VANDERWEIL

POWER GROUP

Valley Green Grow
44 Old Worcester Road
Charlton, Massachusetts 01507

Mechanical Systems
Odor Mitigation Plan

August 14, 2018

Prepared For:

Emerald Ventures
1600 Osgood Street
North Andover, Massachusetts 01845

Prepared By:

VANDERWEIL POWER GROUP

274 Summer Street | Boston MA 02210

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1. Facility Information

1. Facility information

a. Valley Green Grow (VGG)
b. Jeff Goldstein Email: jeffg@miwus.com
c. Facility Operator: TBD
d. 44 Old Worcester Road, Charlton, MA 01507
e. Cultivation Center
f. Hours of Operation 24 hrs
g. Marijuana Cultivation Facility and Marijuana Manufacturing Center
h. Business License Number: In Progress (Siting Profile Stage at DPH)

2. Facility Odor Emissions Information

a. Facility floor plan:

This section includes a facility floor plan, with locations of odor emitting activity(s) and emissions locations specified. Relevant information including, but not limited to, doors, windows, ventilation system, and odor source locations. See Site Plan attached

b. Specific odor-emitting activities

Specific odor-emitting processes at Valley Green Grow

- **Mother/ Clone Rooms**: These operations include the initial growing stage of new plant. The process emits plant terpenes into the atmosphere. Plants are moved from here to the Vegetative Rooms.

- **Vegetative Rooms**: These operations include the initial growing stage of new plant. The process emits plant terpenes into the atmosphere. Plants are moved from here to the Flower Rooms.

- **Flower Rooms**: Trimming or budding operations including plant-stressing occur during a 56- day process. At the time of harvest, the rooms will be emptied and thoroughly cleaned. The plants are physically moved to the Harvest Rooms in order to get product prepared for the drying and extraction processes.

- **Harvest Rooms**: During the harvest process, unusable parts of the plant are removed and placed in sealed containers for anaerobic digestion. The

usable parts of the plant are trimmed and prepared for drying or extraction and moved to Drying Rooms or Extraction Rooms.

- **Drying Rooms**: During the drying process moisture will be removed from the plants at which point plant terpene odors are released to the indoor environment. Once the plants are sufficiently dried or cured they will be moved into the Trimming Room.

- **Trim Rooms**: During the trimming process buds will be separated and waste-trim will be prepped for the extraction process.

- **Packaging Rooms**: this is the process of trimming, packaging the final product for sale at Dispensaries. This room is also post-production for the extraction oil. The post production process of distillation can also produce terpene odors.

  Note: Office and general support areas are not considered odor emitting locations with activities. The central air handling unit, serving these areas will have installed GPS-2400 Bi-polar Ionization Units (or similar) for mitigating VOCs and terpene odors migrating from other areas of the project.

c. Phases (timing, length, etc.) of odor-emitting activities at 44 Old Worcester Road

- **Mother/ Clone**: Plants are in clone stage for 2-3 weeks. The process to move to the Vegetative Room is 4-8 hours.

- **Vegetative**: Plants are in vegetative stage for 5 weeks. The process to move the Flower Rooms is 4-8 hours.

- **Cultivation**: Plants are in the flowering stage for 56 days. The process to harvest and transport to Trimming and Extraction is 1 day.

- **Drying**: Plants are in the drying stage for 2-3 weeks. The process to transport to the Trimming and Extraction is 2-4 hours.

- **Trim**: Trimming processes will occur during all hours of operations.

