

Environmental Quality

Summary of Key Findings

Environmental quality has been a concern in Globeville and Elyria Swansea for many years due to historic metal smelting, heavy industry, two highways, and railroad yards. These activities have impacted air quality, odors, noise, and water and soil quality. Key findings include:

- **Air quality:** The neighborhoods are close to sources of air pollution from vehicles on I-70 and I-25, which carry approximately 150,000 and 250,000 vehicles per day respectively, and are the main sources of air pollution. Stationary sources such as industrial plants also impact air quality. Although average annual air pollution in the neighborhoods is not higher than other areas of Denver, at times the neighborhoods experience spikes in poor air quality depending on location, time of day, and weather. Additionally, the entire Denver metro area – which includes the neighborhoods – currently does not meet standards for ozone.
- **Odors:** Unlike most other Denver neighborhoods, a majority of the land in Globeville and Elyria Swansea consists of industrial and commercial businesses – over 70% in each neighborhood compared with 35% in Denver overall. Some of these industries often produce unpleasant odors that can cause short term health effects and longer term quality of life impacts, such as the ability to engage in outdoor physical activity.
- **Noise:** There are many sources of noise in the neighborhoods in close proximity to Globeville and Elyria Swansea residences and some close to sensitive uses, such as Swansea Elementary School. Sources of noise include highway traffic, freight trains, and industrial operations. Sometimes these noise levels exceed recommended federal thresholds and can cause residents stress and interfere with daily activities, such as the ability to sleep and for children to learn.
- **Water quality:** The stretch of the South Platte River that runs through the neighborhoods is downstream of downtown Denver, and can have poor water quality due to polluted urban runoff – particularly for E. coli levels, which are often above state standards during warmer weather. Recreational activities are the main source of water contact, although occasional, and outreach is being done to educate against contact with the water.
- **Soil quality:** Due to the impacts of historic smelting activity, the area has undergone two large soil cleanup projects in the last several decades. Cleanup of residential properties has largely been completed.

How the Neighborhood Plans Can Improve Environmental Quality

Future neighborhood design can improve environmental quality by well-planned separation or other means to buffer industrial uses from residential and other sensitive uses. Without such buffering, historic conflicts between uses are likely to continue in the future, causing air quality and odor issues for residents. Continued and improved monitoring of environmental conditions is needed, as well as current and future mitigations to improve environmental quality including noise and odors. Partnership with the major redevelopment projects is critical to improve environmental quality in Globeville and Elyria Swansea.



Air Quality in Globeville and Elyria Swansea Today

Air pollution comes from a variety of sources.

Stationary sources include industries such as factories, power plants, refineries, and dry cleaners. **Mobile** sources include cars, buses, planes, trucks, and trains. Other naturally occurring sources in the arid West are windblown dust and wildland fires. Air quality can vary based on location, time of day, and weather.

In Denver, mobile sources are the main source of air pollution. Stationary sources may also be contributors. Air pollution is both a local and regional issue, because pollutants emitted in one location can impact air quality near the source as well as tens to thousands of miles downwind.

The construction of Interstates 70 and 25 across Globeville and Elyria Swansea in the 1960s brought many more vehicles (mobile sources) through the neighborhoods. In addition, the presence of the highways brought more industrial businesses into the community. Combined, the highways and industries resulted in increased public health risk due to decreased air quality.

Regulations designed to reduce air pollution have been successful in dramatically reducing air pollution in Denver and elsewhere since the 1980s.¹ Cleaner cars and trucks, cleaner fuels, reduced wood burning, and cleaner factories have been responsible for much progress, as well. During the same time, however, Denver has seen a significant increase in the City's population and in vehicle miles driven, which can contribute to air pollution.

How Air Quality is Measured

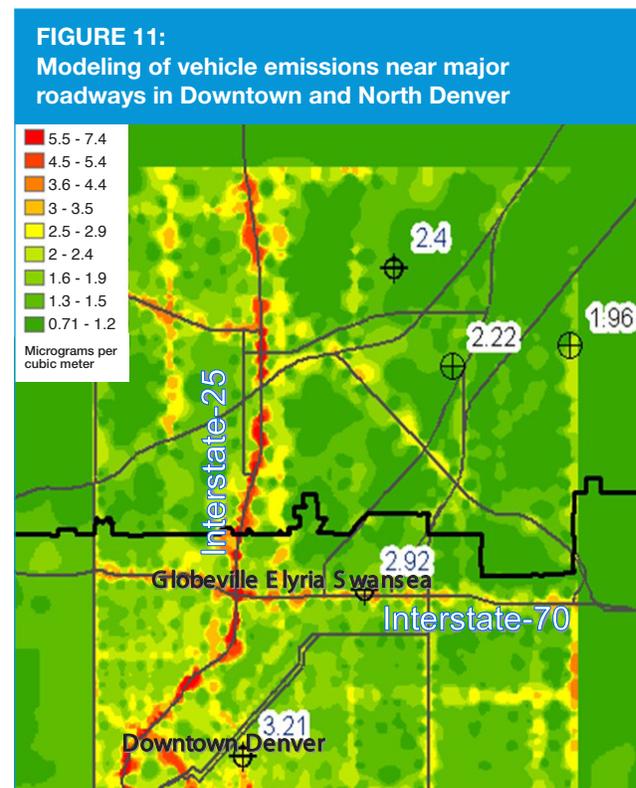
Air quality is measured in Denver through a combination of **monitoring** (measuring the contents of the air using instruments) and **modeling** (computer programs that use actual air quality measurements from some areas to predict air quality in other areas, and into the future). The City monitors air quality using regular monitoring with fixed monitors, as well as specialized monitoring at specific times and places. Pollutants that are regularly measured include fine particulate matter (small particles), ozone, carbon monoxide, and nitrogen oxides (all gases). For more information on how air quality is measured, see Appendices at www.denvergov.org/behealthydenver.

Air Quality in Denver Overall

Vehicle exhaust is the main source of air pollution in Denver. I-70 and I-25, which intersect in North Denver, carry 150,00² and 250,000³ vehicles per day, respectively. Within the Denver metro area, the highest concentrations of air pollution are near the downtown area (several miles south of Globeville and Elyria Swansea). Vehicle emissions are highest along I-25 near downtown, as is the traffic density within a one-mile radius of downtown Denver.

Lead and carbon monoxide concentrations in Denver have decreased significantly in recent years due to cleaner cars and trucks. Ozone, however, continues to be a problem both in Denver and in neighboring counties. Vehicles are a major contributor to ozone, and the Denver metro area is currently classified as not having met the federal standards for ozone.

Figure 11 below shows that air pollution is concentrated along I-25 and I-70, which go through North Denver, Downtown, and parts of Globeville and Elyria Swansea. This is based on modeling that uses one component of vehicle pollution. Globeville and Elyria Swansea are near the intersection of I-25 and I-70 just below the dark black line (the boundary of Denver) in the middle of the figure.



SOURCE: Denver Department of Environmental Health 2014

Air Quality in Globeville and Elyria Swansea

Overall, air quality in Globeville and Elyria Swansea is sometimes poor in particular areas or during what are known as “upset events” that are temporary but significant when they do happen. Details include:

- Air pollution from vehicles is highest near highways, but decreases rapidly within a few hundred feet of the highways.⁴ Within Globeville and Elyria Swansea, there are numerous homes within a few hundred feet of I-70 and I-25, as is Swansea Elementary School.
- Past studies have found slightly higher concentrations of certain solvent-related air pollutants in Elyria Swansea (e.g., benzene, toluene, ethylbenzene, xylenes) than at other air monitoring sites in metro Denver.⁵ This may be the result of the use of these solvents by commercial businesses in the area.⁶
- In North Denver, where Globeville and Elyria Swansea are located, stationary sources also affect air quality (including odors) in “upset events” that do not occur often and tend to be short-lived, but that can be significant when they do occur. For example, the Suncor refinery may have a planned “event” related to an industrial process and the community is normally notified in advance; or there may be emergency events such as flare-offs that occur occasionally and which temporarily affect air quality, particularly in terms of odors.
- The neighborhoods are among those with the lowest amount of tree cover in Denver, and lower than the City’s recommended minimum. Trees can improve air quality by absorbing carbon dioxide, carbon monoxide, and ground-level ozone, as well as producing oxygen.⁷ The inadequate tree canopy in the neighborhoods further magnifies the existing air quality impacts.

