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MEMORANDUM

TO: Sarah Campbell, City Manager, City of Fernandina Beach, Florida
Tammi Bach, City Attorney, Fernandina Beach, Florida

CC: Technical Review Committee Members

FROM: Brenna Malouf Durden
Nicole J. Poot
Amy Taylor Petrick

DATE: December 18, 2024

SUBJECT: RYAM – 2G-Bioethanol Project – Consistency with City's Comprehensive Plan and Land Development Code

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EXECUTIVE SUMMARY

This Memorandum, written on behalf of RYAM, supplements RYAM's application for its proposed second-generation (2G)-Bioethanol project's ("the Project") site plan submitted to the City of Fernandina Beach (the "City") to demonstrate the Project's consistency with the City's Comprehensive Plan (the "Comprehensive Plan" or "Plan") and Land Development Code ("the LDC.") Rayonier Performance Fibers, LLC ("RYAM") owns and operates an acid-sulfite-based, pulp mill in the City that produces high purity cellulose products sold for commercial use (the "RPF Plant"). The Project, which will simply ferment the byproduct currently generated at the existing RPF Plant as necessary in order to enhance the Plant's energy efficiency, environmental sustainability, and economic viability, is consistent with the Plan and the LDC, and is not a prohibited use in the City as can be ascertained by the City's approval of breweries, bakeries, and the City's own water treatment facility that rely on and use the very same biological process. This memorandum explains the following:

I. Application of the traditional rules of statutory construction to the specific facts of the Project requires finding the Project to be consistent with the Plan and the LDC.

A. The Project fits squarely within the definition of "Manufacturing and/or Assembly – Heavy," which includes "uses involving **intensive manufacturing and industrial operations, including the manufacturing**, assembly, fabrication, **compounding, processing and/or treatment of extracted or raw materials or other industrial products**; packaging and freight loading/unloading activities;

utilization, handling and bulk storage of materials including raw materials, chemicals and hazardous materials associated with manufacturing processes; and all other associated or ancillary activities." CITY OF FERNANDINA BEACH, FLA., LAND DEV. CODE § 1.07.00 (2023) (emphasis added).

B. The Project constitutes an associated and ancillary activity that uses the spent sulfite liquor ("SSL"), a byproduct generated by the existing principal pulp manufacturing process, as the source of sugars for fermentation.

C. Fermentation of sugars contained in the existing SSL stream is not "chemical manufacturing." Rather, it is a process that occurs in nature through the use of organisms – a process that the City has approved in multiple locations throughout the City by permitting breweries, bakeries, and even the City's own water treatment plant, to operate within the City.

D. Distilling and drying are physical separation processes, rather than "chemical refining," and are the same processes that have also been approved by the City by permitting the operation of distilleries.

E. The Project is consistent with and furthers many goals and objectives of the City's Comprehensive Plan. These include numerous economic objectives, which are advanced by RYAM's continued economic contribution of more than $379 million in 2023 in Nassau County alone and nearly $575 million in the wider wood-procurement region, as well as the $50 million economic investment represented by the Project itself.

II. The legal opinion drafted by Weiss, Serota, Helfman, Cole & Bierman, dated May 23, 2024 (the "Weiss Serota Memo"), is fatally flawed in its analysis and is not binding on the City. It is not based on an application made to the City. It rests on an erroneous interpretation of an air permit application and draft construction air permit by persons without the expertise to understand the scientific and industrial context of a highly technical application to ensure compliance with the state of Florida's air regulations and the Federal Clean Air Act – neither of which govern administration of the City's Comprehensive Plan or LDC. Moreover, it failed to apply traditional rules of statutory construction to its interpretation of the phrases "chemical manufacturing" and "chemical refining." Consequently, its absolute conclusion that the Project is not consistent with the Comprehensive Plan is wrong. Finally, the City Manager cannot delegate her interpretive authority to a private law firm. Even if such authority existed, treating Weiss Serota's legal opinion as binding would violate RYAM's due process rights by denying RYAM's right to notice and opportunity to be heard on its application to the City.

I. INTRODUCTION AND PROJECT DESCRIPTION

RYAM owns and operates an acid-sulfite-based, pulp mill in the City that produces high purity cellulose products sold for commercial use.

RYAM is proposing to install equipment for a second-generation bioethanol (2G-Bioethanol or "bioethanol")) project within the existing boundary of the RPF Plant. 2G-Bioethanol is produced from biomass – not primary food sources like corn. Because it is not a fossil fuel, it reduces greenhouse gas emissions. The Project presents a unique opportunity in the United States to use the sugars contained in the biomass RYAM already uses to make pulp by fermenting the existing SSL byproduct stream from its existing pulping operations.

The pulp mill's existing operation produces SSL as a byproduct. The use of this byproduct, as the Project proposes, fits within the descriptions of permissible uses in the Industrial land use category and the I-2 Heavy Industrial zoning district. The Project will ferment the sugars contained in the SSL to create the 2G-Bioethanol. The fermentation relied upon by the Project is a natural metabolic process using biologic organisms, usually micro-organisms found in yeast, in which sugar molecules are converted to substances like the lactic acid found in the human body, alcohols, such as beer and wine, and carbon dioxide. The Project also constitutes an associated and ancillary activity to the current principal pulp mill use, subordinate to the RPF Plant's efficiency, sustainability and economic viability and likewise consistent with the referenced Plan and LDC provisions.

In the existing RPF Plant process, the SSL byproduct is not fully utilized. Currently, after the SSL is separated from the pulping process, it is evaporated to concentrate the remaining biomass solids. From there, the SSL is either burned in the sulfite recovery boiler to generate energy and recover valuable raw materials that are reused in the pulping process or is transferred to LignoTech Florida, LLC (co-located at the RPF Plant site), which utilizes some of the SSL to produce wet and dry lignosulfonate products.

The Project itself consists of a variety of equipment to be installed on the RPF Plant property, which support fermentation and allow concentration of the 2G-Bioethanol through physical separation. This equipment includes continuous fermenters, centrifuges to allow yeast recycling, a distillation column for removing water and other liquid components from the ethanol, molecular sieves to further "dry" the ethanol by physically removing water molecules, and storage tanks. Importantly, the footprint of the RPF Plant will not be expanded by the Project.

The Project does not pose threats to environmental resources. It will be sited within the existing footprint of the RPF Plant, will be located outside of the floodplain, and will comply with and incorporate all applicable wetland buffers. It is designed to minimize water usage and wastewater generation, and will comply with the RPF Plant consumptive water use permit and wastewater discharge permit. The design will also include primary and secondary containment systems to prevent unintended discharges to the wastewater treatment system and to soil. Importantly, yeast used in the process will be recycled with centrifuges or neutralized to eliminate the possibility of yeast leaving the RPF Plant. The Project will require no change in hours of

operation or cause any changes in fumes, glare, noise or heat. Visual impacts will remain virtually unchanged because of the existing and substantial buffering and screening along the current RPF Plant site boundaries. The Project will add a few thousand square feet of impervious surface to the RPF Plant property, which is insignificant for a 660-acre parcel. In fact, overall, the Project's characteristics will actually enhance the environmental sensitivity of the Heavy Industrial ("I-2") zoned land with the surrounding land uses by reducing the overall air emissions from the RPF Plant.

The Project allows RYAM to use the RPF Plant property for its highest and best use and ensures the RPF Plant's continuing economic contribution to the City, which furthers two important Goals contained in the Comprehensive Plan, in addition to the many other ways in which the Project is consistent with the Comprehensive Plan. Moreover, the Project will also reduce emissions from the sulfite recovery boiler.[1] Emissions are reduced because, once fermented, almost no sugars will remain in the SSL that is returned to the recovery boiler to be burned, nor will RYAM replace the de-sugared SSL with any other type of fuel, like natural gas. This is because, in order to meet market-driven specifications for 2G-Bioethanol and be considered "green fuel," implementation of the Project must be energy neutral to the overall RPF Plant operations, further ensuring the environmental benefit of the Project. The portion of the fermented SSL that will be sent to LignoTech Florida will continue to be sold and processed as it is now.

RYAM intends to invest $50 million to establish the Project. This investment will increase the City's tax base and support the RPF Plant's long-term economic viability by protecting against economic downturns and ensuring the RPF Plant's sustainability. By growing and investing, RYAM is protecting hundreds of local jobs, the local economy, and the environment.

II. CONSISTENCY WITH APPLICABLE PLAN AND LDC PROVISIONS

In Florida, comprehensive plans are often referred to as "constitutions," and future development orders issued by a local government must be consistent with the provisions of its comprehensive plan. *Nassau Cnty. v. Willis*, 41 So. 3d 270, 276 (Fla. 1st DCA 2010); *Citrus Cnty. v. Halls River Dev., Inc.*, 8 So. 3d 413, 420-21 (Fla. 5th DCA 2009). Fernandina Beach's LDC implements and is consistent with the City's Plan. *See* Sections 1.00.01 and 1.00.02, LDC.

As discussed more fully below, RYAM's application is consistent with and furthers the applicable Plan and LDC provisions, which are addressed in turn.

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[1] The City is not tasked with evaluating or permitting based on the air emissions from the Project. That regulatory authority is exclusively reserved for the Florida Department of Environmental Protection ("FDEP") acting on behalf of the federal Environmental Protection Agency ("EPA"). However, as explained herein, the City's expressed goals, policies, and objectives set forth in its Comprehensive Plan include reducing climate change, encouraging the production and use of energy generated from renewable resources, integrating green/sustainable development, and striving to meet air quality standards established by the EPA and FDEP. As such, the reduction in emissions from the Project provides additional support for a consistency determination in favor of the Project.

A. The Industrial Land Use Category Description and the LDC Definition of Manufacturing and/or Assembly-Heavy.

1. Policy 1.07.12 – Industrial (IN), Future Land Use Plan.

The RPF Plant property has an Industrial (IN) Future Land Use Map ("FLUM") designation. The City's Comprehensive Plan Policy 1.07.12 sets forth the Plan's description for the "IN" land use category as follows:

> Policy 1.07.12. Industrial (IN)
>
> a. The industrial land use category is intended to recognize existing industrial development, appropriate open air recreation activities and animal shelter, and to ensure the availability of land for industrial and airport purposes.
>
> b. The intensity of industrial development shall not exceed a FAR of. 0.75.
>
> c. Industrial sites should have transportation access by air, rail, or highway.
>
> d. ***Industrial uses include***: airport dependent uses, ***manufacturing, assembling and distribution activities***; warehousing and ***storage activities***; ***green technologies***, general commercial activities; integral airport related support services such as rental car facilities, parking facilities; ***and other similar land uses.***

CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 1, Objective 1.06, Pol'y 1.07.12 (emphasis added).

The general policy set forth above makes clear the City's intent to recognize existing industrial development and to ensure the availability of land for industrial purposes. It also expressly includes manufacturing, assembly and distribution activities, storage activities, green technologies, and other similar land uses. The Project clearly falls within this list of permissible authorized industrial uses. In addition, the Site Plan meets the FAR limitation of 0.75, and shows that the RPF Plant site has transportation access, as required by this Policy 1.07.12. *See* Proposed Site Plan, dated December 4, 2024. Thus, the Project is consistent with these portions of the Policy.

However, the Policy also contains the following prohibition:

> *g. Heavy metal fabrication, batch plants, salvage yards,* ***chemical*** *or petroleum* ***manufacturing or refining****, rubber or plastics manufacturing, or other uses generating potentially harmful environmental or nuisance impacts shall be prohibited.*

CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 1, Objective 1.06, Pol'y 1.07.12 (emphasis added).

Due to this limiting provision, the only interpretive issue for demonstrating consistency with the Industrial land use category description is whether the biological process being proposed constitutes "chemical . . . manufacturing or refining."[2] "Chemical . . . manufacturing or refining" is not defined in the City's Comprehensive Plan.

2. LDC Definition of Manufacturing and/or Assembly-Heavy.

The RPF Plant property is zoned Heavy Industrial, I-2, as shown on the City's Zoning Map. In addition to the description of the IN land use category contained in the Plan, the definition of Manufacturing and/or Assembly-Heavy in the LDC (hereafter the "Heavy Manufacturing" definition) describes the numerous types of manufacturing uses and activities authorized in the Heavy Industrial I-2 zoning district. The term as defined means:

> ***[U]ses** involving **intensive manufacturing and industrial operations**, including the **manufacturing**, assembly, fabrication, **compounding, processing and/or treatment of extracted or raw materials or other industrial products**; packaging and freight loading/unloading activities; **utilization, handling and bulk storage of materials including raw materials, chemicals and hazardous materials associated with manufacturing processes; and all other associated or ancillary activities.***

CITY OF FERNANDINA BEACH, FLA., LAND DEV. CODE § 1.07.00 (2023) (emphasis added).

