Environmental Health

This chapter focuses on how the growth distribution alternatives can impact the possibility for exposure to potentially hazardous materials. Other environmental health topics such as active living, noise, and air quality are also discussed. Some summary highlights are noted below regarding potential impacts.

5.9.1 Affected Environment

Although the State Environmental Policy Act requires discussion of Environmental Health related to a specific set of concerns (primarily hazardous materials), this section also responds to public scoping comments and discusses a wider range of environmental and human health issues. According to the University of Washington, environmental health is “the study of how environmental factors can harm human health and how to identify, prevent, and control these effects” (UW, 2000). Environmental health topics include quality of life as well as aspects of human health that are determined by biological, chemical, and social factors. The purpose of analyzing topics relating to environmental health is to determine the necessary measures to assess, correct, control, and prevent potentially adverse environmental factors that may have an adverse impact on public health.

Many topics relating to human health are discussed elsewhere in this Draft Environmental Impact Statement and include:

• Provision of adequate and affordable housing and maintenance of existing housing. They are key factors in promoting and maintaining the public health of a community.

• Safety, including personal safety, as well as mobility-related safety (automobile, transit use, biking and walking).

• Noise may be considered an emerging environmental health issue, due to potential noise increases from transportation, industry, and other sources in urban environment.

• The availability of sidewalks, bikeways and pedestrian-friendly development contributes to physical activity and general well-being of the population.

• Proximity and degree of risk of exposure to hazardous materials. A particular area of concern is the proximity of hazardous waste clean-up sites to residential communities.

• Air quality is a continuing concern, and while the Puget Sound Clean Air Agency addresses this issue, it is also a concern to environmental health — particularly the relationship to respiratory disease.

• Equitable community distribution of potential exposures to environmental hazards and the involvement of all citizens in the planning process.

Among these topics, noise is addressed in Chapter 5.14, while safety is discussed in the Health Issue Paper and Transportation Issue Paper in Appendix E. Water quality discussions, including surface water contamination and impaired waters, are addressed in Chapter 5.6 – Water Quality and Hydrology. Nonmotorized facilities are addressed in Chapter 5.3.
A. TOXIC AND HAZARDOUS MATERIALS

For a risk to human health and the environment to exist, two components must be present:

- Toxicity or hazard, which creates the potential for a substance to cause an adverse health impact (e.g., cancer).
- Exposure, which creates the potential for humans or environmental receptors to come into contact with the hazardous materials.

Examples of potentially hazardous sites include:

- Underground storage tanks
- Locations on the Toxic Release Inventory
- Industrial sites
- Hazardous waste generators
- Hazardous waste transfer facilities
- Federal (Superfund) cleanup sites
- Locations on the Remedial Action Program

Sites with identified chemical releases pose the greatest potential risk from toxic materials in or near the urban growth boundaries. The sites generally known as hazardous waste sites show exceedances of hazardous chemicals, as defined by the State of Washington (Model Toxics Control Act, as well as provisions for dangerous waste regulations, WAC Section 173-303) and the federal government (Comprehensive Environmental Response, Compensation, and Liability Act, commonly known as Superfund).

B. SOURCES AND TYPES OF HAZARDOUS MATERIALS

The following are typical examples of land uses that are potential sources of hazardous materials; the types of associated chemicals are shown in parentheses:

- Vehicle-related businesses, such as gasoline stations, oil-change facilities, and vehicle repair and maintenance facilities (gasoline, diesel fuel, paints, solvents, and oils).
- Other land uses such as dry cleaners (solvents), chemical and photographic labs (solvents, other chemicals), lumber mills (wood preservatives, heavy metals), railroad yards (fuels, oils, solvents), and landfills (methane gas, leachate).
- Light industry, such as machine shops (solvents), storage yards, electrical parts manufacturers (solvents, polychlorinated biphenyls [PCBs]), boat builders and repairers (fuels, oils, solvents, resins), and metal finishers and plasters (heavy metals, solvents).
- Heavy industry and manufacturing, such as fuel and chemical distribution and storage, railroad facilities, and steel mills (fuels, oils, solvents, metals).
- Stormwater and wastewater outfalls and non-paint source pollutants. Contaminants in water may be discharged into rivers, lakes and Puget Sound and eventually settle in sediments and along shorelines.

