GALLOWAY TOWNSHIP

CANNABIS

OPERATION STANDARDS FOR INDOOR CULTIVATION

GALLOWAY TOWNSHIP, ATLANTIC COUNTY

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INTRODUCTION

In November 2020, more than 67% of New Jersey residents approved a constitutional amendment to legalize the possession and use of cannabis. In February 2021, Governor Phil Murphy signed into law the New Jersey Cannabis Regulatory, Enforcement, Assistance and Marketplace Modernization Act (P.L.2021, c.16) (the “CREAMMA”), legislation legalizing and regulating cannabis use and possession for adults 21 years and older, A-21 (P.L. 2021, c.16). In August 2021, the New Jersey Cannabis Regulatory Commission released its first set of regulations addressing issues related to licensing, taxation, and zoning. Notably, few operational controls were put in place and no environmental regulations were implemented. The regulations acknowledge issues of waste, water usage, sustainability, and energy, but charge license-holders with formulating a plan and its subsequent implementation.

Uniform standards and regulations are complicated by the continued classification of cannabis as a Schedule I drug under the Federal Comprehensive Drug Abuse Prevention and Control Act of 1970. Nationwide, the cannabis industry is growing at a rapid pace as individual states legalize recreational cannabis, yet environmental impacts are widely unknown and largely unregulated. As state regulators attempt to define licensing processes, resources devoted to environmental impacts, sustainability, and quality of life are minimal. Many states have begun adopting regulations that are reactionary instead of being proactive, The Township of Galloway (“Township”) recognizes the potential impact the cannabis industry may have on its residents and the environs and resolved to be proactive in its approach to prospective cannabis developers.

On March 22, 2022, Mayor Anthony Coppola, Jr. formed a Cannabis Committee (“Committee”) and charged the Committee with researching and reviewing cannabis industry standards with the intent that the Committee would develop Township-wide standards applicable to the cannabis industry. Members of the Committee conducted extensive research, including reviewing scientific journals, scholarly articles, cannabis statutes and regulations of other jurisdictions, local jurisdictional ordinances, periodicals of national associations related to heating, ventilation, and air conditioning (HVAC), and federal and state departmental reports on air quality and odor. The Committee also consulted with industry professionals, conducted site visits to operational facilities, and privately consulted with stakeholders in the community.

The Committee has adopted this Galloway Township Cannabis Operation Standards as its initial report to the Township Council. The primary focus of the Committee was to ensure that new cannabis facilities had a limited impact on the residents of the Township and the community as a whole, as it relates to odors, water quality, air quality, energy, and waste.

These Operation Standards are provided to the development community to present guidance on issues and concerns that will be addressed in a redevelopment agreement as a prerequisite to any application for land use development of a cannabis-related commercial facility. These Operation Standards are current as of the date of this report and may be modified or revised at any time. The Committee shall meet periodically to evaluate the applicability of these Operation Standards and shall recommend to the Township Council any modifications or revisions

1. EXECUTIVE SUMMARY

Global cannabis sales are expected to increase from $13.4 billion in 2020 to $33.6 billion in 2025. The explosion of the recreational cannabis market has highlighted the shortcomings of statutory and regulatory governance both at the state and local levels across the country. Here in New Jersey, the focus has been on the processes and procedures regarding licensure and operations. No framework has been put in place addressing environmental concerns or aiming to protect the quality of life of its residents.

The chief complaint related to the cannabis industry is odor. New Jersey regulations require businesses to "seek to prevent the escape of odors associated with cannabis over the boundary of the property." N.J.A.C. 17:30-9.4. Other jurisdictions, such as Colorado and California have adopted reasonableness standards, not a prohibition on all scents. Only one town in the United States has approved a "zero tolerance" policy for cannabis odors across property lines.

While the Township strives to prevent the escape of all odors from a cannabis cultivating site, the reality is absolute prevention is a near impossibility with current best practices. As part of its best efforts to mitigate malodors, the Township will require cannabis cultivators to utilize multiple layers of filtration and advanced ventilation. Molecular filtration coupled with containment practices and vertical ventilation must minimize malodors detectable at the ground level.

Sustainability is an often-overlooked aspect of the cannabis industry. Specifically, water conservation and renewable energy sources are an integral part of this blossoming industry. The Township focused on exploring water reclamation versus water distribution methods. Being able to recycle and reuse water lost through evaporation and transpiration, capturing water from the facility's HVAC and dehumidification systems, and treating wastewater for reintroduction are high priorities for the Township with respect to cannabis cultivators. The Township also focused on renewable energy by requiring at least 40% of a cannabis facility's roof area to be actively devoted to capturing renewable energy and requiring energy-saving light fixtures in both vegetation rooms (LED) and flowering rooms (double-ended HPS or LED).

Lastly, the Township reviewed potential waste issues, including solid and hazardous waste produced mainly by non-useable plant material and solvents. Non-useable plant material can be disposed of as solid waste or composted on-site at a facility owned by the operator. Because of concerns regarding odor, the Township will not require composting of non-usable plant material. Solvents create a unique challenge in that they are typically flammable and potentially explosive gases. While the Township will not mandate a cannabis operator utilize a specific solvent or methodology, the Township will require the submission of a chemical inventory so that it can properly evaluate the potential safety hazards and risks associated with the solvents. The Township will also require compliance with the International Building Code for a Group F-1 Moderate-hazard Factory Industrial Use or a Group H, High-hazard Use depending on the type of solvents present at the site.

2. ODOR MITIGATION

The understanding of the forensic odor of cannabis is ongoing. Odors from the cannabis industry are difficult to quantify due to low thresholds for detection, and sensitivity to the odors can vary from individual to individual. It is important to note that the presence of strong odors does not necessarily equate to malodors. The presence of strong malodors also does not necessarily equate to higher concentrations of air contaminants.

Over 200 different compounds have been identified from packaged cannabis samples. Historically, the objectionable odor of cannabis has been long tied to terpenes, aromatic compounds found in a variety of plant emissions. Terpenes are classified as volatile organic compounds (VOCs) because they evaporate easily and release molecules into the atmosphere. VOCs decrease significantly outside of indoor cultivation facilities due to passive dilution into the ambient atmosphere. Terpenes are not considered a pollutant. However, when mixed with nitrogen oxide and sunlight, it forms an ozone-degrading aerosol. Controlling cannabis odor is not only about deterring malodors but is also paramount to controlling air quality.