The Project fits squarely within the description of the types of uses and activities included in this definition. The Project proposes the processing and treatment of SSL, an extracted material, and the utilization, handling and bulk storage of chemicals associated with the pulp manufacturing process.

The definition further specifies that "all other associated or ancillary activities" are also included in the definition and authorized in the Heavy Industrial I-2 zoning district. Here, the Project again fits squarely within this phrase. The Project is an "associated or ancillary activity" to the existing and permitted pulp manufacturing use. The terms "associated" and "ancillary" are not defined in the LDC. When terms in laws or regulations are not defined, plain and ordinary meanings using dictionary definitions to determine the meaning of the terms is appropriate. *See Roldan v. City of Hallandale Beach*, 361 So. 3d 348, 354 (Fla. 4th DCA 2023) and statutory construction discussion at Section II.B. below. "Associated" means closely connected (as in function or office) with another; having secondary or subordinate status. *Associated*, MERRIAM-WEBSTER DICTIONARY, https://www.merriam-webster.com/dictionary/associated (last visited November 25, 2024) . The term "ancillary" means having a subordinate, subsidiary or secondary nature. *Ancillary*, MERRIAM-WEBSTER DICTIONARY, https://www.merriam-webster.com/dictionary/associated (last visited November 25, 2024). "Ancillary" is also defined as "providing necessary support to primary activities or operation of an organization, institution,

[2] This memo does not address petroleum refining because the starting material for such refining operations would be a petroleum product such as crude oil. *See How Refineries Work*, AM. FUEL & PETROCHEMICAL MFRS., https://afpm.org/industries/operations/how-refineries-work (last visited November 22, 2024). The Project does not involve petroleum products.

industry or system; the development of ancillary services to support its products." *Ancillary, Oxford Learner's Dictionary* https://www.oxfordlearnersdictionaries.com/us/definition/english/ancillary (last visited November 25, 2024). The SSL is a byproduct of the existing manufacturing process. Using the SSL, as proposed by the Project, is closely connected and subordinate to the pulp manufacturing process because without the pulping operations, the sugars in the biomass would not be available to ferment. Given these plain and ordinary meanings, the Project constitutes both an associated and ancillary activity.

Similar to the description of the IN-Industrial land use category in the Plan, the Heavy Manufacturing definition also includes the following sentence:

> Such use does not include heavy metal fabrication, batch plants, salvage yards, chemical or petroleum manufacturing or refining, rubber or plastics manufacturing, or other uses generating potentially harmful environmental or nuisance impacts.

CITY OF FERNANDINA BEACH, FLA., LAND DEV. CODE § 1.07.00 (2023).

Just as the case is with the Industrial land use category, the Project clearly fits within the portion of the LDC definition describing all of the permissible and allowable uses and activities included in the Heavy Manufacturing definition. Thus, the only remaining interpretive issue for demonstrating compliance with the Heavy Manufacturing definition as well as the Industrial land use description, is whether the Project falls within the "chemical . . . manufacturing or refining" prohibition. The LDC, like the Comprehensive Plan, contains no definition for "chemical manufacturing or refining."

B. Pursuant to the Rules of Statutory Construction, the Project is Consistent with and Furthers Future Land Use Plan Policies, Goals and Objectives.

When the terms in a law or regulation are not defined, then the language of the regulation should usually be given its plain and ordinary meaning "unless the context indicates they bear a technical sense." *Roldan at* 354, quoting Antonin Scalia and Bryan A. Gardner, *Reading Law: The Interpretation of Legal Texts* 69 (2012); *see also Fla. Birth–Related Neurological Injury Comp. Ass'n v. Fla. Div. of Admin. Hearings,* 686 So. 2d 1349, 1354 (Fla. 1997); *Holly v. Auld*, 450 So. 2d 217, 219 (Fla. 1984) (quoting *A.R. Douglass, Inc. v. McRainey*, 102 Fla. 1141, 137 So. 157, 159 (1931) (..."[W]hen the language of the statute is clear and unambiguous and conveys a clear and definite meaning, there is no occasion for resorting to the rules of statutory interpretation and construction."). However, where a term is subject to different meanings and therefore ambiguous courts will resort to the rules of statutory construction. *See e.g. Forsythe v. Longboat Key Beach Erosion Control Dist.*, 604 So. 2d 452, 455 (Fla. 1992); *Katherine's Bay, LLC. v. Fagan,*52 So. 3d 19, 28 (Fla. 1st DCA 2010) (explaining that rules of statutory construction apply to comprehensive plans). In addition to the long-standing common law principle that comprehensive plans be read as a whole, section 163.3187(4), Florida Statutes, requires that comprehensive plans be internally consistent. Therefore, interpretations that create internal inconsistency within the Comprehensive Plan must be rejected, along with interpretations that are irrational or render words meaningless. *Katherine's Bay, LLC.*, 52 So. 3d at 28. Where the exact meaning of a term is not defined in a statute itself, courts have concluded that terms could be defined by "industry custom." *State v.*

Brake, 796 So. 2d 522, 528 (Fla. 2001), citing *State v. Fuchs,* 769 So. 2d 1006, 1009 (Fla. 2000) and *State v. Hagan,* 387 So. 2d 943, 945-46 (Fla. 1980). Courts also recognize that "zoning regulations are in derogation of private rights of ownership" and therefore give "words used in a zoning ordinance" the meaning that offers the broadest range of uses for the property owner, under the principle that "when there is no definition or clear intent to the contrary, the ordinance should be interpreted in favor of the property owner." *Rinker Materials Corp. v. City of N. Miami*, 286 So. 2d 552, 553 (Fla.1973).

1. The Term "Chemical".

The modifier "chemical" in the phrase "chemical . . . manufacturing or refining" is ambiguous if for no other reason than the word "chemical" is often used both as an adjective, defining the nature of a process, or as a noun, defining the output of a process. The EPA determined that the phrase "chemical process plant" was not subject to a plain meaning interpretation, concluding:

> We do not believe that the term "chemical process plant" is subject to a "plain meaning interpretation." There is not a universally accepted definition of chemical process, and accepted definitions differ depending on whether you view the term from a purely scientific sense or from an engineering sense, or for economic purposes.

Prevention of Significant Deterioration, Nonattainment New Source Review, and Title V: Treatment of Certain Ethanol Production Facilities Under the "Major Emitting Facility" Definition, 72 Fed. Reg. 24060, 24063 (May 1, 2007).

Since the phrase "chemical manufacturing or refining" is ambiguous, the language must be read consistent with the rules of statutory interpretation considering the context of the phrase's usage, both within the Comprehensive Plan as a whole and considering the technical and scientific background in which it applies. *Conage v. U. S.*, 346 So. 3d 594, 598 (Fla. 2022).

Both the Plan and the LDC clearly authorize various types of manufacturing in the Heavy Industrial I-2 zoning district, distinguishing between types by process. The definition of "Manufacturing and/or Assembly – Heavy" includes "***uses** involving **intensive manufacturing and industrial operations***, including the ***manufacturing***, assembly, fabrication, compounding, ***processing and /or treatment of extracted or raw materials or other industrial products***; packaging and freight loading/unloading activities; ***utilization, handling and bulk storage of materials including raw materials, chemicals and hazardous materials*** associated with manufacturing processes; ***and all other associated or ancillary activities.***" (emphasis added)

Likewise, Merriam-Webster offers the following definitions for the word "chemical," both of which focus on the involvement of either chemistry or chemicals in the *process*:

> 1: of, relating to, used in, *or produced by chemistry or the phenomena of chemistry*
> *chemical* reactions

2a: acting or operated *or produced by chemicals*
a *chemical* fire extinguisher.

Chemical, MERRIAM-WEBSTER DICTIONARY, https://www.merriam-webster.com/dictionary/chemical (emphasis added) (last visited Nov. 24, 2024); *see Barco v. Sch. Bd. of Pinellas Cnty.*, 975 So. 2d 1116, 1122 (Fla. 2008) (referring to Merriam-Webster and holding "[i]t is appropriate to refer to dictionary definitions when construing statutes or rules.")

Thus, both the dictionary definition and the context of the Plan and LDC provisions call for the word "chemical" in the phrase "chemical manufacturing or refining" to refer to a manufacturing process that uses chemistry or chemicals in a chemical reaction process to create manufactured or refined items. As explained below, the Project does not use a chemical reaction process to create 2G-, but rather uses biological and physical processes and thus, the Project is not prohibited.

2. The Proposed Production of 2G-Bioethanol at the RPF Plant is a Natural Fermentation and Physical Separation Process that is not "Chemical Manufacturing" or "Chemical Refining".

RYAM proposes to implement a process that generally includes two stages: 1) fermentation, where sugars are converted into ethanol, and 2) distillation, where the ethanol is separated and purified.

a. Fermentation is Not "Chemical Manufacturing".

The Project will produced bioethanol through the natural process of fermentation. Fermentation is a process that happens in nature. It relies on living organisms, typically microorganisms, to convert organic substrates into the desired product—in this case, ethanol for fuel. [3] Industrial fermentation follows this same natural process and is often referred to as "bioprocessing" or "biotechnology" rather than chemical manufacturing.[4]

Fermentation is a well-known natural process used by humanity for thousands of years to make beer, liquor, bread, yogurt, cheese, and other similar products.[5] Local distiller Roger Morenc

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[3] Industrial Fermentation Supporting a Growing Industry, *Institute for Advanced Learning and Research*, (Aug. 20, 2024), https://www.ialr.org/industrial-fermentation-supporting-a-growing-industry/#:~:text=At%20its%20basic%20level%2C%20fermentation,then%20harvested%2C%20packaged%20and%20sold.

[4] *Id.*; *see also* Christopher J. Hewitt et al., *The Scale-Up of Microbial Batch and FedBatch Fermentation Processes,* 62 ADVANCES IN APPLIED MICROBIOLOGY 105-135 (2007) (article relied on by Medardo Monzon in forming his opinions stated publicly).

[5] Sergi Maicas, *The Role of Yeasts in Fermentation Processes*, NATIONAL LIBRARY OF MEDICINE (2020), https://pmc.ncbi.nlm.nih.gov/articles/PMC7466055/; *see also* Memorandum from Glen P. Fox, Anheuser-Busch Endowed Professor in Department of Food Science & Technology at University of California, on Ethanol Production from Natural Sources of Sugar (Oct. 10, 2024) (Attached hereto and made part hereof as Exhibit 1).

confirms this, stating, "[t]his is a natural biological process and actually happens in the wild in a large number of instances."[6] Specifically for the Project, sugars contained in the SSL will be converted by yeast to ethanol.[7]

An article relied on by Medardo Monzon in developing his publicly stated opinions (in opposition to the Project) confirms the biologic nature of the sugar conversion process.[8] The article explains, "[e]thanol can be made synthetically from petroleum or by microbial conversion of biomass materials through fermentation."[9] Notably, this reference acknowledges there are two distinct ways to make ethanol – one a synthetic chemical manufacturing process and one a fermentation process. This article further identifies the three steps for a natural fermentation process: "The fermentation method generally uses three steps: (1) the formation of a solution of fermentable sugars, (2) the fermentation of these sugars to ethanol, and (3) the separation and purification of the ethanol, usually by distillation."[10] For the Project, step one already takes place in the RPF Plant's current existing pulping process when the SSL is created. Finally, this article describes fermentation as "involv[ing] microorganisms that use the fermentable sugars for food and in the process produces ethanol and other byproducts."[11]

By contrast, chemical manufacturing refers to the industrial production of chemicals through chemical reactions involving non-living substances.[12] These processes often include synthesis, catalysis, and other chemical transformations of raw materials such as petroleum, natural gas, or minerals. In fact, the Weiss Serota Memo, which will be discussed more fully below, compares biochemical fermentation to a thermochemical conversion process, which it describes as "involving adding heat ***and chemicals*** to a biomass feedstock to produce syngas, which is a mixture of carbon monoxide and hydrogen…[which is then] mixed with a catalyst and reformed into Ethanol and other liquid coproducts." Weiss Serota Memo, p. 4 (emphasis added). The difference between the two processes, and one of the failings of the Weiss Serota Memo's flawed logic, is clear: on the one hand, the Project uses biological agents in the manufacturing process in the form of yeast while the thermochemical manufacturing process uses chemicals and non-renewable raw materials.

There is a clear distinction between a biological process like fermentation and chemical manufacturing. To conclude otherwise would mean that the production of beer, liquor, yogurt, bread, and even the operation at the City's water treatment plant, which uses living organisms to breakdown waste, would be prohibited in the City. Since the City expressly allows fermentation

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[6] Memorandum from Roger Morenc, Owner of Marlin & Barrel Distillery (Oct. 15, 2024) (Attached hereto and made part hereof as Exhibit 2).

[7] Memorandum from Glen P. Fox, *supra* note 5.

[8] P.C. Badger, *Ethanol from Cellulose: A General Review, reprinted from* TRENDS IN NEW CROPS AND NEW USES (J. Janick and A. Whipkey eds., 2002).

