

**CALGARY ZONE**

**ALBERTA HEALTH SERVICES**

**ENVIRONMENTAL PUBLIC HEALTH**

**MARIHUANA GROW OPERATIONS ABATEMENT  
PROGRAM**

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## Executive Summary

Alberta Health Services Calgary Zone's Environmental Public Health Program employs approximately forty Public Health Inspectors who provide services to approximately 1,275,000 people. Public Health Inspectors inspect food establishments, social care facilities, personal services facilities, and investigate public health hazards including those associated with illegal marihuana grow operations. A small team of Calgary Public Health Inspectors have inspected hundreds of illegal marihuana grow operations during the past seven years. The extensive experience gained by Calgary's Public Health Inspectors has enabled the Calgary Program to become a benchmark for dealing with environmental health hazards associated with illegal marihuana grow operations.

Marihuana is the most commonly used illegal drug in Canada. Criminals often choose residential houses to grow their products because of access to electrical power and the relative ease of converting a house to a marihuana grow operation. Calgary Police Services and the RCMP have partnered to form a special task force called the Green Team South, whose role is to gather evidence to search out and help stop illegal grow operations. Calgary Police had been observing extensive mould growth, problems with exhaust gases entering the living areas of houses, and electrical tampering within houses used for growing marihuana. The police first referred their concerns to Calgary's Environmental Public Health Program back in 2003 to have the health risks associated with the marihuana grow operation assessed. Public Health Inspectors have been joined by Safety Codes Officers who are trained to assess and provide direction on how to lessen the risks associated with damaged heating and ventilation, and electrical systems.

Health hazards associated with a marihuana grow operation can include carbon dioxide, carbon monoxide, mould, airborne pollutants, explosive materials, and violence. Every precaution is taken to ensure the safety of Public Health Inspectors. A police tactical unit secures and monitors the house to ensure the immediate hazards are removed. Public Health Inspectors also use personal protective equipment including respirators, protective vests, coveralls, and gloves to ensure protection. Public Health Inspectors then can enter a marihuana grow operation under the authority granted by

Alberta's Public Health Act. Public Health Inspectors use the Nuisance and General Sanitation Regulation to require the property owner to eliminate hazards. Often, innocent children have been placed at risk. After police have secured the house, Public Health Inspectors begin their assessment of the risks starting in the upper part of the dwelling and moving systematically throughout the house searching for environmental health hazards.

During the inspection, the Public Health Inspector carefully assesses the dwelling and carefully documents the inspection taking detailed notes and photographs. This evidence is used to draft an Executive Officer Written Order. This is the legal document requiring that the owner take corrective actions, which can include hiring an environmental consultant, to eliminate the health risks. Commonly, the Public Health Inspector observes critical health hazards prompting the Inspector to declare the house unfit for human habitation. This Order prohibits anyone from entering or occupying the dwelling without the consent of the Executive Officer. Before the house can be reoccupied, the Public Health Inspector must re-inspect the dwelling to ensure that appropriate corrective actions were taken. Illegal occupants can be removed by the Police.

This report provides two case studies: Dover and Ogden. The Dover case illustrates how planning and collaboration between the police and EPH enables the Public Health Inspectors to safely and thoroughly assess the dwelling. The police tactical unit was able to gain entry and secure the house. Hazards included a trap door, electrical bypasses, exhaust gases vented into the living area, and extensive mould contamination. The Executive Officer issued a Written Order in April 2009 declaring the house unfit for human habitation until extensive remediation work was performed. Copies of the Written Order were posted to Calgary Zone Alberta Health Services web site and at the property. Additionally, the Executive Officer registered a Notice of Health Hazard with Alberta Land Titles to help alert potential property buyers. Approximately nine months passed between the time the grow operation was identified and the associated hazards were adequately corrected and the dwelling once again declared fit.

In March 2004, the Green Team Police Task Force referred a marihuana grow operation located in the Calgary community called Ogden to Calgary Zone Alberta Health Services. Police observed mould growth and extensive moisture seepage through the house's siding. The Public Health Inspector confirmed extensive mould

damage and subsequently issued a Written Order. In this case, the extent of damage was too severe and the house was demolished.

Hundreds of other Calgary cases could have been cited in this report. Likely, many other Canadian cities face similar hazards associated with illegal marihuana grow operations. However, a literature review revealed that Calgary's approach is unique and that other health jurisdictions use techniques that differ from Calgary's. For example, the City of Surrey British Columbia relies on the Safety Standards Amendments Act rather than a Public Health Act. This has been challenged in British Columbia as a possible contravention of the Charter of Rights and Freedoms. Public Health Inspectors can conduct inspection of marihuana grow operations with fire and building inspectors, and other safety codes officers, but the police may or may not be involved. The approach used in Ontario also varies from Calgary's. In Ontario, a multi-disciplinary team consisting of police, fire, building inspectors, and electric authorities respond to complaints regarding illegal grow operations. Building Inspectors refer potential health hazards to environmental consultants rather than to Public Health Inspectors.

Calgary's approach has evolved and improved between 2004 and 2010. For example, there have been significant improvements in the callout process. All safety codes officers including building, electrical, plumbing, and ventilation are involved. The police refer all marihuana grow operations to Public Health Inspectors because Public Health Inspectors are better qualified to determine whether health hazards exist. Calgary Public Health Inspectors use more comprehensive personal protective equipment to help eliminate the risk of harm. Public Health Inspectors have gained expertise and developed remediation standards rather than rely solely on the opinions presented by remediation contractors. The police are now better involved to ensure that condemned houses are not reoccupied without approval from the Public Health Inspector.

Although significant improvements have been realized during the past six years, Public Health Inspectors are looking to further improve the program. For example, the inspection program could benefit by formalizing the roles and responsibilities of everyone involved including the Public Health Inspectors and other members of the multi-disciplinary team. The program may also benefit from a more extensive literature review to review Calgary's approach to Ontario's and other jurisdictions. An extensive literature review may highlight areas within the current protocol that could be enhanced.

Currently, only a select few Public Health Inspectors are involved in conducting inspections of marihuana grow operations. Information regarding marihuana grow operations should be better disseminated to help increase the pool of qualified Public Health Inspectors to help distribute workloads and reduce the risk of burnout. Additionally, better training could increase a Public Health Inspector's abilities to identify houses used as illegal marihuana grow operations. Similarly, consultants involved in this industry must be better trained so that Public Health Inspectors have access to reliable assessment reports. The public might benefit from stronger legislation regarding the repair or demolition of affected properties because some houses are left unfixed for extended periods. Finally, the processes described within this document could be used as a template to guide future program planning and evaluation for an Environmental Public Health marihuana grow operations abatement program.

# 1 Background

## 1.1 Alberta Health Services

Alberta Health Services provides access to patient-focused, quality health care services for 3.5 million people in the province of Alberta, Canada [1]. The organization brings together 12 formerly separate health entities: nine geographically based health authorities and three provincial entities working in the areas of mental health (Alberta Mental Health Board), addictions (Alberta Alcohol and Drug Abuse Commission) and cancer (Alberta Cancer Board).

The scope of Alberta Health Services' organization encompasses:

- Facilities
  - Acute care hospitals: 97 with 5 stand-alone psychiatric facilities
  - Urgent care facilities: 7
  - Long-term care & supportive living beds / spaces: 18,000
- Services
  - Emergency visits: 1.9 million
  - Urgent care visits: 163,000
  - Surgeries: 247,000
  - Births: 50,000
  - Immunizations: 1.3 million to Albertans of all ages
- Human resources
  - Staff: 85,000
  - Physicians: 7,200
  - Volunteers: 13,000

Alberta Health Services has seven operational areas: Quality and Service Improvement, Strategy and Performance, Finance, Corporate Services, Senior Physician Executive, Clinical Support Services and Rural, Public and Community Health. The Population and Public Health portfolio resides within the Rural, Public and Community Health operational area. The Environmental Public Health program operates within this portfolio and is the centre of expertise for the Marihuana Grow Operation program.

## 1.2 Environmental Public Health Program

### Organizational Structure

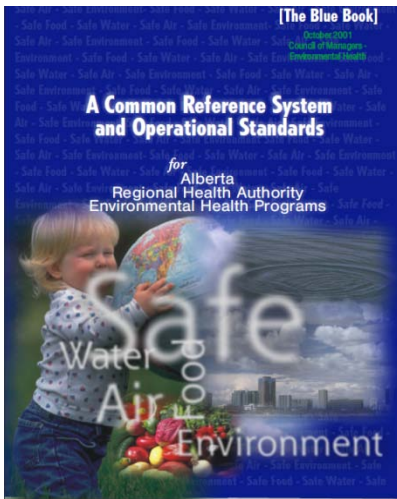
Alberta Health Services' Environmental Public Health program is divided into five geographical zones: North, Edmonton, Central, South and Calgary. The Calgary Zone has approximately 1,275,000 people including Calgary, Alberta's largest city.

Calgary's Environmental Public Health program is similar to other large urban centres employing Certified Public Health Inspectors to conduct inspections of food establishments, bottled water plants, social care facilities, personal services facilities, rental housing premises, and other types of facilities falling within the scope of Alberta's Public Health Act.

The program is divided into three divisions: Rural, Food, and Built. Job responsibilities assigned to public health inspectors/environmental health officers working within the Calgary zone vary depending on where the inspector is based. Calgary's rural Environmental Public Health program employs eleven inspectors. Inspectors assigned to districts outside the City of Calgary can be referred to as generalists and conduct inspections of various types of facilities as mentioned above. Conversely, inspectors working within the City of Calgary normally specialize in conducting inspections of one type of facility. For example, eighteen inspectors have been assigned to the Calgary Food Inspection program and each of these inspectors exclusively conducts inspections of food establishments. Eleven inspectors have been assigned to Calgary's Built Inspection program and two of the inspectors within the Built division specialize in conducting inspections of illegal drug operations, the focus of this report.

### Context: Illegal Drug Operations

The Alberta Council of Managers – Environmental Health developed a guidance document entitled *A Common Reference System and Operational Standards, The Blue Book* [2] in October 2001 (Fig 1-1). This document identifies seven functional areas within Environmental Public Health including Disease and Injury Control, Safe Food, Safe Drinking Water, Safe Recreational Water, Safe Indoor Air, Healthy Environments, and Safe Built Environments. Most of the inspection activities conducted with the Calgary Zone fit within the definitions found in the Blue Book.



**Fig 1-1** Alberta Blue Book

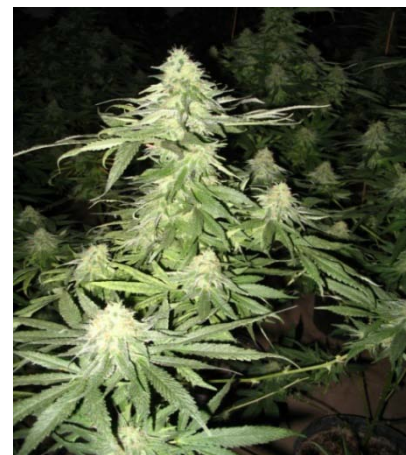
However, the Blue Book does not specifically mention illegal drug operations as a program area but rather acknowledges the widening scope of Environmental Public Health from controlling infectious disease to reducing physical and chemical hazards. Calgary's program dealing with illegal grow operations is an excellent example of Environmental Public Health's response to new and emerging public health hazards. The work performed within the Marihuana Grow Operations program fits well within the goal of the Built environment program: *To contribute to the reduction of adverse health effects resulting from exposure to health hazards in the built environment.*

Calgary's Environmental Public Health program has conducted hundreds of inspections of marihuana grow operations over the past seven years since its inception. The program's comprehensive approach described in this report has been extremely successful in helping ensure the reduction of health risks associated with marihuana grow operations. The program continues to evolve and has become the benchmark for other environmental public health illegal grow-operation programs.

## 1.3 Origins of the Marihuana Grow Operations Program

### Marihuana

Marihuana refers to any preparation of more than sixty-one chemicals, called cannabinoids, derived from the hemp plant (species *Cannabis sativa*) [3]. The dried, shredded leaves, stems, seeds, and flowers of the hemp plant have a psycho-active effect when consumed by the user causing symptoms of intoxication, dry mouth, rapid heartbeat, loss of coordination, poor sense of balance and slowed reaction time. In addition, a number of other short and long-term health effects have been identified [4].



**Fig 1-2** Marihuana plant

Marihuana is categorized as a controlled substance in Canada. It is illegal to grow or possess marihuana except by permission of Health Canada who define the circumstances and manner for accessing medical marihuana in accordance with the Marihuana Medical Access Regulations [5]. Despite this, marihuana is the most widely used illegal drug in Canada. According to the 2005 Alberta Drug Strategy, a provincial framework for action on alcohol and other drug use, 15.4% of Albertans 15 years and older reported being users of cannabis at the time of the report [6].

## Marihuana Grow Operations

While hemp plants are native to tropical and temperate climates, in Canada modern illicit growing operations use sophisticated indoor methods to produce high potency marihuana year round. While a few small-scale marihuana grow operations (MGOs) are operated by individuals for medicinal purposes, many MGOs are larger scale and operated by individuals with direct or indirect links to organized crime. There is a known market for Canadian marihuana in the United States where it may be exchanged for other drugs such as cocaine.

Residential housing is often used as the location for MGOs as it offers convenience, concealment through integration into the community, ability to tap into utility company trunk lines, capacity to fully control the growing environment and geographical risk diversification for larger operations. MGOs are typically located on basement levels yet other rooms may also be converted for this purpose.

There are three common types of MGOs [7]:

1. *Organic Grow operations* use soil-based media. Residential MGOs of this type can contain from a few to several hundred hemp plants in various stages of development. These operations require high intensity grow lamps, sophisticated wiring systems and timers, watering systems, humidifiers and air handlers, fertilizer tanks and piping, pesticides and CO<sub>2</sub> generation systems.



**Fig 1-3** Organic grow operation

2. *Hydroponic Grow operations* refer to plants grown in non-soil inert media such as lava rock or sawdust. The water, fertilizer and nutrients are cycled through a network of hoses from a central mixing tank. Similar equipment to organic MGOs is required with additional plumbing connections to the central tank.



**Fig 1-4** Hydroponic grow operation

3. *Weed Oil Extraction operations* remove the chemical THC (Tetrahydrocannabinol) from the marijuana leaves. This extraction procedure requires a common volatile solvent (butane, naphtha or ethanol) followed by an evaporation process using electrical units resulting in concentrated THC.

