impact.

Copies of the Final EA are available at the DOE Golden Field Office Public Reading Room website at http://www.eere.energy.gov/golden/Reading_Room.aspx or from:

Kristin Kerwin, NEPA Document Manager
DOE Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393
kristin.kerwin@go.doe.gov

For further information of the DOE NEPA process contact:

Office of NEPA Policy and Assistance
U. S. Department of Energy
1000 Independence Avenue, S. W
Washington, DC 20585
(202) 586-4600 or 1-800-472-2756

Issued in Golden, Colorado, the 18th day of October, 2007.

Rita L. Wells
Manager

Attachment 2. USDA Finding of No Significant Impact (RFSP, December 2008)

United States Department of Agriculture
Rural Development

AGENCY: U.S. Department of Agriculture, Rural Business and Cooperative Service

FROM: Richard A. Davis
Director
Program Support Staff

Dec. 31, 2008

SUBJECT: Finding of No Significant Impact (FONSI)
Supplemental Environmental Assessment (SEA)
Proposed Construction and Operation of a Cellulosic Ethanol Facility
Soperton, Treutlen County, Georgia

DESCRIPTION OF ACTION

In accordance with applicable regulations and policies, Rural Business and Cooperative Service, an agency within the Department of Agriculture, has adopted a supplemental Environmental Assessment (SEA) prepared by the Department of Energy (DOE) for the construction and operation of a cellulosic ethanol facility. The Applicant, Range Fuels, Inc. has requested a loan guarantee from the Agency in support of their proposal which at its peak capacity would produce up to 100,000,000 gallons of fuel grade ethanol per year. The facility will be located in rural Georgia approximately two miles north of Soperton, Treutlen County.

No Action Alternative: This alternative would have the least damaging impact on the environment as it would not generate any additional or new impacts upon the physical, socioeconomic, or cultural environment because the facility would not be constructed nor operated. The No Action alternative could result in an impact to biological or water resources as gopher tortoise habitat and wetlands would not be protected or preserved leaving them vulnerable to future development.

This alternative does not meet the nation's goal of promoting the development of renewable energy resources and thus does not meet the purpose and need for the proposed federal action. In recent years, the U.S. government has supported the development of the ethanol industry using a combination of financial support and incentives. Section 9003 of the Food, Conservation, and Energy Act of 2008 specifically mandates Rural Development to provide guaranteed loans for the development and construction of commercial-scale biorefineries or for the retrofitting of existing facilities using eligible technology for the development of advanced biofuels. Cellulosic ethanol production facilities are intended to further the government's goal of rendering cellulosic ethanol cost competitive with gasoline by 2012.

Action Alternative: The Applicant proposes a two-phased build-out of the largest and most advanced cellulosic ethanol facility in the world. The site located near Soperton, Treutlen County, Georgia was selected for the proposal because Georgia has one of the largest concentrations of managed pine forests in the southeastern United States. The close proximity to pine forests (which will serve as the feedstock), other necessary raw materials, and skilled labor along with strong local and regional support provides both economic and environmental benefits. The Soperton Plant will be a completely integrated process that will convert woody biomass into cellulosic ethanol and methanol ready for wholesale markets. The cellulosic ethanol will meet the specifications as an oxygenate for blending into gasoline. In addition, methanol can also be a raw material for emerging fuel and chemical applications. The facility will be located on a site of approximately 300 acres and will be located in an industrial park with appropriate land use characteristics and access to utilities and good transportation infrastructure.

Two alternative sites were considered by Range Fuels during the site selection process, but each was eliminated from further study as neither could accommodate the size of the necessary facility, were located in close proximity to multiple residential properties, did not provide rail or road accessibility, did not provide access to utilities, and one was suspected of having soil and groundwater contamination. No alternative designs were considered as there are no conversion processes that currently exist similar to Range Fuel's unique thermochemical process.

BASIS FOR FINDINGS

All discussion, analysis and findings related to the potential impacts of construction and operation of the Applicant's proposal (including required mitigation) are contained in the Supplemental Environmental Assessment. Further, this finding is based on site investigation, data collection and research, and contact with agencies with special environmental expertise or jurisdictional responsibilities mandated by law. In reviewing the indicators of significance in the attached assessment as outlined in Rural Development Instruction, 7 CFR Part 1940, Subpart G, it has been determined that the Applicant's proposal to construct and operate a cellulosic ethanol facility and the Agency's financial support of it does not constitute a major Federal Action significantly affecting the quality of the human environment.

All of the environmental impacts identified in the Supplemental EA are anticipated to be short-term and minor except for the consumption of wood and water which are anticipated to be long-term but minor. The consumption of these resources used by the facility could potentially not be available to other users and may constrain future development in the area especially if long term drought persists. However, adherence to local, State, and Federal requirements pertaining to standard construction design and operation practices would mitigate any potential negative impact identified in the Supplemental EA and associated with this proposal. Beyond those negative impacts that would normally occur with activities of this type, no additional impacts are anticipated to occur with the operation of the action alternative.

A Clean Water Act Section 404 permit (#200800279) was issued to Range Fuels by the Department of the Army, Savannah District on December 2, 2008. To compensate for wetland impacts, Range Fuels has purchased 10.39 acres of wetland mitigation credits from the Wilkinson-Oconee, LLC Mitigation Bank. The Applicant's commitment to obtain and comply with all necessary permits and to minimize potential environmental impacts identified in the SEA shall be incorporated into the Agency's Conditional Commitment for Guarantee. All preparatory site work, facility design, construction and operation must comply with Federal, State and local environmental codes, ordinances and laws.

FINDINGS

Pursuant to the provisions of the National Environmental Policy Act of 1969 (PL 91-190), regulations issued by the Council on Environmental Quality (40 CFR 1500-1508), Rural Development Instruction 7 CFR Part 1940, Subpart G, we advise you of our findings, based on the Supplemental Environmental Assessment which is incorporated by reference. It is our determination that the EA has adequately analyzed the preferred action alternative and we find the action alternative acceptable. The action in and of itself will not adversely affect the quality of the human and natural environment and an Environmental Impact Statement will not be required.

