AGENDA

CANBY PLANNING COMMISSION

REGULAR MEETING
City Council Chambers

May 13, 1991 - 7:30 p.m.

I. ROLL CALL

II. MINUTES

April 22, 1991

III. CITIZEN INPUT ON NON-AGENDA ITEMS

IV. COMMUNICATIONS

V. NEW BUSINESS

SOLAR ACCESS ORDINANCE presentation by Mike McKeever, President of McKeever/Morris, Inc.

VI. FINDINGS

ANN 91-01 - John Watson

VII. PUBLIC HEARINGS

SUB 90-06, an application by A. Wayne Scott for approval of Phase II of Willow Creek Estates. Forty-nine single family units are proposed with over 6 acres of greenway, including wetlands and a recreational area. A portion of the site lies in the Hazard Overlay Zone. The site is located northwest of 99E, south of N.E. Territorial, and east of Redwood. [Phase I, consisting of 50 single family lots was previously approved by the Commission. The applicant has submitted new information involving wetlands, traffic impact analysis and noise abatement.] (Tax Lot 500 of Tax Map 3-1E-27DB, Tax Lots 700 and 900 of Tax Map 3-1E-27C, and Tax Lot 800 of Tax Map 3-1E-27C.)

VIII. ADJOURNMENT

- M E M O -

TO: **Planning Commission**

FROM: **Robert G. Hoffman, Planning Director**

RE: **Supplemental Staff Report - Willow Creek [SUB 90-06] [Previously Teakwood Terrace]**

DATE: **April 26, 1991**

The applicant has recently submitted information in response to the Commission request regarding traffic impacts, noise, and wetlands. The applicant has also withdrawn his request for being treated under the Planned Unit Development designation. He has also submitted a revised Tentative Plat which has been redesigned to respond to the conclusions of the new studies. The condominium proposals have been eliminated and replaced by 6 lots for single family development. Teakwood Drive has been realigned somewhat, and the lots near the creek have been redesigned. The proposed emergency drive through the wetlands has been eliminated. My analysis and recommendations are as follows:

Traffic Impact Analysis Study

The report concludes that no difficult problems will occur at Redwood and 99E or Teakwood and Territorial. The relocation of Teakwood Drive, among other things, provides for an opportunity to extend Teakwood through the adjacent property to Redwood without crossing the stream or wetlands a second time. One possible street scheme for adjacent land is illustrated on the aerial photos. The Territorial Road cross-section was recommended to be only two moving lanes without the need, at this time, for a center left turn lane.

The intersection of Territorial and 99E was found to **already** warrant a traffic light and the traffic from the subdivision was estimated to increase this traffic load by 20% of the volume. Staff has met with representatives of the State, County, the developer, and the school district about the problem. No traffic light is currently programmed. The Traffic Impact Study will place the intersection on the State's list of hazardous intersections and make it eligible for "safety" funds. It is not currently on the 6-Year Plan for Highway

Improvements, but will be nominated to be added. The current estimate is that this type of project would normally take 5 - 10 years to accomplish, and would cost between $200,000 and $300,000. A fast-track effort, with all funds available and all parties cooperating, would still take about 3 years from now, to have the signal operational. All parties present appeared willing to cooperate. The solution will require the County to coordinate the project, and for each group contributing to the problem to contribute to funding the solution. The developer appears willing to contribute to the solution and has made an offer toward that end.

Noise Study

The noise study estimates a potential noise level which will require special construction techniques for noise mitigation, but does **not** recommend a noise barrier wall or berm. The acoustical engineer has supplemented his study with a letter to say that only 12 trains were present on the day of his survey and that this was not sufficient to change his recommendation. Staff recommends that, if the Commission wishes to approve the proposed subdivision, a condition be added which requires noise mitigation construction techniques for all homes near the train tracks, and that all potential buyers of the affected lots be given a "disclosure" by the seller, of the train traffic and the need for any noise mitigation. (The Canby Building Official has warned that all required windows must be operable.)

