Environmental Registration

For

Bio-Processing Plant

- agricultural hydrolysates from marine ingredients

2021-09-29

Contents

Executive Summary

This Project Registration has been prepared by NL Marine Organics for the Newfoundland and Labrador Department Environment and Wildlife

It addresses the planning, construction and operation of an agricultural bioprocessing plant at Windy Heights Farm in Portugal Cove St Phillips to process fish by-product into hydrolysate fertilizers.

The proposed location is a rural agricultural zone, on a 400 acre farm, inside a building located next to the farms' existing compost handling facilities and waste management infrastructure. The process site is well removed from competing land uses, with a 98- acre buffer zone from public roadways.

Traditional thinking on processing biomass is 'like belongs with like", ie process fishery biomass in traditional fish processing location. We don't agree. End use fish biomass is non-food-grade, classified for use as agricultural. it can be smelly. Competing users, such as tourism or residential developments always want to develop and encroach on industrial zoned ocean frontage. Despite 30,000 km of ocean shoreline, many ocean biomass processing projects face opposition from competing users that typically grow around the industrial shoreline.

And yet the benefits are great. Our Forage Program is getting 55% to 64% weight improvement in hay bales yield per acre. Huge gains in a province stymied by poor forage.

This location offers an alternative. It is inside a rural zoned agricultural area where fishery biomass "fits" in the established farming practice of handling odorous material. Consultation with the Town of Portugal Cove St Phillips suggests a path forward to recognize bioprocessing marine inputs as an agricultural activity.

The undertaking is a culmination of several years of development work including process engineering with MUN, laboratory, field trials and prototype products inside the Newfoundland markets. Bioprocessing technology harness value from a biomass stream, often used to bring unusable feedstock from one sector back into circulation to benefit another sector. This Undertaking is agricultural bio-refining, and at scale can be impactful.

Introduction

The Proponent

The company proposing the undertaking is jointly held by Windy Heights Farm and 63562 Newfoundland and Labrador Limited, operating under the name NL Marine Organics.

Name of Corporate Body:	Newfoundland Marine Organics
Address	Windy Heights Farm, 374 Bauline Line Extension, Portugal Cove- St Phillips, Newfoundland
Executive Officer:	Anita Walsh, CPA
Address	374 Bauline Line Extension, Portugal Cove- St Phillips Newfoundland
Principle Contact Person for the Purposes of Environmental Assessment	Diane Hollett Email hollettdiane@gmail.com Tel 709- 690-9886
Website:	www.nlmarineorganics.com;
Facebook Page:	www.facebook.com/nlmarineorganics

Environmental Assessment Processes and Requirements

Under NL EPA, this project is considered an Undertaking subject to section 41 (f) of the Regulations which states that: an undertaking that is engaged in chemical manufacturing:

> *(f) pesticide, fertilizer, and other agricultural chemicals whether natural organic or chemical in origin and mixtures of these.*

Shall be registered.

The plant will process non-food grade fish protein into stable liquid fish based amino acids and peptides, used as fertilizer and feed ingredients.

This EA registration document is intended to initiate the provincial EA review process pursuant to the NL EPA, and in doing so it:

- Identifies and provides an overview of the project, its proponent and the associated project description.
- Identifies the regulatory context for the proposal.

Project Description

Project Name

The name of the undertaking is the NLMO Marine Ingredients Plant.

Project Rationale and Alternatives

Marine ingredients processing for agricultural uses is an environmentally sustainable, bioeconomy use for non-edible fish by-products.

In Newfoundland, fish plants, hatcheries and aquaculture farms have requirement to remove fish deemed "waste" from the site.

Hydrolysis is a processing method to rapidly stabilize the biomass and refine the proteins into amino acids and peptides, ideal as fertilizer or feed ingredients.

Raw biomass is quickly turned into a soluble, pumpable shelf-stable liquid with some commercial value.

The NL Marine Organics liquid fish fertilizer is proven quite effective, and the company needs a processing plant to keep up with demand and expand into North American commercial agriculture

The undertaking offers a win-win for carbon reduction targets. Diversion of marine protein biomass from ocean dumping or landfilling reduces carbon emissions. Putting the biomass to work as fertilizer improves the carbon sequestration ability of soil. Inputs and outputs can be measured and used in the carbon trade economy.

Wild capture fisheries and processing plants have ocean dumping permits[1] to handle disposal when other alternatives are not available. The footnote provides a link to Environment Canada's list of Newfoundland fish plants with ocean dumping permits. Almost every plant in the province has an ocean dumping permit either as a "just in case" or as a regular strategy for by-product disposal.

The undertaking is a more environmentally sustainable alternative to landfill or ocean dumping and is a safety valve for the unfortunate large-scale cases of fish spoilage or mass die-off at farms.

[1] https://pollution-waste.canada.ca/environmental-protection Registry/permits/search?ReferenceTypeId=2&Year=2020&CategoryId=2&Keyword=

Existing Agricultural Activity

The agricultural area has numerous farms growing hay, livestock, vegetables, dairy, and poultry. The area is actively farmed, the PCSP region has numerous century farms. The google earth images shows extensive land holdings developed for forage necessary to support livestock.

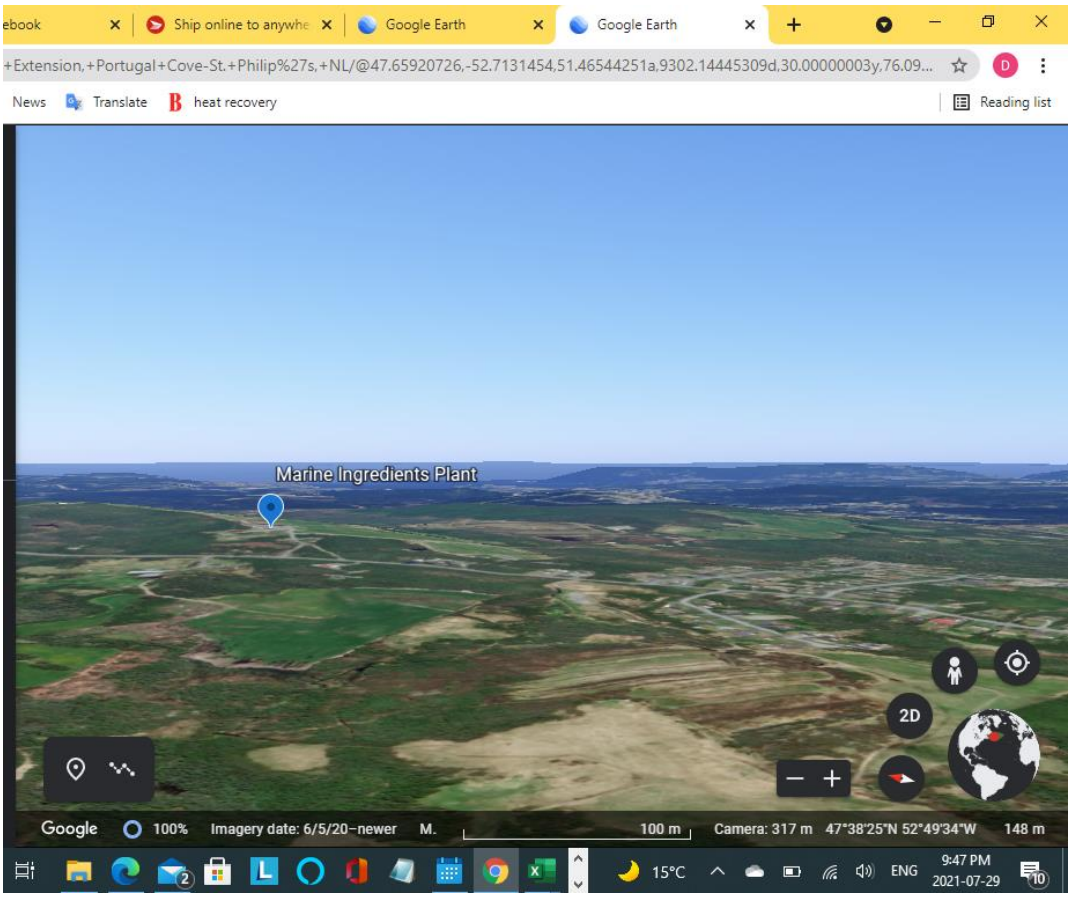

Figure 1 Existing Agricultural Activity in the Region

Soil in the Agricultural zone is usually thin, with little organic matter. Consequently farms in the area use organic biomass to rejuvenate soil and improve yields. Compost teas, chicken and dairy manure, crab shell field spreads and fish composting are regular farming practice. These practices generate odour and are a necessary part of rebuilding soil fertility.