From a health hazard perspective (discussed further in this section) both organic and hydroponic MGOs are managed in a similar manner. However organic MGOs may also be associated with focal areas of mould on walls adjacent to where soil has been stored. Hydroponic grows often have a higher humidity environment leading to a greater extent of mould growth. Lastly weed oil extraction operations constitute a high risk for fire and explosion with volatile agents in close proximity to electrical circuitry.

### **Alberta Combined Forces Special Enforcement Unit**



**Fig 1-5** Drug enforcement team

The Alberta Combined Forces Special Enforcement Unit, Green Team South (GTS) is a joint operations team comprising Calgary City Police Service members and members of the RCMP working together to carry out drug enforcement activities throughout southern Alberta.

Marihuana grow operations are identified through many different means including Crime Stoppers tips, information from the public drug tip line, neighbourhood complaints, investigative links from previous MGOs and primary investigations by both police officers of the drug unit and the district level officer. Police investigations involve physical reconnaissance for street-level signs of an MGO dwelling including visible condensation on external walls, mail

pile-ups, strange odours, unattended lawns and lack of garbage disposal. District-level involvement may include response to a complaint of a break and enter.

A key method of police investigation is the use of Digital Recording Ammeters or DRAs. MGOs require a large amount of power to operate components such as high intensity grow lamps. A typical MGO consumes eight to twelve times the power of a normal residential dwelling. To access this power without cost and detection MGO operators often core through the home's foundation tapping directly into utility company trunk lines before they enter the house. Standard power distribution stations exist in most communities, one for every four to five houses in the neighbourhood. By attaching a DRA to these distribution stations, power consumption patterns can be recorded and analyzed to confirm or refute physical reconnaissance evidence regarding the possible location of an MGO.

Once enough evidence is obtained a chronological list of all items that lead to the belief that an MGO exists, called an *Information to Obtain*, is taken to a Justice of the Peace in a request for approval of a search warrant

## **Environmental Public Health Partnership**

Environmental Public Health in Calgary first began responding to marihuana grow operation problems in the summer of 2003, when the police drug enforcement team entered a residential grow operation and observed significant mould issues. Environmental Public Health was contacted and the home was inspected by a certified public health inspector. The dwelling was subsequently posted as Unfit for Human Habitation and an Executive Officer's Order was issued to the home owner.

Following this initial inspection, the assistance of Environmental Public Health was requested whenever the police encountered mould in an MGO. After inspecting several homes, it became apparent to Environmental Public Health that there were many more public health issues affecting these houses than just mould.

Electrical tampering was prevalent which could potentially lead to fires or electrocution. Mazes of hanging electrical wires caused entrapment issues for emergency response/fire personnel. MGO practices, such as holes cored through foundation walls for re-routing of electrical conduits, impaired the overall structure and weather worthiness of the building. Tampering with the exhaust stacks from the furnace and/or

hot water tank imparted carbon dioxide into the plant growing environment led to unsafe levels within the houses along with potential pockets of reduced oxygen and/or increased carbon monoxide levels. Chemical mixtures were spilled and sprayed throughout the growing and mixing areas and tracked throughout the house. As a result, Environmental Public Health made the decision to attend all marihuana grow operations to address the potentially hazardous conditions found inside as well as to protect future unknowing occupants. Health and safety issues related to marihuana grow operations are further detailed in the following section.

Several partnerships with other organizations have developed over the years. For example, in the initial years of the MGO program it was a requirement that applications be made for Municipal permits, including electrical, plumbing, gas and building, to help insure that remediation and renovation work was done correctly. In 2005 the City of Calgary became a partner in the urban MGO response and started attending all marihuana grow operations inspections along with Environmental Public Health. Environmental Public Health and the City of Calgary Safety Codes Officers became the Safety Component of the Green Team. Safety Codes Officers in the surrounding municipalities now support our request for their involvement in the permitting and inspection process during remediation, and attend the grow op intervention when available. This partnership has resulted in the creation of one of Canada's first cross-disciplinary response teams attending MGOs.

An AHS website [8] has been developed that discusses Environmental Public Health's MGO program. Information includes the nature of health hazards associated with MGOs, signs of an MGO in the community, a look inside an MGO, police and Environmental Public Health's response and guidelines for remediation.

## **1.4 Health and Safety Issues**

### **Operating Marihuana Grow Operation**

Until termination an MGO 'worksites' poses serious hazards to grow operators, emergency response personnel, public health inspectors, and members of the public in the immediate vicinity. Children in the neighbourhood who may play or adventure near the site are a particular concern. The Drug Endangered Children Act [9], discussed further in this report, recognizes that children associated with illegal grow operations

(directly or indirectly) are exposed to the adverse health effects of an unsanitary and unsafe environment.

Health hazards associated with an operating MGO include:

- **Carbon dioxide** – Carbon dioxide (CO<sub>2</sub>) augmentation is used in indoor grow operations to speed plant growth and facilitate the killing of spider mites and other pests. As a result, CO<sub>2</sub> levels are often purposely elevated in the plant growing environment either by the escape of combustion gases from disconnected furnace and hot water tank flues, or by propane or natural gas-fired generators. CO<sub>2</sub> displaces oxygen in air resulting in O<sub>2</sub> depletion. High concentrations of CO<sub>2</sub> will excite then depress central nervous system function. CO<sub>2</sub> levels of 75,000 ppm (natural levels 350 ppm) can cause acute symptoms of shortness of breath, increased pulse rate, dizziness and visual distortion. Concentrations greater than 100,000 ppm have caused acute stupor, loss of consciousness and death. Long term exposure to CO<sub>2</sub> levels of 30,000 ppm over several weeks has been associated with a fall in blood pressure and impaired attentiveness [10].
- **Carbon monoxide** – MGO operators modify HVAC systems to increase CO<sub>2</sub> generation as described above. Poorly vented fuel-fired appliances used for CO<sub>2</sub> generation increase the hazard of carbon monoxide (CO) contamination. CO is a highly toxic colourless, odourless and tasteless by-product of this process that can build up in close spaces and reduce oxygen supply to body tissues. The acceptable short-term exposure limit for CO in residential indoor air is < 12 ppm over an eight hour average and < 26 ppm for one-hour average. Exposure to low levels of CO above this threshold can cause nausea, dizziness, headaches, confusion, fatigue, and shortness of breath. High level exposure can cause impaired vision, convulsions, coma and possibly death [11].
- **Mould** – High humidity environments maintained in MGOs create an ideal environment for the production of mould. Though a reliable quantitative relationship between mould exposure and health effects has not been established, sufficient evidence exists that exposure to mould in indoor environments is associated with asthma and asthma-like symptoms in asthmatic people, upper respiratory tract symptoms, cough and wheeze, and hypersensitivity pneumonitis in susceptible people [12][13].

- **Other Airborne Particles** – Indoor air may be laden with pollen from mature plants, pesticides or other air-borne or particulate chemicals. These airborne contaminants may act as both allergens and pollutants. The resulting health effects correspondingly range from allergic reactions to exacerbations of underlying respiratory conditions such as asthma.
- **Electrical System Bypasses** – To operate equipment such as high intensity grow lamps MGOs require several times the electrical power normally distributed to a residential home. To harness this additional power and avoid detection by utility companies, operators typically manually bypass the home's electrical junction. These improvised power circuits are not protected by fuses or breakers and pose a high risk for electrocution and fires.
- **Chemical Toxins and Residues** – Pesticides, fertilizers, cleaning agents and other chemicals used in MGOs can be highly toxic. They are both a contact hazard (splashing in eyes or dermal contamination) as well as an inhalation and ingestion hazard. The majority of these chemicals are found unlabeled on site and pose a particularly high risk to children who come in contact with them.
- **Fire and Explosive Materials** – MGOs commonly use fertilizers, pesticides, fuel to run CO<sub>2</sub> generators and other chemicals. These materials in proximity to powerful grow lamps and rerouted electrical systems create a high risk environment for fire and explosion. A good example of the degree of risk involved is the December 2009 large-scale fire in northwest Calgary that destroyed five homes (all occupants fortunately escaped unharmed). The occupant of the MGO has since been charged with arson by negligence.
- **Entrapment** – Re-routed electrical, gas and water lines are often bundled together through open living spaces posing entrapment and hanging hazards. This represents a serious risk to first responders, such as fire fighters, who may enter during an emergency in the absence of good visibility.
- **Protective Devices and Weapons** – Anti-personnel devices may be used to protect the lucrative MGO when unattended by the operator. Weapons may also be stored on the premises. Guard dogs have been used by operators and may not be collared, confined or managed appropriately posing a potential health risk to neighbourhood.

- **Violence** - MGOs are a focal point for criminal activities and members of the surrounding community are consequently exposed to chance violence such as accidental home invasions or mistaken identity assaults.

During a first response to an MGO, primary prevention is the key to mitigating the risk associated with these health hazards. All precautions are taken to ensure Environmental Public Health inspectors are properly protected from health hazards. A Police Task Force Tactical Unit enters the building and eliminates all immediate hazards before any Inspector enters the building which may include “booby traps”, occupants or animals. Inspectors are further protected by the following personal protective equipment (PPE):

- Full face mask respirator with P-100/organic vapour barrier cartridges
- Ballistic vest as a proactive measure against residual risk following securing of the premises by police
- Tyvek protective coveralls: full-body breathable material providing barrier to contact exposures
- Nitrile rubber gloves: three times more puncture resistant than rubber offering contact exposure protection
- Rated steel-toe safety boots with non-conducting soles



**Fig 1-6** Personal protective equipment

In addition to this PPE for public health inspectors, portable air monitoring instruments with three or four-gas capability such as CO, oxygen and combustible gas concentrations are used routinely on-site. City of Calgary Safety Code inspectors also survey the immediate scene to identify hazardous safety violations.

## Preparing for Remediation

Following the termination of an MGO, the residential dwelling remains cordoned off by police with entrances barred until the housing remediation process can begin. Though any acute health hazards are identified and addressed immediately by the cross-disciplinary response team, a number of health hazards persist until remediation can be

completed. This includes long-term hazards described above such as mould, chemical residues and indoor air quality concerns as well as HVAC, electrical and structural safety issues.

Since these health hazards cross the boundaries of both public health and municipal building authorities, Environmental Public Health partners with the City of Calgary Building Regulations Division. Together the team works to identify and address public health concerns. The final goal is to ensure that the home is safe to live in by remediating the dwelling from both an environmental public health and housing perspective, thereby integrating the residence and its new homeowner back into the community. Most times this remediation is possible without demolition of the premises.

The process of remediation begins with City of Calgary Safety Code inspectors and AHS Environmental Public Health inspectors/Environmental Health Officers completing a detailed review of all housing and health violations requiring resolution. A complete environmental public health remediation plan is then developed using remediation guidelines discussed later in this report (see Appendix B). Common issues requiring contractor services include removal of MGO materials, delineation and remediation of mould contamination, air quality testing, electrical and HVAC restoration, structural repairs and execution of a hazardous materials audit and management plan.

## 2 Marihuana Grow Operation Program

### 2.1 Partners

This section describes each of the organizations that make up the cross-disciplinary response team involved in Alberta's Marihuana Grow Operations Abatement program.

#### Law Enforcement

- Alberta Combined Forces Special Enforcement Unit – Green Team South, or GTS, was formerly known as the Southern Alberta Marihuana Investigative Team, or SAMIT. They are an integrated unit comprising Calgary City Police officers and RCMP members. They are responsible for carrying out all investigative work leading up to issuing of the warrant through to execution and follow-up within the Alberta Law Enforcement Response Teams (ALERT) Calgary Region. This region incorporates the City of Calgary proper, north to Carstairs, East to Highway #9, South to Okotoks, and West to the Alberta/British Columbia border. They also respond to calls for assistance anywhere in the southern region, which spans South from Highway 13 to the U.S. border, and East and West to both provincial borders.
- Both the Tactical Unit with the Calgary Police Service and Emergency Response Team (ERT) with the RCMP maintain a high level of expertise and skill. They will routinely make the first entry into the grow op, looking to clear the premises of hazards relating to offenders, booby traps and weapons, enhancing safety and security. Within the City of Calgary, this function is handled by members of the Tactical Unit, whereas in rural areas and smaller communities, ERT will respond.
- Members of RCMP or police from the local detachment or district office attend all grow operations and maintain security around the perimeter of the premises while entry and investigative activity is being carried out.
- Members of the Evidence and Property Unit (EPU) within the Calgary Police Service travel to all areas in southern Alberta that are the focus of a GTS operation. Their function is to count, catalogue, remove and secure equipment and evidence from the scene.

## **City of Calgary Building Regulations Division**

Members of the Building Regulations Division include a building inspector, plumbing & gas inspector, and an electrical inspector who work under the legislative authority of the Safety Codes Act. These Safety Codes Inspectors attend and enter grow operations along with the other inspectors and officers and will advise all personnel who may enter the building of any observed safety hazards. They continue monitoring throughout the remediation process, from permit application through to final inspections.

## **Proceeds of Crime/Civil Forfeiture**

Civil Forfeiture is a new Provincial legislation designed to disrupt organized crime groups through the forfeiture of assets used or obtained in criminal offences. The main difference between Civil Forfeiture and Proceeds of Crime is that Civil Forfeiture does not require criminal charges and a guilty verdict to proceed; only a criminal offence needs to have occurred. An example of this is when the Green Team executes a warrant on a marihuana grow operation and nobody is found within the residence. In such a case criminal charges are typically not sought. In this case Proceeds of Crime cannot restrain the residence for forfeiture. However, even without charges, Civil Forfeiture can proceed with a restraint and later forfeiture of the residence.

In the seizure of property, Proceeds of Crime is bound by the charter and caution as well as the burden of proof. With Civil Forfeiture, charter and caution does not apply, and it is a reverse onus of proof, where the property owner is required to prove his/her innocence in order to keep the property.

It currently is the position of the Calgary Police Service to proceed first through Civil Forfeiture before Proceeds of Crime. The assets gained through Civil Forfeiture are returned to the victims of crime in Alberta, whereas with Proceeds of Crime the assets are turned over to the Federal Government in Ottawa.

## **Child at Risk Response Team**

The Child at Risk Response Team, or CARRT, is a joint initiative of the Calgary Police Service and Region 3 – Calgary and Area Child and Family Services. A team of one Police Officer and one Child Services worker investigate situations where a child may be at risk. They will attend grow operation houses when children are affected.