Some scientists believe that terpenes are not the source of cannabis' malodor. Recent studies suggest the "skunky" smell characteristically associated with cannabis is more likely associated with a sulfur-containing molecule. Compounds containing sulfur molecules are typically associated with a pungent odor at low concentrations. As early as March 2021, a research team comprised of Byers Scientific, Iowa State University, and Texas-based odor experts suggested that a volatile sulfur compound (3-methyl-2-butene-1-thiol, more commonly known as 321 MBT) was the source responsible for the cannabis' "skunk-like" aroma. In November 2021, a team of researchers in Southern California agreed.[1]

In Township redevelopment agreements with cannabis-related commercial facilities, the Township will require an effective odor mitigation plan, with firm commitments to technical installation and proper maintenance. Redevelopment agreements will further provide the Township with authority to take immediate action to ameliorate odors that travel beyond a property's boundary.

[1] Iain W. H. Oswald, Marcos A. Ojeda, Ryan J. Pobanz, Kevin A. Koby, Anthony J. Buchanan, Josh Del Rosso, Mario A. Guzman, and Thomas J. Martin. (2021). "Identification of a new family of prenylated volatile sulfur compounds in cannabis revealed by comprehensive two-dimensional gas chromatography." ACS Omega, published online November 12, 2021.

Factors to Consider for Odor Mitigation

There are four (4) key factors cannabis cultivators and processors should be looking at when selecting and sizing an odor mitigation system. The first two are readily available – plant count and the size of the indoor space. The second two, the biogenic volatile organic compounds (BVOC) emission types and the gas-phase BVOC emission rates of the particular cannabis strains are not attainable until cultivation occurs and requires a leaf enclosure study.

Cannabis cultivators and processors must install HVAC systems with multiple stages of VOC control to reduce or eliminate odor-causing compounds. Improper design of a cannabis facility's HVAC system is the primary reason for odor issues. Any cannabis cultivator and/or processor's HVAC system shall account for the following: (a) heat produced by photosynthesis when determining cooling requirements; (b) release of water vapor by plants when calculating dehumidification needs; (c) heat produced by ballasts in addition to the infrared light produced by lamps; (d) heat produced by dehumidification; (e) heat produced by CO2 generation; (f) heat and humidity produced by an increased presence of people within the grow environment; (g) moisture produced by the storage and distribution of water-related to irrigation in the cultivation process (h) a carbon filtration volume (measured in cubic feet per minute or CFM) capacity sufficient for room size when operating at 80% of capacity; (i) proper positioning of fans to pull air through the filtration system; and (j) fan capacity for pulling of air through the filtration system.

System Components for Odor Mitigation

Molecular Filtration System

Molecular filters contain media designed to adsorb a specific subset of molecules to eliminate odors, irritants, and toxic or corrosive gases. According to the "Cannabis Environmental Best Management Practices Guide" published by the Denver Public Health & Environment Department in October 2018 ("BMPG")[2], carbon-based molecular filtration is currently the best control technology for reducing VOC emissions from cannabis cultivation facilities. Approximately 98% of those who installed odor mitigation systems in Denver, CO utilized carbon filtration systems. However, not all carbon media is created equal when it comes to the effectiveness of targeting and remediating different types and volumes of VOC emissions. Carbon filtration can remove 50-98% of VOC emissions depending on the media used. The

[2] https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/MJ%20Sustainability/Best%20Practices%20Management%20Guide%20web%20-%20final.pdf.

BMPG also recommends a filter replacement schedule that includes a changeout in early May, the beginning of the "ozone season" (May to September), to ensure that the filter is at peak performance during the critical season.

Cannabis operations in the Township of Galloway shall utilize carbon-based molecular filtration systems with an efficiency rating of 97% or higher, or a system equivalent thereto. Filters shall be replaced according to the manufacturer's recommended guidelines. Replacement filters should be readily available on-site to alleviate delays in changeouts and to ensure the system operates at maximum efficiency. It is also recommended that the molecular filtration system have its performance validated in accordance with ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Standard 145.1-2015 and/or ISO (International Organization for Standardization) 10121-1:2014, which are recognized test standards for gas-phase air-cleaning systems.

Bi-Polar Ionization

Bipolar ionization breaks air down into two particles (positive and negative ions), which either react with or attach to other particles. This reaction helps break down compounds to eliminate odors. Attaching two particles together causes them to become larger in size and makes them more readily able to be filtered. Ionization systems should be used in conjunction with effective air filtration to ensure the successful removal of particles by the filters.

There is a track record for the use of bi-polar ionization in reducing odors and destroying volatile organic compounds (VOCs), although there are no industry standards or test protocols.[3] In contrast, the Boeing Company investigated bi-polar ionization to combat COVID-19 in aircraft cabins and recommended "continued study, development, and validation."[4]

Technologies and equipment must be carefully evaluated to ensure proper safety for systems and occupants. Some ionization systems produce ozone as a by-product. Ozone is a disinfectant, but it is also an irritant. Ozone attacks rubber and could lead to the deterioration of belts and gaskets in an HVAC system. The CDC recommends ensuring that bi-polar ionization equipment meets UL 2998 standard certification (Environmental Claim Validation Procedure

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[3] Goodfellow, Robert, "Mitigating Airborne Infection Transmission in HVAC Systems" Papyrus, April 2021, 15 (https://www.dynamicaqs.com/commercial/phocadownlaod/category/32-articles?download=504:papyrus-mitigating-airborne-infection-transmission-in-hvac-systems)

[4] https://www.boeing.com/confident-travel/downloads/Boeing-Use-of-Bipolar-Ionization-for-Disinfection-within-Airplanes.pdf

(ECVP) for Zero Ozone Emissions from Air Cleaners) which is intended to validate that no harmful levels of ozone are produced.

The Township does not favor the use of bi-polar ionization due to its risk of ozone as a by-product and its lack of regularity in the cannabis industry. Systems that utilize bi-polar ionization must meet or exceed the UL 2998 standard to be considered by the Township as an acceptable odor mitigating process.

Prefilters

Pre-filters are the first step in the air filtration process in any Heating, Ventilation, and Air Conditioning (HVAC) system. The use of filters or a pre-filter, to capture particles before they pass through the molecular filter extends the life of the molecular filtration filters allowing for fewer media changeouts and less cost. Prefilters collect airborne pathogens including pollen, mold spores, bacteria, and fungi, and help to remove sub-micron particles from the air.

The effectiveness of a filter is quantified by its minimum efficiency reporting value (MERV) as determined by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE). Filters get more efficient as particles get both bigger and smaller compared to the filter’s most penetrating particle size (MPPS). The more efficient a filter is at filtering smaller particles, the higher its MERV.