The region also has a large number of quarries conducting blasting, running heavy equipment for rock crushing and high volume of trucking to transport the product.

Geographical Location

The Windy Heights Farm has a civic address of 374 Bauline Line Extension, Portugal Cove St Phillips, (PCSP) adjacent to the white radar dome. Mapping and reference points are illustrated below.

The land base enclosed by two green circles on the PSCP town plan map illustrates an agricultural zone. The farm is a 400-acre property inside the agricultural zone, boarded by Bauline Line Extension and Indian Meal Line.

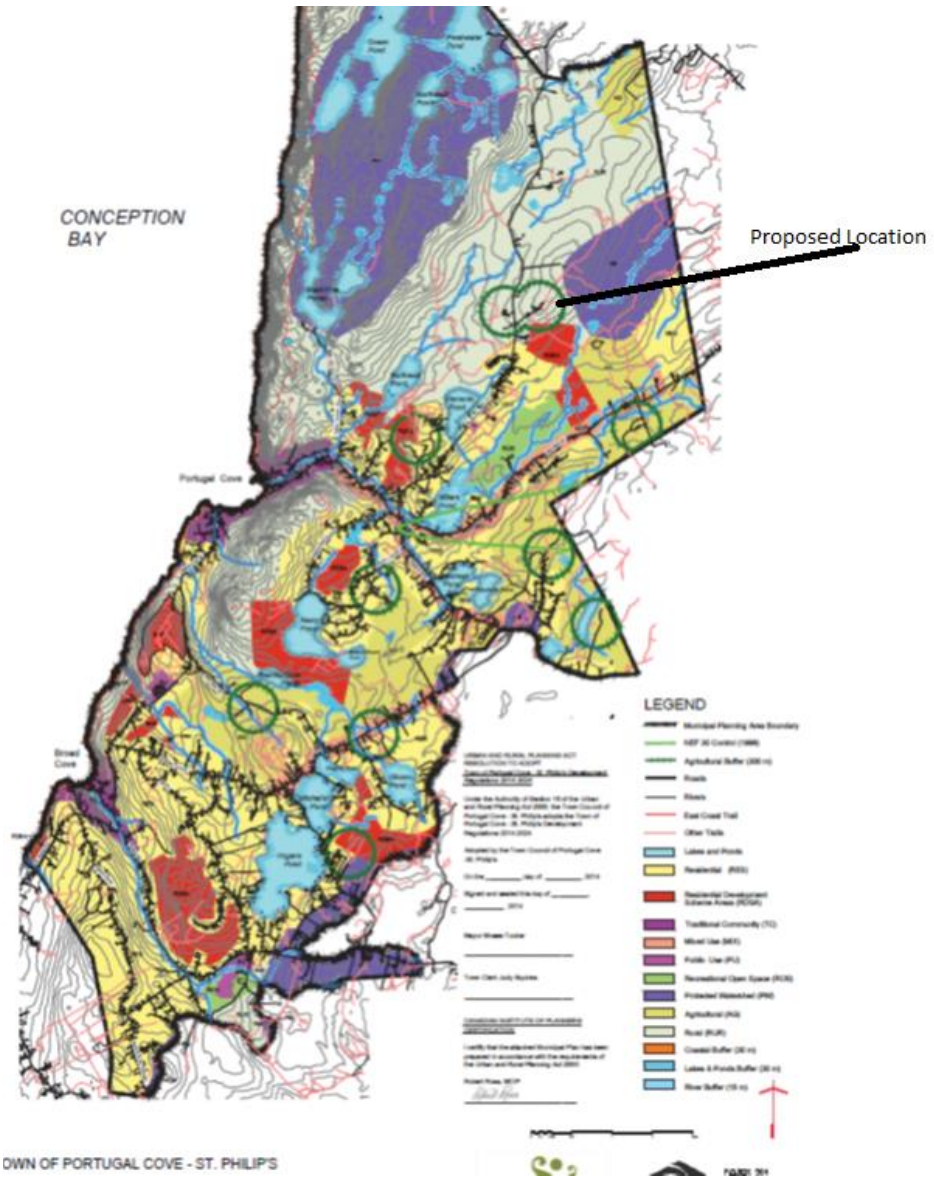

Figure 2 Excerpt PSCP Land Use Map

The Farm is outlined in yellow on the Google Earth image below.

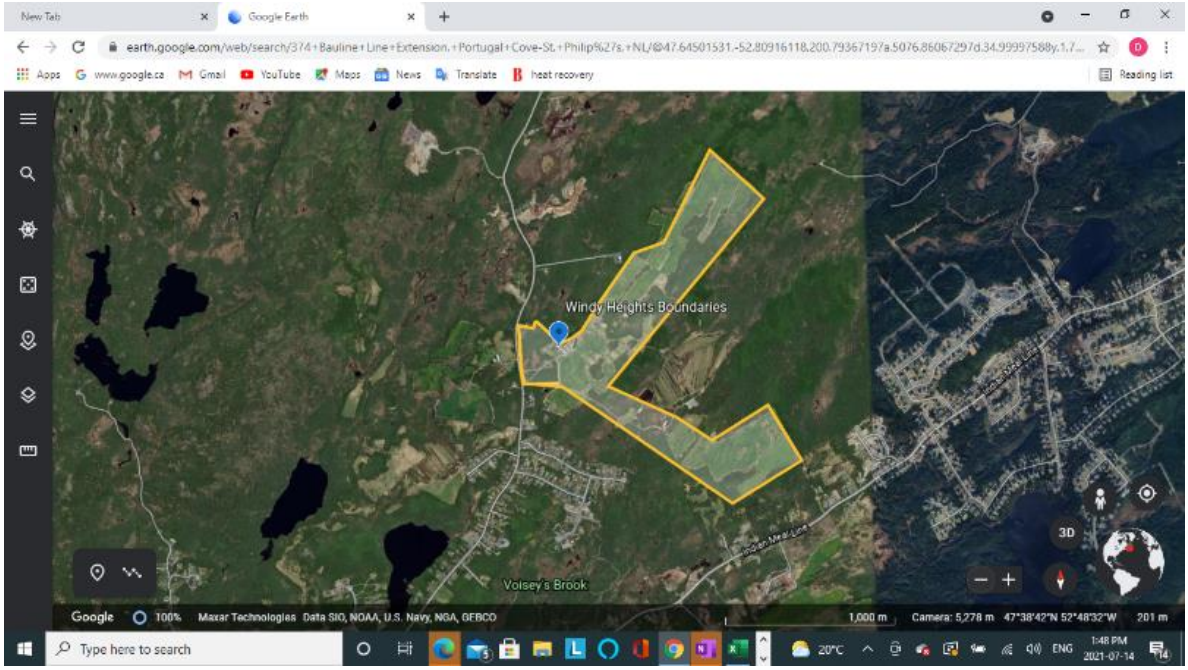

Figure 3 Site Location

Typical of heritage farms, the 400+ acreage is a collection of agricultural leases and granted land in a mountainous, sparsely populated area, 15 minutes form the airport. The plant is located on land deeded to and owned by Windy Heights farm.

A closer look at the image shows the farm boundaries running along Bauline Line Extension, with the hayfields to the northwest and peatlands southeast towards Indian Meal Line.