## Utility Companies

When electrical tampering and theft of electricity are apparent in the MGO, the utility company is notified. Their workers will attend the property while the investigation is ongoing and terminate power to the dwelling. The tampering and crude re-wiring would otherwise remain a serious fire and electrocution hazard.

## Animal and Bylaw Services

Animals are frequent inhabitants of marihuana grow operations. When they are discovered, Animal and Bylaw Services are called to remove them to the safety of their facility where they can be claimed by their owner.

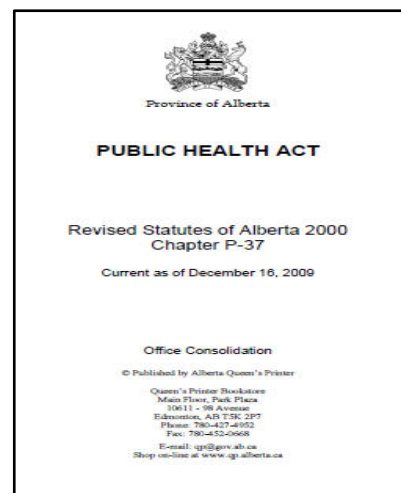
## Fire Department

When the situation is deemed necessary by the Green Team South, the Hazmat division of the fire department is called in to determine air quality or other immediate hazards.

## 2.2 Authority

### The Public Health Act

Public Health Inspectors are appointed as executive officers for the purpose of carrying out the Public Health Act [14] and its regulations. Under the authority of Section 59(1) of the Public Health Act, an executive officer may inspect any public place at any time for the purpose of determining the presence of a nuisance or determining whether the Act and the Regulations are being complied with. Further, Section 60 states that if the executive officer is of the belief on reasonable and probable grounds that a nuisance exists in or on a private place, he/she may, with the consent of the owner or pursuant to a Court of Queen's Bench Order, enter to inspect.



**Fig 2-1** Public Health Act

Where, after an inspection under Section 59 or 60, the executive officer believes that a nuisance exists, he/she is obligated to take action.

In the beginning of Calgary Environmental Public Health's MGO Abatement Program, consultation was made with legal Counsel in Edmonton to obtain an opinion relative to our rights within these types of premises. The opinion received was that a "very strong argument could be made that these premises are a "public place" as defined under Section 1(ii) of the Public Health Act, as they are either:

- places of business and places where business activity is carried on (Section 1(ii)(ii), or
- they would fall under the beginning of the public place definition which states; includes any place in which the public has an interest arising out of the need to safeguard the public health.'[15]

### **Nuisance and General Sanitation Regulation**

The Nuisance and General Sanitation Regulation defines a nuisance as "a condition that is or that might become injurious or dangerous to the public health, or that might hinder in any manner the prevention or suppression of disease". Conditions found within MGOs pose danger to future occupants and anyone who may enter the premises, and creating potentially hazardous conditions for neighbours.

### **Housing Regulation and Minimum Housing & Health Standards**

During the remediation process of MGO houses, the executive officer will also ensure that the requirements of the Housing Regulation and Minimum Housing & Health Standards are met.

### **Drug-endangered Children Act**

The Drug-endangered Children Act (DECA) is the first legislation in Canada to protect children exposed to an adult's involvement in serious drug activity, such as manufacturing and trafficking [9]. Under this legislation, caseworkers and police officers can apprehend a child in danger from an adult's drug activity. Any child who was, or is, likely to become harmed due to an adult's drug activity is considered drug-endangered.



**Fig 2-2** Drug-endangered Children Act

When the Drug-endangered Children Act came into effect in 2006, Calgary Health Region was requested in a letter from the Deputy Minister, Alberta Health & Wellness dated December 12, 2006, to work closely with police, child and family service authorities and other appropriate stakeholders in the implementation of DECA...

Innocent children are frequently found in places used for indoor marihuana grow operations and they are exposed to a large variety of health and safety risks. Mould spores and fragments are easily dispersed throughout the house. Inhalation can cause inflammations or allergic reactions. Some moulds are extremely toxic. Health Canada has concluded that exposure to indoor mould is associated with an increased prevalence of asthma-related symptoms.

A multitude of fertilizers and pesticides are used in grow operations. By their nature, pesticides are toxic substances designed to kill or otherwise adversely affect living organisms, often affecting their nervous systems. Chemical residues are tracked throughout these houses on the footwear and clothing of the person tending the grow operation. Young children are often crawling or playing on the floors and have hand-to-mouth behaviours. These behaviours can result in burns, skin and eye irritation, and respiratory problems. During inspections of these houses, public health inspectors will often see that chemicals have been mixed and placed in unlabelled pop or juice bottles.



**Fig 2-3** Chemical mixtures or juice?

Because their bodies are still developing a child's rate of breathing in relation to body weight is increased and they have higher metabolic and absorption rates. As a result children are more susceptible to environmental exposures than adults.

## **Controlled Drugs & Substances Act**

GTS works under the Controlled Drug & Substances Act which allows the freedom to obtain all assistance deemed necessary to make their entry under warrant as safe as possible. AHS enters grow op houses under this police warrant. Once our entry been obtained, any condition found that is or might become injurious to health can be acted upon.

## **2.3 MGO Investigative Process**

### **Call Out**

When the drug team makes the decision to execute a warrant, they first contact the Tactical Team within the City or the RCMP Emergency Response Team outside of the city boundaries and obtain a time and place to meet to discuss the response. All aspects of the entry are reviewed in detail prior to their actual attendance at the scene. The remainder of the team is then contacted and advised of the location of the property in question and requested to attend. The Environmental Public Health MGO program is staffed as one FTE and an inspector is available to attend an MGO on a scheduled call-out basis.

### **Entry**

Entry is initially obtained by the Police Tactical Team or the RCMP Emergency Response Team. They clear the property of offenders, booby traps and weapons, making it safe for the drug team and the safety team to enter and carry out their investigations. The perimeter of the premises is secured by district police officers during the length of time the investigations are being carried out inside. The district police are there to insure the safety of all members of the team by preventing any unauthorized entry or hindrance.

In an effort to be pro-active, extensive safety equipment is worn by all members who enter (see Section 1.4).

## **Risk Assessment**

An unwritten standard of risk assessment has evolved over the years of this program. After a property has been cleared by the Tactical Unit or ERT and the initial police investigation has been completed, the inspectors with the Safety Team, including the health inspector, are allowed entry. As a general rule, the inspection begins on the uppermost level of the premises, working down to the basement level. All rooms are assessed for mould, water damage, structural modifications such as venting holes, and for their use in any actual grow op activity, including chemical mixing, plant growing or material storage. The location and termination point of all venting is determined, as discharging warm, moist air into an attic space will ultimately lead to mould issues in that space. Evidence of occupancy of the premises is looked for and determined through the presence of personal grooming materials in bathrooms, clothing in closets, food in fridges and pantries, etc.

The areas actively in use for plant growing and chemical mixing are normally the most critically impacted areas of the premises, and may contain spilled and over-sprayed chemicals, electrical tampering, hanging wires, live wires, carbon dioxide production, mould, structural tampering and explosive materials (compressed gases).

Carbon dioxide levels are frequently taken, especially when evidence of children in the premises is found, remembering that CO<sub>2</sub> is heavier than air and children, who are lower to the ground, may be affected earlier and more severely.

Detailed photographic evidence is taken in each area, beginning at the front of the house showing the house number prior to entry. This is a useful tool to tell the story of the premises.

## **Risk Management**

Evidence is obtained and an Executive Officer's Order is written. The Order is sent via registered mail to the owner based on information found on the land title certificate; along with a copy of AHS remediation guidelines (see Appendix B).

The Order will require that all necessary permits be applied for with the City or municipality. Preliminary inspections of the electrical and gas line repairs are necessary so that these essential services can be reinstated to the building to enable proper cleaning and air sampling.

An experienced mould investigator, or environmental consultant, is required to thoroughly investigate both easily accessed and hidden areas for mould growth and reservoirs. Environmental public health requires the submission of a detailed written assessment report from this consultant, also addressing hazardous materials that may be found.

All grow op related or other potentially hazardous materials remaining on the property are to be removed and properly disposed of. This includes all chemicals found on site. Asbestos in building materials is often found and must be properly contained and removed to ensure the safety of workers and future occupants.

Thorough cleaning or removal is required of all surfaces, carpeting and draperies within the premises. The heating and ventilation system, including ductwork, also requires thorough cleaning.

After an acceptable level of remediation work has been completed, which includes the receipt of the scope of work assessment from the environmental consultant and satisfactory air sampling results, on-site re-inspections are carried out both by Environmental Public Health inspectors and City Safety Codes inspectors. Rebuilding of the premises is not to be completed until all inspections have been carried out.

Addresses of all MGOs that have been inspected by Environmental Public Health's MGO program are posted on a publicly-accessible website [8]. Information includes the nature of health hazards associated with MGOs, signs of an MGO in the community, a look inside an MGO, police and Environmental Public Health's response and guidelines for remediation.

## **Enforcement**

The Executive Officer's Order requires that the premises remain unoccupied until the necessary work is completed and accepted by Calgary Zone Alberta Health Services. A warning notice to this effect is posted on the front door or window by the public health inspector/environmental health officer. If the premises are occupied prior to the Order being lifted, AHS has a working relationship with the local police detachments to act on our behalf in upholding the Order. They will inform the occupants that they are illegally occupying the premises and advise them to vacate. Continual non-compliance will result

in charges begin laid under the Public Health Act for failure to comply with a written order. Alternatively, the police may wish to lay charges under the Petty Trespass Act.

## 3 MGO Case Studies

The following are two examples of marihuana grow operations that have been investigated and satisfactorily remediated.

### 3.1 Dover Grow Operation

#### Call Out

Because the police response is driven by criminal activity and controlled by warrant, it is not always possible to have a firm time available for the intervention, especially if the MGO is discovered by a uniformed district police officer in the course of his/her routine activities. Frequently an MGO is found when the officers respond to a neighbour's complaint of possible illegal activity. When this occurs, the police service contacts the Green Team for their expertise.



**Fig 3-1** Inspector on-call

Once the warrant has been issued and the availability of the Tactical Unit or ERT firmed up, environmental public health, along with the remainder of the safety team, is contacted. While every effort is made to have these operations handled during normal working hours, it is not always possible. Evening call outs will happen and the dedication of the entire team is required. This particular MGO is a case in point.

#### Entry

After meeting at a staging area the usual procedure for entry was followed. The Tactical Unit carried out their initial entry at approximately 20:00 (8:00 pm). They found that this property was very heavily fortified with 2x4 bars strengthening the doors.



**Fig 3-2** MGO entrance

All personnel were made aware that there was a trap door cut in the floor in one of the bedrooms which could have created a potential injury to anyone unaware. This trap door and its crudely built ladder were being used for clandestine access in and out of the heavily fortified basement.

After the Tactical Unit completed their search, the site was handed over to the Green Team to proceed with their investigation. Environmental Public Health entry, along with the remainder of the safety team, was done at 20:57, or just prior to 9:00 in evening.



**Fig 3-3** Trap door



**Fig 3-4** Fortified basement

### **Risk Assessment**

The house was in full use for the purpose of growing marihuana. The bedrooms on the main level of the bungalow were being used for plant growing activities, the bathroom was used for chemical storage and mixing.

Chemicals were stored throughout the premises, including in the kitchen. Venting was run from the basement plant growing area up through the floor of a closet and was discharging into one of the plant growing rooms on the main floor. This hot, moist air created a perfect environment for the heavy mould growth that was found throughout the main level of this house. Throughout this house, holes had been cut through walls, floors and ceilings to enable passage of the venting pipes.



**Fig 3-5** Venting in hallway



**Fig 3-6** Marihuana under grow lamps

The basement area was also in use for plant growing and chemical mixing. Electrical tampering was evident, along with access holes cored through the concrete foundation wall to enable the electrical bypass before the meter. These core holes were overlapping and measured approximately 10 inches in diameter each. With the overlap, the final height of the hole breaching the foundation wall was approximately 18 inches.

Hanging wires created an entrapment hazard and overheating ballasts could have potentially resulted in a fire.

The chemical solutions were mixed together in large barrels. A hose connected to the water line was resting in the solution. This may have potentially led to backflow contamination with the city water line. The chemicals were also in spray containers for use in the plant growing areas. There was little containment to prevent the over-spray of chemicals. Spillage and liquids were observed pooling on the floors. Residue of the sprays was on surfaces throughout.



**Fig 3-7** Electrical re-wiring



**Fig 3-8** Chemical mixtures



**Fig 3-9** Notice of "Unfit for Habitation"

Due to the vast array of public health concerns, the house was posted as Unfit for Human Habitation and an Executive Officer's Order was issued on April 9, 2009. The Order was served on the registered owner of the property via registered mail to the address found on the land title documents pulled from Alberta Registries office. The Order stated that, due to the excess heat and moisture, suitable

conditions produced during the plant growing process, an abundance of mould was apparent in the premises. It also spoke to the electrical tampering, surface contamination, and structural and interior damages. It required that the property be vacated and secured from all unauthorized entry. If the property was to be reoccupied, then proper remediation was required, following the requirements of the Order and the remediation guidelines created by the former Calgary Health Region, now Calgary Zone Alberta Health Services.

## **Risk Management**

By late April 2009, contractors advised Calgary Zone Alberta Health Services that they had been awarded the contract to carry out the remediation work. The environmental consultant chosen by the owner provided our offices with their initial assessment report, including their hazardous materials assessment and scope of work in May 2009. Asbestos content of 30% chrysotile was determined in the lower layer of the kitchen linoleum; 2% in the ceiling stipple. The contractors obtained the necessary permits to carry out the work inside.

Removal of contaminated building products and visible moulds was required, after which fungal air samples taken. The results of these samples were submitted to Calgary Zone Alberta Health Services for review in October 2009. Satisfactory levels of fungal contaminants in the interior air had been were obtained (see Appendix C).

The Executive Officer's Order states that no rebuilding is to be carried out until satisfactory air sample results have been received and an inspection has been carried out to approve all work done to date; this re-inspection was carried out by Calgary Zone

Alberta Health Services at the end of October 2009. All drywall and insulation throughout the premises had been removed down to the framing materials. Venting holes were still observed in the floors. The basement had been fully stripped down to the concrete foundation walls. The remediation work to that point appeared acceptable and compliant with the Order.



