Spring 2011

Squalicum Mountain development environmental impact assessment

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Squalicum Mountain Development

Environmental Impact Assessment

ESTU 436: Environmental Impact Assessment
Spring 2011
Huxley College of the Environment
Western Washington University
Squalicum Mountain Development
Environmental Impact Assessment

Professor Jean O. Melious
ESTU 436: Environmental Impact Assessment
Spring 2011
Huxley College of the Environment
Western Washington University

Prepared By:
Amber Smit
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Jake Dunton
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Disclaimer: This report presents a class project undertaken by students of Huxley College of the Environment, Western Washington University. It has not been performed at the request of any person or organization, public or private. Furthermore, it does not represent the position or opinions of individuals from the government or private sector.
Dear Concerned Citizen,

Our group was charged with preparing an environmental impact assessment (EIA) of the proposed construction of a road and twenty-six single-family residences on Squalicum Mountain. Using the statutory rules and guidelines laid out by the Washington State Environmental Policy Act (SEPA), we evaluated the potential significant environmental impacts of the proposal. With the cooperation of community members, documents provided by Whatcom County and the City of Bellingham, and the guidance of Professor Jean Melious we have constructed a profile of the potential significant impacts that could affect the natural environment.

SEPA and its accompanying regulations provide detailed steps that allow us, the “lead agency”, to accurately record and assess the impacts of the proposed development action. By performing an appraisal of the environmental impacts of the proposed action possible alternatives we have established a determination of significance (DS) which mandates a following Environmental Impact Statement (EIS).

We have extensively researched the procedures laid out by SEPA and the Department of Ecology’s (DOE) regulations in order prepare this EIS as required by law. However, it is important to remember that this report is a classroom exercise, and the conclusions found herein will bear no weight on the actual assessment done by Whatcom Planning and Development Services (PDS). This EIA does not seek to supplant the previous report issued by PDS and confirmed by the Whatcom County Council; rather, it seeks to complement it by extending the scope of the assessment to include the construction of the twenty-six residences, along with their supporting infrastructure, in addition to the planned road.

Within this report the reader will find an appraisal of the proposed project, its potential impacts, and recommended mitigation measures including several alternatives that would prevent significant environmental impacts from occurring. It is our hope that the alternatives presented in this report may be used as additions to the current discussion surrounding the proposed Squalicum Mountain development.

With our regards,

Amber Smit
Andrew Donaldson
Jake Dunton
Max Crystal
Oliver Crain
Overview Map

Figure 2: Location Map for Proposed Area of Development for Road and Housing(???)
Fact Sheet

Title: Vineyard Squalicum Mountain Land Disturbance Permit/Squalicum Ridge Road/Squalicum Mountain Development

Description: This project proposes 1) the construction of a road to be located in a Rural Forestry zone. This private road would require clearing and grading for roughly 10,300 linear feet of roadway. The total project impact area produced by road construction would be approximately 11.05 acres in size 2) the construction of 26 residential homes on 20-acre parcels along with the necessary water, sewer/septic, power, and road infrastructure. Due to a lack of detail on the location of these houses they could potentially impact any part of the 520 acres set aside for residential home construction.

Legal location: The parcels of land to be used are denoted by Whatcom County Assessor parcel numbers (APN) –

380324 066302 380324 066366 380324 066432 380324 200432
380324 200495 380324 200366 380324 200302 380313 094020
380313 027119 380313 083119 380313 066230 380313 229052
380313 277058 380313 319056 380313 333111 380313 466495
380313 491440 380313 396386 380313 481336 380313 472289
380313 137128 380313 211152 380313 333171 380313 333231
380313 355328 380313 295341 380313 368452 380313 307476
380313 261171 380313 261121 380313 263100

Proposer: Vineyard Development Group, LLC Attn: Bill Sygitowicz, (360) 756-8463

Lead Agency: Whatcom County Planning and Development Services

Permits:  
Federal: NPDES General Construction Permit

State: Department of Ecology NPDES General Construction Permit

Local: Whatcom County Land Disturbance Permit and Residential Construction Permits (26)

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Andrew McNielley – 2 nd Generation Whatcom County Logger

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SECTION ONE: AN OVERVIEW

1.1 EXECUTIVE SUMMARY

Project Objectives

The proposal holds as its objective the construction of attractive housing located in rural Whatcom County with views of Lake Whatcom and the Squalicum and Agate Creek drainages (SEPA Checklist 2008). The proposal site is zoned Rural Forestry land and the development group has submitted a proposal to change the land use from timber production to the construction of dwellings. The site is described as vacant, being divided into fifteen different tax parcels under three different ownerships. The proposed road would extend from Academy road located near the north shore of Lake Whatcom and is within the watershed.

1.2 SUMMARY OF PROPOSAL

The Vineyard Development Group submitted a proposal to construct a road to 26 individual plots they own on Squalicum Mountain. This proposal was intended to address the need for access to the plots because the “potential exists for future low-density residential site development” (SEPA Checklist 2008). Twenty-one of these plots are within the Lake Whatcom watershed. The proposal seeks to construct a road 10,300 feet in length that would serve a community of 26 future single-family residences each located on its own 20-acre plot (PDS MDNS 2009).

This assessment begins with the road proposal as it has been laid out in the Mitigated Determination of Non-Significance (MDNS) from March 2009 and the Hearing Examiner's amendments from January 2011. To this we are going to add the 26 houses, all placed on the slope in such a way as to maximize their impacts. Each of these houses will be serviced by its own septic tank and an illegal groundwater well. These houses will be 35 feet tall and 3500 square feet in size on average. They will use fertilizer for their lawns and gardens. We are going to assume that 4% of each of the 20 acre lots will be impervious surfaces (roofs, paved drives, basketball courts etc.) and that 20% of the total lot will be cleared of its natural vegetation to make way for views and lawns per the Rural Forestry Zoning Ordinance(WC 20.42.450). Of the proposed 11.05 acres to be cleared for the road 5.20 acres will become impervious surfaces.

For the basis of our assessment, and due to the lack of a site plan or details on the construction, it is assumed that the houses will be 35 ft. tall at the roof peak and have mean square footage of 3500 sq. ft., following the Rural Forestry code for dwelling construction (WCC 20.42.400). Following the setback guidelines found in WCC 20.42.350 the houses will also have a driveway length of twenty-five feet on average. Furthermore each house is assumed to have a septic tank with associated leech field, a groundwater well, and .8 acres of impervious surfaces. These conditions fit the proposal that has been submitted and typical housing arrangements on Rural Forestry plots in Whatcom County.

Further construction and excavation would take place in order to install storm water management systems, power and telephone infrastructure, and refuse collection systems. Due to the lack of detail in the proposal concerning the location of the homes relative to the road and current public services there is a high variability in the magnitude of potential environmental impacts. The proposal has also included...
possible plans to construct an 8” water main along with the construction of the road. A sewer main is also proposed with similar design and construction plan.

The areas of concern that have arisen with this proposal involve both the environmental impacts of subdividing and construction upon rural forestry land on a steep slope and the risk of reducing the water quality of the source of freshwater for approximately 96,000 people. Erosion is always the main issue when quantifying the impacts of building on an undeveloped slope. The slopes in the proposal area can be as steep as 60%, which far out reaches the maximum slope that is legal to construct upon. The management of storm water is a complementary issue since the clearing and removal of vegetation will decrease the soil stability and increase the risk of land sliding and liquefaction of soils. Any amount of soil that is lost from the construction area is poised to be added to the Lake Whatcom waterway and therefore could potentially lead to a decrease in water quality.