The Township recommends the use of a MERV-13 prefilter or better. A filter with a MERV rating of 13 captures particles greater than 1.0 micrometers with a 90% efficiency. This includes bacteria, droplets from sneezing, smoke, and most other sources of pollution. This is also the same standard recommended by ASHRAE in August 2020 in response to the re-opening of schools during the COVID-19 pandemic.

Ultraviolet Light Filters

Ultraviolet (UV) technology has been utilized in air cleaners and heating and cooling systems since the mid-1990s, when UV lamps were promoted as an answer for improving indoor air quality. When installed inside an HVAC system, the airborne contaminants pass through a strong UV germicidal light which works to disrupt the DNA of any airborne contaminants to render them useless. Once the DNA is scrambled, the active contaminants effectively die. This process differs from an air filter which only traps contaminants, whereas UV destroys the contaminants.

There are conflicting opinions when it comes to UV light filters. While UV lights are effective at preventing the outbreak and spread of bacteria, including mildew and mold, some argue that UV lights do not treat any of the air in the occupied space and are not effective on odors or VOCs.

Cannabis operations may not utilize UV light filters as their sole source of odor mitigation. UV light filters may only be utilized in conjunction with other odor mitigating processes, including molecular filtration systems.

Exhaust Stacks

It is well known that odor dissipates due to passive dilution into the ambient atmosphere. Put more simply, odor lessens as it is exposed to a greater volume of air. As air is exhausted from a cannabis facility, typically horizontally out a side wall, odor particles remain at ground level and dissipate as they travel through the air. More innovative exhaust techniques include exhausting with a high-velocity fan through a vertical stack that is at least 1.5 times the height of the building. This process increases the height of discharge of any malodors and introduces a greater air volume to allow natural odor dissipation to occur.

The Township strongly encourages the use of vertical exhaust stacks which extend beyond the building height together with high-velocity fans.

Functional Standards

Control of Odor Within Lot Perimeter

New Jersey regulations require businesses to “seek to prevent the escape of odors associated with cannabis over the boundary of the property.” N.J.A.C. 17:30-9.4. The CREAMMA requires that prospective licensees “include a written description concerning the applicant’s qualifications for, experience in, and knowledge of [odor mitigation practices]” among other topics. Neither the CREAMMA nor the regulations require a no-tolerance policy. Other jurisdictions, such as Colorado and California have adopted reasonableness standards, not a prohibition on all scents. Palm Springs, Calif. was the only identifiable town in the United States to approve a “zero tolerance” policy for cannabis odors across property lines.[5] The focus of cannabis odor mitigation plans has been to alleviate the malodors.

[5] https://www.palmspringsca.gov/home/showpublisheddocument/71319/637127165416470000

The Township will require that cannabis operations perform interval testing of the odors at the lot lines using a device called an olfactometer.[6] An olfactometer is the most prevalent and reliable method for sensory quantification of odors in conjunction with human perception. The frequency of olfactometer testing should not be less than bi-weekly and should occur at multiple locations around the lot perimeter. The testing shall be performed by a committee consisting of of an odd number of persons with no less than three (3) members. Records of all testing are to be maintained by the cannabis operation on-site and shall be available for inspection by the Township upon reasonable notice. The Township strongly encourages cannabis operations to perform routine daily olfactometer testing.

Prohibit Use of Ozone Generators

Some data suggests that an ozone generator can eradicate evaporated terpene molecules, thus reducing odor. While ozone molecules are about 2.5 times more effective than chlorine, they are also harmful to humans, even at low concentrations. An EPA report says "[a]vailable scientific evidence shows that at concentrations that do not exceed public health standards, ozone has little potential to remove indoor air contaminants."[7] That same report suggests that "at concentrations that do not exceed public health standards, ozone is not effective at removing many odor-causing chemicals." Id. In October 2020 the National Cannabis Industry Association's environmental committee released its technical report entitled "Environmental Sustainability in the Cannabis Industry: Impacts, Best Management Practices and Policy Considerations" which recommended against the use of ozone generators. See https://thecannabisindustry.org/wp-content/uploads/2020/11/NCIA-Environmental-Policy-BMP-October-17-final.pdf. The California Air Resource Board has advised against the use of ozone generators "except for approved industrial purposes where harmful exposure to ozone is prevented." See https://ww2.arb.ca.gov/our-work/programs/air-cleaners-ozone-products/hazardous-ozone-generating-air-purifiers. The Canadian government has also advised against the use of ozone generators in homes due to their harmful potential.

The Township has existing concerns with ozone as a by-product of bi-polar ionization. As such, the Township prohibits the use of ozone generators.

[6] Nasal Ranger is a portable field olfactometer that provides a quantifiable measurement of odor. It is the same device both the City and County of Denver and the Colorado Department of Public Health and Environment use to determine whether someone is in violation of cannabis odor standards. The Camden, NJ study also utilized the Nasal Ranger for odor detection.

[7] See https://www.epa.gov/indoor-air-quality-iaq/ozone-generators-are-sold-air-cleaners.

Require Protective Clothing Between Points of Egress and Ingress of the Facility for Employees and Guests

In order to minimize the spread of odor, protective suits, footwear, and coverings must be worn by employees, visitors, and contractors when entering and inside the building or any part thereof where cannabis related activities take place. This includes the use of gloves, a hairnet, a beard net, and a jumpsuit that are in a good, clean and sanitary condition.

The clothing, footwear, and protective coverings should be stored in designated, accessible locations in a manner that prevents contamination (e.g., items required for production activities are stored in cabinets adjacent to the production area). Measures should be taken to ensure that clothing, footwear, and protective coverings are in good condition (e.g., as required depending on the activity being conducted). Clothing, footwear, and protective coverings are to be removed during breaks and changed or cleaned as necessary throughout the course of a shift. No protective clothing shall be worn by any person outside of the cannabis facility. Protective clothing may only be removed from the premises by a licensed vendor responsible for the cleaning and replenishment of such protective clothing.

Require "Air Showers" Between Points of Egress and Ingress of the Facility for Employees and Guests

In addition to protective wear, the Township shall require a cannabis facility install and utilize decontamination air showers at entrances to areas where activities with cannabis take place. Air showers are self-contained air recirculation systems that remove particulate contaminants from workers or products before they enter a clean space. While decontamination air showers are usually used for cleaning gowned personnel before entering a clean environment, they are also used to remove particulates from workers as they leave hazardous work areas and mingle with the general public. The use of an air shower by employees, visitors, and contractors when exiting areas where cannabis is present will help to minimize the transfer of odorous particulate.