**Fig 3-10** Drywall removal

After that risk management inspection, the City of Calgary was notified that the level of contaminants inside, along with the physical remediation work completed, were of an acceptable level to release to the City Safety Codes Officers for their permit inspections. These permit inspections were completed in mid-January 2010.

### Lifting of the Order



**Fig 3-11** Remediated kitchen

The Executive Officer's Order is not lifted, nor the Notice of Health Hazard removed, until evidence of complete rebuild has been provided to Calgary Zone Alberta Health Services. The Unfit posting remains in place until authorization is given by the executive officer for its removal. This notice can be seen in the window of the kitchen photo.

Evidence of remediation is normally in the form of detailed photos that are submitted to the Calgary Zone Alberta Health Services offices either electronically or in hard copy. The photos for this property were received in late January 2010 and showed that the electrical service and wiring had been restored and inspected,



**Fig 3-12** Electrical

walls were rebuilt, flooring reinstalled and new kitchen and bathroom developed. The home was in a suitable condition to be reoccupied.

The length of time from the initial intervention until the lifting of the Order and removal of the Notice of Health Hazard was 9 1/2 months.

## 3.2 Ogden Grow Operation

### Call Out

The initial entry into this property by the Green Team and Hazmat officials took place during an evening in the very early stages of the MGO program within Calgary Zone Alberta Health Services. The Sergeant of the drug unit called the health inspector the following morning indicating that the damages and mould growth in the property were extensive. He felt that the involvement of public health was paramount.

### Entry



**Fig 3-13** Marihuana Grow Operation

Moisture was observed on the exterior of the house, seeping from the beneath the siding. This is a significant indicator that a grow operation may be inside. Observing through the windows, heavy mould was seen on walls. Based on these visuals and the report from the Green Team, and after consultation with our legal counsel, entry was carried out in the accompaniment of a police officer under the

authority of section 62(9) of the Public Health Act which states that *“if, in the course of an inspection under this Act, the executive officer is of the opinion that a condition of emergency exists due to the existence of a nuisance, the executive officer may, notwithstanding anything in this Act, forthwith take any steps the executive officer considers appropriate to remove or lessen the nuisance”*.

## Risk Assessment

This house was fully impacted with water damage and mould. The electrical service was bypassed through the kitchen wall. The underside of the roof sheathing and the rafters were black with water damage and mould.



**Fig 3-14** Mould – Photo A



**Fig 3-15** Mould – Photo B

The house was posted with an Unfit for Human Habitation notice. An Executive Officer's Order was issued to the owner on March 12, 2004 giving the option of either demolition or remediation and repair (see Appendix A).

## Risk Management

In April of 2004, the legal representative for the lending company advised that they had received the go-ahead to take control of the premises and obtained a preservation order.

## Enforcement

The lending company made the decision that the amount of work and money required to properly remediate this house was not warranted. This house was completely demolished in October 2004, approximately seven months after the initial entry.

## 4 Comparative MGO Programs

Environmental Public Health's MGO program is one of very few across North America and its particular approach to MGO investigation and remediation is believed to be unique. A review of North American peer-reviewed and grey literature was conducted to assess other environmental public health MGO programs along with any relevant scientific publications. There was no published literature found on the specific topic of MGO inspection or remediation as it relates to public health and safety. However with respect to grey literature, examples of environmental public health's involvement in MGOs were found in two other Canadian provinces and are described as follows.

### 4.1 British Columbia

The City of Surrey, British Columbia has an MGO program branded as the Electrical and Fire Safety Inspection (ESFI) initiative [16]. The City of Coquitlam, British Columbia has a similar program to the City of Surrey with slight variations [17].

The starting point for the City of Surrey's program was the introduction of a Nuisance (Controlled Substance) Bylaw in 2005 enabling public health and safety inspections for residences containing controlled substances. In 2006 in response to a successful pilot of the ESFI initiative, the British Columbia government passed amendments to its Safety Standards Act to permit the routine disclosure of electrical usage information from electrical producers to municipalities with the purpose to identify MGOs.

ESFI public safety inspections include reviews of fire, electrical, structural and health hazards such as toxic mould. Safety inspections are initiated on the basis of public crime tips such as Crime Stoppers, utility company power usage profiles and drive-by observation.

When a possible MGO is identified a multidisciplinary team involving a fire inspector, building inspector, electrical advisor, and police officer(s) supported by a clerk and/or program manager undertake site visit. Police officer(s) may or may not be present dependent on whether the property or its owners are currently the subject of criminal investigations. A member from the Surrey health authority may also be present with the team.

If the owner is home the team will conduct the safety inspection process under the authority of the *Safety Standards Amendment Act*. If the owner is not at home and cannot be reached or is non-compliant, search warrants are obtained. Following inspection an industrial hygienist creates the permit requirements for remediation and an approved list of contractors is contacted to perform the remedial work.

Surrey's approach to MGOs relies on the *Safety Standards Amendment Act* to enable conducting these public safety inspections in the absence of a warrant. However there have been legal challenges (e.g. *Arkininstall v. City of Surrey*) to this method with respect to possible contraventions to the *Charter of Rights and Freedom*. These challenges have centered on the use of police presence in the absence of referencing the *Controlled Drug and Substances Act*. At present time many communities have addressed this issue by having police officers remain outside the property line but in the vicinity and within radio contact of the potential MGO.

Depending on the remainder of the appeal outcomes, possible strategies in the future include obtaining an entry or administrative warrant under section 275 of British Columbia's *Community Charter*.

## 4.2 Ontario

The City of Toronto [18], City of Burlington [19] and The County of Dufferin [20] in Orangeville, Ontario have Coordinated Marijuana Grow House and Illegal Drug Lab Response protocols. There are slight variations in each city's approach but most regulatory and functional components are the same. The County of Dufferin is used here as an example.

The County of Dufferin's protocol involves the following agencies: local police and fire services, County of Dufferin building department, local electrical and hydro-electric authorities, Orangeville and district Real Estate Board and Wellington-Dufferin-Guelph Public Health (WDGPH).

The protocol entails the following multi-disciplinary approach:

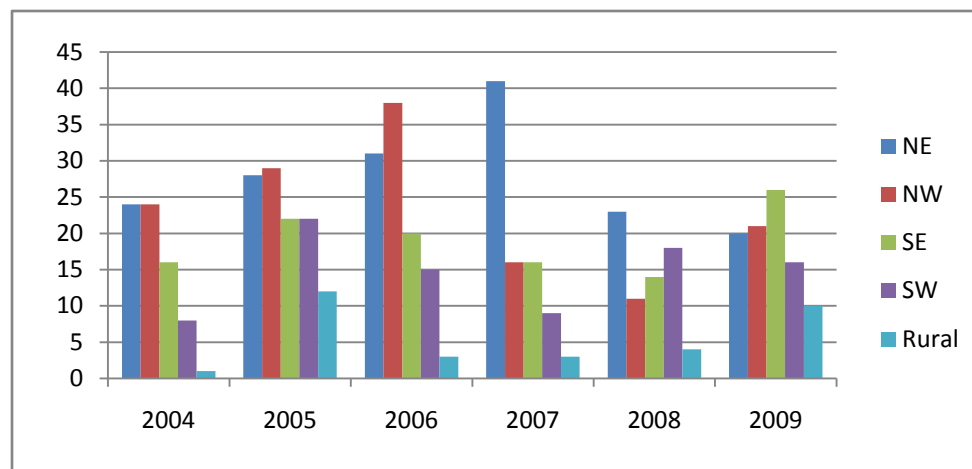
- Local police services conduct a criminal investigation of alleged marihuana grow houses or illegal drug laboratories of any kind. A search warrant is obtained followed by a site visit by local police.

- Local police services prepare a *Police Notification of Illicit Marijuana Grow Operation* report and send appropriate sections to all agencies including WDGPH.
- Where the report indicates a site visit is required, County of Dufferin building inspectors inspect the premises, placard the building with an applicable order and commission reports from environmental consultants regarding potential hazards and remediation plans for the property. Non-compliance with remediation processes can result with a charge of failing to comply under Section 36 (1) of the *Building Code Act*.
- WDGPH receives the police report including photographs and video evidence when available. WDGPH reviews this information for possible health hazards, visits the site to further inspect and placard the premises, and informs the Building Department regarding the issuance or non-issuance of an order pursuant to Section 13 of the *Health Protection and Promotion Act, R.S.O. 1990, c.H.7*. Health hazards noted include mould, water damage, chemical contamination, electrocution and structural defects. Issuance of an order is accompanied by a copy of the *Interim Guidance Document: Environmental Assessment for Mould in Marijuana Grow Houses* which provides guidelines for evaluation and remediation of mould, water damage and chemical contaminations. Environmental consultant reports need not be ordered by building inspectors when WDGPH is involved in ordering a consultant's report.

## 5 Achievements and Recommendations

### 5.1 Achievements

Calgary Zone Alberta Health Services' Environmental Public Health MGO program has conducted inspections and been involved in the subsequent remediation of over 500 grow operations from 2004 to 2009. These MGOs have been located in all four quadrants of the City of Calgary with no appreciable trend towards a particular area.



**Fig 5-1** Distribution of MGOs

The program's comprehensive approach to health hazard identification and risk mitigation has evolved over this time period. A number of improvements have been made in the investigative process which have further enhanced its effectiveness.

These include:

#### Callout

1. More active participation by the City Safety Codes Officers has occurred since 2005. Prior to 2005, it was required in the Executive Officer's Order that permits be taken out for all work carried out during a grow op remediation and that this work be inspected. This remains a requirement of the Order, however, in 2005, all disciplines of City of Calgary Safety Codes, including Electrical, Plumbing/Gas and Building, became active participants in the initial entry and follow-up of all grow operations and remediations.

2. In the early stages of the grow op program, the police made a determination of the need for health involvement based solely on visual mould. This changed during the first few MGOs attended by Environmental Public Health when numerous health hazards were noted. Soon after, Environmental Public Health began attending all MGOs when possible making their own determination of health risk.

### **Entry**

1. The quality and standard of personal safety equipment has increased significantly since the early years of the program.
2. Through the consistent multidisciplinary investigative process, all members of the grow op team have become fully conversant with the roles of the other members resulting in minimal overlap or interference.

### **Risk Assessment**

1. CO<sub>2</sub> and multi-gas detectors have become standard equipment.
2. Executive Officer's Orders are more detailed and much more prescriptive.

### **Risk Management**

1. Re-inspections are carried out to verify the quality of work performed by the contractors instead of relying solely on their assessment reports.
2. Remediation guidelines have been developed and fungal air testing, investigation and reporting requirements policy put in place (see Appendices B and C).
3. Contractors and consultants have become more aware of Environmental Public Health's requirements for remediation.

### **Enforcement**

1. Police have become involved in assisting to keep grow op premises unoccupied while the Order is in effect.
2. A web site has been developed [8] where orders are posted alerting the public about new grow op premises.
3. Due to posted notices on MGOs and information on Environmental Public Health's website, public awareness has increased and people will frequently contact police or the public health inspector when they see activity in and about these posted houses.

## 5.2 Recommendations

Now in its sixth year, Calgary Zone Alberta Health Services' Environmental Public Health Marihuana Grow Operation program continues to evolve. In developing this report a number of continuous improvement opportunities have been identified that will help chart future directions for the program. These recommendations are organized under each step of the MGO investigative process as well as under general program recommendations.

### Call Out

1. The MGO investigative team is multi-disciplinary and processes have developed over time ensuring all members of the team understand their roles and responsibilities. The City of Toronto, City of Burlington and The County of Dufferin in Orangeville, Ontario have a similar investigative approach to MGOs and have formalized their methods using protocols developed and approved by all partner agencies [20]. These protocols contribute to common understanding, consistency and continuity as their program evolves.
  - *Environmental Public Health should document its roles and responsibilities on the MGO team in a similar protocol format. This protocol can be used for internal communication and understanding within Environmental Public Health. It is also recommended that this draft protocol be circulated to all partner agencies for input and approval of all cross-functional roles and responsibilities.*
  - *The roles and responsibilities of all collaborating agencies within Environmental Public Health's MGO program should be compared to the roles and responsibilities detailed in the Ontario-based protocols. The Ontario programs are similar in structure and may provide perspective regarding distribution of roles and responsibilities.*

### Entry

2. MGOs have clear links to organized crime and as a result on-site investigations require significant safety precautions. Surrey's MGO program relies on the *Safety Standards Amendment Act* versus the *Controlled Drug and Substances Act* and thus police presence cannot always be assured (see Section 4.1). Though

significant pre-entry safety measures are taken, there appears to be residual security risk for the Surrey inspection teams.

- *For personal safety of the inspectors, initial entry and inspection should remain in the accompaniment of the MGO team.*

3. The MGO program is currently staffed by 1 FTE and an inspector is available for scheduled call-out. Currently one inspector is available for call-outs and two inspectors provide back-up coverage.

- *To prevent burn-out a flexible schedule should be maintained among the MGO responders within Environmental Public Health.*

### **Risk Assessment**

4. MGOs are associated with a number of health hazards during their operation as described in Section 1.4. As a result, Environmental Public Health should leverage opportunities to proactively identify MGOs in the community.

- *Since public health inspectors cover a wide geographic area in the course of their non-MGO routine inspections, it is recommended that public health inspectors be trained in identifying curb-side external indicators of an MGO so they may communicate valuable tips to law enforcement.*

5. Health hazards managed through remediation (e.g. mould, chemical residues, airborne particulate, air quality testing) are both a matter of risk determination and risk communication. Though reliable quantitative relationships between exposure and health risk in many cases have yet to be determined, qualitative effects on health, especially for susceptible individuals, have been documented in several reviews. There is also ongoing public concern regarding exposure to these health hazards.