1.3 SUMMARY OF ALTERNATIVES TO PROPOSAL

This report outlines the possible effects of two alternatives in addition to the proposed plan. The first alternative is to continue the land use that is currently being conducted. The plots would be managed and developed for timber resources and no construction of road or dwellings would be made. This option does not decrease any environmental risks since the vegetation will still be removed periodically and the effects of logging equipment are comparable to construction equipment.

A second alternative that attempts to achieve both the objectives of the development group and reducing environmental impacts includes a plan to construct a modified road and a reduced amount of dwellings for sale. The houses would be constructed well away from the treacherous slopes in the eastern portion of the plots and the road would be reduced in length and only serve to reach the constructed houses. The absence of drinking water on top of the mountain is an issue for the development of 26 houses, but the report conducted by the Department of Ecology has found that one exempt well could be drilled for the use by 6 single family homes. The construction of six homes away from steep slopes would have a much lower environmental impact than 26 houses with little regulation of placement. An exempt well and a septic system would replace an 8-inch water pipe and sewer main. The option that would have the least impact on the environment and significantly reduced risk of adverse impact would be for the City of Bellingham to purchase the land and develop it as a natural setting park.

Controversy and Uncertainty

The development of Squalicum Mountain is a debate that spans the environmental, political, social, and health realms of Whatcom County. Squalicum Mountain has historically been managed for timber, and only in the recent decades has been developed for housing due to its proximity to the city of Bellingham and aesthetic value. A large portion of Squalicum Mountain is demarcated as within the boundary of the Lake Whatcom watershed. Recently, Lake Whatcom has been deemed an impaired water body according to the Clean Water Act, and measures have been set in place to prevent any addition of Phosphorus to the watershed. Phosphorus has been observed to lead to the eutrophication of Lake Whatcom consequently has resulted in a decrease in water quality and ecological health. Any construction in the immediate area has been prohibited due to the sensitivity of the environmental health of the region (Department of Ecology 2007).
# 1.4 Decision Matrix

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<td>Communications</td>
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<td>Sewer/Solid Waste</td>
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<tr>
<td>Other gov. service or utilities</td>
<td>+</td>
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**DECISION MATRIX KEY**

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<tr>
<td>-</td>
<td>Slight Negative Impact</td>
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1.6 GLOSSARY OF TECHNICAL TERMS

Source for definitions: Merriam-Webster

Anoxia: hypoxia especially of such severity as to result in permanent damage
Epilimnion: the water layer overlying the thermocline of a lake
Hypoxia: a deficiency of oxygen reaching the tissues of the body
Hypolimnion: the part of a lake below the thermocline made up of water that is stagnant and of essentially uniform temperature except during the period of overturn
Eutrophication: the process by which a body of water becomes enriched in dissolved nutrients (as phosphates) that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen
Phosphorus: Chemical element commonly found in fertilizers and soils that has been observed to cause eutrophication.
Storm water: surface water added to an area through heavy precipitation that has the potential to cause large erosion events.
Watershed: A region or area bounded peripherally by a divide and draining ultimately to a particular watercourse or body of water.
Understory: an underlying layer of vegetation; specifically: the vegetative layer and especially the trees and shrubs between the forest canopy and the ground cover
Secondary Growth Forest: Characterized by dense understory. In the Pacific Northwest the canopy is Douglas fir dominant. Secondary succession lasts for approximately twenty years before entering the old growth stage.
Tributary: A body of water that feeds into another, larger body of water.
Shovel (logging): The use of heavy machinery to pull logs from an excavated pit around the bole of the tree and throw them onto the landing site.

Runoff: the portion of precipitation on land that ultimately reaches streams often with dissolved or suspended material

Sediment: material deposited by water, wind, or glaciers

Best Management Practices

Liquefaction: conversion of soil into a fluid-like mass during an earthquake or other seismic event

ESA: Environmental Species Act

1.7 ABBREVIATIONS

- Assessor parcel numbers: APN
- Certified erosion and sedimentation control lead: CESCL
- Department of Ecology: DOE
- Mitigated determination of non-significance: MDNS
- National pollutant discharge elimination systems: NPDES
- Planning and Development Services: PDS
- Squalicum Valley Community Association: SqVCA
- State Environmental Policy Act: SEPA
- Storm water Management plan: SWMP
- Temporary erosion and sedimentation control: TESC
- Total maximum daily load: TMDL
- Whatcom County Code: WCC
- Trihalomethanes: THMs
SECTION TWO: SIGNIFICANT IMPACTS TO THE NATURAL ENVIRONMENT

2.1 EARTH

EXISTING CONDITIONS

Squalicum Mountain is geologically composed of a mixture of bedrock and soils known as the Chuckanut Formation. This rock type is typically defined as interbedded sedimentary rocks including claystone, course sandstone, conglomerate, shale and coal (GeoEngineers 2008). The organic and sediment layers appear to be shallow in the proposal area, according to the Geological Hazard Report (GeoEngineers 2008). Soil composition on the site varies from plot to plot but the assessment generally found Bellingham silty clay loam, Everett gravelly loam, Everett complex, Nati loam, and Squalicum gravelly loam. These soils are superimposed on substrata of sandstone conglomerate and shale (GeoEngineers 2008). The Nati loam is noted as an erosion hazard. All the soils are noted as being well drained and deep (GeoEngineers 2008). Slopes run S-SE-E with the steepest slopes (approximately 50 percent grade) located on the east side of the Squalicum Mountain (GeoEngineers 2008). The soils and geology clean and purify the groundwater and runoff that empties into Lake Whatcom.

IMPACTS OF PROPOSED ACTION

Geology – Excavation and construction of houses, driveways, septic tanks, and groundwater wells will create excess soils which could be used to grade driveways and shore up slopes, landscape around the houses, or be deposited in the soil disposal areas designated in the Geo-Hazard Assessment (GeoEngineers 2008). The report also notes that large track-mounted excavators, hydraulic rams, or hydropunches may be necessary for bedrock excavation. This has the potential to fracture the face of bedrock and destabilize the slope.

Soils – Soil disposal from excavation during the construction of the road has been designated in three different stockpiles evenly spaced along the length of the proposed project area. Sections of the road and driveways will abut areas with slopes of 50% or more. This raises the possibility of landslides and erosion during storm events.

Erosion – With the construction of the road and the houses will result in an increase in major soil disturbances that could result in erosion and landslides. The construction of the road will require the removal of soil-stabilizing vegetation and the disturbance of slopes for the installation and maintenance of roadway cuts. The disposal of excess soils from the excavations, fills, and grading may lead to large masses of loose soil that can easily be washed downhill in a rainstorm. The grading and slope-cutting necessary for the driveways could contribute to further stream sedimentation if slope cuts are too steep, have poor filling, or fail during severe storms or seismic events.

IMPACTS OF NO-ACTION ALTERNATIVE

Geology/Soils – The construction of logging roads and the extensive clearing of trees and understory by heavy logging machinery will lead to destabilization of surface soil layers. This will facilitate the erosion
of topsoils during storm events. The continued operation of machinery could lead to soil compaction and the formation of run-off channels.

