

## **Midway City Miscellaneous Application**

### **PREVIOUS APPLICATIONS AND APPROVALS**

**Refer to 2010 Remund Dairy Application to Build and Operate Greenhouses**

### **TYPE OF APPLICATION**

**To be determined by Planning Staff**

### **SPECIFIC INFORMATION REQUESTED BY PLANNING STAFF**

#### **Planned Operation**

Jagati Farms operates commercial greenhouse facilities specifically for the purpose of growing produce, and includes the incorporation of Aquaponics<sup>1</sup>. Currently tomatoes and lettuce are the primary crops produced by Jagati while secondary crops such as basil, cilantro, rosemary and different fruit species are grown. The Aquaculture<sup>2</sup> element includes the raising of trout, salmon and tilapia, The produce is marketed locally to various restaurants and outlets. An integral element of the development and marketing of Jagati Farms in the Midway area includes a Great Western Farmers Market planned for development on the Homestead property also located in Midway City. While the development of the Western Market is critical to both the designs of Jagati and the impact relative to Midway City, it is not part of this application and should not be considered as such. It should be noted as part of the overall significance that Jagati brings to Midway City.

Jagati Farms will build the intended facility on the 28 acres currently owned by Roy and Martha Remund located at approximately 250 East 600 North Midway Utah. This application is specific to the development of that property.

The Jagati production plan includes produce grown in hydroponic<sup>3</sup> growing systems elevated from ground level. Included in the hydroponic system is a complete nutrient application system known as fertigation<sup>4</sup>. The Jagati system of fertigation includes the complete recycling of the water and nutrients with the exception of the water and those elements hydrated through the photosynthesis process. By using this process the water consumption is reduced to a minimum; consumption is less than 7% of the water use by traditional farming methods using pressurized irrigation systems with sprinklers. Because the hydration process occurs inside a controlled environment where the temperature and humidity level are constantly maintained, the hydration and evaporation are also considerably less than traditional farming methods.

While the produce is cleaned and packaged onsite prior to delivery, all of the fish products are processed off-site with the exception of the fish effluent, which is a critical element in the process, (please refer to section on Waste Management for information on plant processing and fish waste treatment and disposal)

### **Phase I**

Phase I will consist of one greenhouse 336 feet by 140 feet for a total of just over 47,000 feet in total space. 31% or 14,582 feet will contain raceways for live fish. 24%, or 11,289 feet will consist of concrete tanks used as part of the aquaponics process with gravel beds, bacterial processing or filtering and draining. Phase one will produce 2300 heads of lettuce per day and 140 cases of tomatoes per week. The workforce will consist of 9 employees for this phase. Employees will come and go at different times based on a "flex schedule" allowing employees to work at convenient times.

Phase I will also consist of a warehouse or standard steel commercial building 60 feet by 100 feet, or 6000 sq ft which will be used for the processing, cleaning and refrigeration of the produce.

Phase I transportation will consist of one truck; a 16 ft cargo van will make 2 deliveries each day. Every other week a 16 ft panel truck will deliver operational supplies, fertilizers and seed to the warehouse. For access purposes, an all weather gravel surface road will be constructed from 600 North Street approximately 400 feet toward the

south along the western bound of the property. This roadway will be engineered to withstand weather conditions and the use of delivery trucks.

This phase will also consist of the development of a non-consumptive use warm water surface well, the application of which has been submitted to the Utah State Water Engineer for approval. This well will satisfy all of the conditions required by the State Engineer. The initial phase will also consist of the development of restroom facilities and necessary water and sanitation systems. Jagati Farms will transfer one-half (1/2) share of water to the City of Midway for a culinary water connection for this purpose. Jagati also agrees to monitor the use of culinary water and, if at any point the consistent use of culinary water from the city supply exceeds the requirement, additional shares will be transferred equal to the usage. Jagati will purchase water from Midway City at standard and published water rates. Metering fees will be in accordance with water consumption at Jagati. Jagati will also use and meter water from Midway Irrigation Company according to the verbal agreement reached at a previous staff meeting held at Midway City building.

State fire code requires a fire hydrant within 250 ft of the property, this requirement has been satisfied with the hydrant north of the property on the north side 600 North Street.

### **Phases II and III**

Continuing phases will be added as market conditions dictate. Similar ratios will apply through out the development of the project, some are noted:

- Typically between 8 and 12 employees will be added to each subsequent 45,000 feet of greenhouse.
- Aquaculture to Hydroponic ratios will be similar to Phase I
- Water use will expand under the terms defined in Phase I with standard metering and usage requirements.
- Total square footage of the greenhouse space will never exceed the 10 acres which had been approved in the previous Remund agreement. Further Jagati will never exceed 435,600 square feet of greenhouse space on the entire project.

