

# **FREMONT ENVIRONMENTAL INC.**

October 24, 2005

Ms. Elizabeth Sopher  
Lowry Assumption, LLC  
555 Uinta Way  
Denver, CO 80230-6917

Subject:       **Health and Safety Plan**  
                  Lowry Assumption LLC  
                  Fremont Project No. C005-007

Dear Elizabeth:

Enclosed is the Health and Safety Plan for the Lowry Site. This plan was developed to identify potential site hazards and establish controls for tasks involving hazardous substances on the Lowry Redevelopment site. The plan is required by the Occupational Safety and Health Administration under the Hazardous Waste Operations and Emergency Response Standard, 29 CFR 1910.120. It applies to field tasks on the Lowry site.

Fremont Environmental appreciates the opportunity to provide this service. Please contact me at (720) 351-8984 if you have any questions regarding this plan.

Sincerely,

**FREMONT ENVIRONMENTAL INC.**

Joan Henehan, P.E., C.I.H., C.S.P.  
Senior Engineer

Enclosure

**DRAFT SITE HEALTH AND SAFETY PLAN  
LOWRY ASSUMPTION, LLC  
LOWRY REDEVELOPMENT  
FREMONT PROJECT NO. C005-007**

**Prepared by:**

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**October 24, 2005**

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**SITE HEALTH AND SAFETY PLAN  
LOWRY ASSUMPTIONS, LLC  
LOWRY REDEVELOPMENT  
FREMONT PROJECT NO. C005-007**

**1.0 INTRODUCTION**

This site-specific health and safety plan (HASP) was developed to provide safety guidelines and control measures for employees of International Risk Group, LLC (IRG) and its affiliates and subsidiaries working on behalf of the Lowry Assumption, LLC (LAC) during the implementation of the remediation activities defined in the Consent Agreement between the Colorado Department of Public Health and Environment (CDPHE) and the LAC at the former Lowry Air Force Base (LAFB). It applies to IRG employees directly involved in coordinating and managing field activities on the LAFB. This HASP was prepared in accordance with applicable Occupational Safety and Health Administration (OSHA) standards and specifically addresses the requirements of 29 Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Operations and Emergency Response.

**1.1 Application**

Information regarding environmental conditions of the property was developed under the Air Force Installation Restoration Program (IRP) and conducted pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Defense Environmental Restoration Program (DERP) and other applicable Federal and state regulations. Specific clean-up operations are corrective actions covered by the Resource Conservation and Recovery Act of 1976 (RCRA) issued by the Colorado Department of Public Health and Environment (CDPHE) as consent orders. The OSHA 1910.120 standard applies to clean-up operations conducted under these standards.

Extensive site characterization and cleanup has been completed since the AFB closed in 1994. Environmental cleanup of the groundwater and closure of the landfill were privatized in August 2002; cleanup of the remaining soil issues were privatized in 2005. These activities are managed by the Lowry Redevelopment Authority (LRA) and its contractor, LAC. LAC is responsible for the property restoration and identification of additional environmental conditions during the course of development activities, pursuant to the Consent Agreement effective December 22, 2006.

**1.2 Purpose**

The purpose of this HASP is to describe chemical and radiological hazards historically present on the site and to provide control measures and procedures for protecting IRG field personnel assigned to the LRA project. This plan has been developed for IRG employees working on the LAFB only. IRG employees are responsible for coordinating and managing field activities associated with the redevelopment of the former base property for residential and commercial use.

Specific remediation and redevelopment tasks are subcontracted as redevelopment progresses to firms with applicable expertise. The majority of contracts associated with the redevelopment efforts are construction-related. This plan does not apply to these tasks or to subcontractor

employees. Subcontractors are required to develop and comply with their own HASP that protects their employees from site hazards.

IRG field activities associated with this site include general oversight of subcontractor tasks. Generally, this involves ensuring that subcontractors are complying with the specifications of their contract. In addition, IRG field personnel will assess unanticipated environmental hazards if encountered by subcontractors. They may also characterize unanticipated hazards through sampling when it is safe to do so. Unique hazards, such as unexploded ordnance (UXO), will be sampled and abated only by qualified contractors.

This plan specifically addresses:

- Potential hazards that may be encountered during redevelopment tasks,
- Responsibilities of key project personnel for the health and safety of employees and the public from potential site hazards and for identifying and minimizing risks from hazards through communication and the implementation of appropriate controls,
- Training for site employees including the specific requirements of this HASP and other necessary programs to ensure that they can appropriately anticipate, identify and control exposures to site hazards,
- Exposure monitoring requirements for assessing site hazards and protecting site personnel and the public,
- Area monitoring requirements for ensuring that site hazards do not migrate from designated work zones,
- Emergency response procedures for anticipated or unexpected hazards or hazardous situations, and
- Safety guidelines needed to protect site personnel, visitors, and the public from physical and environmental hazards associated with redevelopment tasks.

## **2.0 SITE DESCRIPTION**

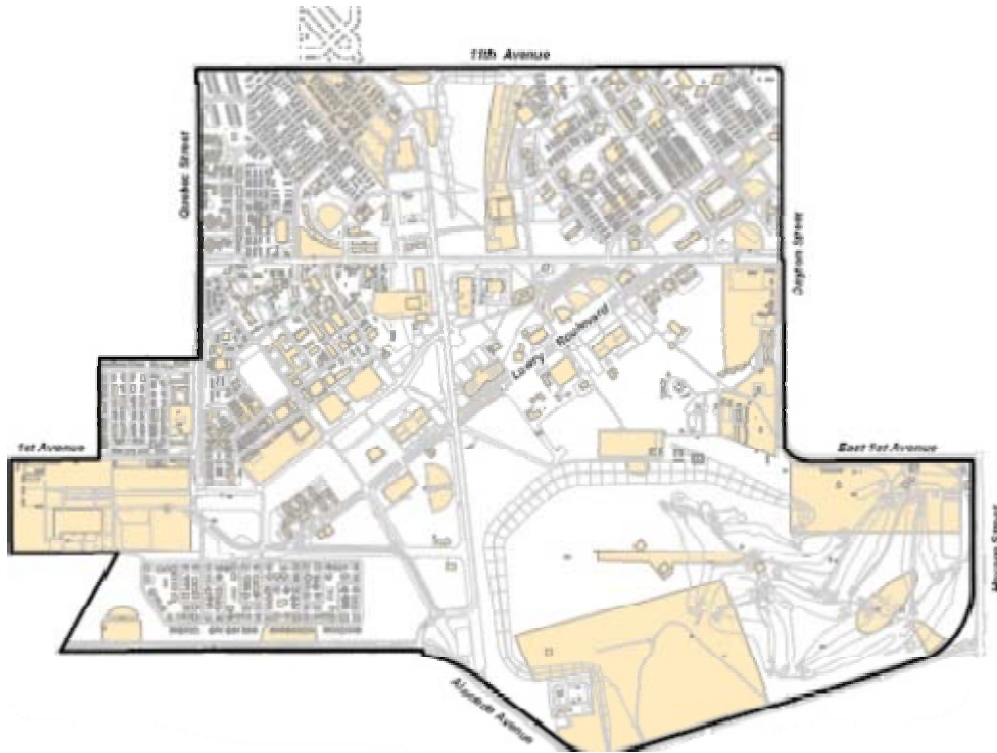
LAFB is located approximately five miles southeast of downtown Denver. It covers approximately 1,866 acres and is generally located between Quebec Street to the west, Eleventh Avenue to the north, Dayton Street and Havana Street to the east and Alameda Avenue to the south. More than half of the property is located in the city of Denver (Denver County) and the remainder in the city of Aurora (Arapahoe County). A site map is provided as Figure 1.