IMPACTS OF ALTERNATIVE ACTION

Geology/Soils/Erosion – Any construction in the area will involve a certain amount of excavation. The construction of the road and the 6 single family households will require heavy excavation equipment and construction equipment. The use of these machines may lead to greater erosion or risk of mass wasting during construction. There were also observations of weathered bedrock cuts and steep gradients that can increase mass wasting risk if the bedrock is to be removed for construction. At present state there were no areas found by the Geologic Hazard survey to be an active risk or mass wasting (GeoEngineers 2008). As concluded by the geo-hazard report, any construction on slopes exceeding 15% with a fine sediment base is at risk of erosion.

MITIGATION

PROPOSED

Geology/Soils/Erosion — The proposed impervious roadway is approximately 1.95 miles long, 22 feet wide with a total area of 5.2 acres (GeoEngineers 2008. To mitigate for the road impact, the road will be narrowed by 2 feet, making the road 20 feet wide, which lessens the area to 4.73 acres. This will decrease the amount of road runoff and the amount of clearing that would have to occur in preparation for the construction of the road.

Houses must be constructed away from steep slopes, thus mitigating for potential landslides or erosion, while also decreasing the amount of clearing and grading necessary for development. Clusters will adhere to current Whatcom County Zoning Ordinance prescriptions, with houses being set 100’ away from property lines (WCC 20.43.187). With these reductions in environmental disturbances, less soil will be released into the environment, lessening sedimentation and better protecting the watershed. By clustering the houses (Fig G.), while still complying with Rural Forestry Code (WCC 20.42.250), we will confine environmental impacts to more manageable locations. This will also provide for larger dispersion areas for water runoff that may contain phosphorus or sediments. Larger dispersion areas will allow for the absorption and filtration of storm water runoff.

Development of impervious surfaces and clearing will be allowed for 6% of the 20 acre lots rather than the 20% or 4 acres permitted by the Rural Forestry Zoning Ordinance (WCC 20.42.450). This allows for 1.2 acres of each lot to be cleared or 31.2 acres of the 520 total acres to be cleared for development. To ensure a mature forest for slope stability and filtration of storm water runoff only 6% of each zoned lot will be allowed for development/clearing.

Underground Power — Installation of subsurface power lines running alongside the proposed road. Tree clearing will not be necessary to accommodate overhead power lines.

Only native vegetation will be allowed. This especially excludes green lawns which are fertilizer intensive in the first stages of growth. No plant fertilizer is allowed to decrease the likelihood that this development will contribute to nutrient loading to the Lake Whatcom Watershed.
NO-ACTION ALTERNATIVE

Geology/Soils/Erosion — Tower logging instead of shovel logging will only be allowed in the project area. There are many methods to logging rural areas, the method that has the most environmental impacts used in Whatcom County is shovel logging. This logging practice allows for a loader to move along the harvest area and grab logs and swing them closer to the landing. Tower logging allows for less compaction and destruction of harvest areas by the tower sitting on the already paved road and pulling trees up with cables.

ALTERNATIVE 2 (6 HOUSES)

The construction of the road, houses and other infrastructure must be US Green Building Council, LEED certified. This will ensure sustainable practice throughout the development and operation of the road and houses. The areas affected by this certification include water efficiency, energy, materials and resources, indoor environmental quality and design (U.S. Green Building Council).

2.2 AIR

EXISTING CONDITIONS

Squalicum Mountain currently does not have any outstanding issues with air pollution and Whatcom County abides by the Washington Clean Air Act (CH 70.94 Revised Code of Washington). Approximately 2.5 million tons of harmful gases and particles are released into the atmosphere in Washington State. Outdoor air pollution in Washington can be attributed to four major sources: Motor vehicles (55%), industrial emissions (21%), outdoor burning (12%), and residential wood smoke (12%) (Whatcom County Health Status Report, Air Quality: 2002). Whatcom County, as categorized by the national and state air quality standards is “good”, which means that the harmful particles levels are below the limits. According to the Whatcom County government, the good air quality is due to the low population and the strict emissions requirements placed upon the industries in the local area. Whatcom County has been deemed an attainment area for all regulated air pollutants (Whatcom County 10-Year Urban Growth Area Review Environmental Impact Statement Section 4.2).

IMPACTS OF PROPOSED ACTION AND ALTERNATIVE ACTION

Air quality: Grading, excavation, and soil disposal will generate large amounts of dust. This will be in addition to any exhaust emissions from vehicle use on the mountain, both during construction and after. Also, the clearing of the forest will reduce the amount of Carbon Dioxide being sequestered from the atmosphere. Furthermore, the construction of the road and houses will require heavy equipment that will burn fossil fuels that will add additional Carbon Dioxide to the air. Lastly, the families that live in the 26 houses will most likely have automobiles and will need to heat their house, both of which will contribute negatively to Global Climate Change.

Emissions: As calculated by the Greenhouse Gas Worksheet developed by the King County Government the proposed action would emit 52,324 Megatons of Carbon Dioxide. This number is an estimation that includes the construction of the road and the 26, 3500 ft² houses (Fig 3).
Global Impacts: The amount emitted by this proposed action may not be substantial when compared to the total emissions from Washington State, but keep in mind that this is only the development of 26 houses. Expansion of this size is not sustainable with respect to the negative effects of Global Climate Change that is a result of Greenhouse Gas Emissions.

**IMPACTS OF NO-ACTION ALTERNATIVE**

Air Quality: The loss of soil stability and the removal of trees creates large amounts of dust. This dust can pose a health issue for the surrounding households and often the dust is picked up by the wind and transported to other areas. The dust can coat nearby trees, which makes respiration and photosynthesis strained. From a human health standpoint, large amounts of dust have been known to cause breathing issues.

Emissions: Increased emissions of carbon dioxide from the removal of trees, the operation of logging vehicles, and any burning done during logging operations. A calculation of the Greenhouse Gases emitted from the logging of secondary forest was not available, but it is generally assumed by foresters that all of the timber harvested eventually degrades and is lost into the ground and ultimately the atmosphere.

Global Impacts: The loss of a young, fast-growing, secondary growth forest means that there will be net carbon release into the atmosphere, preventing the sequestration of the greenhouse gas carbon dioxide. Global Climate Change has negative effects upon every ecosystem including but not limited to rising mean temperatures, desertification, drought, and general ecosystem breakdown.

**IMPACTS OF ALTERNATIVE 2 (6 HOUSES)**

Air Quality: The amount of dust created by the reduced construction will be minimal compared to the amount created by logging or the larger development. This means that there will be less of an impact upon local air quality and therefore local respiratory health.

Emissions: The reduced amount of houses will require less construction equipment than the proposal and therefore will be responsible for a reduction in carbon emissions. Furthermore, the fewer houses will mean that fewer cars will be emitting carbon dioxide from the area than the amount in the proposed action.

Global Impacts: More forest will be preserved in the reduced action proposal. Since the forests present on Squalicum Mountain are still in secondary succession, they are sequestering a negative net carbon amount, which means that carbon is being removed out of the atmosphere. This has a positive impact on global Climate Change.
MITIGATION AND SIGNIFICANCE AFTER PROPOSED

Dust control: Watering of dry soil by means of trucks, hoses and/or sprinklers at sufficient frequency and quantity to prevent excessive dust will be required during construction of the road and houses. The Best Management Practices for construction and erosion control are thoroughly described by the Environmental Protection Agency (EPA Best Management Practices).