Is the air in Globeville and Elyria Swansea more polluted than other parts of Denver?

The average annual level of air pollution in Globeville and Elyria Swansea is not higher than other areas of metro Denver, for the air pollutants routinely measured. But North Denver neighborhoods are located closer to major sources of air pollution (e.g., refinery, powerplant, asphalt roofing manufacturer), and occasional spikes are noticeable and measurable. Residents have expressed concern about air quality, often due to strong odors in the air. One community member recently noted,

*“... contamination as well as the air pollution and odors from Purina and I-70 would be reasons that people would keep their children inside, not able to play. These also factor into the question about a safe place to exercise. People don’t want to walk or jog in impure air. A lot of residents said that they felt they could get cancer from the air...”*⁸

The perception of air pollution is often created by the presence of strong odors, which may or may not contain pollutants normally measured in outdoor air. (Odors are discussed in more detail in the following section).



Will air pollution get worse?

It is anticipated that air pollution will not get worse in Denver or in Globeville and Elyria Swansea. However, this will require a large ongoing effort from all stakeholders. In recent years, Denver has significantly reduced most types of air pollution. Our understanding of air pollution and health effects is also improving (both short- and long-term). Despite these improvements, ozone remains a regional problem even with reductions in pollutants that form ozone. Denver generally has lower ozone concentrations compared to sites in the suburbs, although it remains a problem in Denver, as well.

Most motor vehicles will continue to get cleaner as a result of recent and pending federal regulations. Statewide regulations such as the Renewable Portfolio Standard (RPS) and the Clean Air Clean Jobs Act will result in significantly cleaner electric generation over the next decade. As a result, further air pollution reductions are expected despite increasing population. The City and other agencies have begun several activities to improve air quality; see sidebar “Future activities to improve air quality in Denver.”

Future activities to improve air quality in Denver

During the end of 2014, the City's Department of Environmental Health (DEH) will update its modeling of air toxics using the most recent data available, from 2010-2011, and include forecasts for a future year such as 2025. This work should help to answer questions about the future of air pollution throughout Denver, especially after the build-out of several major transportation projects, such as I-70 and the regional rail transit system, known as FasTracks.

Also, before starting construction of the I-70 project, DEH will work with other agencies to best place air quality monitoring in the Globeville and Elyria Swansea neighborhoods, to measure any potential effects of the construction project. DEH will advocate for mitigation measures, especially for vulnerable individuals near the highway, like those with breathing problems. Special filters added to the ventilation systems of schools have shown to be of benefit in improving indoor air quality by removing outdoor air pollutants, and could be considered here as well.⁹ In addition, DEH and other City agencies are participating in the design process for the I-70 reconstruction project.

Separate from the I-70 construction project, the Colorado Department of Public Health and Environment (CDPHE) will place an additional near-road air quality monitor in north Denver to measure emissions from an interstate highway. This new monitor is a federal requirement, and DEH is working with CDPHE to help make sure the monitor is located appropriately. The monitor may provide additional information relevant to the Globeville and Elyria Swansea neighborhoods. In addition, DEH will pursue funding with our community partners to conduct additional specialized air pollution monitoring in the Globeville and Elyria Swansea neighborhoods. This may also help in the measurement of odor compounds.

In 2014, DEH and Denver Public Health plan to explore whether there are statistically valid relationships between air pollution data and data regarding health conditions, such as asthma that are worsened by air pollution.

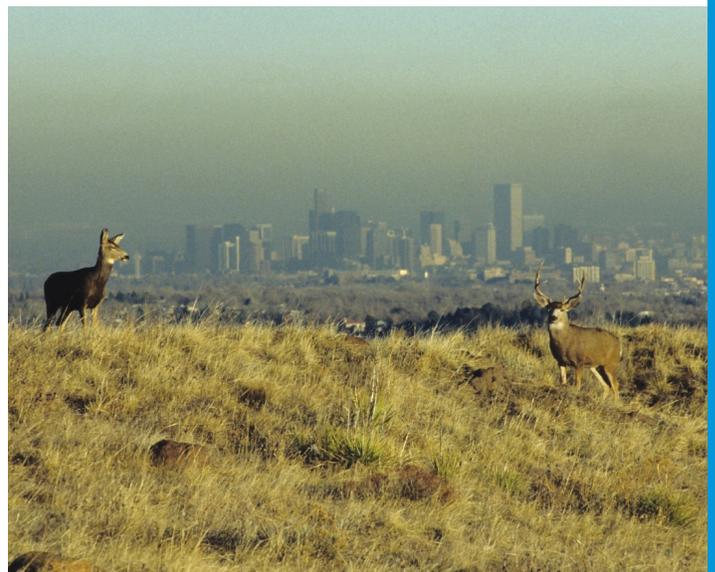
Finally, a potential revision to the health-based national ambient air quality standard (NAAQS) for ozone is likely in the years 2015-16, which might mean additional regional requirements for emissions reductions.¹⁰ Denver will work with CDPHE and the Regional Air Quality Council in all stakeholder processes associated with this and other rulemakings, in an attempt to comply with the new standard.

How Air Quality Affects Health

On average, each person breathes over 3,000 gallons of air per day. When pollutants released from tailpipes and smokestacks get into the air we breathe, it can cause health problems – including asthma, bronchitis, and other respiratory problems. The health and environmental impacts of air pollution are significant, and demonstrate why clean air is one of our most valuable natural resources.

At ground level, ozone is a health hazard for humans, especially the young and elderly. Those who are active and exercising outdoors may experience breathing difficulties and eye irritation when ozone levels are high. Ozone can trigger attacks and symptoms in individuals with pre-existing conditions, like asthma, bronchitis or other respiratory infections.¹¹ In addition, recent studies link nearness to high traffic roads with adverse health effects in children and adults. Much

of the research has focused on associations between exposure to small particulate matter or nitrogen oxides with an increased risk for respiratory effects, like childhood asthma, or cardiovascular effects in adults, such as heart attacks.¹²



Prediction: How the Neighborhood Plans Can Affect Air Quality

The Neighborhood Plans can direct where future industrial businesses are located, to reduce air quality conflicts between residences and businesses. In the past, certain types of businesses (e.g., biofuel plants, fleet operations, auto body shops) were approved by the City to locate in very close proximity to residential neighborhoods. Without a greater buffer distance (or other means to mitigate impacts) between such uses, future conflicts are likely to continue to occur.

Because of where businesses are located and their need for access to transportation, the Neighborhood Plans can identify routes where large trucks may operate in order to minimize air quality impacts on residents.

Additionally, while the I-70 expansion project is not specifically part of the neighborhood plan, its design and construction will have a large impact on the neighborhood. Most immediately, there are concerns for potential additional air pollution during the construction stage.

Finally, in accordance with recent research, locating new schools near emissions sources such as highways or industry will continue to make health conditions like asthma worse among children and youth.¹³

Without a greater buffer (or other means to mitigate impacts) between industrial and residential uses, conflicts affecting the environmental quality of the neighborhoods are likely to continue to occur.

