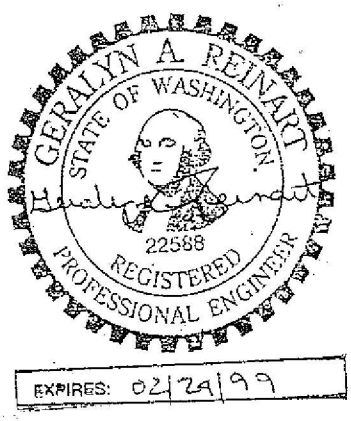
Appendix C

Traffic Study

TRAFFIC IMPACT ANALYSIS
TINAS COMA SUBDIVISION
BURLINGTON, WASHINGTON

November 1998



Prepared for:
Dan Madlung

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TRAFFIC IMPACT ANALYSIS
TINAS COMA SUBDIVISION
BURLINGTON, WASHINGTON

A) Introduction

The purpose of this report is to assess the traffic-related impacts associated with the development of a new residential subdivision in the City of Burlington. The project is located on "Burlington Hill", which is a large hill rising from the flat valley land which surrounds it. The information contained herein will review the existing conditions, estimate the project trip generation and distribution, determine the impacts to intersection levels of service, and determine the appropriate mitigation for the project. The remainder of the report will summarize the findings of the data collection and analysis.

B) Project Description

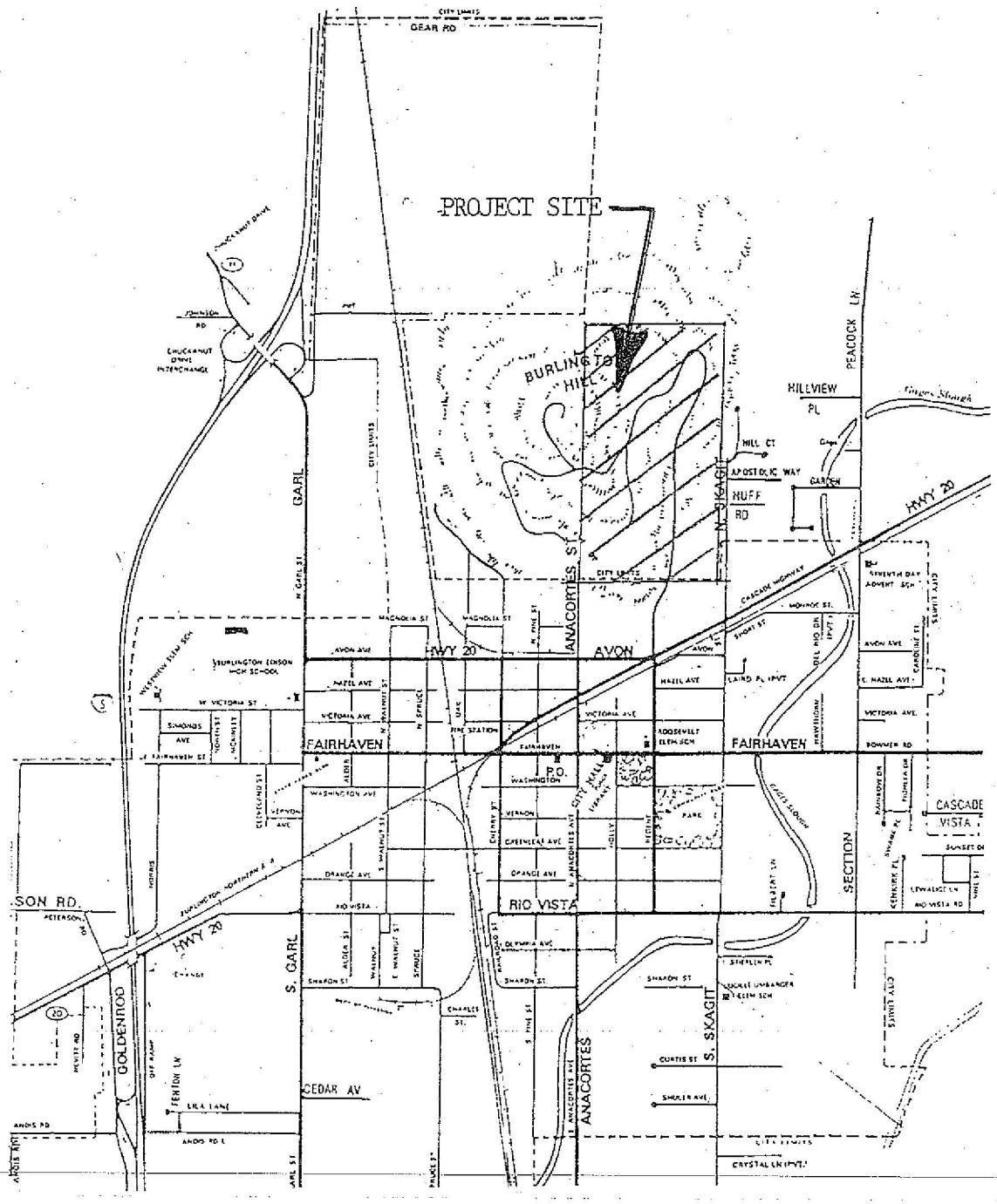
The proposed subdivision is located north of SR-20 and west of Skagit Street in an area which is currently not incorporated into the City of Burlington, but is undergoing the annexation process at the writing of this report. (See Figure 1). The proposed plat would contain a maximum of 79 single-family lots, plus a maximum of 15 condominium units. The proposed subdivision contains a total of 5.5 acres and is currently zoned RR - rural reserve, with a proposed zoning of R-1.8.4 (8400 square foot lots) upon annexation of the property. The project proponent is Dan Madlung (360-855-0688).

The Tinas Coma site is currently undeveloped and is heavily wooded with steep slopes. Access for the plat will be from a new street proposed to intersect Skagit Street located on the east side of the property, and from a southerly extension of Hillcrest Drive in the Burlington Hill Business Park located on the north side of the site. An internal roadway which curves through the site would connect these two access points.

C) Existing Conditions

1. Transportation System

The main roadway facilities in the area which will be



VICINITY MAP

FIGURE 1

impacted by the development are Skagit Street, Hillcrest Drive, North Hill Blvd., Old Highway 99, and SR-20. A description of these facilities follows.

Skagit Street is a north/south local neighborhood collector with varying widths. Immediately north of its intersection with SR-20, Skagit Street is 44 feet wide, narrowing to 36 feet wide shortly thereafter. Curb, gutter, and sidewalk have been constructed to approximately Bradley Court. The street narrows to approximately 20 feet with gravel shoulders north of Bradley Court. The posted speed is 25 mph and the adjacent land use is residential.

SR-20 Street is an east-west state highway located to the south of the Burlington Hill property. The highway is two lanes wide with left-turn storage and eight foot paved shoulders. (A left-turn lane has been installed at the Skagit Street intersection.) The roadway provides a connection to I-5 to the west and Sedro Woolley and the North Cascades to the east. The posted speed is 30 mph west of Peacock Lane, increasing to 50 mph east of Peacock Lane. SR-20 is fronted by undeveloped properties, single-family residences and some commercial development.

Old Highway 99 is a north-south arterial which extends north from Garl Street to beyond Cook Road. The roadway is two lanes wide with six to eight foot paved shoulders. The street is straight and flat and is fronted by undeveloped parcels and car dealers. Traffic on Old Highway 99 is required to stop at its intersection with Garl Road, and a traffic signal controls its intersection with Cook Road. The posted speed is 35 mph south of North Hill Blvd. and 50 mph north thereof.

North Hill Blvd. is a new commercial access street serving the Burlington Hill Business Park. The street includes curb and gutter on both sides of the street with sidewalk on the south or west sides of the street, and street lights. An at-grade railroad crossing with crossing arms and lights is located just to the east of Old Highway 99. The posted speed is 25 mph and the adjacent land is in the process of being developed for commercial and light industrial sites.

Hillcrest Drive is also a new commercial access street serving the Burlington Hill Business Park and extending east from its intersection with North Hill Boulevard. Hillcrest Drive is similar to North Hill Blvd., i.e., curb and gutter have been installed on both sides of the street with sidewalk on the north and east sides of the street. No properties are currently developed along

Hillcrest Drive and the street currently dead-ends at the base of Burlington Hill.

2. Traffic Volumes

Daily traffic counts in the area were available from WSDOT and the City of Burlington. Figure 2 shows the daily traffic volumes along the roadways in the area based on counts conducted by WSDOT in 1996 and by the City of Burlington in 1997.

A manual traffic count for the PM peak hour at the intersections of SR-20/Skagit Street, SR-20/Garl Street, SR-20/Old Cascade Highway, SR-20/Burlington Blvd., SR-20/ Fairhaven Avenue, Cook Road/Old Highway 99, Cook Road/I-5 Northbound Ramp, and Old Highway 99/North Hill Boulevard were conducted or available for this study. These counts are shown on Figure 2.

