2.000 Natural Environment

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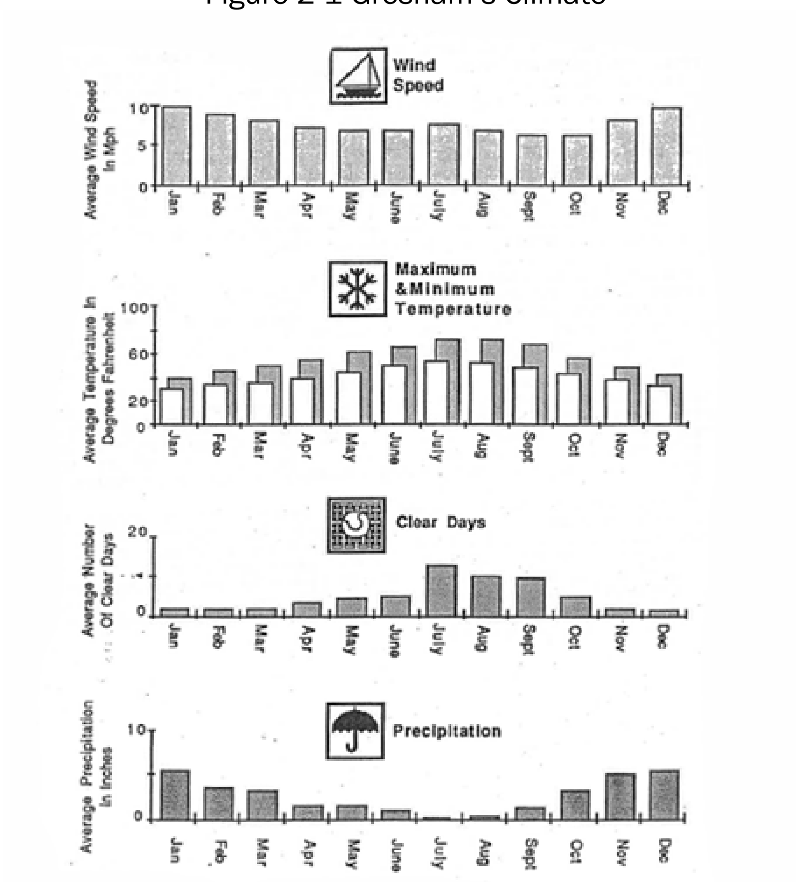
2.100 CLIMATE

Gresham is located about 65 miles inland from the Pacific Ocean and midway between the low Coast Range on the west and higher Cascade Range to the east. Each mountain range is about 30 miles distant. The Coast Range provides some shielding from Pacific Ocean weather while the Cascades steep slopes lift moisture-laden westerly winds with consequent moderate rainfall. The cascades form a barrier from continental air moving infrequently through the Cascade passes. Airflow is usually northwesterly during the spring and summer and southeasterly in fall and winter. The winter months are mild with cloudy skies and most of the annual rainfall. About 88% of the annual rainfall occurs from October through May. Mild summer temperatures are accompanied by very little precipitation. Destructive storms are infrequent as surface winds rarely exceed gale force. Thunderstorms occur monthly during spring and summer.

Climatic factors combine to produce the most inclement weather during the winter months (see Figure 2-1). Normal wind speeds are high, sunny days are few, and precipitation is greatest during winter. While the absence of extremely low temperatures enables a characterization of the winter as “mild”, there are normally each year 44 days which fall below freezing during the months of October through April. January is the coldest month, averaging 13 days a year of minimum temperatures below 32 degrees F. Outbreaks of dry continental air move frequently through the Columbia River gorge at all times of the year, resulting in either extremely cold or hot temperatures. The combination of high precipitation and below freezing temperatures in the winter months produces icy conditions, frequently the region’s major destructive climatic condition.

Climatic implications for urban design suggest that windbreaks or buffers be aligned so as to protect from the prevailing winter winds from the east southeast. Structures and people should also be buffered from cold continental air from the east. Windscreens, whether artificial or naturally occurring, which protect dwellings from cold winter winds, could aid in conserving energy expenditures for home heating. Bus shelters should also be aligned to protect passengers from prevailing winter winds and westward moving continental air.

Figure 2-1 Gresham’s Climate



2.200 PHYSICAL CONSTRAINTS

2.210 GEOLOGIC CONSTRAINTS

2.211 Valley Fill Deposits

The Gresham landscape consists of nearly level to gently rolling terrain occasionally interrupted by prominent low elevation hills. The level terrain was formed by geologically recent valley fill deposits through the actions of rivers, lakes, glacial flooding and wind. Valley fill deposits are unconsolidated and semi-consolidated materials in distinct contrast to well-consolidated bedrock formations.

Unconsolidated valley fill is composed of sand, silt, gravel and clay. Lacustrine deposits and Loess (known locally as Portland Hills Silt) are composed of very recent unconsolidated material. The major constraint of unconsolidated material in flat terrain is that reinforced building foundations are required to prevent differential settling of very large urban structures.

A silt mantle of unconsolidated loess overlies much of southern Gresham. The material is identical to the Portland Hills Silt which is associated with many small earthflows in the region. These minor slumps occur on steep slopes during the rainy season when the soil and silt mantle becomes water saturated. Small earthflows, typically confined to a depth of twenty feet are common in the region under these conditions.

Semi-consolidated valley fill covers most of the City, occurring in flat terrain as well as on the low elevation hills. Semi-consolidated material consists of sandstone, siltstone, claystone, mudstone and conglomerate. Semi-consolidated material represents older valley fill deposits over bedrock. Few building constraints are associated with semi-consolidated formations which occur in flat terrain. Some areas may be unsuited for septic tanks depending upon the hydrologic features of the soil and silt mantle.

Localized landslide hazards are associated with semi-consolidated formations, in certain instances. South of Gresham and along the Clackamas River, major landslides involving both bedrock and mantle material have occurred where the semi-consolidated Troutdale formation underlies Boring lava. This association, when combined with erosion of the underlying semi-consolidated formation results in oversteepening of the conglomerate, causing severe landslides. Conglomerate, bedrock and mantle material are involved in major slides. Although no major landslides appear to have occurred in Gresham within the recent geologic past, the association of Boring lava capping the Troutdale formation exists in the City. Where the association occurs on steep slopes subject to erosion, the potential for major landslides exists.

Older valley fill deposits during the middle Pliocene time, were laid down, (about 5-7 million years ago), and overlie the City. Before the end of the Pliocene time, volcanism began in the region and continued into the early Pleistocene, (about 1-5 million years ago). The volcanic products in the form of lava thus overlie semi-consolidated valley fill creating a potential for major landslides under the conditions described above.

The volcanic products are named Boring lava, which is found locally around a single vent or complex of volcanic vents. The Gresham hills were formed by Boring lava flows. In most areas, the Boring lava was subsequently overlain by more recent valley fill such as the Walters Hill and Springwater formations.

The stratigraphic picture of the Gresham hills consists of a middle layer of Boring lava sandwiched between valley fill deposits. In some areas, the Boring lava lies directly under the very recent loess depositions. The nearness of the bedrock to the surface may mean high costs for construction which requires deep excavation. Where loess overlies Boring lava on steep slopes the potential for earthflow is high.

2.212 Seismic Activity

Earthquake damage has been slight in the region despite the fact that the metropolitan region experiences an earthquake averaging 4.2 magnitude each year (see Appendix 1). The strongest tremor was the November 5, 1962 shock (5.4 magnitude) which was felt over a 20,000 square mile area of Oregon and Washington. The shock caused damage at the Veterans Hospital on Marquam Hill. It has been calculated that the region will experience one earthquake of this magnitude about every 100 to 130 years. Although 54 earthquakes with epicenters within 30 miles of downtown Portland have occurred between 1877 and 1970, landslides represent the greatest geologic hazard to the City residents.

2.213 Earth Movements – Case Studies

A minor slumping occurred on the lower slopes of Walters Hill during the 1978-79 winter season. In preparation for the construction of a residential subdivision, a large tract of land was cleared of vegetation and graded in late fall. Construction was delayed by the rainy winter season during which the runoff was not controlled by vegetation, diversion ditches or other methods. Severe erosion gullies developed, large amounts of silt were deposited into waterways, and a portion of the development became water saturated and was weakened enough to give way.

A steep slope earth movement occurred on the north face of Powell Butte, just west of Gresham in December of 1976. The first slide poured mud and debris into several residential lots. One home was severely damaged with walls broken in and the basement filled with mud. The second slide occurred minutes later, crashing through fences and trees near the site of the first slide.

The apparent cause of the Powell Butte slides was traced to an old road above the hillside homes. The natural drainageway was obstructed with debris by lack of maintenance of the road. Water flowed along the road to a location where it crossed the road and broke over the steep hillside. The additional burden of excess water weakened the strength of the soil to the point where it gave way and triggered a mud and rock flow.

Powell Butte is similar to many of Gresham's hills in structure, slope and soil character. The apparent cause of the 1976 slide indicated how easily the delicate balance of slope, soils and vegetation can be disrupted with hazardous consequences resulting. Visible signs of slumping can be seen on Grant Butte, and homeowners on the lower slopes have had problems with earth movement damaging laws.

The winter storm in January 1980 created extensive damage as well. With an unusual 20" snowfall followed by heavy rains, a number of slides occurred. most notable along Towle Road and Miller Court. An undetermined amount of top soil was lost as well, due to poor construction practices of removing vegetation prior to the winter rainy months.

2.220 SOIL CONSTRAINTS

The suitability of soil type for urban uses is a result of the combination of several factors. Steepness of slope, underlying surficial deposit, hydrologic characteristics and particle size.

Gresham soils are moderately deep to deep, usually poorly drained with high silt and clay content. Soil characteristics which post constraints upon urban uses in Gresham include high water tables, slow percolation, low bearing strength, rapid runoff and erosion. One or more of these features may cause constraints upon development. When combined with steep slopes, limiting factors are increased in severity, creating potential hazards to life and property. Steep slopes may also be considered as a limiting factor separate from other soil features. The occurrence of steep slopes alone is a severely limiting factor regardless of soil type.

Soils with severe limitations have features such as steep slopes, bedrock near surface, flood hazards, a seasonal high water table or low bearing strength. Major soil reclamation or special construction design are required to overcome the limitations. It is difficult and costly to overcome the limiting factors.

Soils in Gresham pose severe constraints for urban uses in two distinct ways: Intrinsic soil characteristics unrelated to steepness of slope; and soils which pose constraints only because of steepness of slope.

2.221 Intrinsically Poor Urban Use Soils

Cascade silt loam and Powell silt loam pose inherently severe constraints for urban uses. Perched high water tables, 18" to 24" from the surface during the rainy season, slow permeability, and wetness are the limiting factors. Differential settling potential exists and special drainage is required to prevent property damage. Even homes without basements require foundation drains. Site drainage must be planned for all developments. Construction practices should minimize vegetation removal and occur during the dry season. Development on slopes with these soils have runoff and erosion problems with potential for mudslides and other earth movement during the rainy season when soils become saturated. Cascade silt loam and Powell silt loam occur throughout the entire southern half of Gresham.

Aloha silt loam severely constrains development because of slow permeability and wetness. The soil is unsuitable for septic tanks, and excavating for basements and utilities is difficult during the rainy season. Aloha silt loam does not occur on slopes above 8% and presents few erosion or runoff problems. Proper drainage and rainy season construction practices are required. Aloha soils generally occur in the northeast portion of the City.

Wapato and Wollent soils occur on slopes of 0-3%, are located in or near the floodplain, and are unsuited for all urban uses. The soils are poorly drained, the high water table exists above or very near the surface during the rainy season. The soils are extremely wet and subject to flooding.

A small area of Terrace Escarpment occurs in the extreme northeast edge of Gresham. This soil is found on slopes of 20-60% and is associated with rapid runoff and erosion. Escarpment soils are located along small streams that have cut deeply into valley terraces. Severe constraints exist for all urban uses.

2.222 Soils with Severe Constraints Only on Steeper Slopes

Latourell loam and Multnomah silt loam are good for urban development on low to moderate. The soils are deep and well-drained... Severe constraints occur only when they are found on steep slopes. These soils extend south from the northern City limits to Johnson Creek in the west and to Burlingame Creek in the east.

The Quatama loam soils occur in minor amounts near the northeastern edge of Gresham.

2.223 Case Study

Intrinsically poor urban use soils on slopes below 15% severely constrain development. When these soils are located on slopes over 15%, the degree of severity for urban uses is increased. The classification of soils by severity according to the degree of slope does not take into account the interrelationship of different slopes which grade into one another. Property lines are not arranged along contour lines but encompass several slope angles. Conventional development practice, however, which typically employs a slope "averaging" technique, may not accurately reflect true soil and slope relationships. Averaging often produces a slope angle for a tract of land which appears less severe than it may actually be due to the poor soil conditions.

The Binford Farms subdivision, located in southeast Gresham near Johnson Creek is an example of a relatively moderate slope area which has nevertheless experienced substantial problems because of the intrinsically poor suitability of the soils. The soil in the Binford Farms area is Cascade silt loam. The slopes range from eight to eighteen percent.

Homeowners had lived in their new homes six months to a year in Binford Farms by the arrival of the 1978-1979 rainy season. Nearby grading and excavation had removed vegetation and the topsoil leaving the perched high water table very near the surface. The exposed soil was not revegetated, mulched, or otherwise prepared for the rainy season. With the rains, severe surface runoff and subsurface saturation occurred, causing a variety of problems. Sheets and streams of runoff flowed against buildings. Erosion occurred in yards and around foundations. Basements developed cracks and seepage, banks eroded, gullies formed, sediment was deposited in driveways. Vegetation such as grass and shrubs was impossible to establish due to subsurface saturation and ponding. Sidewalks cracked, silt and debris were deposited everywhere. When temperatures fell below freezing, ice buildup in streets and driveways was extreme, making access, mail delivery and emergency services very difficult for residents. Sediment was deposited into the storm sewer system and silt pollution was caused in Johnson Creek.

The Binford Farms problems are directly related to the characteristics of the Cascade silt loam soil in the subdivision. The soil percs slowly and has a seasonal perched water table starting at about 18" to 30" below the undisturbed surface. When the topsoil and vegetation are removed during the winter season the soil is quickly saturated so that rainwater flows across the surface causing erosion and deposition. Simple preventive measures such as mulching/reseeding, installation of diversions, installation of silt traps, minimizing soil disturbances prior to the rainy season and drainage grading around foundations greatly minimize the problems.

2.230 TOPOGRAPHICAL CONSTRAINTS

The majority of the land in Gresham consists of relatively flat terrain. Areas of relief occur in two types of locations: the Gresham hills (Grant Butte, Walters Hill and unnamed hills in the southeast portion of the City); and in localized areas along Gresham's creeks.

Extremely steep slopes (over 60%) are displayed on the north and east faces of Grant Butte and the north face of the southeast hills along Johnson Creek. Slopes over 35% occur on portions of all the hills as well as at localized areas along Johnson Creek and its tributaries. Slopes between 15% and 35% are generally found on the gentler southern flanks of the hills and along the City’s creeks.

Steepness of slope is the greatest contributing factor in causing earthflow. Slopes over 35% have high to extreme susceptibility to landslides. Moderate susceptibility to earthflow exists between 15% and 35% slopes as a general rule, although areas of especially wet or unsuitable soil may have higher landslide potential.

Earthflow occurs as a part of the natural geologic and geomorphic process. Human activity, however, greatly affects the process. The friction which holds a hillside in place is altered by increasing the bearing load of the hillside (additional structures, roads or soil saturation); by reducing friction with water, by removing support from below (excavation); or by an earthquake tremor.

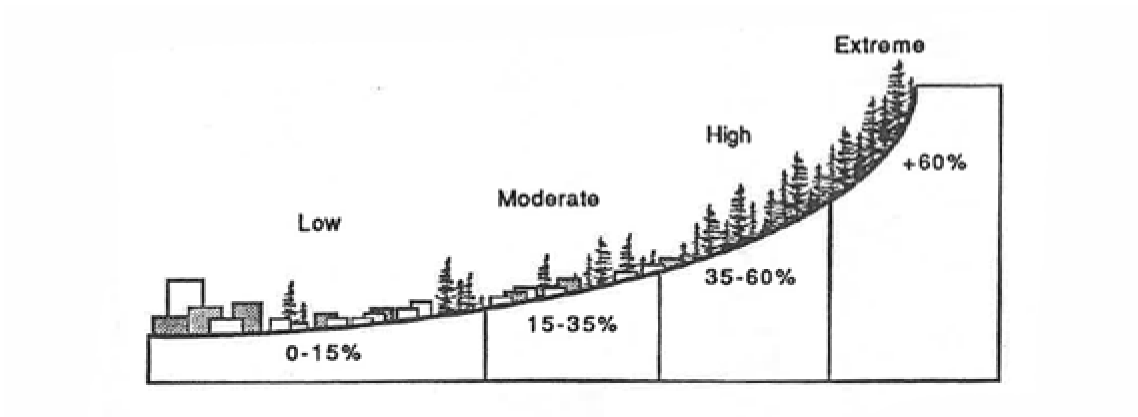
The two most frequent causes of disturbances are decreasing stability and increasing groundwater loads. Vegetation contributes to slope stability via strong root systems and reduces soil saturation by consumption of large quantities of water. Removal of vegetation forces the soil to accommodate larger amounts of water without the aid of roots to stabilize the slope. Areas of high water tables also affect absorption capacity and cause more rapid saturation.