- At any time when Jagati exceeds 30 percent of either the total estimated space (130,000 sq ft) or at any time Jagati exceeds 40 employees, Jagati will provide an asphalt or concrete parking lot and roadway to the greenhouse facility from 600 North.
- Jagati will provide restroom facilities at a ratio of one toilet per 10 employees. Jagati will also provide additional wash sinks through out the facility at a ratio of 1 per 5 employees.

### **Noise Levels**

The only significant noise produced at the green house will be on the occasions when the exhaust fans are in operation. The typical fan operation causes between 36 and 55 db. Typical noise can be defined using this simple chart:

#### Examples of Sound Levels

(in decibels)

10 a light whisper

20 quiet conversation

30 normal conversation

40 light traffic

**50 typewriter, loud conversation**

**60 noisy office**

70 normal traffic, quiet train

80 rock music, subway

90 heavy traffic, thunder

100 jet plane at takeoff

The sound produced by greenhouse fans is similar to a loud and noisy office, or a typewriter or a loud conversation. At the completion of the final phase of the greenhouse build-out, the distance from any of the exhaust fans to any of the neighboring properties will exceed 200 feet and will be isolated on the opposing side of the buildings.

## Smell (Odor) Concerns

I will include a section on Odor as I perceive the concern is over the concern of an odor that may be the result of raising fish.

An odor (commonly referred to as a smell) is caused by one or more volatilized chemical compounds, generally at a very low concentration, that humans or other animals perceive by the sense of olfaction. Odors are also commonly called scents, which can refer to both pleasant and unpleasant odors. The terms fragrance and aroma are used primarily by the food and cosmetic industry to describe a pleasant odor, and are sometimes used to refer to perfumes. In contrast, malodor, stench, reek, and stink are used specifically to describe unpleasant odors.

Different aspects of odor can be measured through a number of quantitative methods, such as assessing concentration or apparent intensity.

Initial entry into a room provides the most accurate sensing of smell, before habituation begins to change perception of odor.

Sensation of odor has 4 properties related to threshold and tolerance: Odor concentration, odor intensity, odor quality, and hedonic tone

Odor concentration is an odor's pervasiveness. To measure odor sensation, an odor is diluted to certain amounts to reach a detection or recognition threshold. The detection threshold is the concentration of an odor in air when 50% of a population can distinguish between the odorous sample and an odor free blank. The recognition threshold is the concentration of an odor in air in which 50% of a population can discern from an odorous sample and odor free blank. The recognition odor threshold is usually a factor of 2 to 5 times higher than the detection threshold.<sup>[10]</sup>

The measurement of odor concentration is the most widespread method to quantify odors. It is standardized in CEN EN 13725:2003.<sup>[15]</sup> The method is based on dilution of an odor sample to the odor threshold (the point at which the odor is only just detectable to 50 % of the test panel). The numerical value of the odor concentration is equal to the dilution factor that is necessary to reach the odor threshold. Its unit is the European Odor Unit,  $OU_E$ . Therefore, the odor concentration at the odor threshold is 1  $OU_E$  by definition.

To establish the odor concentration, an olfactometer is used which employs a group of panelists. A diluted odorous mixture and an odor-free gas (as a reference) are presented from sniffing ports to a group of panelists. In comparing the odor emitted from each port, the panelists are asked to report if they can detect a difference between the ports. The gas-diluting ratio is then decreased by a factor of 1.4 or two (i.e. the concentration is increased accordingly). The panelists are asked to repeat their judgment. This continues until the panelists respond certain and correct twice in a row. These responses are used to calculate the concentration of the odor in terms of European Odor Units ( $OU_E/m^3$ ).

The test persons must fulfill certain requirements, for example regarding their sensitivity of odor perception. The main panel calibration gas to verify this requirement used is n-Butanol (as  $1 \text{ OU}_E/\text{m}^3 \approx 40 \text{ ppb/v n-butanol}$ ).<sup>[16]</sup>

To collect an odor sample, the samples must be collected using specialized sample bags, which are made from an odor free material e.g. Teflon. The most accepted technique for collecting odor samples is the lung technique, where the sample bag is placed in a sealed drum, and a vacuum is placed on the drum, which fills the sample bag as the bag expands, and draws the sample from the source into the bag. Critically, all components which touch the odor sample, must be odor free, which includes sample lines and fittings.