Require Negative Pressure Barriers Between Points of Egress and Ingress

"Negative Pressure" simply means that the air pressure inside a room is lower than the air pressure outside a room. In a negative pressure room, potential contaminants in the air do not travel from inside a room to the outside.

The Township shall require negative air pressure barriers at all points of egress and ingress in cultivation rooms for two reasons: (1) as grow rooms are the most odorous room in the facility, the negative pressure helps to control odor migration; and (2) the negative pressure positively contributes to the growth of the plants.

Require Submission of an Emissions Management Plan

The Township will require the submission of an Emissions Management Plan (EMP), which shall be subject to the Township's review and approval. Upon approval, the EMP shall be formally adopted and incorporated into any redevelopment agreement between the Township and a developer of a cannabis site. The EMP shall be prepared by a qualified professional (professional engineer, certified industrial hygienist) and shall address the following: (1) plan for odor mitigation; (2) the type of filtration system; and (3) HVAC and dehumidification. For each area of focus, the EMP should include discussions regarding system design, operational procedures, and a maintenance plan.

Require Maintenance Records

The Township will require a "Carbon Filter Report Card" to be maintained by the facility tracking all filter change-outs which shall be done as needed or in accordance with the manufacturer's recommended changeout periods. On-site replacement filters shall be maintained to prevent any disruption in service or use of a filter beyond its useful life.

Advancements in Technology to Require Upgrades

The Township anticipates that there will be new developments within the cannabis industry regarding odor mitigation. Accordingly, at the start of the project, all cannabis businesses must agree, at a minimum, to use "accepted and best available industry-specific technology and business practices" and to upgrade the facility in accordance with advancements in technology and future established "accepted and best available industry-specific practices."

Odor-Absorbing Neutralizers

The Colorado BMPG recognizes odor-absorbing neutralizers. These are classified into two categories: perimeter treatment or point-of-source treatment. Both involve the use of oils and liquids derived from plant extracts or synthetically manufactured. The cannabis industry trend is to use natural plant extracts. Odor neutralizers are misted, fogged, or vaporized into the exhaust air at cultivation facilities to neutralize odorous VOCs. Odor neutralizers cannot be used directly within the grow room as they have the potential to impact the taste and smell of the product. The result is an odor-neutralizing, not an odor-masking technology.

The Township strongly recommends the use of odor-absorbing neutralizers at all locations where the air is being exhausted from the facility.

Masking and Counteractive Agents

This is the use of chemical odor control technologies that are misted, fogged or vaporized at the cultivation facility's exhaust. Masking agents release VOCs with a stronger odor than the VOCs emitted by cannabis, so the intention is for the human sensory system to be overloaded so that the smell of the masking agent is the only smell perceived. Counteractive agents bind with the volatile-smelling compound and block them from the sense of smell, but this does not eliminate VOCs. Both masking and counteractive agents add more VOCs to the ambient air to neutralize odors. These technologies are not typically recommended in urban areas and can lead to increased air quality impacts from higher VOC emissions. The Colorado BMPG does not recommend this type of odor mitigation in urban areas; no comment was made on its potential use in rural areas.

The Township does not favor the use of masking and counteractive agents.

Biofilters

Biofilters are an emerging odor technology for the cannabis industry. Biofilters are made of an organic medium, like wood chips, that are injected with bacteria that form a film on the filter. The odor mitigation occurs as the particles pass through the filter and are consumed by the biofilm. Biofilters have traditionally been used to control odors at industrial-scale agricultural operations like feedlots and municipal waste facilities. Research and development on biofilters that will consume terpenes are ongoing. This technology is emerging; however, based on the known information, it is not recommended for cannabis operations.[8]

The Township does not permit the use of biofilters.

Overall Air Quality

The cultivation and recreational sale of cannabis does not have the same strict environmental monitoring and reporting procedures in place as do other industries of similar size. Although

[8] https://thecannabisindustry.org/wp-content/uploads/2020/11/NCIA-Environmental-Policy-BMP-October-17-final.pdf

medicinal benefits were the initial catalyst for the cannabis industry, the boom in recreational usage and the need for cultivation poses significant environmental concern regarding air quality.

Cannabis plants naturally produce volatile organic compounds (VOC). The level and amount of VOCs emitted fluctuate and are dependent upon the type of cannabis, the stage of life of the plant, temperature, and humidity. Terpenes, one of the VOCs emitted from the plant, has been linked to cannabis' distinctive odor. In both Colorado and Washington, regulators have attributed cannabis odor to air quality issues.

Until 2019, the only studies that have measured the composition of gaseous air emissions from cannabis had been limited to samples collected directly above the plants.[9] A 2019 study focused its research on ozone finding that ground-level ozone concentrations increased because of cannabis cultivation activities. The study did not conclude that the elevated levels were, in fact, harmful or potentially harmful to the greater population.

There is limited data available regarding volatile air emissions produced by a cannabis facility. The Township recommends facilities utilize the following practices to address cannabis air emission management:

- Installation of molecular filters, specifically carbon filters;
- Extended vertical exhaust ports for maximum dissipation of potential contaminants; and
- Use of odor neutralizers.

[9] C.-T. Wang et al.: "Potential regional air quality impacts of cannabis cultivation facilities in Denver, Colorado." Atmos. Chem. Phys., 19, 13973–13987, 2019

3. WATER USE AND REUSE

Water is a crucial resource in the growth of cannabis and in the functioning and operations of cannabis growing facilities. Indoor cultivation facilities almost exclusively rely on potable water for its water source. It is anticipated that the Northeastern parts of the United States will be more likely to rely on public water than investing in building onsite groundwater supplies.

In October 2020, the National Cannabis Industry Association (NCIA) argued that early estimates of water consumption were unreliable because they were largely based on studies of outdoor illicit growing operations in Northern California.[10] In 2021, New Frontier Data (NFD), a data, analytics, and technology firm specializing in the global cannabis industry, in partnership with Resource Innovation Institute and the Berkeley Cannabis Research Center, released “Cannabis H2O: Water Use and Sustainability in Cultivation” (NFD Report) The report contained an in-depth look at water consumption as it relates to cannabis cultivation and how its use compares to the illicit drug trade and traditional agricultural methods.

The NFD Report suggests that cannabis cultivation uses approximately 40 to 50 gallons of water per square foot annually.[11] Variables including plant density, plant size, room temperature, humidity, light intensity, and growing substrate also influence water usage. While estimates vary greatly, conservative estimates suggest a Tier VI indoor cultivator (150,000 square feet of growing canopy) could use more than 6,000,000 gallons of water annually. Indoor environments offer a tremendous opportunity for many water-saving techniques to lower daily water consumption, but that is largely dependent on the cultivation methods employed and the sophistication of the mechanical systems.