### **2.1 Site History**

LAFB was established as a technical training facility for the Army Air Corps Technical School in 1937. It was scheduled for permanent closure under the Base Realignment and Closure (BRAC) Act of 1988 and the Defense Base Realignment and Closure Act of 1990. It was formally closed on September 30, 1994. Tasks and facilities associated with the former base included:

- aircraft storage and maintenance,
- waste disposal (landfill areas, hazardous waste storage, and a fly ash disposal area),
- vehicle maintenance and storage,
- medical and dental clinics,

- aircraft and vehicle fueling,
- coal storage areas,
- housing,
- classroom facilities,
- administration buildings,
- recreation areas (swimming pools, ball fields, and golf course), and
- warehouse facilities.



**Figure 1: Lowry Site Map** (from Final Executive Summary, January 2005, RCRA Facility Assessment Report)

Chemicals were utilized for many of these activities in accordance with standard practices at the time. Chemical substances were also used as part of training programs. Training programs, which in some cases used dummy chemicals, involved the following:

- armament,
- chemical warfare,
- fire fighting,
- flight and avionics,
- missiles,

- ordnance,
- photography, and
- Precision Measurement Equipment Laboratory (PMEL).

Current response actions include the Fire Training Zone soil remediation, the Outdoor Firing Range soil and lead remediation, asbestos soil removal at Building 670, closure of the 75-acre base landfill located at the south-central portion of the base, groundwater remediation and monitoring at Building 606, mercury remediation at Building 898, abandonment of former water supply wells at Buildings 950 and 1435, investigations of two septic tanks/leach fields, and asbestos in soils investigation and cleanup in the Northwest Neighborhood (Final RFA Report, January 2005).

### **3.0 ORGANIZATION AND RESPONSIBILITIES**

LAC is committed to providing a safe work environment for IRG and its employees. All site personnel are responsible for understanding the safety requirements established for this site and discussed in this plan. Key site personnel are identified in Figure 2.

#### **3.1 Program Manager**

The Lowry Program Manager is ultimately responsible for the safety of site employees and for protecting the public and the environment from hazards associated with project tasks. The Program Manager is also responsible for ensuring that adequate resources are available for necessary safety controls. The Program Manager will ensure that subcontractors comply with the specified requirements of their contracts and that IRG tasks are conducted in accordance with established procedures in this HASP and other applicable sound safety practices.

#### **3.2 Project Manager**

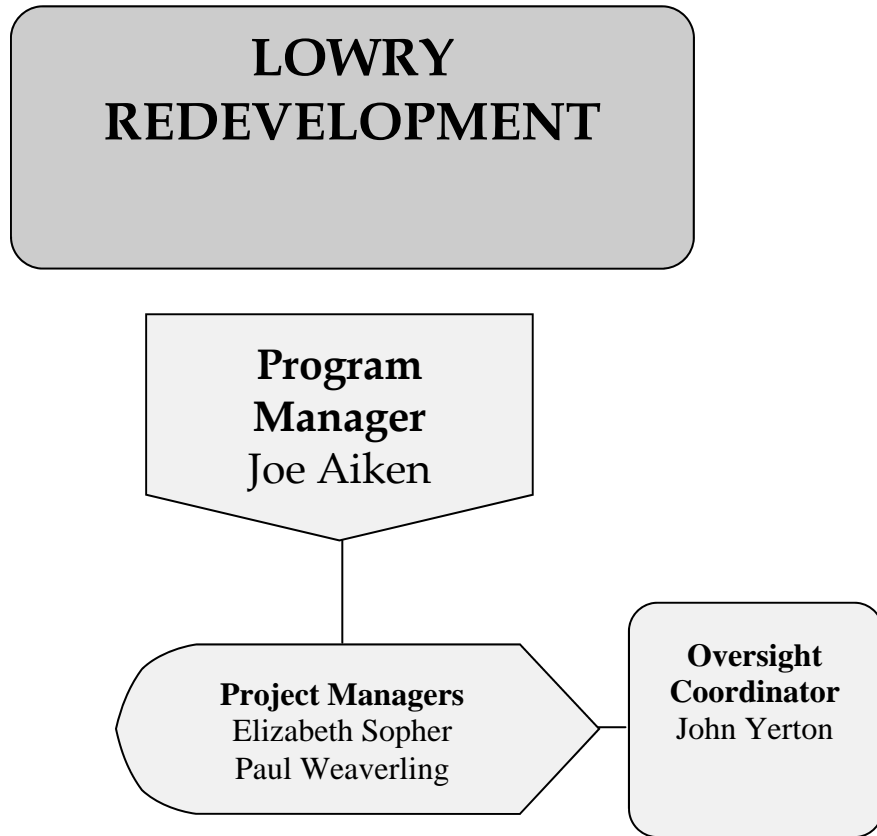
The Project Manager (PM) is responsible for approving this site-specific HASP and any revisions or addendums to the plan. The PM is also responsible for implementing the HASP and ensuring that adequate resources are available as needed for controls specified in the HASP.