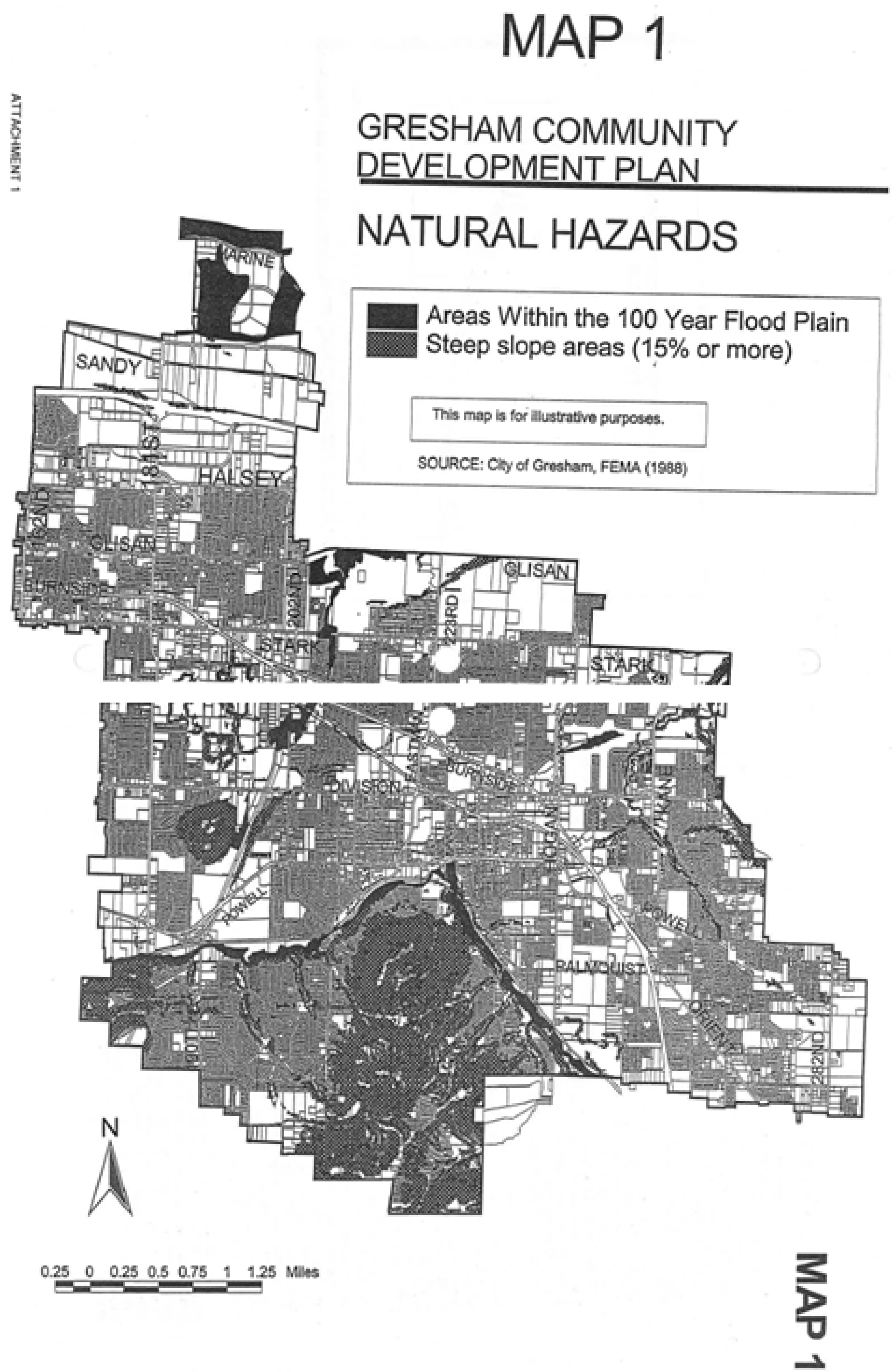
Landslides involving the soil/silt mantle are common in the region and are "generally due to the slope, low strength of the material, and to high groundwater conditions. Many local failures have been directly related to development, logging or road construction." (Shannon and Wilson, 1978). Alteration of the bearing load through improvements and excavation or increasing saturation by vegetation removal may easily upset the stability of slopes over 35%, resulting in landslides. Development on slopes between 15% and 35% which upsets the slope, soil and vegetation balance also has potential for causing earth movement. Careful construction practices and development design are required on slopes of moderate landslide potential to minimize hazardous consequences. Based upon potential for landslides, slopes in Gresham may be classified into one of three types of zones: 0-15% slopes, little landslide potential; 15-35% slopes, moderate landslide potential, and; 35% and over slopes, high to extreme susceptibility for landslides.

The vast majority of Gresham land occurs at less than 15% slope. Topographical constraints, absent in most of the city, are confined to a few distinct locations. Physical constraints imposed upon land below 15% relate to soil characteristics and flood hazards.

Figure 2-2 Susceptibility of Steep Slopes to Landslide

Source: Hammond, Paul E., et al; A Preliminary Geological Investigation of the Ground Effects of Earthquakes in the Portland Metropolitan Area, Oregon. 1974




MAP 1
GRESHAM COMMUNITY
DEVELOPMENT PLAN
NATURAL HAZARDS
Areas Within the 100 Year Flood Plain
Steep slope areas (15% or more)
This map is for illustrative purposes.
SOURCE: City of Gresham, FEMA (1988)
ATTACHMENT 1
MARINE
SANDY
181ST
HALSEY
162ND
GLISAN
BURNSIDE
STARK
202ND
223RD
GLISAN
STARK
DIVISION
BURNSIDE
POWELL
POWELL
PALMQUIST
ORIENT
282ND
N
0.25 0 0.25 0.5 0.75 1 1.25 Miles
MAP 1

2.240 HYDROLOGIC CONSTRAINTS

Within Gresham there are well-defined areas in which development potential is limited due to the periodic presence of surface water as a result of flooding. These areas lie adjacent to streams which drain the land surface within Gresham and carry flows originating in upland areas outside the city. Streams in Gresham which are subject to periodic flooding are Johnson Creek, Kelly Creek, Butler Creek, Fairview Creek, Burlingame Creek, Beaver Creek, and the Columbia Slough. Johnson Creek, a tributary of the Willamette River, flows east to west through the southerly portion of the community, skirting the bases of Walters Hill and Jenne Butte. Beaver, Kelly, and Burlingame Creeks flow into the Sandy River to the east, draining the eastern portion of the city. Fairview Creek flows northerly toward the Columbia River and drains much of the central and northern parts of Gresham. The Columbia River has been diked to prevent floodwaters from encroaching directly into adjacent areas. The Columbia Slough drains lowlands lying behind the dike. This slough is part of a large system which drains the Columbia south shore area between the Sandy River on the east and the Willamette River to the west. While the Columbia River dike protects a large area to the south from floodwaters, this area is subject to flooding when the capacity of the slough is exceeded.

Through studies carried out by the Federal Emergency Management Agency (FEMA), approximately 560 acres of land adjacent to these streams have been identified as areas of special flood hazard. These are lands which are subject to a one percent or greater chance of flooding in any given year, also known as the 100-year flood plain. In addition to designated flood plain areas, there are wetlands and riparian areas where moist soils and high water tables present constraints to development. Many of these areas, and a large portion of flood plain areas, have high natural resource values and serve as valuable wildlife habitats.

Past floods in Gresham have been caused by bank overflow from Johnson and Burlingame Creeks and shallow flooding from Fairview Creek. Property damage from overflow of Johnson Creek has occurred from 190th Ave. upstream to Regner Rd. The worst flood of record on Johnson Creek occurred in December, 1964. Overbank flows occurred at Regner Rd. and continued downstream along the Portland Traction Co. railroad. This flood had a discharge of 2,620 cubic feet per second. According to FEMA studies, flows in Johnson Creek have exceeded the major flood stage ten or more times since 1940. Floods from Burlingame Creek have occurred frequently in the past and have been characterized by shallow overflows near the intersection of Hogan Dr. and Burnside St.

In June, 1949, flooding from the Columbia River seeped through a portion of the dike on which Marine Drive is built, inundating portions of Multnomah County Drainage District No. 1, including the Columbia Slough area. Flood depths in the drainage district ranged from ten to twenty feet. According to the FEMA Flood Insurance Study, the existing dike is expected to withstand a 500-year flood of the Columbia River, although major rainstorms could cause extensive interior ponding in low areas if runoff exceeds the capacity of dewatering-drainage pumps which now serve property adjacent to the slough.

With respect to potential development in flood plain areas there are two important issues. First, the degree of hazard to life and property must be considered; second, preservation of natural functions of stream corridors as drainageways must also be taken into account. In designating flood plain areas, FEMA has conducted studies which delineate land areas needed to hold anticipated water volumes resulting from 100-year flood conditions. These delineations have also been made with the stipulation that development activity and alterations to the landform may be possible within floodplain areas without significant increases in the base flood elevation. The implication is that such activity could occur without reducing the flood carrying capacity of the designated flood plain area. Thus, there is reason to believe that development may be appropriate within certain flood plain areas without posing substantial hazards to life or property, provided it is designed and constructed consistent with standards which minimize the potential for damage and preclude adverse impacts to adjacent properties.

At the same time, however, flood plains also function as natural systems having their own intrinsic values which could be adversely affected by development, even if such development can theoretically be accommodated without substantially increasing flood elevations. Flood plains are riparian corridors which frequently contain wetlands having high value as natural resource areas. These wetlands and riparian corridors serve as temporary storage areas for flood waters, reducing flood peaks and the frequency of flooding downstream. Riparian and wetland vegetation works to improve water quality by reducing sedimentation nutrients (e.g. sediments, metals), and reducing water temperatures. These areas frequently have scenic, educational, and recreational value and, when relatively undisturbed, they support a wide variety of wildlife. To the extent that flood plain development and alterations occur, especially in areas which have retained their natural character or which serve open space and greenway functions, these functions may be adversely affected.

The findings of recent master storm drain plans for Fairview, Kelly, and Burlingame Creeks have underscored the importance of flood plain areas for conveying and storing runoff even during flood episodes which do not approach the volumes of 100-year flood conditions. In some cases, these master plans have included specific recommendations concerning the nature of development and needed improvements adjacent to these streams in order to maintain and enhance their drainage characteristics. The master storm drain plans for these creeks make up an important part of a comprehensive program to minimize flood hazards. Their findings and recommendations should be taken into account in undertaking any development activity in flood plain areas where development may be appropriate.

Traditional Federal flood management programs are now being re-evaluated as a result of the disastrous 1993 Midwest flooding along the Mississippi River. Today there is a growing understanding that government can neither solve all flooding problems, nor can it financially cover the cost of flood damage. New approaches to flood management and prevention are being proposed by the Federal agencies involved in floodplain management and flood disaster relief.

In a 1996 publication by the National Parks Service entitled Flood, Floodplains and Folks, the NPS profiles communities across the nation that are pioneering new approaches to managing floodplains and addressing the threats of flood damage. These approaches involve communities forming innovative public-private partnerships and implementing multi-objective programs that use a variety of non-structural, regulatory and incentive approaches to address serious flooding problems. Solutions to these problems vary in each community, but often include one or more of the following: flood loss reduction, flow control, streambank stabilization, restoration, fisheries improvement, recreation, natural hazard mitigation, wetland enhancement, habitat improvement, cultural resource enhancement, economic revitalization and environmental education.

In view of the varied purposes being served by Gresham's stream corridors and flood plains, the potential development constraints which may exist in these areas, and the differing character of the community's streams, it may be appropriate to permit development activity in some flood plain areas, and to restrict it in others. Specifically, policies and standards are called for which would limit development and landform alterations in flood plains where natural resource or open space values are high, while permitting such activities in flood plains where natural features have already been altered or removed and the principal function of the stream and adjacent land is conveyance of surface water.

(Sec. 2.240 amended by Ord. No. 1464 passed 12/1/98; effective 1/1/99)

2.250 SUMMARY

2.251 Physical Constraints in Gresham

Geologic foundations, soil types, slopes, and hydrologic features combine to create constraints on urban uses. In some cases, constraints may be overcome through design, engineering, and construction practices. In other instances, the risks involved, and the consequences to adjacent land of mitigating the limitations require that land use designations be applied to minimize hazardous conditions.

Within Gresham, the hillsides are the critical element to which most physical constraints are related. Concerning geologic hazards, slopes over 35% are high in potential for landslides and earthquake damage. while it is technically possible to install improvements by engineering for these extremely steep slopes, very steep hillside development involves severe risks. Alteration of hillsides over 35% by vegetation removal, surfacing with impervious material and increasing the bearing load may easily trigger landslides, endangering downslope improvements as well as the steep slope areas. Development of steep hillsides greatly increases the amount and rate of surface runoff, increasing the severity of flooding. Costs and difficulties of installing sewer and water lines in steep hillsides are very high. Septic tanks are completely unsuited for steep hillsides. Ice build-up during freezing temperatures makes access, maintenance, and emergency services delivery virtually impossible.

Improper construction practices, site design and drainage on landslide prone areas result in erosion and deposition, triggers earthflows and increases flood severity by contributing to surface runoff. Construction or development in areas identified by DOGAMI IMS57 as at High or Moderate Risk for deep-seated landslides or high risk for shallow landslides involves severe constraints for urban uses regardless of soil type, and must be appropriately designed and constructed to minimize adverse effects.

Physical constraints not associated with hillsides involve the suitability of soils generally for urban uses and the potential for damage due to flooding. Areas of moderate slope but having intrinsically poor soils require construction practices and site design techniques which work to minimize the unfavorable characteristics of poor soils.

Floodplains in Gresham are well-defined and encompass a relatively small area of the city. Non-structural solutions to flood damage prevention include minimizing surface runoff through proper development practices and design so that flooding severity is not increased. Stormwater drainage systems to accommodate increased runoff from impervious surfaces should be designed to enable control of both the rate and volume of discharge. Where they have high natural resource values and are relatively undisturbed, floodplains are inappropriate locations for most types of urban development.

Heavy rainfall is the distinguishing element of the local climate, and is directly related to the city's physical constraints. Construction periods and practices arranged to minimize activity during the rainy winter season will reduce potential erosion, deposition of silt, earthflow, and flooding.

2.300 NATURAL RESOURCES

Gresham contains a wide variety of natural resource types. These include wetlands, riparian areas, forested uplands, and mineral and aggregate deposits. In addition to their intrinsic value as relatively undisturbed lands in an otherwise urban environment, many of these resource areas comprise significant wildlife habitats and noteworthy scenic features. They also perform a variety of useful functions in maintaining environmental stability, including retention of soils, control of pollutants, groundwater recharge, and flood control.

In the fall of 1987 a comprehensive survey of Gresham's fish and wildlife areas and habitats, wetlands, and ecologically and scientifically significant areas was carried out by a team of consultants and by faculty and students from Mt. Hood Community College. This survey was oriented primarily toward wildlife habitat values of lowland and upland natural areas. Sites which rate highly as wildlife habitats are typically found to have high values for other natural functions as well. The results of this survey are contained in the Inventory of Significant Natural Resources and Open Spaces, adopted as Appendix 2 to the Community Development Plan. In the Inventory, 45 natural resource sites were identified. These were classified generally as wetlands, riparian areas, and upland sites.

2.310 WETLANDS

Wetlands are defined as follows: "Areas that are inundated and saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Among the useful functions served by wetlands are the following:

- Wetlands provide important habitat for warm water fishes, numerous waterfowl, non-game birds, beaver, muskrat, nutria, otter, mink and raccoon. Other important non-game species such as mammals, reptiles, and amphibians are also found in wetland areas.
- Wetlands serve as temporary storage areas for flood waters, reducing floodpeaks and the frequency of flooding in downstream areas.
- Wetlands function to improve water quality by reducing sedimentation and removing nutrients.
- Wetlands rank as one of the world's most productive ecosystems. The biomass produced within wetlands provides food and cover to a multitude of animals.
- Wetlands provide scenic, educational and recreational opportunities and values.

One of the most significant wetlands described in the Inventory is an area of 30 - 50 acres located east of Grant Butte, between Division St. and West Powell Blvd. This is an emergent wetland with small pockets of wetland forest and scrub shrub scattered along the edge. The emergent areas are vegetated with cattail, rush, sedge, reed canary grass, polygonum and nightshade. The scrub shrub and forest areas are composed of black cottonwood, willow, spirea, and elderberry. Among wildlife species observed at this wetland are the great blue heron, green-backed heron, belted kingfisher, American kestrel, red-tailed hawks, and red-winged blackbirds. The structural diversity, plant species variety, large size, adjacency to a large upland area (Grant Butte), and rarity of habitat all add to the value of this site. A railroad track which runs north-south through this wetland provides good access to this site without direct impact on the wetland.

Another significant wetland lies on the east edge of the Mt. Hood Community College campus, south of Stark St. This area is a mosaic of riparian corridor (Douglas fir, big leaf maple, western red cedar), emergent wetland (sedge, cattail, polygonum, reed canary grass), wetland scrub shrub (several types of willow, spirea, elderberry), wetland forest (ash, sedge, black cottonwood), upland mixed coniferous/deciduous forest (Douglas fir, alder, big leaf maple), and open grassland. The high structural diversity and species diversity provide habitat for a variety of wildlife species including deer, coyote, beaver, small mammals, owls, hawks, songbirds, and reptiles. The large size and diversity of habitats within one area in addition to the ash/sedge forest combine to make this a rare habitat in Gresham.

Five other wetlands of varying degrees of significance were also identified in the Inventory.

2.320 RIPARIAN AREAS

Riparian areas are defined as lands which are adjacent to rivers, streams, lakes, ponds, and other water bodies. They are transitional between aquatic and upland zones and contain elements of both aquatic and terrestrial ecosystems. They have high water tables because of their close proximity to aquatic systems, soils are usually largely of water-carried sediments, and some vegetation that requires free water or conditions that are more moist than normal. In Gresham, riparian zones occur along rivers, streams, and lakes. Riparian areas have a number of attributes and serve several useful functions:

- Riparian zones generally contain water, food, and cover - three important habitat components.

- Riparian areas provide important habitat for songbirds, raptors, raccoon, mink, beaver, deer, and muskrat. Various small mammals, reptiles, and amphibians are also found.
- Riparian zones serve as natural migration routes and travel corridors for many wildlife species.
- Riparian forests stabilize stream banks and adjacent slopes, promoting better water quality in the adjacent waterways.

Twenty-three of the 45 natural resource sites identified in the Inventory of Significant Natural Resources and Open Spaces are listed as riparian areas.