Wetlands Study

The wetlands report is now available, which gives further definition to the wetlands boundaries. In some areas, the preliminary boundary has shrunken and, in other areas it has expanded. The consequences of the expert's conclusions is that Teakwood Drive has been somewhat relocated and lots reconfigured. The original proposed emergency road through the park (and wetlands) has been eliminated and the "easement for emergency access" between Lots 7 and 8 will be retained. A second means of access will eventually be available through adjacent property, to Redwood. The location of this additional access will need to be adjacent to Lots 73 and 74 in order to avoid wetlands and stream crossing

on the adjacent property and minimize impact on the subject property. The wetlands report does not make any proposals about type of treatment for the wetlands area. The map, Figure 3, submitted with the study by the Wetlands Consultant, illustrates an "approximate wetland boundary." It also states that approximately 6 acres of wetlands were "flagged" during the field study. Presumably, it is this "flagged" area which is shown on the "Revised Phase 2 Tentative Plat" as the "wetlands boundary." The only improvement within the wetlands area on the tentative plat appears to be one edge of the proposed tennis court and the stream crossing of the new Teakwood Drive alignment. On page 7 of the Wetland Report, it states that "Wetland functions and values of the Willow Creek Estates site were evaluated and determined to have low to moderate value for wildlife habitat, sediment trapping, flood storage/desynchronization for on- and off-site runoff and groundwater modification, passive recreation, and food chain support. The remaining wetland values and functions reviewed in the evaluation process, including active recreation, endangered species habitat, unique/rare wetland, fisheries habitat, nutrient retention removal, and shoreline stabilization, have low or no functional value." Since this area is within a Hazard Overlay Zone, the Commission will need to consider conditions related to this designation.

Revised Tentative Plat

Given the revised wetlands boundary, the realigned Teakwood Drive appears to be appropriate. Condominiums are no longer proposed. Planned Unit Development is no longer proposed. There are 6 proposed single family lots in the general location where the condominiums were previously proposed. They are entirely outside of the most recent wetlands boundary, as indicated on the revised tentative plat. All new lots exceed the minimum dimensional requirements of the development ordinance. A few of the flag lots will require reciprocal easements for the driveways, or be constructed with a paved width of at least 20 feet for each driveway. No driveways are currently proposed to cross the steam corridor. However, the area of the stream and land between the stream and Teakwood Drive (adjacent to Lots 45, 54 and 57) is not allocated to any lots. To provide for proper responsibility and maintenance, this area should be assigned somewhere, probably as a common area assigned to the proposed subdivision association, the same as the wetlands/recreation area.

RECOMMENDATION

Based on the findings and conclusions as outlined above, discussions at Commission meetings and in the original staff reports dated January 4, January 9, and February 8, 1991, file memo dated April 23, 1991, and as indicated on the revised application and on undated maps received by the City of Canby on April 11, 1991, staff recommends approval of SUB 90-06 - Phase 2 of Willow Creek Estates [Lots 51-89, the wetlands and floodplain area, and excluding Lot 56], subject to the following conditions:

1. Any proposed fill and grading shall be submitted for review and approval of the Director of Public Works.

2. Prior to Final Plat approval, a Tree Preservation Plan, prepared by a recognized professional arborist/urban forester, shall be submitted. Such plan shall follow the principles and practices described in pages 34-44 of the chapter entitled, "Preserving Trees Affected by Development" from a Technical Guide to Community and Urban Forestry in Washington, Oregon and California, available from the World Forestry Center, Portland. The City Forester shall review and approve such plan for consistency with the approved plan and all conditions. The subdivision developer shall implement the approved plan. The lot layout on proposed subdivision maps, as received by the City of Canby on April 11, 1991, need not be redesigned in a major fashion, but minor adjustments may be necessary to preserve selected trees.

3. During construction, erosion control shall follow the Erosion Control Plans Technical Guidance Handbook published by Portland, dated November 1989 (as amended).

4. The applicant shall provide a waiver of remonstrance for any traffic improvements needed for N.W. Territorial Road. The Final Plat for Phase 2 shall be approved only after the developer has provided written agreement to participate in funding his proportional share of the needed improvements or has provided an actual cash contribution accepted by City Council as a "Fair Share" contribution toward improvements at Territorial Road and 99E.

5. All vehicular bridges and stream crossings to be used by fire equipment shall be engineered to sustain at least 41,800 pounds vehicle minimum. An additional fire hydrant shall be installed at Teakwood Drive in the vicinity of Lot 55. All hydrants shall be three port type hydrants.

6. The applicant shall participate in a preconstruction meeting with City staff, CUB, the fire district, etc., prior to construction of the second phase of development.