Prepared by:

Donna M. Meyer
Senior Environmental Protection Specialist
Program Support Staff

Recommended:

William F. Hagy, III
Deputy Administrator
Rural Business Service

Approved:

Ben Anderson
Administrator
Rural Business Service

Attachment 3. DOE Finding of No Significant Impact (RFSP, January 2009)

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

January 14, 2009

DOE/EA 1647

FINDING OF NO SIGNIFICANT IMPACT for the PROPOSED CONSTRUCTION AND OPERATION OF A CELLULOSIC ETHANOL PLANT, TREUTLEN COUNTY, GEORGIA

AGENCY: U.S. Department of Energy, Golden Field Office

ACTION: Finding of No Significant Impact

SUMMARY: In October 2007, the U. S. Department of Energy (DOE) completed an environmental assessment (EA) that analyzed the potential impacts associated with the construction and operation of a proposed cellulosic ethanol plant in Treutlen County, Georgia. Subsequent to the issuance of a Finding of No Significant Impact (FONSI) for the October 2007 EA, changes were proposed for the design and operating parameters of the facility. In compliance with NEPA (42 U.S. Code [USC] §§ 4321 *et seq.*) and DOE's NEPA implementing regulations (10 Code of Federal Regulations [CFR] Section 1021.330) and procedures, DOE completed a supplemental environmental assessment (SEA) to examine the potential environmental impacts associated with the changes to the original project design, construction and operation.

The SEA evaluates the potential individual and cumulative effects of the modified project design relative to the No Action Alternative. The modified proposed action includes changes to proposed facility components, facility layout, construction and operation. No other alternatives are analyzed in detail. The October 2007 EA provides a discussion of alternate sites that were considered but determined to be unfeasible. This draft SEA was available to the public and to Federal, state, and local agencies for review and comment prior to DOE's final decision on the modified Proposed Action.

Potential impacts to the following resource areas are discussed in detail in the SEA:

- Land Use
- Noise
- Soils
- Hydrology
- Water Quality
- Wetlands
- Biological Resources
- Protected Species

- Air Quality
- Waste Management (operations waste)
- Hazardous Materials
- Transportation
- Socioeconomic Factors (wood supply)
- Aesthetics

DOE, through its Golden Field Office, in Golden, Colorado, would provide funding to Range Fuels, Inc., a Colorado based corporation, to support the construction and initial operation of the proposed cellulosic biorefinery. All discussion, analysis and findings related to the potential impacts of construction and operation of the proposed cellulosic ethanol plant (including the applicant-committed practices presented in the Proposed Action) are contained in the October 2007 EA and all changes to the proposed action and associated impacts are included in the Final SEA. The Final SEA is hereby incorporated by reference.

The proposed modified cellulosic ethanol plant would utilize a two-step catalytic conversion process to produce ethanol and other usable byproducts. When at peak capacity, the plant would produce approximately 42,000,000 gallons of fuel-grade ethanol per year. In converting biomass to cellulosic ethanol, the amount of feedstock used in the process would be as much as 2,625 dry tons/day, consisting of a mix of forest residue and timber from Treutlen County and the surrounding area. Once produced, the ethanol would be sold as fuel for transportation. Up to 42,000,000 gallons per year of methanol and limited quantities of higher molecular weight alcohols ranging from propanol to pentanol would be produced as by-products of the process. These by-products would either be sold to reduce the absolute cost of the ethanol produced or recycled into the process. A portion of the methanol produced would be used as denaturant for the ethanol. The October 2007 EA evaluated the impacts associated with producing 100,000,000 gallons of fuel-grade ethanol per year using approximately 2,500 dry tons/day of feedstock. Additionally, the SEA evaluates the impacts associated with placement of fill in 0.54 acres of wetlands and 0.07 acres of wetlands that were cleared during initial site preparation work. These wetlands impacts were not part of the original site plan and therefore not included in the October 2007 EA.

DOE sent notices to interested local, State and Federal agencies, including the U. S. Fish and Wildlife Service, the Georgia Department of Natural Resources, and the Georgia Department of Transportation announcing the availability of the DSEA and requesting comments. Additionally, DOE published a public notice in a local newspaper announcing availability of the draft EA and inviting comments on the draft. DOE received no comments on the draft SEA.

DETERMINATION

DOE determines that providing funding to support the construction and initial operation of the proposed cellulosic ethanol plant in Treutlen County, Georgia, would not constitute a major Federal Action significantly affecting the quality of the human environment, as defined by the National Environmental Policy Act. The applicant-committed measures

identified in the Proposed Action of the October 2007 EA as well as the SEA to obtain and comply with all required permits and minimize potential impacts through the implementation of construction and operation Best Management Practices and other identified design features shall be incorporated and enforceable through DOE's funding award documents to Range Fuels. In addition, DOE's funding award documents shall require that Range Fuels comply with all permits and associated provisions. This includes discharge monitoring and reporting, and all other conditions-of-operation specified in Range Fuels' National Pollution Discharge Elimination System Permit, federally enforceable state Air Quality Permit for construction and operation, Georgia Environmental Protection Division water withdrawal permit and U. S. Army Corps of Engineers Clean Water Section 404 wetland permit.

The preparation of an environmental impact statement is not required and DOE is issuing this Finding of No Significant Impact.

Copies of the Final SEA are available at the DOE Golden Field Office Public Reading Room website at http://www.eere.energy.gov/golden/Reading_Room.aspx or from:

Kristin Kerwin, NEPA Document Manager
DOE Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393
kristin.kerwin@go.doe.gov

For further information of the DOE NEPA process contact:

Office of NEPA Policy and Assistance
U. S. Department of Energy
1000 Independence Avenue, S. W
Washington, DC 20585
(202) 586-4600 or 1-800-472-2756

Issued in Golden, Colorado, the 16th day of January, 2009.

Christine A. Shaw

for Rita L. Wells
Manager

Attachment 4. USDA Finding of No Significant Impact (LanzaTech, September 2011)

United States Department of Agriculture
Rural Development

September 23, 2011

SUBJECT: Finding of No Significant Impact (FONSI)
LanzaTech Freedom Pines Biorefinery
Soperton, Georgia

DESCRIPTION OF ACTION

The U.S. Department of Agriculture, Rural Business-Cooperative Service (RBS) has received an application to transfer a lender guarantee and new plant operator for an existing loan guarantee provided under the RBS 9003 Biorefinery Assistance Program. The proposed transfer of the guarantee is for retrofit actions and operations to produce advanced biofuels at the site of the existing Range Fuels biofuels facility in Treutlen County, Georgia. The applicant proposes to modify existing processes and add some additional facilities there to process woody biomass and produce approximately 2 million gallons of ethanol and 3-7,000 pounds of butanediol (2,3-BDO) annually; the production of which would help meet the national goal for renewable fuel standard production of 36 billion gallons of renewable fuels by 2022 established by the Energy Independence and Security Act of 2007.

The environmental analysis of this proposed action are contained in a Supplemental Environmental Assessment (EA) adopted by RBS in 2009; an EA prepared by the Department of Energy (DOE) in 2007; a comparative analysis of the proposed changes are summarized in Attachment 1.

LanzaTech proposes to modify and add to existing facilities to operate a cellulosic biofuels facility on the site of the existing Range Fuels biofuel plant, a site of 281 acres located two miles north of Soperton, Georgia. The feedstock LanzaTech will use is woody biomass which is available within a 50 mile radius of the plant. The processing technology will be a hybrid approach of using Range Fuels syngas production facility with syngas fermentation from using a LanzaTech proprietary microbe, process, and bioreactor design. The existing Range Fuels facilities for feedstock handling, drying, and reactor devolatization will be used at the site. In addition, existing utility systems, water supply, natural gas, electricity and wastewater treatment will be used.