The highest-scoring riparian area identified in the Inventory is the Johnson Creek corridor from the southeast city limits near Hogan Rd. downstream to Highland Ave. Most of this portion of the creek is relatively natural in character, largely due to the fact that none of it has been altered by rip-rap along the banks. There are numerous residences along Johnson Creek but they have not intruded into the stream or reduced the riparian habitat in most areas. There is a wide variety of riparian vegetation that provides both wildlife habitat and shading. The dominant streamside plant species are western red cedar (including Hogan cedars), red alder, willow, Douglas fir, black cottonwood, big leaf maple, and a limited amount of Oregon ash. Understory species include Himalayan blackberry, creek dogwood, spirea (hardhack), buttercup, reed canary grass rushes, sedges, cattails, horsetail, and hazelnut.

The complex of structurally diverse riparian vegetation, emergent wetland, and open grass fields along Johnson Creek provides habitat for deer, belted kingfisher, great blue heron, green-backed heron, mallards, common bushtits, evening grosbeaks, tree frogs, and beavers.

Other significant riparian areas identified are the small, narrow tributaries which flow down wooded drainages through greenways into Johnson Creek from the south. Kelly Creek, from the southeast corner of the city to its confluence with Beaver Creek, has many of the same riparian characteristics as Johnson Creek between Salquist Rd. and Powell Valley Rd. To the north, a portion of the Columbia slough flows westerly from Fairview Lake to 185th Ave. Although the slough has limited wildlife habitat value, it is part of a regional waterway and could be enhanced by contouring the banks and planting a diverse selection of native vegetation.

2.330 UPLAND AREAS

Seven upland areas were investigated in preparation of the Inventory of Significant Natural Resources and Open Spaces. The most significant of these are Jenne Butte in southwest Gresham, Grant Butte, and portions of Walters Hill and adjacent hillsides to the south.

Upland resource areas enrich the urban environment by providing visual relief and a sense of orientation. They also serve a number of important natural functions:

- Uplands provide valuable habitat for mammals, birds, and some reptiles. Mammals include deer, coyote, fox, rabbits, squirrels, and mountain beaver. Birds include songbirds, woodpeckers, quail, and hawks.

- Uplands serve as important nesting habitat, roosting sites, hiding cover, escape cover, thermal cover, and feeding sites for some species.
- Uplands provide routes of travel for wildlife.
- Uplands provide both seasonal and year-round feeding sites for many species of birds, mammals, and reptiles.

Jenne Butte was found to be one of the most significant of Gresham's upland areas. On the north and west facing slopes there are western red cedar/bigleaf maple forests. The understory is dogwood, alder, and vine maple. In places the canopy cover is nearly 100%. Near the top of Jenne Butte are numerous snags interspersed within the cedar/maple forest, giving this area high structural diversity and enhancing its habitat value. Evidence of deer, coyotes, and other small mammals was noted.

Grant Butte is a prominent upland feature in Gresham. Like nearly all portions of steep-slope uplands in the area, Grant Butte has been logged in the past, removing most of the old, large coniferous trees. The resulting successional patterns have produced wildlife habitats that are structurally diverse, with an abundance of maple, alder, and other deciduous trees. Much of Grant Butte's significance as a natural resource area and wildlife habitat is derived from its proximity to the large wetland lying to the east of the base of the butte. Direct access to water is available for wildlife and the linear pattern of the wetland provides a corridor for passage to habitat areas to the south.

Much of Walters Hill and the complex of hills to the south of Walters Hill have been highly developed or affected by human activity. The lower slopes on the north and west sides have been developed in residential subdivisions, and the top areas have been cleared and cultivated, in addition to serving as large-lot homesites. Nevertheless, Walters Hill gives the appearance from lower elevations of a largely undisturbed hillside with a mix of deciduous and coniferous trees. The complex of hills adjacent to the north and south sides of Butler Rd. has a diverse mix of conifers and hardwoods and provides habitat for deer, raccoon, coyotes, and other, smaller mammals.

2.340 ECOLOGICALLY AND SCIENTIFICALLY SIGNIFICANT NATURAL AREAS

While all of the natural resource sites identified in the Inventory of Significant Natural Resources and Open Spaces might be considered representative of ecologically and scientifically important resources in Gresham, one particular site stands out in this regard. In southeast Gresham, in the vicinity of Hogan Rd. and Johnson Creek, is found the Hogan's Cedar (Thuja plicata fastigata - see Appendix 3). This is a prime example of a rare and spectacular life form which has adapted to human presence while maintaining its ecological integrity. It is a beautiful and striking tree, and this grove maintains itself through seed production.

The Nature Conservancy describes the Hogan's Cedar as, "...a true breeding mutant columnar form of the western red cedar. This new variety is disease resistant, especially to root rot. it is a particularly beautiful tree, and as far as we know, occurs naturally only at this site."

The site referred to is adjacent to Johnson Creek near SE Hogan Rd. in an area known as Ambleside. The stand of Hogan's Cedars is in private ownership, scattered over an area of approximately 30 acres and 10 tax lots. Discussions with various property owners indicate that they highly value the trees and that they are considered an irreplaceable element of the Ambleside area. Nevertheless, these trees are subject to potentially conflicting uses in the form of increased residential development and occasional public improvements. (The original right-of-way for the defunct Mt. Hood Freeway would have obliterated this grove.)

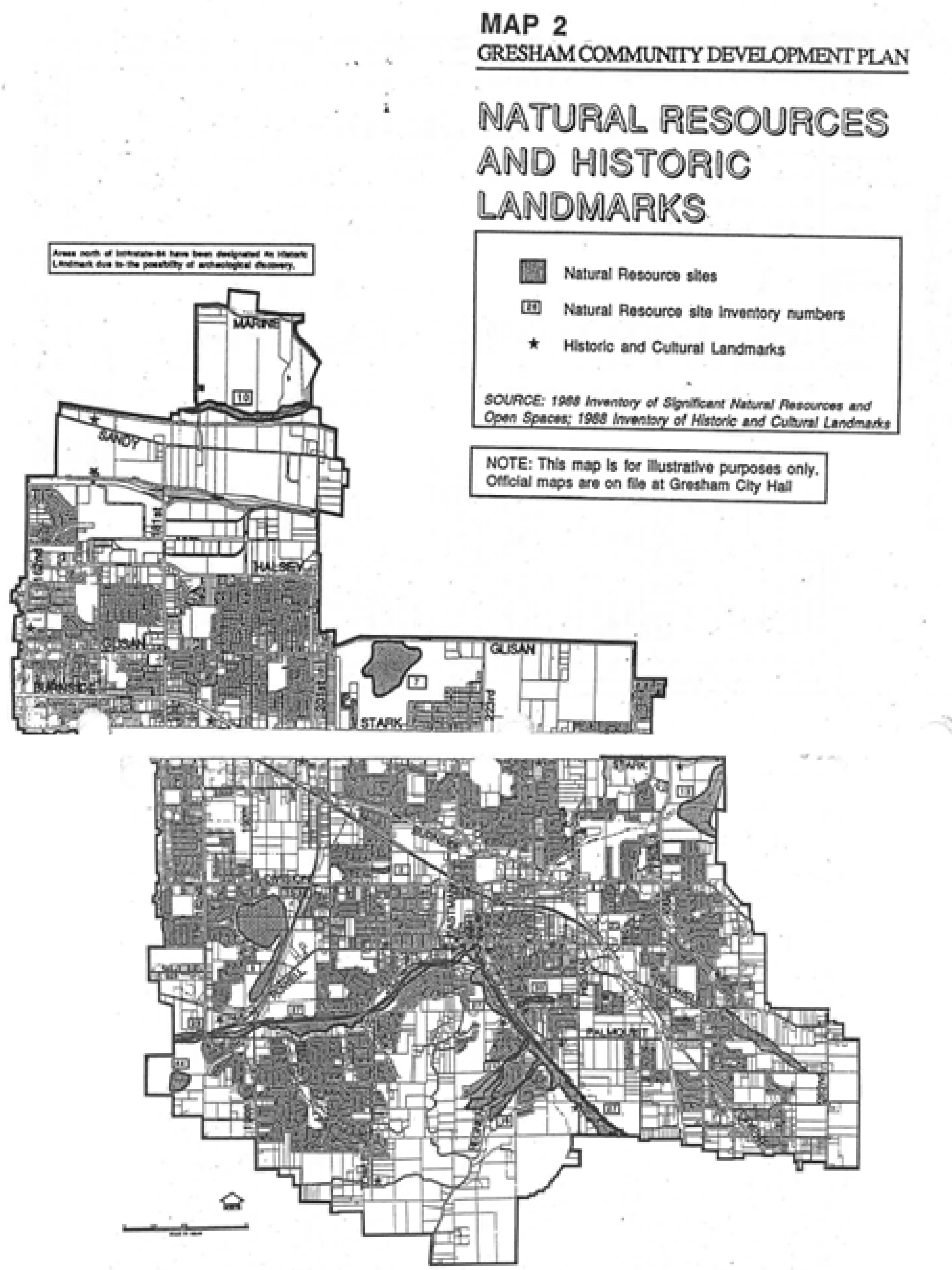
Figure 2-3 Inventory of Significant Natural Resources Summary

Site No.	Site Name	Score	Resource	Primary District	Secondary District	Open Space	Flood Plain	Slopes 15-35%	Slopes > 35%	Overlay	Protected
45	Jenne Butte – Northwest Slope	78	U	LDR-7		N	N	Y	Y	SS	Y
44	Jenne Butte – Top	76	U	LDR-7		N	N	N	N	NR	Y
13	Mt. Hood Community College	75	W	LDR-7		Y	Y	Y	N	NR	Y
27	Johnson Creek – SE Hogan – 182nd Ave.	75	R	LDR-7	MDR-24	Y	Y	Y	N	NR	Y
5	Division – Powell Wetland	70	W	LI		N	Y	N	N	NR	Y
6	Fujitsu Forest & Wetland	63	W	LI		N	N	N	N	None	N
16	Kelly Creek – Powell Salquist	63	R	LDR-7		Y	N	N	N	NR	Y
21	Johnson Creek Trib. – Kelly Ave.	62	R	LDR-7		Y	N	Y	Y	NR	Y
30	Johnson Creek Trib. – Thom Park	62	R	LDR-7		Y	N	N	N	NR	Y
38	Grant Butte – West Slope	59	U	LDR-7		N	N	N	Y	NR	Y
39	Grant Butte – East Slope	59	U	LDR-7		N	N	N	Y	NR	Y
41	Walters Hill Complex – South Facing	59	U	LDR-7		N	N	Y	Y	SS	Y
19	Johnson Creek Trib. – Regner Rd	58	R	LDR-7		N	N	Y	N	NR	Y
40	Walters Hill – Top and North Slope	58	U	LDR-7		Y	N	Y	Y	SS	Y
8	Wetland Forest – Marine Dr. – Interlachen	55	W	LI		N	N	N	N	None	N
42	Walters Hill Complex – North Facing	54	U	LDR-7		N	N	Y	Y	SS	Y
43	Jenne Butte – South Slope	51	U	LDR-7		N	N	Y	Y	SS	Y
7	Fujitsu Lakes	50	R	LI		N	N	N	N	NR	Y
22	Johnson Creek Trib. – Heiney Rd.	49	R	LDR-7		Y	N	Y	N	OS/SS	Y

Site No.	Site Name	Score	Resource	Primary District	Secondary District	Open Space	Flood Plain	Slopes 15-35%	Slopes > 35%	Overlay	Protected
1	Log Ponds & Riparian Area – City Hall	48	W	TDD		N	N	N	N	None	N
37	Grant Butte – South Slope	48	U	LDR-7		N	N	N	Y	NR	Y
17	Kelly Creek – South of Salquist	46	R	LDR-7		Y	N	N	N	OS	Y
36	Grant Butte – Northwest Slope	46	U	LDR-7		N	N	N	Y	NR	Y
2	Wallula Ave. East of 13th St.	44	W	MDR-24		N	N	N	N	NR	Y
9	Cottonwood Forest – Marine Dr.	44	W	HI		N	N	N	N	None	N
15	Kelly Creek – Kane Rd. – Powell Vly Rd.	44	R	LDR-7		Y	Y	N	N	OS	Y
35	Grant Butte – Middle	44	U	LDR-7		N	N	N	Y	NR	Y
10	Columbia Slough	42	R	HI	LI	N	Y	N	N	NR	Y
34	Grant Butte – Top	42	U	LDR-7		N	N	Y	N	NR	Y
25	Butler Creek – Upper	41	R	LDR-7		Y	Y	Y	N	OS	Y
33	Grant Butte- North Slope	39	U	LDR-7		Y	N	Y	Y	NR	Y
3	Fairview Creek = Burnside-Birdsdale	38	R	BP	LDR-7	N	Y	N	N	FP	N
23	Butler Creek – Lower	37	R	LDR-7		Y	Y	N	N	OS	Y
4	Fairview Creek = Division-Birdsdale	36	R	HI	LI	N	Y	N	N	FP	Y
20	Johnson Creek Trib. – Meadow Ct.	36	R	LDR-7		N	N	N	Y	SS	Y
11	Kelly Creek North of Division	35	R	MDR-12	LDR-7	Y	Y	N	N	OS	Y
32	Southeast of Palmquist/Hogan	34	U	HI		N	N	Y	N	SS	Y
26	Johnson Creek Trib. – 190th Ave.	33	R	LDR-7		N	Y	Y	N	SS	Y
28	Johnson Creek Corridor – 182nd-174th	33	R	LDR-7	MDR-24	Y	Y	N	Y	NR	Y
29	Johnson Creek Trib. – Towle Rd.	33	R	LDR-7		Y	N	Y	N	OS	Y
14	Kelly Creek – Kane Rd – Division	32	R	MDR-24	LDR-7	Y	Y	N	N	OS	Y
24	Binford Lake	29	R	LDR-7		Y	Y	N	N	OS	Y
18	Johnson Creek Trib. – West of Hogan	19	R	LI		N	N	N	N	None	N
12	Burlingame Creek	16	R	LDR-7		Y	Y	N	N	OS	Y

Site No.	Site Name	Score	Resource	Primary District	Secondary District	Open Space	Flood Plain	Slopes 15-35%	Slopes > 35%	Overlay	Protected
31	McGill Property	6	U	LI	BP	N	N	N	N	None	N

SS: Steel Slopes Area (15%+)
NR: Natural Resources
FP: 100-Year Floodplain
U: Upland
W: Wetland
R: Riparian



2.350 VISUAL RESOURCES

Gresham has a geographic setting which bestows on the city a number of notable visual amenities. The city sits on a rise overlooking the Columbia River, encompassing buttes and hillsides to the south, with Mt. Hood dominating the view to the east. This setting and its visual amenities contribute substantially to the attractiveness of the community as a whole. In addition, features such as the Columbia River, Mt. Hood, Grant Butte, and Walters Hill serve as landmarks which provide a sense of orientation. Views of these features enable residents and visitors alike to know that they are in Gresham.

While prominent visual resources are known to exist and their value in general to the community can be acknowledged, the identification of specific resources can be a highly subjective undertaking which does not lend itself to precise boundary delineation. Nevertheless, it does seem possible to group Gresham's most important scenic and visual resources into two broad categories: view corridors and scenic backdrops. within these categories, actual resources can be identified and analyzed in terms of conflicting uses and activities which might affect them, and the economic, social environmental, and energy (ESEE) consequences of either permitting or restricting the conflicting uses.

2.351 Signs and Visual Resources

Gresham is fortunate to have an extraordinary variety of visual resources. Topographic backdrops range from spectacular views of the Cascade Range to the forested volcanoes that form a local backdrop in the south part of the city. On a smaller scale, broad stands of Douglas fir extend across residential areas from Rockwood to the East Hill neighborhood. In addition, the architecture and landscaping of many buildings and sites in the city complement the natural backdrop, and have significant aesthetic value to Gresham residents.

These visual resources can be seen from most of the city's residential, commercial, and industrial areas, and though some of the features themselves may be protected, most of the views are not. Citizens involved with the update of the Community Development Plan have reviewed a wide range of potential impacts on visual resources, and identified signs and above-ground utility lines as features with a potentially significant impact; of these, sign controls are the most important tool for protecting visual resources, since existing above-ground utility lines are generally located along older county right-of-way, and Gresham development standards require that new utility lines be buried.

The recurring theme in citizen discussions, as well as recent literature regarding sign control, is that signs should serve as a means to identify a site or activity, not distract or confuse motorists, or demand attention. Under this premise, excessive signage that detracts from the aesthetic quality of the landscape, such as large signs that obstruct views and create a cluttered street scene, should be discouraged. These signs have an unnecessary impact on visual resources. However, the cumulative effect of all signs should be considered as well, since close spacing of relatively small signs could have a similar, unsightly impact.

Communities across the nation have identified signs as a source of visual clutter and negative impact on visual resources. During the past two decades, sign codes have become more restrictive in an effort to reduce the visual impact of signs. While in the late 1960's, this effort was characterized by federal highway beautification programs, most recent sign control efforts have occurred at the local level. Sign ordinances range from extremely aggressive campaigns to limit signage, such as the City of Houston, where the Gateway Project includes the removal of billboards, large commercial signs and above-ground utilities, to the City of Portland, where sign standards are generous, and the billboard industry is guaranteed a minimum number of signs under a “billboard bank” system.

Gresham's sign standards have eroded from a relatively stringent code in 1980, to a more lenient set of sign standards today; to gauge Gresham's standards in comparison to other jurisdictions in Oregon, a sign standards study was conducted in 1987. The study surveyed Oregon's twelve largest cities, and was focused on an analysis of standards for freestanding signs, and general sign code policies (See Figure 2-4).

Of the cities surveyed, Gresham permits the largest sign area for freestanding signs; Gresham's sign height regulations rank fifth at twenty-five feet, with several cities permitting thirty foot signs. Eight of the cities reported that the current sign code was at least as restrictive as the previous code, and five cities include amortization programs in the sign code.

Though Gresham's sign standards are not particularly stringent, two aspects of the city's sign code are unique, and quite effective in protecting visual resources. First, the city's standards permit signage based on frontage; this approach helps to minimize sign clutter, and in many cases, relates the extent of signage to the scale of a site or activity. Secondly, the concept of a multi-business complex has reduced the visual impact of signage at many new commercial centers; relating collective signage to these sites is a logical extension of the intended function of a shopping center, where other site components, such as parking, landscaping, access, and often architectural features help to create a unique identity.