The boundary bordering Bauline Line Extension is visible on the left of the yellow farm boundary. The plant location, pinned in blue, has a 98+ acre block of land between the process site and Bauline Line Extension, a large buffer zone.

There are some residential properties inside the agricultural zone, the closest property is illustrated in figure 4, across the 98-acre block and 270 meters, as the crow flies.

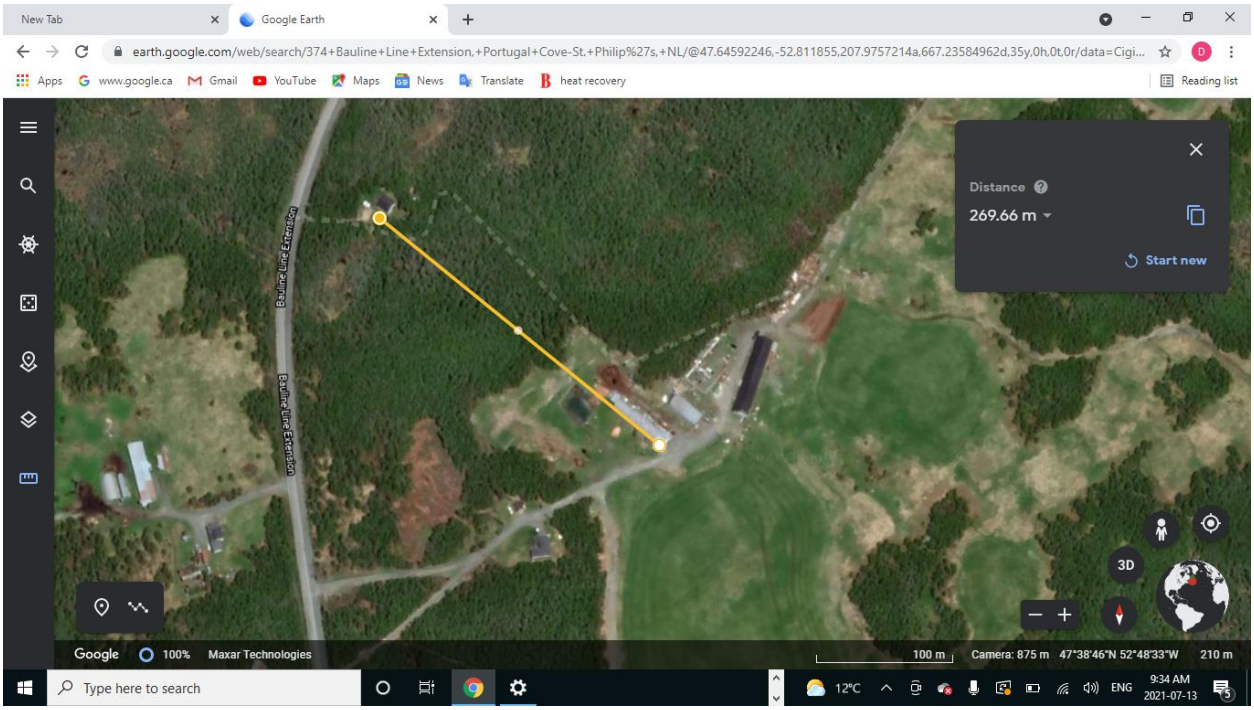

Figure 4 Distance to nearest off farm residence

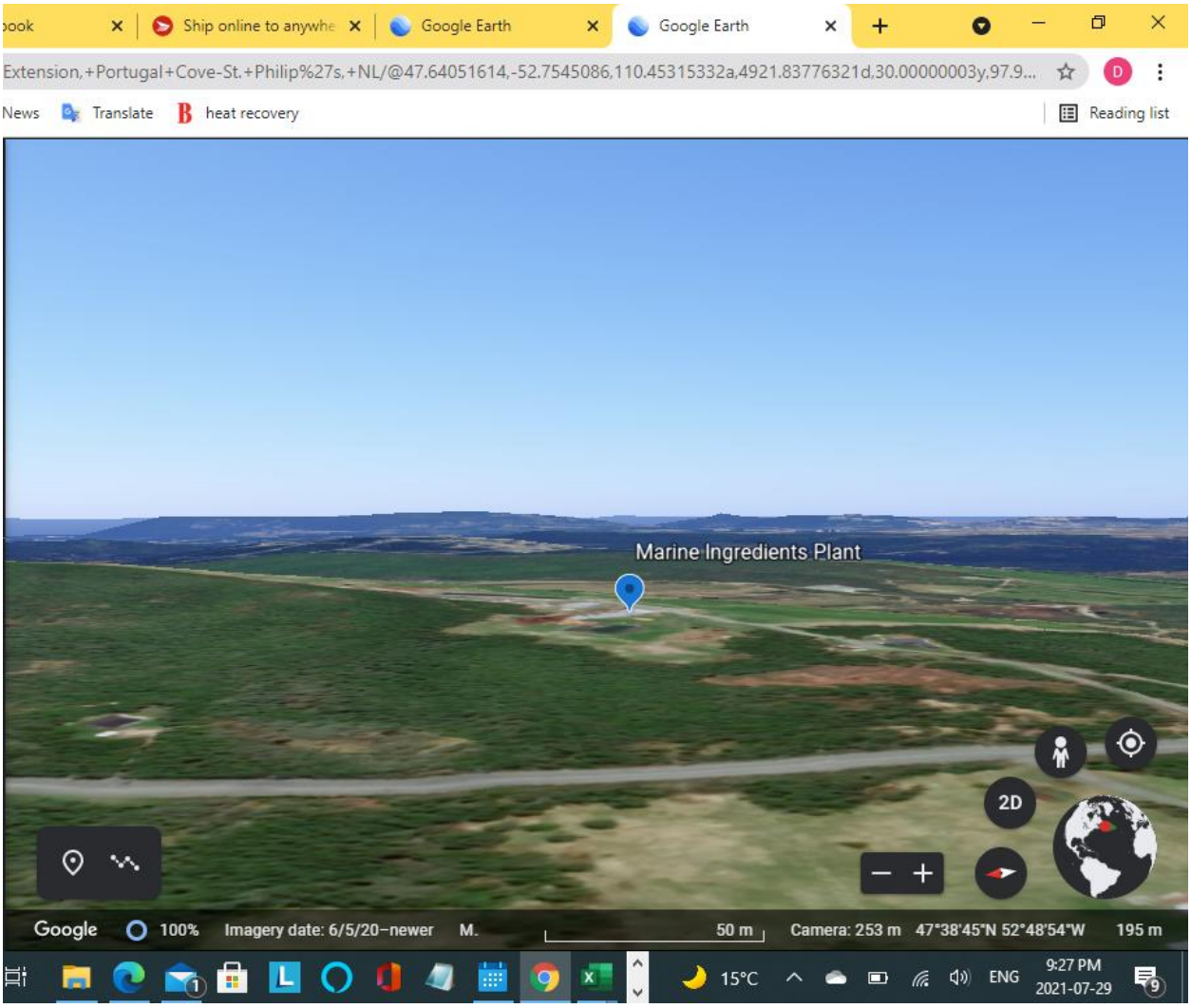

Figure 5 Aerial view from Bauline Line Extension showing elevation and wooded area between plant and public road

Figure 6 Residences on Bauline Line Extension 348 M "as the crow flies"

The Marine Ingredients Site is not visible from public roads or residential areas, given tree cover and the higher elevation of the proposed site. New tree planting for wind blocks will shield the site from public view when the Farm clears the agricultural land between the plant and the Bauline Line Extension.

The following table provides geographical reference points for the Undertaking.