#### **3.3 Oversight Coordinator**

The Oversight Coordinator or designate will be on site for invasive ground activities in designated areas of the site where the potential for exposure to contaminated soil, ground water or debris exists. The Oversight Coordinator will ensure that subcontractors perform work in accordance with safe work procedures, that airborne contaminants are controlled, and that the surrounding population and environment are protected.

#### **3.4 Visitors**

All visitors will be escorted by an IRG employee or designate in controlled areas during tasks where the possibility of exposure to hazardous substances exists. Prior to accessing these areas, visitors will be informed of the hazards that may exist and read the relevant portion of the HASP. Following the safety briefing, they will sign the appropriate form (see Appendix A) acknowledging that they are aware of the hazards and will follow safety procedures for the controlled location.



#### 4.0 HAZARD ASSESSMENT

Due to the historical use of Lowry property as a former Air Force Base, chemical and radiological hazards have been investigated on the site. Significant characterization data is available from both historical records and samples (i.e., soil, groundwater, surface water and air) obtained during site investigation and cleanup efforts. Characterization data provides information on both the location of potential contaminants and anticipated concentrations.

The following specific hazards potentially exist and may be encountered on the site as the redevelopment continues.

- Petroleum
- Chlorinated solvents
- Oil/grease
- Coal
- Fly ash
- PCBs
- Friable and non-friable asbestos
- Lead
- Metals
- PAHs
- Pesticides

- **Mercury**

During the investigations, most of these contaminants have been identified in the soil or ground water in isolated areas and response actions have been performed or are planned where necessary. Contaminants were typically present in the soil and ground water in the parts per million (ppm) range. Sludge has been identified in septic tanks and oil/water separators. Similar concentrations have been identified in sludge samples. Many substances in the above list are not volatile; they present a more significant hazard as an airborne dust than as a vapor. Suppression of airborne dust will significantly minimize or prevent exposure to many site contaminants if they are identified in the future.

The ground water elevation varies across the site from approximately 8 to 60 feet below the ground surface. Contact with ground water is not anticipated during most excavation or trenching tasks. However, contaminated ground water may be encountered in the Lowry East section due to the shallow ground water elevation in this area. Adequate controls, including air engineering controls, monitoring and the use of PPE, will be utilized for utility or trenching operations reaching depths at or near the ground water level in areas overlying contaminated ground water where appropriate.

This section discusses hazards associated with contaminants historically identified on this site. Toxicological risks vary and health affects depend on the degree and extent of exposure.

#### **4.1 Petroleum - Hazards and Controls**

Health effects associated with exposure to petroleum vary and depend upon the route of exposure, formulation of the material, and the level and duration of exposure. Potential routes of exposure associated with Lowry site tasks include skin contact and inhalation of volatilized petroleum constituents. Ingestion of contaminated material is less likely but can occur through poor industrial hygiene practices such as smoking or eating with soiled hands.

Acute health effects associated with petroleum exposure include irritation of the eye, skin, and mucous membrane. Health effects become more pronounced with increasing concentrations and can include nausea, headache, fatigue, and dizziness; unconsciousness can occur at very high concentrations. Dermatitis is associated with repeated exposure of the skin to petroleum. Organs affected by gasoline exposure include the eyes, skin, respiratory system, central nervous system (CNS), liver, kidneys. Benzene, a common constituent of gasoline, is a known human carcinogen associated with leukemia.

Volatilized petroleum presents a serious fire hazard. The explosive limits are about 1.4% and 7.6% (formulations vary) and the flash point is about -50°F. The vapor density of petroleum is three to four times heavier than air further increasing the exposure and fire risk in enclosed areas. It is also not miscible with water (low ppm range) and is less dense allowing it to separate and collect on water surfaces.

Petroleum may be encountered in soil, ground water or in closed containers such as drums or underground storage tanks. The potential for vapor inhalation exists in all circumstances. Exposure to petroleum vapors from contaminated soil at concentrations anticipated on the

Lowry site can usually be controlled by standing or working up wind. The odor threshold of gasoline is about 0.3 ppm, well below published exposure limits (see Table 1), allowing it to be readily detected at low concentrations.

**TABLE 1: PETROLEUM EXPOSURE LIMITS**

Substance	OSHA PEL/ACGIH TLVs				
	8-Hour Time Weighted Average	Short-Term Exposure Limit	Acceptable Ceiling Concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
				Concentration	Maximum Duration
Benzene	1 ppm/0.5 ppm	5 ppm/2.5 ppm	-	-	-
Ethylbenzene	100 ppm/100 ppm	none/125 ppm	-	-	-
Gasoline	none <sup>1</sup> /300 ppm	none <sup>1</sup> /500 ppm	-	-	-
MTBE	none/50 ppm	none	-	-	-
Naphthalene	10 ppm/10 ppm	none/15 ppm	-	-	-
Toluene	200 ppm/50 ppm	none	300 ppm	500 ppm	10 minutes
Total inorganic lead	50 µg/m <sup>3</sup> /50 µg/m <sup>3</sup>	none	-	-	-
Xylene	100 ppm/100 ppm	none/150 ppm	-	-	-

<sup>1</sup>OSHA no longer publishes a Permissible Exposure Limit (PEL) for gasoline and/or petroleum distillates. Their current policy states that “the composition of these materials varies greatly and thus a single Threshold Limit Value (TLV) for all types of these materials is no longer applicable. The content of benzene, other aromatics and additives should be determined to arrive at the appropriate TLV.”

Exposure to petroleum constituents will be controlled through the use of personal protective equipment (PPE), air monitoring and administrative controls. Site tasks with the highest potential for petroleum exposure include sampling of tanks or other bulk containers or entry into excavations with petroleum-contaminated soil. Neither of these tasks is anticipated but may occur as redevelopment progresses. Controls will be utilized to ensure that exposure levels are maintained below published exposure levels.

PPE is required for tasks where petroleum product or contaminated media such as soil or groundwater may be encountered. The use of respirators is not anticipated but may be warranted in enclosed spaces or when sampling concentrated product in bulk containers. A Job Safety Analysis will be developed for any task warranting the use of a respirator. Nitrile or Viton gloves will be utilized when handling petroleum contaminated media.

Monitoring will be conducted during tasks which may result in exposure to petroleum vapors. See Section 8.0 for air monitoring actions levels.