- *It is recommended that periodic monitoring of the evidence-base for these health hazards be conducted. Given Environmental Public Health's position as a leader in MGO health hazard identification and mitigation, the current state of the literature may also be communicated to the Environmental Public Health practitioner community.*

6. The MGO program's success in reducing adverse health effects resulting from health hazards hinges on an effective remediation process. Central to this are environmental consultants who provide input on both the initial and follow-up risk assessments. However consultant skill can vary depending on experience and level of training.
  - *An approved consultant list should be established based on documented training, experience and past performance.*
7. A well-defined risk assessment process has been developed by MGO inspectors which is both comprehensive and efficient.
  - *The risk assessment process should be documented.*

### **Risk Management**

8. The MGO program's success in reducing adverse health effects resulting from health hazards hinges on an effective remediation process. Central to this are contractors who perform the necessary structural, electrical, and mechanical repairs. However contractor skill can vary depending on experience and level of training.
  - *An approved contractor list should be established based on documented training, experience and past performance*
9. Both the British Columbia and Ontario MGO programs described in this report have established remediation guidelines similar to those developed by Alberta Health Services Environmental Public Health.
  - *Environmental Public Health's remediation guidelines should be compared to the British Columbia and Ontario program guidelines to identify possible enhancements.*

### **Enforcement**

10. The remediation process can be lengthy and an emphasis is placed on quality of work as well as timely execution. Nevertheless, occasionally owners wilfully neglect or intentionally hinder an Executive Officer's order for remediation.
  - *The MGO program should investigate opportunities within the newly created Unsafe Properties Initiative with the City of Calgary to have MGO*

*houses that have no remediation activity started within a designated time frame demolished by the City.*

### **General program recommendations**

11. The MGO program is strategically aligned with the goal of Environmental Health's Built Environment program: To contribute to the reduction of adverse health effects resulting from exposure to health hazards in the built environment.

- *With the consolidation of Environmental Public Health under the provincial Alberta Health Services organization, this program was used to guide development of a provincial standard for dealing with marihuana grow operations and could be used by other jurisdictions*

12. This report has provided an overview and description of Alberta Health Services Environmental Public Health's MGO program along with some initial continuous quality improvement recommendations. A natural continuation of this work would be an examination of the program's value stream in comparison to other Environmental Public Health programs.

- *A logic model should be developed to enable future program planning and evaluation.*

## Appendix A: Executive Officer's Order

### ***EXECUTIVE OFFICER'S ORDER (EXAMPLE)***

**TO:** (the “**Owner**”)

**And To:** All Occupants (the “**Occupants**”) of those premises located in Calgary, Alberta and municipally described as:

XXX

**RE:** Those premises located in Calgary, Alberta and municipally described as:

[xxx]

WHEREAS, pursuant to section 62 of the Public Health Act Chapter P-37 of the Revised Statutes of Alberta 2000, an Executive Officer who, following an inspection, has reasonable and probable grounds to believe that a nuisance exists in or on the place that was the subject of the inspection or that the place or the owner of it or any other person is in contravention of this Act or the regulations, the Executive Officer may issue a written order,

AND WHEREAS I, an Executive Officer of Alberta Health Services, have inspected the above noted premises and found to exist conditions which are or might become injurious or dangerous to the public health or that might hinder the prevention or suppression of disease or are in contravention of the Housing Regulation and/or the Nuisance and General Sanitation Regulation promulgated pursuant to Section 66 of the Public Health Act,

AND WHEREAS such inspection disclosed that the following breaches of the Public Health Act and the Nuisance and General Sanitation Regulation, Alberta Regulation 243/03, the Housing Regulation, Alberta Regulation 173/99, and Minimum Housing and Health Standards exist in and about the above noted premises, namely:

- Mould growth and conditions that support mould growth are evident within the premises. Excess heat and humidity produced during the plant growing activities are suitable conditions for mould growth. Heavy mould growth was apparent throughout the main level of the house and was suspect in the plant growing areas in the basement. This is a breach of Section 2(1) of the Nuisance and General Sanitation Regulation and of Sections 3, 4 and 5 of the Housing Regulation.

- Electrical system has been tampered with and a hole has been cored through the foundation wall to bypass the meter. This is a breach of Section 2(1) of the Nuisance and General Sanitation Regulation and of Sections 3, 4 and 5 of the Housing Regulation.
- Surfaces throughout the growing and mixing areas are contaminated from the use of chemical/fertilizer solutions. This is a breach of Section 2(1) of the Nuisance and General Sanitation Regulation and of Sections 3, 4 and 5 of the Housing Regulation.
- Structural and interior damages are evident in the premises. Walls, floors and ceilings have been breached to enable the passage of grow op venting and trap door access to the basement level. Water and mould damages are evident. Doors and door jambs were broken during entry because they were heavily fortified. This is a breach of Section 2(1) of the Nuisance and General Sanitation Regulation and of Sections 3, 4 and 5 of the Housing Regulation.
- Venting from the basement plant growing level appeared to be discharging into the furnace b-vent. This is a breach of Section 2(1) of the Nuisance and General Sanitation Regulation and of Sections 3, 4 and 5 of the Housing Regulation.
- Services have been turned off. This is a breach of Section 2(1) of the Nuisance and General Sanitation Regulation and of Sections 3, 4 and 5 of the Housing Regulation.

AND WHEREAS, by virtue of the foregoing, the above noted premises are hereby declared to be **unfit for human habitation**;

NOW THEREFORE, I hereby **ORDER** and **DIRECT**:

1. That the above noted premises be vacated immediately.
2. That the above noted premises be **secured from any and all unauthorized entry**.
3. That all products that may rot or decay be removed from the premises and properly disposed of.
4. That **permission to enter is received in writing** from the undersigned or a designated alternate Executive Officer of Alberta Health Services.

5. That, if the above noted premises are to be reoccupied, the Owner immediately undertake and diligently pursue the completion of the following work in and about the above noted premises, namely:

a. Retain the services of an **Environmental Health or Indoor Air Quality Consultant** to:

- (i) assess the conditions within the above noted premises including the carrying out of environmental air quality analyses of the interior spaces (including the attic, wall and floor cavities, and crawlspaces) for water and mould damage; and
- (ii) prepare for review by Alberta Health Services a detailed assessment report and scope of work plan, including a hazardous materials audit and management plan.

Testing and reporting shall follow the requirements outlined in Calgary Health Region's Fungal Air Testing Protocol and must include extensive intrusive and destructive testing and shall and must include inspection and assessment of hidden cavities and surfaces such as, but not limited to, cutting access holes (or using boroscopes) into walls and ceilings, lifting carpets or vinyl sheet flooring, removing wallpaper for investigation purposes. The consultant's report shall describe, amongst other things, the building construction, finishes, materials and components and the results of their investigations along with recommendations for restoration, repair, and the remediation as required for reoccupation of the building. ***The Consultant should have current, active membership in a related professional organization or certifying body and shall be first approved in writing by Alberta Health Services.***

**NOTE – THE AGE OF THIS PROPERTY MAKES THE PRESENCE OF ASBESTOS WITHIN BUILDING MATERIALS LIKELY. ALL PRECAUTIONS MUST BE TAKEN. PROPER REMOVAL/HANDLING FOLLOWING CURRENT CODES AND STANDARDS IS REQUIRED AND A WRITTEN ASBESTOS MANAGEMENT/ABATEMENT PLAN IS REQUIRED WHICH WILL INCLUDE CONFIRMATION OF ACCEPTANCE FROM ALBERTA OCCUPATIONAL**

**HEALTH & SAFETY (OH&S) AND POST-ABATEMENT AIR SAMPLING FOR  
ASBESTOS AS MAY BE NECESSARY.**

- b. **Prior to performing any work inside the above noted premises** apply for and obtain all permits and approvals required by law, including, but not limited to, Environmental Restoration, Electrical, Plumbing, Gas and/or Mechanical permits. (The Environmental Restoration permit may require that you obtain the services of a **Professional Engineer (Alberta)** to provide an intended Scope of Work report which shall describe the building construction, finishes, materials and components and the results of their investigations along with recommendations for restoration, repair, and remediation as required for reoccupation of the building. Any such Report shall be forwarded to Alberta Health Services.) ***It is important that services (electricity and natural gas) be reinstated to allow the provision of light, heat and hot water to facilitate proper cleaning.***
- c. Retain the services of contractors to make all structural, electrical, and mechanical repairs necessary, all in compliance with applicable codes and regulations, and thereafter provide Alberta Health Services with a report or reports from such contractor or contractors confirming the work performed. ***It is recommended that the cleaning and restoration work be carried out by a member in good standing of the Better Business Bureau (BBB) and/or the Institute of Inspection, Cleaning and Restoration or an equivalent professional body.***
- The hole cored through the foundation wall must be properly repaired and must be sealed from the outside to prevent water infiltration into the premises. The repair must be inspected prior to backfilling the exterior excavation.
  - All damages shall be properly repaired, inspected and reported on as to the suitability of the repairs prior to replacement of new materials.
  - **NOTE THAT ALL INSPECTIONS MUST BE PERFORMED PRIOR TO COVERING UP ANY REPAIR OR INVESTIGATION SITES**

- d. Retain the services of a restoration and mould remediation specialist, approved by Alberta Health Services, to remove and replace or clean, as required, any and all drywall, building materials, and finishing materials, or any other item that is or may be water damaged, infested with or damaged by mould or bacteria or otherwise contaminated with chemicals or other substances of concern, all in accordance with the direction required at item 4.a, above. (Reference should be made to Mould Guidelines for the Canadian Construction Industry located at [www.cca-acc.com/mould/](http://www.cca-acc.com/mould/).) **It is recommended that the cleaning and restoration work be carried out by a member in good standing of the Institute of Inspection, Cleaning and Restoration or an equivalent professional body.**
- **All materials related to the plant growing operation that are remaining behind, including pots, soil, fans, lights, cutting tools, chemicals and general rubbish, shall be removed and disposed of and a manifest attesting to this disposal provided to Alberta Health Services.**
  - **All furnishings and window coverings throughout shall be removed and professionally cleaned or disposed of and shall not be stored in an attached garage due to the chance of recontamination.**
  - **All paneling, drywall, vapour barrier, and insulation throughout the main floor, including ceilings, shall be removed and disposed of. All wood framing and exterior sheathing throughout the premises shall be assessed for suitability and damages and replaced as deemed necessary by.**
  - **All paneling, drywall, vapour barrier, insulation throughout the basement and the basement stairway, including ceilings and rim board areas, shall be removed and disposed of. All wood framing throughout the basement shall be removed and disposed of. All concrete basement walls and floors shall then be thoroughly washed with detergent and water and quickly dried. The concrete basement floor shall not be covered or painted until after remediation and air**

sampling is complete and has been accepted by Alberta Health Services.

- Any carpeting and underlay within the premises, including all tack boards, shall be removed and disposed of and the sub floor assessed for suitability after thorough cleaning. All baseboards shall be removed, cleaned and assessed for suitability.
  - Any damaged linoleum within the premises shall be assessed for asbestos content and properly removed and disposed of and the sub floor assessed for suitability after thorough cleaning.
  - All attic insulation and vapour barrier shall be removed and disposed of and replaced with new materials. The roof sheathing and roof trusses must be thoroughly cleaned, inspected for damage, and repaired or replaced.
  - All remaining hard surfaces throughout, including but not limited to walls, floors, doors, cupboards, shall be thoroughly washed with detergent and water.
- e. Ensure that additional, general renovation work, including painting, reinstallation of drywall and laying of new flooring and/or sub floors does not occur until suitable air sample results are received and submitted and the work identified at items 5.a, 5.b, 5c. and 5.d has been completed to the satisfaction of Alberta Health Services.
- f. Ensure that general renovation work, including painting, reinstallation of drywall and laying of new flooring and/or sub flooring is completed to the satisfaction of Alberta Health Services.
- g. Properly dispose of all chemicals and produce a valid manifest attesting to such proper disposal. Chemicals and chemical mixtures are **not to be disposed of in the sanitary nor storm sewers.**
- h. Retain the services of a licensed furnace company to inspect and clean the furnace and all ducts within the premises. Furnace cleaning shall take place as a final step after the completion of all remediation work but before final air sampling. ***It is***

***recommended that the furnace cleaning company be a member in good standing of the Better Business Bureau (BBB) and/or the National Air Duct Cleaners Association or an equivalent professional body.***

- i. Retain the services of a fireplace professional to inspect, clean and certify the integrity of the firebox and chimney.
- j. Ensure that water, gas and electrical services are properly reinstated by the providers of such utility services.
- k. Provide a detailed remediation and repair report which includes copies of all disposal manifests for removed materials, invoices for new, replacement materials, work orders, receipts, results, photos, inspection certificates and any other documentation pertaining to the work required hereby to Alberta Health Services.
- l. Take any further steps in the interests of preserving and maintaining the health of any person who may, in the future, occupy the above noted premises as may be required by the Executive Officer.

That, until such time as the work referred to in paragraph 5 is completed to the satisfaction of the undersigned or by another executive officer of Alberta Health Services, the above noted premises shall remain vacant and shall be secured from unauthorized entry. Entry may be authorized only for the purposes of complying with this Order, and full personal protective equipment should be worn. Until otherwise directed by Alberta Health Services, full personal protective equipment should be worn by any person seeking entry.

The above conditions were noted at the time of inspection and may not necessarily reflect all deficiencies. You are advised that further repairs may be required to ensure full compliance of the Housing Regulation and/or the Nuisance and General Sanitation Regulation, or to prevent a Public Health Nuisance.

This order remains in effect until the nuisance has been corrected to the satisfaction of an Executive Officer of Alberta Health Services. Failure to comply with this order will result in further action.

**No person shall conceal, deface, destroy, or remove a notice posted pursuant to the Public Health Act.**

Dated at Calgary, Alberta, this 9<sup>th</sup> day of April, 2009.

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[Public Health Inspector], CPHI(C)

Executive Officer/Public Health Inspector

***Section 5(2) of the Public Health Act provides that a person who is directly affected by this Order and considers himself or herself aggrieved hereby may appeal the same to the Public Health Appeal Board, 21<sup>st</sup> Floor, Telus Plaza North Tower, 10025 Jasper Avenue, Edmonton AB T5J 1S6, within ten (10) days. The terms of this Order remain in effect notwithstanding the filing or proposed filing of any such appeal.***

***The Owner is advised that the Public Health Act empowers Alberta Health Services to carry out the terms of this Order on the Owner's behalf and at the Owner's expense should the Owner fail to comply with the terms hereof.***

## **Appendix B: Remediation Guidelines**

### **MARIHUANA GROW OPERATION REMEDIATION GUIDELINES**

**Revised November 2007**

This policy is effective November 14, 2007 and is approved by [Director of Health Protection].

#### **BACKGROUND**

Marihuana grow operations (MGOs) are operated with little or no regard to the immediate or future safety of the occupants or neighbours. Buildings that have been used as MGOs may contain significant health and safety hazards. Substantial damage and hazardous conditions found in these homes can include structural problems, electrical tampering, and chemical contamination, increased levels of combustion gases and abundant growth of visible and hidden moulds. Inspector files Notice of Health Hazard with Land Titles Office when houses are deemed to be Unfit for Human Habitation.