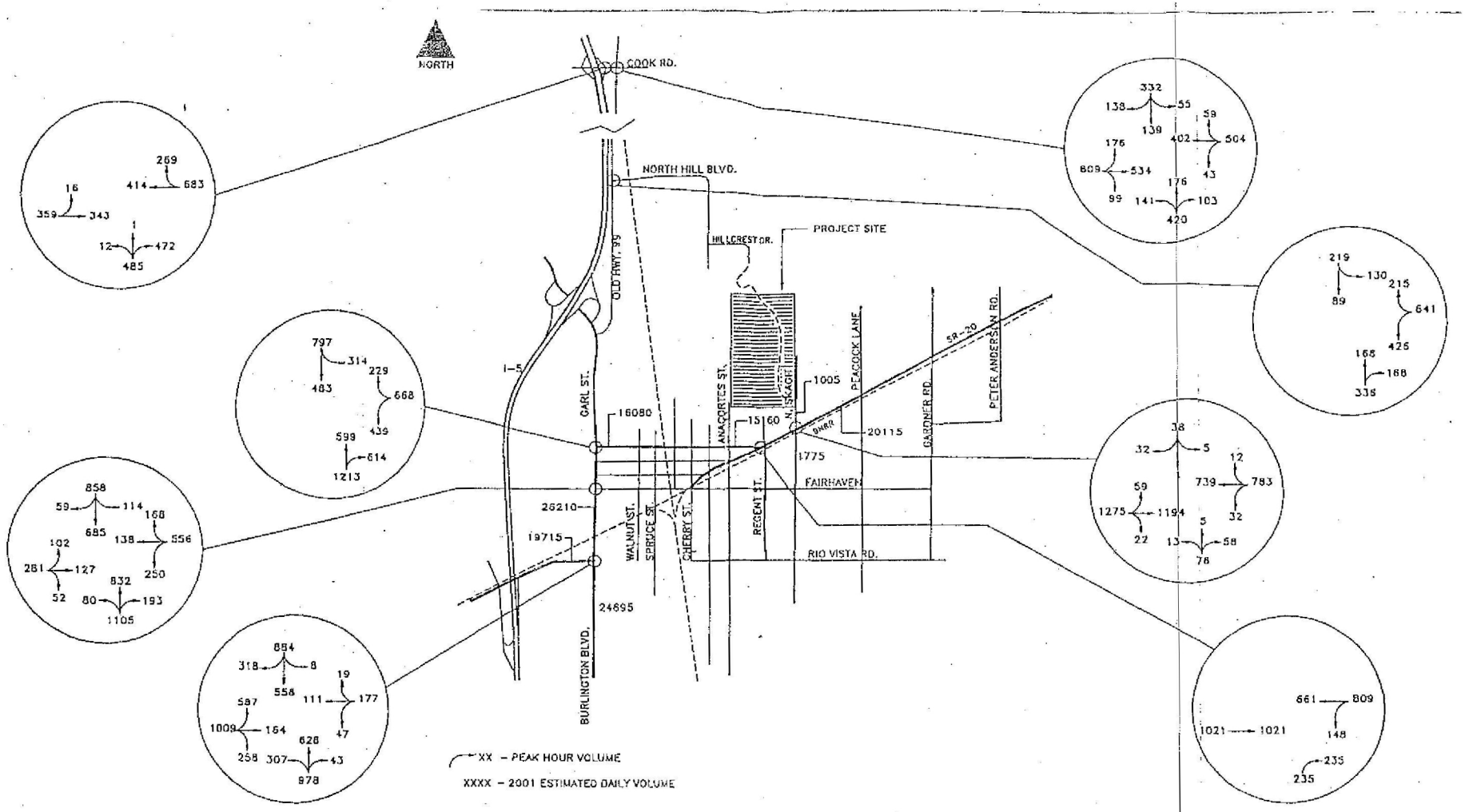
Currently there is a fairly small amount of traffic using the intersection of North Hill Road/Old Highway 99, much of which is construction-related. However, future development in the business park is expected to increase the side street volumes. The remaining intersections are all fairly well utilized due to their location along a state highway or major arterial.

A review of the WSDOT historical data for the area indicates that the daily traffic volumes have been growing at a rate of approximately 2-3% per year for the past few years.

3. Level of Service

A capacity analysis was conducted for the intersections of SR-20/Skagit Street, SR-20/Garl Street, SR-20/Old Cascade Highway, SR-20/Burlington Blvd., SR-20/Fairhaven Avenue, Cook Road/Old Highway 99, Cook Road/I-5 Ramp Northbound Ramp, and Old Highway 99/North Hill Boulevard. The intersections of SR-20/Skagit Street, SR-20/Old Cascade Highway, Cook Road/I-5 Northbound Ramp, and Old Highway 99/North Hill Boulevard are stop sign controlled, while SR-20/Garl Street, Cook Road/Old Highway 99, SR-20/ Fairhaven Avenue, and SR-20/Burlington Boulevard are controlled by a traffic signal.

"Level of service" is a common term used in the Traffic Engineering profession which is defined as a qualitative measure describing operational conditions within a traffic stream, and its perception by motorists and/or passengers. These conditions are usually described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Six levels of service are



ESTIMATED 2001 DAILY AND PM PEAK HOUR VOLUMES – WITHOUT PROJECT
FIGURE 6

designated, ranging from A to F, with level of service "A" representing the best operating conditions and level of service "F" the worst.

The intersection is then analyzed, taking into account all of the physical features and methods of traffic control. This process produces a rating for the intersection that defines a "level-of-service". An expanded explanation of "level of service", along with the tables which identify the criteria for analyzing unsignalized and signalized intersections respectively, is presented in the *Highway Capacity Manual*.

The actual capacity of an intersection is generally considered to be at the lower end of level of service "E" and most agencies strive to maintain a roadway network that will not drop below this level of operation, except perhaps during unusual periods such as holiday shopping, sporting events, etc.

Calculations for the levels of service were conducted using the McTrans Highway Capacity Software version 2.1f based on the *1994 Highway Capacity Manual.* The manual traffic counts described earlier were used in these analyses and are shown on Figure 2. The following tables show the current levels of service.

TABLE 1
EXISTING LEVELS OF SERVICE - UNSIGNALIZED INTERSECTIONS
PM PEAK HOUR

Location	Level of Service (Delay)
SR-20/Skagit Street	EBLT - B (5 sec.)
	WBLT - B (8 sec.)
	NB - E (44 sec.)
	SBTH/LT - F (84 sec.)
	SBRT - B (7 sec.)
	OVERALL - A (2 sec.)
SR-20/Old Cascade Highway	WBLT - B (8 sec.)
	NBRT - C (20 sec.)
	OVERALL - A (3 sec.)
Cook Road/I-5 NB Ramp	EBLT - A (4 sec.)
	NB - C (15 sec.)
	OVERALL - B (5 sec.)
North Hill Blvd./Old Highway 99	WBLT - B (7 sec.)
	WBRT - A (4 sec.)
	SBLT - A (3 sec.)
	OVERALL - A (2 sec.)

Where:

LOS	Delay
A	≤ 5 seconds
B	> 5 & ≤ 10 seconds
C	>10 & ≤ 20 seconds
D	>20 & ≤ 30 seconds
E	>30 & ≤ 45 seconds
F	>45 seconds

TABLE 2
EXISTING LEVELS OF SERVICE - SIGNALIZED INTERSECTIONS
PM PEAK HOUR

Location	Level of Service (Delay)
SR-20/Garl Street	WB - B (14 sec.)
	NB - B (9 sec.)
	SB - B (9 sec.)
	OVERALL - B (11 sec.)
Cook Road/Old Highway 99	EB - B (7 sec.)
	WB - C (21 sec.)
	NB - B (12 sec.)
	SB - B (9 sec.)
	OVERALL - B (12 sec.)
SR-20/Fairhaven Avenue	EB - C (19 sec.)
	WB - B (14 sec.)
	NB - C (18 sec.)
	SB - B (14 sec.)
	OVERALL - C (16 sec.)
SR-20/Burlington Boulevard	EB - C (23 sec.)
	WB - C (23 sec.)
	NB - B (11 sec.)
	SB - D (27 sec.)
	OVERALL - C (20 sec.)

Where:

LOS	Delay
A	≤ 5 seconds
B	> 5 & ≤ 15 seconds
C	>15 & ≤ 25 seconds
D	>25 & ≤ 40 seconds
E	>40 & ≤ 60 seconds
F	>60 seconds

The level of service tables indicate that the signalized intersections are operating at good levels of service, as

well as the unsignalized intersections, with the exception of SR-20/Skagit Street. Due to the high volumes on SR-20, the side street movements are at level of service "E" or "F".

D) Project Impacts

1. Trip Generation

The *ITE Trip Generation Manual* (published by the Institute of Transportation Engineers, 6th Edition, 1997) has been used to estimate the number of trips which can theoretically be expected to be generated by a development of this type. ITE Land Use Codes 210, Single-Family Detached Housing, and 230, Residential Condominium/Townhouse, were chosen as the appropriate trip rates for use in this study. Table 3 shows the trip generation for the two uses, using the average trip rates.