This proposal, modification and operation of an advanced biofuels facility, does not pose significant adverse effects to the natural or human environment.

BASIS FOR FINDINGS

RBS has assessed the potential environmental effects of the proposal in comparison to the effects documented in the existing Supplemental Range Fuels EA of 2009, and Range Fuels EA of 2007, adopted by RBS and documented in a FONSI issued in January, 2009. After consideration of the applicant's proposal and comparison to the impacts of the Range Fuels EA, it is clear that the LanzaTech modifications are bounded by the analyses of those EAs, and that no new adverse impacts would occur from the LanzaTech proposal at the existing Range Fuels site . The agency has determined that the proposal will not have a significant adverse effect on the natural or human environment. Therefore, RBS will not prepare an Environmental Impact Statement for this proposal.

The Applicant must obtain and comply with all appropriate Federal, State, and local permits and approvals required for construction and operation of the biorefinery, and this requirement shall be incorporated and enforceable through the Agency's Conditional Commitment for Guarantee.

FINDINGS

The attached analysis and comparison to the existing EAs for the subject proposal has been prepared and reviewed by the appropriate Rural Business-Cooperative Service officials. After reviewing the analysis and the supporting materials attached to it, I find that the subject proposal will not significantly affect the quality of the human environment. Therefore, the preparation of an environmental impact statement is not necessary. I also find that the assessment properly documents the proposal's status of compliance with the environmental laws and requirements listed therein.

Prepared by: _____

FRANK MANCINO Date
Environmental Protection Specialist, Program Support Staff

Recommended: _____

LINDA J. RODGERS Date
Director, Program Support Staff

Recommended: _____

WILLIAM C. SMITH Date
Director, Energy Division, Rural Business-Cooperative Service

Approved: _____

JUDITH A. CANALES Date
Administrator, Rural Business-Cooperative Service

Attachment 1

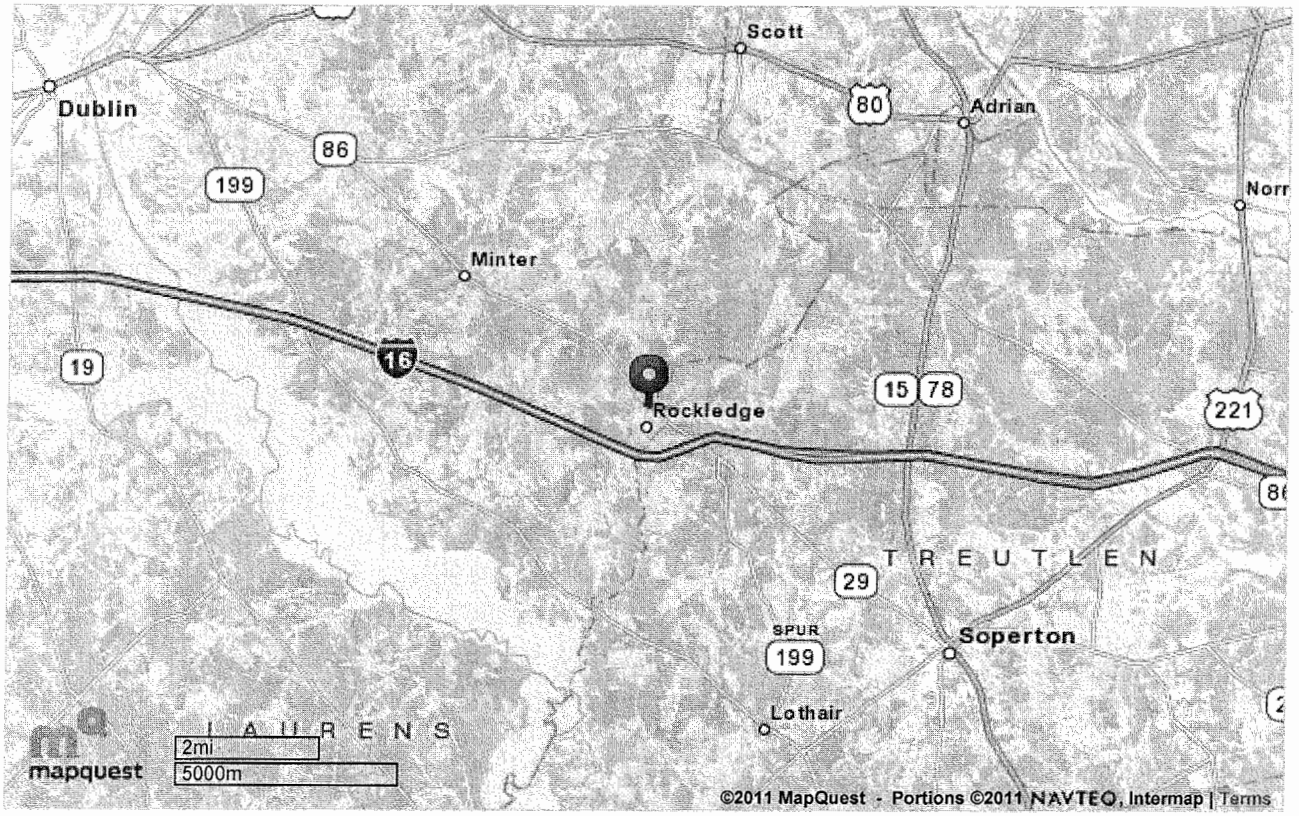
mapquest

Map of:

Soperton, GA 30457-5270

Notes

LanzaTech Site (926 Commerce Drive)



Range Fuels Soperton Plant, Soperton, Georgia

GENERAL NOTES

1. NOT USED.

KEYED NOTES

(1) NOT USED.