From nearest approved waste site	17.7 km
From nearest public road	285 m
From nearest residence	269 m
From nearest Cemetery	1.5 km
From nearest water course	1.5 km Voisey's Brook
From nearest water body	1.3 km
From building to vegetation line	66 m at closest point
Type of vegetation	Spruce/fir /deciduous mixed forest
From nearest airport (closest boundary road point at the airport to farm.)	3.7 m
From nearest commercial activity with food service	4 km

Table 1 Proximity to Reference Points

Location to Nearest Water Bodies

At this altitude, the location does not have any adjacent water bodies. There are water systems outside and downhill from the 400 acre farm. The following google map images illustrate the nearest water bodies,

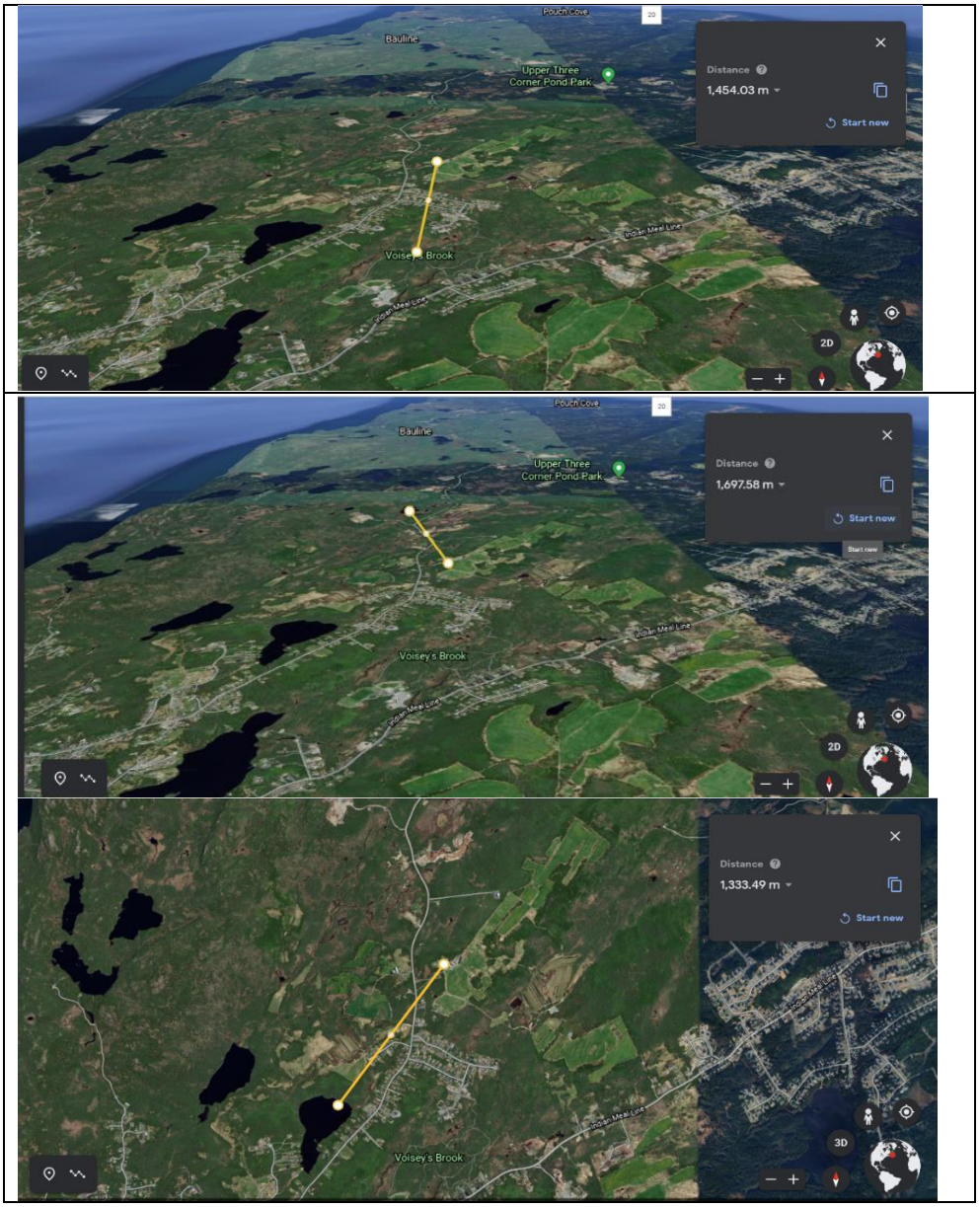

Figure 7 Distances to Water Bodies

Transportation Routes

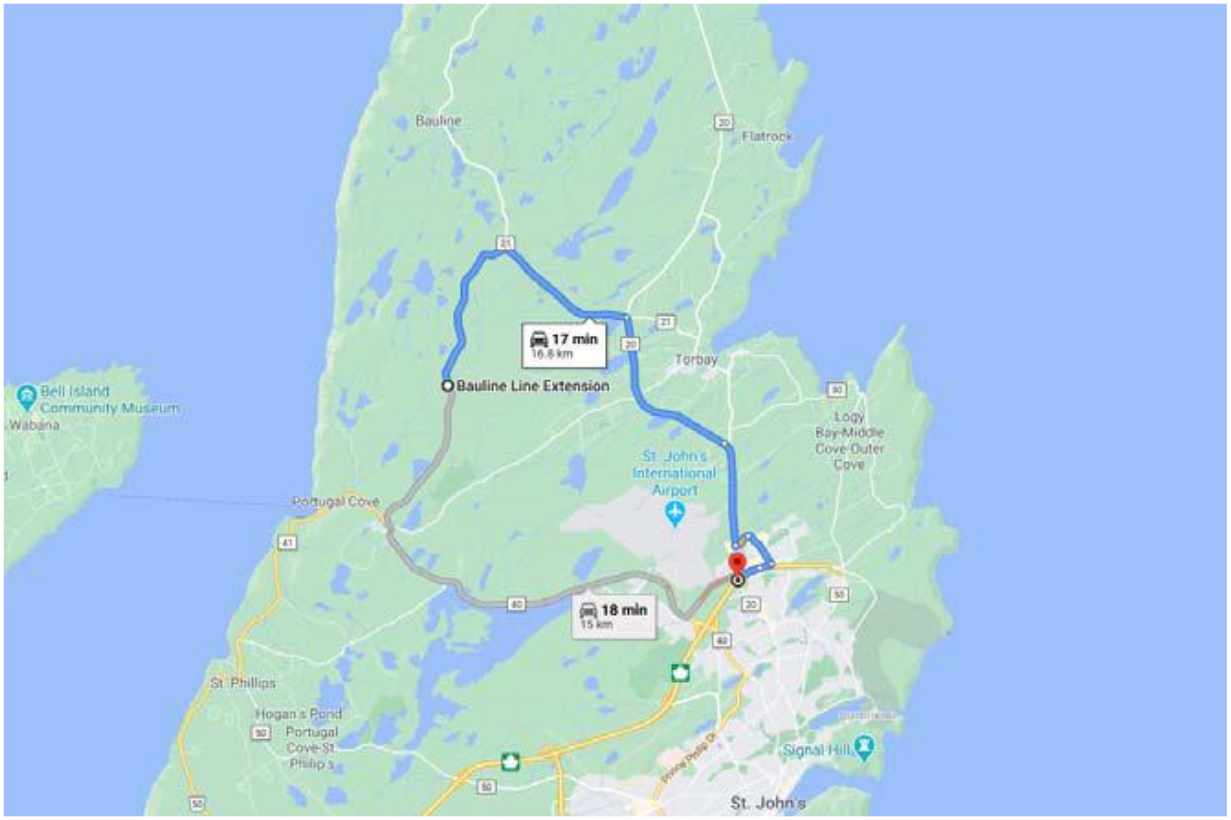

Figure 8: Transport Routes

The location offers convenient highway access for transport. Trucks can take the TCH into Torbay on to Bauline Line Extension, rather than travel through the more densely populated Portugal Cove route. The latter has a narrow road and steep grades, whereas the preferred road route has a more stable grade and lower population density. Truck traffic is projected at less than once per day, a negligible rate of activity given other industrial activity in the region, such as quarries transporting crushed stone and soil.

Physical Features

The predominant physical features are wind and elevation.