While these findings generally support limiting signage in the interest of protecting visual resources, there may be situations where a particular sign is of such value to city residents as an aesthetic, cultural or symbolic landmark that is popularly regarded as a unique visual asset to the community. While these exceptional signs are not necessarily significant as Historic or Cultural Resources (Section 3.120 of Volume 1 contains findings on Historic and Cultural Resources), they are usually old and appear in their original condition, and because of their age and unique visual impact have become a familiar, positive element in the community's identity. Since most signage in Gresham is of recent construction, the number of exceptional signs is very limited.

In addition, there are some areas in the city that, because of their unique or special development pattern, may justify exceptions to certain sign standards. For example, A-Board signs may be appropriate in areas such as the Main Street District and large shopping centers, where the patronage is pedestrian-oriented, and the development pattern and sign standards make freestanding signs difficult or impossible to construct. Another example is when community service activities are permitted in a residential structure, and signage has the potential to negatively impact the character of the surrounding neighborhood.

As the sign matrix demonstrates, many cities used amortization programs to bring all signs into compliance with their sign code in a timely and fair manner. Some cities use valuation formulas to determine when signs will be required to comply, with the assumption that some signs reflect a greater investment by the owner, and thus should have a more extended non-conforming status than a sign of lesser value. Other cities simply use an amortization deadline, by which time all signs are required to conform to the code. These deadlines are usually based on a five, seven or ten year "amortization period," during which all signs are encouraged to comply voluntarily.

Figure 2-4 Gresham Period Review –
Comparative Sign Standards matrix of Oregon's Twelve Largest Cities

April 1988	Commercial		Industrial		Commercial		Industrial				
	Max Area (Sq. Ft.)	Max Height	Max Area (Sq. Ft.)	Max Height	Max Area Range (Sq. Ft.)	Height Range	Max Area Range (Sq. Ft.)	Height Range	More or Less Restrictive than previous Ordinance	Amortization Program	Amendments Initiated
Albany	160	30'	160	30'	50-160	15-30'	160	30'	More	Yes	Public
Beaverton	32	15'	32	8'	15-32	8-15'	15-32	15-32'	More	Yes	Public
Corvallis	200	30'	200	30'	100-200	20-30'	100-200	20-30'	More	Yes	Public
Eugene	200	30'	200	30'	100-200	20-30'	100-200	20-30'	More	Yes	Public
Gresham	400	25'	400	25'	40-400	25'	40-400	25'	Less	No	Private
Hillsboro	*	*	*Hillsboro is in the process of writing a sign ordinance*						*	*	*
Lake Oswego	32	18'	32	18'	32-64	18'	32-64	18'	More	No	Public
Medford	150	20'	200	24'	36-150	9-20'	200	24'	Less	No	Public
Portland	300	30'	300	30'	50-300	10-30'	300	30'	Same	No	Courts
Salem	350	35'	350	35'	150-350	30-35'	150-350	30-35'	Same	No	Public
Springfield	200	30'	100	30'	32-200	8-30'	100	30'	Less	No	Private
Tigard	135	22'	135	22'	70-135	20-22'	70-135	20-22'	More	Yes	Public

Note: -Some jurisdictions, such as Gresham and Lake Oswego, permit larger signs based on structure or street frontage.
-Several jurisdictions, including Springfield, Albany, and Lake Oswego, permit larger signs for sites with freeway frontage.
-Though not considered in this study, wall sign area limitations were generally within the range of freestanding sign limits.

While enforcement of the valuation approach is rather expensive, the amortization method has proved both effective and easier to enforce. The City of Tigard began to enforce their amortization deadline in 1988, and the City of Beaverton is scheduled to enforce their deadline this year. While non-conforming signs will almost certainly remain at the end of any amortization period, studies suggest that most signs come into compliance voluntarily, or through a change in business. This was the case in Gresham in 1984; although the City did not have adequate staff resources to enforce the amortization deadline, an inventory of non-conforming signs found that a majority had already complied with the sign code. A recent non-conforming sign inventory on a larger scale showed similar results in the City of San Diego. Compliance during the amortization period can be attributed to a number of factors, including the inherent practical life of a sign, the natural turnover of established businesses, the high failure rate of new businesses and the negative image that an outdated or poorly maintained sign can project for an establishment (see Appendix 35).

(Amended by Ordinance No. 1134, passed on June 27, 1989, effective July 27, 1989.)

2.352 View Corridors

View corridors can be thought of as lines of sight which have as their object a prominent and appealing visual element. Various view corridors oriented toward such features as Mt. Hood can be found throughout the city. However, there are three particular view corridors which can be considered significant not only because they naturally direct the eye to a scenic focal point, but also because they are readily apparent and accessible to large numbers of people. These are described below:

Burnside St. Eastbound – Fariss Rd. to Cleveland Ave.

When traveling eastbound on this portion of Burnside St., whether in a vehicle or on foot, Mt. Hood dominates the horizon on clear days or when there is a high cloud ceiling. The appearance of the mountain is made more dramatic by the gentle slope which must be climbed when approaching the Fariss Rd. intersection from the west, and which obstructs the view until the top of the rise is reached. Continuing eastward on Burnside St., Mt. Hood remains prominent until the Cleveland Ave. intersection is reached. At that point, Burnside curves toward the south-southeast and conifers obstruct the view.

The primary land use district along this portion of Burnside St. is General Commercial, with an area of Transit Development District. Commercial developments which develop in such a manner as to obscure the view of Mt. Hood along this street segment must be considered conflicting uses. In addition, public improvements, such as utility poles and power and communication lines, may conflict with the preservation of this view corridor.

Stark St. Eastbound – 223rd Ave. to East City Limits

This segment of Stark St. defines a view corridor which is comparable in its orientation to Mt. Hood with the Burnside view corridor described above. When traveling eastbound on this portion of Stark St. the relatively unobstructed view of Mt. Hood comprises a significant scenic resource.

Plan map designations along this segment of Stark St. are primarily residential, with stretches of office/residential and commercial adjacent to the intersections at 223rd Ave., 242nd Ave. and Kane Dr. Again, any of a wide range of development activities permitted in these districts which obstruct the relatively clear view of Mt. Hood in this area could be considered conflicting uses.

North Side of Marine Dr. – 185th Ave. to Interlachen Ln.

Northward of this portion of Marine Dr. is an open view of the Columbia River, McGuire Island, and the slopes of the Washington side of the river. The closeness of the river, the elevation of Marine Dr. and the expanse of water both upstream and downstream make this a significant scenic resource in

Gresham. Houseboat moorages existing along this portion of the river shoreline contribute an additional element of visual interest to the scene.

The very narrow strip of land lying between Marine Dr. and the river is designated for both Light Industrial and Heavy Industrial uses. Such uses could also conflict with the quality of the view from this location, although there is very little developable land lying between Marine Dr. and the shoreline. At this time, existing vegetation and a few small signs make up the only notable obstructions to an otherwise clear view of the Columbia River in this area.

ESEE Consequences

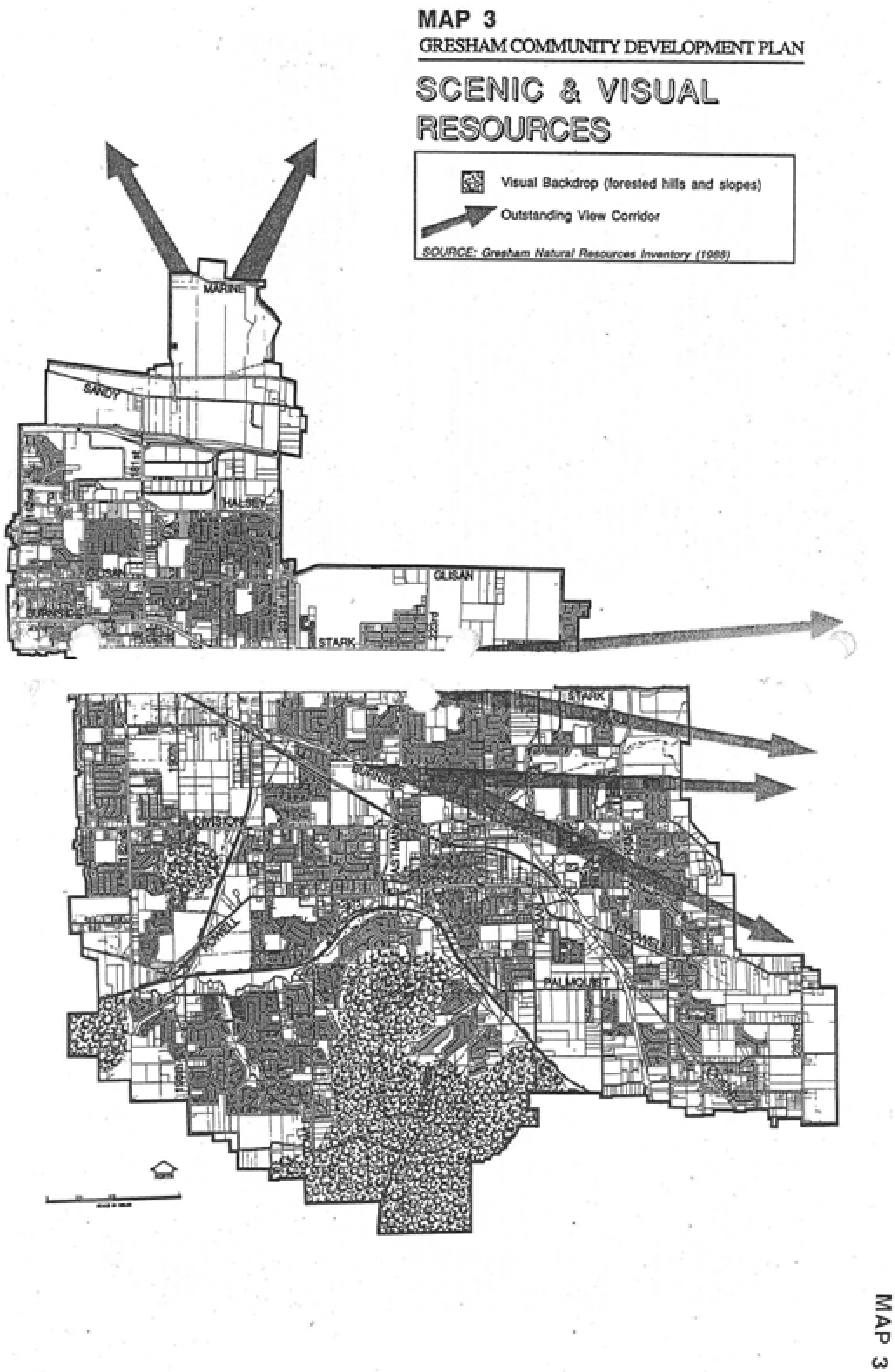
Economic consequences could result from measures which might be taken to ensure protection of these view corridors. Such measures could include requirements that new buildings be set back, that building heights be restricted, and that commercial sign structures and other forms of "street furniture" also be set back from the edge of the Burnside St., Stark St. and Marine Dr. rights-of-way. Likewise, there would be considerable expense involved in a requirement that utility lines be relocated underground in order to preserve or enhance these view corridors. To the extent that such measures add expense to development activity, adverse economic consequences could result. At the same time, however, such measures could yield positive economic consequences if, as a result, these street segments make the general area more attractive for new development because of their aesthetic appeal.

There may be some adverse social consequence resulting from elimination of these view corridors due to new development activity. The sense of place, the spatial orientation, and the visual texture which view corridors bring to residents of the community could be diminished or lost as these resources are replaced by relatively monotonous, urban streetscapes which tend to be indistinguishable from one city to another.

Certain environmental consequences might also be expected from measures to protect these view corridors. Overall, the quality of the visual environment in the immediate area would be enhanced by provisions which prevent the close encroachment of buildings to the street edge, or which preclude large, distracting signs from obstructing a scenic focal point which otherwise would be visible.

It is not expected that any significant energy consequences would result either from taking steps to preserve the quality of these view corridors or from permitting uses and actions which conflict with these scenic resources.

Based on this examination of potentially conflicting uses and ESEE consequences, policies and strategies which restrict development actions along these view corridors would be appropriate. Prohibition of all development actions which might conceivably obscure or degrade existing scenic views along these corridors is not warranted. However, a concern for protecting the outstanding scenic quality of these particular view corridors may be added to the rationale for maintaining limits on these height and placement of structures, signs, and other improvements in these areas and throughout the city.


MAP 3
GRESHAM COMMUNITY DEVELOPMENT PLAN
SCENIC & VISUAL RESOURCES
Visual Backdrop (forested hills and slopes)
Outstanding View Corridor
SOURCE: Gresham Natural Resources Inventory (1988)
MARINE
SANDY
HALSEY
GLISAN
STARK
DIVISION
PALMQUIST
MAP 3

2.353 Scenic Backdrops

In contrast to view corridors, which generally have a linear alignment and are oriented to distant objects, scenic backdrops provide a more local source of visual relief as well as an immediate sense of orientation. By their nature, prominent topographical features in Gresham present themselves as visually pleasing backdrop and contrast to the rapidly expanding urban landscape which is developing on adjacent flatlands.

The slopes of Walters Hill, Grant Butte, and Jenne Butte are always visible from virtually any location in Gresham. Each of these features reaches an elevation in excess of 600 ft. whereas most adjacent lands are at an elevation of 250-300 ft. Their steep, heavily wooded slopes also provide wildlife habitat. Woodland areas found on these slopes are important in addition for their value in stabilizing hillsides and minimizing erosion and runoff. There are approximately 1,500 acres of woodland in Gresham, and nearly all of this is found on the steep slopes of Walters Hill, Grant Butte, and Jenne Butte. If the large areas of woodlands on these slopes were removed, the visual quality of these features would be seriously diminished, hazards to development would increase, wildlife habitat would be reduced and water quality would suffer in wetlands and streams at the base of these slopes due to increased erosion.

All of Grant Butte, Walters Hill, and Jenne Butte are designated for low-density residential development. Full development of these slopes with dwelling units, and with the streets and utilities which accompany such development, would constitute conflicting uses having a negative impact on these scenic resources. In addition, removal of large areas of woodlands existing on these slopes must be considered to be in conflict with the scenic quality of these visual backdrops.

ESEE Consequences

The most effective means of preserving the scenic quality of these areas might be to prohibit future development activity, including the removal of any trees, on these slopes. Such action could be expected to have negative economic consequences for landowners who have anticipated eventual development of these lands, even at the relatively modest scale which would be dictated by slope-related constraints. On the other hand, negative economic consequences community-wide could result from degradation of the scenic quality of these hillsides. The appearance of these wooded uplands adds to the attractiveness of gresham for all types of economic development activity taking place on sites other than Walters Hill, Grant Butte, and Jenne Butte.

The social consequences of protecting these scenic resources or permitting conflicting uses are difficult to quantify or to identify precisely. However, it seems certain that the sense of place, the spatial orientation, and the rich visual texture which scenic backdrops such as these bring to residents of the community would be diminished or lost if these slopes were cleared of vegetation or developed as residential subdivisions.

The environmental consequences of permitting conflicting uses on the steep slope portions of these areas would be severe. In addition to diminishing the scenic quality of the community in general, removal of large areas of vegetation on steep slopes would increase the amount and rate of surface water runoff, increasing siltation and the severity of flooding in nearby streams. In such situations, the soils become much less stable and bearing loads from development in the form of buildings and roads may exceed the capacity of the ground to support them. Steep slope areas on these upland resources also serve as wildlife habitat. As noted in the Inventory of Significant Natural Resources and Open Spaces, a wide variety of birds, small and large mammals, and vegetation are found on the slopes of Jenne Butte, Grant Butte, and Walters Hill. Dense residential development or removal of trees for their value as timber would have direct, negative consequences on the wildlife habitat values of these areas.

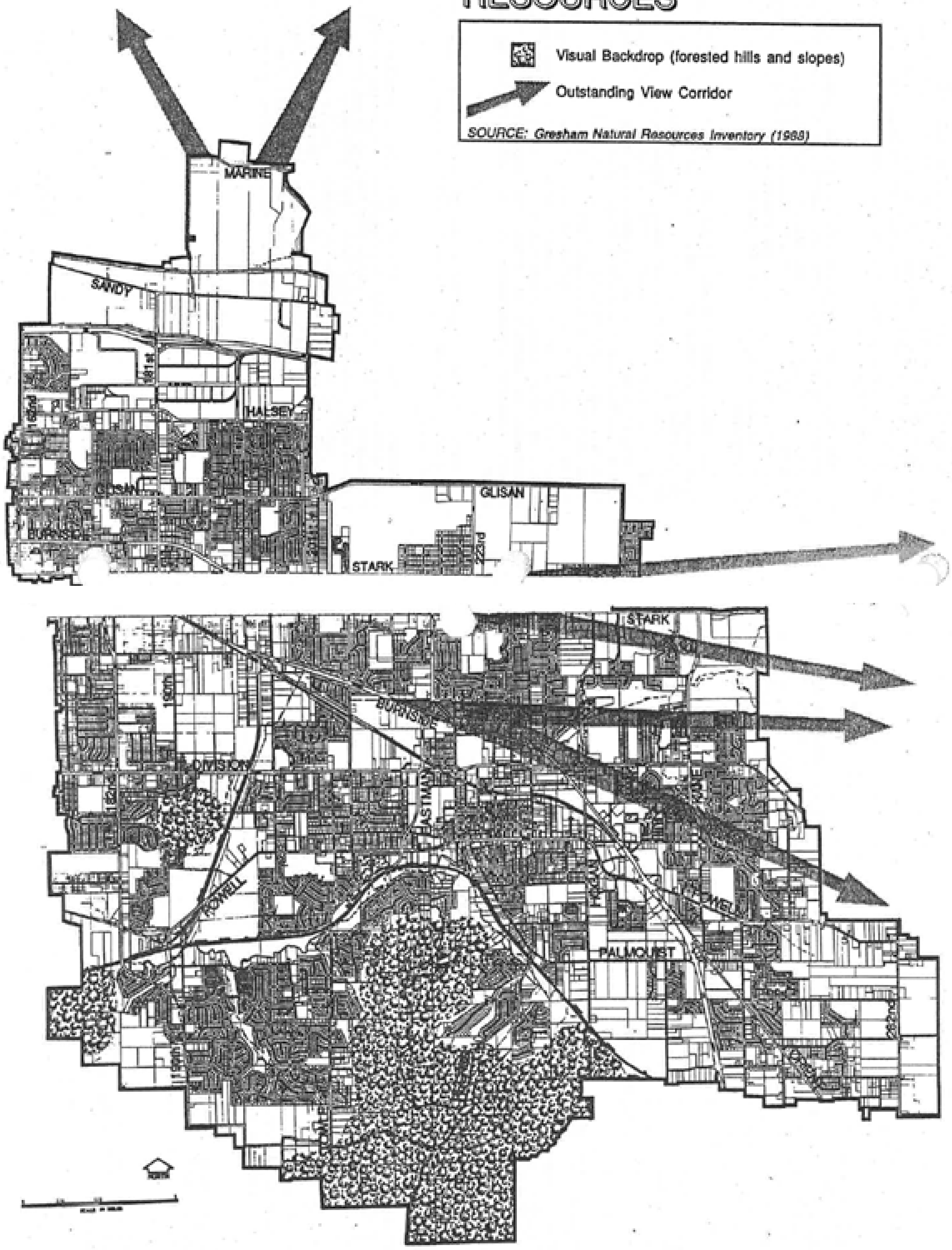
There are no significant energy consequences from either allowing conflicting uses in these scenic backdrop areas or preserving them from development.