C. LAND USES OF POTENTIAL ENVIRONMENTAL CONCERN

Contaminated-site maps were reviewed for the urbanized areas of King, Kitsap, Pierce and Snohomish counties. Contaminated sites of particular concern are located in all four counties — commonly near shorelines, major

1 Sources: Washington Department of Ecology base data
transportation corridors, and in industrial and manufacturing areas. Figure 5-9-1 illustrates the location of potentially significant hazardous waste sites in the region, using 2005 data from the Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology).²

FIGURE 5-9-1: POTENTIALLY SIGNIFICANT HAZARDOUS WASTE SITES IN THE CENTRAL PUGET SOUND REGION

D. APPLICABLE FEDERAL AND STATE LAWS

A high degree of regulation applies to the release and management of hazardous materials. Future development projects and the actions of local governments to accommodate growth would likely be subject to the following regulations:

- **Occupational Safety and Health Act of 1970 (29 U.S.C. Sec. 651 et seq.)**
  Purposes: To encourage employers and employees in their efforts to reduce the occupational safety and health hazards at their places of employment, and to stimulate employers and employees to perfect existing programs and institute new ones for providing safe and healthful working conditions.

- **Washington Industrial Safety and Health Act (Chapter 49.17 RCW)**
  Purposes: To create, maintain, continue, and enhance the industrial safety and health program of the state, which shall equal or exceed the standards prescribed by the Occupational Safety and Health Act of 1970 (Public Law 91-596, 84 Stat. 1590).

- **Model Toxics Control Act (Chapter 173-340 WAC)**
  Purposes: To establish administrative processes and standards to identify, investigate, and clean up facilities with hazardous substances. It defines the role of the Department of Ecology and encourages public involvement in decision making at these facilities.

- **Dangerous Waste Regulations (Chapter 173-303 WAC)**
  Purpose: To designate solid wastes which are dangerous or extremely hazardous to public health and the environment. Provide surveillance and monitoring of dangerous and extremely hazardous wastes until they are detoxified, reclaimed, neutralized, or disposed of safely. Provide the form and rules necessary to establish a system for manifesting, tracking, reporting, monitoring, recordkeeping, sampling, and labeling wastes. Establish the siting, design, operation, closure, post-closure, financial, and monitoring requirements for waste transfer, treatment, storage, and disposal facilities. Establish design, operation, and monitoring requirements for managing the state's extremely hazardous waste disposal facility. Establish and administer a program for permitting dangerous and extremely hazardous waste management facilities. Encourage recycling, reuse, reclamation, and recovery to the maximum extent possible.

- **Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)**
  Purposes: Establish prohibitions and requirements concerning closed and abandoned hazardous waste sites. Provide for liability of persons responsible for releases of hazardous waste at these sites. Establish a trust fund to provide for cleanup when no responsible party can be identified.

For more discussion of other environmental regulations related to air quality, see Chapter 5.4 – Air Quality.

E. INTERDISCIPLINARY CONSIDERATIONS

In order to effectively maintain the environmental health of a region and determine which growth model could best serve the population, there are many interrelated factors to consider. In order to understand regional environmental health, policy makers must take into account different disciplines such as toxicology, sociology, public policy, and epidemiology, among others. The following text gives a brief overview of the interrelationships between human health and the built environment.

Much research has been conducted to explore the link between human health and the built environment. One of the primary concerns for human health is air pollution and its adverse health impacts such as cardiovascular diseases, asthma, and other respiratory illnesses.

In the paper “At the Microscale: Compact Growth and Adverse Health Impacts,” researcher Gail Sandlin notes that in Washington state “…the primary source of air pollutants is motor vehicles” (Sandlin, 2005). The paper later discusses the concept of the “urban canyon,” which is an area of urban streets surrounded by buildings on both sides, which trap high concentrations of traffic pollutants. High-density urban designs often foster increased opportunities for physical activity due to decreased reliance on personal automobiles. While pedestrians are experiencing the health benefits of walking, these benefits may be negated by the fact that they are being exposed to high levels of particulate matter in these urban canyons. Mitigation measures, such as improving vehicle emissions to reduce levels of carbon dioxide and other particulate matter, should be explored to avoid potential health impacts due to air quality.

The built environment also has an impact on the mental health of individuals in the community. In 2003, G.W. Evans concluded that the physical environment may have indirect influence on mental health by “…altering psychosocial
processes” (Evans, 2003). Evans further argues, “Personal control, socially supportive relationships, and restoration from stress and fatigue are all affected by properties of the built environment” (Evans, 2003). Walkable and mixed-use communities have been proven to foster a sense of community and provide positive mental and physical health benefits for community members.

High-density urban design has the potential to decrease reliance on personal automobiles, which can encourage physical activity and reduce diabetes, obesity, cardiovascular disease and other health problems. However, as more people live and work in urban areas, more people may be exposed to impacts such as noise and air pollution.

Dispersed growth models have risks and trade-offs, as well. Greater travel distances typically occur with a more dispersed, lower density development pattern, leading people to drive more and farther to access jobs, schools, shopping, and entertainment. This increase in driving often leads to an increase in vehicular-related accidents and fatalities (Dearry, 2006).