[9] *Id.* at 17.

[10] *Id.*

[11] *Id.*

[12] *Id.* (stating that ethanol can be made synthetically).

within its boundaries in the same Industrial future land use designated area and Heavy Industrial I-2 zoning district as the RPF Plant, as shown in Table 2.03.02, Table of Land Uses in the City's LDC, the phrase "chemical manufacturing" cannot be interpreted as encompassing fermentation and remain internally consistent. As noted above, Florida Statutes requires both that comprehensive plans be internally consistent, and that zoning regulations be consistent with comprehensive plans. § 163.3187(4), Fla. Stat. (2023); § 163.3194, Fla. Stat. (2002). Therefore, the express allowance of breweries and distilleries, which create alcohol through a fermentation process, means that the Project must likewise be allowed since it also creates alcohol through a fermentation process. *Fla. Dept. of Env't. Prot. v. ContractPoint Fla. Parks, LLC,* 986 So. 2d 1260, 1270 (Fla. 2008) (A basic rule of statutory construction requires the court to avoid a literal interpretation that would result in an absurd result, ridiculous conclusion or untenable consequence.)

b. Drying and Distillation is Not "Chemical Refining".

Just as chemical manufacturing does not encompass the production of alcohol through fermentation, the phrase "chemical refining" does not encompass the processes of "drying and distillation."

Distillation is a physical separation process based on differences in boiling points of components in a mixture. It involves heating the mixture to convert the more volatile component(s) into vapor, which is then condensed back into a liquid and collected separately. The process of distillation typically involves a distillation column or still, where the mixture is heated, and the vapor is collected and condensed.[13] No new chemical is introduced, nor is any new chemical produced. Substances are simply separated from one another. The Project would produce 2G-Bioethanol in a manner identical to the way Marlin & Barrel makes liquor.

Roger Morenc owner of Marlin & Barrel describes distilling as follows:

> Once all of the potential alcohol is made in a ferment then its [sic] time to take the part you want and discard the rest. Since ferments are a natural process [sic] you'll find that a small amount of other-than ethyl alcohol can be present. Said another way, even though the vast majority of alcohol made is ethyl alcohol, there will be other types present. Each will have its unique molecular weight and that directly corresponds to a unique boiling point. As the ferment is distilled, the liquid is heated and the lighter compounds that require less heat to change from a liquid to vapor state will climb the sill [sic] column first and further then those needing more energy to get to their vapor form. In this way a still organizes all of the different molecule types present in a finished ferment. From that position of stratification a distiller can extract the desired piece of the ferment, cool it to liquid temperature again and then collect it. ***In no part of this process are chemicals being changes* [sic]. *This is simply a liquid sifter of sorts.***

[13] *Distillation*, BRITANNICA, https://www.britannica.com/science/distillation (last updated Oct. 24, 2024).

Memorandum from Roger Morenc, Owner of Marlin & Barrel Distillery (Oct. 15, 2024) (Exhibit 2, attached) (emphasis added).

Similarly, drying is another way to separate molecules from one another based on size. The Project anticipates using molecular sieves to separate water and ethanol molecules from one another. The molecular sieve will trap water molecules in a bed of adsorbent beads with small pores that small water molecules can pass through and be adsorbed, thereby allowing the ethanol molecules to pass through. This allows water content to be removed without introducing any new chemical or a new process, and no new chemical is produced. Pre-existing substances are simply separated from one another.

Conversely, "chemical refining" typically involves chemical reactions to remove impurities or unwanted components from a substance. It may involve adding chemical agents that react with specific impurities, turning them into removable substances. Chemical refining is also commonly used in the purification of oils (like vegetable oils) or metals (such as the refining of crude metals into purer forms).[14] For example, in vegetable oil refining, caustic soda is added to the mixture to neutralize free fatty acids.[15] In metal refining, chemicals are added to remove impurities like sulfur or phosphorus.

The critical distinction between the two processes is that distillation and drying are physical processes, relying on temperature differences and mechanical separation, while chemical refining is a process that involves the use of chemicals to cause reactions. And most important, the City has approved distillation of ethanol intended for drinking within its City limits. As confirmed by its owner, distillation operations like those Marlin and Barrel performs are the same as the distillation operation that is proposed by the Project. Thus, the City cannot define the processes proposed by the Project as "chemical refining," while maintaining internal consistency within the Plan and between the Plan and the LDC, as well.

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[14] *Chemical Refining*, BRITANNICA, https://www.britannica.com/technology/chemical-refining (last visited Nov. 22, 2024); *Chemical Refining*, FEDIOL, https://www.fediol.eu/web/chemical%20refining/1011306087/list1187970098/f1.html (last visited Nov. 22, 2024); *Fractional Distillation vs. Refining*, THIS VS. THAT, https://thisvsthat.io/fractional-distillation-vs-refining (last visited Nov. 26, 2024); Said Gharby, *Refining Vegetable Oils: Chemical and Physical Refining*, NAT'L LIBR. MED. (Jan. 11, 2022), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8767382/#:~:text=However%2C%20the%20chemical%20refining%20has,the%20release%20of%20polluting%20effluents.

[15] Said Gharby, *Refining Vegetable Oils: Chemical and Physical Refining*, NAT'L LIBR. MED. (Jan. 11, 2022), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8767382/#:~:text=However%2C%20the%20chemical%20refining%20has,the%20release%20of%20polluting%20effluents.

3. The Weiss Serta Memo Incorrectly Interprets Chemical Manufacturing and Chemical Refining Based on Flawed Reasoning, Insufficient Data, and a Lack of Understanding Regarding the Science and the Industry.

On May 23, 2024, the City received the Weiss Serota Memo that considers whether the production of bioethanol at the RPF Plant would violate the prohibition against chemical manufacturing and refining found in the description of the Industrial land use category (Policy 1.07.12, Land Use Element) and the definition of "Heavy Manufacturing" in the LDC. It cannot be stressed enough that there was no application pending before the City when the Weiss Serota opinion was requested. The request was made because of an application submitted by RYAM to the FDEP.

The Weiss Serota Memo, authored by attorneys, without apparent input from scientific or technical consultants, was based on the attorneys' flawed understanding of information gleaned from an air permit application submitted to FDEP by RYAM, and on a draft construction air permit issued by FDEP -- both of which have never been submitted to the City nor made a part of any application to the City by RYAM. These documents contained only the information necessary for FDEP to conduct a highly technical "prevention of significant deterioration" ("PSD") applicability review and evaluate whether and under what conditions a construction air permit could properly be issued under the Federal Clean Air Act ("CAA") and applicable Florida law.

Importantly, the FDEP documents did not contain information required by the City when submitting a site plan for approval and did not address how words used in the City's Plan, a regulatory document created for an entirely different purpose, apply to the Project. Nevertheless, the Weiss Serota Memo improperly attempted to correlate these extra-record documents produced in an entirely different context to the question of whether the Project is consistent with the Comprehensive Plan and LDC with insufficient information about the Project, with limited or no expertise in the industry or in the areas of air permitting and critically PSD applicability review, and with little to no analysis of the Comprehensive Plan as a whole. As a result, the conclusions in the Weiss Serota Memo are legally and factually unsupported and do not represent competent, substantial evidence upon which the City could deny the Project.

While the Weiss Serota Memo correctly identifies that the Project is in an area zoned "Heavy Industrial (I-2)" and that chemical manufacturing and refining are not permitted uses under this zoning category, it does not accurately analyze whether the specific processes involved in the Project, namely fermentation and distillation, fit within the subject prohibitions.

Instead, Weiss Serota's Memo summarily interprets the word "chemical" as a noun in isolation, with no apparent cross-reference to other uses permitted in the I-2 district, or the remaining language in the Plan as a whole, and concludes that any operation that results in a chemical being produced is prohibited chemical manufacturing and refining. As a result, the interpretation advanced by the Weiss Serota Memo would include within the category of prohibited manufacturing virtually all substances. For example, water (H_2O) can be considered a chemical.

Rather than analyzing the phrase "chemical manufacturing" in context, the Weiss Serota Memo focuses on the end product "ethanol" and simply asserts that because ethanol is a chemical, its production automatically qualifies the Project as one that constitutes prohibited "chemical manufacturing or refining". This oversimplification neglects to differentiate between different types of processing operations to create chemicals and ignores the fact that production of alcohol is already expressly allowed and permitted under the same Plan and LDC provisions through the same processes proposed by the Project. This narrow view also leads to results that are inconsistent with the City's existing application of the Plan and ignores well-established cannons of statutory construction.

Where the Weiss Serota Memo *does* attempt to consider industry regulation for context, it gets it demonstrably wrong. The Weiss Serota Memo attempts to support its argument that the Project constitutes "chemical manufacturing" by noting references to ethanol in the Toxic Substances Control Act ("TSCA"), ethanol being listed in EPA's Substance Registry Services ("SRS") online web database, ethanol being listed in EPA's Consolidated List of Chemicals, and the existence of a NAICS code, (NAICS 325-193), for "Ethyl Alcohol Manufacturing." As described herein, none of these bases serve to establish what is and is not "chemical manufacturing and refining" under the Plan, which functions in the land use, rather than in any federal regulatory protection context. However, the Weiss Serota Memo fails to recognize that, even in the regulatory context it relies on, the EPA has determined that the alcohol made by and the production processes used by breweries and distilleries is functionally equivalent to the production of bioethanol.

Specifically, while purportedly relying on the information contained in the air permit application, the Weiss Serota Memo noticeably omits from its analysis guidance documents from EPA that distinguish ethanol production by fermentation from chemical manufacturing. EPA's guidance is reviewed below.

The RPF Plant and the Project are subject to regulation by the EPA and FDEP under the Clean Air Act. The CAA is the comprehensive federal law that regulates air emissions from stationary sources such as the RPF Plant. The main goal of the CAA is to protect the public health and the environment by regulating emissions of certain air pollutants. The CAA is implemented through an extensive list of federal and state administrative regulations. Various regulations implementing the CAA include New Source Performance Standards "NSPS", "Prevention of Significant Deterioration" requirements, and National Emission Standards for Hazardous Air Pollutants "NESHAPS". The specific CAA requirements for the Project are set forth in RYAM's permit application submitted in 2023 to FDEP.

Generally, the EPA differentiates facilities that manufacture ethanol through chemical synthesis from those that use biological synthesis. For example, the EPA has determined that facilities that produce ethanol through fermentation are ***not considered*** synthetic organic chemical manufacturing industry (SOCMI) sources subject to regulation under applicable portions of 40 Code Federal Regulations Part 60. Pursuant to a series of Applicability Determinations by the EPA analyzing the applicability of various provisions of 40 Code Federal Regulations Part 60 to ethanol manufacturing facilities, the EPA determined that although ethanol is listed as a chemical affected by both "NSPS" Subparts RRR and NNN, background documentation created during the

development of both standards indicated that the creation of ethanol by fermentation should properly be excluded from the scope of both NSPS, Subparts RRR and NNN.

Consistent with this interpretation, the EPA specifically excluded ethanol production by fermentation from its definition of "chemical process plants." For example:

> 40 CFR § 51.165 provides:
>
> Permit requirements.
>
> (a) * * *
>
> (1) * * *
>
> (iv) * * *
>
> (C) * * *
>
> (20) Chemical process plants—**The term chemical processing plant shall not include ethanol production facilities that produce ethanol by natural fermentation included in NAICS codes 325193** or 312140;
>
> * * * * *
>
> (4) * * *
>
> (xx) Chemical process plants—**The term chemical processing plant shall not include ethanol production facilities that produce ethanol by natural fermentation included in NAICS codes 325193** or 312140.

40 CFR § 51.165 (emphasis added).

The EPA expressed that one of its policy rationales for adopting the exclusion was to correct the disparate treatment related to the production of ethanol for fuel versus the production of ethanol intended for human consumption by applying two different major source thresholds. Because the two manufacturing processes are substantially similar, EPA stated that the process should be treated and regulated identically for purposes of the PSD and Title V regulations under the CAA, regardless of the intended product use. It is also clear from EPA's discussion of NAICS code 325193 in the Federal Register, that it considers ethanol production distinct from the broader classification of chemical manufacturing in NAICS code 325.[16]

[16]Prevention of Significant Deterioration, Nonattainment New Source Review, and Title V: Treatment of Certain Ethanol Production Facilities Under the "Major Emitting Facility" Definition, 72 Fed. Reg. 24060, 24062 (May 1, 2007) ("Ethanol fuel and industrial ethanol fall within NAICS 325193 (Ethyl Alcohol Manufacturing) which includes denatured alcohol, nonpotable ethanol, and nonpotable grain alcohol. NAICS 312140 (Distilleries) includes potable ethyl alcohol and grain alcohol beverages. Even though NAICS 325193 (ethyl alcohol manufacturing) has been classified under NAICS Chemical Manufacturing subsector, unlike under the SIC classification of 2869 (Industrial Organic Chemicals, Not Elsewhere Classified), ethyl alcohol manufacturing is within its own narrowly defined category.")