TABLE 3
TRIP GENERATION
TINAS COMA SUBDIVISION

TIME PERIOD		79 SF LOTS	15 CONDO. UNITS	TOTAL TRIPS
Daily		756	88	844
AM Peak	Enter	15	1	16
	Exit	44	6	50
	Total	59	7	66
PM Peak	Enter	51	5	56
	Exit	29	3	32
	Total	80	8	88

The trip generation summary indicates that the proposed development would generate a moderate amount of traffic.

2. Trip Distribution/Assignment

The proposed subdivision will provide new housing in a growing area along the I-5 corridor. The trips from the proposed development will be able to travel either to the north through the business park, or to the south to Skagit Street to access SR-20. Access to I-5 is available to the southwest from SR-20, to the west at the Chuckanut Drive interchange, and to the northwest at the Cook Road interchange. The peak hour counts at the intersections in the area, an inspection of the available transportation routes, and previous studies in the area

have been used to estimate the trip distribution/ assignment.

Figure 3 shows the generalized trip distribution by percent and daily volume for the subject site. It should be noted that these values are approximate and may vary from day to day depending on the needs and desires of the future residents of the development. It is estimated that approximately 90% of the traffic will be destined to/from the west/northwest/southwest, and 10% to/from the east. Many of the trips will be local, i.e., to schools, shopping, or employment locations within the City of Burlington. The remainder of the trips are expected to travel to areas beyond the City, such as Bellingham, Mount Vernon, or south on I-5.

Figures 4 and 5 show the trip assignment to the various roadways during the AM and PM peak hours. The figures show that the project trips will have the greatest impact on the intersection of Skagit Street/SR-20.

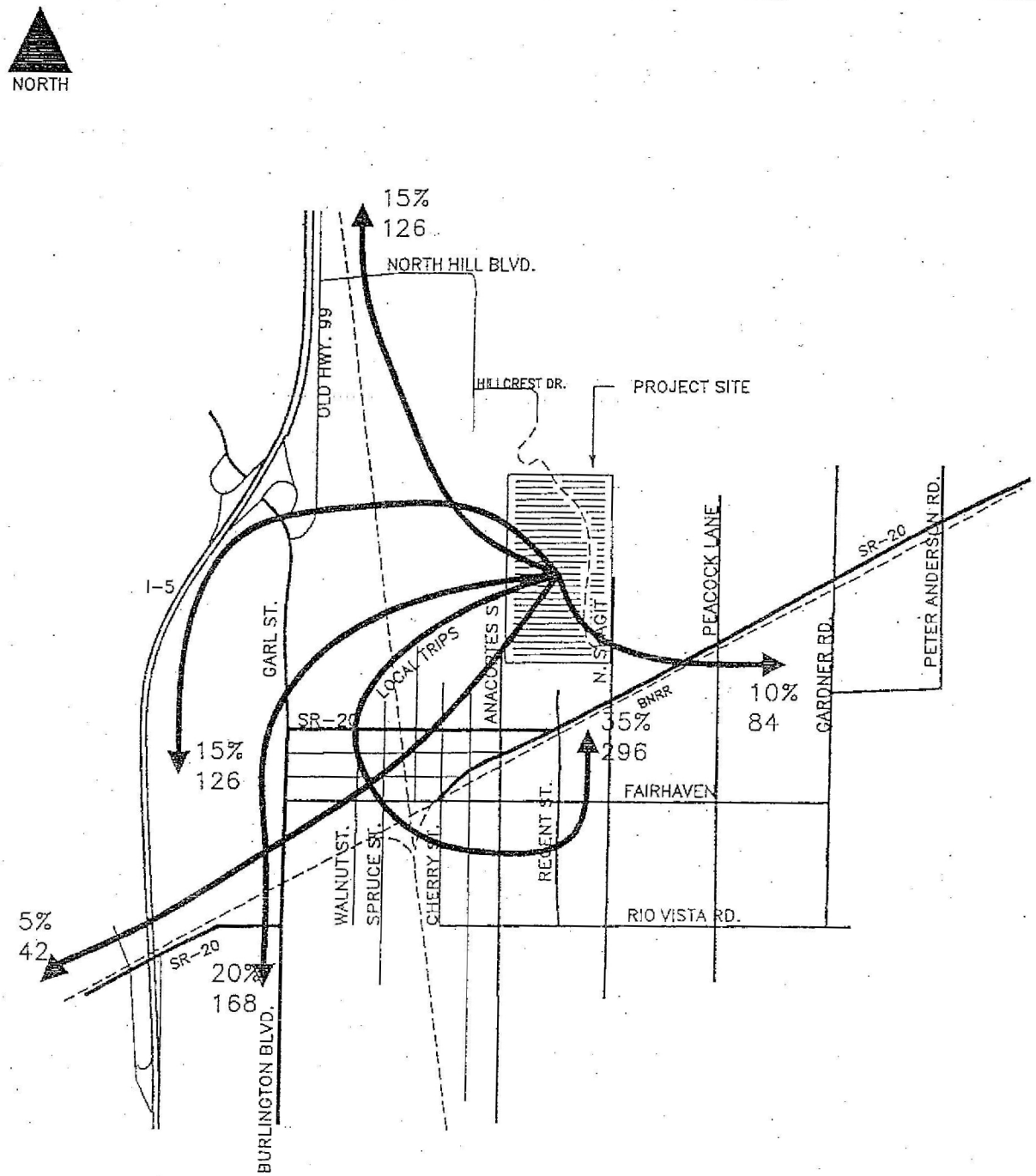
3. Traffic Volumes

Figures 6 and 7 show the estimated 2001 daily and PM peak hour traffic volumes with and without the development. As stated earlier, the historical data for the area indicates that the daily traffic volumes have been growing at a rate of approximately 2-3% per year for the past few years. Thus, the existing peak hour volumes were increased by 3% for the 2001 volumes. In addition to this general background growth, the trips associated with the further build-out of the Burlington Hill Business Park were added into the volumes per the assignment presented in the traffic impact analysis for that project (prepared by David Evans and Associates).

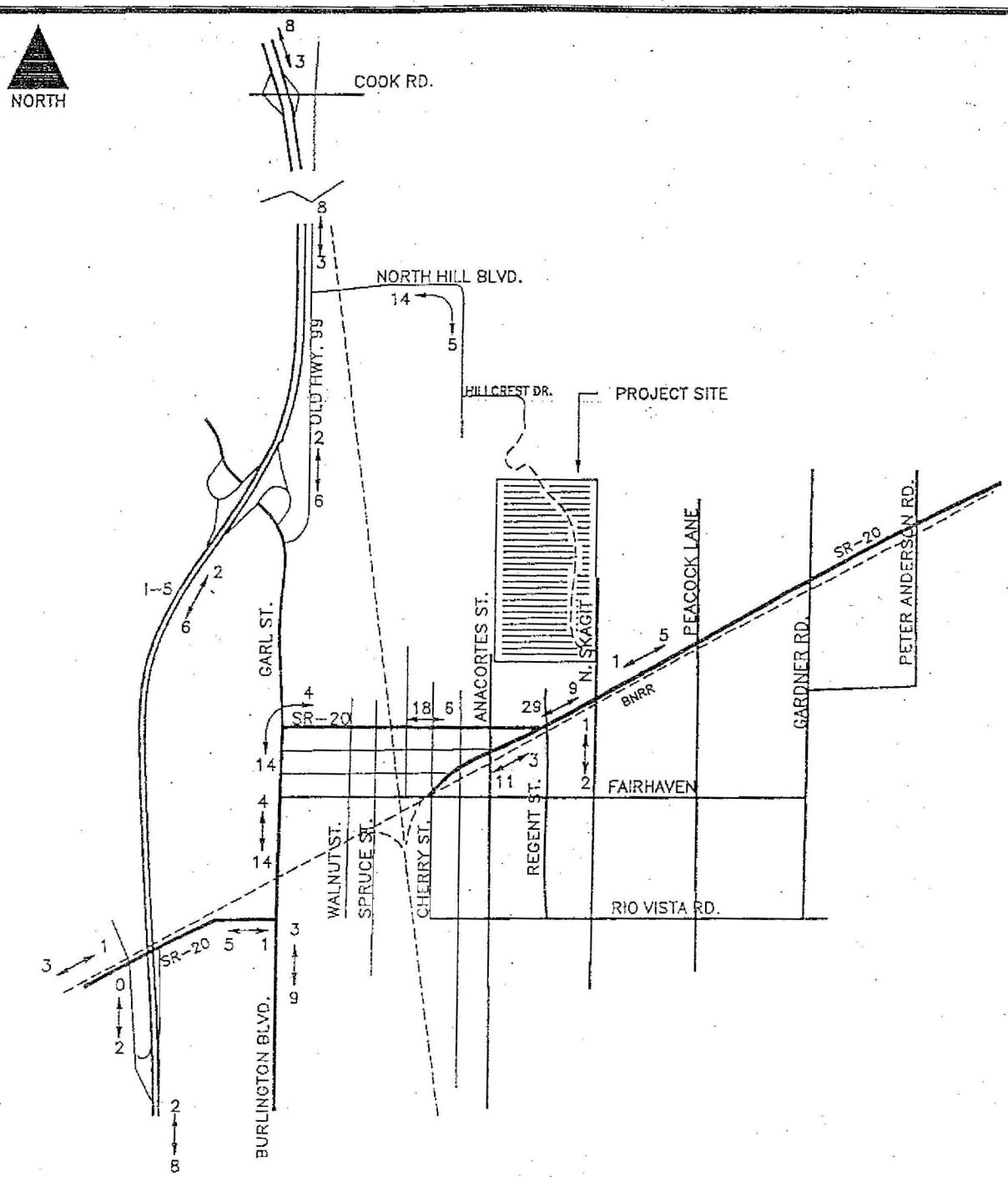
4. Level of Service

Level of service calculations were conducted again for the intersections for the year 2001, which is the expected year of completion for the project. It has been assumed for purposes of analysis that no changes in the geometrics at the intersections have occurred.