Water consumption is not the only area of concern in the emerging cannabis industry. Concerns regarding wastewater and contamination are also at the forefront of industry discussions. States are suffering from the lack of regulatory framework and assistance from federally funded agency programs such as the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA). Without the FDA and EPA’s resources, individual states are left to develop their own policies based on limited information and research.

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[10] National Cannabis Industry Association. “Environmental Sustainability in the Cannabis Industry: Impacts, Best Management Practices, and Policy Considerations,” 2020, p.22.
[11] Frontier Financial Group, Inc., dba/ New Frontier Data. “Cannabis H_2O: Water Use & Sustainability in Cultivation,” 2021, p.24.

Water Distribution Methods

Hand Watering

Hand watering includes the use of hoses or watering cans. It is applicable to the cultivation of plants using a growing medium known as a substrate. The substrate helps keep the plant in place, it serves as a reservoir for moisture and nutrients, as well as provides an environment where the root system can function. Examples of substrates include potting soils, coco and rock wool. The downside to hand watering is that there is extremely limited recycle or reuse potential for the water.

Drip Irrigation

Drip irrigation systems allow water to be directed to each individual plant without having to irrigate the entire cultivation area. Compared to using hand watering to irrigate the plants, which is highly water-intensive, the precise targeting of drip irrigation can reduce water consumption by 30% to 70%, and improve water productivity by 20% to 90%.

Sensor-Based Micro-Pulse Irrigation

Although not the standard in the cannabis industry and not widely available to large-scale operations, the use of sensor-based systems that deliver steady micro-pulses of water to each plant have been found to be more efficient than the drip irrigation method and yield better crops. Estimates are that the sensor-based system reduces water consumption by twenty (20) times over hand watering.

Wick System

Wick systems employ a reservoir that provides water and nutrients for a plant via capillary action through wicking material. Seedlings and newly vegetating plants are occasionally watered with this method since it is a simple system that does not require machinery or electricity. However, it is insufficient in supplying large plants with greater water needs.

Aeroponics

Aeroponics uses spray nozzles to mist the stem or roots with nutrients. Larger operations put the stem/root in a channel and have the spray nozzles line the channel, while others may use the bucket system in which the nitrified water and air are maintained in buckets.

Township Recommendation

The Township strongly discourages hand watering. While the Township's preferred method of water distribution is the sensor-based micro-pulse irrigation system, any of the water distribution methods will be considered and evaluated.

Reclamation and Filtration

More than 90% of water absorbed by plants is lost through evaporation and transpiration. Therefore, a significant portion of the condensate has the potential to be reclaimed. However, few facilities are designed to collect, store, and treat the condensate. Reclaimed water must also be further treated to filter out contaminants and reintroduce minerals necessary to help plants flourish.

Reclamation of HVAC Condensate

In indoor and greenhouse facilities, HVAC and dehumidification systems can capture significant proportions of the water lost through evaporation and transpiration. Given the volume of water lost, there is a significant opportunity for reclamation and reuse.

Reclamation of the HVAC and dehumidification systems has some challenges associated with its implementation. First, reclamation requires on-site water storage and, depending on the amount of water usage, may be prohibitive. In addition, the reclamation process likely requires water purification as a result of certain disinfectants or chemicals introduced by the HVAC system to prevent algae or microbiological growth. Lastly, the use of copper or zinc water pipes could present issues as it relates to heavy metal contamination. The use of PVC, PEX, or other leach-resistant piping can help to alleviate these concerns.

Carbon Filtration

The reclamation process likely requires water treatment before it can be reintroduced to foster the vegetation. Carbon is a commonly used medium in water filtration processes. In fact, nearly every type of water filter system utilizes some form of carbon filtration. Carbon filters remove contaminants through adsorption, contaminants are attracted to the surface of the activated carbon and held to it, much the same way a magnet attracts and holds metal.

Reverse Osmosis

Reverse Osmosis (RO) is a type of filtration process used to purify water. By using a semipermeable membrane, many solids can be removed from a water source, theoretically making it perfectly pure. In practice, however, particles as small as 0.001 microns (1 micron = 1 millionth of a meter) can be removed.

Usually, in relation to cannabis, RO is associated with hydroponic setups because you can specify the mineral profile of the water. RO can be used to filter water for soil-grown cannabis plants as well, but alone it is typically worse than traditional tap water. The reason tap water is better is that it already contains minerals to assist the plants in the growing phase. Pure RO water requires the manual introduction of minerals for effective plant growth, which may be costly and unnecessary. Poorly adjusted RO water may do more harm than good.

Although RO has gained traction in the cannabis industry, it is not without issues. Depending on the efficiency of the system, significant amounts of wastewater can be produced. The most efficient RO systems will produce approximately 1 gallon of wastewater for every 10 gallons of purified water. Less efficient systems will produce 1 gallon of wastewater for every 1-2 gallons of purified water. Running RO equipment also requires a significant amount of energy.

Pesticide Use

New Jersey's regulations regarding medicinal marijuana expressly prohibit the application of pesticides.[12] However, the State's recreational marijuana regulations prohibit pesticide use except "a pesticide that has been deemed to be [a] minimum risk by the United States Environmental Protection Agency."[13] This raises concerns regarding water runoff and reclamation.

Township Recommendation

The Township strongly encourages reclamation of the HVAC and dehumidification systems.

[12] See N.J.A.C. 17:30A-10.8.
[13] See N.J.A.C. 17:30-10.9.

4. ENERGY

Quantifying energy use and the carbon footprint associated with the cultivation of cannabis and its associated processes remains one of the least explored yet highly relevant considerations for all levels of state governments. The absence of federal oversight and the immediate need for state governments to regulate the licensing process has left little consideration to the demand for energy.

The rapid expansion of the cannabis industry and its corresponding energy demands has severely impacted utilities, public utility commissions, and government officials. In July 2016, Oregon legalized recreational cannabis and that summer it is reported that Pacific Power in Portland experienced seven (7) blackouts traced to marijuana production facilities.

Few public policy issues are as multifaceted as that of cannabis production and energy consumption. When confined to the black market, this sector could not readily access relevant expertise and information-sharing networks. However, little progress has been made in the wake of legalization efforts. To our knowledge, no state has initiated a comprehensive approach to the problem, and federal engagement is non-existent.

At the forefront of energy consumption are indoor cultivation facilities. Greenhouse grow operations typically save 60-75% of the energy needs compared to indoor grow facilities. In practicality, the practice of indoor cultivation has been driven by criminalization, security interest, pest and disease control, and the desire for greater process control and yields.