A human's odor detection threshold is variable. Repeated exposure to an odorant leads to enhanced olfactory sensitivity and decreased detection thresholds for a number of different odorants.<sup>[17]</sup> It was found in a study that humans that were completely unable to detect the odor of androstenone developed the ability to detect it after repeated exposure.

Humans can discriminate between two odorants that differ in concentration by as little as 7%. There are a number of issues which have to be overcome with sampling, these include: - If the source is under vacuum - if the source is at a high temperature - If the source has high humidity

Issues such as temperature and humidity are best overcome using either pre-dilution or dynamic dilution techniques.

Odor intensity is the perceived strength of odor sensation. This intensity property is used to locate the source of odors and perhaps most directly related to odor nuisance.<sup>[5]</sup>

Perceived strength of the odor sensation is measured in conjunction with odor concentration. This can be modeled by the Weber-Fechner law:  $I = a * \log(c) + b$ <sup>[20]</sup>

I is the perceived psychological intensity at the dilution step on the butanol scale, a is the Weber-Fechner coefficient, C is the chemical concentrations, and b is the intercept constant (0.5 by definition)<sup>[20]</sup>

Odor intensity can be expressed using an odor intensity scale, which is a verbal description of an odor sensation to which a numerical value is assigned.<sup>[20]</sup>

Odor intensity can be divided into the following categories according to intensity:

- 0 - no odor
- 1 - very weak (odor threshold)
- 2 - weak
- 3 - distinct
- 4 - strong
- 5 - very strong
- 6 - intolerable

This method is applied by in the laboratory and is done so by a series of suitably trained panelists/observers who have been trained to appropriately define intensity.

While some odor testing has been done at different fish operation across the country there is no conclusive evidence that the odor produced from growing fish in live water tanks ever reaches the #2 designation of "weak" on the scale above. The recommendation that I would offer is a "Council Field Trip" to the local state operated fish hatchery. On a recent visit to a similar facility the odor that seemed more prevalent to a group of independent investors seemed to be the odor of the fish food which was more distinct than the actual fish in the water. The more distinct odor found in our operating greenhouses seem to be that of the exhaust of the tomato vine which can be found in most summer gardens in the Midway area.

### **Landscape Buffering and Setbacks**

Because of the propensity of insects to live in vegetation, the greenhouses will be buffered by a section of non-vegetative gravel. In every case the greenhouse will meet all city codes relative to set-backs, building dimensions, building heights, etc.

### **Compliance with State Department of Agriculture**

Just as Jagati strives to comply with local municipality requirements we are fully aware and compliant with the State Department of Agriculture requirements. Several months prior to the submission of this application, we were submitting application to the State for approval regarding the development of an aquaculture operation. Some of the requirements that we will be required to adhere to are:

- Completely filtered water supply at inlet and outlet
- Closed loop system of water and nutrients
- Sterile trout and salmon
- Tilapia cannot survive in the Utah waterways but there is still a requirement for a closed system even though the tilapia are not required to be sterile
- Regular State inspections

- Fish must be purchased and delivered from a State approved vendor, there are 2 in Utah.
- Annual re-application and fee schedule
- Other than State approved fish transport companies, no live fish may exit the property (no fishing days, no fish to local ponds, no pets or aquarium supply)

As with any and all previous concerns, all Federal, State and Local government laws and ordinances will be strictly adhered to.

### **Waste Management**

Jagati Farms operations exceed USDA and State requirements for food grade processing. Any waste materials will be satisfied to meet these requirements.

The waste system inside the processing area consists of a mechanical vacuum system which transports the cut leaves, roots, and unacceptable produce to a mulching/grinding machine which then becomes part of the aquaponic solution. All of this process is contained in a sealed system.

Standard waste products will be dealt with using covered dumpsters provided by commercial waste management companies.

### **Building Material Reflectivity**

The greenhouses maintained by Jagati farms will be constructed using a welded steel frame covered with a polycarbonate covering. Because light is such an important element in the growing process of plants, the coverings used on the greenhouses are designed to do exactly the opposite of reflect light. They coverings are designed specifically to allow light to pass through with minimal reflection. The sidewalls will be 96% clear polycarbonate. The roof system will be covered with a "Solar Soft 90" polycarbonate which will allow 90% of the light to pass through the covering. While it would be impossible to prevent any reflection, the amount of reflection can be defined mathematically as less than 10%.



The north side of the greenhouse as well as the entire warehouse area and also the lower 36 inches of all of the side walls will be covered in a commercial grade metal covering.