- **Package Rooms**: Packaging processes will occur during all hours of operations

3. Odor Mitigation Practices

The following are the list of 'administrative controls' and 'engineering controls' that include, but not limited to:

a. Administrative Controls

iv. **Procedural activities**: VGG has taken extreme measures to isolate all odor emitting activities. These include, carbon filters installed in each room and isolating all odor producing activities in their own rooms that have heavy duty doors with door closers to insure doors are always closed. In addition we have installed the state-of the-art odor mitigation control systems.

i. These procedures will be applied to the following odor-emitting areas of activity:

- Mother/ Clone Rooms
- Vegetative Room
- Cultivation Rooms
- Harvest Rooms
- Drying Rooms
- Trimming Rooms
- Package Rooms

ii. **Staff training procedures**: VGG has an extensive training program that includes training specifically for odor mitigation. The importance of keeping doors shut, changing carbon filters are among the other Standard Operating Procedures, that all employees must follow. VGG will conduct weekly staff meetings At these meetings we discuss odor mitigation and discuss with all departments the importance of keeping up with the processes we have in place.

iii. **Recordkeeping systems and forms**: Attached you will find our Carbon Filter Report Card, this card is maintained and filled out monthly by our Operations Manager. VGG will have a 2 month (or equivalent of 2 change outs per unit) supply of Carbon Filters on site that will be re-ordered by the Operations manager to keep aligned with the facility maintenance program. If a Filter needs to be changed sooner Filters will be on premises to do so. If maintenance is needed it will be done immediately as to not affect the surrounding areas at the VGG Facility.

iv. **Monitoring and inspection**: Every odor emitting room will be continuously monitored with daily inspections for odor. If a high volume of odor is detected by an employee, they will directly inform the Facility Operator. If a filter needs to be changed it will be done so at this time. If doors are not closing by themselves, doors will be fixed as soon as the problem is detected.

b. Engineering Controls

v. The engineering odor control system has been designed by a Professional Engineer licensed in the State of Massachusetts.

vi. HVAC system odor control plan: Closed Loop System with limited exhaust.

Bi-polar Ionization Control: Plasma Air Systems

Odor Control –The ions produced by Plasma Air units, breaks down gases with electron-volt potential numbers below 12 to harmless compounds prevalent in the atmosphere such as oxygen, nitrogen, water vapor and carbon dioxide. The resultant compounds are a function of the entering contaminants into the plasma field. In this case the VOC's or terpene odors generated by the marijuana breaks down to carbon dioxide and nitrogen, and water vapor, thus eliminating the odor.

Reduction in Airborne Particles –The positive and negative ions are drawn to airborne particles by their electrical charge. Once the ions attach to the particle, the particle grows larger by attracting nearby particles of the opposite polarity, thereby increasing the filtration effectiveness.

Kills Virus, Bacteria & Mold – Similar to how positive and negative ions surround particles, they are also attracted to pathogens. When the ions combine on the surface of a pathogen, they rob the pathogen of the hydrogen necessary for them to survive. During the final step of deactivation, the ions eliminate hydrogen from the pathogen and then the plasma cleansing process is complete, making the airborne virus, bacteria or mold spore inactive.

Active Carbon Odor Control (Can-Lite Fans, Carbon Filters and Rolled Carbon Filter Material)

Odor Control – The Active Carbon Filters absorbs its molecular weight of contaminants it comes in contact with. Adsorption is a distinct process where organic compounds in the air react chemically with the activated carbon, which causes them to stick to the filter. The more porous the activated carbon is, the more contaminants it will capture. These filters are most notably used to remove terpene compounds in MIW facility, air handling systems.

1) Odor Mitigation System design

a. **General**: All the HVAC systems installed at this facility will be considered “closed-loop” systems. Other than ventilation air, all the of the HVAC equipment will recirculate 100% of the supply being distributed to the various applications areas throughout the facility. Ionization and active carbon filtering will be installed to mitigate odors within the facility. To the extent possible, the odor mitigation will be intended to mitigate odor migration to the outside of the building and surrounding areas.

b. **Office and Support Spaces**: Ventilation air will be provided as required for listed occupancy. The units will utilize Plasma Air bi-polar Ionization units for odor and bacterial mitigation as well as active carbon filters installed in the return air.