Consistent with EPA's "chemical process plant" exclusion, FDEP, which acts as the statewide enforcer of the EPA's regulatory framework under the CAA and has authority to issue CAA permits in Florida on behalf of the EPA, has adopted regulations in the Florida Administrative Code that mirror the Code of Federal Regulations. For example, in Rule 62-210.200(156) of the Florida Administrative Code the definition of "Major Stationary Source" expressly excludes ethanol production facilities that produce ethanol by natural fermentation:

> (a) A major stationary source is:
>
> 1. .... chemical process plants (**the term "chemical process plants" shall not include ethanol production facilities that produce ethanol by natural fermentation included in North American Industry Classification System (NAICS) codes 325193 or 312140**)....
>
> (c) The fugitive emissions of a stationary source shall not be included in determining for any of the purposes of this definition whether it is a major stationary source, unless the source belongs to one of the following categories of stationary sources: ....
>
> 20. **Chemical process plants (the term "chemical process plants" shall not include ethanol production facilities that produce ethanol by natural fermentation included in North American Industry Classification System (NAICS) codes 325193 or 312140)**

Fla. Admin. Code R. 62-210.200(156) (2020) (emphasis added).

The National Resource Defense Council ("NRDC") challenged a similarly adopted exclusion in the State of Indiana. Specifically, the Supreme Court of Indiana determined that its state environmental agency, which adopted a mirror definition of "chemical process plant" to exclude fuel ethanol plants for air permitting purposes was reasonable as a matter of regulatory interpretation. *Nat'l Res. Def. Council v. Poet Biorefining-N. Manchester*, LLC, 15 N.E. 3d 555, 565 (Ind. 2014). In that case, the NRDC argued that fuel ethanol plants should be classified as "chemical process plants" based on a plain reading of the term. However, the Court rejected this interpretation. The Court noted that prior to the EPA's revision to its definition of chemical process plant, ethanol production by fermentation for human consumption was treated differently than ethanol production for fuel, despite both involving the same biological processes. Moreover, the Court found that fermentation, a process used in ethanol production, is common across industries, many of which are not classified as "chemical process plants."

The Court emphasized that the NRDC did not justify why its interpretation of "chemical process plant" should apply only to fuel ethanol plants and not to food-grade ethanol production or other industries using fermentation. As such, the Court held that such an interpretation would improperly broaden the definition and stated "[w]e will not interpret a regulatory phrase in a way that both produces absurd results and vitiates other regulatory provisions for the sake of strictly applying the "plain meaning" canon of regulatory interpretation. *Id.* at 565. We give words their common and ordinary meaning without unduly emphasizing a strict literal or selective reading of the individual words." *Id.* The Court concluded that the Indiana environmental agency's exclusion of fuel ethanol plants from the "chemical process plant" category was reasonable, as it was consistent with EPA's stance and did not conflict with the regulatory framework.

Thus, the EPA's application of the Clean Air Act and judicial review of those decisions support RYAM's position (and common sense) here: the Project is like brewing beer, distilling alcohol for human consumption, or even making yoghurt or bread, not "chemical manufacturing" as that term is used by the industry or its environmental regulators. The Weiss Serota Memo's failure to evaluate or even discuss the CAA when the EPA and FDEP have clearly offered the above guidance further indicates that the Weiss Serota Memo is incomplete, based on incompetent evidence and analysis, and should be disregarded by the City in making its consistency determination.

Further, the Weiss Serota Memo selectively analyzes other Federal and state laws and regulations and ignores any of the references identified below to the various exclusions found throughout EPA's and FDEPs regulations for facilities producing ethanol by natural fermentation like the Project. Moreover, none of the regulatory provisions cited in the Weiss Serota Memo define or take into account the process of "chemical manufacturing." For example, TSCA establishes certain reporting, testing and recordkeeping requirements. The main goal of the TSCA is to ensure that chemicals used in commerce do not pose an unreasonable risk to human health or the environment.[17] TSCA does not define any actual manufacturing processes. Nonetheless, the Weiss Serota Memo concludes that because ethanol falls within TSCA's broad definition of "chemical substance," its production must constitute "chemical manufacturing," as that term is used in an entirely different regulatory context in a different jurisdiction and under a document with no express reference to the TSCA or its purposes.

Similarly, the Weiss Serota Memo relies on NAICS definitions without considering that NAICS are used by federal agencies for statistical purposes only. While they may help identify applicable regulations, they are not determinative of what constitutes "chemical manufacturing or refining" in any context much less the land use regulations of a local government in Florida. Furthermore, there is no requirement that a local government must utilize NAICS, nor is there any indication that the City considered the NAICS code in adopting the Heavy Manufacturing definition included in the LDC.

[17] *See e.g., Learn About the Toxic Substances Control Act (TSCA)*, U.S. ENV'T PROT. AG., https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/learn-about-toxic-substances-control-act-tsca (last updated Oct. 4, 2024).

Additionally, while the EPA's Substance Registry Services ("SRS")[18] and the Consolidated List of Chemicals ("CLC")[19] cited to in the Weiss Serota Memo, may be useful tools for identifying regulated substances and tracking chemical inventories, their listing of ethanol does not automatically determine that the production of ethanol through fermentation is classified as "chemical manufacturing." The SRS and CLC identify substances that are regulated under various environmental statutes, such as the CAA and TSCA. While ethanol may appear on these lists, this is primarily for regulatory tracking, safety, or reporting purposes. The presence of a substance in these databases does not automatically dictate how the process of producing that substance is categorized -- especially by the industry. These databases ensure that producers are aware of regulations related to the handling, reporting, and usage of substances, but they do not define how

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[18]The United States Environmental Protection Agency describes the SRS as follows:

> Substance Registry Services (SRS) is the Environmental Protection Agency's (EPA) central system for information about substances that are tracked or regulated by EPA or other sources. It is the authoritative resource for basic information about chemicals, biological organisms, and other substances of interest to EPA and its state and tribal partners.
>
> The SRS makes it possible to identify which EPA data systems, environmental statutes, or other sources have information about a substance and which synonym is used by that system or statute. It becomes possible therefore to map substance data across EPA programs regardless of synonym.
>
> The system provides a common basis for identification of, and information about:
>
> - Chemicals
> - Biological organisms
> - Physical properties
> - Miscellaneous objects

About Substance Registry Services (SRS), U.S. ENV'T PROT. AG., https://cdxapps.epa.gov/oms-substance-registry-services/about-srs (last visited Nov. 26, 2024).

[19]The United States Environmental Protection Agency explains the list as follows:

> The List of Lists is a consolidated list of chemicals subject to:
>
> - Emergency Planning and Community Right-to-Know Act (EPCRA);
> - Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); and
> - Section 112(r) of the Clean Air Act (CAA).

It was prepared to help facilities handling chemicals determine, for a specific chemical, whether they may be subject to certain reporting requirements. These lists should be used as a reference tool, not as a definitive source of compliance information.

Consolidated List of Lists, U.S. ENV'T PROT. AG., https://www.epa.gov/epcra/consolidated-list-lists (last updated Nov. 12, 2024).

the process of producing said substance is categorized. As explained above, this distinction matters when evaluating consistency with the Comprehensive Plan and was not something considered by the Weiss Serota Memo.

This distinction between the processes is further emphasized by examining EPA's website, which includes an information page on "chemical manufacturing" in the context of its Toxic Release Inventory ("TRI") Program and how TRI chemical wastes are managed in the chemical manufacturing sector (defined as facilities reporting their primary NAICS code as 325).[20] The page includes a "Chemical Manufacturing Facilities by Subsector" pie chart that provides a summary of operations in the chemical manufacturing sector. According to EPA, operations in the chemical manufacturing sector include:

- Basic chemicals facilities produce large quantities of chemicals that are often used to make other chemicals or products. Basic chemicals include petrochemicals, industrial gases, and synthetic dyes and pigments.
- Coatings and adhesives facilities mix pigments, solvents, and binders into architectural and industrial paints; manufacture paint products such as paint removers and thinners; and manufacture adhesives, glues, and caulking compounds.
- Resins and synthetic rubber facilities manufacture resins, plastic materials, synthetic rubber, and fibers and filaments.
- Facilities in the "Other Chemical Products" subsector make chemicals for a wide variety of applications. These include chemicals used in photography, explosives, inks and toners, and transportation equipment like antifreeze or brake fluid.

Chemical Manufacturing, U.S. ENV'T PROT. AG., https://www.epa.gov/trinationalanalysis/chemical-manufacturing (last updated Aug. 20, 2024).

Notably absent from its descriptions are facilities that manufacture ethanol through a biological process.

Similarly, another glaring issue with the Weiss Serota Memo is its conclusion (without citation) that distillation is equivalent to "chemical refining." As explained above, these processes are distinct and have very distinct technical meanings. Thus, simply stating refining and distilling are the same is not a supportable position.

4. The Weiss Serota Memo Fails to Analyze the Comprehensive Plan as a Whole.

The Weiss Serota Memo also fails to analyze the Plan holistically, as required by Florida law. For example, the Weiss Serota Memo does not recognize that the prohibition against "chemical manufacturing or refining" is aimed at preventing the types of environmental and public safety hazards posed by traditional, stand-alone chemical and refining plants rather than existing

[20] *Chemical Manufacturing*, U.S. ENV'T PROT. AG., https://www.epa.gov/trinationalanalysis/chemical-manufacturing (last updated Aug. 20, 2024).

facilities wishing to augment their existing production process with renewable energy production as a means to utilize its byproducts in a more environmentally sensitive manner. This point is supported by the following language that was included as part of the prohibition language when it was initially adopted by the City in October, 2000, and describes characteristics of the targeted uses that will be avoided as a result of the prohibitions:

> "These uses typically generate heavy truck traffic, require significant acreage, are difficult to screen and buffer from residential areas, and therefore should be located in more sparsely developed unincorporated areas."[21]

Even though this language has since been deleted from the current version of Policy 1.07.12 describing the Industrial future land use category, it nevertheless serves as a clear indication of the original intent and rationale behind the prohibitions. As the Florida Supreme Court in *Ham v. Portfolio Recovery Assocs, LLC,* 308 So. 3d 942, 947 (Fla. 2020) stated, "[w]e thus recognize that the goal of interpretation is to arrive at a 'fair reading' of the text by 'determining the application of [the] text to given facts on the basis of how a reasonable reader, fully competent in the language, would have understood the text at the time it was issued." quoting *Scalia & Gardner, Reading Law* at 33. The Project has none of the characteristics of the uses that were the original drafter's target. Rather, the Project will generate only three truck trips per day, will require only about 2.5 acres located within the current RFP Plant property, and will be easily screened and buffered by trees and other natural buffers that already exist.

In addition, the Weiss Serota Memo does not consider the broader goals and objectives of the Comprehensive Plan. Principles of statutory construction demand that consideration be afforded "not only to the literal and usual meaning of the words, but also to their meaning and effect on the objectives and purposes of the statute's enactment." *Florida Birth-Related Neurological Inj. Compen. Assoc. v. Fla. Div. of Admin. Hrg.*, 686 So. 2d 1349, 1354 (Fla. 1997). In this case, when viewed in its entirety, the Plan's emphasis on sustainability, economic growth, and industrial development actually supports, rather than conflicts with, approval of the Project.

5. The Project is Consistent with and Furthers Future Land Use Provisions Related to Safety.

For example, the Project supports Goal 1 of the Future Land Use Element, which encourages land uses that maintain the City's economic base while minimizing threats to health, safety, welfare, and environmental resources. The Project will contribute to a diverse economic base by introducing renewable energy production, a key industry that supports job creation and economic growth without compromising public safety or natural resources. The Project's focus on sustainability also furthers the Goal's stated intent to protect environmental resources.[22]

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[21] City of Fernandina Beach, Fla., Ordinance 99 – 49, (Oct. 17, 2000).

[22] GOAL 1 of the City's Comprehensive Plan provides the following:

> The city shall encourage and accommodate land uses which maintain the city as a viable community, enhance the city's economic base, and offer diverse opportunities for a wide

With respect to the second part of Goal 1, the Project is engineered to comply with rigorous safety and environmental protocols and regulations to protect health, safety, welfare, and environmental resources. The safety of RYAM's employees and the community is RYAM's highest priority. From a safety perspective, the primary concern of the Project is the flammability of ethanol, a fact of life whether you are brewing beer or making ethanol for fuel. The engineering design of the Project was developed in collaboration with local fire officials and the Company's insurance provider and includes dedicated fire prevention technologies and fire suppression systems that adhere to the latest federal, state, and local codes, standards, and regulations. As described in detail within the application, the fire safety systems will include concrete containments walls around fermentation, distillation and storage, floating roof tanks, process and ambient monitoring, control system interlocks and alarm systems, fire suppression systems using non-PFAS alcohol foams, and firefighting equipment.