Emissions: The construction of energy efficient homes and the use of energy efficient automobiles will have a great reduction in the amount of Greenhouse Gases produced. However, the proposal indicates that these homes will most likely be large and designed for luxury rather than sustainability. The use of native vegetation will have a positive impact upon the carbon footprint of the houses, since native Washington vegetation is very efficient at CO₂ sequestration.

Significance: The breadth of this development adds a considerable amount of Greenhouse Gas Emissions, and as long as the proposal is followed no mitigation is going to significantly lower the impact upon the atmosphere. Any development or logging will have a negative impact upon Global Climate Change.
NO-ACTION ALTERNATIVE

Dust Management: As stated above in the mitigation for the proposal, the Best Management practices for dust control should be implemented for logging. This will control the amount of dust that is released into the air and hopefully reduce the negative impact upon the surrounding area.

Emissions: If managed for longer harvesting periods, the forest on Squalicum Mountain could have a reduced negative impact upon Global Climate Change. Timber forests that are allowed to grow for longer periods (50 years or more) generally give more timber and sequester carbon at faster rates than quick turnaround harvests. Longer periods between harvests would benefit the carbon footprint of the logging greatly.

Significance: Logging of the area may prove to be more harmful to the environment than the development of the proposal. This is mostly due to the compounded effects of multiple loggings. Whereas the development of the houses may have a larger impact than one logging event, multiple harvests would eventually outweigh the development in regards to adverse atmospheric impacts. In addition, dust would be created each harvest, which would mean a routine release of dust into the area.

ALTERNATIVE 2 (6 HOUSES)

Dust Management: As stated above in the mitigation for the proposal, the Best Management practices for dust control should be implemented for the construction of the road and houses. This will control the amount of dust that is released into the air and hopefully reduce the negative impact upon the surrounding area.

Emissions: The houses could decrease the adverse impact of the development by implementing sustainable designs in architecture and landscaping. Sustainable housing can greatly decrease the carbon footprint of a home. The use of native vegetation will have a positive impact upon the carbon footprint of the houses, since native Washington vegetation is very efficient at CO₂ sequestration.

Significance: The impact that these 6 houses will have is minimal in comparison to the impact of the 26 houses. However, a negative impact upon the atmosphere is still expected due to the clearing of native vegetation, and emissions.

2.3 WATER

EXISTING CONDITIONS

Lake Whatcom is a large natural lake in Whatcom County. The northwest end of the lake lies within the city of Bellingham, and 22 small watersheds drain into the lake. Lake Whatcom serves as the drinking water source for about 96,000 people Bellingham and Whatcom County. The lake is popular for recreation, and the area around it has become a popular place to live (Ecology 2011).

Lake Whatcom provides drinking water for the City of Bellingham, the Lake Whatcom Water and Sewer District, several smaller water districts and associations, and a few hundred homes that draw water directly from the lake. It is estimated that the lake holds 250 billion gallons of water. The Lake Whatcom watershed consists of about 36,269 acres of land (Institute for Watershed Studies 2009, Lake Whatcom
The rapid development of this watershed has led to the lake being listed under the Clean Water Act as an impaired body of water (Ecology 2011).

The lake consists of three distinct lake basins separated by glacial sills. Basin 1, closest to Bellingham, contains only 2% of the lake’s volume. Basin 2 is slightly smaller. Basin 3 contains 96% of the lake’s volume. The lake is a complex system, and the arrangement of the basins keeps pools of water in the lake a long time rather than moving water through quickly (Ecology 2007). Figure 4 below is a photograph with the three basins clearly labeled.

Figure 4: Lake Whatcom Basins 1 and 2, with Basin 3 in the background.
Impaired Body of Water: Fecal Coliform and Phosphorus Loading

The 303(d) designation, assigned by the Department of Ecology in 1998, declares that Lake Whatcom does not meet minimum federal standards for several indicators of water quality, in this case fecal coliform and dissolved oxygen. The Washington State Department of Ecology (Ecology) seeks to set bacteria and fecal coliform criteria in order “to protect people who work and play in and on the water from waterborne illnesses” (Ecology 2007). Fecal coliform is used to measure the amount of bacteria present in a waterway because it indicates whether or not human or other warm-blooded animal waste is present. Waste from warm-blooded animals is more likely to contain pathogens than waste from cold-blooded animals, thus posing a greater risk to human health. Ecology tests whether the presence of fecal coliform would endanger the health of more than seven people per 1,000 recreational or occupational users of Lake Whatcom.

In Washington State at least 260 bodies of water are polluted because of phosphorus. Phosphorus is most often found in household detergents and fertilizers; however, it has many industrial applications, and occurs naturally in soil and human and animal wastes. When phosphorus enters a water ecosystem it acts as a fertilizer, accelerating the growth and overall lifecycle of algae. When plants and algae die, decomposing bacteria consume their remains. This process requires the oxygen that is dissolved in the water, and can lead to rapid depletion of dissolved oxygen (DO) levels in the overall lake ecosystem. Fish and aquatic life depend on abundant amounts of DO to survive. Aesthetic values are also affected; algae blooms cover the surface of the lake and coat beaches, boats, and lakeshore buildings. There are additional economic and human costs as well. The results of accelerated plant and algae growth in the water can require an increase in drinking water treatment chemicals that form carcinogenic byproducts and add treatment costs (TMDL 2008).

Critical aspects of dissolved oxygen depletion trends observed in Lake Whatcom are (1) formation of a little or no DO, or anoxia, in the deepest parts of the lake, the hypolimnion, earlier in the summer, and (2) the development of anoxia and hypoxia covering a larger portion of the water column over a longer period. The critical time period for oxygen depletion is identified as June – October, which starts with the period where the lake becomes stratified and oxygen depletion of the hypolimnion appears (Ecology 2008).

The management of Lake Whatcom and its tributaries by the City of Bellingham, Whatcom County, and the water districts along the lake seeks to follow Ecology’s recommendations for reductions in the levels of pollutants in order to meet state and federal water quality standards. Whatcom County passed a fertilizer ban on April 15, 2005 in order to mitigate the levels of phosphorus entering Lake Whatcom; however, in their latest assessment of Lake Whatcom’s state Ecology states “phosphorus levels would meet dissolved oxygen standards if they were equivalent to 85.5% fewer acres of 2003 development, or 94.6% fewer acres than the total development allowed under 2003 zoning” (Ecology 2008 TMDL).

In their Total Maximum Daily Load (TMDL) study in 2008 Ecology finds that the maximum amount of phosphorus that could be released into the lake, per day, is 14.15 kilograms. If one takes the 2003 levels of phosphorus emissions as a benchmark then only 563 developed acres of land could be allowed. In order to combat phosphorus pollution, developed acreage must be reduced by 94.6%.
Figure 5. Lake Whatcom, the drinking water source for 96,000 residents of the city of Bellingham and Whatcom County.
IMPACTS OF PROPOSED ACTION

Surface water movement/Runoff/Absorption - Soil and chemical runoff from excavation and machinery can lead to increased turbidity and pollution of waterways if not properly dispersed. Increased turbidity is directly linked to higher water temperatures and lower dissolved oxygen in Lake Whatcom and Academy Creek, one of the metrics of concern with this project (DOE TMDL 2008). Due to the proposed extent of the clearing sediment laden waters will flow unimpeded downslope, collecting in the tributaries of Lake Whatcom. Considering that 21 of the proposed 26 plots fall within the Lake Whatcom Watershed boundary (Figure 2), specifically falling within the Academy and Agate sub-basins as show above in Figure 4. and given the extent of the proposed clearing and the presence of impervious surfaces there is a high probability that, without adequate mitigation, excess phosphorus from fertilizer application will lead to further eutrophication of the Lake Whatcom and its affected tributaries.