### **Impact of Radiant Heating**

Presently 100% of the hot water that comes from the well/spring on the Remund property flows down a ditch. While the water may serve some purpose, the energy is completely wasted. The water engineer that we have hired (Sound Geothermal, Sandy Utah) has estimated that the total amount of water that flows through Midway City, without any control or consideration, has enough energy to provide electricity, provide heat, and provide cooling for all (100%) of the residents of Midway City.

The only impact that Jagati Farms has on the use of radiant heat is that we will conserve a natural resource. We will be able to use less carbon based fuel, less natural gas than if we would let the water continue to be wasted through non-use. The building will remain the same temperature as if we heated them with natural gas. We will, in some small part, play a role in the preservation of the planet.

### **600 North Traffic Impact and Employee Parking (Development Agreement)**

This section was referenced in the earlier section regarding the phasing of the project. I will reiterate and expand to include the use of a Development Agreement.

Jagati Farms will enter into a "Development Agreement" with the City of Midway for the development of the entire project. The elements of the agreement should contain the following:

- A water agreement stating the desire of Jagati Farms to purchase water at the standard rates and usage.
  1. Jagati agrees to maintain a metered culinary system, transferring ownership of water shares based on projected use (beginning) and metered use as the project develops. Midway City will provide the culinary water through its system.
  2. An agreement with the Irrigation company solidifying the verbal agreement concerning water use and more specifically winter water rights.

- At such time or if event driven, as stated above, Jagati will provide a hard surface roadway and parking to the facility from 600 North Street.
- Jagati agrees to participate in, at such time as is required, and defined in the development agreement, to the mitigation of any traffic impact caused along 600 North Street. This may include widening the street along the frontage owned by Jagati (presently Remund) as long as the City of Midway agrees that the expenditure to Jagati be limited to the frontage owned by Jagati and also that no street improvements will be required until such time as the City of Midway is willing to continue the improved section of 600 North Street to 400 East Street.
- Limiting further development outside the bounds of the Jagati proposal
- Allowing a historical but limited dairy/cow operation on a section of the property.
- Allow the two existing residential units to quietly exist on the property.

## **Conclusion**

As part of our application, we have provided this additional information about the project we are starting in Midway. We hope this information has been beneficial in allowing us to build a greenhouse and provide fresh food to the local area.

## Footnotes

1 Aquaponics /'ækwe'pɒnɪks/ is a sustainable food production system that combines a traditional aquaculture (raising aquatic animals such as snails, fish, crayfish or prawns in tanks) with hydroponics (cultivating plants in water) in a symbiotic environment. In the aquaculture, effluents accumulate in the water, increasing toxicity for the fish. This water is led to a hydroponic system where the by-products from the aquaculture are filtered out by the plants as vital nutrients, after which the cleansed water is recirculated back to the animals. The term aquaponics is a portmanteau of the terms aquaculture and hydroponic.

2 Aquaculture, also known as aquafarming, is the farming of aquatic organisms such as fish, crustaceans, molluscs and aquatic plants. Aquaculture involves cultivating freshwater and saltwater populations under controlled conditions, and can be contrasted with commercial fishing, which is the harvesting of wild fish. Mariculture refers to aquaculture practiced in marine environments and in underwater habitats.

The reported output from global aquaculture operations would supply one half of the fish and shellfish that is directly consumed by humans; however, there are issues about the reliability of the reported figures.<sup>1</sup> Further, in current aquaculture practice, products from several pounds of wild fish are used to produce one pound of a piscivorous fish like salmon.

Particular kinds of aquaculture include fish farming, shrimp farming, oyster farming, algaculture (such as seaweed farming), and the cultivation of ornamental fish. Particular methods include aquaponics and Integrated multi-trophic aquaculture, both of which integrate fish farming and plant farming.

3 Hydroponics is a subset of hydroculture and is a method of growing plants using mineral nutrient solutions, in water, without soil. Terrestrial plants may be grown with their roots in the mineral nutrient solution only or in an inert medium, such as perlite, gravel, mineral wool, expanded clay or coconut husk.

4 Fertigation is the application of fertilizers, soil amendments, or other water-soluble products through an irrigation system.

Chemigation, a related and sometimes interchangeable term, is the application of chemicals through an irrigation system. Chemigation is considered to be a more restrictive and controlled process, due to the potential nature of the products being delivered - pesticides, herbicides, fungicides - to cause harm to humans, animals, and the environment. Therefore, chemigation is in general more regulated than fertigation.

Some information provided by Wikipedia