The projected future level of service conditions with and without the proposed development are shown in Tables 4 and 5.

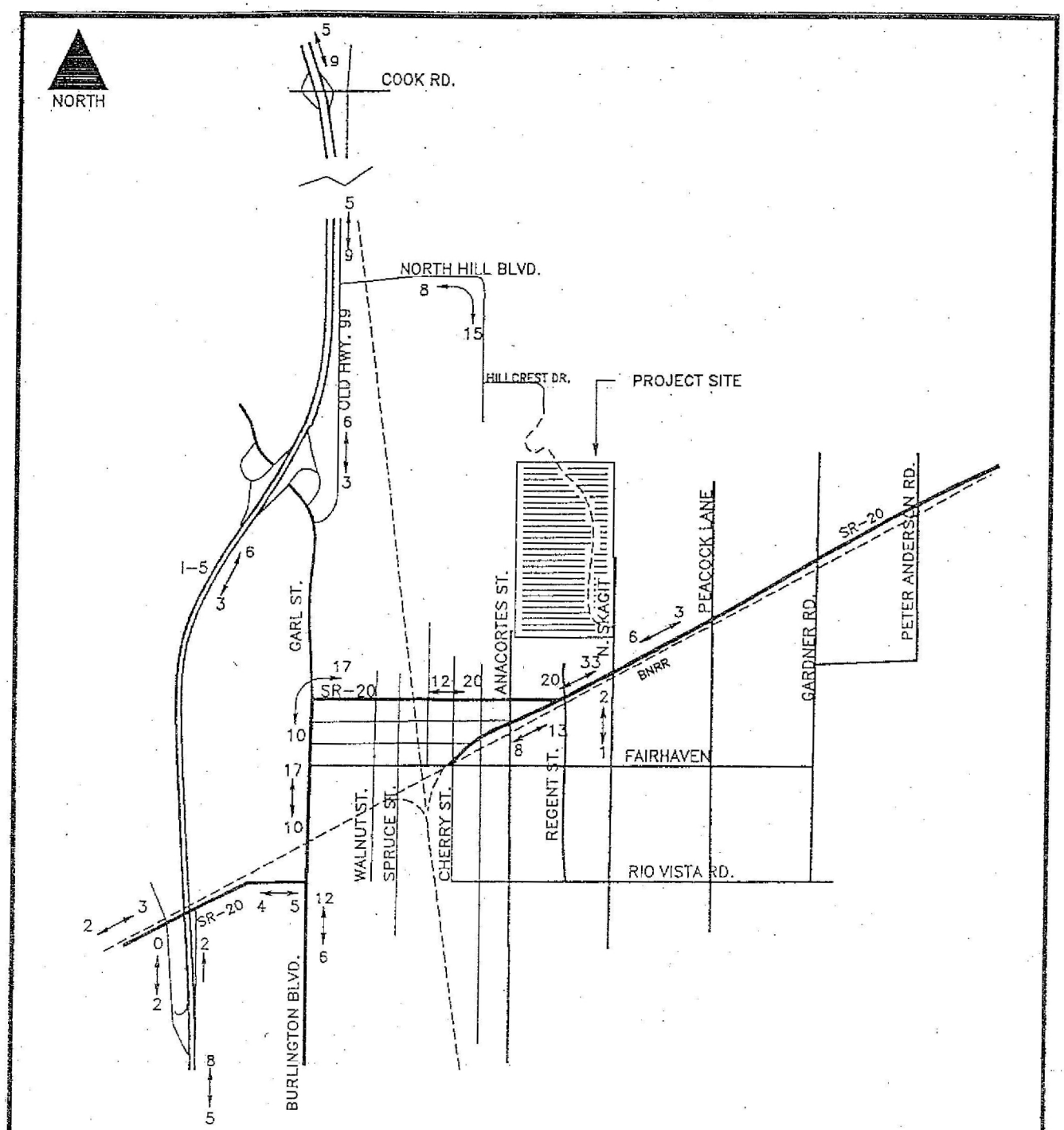


ESTIMATED TRIP DISTRIBUTION
(BY PERCENT & DAILY VOLUME)
FIGURE 3



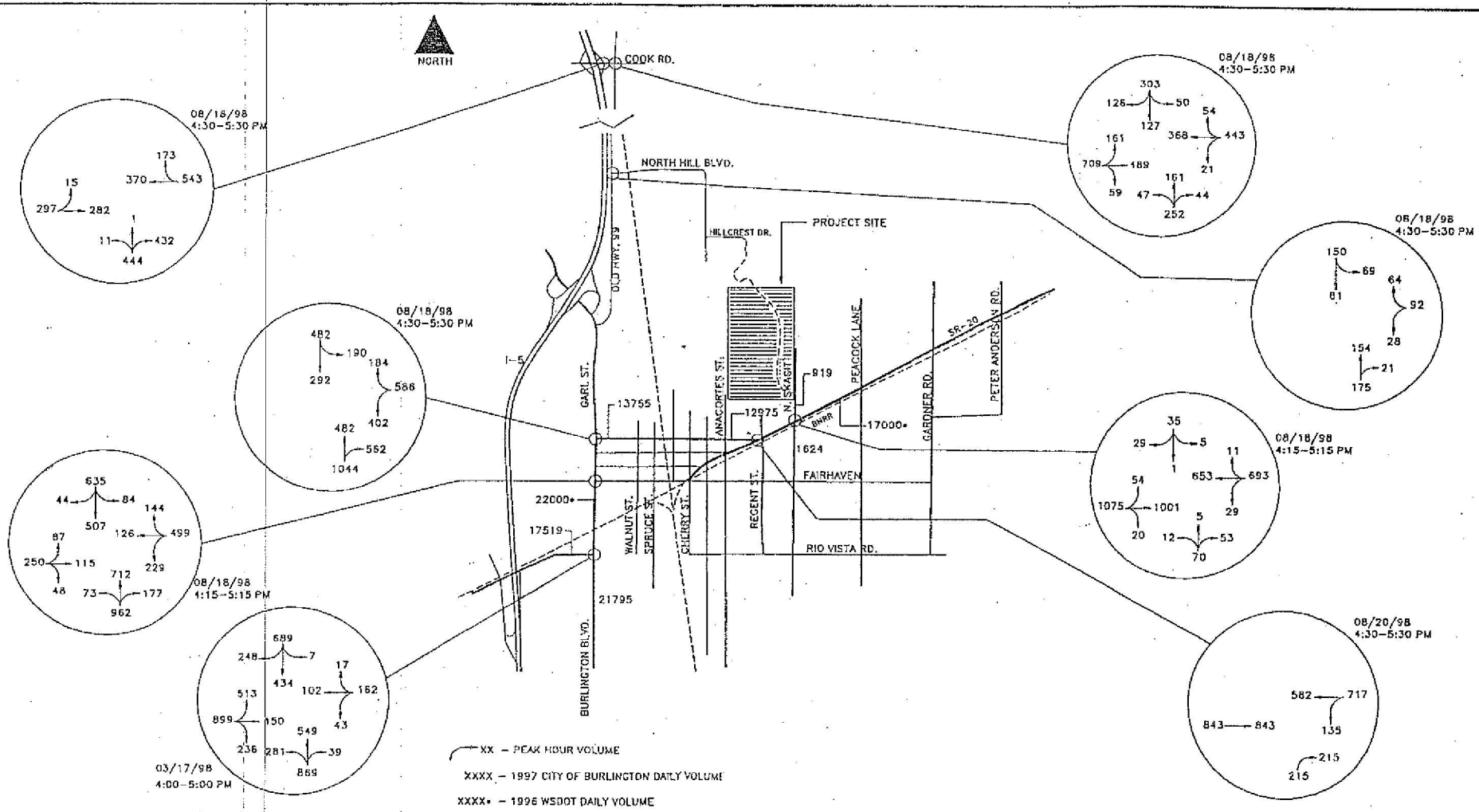
ESTIMATED AM PEAK HOUR TRIP ASSIGNMENT

FIGURE 4



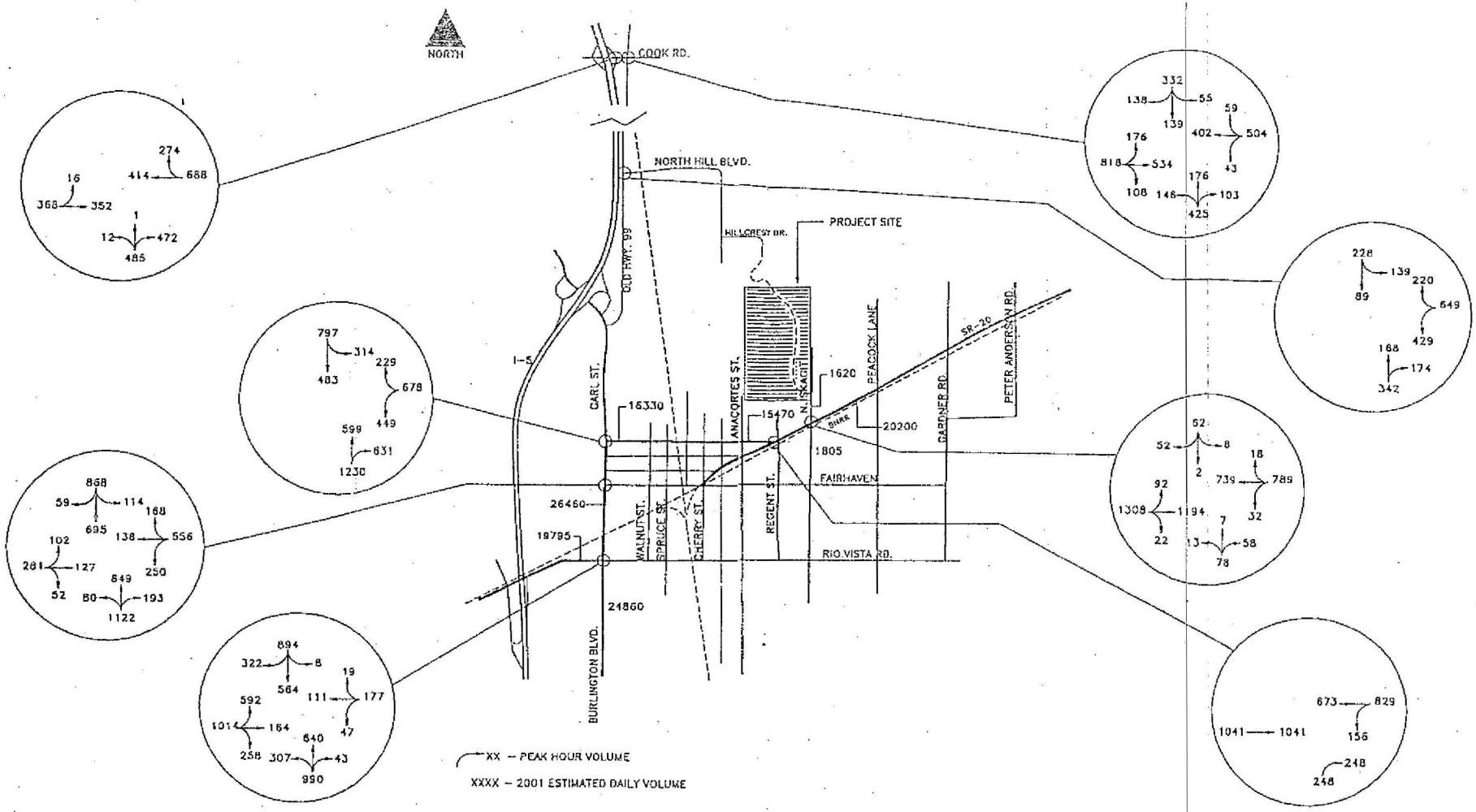
ESTIMATED PM PEAK HOUR TRIP ASSIGNMENT

FIGURE 5



EXISTING DAILY & PM PEAK HOUR VOLUMES

FIGURE 2



ESTIMATED 2001 DAILY AND PM PEAK HOUR VOLUMES – WITH PROJECT
FIGURE 7

TABLE 4
2001 LEVELS OF SERVICE - UNSIGNALIZED INTERSECTIONS PM PEAK HOUR

Location		2001 Levels of Service (Delay) W/out Project	W/Project
SR-20/Skagit Street	EBLT	B (6 sec.)	B (6 sec.)
	WBLT	C (10 sec.)	C (10 sec.)
	NB	F(>99 sec.)	F(>99 sec.)
	SBTH/LT	F(>99 sec.)	F(>99 sec.)
	SBRT	B (8 sec.)	B (8 sec.)
	OVERALL	B (6 sec.)	C (14 sec.)
SR-20/Old Cascade Highway	WBLT	C (12 sec.)	C (13 sec.)
	NBRT	F (52 sec.)	F (74 sec.)
	OVERALL	B (7 sec.)	B (10 sec.)
Cook Road/I-5 NB Ramp	EBLT	A (5 sec.)	A (5 sec.)
	NB	E (36 sec.)	E (40 sec.)
	OVERALL	C (12 sec.)	C (13 sec.)
North Hill Blvd./ Old Highway 99	WBLT	F (**)	F (**)
	WBRT	B (5 sec.)	B (5 sec.)
	SBLT	A (4 sec.)	A (4 sec.)
	OVERALL	F(>99 sec.)	F(>99 sec.)

** - Calculated value greater than 999.9 seconds.

TABLE 5
2001 LEVELS OF SERVICE - SIGNALIZED INTERSECTIONS
PM PEAK HOUR

Location	2001 Levels of Service (Delay) W/out Project	W/Project
SR-20/Garl Street	WB - C (20 sec.)	C (21 sec.)
	NB - B (15 sec.)	B (15 sec.)
	SB - B (13 sec.)	B (13 sec.)
	OVERALL - C (16 sec.)	C (16 sec.)
Cook Road/Old SR-99	EB - B (7 sec.)	B (7 sec.)
	WB - D (38 sec.)	D (38 sec.)
	NB - C (19 sec.)	C (19 sec.)
	SB - B (12 sec.)	B (12 sec.)