The location of the process and storage tanks within the footprint of the RPF Plant is also an important consideration for risk minimization. The proposed location is a safe distance from the pulping operations and related chemical storage, and a safe distance from the community around the facility. RYAM's expert safety consultant conducted an independent evaluation of the potential impacts of a worst-case scenario event. This scenario assumes that none of the safety systems discussed above are in place. The study concluded that even in that highly unlikely scenario, the area of highest risk extends only 25 meters (0.0155 mile or 82 feet) from the storage tanks and the area of minor risk, such as broken windows, extends only 120 meters (0.0745 mile or 393.7 feet). Both distances are well within the boundaries of the current RPF Plant footprint and well away from the pulping operations and chemical storage.

Notwithstanding the actual impact radius for the worst-case event, the 2024 Emergency Response Guidebook[23] recommends an 800-meter (0.497 mile or 2,624.7 feet) evacuation radius for incidents involving flammable liquids. For the proposed process, that evacuation radius would not reach any residences or other private properties. It should be noted that, by contrast, a gasoline fire at the gas stations located on State Road 200 and on 8th Street are also subject to an 800-meter evacuation radius, and an incident at one of these *would* impact numerous residences and businesses in the community.

Finally, the Project will not create nuisances for the community. There will be no increase in raw materials usage. Finished product shipments will require up to three trucks per day . In recent years, the existing RPF Plant has reduced truck traffic by about six trucks per day by reducing the use of fuel oil at the facility.

> variety of living, working, shopping, and leisure activities, while minimizing any threats to health, safety and welfare posed by hazards, nuisances, incompatible land uses and without adverse impact on its natural environment and cultural resources.

CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 1, Objective 1.02.

[23] U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, 2024 Emergency Response Guidebook, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2024-04/ERG2024-Eng-Web-a.pdf (last visited December 3, 2024).

C. The Project is Consistent with Numerous LDC Provisions, Which Implement the Applicable Future Land Use Plan Policies.

For the same reasons that it is consistent with the Plan, the Project is consistent with the LDC, which implements the Plan. Pursuant to the LDC, the RPF Plant is zoned Heavy Industrial (I-2). Section 2.01.00 of the LDC, provides for the establishment and purpose of the City's Zoning Districts. Section 2.01.17 specifies the intent of the Heavy Industrial zoning district as follows:

> The I-2 District is intended for the development of warehousing, fabrication, storage, and commercial services which are likely to produce adverse physical and environmental impacts such as noise, land, air, and water pollution and transportation conflicts. The Heavy Industrial District recognizes existing heavy manufacturing development with locations that have access to major highways. Residential development, with exception of a caretaker's unit, is not permissible within the zoning district. The designation of land for the I-2 District shall be based on compatibility with surrounding land uses, considering environmental sensitivity, intensity of use, hours of operation, heat, glare, fumes, noise, and visual impacts.

Table 2.03.02, Table of Land Uses in the LDC, lists numerous uses authorized as "permissible" or "permissible subject to supplemental standards," in the Heavy Industrial I-2 zoning district. For example, permissible uses include bakery plants, craft breweries, wineries, and distilleries, bulk storage yards for liquids and solids, bottling plants, wastewater treatment plants, and heavy manufacturing and assembly. Section 1.07.00 of the LDC defines several allowable uses for property zoned "Heavy Industrial," including "Heavy Manufacturing and Assembly," which contains language similar to that in the Plan regarding the prohibition of "chemical or petroleum manufacturing or refining." [24] As with the Plan, the terms "chemical or petroleum manufacturing or refining" are not defined in the LDC. Nonetheless, since the LDC implements the Plan and does not differ substantively from the Plan in terms of the specific "chemical manufacturing or refining" prohibition, the analysis set forth above demonstrating compliance with the Industrial future land use category also demonstrates compliance with the LDC's corresponding zoning requirements.

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[24] Section 1.07.00 of the LDC defines Manufacturing and/or Assembly – Heavy as follows:

> "[U]ses involving intensive manufacturing and industrial operations, including the manufacturing, assembly, fabrication, compounding, processing and/or treatment of extracted or raw materials or other industrial products; packaging and freight loading/unloading activities; utilization, handling and bulk storage of materials including raw materials, chemicals and hazardous materials associated with manufacturing processes; and all other associated or ancillary activities. Such use does not include heavy metal fabrication, batch plants, salvage yards, chemical or petroleum manufacturing or refining, rubber or plastics manufacturing, or other uses generating potentially harmful environmental or nuisance impacts.

CITY OF FERNANDINA BEACH, FLA., LAND DEV. CODE § 1.07.00 (2023).

D. The Project is Consistent with and Furthers Plan Provisions Related to Economic Development.

The Plan aims to balance and harmonize economic development with environmental protection and community needs. The production of bioethanol through fermentation in the heavy industrial zoning district furthers the City's stated goal to harmonize these respective goals. On the one hand, the Project allows RYAM to realize the highest and best use of its private property through the utilization of its existing, unique SSL stream to produce another saleable product within its existing Heavy Industrial-designated footprint, which in turn supports and encourages millions of dollars of continued investment in the community, increasing the tax base and job opportunities in the City. On the other hand, the Project creates a renewable energy source that reduces greenhouse gas emissions without compromising safety or causing compatibility issues for neighboring properties.

Importantly, the Project contributes significantly to the City's economic development strategies outlined in Goal 12 of the Economic Development Element.[25] First, it ensures RYAM's continued contribution to the economic needs of the City. A preliminary economic study prepared by the University of Florida, *Economic Contributions of Forest Product Manufacturing in Fernandina Beach, Florida* (Dec. 10, 2024), concludes that RYAM's total economic contribution in 2023 in Nassau County alone was $379.5 million and nearly $575 million in the wider wood-procurement region. The Project on its own represents a $50 Million capital investment by RYAM within the City limits, which increases the City's tax base. Moreover, by maintaining skilled labor jobs and expanding those jobs into the renewable energy sector and reducing reliance on imported fuels, the Project aids in diversifying the City's tax and employment base, contributing to long-term economic sustainability.

Not only does the Project expand the economic contribution of the RPF Plant, but it also supports its continued existence by introducing economic efficiencies and diversifying revenue streams that are vital to the RPF Plant's continued existence. Every business has to continue to invest, innovate, and diversify to remain competitive. The Project allows RYAM to do this and as a result, RYAM will be in a better position to protect local jobs and local operations for the long-term. Further the Project will support other existing businesses in the City by creating new jobs

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[25] GOAL 12 of the City's Comprehensive Plan, the Economic Development Element, provides the following:

> The City shall create and implement an economic development strategy focused on the retention, expansion, and relocation of high wage jobs and targeted businesses, while seeking to diversify the city's tax and employment base to lessen the tax burden for existing residents and businesses. This shall be accomplished through the preservation of the City's unique character, historical, cultural, and environmental assets and through promotion of sustainable development, redevelopment, and rehabilitation of properties with existing infrastructure and public services.

CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 12.

and additional demand for support services for the Project. This aligns with Objective 12.03[26] which aims to promote the expansion and sustainability of local businesses.

The Project also furthers Objective 12.07,[27] which emphasizes workforce development and retention. The Project creates opportunities for workforce training in green technology and renewable energy, while ensuring the continuation of existing jobs at the RPF Plant.

The Project is also consistent with and furthers Policy 1.01.01[28], which directs the City to develop strategies to reduce greenhouse gas (GHG) emissions. The Project will reduce reliance on fossil fuels by not burning additional natural gas to replace the loss of sugars in the SSL returned to RYAM's recovery boiler, thereby contributing to the City's climate change mitigation goals. It will also assist the City in establishing a GHG baseline by providing data on emissions reductions through renewable energy production.

The Project directly aligns with Policy 1.01.04,[29] which encourages the production and use of energy from renewable resources. The Project's role in converting biomass into bioethanol exemplifies the City's policy for renewable energy, reducing its carbon footprint, and dependence on non-renewable energy sources.

The Project furthers Objective 1.02[30], which focuses on managing growth through sustainable land use by facilitating industrial growth that is both economically beneficial and

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[26] Objective 12.03 of the Comprehensive Plan's Economic Development Element, which details support of existing businesses, provides that "[t]he City shall develop and maintain strategies that support and promote the expansion of existing businesses within the City, including its small businesses." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 12, Objective 12.03.

[27] Objective 12.07 of the Comprehensive Plan's Economic Development Element, which details workforce development and retention, provides that "[t]he City shall develop and maintain a strategy to provide training for and retain a qualified workforce to support targeted industries and to better prepare its local students for future careers relating to employment within its identified target industries and businesses." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 12, Objective 12.07.

[28] Policy 1.01.01 of the Comprehensive Plan's Future Land Use Element provides that "The City shall explore various funding opportunities to assist in developing City GHGs emissions baseline data, which will support setting GHG emission goals, developing strategies to reduce climate change and mitigating and adapting to its impacts throughout the City." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 1, Objective 1.07, Pol'y 1.01.01.

[29] Policy 1.01.04 of the Comprehensive Plan's Future Land Use Element provides that "The City shall encourage the production and use of energy generated from renewable resources." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 1, Objective 1.07, Pol'y 1.01.04.

[30] Objective 1.02 of the Comprehensive Plan's Future Land Use Element, which details growth management, provides:

> The City of Fernandina Beach shall implement growth management techniques to ensure that land use decisions are consistent with the Fernandina Beach Comprehensive Plan, to provide land development regulations consistent with accepted planning principles and practices, to ensure that public services and facilities are provided when needed by

environmentally sustainable. It also demonstrates creative land use, as it repurposes SSL that is created by the existing RPF Plant for energy production within the RPF Plant current footprint, thereby preventing sprawl while ensuring the land is used efficiently.

E. The Project is Consistent with and Furthers Plan Provisions Related to Conservation and Coastal Management.

The Project furthers Objective 5.12[31], which commits the City to maintaining air quality standards as established by the EPA and FDEP. Bioethanol production, particularly from second-generation feedstocks, results in lower GHG and pollutant emissions, helping the City and region to meet air quality goals. The City's coordination with major industrial operators regarding air quality, as set forth in Policy 5.12.03[32], will extend to the Project to ensure compliance with these standards.

The Project is a prime example of green development/sustainable development, as defined in the Comprehensive Plan.[33] Not only will the Project's design and operation integrate environmentally responsive technologies, use resources efficiently, and promote sustainability, the use of SSL as a feedstock minimizes waste and reduces environmental impact from the RPF Plant, fostering and furthering resource efficiency, as contemplated in Policy 5.13.02.

The Project qualifies as clean technology, supporting renewable energy and improving energy efficiency. By producing bioethanol from SSL and reducing carbon emissions, it embodies the principles outlined under green technology in the City's Comprehensive Plan.[34]

> development, to control instances of sprawl, to support sustainability and to encourage creativity in land use and design.

CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 1, Objective 1.02.

[31] Objective 5.12 of the Comprehensive Plan, which details air quality, provides that "[t]he City will continue to strive to meet air quality standards established by the EPA and the DEP." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 5, Objective 5.12.

[32] Policy 5.12.03 of the Comprehensive Plan provides that "[t]he City will coordinate with major industrial operators within the City such as Rayonier, Smurfit Stone, and the Port regarding air quality information." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 5, Objective 5.12, Pol'y 5.12.03.

[33] The Comprehensive Plan defines "Green Development/Sustainable Development" as:

> A development approach that integrates the following elements: environmental responsiveness, which benefits the surrounding environment; resource efficiency, which involves using resources in the construction and development and operations of buildings and/or communities in ways that are not wasteful; and sensitivity to culture and community, which is to foster a sense of community in design, construction, and operations.

CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Acronyms & Definitions (noting policy references to "5.13.02 (pg. 5-23), 11.06.03 (pg. 11-7), [and] 11.09 (pg. 11-10)").

[34] The Comprehensive Plan defines "Green (or Clean) Technology" as: "[r]enewable energy and energy efficiency technologies plus other technologies that make use of resources more environmentally benign

F. The Project is Consistent with and Furthers Plan Provisions Related to Property Rights.

Under Policy 1.02.07[35]and Goal 9[36], the City must consider the rights of property owners to develop their land with broader community objectives. The establishment of the Project respects these rights while furthering the City's vision for sustainable growth. The Project supports RYAM's ability to utilize its property by realizing the highest and best use of the property in a manner consistent with the City's growth and environmental policies. Without the ability to modernize its treatment of SSL, RYAM's use of its property will be substantially diminished and the continued viability of its RPF Plant will be threatened. A finding that the Project furthers this Comprehensive Plan policy is consistent with the Court's instruction to expansively interpret land use regulations as needed to minimize impacts on "private rights of ownership" in *Rinker Materials Corp. v. City of N. Miami*, 286 So. 2d 552, 553 (Fla.1973).