7. Teakwood Drive shall be constructed with a minimum of 40 feet of right-of-way width throughout the subdivision, to the edge of the property near Lot 74, with a minimum of 36-foot pavement. The remainder of Teakwood Drive shall be a dedicated 40 foot right-of-way and pavement width for local public street shall meet City standards.

8. All utilities shall be constructed to the specifications of the provider.

9. Utility easements shall be provided and shall be twelve (12) feet along all streets and exterior boundaries of the subdivision, adjacent to other platted subdivisions with easements, if any, and easements along all interior lot lines are to be six (6) feet wide off of each lot, for a total of twelve (12) feet. Utility easements along all interior lot lines shall be six (6) feet wide off each lot, for a total of twelve (12) feet.

10. "As built" drawings shall be submitted to the City of Canby within sixty (60) days of completion.

11. Five (5) foot curbs and sidewalks, designed to City standards, shall be constructed along all street frontages. If the sidewalk is set back from the curb, it may be four (4) feet wide. The setback for the garage, in that case, shall be measured from the back of the sidewalk in front of the garage, and shall provide twenty (20) feet for parking.

12. All requirements of the Canby Utility Board, Fire District #62, North Willamette Telecom and the Canby Telephone Association shall be considered as conditions of approval, with final plans to meet staff approval.

13. Water lines shall be constructed to the standards established by the Canby Utility Board. Hydrants shall meet CUB and the Fire Marshal requirements. Electric service and street lights shall meet CUB requirements. Street, curb, sidewalk, storm drainage and sanitary sewer construction shall meet the requirements of the Director of Public Works.

14. The final plat shall reference this land use application - City of Canby, File No. SUB 90-06, and shall be registered with the Clackamas County Surveyor's Office and recorded with the Clackamas County Clerk's Office. Evidence of this shall be provided to the City of Canby Planning Department prior to the issuance of building permits requested subsequent to the date of this approval.

15. Regarding covenants, conditions and restrictions, the following shall apply:

    a. Such covenants, conditions and restrictions and homeowner association by-laws shall be filed with the County Register of Deeds and shall provide for notice to the City Attorney and to the purchaser of any lot, at least ten (10) days in advance of any changes to be made, if such change is made prior to the sale of 75% of all lots in the development.

    b. Such covenants, conditions and restrictions shall assure the continued maintenance of the commonly held areas by a homeowners' association, created thereunder.

c. All covenants, conditions and restrictions and homeowner association by-laws adopted thereunder shall be reviewed and approved by the City Attorney to assure continued conformity with City Code provisions and the conditions of this approval.

16. Construction costs of all roads and utilities shall be borne by the applicant.

17. Street names and numbering shall meet City requirements, and numbering shall be uniform and conspicuous on all units.

18. The developer shall maintain separation between the sanitary sewer and water system improvements to comply with State health division requirements.

19. Street grades shall use vertical curve when grade breaks exceed 1%.

20. No work shall commence until the developer has signed the necessary certificates and paid the subdivision development fees specified in Section 16.68.040(G).

21. The wetlands report, as submitted with the revised application, is accepted as a preliminary wetlands boundary determination provided that, prior to approval of the final plat, a final report is prepared by a recognized wetlands/wildlife habitat expert(s). Such report(s) shall include a final wetlands determination and delineation. Wildlife habitat preservation and enhancement recommendations and stream corridor protection recommendations shall be included and any needed mitigation procedures shall be described and shall include recommended buffer zones or open space development around all streams on the entire site, ponds and wetlands, and shall provide restrictive covenants that prevent mowing and removal of desirable wildlife plants. The applicant shall submit his wetlands report and wetlands determination to the Division of State Lands for acceptance of such determination. The action of the Division of State Lands shall be provided to the Canby Planning Director for review and approval for consistency with this approval

and all conditions and approval criteria. The report and recommendation of the Wetlands and Wildlife Habitat and Open Space expert(s) shall be implemented by the developers and subdivision association in their final design, construction and maintenance of the subdivision, provided the recommendations are consistent with other conditions of this subdivision approval, as determined by the Planning Director.