	OVERALL - C (18 sec.)	C (18 sec.)
SR-20/Fairhaven Avenue	EB - C (19 sec.)	C (19 sec.)
	WB - B (15 sec.)	B (15 sec.)
	NB - C (23 sec.)	C (24 sec.)
	SB - C (16 sec.)	C (16 sec.)
	OVERALL - C (19 sec.)	C (19 sec.)
SR-20/Burlington Boulevard	EB - D (28 sec.)	D (28 sec.)
	WB - D (26 sec.)	D (26 sec.)
	NB - C (15 sec.)	C (15 sec.)
	SB - D (38 sec.)	E (40 sec.)
	OVERALL - D (27 sec.)	D (28 sec.)

The results of the capacity analyses indicate that the background growth in the area will increase the delay at the intersections. All of the signalized intersections are expected to continue to operate at acceptable levels of service in the future, with or without the project. However, the unsignalized intersections will become increasingly congested, with level of service "E" or worse expected for some of the side street movements. Much of this decrease can be associated with the full build-out of the Burlington Hill Business Park, especially at the North Hill Blvd./Old Hwy. 99 intersection where the entire intersection is expected to drop to level of service "F".

5. Site Access

Access to the development is proposed from N. Skagit Street and from an extension of Hillcrest Drive. Residents using Hillcrest Drive are expected to be destined to I-5 and using either the Cook Road interchange or Chuckanut Drive interchange. Residents

using the Skagit Street access are likely to be those destined to the east, or to locations within the City. The access to Skagit Street is located along a flat straight section of street and sight distance is good.

Level of service calculations have been conducted for the access to Skagit Street and are shown in the following table. The estimated volumes at this intersection are shown on Figure 8.