III. THE WEISS SEROTA MEMO CANNOT BE CONSIDERED BINDING

In the sections above, the factual and logical flaws of the Weiss Serota Memo are addressed. However, there are additional reasons why the Weiss Serota Memo cannot be treated as binding the City's decision regarding the interpretation of Plan and LDC provisions as applied to the Project.

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and/or reduce carbon emissions." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Acronyms & Definitions.

[35] Policy 1.02.07 of the Comprehensive Plan provides that "[t]he City shall implement the Fernandina Beach Comprehensive Plan in a manner that acknowledges private property rights." CITY OF FERNANDINA BEACH, FLA., 2030 COMPREHENSIVE PLAN, Goal 1, Objective 1.02, Pol'y 1.02.07.

[36] Goal 9 of the Comprehensive Plan, which details private property rights, provides the following:

> Pursuant to Section 163.3177(6)(i), Florida Statutes the following rights will be considered in local decision making:
>
> 1. The right of a property owner to physically possess and control his or her interests in the property, including easements, leases, or mineral rights.
>
> 2. The right of a property owner to use, maintain, develop, and improve his or her property for personal use or for the use of any other person, subject to state law and local ordinances.
>
> 3. The right of the property owner to privacy and to exclude others from the property to protect the owner's possessions and property.
>
> 4. The right of a property owner to dispose of his or her property through sale or gift.

CITY OF FERNANDINA BEACH, FLA, 2030 COMPREHENSIVE PLAN, Goal 9.

A. The City Manager Cannot Delegate Her Interpretive Authority to Outside Law Firm.

Section 1.04.00, LDC, identifies the City Manager as the person responsible to "administer, interpret and implement the standards, criteria and procedures of this LDC." This same section also expressly provides that "[t]he City Manager may delegate such responsibilities to *City staff*." By its very terms, this provision expressly limits the City Manager's ability to delegate interpretive authority to City staff only. The City Manager has no authority to either exercise or delegate power in a manner that is inconsistent with the powers expressly delegated to her. *See Barry v. Garcia,* 573 So.2d 932 (Fla. 3d DCA 1991). Since the LDC expressly limits the potential recipients of delegated authority from the City Manager to City staff, the City Manager has no authority to delegate interpretive authority to outside counsel like Weiss Serota. Notably, neither does the LDC grant the City Attorney any power to delegate interpretive power to an outside law firm.

While local government officials may obtain *advisory opinions* from outside law firms, the final interpretive responsibility must be exercised consistent with the express provisions of the applicable governing documents. *Id.* A decision to treat the Weiss Serota Memo as binding effectively converts it from advisory material to an exercise of delegated authority not contemplated by the LDC. Thus, the LDC does not permit the City to treat the Weiss Serota Memo as binding on the City Manager in her final interpretive role.

B. Treating the Weiss Serota Memo as Binding Violates Procedural Due Process By Depriving RYAM of Notice and an Opportunity to Be Heard and By Relying on the Consideration of Extra-Record Materials By Persons Not Competent to Evaluate Such Materials.

Even if the LDC did contemplate the delegation of interpretive authority to an outside law firm, which it does not, the exercise of that delegated authority would still be required to meet state and federal constitutional standards for procedural due process. While the specific requirements for procedural due process are context specific, the cornerstone of procedural due process is a fundamental right to be notified of a decision implicating a property interest and a fundamental right to be heard on that decision within a meaningful time and in a meaningful manner. *Goldberg v. Kelly*, 397 U.S. 254, 267-68 (1970).

Treatment of the Weiss Serota Memo as binding in this case would represent a shocking deprivation of RYAM's rights to notice and an opportunity to be heard. First and foremost, the Weiss Serota Memo was sought before RYAM had submitted any type of application to the City, and there is no reference in the LDC or the City's Charter to any type of pre-application interpretive decision-making process that would put RYAM on notice that its rights were being determined by this extra-administrative process.

Since RYAM had not submitted an application, or even a pre-application, before Weiss Serota issued its Memo, RYAM necessarily had no opportunity to be heard in the process. To the contrary, the only documents that Weiss Serota chose to consider were materials developed and submitted as part of the Air Permit Application and a Draft Permit issued by FDEP. These materials were provided to and by an entirely different agency under entirely different regulatory

criteria and thus have no relevance to the Site Plan Application requirements or the approval process used by the City. Weiss Serota itself has no scientific or technical expertise sufficient to correlate the two very different regulatory processes and never offered RYAM, who does have the scientific and technical expertise, the opportunity to provide information in the form of evidence or legal analysis to Weiss Serota in the development of its opinion. The Weiss Serota Memo cannot be considered "evidence" because it was written by persons unfamiliar with the Project, relied on irrelevant materials and was not otherwise authenticated. As a result, it is of dubious interpretive value.

Application of comprehensive plan and development code definitions to a specific application is inherently context specific. For that reason, local government decisions pertaining to site plans and other similar development orders typically provide notice and opportunity to be heard in the form of a quasi-judicial hearing, where the competency of evidence can be established and the grounds for decision-making can be adequately disclosed. *See e.g. Park of Com. Assoc. v. City of Delray Beach,* 636 So. 2d 12, 15 (Fla. 1994); *Board of Cnty. Comm'r v. Snyder,* 627 So. 2d 469, 474 (Fla. 1993); *Grace v. Town of Palm Beach,* 656 So. 2d 945, 946 (Fla. 4th DCA 1995); *City of St. Petersburg v. Cardinal Industries Dev. Corp.,* 493 So. 2d 535, 537 (Fla. 2d DCA 1986).

The LDC provisions governing the site plan approval process, which is not well delineated in process by the LDC and does not appear to allow for a quasi-judicial hearing, already fall short of the typical regulatory standard in this regard. The decision to delegate contextual analysis to an outside agency with no expertise in the scientific or technical intricacies of the proposed add-on process before an application is even made and with no notice or opportunity to be heard to the would-be applicant is unprecedented. It is worth noting that the City itself does not appear to have taken similar action for other site plan approval applicants, raising the question of whether RYAM is being singled out in this regard.

If the City decides that the Weiss Serota Memo is binding, it will have effectively delegated its interpretive authority to a private law firm without the requisite expertise in a manner not contemplated by the LDC or other City Code, in a manner that to our knowledge it has never done before, and without having advised RYAM or given RYAM any opportunity to provide input. Accordingly, a decision that the City is bound by the Weiss Serota Memo would be a rank violation of RYAM's constitutionally protected due process rights.

IV. CONCLUSION

The Project is consistent with the Comprehensive Plan and LDC. The Project fits squarely within the description of permissible industrial uses contained in both Policy 1.07.12 of the Plan and in Sections 2.01.17, 1.07.00 and the Table of Land Uses, Table 2.03.02 of the LDC. In addition, the Project qualifies as a bona fide "associated or ancillary activity" to the existing pulp manufacturing process because it uses the SSL, a byproduct of the current manufacturing process. It constitutes an "add-on" process that is closely connected to and subordinate to the existing manufacturing process. Moreover, the Project does not constitute "chemical manufacturing" or "chemical refining." In fact, it is consistent with and furthers many of the goals in the City's Comprehensive Plan.

The Project consists of fermentation of sugars contained in SSL, a byproduct of the current pulp production process, and the physical separation process of drying and distillation. Technical literature explains that fermentation is not considered "chemical manufacturing or refining," but is instead a biological process occurring in nature that has been expressly excluded from other regulations that apply to chemical processing plants. Furthermore, the same biological process is utilized by many operations in Fernandina Beach and those operations, such as breweries, bakery plants, and water treatment plants, are all shown as permissible uses in Table 2.03.02 in the Heavy Industrial I-2 zoning district. At no time has this same process ever been classified as "chemical manufacturing and refining" by the City. Similarly, physical separation processes like distillation and drying are also allowed by the City in the Industrial land use category and Heavy Industrial I-2 zoning district and do not constitute "chemical refining." Accordingly, it would be arbitrary and capricious and render the Comprehensive Plan internally inconsistent to conclude that the Project is "chemical manufacturing" but breweries and distilleries, bakeries, and even the City's water treatment plant, are not.

The Weiss Serota Memo failed to undertake the required, thorough review and analysis to determine that the Project as is being presented to the City with RYAM's site plan approval application is inconsistent with the Comprehensive Plan. In reality, it simply determined that because ethanol is a chemical in the generic sense, the fact that it will be the resulting product of the Project must constitute chemical manufacturing and refining. This overly simplistic approach to the interpretive inquiry ignores the context provided by other language in the Plan and LDC, as well as other regulations and interpretive cases impacting the bioethanol production industry. As a result, the Weiss Serota Memo is deficient and its conclusion should not be considered persuasive by the City. In addition, by the very terms of the LDC, the Weiss Serota Memo has no binding effect on the City Manager in her final interpretive role. Moreover, the procedure used to procure the Weiss Serota Memo failed to adhere to basic principles of procedural due process in administrative land use decision-making and therefore cannot be binding on the City as to RYAM's application.

We look forward to the City's full consideration of RYAM's application and are available if you have any questions or need additional information.

EXHIBIT 1 TO MEMORANDUM

Ethanol production from natural sources of sugar

Glen P Fox

Anheuser-Busch Endowed Professor Malting and Brewing Science

University of California,

Department of Food Science & Technology

Davis, California

Executive summary

For millions of years, a range of microorganisms have survived and evolved to change simple sugars like glucose and xylose into alcohol. Both fungi and bacteria are capable of undertaking such biochemical processes[1]. Around 10,000 years ago, humans through trial and error discovered the fermentation process when grains like barley and wheat sprouted and the liquid left over that cause the sprouting, absorbed some of the sugars released form the grains, and wild yeast changed the sugars to alcohol. It wasn't until the 1800's that we began to understand the science behind this process, but from those very early days of brewing with grains or fermenting grapes, societies have developed and major fermentation industries have been established.

It is typically thought that fermentation is used only in the production of alcohol for human consumption, but the same fermentation process, i.e., a series of natural biochemical processes, can also be used in the production of industrial ethanol (bioethanol). Bioethanol is produced from various sources of plant and wood materials or byproducts from industrial processing of these materials, using the normal fermentation process.

The use of such fermentation process is one way to reduce human dependance on fossil fuels as well as upcycle waste streams from industrial processing of organic materials.

[1] Biochemical processes occur within living organisms and cells and involve the alteration of biomolecules – in fermentation, the conversion/transformation of sugars to ethanol. These types of processes can generally be referred to as metabolism. There are many examples of biochemical processes that occur in nature and within the human body. Examples other than fermentation include digestion and photosynthesis.

History of fermentation

Alcohol, and specifically ethanol, is produced from the biochemical (enzymic) modification of sugar by several species. Typically, ethanol is produced by fungi and bacteria.

Pre-cursors of fermented beverages

This natural process, that has been going on for tens of thousands of years, could be witnessed where ripe fruit will drop to the ground, and wild fungi will inoculate the open fruit and convert the sugars into alcohol. Animals would eat the sweet fruits with trace amounts of alcohol and get a good feeling from the low volume of alcohol produced. Our ancestors followed suit in eating these fermented fruits from the ground and enjoyed the residual sweetness but also feeling the effects of alcohol.

Fermented beverages

Possibly, the very earliest fermented beverage was mead, where honey may have dripped from a hive onto the ground. The simple sugars in honey, (sucrose, fructose and glucose) are highly fermentable by fungi and a natural fermentation would have occurred. Animals and our human ancestor would have consumed this and found it very flavorsome with some nice side-effects. Over time, humans worked out a way to control this 'fermentation' process so they had a readily available supply of mead.

The next alcoholic beverage created by nature was beer. Around 10,000 years ago, in the now Middle East, people started to farm the cereal grains, barley and wheat, for food production. It is thought that some harvested grains got wet, and started to germinate. The natural enzymes in the germinating grains, the same enzymes that help grains germinate when a farmer plants seed for a new crop such as corn, hydrolyze starch (long polymers of glucose), into small chains forming the simple sugars, glucose and maltose (glucose + glucose), which are readily fermentable by fungi. Over the millennia, humans industrialized the brewing process to be the global multibillion dollar industry it is today.

The final major fermented beverage created by nature was wine, where wild grapes would have also split open on the vine or dropped to the ground when ripe, and the natural sugars (glucose and fructose) in grapes were converted to alcohol. Humans domesticated grapes, like the cereals, to making these fermented beverages a key part of life, with harvest celebrations, worshipping the ancient gods, as well as the very first taxation systems being based on alcohol production.

Fermentation in the human body

For a very small number of people, they go through the fermentation process and naturally produce alcohol in their bodies. This rare condition is called Auto-brewery syndrome, where gut bacteria produce the same alcohol (ethanol) as per a normal beer, or wine fermentation.

Ethanol is also the reason civilizations grew in regions with extreme population growth as the alcohol consumed allowed humans to survive the quality of toxic water supplies, prior to having any water treatment facilities.