Based on this examination of potentially conflicting uses and ESEE consequences, policies and strategies which restrict development actions on the highly visible, steep slope portions of Grant Butte, Jenne Butte, and Walters Hill would be appropriate. Prohibition of all development actions which might conceivably affect the scenic quality of these resources is not warranted. However, measures such as a reduction in residential densities on steep slopes and some control over commercial-scale tree harvesting would result in reasonable development potential for these areas while ensuring their continued existence as outstanding scenic resources in the community.

MAP 3

GRESHAM COMMUNITY DEVELOPMENT PLAN

SCENIC & VISUAL RESOURCES



2.360 MINERAL AND AGGREGATE RESOURCES

Mineral and aggregate resources are natural resources of a non-renewable nature which are crucial to urban development. No metallic mineral resources are known to occur in the Gresham vicinity. Non-metallic mineral resources, however, in the form of clay and aggregate, occur in Gresham. There are two particular areas in which large quantities of aggregate and clay resources have been identified and are being extracted. Along both the east and west sides of 190th Ave. between Stark St. and Division St. is an area of some 170 acres which is in active use as sand and gravel quarries. East of SE Hogan Ave,, north of Johnson Creek, there is a pit from which clay is extracted and manufactured into bricks.

The most important planning issues involved with mineral and aggregate resource management are ensuring that in-place and migratory sites are both utilized effectively now and managed to facilitate future use, and ensuring that adverse environmental impacts resulting from mining and processing are minimized.

2.361 Aggregate Resources

Aggregate resources are literally the foundations of urban development. They are required for nearly all public and private building, including roads and sewer lines. So great is our reliance upon aggregate resources that the annual per capita consumption of sand and gravel has been estimated at 25 tons. Aggregate is comprised of sand, gravel, and crushed rock. The value of these three resources greatly exceeds the value of all other minerals produced in the State of Oregon. Aggregate is heavily used in all aspects of the construction industry, from homes to roads to dams, and is a prerequisite for continued economic growth and development.

The Willamette Valley produces and consumes two-thirds of the state's total aggregate resources. Rapidly urbanizing areas place a two-fold demand/supply constraint on available aggregate resources. Urbanization places a heavy demand for aggregate products while simultaneously covering over other potential sand and gravel deposits. A prime example of this situation is the urbanized east Multnomah County area, where much of the land area overlays aggregate deposits. As local resources are depleted, it will be possible to import aggregate, but only at increased cost. It has been estimated that the price of sand and gravel doubles for every ten miles hauled.

Per capita aggregate usage, nationwide, has been steadily on the increase, Analysis of the uses of sand and gravel indicates that 80-85% of aggregate resources are used for building or paving; some pertinent facts are cited below:

- A typical housing unit requires approximately 40 cubic yards of concrete.
- A cubic yard of concrete contains 1 1/4 to 1 1/3 cubic yards crushed aggregate, about 460 pounds of cement, and 15 to 20 pounds of water, and weighs 4,000 pounds.
- Each housing unit generates a secondary market for aggregate equivalent to more than 100 cubic yards per house.

- A typical subdivision residential collector street (40’ paved width) requires 232 tons of aggregate for road base and 47 tons of crushed rock for asphalt paving for every 100 linear feet.

All forms of urban development, public and private, use vast quantities of aggregate. The relatively high consumption rates in the Portland area are expected to continue for the foreseeable future.

Aggregate resources can be categorized generally into migratory resources and in-place resources. Both types can be found in and adjacent to the Gresham planning area. Migratory resources are affected by the flow of water. Both the Willamette River and Columbia River systems carry considerable amounts of sand and gravel. Larger deposits are found in the form of channel bars and point bars. The deposits are exploitable by point bar mining or scalping during low stream flow periods. Considerable volumes of sand are removed from the Columbia River by drag bucket and suction dredging. Migratory deposits are significant sources of aggregate in that they are partially recharged during annual high stream flow periods.

Other than the Columbia River, no migratory aggregate sources are known to exist within the immediate Gresham area. The Columbia does offer potential as a rechargeable source of masonry sand; however, little gravel is available from this source due to upstream dams and controlled river flows. Perhaps the greatest significance of the Columbia River with respect to aggregate resources is its barge traffic from aggregate deposits located above Bonneville Dam. Deposits below the dam contain large amounts of pumice and are not suitable for concrete or asphalt production. Although the Portland metropolitan area currently receives much of its aggregate from Willamette River deposits, when these deposits are depleted, more emphasis will be placed on upstream Columbia River deposits.

Most of east Multnomah County sits atop fluvio-lacustrine sand and gravel deposits of the recent and late Pleistocene epoch. Briefly, these deposits were laid down approximately 13,000 years ago by a lake which covered much of the Columbia River region and Inland Empire. The deposits are stratified to unsorted and size ranges from sand to cobbles to boulders. These formations are the source of Gresham's in-place aggregate resources.

Existing gravel pits within the city are utilizing the gravelly phase of the lacustrine deposits, consisting of coarse gravel with a sandy matrix. The gravelly phase is found throughout the north and west regions of the city. Further westward, the deposits become less gravelly and increasingly sandy. To the east, cobbles and boulders are more predominant, some reaching sizes of seven to eight feet in diameter. The majority of the gravel being mined is basaltic with some quartzite and granitic rock. The deposits extend down to approximately 150 ft., averaging 30 to 80 ft. in thickness. The material is of good quality for construction purposes. Much of it is used in making concrete.

Consumption rates at sand and gravel operations within Gresham have risen and fallen somewhat in recent years, paralleling the level of building activity and the overall urbanization of east Multnomah County. The location of these sites is such as to serve most of east Multnomah County as well as all of Gresham.

2.362 Clay Resources

Clay is a natural, earthy, fine-grained material composed of rock or mineral fragments less than 0.002 mm. in size and a group of crystalline minerals known as clay minerals. It is a commonly occurring commodity in the soil profile of northwestern Oregon. Most clay minerals originate under conditions associated with water. Clay beds are typically deposited by water transport or hydrothermal action. Where clay is found deeply bedded into more or less pure form, a potentially exploitable natural resource is present.

The major use of clay is for common and structural brick and tile production. The economics of brick and tile production are sensitive to factors other than the availability of clay. Transport costs to market and energy costs are significant factors affecting the long-run viability of this activity. Out-of-state producers are able to compete effectively in the Oregon market, off-setting higher transport costs with lower unit production costs.

In 1948 there were 28 brick producers in Oregon. By 1979 only four were remaining, one of which is in Gresham. The reasons for the decline are many: technological obsolescence, fluctuating demand, and land use conflicts are the major sources. Over time, the demand for brick and concrete for structural purposes has fluctuated. Other uses of clay, such as architectural facade and clay tile, are unlikely to be displaced by concrete. It is therefore critical that existing sites and operations be utilized wisely.

In the southeast portion of the city and east toward the Sandy River, bedded clay deposits are found in the form of clayey silt, and in conjunction with Sandy River mudstone. These deposits are relatively high in iron, resulting in fired brick of a red/brown color. The formations may vary in thickness and purity, but are found uniformly close to the surface. One particularly desirable deposit is found near SE Hogan Rd. north of Johnson Creek (SW 1/4, Sec. 14, T1S, R3E). Here, Columbia Brick works, Inc., maintains a surface mine and brick manufacturing plant.

2.363 Inventory of Aggregate and Clay Resources

While aggregate and clay resources can be found as elements of soil types existing throughout Gresham, there are only two locations where these resources are both undisturbed by urban development and found in sufficient quantities to make commercial extraction feasible. These locations are along both sides of 190th Ave., between Division St. and SE Yamhill St., and at the site of Columbia Brick Works.

Vance Pit

On the west side of 190th Ave. north of Division St. is Vance Pit, a sand and gravel quarry operated by Multnomah County. Vance Pit covers approximately 27.5 acres. In 1987, 26,300 cubic yards of crushed rock were mined from Vance Pit. In recent years, the average annual output of the pit has been running at approximately 60,000 cubic yards of rock. In addition to the active quarry area, the county owns approximately 15.75 acres of park land between Vance Pit and 182nd Ave. The county will be preparing a master plan for the Vance Pit and adjacent park area during 1988. At present, it is expected that as the existing pit resources are depleted, the operation will expand into the park site. Through this expansion of the quarry area, the county projects continuing operation of the pit over the next 20-30 years, given current rates of extraction.

Rogers Construction Co.

Abutting the east side of 190th Ave south of Yamhill St. is a sand and gravel quarry owned and operated by Rogers Construction Co. and its subsidiary, Oregon Asphaltic Paving Co. This quarry encompasses approximately 36 acres. It is estimated that this quarry contains a total of some 6 - 7 million cubic yards of aggregate material, most of which remains to be extracted. Based on recent trends, it is estimated that this quarry will continue to be in production for the next 10-20 years.

Gresham Sand and Gravel Co.

Directly south of the Rogers quarry, on the east side of 190th Ave., is the Gresham Sand and Gravel quarry. Gresham Sand and Gravel Co. owns approximately 100 acres on this site. Some of this area has been mined in the past and is now occupied by lakes where the water table has submerged these previous quarry pits. During 1987 approximately 300,000 cubic yards of aggregate material were extracted from this quarry. It is estimated by the operators of this quarry that there are sufficient aggregate resources to support its continued operation for the next 20 to 30 years.

Columbia Brick Works, Inc.

This surface mine and brick manufacturing plant have been in operation since 1906. In 1980 the clay pit and plant occupied a 55-acre site. Since that time, the brick works has acquired additional property south of Palmquist Rd. to hold in reserve for future mining. Also in 1980, the plant was consuming 25,000 - 28,000 cubic yards of clay annually, and producing 14,000,000 eight-inch face brick equivalents. In recent years, production has declined somewhat due to economic conditions. The depth and extent of clay deposits at this location are not known precisely, although a deposit life of 95 to 140 years has been estimated. This estimate could be extended as a result of the additional, recently acquired property.

Conflicting Uses

The three aggregate quarries located along 190th Ave. between Stark St. and Division St. have an industrial land use designation. Abutting the Rogers Construction Co. and Gresham Sand and Gravel Co. quarries to the east is additional industrial land. On the south is additional light industrial and commercial land. Adjacent to these quarries on the north and west are areas designated for low-density (LDR-7) and moderate-density (MDR-24) and high density (HR-60) residential uses.

The abutting industrial district permits a wide variety of manufacturing, assembly, and processing uses which are likely to require at least some outdoor storage. In the adjacent residential districts there are existing detached dwellings and attached, multi-family developments at densities ranging from 5 to 24 units per net acre. The noise, dust, and truck traffic generated by the quarry operations in these areas can result in conflicts with adjacent residential, commercial, and industrial uses, although the potential for conflict is greater with respect to adjacent residential uses.

Land use designations adjacent to the Columbia Brick Works site are residential to the north, east, and south. Across Hogan Rd. to the west is property designated industrial. Potentially conflicting uses for this operation are the same as those identified for the aggregate quarries, although the relatively isolated location of the clay pit and brick plant mitigate somewhat the extent of these conflicts at present.

ESEE Consequences

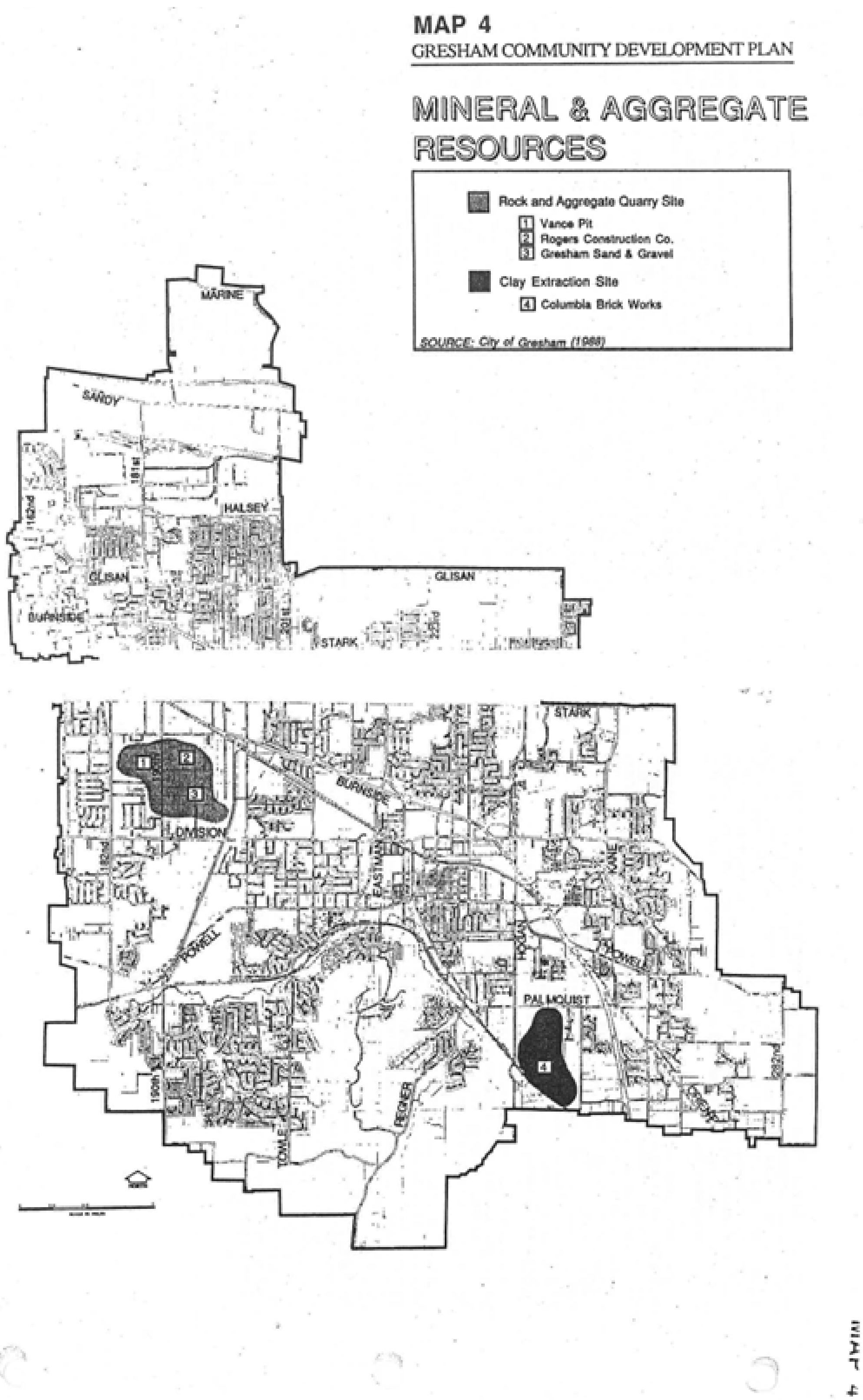
For reasons discussed above, the economic consequences of prohibiting or restricting activity at these sites could be severe. Aggregate resources and clay products are required for a wide variety of construction and development needs, both public and private. If these resources were not available from these operations, new development projects proposed for the local area would be forced to obtain aggregate materials and clay products from other suppliers more distant from Gresham and at greater cost. Multnomah County uses the output of Vance Pit for maintenance and construction of roads and streets which are vital for the economic development of the community. There would also be adverse economic consequences on these operations themselves, in the form of jobs lost. At the same time, the characteristics of these resource extraction operations have some negative economic consequences for nearby residential neighborhoods. Property values of nearby residential parcels may be adversely affected by the effects of unrestricted noise, dust, and heavy equipment traffic.

To the extent that the peaceful enjoyment of nearby residential properties is disturbed by the operation of these quarries and the clay pit, negative social consequences can be expected. Complaints of loud noises, dust, and unpleasant visual impacts are periodically reported to the city by residents living in close proximity to the quarries on 190th Ave. Unrestricted mining activities at these locations could be expected to result in more such complaints and an overall decline in the livability of nearby neighborhoods.

The environmental consequences of aggregate and clay extraction operations can be significant. Existing, natural ground surface features, such as trees, shrubs, and other ground covers, must be removed. This leaves gaping holes which increase in size as extraction activities increase, resulting in adverse visual impacts. If excavation is not carried out carefully, the sides of the pits may de-stabilize adjacent land areas, causing slides. Subsurface water resources may also be affected, sometimes lowering the water table of adjacent properties. As noted, the operation of gravel quarries involves considerable noise, both in the process of extracting the aggregate and in operating rock crushing equipment which turns the aggregate into a marketable resource.

The energy consequences which could result from prohibiting or tightly restricting the mining and processing of aggregate or clay would take the form of increased energy use required to meet local needs by obtaining these resources from more remote suppliers.