c. **Mother/ Clone Rooms**: Each mother/ clone rooms will have supplemental environmental control units installed to accommodate the cooling and dehumidification, monitoring and control for each room. Ventilation air will be provided as required for listed occupancy. The units will utilize Plasma Air bi-polar Ionization units for odor and bacterial mitigation as well as active carbon filters installed in the return air.

d. **Vegetative Rooms**: Each vegetative room will have supplemental environmental control units installed to accommodate the cooling and dehumidification, monitoring and control for each room. Ventilation air will be provided as required for listed occupancy. The units will utilize Plasma Air bi-polar Ionization units for odor and bacterial mitigation as well as active carbon filters installed in the return air.

e. **Cultivation Rooms**: Each cultivation room will have supplemental environmental control units installed to accommodate the cooling and dehumidification, monitoring and control for each room. Ventilation air will be provided as required for listed occupancy. The units will utilize Plasma Air bi-polar Ionization units for odor and bacterial mitigation as well as active carbon filters installed in the return air.

f. **Drying Rooms**: Provide nominally sized vertical high-efficiency split- system AC units and dehumidification units with outdoor remote condensing unit(s). Ventilation air will be provided as required for listed occupancy. The units will utilize Plasma Air bi-polar Ionization units for odor and bacterial mitigation.

g. **Trimming Rooms**: Each vegetative room will have supplemental environmental control units installed to accommodate the cooling and dehumidification, monitoring and control for each room. Ventilation air will be provided as

required for listed occupancy. The units will utilize Plasma Air bi-polar Ionization units for odor and bacterial mitigation as well as active carbon filters installed in the return air.

Trimming Rooms will also have installed Can-Light active carbon filters to operate as “scrubbers” the room. The Trimming Rooms Can-Light fans will have quantities sufficient to provide a minimum of 6 air-changes per hour of active carbon filtration for each room.

h. **Packaging Rooms**: Each vegetative room will have supplemental environmental control units installed to accommodate the cooling and dehumidification, monitoring and control for each room. Ventilation air will be provided as required for listed occupancy. The units will utilize Plasma Air bi-polar Ionization units for odor and bacterial mitigation as well as active carbon filters installed in the return air.

Packaging Room will also have installed Can-Light active carbon filters to operate as “scrubbers” the room. The Packaging Rooms Can-Light fans will have quantities sufficient to provide a minimum of 6 air-changes per hour of active carbon filtration for each room.

2) Building Exhaust Systems

a. **Toilet Exhaust Fans**: The toilet exhaust fans will have active carbon rolled filter material installed on the fan inlets. The filters will be roll-type material secured to the fan inlet. Where possible pleated carbon filter and filter box will be installed on the fan inlet.

b. **Cultivation Ventilation Fans**: The grow room ventilation fans will have active carbon rolled filter material installed on the fan inlets. The filters will be roll-type material secured to the fan inlet. Where possible pleated carbon filter and filter box will be installed on the fan inlet.

c. **Service Sink Exhaust Fans**: The service sink exhaust fans will have active carbon rolled filter material installed on the fan inlets. The filters will be roll-type material secured to the fan inlet. Where possible pleated carbon filter and filter box will be installed on the fan inlet.

d. **Misc. Exhaust Fans**: Other misc. exhaust fans will have active carbon rolled filter material installed on the fan inlets. The filters will be roll-type material secured to the fan inlet. Where possible

pleated carbon filter and filter box will be installed on the fan inlet.

Note: The Extraction Process in not considered to be an odor generating process all material is sealed prior to entering the room. Per Section 510, of the 2015 IMC: No filtration can be installed between the exhaust inlet and the fan outlet.

Extraction Rooms will also have installed Can-Light active carbon filters to operate as “scrubbers” the room. The Extraction Rooms Can-Light fans will have quantities sufficient to provide a minimum of 6 air-changes per hour of active carbon filtration for each room.