Indoor cultivation facilities consume about ten times the amount of energy of a typical office building. Energy costs account for 20%-50% of indoor cultivators' costs.[14] Despite exorbitant energy costs, the demand for products outside of outdoor growing seasons, as well as the advantages associated with indoor growing, makes indoor cultivation economically feasible.

Cultivators that grow indoors, mainly in windowless warehouse-like structures, are responsible for re-creating the outdoor environment within an enclosed structure. The benefit is the ability to remove the uncertainty and volatility of the weather and environment from the growing equation. Indoor facilities can control light, humidity, and temperature, as well as control pests and vermin. Perfecting growing conditions helps to shorten a plant's growing cycle and maximizes product output; perfecting growing conditions leads to great profits.

[14] "Trends and Observations of Energy Use in the Cannabis Industry," Jesse Remillard and Nick Collins, ERS, ACEEE Summer Study of Energy Efficiency in Industry, 2017.

The electricity consumption of indoor cultivation facilities is staggering when compared to other uses. The CREAMMA allows six (6) tiers of cultivation. At its largest, a Tier VI cultivator is permitted 150,000 square feet of growing canopy. In theory, a Tier VI cultivation operation would account for approximately 17.3% of the Township's total electricity usage.[15]

How does Power Output Compare		
Growing four (4) cannabis plants	=	29 Refrigerators
Microbusiness cultivator[16] (max 2,500 sq.ft)	=	45.5 NJ households[17]
Tier VI Cultivator[10] (max 150,000 sq.ft.)	=	2,671.6 NJ households[11]

Cultivation facility operators should be prepared to address strategies to reduce electric demand (such as lighting schedules, active load management, and energy storage) with the Township. Cultivation facilities should also continuously re-evaluate opportunities for energy conservation and mitigation of their environmental impact.

Lighting

To achieve "optimal" plant growth and flower production, indoor grow operations use intensive lighting. These lighting levels are best compared to hospital operating rooms, which have light intensities 500 times greater than recommended reading light levels. The two most energy-intensive phases are the vegetative and flowering stages. Vegetative rooms, on average, require lighting 18-24 hours per day over a 4-8 week period. Flowering rooms require approximately 12 hours daily over a 6-10 week period. Vegetative rooms have consistently used metal halide (MH) or high-intensity fluorescent (HIF) lighting fixtures, while flowering rooms have used single-ended (SE) high-pressure sodium (HPS) fixtures.

As we look for ways to reduce energy consumption in lighting, two alternatives have emerged as comparable replacements resulting in significant energy savings. Vegetative rooms are

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[15] According to the most recent census data (2016-2020), Galloway Township is home to 12,713 households.
[16] Indoor grows consume up to 150 kilowatt-hours of electricity per year per square foot. Kolwey,Neil. A Budding Opportunity: Energy efficiency best practices for cannabis grow operations. Southwest Energy Efficiency Project (2017).
https://www.swenergy.org/data/sites/1/media/documents/publications/documents/A%20Budding%20Opportunity%20%20Energy%20efficiency%20best%20practices%20for%20cannabis%20grow%20operations.pdf
[17] Based on the average New Jersey household consumption of 687kWh per month.
https://www.electricchoice.com/blog/electricity-on-average-do-homes/

utilizing light-emitting diodes (LEDs) and flowering rooms are transitioning to double-ended HPS fixtures or, separately, LEDs.

Light-Emitting Diodes (LEDs)

For vegetative rooms, light-emitting diodes (LEDs) have been demonstrated to be very effective. A 300-watt LED fixture can replace a 600-watt MH or HIF fixture resulting in equivalent lighting with an energy saving of approximately fifty percent 50%. LEDs also generate significantly less heat reducing HVAC energy consumption to cool the ambient air. LEDs also offer varying light spectrums, which allows the grower the ability to change the morphology of the plants. While the upfront costs for MH or HIF equipment are approximately 35% less than its LED counterpart,[18] the use of LEDs creates an overall savings in energy spending over the life of the fixture, including equipment and electricity, and yielded less power consumption.

Flowering rooms have not seen the same level of acceptance of LED lighting. As discussed in further detail below, the best double-ended (DE) HPS provides equivalent lighting as the best LED. The main difference between the two is the cost savings. DE HPS is estimated to save 20-25% in energy costs, while LEDs could save as much as 40% in energy costs. Because HPS fixtures have been the mainstay for flowering rooms, industry leaders are not as inclined to experiment with LED lighting. As LED products continue to improve, we could see a shift to uniform LED usage throughout an indoor cannabis cultivation facility.

High-Pressure Sodium (HPS) Fixtures

HPS fixtures are not typically utilized in the vegetative growth room. In flower rooms, HPS is the standard.

Recently, cultivators have been replacing single-ended HPS fixtures with double-ended (DE) HPS fixtures. The DE HPS fixtures produce up to 30% more intense light than their counterparts and save approximately 20-25% in energy costs. They also last longer, maintaining 90% of their output at 10,000 hours of use, compared to a typical life for single-ended HPS of only 6,000 hours, and reduce waste.

The best DE HPS also rival top LED fixtures. It is for this reason, that cultivators have been hesitant to switch to LED lighting in their flowering rooms. However, for those who have made the switch to LED or LED/HPS hybrids, the energy savings are typically between 30-40%.

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[18] MA Department of Energy Resources, Energy and Environmental Affairs, “Cannabis Energy Overview and Recommendations.” February 23, 2018.

Township Requirements

The Township will require cultivators to utilize LED fixtures in its vegetation rooms, or a fixture with a comparable efficiency and energy consumption rating, and double-ended HPS fixtures in its flowering rooms, or a fixture with a comparable efficiency and energy consumption rating. As LED products continue to improve, the Township urges cultivators to consider installing LEDs or LED/HPS hybrid systems in flower rooms.

The Township will also require an annual reporting of energy consumption to consist of, at a minimum, total electricity consumption (kWh), total renewable energy produced (kWh), total electricity consumption (kWh) per pound of flower, pounds of flower per square foot (or per light).

Heating, Ventilation, and Air Conditioning (HVAC) and Dehumidification Systems

HVAC, as well as dehumidification, are primary drivers of energy use in a Cultivation Facility. Indoor cannabis cultivation facilities can have upwards of thirty (30) temperature or fan speed changes in a single hour. That rate is more than 60 times the rate of the average home.