Based on the foregoing analysis of conflicting uses and ESEE consequences, it is clear that the functioning of these mining operations can have significant adverse impacts on adjacent uses, and that measures which might be implemented to prevent these impacts could impose significant adverse impacts on the mining operations. Given these conclusions, a program which would protect mineral and aggregate resources and extraction operations completely is not appropriate. Likewise, measures which would allow fully the conflicting uses identified above are not called for. Instead, policies and implementing measures should be adopted which limit conflicting uses. Specifically, mineral and aggregate resources must continue to be extracted where economically feasible, but such operations should take place in a manner which minimizes negative impacts on the value and enjoyment of nearby properties and on public facilities serving the area.


MAP 4
GRESHAM COMMUNITY DEVELOPMENT PLAN
MINERAL & AGGREGATE RESOURCES
Rock and Aggregate Quarry Site
1 Vance Pit
2 Rogers Construction Co.
3 Gresham Sand & Gravel
Clay Extraction Site
4 Columbia Brick Works
SOURCE: City of Gresham (1988)
MARINE
SANDY
HALSEY
GLISAN
BURNSIDE
STARK
DIVISION
BURNSIDE
EASTMAN
POWELL
PALMQUIST
TOWLE
REGNER
MAP 4

2.370 RESOURCE CONFLICTS

Potential conflicts with preservation of Gresham's significant natural resources have been found and documented in the Inventory of Significant Natural Resources and Open Spaces. Similarly, conflicting uses have been identified for other types of natural resources, including mineral and aggregate resources, and outstanding scenic views and sites. A concern for protecting the most important of the community's natural resources while accommodating urban development leads to programs which limit conflicting uses to the extent necessary to achieve a balance between these conflicts. Uncontrolled urban development, if allowed to proceed without limits in sensitive areas, conflicts with Statewide Land Use Goal 5, "To Conserve Open Space and Protect Natural and Scenic Resources." Uncontrolled development of forested hillsides and sensitive floodplain areas is also in conflict with the intent of Statewide Land Use Goal 7, "To Protect Life and Property from Natural Disasters and Hazards." Regulation of development to minimize the threat of natural hazards therefore results, in many cases, in conservation of Gresham's significant natural resources. Extremely steep slopes (those in excess of 35%) pose severe constraints upon urban uses and should be subject to only minimal alteration or development activity. In addition to benefiting drainage management and preventing hazardous conditions, prohibition of steep slope development protects open space, forested areas, fish and wildlife habitat, and scenic resources. Prohibition of development in sensitive natural areas benefits flood control efforts, reduces flood hazards, improves drainage management, preserves riparian vegetation, and protects fish and wildlife habitat. There is floodplain throughout the City in areas adjacent to Johnson Creek, Kelley Creek, Kelly Creek, Beaver Creek, Butler Creek, Hogan Creek, Brick Creek, Brigman Creek, North Fork Johnson Creek, McNutt Creek, Badger Creek, Sunshine Creek, Jenne Creek, and portions of Burlingame Creek, Botefur Creek, Heiny Creek, Fairview Creek and Columbia Slough, 90% of the floodplain is also designated also as significant natural resource areas.

Landslide prone slopes with particular soil types, although posing severe constraints upon urban development, are appropriate for low-density uses if planned to overcome the particular constraints and if appropriate construction and site design requirements are followed. Where landslide prone slopes coincide with natural resources, such as wildlife habitat, a resource use conflict may occur, as discussed in the Inventory of Significant Natural Resources and Open Spaces, adopted as an appendix to the Community Development Plan. Special regulations and guidelines for development within landslide prone areas can minimize resource use conflicts and accommodate urban growth while maintaining important natural resources. Regulations which minimize vegetation removal, preserve open space, and impose erosion and drainage controls are examples of actions which resolve conflicts between development needs and natural resources. In particular, prohibition of large-scale, commercial timber harvesting operations in steep slope areas would conserve soil, stabilize slopes, protect wildlife habitat, and preserve the scenic value of the wooded hillsides in Gresham. The Community Development Code is designed to resolve resource use conflicts in these areas through the establishment of special requirements for development on landslide prone slopes.

As discussed in Section 2.360, mineral and aggregate resources come into conflict with urban uses as development often covers over underlying depositions. Conflicts also occur when extractive operations interfere with incompatible adjacent land uses such as residential areas. These potentially conflicting situations are resolved in Gresham through land use designations as shown on the Community Development Plan Map. In addition, standards of the Community Development Plan require these operations to maintain adequate buffers from adjacent land uses and to minimize impacts of public facilities. The four existing surface mining operations in the city have been designated as industrial land to protect these resource areas from other competing uses.

Mining operations result in another type of resource use conflict, the rehabilitation and reclamation of depleted sites. State law (ORS 517.750 et seq.) regulates surface mining operations and requires reclamation plans and surety bonds to guarantee that the sites of these operations will be returned to productive use following depletion of mineral and aggregate resources.

2.380 ENERGY RESOURCES

Currently, most energy used in Gresham comes from outside the city. This includes electricity generated from solar, wind, hydropower and fossil fuels such as coal. It also includes fuel oil, natural gas and wood fuels. Gresham has potential for renewable energy within its boundaries. Renewable energy sources include solar, wind, biomass, geothermal and micro-hydro energy. Energy technology continues to advance, so additional opportunities could develop in the future.

Energy generation within Gresham provides an opportunity to locally produce energy, which could reduce dependence on imported energy and reduce energy costs for citizens in the long term. The technologies currently available in Gresham are mostly renewable energy technologies that enhance sustainability and help reduce greenhouse gas emissions that have been linked to climate change.[1]

(Amended by Ord. 1724 effective 2/14/13)

2.381.1 Solar Power

Solar power is the most widely used form of renewable energy. There are two kinds of active solar energy systems for deriving energy from the sun - solar hot water and solar photovoltaic systems.

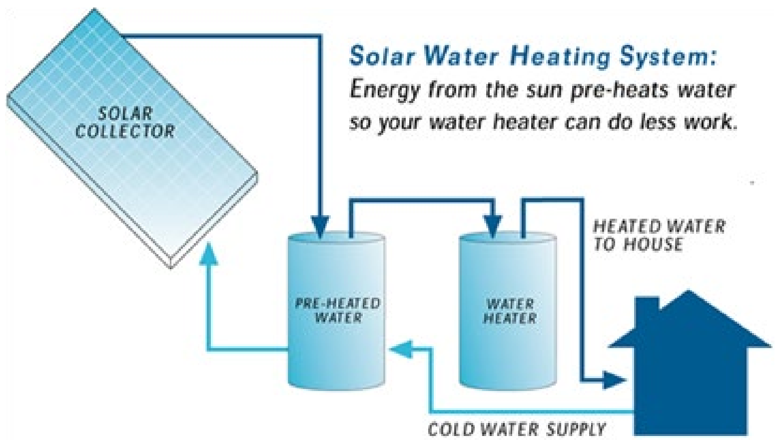
A solar hot water system typically helps heat the water that goes into a water heating system, which reduces the amount of electricity or gas that system consumes. A photovoltaic system produces electricity for use in the home/business or for sale back to the electric utility or for energy storage in batteries. Solar collectors work best on south facing roofs, though east-west oriented roofs may be suitable as well. There are also ground-mounted systems for situations where roof slopes and building orientation are not optimum or where there is significant shading by adjacent buildings, etc.

Heating water is one of the largest energy consumers in a home. Solar water heating systems can reduce the amount of energy used to heat water in the average home by about 60 percent. Typically, cold water is warmed by the sun, and that water drains down to a pre-heated water tank and then on

[1] Intergovernmental Panel on Climate Change

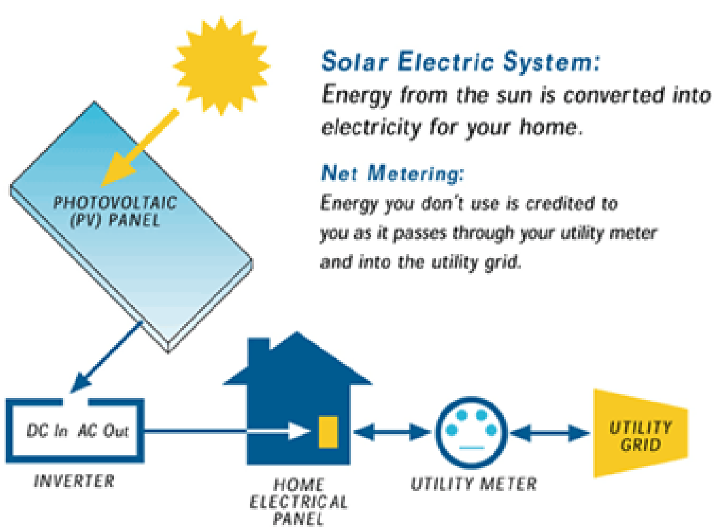
to the home's hot water tank, which reduces the amount of energy needed to get the water up to the desired temperature.

Source: Energy Trust of Oregon



Photovoltaic panels convert sunlight directly into electricity (electrons). This is made possible by the material inside the collector (semiconductors usually made of silicon) which is organized into cells that can conduct electricity. Electrons in the semiconductor material are energized by sunlight and are driven toward the surface of each cell where they are collected and transmitted elsewhere through wiring. In the U.S., electrical devices and utility grids use electricity in the form of alternating current (AC). Because photovoltaic panels create direct current (DC), it must first be directed to an inverter box, usually mounted on the side of the house, where it can be converted to AC and then synchronized with the utility-supplied electricity. From the inverter, it goes to the electrical panel (circuit breaker box) and then through the house wiring. Any surplus power goes to the utility meter where it can be recorded for utility bill deductions and then to the utility grid, which is referred to as "net metering" or feed-in tariff. The surplus power can also go to battery storage for future use.

Source: Energy Trust of Oregon



Electricity produced by photovoltaic panels is expressed in watts and kilowatt hours. A watt is a measurement of electricity and a kilowatt hour is the amount of electricity that is transmitted at a constant rate of 1,000 watts per hour. A kilowatt hour is the unit that is used by utilities to determine the amount of power used by a home or business for billing purposes.

The average four-person household in the Portland area uses about 12,000 kilowatt (kW) hours annually.[2] Typically in western Oregon, a 1 kilowatt solar array measures an estimated 100 square feet and can generate about 1,000 kilowatt hours annually.[3] A recently installed local residential system produced approximately 4,500 kilowatt hours with only 270 square feet of high efficiency panel area and saved $400 per year in energy costs in 2012.

Solar panels also are used for commercial, industrial and institutional uses, as well as to power auxiliary uses such as irrigation systems, restrooms, signs and traffic control devices.

A recent technological advance in solar electric power is the development of thin plastic-like film that has embedded metal semiconductors. These conduct electricity when exposed to sunlight. Power output and cost promises to be superior to current photovoltaic panels. The film can be manufactured by printing it out in large sheets which can then be cut into desired sizes and shapes. This material will be able to be seamlessly integrated into exterior building materials such as roofing, siding and windows.

The amount of solar radiation reaching the earth's surface is dependent on the condition of the sky, the angle of the sun's rays above the horizon and the duration of the day. Sky conditions refer to the extent of cloud cover, the density of the air and the components of the air (i.e. pollutants). The altitude of the sun above the horizon is dependent on the latitude north or south of the equator. The farther the location is from the equator, the less intense are the rays of the sun. The length of daylight also affects the amount of solar radiation reaching the earth's surface, so more solar radiation reaches the surface during the summer.

The Portland area receives an average of about 68 clear days between sunrise and sunset each year. This is equivalent to 20 percent of the days in a year, and more than half of these days occur during the late summer months. Adding in partly cloudy days, the area averages more than 140 days of clear and partly cloudy skies each year, according to National Weather Service data.

The available amount of sunlight in Gresham is adequate to make solar a part of electrical generation in the Gresham area, partly because surplus electricity generated during the summer can be sold back to the utility via net metering or feed-in-tariff.

Potential issues with solar installations include:

- How to preserve solar access in the future.

[2] PGE website, Renewables & Efficiency, Go Solar

[3] Oregon Dept. of Energy, "Oregon Solar Electric Guide"

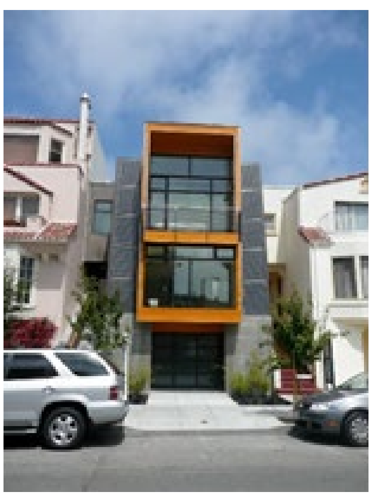
- How to balance goals of adding tree canopy and increasing solar energy productions.
- How to achieve desired densities and building heights, visual appearances, locations, and setbacks to accommodate solar facilities.

Additionally, a new State law requires that solar panels be an allowed use for residential and commercial structures if they do not increase the structure's footprint, do not exceed the roof height, and the panels are parallel to the roof slope and not more than 18 inches off the roof. Standards cannot be created that require extensive site surveys or restrictions for these types of renewable energy systems.

Examples of Solar Installations:

Roof-top solar panels on a single-family residence.

Flat roof solar film on an industrial building.



Integrated solar wall panels on a townhouse.

Stand-alone solar panels in an array along a freeway at the intersection of I-5 and I-205

2.381.2 Wind Power

Wind turbines convert wind energy into electricity and are the second most widely used type of renewable energy system. Although wind power accounts for only 1.5 percent of worldwide electricity production in 2012, it is growing rapidly, having more than doubled production since 2005.[4]

A wind turbine works by having the wind turn its blades or rotor, which spins a shaft that connects to a generator to make electricity. The higher and more constant the wind speed, the more electricity is produced, up to the maximum output of the turbine. Wind turbines need to be attached atop a pole, tower or building for support and to access the wind. Because wind speeds increase (and turbulence and interference decreases) with height, turbine efficiency generally increases with tower height. In general, the larger the rotor, the larger the amount of wind caught and electricity produced. Wind speed can be highly variable, especially in urban environments where buildings and other structures can deflect wind. Power production is measured in watts and kilowatt hours. An inverter is necessary to convert direct current into alternating current.

Wind turbines come in two basic scales:

- Large turbines: These are used mainly by utilities in wind farms and transmit electricity into the power grid. They consist of dozens and sometimes hundreds of large turbines that can generate up to several megawatts (million watts) each. Such farms can occupy hundreds of acres or square miles. They are typically located in wind-swept plains, deserts, mountain passes and along seashores where there is a stronger, more constant wind speed.

  An example of a wind farm is Portland General Electric’s Biglow Canyon Wind Farm in eastern Oregon (Sherman County).[5] When completed, it will consist of 217 wind turbines that will generate 450 megawatts or enough electricity to power 125,000 homes. Each turbine weighs at least 246 tons, has a 300-foot diameter rotor and is mounted on a 400-foot tower.

- Small turbines: These are wind turbines designed for individual residential or commercial applications where most of the power will be consumed on-site. They generate less than 100 kilowatts. Most home systems generate between 1 kilowatt and 10 kilowatts. They typically have tower heights of 60 feet to 100 feet and rotors up to 20 feet in diameter. In recent years, small turbine systems have been developed that use vertically oriented rotors and generators rather than conventional horizontally oriented systems using rotor blades. The rotor used to capture the wind is a cylinder shaped device that is narrower than a blade type rotor. Turbines made by Helix Wind and Oregon Wind are examples.

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[4] World Wind Energy Association

[5] PGE website, Community & Environment, Biglow Wind Farm

Many locations in Gresham have 9 miles per hour or 10 miles per hour average wind speeds, which are considered marginal for small-scale wind turbines with current technology.[6] The wind speed at a given site usually varies frequently in direction, and its speed may change rapidly under gusting conditions. Its average velocity also usually changes significantly with the season of the year. In Gresham the amplitude of winter winds is almost twice that of summer winds.

Energy Trust of Oregon encourages small-wind turbines be installed in urban or rural locations. For rural locations, the Energy Trust lists the following characteristics as increasing financial feasibility:

- Site size of one acre
- Location within about 1,500 feet of a utility electrical meter
- Average wind speeds of at least 10 miles per hour

Small-scale wind turbines for residential applications typically range in electrical output capacity from 500 watts up to 10 kilowatts. These systems can be mounted on towers, poles or buildings. Tower heights are generally between 60 and 100 feet off the ground, preferably at least 30 feet above any obstructions within a 300-foot radius. The wind turbines have blades or rotors up to about 20 feet in diameter.[7]

The American Wind Energy Association lists the following issues as critical for successful small turbine projects when it comes to local government zoning:

- Aesthetics
- Size and structure heights
- Setback distances and lot sizes for safety
- Sound
- Environmental concerns particularly with birds and bats
- Abandonment of turbines

Other considerations include effects on property values, insurance, rules concerning whether/how to allow multiple turbines, potential structural failure, potential electrical failure and appropriateness of soils.

Turbines in urban environments are more difficult to implement effectively because wind patterns are affected by buildings, trees and other urban obstacles. Height can become more important so the turbine can rise above the aerodynamic obstacles and turbulence, according to the American Wind Energy Association.

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[6] Energy Trust of Oregon

[7] Oregon Department of Energy

Gresham has received interest from property owners for both small-scale wind turbines (such as those in residential areas) and large (but individual) wind turbines (such as in an industrial area). Wind turbines can successfully be installed in urban environments provided that the issues listed above are addressed.

Examples of Wind Turbines Installations

Large-scale wind turbines on a wind farm.

Small-scale wind turbines mounted on a roof.

Small-scale, blade-type wind turbine mounted on a pole.

Small-scale, vertical-type wind turbine mounted on a pole.