Calgary Health Region's Environmental Public Health Program has been actively involved in the assessment of these marihuana grow operations since 2003, working in partnership with the Southern Alberta Marihuana Investigative Team and the City of Calgary Safety Codes Team.

#### **PURPOSE**

The purpose of this guideline is to describe the Calgary Health Region's current requirements to have an Unfit for Human Habitation Order and Notice of Health Hazard removed from a remediated MGO property.

## **AUTHORITY**

Section 62(1) of the Public Health Act of Alberta gives the Public Health Inspector/Executive Officer of the Calgary Health Region the authority to carry out inspections and issue written orders.

## **HAZARDS WITHIN MARIHUANA GROW OPERATIONS**

An Executive Officer for Calgary Health Region attends the property, usually at the time of the police intervention and criminal investigation. The property is assessed for physical damage to walls, floors and ceilings from possible electrical bypass, water damage, ducting holes, chemical spills and moulds. The combustion stacks from the heating, ventilation and air conditioning (HVAC) system and hot water tank are often disconnected for the purpose of discharging the combustion gases into the building. Tampering of HVAC systems and hot water tanks can result in a build up of carbon dioxide (CO<sub>2</sub>), with pockets of carbon monoxide (CO) and other combustion by-products, and a possible oxygen-depleted indoor environment. Electrical system tampering can lead to fires or electrocution. Chemical contamination on surfaces, a result of mixing and spraying fertilizers and pesticides in and around the crop areas, presents a health risk to government officials, consultants, and contractors as well as to future occupants if the areas are not properly cleaned and remediated. In addition, some activities by the “grow operators” may introduce hazardous substances into the buildings, such as asbestos-containing building materials, lead-containing paints or mercury from thermostats. In most cases the property is posted as Unfit for Human Habitation and a subsequent Executive Officer’s Order is issued to the owner<sup>1</sup> requiring thorough investigation and remediation of the site, including confirmatory air quality testing.

### **1. Remediation and Air Testing Contractors**

Alberta, at this time, has no established mechanism to license, regulate, permit or otherwise certify persons or companies qualified to investigate, remediate and test the environmental conditions within former drug operations. Owners are responsible for selecting contractors and/or consultants using the same diligence they would in

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<sup>1</sup> “Owner” means the registered owner and any agent of the owner in actual or apparent possession or control of land or premises (Alberta Regulation 173/99 Public Health Act Housing Regulation)

choosing someone to perform any other professional service. Calgary Health Region (CHR) can offer advice and guidance to concerned parties to aid in the selection process but cannot recommend or guarantee the work of any company. Be aware of potential conflict of interest issues if the company doing the mould/air testing is involved in the abatement or remediation process. It is highly recommended that the company chosen to test for mould carries environmental liability insurance in the minimum amount of \$1,000,000.00 and qualifies for Professional Errors and Omissions coverage and be a member in good standing of the Better Business Bureau (BBB) and/or the Institute of Inspection, Cleaning and Restoration or an equivalent professional body.

A Project Manager must be specifically named for each site and should be an Environmental Health or Indoor Air Quality Consultant. The Project Manager shall begin communication with CHR early in the process to obtain permission to enter and proceed.

Duties of the Project Manager include:

- conduct a preliminary assessment identifying and delineating the extent of mould and water damage and any hazardous materials and contamination, such as lead, asbestos, pesticides and mercury contamination, that were disturbed or caused by the MGO operator, or that may be impacted by the planned mould remediation or by general repair and renovation work
- prepare a scope of work plan based on this assessment and the Executive Officer's Order and submit a copy to Region for review and comment
- obtain permits from the City or Municipality
- complete and submit a final report to CHR once all work has been completed

The Project Manager or his Site Supervisor must be present on site to observe and document the following activities:

- remediation or abatement of any hazardous materials, including moulds and water damaged materials
- removal of any remaining MGO equipment and chemicals
- removal of drywall, vapour barrier and insulation
- removal of carpet and underlay or other flooring

The Region may reject or require replacement of a Project Manager or Site Supervisor if a finding is made of:

- criminal activity
- disregard for public health or the environment
- failure to comply with the requirements of this Guideline or the Executive Officer's Order
- disregard for and/or non-compliance with health, safety, or pollution rules or standards
- misrepresentation or falsification of sampling, figures, reports or data
- negligence, incompetence or misconduct in the performance of duties

## **2. Permit Applications**

Before carrying out any work inside the property, the Project Manager or his Site Supervisor shall apply to the City or Municipality for all required permits which may include Building, Electrical, Plumbing/Gas and Mechanical. These permits are subject to final inspection and completion by the relevant Safety Codes Officers.

It is important to note that in Calgary and many other jurisdictions, the electrical service is cut off at the time of the police intervention due to hazards associated with the electrical tampering. In Calgary the gas and water are also cut off. During months of cold weather, it is important that water lines are drained to prevent pipes from bursting.

Preliminary inspections of the electrical repairs and gas line repairs need to be carried out so that services can be reinstated to the building to enable proper cleaning and air sampling.

## **3. Removal of Materials**

All grow op related materials remaining behind, including plant pots, soil, fans, lights, cutting, tools and general rubbish, shall be removed and disposed of.

Chemicals, both in their original containers and in mixed solutions, must be properly disposed of and not dumped into the sewers. The local fire department or hazardous material transfer stations (the City has a list of these) may accept these chemicals for disposal and should be contacted in that regard.

Walls, floors and ceilings, including floor coverings, drywall, vapour barrier, insulation and wooden framing, in any grow area or chemical mixing area are considered contaminated with an assortment of chemicals and possible mould and must be removed and properly disposed. Unless more extensive removal is required in the Executive Officer's Order, intrusive testing on all remaining levels may be required.

#### **4. Attic Considerations**

Heat and odours are frequently vented out of the grow areas through or into the attic. This involves cutting holes for the ducting through floors and ceilings until the ducting reaches into the attic area. In colder seasons, particularly if the "grow" was being maintained in winter months, this can result in significant amounts of condensation building up inside the attic with resultant water damage to the underside of the roof, beams, insulation and ceilings beneath. Often water seeps down the outer edges, through soffits and possibly between exterior and interior walls making intrusive testing for moisture and moulds imperative. These continual moist conditions are suitable for mould growth.

When moist conditions have been maintained in the attic, all insulation in the attic area is to be removed and disposed. Vapour barrier will have to be removed or properly repaired as necessary. Roof sheathing, trusses and/or beams must be assessed for structural damage and repaired or replaced.

#### **5. Cleaning With Detergent and Water**

All nonporous and semi-porous surfaces in all areas are to be thoroughly cleaned with detergent and warm water and quickly dried (e.g. fans, heat, towel drying). Surfaces such as wooden beams and studs and concrete may require aggressive scrubbing with a stiff brush. If mould has deeply penetrated into wood to the point that scrubbing is not effective or if the wood shows obvious signs of decay, it should be replaced where at all possible. Porous or fleecy surfaces/materials should be removed from the premises and thoroughly cleaned or replaced.

#### **6. Cleaning the Ventilation System**

Contaminants are easily carried from one area to another through the ventilation system. All air cleaning filters need to be replaced, all vents and grills removed and cleaned, and all ductwork thoroughly cleaned. It is recommended that the furnace

cleaning company be a member in good standing of the Better Business Bureau (BBB) and/or the National Air Duct Cleaners Association or an equivalent professional body.

## **7. Air Scrubbing**

Air scrubbing, using high efficiency particulate (HEPA) air scrubbers, is to be done in all areas of the building to remove airborne spores. Filtration of air should be undertaken such that a minimum of six (6) equivalent air exchanges are completed.

## **8. Air Sampling**

Air sampling is required in all areas of the building, including attics, crawlspaces and attached garages. Calgary Health Region has developed a protocol entitled “Fungal Air Testing, Investigation and Reporting Requirements for Residential Marijuana Grow Operations” which is attached as Appendix A.

## **9. Rebuilding**

Physical damage must be repaired in accordance with the current Alberta Building Code.

If a borehole for electrical bypass exists, it must be moisture proofed from the exterior and the excavation site not filled until inspected and approved by the City or Municipal inspector. Holes in ceilings and particularly in floors require proper repair and need to be left visible for inspection by the City or Municipal inspector.

General renovation work, such as painting, reinstalling drywall, or laying of new flooring or sub flooring must not occur until suitable air testing results have been received and accepted by Calgary Health Region and all repair work has passed City or Municipal inspection.

All repairs affecting the structure, including floors and the building envelope, require inspection and reporting by a Professional Engineer.

## **10. Owner-Assisted Remediation**

The Property Owner may assist with painting or other reconstruction tasks but must first seek approval from the Region and the Project Manager.

## **11. Inspections**

The Project Manager is responsible for ensuring that all remediation work is completed. After work is completed, the Project Managers must contact appropriate inspectors to verify that work was completed properly. Inspections are required to be carried out by the City or Municipality in authority to verify the work done meets Code and to close the following permits:

- Electrical permit for system repairs, both interior and at the service entry site
- Building permit
- Plumbing and Gas permits
- Mechanical permit (if required by the City or Municipality)

City of Calgary Safety Codes Officers will not carry out final inspections until they have received verification from CHR of satisfactory air quality inside the premises.

Once inspections have been completed and passed, the insulation, vapour barrier and drywall can be replaced.

## **12. Submission of Documents**

The Project Manager is responsible for the thoroughness and accuracy of remediation reports and must ensure that all documents pertaining to the assessment, cleanup, repair, sampling, and Safety Codes Officers' inspections are submitted to CHR. The information contained in the documents should clearly state the address, the date the work was performed and the name of the person and company who performed the work, along with original, signed reports and detailed photographs or video. These records are used to verify that the property was assessed, cleaned up and repaired as required, and that air sampling results indicate that the property is suitable for reoccupancy.

## **13. Removal of Notice of Health Hazard**

Upon submission of complete and satisfactory documentation, the Calgary Health Region will remove the Notice of Health Hazard from the property title following payment of a fee.

## Appendix C: Checklist

### CHECK LIST

#### REMEDIATION REQUIREMENTS FOR MARIHUANA GROW OPERATIONS

If a property is the subject of an Executive Officer's Order relating to a former marihuana grow operation, be aware that the Registered Owner and/or Agent shall:

**Phase 1** - *removal of all contaminated materials, waste matter and refuse and reinstatement of utility services, furnace, etc. Restricted entry allowed (ie contractors or inspectors).*

- ☐ **OBTAIN ORDER** - Obtain a copy of the Executive Officer's Order either via registered mail or on-line at [www.calgaryhealthregion.ca/envhealth](http://www.calgaryhealthregion.ca/envhealth) and follow the links to "closure orders"
- ☐ **HIRE CONTRACTORS** - Hire an environmental consultant and a remediation contractor (hereinafter known as the "*Contractors*").
- ☐ **OBTAIN PERMISSION TO ENTER** - The *Contractors* shall obtain written permission from the Executive Officer of Alberta Health Services **prior to entering the premises**. The *Contractors* shall provide AHS with written documentation from the property owner authorizing them to act on their behalf.
- ☐ **APPLY FOR PERMITS** - Application shall be made to the City or Municipality for all required permits (Environmental Restoration, or ERP, is required by the City of Calgary). The detailed Assessment and Scope of Work report must be submitted with this application to the City or Municipality. The detailed Assessment and Scope of Work report must include a hazardous materials summary. A STRUCTURAL ENGINEER'S REVIEW MAY BE REQUESTED BY THE CITY BASED ON THEIR INSPECTOR'S NOTES OR THE SCOPE OF WORK.
- ☐ **PREPARE ASSESSMENT & SCOPE OF WORK** - The *Contractors* shall prepare a detailed assessment and Scope of Work based on their initial inspection **prior to carrying out any work inside including cleaning. Intrusive testing shall be carried out at this time by the environmental consultant.** The *Contractors* shall oversee all remediation and repair work and perform or arrange for a complete mould investigation and air sampling. Work shall follow the requirements indicated in the Executive Officer's Order and established in the Alberta Health Services' *Marihuana Grow Operations Remediation Guideline* and the *Fungal Air Testing, Investigation and Reporting Requirements for Marihuana Grow Operations*.

- ❑ **HIRE ELECTRICAL CONTRACTOR** - Hire a qualified electrician/s to repair the electrical deficiencies to the service and to any wiring. THIS MUST BE DONE BEFORE OBTAINING THE PERMIT SO THE ELECTRICAL CONTRACTOR CAN BE NAMED ON THE PERMIT.
- ❑ **HIRE PLUMBER/GAS FITTER CONTRACTOR**- Hire a qualified plumber/gas fitter/s to repair any defects to the gas service and perform a gas line pressurization test. THIS MUST BE DONE BEFORE OBTAINING THE PERMIT SO THE PLUMBING/GAS FITTER CONTRACTOR CAN BE NAMED ON THE PERMIT.
- ❑ **SUBMIT DOCUMENTS TO AHS** - The detailed Assessment and Scope of Work report must also be submitted to Alberta Health Services. The detailed Assessment and Scope of Work report must include a hazardous materials summary.
- ❑ **INSPECTION** - Call the City or Municipality to carry out an “electrical service inspection” and a “gas inspection” when related deficiencies have been corrected.
- ❑ **REINSTATE GAS & ELECTRICITY** - Once these initial inspections have passed, contact the utility companies to reinstate the services that have been disconnected (electrical, gas and/or water service).
- ❑ **REINSTATE WATER SUPPLY**  
(Proper and thorough remediation work and air sampling cannot be completed nor accepted without the availability of heat, light and hot water.)
- ❑ **FLUSH PLUMBING AND SEWER LINES** – thoroughly flush all lines to remove all stagnant water, microorganisms, and any leachates or particulates.
- ❑ **SUBMIT WATER BACTERIOLOGICAL SAMPLE FOR ANALYSIS** – Contact a private laboratory to obtain the sample bottle and instructions for taking and submitting the water sample.

**Phase 2** - surface cleaning and furnace cleaning followed by air sampling. After **Phase 2** has been completed and only once air samples have been accepted by AHS, will realtors and potential purchasers, etc. be granted access.