TABLE 6
2001 LEVELS OF SERVICE
SITE ACCESS

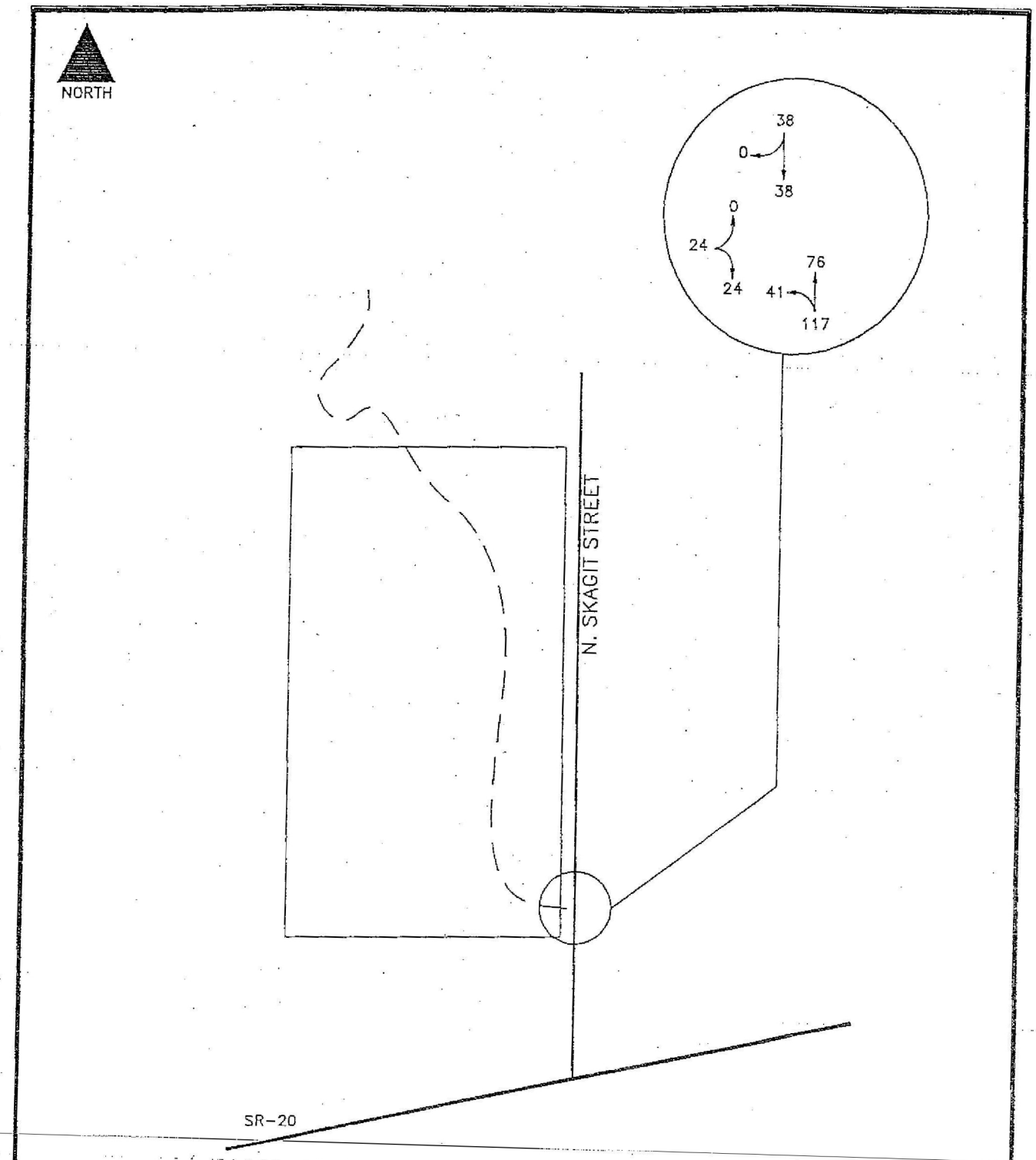
Location	Level of Service (Delay)
Skagit Street/	NBLT - A (2 sec.)
Site Access	EB - A (3 sec.)
	OVERALL - A (<1 sec.)

The level of service analyses indicate that the access to Skagit Street should operate at a good level of service.

The extension of Hillcrest Drive through the plat to tie into the existing street system would provide a secondary access not only to the residents of the proposed development, but would also serve the existing residents along Skagit Street by providing them with an alternative to using SR-20. There is also the potential that business park traffic could use this new connection. While the use of this new street by anyone other than the residents of Tinas Coma may be considered undesirable, the connection of this street does provide better localized circulation. Furthermore, the steep grade of the roadway and horizontal curvature will tend to limit the amount of "cut-through traffic" since speeds will tend to be lower along the new street due to its geometrics.

E) Development Impacts Summary

The proposed subdivision will create a moderate impact on the adjacent streets. The project will generate a total of 842 daily trips, 88 of which will occur during the PM peak hour. The majority of the trips will be destined to the south to SR-20, with further dispersion onto the local arterials or to the freeway system. The project will be constructing a new street through the subdivision which will provide a connection between Skagit Street and Hillcrest Drive. This connection will not only provide good access for the subdivision, but also provide better neighborhood



ESTIMATED PM PEAK HOUR VOLUMES – AT SITE ACCESS

FIGURE 8

circulation.

The project will have its greatest impact on the intersections of SR-20/Skagit Street, SR-20/Old Cascade Highway and North Hill Blvd./Old Highway 99. All three of these intersections are currently unsignalized and are expected to have one or more movements operating at level of service "F" by 2001. The year 2001 analyses assumed full build-out of the Burlington Hill Business Park which contributes extensively to the drop in the levels of service. The level of service deficiencies would occur with or without the proposed subdivision. Furthermore, should the business park not generate the traffic volumes which were previously estimated, the resultant levels of service would be better.

Discussions with City of Burlington Staff indicated that the City has been interested in the installation of a traffic signal at Skagit Street/SR-20. The additional volumes associated with the proposed subdivision would further increase this need, although the peak hour volumes indicate that the sides street volumes are still not high enough to warrant a signal.

A traffic signal was recommended for the North Hill Blvd./Old Hwy. 99 intersection as part of the development of the Burlington Hill Business Park, and the traffic from the subdivision will contribute to this need. Participation in this installation, when warranted, would be appropriate.

The remaining intersection that would have a level of service deficiency is SR-20/Old Cascade Highway. This intersection has a limited number of turning movements present, i.e., just a side street right-turn and a main street left-turn. The projected increase in traffic volumes indicate that the side street right-turn would operate at level of service "F" by 2001, although the overall intersection level of service would be "B". Since this right-turn is the only movement with a level of service deficiency, no action is recommended at the present time. However, should the City or WSDOT decide to signalize the intersection, within the next few years, the proposed subdivision should contribute a proportionate share to the improvements.

Based on the above analyses, **potential** mitigation to be considered for the Tinas Coma subdivision is as follows:

- Contribution towards the future signalization of Skagit Street/SR-20 (if constructed by either the City of Burlington or WSDOT). The proportionate share is estimated at 2.9% (65 of 2237 PM peak hour trips).
- Contribution towards the future signalization of North Hill Blvd./Old Highway 99 (when warranted). The

proportionate share is estimated at 1.9% (23 of 1219 PM peak hour trips).

- Contribution towards the future signalization of Old Cascade Highway/SR-20 (if constructed by either the City of Burlington or WSDOT). The proportionate share is estimated at 2.5% (53 of 2118 PM peak hour trips).
- Construction of internal plat roadway to connect Skagit Street with Hillcrest Drive.

No other mitigation for intersection or roadway improvements is recommended at this time.

Appendix D

Wetland Reconnaissance

AQUA-TERR SYSTEMS, INC.

19 October 1998

Dan Madlung
Burlington Hill Business Park
669A Sunset Park Drive
Sedro-Woolley, WA 98284

(360) 855-0688
Fax 855-0591

Dear Mr. Madlung,

As requested, Aqua-Terr Systems, Inc. (ATSI) reviewed the plant and animal communities, soils, and hydrology, of the following property to determine the presence of wetlands and other critical habitats (e.g. Skagit County Fish and Wildlife Habitat Conservation Areas). The property reviewed was the approximate 55 acre parcel on Burlington Hill, Burlington, Washington (Sections 29 and 32, Township 35 North, Range 4 East, W.M. (Figures 1 and 2).

The purpose of our review is to provide an assessment of the presence, location, and extent of wetlands under the jurisdiction of the U.S. Army Corps of Engineers (Corps) and the City of Burlington. The wetlands referred to in this report follow the Corps definition: "*....those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*" (Environmental Laboratory, 1987) and the State of Washington, *Washington State Wetlands Identification and Delineation Manual, March, 1997*. Through Section 404 of the Clean Water Act, the Corps has the authority to regulate the placement of fill materials in wetlands and requires permits for such activities. The City of Burlington regulates all activities in and around wetlands, streams, and other critical habitats.

METHODS AND PROCEDURES

A two step procedure is used to determine the presence and extent of wetlands and other critical habitats on the parcel. This procedure includes a preliminary data review and an on-site investigation. A qualitative analysis for all biota and habitats is performed. We observe the general topography and traverse the entire parcel to identify wetlands and other critical habitats. Data is collected from the dominant plant communities and soils present. In addition, aerial photographs, soil data, and/or topographic maps are used to orient ourselves, to locate wetlands, and to locate unique and/or critical habitats.

21993 Gripp Road Sedro-Woolley, WA 98284-9216 (360) 856-2139 FAX (360) 856-5238

The goal of this analysis and site review is to describe the biological aspects of the parcel in order to provide sufficient data for the client and regulating agency to make informed decisions regarding wetlands and other critical areas.

A preliminary review of public resource documents is used to provide initial site information on soils, vegetation, hydrology, and critical areas (see references). These resources include:

- United States Department of Agriculture, Soil Conservation Service soil survey.
- Natural Resources Conservation Service, hydric soils list.
- National Wetland Inventory maps.

An on-site investigation was conducted on 10 September 1998 by Jim Wiggins and Elizabeth Binney. Jim and Elizabeth are Professional Wetlands Scientists (P.W.S.) certified by the Society of Wetlands Scientists and Elizabeth is certified as a wetlands delineator by the Seattle District of the U.S. Army Corps of Engineers. Jim has a M.S. in ecology and Elizabeth has a Ph.D. in plant ecology.

All wetlands are identified based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology as described in the Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the State of Washington, *Washington State Wetlands Identification and Delineation Manual, March, 1997*. All three parameters must be present for an area to be considered a jurisdictional wetland. Figure 2 depicts the approximate location of the sample plots; Data Forms for individual sample plots are at the back of this report.