Water Resources

There are no ponds, rivers, or streams in the land mass around the proposed undertaking, consequently, the Farm must rely on groundwater or artesian wells. The groundwater appears to be in the 100-foot range, based on observations of water movement by the farmer.

The location for the undertaking is not inside any watershed area. There is a section of farm pastureland inside the municipal watershed, approximately 1.5 kilometers away to the east of the undertaking.

Water run off pattern from site is observable in the westerly direction, towards the King's farm across the Bauline Line Extension Road, though the farm's 98-acre block of land between the site and the road. When this land is cleared and opened for pasture, 100" shelter belts of trees and shrubs will be planted for wind and soil control.

Wind

Wind is the predominant physical feature at the Site. At the farm's elevation of 680 feet above sea level, the winds are regular feature, with high gales of wind and rapid air dissolution.

The prevailing wind blow west, southwest away from Portugal Cove residential developments, across the hayfields and farmland. The following table provides data for the nearby St Johns airport.

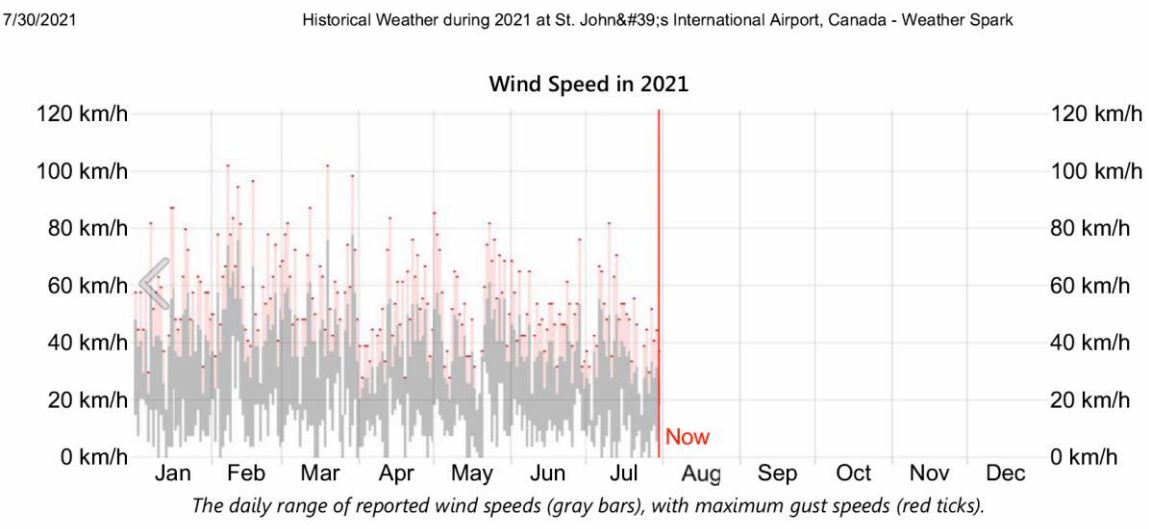

Figure 9: Wind Speeds

Wind speed is a considerable natural force at this height. Increased storm events and high winds are projected to increase over the next decade according to recent CBCL assessment of climate change impacts.

Landscape design can mitigate wind impact around buildings to a certain extent; Windrows, wind shelters, porch design can improve the design look & performance and mitigate wind impacts on the proposed undertaking. The Undertaking and Farm are collaborating on mixed species tree plantings for wind block and pleasing landscape design.

Wildlife

The agricultural zone is adjacent to a large area of wilderness up through the north, providing habitat for wildlife. The following google earth images illustrate the position of the undertaking relative to the undeveloped land mass surrounding the site.

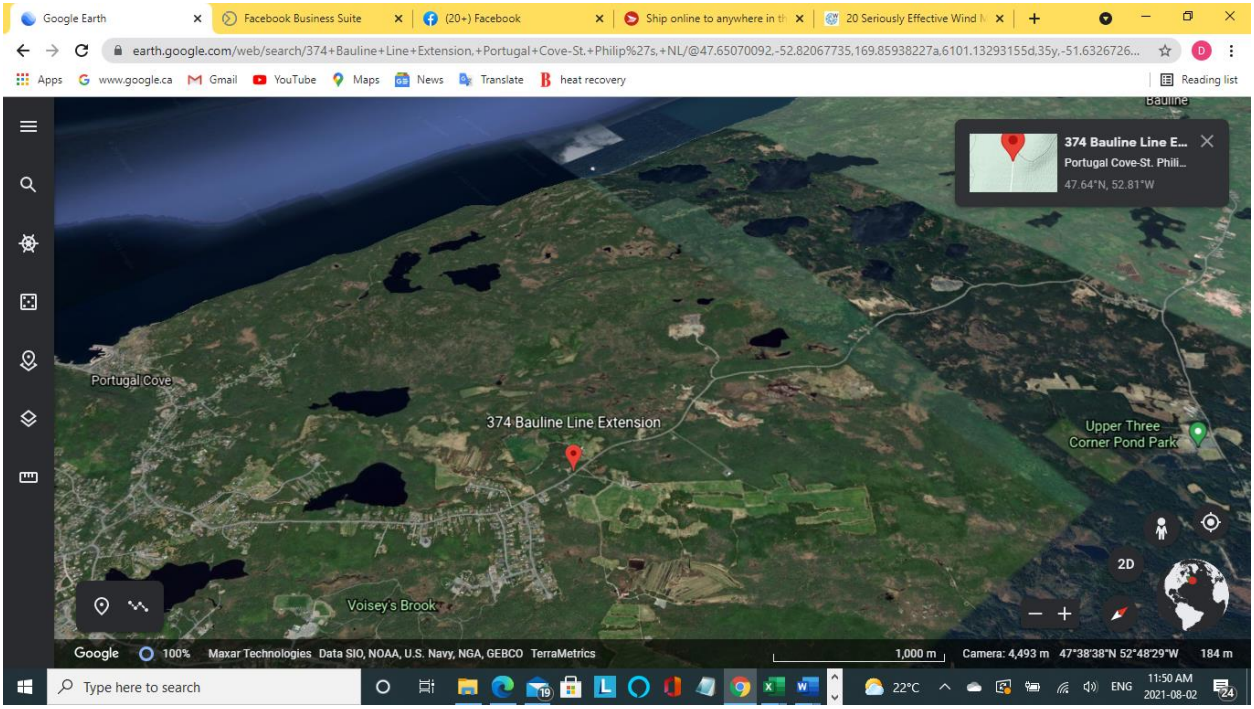

Figure 10 Undeveloped 'wild' land around the Location

Species Observed	Notes
Coyote	Visuals at perimeter of fields, footprints around farm
Moose	Sightings, moose damage in sod fields
Eagles, Hawks, Osprey	Predator birds target farm chickens and wildlife
Starlings	Clusters around fields, forests, farm compost
Ducks, Geese	Field siting's on sod land
Soil life: worm, insects	Increased soil life since Farm adopted regenerative agriculture methods (no pesticide). Monitored by farm
Flies and flying insects, spiders.	Monitored by farm.

Table 2 Species observed or reported by Farm

Ecosystem health of the farm and proposed undertaking is currently monitored. The farm has an Environmental Farm Plan, and participates in monitoring programs with the federal and provincial government, under two themes:

- Farm Ecosystem management through regenerative agriculture techniques, i.e., soil building, plant diversity
- Reporting and sharing information to participate in broader provincial scale trend watching.

Plant Life

The undisturbed plant life in the agricultural area are generally mixed forest of Black Spruce, Fir, Tamarack, and deciduous other boreal plants.

'Disturbed land' land bordering farm buildings, roads, fields support broad range of pollinators such as yarrow, camomile, clovers, and grasses.

Cultivated fields are planted with grasses and forage blends.

The Undertaking will landscape the site with native species and cultivars, for wind filtering, and use sections of the farm for cultivation trials of fish liquid on boreal-tolerant varieties of fruit & nut bearing trees, crops, and shrubs.