Obesity has been called an epidemic and Dearry states that obesity is “…the most recently publicized link between the built environment and public health…” (Dearry, 2004). Studies have shown that low-density development is associated with more vehicle travel and low levels of physically active modes of transportation such as walking or bicycling. The converse is associated with high-density development (Dearry, 2004).

Tony McMichael argues in his book Human Frontiers, Environments, and Disease that over-eating is not the sole cause of rising obesity levels but instead is a result of “… a systematic imbalance between the average amounts of energy ingested and expanded” (McMichael, 2001). Walkable cities, increased food options for people of all races and socioeconomic levels, and mixed-use development are all mitigation measures that may help curb the obesity epidemic.

5.9.2 Analysis of Alternatives (Long-Term Impacts)

A. IMPACTS COMMON TO ALL ALTERNATIVES

The four alternatives would indirectly result in redevelopment or development activities that could potentially occur in the presence of hazardous materials. All of the alternatives would involve urban activities that would involve the use of hazardous materials. This could include the need to develop or transport increased amounts of hazardous materials to support economic growth and human activities (i.e., transportation, aviation, heating, power, etc.).

Workers excavating contaminated soils and being exposed to contaminated groundwater and people living near construction areas are most likely to be affected, but releases can also affect nearby people and the environment.

As Figure 5-9-1 shows, the highest number of contaminated or potentially contaminated sites is within the more established cities and along waterfronts and transportation corridors. The occurrence of contamination diminishes away from the established, city centers, transportation corridors and waterfronts, although pockets of large-scale contaminated sites (landfills, industrial, or manufacturing sites) still occur. Rural land uses, such as farms, can have areas with localized contamination, as can residential areas, usually related to fuel releases; however, the overall potential for contamination is lower in these areas. The incidence of both point and non-point source pollutants released to water from sewer and stormwater systems may carry fertilizers, automobile runoff, and runoff from industrial, commercial, and other developments.

When growth is focused in areas with previous releases, cleanup and management requirements would result in an environmental benefit, although the costs of development could be higher to clean a contaminated property before construction could occur. When growth occurs in areas with few or no past releases, there could be an increased potential for new contamination to occur. However, with increasingly stringent regulations, the potential for harm is lower than in the past.

B. ANALYSIS OF EACH ALTERNATIVE

GROWTH TARGETS EXTENDED ALTERNATIVE

Growth Targets Extended would keep the adopted planned proportions of regional growth in place and would extend the plans out until the year 2040. Population and employment growth would continue to be dispersed throughout major metropolitan cities and core suburban cities. Redevelopment of contaminated sites, as well as the risk of contaminating...
new ones, is likely under Growth Targets Extended. However, rural areas and the less developed unincorporated urban growth area would also be developed, which increases the potential for future releases.

The Growth Targets Extended and Smaller Cities alternatives, with their dispersed growth patterns are estimated to have the highest amount of vehicle miles traveled. Decreases in the amount of daily physical activity are also likely given that supermarkets, entertainment, schools, and major centers of employment would not be within walking distances in many instances. This could have impacts on community-building, various physical and mental health concerns, habitat loss, and would likely degrade air and water quality.

Unincorporated urban and rural areas would experience the second highest levels of growth under Growth Targets Extended as would large and metropolitan cities. Improvements and expansion of existing roads and highway systems would be necessary, as could the construction of new roads. Transportation forecasts show that Growth Targets Extended increases travel demand compared to other more focused growth alternatives (Metropolitan Cities and Larger Cities alternatives). The impacts associated with this are discussed in great detail in Chapter 5.3 – Transportation.

**METROPOLITAN CITIES ALTERNATIVE**

The intent of the Metropolitan Cities Alternative is to focus growth in the region’s major centers, primarily Seattle, Tacoma, Bremerton, Everett, and Bellevue, and to limit growth in less developed parts of the region. Under the Metropolitan Cities Alternative, environmental and hazardous waste risks would be largely confined to metropolitan cities and would be reduced in outlying rural areas. As these cities are more established and have a higher level of occurrence of past uses that are likely to have caused releases to the environment, there could be a greater likelihood that development and redevelopment would encounter contaminated sites. Cleanup would be a benefit, but costs for development would increase. In economic terms, higher intensity development could create an “economy of scale,” or provide sufficient market value for available redevelopable land to attract investments.

The Metropolitan Cities Alternative would have higher density development in cities such as Seattle, Tacoma, Everett, and Bellevue, with the potential for exposing people to typical impacts found in denser areas (air quality, noise), but also providing the potential for walking, biking, and transit to compete with the private automobile, and encourage greater levels of physical activity.