Recommendations to Improve Air Quality

Health Recommendations that Can Be Addressed by the Globeville and Elyria Swansea Neighborhood Plans

1. Minimize negative environmental impacts of industrial uses upon residential neighborhoods through land use designation, buffering, or other means. *(See Section 8, Recommendation 1.A)*
2. Review truck routes in the neighborhoods to improve environmental quality, safety and connectivity. *(See Section 8, Recommendations 11.A)*
3. Increase urban tree canopy with tree planting and green infrastructure to improve environmental quality. *(See Section 8, Recommendation 20.A)*

Health Recommendations that Can Be Addressed by Other Means (by the City, private sector, or nongovernmental organizations):

4. In advance of the I-70 reconstruction project through Globeville and Elyria Swansea: *(See Section 8, Recommendations 1.B)*
 - a. DEH should work with CDOT, CDPHE and Public Works to start defining types of air pollution monitoring that can be done to determine a community baseline.
5. DEH should work with stakeholders to recommend mitigation measures that may be required during the reconstruction of I-70, including upgrading the heating/ventilation/air conditioning (HVAC) system at Swansea Elementary School to improve indoor air quality.
5. The City should explore the feasibility of an environmental review prior to approval of development applications in order to minimize conflicts between industrial and residential uses. *(See Section 8, Recommendation 2.B)*
6. DEH should continue to improve the City's air quality through specific actions can including: *(See Section 8, Recommendation 3.B)*
 - a. DEH should update its community air pollution modeling assessment to a 2011 baseline, and make projections for a future year (such as 2025).
 - b. DEH should work with CDPHE and EPA to establish an additional air quality monitor station in Globeville or Elyria Swansea by 2015, with a goal of quantifying near-highway pollution separately from the I-70 project.

Odors in Globeville and Elyria Swansea Today

Odors can either be pleasant or unpleasant, and an odor that is pleasant to one person can be unpleasant to another. Just because something smells bad does not mean that it is harmful. However, at some point, odors that are objectionable become a nuisance and interfere with quality of life. These are known as **nuisance odors**.¹⁴

Nuisance odors rarely have long-term direct effects on health, but can cause distress for people (depending on the severity, frequency, and duration of the odor). In some cases, if an odor is severe enough, it can be associated with short-term symptoms such as headaches, or irritation of the eyes or throat. These effects usually stop when the exposure goes away. However, long-term exposure to nuisance odors have an indirect effect on health by interfering with quality of life, reducing the desire to be outdoors, and contributing to stress.

Unlike most other Denver neighborhoods, a majority of the land area in Globeville and Elyria Swansea consists of industrial and commercial businesses, utilities and transportation, including railyards. Over 70% of each neighborhood contains these types of businesses, compared with an average of 35% in Denver overall. The adjacent areas of Commerce City and unincorporated Adams County are heavily industrial as well. A number of local businesses generate odors (*Figure 12*):

- Owens Corning (roofing products manufacturer)
- Koppers Industries (creosote based wood treatment)
- Darling International (animal rendering plant)
- Nestle Purina Pet Care (pet food production)
- Kasel Industries (pet treats)
- National Western Stock Show (livestock)
- Suncor Refinery (oil and gas)
- Metro Wastewater, and
- Xcel Energy Cherokee Generating Station.

Given the concentration of industries surrounding the residential neighborhoods, Globeville and Elyria Swansea residents frequently experience odors and report these odor incidents to the City. Nuisance odors are investigated on a complaint basis and are regulated by City municipal code and state law. For more information on odor investigation and enforcement, see Appendices at www.denvergov.org/behealthydenver.

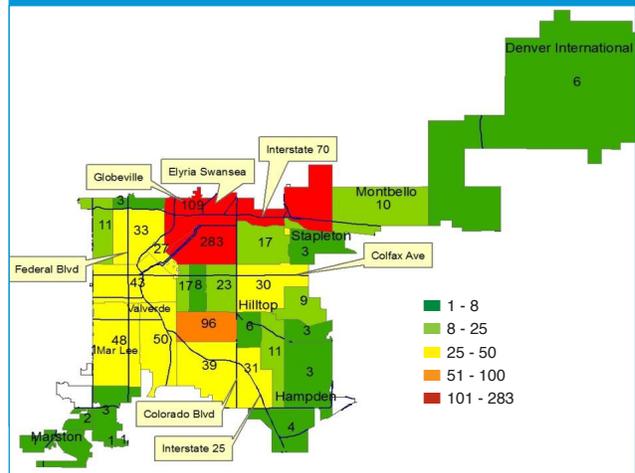
Out of 983 odor complaints in Denver over the last 10 years, over one-third came from the Globeville and Elyria Swansea area (*Figure 13*).

FIGURE 12:
Industrial facilities that can cause odors in and around North Denver



SOURCE: Denver Department of Environmental Health 2014

FIGURE 13:
Odor complaints received in Denver, by zip code, 2004 – 2013



SOURCE: Denver Department of Environmental Health 2014

Odor complaints in Denver tend to happen in the overnight and morning hours, the same time of day that poor air quality is usually recorded. During intense odor episodes caused by stagnant weather conditions in the South Platte River valley, residents describe burning eyes and throats, headaches, skin irritation, and problems sleeping. Many different terms are used by residents to describe the odors.

Of the two hundred households that completed a door-to-door survey in Globeville in 2012, 75% indicated some type of odor had negatively affected their quality of life. Residents described dog food, sewer, animal rendering, vehicle exhaust, and death, as smells present in the neighborhood.¹⁵ Limited air quality sampling was also conducted as part of the project.¹⁶

Recently, the newly legalized marijuana industry in Colorado has resulted in marijuana grow facilities

locating in industrial areas where land or warehouses are available. There are many such areas in Globeville and Elyria Swansea, and they are adjacent to residential neighborhoods. The marijuana grow facilities emit odors when venting their indoor air to the outside. The City has received a number of complaints from residents about odors coming from these facilities.¹⁷ This is an issue that needs further study and consideration, both for health impacts and potential odor mitigation.

How Nuisance Odors Affect Health

Nuisance odors do not necessarily cause long-term health effects, but can cause symptoms such as headaches, nausea, fatigue, runny nose, or irritation of their eyes or throat. Research is ongoing into how much of the reaction is a physical response to the chemical and how much is a result of our perception of the odor.¹⁸

It is known that people react differently to the same odor. People's reactions may vary by the concentration of the odor, how often and for how much time

they're exposed, the type of odor, as well as their own sensitivity. Most health symptoms from odors go away quickly when the exposure stops.¹⁹

Nuisance odors can also have indirect effects on health. They may affect one's quality of life and can reduce the desire to walk, play, or exercise outdoors, or become a source of stress and anxiety. In this manner, they may contribute to long-term adverse health outcomes, whether associated with a direct exposure effect or not.²⁰

Prediction: How the Neighborhood Plans Can Affect Nuisance Odors

Smart land use planning combined with industrial odor control systems will reduce odor impacts.

If industry and business sources of nuisance odors continue to be located near residential areas without any buffer or separation, the nuisance odor issue will likely persist.

The increase in marijuana grow houses in the neighborhoods due to statewide legalization of marijuana has created new odor impacts on residents. The number of grow houses will likely multiply and odors will escalate unless mitigation measures are put in place.

Due to the airborne nature of odors, continued regional cooperation through alliances such as the Northeast Metro Pollution Prevention Alliance (NEMPPA) will be required to reduce odors originating from industries outside of City boundaries.

Some businesses are being proactive in their approach to reduce odors. For example, Nestle Purina Pet Care has implemented a \$1.5 million emissions mitigation plan to reduce odors from the plant's emissions vents. They have installed two plasma ventilation scrubbers and have realized a 90% reduction in odor particulate emissions from those vents. Plasma scrubbers are scheduled to be installed on their remaining emissions vents throughout the next year, with all scrubbers in place by the end of 2015. Purina estimates that the scrubbers will achieve an overall 90% to 95% reduction in odor particulate emissions.