#### **4.2 Chlorinated Solvents - Hazards and Controls**

Several chlorinated hydrocarbons have been identified in soil and groundwater on the site including perchloroethylene (PCE), trichloroethylene (TCE), and 1,2-dichloroethane (DCA). The likely routes of exposure to chlorinated solvents include inhalation, ingestion and direct contact with the skin or eye.

The toxicity of chlorinated solvents varies; many affect the CNS and some are identified as carcinogens. PCE can affect the CNS and cause irritation of the skin, eyes, and upper respiratory tract. TCE can depress the CNS, affect kidneys, liver, and lungs and can cause rapid and irregular heartbeat. Toxic effects are increased when combined with alcohol, caffeine, and other drugs. DCA can cause CNS depression and damage to the liver, kidneys, heart, and digestive system. Eye contact with DCA can cause irritation and serious injury if not removed promptly.

DCA and TCE are flammable liquids; the LEL of both solvents are approximately 6% and their flash points are less than 100°F. PCE is not considered flammable. These chlorinated solvents are only slightly soluble in water.

Exposure levels will be maintained below OSHA PELs as shown in Table 3. Colorimetric tubes will be used in situations where chlorinated solvents may be encountered. A standard photoionization detector (PID) equipped with a 10.6 eV lamp will not ionize several of these chlorinated solvents and, thus, cannot be used for detecting their presence. A PID equipped with an 11.7 eV lamp is required to detect these contaminants. Air monitoring action levels are included in Section 8.0.

**TABLE 2: CHLORINATED SOLVENT EXPOSURE LIMITS**

Substance	OSHA PEL (ppm)			
	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum duration
1,2-DCA	50	100	200	5 min in any 3 hrs
TCE	100	200	300	5 min in any 3 hrs
PCE	100	200	300	5 min in any 2 hrs

Viton gloves will be used when sampling or handling media contaminated with chlorinated solvents. The use of air purifying respirators is not recommended for some chlorinated solvents since the odor threshold is not an adequate warning property for cartridge saturation.

#### 4.3 Coal Dust - Hazards and Controls

Chronic inhalation of coal dust can directly affect lung function. Exposure to airborne levels of coal dust at or above the OSHA PEL (2 mg/m<sup>3</sup>) is not anticipated on the Lowry site. Basic controls will be implemented when working at or in the vicinity of the former coal storage yard to ensure that the airborne dust is controlled through suppression measures. Nitrile or latex gloves will be worn for sampling tasks.

#### 4.4 Fly Ash - Hazards and Controls

The fly ash present on the site has been characterized through analysis; hazardous constituents detected in the fly ash include coal tar pitch volatiles, pesticides, boron and selenium. Specific coal tar pitch volatiles include anthracene, chrysene, fluorene and phenanthrene. Exposure to anthracene, chrysene and phenanthrene is regulated by OSHA at 0.2 mg/m<sup>3</sup>. Exposure to coal tar pitch volatiles can irritate the skin. Target organs include the kidney, lung and skin. Coal tar pitch volatiles are also considered a potential carcinogen. Potential exposure levels associated with concentrations detected in the fly ash are not anticipated to reach or exceed OSHA PELs.

Pesticides detected in the fly ash include aldrin, delta-BHC (lindane), heptachlor and methoxychlor. The primary acute toxic action of organochlorine pesticides is on the nervous system. They can be absorbed through the skin. Pesticide-contaminated dust particles trapped in respiratory mucous, when swallowed, can be absorbed in the gastrointestinal tract.

Selenium is a trace mineral; it is needed in small amounts for good health. However, exposure to higher concentrations can result in neurological effects. Short-term oral exposure to high concentrations of selenium may cause nausea, vomiting, and diarrhea. Chronic oral exposure to high concentrations can cause hair loss, nail brittleness, and neurological abnormalities.

Boron is a trace mineral. It is not considered toxic except at high concentrations.

The following table includes the OSHA PELs for individual constituents detected in the fly ash.

**TABLE 3: FLY ASH CONSTITUENT EXPOSURE LIMITS**

Constituent	OSHA PEL/ACGIH TLV (mg/m <sup>3</sup> )
Anthracene	0.2/0.2
Chrysene	0.2/0.2
Fluorene	none
Phenanthrene	0.2/0.2
Aldrin	0.25 (skin)/0.25 (skin)
delta-BHC	0.5 (skin)/ 0.5 (skin)
Heptachlor	0.5 (skin)/0.5 (skin)
Methoxychlor	15 (total dust)/10
Boron (oxide)	15 (total dust)/10
Selenium	0.2/0.2

Exposure to constituents in the fly ash will be controlled through dust suppression measures. Table 4 identifies the maximum concentrations of individual constituents detected on the Lowry site and the airborne concentration of soil needed to reach the OSHA PEL. The airborne dust levels identified in Table 4 are significant and would impair visibility at a close range.

**TABLE 4: HAZARDOUS CONCENTRATIONS OF AIRBORNE DUST**

Constituent	Maximum Concentration (mg/kg in soil)	Airborne Dust Concentration at PEL
Anthracene	0.2	>1,000
Chrysene	0.45	>1,000
Phenanthrene	1.0	>1,000
Aldrin	0.00029	>1,000
delta-BHC	0.00048	>1,000
Heptachlor	0.0017	>1,000
Methoxychlor	0.002	>1,000
Boron (oxide)	91.5	>1,000
Selenium	2.9	>1,000

**4.5 Polychlorinated Biphenyls - Hazards and Controls**

PCBs may be present on the Lowry site in soil and groundwater (solubility is approximately 70 ppb) in isolated locations. PCBs were also identified in concrete rubble and a grease trap associated with Building 402. Health effects associated with exposure to PCBs include eye irritation, chloracne, liver damage and reproductive effects. PCBs have a very low vapor pressure, but can volatilize. Exposure routes include inhalation, ingestion and skin contact. Contaminated soil can be inhaled or ingested as airborne dust. Exposure levels will be maintained below OSHA PELs as shown in Table 5.

**TABLE 5: PCB EXPOSURE LIMITS**

Constituent	OSHA PEL ACGIH TLV mg/m <sup>3</sup>
Chlorodiphenyl (42% chlorine)	1 (skin)/1 (skin)
Chlorodiphenyl (54% chlorine)	0.5 (skin)/0.5 (skin)

Generation of airborne dust during excavation or other invasive ground activities in areas where PCBs have been identified will be controlled through dust suppression measures. Neoprene, butyl rubber or Viton gloves will be worn for sampling tasks.