Project Construction Phase

The development will use an existing barn and footprint for the first year of operation, plus a shed located adjacent to the process barn. Construction work inside the barn includes utility rooms and workspaces. Exterior site work includes a small 10 by 10 utilities shed, replacement of windows, doors, & insulation &

coating on the exterior roof of the Barn for year-round work. Landscaping around site to support truck turnarounds, loading and offloading zones.

When all materials are onsite, installation is within two months and not anticipated to generate any environmental conflicts

The project will install office and lab space on site during a phase two expansion to bring the plant up to full scale. Plans will be developed at that a time and circulated through the regulatory channel of municipal and government services. An innovative designed re-use of sea containers for people space at the site would suit the brand and the theme of circular economy.

The site plan below illustrates the building footprint. All processing work will happen inside the 6000 sq ft barn.

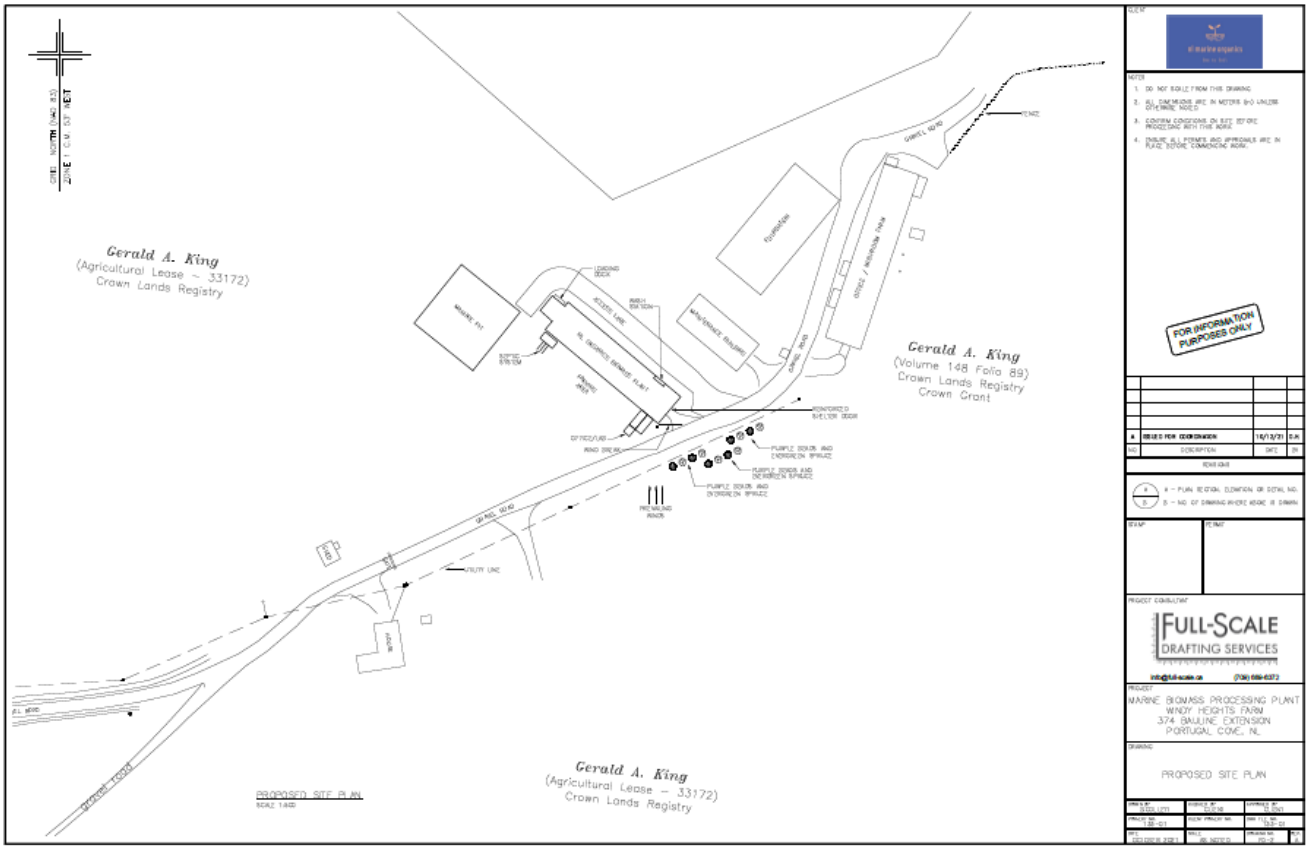

Figure 5 Site Plan

Project Operations Phase

Description of Operations

Raw materials will be trucked to the site in sealed enclosed liquid carrying tanks on a flatbed, and pumped into sealed receiving tanks on arrival. The material is pumped into the process tanks in a semi-continuous batch system. The final product is circulated inside curing tanks for completion.

The process tanks conduct the hydrolysis process. Phosphoric, or formic acid is pumped into the tanks to create a low pH level of 3.8 and maintained to inhibit bacterial spoilage while enabling enzymes to "digest" and solubilize the fish protein. PH controls will be automated with sensors and on demand dosing and integrated with a software-controlled plc device to optimize temperature, acid dosing, mix speed and enzyme dosing. The system can be controlled from an authorized computer or smartphone.

The final product will be treated to deactivate the enzymes and prevent gas-off, ensuing a stable product for customers and the distribution channel. The entire process is completed inside the process barn. Finished material is packaged into bottles for retail clients, or bulk shipping containers for commercial farmers and shipped.

Post processing cleanup and sanitization of equipment is conducted after each shift to maintain clean working conditions for the production crew.

A schematic of the process is described below.