- ❑ **REMEDIATE & CLEAN** - Ensure that all remediation is completed by the *Contractors* according to the requirements set out in the Executive Officer’s Order and the prepared Scope of Work.
- ❑ **FURNACE, HOT WATER TANK & FIREPLACE** – Hire professional and reputable companies to inspect and clean the furnace and ducting, hot water tank exhaust, and/or fireplace. Ensure that inspections and cleaning are completed. Inspection reports/documentation will be required for review by AHS.
- ❑ **AIR SAMPLING** - *Contractors* must arrange for air sampling to be done after all remediation and cleaning, including that of the furnace and ducting, have been completed.

- **SUBMIT DOCUMENTS** - Submit all documents to Alberta Health Services for review and acceptance.
- **AIR RESULTS - SATISFACTORY** - If the air results are acceptable, Alberta Health Services will arrange to inspect the premises. You must also contact City/Municipal gas and electrical inspectors to carry out their **final inspections** and the Building Inspector to carry out a **framing inspection** prior to reinstallation of insulation and vapour barriers. The building inspector will carry out a final inspection after reinstallation of insulation and vapour barriers. **The City/Municipal inspectors will not enter the facility for final inspections until satisfactory air sampling has been confirmed by Alberta Health Services.**
- **AIR RESULTS - UNSATISFACTORY** - If the air results are not acceptable, further cleaning and remediation will be necessary. Contact the Executive Officer for further information.

**Phase 3** - complete rebuild, including cosmetic repairs. Only after satisfactory completion of **Phase 3** will the Unfit Order be lifted.

- **COMPLETE RENOVATIONS** – Once all documents are submitted to AHS and necessary inspections have been completed and permission to proceed is obtained from the Executive Officer, the final renovations may be done to ensure the dwelling is in a habitable condition (reinstallation of walls, floor coverings, cabinetry, etc.). When the basement is redeveloped, separate electrical, building & plumbing permits are required.
- **LIFTING OF ORDER** - If all inspections pass and all documents have been submitted as required, AHS will lift the Unfit Order and prepare a Rescind notification. Any postings may then be removed from the premises.
- **REMOVAL OF NOTICE OF HEALTH HAZARD** – AHS will prepare to have the Notice of Health Hazard discharged from the title.

**More detailed remediation information is available on the Environmental Health Website at**

[http://www.calgaryhealthregion.ca/publichealth/envhealth/program\\_areas/illegal\\_drug\\_operations/illegal\\_drug\\_operations\\_guidelines.htm](http://www.calgaryhealthregion.ca/publichealth/envhealth/program_areas/illegal_drug_operations/illegal_drug_operations_guidelines.htm)

# Appendix D: Fungal Air Testing Protocol

## FUNGAL AIR TESTING, INVESTIGATION AND REPORTING REQUIREMENTS FOR

### MARIHUANA GROW OPERATIONS

Revised October 2007

This policy is effective October 9, 2007 and is approved by [Director of Health Protection].

The following are the fungal air testing, investigation and reporting requirements for owners seeking to have removed an 'Unfit for Human Habitation Order' and/or Notice of Health Hazard issued by the Calgary Health Region against a property due to recent use as a Marihuana Grow Operation. The owner or the consultant representing the owner is advised to review the Executive Officer's Order issued by the Calgary Health Region for clarification on the varied and specific requirements that must be satisfied for the release of the Order by the Calgary Health Region.

Failure to adhere or comply to the requirements set forth below or in the Executive Officer's Order are sufficient cause for the Calgary Health Region to deny the removal of both the "Unfit for Human Habitation Order" and the Notice of Health Hazard.

#### **1. Consultant and Contractor Qualifications:**

The contracted consultant(s) and contractor(s) shall have and demonstrate to Calgary Health Region (1) current and active membership in a related professional organization or certifying body or expertise (ie Environmental Health or Indoor Air Quality), and (2) professional liability insurance, prior to the start of any work on the premises.

#### **2. Delineation and Remediation of Mould Contamination:**

The owner shall at a minimum contract a qualified consultant to fully and completely investigate and assess the building, including hidden cavities and surfaces, for the signs of water damage and moulds. This shall include intrusive and destructive investigation of hidden cavities and surfaces to the extent considered necessary in the opinion of the expert consultant. Intrusive and destructive testing may include, but is not limited to, cutting access holes in walls and ceilings, lifting carpets or vinyl sheet flooring, and removing wallpaper for investigation purposes. The contracted consultant shall ensure and document that any and

all mould remediation work completed by a contractor hired by the owner was thorough and effective. That is, that in the opinion of the consultant, the mould remediation work was effectively, thoroughly and satisfactorily completed in accordance with the protocols of New York City Department of Health, United States Environmental Protection Agency and Health Canada<sup>1</sup>. The consultant shall document the mould investigation, delineation and remediation work and shall submit the detailed report or reports to Calgary Health Region, Environmental Health.

Mould remediation consisting of treatment only with a biocide or disinfectant (e.g., bleach) is not acceptable. The presence of any mould, whether alive or dead, on visible surfaces or hidden in cavities (e.g., wall cavities) presents an unacceptable situation requiring remediation by mould removal and surface cleaning. In addition, the application of a biocide or disinfectant following the completion of mould remediation, with the intent of inhibiting possible future fungal growth, is not considered effective, necessary or beneficial.

### **3. Hazardous Materials Audit and Management Plan:**

A hazardous materials audit of the building shall be completed by the qualified consultant prior to the start of any mould remediation or any other building disturbance activities. The hazardous materials audit shall include, but not be limited to, the identification and delineation of the following:

- Asbestos-containing materials
- Lead-containing surface coatings
- Mercury-containing switches, thermometers, etc.
- Pesticides
- Poly Chlorinated Biphenyls
- Radioactive equipment such as some smoke/fire detectors
- Refrigerants

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<sup>1</sup> Health Canada 2004, Fungal Contamination in Public Buildings: Health Effects and Investigation Methods; Health Canada 1995, Fungal Contamination in Public Buildings: A Guide to Recognition and Management; US EPA 2001, Mold Remediation in Schools and Commercial Buildings; NY City Dept of Health and Mental Hygiene 2005, Guidelines on Assessment and Remediation of Fungi in Indoor Environments. See also Health Canada 2007, Canadian Environmental Protection Act, Residential Indoor Air Quality Guidelines for Moulds. Canada Gazette.

The consultant shall document to the owners in written form the proper management or disposal of the identified hazards in the building. In addition, as the owner's agent the consultant shall direct and document that the identified hazards in the building are properly managed or disposed of in accordance with government standards and guidelines and industry codes of practice.

The findings of the hazardous materials audit, including the management or disposal activities undertaken on the premises, shall be documented and submitted in a report to Calgary Health Region prior to active remediation work proceeding.

#### **4. Air Sampling Locations:**

Following the completion of all remediation work, the consultant contracted by the owner shall collect representative air samples from each habitable floor of the building, including basement(s), attic(s), attached garage and crawlspaces. The consultant shall collect a minimum of one (1) air sample per floor for an open concept floor plan or a minimum of two (2) air samples per floor for a compartmentalized floor plan. An open floor plan is where 75% or more of the floor footprint consists of 1 room. More samples per floor may be collected at the professional discretion of the consultant.

#### **5. Number of Outdoor or Control Air Samples:**

The consultant shall collect at least three (3) representative outdoor samples for each day of sampling in accordance with Health Canada (2004) recommendations. Outdoor/control samples shall be collected on the same day as indoor samples. The owner/consultant can store viable test samples for later analysis pending receipt of acceptable results of total fungal particulate samples. The characterization of outdoor variability assists in the assessment of indoor samples.

#### **6. Type of Air Sampling Required (Viable and Total):**

Fungal air sampling shall consist of both viable fungal air sampling (e.g. Reuter Centrifugal Sampler or similar) and total fungal particulate sampling (e.g., Air-O-Cell).

- Speciation of all viable fungi is required.
- At ambient temperatures  $\leq 0^{\circ}\text{C}$ , control and indoor samples may be collected using membrane or grease filters (e.g., Burkard or Air-O-Cell filters) and results analyzed for Total Fungal Particulates. Table 2 Total Fungal Particulate criteria shall apply to interpreting the results.

- Indoor total fungal particulate sampling may be accepted without outdoor controls and viable testing if the results satisfy the criteria presented in 9e.

## **7. Environmental and Building Conditions for Sampling:**

Fungal air sampling shall occur in compliance with Health Canada 'Fungal Contamination in Public Buildings: Health Effects and Investigation Methods' (2004), page 41, and requires:

- Ventilation system is operational.
- Non quiescent conditions (i.e., sampling following or during quiescent periods is not acceptable – sampling conditions must occur during or simulate disturbance conditions associated with normal occupancy).
- Allow one or two hours between duplicate air sampling (i.e., outdoor backgrounds).
- Sampling is not to occur during or immediately following precipitation events. Calgary Health Region recommends a 24 hour buffer period between the end of a precipitation event and air sampling.
- One of the outdoor control samples shall be collected at the furnace outdoor air intake grill. If the air intake grill is not accessible, the test location is at the discretion of the consultant but sampling on the windward side of the structure is recommended.

## **8. Reporting Requirements:**

- Forward report(s) and assessment(s) to Calgary Health Region, Environmental Health
- The consultant shall document and comment on the mould investigation, delineation, and remediation work undertaken in the building. The consultant shall offer an opinion as to whether or not the mould investigation, delineation and remediation work was effective, thorough and satisfactorily completed in accord with acceptable guidelines and protocols (see bullet number 1, page 1).
- Regarding mould air testing, the consultant report shall include:
  - a comment on the assessment of the building regarding evidence of water damage or signs of mould contamination during air sampling.

- all laboratory test results as provided by the analytical laboratory. The consultant can summarize the findings in the body of the report but must submit laboratory test results showing the mould genus/species breakdown for each sample.
- a description of environmental and building conditions on the day(s) of sampling, including outdoor temperature and recent precipitation, the operational status of the ventilation system and the occupancy or disturbance activities prior to and during sampling.
- if a test of Statistical Significance is used, then the test shall be named, the input parameters tabulated and the results presented.
- an interpretation of the air monitoring results and their significance.
- indicate sampling locations in the report (e.g., main floor living room).
- indicate the duration of sampling and volume of air collected for each sample in the report.

## **9. Interpretation of Air Sampling Results:**

Acceptable criteria for total fungal particulates and viable fungi are the Health Canada numeric criteria (Fungal Contamination in Public Buildings: A Guide to Recognition and Management (1995) or Indoor Air Quality in Office Buildings (1993). The criteria are based on Health Canada's statement that 'normal' indoor air mycoflora at the genus and species level is qualitatively similar to and quantitatively lower than outdoor air. In other words, the distribution of indoor moulds at the genus or species level is similar to the outdoor distribution and quantitatively lower than outdoors. Calgary Health Region criteria for interpreting the results of fungal air testing are as follows in Table 2.

The few indoor and outdoor samples collected at a site along with the brief sampling period (i.e., 3-7 minutes) cannot be considered statistically representative sampling (American Industrial Hygiene Association, 1999). Such limited sampling cannot accurately characterize the indoor and outdoor mould population. The lack of statistically relevant sampling makes the direct and simple indoor to outdoor numeric comparison to any guideline, including the Health Canada guideline, difficult. Numerous scientific studies have shown tremendous variability in sequential mould sampling results. The extent of the variability is such that a single indoor sampling result, although quantitatively higher than

outdoors, may in fact satisfy the Health Canada requirement of indoor moulds being quantitatively lower than outdoors.

Air monitoring is a useful tool, among other tools, in identifying the presence of an indoor fungal amplifier requiring remediation, assessing potential health risks, managing a microbial problem and returning a building, or portion of, to normal use or occupancy (Health Canada (2004). In 1995, Health Canada wrote that, “Although it is clear that pathogenic and toxigenic fungi can cause disease, the health risks associated with a given measured level are, for the most part, unknown” (page 6). The U.S. National Academy of Science, Institute of Medicine (2004), concluded that exposure to moulds is causally associated with aggravation of asthma in individuals allergic to moulds and increased symptoms of lower and upper respiratory effects. Lower respiratory tract symptoms include increased nasal congestion, increased cough with or without phlegm production, wheeze, chest tightness, shortness of breath, runny or itchy nose and sore throat (Institute of Medicine 2004). However, in reviewing this and other studies, Health Canada (2004) concluded, “Due to limitations in the assessment of exposure and outcomes, and since in almost all studies to date an independent effect of mould could not be isolated from other contaminants associated with dampness, epidemiologic data alone are insufficient to conclude that indoor mold causes respiratory disease. However, such a causal link is highly plausible...” (page 33). Health Canada (2007) says mould exposure is associated with aggravation of asthma, lung inflammation, and may be a risk factor for developing asthma but that the lack of a dose-response prohibits the use of air sampling to assess health risk. Thus air monitoring is a useful tool in identifying the presence of an indoor fungal amplifier as a health concern requiring remediation, managing a microbial problem and returning a building, or portion of, to normal use or occupancy

The criteria presented below provide guidance on interpreting test results and remain subject to application and interpretation of the Health Canada criteria by the Calgary Health Region.

- a. Fungal indicators of mould damaged buildings are indicated below in Table 1.

**Table 1: List of Indoor Indicator Mould Species**

<b>Alternaria alternata</b> (tenuis)		
<b>Aspergillus fumigatus</b>	Aspergillus sydowii	Aspergillus versicolor
<b>Chaetomium globosum</b>		
<b>Cladosporium cladosporioides</b>	Cladosporium sphaerospermum	
<b>Cryptococcus neoformans</b> <sup>1</sup>		
<b>Eurotium herbariorum</b>	Eurotium repens	
<b>Histoplasma</b> <sup>1</sup>		
<b>Memnoniella echinata</b>		
<b>Paecilomyces variotii</b>		
<b>Penicillium aurantiogriseum</b>	Penicillium chrysogenum	Penicillium commune
<b>Stachybotrys chartarum</b>		
<b>Ulocladium chartarum</b>		

Source: Health Canada 2004. Health Effects of Fungi; Health Canada 1995

<sup>1</sup>The acceptable concentration for these moulds in indoor air is zero.

- b. Table 2 below presents criteria for acceptable indoor air quality for both Total Fungal Particulates and Viable Fungal Particulates. All viable fungi must be speciated. The criteria apply to the determined concentrations of each mould of each sample. As it is not possible to capture the full scope of variables in the Health Canada criteria in this or any table, the Health Canada criteria must still inform the interpretation of this table and of air monitoring results.