Discovery of the fermentation process

Despite productive industrialized alcohol processes growing in different societies globally, there was no understanding of this mystical, and magical conversion of the content of the fruit, or of the water used in germinating grains, into better tasting, safer and mind-altering products. It wasn't until the 1800s, through the efforts of scientists working at breweries, that alcohol was characterized.

It was also discovered what was responsible for this change from sugar to alcohol. In the 1700s, using one of the first microscopes, an 'animal' was first identified in a beer sample. This 'animal' was a wild yeast (fungus). Thus, our understanding of this very natural process of turning sugar into alcohol was born. From this study, researchers (Louis Pasteur and Emil Hansen) at Carlsberg Research Laboratory in Denmark in the 1800s purified the first beer yeast strain as well as identified the first spoilage bacteria.

Many 1000's of different type of fungi can carry out this natural fermentation process. But, for most alcohol beverages (and for bioethanol), we use yeast. For sour beer and kombucha, we use yeast and bacteria. For fermented food, such as sauerkraut, specific strains of bacteria can be used. For sour dough breads, it would be a mix of yeast and bacteria.

A recent article describes the value of yeast alone to the global economy is worth around $900 billion. The screen shot below gives the key industries benefiting from our fungal friends.

One important point is that the bioethanol industry, like the alcoholic beverage industry, uses yeasts to convert starch from grains, and sugars from plant and wood materials to bioethanol.

The fungus that's worth $900 billion a year

BY NICHOLAS P. MONEY FEBRUARY 25TH 2018

- Brewing: $311 billion, 2.23 million jobs
- Wine: $220 billion, 1.7 million jobs
- Baking: $311 billion, 1.8 million jobs
- Bioethanol: $44 billion estimated value
- Yeast insulin: $15 billion estimated value
- Other yeast products: $1 billion estimated value (Report FB2233)

https://blog.oup.com/2018/02/fungus-worth-900-billion/

Relationship between bacteria and yeast

It is also important to understand the relationship between bacteria and yeast because some industries, like bioethanol, use only yeasts, some use bacteria, and some used mixed cultures of both. The figure below (Figure 1) shows the family tree of life.

Fungi, which includes yeasts, are in between plant species and animal species. Whereas, bacteria are not so related.

However, of specific interest are some common genes amongst all these different life forms. An example is a key enzyme, alpha-amylase, which is responsible for hydrolysis starch into its simple glucose units. It is present in plants, grains, and animals including humans (saliva and pancreas). Another example is alpha glucosidase, which is also involved in hydrolyzing starch in germination seeds and also used by fungi to break down maltose (glucose + glucose) from starch into two glucose molecules, which become of the first sugars required in the production of ethanol in any alcohol production.

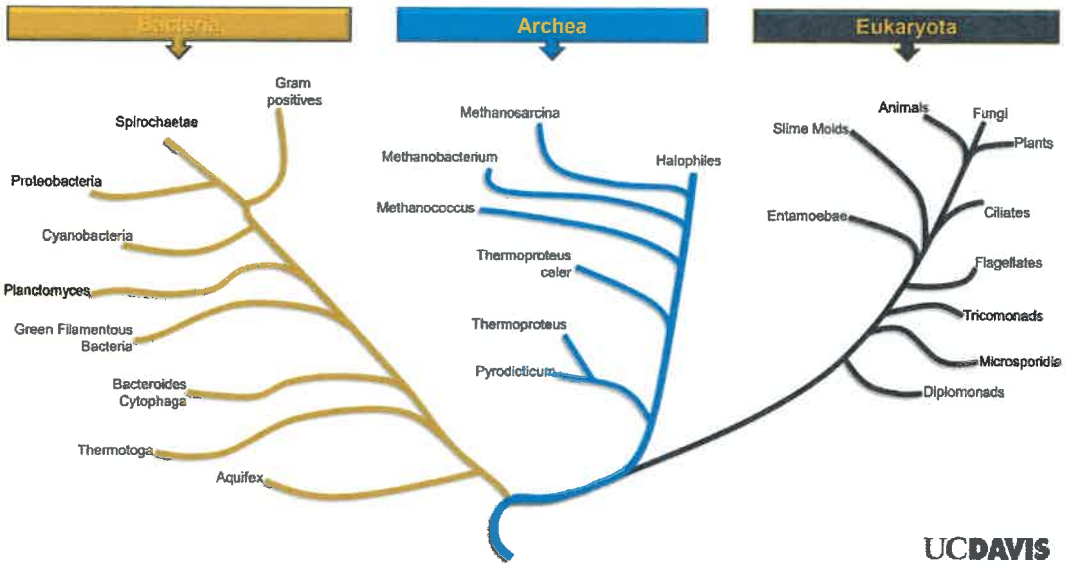

Figure 1. The tree of life.

As mentioned previously, there are 1000s of different fungi and each have different characteristics including different tolerances to ethanol production. The table below shows the different fungal species, including the most common in ethanol production, *Saccharomyces cerevisiae*.

YEASTS & ALCOHOLIC FERMENTATIONS

TABLE 61.3 Fermentation Power (w/v) of Some Yeast Species[1]

<2%	2–5%	5–8%	>8%
Candida emobii *C. guilliermondii* *C. melinii* *C. parapsilosis* *C. sake* *C. tropicalis* *C. valida* *Debaryomyces castellii* *Lindnera saturnus* *Metschnikowia pulcherrima* *M. reukafii* *Pichia membranifaciens* *Schwanniomyces polymorphus* + >300 ca. fermenting species, including about 50 that exhibit slow or retarded fermentation	*Hanseniaspora uvarum* *Pichia fermentans* *Lachancea kluyveri* *Schwanniomyces occidentalis* *Torulaspora pretoriensis* *Zygotorulaspora mrakii*	*Candida stellata* *Lachancea thermotolerans* *Saccharomyces kudriavzevii* *S. mikatae* *Saccharomycodes ludwigii* *Schizosaccharomyces pombe* *Torulaspora delbrueckii* *Zygosaccharomyces bailii* *Z. rouxii* *Zygotorulaspora florentinus*	*Saccharomyces bayanus/uvarum S. cerevisiae* *S. pastorianus* *S. paradoxus*

- **Saccharomyces Species most commonly in the production of alcohol**
  - *saccharo* means sweet
  - *myces* means fungi
- **All ferment carbohydrates** (simple sugars) to alcohol
- **Hundreds of specialized strains** are used industrially, with some **very specific applications.**

UCDAVIS

Conversion of sugars to ethanol

As mentioned several times above, the fermentation process is a natural process where a sugar is converted to ethanol.

This 'conversion' is a simplified way of saying, *the structure* of the sugar *is changed* into a *new structure*, making it an alcohol (see Figures 2, 3, 4 & 5).

This multiple step conversion (Figure 4) is controlled by specific natural proteins, namely enzymes. What are the mechanics of this conversion? The simplest analysis is a lock and key mechanism. You require a specific key (enzyme) to open (modify) the lock (specific substrate). The stepwise glycolysis process follows foundational biochemistry, where the substrate (a sugar) is changed over several steps by different enzymes into a new chemical structure. The final structure being an ethanol molecule.

Details of the fermentation process to convert sugars to alcohol

Regardless of the type of sugar, the same metabolic pathway converts that sugar to alcohol and CO2. Figure 2 shows the different types of sugars and their assimilation into a yeast cell for beer fermentation. For a simple monosaccharide sugar like glucose or fructose, the transport into the cell is straight forward. But for disaccharides, like sucrose and maltose, then an enzyme splits the disaccharide into the two base units before these are transported into the cell.

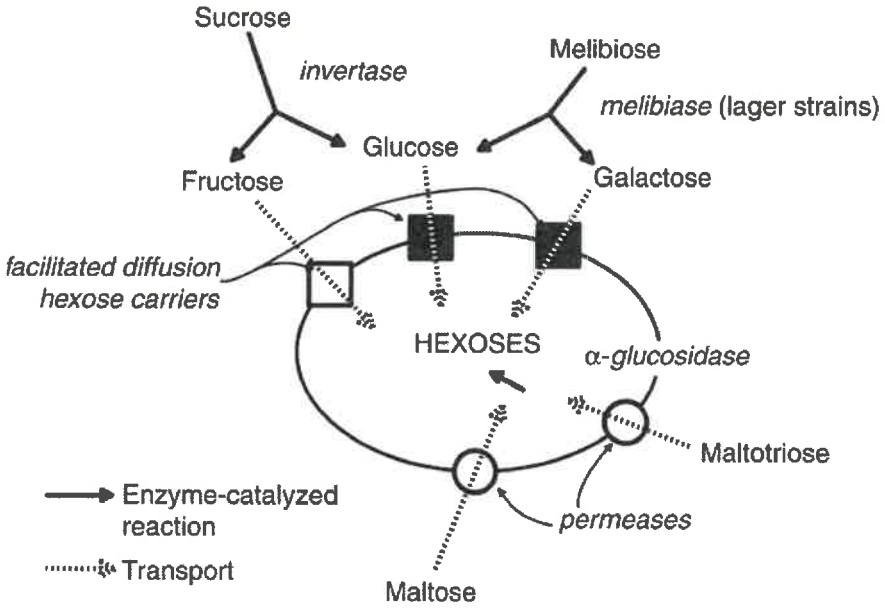

FIG. 15.1. Access of sugars to yeast cells. (Courtesy C. W. Bamforth—© ASBC.)

Figure 2. Transport of different sugar molecules into a yeast cell. From Scientific Principles of Malting and Brewing (Bamforth & Fox (2023)).

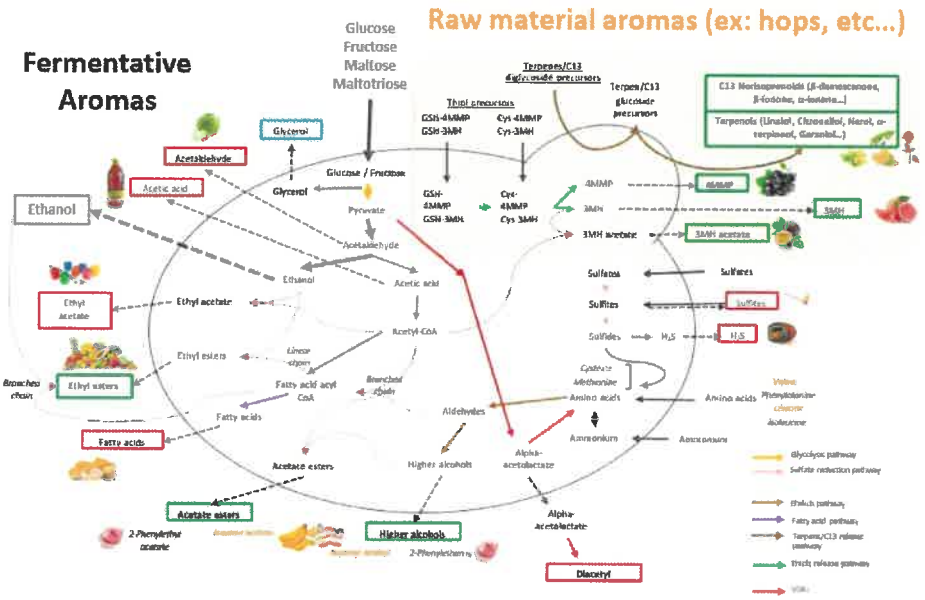

Figure 3. Different pathways within the yeast cell.

Figure 4 shows the structure of sucrose, the most abundant sugar in plants. Sucrose is made of two other monosaccharides, glucose and fructose. During the growth of the plant, sucrose is made, split into glucose and fructose and then remade during the daily diurnal cycle (light/dark or day/night) as these sugars are used in other metabolic processes. Other plant sugars are used in different metabolic process such as xylose which is used in building cell walls of plants.

In a liquid matrix where there are different sugars, yeast have a preference of sugars so they metabolism sugars in specific orders, i.e., monosaccharides (one sugar) before disaccharides (two bonded sugars). The three examples provided show glucose and fructose being converted to pyruvate via the glycolysis process or the Embden Meyerhof-Parnas (EMP) pathway (Figure 5). Pyruvate is important because it is the first step for several pathways to ethanol, depending upon fermentation conditions.

Pyruvate conversion during fermentation

For alcohol production, pyruvate is enzymically changed in two steps to acetaldehyde, then ethanol (Figure 6). The overall mass balance from one sugar molecule is two molecules of ethanol and two molecules of CO_2.

Pyruvate is also the molecule used in other fermentation conversions, but these are dictated by the amount of oxygen available or of another organisms involved in the process. More relatable examples of pyruvate being converted into other molecules from the natural glycolysis process are the production or sour bread or yogurt. In these cases, pyruvate is converted to lactate (lactic acid) via a single enzymic reaction (lactate dehydrogenase). This is called lactic acid fermentation.