Calculation of Annual Runoff

This assessment utilized the Impervious Surface Method (EPA 2011) to calculate sheet-flow volume of storm water run-off that could be expected from the proposed action. This type of analysis allows for the construction of a relationship between an aquatic system’s overall health, or current state of impairment, and the amount of impervious cover in that system’s watershed. This method requires Geographical Information System (GIS) analysis that was beyond that skill set of the current analysis’s team. In particular, in order to ensure the accuracy of the analysis, the GIS specialist must develop or acquire a GIS data-layer of the watershed for the subject water body. Additional sub-layers must be acquired for the tributary watersheds, development, and impervious surfaces. The next step is to extract the acreage of impervious surfaces and divide by the acreage of the watershed (A), which yields the the impervious fraction of the watershed (Ia). Annual precipitation numbers were collected from The Weather Channel (http://www.weather.com) and converted into feet of annual precipitation per year (P). We held the fraction of precipitation events that produced runoff at 0.9 (Pj). We calculate our runoff volume coefficient (Rv) as 0.05 + 0.9Ia. We then take all of our calculated values and place them in the equation

\[ R = P \times P_j \times R_v \times A \]

Where R is the amount of annual runoff in acre-feet (EPA 2011, Molinar 2006). Table 3 presents the values calculated for this analysis derived from information found through the Washington Department of Ecology, the Lake Whatcom Management Program, Whatcom County, and the City of Bellingham.
Table 3

<table>
<thead>
<tr>
<th>Proposed Action</th>
<th>Academy Sub-basin</th>
<th>Agate Sub-basin</th>
<th>Agate + Academy</th>
<th>Lake Whatcom (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impervious Surfaces (acres)</td>
<td>187.4</td>
<td>512.3</td>
<td>699.7</td>
<td>3625.9</td>
</tr>
<tr>
<td>Watershed Size (A) (acres)</td>
<td>780.1</td>
<td>2135.8</td>
<td>2915.9</td>
<td>31183.9</td>
</tr>
<tr>
<td>Impervious Fraction (Ia)</td>
<td>0.240225612</td>
<td>0.239863283</td>
<td>0.239960218</td>
<td>0.1163</td>
</tr>
<tr>
<td>Weather events producing runoff (Pj)</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Annual Precipitation (P) (feet)</td>
<td>0.093810428</td>
<td>0.256839266</td>
<td>0.350649694</td>
<td>3.54</td>
</tr>
<tr>
<td>Run-off Volume Coefficient (Rv)</td>
<td>0.266203051</td>
<td>0.265876955</td>
<td>0.265964196</td>
<td>0.15467</td>
</tr>
<tr>
<td>Annual Runoff (R) (acre-feet/year)</td>
<td>17.53302824</td>
<td>131.2638712</td>
<td>244.7438437</td>
<td>15366.75921</td>
</tr>
<tr>
<td>R (gallons/year)</td>
<td>5,699,135.38</td>
<td>42,667,505.12</td>
<td>79,554,329.04</td>
<td>4,994,986,594.09</td>
</tr>
</tbody>
</table>

Data from: Department of Ecology Lake Whatcom TMDL 2008, Whatcom County NPDES II Stormwater Management Program, Weather.com

Table 3 demonstrates the amount of storm-water runoff due to impervious surfaces, in gallons, that is generated in the Agate and Academy Sub-basins, separately and together, as well as in Lake Whatcom as a whole. These calculations will be repeated to take into the account the 94.42 acres that will be made into impervious surfaces through the implementation of the proposed action. The results are shown below in Table 4.
Table 4:

<table>
<thead>
<tr>
<th>Proposed Action</th>
<th>Academy Sub-basin</th>
<th>Agate Sub-basin</th>
<th>Agate + Academy</th>
<th>Lake Whatcom (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impervious Surfaces (acres)</td>
<td>281.82</td>
<td>606.72</td>
<td>794.12</td>
<td>3720.32</td>
</tr>
<tr>
<td>Watershed Size (A) (acres)</td>
<td>780.1</td>
<td>2135.8</td>
<td>2920.9</td>
<td>31183.9</td>
</tr>
<tr>
<td>Impervious Fraction (Ia)</td>
<td>0.361261377</td>
<td>0.284071542</td>
<td>0.271875107</td>
<td>0.119302589</td>
</tr>
<tr>
<td>Weather events producing runoff (Pj)</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Annual Precipitation (P) (feet)</td>
<td>0.093810428</td>
<td>0.256839266</td>
<td>0.350649694</td>
<td>3.54</td>
</tr>
<tr>
<td>Run-off Volume Coefficient (Rv)</td>
<td>0.375135239</td>
<td>0.305664388</td>
<td>0.294687596</td>
<td>0.15737233</td>
</tr>
<tr>
<td>Annual Runoff (R) (acre-feet/year)</td>
<td>24.70766852</td>
<td>150.9069897</td>
<td>271.6404986</td>
<td>15635.24084</td>
</tr>
<tr>
<td>R (gallons/year)</td>
<td>8,031,262.24</td>
<td>49,052,528.27</td>
<td>88,297,124.38</td>
<td>5,082,256,923.73</td>
</tr>
<tr>
<td>Difference After Proposal</td>
<td>2,332,126.87</td>
<td>6,385,023.16</td>
<td>8,742,795.34</td>
<td>87,270,329.63</td>
</tr>
</tbody>
</table>

Data: Ibid.

Based on our calculations we are showing a net impact of 8.7 million gallons of annual storm water runoff that will occur due to the development. This is likely an overestimate of the impacts because it was not done using GIS analysis and the current report assumes “developed acres” as listed in Ecology’s TMDL for 2008 is the same as “impervious surfaces. However, this analysis provides a perspective on the magnitude of the impacts that could occur if the implementation of the proposed action occurs.

If we hold that the Agate Sub-basin will be the most affected and use data from the TMDL study we find that each house would emit about 0.97 kilograms of phosphorus (P) per year. If we multiply this by twenty six homes we find that the total phosphorus emitted from each house, due to lawn fertilization, pet waste, and other uses, would be 25.12 kilograms of P per year. The TMDL recommends that emissions of phosphorus be 38.9 kilograms P per year for the Academy sub-basin and 106.7 kg P per year for the Agate sub-basin. Holding constant that each home, on average, emits 0.97 kilograms of P per year, and taking into consideration that there are about 200 houses in the Agate sub-basin and over 110 in the Academy sub-basin, the current level of development exceeds the recommended releases of phosphorus. The addition of the twenty-six houses would further exacerbate the phosphorus loading in Lake Whatcom.

Groundwater – Each house will withdraw the maximum 5000 gallons per day of water through the construction of an exempt well. This will lead to daily withdrawals of up to 130,000 gallons of water per day. This would lead to the rapid depletion of groundwater reserves (GeoEngineers 2008).
IMPACTS OF NO-ACTION ALTERNATIVE

Surface Water/Runoff/Absorption – The environmental impacts in this category depend on the type of logging that occurs on the site. There will be very little absorption of surface-water runoff due to the compaction of soils from logging machinery and the removal of vegetation. Due to the lack of knowledge surrounding the extent of future logging operations it is impossible to quantify these impacts.