BAR SCALE

0 100 200 400 600

SCALE: 1"=200'-0"
(UNLESS NOTED OTHERWISE)

PRELIMINARY - NOT FOR CONSTRUCTION

Reference Drawings		Revisions				Revisions			
Drawing No	Title	Rev	Date	By	Description	Rev	Date	By	Description
		A	09/20/11	DGT	ISSUED FOR PRELIMINARY REVIEW				

Rev	Date	App'd	Client Approval Milestone

LanzaTech

Harris Group Inc.
Engineering Solutions for a Better World®
www.harrisgroup.com

Subconsultant:
Drawn: SKK Check:
Engr: PWS Check:
Appr: PMgr: DGT

SITE
GENERAL ARRANGEMENT
WETLANDS LOCATION

125 TPD SOPERTON PLANT

Project No: 30224.00
Drawing: G-002
Rev: A

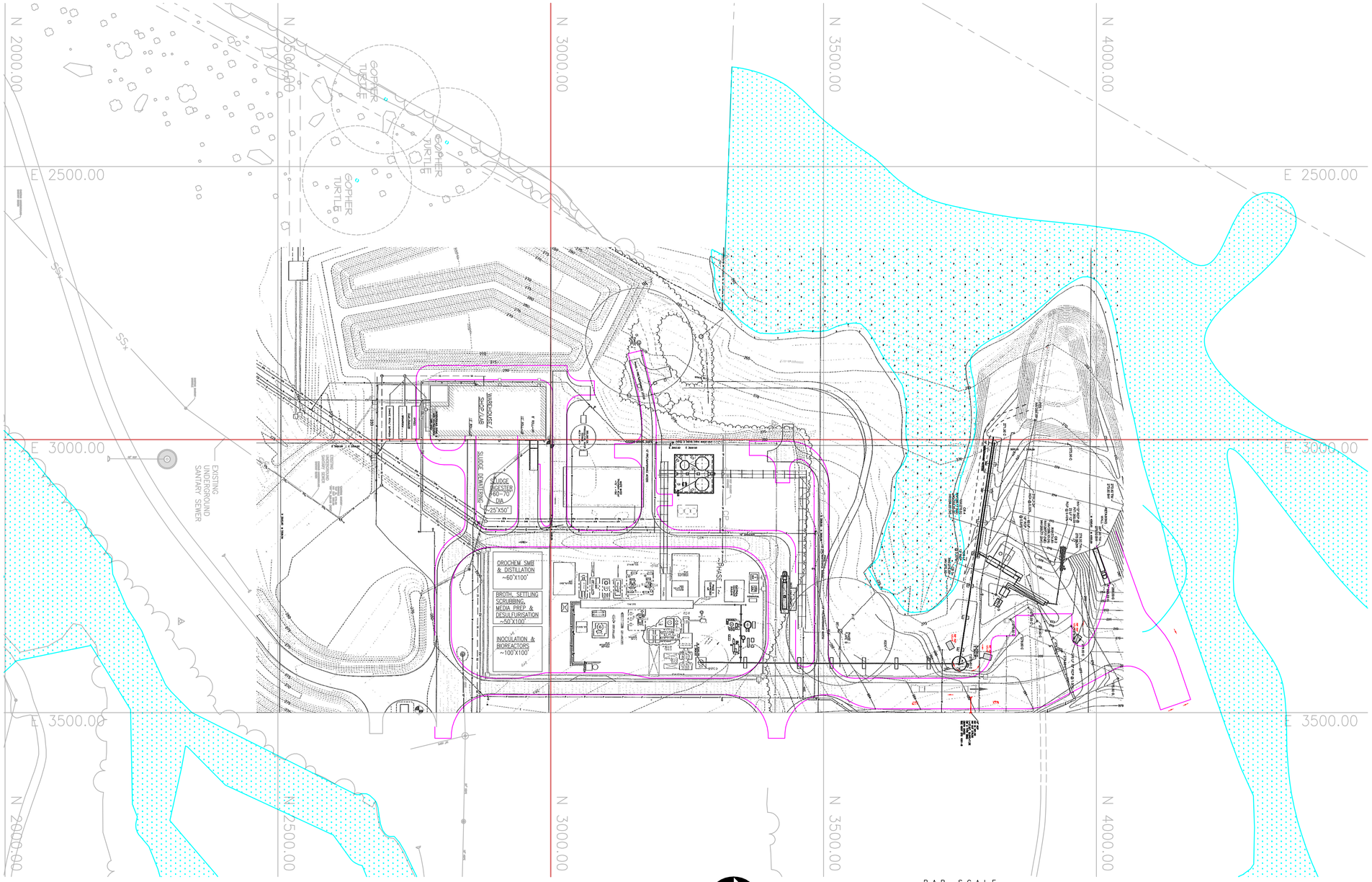
Save Date:9/20/11 By: Korinek,Susanne File Location: \\Seasvr01\eng\1A - Process Solutions\11-30224 LanzaTech\Drawings\General\G-002.dwg

GENERAL NOTES

1. NOT USED.

KEYED NOTES

(1) NOT USED.



PLAN
SCALE: 1"= 100'-0"

NORTH

BAR SCALE
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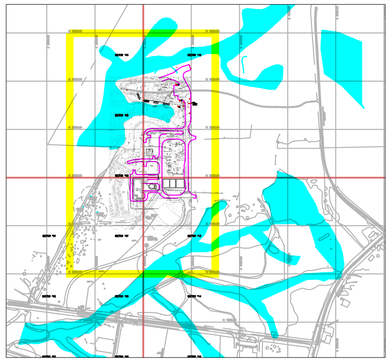
SCALE: 1"=100'-0"
(UNLESS NOTED OTHERWISE)



KEY PLAN
SCALE: NONE

PRELIMINARY - NOT FOR CONSTRUCTION

Reference Drawings		Revisions				Revisions			
Drawing No	Title	Rev	Date	By	Description	Rev	Date	By	Description
		A	09/20/11	DGT	ISSUED FOR PRELIMINARY REVIEW				

LanzaTech

Rev	Date	App'd	Client Approval Milestone

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Subconsultant:
Drawn: SKK Check:
Engr: PWS Check:
Appr: PMgr: DGT

SITE
GENERAL ARRANGEMENT
WETLANDS LOCATION SHT. 2 OF 2

125 TPD SOPERTON PLANT

Project No: 30224.00
Drawing: G-003
Rev: A

Save Date:9/20/11 By: Korinek,Susanne File Location: \\Seasvr01\eng\1A - Process Solutions\11-30224 LanzaTech\Drawings\General\G-003.dwg

Side-by-Side Environmental Impact Comparison - Range Fuels vs. LanzaTech
(Tab "Inputs and Outputs" provides summary comparison of input/output streams)