Many of these man-made elements serve counterintuitive purposes which further contribute to massive energy needs. For example, “sunlight” is produced by lights that emanate heat to nourish the plants. However, ambient air temperatures are required to remain between 65^{o}F and 75 ^{o}F. Thus, while the lights introduce heat to the indoor space, the HVAC system is responsible for counteracting the heat to cool the space and maintain humidity levels. This requires great mechanical effort and a substantial amount of energy.

Exhaust systems should be designed and constructed to capture sources of contaminants to prevent the spread of contaminants or odors to other occupied parts of the building. Cultivation facilities must meet or exceed ventilation rates relative to the size of the operation.

Split-Ductless Air Conditioning Units

Opportunities for energy savings and a reduction in consumption are available through alternate HVAC solutions. For cooling and dehumidification, smaller grow operations can save energy by using split ductless air conditioning units in place of standard rooftop units. High-efficiency split ductless heat pump/air conditioning systems available with seasonal energy efficiency ratings (SEER) of 25 or higher, compared to rooftop HVAC units with typical SEERs of 14-15.[19]

Chilled Water Systems

Medium and large-sized grow operations are using chilled water systems to accomplish both cooling and dehumidification, with energy savings of up to 40% compared to the standard practice.

If the grow operators are willing to handle slightly more complexity, the chilled water system can be designed to recover heat from the system's condenser coil. With heat recovery and a few other operating adjustments, the chilled water system can thus avoid the need for separate portable dehumidifiers for controlling humidity.

Energy Recovery Ventilation (ERV) Systems

The Energy Trust of Oregon, a state-wide independent energy efficiency program administrator, recently completed several studies of more efficient HVAC systems. One study involves the use of energy recovery ventilation (ERV) systems, a type of air-to-air heat exchanger that allows economizing without introducing outside air into the grow rooms. The Energy Trust estimated energy savings of 50% compared to a traditional ducted rooftop air conditioning and auxiliary dehumidifier system.

Dehumidification

Small grow operations are utilizing portable dehumidifiers as standard practice. In order to improve energy conservation, small grow operations should transition to more efficient models. Similar to residential heating systems, the greater the efficiency rating, the more energy savings. Fixed, commercial dehumidifiers operate at up to 15% greater efficiency. Large grow operations are typically using commercial models or even greater efficient "premium" units.

Premium units offer two different technologies from that of standard units. The first, plate air-to-air heat exchangers , improves energy consumption by 30-65% over commercial units, according to independent testing. The second, a hybrid desiccant and evaporative system, is estimated to improve energy consumption by 30-50%, although less widely tested and proven.

[19] Jack Zeiger, op. cit. The seasonal energy efficiency rating (SEER) of a heat pump or air-conditioning unit is the cooling energy output (in thousand BTU's) during a typical cooling season divided by the total electric energy input (in kilowatt-hours) during the same period. The higher the unit's SEER rating, the more energy-efficient it is.

Township Requirements

For small grow operations, the Township will require the installation of ductless split air conditioning/heat pump units, which provide cooling (or heating) more efficiently than rooftop HVAC units, or a functional equivalent.

For mid-size grow operations, the Township will require the installation of a chilled water system accompanied by dehumidifiers or an ERV system.

For large grow operations, the Township will require the installation of an ERV system, a chilled water system with heat recovery that can provide both cooling and dehumidification without separate dehumidifiers, or a functional equivalent. Efforts should also be made to incorporate water-side economizing for greater energy savings.

Renewable Energy

In November 2021, Governor Murphy signed into law Assembly Bill A3352 requiring warehouses used for the storage of goods that meet or exceed 100,000 square feet to reserve at least 40% of their roof space for the future installation of a solar photovoltaic or solar thermal system.[20] The measure was in furtherance of New Jersey's 2019 Energy Master Plan goal of having 50% of the State's energy produced by renewable sources by 2030.

With specific regard to the cannabis industry, Boulder County, Colorado, requires commercial growers to either implement renewable energy in their facilities or pay a $2.16 charge per kilowatt-hour to a fund, which educates cultivators on energy use practices and funds other efficient and renewable energy projects.[21]

Township Requirements

Due to the significant energy consumption by cannabis cultivators, the Township will require the incorporation of a renewable energy source. The Township shall require 40% of the "roof space"[22] to be actively used to capture renewable energy, such as solar, wind, or thermal energy, for use on the premises.

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[20] See P.L.2021, c.290

[21] See Boulder, CO Municipal Code § 6.16.8(i) ("[a] marijuana cultivation facility shall directly offset one hundred percent of its electricity consumption through a verified subscription in a Community Solar Garden, or renewable energy generated onsite, or an equivalent that is subject to approval by the city").

[22] "Roof Space" shall be calculated in the same manner as N.J.S.A. 52:27D-123.19(c).

5. SOLID AND HAZARDOUS WASTE

In December 2011, the New Jersey Department of Health's (NJDOH) Medicinal Marijuana Program Rules went into effect for alternative treatment centers (ATCs). As part of those initial rules, the disposal of cannabis was first addressed. At that time, the NJDOH defined waste management practices based on whether the waste was "usable marijuana" (i.e., the dried leaves and flowers of the female marijuana plant, and any mixture or preparation thereof), "unusable marijuana"[23] (i.e., marijuana seedlings, seeds, stems, stalks, and roots), or marijuana waste that was considered hazardous. Usable cannabis was required to be turned over to the New Jersey State Police for destruction.

On October 2, 2018, the NJDOH, after consultation with the New Jersey Department of Environmental Protection (NJDEP), sent correspondence titled "Guidance for the Disposal of Unusable Marijuana Waste" to all of the licensed ATCs in the State (Guidance Letter). The Guidance Letter only provided direction for unusable cannabis free from hazardous materials. Usable cannabis continued to be subject to destruction only. The Guidance Letter permitted ATCs to dispose of unusable cannabis as solid waste or to compost it, subject to certain procedural guidelines.

After the passage of CREAMMA, the newly established New Jersey Cannabis Regulatory Commission (CRC) adopted Personal Use Cannabis Rules which set forth the rules and regulations for recreational cannabis and subsumed control over ATCs from the NJDOH. The CRC Rules require licensees to have a waste reduction plan[24] and standard operating procedures for sanitation and the disposal of waste[25] but provide no guidance on waste disposal requirements or procedures.