Aspergillus and Penicillium are often grouped together as one result for Total Fungal Particulate sampling. As a result, acceptable air testing criteria were developed to address this unique grouping and are presented in Table 2 under “For Aspergillus & Penicillium measured together (Total Fungal Particulates Sampling Only)”. These

criteria should not be used for assessing *Aspergillus* and *Penicillium* species identified and enumerated using viable sampling. For viable sampling, the other criteria should be used: “Each Indicator Mould” and “Each Non-indicator Mould”.

Determine the acceptable criterion by inputting the highest measured level of a mould into the Table 2 equation. If there are no measurable levels of mould, use the default value provided.

For example, three (3) outdoor sample results for *Penicillium chrysogenum* are 24, 60 and 48 cfu/m<sup>3</sup> (colony forming units per cubic metre). Input the 60 cfu/m<sup>3</sup> value (the highest value) into the appropriate Table 2 equation,  $50 + 2 \times 60 \text{ cfu/m}^3$ , to derive an acceptable criterion of 170 cfu/m<sup>3</sup>. The indoor level could be compared to the calculated acceptable criterion of 170 cfu/m<sup>3</sup>.

As another example, the three (3) outdoor sample results for *Penicillium chrysogenum* are 0, 0 and 0 cfu/m<sup>3</sup>. In this case, use the default value of 50 cfu/m<sup>3</sup> provided in the table as the acceptable criterion

The assumptions of the default values shown in Table 2 are as follows:

- Total fungal particulates: 1 raw spore count is equivalent to 45 ctns/m<sup>3</sup>, assuming ~30% of the trace is analyzed. CHR accepts as background a maximum of 2 raw counts on the ~30% trace analyzed, which is equivalent to 6 raw counts on 100% of the trace. Two (2) raw spore counts on the ~30% trace are equivalent to 90 ctns/m<sup>3</sup>, rounded up to 100 ctns/m<sup>3</sup>.
- Viable fungi: 1 raw count is equivalent to 6 cfu/m<sup>3</sup>. Calgary Health Region accepts a maximum of 6 raw counts as background, which is equivalent to 36 cfu/m<sup>3</sup>, rounded up to 50 cfu/m<sup>3</sup>.

Deviation from these assumptions by the laboratory or consultant may render Table 2 criteria invalid. Under these conditions, the criteria used by Calgary Health Region to interpret the air monitoring results will be at variance with Table 2.

#### c. Finding and Implications of an Exceedance

The finding of an exceedance of airborne fungal criterion at a single location shall result only in the declaration of an exceedance for the area represented by that sample. The interpretation of an air monitoring result as an exceedance or not shall

also consider the professional consultant's visual assessment, site history presentation, and judgement.

d. Statistical Significance Testing

Tests for statistical significance of non-indicator moulds include Wilcoxon Match-Pairs Signed-Ranks Test (Wilcoxon Signed-Ranks Test for Matched Pairs) and the Spearman Rank-Order Correlation Coefficient.

**Table 2: Acceptable Fungal Indoor Air Quality Criteria for Remediated Marihuana Grow Houses.**

- Failure of any one indoor mould to satisfy the criteria for any one sample is an unacceptable result for that sample.

For Each Individual Mould Species/Genus in Each Sample	Acceptable Indoor Criteria for Each Mould Detected in a Sample at the Genus and/or Species Level	
	Viable Fungi – Species Level	Total Fungal Particulates – Genus Level
	Cfu/m <sup>3</sup> per species isolate per sample	Counts/m <sup>3</sup> per genus isolate per sample
<b>NON ATTIC SPACES</b>		
For Aspergillus & Penicillium measured together (Total Fungal Particulates Sampling Only)	-	≤ 200 or (200 + 2x outdoor) or the measured maximum <sup>1</sup>
Each Indicator Mould (see Table 1)	≤ 50 or (50 + 2x outdoor) or the maximum measured	≤ 100 or (100 + 2x outdoor) or the measured maximum <sup>1</sup>
Cladosporium species (non indicator)	≤ 150 or (150 + 3x outdoor) or the measured maximum or Statistical Test of Significance <sup>2</sup>	≤ 300 or (300 + 3x outdoor) or the measured maximum or Statistical Test of Significance <sup>2</sup>
Alternaria species (non indicator)	≤ 50 or (50 + 3x outdoor) or the measured maximum or Statistical Test of Significance <sup>2</sup>	≤ 100 or (100 + 3x outdoor) or the measured maximum or Statistical Test of Significance <sup>1,2</sup>
Each Non Indicator Mould	≤ 50 or (50 + 2x outdoor) or the measured maximum or Statistical Test of Significance <sup>2</sup>	≤ 100 or (100 + 2x outdoor) or the measured maximum or Statistical Test of Significance <sup>1,2</sup>
<b>ATTICS</b>		
Attics - For Aspergillus &	-	≤ 400 or (400 + 2x outdoor) or the measured

Penicillium measured together (Total Fungal Particulates Sampling Only)		maximum <sup>1,3</sup>
Attics – Each Indicator Mould	$\leq 100$ or $(100 + 2x \text{ outdoor})$ or the measured maximum <sup>3</sup>	$\leq 200$ or $(200 + 2x \text{ outdoor})$ or the measured maximum <sup>1,3</sup>
Attics - Cladosporium species (non indicator)	$\leq 300$ or $(300 + 5x \text{ outdoor})$ or the measured maximum or Statistical Test of Significance <sup>2,3</sup>	$\leq 600$ or $(600 + 5x \text{ outdoor})$ or the measured maximum or Statistical Test of Significance <sup>1,2,3</sup>
Attics - Alternaria species (non indicator)	$\leq 100$ or $(100 + 5x \text{ outdoor})$ or the measured maximum or Statistical Test of Significance <sup>2,3</sup>	$\leq 200$ or $(200 + 5x \text{ outdoor})$ or the measured maximum or Statistical Test of Significance <sup>1,2,3</sup>
Attics – Each Non Indicator Mould	$\leq 100$ or $(100 + 3x \text{ outdoor})$ or the measured maximum or Statistical Test of Significance <sup>2,3</sup>	$\leq 200$ or $(200 + 3x \text{ outdoor})$ or the measured maximum or Statistical Test of Significance <sup>1,2,3</sup>

Source material on variability: McGrath et al. 1999 Current Microbiology 38:33-36. Ebner et al. 1992 Mycological Research 96(2):117-124. Verhoeff et al. 1990 Allergy 45:275-284. Shelton et al. 2002 Applied & Environmental Microbiology 68(4):1743-1753. AIHA 1999 Bioaerosols Assessment and Control.

<sup>1</sup> Excessive presence of fungal mycelial fragments beyond outdoor background would be cause for declaration of non-acceptable sampling results.

<sup>2</sup> Statistical significance testing can be used to determine whether the observed measurements in any given indoor sample are significantly different, or the same, as those measured outdoors. The test must include the entire dataset (i.e., all identified moulds) in an indoor sample excluding Table 1 indicator organisms. The distribution in the indoor sample must be compared to the distribution in the outdoor control.

<sup>3</sup> For attics, acceptance of results with marginally elevated levels is possible if the consultant thoroughly inspects the space for evidence of mould and water damage, including the conditions of drywall surfaces (including the presence of a vapour barrier overlying the drywall), insulation, exposed attic surfaces and surfaces around the soffit.

<sup>4</sup> The acceptable concentration of Cryptococcus and Histoplasma in indoor air is zero. In addition to the above, the outdoor control data can be a compilation of the median and maximums recorded in outdoor controls.

e. Conditions for Acceptance of Total Fungal Particulate Only Test Data:

The results of Total Fungal Particulate sampling will be accepted as the sole and only test method if the following criteria are satisfied for each mould identified for each sample:

- Penicillium/Aspergillus  $\leq 200$  (for attics  $\leq 400$ ) counts/m<sup>3</sup>
- Cladosporium species (non indicators)  $\leq 300$  (for attics  $\leq 600$ ) counts/m<sup>3</sup>
- Alternaria species (non indicators)  $\leq 100$  (for attics  $\leq 200$ )
- For each other mould (indicator or non indicator)  $\leq 100$  (for attics  $\leq 200$ )
- Statistical significance testing can be used to determine whether the observed measurements in any given indoor sample are significantly different, or the same, as those measured outdoors. The test must include the entire dataset (i.e., all identified moulds) in an indoor sample excluding Table 1 indicator organisms. The distribution in the indoor sample must be compared to the distribution in the outdoor control.
- Excessive presence of fungal mycelial fragments beyond outdoor background would be cause for declaration of non-acceptable sampling results.
- For attics, acceptance of results with elevated levels is possible if the consultant thoroughly inspects the space for evidence of mould and water damage, including the conditions of drywall surfaces (including the presence of a vapour barrier overlying the drywall), insulation, exposed attic surfaces and surfaces around the soffit.

If these conditions are satisfied, then viable mould testing is not required.

## 10. Laboratory Qualifications:

The Laboratory selected by the consultant to do the microbial analysis associated with this protocol shall demonstrate AIHA (American Industrial Hygiene Association) certification as an Environmental Microbiology Accredited Laboratory with a competence in moulds, or

other comparable accreditation, or demonstrated routine participation and acceptable performance in an Environmental Microbiology Proficiency Analytical Testing (PAT) program for both culturable and direct examination determination of fungi, or other comparable accreditation. Documentation of laboratory certification or performance in PAT programs is to accompany analytical reports and is to be included in reports submitted to Calgary Health Region. Calgary Health Region understands that PAT programs for direct examination of fungi are anticipated to have begun in 2005.

## References

1. Alberta Health and Wellness. *Alberta Health and Wellness Annual Report 2008/2009*. [cited 2010 March]; Available from: <http://www.albertahealthservices.ca/211.asp>.
2. Council of Managers-Environmental Health for Alberta Regional Health Authority Environmental Health Programs, *A Common Reference System and Operational Standards, [The Blue Book]*. 2001: Alberta.
3. Centre for Addiction and Mental Health. *About Marijuana*. [cited 2010 March]; Available from: [http://www.camh.net/About\\_Addiction\\_Mental\\_Health/Drug\\_and\\_Addiction\\_Information/about\\_marijuana.html](http://www.camh.net/About_Addiction_Mental_Health/Drug_and_Addiction_Information/about_marijuana.html).
4. Canadian Public Health Association. *How Does Marijuana Affect Health?* [cited 2010 February]; Available from: <http://www.cpha.ca/en/portals/substance/health/faq02.aspx>.
5. Health Canada Marijuana Medical Access Division. *Marihuana Medical Access Regulations, Daily Amount Fact Sheet*. [cited 2010 February]; Available from: [http://www.hc-sc.gc.ca/dhp-mps/alt\\_formats/hecs-sesc/pdf/marihuana/how-comment/medpract/help-aide/daily-quotidienne-eng.pdf](http://www.hc-sc.gc.ca/dhp-mps/alt_formats/hecs-sesc/pdf/marihuana/how-comment/medpract/help-aide/daily-quotidienne-eng.pdf).
6. Government of Alberta Alberta Alcohol and Drug Abuse Commission, *Alberta Drug Strategy, A Provincial Framework for Action on Alcohol and Other Drug Use*. October 2005: Alberta.
7. Alberta Municipal Affairs Calgary Fire Department, *Clandestine Drug Operations, Awareness and Safety*. 2004: Alberta.
8. Alberta Health Services Environmental Public Health. *Environmental Health - Illegal Drug Operations*. [cited March 2010; Available from: [http://www.calgaryhealthregion.ca/publichealth/envhealth/program\\_areas/illegal\\_drug\\_operations/illegal\\_drug\\_operations\\_home.htm](http://www.calgaryhealthregion.ca/publichealth/envhealth/program_areas/illegal_drug_operations/illegal_drug_operations_home.htm).
9. Government of Alberta, *Drug-endangered Children Act, Chapter D-17*. 2006, Alberta Queen's Printer: Edmonton, Alberta.
10. Canadian Centre for Occupational Health and Safety. *Health Effects of Carbon Dioxide Gas*. [cited 2010 March]; Available from: [http://www.ccohs.ca/oshanswers/chemicals/chem\\_profiles/carbon\\_dioxide/health\\_cd.html](http://www.ccohs.ca/oshanswers/chemicals/chem_profiles/carbon_dioxide/health_cd.html).
11. Health Canada Federal-Provincial Advisory Committee on Environmental and Occupational Health, *Exposure Guidelines for Residential Indoor Air Quality*. 1989, Health Canada publications: Ottawa, Ontario.
12. Health Canada. *Fungal Contamination in Public Buildings: Health Effects and Investigation Method*. 2004 [cited 2010 March]; Available from: [http://www.hc-sc.gc.ca/ewh-semt/pubs/air/fungal-fongique/index\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/pubs/air/fungal-fongique/index_e.html).
13. National Collaborating Centre for Environmental Health, *Health Effects from Mould Exposure in Indoor Environments, Evidence Review*. November 2009.
14. Government of Alberta, *Public Health Act, Revised Statutes of Alberta 2000, Chapter P-37*. 2000, Alberta Queen's Printer: Edmonton, Alberta.

15. O'Neill, R., *Legal opinion regarding rights of public health inspectors to inspect probable nuisance conditions on private property*. March 2004, Ogilvie LLP: Edmonton.
16. City of Surrey British Columbia and University of Fraser Valley, *Community Response to Marijuana Grow Operations: A Guide Towards Promising Practices*. September 2009: British Columbia.
17. Coquitlam Public Safety Inspection Team. *Coquitlam Public Safety Inspection Team Program Questions and Answers*. March 2010; Available from:  
[http://www.coquitlam.ca/Residents/Public+Safety/Public+Safety+Inspection+Program/\\_Coquitlam+Public+Safety+Inspection+Team+Program+Q+and+A.htm](http://www.coquitlam.ca/Residents/Public+Safety/Public+Safety+Inspection+Program/_Coquitlam+Public+Safety+Inspection+Team+Program+Q+and+A.htm).
18. City of Toronto Municipal Licensing and Standards, *Coordinated Marijuana Grow House and Illegal Drug Lab Response Protocol (Draft)*. November 2006: Toronto, Ontario.
19. City of Burlington Building Department, *Marijuana Grow Operation Response Protocol*. November 2007: City of Burlington, Ontario.
20. County of Dufferin Building Department, *Coordinated Marijuana Grow House and Illegal Drug Lab Response Protocol*. April 2007: County of Dufferin, Ontario.