**4.6 Friable and Non-friable Asbestos - Hazards and Controls**

Asbestos has been identified on the Lowry site primarily from building demolition and the resulting debris. Friable and non-friable asbestos has been found during excavation or other soil preparation tasks. Asbestos exposure is associated with lung disease including asbestosis, mesothelioma, and lung cancer. Asbestos can also irritate the eyes.

Generation of airborne dust during excavation or other invasive ground activities in areas where asbestos has been identified will be controlled through dust suppression measures. Non-friable asbestos, when identified during these tasks, will be collected and disposed of in accordance with State requirements. Friable asbestos will be abated in accordance with the Asbestos Soil Characterization and Management Plan and applicable Colorado standards. Air

monitoring will be conducted around the perimeter of tasks where friable asbestos has been identified. Latex or nitrile gloves will be worn for sampling tasks.

#### **4.7 Metals**

Lead and mercury have been identified in isolated locations on the Lowry site. Lead has been detected in soil samples at the former Outdoor Firing Range. Mercury has been encountered in buildings housing former dental clinics. Significant abatement and subsequent sampling of mercury has been completed.

Exposure to lead can affect the gastrointestinal system, blood, CNS and neuromuscular system. Exposure can be controlled through dust suppression techniques. The OSHA PEL for elemental lead is 0.05 mg/m<sup>3</sup>. Dust will be controlled during all excavation or other ground invasive activities to prevent exposure by this route.

Mercury can be absorbed through the skin, inhaled or ingested. Target organs include the kidneys, CNS and respiratory system. OSHA publishes a ceiling PEL for mercury of 0.1 mg/m<sup>3</sup> and specifies that an employee's exposure cannot exceed this limit.

Although the vapor pressure of mercury is low, it can volatilize. Volatilization is a function of temperature. Volatilization can be minimized by keeping the temperature in controlled abatement areas as low as possible. Volatilized mercury can be monitored on a real time basis with a mercury vapor analyzer or with colorimetric tubes and will be monitored as warranted.

#### **4.8 Radiological Hazards**

Extensive sampling and monitoring has been completed on the site to identify and characterize radiological hazards. There have been no radiological hazards identified on the site. Measured levels are associated with naturally occurring isotopes for Colorado and not with former usage or activities on the site.

#### **4.9 Unexploded Ordnance/Weapons**

IRG employees are not responsible for weapons or UXO hazards. UXO will be handled by a specialty contractor to LAC or by the Air Force, depending where they are found. All suspect nuclear, biological, chemical or other weapons will be handled directly by the Air Force. Contact information is provided in Section 10.0.

#### **4.10 General Site Hazards and Controls**

Numerous physical hazards may be present on site. Sound safety practices will be used to prevent injuries to site personnel. General hazards include slips, trips, falls, cuts, and abrasions. Mechanical hazards include entrapment or being struck by moving parts of heavy equipment or falling objects. Adequate distances will be maintained between personnel and rotating or moving mechanical equipment. Work areas will be maintained clean and free of debris that could cause slips, trips or falls including hoses and electrical cords.

Electrical hazards include contact with power lines during excavation or drilling activities. A minimum of at least 20 feet clearance will be maintained between drilling equipment and

overhead power lines. All equipment will be properly locked and/or tagged out when required by the Energy Lockout/Tagout Program.

Traffic cones and/or barricades will be used to maintain safe distances between vehicular traffic and work locations. Employees will wear orange traffic safety vests when work locations close to moving vehicular traffic cannot be avoided.

Colorado One-Call (1-800-922-1987) will be contacted and informed of scheduled field activities at least 48 hours prior to any drilling. The locator company will identify all underground utilities (e.g., electrical, gas, sewer, water, telephone, cable TV) that are present in the work area and notify their respective owners. Probing to a depth of 5 feet will be done where feasible to ensure no utilities, lines or tanks are in the way prior to drilling or excavating activities.

Heat stress precautions will be followed by IRG personnel when working during period of high ambient temperatures (especially in conjunction with high humidity). Adequate cool water and/or electrolyte-replacement beverages (e.g., Gatorade) should be available on site. Employees will be instructed to take frequent breaks out of direct sunlight and to remove protective clothing during breaks. The frequency of rest breaks will be increased if the resting pulse does not return to normal during the break period. Work schedules will be altered so that work may be conducted during cooler parts of the day (i.e., early morning or evening) when possible.

Symptoms of heat exhaustion and heat stress include:

- heavy sweating or complete cessation of sweating,
- changes in skin color,
- increased respiration,
- vision problems,
- dizziness,
- confusion,
- nausea,
- body temperatures in excess of 100°F, and
- increased heart rate.

Personnel exhibiting these symptoms will be removed immediately from the area and observed while resting in a shaded area. Impervious or restrictive clothing will be removed and the individual will be instructed to drink cool water or electrolyte-replacement fluid. Medical attention will be sought if symptoms persist.

The following hypothermia precautions will be followed when working in cold temperatures:

- Work breaks will be taken in a wind-sheltered area.
- Removable layers of insulated clothing will be worn to prevent sweating.
- Water-proof gear will be used when needed.
- Warm fluids will be available for drinking.

- Workers will be monitored for signs of shivering, incoordination, or confusion. Workers exhibiting these signs will be removed from the work area and allowed to warm up in a heated warming shelter.

Frost-bite (superficial or deep tissue) can occur on any exposed skin at temperatures of 30.2°F or colder. Employees will be instructed to wear adequate clothing to prevent hypothermia or frostbite (which can occur on any exposed skin).

## **5.0 TRAINING REQUIREMENTS**

All IRG employees working on the Lowry Redevelopment site with field responsibilities and that may be exposed to potentially hazardous chemicals during the course of their work will be adequately trained. Training will meet the requirements of 29 CFR 1910.120 including the OSHA 40-hour HAZWOPER course and annual refresher training. The Project Manager and Oversight Coordinator training will also include the 1910.120 Supervisor course. The Oversight Coordinator will be current in CPR/First Aid.

Prior to working on the Lowry site, IRG field employees will read the site HASP and participate in a safety briefing that addresses the following:

- Job responsibilities,
- Anticipated hazards,
- Required training,
- Emergency response procedures,
- Route to hospital,
- Availability and location of emergency equipment such as first aid kit, eye wash, and fire extinguishers,
- Access control points when relevant, and
- Proper use and location of PPE.