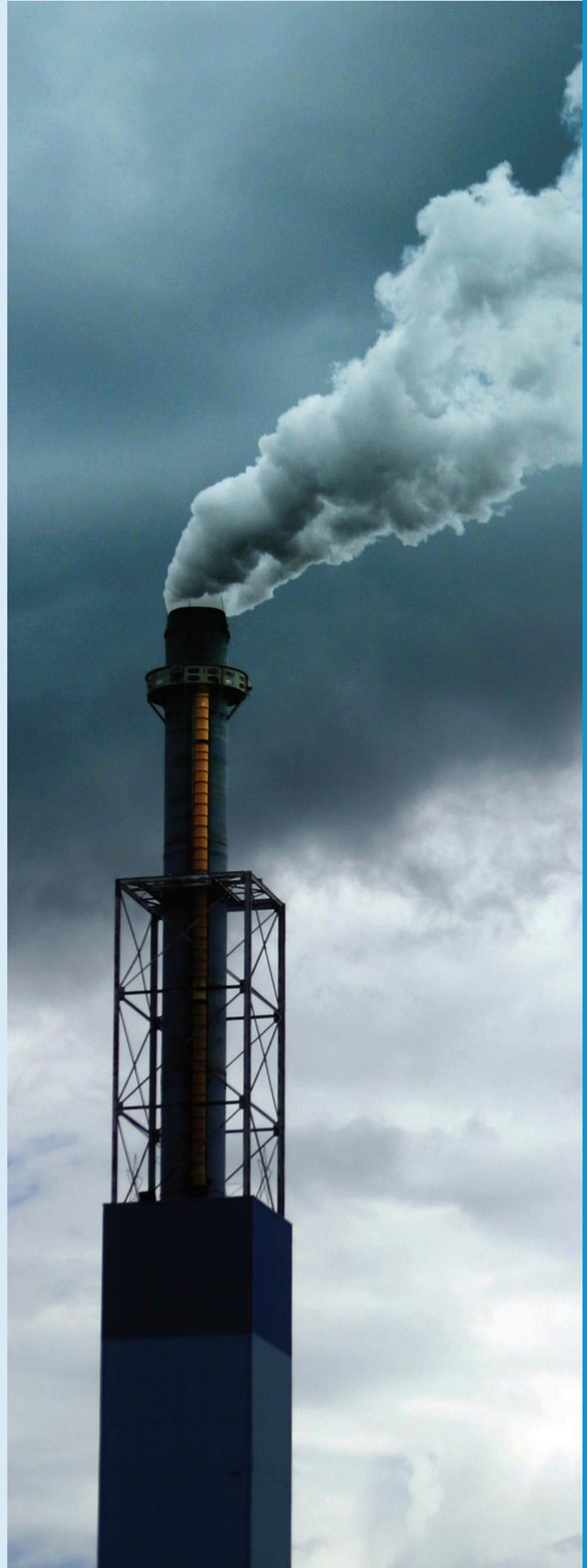
Recommendations to Reduce Nuisance Odors

Health Recommendations To Be Included in the Globeville and Elyria Swansea Neighborhood Plans

1. Minimize negative environmental impacts of industrial uses upon residential neighborhoods through land use designation, buffering, or other means. *(See Section 8, Recommendation 1.A)*
2. Mitigate the odors and emissions from marijuana grow facilities on residential neighborhoods through methods such as land use designation, siting, buffering, or other means. *(See Section 8, Recommendation 8.A)*

Health Recommendations that Can Be Addressed by Other Means (by the City, private sector, or nongovernmental organizations):

3. The City should advocate to state government agencies or research entities for funded research on the potential human health impacts from marijuana grow facilities, as such impacts are unknown. Concerns include emissions to air, odors, mold, and discharges to the water system. *(See Section 8, Recommendation 5.B)*
4. The City should explore the feasibility of an environmental plan review prior to approval of development applications in order to minimize conflicts between industrial and residential uses. *(See Section 8, Recommendation 2.B)*
5. The City should continue to address nuisance odors through specific actions including: *(See Section 8, Recommendation 6.B)*
 - a. DEH should work with City agencies, other government, non-profit, community and industry partners to form a long-term steering committee to implement solutions to reduce odors, potentially including recommendations for local and state policy changes.
 - b. DEH should create and lead a community partnership of interested organizations to pursue funding for research on manufacturing processes that produce odors, and odor monitoring technologies to address nuisance odors in Globeville and Elyria Swansea.
 - c. DEH should continue its work with the Northeast Metro Pollution Prevention Alliance (NEMPPA) to cooperate on potential solutions to odor reduction for industries outside of City boundaries, due to the airborne properties of odors.



Noise in Globeville and Elyria Swansea Today

Noise, or unwanted sound, is detrimental when it harms “individuals or the community in the enjoyment of life, property, and the conduct of business.”²¹

Sound is measured in decibels. Zero (0) decibels is the softest level that a person can hear, whereas normal speaking voices are around 65 decibels. A rock concert can be about 120 decibels. An increase of 10 decibels sounds twice as loud to a healthy human ear (in other words, 60 decibels sounds twice as loud as 50 decibels) The U.S. Environmental Protection Agency (EPA) considers noise exceeding 55 decibels outdoors, and 45 decibels indoors, as an annoyance that can interfere with daily activities such as conversation, working and recreation.²²

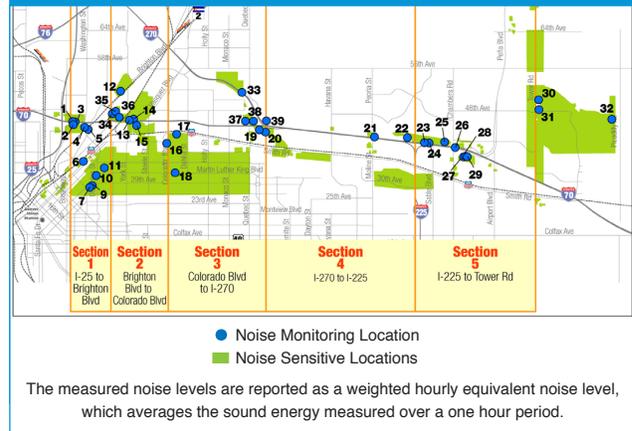
There are several significant sources of noise in Globeville and Elyria Swansea that have been found to exceed acceptable noise thresholds as defined by the EPA:

- Train horns ;
- Train engines ;
- Industrial operations; and
- I-70 located through the southern section of the neighborhoods.

Residents have expressed distress about excessive noise in the neighborhoods for quite some time, and raised those concerns throughout the Neighborhood Planning process.²³ Two recent studies confirm that noise levels in certain areas of Globeville and Elyria Swansea exceed thresholds recommended by the EPA.

A Draft Environmental Impact Statement (DEIS) for the I-70 reconstruction²⁴ found that existing noise levels from traffic in areas near I-70, extending from Brighton Boulevard east to Colorado Boulevard, exceed the 55 decibels noise level that the EPA states can interfere with daily activities (*Figure 14*). These areas include both residential and industrial land uses.

FIGURE 14:
Noise study area for I-70 reconstruction DEIS
(Sections 1 and 2 are located in the Globeville Elyria Swansea neighborhoods.)



SOURCE: I-70 East DEIS, Exhibit 5.12-2

- Noise levels within Section 1 ranged from a low of 62.5 decibels to a high of 68.1 decibels.
- Section 2 included Elyria Swansea and other neighborhoods to the south. Noise levels ranged from a low of 56.5 decibels to a high of 74.6 decibels. As noted earlier, the EPA considers noise exceeding 55 decibels outdoors an annoyance that can interfere with daily activities.