As rapidly as the cannabis industry grows, the production of cannabis waste, including by-products, expended products, and solid waste will keep pace. Two main areas of concern in the cannabis industry are the plant material and solvents. While spent solvents, solvent-soaked plant materials, pesticides, and certain lighting bulbs are considered hazardous wastes and their

[23] Large fan leaves of the cannabis plant were identified as "unusable marijuana" in the NJDOH Guidance Letter.
[24] See N.J.A.C. 17:30-9.4.
[25] See N.J.A.C. 17:30-9.6.

disposal is regulated by the United States Environmental Protection Agency (EPA), the use and storage of solvents warrants discussion.[26]

Cannabis Plant Material

In October 2018, the New Jersey Department of Health (DOH), after consultation with the New Jersey Department of Environmental Protection (DEP), issued a memorandum of guidance for the disposal of unusable marijuana waste for alternative treatment centers (ATCs). At that time, "unusable marijuana" could be disposed of as solid waste or by composting, provided that the product was first rendered it useless for diversion by finely shredding or grinding the unusable marijuana; and then mixing the finely shredded/ground plant waste with non-consumable, biodegradable material or other ground materials so the resulting mixture would be at least 50% non-marijuana waste by volume.

Composting the "unsuable marijuana" was required to be on-site at a facility owned by an ATC and operated in compliance with all applicable environmental law and NJDEP regulations. States such as Massachusetts considers cannabis plant material to be "commercial organic material" and bans its disposal in the trash if a business generates one ton or more per week. Businesses that generate one ton or more per week are required to divert the material from disposal, typically to a compost or anaerobic digestion (AD) operation.

The Township does not require composting of unusable plant materials.

Solvents

Cannabis extraction involves breaking down the plant's flowers into unique compounds for use in other cannabis related products. Extraction typically involves the use of solvents, chemicals which aid in the breakdown of the plant, although solventless and hydrodynamic extraction processes are alternatives. Compounds extracted from the cannabis plant, including its essential oils, are commonly used in making concentrations such as hash, oil, shatter, and wax. Different methods of extraction result in varying degrees of extract quality and composition. Some methods are more environmentally friendly than others including ultrasonic-assisted,

[26] Although the EPA may regulate hazardous waste products, the EPA does not regulate cannabis or set any standards or regulations specific to the cannabis industry. All businesses are required to comply with EPA standards regarding hazardous wastes.

microwave-assisted, supercritical fluid, and pressurized liquid extraction processes, although these are less conventional methods.

A variety of solvents can be used to extract cannabinoids including ethanol, butane, propane, hexane, petroleum ether, methyl tertbutyl ether, diethyl ether, carbon dioxide (CO2), and olive oil. Butane, propane, and cardon dioxide (CO2) are the most commonly used solvents in the extraction process. Most solvents are flammable and potentially explosive gases which present safety hazards. In addition, the gases used in cannabis extractions are often industrial grade and contain impurities that may carry into the extract and become a residue in the final product.

Soxhlet Method

The Soxhlet extraction method has been widely employed for various extraction purposes and it widely accepted. While the Soxhlet Method uses a solvent, its methodology is simple and the ease of system optimization can result in high yields. In addition, the need for a trained personal for process operation is minimal when compared to recently developed methods of extraction. Soxhlet methods can be manual or automatic, and the latter is less hazardous. However, the long-running time and the large amount of solvent required are limitations that not only increase the cost of operation but also cause environmental complications.

Dynamic maceration (DM)

Dynamic maceration is a conventional extraction process that is based on soaking a sample in solvents for a length of time at a specific temperature and followed by agitation to separate the extract. The process is inexpensive and a popular method used to obtain essential oils. However, each of the solvents used in this process contain significant concerns.

Vegetable oils, including olive oil, have been used as DM solvents. Although they result in extracting higher amounts than other solvents, the vegetable oils are difficult to remove from the extracted yield. Ethanol, the cannabis industry’s baseline, results in high yields, but also extracts unwanted chlorophyll from the plant. The unwanted chlorophyll can be filtered out using activated charcoal, but this results in a reduced yield of 50%.

Ultrasonic-assisted extraction (UAE)

Ultrasonic-assisted extraction (UAE) uses sound waves to penetrate solvents into a sample to extract the compounds of interest. Again, ethanol produced the highest extract yield. However, the yields were not significant enough to warrant UAE as a primary extraction method. This is disappointing because the UAE procedure provides extracts using lower temperatures in an environmentally friendly, safe, and energy-efficient way. Studies have come to show that the UAE method when used in conjunction with a Soxhlet extraction improved the crude yield by nearly 25% without affecting the quality of the extract.

Microwave-assisted extraction (MAE)

The Microwave-assisted extraction procedure utilizes electromagnetic energy in the form of microwaves to break cell walls and collects the extract in a liquid phase. MAE is an environmentally friendly highlighted by the superior yield from olive oil versus ethanol.

Supercritical fluid extraction

Supercritical fluid extraction involves solubilizing the plant material in a solvent at its so-called supercritical state and then recovering the yield from the solvent. The most common solvent in this process is CO2. CO2 is the solvent of choice due to the low critical temperature and pressure requirements to convert CO2 to its supercritical state and because it can be removed from the yield through simple evaporation. This eliminates the cross-contamination of most other solvents in the yield. It is also non-flammable, non-toxic, inert, renewable, easy to remove, abundant, and relatively low-cost. The significant downfall of SFE is that yield is the lowest compared to all other methods of extraction.

Solventless Methodology

Long-established solventless methods such as dry-sieving, water extraction, and rosin are not popular for the industrial level because of their difficulty in scaling despite having simple procedures.

Township Requirements

The Township does not favor open blasting extractions or equipment that releases butane to the atmosphere during the extraction process.

All cannabis operators will be responsible for providing to the Township a list of the facility's chemical inventory. As the chemical inventory is revised to add or remove substances, the cannabis operators shall immediately notify the Township Depending on the classification and quantification of chemicals, the facility may be subject to construction requirements based upon the Use and Occupancy Classification for a High-hazard, H, Occupancy, as defined in the International Building Code § 307.

Hazard Occupancy Classifications

Cannabis Cultivation facilities must, at a minimum, be consistent with requirements based upon the Use and Occupancy Classification for a Group F-1 Moderate-hazard Factory Industrial Use, as defined in the International Building Code (IBC) § 306.2.

Cannabis Cultivation facilities using chemical solvents to extract oils and other compounds may be subject to construction requirements based upon the Use and Occupancy Classification for a High-hazard, H, Occupancy, as defined in § 307 of the IBC, depending on the classification and quantification of chemicals located in the facility.

6. CONCLUSION

The Operation Standards are designed to provide guidance to the cannabis-related commercial industry as to those operational issues that will be addressed in redevelopment agreements that are a condition for making applications for land use approvals from the Township under The New Jersey Municipal Land Use Law.

The Township reserves the right to amend and update these Standards.