IRG field personnel will participate in contractor tailgate safety meetings as follows:

- Conditions warrant air monitoring, and
- Hazards are suspected based on historical information.

## **6.0 PERSONAL PROTECTIVE EQUIPMENT**

Personal protective equipment will consist of Level D protection for most tasks. For any task requiring respiratory protection, a separate Job Safety Analysis will be written. When accessing construction areas, personal protective equipment will include steel-toed work shoes/boots, cotton coveralls or long-sleeved shirts and long pants, and eye protection. A hard hat, hearing protection, and gloves will be used as needed. Hard hats will be required in construction areas or for any task with overhead hazards. Hearing protection will be utilized as follows:

**TABLE 6: HEARING PROTECTION ACTION LEVELS**

Noise Level	Protection
< 85 dBA	Wear hearing protection when it is necessary to raise voice to be heard at distance of 3 feet.
85 - 90 dBA	<b>Hearing protection required.</b> Install warning signs for fixed noise sources. Employer must have Hearing Conservation Program when employee noise exposures equal or exceed an 8-hour TWA of 85 dBA.
> 90 dBA	<b>Hearing protection required.</b>

If monitoring equipment or site conditions indicate the need to upgrade the level of protection to Level C, air-purifying respirators with organic vapor canisters (or other appropriate cartridges), Tyvek coveralls, Viton or other appropriate gloves, and disposable boot covers will be donned. This information will be specified in the written Job Safety Analysis.

## 7.0 MEDICAL SURVEILLANCE

OSHA requires that “all employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year or all employees who wear a respirator for 30 days or more a year” participate in a medical surveillance program. There are also other substance-specific OSHA standards (e.g., benzene) that require medical surveillance. None of these criteria are anticipated on the Lowry site. Employees will not participate in a medical surveillance program unless conditions change warranting a modification to the program.

Medical (emergency, hearing, etc.) and exposure monitoring records will be maintained in accordance with applicable standards. Employees and their representatives can access their records in accordance to 29 CFR 1910.1020.

## 8.0 AIR MONITORING

Air monitoring will be used to ensure that exposures to airborne hazards are identified and controlled. Air surveys will also be conducted to identify hazardous atmospheres such as those with insufficient oxygen or flammable vapors. Air monitoring is required when the potential for an exposure or hazardous atmosphere exists. Historical site characterization data will be evaluated to identify potential hazards in specific areas. Work areas with potentially hazardous atmospheres will be cordoned off and access to the area will be restricted.

Monitoring equipment will be maintained and calibrated in accordance with manufacturer’s recommendations. Personnel utilizing the monitoring equipment will be adequately trained in the proper calibration and use of the instruments and in the accurate interpretation of monitoring results.

### 8.1 Organic Vapors

Organic vapor surveys will be conducted with a photoionization or flame ionization detector (PID or FID). The PID will be equipped with a 10.6 or 11.7 eV lamp. The 10.6 eV lamp is

adequate for many organic vapors including most petroleum constituents. However, most chlorinated solvents require the use of either an FID or PID equipped with an 11.7 eV lamp. For air monitoring tasks where chlorinated solvents are suspected, the 11.7 eV lamp will be used.

Colorimetric tubes will be utilized to identify suspected contaminants when elevated readings persist on the PID or FID. Benzene tubes will be utilized when petroleum is suspected or contaminants are unknown. Perchloroethylene tubes will be used to screen for chlorinated solvents. Colorimetric tubes or a real-time monitor will be used when mercury is suspected. Additional tubes will be utilized if other specific contaminants are identified through characterization data or historical records.

Survey instruments will be used to determine the source of the airborne hazard and to protect workers from exposure. Sources will be identified by monitoring close to suspected locations such as contaminated soil or water. Monitoring will be conducted upwind to identify background concentrations. Worker exposure levels will be assessed by evaluating contaminant concentrations in the breathing zone.

## **8.2 Airborne Dust**

Generation of airborne dust will be controlled below visible levels through dust suppression techniques such as water spray. Data presented in Table 4 indicates that significant levels of airborne dust would have to be generated to reach published exposure levels for specific constituents. Routine dust monitoring is not warranted based on identified contaminant levels. Specific locations may warrant monitoring based on characterization data and will be determined by the Oversight Coordinator.

## **8.3 Combustible Gases**

Explosive gases will be evaluated with a combustible gas indicator. Tasks warranting combustible gas monitoring include drilling, monitoring well installation, and container/tank sampling. The action level for combustible gases is 10% of the lower explosive limit. If combustible gases at concentrations greater than the action level are identified, work will stop until the concentration dissipates through natural or forced ventilation.

## **8.4 General Considerations**

All instruments will be calibrated in accordance with manufacturer's recommendations and prior to starting work. Calibration information will be recorded in the logbook. Weather conditions will also be noted. Background readings will be taken upwind of the work area. Sources contributing to the airborne contaminant level will be identified.

Exposures will be maintained below published exposure levels through the use of air monitoring and adequate controls. The action levels specified in Table 7 were developed for use during excavating, trenching, or other invasive ground work. The use of air monitoring instrumentation and specified action levels will be used when airborne hazards are present or suspected. If contaminants can not be adequately characterized in the field, work will stop until airborne levels return to background or additional characterization data is obtained.

**TABLE 7: ACTION LEVELS FOR AIR MONITORING INSTRUMENTATION**

<b>Instrument</b>	<b>Breathing Zone Reading</b>	<b>Action Taken</b>
PID or FID for VOCs	Background - 2.5 ppm	<b>Level D</b> work may continue.
	2.5 - 10 ppm	Collect benzene detector tubes if petroleum is suspected.
	10 - 500 ppm	<b>Leave area.</b> Contact Project Manager if contaminant levels do not dissipate. Don air-purifying respirator with organic vapor canisters in accordance with Job Safety Analysis.
Benzene Colorimetric Detector Tubes	0 - 0.5 ppm	<b>Level D.</b> Work may continue.
	0.5 - 10 ppm	<b>Leave area.</b> Contact Project Manager. Don air-purifying respirator with organic vapor canisters in accordance with Job Safety Analysis.
Perchloroethylene Colorimetric Detector Tubes (other halogenated hydrocarbons will give a response on tube)	0 - 5 ppm	<b>Level D.</b> Work may continue.
	> 5 ppm	<b>Leave area.</b> Contact Project Manager.
Combustible Gas Meter	<10% of LEL	<b>Continue working.</b> Evaluate exposure levels to determine adequate respiratory protection.
	>10% of LEL	<b>Stop work and evacuate.</b> Eliminate all ignition sources and increase monitoring frequency. Ventilate work area.