**LARGER CITIES ALTERNATIVE**

Under the Larger Cities Alternative, growth would be concentrated in core suburban and larger suburban cities. This likely means that the benefits of cleanup from redevelopment would be spread throughout a larger area. Areas presently classified as open space or low density would still be relatively protected from risks of environmental degradation and hazardous materials under the Larger Cities Alternative. However, with a more dispersed growth pattern, the pressure to redevelop previously contaminated sites may be less than for more focused growth alternatives such as the Metropolitan Cities Alternative.

The impacts to human health by regional geography and county expected under the Larger Cities Alternative are similar to those expected under the Metropolitan Cities Alternative, but with a higher potential to increase density in currently suburban cities. These areas would have an increased potential for changes in transportation choices, particularly transit, walking, and biking. They also tend to have lower levels of localized air quality pollutants than the densest urban cities, and exposure of people to adverse health effects of urbanization would be somewhat less.

**SMALLER CITIES ALTERNATIVE**

Under this alternative, growth would be widely dispersed in outlying portions of the urban growth area and beyond into the rural area. As growth disperses, the risk of contaminating new sites with hazardous waste increases (although this is limited given current regulations). The Smaller Cities Alternative could expose areas presently defined as rural and open space to the risks associated with development far more than the development proposed in other alternatives because growth is spread over a wider area.

The impacts to human health by regional geography and county expected under the Smaller Cities Alternative are similar to those expected under Growth Targets Extended.
5.9.3 Cumulative Effects

The impacts discussed are inherently cumulative in that they consider the past and future activities of others and involve actions that would not directly occur with PSRC’s adoption of an updated vision.

- The demand for fuel, power, and materials could increase pressures to develop or expand manufacturing or processing activities that involve hazardous materials.
- Increased development activities would result in a higher potential for the release of hazardous materials.
- The military bases in the region are also potential sources of contamination.

5.9.4 Potential Mitigation Measures

For hazardous waste management, as individual projects are developed, they would be subject to approval and would need to be in compliance with the regulatory requirements as discussed above. This would minimize the potential for further release of hazardous materials and the exposure or further transport of past releases. However, the potential for exposure would still exist under all alternatives. Actions to help minimize the level of exposure to resources and people, and to encourage cleanup of contaminated properties include:

- Incentives or actions to encourage "brownfields" redevelopment either by individual jurisdictions or collectively in the region.
- Seeking alternatives to the use of chemical-intensive activities.
- Seeking alternatives to petroleum-based fuels for heating, transportation and manufacturing.
- Further refinement of land use plans to discourage chemical-intensive industries or practices from occurring in areas that have been identified as high priority conservation areas (or that are in areas where large amounts of people live and work).

Many adverse health impacts could be mitigated through planning and design measures that emphasize alternatives to driving. Walkable cities could increase physical activity levels with all of its associated benefits. Parks, greenbelts, bicycle paths, and mixed-use development are all ways to encourage community building, alternative means of transportation, and higher levels of physical activity. Stringent vehicle emissions policies would help curb air pollution.

The Sandlin paper also identifies the following as possible mitigation strategies:

- **Improved Education could also help minimize human health impacts.** Understanding the interdisciplinary relationship between many issues relating to environmental and public health is key to developing appropriate growth models and mitigation measures. According to Sandlin, “…only 7 percent of accredited planning programs in North America offer specialized coursework in air quality planning,” (Sandlin, 2005) which shows a potential disconnect in the academic world. Collaboration between different disciplines could greatly improve big picture understanding and would lead to better policy decisions.

- **Technological Advances.** Underutilized technological advances could mitigate impacts to environmental health. For instance, more fuel-efficient buses are already being used in the Puget Sound region as a result of the implementation of the Diesel Solutions program developed by the Puget Sound Clean Air Agency. Additional discussion of air quality mitigation is found in Chapter 5.4 – Air Quality.

5.9.5 Significant Unavoidable Adverse Impacts

Development and redevelopment will occur under all alternatives, and the risk of encountering old hazardous sites (and creating new ones) is present under all alternatives as well. With increased development comes an increased risk to human health in the form of exposure to toxic or hazardous materials. The benefit of promoting growth within already developed metropolitan and larger cities is the decreased risk of contaminating less spoiled rural and open areas. However, when the risks to human health as a result of site contamination from hazardous materials are analyzed together, the differences between the alternatives are minimal. Cleanup of contaminated sites in order to redevelop sites presently deemed unfit for use is possible under all alternatives.

Some of the other human health concerns associated with increased development, as discussed above, could be reduced by mitigation, but not wholly avoided.