2.381.3 Biomass Energy

Biomass energy technologies utilize the solar energy that is stored as carbohydrates in plant materials. Biomass is a renewable energy source because the growth of new plants replenishes the supply. In 2012, three percent of all energy produced in the nation is derived from biomass.[8] This renewable energy source is currently done on a large scale on farms or by utilities or industry, not in a residential

[8] Oregon Dept. of Energy website, "An Overview of Biomass Energy"

setting. Some district energy systems in downtowns and mixed-use areas use biomass as an energy source.[9]

Ideally, the use of biomass for energy causes no net increase in carbon dioxide emissions to the atmosphere in the long term. As plants grow they use carbon dioxide to make carbohydrates. When used to produce energy, the plant releases the carbon dioxide it absorbed during its lifetime, therefore it is “carbon neutral.” That is, the use of biomass does not increase carbon dioxide emissions and does not contribute to global climate change. In addition, the use of biomass is often a way to dispose of waste material that would otherwise create environmental pollution.

Plant material or organic waste (e.g. manure) derived from plant material is the source of all biomass fuel. Some biomass fuel is the waste products left after plant materials have been used for other purposes or consumed by animals. Other biomass fuel is plant material harvested for their energy value (e.g. poplar trees). Oregon biomass sources include wood, agricultural crop residue and organic waste.

The following technologies use biomass:

- Direct Combustion: Wood, agricultural waste, municipal solid waste and residential fuels (wood pellets, logs) are burned in boilers, stoves, etc. to create radiant heat or to heat water. Industrial/utility applications often use the hot water to produce steam. The steam can then be used for heating buildings, industrial processes or directed to a steam generator to produce electricity.
- Biogas Production: Wastewater treatment plant sludge, animal manure, and food waste is used to produce methane gas or other combustible gas by allowing bacteria to decompose the material in a digester under anaerobic (no oxygen) conditions. It can be burned in boilers to produce hot water for space heating or directed to a gas generator to produce electricity. Methane gas emitted from landfills and sewage treatment plants can also be captured and used for these purposes. For example, Gresham’s wastewater treatment plant captures methane gas from sewage which is then piped to a co-generator. This provides about 50 percent of the electricity needs of the plant.
- Biofuels Production: Plant material is fermented in tanks where bacteria convert the sugars in the carbohydrates into alcohol (ethanol or methanol). Also, diesel fuel can be produced by heating oilseed crops and pressing the oil out or by converting vegetable oils or animal fats. Larger quantities can be produced in a distillation process using chemical solvents.

Potential issues with biomass include:

- Odor
- Noise

[9] International District Energy Assocation

- Potential traffic generation for larger facilities
- Air quality reduction resulting from combustion
- Groundwater pollution
- Soil pollution
- Storage of biomass materials

Biomass may be viable in Gresham as evidenced by the biogas facility in operation at the City's wastewater treatment plant. Its viability depends largely on whether the material (wood, food scraps, manure) is available in sufficient quantities to make industrial-scale biomass facilities economically feasible.

Examples of Biomass Installations:

Direct Combustion System Furnace
From: A-Maizing Heat Furnace

Biogas/Methane Production Facilit

Biomass Plant
From: Gestamp

2.381.4 Geothermal Energy

Geothermal energy is generated from heat stored in the earth. Geothermal resources range from the modest but constant heat (50-70 degrees) generated at shallow depths in the ground that is found nearly everywhere to the extreme heat generated by hot water and steam found at much greater depths in certain areas, such as southern and central Oregon. These areas have a geologic history of lava flows and volcanism. According to the Oregon Department of Geology, Multnomah County does have minor low temperature (approximately 70 degrees) geothermal resources.

Geothermal energy is utilized in two ways:

- High Temperature Geothermal: Hot water and steam is utilized directly for space heating or to generate electricity. For example, Klamath Falls established a heating district in 1981 that uses geothermal hot water to heat roads/sidewalks, homes, businesses, schools, etc. in and near its downtown. No known high-temperature wells are available in Gresham.
- Low Temperature Geothermal: This approach utilizes the relatively constant and mild temperatures naturally found at shallow depths in the soil and groundwater throughout the year. The ground-source heat pump transfers heat stored in the earth or in groundwater into a building during the winter and transfers heat out of a building and into the ground during the summer. Water is used as the heat transfer mechanism with the ground. Low-temperature geothermal is widely available in Gresham.

A ground-source heat pump has two main parts:

- Either a closed-loop or open-loop system in the ground where the heat transfer occurs with the soil or groundwater.
  - A closed-loop system typically has two loops in the ground side: the primary refrigerant loop in the applicant cabinet where it exchanges heat with the secondary polyethylene pipe loop of water/anti-freeze mix underground. It does not directly draw water out of the ground.
  - An open loop system (also called a groundwater heat pump) has a secondary loop that pumps natural water from a well or body of water or aquifer into a heat exchanger inside the heat pump. Heat is either extracted or added by the primary refrigerant loop and the water is returned to a separate injection well, irrigation trench, tile field or body of water.
- A ground-source heat pump, similar to an air conditioner, moves heat from or to the earth. The heat pump uses refrigerant in a closed loop system indoors to exchange heat with the water that is pumped from the ground. Heat is then transferred from the refrigerant pipes to the interior air ducts or plumbing system.

A Portland example of a building using a ground source heat pump is the Burnside Rocket, a 16,000-square-foot mixed-use building in northeast Portland that has office and retail tenants. It utilizes a groundwater heat pump/well system to reduce energy consumption by 40 percent compared with a conventional heating, ventilation and air conditioning system. It helped the project attain Leadership in Energy and Environmental Design (LEED) Platinum certification.[10]

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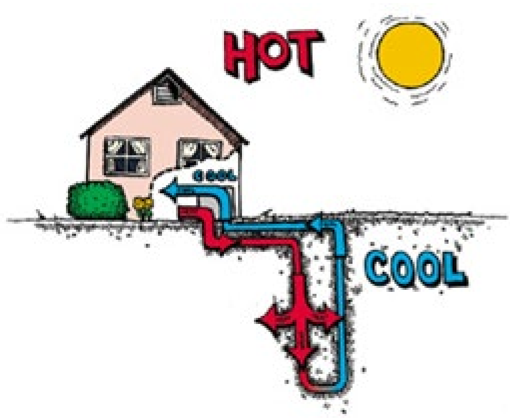
[10] Energy Trust of Oregon website, Business: HVAC/Geothermal

Potential issues with geothermal energy include safety (if not properly installed) and visual impact. Visual impact could include large earth disturbances during construction. Open loop systems can contribute to aquifer depletion, water shortages, groundwater and well contamination and the subsidence of soils. Low-temperature geothermal is available in Gresham. Its viability depends on its costs in comparison with the energy cost savings it produces.

Examples of Geothermal Installations

Geothermal Heating Furnace System

Geothermal Energy Generation Facility Plant



Closed-loop Geothermal System

2.381.5 Micro-Hydro Power

There is some opportunity for development of hydropower energy sources within Gresham. Although damming streams or the Columbia River likely would cause environmental concerns, there is opportunity for micro-hydro power in the streams and even in piping. Micro-hydro energy is energy derived from small power installations producing up to 100kW of electricity. The energy is generated from moving water feeding into a turbine which then turns and generates energy. The water is then directed back into the stream with relatively little impact on the surrounding ecology.

Micro-hydro power is an efficient, low cost energy source as it requires a small amount of flow (as little as two gallons per minute) or a drop as low as two feet to generate electricity. Electricity can be delivered as far as a mile away to the location where it is being used. It is a reliable electricity source during the peak winter energy season when large quantities of electricity are required.

There are two main types of micro-hydro systems:

- In-Outfall Pipe. This micro-hydro system places a turbine within the storm water pipe and generates energy/electricity as water flows past it.
- In-Stream. This micro-hydro system places a turbine in a flowing stream to generate energy/electricity.

The City of Gresham's wastewater treatment plant is investigating the installation of a mini-hydropower facility at the plant's outfall into the Columbia River.

Potential issues include the visual impact of the turbine set into the center of the flowing stream and possible environmental concerns with fish and the local ecology if stream water is diverted away from a portion of the stream.

Examples of Micro-Hydro Installations

In-Stream Micro-Hydro Systems

In-Outfall Pipe Micro-Hydro System

2.381.6 Electric Vehicle Charging Stations

Major automotive manufacturers have been developing plug-in electric vehicles (EVs) which will change the future of transportation with a shift toward cleaner, more energy efficient vehicles. The motor vehicles incorporate a battery energy storage device with the ability to connect to the electrical grid for the supply of some or all of its fuel energy requirements.

Manufacturers of plug-in hybrid vehicles use different strategies in combining the battery and internal combustion engine and may utilize the battery only for the first several miles with the engine providing generating power for the duration of the vehicle range (Chevy Volt for example). Others may use the battery power for sustaining motion and the internal combustion engine for acceleration or higher energy demands at highway speeds. Frequently, the vehicles employing the former strategy gain a designation such as plug-in electric vehicle-20 to indicate that the first 20 miles are battery only.

Batteries

Battery Technology. Recent advancements in battery technologies will allow EVs to compete with internal combustion engine vehicles in performance, convenience and cost. Most major electric car companies utilize Nickel-Metal-Hydride or Lithium batteries for their EVs. The materials for Lithium based batteries are generally considered abundant, non-hazardous and lower cost than Nickel based batteries. The current challenge with lithium-based technologies is increasing battery capacity while maintaining quality, cycle life and lowering production costs. As battery costs decrease over time, the auto companies will increase the size of the lithium based battery packs and thus the range of electric vehicles.

Battery Charging Time. Battery electric vehicles depend upon charging equipment placed at homes, employment centers, and in public. The amount of time to fully charge an EV battery is a function of the battery size and the amount of electric power or kilowatts (kW) that an electrical circuit can deliver to the battery. Larger voltage and amperage circuits will deliver larger amounts of kW. The common 110-120 volts AC, 15 amp circuits will deliver at minimum 1.1 kW to a battery. A 220-240 volt AC, 40 amp circuit (like the household dryers and ovens circuits) will deliver at minimum 6 kW to a battery.

The charging times for battery electric vehicles ranges from 55 minutes at 440 volts AC current to 31 hours 50 minutes for 110 volt AC current. The charging times for plug-in hybrid vehicles range from 17 minutes at 440 volts AC current to 14 hours 30 minutes for 110 volt AC current.

This technology is changing at a rapid rate and times are being reduced significantly.[11] Most vehicles will recharge at a fast charger in half-an-hour or less in the future. EV operators will seek fast chargers when they need a charge that could not be accomplished while doing other activities. The stations could generate additional local traffic. Fast chargers operate at high voltage (for example, 480 volts) and/or high amperage and many potential locations do not have adequate capacity (or funds) for installation. Few EV manufacturers currently utilize fast charging; hardware standards are lacking.

Electric vehicle charging station companies are already scrambling for the best locations to set up networks and provide services to electric car owners. Public dollars can help facilitate initial stages of the EV rollout through policy and planning documents, ordinances, and permit streamlining. Public agencies can also fund socially beneficial actions without duplicating private efforts.[12]

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[11] Ecotality Company, "Electric Vehicle Charing Infrastructure Deployment Guidelines for The Oregon I-5 metro Areas of Portland, Salem, Corvallis and Eugene", Jan. 2010.

[12] David Mayfield, "Electric Vehicles, Oregon Style," Oregon Planners' Journal, November/December 2011.

Examples of Electric Vehicle Charging Stations:

Single Electric Vehicle Charging Station in Parking Lot

Multiple Outlet Electric Vehicles Charing Station

Single Electric Vehicle Charging Station on Street

Potential issues to consider when regulating vehicle charging stations include the scale, location, time limitations and traffic patterns, effects on parking counts, signage, safety and general infrastructure.

2.381.7 Technological Changes

Technology continues to advance for renewable energy generation, and the City likely will need to respond to new methods of energy generation and new needs for distribution and storage.

(Amended by Ord. 1724 effective 2/14/13)

2.381.8 Energy Conservation

The rapidly changing energy situation is an issue that can impact the economy, the environment and the quality of life.

Energy prices fluctuate daily depending on supply and demand. When energy supply increases, prices usually drop and when there is a shortage in the energy supply, the prices tend to increase. Energy supply and demand is impacted by world economic conditions and stability, extreme weather conditions and availability of supply.

Historically, the Federal government was perceived as the appropriate level of government to respond to energy issues. In recent years, state and local governments have established programs to address the energy impacts on local citizens. Oregon has a track record as a leader in clean energy policies, programs and practices to reduce energy consumption and promote renewable energy system alternatives to fossil fuels.

Oregon has minimal fossil fuel reserves but has substantial electricity generation from conventional hydropower facilities. Fifty percent of the state's total electrical generation is from these facilities. Electricity consumption is growing at 0.8 percent per year which is one-third the national average. Meanwhile the state's population is growing at 1.2 percent per year which is slightly higher than the national average.

Oregon contains significant renewable energy resources from biomass and wind. Currently, the state ranks 21st in the country in biomass electricity production and 23rd in electricity production from wind energy systems.[13] The state will have over 1,900 megawatts of wind energy capacity by the end of 2012.[14]

On June 5, 2012, John Kitzhaber, M.D., governor of Oregon, unveiled his draft 10-Year Energy Action Plan. Oregon's Department of Energy mission statement is to ensure that the state "…has an adequate supply of reliable and affordable energy and is safe from nuclear contamination, by helping Oregonians save energy, develop clean energy resources, promote renewable energy, and clean up nuclear waste." The Department of Energy is responsible for developing and administering the state's energy programs and helping with the strategic planning to develop the state's future energy portfolio.

The 10-Year Energy Action Plan is intended to establish a framework to manage energy policy at the state level in order to:

- Maintain affordable energy costs;
- Assure a high level of regional and local system reliability;
- Promote a clean energy economy and jobs through new business and workforce development;
- Meet state goals and commitments on greenhouse gas emission standards;
- Meet state goals and commitments on developing renewable resources; and
- Ensure the health and welfare of Oregon's citizens.[15]

Local government must also be involved in energy conservation efforts. The role of local government in energy conservation is defined by two basic strategies:

1. Reduce the demand for traditional, non-renewable or finite energy sources; and

[13] U.S. Department of Energy, Oregon Energy Fact Sheet, 2012.

[14] Wikipedia, Wind Power in Oregon, 2012.

[15] Governor Kitzhaber, 10-Year Energy Action Plan, June 2012.

2. Increase the supply and use of alternative, renewable energy sources.

The City of Gresham has worked to provide leadership in energy conservation. Sustainable energy efficient practices implemented by the City in 2012 include:

- The Internal Operations and Facilities Sustainability Plan to transition to 100 percent renewable energy by 2030 and reduce the city's greenhouse gas emissions by 80 percent by 2050;
- The Sustainable Gresham program on line to provide residents, businesses and interested parties with energy efficiency opportunities;
- The new Solar Gresham program to provide information on and facilitate solar energy system installations, thereby increasing the amount of renewable energy produced locally;
- The Sustainable Cities Initiative in collaboration with the University of Oregon to provide university students real world experience in designing sustainable, energy efficient communities; and
- The current Renewable Energy Council Work Plan project to determine where and how renewable energy systems should be allowed in Gresham in order to encourage renewable energy development in appropriate locations while protecting the natural environment, the social and economic quality of life and the design of the built environment.

These efforts have resulted in some significant strides in energy conservation and more will follow. Gresham currently has 53 residential solar installations and 12 commercial solar installations scattered throughout the city. There are currently no wind energy systems but the City's Wastewater Treatment Plant has installed solar and biomass energy systems and will be installing a micro-hydro energy system later this year.

(Amended by Ord. 1724 effective 2/14/13)

2.400 ENVIRONMENTAL QUALITY

The air, land and water quality of Gresham is generally good; the city's environmental quality is a community asset which pays both social and economic dividends, and many residents have chosen to locate here based on these environmental amenities. It has been well documented over the past three decades that air, land and water pollution can create heavy economic liabilities and impose exorbitant clean up costs on communities. Therefore, though the present level of environmental quality in Gresham is good, it is important to recognize that continued growth and development is accompanied by the potential for environmental degradation.

2.430 NOISE

2.341 Impacts of Noise Pollution

Noise might be simply defined as unwanted sound; just as contaminants in water harm the environment, noise can degrade the livability of a community and damage the physical and mental health of persons living there. Like other kinds of pollution, noise also accompanies urban development.

Noise is measured in terms of its loudness and pitch. The loudness, or magnitude, of sound is usually measured in decibels (~); the pitch, or frequency, of sound is expressed in Hertz (Hz), or cycles per second. For human beings, the audible spectrum ranges from 20 to 20,000 Hz and from zero to more than 140 C]B. Sound pitch and magnitude are often measured together on a weighted decibel scale (Figure 2-28).

Figure 2-28 Loudness Range of Common Sounds
Loudness Range of Common Sounds Measured at Source or Indicated Distance

Source: Council on Environmental Quality (1970)

Sound Source	Decibels (dB)	Response Criteria
Jet Operation	150	
	140	Painfully Loud
	130	Limits Amplified Speech
Jet Takeoff (200 feet)	120	Maximum Vocal Effort
Auto Horn (3 feet)	110	
Shout (0.5 feet)	100	Very Annoying
Heavy Truck (50 feet)	90	Hearing Damage (8 hours)
Freight Train (50 feet)	80	Annoying
Freeway Traffic (50 feet)	70	Intrusive
Light Auto Traffic (50 feet)	60	Quiet
Living Room	50	Very Quiet
Library	40	Barely Audible
Soft Whistle (15 feet)	30	
Studio Background Level	20	Threshold of Hearing
	10	
	0	

Though coping with noise is a fact of urban life, it becomes pollution when its magnitude becomes harmful to our health and well-being. The U.S. Environmental Protection Agency (EPA) has documented many of the detrimental effects of noise. The findings of the EPA regarding the detrimental effects of noise include hearing loss, emotional stress, sleep disruption, and even risk to unborn infants. Even when noise is not a direct source of physical or mental problems, it is a recognized cause of physical and psychological stress which has been directly attributed to numerous health problems. Broad reductions in harmful noises have not occurred, however, probably due to a lack of education as to the negative effects of noise. Still, it is possible to limit further increases in noise that result from urban growth, and this may be a more practical approach to controlling noise levels.

2.432 Noise Sources in Gresham

In Gresham, noise sources fall roughly into two categories; noises that occur intermittently, such as construction projects, and those which occur on a continuous basis, such as traffic.