IMPACTS OF ALTERNATIVE ACTION

Table 5: Impacts of Alternative Action

<table>
<thead>
<tr>
<th>Proposed Action</th>
<th>Academy Sub-basin</th>
<th>Agate Sub-basin</th>
<th>Agate + Academy</th>
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</tr>
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<tbody>
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<td>Impervious Surfaces (acres)</td>
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<tr>
<td>Watershed Size (A) (acres)</td>
<td>780.1</td>
<td>2135.8</td>
<td>2920.9</td>
<td>31183.9</td>
</tr>
<tr>
<td>Impervious Fraction (Ia)</td>
<td>0.244737854</td>
<td>0.241511377</td>
<td>0.240754562</td>
<td>0.116387623</td>
</tr>
<tr>
<td>Weather events producing runoff (Pj)</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Annual Precipitation (P) (feet)</td>
<td>0.093810428</td>
<td>0.256839266</td>
<td>0.350649694</td>
<td>3.54</td>
</tr>
<tr>
<td>Run-off Volume Coefficient (Rv)</td>
<td>0.270264069</td>
<td>0.26736024</td>
<td>0.266679106</td>
<td>0.154748861</td>
</tr>
<tr>
<td>Annual Runoff (R) (acre-feet/year)</td>
<td>17.80</td>
<td>131.10</td>
<td>245.82</td>
<td>15374.59</td>
</tr>
<tr>
<td>R (gallons/year)</td>
<td>5,786,077.62</td>
<td>42,905,540.30</td>
<td>79,904,951.77</td>
<td>4,997,533,361.99</td>
</tr>
<tr>
<td>Difference After Alternative</td>
<td>86,942.24</td>
<td>238,035.18</td>
<td>350,622.74</td>
<td>2,546,767.90</td>
</tr>
</tbody>
</table>

This analysis assumes that 3.52 acres of impervious surfaces will be created through clearing for driveways, house construction, and the construction of the access road. Adding these values to the first row of table 3 we find values for the number of impervious surfaces that result from the alternative action.

Once again phosphorus runoff is 0.97 kilograms per house per year. As mentioned above the two sub-basins, Agate and Academy, are already out of compliance with the recommendations set forth in the TMDL. Any additional kilograms of phosphorus per year would push the watersheds even further out of compliance and inhibit the recovery of Lake Whatcom.

There will also be additional sediment loading that occurs due to the construction, excavation and grading of roads, driveways and houses. It is not possible to quantify the impacts of sedimentation at this time because there is a lack of detail over the extent of excavation and grading.
Eutrophication: Releases of phosphorus will contribute to the eutrophication of Lake Whatcom: algae blooms, depletion of dissolved oxygen and the endangerment of aquatic species and human health.

MITIGATION AND SIGNIFICANCE AFTER

PROPOSED AND ALTERNATIVE 2(6HOUSES)

Water Resource Protection — Maintenance and operations of Temporary Erosion and Sedimentation Control (TESC) measures will be required as part of the Department of Ecology (DOE) National Pollutant Discharge Elimination System (NPDES), General Construction Permit WCC 20.80.632(2), 20.80.634(2)(a), 20.80.735(2)(a) and 20.80.737(1). The applicant will maintain a Certified Erosion and Sedimentation Control Lead (CESCL) to create the TESC plan.

Water & Sewer Services — Each house will have access to a water and sewer main, mitigating the environmental impacts of 26 wells and 26 septic tanks. Lake Whatcom watershed is on the 303d list of impaired water bodies, with each house having access to a sewer main, nutrient loading from septic tanks will not be an issue. By implementing a water main system, drilling wells will not be necessary, mitigating for excavation.

No activities will be permitted to lead to more than 500 square feet of exposed soils between September 1st and April 30th, as stated in WCC 20.80.735(2)(e).

Storm water drainage systems — A storm water drainage system will be designed to neutralize nutrient loading from all impervious surfaces. This system will be designed to either treat or disperse approximately nine million gallons of storm water runoff per day. These measures will include dry wells, gutter down spouts, dispersion fields, drainage ditches, bioswales, and rain gardens. Department of Ecology Certified Erosion and Sedimentation Control Lead (CESCL) shall design, implement and monitor the effectiveness of the drainage system during construction and operation of the development to ensure zero nutrient loading.

Each lot, at the time of permit application for driveway construction, home construction and land clearing shall prepare a wetland, stream, wildlife habitat assessment to avoid, compensate and minimize the impacts to wetland or fish and wildlife habitat related to the proposed construction or clearing of a particular lot (MDNS 2008).

Based on the requirements above, adequate mitigation of most impacts from construction and operation of the proposed road and houses would be sufficient, no significant adverse environmental impacts would likely occur.

All development on-site must comply with the conditions of the above conditions.

NO-ACTION ALTERNATIVE

Loggers of the site must comply with the highest standards of logging practices. Cable logging or helicopter logging is recommended to reduce the impacts of tree removal. Selective cuts will be required and a three to one replant ratio will be enforced by the Department of Natural Resources and Whatcom County to ensure that the soil remains stabilized and any sedimentation due to storm water runoff is mitigated.
**Fig 6: Comparison of Overall Runoff Contributions**

**Overall Runoff Contributions**

![Graph of Overall Runoff Contributions](image)

**Runoff of Proposal vs. Runoff of Alternative**

![Graph of Runoff of Proposal vs. Runoff of Alternative](image)
2.4 PLANTS AND ANIMALS

EXISTING CONDITIONS

The current vegetation in the proposed development area serves an important ecological function for wildlife in the area. However, the thriving forested mountain helps provide habitat for three threatened species of salmon that are listed on the ESA. The threatened salmon are the Chinook (King), Steelhead, Bull Trout. Restoration project efforts around Whatcom County have been in progress to help with salmon recovery, but it is a long process to take back urbanization. Squalicum Mountain is important to the recovery process because it is home to a thriving recovering secondary forest of mature young conifer and deciduous trees. The understory consists of ferns, stinging nettles, horsetail, blackberry, salmonberry, and other vegetation. The ground cover is made up of developed topsoil, forest duff and vegetative cover. The trees are gaining height and mass quickly and developing the ecosystem towards old growth succession. Though hard to monetize the ecological benefits from Squalicum Mountain’s ecosystem being preserved are substantial. Also, the secondary forest type that currently occupies the area is sequestering carbon dioxide out of the atmosphere and having a positive impact upon the global climate.

A maturing forest has many positive attributes to it, but the forest on Squalicum Mountain is important because it provides water, shading and buffer zone to many important streams that are home for the three species of salmon. Squalicum creek, Whatcom Creek, and Anderson Creek are currently known habitats for all three salmon species and each wrap around Squalicum Mountain. Figures 9, 10 and 11 show the distribution of Chinook, Steelhead, and Bull Trout throughout Whatcom County.
Fig 9: Steelhead Distribution Chart in Whatcom County

Fig X: Chinook Distribution Chart for Whatcom County
FIG 11: BULL TROUT DISTRIBUTION CHART IN WHATCOM COUNTY

IMPACTS OF PROPOSED ACTION

Natural Resources/Habitats/Scenic Resources- The clearing of timber for views, up to 16% of 20 acres or 3.2 acres, removes the retention and stabilizing influences of vegetation. A numerical analysis shows that the removal of 3.2 acres in 26 plots yields 83.2 acres cleared on the site in addition to the approximately 11.05 acres for the road. This adds up to a total of 94.25 acres which would lose the stability enhancement of having trees and understory vegetation and no longer provide natural habitats for neighboring species. Add this to the 25’ driveways that are at least 12’ wide. Taking this into consideration, the calculations show 300 square feet of driveways multiplied by 26 houses yields 7800 total square feet of driveways (.17 acres) for a total of 94.42 acres cleared.