22. In the vicinity of Lots 45, 46, 54, 55 and 57, preliminary design of roadway and utility is approved, as shown on the "Revised Phase 2 - Tentative Plan" received by the City of Canby on April 11, 1991, and submitted with the revised application. Prior to Final Plat approval, such roadway and utility design shall be finalized in such a fashion that the following objectives are met:

a. roadway right-of-way is to be extended to the property line (with a one foot reserve strip) to be provided to the City of Canby at the subdivision property line adjacent to the new roadway at the end of Teakwood Drive and adjacent to Lot 74, in order to provide for an ultimate extension to service off-site tax lots to the southeast and the adjacent parcel(s). and ultimately connect to Redwood.

b. wetlands, stream corridors, flood plain fringe, and wildlife habitat are to be preserved to the maximum degree practical.

c. necessary sewer, water, storm drainage, and other utility services be provided (and waterproofed for flood conditions, if needed).

d. construction details to provide for adequately meeting the soil conditions encountered in order to minimize maintenance costs.

e. for road and sidewalk construction near flood plain, stream corridors and wetlands, an adequate base shall be provided.

f. a wetlands and water crossing permit application for any affect on streams and wetlands shall be made to the relevant agencies.

Such proposed roadway and utility plans to be reviewed and approved by the Director of Public Works with input from the City Engineer and CUB for consistency with the approved plan and all conditions.

23. To assure public awareness of flood potential, past and potential flood heights shall be prominently displayed in the designated flood plain areas on the site.

24. For any portions of property within the Hazard Overlay Zone area, approval of the City Forester shall be obtained prior to removing any trees over six inches in diameter, to help preserve the wetlands as wildlife habitat. Grading plans for such area shall be provided to the Director of Public Works, who shall review such plans for consistency with the Hazard Overlay Zone.

25. Noise mitigation construction methods, as recommended by Van Gulik/Oliver, Inc., Engineers, or a comparable certified Acoustical Engineer, shall be utilized on Lots 61-68 and 80-81,inclusive, as a part of building permit requirements of the City of Canby. All buyers of the above described lots shall be notified by the seller, prior to sale, that a main line railroad track exists nearby, and that a number of trains are scheduled daily (some at night and some during the day). Prior to sale, the seller of each lot shall also provide the buyer with a copy of the "Noise Impact Analysis" report dated March 21, 1991, by Van Gulik/Oliver, Inc., Engineers, including the letter and attachments of April 29, 1991, from Van Gulik to R. G. Hoffman, Canby Planning Director. Such letter and attachments shall supplement the March report. The applicant for a building permit on the above described lots shall present to the Canby City Planner a signed affidavit certifying that he/she has received the noise impact analysis report.

26. The area of the stream and the area between the stream and new roadway adjacent to Lots 45, 46, 54, 55 and 57 shall be treated as common area and maintained by the subdivision association.

Loverna Wilson, Environmental Consultant Botany / Plant Ecology

1835 N.E. Steele Avenue, Corvallis, Oregon 97330 (503) 752-4156

TRANSMITTAL

DATE: 3 May 1991

TO: George Wilhelm
Wilhelm Engineering, Inc.
546 S.E. Township Road
Canby, OR 97213

FROM: Loverna Wilson LW

PROJECT: Willow Creek Estates - Canby

TRANSMITTED: Mitigation Letter

VIA: FAX (503) 829-6765

COMMENTS:

Loverna Wilson, Environmental Consultant Botany / Plant Ecology

1835 N.E. Steele Avenue, Corvallis, Oregon 97330 (503) 752-4156

3 March 1991

George H. Wilhelm
Wilhelm Engineering, Inc.
546 S.E. Township Road
Canby, OR 97013

RE: Willow Creek Estates
Mitigation Recommendations

Dear George:

Thank you for sending me the Willow Creek Estates Revised Phase 2 plat map with the surveyed wetland boundaries on it. It seems that the only direct impacts to wetlands on the property will be the road crossing by lot 55, and the walking trail around the perimeter of the wetland area.

Mitigation for these impacts should be possible on site, through restoration and enhancement of existing degraded wetlands. The following is a brief description of site-specific mitigation measures.

- The stream has been channelized and dammed for years. The lower channelized part of the stream has silted in over time, and the dam at Territorial Road is set to keep water levels low. As a result the ash/willow woodland area has probably been dewatered. If the channels were dredged and cleaned, and the water were controlled at the dam on the west end to raise the water level 12 inches, wetland hydrology could be restored to more natural levels.