An area is considered to have hydrophytic vegetation if greater than 50% of the total composition of plant species from all strata have an indicator status of facultative, facultative wetland, or obligate wetland as defined in the *National List of Plant Species that occur in Wetlands: Washington* (Reed 1988). Dominant plant species are determined for each stratum (canopy, shrub, and herbaceous) generally within a thirty foot radius of each plot. The percent areal cover is recorded for each dominant species. If the dominant vegetation is made up of greater than 50 percent of vegetation which is listed as facultative, facultative wetland, or obligate wetland species (Reed 1988), or a frequency analysis of all species yields a prevalence index less than 3.0 (Environmental Laboratory 1987), the definition for hydric vegetation is met.

Hydric soils are determined to be present on the basis of high organic-matter, sulfitic material, reduced soil conditions, aquic or peraquic moisture regimes, soil colors with a chroma of 2 or less with mottles, or a chroma of 1 with or without mottles, and/or the presence of iron or manganese concretions. Soils are observed from a 20" soil pit; soil hydric characteristics are examined just below the A-horizon or at 10". Soils are examined for hydric characteristics and indicators such as mottling, texture, and color. Color is determined using a Munsell soil color chart (Kollmorgen 1975).

Wetland hydrology is considered present when seasonal or permanent indicators of local water inundation are observed. These indicators include: soil saturation, free standing water in test pits, surface inundation, oxidized root channels, water-stained leaves, water marks, drift lines, sediment deposits, drainage patterns, and/or data from the local soil survey.

In order to provide some documentation of the existing wetland functions, we use the Washington State Department of Ecology (DOE) "Functions Worksheet" with updated modifications by ATSI. This provides information that aids in categorization of the wetlands and provides baseline information if future mitigation is required. Below is a partial list of functions and attributes addressed:

1. Age and classes of wetland communities and populations.
2. Buffer size and character.
3. Cultural, heritage, recreational, and local values.
4. Ecotone complexity and transition zone between dry land and water courses.
5. Enhancement potential.
6. Flood and storm drainage protection.
7. Habitat for fish and/or wildlife.
8. Presence of sensitive, threatened, or endangered plants or animals.
9. Presence and number of unusual habitat features.
10. Shoreline stabilization.
11. Size of wetland or habitat.
12. Support of baseflow and, surface and ground water recharge and discharge.
13. Uniqueness of habitat to area or in general.
14. Water quality functions.
15. Wetland/habitat classification diversity.
16. Wildlife corridors and linkage to other habitats.

SITE DESCRIPTION

This approximate 55 acre parcel is located on Burlington Hill in the City of Burlington (Figures 1 and 2). Pasture land borders the northern and eastern property lines, Burlington Hill surrounds the parcel with pasture land, commercial and residential properties bordering the hill, the City of Burlington lies to the south (Figure 2).

The parcel, particularly the northern portion of Burlington Hill, was recently logged and partially cleared. The hill is steep with areas of exposed rock. A number of abandoned and maintained roads traverse the hill. An abandoned rock quarry and abandoned city refuse dump are located on the east facing portion of the hill within the parcel Several homes are located on the south-side of the hill but are situated off the parcel. The hill consists of upland mixed deciduous-coniferous forest. A portion of the abandoned quarry has the appearance of a wetland. This area appears to have been filled with silt or clay soils and spoils from the quarry. Weedy hydric vegetation is growing on this soil and the

soils were saturated at 14 inches. Due to the disturbed conditions of this area, there is not sufficient evidence that this area is saturated to the surface during the growing season. A road side ditch conveys surface drainage from this area to the abandoned refuse area.

The Natural Resource Conservation Service (NRCS) maps Andic Xerochrepts, warm-Rock outcrop, 65 to 90 percent slopes (4) on Burlington Hill, (Klungland and McArthur 1989) (Figure 3). We concur with this assessment. This soil series is not listed as hydric by the NRCS.

The National Wetlands Inventory (NWI) map does not indicate the presence of wetlands on this parcel (Figure 4). We concur with this assessment.

VEGETATION

The vegetation on Burlington Hill is dominated by upland mixed deciduous-coniferous forest. The logged portion of the hill is assumed to have had vegetation similar to the intact vegetation on the remaining portion of the hill due to observations of natural reproduction, stumps, and slash piles. The vegetation is dominated by a canopy of big-leaf maple (*Acer macrophyllum*), western red-cedar (*Thuja plicata*), and Douglas-fir (*Pseudotsuga menziesii*), with a sub-dominant of western hemlock (*Tsuga heterophylla*). The shrub layer is dominated by osoberry (*Oemleria cerasiformis*), red elderberry (*Sambucus racemosa*), snowberry (*Symphoricarpos albus*), thimbleberry (*Rubus parviflorus*), trailing blackberry (*Rubus ursinus*), ocean spray (*Holodiscus discolor*), with some vine maple (*Acer circinatum*), salal (*Gaultheria shallon*), beaked hazelnut (*Corylus cornuta*), and Himalayan blackberry (*Rubus discolor*). The herbaceous layer is dominated by sword fern (*Polystichum munitum*).

A portion of the abandoned quarry that appears to have been filled with off-site silt and clay soils and quarry spoils is dominated by salmonberry (*Rubus spectabilis*), trailing blackberry, fireweed (*Epilobium angustifolium*), horsetail (*Equisetum arvense*), and soft rush (*Juncus effusus*).

SOILS

The NRCS maps Andic Xerochrepts, warm-Rock outcrop, 65 to 90 percent slopes (4) on Burlington (Klungland and McArthur 1989) (Figure 3). The fill soils in the quarry are mixed silt loams with soil colors of 10YR 3/2 and 3/3. The Andic Xerochrepts are not listed as hydric by the NRCS. The NRCS (Klungland and McArthur 1989) description of this soil series is listed below.

> **Andic Xerochrepts, warm-Rock outcrop complex, 65 to 90 percent slopes (4).** This map unit is on the sides of valleys and canyons. The native vegetation is mainly conifers and hardwoods. Elevation is 100 to 1,200 feet. The average annual precipitation is about 60 inches, the

average annual air temperature is about 49 degrees F, and the average frost-free season is 145 to 180 days.

This unit is about 65 percent Andic Xerochrepts and about 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Heisler, Squires, Tokul, and Vanzandt soils on glaciated low uplands.

The Andic Xerochrepts are moderately to very deep and are well drained. They formed in colluvium derived from volcanic ash, glacial till, and phyllite, argillite, or other metasedimentary rock. No single profile is representative of these soils, but one commonly observed in the survey area is covered with a mat of leaves and twigs about 1 inch thick. The surface layer is dark reddish brown gravelly silt loam 3 inches thick. The subsoil is reddish brown and yellowish brown very gravelly sandy loam 21 inches thick. The substratum to a depth of 60 inches or more is brownish yellow and olive brown extremely gravelly sandy loam. Texture, the content of rock fragments, and depth to dense glacial till and bedrock vary widely within short distances.

Permeability of the Andic Xerochrepts is moderate. Available water capacity is low to moderately high. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

Rock outcrop consists of exposures of phyllite, argillite, or other metasedimentary rock that is hard and is mostly unweathered. Rock outcrop occurs as steep cliffs and irregular formations.

HYDROLOGY

Wetland hydrology was not observed during our site visit. On-site hydrology is from direct precipitation. The filled quarry on Burlington Hill had saturated soils at 14 inches.

WILDLIFE

No threatened, sensitive, or endangered plant or animal species regulated by the City of Burlington, the State of Washington, or the Federal Government were observed on this parcel. However, much of Burlington Hill provides excellent wildlife habitat.

WETLAND FUNCTIONS & ATTRIBUTES, AND CATEGORIZATION

No jurisdictional wetlands were observed on this Burlington Hill parcel.

DETERMINATION

We did not observe jurisdictional wetlands this parcel.

Please be advised that any disturbances to regulated wetlands, streams, or their regulated buffers, require a permit from the City of Burlington and a mitigation plan to compensate for said disturbances.

In brief, at this time, the U.S. Army Corps of Engineers (Corps) requires notification of all disturbances to **all** wetlands and it is incumbent upon the land owner to disclose such disturbances. The Washington State Department of Ecology (DOE) and the Environmental Protection Agency (EPA) require a 401 water quality certification for disturbance of areas greater than one third (1/3) acre isolated or above the headwater wetlands. Any disturbance of a wetland area greater than two (2) acres, below the headwaters, or within 100 feet of a stream greater than 24 inches in width requires a compensatory mitigation plan by the Corps, an alternatives analysis, and an Individual Permit. The Corps also has the discretion to not allow disturbance to high quality wetlands. The DOE and Corps requires certification that no listed nor known endangered or threatened animal species, or National Historic Places are present on the parcel.

We have used the most current, established methods to make determinations as to the location, size, and types of wetlands on this parcel. All of the above statements are based on our best professional judgment and although we follow the federal, state, and local criteria, we cannot guarantee the U.S. Army Corps of Engineers or the local jurisdiction determination will correspond to ours. Please note, regulations pertaining to critical areas are subject to change over time. If you have further questions or comments about this report, please contact Mr. Jim Wiggins or Ms. Elizabeth Binney at (360) 856-2139 or FAX at (360) 856-5238.