A second study was conducted at the Swansea Recreation Center and Park in 2011²⁵ and found that noise near those specific locations can exceed accepted thresholds. The main sources of noise included:

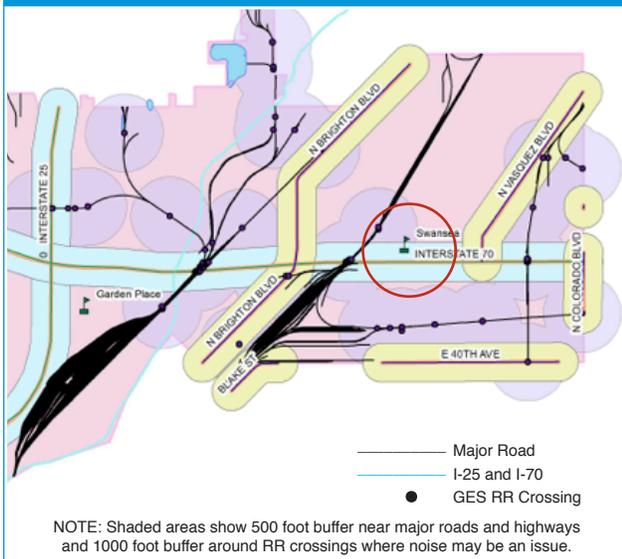
- Train horns – particularly freight trains – when approaching the nearby York St. crossing;
- Train engines and interaction of wheels and the rails;
- Various industrial metal working operations on the west side of the tracks; and
- I-70 located approximately 1,800 feet to the south.

Noise from the train horns was measured as loud as 90 to 100 decibels and likely would be higher closer to the tracks. Trains are required by law to sound their horns when approaching the York Street crossing and other crossings. At the Swansea site, the noise from train engines and wheels was less intense than train horn noise but lasted longer and could be present for many minutes at a time as slow moving trains passed the site.

Noise in Globeville and Elyria Swansea Today continued

The York Street crossing is one of many railroad and road crossings in the Globeville and Elyria Swansea neighborhoods. Figure 15 shows where railroad tracks and streets cross. Average noise levels at the Swansea Recreation Center were approximately 55 decibels and were, in part, the result of industrial activities near the site and traffic noise from I-70 and other roadways.

FIGURE 15:
Areas Affected by Automobile and Train Noise



SOURCE: Denver Department of Environmental Health 2014

Denver ordinances can be used to help control noise from industrial sites; however, the Federal Highway Administration (FHWA) and the Colorado Department

of Transportation (CDOT) are the agencies responsible for regulating noise and roadways.²⁶ The Federal Railroad Administration (FRA) is the agency responsible for regulating train and rail noise.²⁷

In a 1980 publication, the FHWA notes that traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads.²⁸ However, Figure 15 shows that there are a number of affected areas in Globeville and Elyria Swansea that are within 500 feet of I-25 and I-70 and 100 feet of other major roadways. Trains start sounding their horns well in advance of railroad crossings, so the areas affected by train noise as shown in Figure 15 are the minimum area impacted.

One of the locations affected by both traffic and train noise is Swansea Elementary School (circled in red in Figure 15). It is well within the 500 foot buffer along I-70. The EPA recommends installing noise controlling features, such as sound walls, for schools located near highways.²⁹ Sound walls along highways and roadways can reduce the volume of traffic noise by up to one-half.³⁰

Another option to address noise from trains is the implementation of a “quiet zone.” A **quiet zone** is a section of a rail line that contains one or more consecutive public crossings at which locomotive horns are not routinely sounded.³¹ In place of the noise from the train horn, alternative safety measures must be put in place to reduce excess risk associated with no use of a horn.

How Noise Affects Health

Excessive noise is a potential health issue in Globeville and Elyria Swansea. Noise can damage health depending on its intensity, duration, type, and source. Long-term exposure to moderate levels of noise can adversely affect sleep, school and work performance, and increase risk of cardiovascular disease. Noise affects sleep both by waking people up and reducing the quality of sleep.

According to the World Health Organization (WHO), an annual average night exposure not exceeding 40 decibels outdoors is recommended for restful sleep.³² Reliable evidence exists showing adverse effects of

chronic noise exposure on children’s ability to learn.³³

To aid student learning and comprehension, it is recommended that school buildings should be designed and built to provide for indoor sound levels of 35 decibels or less.³⁴

Health studies suggest a higher risk of cardiovascular diseases in people chronically exposed to high levels of road or air traffic noise.³⁵ Stress from noise affects biological risk factors such as blood pressure, fats and sugar levels, and blood flow. These changes, due to chronic exposure to noise, increase the risk of high blood pressure, hardening of the arteries and heart attacks.³⁵

Prediction: How the Neighborhood Plans Can Affect Noise

There are several sources of unwanted noise in these neighborhoods, including noise from vehicles, trains and industry that exceeds EPA thresholds. Unwanted noise goes hand in hand with urban landscapes and without controls is likely to increase with growth of local business, transportation corridors and population.

The Metro Denver Economic Development Corporation and the Denver Metro Chamber of Commerce expect job and population growth in the metro Denver region to continue at rates that exceed

Unless active measures are taken, unwanted noise levels in Globeville and Elyria Swansea are likely to stay at existing levels or increase as growth occurs in the neighborhoods and surrounding areas.

national averages.³⁶ Unless active measures are taken, unwanted noise levels in Globeville and Elyria Swansea are likely to stay at existing levels or increase as growth occurs in the neighborhoods and surrounding areas.

Recommendations to Reduce Noise

Health Recommendations To Be Included in the Globeville and Elyria Swansea Neighborhood Plans

1. Sound walls or other noise mitigation measures are recommended along major roadways and highways where sound levels are expected to increase. *(See Section 8, Recommendation 6.A)*
2. Noise in residential areas and at schools near major roadways and highways should be mitigated to no more than 55 decibels, where feasible. *(See Section 8, Recommendation 5.A)*
3. Explore solutions to reduce the noise impacts from trains. These could include “Quiet Zones,” or grade separation of trains from other modes of transportation. One intersection to explore for potential modification includes the train crossing at 47th St. and York St. *(See Section 8, Recommendation 7.A)*

4. Minimize negative environmental impacts of industrial uses upon residential neighborhoods through land use designation, buffering, or other means. *(See Section 8, Recommendation 1.A)*
5. Review truck routes in the neighborhoods to improve environmental quality, safety and connectivity. *(See Section 8, Recommendation 11.A)*

Health Recommendations that Can Be Addressed by Other Means (by the City, private sector, or nongovernmental organizations):

1. The City should work with CDOT to mitigate noise impacts of the I-70 reconstruction during the construction period. *(See Section 8, Recommendation 1A)*



Water Quality in Globeville and Elyria Swansea Today

The South Platte River and Heron Pond are the most significant water features in Globeville and Elyria Swansea and the only ones monitored by the Denver Department of Environmental Health (DEH).

The greatest health concern related to water quality in the outdoor environment is exposure to bacteria while recreating in urban streams and lakes. Water quality in the South Platte River in Globeville and Elyria Swansea tends to be worse than elsewhere in the City, primarily because it is downstream of other pollutant sources in Denver. Water quality in Heron Pond has been affected by runoff from the ASARCO Globe facility in past years. Although there are many opportunities to improve water quality in Heron Pond and in the South Platte River, there are also many challenges.

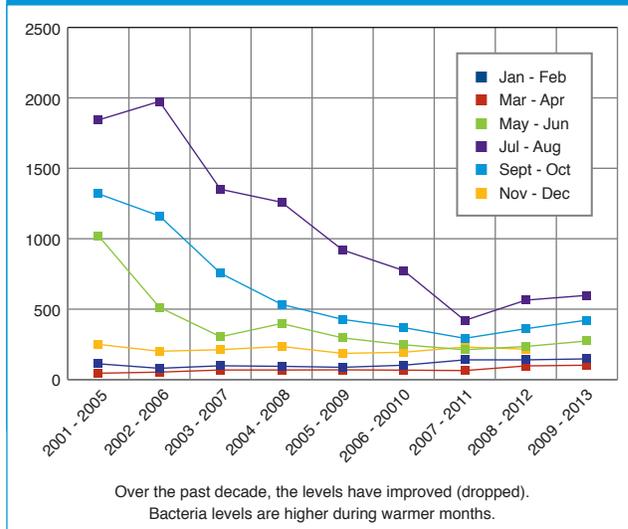
The South Platte River

DEH collects monthly water quality samples from the South Platte River at multiple locations in Denver, including in Globeville and Elyria Swansea. The water quality of the river in these neighborhoods tends to be worse because the area is downstream of Denver's urban core.³⁷ The City's urban downtown area contains large areas of hard surfaces, such as parking lots, roads, and rooftops, that don't allow water to penetrate into the ground. During storms, less water soaks into the ground, and stormwater travels quickly to drainage ditches, streams, lakes, and retention ponds. This runoff can carry oil, chemicals, pesticides, fertilizers, pet waste, debris and sediment from hard surfaces directly into storm sewers, streams, or lakes, without treatment. The cumulative impact of these pollutants becomes greater as the river passes through Denver. Arsenic, a naturally occurring element found in soil and minerals can also be present in the river at higher levels than the state's water quality standards.