The almost 95 acres of cleared forested would be harmful to the surrounding eco systems by reducing buffer zones for nearby streams and increasing erosion and sedimentation into streams during storms and subsequently increasing water temperatures and decreasing dissolved oxygen levels and reducing salmon populations of threatened species.

IMPACTS OF NO-ACTION ALTERNATIVE

Clearing: The removal of all trees in the cut area, including mature young conifer and deciduous trees will lead to significant soil destabilization and loss of habitat. The understory consists of ferns, stinging nettles, horsetail, blackberry, salmonberry, and other vegetation, all of which provide habitat for eagles, hawks, songbirds, bears, deer, salmon, and numerous rodent and reptile species.

IMPACTS OF ALTERNATIVE ACTION
The alternative action would preserve more of the current ecosystem by reducing the amount that needs clearing for construction and human occupation.

**MITIGATION AND SIGNIFICANCE AFTER**

**PROPOSED AND ALTERNATIVE 2(6HOUSES)**

Sufficient space for drain fields and reduction in homesteaded space allowing for more of the natural vegetation to stay will lower the impacts of the initial development but would overall contribute to the decline of the native salmon species and Lake Whatcom’s water quality.

**NO-ACTION ALTERNATIVE**

Tower logging instead of shovel logging would be the mitigation measures made for timber harvesting because the tower logging is less invasive to the soil and shrubbery on the cutting site (McNeilly 2011). Even using specific logging techniques and following the replant rule of three to one will not make an MDNS. Clear cutting a young secondary growth forest will have the same impact as developing 26 lots.

**SECTION THREE: SIGNIFICANT IMPACTS TO THE BUILT ENVIRONMENT**

**3.1 ENVIRONMENTAL HEALTH:**

**EXISTING CONDITIONS**

There are about 96,000 residents in Bellingham and Whatcom County that receive their drinking water from Lake Whatcom and the quality of water has been declining. Lake Whatcom was put on the 303(d) list thirteen years ago as an impaired body of water. Thirteen years later it is still on the list and according to recent studies by the Institute of Watershed Studies at Western Washington University has not made any improvements. Fig. 12 shows the different types of sources that are making their way into Lake Whatcom and promote algal growth and deplete dissolved oxygen levels slowly turning a vibrant lake into a bog. Newer reports indicate a concern for trihalomethanes (THMs) and chloroform being produced as a by-product. “Algae excrete dissolved organic carbon into water, which, along with other decaying organic material, can react with chlorine to form disinfection by-products, predominately chloroform and other trihalomethanes (THMs)” (Mathews et. al 2011).
Fig 12: Common Phosphorous Sources in Lake Whatcom (Executive Summary 2007).

In Fig. 13 levels of THMs in Bellingham’s drinking water has increased and the Institute of Watershed Studies is expecting the levels to continue to increase although they decreased slightly in 2008.

Fig 13: Total Trihalomethanes levels in Lake Whatcom (Lake Whatcom Monitoring Report 2011)

IMPACTS OF PROPOSED ACTION

Eutrophication – The risk of erosion discussed above is made exponentially direr due to the possible effect upon Lake Whatcom. Lake Whatcom is a sensitive area due to the eutrophication and resulting algal blooms. Any additional sediment from Squalicum Mountain is seen as danger to a large fraction of the citizens of Whatcom County.
Drinking Water/Water Quality – Any decrease in water quality may impair the drinkability of the water in Lake Whatcom. From a construction standpoint, 6 houses that are well away from steep slopes are much safer than 26 houses that are placed on the steepest areas. The alternative proposal reduces the risk of harming the quality of the water that 96,000 people rely upon.

IMPACTS OF NO-ACTION ALTERNATIVE

Logging would create more runoff and erosion for the area being logged because the ground would less able to absorb and filter. The heavy machinery would compact the soil along with the removal of trees.

IMPACTS OF ALTERNATIVE ACTION

Impacts of the alternative action would be the same as the proposed action.

MITIGATION AND SIGNIFICANCE AFTER

Lake Whatcom is a sensitive watershed and the main supply of drinking water to Bellingham residents. Storm water management plans are in place for new developments in hopes of reversing the decline of Lake Whatcom, but more development or harvesting of timber will still provide a significant impact after mitigation.

3.2 LAND AND SHORELINE USE

EXISTING CONDITIONS

The area of proposed development is zoned by Whatcom County as rural forestry. There are no structures or paved roads nor does the area have any shoreline. There are roads previously used for logging.

IMPACTS OF PROPOSED ACTION

Housing – Proposal seeks to construct 26 single-family residences, one per 20 acre plot. The Whatcom County Code (WCC) and the Revised Code of Washington make no specific provision for the design of houses or their landscaping beyond the height limit of 35 feet (WCC 20.80.300, 20.42.450). The WCC allows future residents to use phosphorus fertilizers for the first growing season of turf or lawns (WCC 16.32.060).

Driveways – Driveway sizes are mandated to be at least 20’ - 25’ long, per the setbacks detailed in WCC 20.80.200. Driveways will be approximately 0.8% of the each lot, or almost one quarter of the allowable impermeable surfaces. The remaining 3.2% of each lot will be impervious services such as houses, garages, sheds, patios, etc. Impermeable surfaces do not allow the absorption of water and can cause environmental concerns.

Pollution of surface water can occur when water runs off an impermeable surface resulting in the accumulation of chemicals and oils on the driveway.
Water table is not recharged at a natural rate due to storm drains that do not allow the water to percolate into the natural aquifer. Heat island effect can occur due to the nature of asphalt and other paving materials.

**IMPACTS OF NO-ACTION ALTERNATIVE**

The land is currently zoned as rural forestry under Chapter 20 of the Whatcom County Code (WCC 20.42). Portions of the site have been determined to contain landslide hazards based on the Whatcom County Critical areas designations (WCC 16.16.310, GeoEngineers 2008). The proposal site shares boundaries with low-density residential areas to the north, east and south.

Timber will be harvested resulting in a clear-cut. This is not aesthetically pleasing and has negative impacts on stream quality and wildlife that lives in or around the harvest sight.

**IMPACTS OF ALTERNATIVE ACTION**

**Housing** — Construction of 6 houses per 20-acre plot would require heavy machinery and removal of vegetation. This has the ability to increase the risk of landslides, erosion and could compromise the slope of the mountain.

**Road and Driveways** — Installation of a road to access 6 new driveways would increase the amount of storm water runoff resulting in an increase in nutrient loading to the Lake Whatcom watershed.

Pollution of surface water can occur when water runs off an impermeable surface resulting in the accumulation of chemicals and oils on the driveway.

Water table is not recharged at a natural rate due to storm drains that do not allow the water to percolate into the natural aquifer.

Heat island effect can occur due to the nature of asphalt and other paving materials.

**MITIGATION AND SIGNIFICANCE AFTER**

**PROPOSED**

No fertilizer will be permitted to be used on lawns as outlined in WCC 16.32.060.