Thank you,

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President
ATSI

Elizabeth Binney, Ph.D., P.W.S.
Vice-President
ATSI

REFERENCES

Cooke, Sarah Spear, Editor. 1997. *A Field Guide to the Common Wetland Plants of Western Washington and Northwestern Oregon.* Seattle Audubon Society, Washington Native Plant Society. Seattle, WA.

Cowardin, L.M. V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* Office of Biological Services, Fish and Wildlife Service, U. S. Dept. of the Interior. FWS/OBS-79/31.

Department of Natural Resources. 1995. *Washington Forest Practices.* Department of Natural Resources, Forest Practices Division: Olympia, WA.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Federal Interagency Committee for Wetland Delineation. 1989. *Federal Manual for Identifying and Delineating Jurisdictional Wetlands.* U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S.D.A. Soil Conservation Service, Washington D.C. Cooperative technical publication. 76 pp.

Hitchcock, C.L. and A. Cronquist. 1973. *Flora of the Pacific Northwest.* University of Washington Press. Seattle, Washington.

Kollmorgen Corporation. 1975. *Munsell soil color charts*, Baltimore, MD.

Klungland, M.W. and M. McArthur. 1989. *Soil Survey of Skagit County Area, Washington.* Soil Conservation Service, U.S.D.A., Washington State Department of Natural Resources, and Washington State University, Agriculture Research Center.

Leonard William, P., Herbert A. Brown, Lawerence L. C. Jones, Kelly R. McAllister, and Robert M. Storm. 1993. *Amphibians of Washington and Oregon.* Seattle Audubon Society. Seattle, WA. 168 pp.

National Wetland Inventory, 1987. U.S. Department of the Interior: Fish and Wildlife Service.

Reed, P.B., Jr. 1988. *National List of Plant Species that occur in Wetlands: 1988 Northwest.* Biological Report 88 (26.9), U.S. Fish and Wildlife Service, St. Petersburg, Florida.

Stebbins, R.C. 1985. *A Field Guide to Western Reptiles and Amphibians*, 2nd edition. Houghton Mifflin Co. Boston, Massachusetts.

United States Department of the Interior, Fish and Wildlife Service. 1977. "National Wetlands Inventory Maps," Scale 1:24,000. Office of Biological Services.

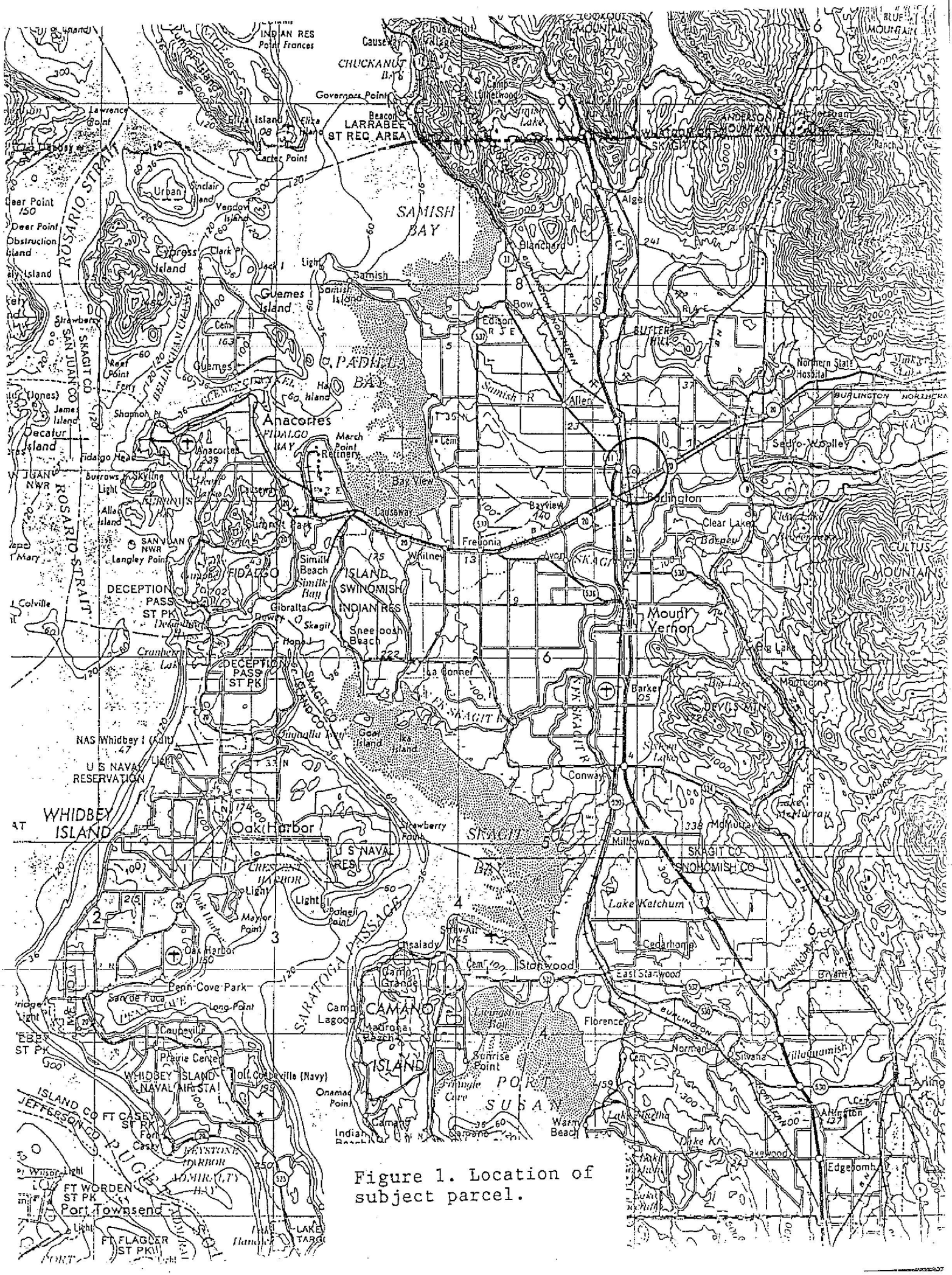
Washington Department of Ecology. 1991. *Washington State Wetlands Rating System for Western Washington.* Publication #91-57.

Washington State Department of Ecology, *Washington State Wetlands Identification and Delineation Manual*, March, 1997; Pub. No. 96-94

Washington State Department of Wildlife. 1993. *Priority Habitats and Species.* Olympia, WA. 22 pp.

Washington State Department of Wildlife. May 1991. *Management Recommedations for Washington's Priority Habitats and Species.* Olympia, WA.

Washington State Wetland Function Assessment Project, *An approach to Developing Methods to assess the Performanace of Washington's Wetlands*, June 1996 Draft, Pub. # 96-110.


ROSARIO STRAIT
SAMISH BAY
PADILLA BAY
Anacortes
FIDALGO BAY
Burlington
Mount Vernon
DECEPTION PASS ST PK
FIDALGO ISLAND
SWINOMISH INDIAN RES
WHIDBEY ISLAND
Oak Harbor
U S NAVAL RESERVATION
NAS Whidbey I (Ault)
SKAGIT BAY
CAMANO ISLAND
PORT SUSAN
Stanwood
Conway
Lake Ketchum
Lake McMurray
Cedarhome
Florence
Silvana
Arlington
Edgecomb
Port Townsend
FT WORDEN ST PK
FT FLAGLER ST PK
SAN JUAN CO
SKAGIT CO
SNOHOMISH CO
ISLAND CO
JEFFERSON CO
PUGET SOUND
LARRABEE ST REC AREA
CHUCKANUT BAY
Guemes Island
Cypress Island
Decatur Island
Lopez Island
Samish Island
Clear Lake
Cultus Mountains
Northern State Hospital
Sedro-Woolley
Bayview
Fredonia
Whitney
Avon
Conway
Milltown
Stanwood
Camano Lagoon
Madrona Beach
Sunrise Point
Warm Beach
Indian Beach
Langley Point
Langley
Coupeville
Prairie Center
Penn Cove Park
Long Point
Mayor Point
Polnell Point
Strawberry Point
Gibraltar
Sneeloosh Beach
Simiahmoo Beach
Cranberry Lake
Deer Point
Obstruction Island
Urban
Sinclair Island
Vendovi Island
Clark Pt
Jack I
Lawrence Point
Elliza Island
Lactec Point
Governors Point
Point Frances
Causeway
Bow
Edison
Allen
Blanchard
Alger
Samish
Bayview
Clear Lake
Cultus Mountains
Butler Hill
Anderson Mountain
Blue Mountain
Lake Samish
Lake McMurray
Lake Ketchum
Lake Stevens
Lake Goodwin
Lake Cavanaugh
Lake Tarbo
Lake Hancock
Lake Sylvia
Lake Ki
Lake Stickney
Lake Gissberg
Lake Ebey
Lake Pleasant
Lake Hancock
Lake Tarbo
Lake Sylvia