As in most urban areas and along most of the South Platte River in Denver, *E. coli* levels are above the state's water quality standards and, as a result, swimming or wading in the river is not recommended. *E. coli* is a bacterium that can make people sick. However, levels of *E. coli* and other pollutants in the river, such as nitrate and phosphorous, have declined steadily over the past decade. Levels of *E. coli* tend to be higher during warmer weather (*Figure 16*).

DEH has undertaken a number of campaigns to educate the public about the importance of avoiding

FIGURE 16:
Changes in mean *E. coli* levels in the South Platte River near 46th Ave.



SOURCE: Denver Department of Environmental Health 2014

contact with the South Platte River when high levels of bacteria are measured, especially during the summer.

Additional outreach to the Globeville and Elyria Swansea neighborhoods may be of benefit in reducing risk of exposure for residents. Also, outreach to businesses about proper disposal of debris and chemicals may help reduce the amount of polluted runoff that enters the river.

Heron Pond Natural Area

Heron Pond Natural Area is a 46-acre designated conservation and restoration area in Globeville managed by Denver Parks and Recreation. It includes a riparian pond and wetlands and is open for public use for walking and jogging, wildlife viewing, photography, and educational activities. Fishing, boating, and swimming (humans or pets) are prohibited in the pond.

Sampling of Heron Pond conducted in 2012 revealed that manganese concentrations were above secondary drinking water standards (non-enforceable standards based on things like taste, odor, or color) and that concentrations of cadmium, iron, and manganese exceeded levels allowed in surface water discharges.³⁸ Cadmium and manganese can be harmful to aquatic life and at high levels (much higher than in Heron Pond), cadmium, iron, and manganese can impact human health, if regularly consumed in drinking water. Heron Pond is closed to aquatic recreational uses and, as a result, health risks to the public are generally minimal.

How Water Quality Affects Health

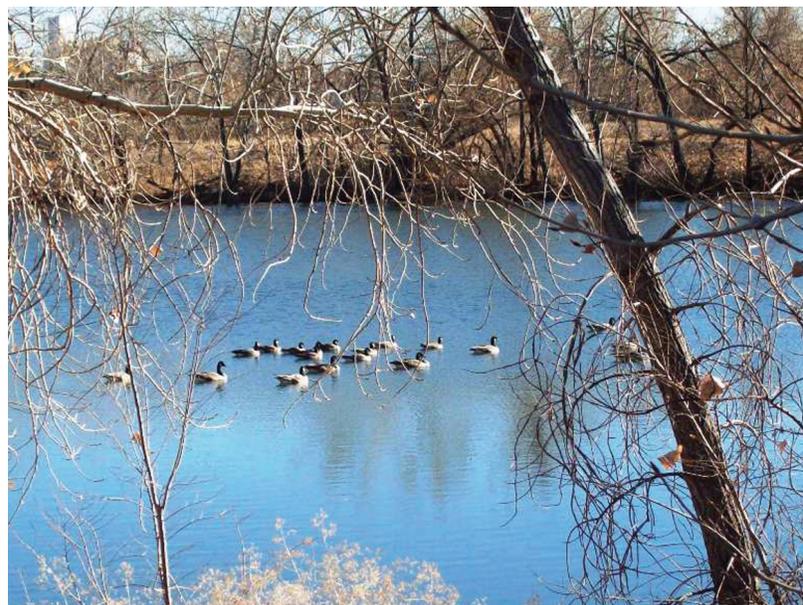
Exposure to pollutants in surface water can occur in two different ways: 1) ingestion, which is drinking the water from a lake or stream or eating fish that have been exposed to pollutants in the water, or; 2) through skin contact with the water. Federal and state water quality standards are intended to protect people from exposure to pollutants, even if they only accidentally ingest a small amount of water during a recreational activity.

In general, concerns about exposure to pollutants in water in the South Platte River due to eating fish or from intentionally drinking the water are relatively minor. While it is possible that people occasionally catch and eat fish from the South Platte, there is not a sustainable population of fish in the river to provide a regular source of food for humans. Likewise, there are not known to be any Denver residences directly obtaining their source of drinking water from the South Platte. The main concern for exposure to pollutants in the South Platte River is through water contact associated with recreational activities. Occasionally, people have been observed wading, swimming, fishing, and boating in the river.

Based on a recreational exposure, the main health concern is people may be exposed to pathogens, that is, microbes that can make you sick. *E. coli* are a common pollutant in urban waterways. Sometimes, especially in the summer, *E. coli* levels in the South Platte exceed the State of Colorado's water quality standard. *E. coli* is an indicator of other types of bacteria, viruses, or parasites, such as *Staphylococcus* (Staph), *Giardia*, or *Cryptosporidium*, that might be present in the water. The most common way to be exposed to pathogens in a stream or lake is by accidentally drinking small amounts of the water. It is also possible to be exposed to pathogens if you enter a stream or lake with open cuts or sores. Symptoms of exposure to *E. coli* or other pathogens can include severe gastrointestinal distress or other types of infection. For example, if you accidentally drank the water you might have tiredness, fever, stomach pain, vomiting, cramps and diarrhea, and if you touched the water and had an open cut you might get a skin infection.³⁹

Prediction: How the Neighborhood Plans Can Impact Water Quality

Development projects including the National Western Center and road improvements including I-70 and arterial streets such as Washington St. and neighborhood streets will all significantly impact water quality in the South Platte River and Heron Pond. Runoff from impervious surfaces such as roads during storm events can carry oil, chemicals, and other pollutants directly into storm sewers, streams, or lakes. Without low impact development techniques such as permeable pavers or bioswales that can treat water coming off of hard surfaces, pollutants will continue to degrade water quality in the South Platte River and Heron Pond.



Water Quality: Challenges and Opportunities

Denver's goal is to have fishable and swimmable waters in all our lakes and streams by 2020. Achieving those goals will be challenging in Globeville and Elyria Swansea for several reasons.

- The area is at the downstream-most limit of the South Platte River in Denver and pollution from upstream sources will need to be addressed before significant improvements in water quality in the Globeville and Elyria Swansea neighborhoods can be realized.
- Heron Pond received runoff from the ASARCO Globe facility for decades and clean up is unlikely. The 1993 Record of Decision for the ASARCO Globe site⁴⁰ includes an estimate for removal of contaminated sediments from Heron Pond of \$8.5 million (adjusted to 2012 dollars by DEH⁴¹). The estimate assumes the waste is disposed of near Heron Pond. Offsite disposal would cost two to three times as much.

- The Globeville and Elyria Swansea neighborhoods are largely built out, and there are only a few existing water quality treatment features in the area. Although there has been discussion of a regional water quality pond at 52nd and Emerson, south of Heron Pond, there is little pressure for other water quality treatment features. Space for installation of water quality treatment features is limited outside of City parks, such as the Platte Farm Open Space.

On a positive note, the City and County of Denver is currently seeking funding to implement some of the recommendations in the River North Master Plan. Once funding is acquired, it may be possible to incorporate features to improve water quality into some of the parks in the Globeville and Elyria Swansea neighborhoods.