Sampling of closed tanks or containers presents a unique hazard; contents may be under pressure presenting an increased inhalation risk. Containers and tanks will be evaluated to determine whether characterization data exists. If the contents of a container are unknown, a Job Safety Analysis will be written to ensure that adequate safety controls are utilized for sampling.

Confined spaces also present a unique hazard that must be evaluated on a case-by-case basis. Entry into permit required confined spaces, as defined by OSHA, are not anticipated on this site. If identified, confined spaces will be adequately assessed prior to entry for hazardous atmospheres including toxic gases, combustibles gases and oxygen deficiency. A permit system will be used for any space meeting the criteria established by OSHA in 29 CFR 1910.146.

A separate air sampling program has been developed for airborne asbestos sampling. Asbestos sampling criteria and action levels are included in the Asbestos Soil Characterization and Management Plan (Appendix of Soil Management Plan).

## **9.0 DECONTAMINATION**

Decontamination areas will be established for equipment and personnel by contractors when warranted. IRG personnel will comply with work zones requirements when established by contractors in designated work areas.

Disposable boot covers, when used in areas where asbestos or other contaminants are present in the soil, will be disposed of with other contaminated debris when leaving the work area. Dirt or mud from construction sites will be removed from boots prior to leaving the site.

## **10.0 EMERGENCY RESPONSE**

Site emergencies are unexpected, sudden events that present an immediate threat to site personnel, the public or the immediate environment. Potential emergency situations include those associated with residential or commercial areas including fires, vehicle accidents, injuries, and weather incidents. In addition, significant construction is ongoing and in various stages of completion; hazards exist due to heavy equipment operation and working in close proximity to overhead power lines or buried utilities.

### **10.1 Emergency Reporting**

Any IRG employee identifying an emergency situation will immediately notify management personnel by contacting the site office. Immediate assistance will be requested as warranted via the 911 system for fire, medical, or police. Affected areas will be evacuated as warranted with the assistance of site personnel and emergency responders. Access into affected areas will be controlled to minimize risks. Immediate action is critical for minimizing the spread of the hazard or risk to the affected population.

When reporting an emergency, the following information should be conveyed to emergency responders:

- Name and number of person reporting incident,
- Location of incident,
- Nature of incident (fire, spill, medical emergency),
- Number of people involved,
- Hazardous material involved,
- Risk to surrounding population,
- Movement and direction of released materials,
- Quantity of hazardous materials involved,
- Controls and emergency measures currently implemented, and
- Other pertinent information or as requested.

### **10.2 Fire and Spill Response**

Emergency fire fighting services are available through Denver Fire Station 14, District 5 located at 1426 Oneida Street, Denver. Fire extinguishers are located in subcontractor trailers, company vehicles and mounted on heavy equipment. In the event of a fire or explosion, evacuate the site

immediately and call for emergency assistance. In case of a spill, contain with clean dirt, if possible, and call the local fire department or hazardous materials response (HAZMAT) unit.

### 10.3 Medical Assistance

Hospitals in the immediate vicinity include:

#### THE MEDICAL CENTER OF AURORA

The Medical Center of Aurora North  
700 Potomac Street  
Aurora, CO 80011  
Telephone: (303) 695-2600  
(near I-225 and 6th Ave.)

The Medical Center of Aurora  
1501 S Potomac Street  
Denver, CO 80012  
Telephone: (303) 695-2600  
(near I-225 and Mississippi)

#### UNIVERSITY HOSPITAL

Fitzsimmons Campus  
Colfax and Ursula  
Aurora, CO  
303-372-0000

9th & Colorado Campus  
4200 E. Ninth Ave  
Denver, CO  
303-372-0000

Maps to these facilities are included in Appendix B. Emergency medical services will be contacted via the 911 system.

### 10.4 Ordnance Response

Nuclear, biological and chemical UXO are the responsibility of the Air Force. Notify LAC management immediately, if any of these materials are suspected or identified. LAC will contact the Air Force representative, Paul Carroll at (806) 885-5010 or (806) 438-1429 (cell) to report the suspected material.

### 10.5 Emergency Equipment

A standard first aid kit and a portable eye wash is available in the LAC offices located in Building 667 at 765 Uinta Way and in the Oversight Coordinator's vehicle. These items are also available in subcontractor trailers and company vehicles. Supplies in the first aid kit are available for use in case of minor injuries.

### 10.6 Communication

Communication will be maintained between the site office and the Oversight Coordinator via a cell phone. Site and emergency numbers are as follows:

Program Manager, Joe Aiken	(303) 972-6633
Project Manager, Elizabeth Sopher	(303) 326-7103
Oversight Coordinator	
Site Office	
Fire	911
Ambulance	911
Police	911