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
1. Land Use	The county is rural with forestry and some agricultural uses. Forestry accounts for 80% of the county's land use. The facility is located 2 miles northwest of Soperton in an Industrial Park occupied by 7 other commercial operations. The majority of the site was previously cleared and consists of old field plant communities, streams, and wetlands. Buffer areas around streams and wetlands were not cleared and contain mature deciduous trees.	Create 12.8 acres of impervious surface and 1.3 acres of planned paved road. Would not changed intended industrial use of land and would have negligible impact on forest land in Treutlen county.	LanzaTech units are within Range Fuels' planned area of impervious surface and no paved road required.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
2. Geomorphology, Geology, Seismic Hazard, and Soils	The topography at the site ranges from 250 to 320 feet above average mean sea level (AMSL). Four soil series occur within the proposed project area: Gilead, Lakeland, Norfolk, and Plummer. The Gilead and Norfolk Series cover the majority of the proposed project area. The Gilead Series consists of moderately well drained, firm, clayey soils found in the upper coastal plain and has moderately slow permeability. Two soil types from the Norfolk soil series (Norfolk loamy sand with 2 to 5 percent slopes and Norfolk loamy sand with 2 to 5 percent slopes, eroded) that are designated as prime farmland by the NRCS)occur on the proposed project site (Alex Comegys - NRCS personal communication, July 20, 2007). Based on review of the Treutlen County, Georgia Soil Survey, these soils cover 24.6 acres within the project area.	Minimal impact on geomorphology. Low risk for earthquake. New disturbance to ~48.3 acres of soils. Negligible impact on prime farmland.	Reduced area of soil disturbance.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
3. Hydrology	**Surface Water:** There are three unnamed streams within the Range Fuels site. The primary stream is approximately 2 feet wide. This stream flows from the northeast to the southwest and is joined by two additional unnamed streams within the property. One of the tributary streams is a perennial stream that originates offsite and the other is an intermittent stream that flows only in response to an offsite water discharge. The primary drainage on the property originates from farm ponds offsite, with additional flows provided by a spring/ seep in the north-eastern portion of the property. There are no Federal Emergency Management Agency (FEMA) designated floodplains or floodways on the site (Treutlen County, 2006). **Groundwater:** Several aquifers underlie the lower half of the Oconee River basin in Treutlen County, which includes the Range Fuels site. The only aquifer that receives recharge in Treutlen County is the surficial aquifer, and this recharge area is more than 5 miles away from the site.	No encroachment on surface waters or existing buffers. Potential soil disturbance during construction, with possible modified surface water runoff patterns. Mitigated through use of construction and post-construction BMPs. Planned groundwater withdrawal of 316,800 gpd would have minimal impact on other groundwater users.	Water supplied by City of Soperton; no need for additional groundwater withdrawals.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
4. Water Quality	The 303(d) List of Waters reports on streams and lakes identified as impaired for one or more pollutants and do not meet one or more water quality standards. There are no 303(d) (DNR, 2007) listed segments of impaired waters near the project area. Because there would be no changes in harvest site runoff characteristics following removal of feedstock, there would be no impacts to water quality resulting from the purchase of feedstock materials.	Impact of runoff during construction mitigated by BMPs. Post-construction, impact of additional impervious surfaces expected to have no direct impacts to existing stream and wetland buffers. Post-construction grading and detention pond to contain or treat stormwater. Facility SPCC plan to minimize potential impacts to surficial aquifer due to hazardous material release. Added sanitary wastewater within capacity of Soperton treatment facility. No impact from discharge to Soperton WWTP.	Unchanged. See Table 4-1 for specifics.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
5. Wetlands	Approximately 18 acres of forested wetlands have been identified on the project site within the Industrial Park. Approximately 90 percent of the wetlands on the site are within a forested area immediately adjacent to perennial and intermittent streams that bisect the property, extending 30 to 100 feet to either side of the stream channel. The remaining 10 percent of onsite wetlands are emergent wetlands located in the eastern portion of the parcel that would remain undeveloped. Additional wetlands are located on the parcel adjacent to the Industrial Park that would contain the chipper. This parcel contains two small forested wetlands. Both wetland areas are located outside of the area proposed for the chipper, storage areas, and truck travel.	Layout of Range plant and supporting infrastructure avoided encroachment on wetlands and associated buffers. No long term negative impacts to wetland hydrology from replacement of the culvert. Encroachment into two wetlands totaling 0.61 acres were self-reported and addressed in Supplemental EA. The encroachments were found to have negligible temporary impacts to hydrology. With purchase of mitigation credits, the encroachments considered to have no net impacts on the wetland.	Unchanged. Facility will remain within planned footprint.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
6. Biological Resources	The facility site includes 6 parcels totaling approximately 275.1 acres. Approximately 67.4 of the 275.1 acres would be developed for the project and the remaining acreage would be kept as natural and landscaped greenspace. The main facility site would cover 115.7 acres, much of which has been previously cleared. Within the previously cleared areas, much of the northern and western areas of the site are vegetated with native grasses, dominated by brooms edge, while the southern and eastern portions of the site are predominantly bare dirt. The areas surrounding wetlands and streams on the parcel were not cleared and a 30- to 100-foot wide strip of mature trees remains around the streams and wetlands. These forested areas are dominated by hardwoods (red maple, magnolia, sweet gum and willow oak). It is expected that the site and the surrounding areas would contain a variety of common small animals including field mice, armadillos, opossums, foxes, rabbits, snakes and squirrels, as well as a variety of birds typical of the upper coastal plain of Georgia in forested areas. The northwestern and western perimeter of the main parcel and the western portions of the northern parcel near where the chipper would be located contain active and inactive burrows for the gopher tortoise.	Possible minor impacts to biological resources and habitat quality. Displacement of animals during construction mitigated by ability to migrate to adjacent habitat via preserved riparian corridors and forest habitat. Activity during operations would have negligible impact on regional populations. Feedstock is normally removed from harvest sites before replanting and therefore does not provide habitat for nearby animals.	Unchanged.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
7. Protected Species	CH2M HILL conducted multiple site visits in the spring and summer of 2007 to assess the site for protected species. No federally protected species were identified during these site visits. Habitat and evidence of the presence for gopher tortoise, state listed as threatened, were identified. None of the other protected species known to occur in Treutlen County were observed within or adjacent to the project boundaries.	Gopher tortoise burrows were identified. A gopher tortoise relocation program was implemented and exclusion fences constructed. Range agreed to notify USFWS if Indigo Snakes were found. No known instances of federally protected species in Treutlen County.	Unchanged.
8. Safety and Occupational Health	Firefighting services currently are provided for the Industrial Park by the Soperton Fire Department, located in downtown Soperton approximately three miles from the proposed plant. Police services at the proposed plant would be provided by the Treutlen County Sheriff's Office in Soperton. Medical services, including emergency rooms, are available at the Fairview Park Hospital in Dublin, Meadows Regional Medical Center in Vidalia, and Emanuel Medical Center, in Swainsboro, approximately 26, 21, and 25 miles, respectively, from the proposed plant.	Hazards result from high temperature and pressure operations, and from toxic and flammable materials. Hazards addressed in site safety plan.	Hazards from high temperature and pressure operations reduced. Significant reduction in hazard from 2,3-BDO product compared to methanol. Ethanol product unchanged. See Tables 8-1, 8-2 for details. See attached document regarding microbe safety.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
9. Noise	Noise, in the context of this analysis, refers to sounds generated by activities that could affect employees of the facility, employees of nearby commercial operations, residents near the proposed facility, or wildlife. Noise levels within the Treutlen County Industrial Park are variable, depending on truck and train traffic in the area. While no specific data have been compiled for the Treutlen County Industrial Park, background noise levels in these areas would be expected to range from 40 db, to 75 dBa, with occasional upward spikes related to rail and road traffic.	Construction noise limited to daylight hours. Staff to use hearing protection and follow OSHA standards. Operational noise primarily due to chipping. No adverse impacts to outdoor or indoor activities in local residences. Noise disturbance for truck deliveries at one residence during daylight hours only.	Significantly reduced noise levels: (1) no chipper planned; (2) estimated 10 trucks/day at current capacity versus > 500 considered in Range EA. Surrounding forest acreage will be maintained as a noise buffer.
10. Meteorology	Treutlen County is characterized by a warm and humid, temperate climate. Average annual temperature ranges from lows of about 53°F to highs of approximately 78°F. Average annual precipitation is approximately 46 inches. Treutlen County has a low incidence of tornadoes, which is 3.1 times lower than the national average. Only one damaging tornado has occurred since 1950. Georgia has not experienced a major hurricane (Category 2 or greater) since before 1900.	No impact on climate or weather. Minor potential risk for severe weather to adversely impact operations.	Unchanged.