Recommendations to Improve Water Quality

Health Recommendations To Be Included in the Globeville and Elyria Swansea Neighborhood Plans

1. Encourage developers to use low impact development and green infrastructure techniques in new development and redevelopment in Globeville and Elyria Swansea to enhance water quality in each basin. *(See Section 8, Recommendation 25.A)*
2. Implement recommendations from the River North Greenway Master Plan to improve water quality. *(See Section 8, Recommendation 26.A)*

Health Recommendations that Can Be Addressed by Other Means (by the City, private sector, or nongovernmental organizations):

3. DEH should partner with other agencies and organizations to improve education and outreach to residents and businesses related to water quality in Globeville and Elyria Swansea. *(See Section 8, Recommendation 7.B)*

Soil Quality in Globeville and Elyria Swansea Today

The Globeville and Elyria Swansea neighborhoods have been the location of a number of industrial activities for more than 125 years, including the site of several historical smelters. Beginning as early as 1870, three smelting plants, the Omaha-Grant, Argo, and Globe operated for varying lengths of time, and refined metals including gold, silver, copper, lead, and zinc. As a result of these activities, the soils in some areas of the neighborhoods required soil remediation (or cleanup). The sections of those cleanup projects that are in residential areas have largely been completed. However, residents continue to express concerns about hazardous materials in the soil, and a distrust of government intentions in the cleanup efforts.

ASARCO Globe Site

At the publishing of this report, remediation is ongoing at the site of the former ASARCO Globe smelter as the land is being prepared for redevelopment. Legal controls are in place to prevent future disturbance of the subsurface and to prohibit residential development. Cleanup of soil in the surrounding vicinity was completed a decade ago.

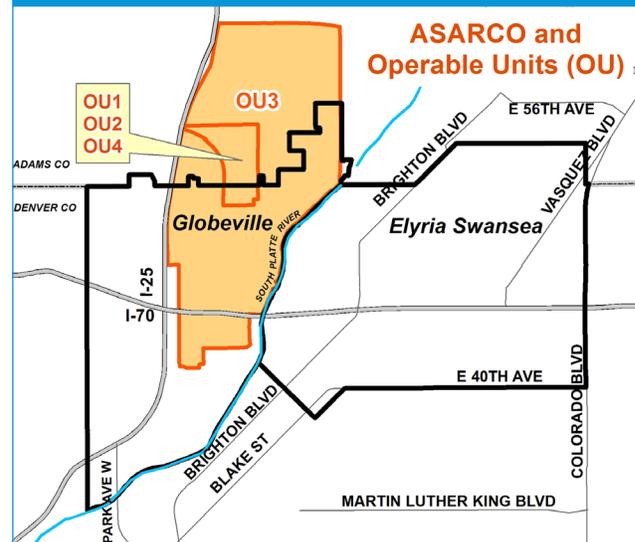
The ASARCO Globe smelter (originally the Holden smelter) operated from 1886 until 2006. Most of the facility site is in Adams County with only the southern portion of the facility in Globeville (within the City of Denver) (Figure 17).

One community member expressed an often-repeated perception:

...“A lot of homes to this day still have contaminated soil because they will not allow EPA to go to their properties because they feel if they signed that consent form they would take away their properties.”⁸

Because of ongoing resident concerns, this Soil Quality section focuses on the two recent environmental cleanups that have occurred in the neighborhoods, namely the Vasquez Boulevard/Interstate-70 Superfund Site (VB/I-70)⁴² and the ASARCO Globe site.⁴³ Both projects are related to historical smelters suspected of contaminating surface soils and, in some cases groundwater and surface water, with metals. The metals of concern for the ASARCO site were arsenic, lead, cadmium, and zinc. While the VB/I-70 site had some properties with elevated levels of arsenic and lead in soil, and cadmium in groundwater near the old Argo smelter site.

FIGURE 17:
Map of the ASARCO Globe site.
The boundary of the entire cleanup area includes much of the neighborhood of Globeville, as well as extending north into Adams County.



SOURCE: Denver Department of Environmental Health 2014

Soil Quality in Globeville and Elyria Swansea Today continued

In 1983, the state health department sued ASARCO after finding contamination just west of the site nearly a decade earlier. In 1993, CDPHE and ASARCO signed what is known as a Consent Decree that among other activities identified steps for remediation. There were also several civil lawsuits brought against ASARCO that resulted in additional soil cleanup.

CDPHE divided the site into four operable units (OUs), or individual project units:

- OU1 - the Former Neutralization Pond
- OU2 - Groundwater and Surface Soils
- OU3 - Community Soils and Vegetable Gardens
- OU4 - ASARCO Globe Plant site.

Following are descriptions of the history and current status of each operable unit, three of which – OU1, OU2, and OU4 – primarily deal with issues specific to the site of the smelter itself, and one – OU3 – that focuses on the offsite soil contamination in nearby residential and commercial areas.

Facility site (OU1, OU2, and OU4)

Early work at the site of the smelter sought to minimize immediate exposure. Contaminated sediments were excavated and consolidated onsite. Contaminated soils were capped with clean soil to prevent off-site dust emissions. Groundwater was captured and treated before more contaminated groundwater could move off-site. Legal restrictions, called institutional controls, were put into place to limit how the site could be used in the future. Much of this work was completed well before ASARCO filed for bankruptcy in 2005.

In 2010, CDPHE proposed additional work be done at the ASARCO site to complete the earlier work, perform additional soil and groundwater treatment, and provide a site that can be re-used. Buildings were demolished and the site currently is being graded, both to remediate areas of the soil and to provide level ground for future redevelopment. Onsite facility soil that does not meet the cleanup standards for commercial or industrial use are being mixed, chemically stabilized, moved to a designated area within the site, and covered with clean soil. Final development will include areas covered by buildings and pavement, and the institutional controls will remain in place to prevent future disturbance of the subsurface. Residential development is not allowed on the site.

Groundwater is collected and treated to prevent additional new contaminant movement offsite. The cadmium groundwater plume (underground water that

slowly moves through the subsurface) is moving offsite and will continue to fall to safe levels through natural processes. It is expected the plume will meet surface water standards before it encounters the South Platte River, more than one mile away. No nearby residents are drinking the groundwater. As part of the cleanup remedy, CDPHE is monitoring the groundwater status and has the legal responsibility to take action if necessary. The City of Denver monitors the South Platte in several places as well. The closest sampling point is approximately one-half mile downstream from the outfall and does not show elevated cadmium.

Community and Garden Soils (OU3)

The cleanup of community soils (the area surrounding the original site of the ASARCO Globe smelter) began in 1994 and was largely completed by 2002, after all contaminated properties that allowed access for cleanup were provided remediation. The properties were tested, and cleaned if levels of contaminants in soil were above levels determined to be protective of human health. Residents could also choose to have their property cleaned if the soil contained arsenic above the average background (naturally occurring) level for the area. In yards, one foot of soil was removed and replaced with clean soil. In vegetable gardens, 18 inches of soil was removed and replaced. By 2003, approximately 700 residential properties had been remediated in the area near the Globe Plant site. Only a few residents refused access for the cleanup, perhaps less than ten. Similarly, all contaminated schools, parks, and commercial or industrial properties in the area received soil remediation if they allowed access. Again, only a few commercial owners refused access, perhaps less than six. In addition, soil cleanup work was completed at Laradon Hall and Argo Park. The Argo Park project covered several hundred thousand square feet and established a new soccer field on a previously undeveloped portion of the park.



Residential Soils (OU1)

The EPA began cleanup with the residential soils area (OU1) because it most affected people's potential exposure. As of 2014, approximately 98% of the residential properties in the site have been tested and provided cleanup, if needed. Currently, about 100 properties of the more than 4,500 properties within OU1 in the site remain where the owner has not granted EPA access for either testing or cleanup. In those cases, EPA plans to place a notice on the property record to alert future potential property owners and to send an annual letter to these property owners or their renters, so they are aware of the potential contamination. It is likely EPA will determine that these actions complete the cleanup, and will recommend to de-list, or remove, the residential properties (OU1) from the Superfund site designation in their next review cycle, in 2017.