**APPENDIX A**  
**FORMS**





**APPENDIX B**  
**ROUTES TO AREA HOSPITALS**

## The Medical Center of Aurora North

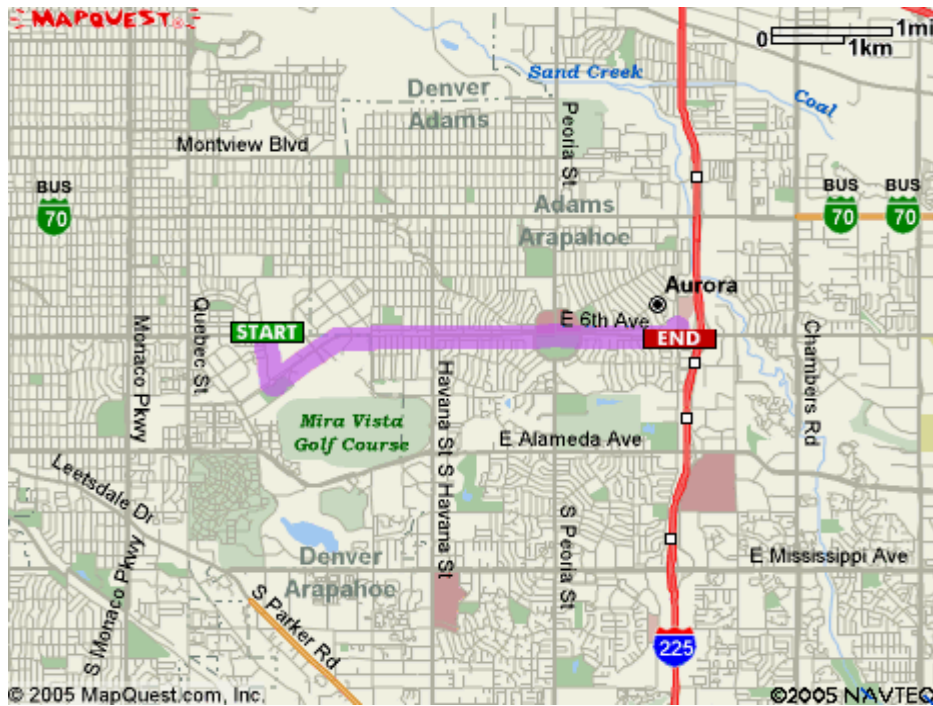
700 Potomac Street

Aurora, CO 80011

Telephone: (303) 695-2600

(near I-225 and 6th Ave.)

**Directions:** East on East 6<sup>th</sup> Avenue for approximately 2.5 miles, North on Potomac for less than 0.5 miles.



## The Medical Center of Aurora

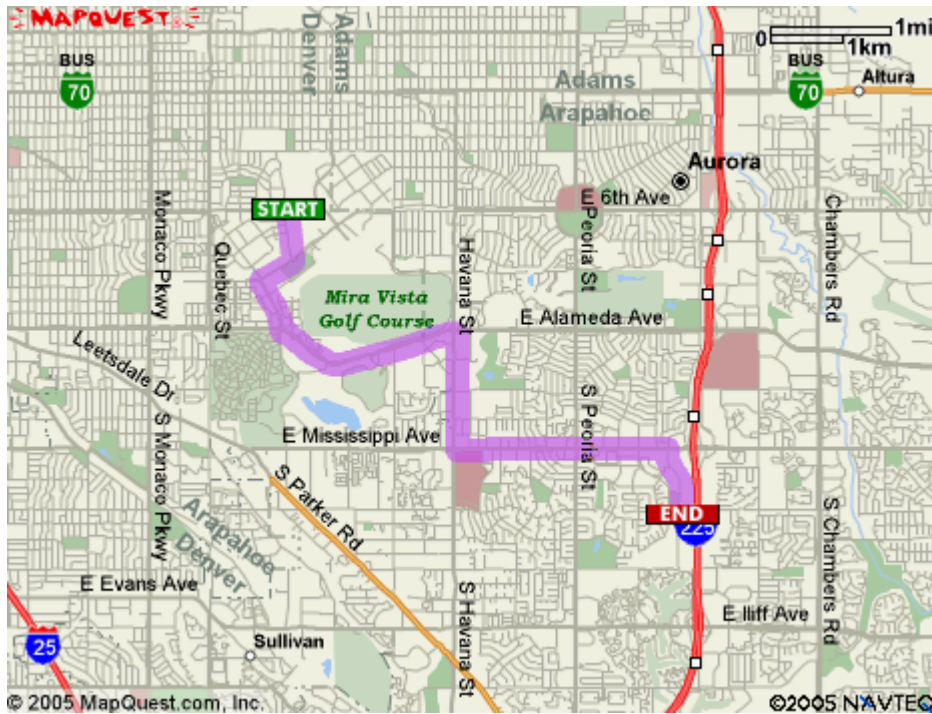
1501 S Potomac Street

Denver, CO 80012

Telephone: (303) 695-2600

(near I-225 and Mississippi)

**Directions:** East on East Alameda Ave for 1.5 miles, South on South Havana St for 1mile, East on East Mississippi Ave for 1.7 miles, South on South Potomac for less than 0.5 miles.



# UNIVERSITY HOSPITAL

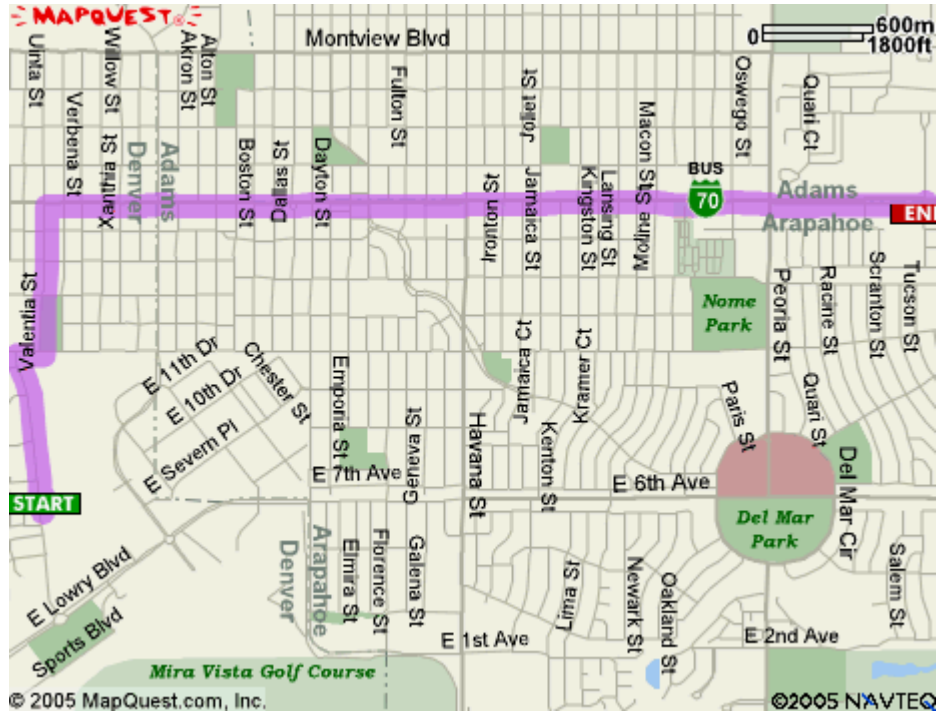
Fitzsimmons Campus

Colfax and Ursula

Aurora, CO

303-372-0000

**Directions:** East on Colfax Ave for 2.8 miles.



## UNIVERSITY HOSPITAL

9th & Colorado Campus

4200 E. Ninth Ave

Denver, CO

303-372-0000

**Directions:** West on 6<sup>th</sup> Ave for 2.2 miles, North on Dexter St for 0.3 miles, West on East 9<sup>th</sup> Ave for 0.2 miles.