Category	Existing Environment (See excerpt from EA for more detail)	Consequences of Range Fuels Construction and Operation	Differences in LanzaTech Construction and Operation
11. Air Quality	Treutlen County is in attainment for all criteria air pollutants, including the new 8-hour ozone standard (USEPA, 2007b). Because the proposed facility would not be built in a criteria air pollutant non-attainment or maintenance area or emit any criteria pollutant in excess of the major source threshold of 100 tpy, a full CAA conformity determination is not required.	Temporary and minor construction-related air quality impacts due to dust during construction. Criteria pollutants below threshold for Prevention of Significant Deterioration regulations. Facility to be constructed and operate under "Air Permit to Construct and Operate" issued by EPD. Ambient concentrations of all toxic air pollutants below acceptable ambient concentrations (AAC).	Unchanged. See Table 11-1 for details.
12. Waste Management and Hazardous Materials	Treutlen County has no landfill sites within the county. Solid wastes are collected and transported to the Toombs County Landfill. The Toombs County landfill is located approximately 18 miles southeast of the site along SR 29, and has capacity to accept solid wastes for an additional 20 years, and is permitted to accept both solids/ sludges and construction/ demolition debris. No hazardous waste sites or hazardous materials have been identified on the site of the Proposed Action.	No known hazardous waste sites. No impacts from hazardous materials during construction. Spill prevention and containment measure and flare placement designed to reduce impacts from fuel production, storage, transport. No hazardous wastes generated and solid wastes can be accommodated in existing Toombs County Landfill.	No hazardous wastes generated. Biocatalyst replaces solid inorganic catalyst and is disposed of through anaerobic digestion. Residual solids from digester are returned to gasifier feed or disposed of with char, leaving no net solid output from the unit.

Table 8-1 Hazards and Hazardous Materials

	With Range	With LanzaTech	Comments
High temperature & pressure operations	Syngas production at high T, P	Unchanged	Existing safety plan suffices
Syngas	Mixture of PAHs	Unchanged	Existing safety plan suffices
Methanol	Toxic, flammable	N/A	Methanol replaced by 2,3-BDO. See Table 8-2 for comparison of relative hazards from methanol and 2,3-BDO
Ethanol	Toxic, flammable	Unchanged	Existing safety plan suffices
2,3-BDO	N/A	Non-toxic, non-hazardous	Replaces methanol, with reduced handling requirements relative to existing safety plan. See Table 8-2 for comparison of relative hazards from methanol and 2,3-BDO.
Solid inorganic catalysts	Non-toxic, generate dust	N/A	N/A

Biocatalyst	N/A	Non-toxic, non-GMO, naturally-occuring, anaerobic	See file "Safety of LanzaTech Biocatalyst" summarizing containment of biocatalyst in bioreactors, Health Risk Assessment of organism, and safety data sheet (SDS) of freeze-dried bacteria (method of delivery to site).

Summary of System Input and Output Streams

	Range Fuels Plan (from Oct 07 EA from unless otherwise	LanzaTech Plan	Comments
Feedstock (tpd, dry)	2,650*	125	
Water requirements, process - from groundwater (gpd)	316,800	0	Not required
Water requirements, process - from municipal supply	N/A	66,870	City commitment to supply 200 gal/minute (288,000 gal/24 hour day) is sufficient
Water requirements, potable - from municipal supply (gpd)	5,000	≤5,000	Potable water for offices and restrooms
Natural gas demand (cubic ft/day)	11,400 (OSBL) & 3,900 (avg ISBL)	11,400 (OSBL) & 3,900 (avg ISBL)	OSBL is natural gas to flares. ISBL is natural gas demand based on yearly average for plant startup only. Atlanta Gas line can supply 32,430 cubic ft/hr.
Electricity (kWh/year)	290,832,000	13,680,000	Site has infrastructure for full Range Fuels plan
Wastewater treatment (gpd to onsite WWTP) - to municipal treatment	864,000	75,000	Existing WWTP capacity is 100,000 gpd. Wastewater is discharged to local POTW
Sanitary wastewater - to municipal treatment	5,000	≤5,000	Determined by staffing

Solid waste	unknown	134.1 ton/year sulfatreat waste 2,492.8	Assumes biomass sludge recycled to gasifier feed.

* From Jan 09 Supplemental EA

Table 8-1 Comparison of Co-Products based on MSDS Information

2,3-Butanediol

CAS-No.513-85-9
EC-No.208-173-6

Hazard Rating

Comment: hazard rating is significantly lower than Methanol

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.
Not a hazardous substance or mixture according to EC-directives 67/548/EEC or 1999/45/EC.

Prevention

Comment: Plant and operational controls are significantly lower than methanol

Provide appropriate exhaust ventilation at places where dust is formed.
Store in cool place. Keep container tightly closed in a dry and well-ventilated place.

Toxological information

Comment: Toxicology effects are significantly lower than methanol

Acute toxicity
no data available
LD50 Intraperitoneal - mouse - 6.075 mg/kg
Skin corrosion/irritation
no data available
Serious eye damage/eye irritation
no data available
Respiratory or skin sensitization
no data available
Germ cell mutagenicity
Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as

probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity

Specific target organ toxicity - single exposure

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.

Ingestion May be harmful if swallowed.

Skin May be harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.