To achieve the successful 98% cleanup rate of all properties in OU1, EPA had taken a series of measures over the years. Starting in 1998 and through 2006, EPA sampled more than 4,300 properties, including neighborhood parks, schools, and a number of alleyways. Property owners were offered a cleanup if the samples showed lead or arsenic above the site cleanup levels. Contaminated soils were removed to a depth of 12 inches, replaced with clean soil, and the yard was re-landscaped. More than 800 properties received a soil cleanup by 2006.

EPA also funded the City to conduct an extensive community outreach program in partnership with CDPHE. The program – known as the VB/I-70 Community Health Program – recruited community members or health promoters (promotoras) to visit residents in their homes, and provide education on the hazards of lead or arsenic exposure. As part of the program, parents could have their children tested for exposure to lead or arsenic and their soil tested by EPA. If a home receiving a soil cleanup also contained lead-based paint, EPA funded a special program to remove or prevent the lead-based paint from contaminating the soil and creating new hazards. The community outreach program ended when most of the site work was complete in 2008.

In 2012 and 2013, EPA again tried to contact property owners and gain access to properties where it previously had been denied, because properties sometimes had new owners. With these efforts, EPA was able to get additional access agreements and perform soil cleanup in the last two years, reaching a cleanup completion rate of 98% of all properties.



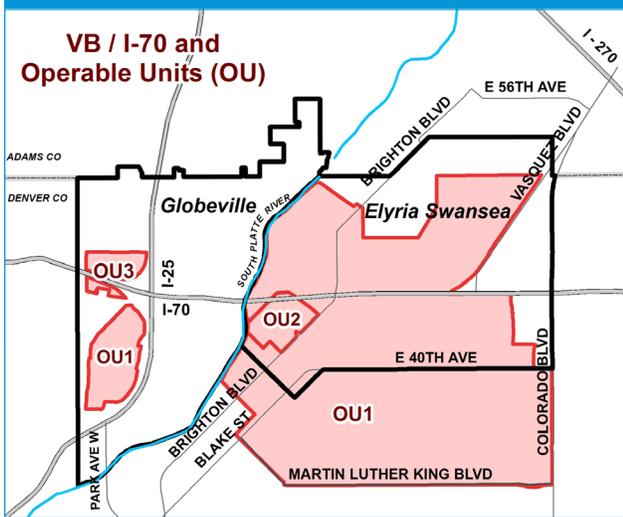
Vasquez Blvd/I-70 site

Because of elevated metals in the soil at the ASARCO site and because there used to be other smelters in the area, the EPA sampled yards in several other nearby neighborhoods. The EPA found elevated levels of arsenic and lead in some residential yards, and listed the area as a Superfund site in 1999. The area was called the Vasquez Boulevard/Interstate-70 Superfund site, and included the neighborhoods of southwest Globeville, Elyria Swansea, Cole, Clayton, and later, part of Curtis Park. The site is approximately 4 square miles in size, and contains more than 4,500 properties with about 17,500 residents (Figure 18).

The VB/I-70 site was separated into three project units, or Operable Units (OUs) to help with clean up:

- OU1 – Residential soils
- OU2 – Omaha-Grant smelter on-facility soils
- OU3 – Argo smelter groundwater

FIGURE 18:
Map of Vasquez Blvd/I-70 Superfund site.
This site is adjacent to the ASARCO site, and includes the neighborhoods of Elyria and Swansea, as well as the southwest portion of Globeville.



SOURCE: Denver Department of Environmental Health 2014

Omaha-Grant Smelter On-Facility Soils (OU2)

OU2 consists of arsenic and lead contaminated soils in a commercial/industrial area located directly on and around the historical Omaha-Grant smelter, in the area now occupied by the Denver Coliseum and nearby businesses. The majority of the affected soils are capped by parking lots, roads and buildings that greatly limit the possibility of human contact. EPA's risk assessment showed risks were limited to workers at the site, if they might regularly be exposed to disturbed soil (USEPA 2009).⁴⁴ Extensive testing has shown the South Platte River is not being affected by the soils. The site is moving through the Superfund process, and a remedy is expected to be chosen in the next year or two.

Argo Smelter Groundwater (OU3)

The historical Argo smelter site is located just west of I-25, in the area of I-70. Like OU2, the smelter was demolished and the area has been redeveloped into industrial and commercial uses. In 2007, EPA determined that the groundwater beneath the site might be contaminated with cadmium from buried wastes. EPA is performing additional testing to determine the extent of the groundwater plume. DEH sampling indicates the contamination has not affected the South Platte River. EPA expects to complete their investigation in 2015, and follow that with a study to identify the best remedy for the site.

How Soil Quality Affects Health

The most common way people are exposed to most metals in soil is through incidental ingestion.⁴⁵ This is when a small amount of dirt or dust is eaten by accident; for example, when a person touches their hands or other objects to their mouth. This is especially important for small children who frequently put their hands or other objects into their mouths, as part of their normal development. Some children also intentionally eat soil, which leads to even greater exposure. Finally, vegetables grown in contaminated garden soil should be thoroughly washed, because this too can be a source of metal exposure.

Other ways of exposure are possible but usually are of less concern for most metals in soil. As part of its risk assessment for the VB/I-70 site, EPA estimated how much exposure could potentially come from breathing dust, if the wind blew contaminated soil into the air. They found it would account for less than one percent of a resident's exposure from incidental soil ingestion.⁴⁶

EPA estimated that mechanical disturbance of soil, such as dust blowing from an uncontrolled construction site, would result in a slightly greater exposure but still only a small fraction of that from incidental ingestion. This means that if ingestion is stopped, the exposure is also mostly stopped.⁴⁷ Therefore, common ways of preventing exposure are to cover the contaminated soil to prevent contact, or to remove the soil. Soil removal was the chosen remedy for residential areas in both Globeville and Elyria Swansea sites.

As discussed, the metals found near the smelter sites include arsenic, cadmium, lead, and zinc. If taken into the body above levels of health concern, several of those metals can potentially cause cancer. Possible non-cancer effects from exposure over long periods of time include damage to the central nervous system, the reproductive system, the kidneys, or the body's blood forming system.⁴⁸

Prediction: How the Neighborhood Plans Can Affect Soil Quality

Future development projects in Globeville and Elyria Swansea could encounter contaminated material when excavating soil. This is true in any historical urban environment, whether near a smelter site or not. Aside from the known sites of buried smelter wastes in the City, potential sources of contamination include gas stations, dry cleaners, fuel storage, or other businesses that used hazardous chemicals.

It is a common business practice for land developers to review available environmental and historical information before beginning a new project. Through this research, known as "due diligence," potential problems are often anticipated and cleanup is incorporated into the project planning.

Recommendations for Soil Quality

Health Recommendations To Be Included in the Globeville and Elyria Swansea Neighborhood Plans

1. The City should continue to be involved in public sector development projects in Globeville and Elyria Swansea, including the I-70 reconstruction and the National Western Center, to help anticipate environmental conditions of concern. (See Section 8, Recommendation 24.A)
3. The City should work with the EPA to continue to take steps to remove the residential portion (Operable Unit 1) of VB/I-70 from the Superfund site (i.e., de-list OU1), as the remedy has been completed. (See Section 8, Recommendation 8.B)
4. The City should work with community partners to provide information to residents about best practices for backyard gardening. (See Section 8, Recommendation 23.A)

Health Recommendations that Can Be Addressed by Other Means (by the City, private sector, or nongovernmental organizations):

2. The City should partner with other agencies and organizations to improve education and outreach to businesses and residents about water and soil quality regulations. (See Section 8, Recommendation 7.B)

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