3) Operational processes

Mother Clone Rooms: The existing air conditioning fan operates 24 hours per day. The Plasma Air Bi-polar ionization units will be interlocked with the supply fan. The air conditioning units will also have active carbon filters installed on the return air section to each fan.

Vegetative Rooms: The existing air conditioning fan operates 24 hours per day. The Plasma Air Bi-polar ionization units will be interlocked with the supply fan. The air conditioning units will also have active carbon filters installed on the return air section to each fan.

Cultivation Rooms: The existing air conditioning fan operates 24 hours per day. The Plasma Air Bi-polar ionization units will be interlocked with the supply fan. The air conditioning units will also have active carbon filters installed on the return air section to each fan.

Drying Room: The supplemental air conditioning unit fan operates 24 hours per day. The Plasma Air Bi-polar ionization units are interlocked with the supply fan. The Can-light fans will operate 24 hours per day.

Trimming Rooms: The existing air conditioning fan operates 24 hours per day. The Plasma Air Bi-polar ionization units will be interlocked with the supply fan. The air conditioning units will also have active carbon filters installed on the return air section to each fan.

Packaging Rooms: The existing air conditioning fan operates 24 hours per day. The Plasma Air Bi-polar ionization units will be interlocked with the supply fan. The air conditioning units will

also have active carbon filters installed on the return air section to each fan.

4) Maintenance plan

a. Plasma Bi-polar Ionization Units: have a manufacturer's recommended service requirement for cleaning the electrodes every 2 years in order to maintain their effectiveness.

b. Active Carbon: The active carbon filters absorbs its molecular weight of contaminants it comes in contact with. Adsorption is a distinct process where organic compounds in the air react chemically with the activated carbon, which causes them to stick to the filter. The more porous the activated carbon is, the more contaminants it will capture. These filters are most notably used to remove terpene compounds in cannabis facility air purification systems.

The physical process of adsorption is followed by chemical adsorption (chemisorption). This is a chemical reaction in which the two substances react together and the resultant chemical is trapped on the filter material. The impregnation of filter media can greatly extend the range of gases that can be removed from the air stream.

- Terpenes commonly occur in the oils that give plants their fragrance.
- The fundamental building block of cannabis terpenes is the isoprene unit, C_5H_8
- The larger structures are "assembled" from several isoprene units, usually by "head-to-tail" linked isoprene units.

c. **Mother/ Clone Room**: Maintenance Active: Bi-polar Ionization- every 2 years or as needed for maintenance. Active carbon filters. The molecular weight of the cannabis terpene isoprene unit is 358.4733 g/ mole. The amount of active carbon in the Mother/ Clone Room 0.10-0.12 12 lbs per CFM Recommended rate of replacement of the carbon filter material is every 24-30 months. This is empirically based on 6 air-changes/ hour and an average cannabis plant size and plant totals, for each room.

d. **Vegetative Room**: Maintenance Active: Bi-polar Ionization- every 2 years or as needed for maintenance. Active carbon filters. The molecular weight of the cannabis terpene isoprene unit is 358.4733 g/ mole. The amount of active carbon in the Vegetative Rooms 0.010-0 – 0.012 lbs per CFM Recommended

rate of replacement of the carbon filter material is every 24-30 months. This is empirically based on 6 air-changes/ hour and an average cannabis plant size and plant totals, for each room.

e. **Cultivation Rooms** Maintenance Active: Bi-polar Ionization-every 2 years or as needed for maintenance. Active carbon filters. The molecular weight of the cannabis terpene isoprene unit is 358.4733 g/ mole. The amount of active carbon in the Cultivation Rooms 0.020 - 0.024 lbs per CFM. Recommended rate of replacement of the carbon filter material is every 24-30 months. This is empirically based on 6 air-changes/ hour and an average cannabis plant size and plant totals, for each room.