Signs and Symptoms of Exposure

Gastrointestinal disturbance, Nausea, Headache, Vomiting

Transportation

Comment: Significantly lower environmental impact and transport requirements

UN number

ADR/RID: - IMDG: - IATA: -

14.2 UN proper shipping name

ADR/RID: Not dangerous goods

IMDG: Not dangerous goods

IATA: Not dangerous goods

14.3 Transport hazard class(es)

ADR/RID: - IMDG: - IATA: -

14.4 Packaging group

ADR/RID: - IMDG: - IATA: -

14.5 Environmental hazards

ADR/RID: no IMDG Marine pollutant: no IATA: no

Regulatory requirements

Comment: Significantly lower regulatory requirements noted

Methanol

Cas No: 67-56-1
EC-NO.200-659-6

Hazard rating

Flammable Liquids (Category B)
Acute toxicity, Oral (Category C)
Acute toxicity, Inhalation (Category C)
Acute toxicity, Dermal (Category C)
Skin irritation (Category A)
Eye irritation (Category A)
Specific Target Organ Toxicity (Category A)

Prevention

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
Sigma - M3641 Page 2 of 8
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Toxological information

Acute toxicity
LD50 Oral - rat - 5,628 mg/kg
LC50 Inhalation - rat - 4 h - 64000 ppm
LD50 Dermal - rabbit - 15,800 mg/kg
Skin corrosion/irritation
Skin - rabbit - Irritating to skin. - 24 h
Serious eye damage/eye irritation
Eyes - rabbit - Eye irritation - 24 h
Respiratory or skin sensitization
no data available
Sigma - M3641 Page 6 of 8
Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure

Causes damage to organs.

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation Toxic if inhaled. Causes respiratory tract irritation.

Ingestion Toxic if swallowed.

Skin Toxic if absorbed through skin. Causes skin irritation.

Eyes Causes serious eye irritation.

Signs and Symptoms of Exposure

Methyl alcohol may be fatal or cause blindness if swallowed., Cannot be made non-poisonous., Effects due to ingestion may include:, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Dizziness, Weakness, Confusion., Drowsiness, Unconsciousness, May cause convulsions.

Additional Information

RTECS: PC1400000

Transportation

UN number

ADR/RID: 1230 IMDG: 1230 IATA-DGR: 1230

14.2 UN proper shipping name

ADR/RID: METHANOL

IMDG: METHANOL

IATA-DGR: Methanol

14.3 Transport hazard class(es)

ADR/RID: 3 (6.1) IMDG: 3 (6.1) IATA-DGR: 3

14.4 Packaging group

ADR/RID: II IMDG: II IATA-DGR: II

14.5 Environmental hazards

ADR/RID: no IMDG Marine pollutant: no IATA-DGR: no

Regulatory requirements

Table 11-1

Criteria Pollutants

Maximum Annual (PTE) Criteria Pollutant Emissions* (maximum operation)

	With Range	**With LanzaTech**	*Emissions dominated by existing units at site*
$PM_{2.5}$	41.2	Unchanged	
PM	93	Unchanged	
NOx	95.5	Unchanged	
SOx	0.72	Unchanged	
CO	86.6	Unchanged	
VOC	26.2	Unchanged	
HAPs (total)	9	Unchanged	
HAPs (individual)	all < 10	Unchanged	

*Air Toxics also will be unchanged from those listed in Range EA.

Attachment 2

Safety of the LanzaTech Biocatalyst

The biocatalyst to be used in the syngas fermentation process is LanzaTech's proprietary microbe, LZ1561. LZ1561 is a naturally selected , and therefore ***not*** genetically modified or GMO, strain of *Clostridium autoethanogenum*. This microbe has been classified as a Risk Group 1 organism by the World Health Organization (WHO). The definition of WHO Risk Group 1 is that the organism poses no or low individual and community risk and is therefore a microorganism that is unlikely to cause human or animal disease.

LZ1561 is also a strict anaerobe, which means that small quantities of oxygen, <100 parts per million (ppm), are fatally toxic to the organism.

In the fermentation process, the microbe is contained both physically and environmentally:

> **Physical containment:** The specialized gas fermentation bioreactors developed by LanzaTech to cultivate LZ1561 are designed to US ASME 8 standards, enabling the handling and containment of gases, liquids, and vapors under pressure. This design standard thus ensures that the microbes, held within this vessel, are also securely physically contained and separated from the external environment in the same manner as the liquids, gases, and vapors processed within the facility.
>
> **Environmental containment**: The microbe is a strict anaerobe. Any unintentional release of the microbe into the environment results in exposure of the microbe environmental oxygen levels (21% OXYGEN OR 210,000ppm). Exposure to this level of oxygen is fatal to the organism. In this way, the organism is environmentally contained within the bioreactor due to its oxygen-free (anaerobic) conditions.

The following document provides a Health Risk Assessment for the *C. autoethanogenum* organism. The microbe is delivered to site in freeze-dried form, for which the Safety Data Sheet is also provided.

LanzaTech

capturing carbon fueling growth

Auckland 02 August 2011

Health Risk Assessment of *Clostridium autoethanogenum.*

Risk Group Classification

The World Health Organisation (WHO) classifies the agents within a country by Risk Group 1, to 4 , equivalent to Bio-safety Level 1(BSL-1) to Level 4 (BSL-4) , based on pathogenicity of the organism, modes of transmission and host range of the organism. Group 1 (BSL-1): low individual and community risk, Group 2 (BSL-2): moderate individual risk, limited community risk, Group 3 (BSL-3): high individual risk, limited community risk, Group 4 (BSL-4): high individual and community risk. This is a worldwide adopted and trusted classification.

The WHO classification of *Clostridium autoethanogenum* is Risk Group 1 (BSL-1). This is the lowest nomination possible confirming *Clostridium autoethanogenum* has no or low individual and community risk and is a microorganism that is unlikely to cause human disease or animal disease. The equivalent BSL-1 definition is a "well characterized agents not consistently known to cause disease in healthy adult humans of minimal potential hazard to laboratory personnel and the environment"
http://www.absa.org/riskgroups/index.html

Strain availability

The German Resource Centre for Biological Material (DSMZ) provides internationally renowned services for the collection, maintenance, storage and worldwide shipment of microorganisms and their identification and characterization.

The strain *Clostridium autoethanogenum* is readily available from DSMZ for a small fee. Strain details such as isolation and growth procedure, associated publications and Risk Group are available on their website under strain identification number DSM10061.
http://www.dsmz.de/microorganisms/html/strains/strain.dsm010061.html

Origin of strain *C. autoethanogenum*

The original isolation paper published by Abrini et al, 1994, '*Clostridium autoethanogenum*, sp. nov., an anaerobic bacterium that produces ethanol from carbon monoxide' is readily available. In this publication the original isolation of *Clostridium autoethanogenum* from hybrid rabbit feces is described. The research was performed in Belgium, European Union.