**NO-ACTION ALTERNATIVE**

Replanting of harvested trees at a three to one ratio following DNR state guidelines.

**ALTERNATIVE 2(6 HOUSES)**

No fertilizer will be permitted to be used on lawns as outlined in WCC 16.32.060.

3.3 **TRANSPORTATION**

**EXISTING CONDITIONS**
The road that will service the proposed road is Academy Road, which is located on the southern foot of Squalicum Mountain. Logging roads already exist where the proposed road is planned to be constructed. These logging roads will need to have the surrounding vegetation cleared and the soils compacted and prepared for asphalt. The additional 26 single-family residences will add 260 daily annual trips to Academy road and consequently, the nearby arterials and roads (SEPA Checklist 2008). This amount of additional drivers will not have a large impact however, due to the current usage of these roads. Many people already use the roads surrounding Whatcom County and they are designed to handle this magnitude of traffic.

IMPACTS OF PROPOSED ACTION

Vehicular traffic/Traffic hazards – An estimated 260 annual daily trips (ADT) will occur because of this development (SEPA Checklist 2008). Drivers in the vicinity will suffer from reduced visibility due to weather, trees, and slopes. Vehicle collisions with wild animals pose another economic and health risk to residents of the Squalicum Mountain Development. Overall, the main impacts will be a slight increase in traffic on local roads leading to the road to be constructed. The local roads, however, already service many thousands of people that live in the Lake Whatcom area and so this impact will be minimal.

IMPACTS OF NO ACTION ALTERNATIVE

The only traffic that will occur as a result of this alternative is the transportation of timber from Squalicum Mountain to the mill. Since timber harvests only occur on the order of decades, the impact on everyday traffic is non-sensical. The only real effect that could be seen from this is the refuse and debris that could fall off the logging truck during transportation. Even then, the effect would be minimal additions of sediment and woody debris to the roadsides.

IMPACTS OF ALTERNATIVE ACTION

Six single-family houses will not have a large impact on traffic. Twenty-six single-family residences will have a much larger impact upon local traffic and even that impact will not be significant in regards to traffic flow. In comparison, the amount of construction equipment needed for the proposed project will be hindering to local traffic for much longer and in larger magnitude.

MITIGATION AND SIGNIFICANCE AFTER PROPOSED

The use of high reflection devices in the median of the road will help to provide guidance while driving at night.

NO-ACTION ALTERNATIVE

If the general public around Lake Whatcom was informed before each timber harvest that equipment and trucks will be using the roads that would do well to reduce the amount of unnecessary traffic.
ALTERNATIVE 2(6 HOUSES)

None proposed. The impact from 6 homes will be unnoticeable in terms of traffic flow and magnitude.

3.4 PUBLIC SERVICES AND UTILITIES

EXISTING CONDITIONS

There are no utilities in the development area.

IMPACTS OF PROPOSED ACTION:

Electricity — The proposed residential development will require electricity to be provided by public or private utilities. Overhead lines will have to be installed along the road and driveways leading to further clearing along the roadways. This clearing raises the risk of further slope destabilization, landslides, and erosion.

Sewer — Septic tanks and leech field are assumed to be installed for each of the 26 houses. The installation of septic tanks and will require heavy machinery and generate noise pollution as well as contribute to slope destabilization. Septic tanks and leech fields will also contribute to the nutrient loading problem of the Lake Whatcom watershed.

Water — Illegal wells will be dug for each of the 26 houses. Heavy machinery will be required, it is anticipated that noise pollution will occur. Extracting water from the Lake Whatcom watershed will result in nutrients being more concentrated, creating a greater risk for eutrophication.

IMPACTS OF NO ACTION ALTERNATIVE

No utilities will be required to harvest timber from Squalicum Mountain.

IMPACTS OF ALTERNATIVE ACTION

Water and Sewer — The proposed action includes plans to construct 26 wells and septic tanks adjacent to each house. Instead of the needed clearing and excavating to install wells and septic tanks, the alternative plan proposes the use of one exempt well (RCW90.44.105) and 6 septic tanks for utilities. The septic tanks on the properties will minimize the construction needed for the graded road, but have the risk of leaking into the ground water. Regular checks and care of the tanks should render this risk as non-issue. Similarly, the drilling of an exempt well minimizes the road construction, but had other possible effects. The well would need to be drilled to satisfactory depth to achieve acceptable water flow and accessibility. There is some concern of the drilling or blasting of bedrock, but the effect is minimal compared to the bedrock excavation that would be needed by the larger development.

Electricity — Subsurface power lines will be installed along the road. This will require the clearing and excavation of extra vegetation along the road which may lead to slope destabilization.

MITIGATION AND SIGNIFICANCE AFTER FOR IMPACTS
PROPOSED

Electricity — Subsurface power lines will be installed during road construction to eliminate further clearing of vegetation along the road, leading to better slope stabilization and a less likelihood of erosion.

Water and Sewer — When Squalicum Mountain Road is in the process of development, additional action will take place to install water and sewer mains along the road. This will decrease the need to blast bedrock for wells and illuminate the likelihood that a septic tank and its leech field will infiltrate the Lake Whatcom watershed.

NO-ACTION ALTERNATIVE

No mitigation

ALTERNATIVE 2(6 HOUSES)

Water and Sewer — To eliminate any probability of nutrient loading to the Lake Whatcom watershed a sewer main will be installed during the construction of the road. With the absence of septic tanks and leech fields it is unlikely that any human waste will contribute to the nutrients in Lake Whatcom.

SECTION FOUR: WORKS CITED


King County Greenhouse Gas Emissions Calculator.


Revised Code of Washington. Chapter 70.94: Clean Air Act.

Whatcom County Code 20.42 Rural Forestry Guidelines

Washington State Department of Ecology -
http://www.ecy.wa.gov/programs/wq/tmdl/LkWhatcom/LkWhatcomTMDL.html

Washington State Department of Ecology Lake Whatcom TMDL 2008


Whatcom County 10-Year Urban Growth Area Review Environmental Impact Statement Section 4.2

SECTION FIVE: APPENDIX (MAPS)

Fig A. Map of Proposed Action
Fig B. Map of Property Ownership and Watershed Boundary
Fig C. Map of Restoration Projects in the Lake Whatcom Watershed

KEY:
- Green: Riparian Restoration Site (Anderson Cr.)
- Light Green: Restoration Project Sites
- Pink: City Owned Properties in the Watershed
- Blue: Lake Whatcom Watershed

City of Bellingham
Restoration Project Sites:
Lake Whatcom Watershed 2007
Fig D. 3-D Model of Current Site with Academy Road

Fig E. 3-D Model of Proposed Road Looking East
Fig F. 3-D Model of Proposed Road Looking West

Fig G. 3-D Model of Proposed Road with 26 Houses Grouped in Fours from West
Fig H. 3-D Model of Proposed Road with 26 Houses Grouped in Fours from East

Fig I. 3-D Model of Proposed Road with 26 Houses and 26 Driveways from West
Fig J. 3-D Model of Proposed Road with 26 Houses and 26 Driveways from East

Fig K. 3-D Model of Proposed Road with 26 Houses and 26 Driveways from South
Fig L. 3-D Model of 6 Houses Located on West Side of Squalicum Mountain from West (Alternative # 2)

Fig M. 3-D Model of 6 Houses Located on West Side of Squalicum Mountain from East (Alternative # 2)