f. **Drying Rooms**: Maintenance Active: Bi-polar Ionization-every 2 years or as needed for maintenance. Active carbon filters. The molecular weight of the cannabis terpene isoprene unit is 358.4733 g/ mole. The amount of active carbon in the Mother/ Drying Rooms 0.010-0 – 0.012 lbs per CFM Recommended rate of replacement of the carbon filter material is every 24-30 months. This is empirically based on 6 air-changes/ hour and an average cannabis plant size and plant totals, for each room.

g. **Trimming Rooms**: Maintenance Active: Bi-polar Ionization-every 2 years or as needed for maintenance. Active carbon filters. The molecular weight of the cannabis terpene isoprene unit is 358.4733 g/ mole. The amount of active carbon in the Trimming Rooms 0.020 - 0.024 lbs per CFM. Recommended rate of replacement of the carbon filter material is every 24-30 months. This is empirically based on 6 air-changes/ hour and an average cannabis plant size and plant totals, for each room.

h. **Packaging Rooms**: Maintenance Active carbon Can-lite Fans: The molecular weight of the cannabis terpene isoprene unit is 358.4733 g/ mole. The amount of active carbon in the Packaging Rooms is 12 lbs. Recommended rate of replacement of the carbon filter material is every 24-30 months. This is empirically based on 15 air-changes/ hour and an average cannabis plant size and plant totals, for each room.

i. **Toilet/ Service Sink Exhaust Fans**: Maintenance of active carbon roll material will be replaced every 6 months.

j. **Flower Room Purge Fan**: Maintenance of active carbon roll material will be replaced on a monthly basis.

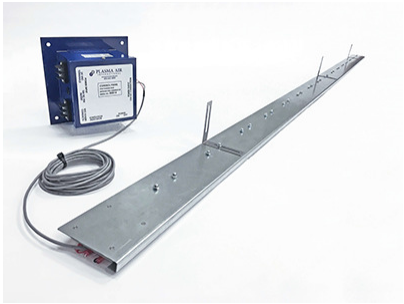
Appendices

Filter Replacement Schedules

Location	Filter Type	Activity: Replace	Date
Vegetative	Active Carbon		
Flower	Active Carbon		
Harvest	Active Carbon		
Trim	Active Carbon		
Extraction	Active Carbon		
Vault	Active Carbon		
Packaging	Active Carbon		
Shipping	Active Carbon		
Support Areas	Active Carbon		

Active Carbon Filters: Industrial Products

Plasma Air: Industrial Products



Model: Plasma Air - BAR PB

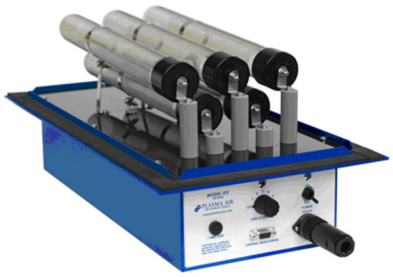
Voltage: 24V AC or 12V DC. Power supply provided for 120V - 230V

Energy use: 1.5 Watts/LF

Capacity: Up to 20,000 CFM per BAR. Multiple BARS can be used.

No. of ionization outlets: 3-16 depending on length. 1 outlet per 6” of length.

Application: Long narrow profile Plasma BAR for mounting on air entering side of coil. Ideal for larger RTUs and AHUs. BAR is powered by supplied control panel. Interconnecting voltage is only 12V DC.



Model: Plasma Air 50E

Voltage: 120V / 230V

Energy use: 30 watts

No. of tubes: 5

Tube Size: E

Capacity: 8,000 CFM

Application: In duct unit for larger central HVAC systems. Ideal for office buildings, hospitals, schools, nursing homes, childcare facilities, casinos, food processing facilities, manufacturing plants, and remediation of odors from waste water treatment facilities, etc.

Model: Plasma Air 200D, 200E

Voltage: 120V / 230V

Energy use: 10 or 12 watts

No. of tubes: 2

Tube Size: D or E

Capacity: 4,000 CFM to 5,000 CFM

Application: In duct unit for medium sized central HVAC systems.

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