In summary: *Clostridium autoethanogenum* is:

- Non spore forming
- Strictly anaerobic

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LanzaTech

capturing carbon fueling growth

- Has no toxin coding genes
- Risk Group 1 classification
- Environmental isolate
- Not genetically modified

Signature

02 AUGUST 2011
Date

AJIT SURJUPERSAD
Name

Director of Environmental Health and Safety
Title

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LanzaTech

SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product:	Freeze Dried Bacteria
Synonyms:	
Product Code:	
Product Use:	Industrial: chemical industry and laboratory reagent
New Zealand Supplier:	LanzaTech NZ Ltd
Address:	24 Balfour Road Parnell, Auckland New Zealand
Telephone:	+64 9 304 2110
Fax Number:	+64 9 929 3038

Emergency Telephone:

New Zealand	**0800 764 766 (NZ Poisons and Hazardous Chemicals)**
Australia	**13 11 26 (Poisons Information Centre)**
USA	**800 424 9300 (CHEMTREC)**
Canada	**613 996 6666 (CANUTEC)**

Date of MSDS Preparation: 7 June 2011 version 1

Section 2. Hazards Identification

This substance is freeze dried bacteria Risk Group 1. No health hazard

Section 3. Composition / Information on Ingredients

Ingredients	Wt%	CAS NUMBER.
Clostridium autoethanogenum	98-100	not available

Section 4. First Aid Measures

Swallowed: Not likely to require attention. If patient continues to vomit or is distressed seek medical advice.

Eyes: Flush eye with water for a minimum of 15 minutes. Seek medical attention promptly if irritation persists or any loss of vision occurs.

Skin: Not likely to require attention. Wash skin with soap and water. Launder contaminated clothing before re-use.

Inhaled: Not likely to require attention

First Aid Facilities: Safety showers, eye wash stations and First Aid kits.
Advice to Doctor: Treat symptomatically

Section 5. Fire Fighting Measures

Hazard Type	Not flammable or combustible
Hazards from decomposition products	None
Suitable Extinguishing	All forms of extinguishing media.

media	
Precautions for firefighters and special protective clothing	Treat according to storage and surroundings
HAZCHEM CODE (UK, Australia, NZ)	**2T** (no violent reaction or explosion, dilute)

Section 6. Accidental Release Measures

Emergency Procedure: All microbial cultures whether hazardous or not should be handled in an emergency by qualified microbiologists using appropriate safety procedures and precautions.

Containment Procedure: Actions must be taken on the assumption that the culture may be a pathogen. The release area must be sealed to prevent escape to the wider environment and HAZMAT personnel trained in biological products called to advise on containment.

Clean Up Procedure: Seek advice on appropriate disinfection procedures for Clostridium species.

Section 7. Handling and Storage

Approved Handlers: (New Zealand): Not Required.

Handling Advisable to wear gloves and particulate cartridge mask when handling bulk quantities or for liquid transfer.

Storage:
Store refrigerated in tightly closed containers.
Store away from oxidizing agents.
Keep containers closed at all times - check regularly for leaks.
Do not eat, drink or smoke in areas of use or storage.
Do not store next to food or animal feeds

Section 8 Exposure Controls / Personal Protection

Use Personal Protective Equipment;
Goggles, chemical resistant gloves and appropriate clothing to prevent skin exposure.

Engineering Controls:

Local exhaust ventilation and/or mechanical (general) exhaust is recommended.

Personal Protective Equipment:

Personal Hygiene	Protective clothing (gloves, overalls, boots, etc.) should be worn to prevent skin contact. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storing or re-using.
Skin Protection:	Avoid skin contact by the use of approved chemical resistant gloves PVC or Neoprene (AS 2161) and biological protection coveralls.
Eye Protection:	Avoid eye contact by wearing chemical goggles with side-shields or face-shield (AS/NZS 1336) whenever exposed to vapour or mist or if there is a risk of splashing liquid in the eyes.

Respiratory Protection:	Wear respirator mask with particulate filters when handling freeze dried material.
Thermal Protection:	None should be needed under normal circumstances.

Section 9 Physical and Chemical Properties

Appearance:	Straw colored powder or cake
Odour:	odourless.
pH	Not applicable
Vapour Pressure:	Not applicable
Vapour Density:	Not applicable
Boiling Point/range (℃):	Not applicable
Flash Point:	Not applicable
Freezing Point (℃):	Not applicable
Solubility:	Infinitely soluble in water
Specific Gravity (H2O = 1):	Approximately 1.0
Flammable (Explosive) Limit - Upper:	Not applicable
Flammable (Explosive) Limit - Lower:	Not applicable
Autoignition Temperature:	Not applicable
Evaporation Rate:	Not applicable

Section 10. Stability and Reactivity

Chemical Stability:	Stable
Incompatible Materials:	Strong oxidizing agents.
Conditions to avoid:	Heat
Hazardous Decomposition Products:	Nil. May form moulds and fungi if not refrigerated for several days.
Hazardous Reactions:	Containers should be regularly vented. Hazardous polymerisation will not occur.

Section 11 Toxicological Information

Toxicological Data:

LD50 oral (rat):	not known
LC50 inhalation (rat):	not known

Acute Effects

Swallowed:	May induce nausea
Eyes:	Powder will cause temporary eye irritation .
Skin:	Contact with skin unlikely to have any more than temporary irritation
Inhaled:	Unlikely to have any effect

Chronic Effects

Long term chronic skin exposure could cause sensitivity or dermatitis.

Additional Notes: Whilst this strain is not hazardous it should be treated with caution

Section 12. Ecotoxicological Information

NZ HSNO Classifications: Not known

Persistence and Degradability: Likely to biodegradable and not persist in the environment

Section 13. Disposal Considerations

Empty containers and wastes must be decontaminated by steam sterilization or chemical disinfection before disposal

Section 14 Transport Information

This substance is classified as NOT a dangerous good for Land Transport according to NZS5433: 2007 and is NOT a dangerous good for rail, air, or sea transport.

Section 15 Regulatory Information

For New Zealand:

ERMA Approval Code: Not Hazardous

HSNO Trigger quantities for this substance

	Quantity
Approved Handler	No
Tracking	No
Location Certificate (containers)	No
Signage	No
Emergency Response Plan	No
Secondary containment	No

For USA

TSCA 8(b) Inventory : No data available

SARA listed: No data available

For EU

Risk Phrases	R36	Irritating to eyes
Safety Phrases	S-2	Keep out of reach of children
	S-7	Keep container tightly closed

Section 16 Other Information

1 HSNO Approved Code of Practice: Preparation of Safety Data Sheets, September 2006.

Disclaimer

This document has been compiled by TCC Ltd on behalf of the manufacturer of the product and serves as the manufacturer's Safety Data Sheet ('SDS'). It is based on information concerning the product which has been provided to TCC by the manufacturer or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer. While TCC has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, TCC accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS. The information herein is given in good faith, but no warranty, express or implied is made.

Please contact the New Zealand proprietor, LanzaTech NZ Ltd , if further information is required.

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