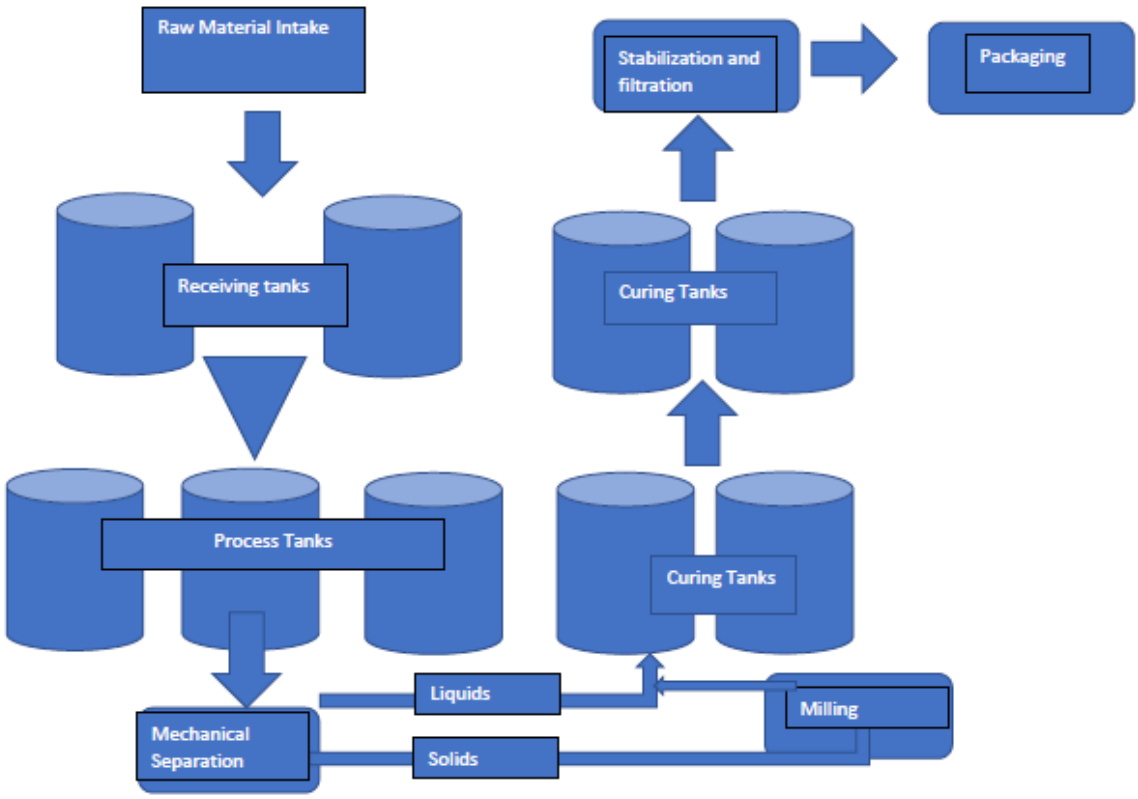

Figure 11 Production Equipment Layout

Hazardous Materials: Operations Phase

Agent	Annual 1000M intake	Annual 5000 mt intake	Precautions
Phosphoric Acid at 2% by weight of raw material.	20 totes	100 totes	Storage in secure storage shed with required ventilation (CFM exchange rates per square foot) Safety equipment and PPE Acid tolerant piping, pump, tankage Staff certificates in hazardous materials training
Hydraulic oils, lubricants	45 gallons annually	100 gallons annually	Appropriate storage & filling equipment, spill absorbents in case of spills or leaks.
Cleaning agents' "Blizzard"	100 gallons	500 gallons	Appropriate storage & filling equipment, spill absorbents in case of spills or leaks.

Table 3 Dangerous Substances Processing Aids

Stabilizing agents: Phosphoric Acid 85%; Formic Acid 85% will be used to control pH and odor, at a 2% by weight of raw biomass. At 1000 ton of raw material biomass, the order of magnitude chemical supply is 20 totes per year. These organic acids are purchased from chemical supply companies such as Univar or Eastchem and can be delivered to site monthly given the proximity of proposed site to chemical supply storage yards.

When delivered onsite, hazardous material is received and stored in a separate storage unit equipped with the required level of CFM ventilation and safety equipment for materials handling. Employees handling hazardous materials will need occupational health and safety required training certificates.

Other materials used onsite include cleaning agents, hydraulic oils & lubricants.

Equipment Description

The following standard equipment will be installed onsite to run the system. Refer to the plant layout schematic configuration,

-Hydraulic power supply system for mixers, compressed air for diaphragm pumps,

-Fibreglass tanks for receiving (2 @ 15,000 litres) processing (3 @ 7000 litre) and curing (4 @ 15,000).

-Pumps, grinder, screw press separation equipment, screw press,

-pH resistant pump and hosing

-Packaging & bottling equipment

-Safety equipment, wash stations & OHSE PPE for handling low pH acids.

-Tractors with buckets, and forks

-Excavator for earth moving

- Spreader tank truck for field distribution

Potential Sources of Environmental Conflicts

This is a contained, indoor closed system process. Material is transported to site in standard sealed IBC liquid handling totes and pumped into stainless steel and fiberglass system. The plant is more akin to a microbrewery than a fishplant.

Refer to section Odour and Air Quality for process steps in odour control in liquid biomass processing of marine ingredients. Given these process steps and the geographical location, the smell will be reasonable and within acceptable limits for good business operation.

Birds and rodents would not have access to the product, so not a conflict there.

The business is a secondary processor of inedible fish protein, adding value through prompt stabilization and solubility. Fishery biomass, often considered waste, will be handled in a manner to preserve nutrient values and process into products for end users. The category moves from waste into ingredient though successful processing.

The proponent suggests the project falls under a "net positive" environmental benefit.

- It reduces the amount of fish waste/offal currently going into the landfill and or ocean, which reduces methane gas generated in the ocean or landfill by large dumps of fish protein.

- Raw material is offloaded on concrete and pumped in hoses

- End users will increase the organic content in soils, thereby improving the ability of soil to sequester more carbon and retain water.

- The enclosed system prevents rodents, birds, or flies from getting access to the biomass

- Air quality, odor emissions and sanitation processes mitigate potential risks and ensure safe and pleasant workspace.

- Floor drains into a cement waste handling pit handle wash water and remove risk of uncontrolled spills or water flow. In the unlikely event of a tank failure, liquids would flow and be contained in the cement holding pit.

- The facility is located inside an active agricultural zone without adjacent competing users, i.e., residential developments or tourism. Farms routinely truck and spread raw biomass on fields. This biomass is trucked in, processed, and stabilized. The additional odour load would be minimal.

Solid Waste

…In the circular bio economy lense…fish waste are ingredients waiting to be developed….

All the biomass brought to plant is processed. Proteins converted to soluble amino acids and bone mass micronized for inclusion. A maximum of 5 % of the solids will be waste from the milling process. On a batch of 20-ton raw material, this is equivalent to one ton, or 2204 lbs of sold waste per batch.

At this scale the most efficient alternative is to use it as pig feed for the growing herd of Mengalista pigs. The farm has enough internal demand to absorb all of the solids waste, which is a rich source of amino acids. Peptides, essential minerals and enzymes.

Waste Streams		Volume at full production
Solid Waste	Partially hydrolysed fish bone material,	250 ton annually

	maximum 5% of production	
Liquid Waste	Wash water	25,000 litres

The Guidance document issued by Pollution Prevention Division. Titles "Landfill Bans, Special Wastes and Diversions Programs, amended November 26, 2020 addresses Aquaculture waste and Wild Capture Fishery Waste:

> *The majority of Aquaculture fish by-products are utilized through a combination of secondary processing, animal feed and agricultural soil amendments. In the event that a by-product cannot be processed, burial is acceptable at an approved organic disposal site. Composting and ensiling of fish waste are also supported by ECCM.* [2]

This undertaking uses biological enzymatic processing and would appear to meet the criteria outlined for accepting aquaculture fish by-product, and the small stream of solid waste can be managed through pig feed to the fam's growing herd.

Liquid Waste

The process is designed to solubilize fish into liquid, so all liquid from process operations is retained as product.

The plant requires regular sanitation and wash water used to clean the system will carry an amount of organic particulate. The process building has sloped cement floors with drainage into an underground cement cistern that will collect wash water for re-distribution into farm processes, compost teas or field irrigation. We project one thousand liters per process day for pressure washing the system according to maintenance schedule.

Liquid storage is also useful for reducing fire risk such as wildfires or combustion through organic biomass, which is more easily managed if contained in a cement structure.

Cleansing agents will be sourced that are organic for an anticipated plant organic certification, and used at dilution rates so as to not harm soil microbial life when the wash water is applied to farm fields.

[2] Guidance Document "Landfill Bans, Special Wastes and Diversions Programs. amended November 26, 2020. Pollution Prevention Division

Air Quality and Odour

Fish by-product carries with it a fishy smell, much as a fish plant has a smell.

During R&D processing there was a sour smell, like that at the Evergreen recycling depot in St Johns. The existing composting operation at the farm has a stronger smell which has not been a concern given the 98 acre setback between the plant zone and homes inside or outside the agricultural zone.

The farm is the right location to handle organic biomass. The high altitude at Windy Heights farm ensures rapid air dissolution, with a prevailing wind blowing away from Portugal Cove and into the plateau out towards the ocean.

Air quality inside the processing plant will be maintained through appropriate fresh air replacement rates and use of activated charcoal filters.

Following the Twillingate R&D work, MUN Process Engineering ran process optimization tests[3]. Odor reduction was achieved, and several recommendations from the study will be applied in the undertaking.

The plant will employ standard operating practices used in similar processing plants in Canada. One of the independent variables is always the condition of the raw material upon arrival, and how quickly it can be stabilized.

- the process is conducted indoors with appropriate controls to prevent "gas-off" and manage air quality.
- Keeping material covered and contained in storage/ transport vessels.
- First in-first out order of processing
- SOP's on process times to maximize stabilization of incoming raw materials. Timing shipment of raw materials to arrive at plant when plant is ready to process them,
- Securing fresh as possible raw material
- Charcoal filters to capture air emission from the process unit vents
- Adequate airflow in the building and fresh air replacement rates
- Compost field to use aerated floor system to quickly bring the organic composting material into stable aerobic conditions, a best practice to mitigate composting odor.