The first group includes unusual, occasional noises, which often prompt police complaints when they reach a disruptive level. In addition to domestic disturbances, the Gresham Police Department frequently receives complaints about loud vehicles, construction related noises, barking dogs or other animal noises, and home repair or yard projects that involve heavy equipment. These disturbances are particularly noticeable during the night and early morning, when sleep periods are interrupted.

The second group includes noises which are continuous contributors to the ambient noise levels that are present throughout the city. These noises are nearly always present, and specifically include motor vehicle traffic, industrial and commercial noises, and aircraft related noise.

2.433 Motor Vehicle Traffic Noise

Unlike many rapidly growing suburban communities, Gresham has an extensive network of arterial and collector streets that help to distribute traffic flow more evenly across the city. However, some routes continue to carry exceptional traffic loads, including Burnside, Division, Hogan, and 181st. Traffic noise is generated along these streets almost continuously during the day, and impacts all adjacent activities. In most cases, these activities are commercial or moderate and high density residential developments, and street and site design standards help to buffer them from traffic noise. The City's buffering and screening standards specifically require a ten foot landscaped buffer between residential developments and arterial streets. In addition, land use designations for noise sensitive, low intensity developments, such as detached housing, generally do not occur along arterial streets.

A sample of ambient noise levels at three of the city's major intersections was taken in May 1988 to measure the impact of traffic noise on pedestrian activity along arterial streets. The results of this survey show that ambient noise levels at the busiest intersections do not exceed tolerable levels for humans. At 181st and Halsey, where it is estimated that nearly 36,000 vehicles enter the intersection each day, the noise level measured between 63 and 80 dBA. At the intersection of Stark and Burnside, where just over 33,000 vehicles pass each day, the noise level measured between 60 and 80 dBA. The city's busiest intersection, at Hogan and Burnside, where over 40,000 vehicles pass each day, showed a noise level of 60 to 70 dBA. These levels were recorded at about 3:00 PM, on a weekday. Traffic counts were also measured on weekdays.

2.434 Commercial and Industrial Noise

Most noise complaints that involve commercial and industrial activities result from the standard equipment and operational practices, rather than unusual, intermittent noises. Thus, the issue is often the proximity of residential uses to industrial and commercial sites, rather than the magnitude of the noise generated. The city can prevent these situations in the future by careful site planning, and by separating incompatible land use districts that promote a transition in development types. In addition to the usual setbacks that most jurisdictions require, city standards also require buffering and screening between conflicting uses, so that regardless of the underlying land use designation, all new uses must consider neighboring developments in their site plan. In addition, limiting night and early morning activities can often resolve noise conflicts that occur.

2.435 Aircraft Noise

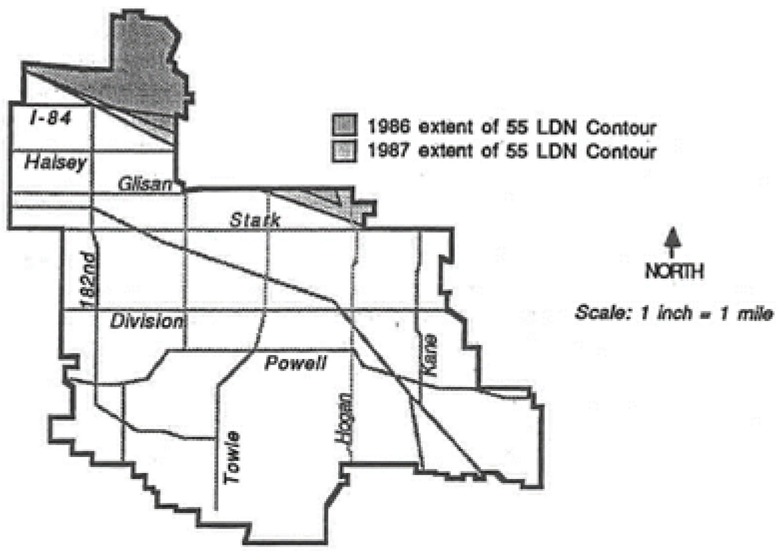
Noise generated by heavy aircraft is of concern to many East Multnomah County residents, since the departure and arrival patterns for Portland International Airport (PDX) are nearby. The Port of Portland monitors noise levels throughout the metropolitan area, and fields noise complaints related to aircraft. Each year, the Port publishes an updated Noise Abatement Annual Report, which documents the impacts of aircraft noise on the region, noise monitoring activities, and noise complaints.

In the Gresham area, the Port monitored noise for single events near 158th and Marine Drive, 148th and Rose Parkway, and Interlachen Lane; these single event measurements ranged from 73 to 76 dBA. In addition, the Port monitored noise for a 24 hour LDN (Level Day Night; this is a 24 hour average noise level index that gives a 10 decibel penalty to noise events that occur between 10 PM and 7 AM) near Fairview Lake, and recorded an average LDN of 59 dBA.

The 55 and 60 LDN contours both increased slightly in the Gresham area between 1986 and 1987. The 60 LDN contour increased to include an areas east of 185th, north of Sandy Boulevard, and the 55 LDN contour increased to include an area between Stark and Halsey, along 242nd (see Figure 2-29). The 55 LDN contour crosses the city diagonally, from 162nd and Russell to 242nd and Stark; areas north of this contour have 55 LDN or more. No areas in the city are within the 65 LDN contour.

Several aircraft noise complaints occurred in the city in 1987. Single complaints were generated near Eastman and Division, Eastman and Powell, 190th and Division, and 162nd and Russell. Multiple complaints were generated near 201st and Sandy.

Figure 2-29 Aircraft Noise Impacts – Gresham Areas within the 55 LDN Contour
Source: Portland International Airport 1988 Noise Abatement Annual Report – May-89



2.436 State and Federal Noise Control

The Federal Noise Control Act of 1972 placed a number of noise related programs under the authority of the Environmental Protection Agency (EPA). The EPA's authority extends to aircraft noise (with the Federal Aviation Administration), interstate railroads and motor carriers, and other noise sources of national concern.

The State Noise Control Act of 1971 gives the DEQ authority to adopt standards for motor vehicles, industry and commerce. The standards establish motor vehicle noise emission limits and set ambient noise limits for commercial and industrial operations. The standards vary according to time of day and proximity to "noise sensitive properties." The DEQ is normally involved in local noise problems when it receives a citizen complaint and the noise source falls under DEQ authority. The DEQ investigates these complaints and works with the owner or operator to resolve the problem. DEQ's role in noise prevention, because of the absence of permit authority, is confined to technical assistance. The DEQ currently has three unresolved noise complaints in Gresham; all three are industrial uses, and only two relate to noise created by a production process (see Appendix 36 - Noise Source Inventory).

2.437 Loud Noise Control

Local noise control is addressed by the city's nuisance ordinance. During 1987, only four noise complaints were investigated through the Code Enforcement program. Only one of these complaints involved commercial and industrial activities. Another twelve complaints to the Police Department are documented in police reports, although many more calls were actually received; of these, most were domestic disturbances, and only two related to commercial or industrial activities. Both the Code

Enforcement Officer, and the Police Department have noise metering devices for noise level monitoring (see Appendix 42 - Noise Source Inventory).

In addition to the nuisance ordinance, noise conflicts between incompatible land uses are avoided through setback and buffering standards, and appropriate placement of land use districts. The buffering and screening standards are particularly unique, as they recognize issues of compatibility between adjacent land uses. Because of this, noise is not a significant problem in Gresham, since most noise sensitive uses are not located near noise producing activities, and the buffering standards address situations where conflicting activities do occur. During the Periodic Review process, noise compatibility was considered when existing land use designations were reviewed, and new designations considered.

2.440 LAND RESOURCES QUALITY

2.441 Solid Waste Disposal

Metro is the designated solid waste planning authority for the Portland area, including Multnomah, Clackamas and Washington counties. In this capacity, Metro is responsible for the region's solid waste management plan.

The St. Johns Landfill is the only general purpose landfill in the metropolitan area, and is scheduled to close in early 1991. At that time, solid waste will be transported to the newly-sited landfill in Arlington. In addition, Metro is in the process of updating the region's solid waste management plan which addresses disposal options, location of a transfer station, and programs to increase recycling. Also, the State Department of Environmental Quality is continuing to expand recycling requirements and programs that must be implemented by the local governments in cooperation with the solid waste and recycling industry.

The effect of these actions will directly impact Gresham's system of solid waste collection. Solid waste disposal costs are expected to triple as the new landfill begins operation, and the higher cost will probably translate to increased collection rates for customers. In addition, recent annexations and population growth have changed the shape of the city, and the current system of solid waste collection has not been comprehensively reviewed since it was established in 1970. Furthermore, the city will continue to be responsible for the implementation of the state's recycling programs.

In response to the growing concerns about the management of solid waste from the residential and commercial community, the city has initiated a study to evaluate Gresham's existing solid waste collection and recycling system and to explore alternate collection systems, including municipal, franchise, contract and free market. The City Council is expected to determine the type of solid waste collection and recycling system that is to operate in the city in the Fall of 1988.

2.442 Recycling

In 1983, Oregon's Recycling Opportunity Act ensured that citizens would be given the opportunity to recycle; local jurisdictions, solid waste collection and disposal service providers, recyclers, and citizens were directed to plan and implement a program that meet the needs of each community. Under state guidelines, local governments are given the primary responsibility for solid waste management, and providing the opportunity to recycle.

Solid waste haulers in Gresham are required to provide recycling services to their customers as a condition of their operating license. Curbside collection of recyclables is provided monthly to all residential customers, and as needed for commercial customers. Many of the haulers have chosen to provide weekly collection of recyclable materials. Under the provisions of the Community Development Code, recycling facilities are permitted to locate in areas designated for industrial uses.

Recycling has been actively promoted by the city; programs include "how-to" brochures for recycling, interpretative displays, newsletter articles, workshops, and the annual Spring Clean Up Week, when the city sponsors a free yard debris disposal program.

New recycling requirements are currently being developed by the Department of Environmental Quality and Metro. Gresham will consider the implementation of these new programs during the analysis of its solid waste collection system.

2.443 Sewage Sludge Disposal

Sludge is a product of the city's sewage treatment process, and is presently hauled to the Hood River Wastewater Treatment Plant, where it is stabilized. The stabilized sludge is then applied to agricultural land. The current sewage treatment plant expansion project will enable the city to stabilize the sludge here in the future.

2.450 THERMAL POLLUTION

Thermal pollution occurs when the temperature of a body of water is increased as a result of man's activities. This form of water pollution interferes with the natural process of resident organisms and disrupts the normal concentration and mixing of physical components. Thermal pollution of water resources is commonly regarded as an end result of power plant operations; however, it can also result from increased urban imperviousness and the removal of riparian vegetation and the tree canopy near streams that exposes the streambed to sunlight.

Temperature changes in a water body will alter its fish and plant habitat characteristics. The natural system becomes unbalanced and the resulting new equilibrium may prove undesirable, especially if popular fish life disappears or if algae and weed growth greatly increases. The Oregon Department of Environmental Quality (DEQ) has developed stream and river temperature standards as part of the Statewide Water Quality Management Plan. The DEQ enforces standards for streams in the Willamette and Sandy River basins, both of which Gresham is a part.

For all salmonid fish producing waters in the Willamette Basin, DEQ requires that no measurable increases shall be allowed when stream temperatures are 58 degrees F. or greater. In addition, no increases of more than 0.5 degrees F. is permitted as a result of a single source discharge when receiving water temperatures are 57.5 degrees F. or less, or more than 2 degrees F. increase due to all sources combined when stream temperatures are 56 degrees F. or less.

For all non-salmonid fish producing waters in the Willamette Basin, the DEQ requires that no measurable increases shall be allowed when stream temperatures are 64 degrees F. or greater. In addition, no increases of more than 0.5 degrees F. due to a single-source discharge is permitted when receiving temperatures are 63.5 degrees F. or less, or more than 2 degrees F. increase due to all sources combined when stream temperatures are 62 degrees F. or less.

For other basins, no measurable increases shall be allowed when stream temperatures are 58 degrees F. or greater. In addition, no increase of more than a 0.5 degrees F. due to single-source discharge is permitted when receiving water temperatures are 57.5 degrees F. or less, or more than 2 degrees F. increase due to all sources combined when stream temperatures are 56 degrees F. or less.

Some exceptions to these standards are permitted by the DEQ for activities with specifically limited duration, and where exceeding the standards is unavoidable. Temperature has been identified by the DEQ as a parameter of concern for the Columbia Slough and Johnson Creek water quality-limited streams. As a general rule, new or increased discharges of elevated temperature, however minimal, are prohibited on these listed segments until DEQ establishes the relevant TMDL. Recent listings of Steelhead and Coho Salmon for the Lower Columbia River will require agencies such as Gresham to implement strategies to protect fish habitat, including maintaining ideal instream water temperatures necessary to sustain fish communities.

Temperature records are not maintained for creeks passing through Gresham, with the exception of Johnson Creek. During the early 1970s, temperature and other water quality information was collected at 16 points along the full length of the Creek. During high water periods, temperatures along the portion of the stream within Gresham ranged from 40.1 degrees F. to 62.6 degrees F. Temperatures during low water periods for this section ranged from 40.1 degrees F. to 69.8 degrees F. (see Appendix 29). More recent temperature monitoring conducted in Johnson Creek in 1992 indicated temperatures at or above the critical temperatures for growth and spawning of salmonids.

Thermal pollution is a recognized concern for the Columbia Slough and Johnson Creek in Gresham. Continued erosion control and floodplain management policies, and extensive protection of riparian vegetation through buffer requirements and open space policies will greatly reduce the threat of thermal pollution to Gresham's streams. In addition, DEQ monitoring and enforcement of air quality standards will also limit thermal pollution of the airshed. An awareness of the causes and effects of thermal pollution of streams and the airshed should be maintained as Gresham develops. Activities which require the removal of riparian vegetation, or the introduction of point and non-point source discharges into the creeks should be identified in terms of their impacts on water quality.

(Amended by Ordinance 1464 passed 12/1/98; effective 1/1/99)

2.460 ADMINISTRATION OF POLLUTION CONTROL MEASURES

The Oregon Department of Environmental Quality (DEQ) has site-specific programs which require coordination with local governments. Following is a list of those programs.

Notice of Construction (NC). OAR 340-20-200 through OAR 340-20-030. Certain types of air contaminant sources are required to file a Notice of Intent to Construct and Request for Preliminary Certification for Tax Credit.

Air Contaminant Discharge Permit (ACDP). ORS 468.310 to 468.330; OAR 340-20-140 through 340-20-185; OAR 340-14-005 through 340-14-050. Certain types of air contaminant sources are required to obtain an ACDP before operation of that source may occur.

Indirect Source Construction Permit (ISCP). ORS 468.020, 468.310; OAR 340-20-100 through 340-20-135. Applies to motor vehicle activity which causes concentrations of air pollution by highways, parking facilities, airports, etc. Gresham will notify DEQ of activities which involve 50 or more parking spaces or two level parking structures.

On-Site Sewage Disposal System Approval/Permit. ORS 468.020 through 468.035; ORS 454.615 et seq.; OAR 340-71-015 et seq.; OAR 340-74-010 et seq. DEQ contracts with Multnomah County to operate the program which applies to all on-site sewage disposal systems without discharge to public waters including septic tanks and alternative systems.

Waste Discharge Permit. ORS 468.065, 740; OAR 340.14.005 et seq.; OAR 340.45.005 et seq.; Section 402 of PL 92-500 and related Federal Regulations. DEQ issues permits for construction and operation of new or modified sewage and industrial waste treatment facilities and related disposal of effluent. (NPDES and WPCF permits are involved). NPPES permits apply to discharges to public waters, pursuant to Federal and State requirements. The WPCF permit for disposal by other than stream discharge is issued pursuant to State requirements.

Industrial and Construction Stormwater Discharge Permits. CFR 122.26. DEQ issues 1200-Z National Pollutant Discharge Elimination System (NPDES) stormwater permits to industrial facilities having a specified Standard Industrial Code (SIC) with activities exposed to stormwater runoff. DEQ also issues 1200-C NPDES stormwater permits to construction activities of five acres or more. It is anticipated that this will be reduced to 1 acre or more the EPA finalizes amendments to CFR 122.26 (expected 1999).

Solid Waste Disposal Permit. ORS 459.205; OAR G1-020. DEQ issues permits for specific solid waste landfills or other solid waste facilities.

Tax Credit Certification. ORS 468.150; ORS 468.175(3). Tax credit certification is issued by DEQ for pollution control facilities for solid waste and noise.

The DEQ Coordination Program requires that local governments issue a Statement of Compatibility for all proposed activities subject to the above DEQ requirements. The Statement of Compatibility must accompany applications for DEQ permits. The local government determines compatibility of the proposed action with its acknowledged comprehensive plan. For Gresham activities, the applicant and the DEQ must initiate requests for the Statement of Compatibility. The city processes the Statement of Compatibility through its normal procedures for obtaining a Development Permit, and Development Permit approval serves as the Statement of Compatibility. For any activity which requires a Statement of Compatibility, but does not require a Development Permit, the City Manager shall process the Statement of Compatibility as a Type I procedure pursuant to the Community Development Code.

(Amended by Ordinance 1464 passed 12/1/98; effective 1/1/99)

2.461 DEQ Emissions Offset Policy

The DEQ requires that a major new source of air pollution proposed for an area that exceeds a national ambient air quality standard be allowed only if stringent pollution controls are met. One of the conditions for permitting major source polluters is that more than equivalent offsetting emission reductions be achieved from existing sources within the non-attainment area.

In Gresham, a discharger which emits particulates would not be required to participate in the emissions offset policy if emissions do not exceed 50 tons actual emissions. Major ozone dischargers would be required to obtain offsetting emissions. The DEQ administers the policy, and although the emissions offset policy is a site-specific action which would require a Statement of Compatibility to meet other permit requirements, local governments are not directly involved in obtaining emission offsets. A local jurisdiction interested in siting a major source discharger subject to the emissions offset policy could request technical assistance from DEQ.

Comprehensive Plan policies developed by citizen task forces discourage major industrial polluters from locating in the city, and make it unlikely that such activities will locate here. In the event major air polluters apply for a development permit, the city may request technical assistance from DEQ pursuant to the emissions offset policy.