To bring another example, which almost very human can relate to when exercising, is sore muscles. Under aerobic conditions when exercising, you have a lot of air (oxygen) coming into your cells via blood transport, and you can exercise for a long time. However, when you start to run out of air through intense exercise, your system goes anaerobic (low oxygen), then your body converts pyruvate to lactic acid. Your muscles are crying out for relief. Only when you regain your normal breathing then you reduced the production of lactic acid from pyruvate.

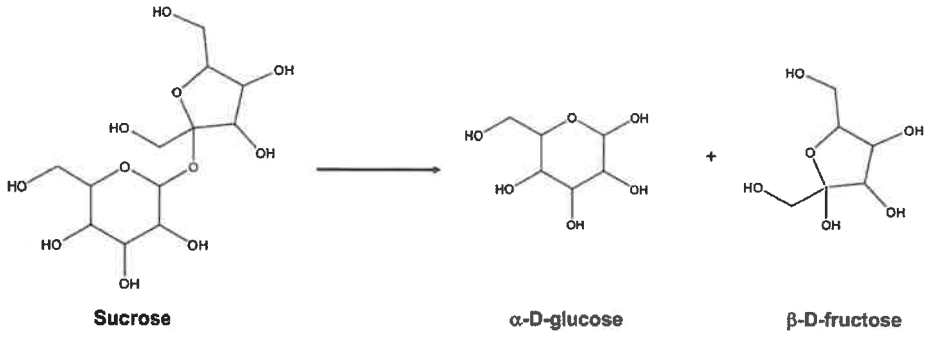

FIG. 15.7. The action of invertase. (Courtesy C. W. Bamforth and G. P. Fox—© ASBC. Drawing by L. Watson.)

Figure 4. The structure of sucrose, glucose and fructose. From Scientific Principles of Malting and Brewing (Bamforth & Fox (2023)).

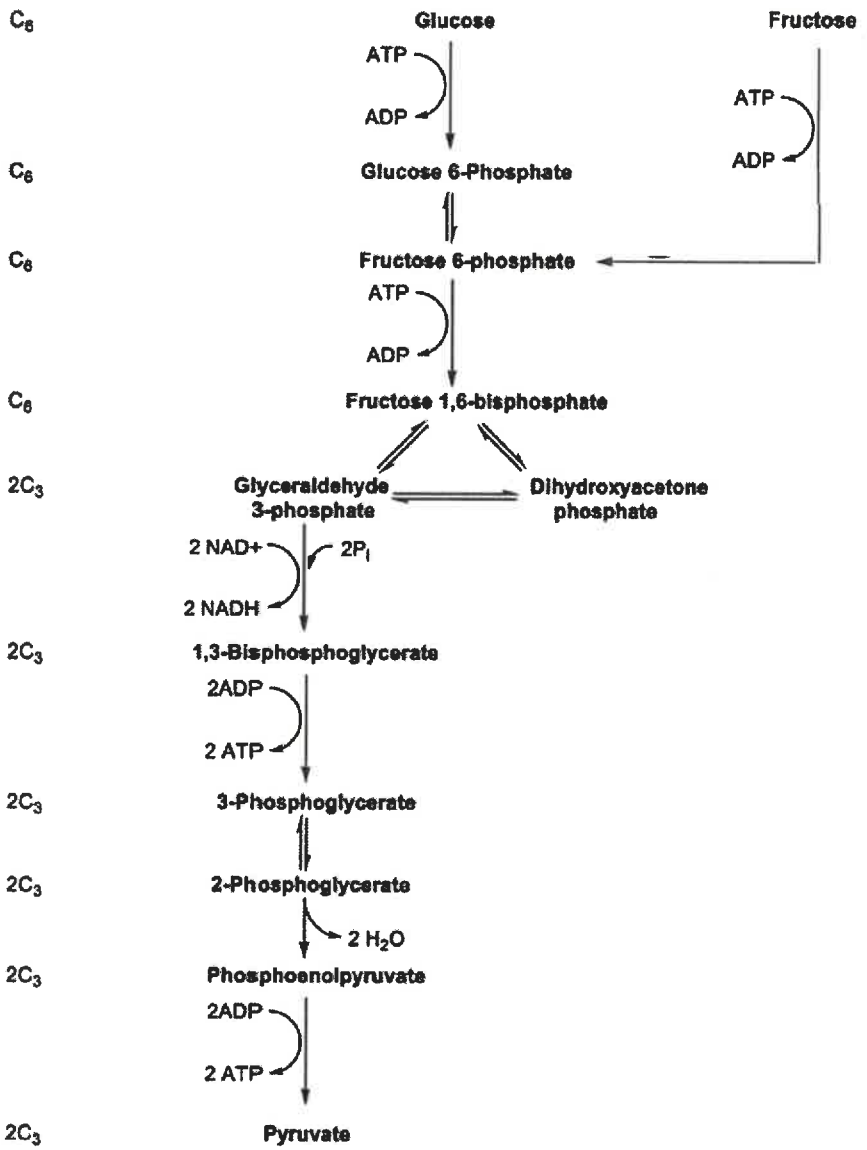

FIG. 15.8. The Embden-Meyerhof-Parnas pathway. (Reproduced by permission from Bamforth, C. W., and Cook, D. J. (2019) Food, Fermentation and Microorganisms, 2nd ed. Wiley Blackwell, Chichester, U.K.)

Figure 5. Enzymic conversion of glucose and fructose to pyruvate. Modified from Figure 15.8 in Scientific Principles of malting and Brewing (Bamforth & Fox (2023)).

The C on the left of the Figure 5 indicates the number of carbons in each molecule, e.g., pyruvate is a 3 carbon molecule (C_3). Additionally, the changes in ATP (adenosine triphosphate), and ADP (adenosine diphosphate) shown in Figure 5 show the change in energy for the specific enzyme reactions.

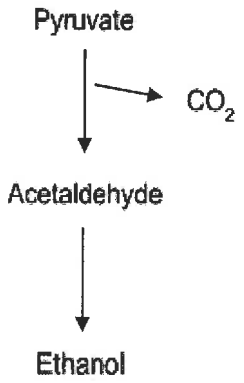

Figure 6. Enzymic conversion of pyruvate to ethanol.

Conversion of C5 sugars

The enzymic pathway for converting a C_5 molecule like xylose to ethanol involves several steps prior to the last 9 steps of the EMP pathway. Not all yeasts are capable of doing this; so, specific yeast strains are required for the conversion of C5 sugars into ethanol. Figure 7 shows the more complex pathway for the natural conversion of the C5 sugar xylose to pyruvate, then pyruvate conversion to ethanol follows the same steps shown in Figure 6.

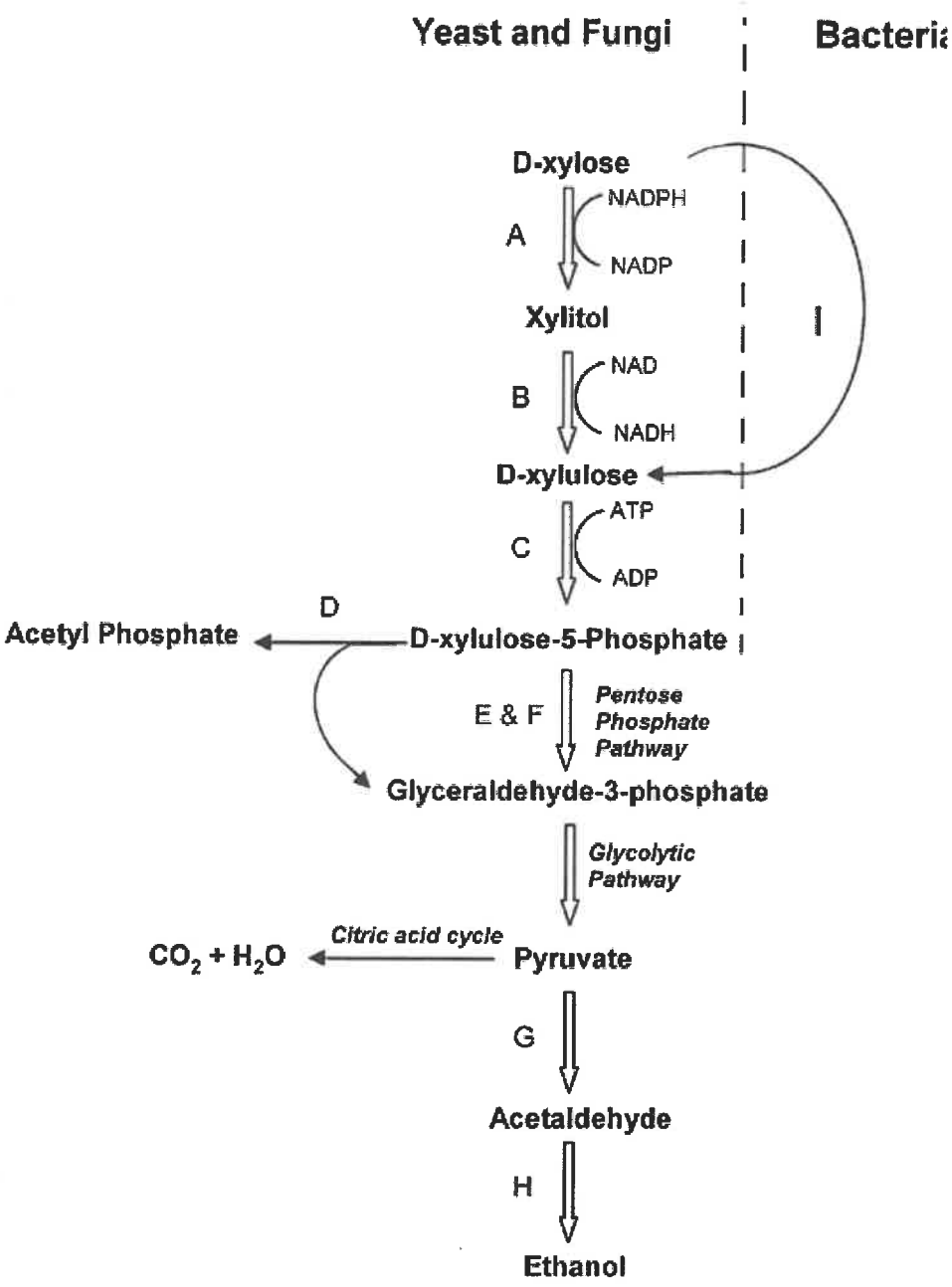

Figure 7. The natural enzymic conversion of the five carbon sugar, xylose, to pyruvate following the pentose phosphate pathway, then the Embden Meyerhof-Parnas pathway. Pyruvate is converted to ethanol as per the normal acetaldehyde steps.

Conclusion

The production of alcohol from sugars is a natural molecular conversion process, regardless of the source of sugars or the end product. In recent decades, there have been specific industrial processes successfully established to use specific plant materials for the production of bioethanol. These processes use plant materials, with the addition of specific yeast strains to produce alcohol through the natural fermentation process under controlled conditions.

EXHIBIT 2 TO MEMORANDUM

Marlin & Barrel Distillery

A prefacing comment; at the Federal level we are primarily regulated by the Trade & Tax Bureau (TTB). This is the governing agency that authorizes all distillation plants in the nation.

Distillation & Fermentation

I tell anyone who's toured our facility that most people think that still make alcohol. That's a misnomer. All alcohol is made through the process of fermentation. This is true for beer, wine and distilled spirits. The still is simply an extraction tool.

Fermentation

Fermentation starts with a sugar source. Sugar is a generic term, but for simplicity's sake, any fermentable sugar is the basis for alcohol. A ferment is the combination of sugar, water and the necessary ingredients to create a healthy environment for yeast. Yeast are added to a ferment as the last step and, at first, they will propagate. That activity lasts until the right oxygen depleted anaerobic conditions occur. At that point the yeast find sugar molecules and break sugar into C02 (which escapes the tank) and ethyl alcohol. That lasts until all sugars have been consumed.

This is a natural biological process and actually happens in the wild in a large number of instances. For example, rum made in Caribbean islands once controlled by the French still follow their original process. The juice of sugar cane is fresh pressed and immediately will see wild yeast begin the process of fermentation. This is the nature of yeast and sugar.

Distillation

Once all of the potential alcohol is made in a ferment then its time to take the part you want and discard the rest. Since ferments are a natural process you'll find that a small amount of other-than ethyl alcohol can be present. Said another way, even though the vast majority of alcohol made is ethyl alcohol, there will be other types present. Each will have its unique molecular weight and that directly corresponds to a unique boiling point. As the ferment is distilled, the liquid is heated and the lighter compounds that require less heat to change from a liquid to vapor state will climb the sill column first and further then those needing more energy to get to their vapor form. In this way a still organizes all of the different molecule types present in a finished ferment. From that position of stratification a distiller can extract the desired piece of the ferment, cool it to liquid temperature again and then collect it. In no part of this process are chemicals being changes. This is simply a liquid sifter of sorts.