Once the initial hydrolyzation process is complete, the product resembles thick chocolate milk. It can be further formulated with ingredients[4] for specific recipes, or thickened for higher levels of nutrient concentration.

[3] Hawboldt, MacQuarrie 2019, unpublished private report.
[4] Marine ingredients such as micronized seaweed, shells, humates, biochar.

Risk Management

Processing solids to liquids has a prerequisite risk on material containment. Tanks are tested for integrity before commissioning into the system and repaired or replaced.

The worst-case scenario would be containment failure across all tankage, at the same time. Highly unlikely as the system is maintained by professionals, but, in a catastrophic event…. The undertaking has that covered.

The building has sloped floors for drainage with channels and pipes that drain into a primary holding pit and into the 76,800 cubic foot/ 2.1 million litres cement holding pit. The fluid holding capacity at the plant is 100,000 litres, so we have full containment any spill, even a catastrophic event.

Operations

Capacity and Scale

The system is sized to intake and process a truckload (20 mt into 15,700 litres) per 8-hour shift in a semi continuous batch process. The line has 25,000 litres of process tankage, and 75,000 litres in curing and holding tanks, for 100,000 litres of storage at full capacity. This is non-pressurized storage, distributed across 8 tanks. The liquid flow from bottom outlet had psi 25.

In the first year of operations annual raw material intake is expected at less than 1000 ton initially, one truckload per week on average. After the start-up period and milestones in place with customers and distributors, the plant can intake daily to 5000 ton. The process flow speed can be adjusted to provide rapid stabilization for large biomass events.

Distribution and Transportation

Raw material: Transported in sealed liquid tankage, or bulk biomass trailers. Trucking will be contracted out to a commercial trucking company and expected to adhere to environmental controls for safe and clean transportation.

Finished material destined for local provincial market is bottled, boxed and palletized for distribution via truck. Bulk material packed in liquid handling IBC totes will be loaded in sea containers and exported on container ship. Bulk shipments by sea cans with impregnable liners can also be used.

Source, Volume and Type of Raw Material and Output.

The undertaking can process fish-based material, such as salmonids, pelagics and groundfish. Consumer packaged or household waste is out of scoop for this work,

	Intake
Year One	1000
Year Two	5000+

Table 4 Raw Material Intake

Aquaculture operations in the province generate regular mortalities, episodic mass fish kills, and a regular stream of processing waste. This volume will grow with Grieg NL,[5] and with new aquaculture water leases undertaken in the south coast of the Province. The industry acknowledges there will be a need for increased mort handling facilities in the province, and the proposed type of undertaking has been listed as a potential source for waste management in the Environmental Registrations by Grieg NL and the Marbase Hatchery.

The wild capture fish processing sector involves a level of spoilage, accidental waste, processing disruptions that can or create a need alternate disposal. Wild fishery fish plants typically have little waste, mince & freeze by-product for petfood, but there are gaps in the market and periodic spoilage than can be received by the hydrolysis plant.

Inshore and community recreation fisheries generate biomass and may make a community bio-waste collection program worthwhile. Inshore fishers consulted with in the Northeast Avalon are amenable to a collection program. Dumping stations and waste removal services could be developed with harbour authorities, diverting tonnage of recreational fish carcass into useful commodity generating economic activity at the community level.

[5] Mort volume as a percentage of fish can range from lows of 5% to higher ranges of 15-20% pending climatic fluctuations.

End Users

The product appeals to a broad range of growers, interested in soil rejuvenation tools and organic methods to improve crop yields, nutrient density, and lower the chemical footprint of using synthetic chemical based fertilizers.

Agriculture Canada has a push on to reduce synthetic fertilization use in commercial farms. This team is collaborating with Grenfell and Living Labs programming to bring new R&D into the field and create impactful change.

The broad end users or "market" for this organic fertilizer include the following categories.

- Home Gardeners
- Cannabis Growers
- Commercial Farmers
- Golf Courses
- Greenhouses
- Fruit orchards, Vineyards
- Livestock "starter" feeds,
- Pet Feed ingredients

Newfoundland home gardeners got involved with the product from R&D batches and shared success online in the popular gardening groups. Product is on the retail shelves at about 24 garden centers across the province, with a great brand and online following. The company works with distributors and crop consultants who have already developed the knowledge curve around using fish based fertilizers.

For commercial farmers the choice is not organic vs synthetic, it's how best to nurture a healthy soil. Biologicals are the proven leader in stimulating soil health, and can be used with other inputs such as lime, manure, to restore soil chemistry and biological life.

The proposed location enables the team to conduct controlled research trials of product formulations on hay fields and crops. Windy Heights is trialing multiple formulations on an acre each on pasture land with controls (zero application) zones for comparison.

Alternative Locations

No alternative location has been identified that offers the combination of

1. Farmland on the Avalon Peninsula
2. Integrated waste management and emission controls
3. Compatible neighbouring activities
4. Secure zoning to safeguard the investment

Biomass processing is a necessary part of life in a sustainable world. This activity is better done on a farm than in an industrial park, or in fish plants inside towns that have grown up around them.

The selected location in Portugal Cove St Phillips has a comprehensive town plan with clearly defined areas for industrial and farming activities. The zoning protects the undertaking from competing users.

The farm has a 98-acre buffer zone between the plant and the nearest public road. This project is not in anyone's backyard.

The alternative to not proceeding with the investment, such as maintenance of the status quo is a very poor alternative. Our status quo for much organic biomass is generally landfilling or ocean dumping. The biomass generates methane gas and ammonia, which acidifies the ocean. Ocean acidification is harmful and disrupts the life cycle of marine life. Land filling organic waste generates large amounts of greenhouse gases.

Given the ability to divert '000 s of tonnes of organic biomass and use the results to improve carbon sequestration, the proponents strongly suggest this project is a net benefit to carbon management capacity in the province.

There is possibility of another location closer to the biomass source. However, at this scale of operation, using an existing site makes better sense. The current location can service multiple sources of wild and aquaculture biomass, and operate profitably at this scale in this location.

Workforce Requirements

Construction

The build phase will require:

NOC	Description
7251	Plumbing
7242	Industrial electrician
2131	Civil Engineer
7521	Heavy Equipment operator
7271	Carpenters

Table 5 Construction NOC

Operations

The operational phase will require:

7511	Truck Drivers
7452	Material Handlers
0911	Manufacturing Manager
9463	Plant workers
2123	Crop Consultant/Agronomist
1411	Office Administration

Table 6 Operations NOC

Economic and Social Benefits

The undertaking will generate 6-10 jobs with additional labour required for peak processing seasons, supplying a largely export market. The payroll generates an approximate 2.5 multiplier effect in the community.

New secondary processing of fish hydrolysate also enables tertiary producers to provide new products and services. Windy Heights farm launched a product line of organically grown sod, local landscapers are requesting organic fertilizer for lawn care, a neighbouring farm invited the proponent to participate in fish silage feed trials for pork. Marine Ingredients provide essential amino acids for rapid growth in young animals, easily absorbed.

Home gardeners, backyard farmers benefit from a secure supply of a popular soil amendment, retailed through approximately 25 retailers in the province.

Additional Approvals of the Project

- Municipal development permit
- Electrical permits.
- Service NL will be consulted on any other permits required
- Nav Canada has been consulted about the location and activity given the proximity to the airport

Schedule

The schedule is tentative pending the outcome of this Registration; however, the intent is to install in fall 2021.

Funding

The project is not dependent on government funding at this time but may seek funds for growth or expansion in the future. The development aligns with federal and provincial spending priorities to improve food security, local agriculture and reduce carbon.

Development, application evaluation of novel formulations using fish hydrolysates, sea mineral extracts and other bio actives advances knowledge frontiers in realizing goals though carbon-safe applications.

The company participated with Grenfell College, MUN in a successful competition for research money to support product development and evaluation within the University and is part of the New Frontiers Program for multi-year development support. NLMO will be investing in pilot plant development and may leverage relevant funding supports to supplement private equity.