- Years of sheep grazing has impacted the vegetation of the wetland areas. Simply removing the sheep from the property will greatly enhance the riparian and wetland vegetation of the site. There are excellent seed sources available on the site, and natural successional processes will restore much of the native herbaceous vegetation. It may be desirable to restore some of the woody vegetation along the stream corridor through replanting. Cuttings from willows, red-osier dogwood, and alder would enhance riparian bank stabilization and provide good wildlife habitat. They occur naturally in the vicinity so planting efforts are likely to be successful. Consultation with a horticulturist who specializes in native plants would provide information on how best to accomplish this.

- If additional mitigation acreage is required, there is the possibility of restoring wetlands through removal of some of the fill on the northwest corner of the property.

- Project design should include protection of existing hydrologic patterns to avoid dewatering existing wetlands or inadvertently creating new wetlands in inappropriate locations. Construction should be implemented while preserving hydrologic patterns necessary for maintenance of the wetlands on the site and on adjacent downslope sites.

- During construction, wetland boundaries should be clearly marked so that all construction activity is kept out of the wetland areas (e.g. no materials storage, equipment storage, or vegetation clearing).

- The walking trail should be constructed during the driest part of the summer to minimize soil compaction impacts.

- Erosion control practices should be implemented during and after construction in order to minimize sediment deposits in wetland areas.

- An upland vegetation buffer should be left around the wetland perimeter. The buffer zones should be protected in perpetuity with restrictive covenants that prevent mowing and removal of desirable riparian and wetland vegetation, either by the residents or the manager of the wetland/open space area.

- Storm water systems and parking areas should be designed to direct surface run-off through bio-filtration systems prior to discharge to wetlands, thus reducing potential non-point-source pollution. These bio-filtration systems can be part of the upland vegetation buffer.

- After construction is completed, it may be necessary to have a maintenance program for several years to protect the wetlands and adjacent upland buffers from invasion by weedy species such as Himalayan blackberry and Scotch broom. Undesirable vegetation should be hand removed at regular intervals during the spring and summer months (e.g. April, July and October) for a period of two or three years. Later, the local home owners on the site may wish to make this a neighborhood project.

Please call if you need any additional information.

Sincerely,

Loverna

Loverna Wilson
Plant Ecologist

543 Third Street
Lake Oswego, Oregon
97034-3095
(503) 635-3734
Telex: 285767

Van Gulik/Oliver, Inc.
Engineers

April 29, 1991

City of Canby
182 North Holly
P.O. Box 930
Canby, Oregon 97013

File: Q21711

Attn: Robert G. Hoffman
Planning Director

Re: Noise Impact Analysis Report
of Trains at the Teakwood Terrace, Canby, Oregon
dated March 21, 1991

In our telephone conversation on April 23, 1991, you informed me that you received information from Southern Pacific on the number of trains that pass on the road between Lake Oswego and Canby. The number of trains you receive is greater than the number we calculated.

We did not receive a reply to the March 4, 1991 letter we sent to Southern Pacific (see enclosure) which requested the train schedule.

The following letter is a supplement to our March 21, 1991 report which shows the procedure taken to gather train noise data. This letter also indicates that the number of trains passing by is not significant but the percent of time that the trains pass near the proposed housing development is what affects average noise level. For example, one slow train that takes 5 minutes has a greater affect than two trains that take 2 minutes each to pass.

On March 14, 1991, a noise level analyzer and chart recorder were placed at the site to gather statistical data and chart data of the site A-weighted sound level. From this data and the statistical noise data, we calculated the number of trains which passed and the L_{dn} contours.

Figure 1 is the section of the chart recorder graph of the train at the site. The chart paper was set to move at a speed of 160 mm/hr, which is 22.5 seconds per one millimeter. This chart indicates that the period of time which the train passed near the site after 6:15PM and a generated sound level above 62 dBA is 112.5 seconds. This graph also indicates that the peak noise level generated by that train was below 90 dBA. The enclosed Figure 4.2 from our report indicates that 655 events were recorded which exceeded 62 dBA. As the report indicated, each event represents two seconds. Therefore, the duration of time which the sound level of the site exceeded 62 dBA is (655 events x 2 seconds per event) 1310 seconds. The number of trains which passed was (112.5 seconds of one train passing/1310 seconds) 12

trains. This number differs from our report because in our report we used three minutes for the passing of a train instead of only 112.5 seconds. Also, our report indicates in error that 1.52% of a 24-hour period is 14 minutes instead of 22 minutes.

Those errors do not change the statistical level of the site noise level. As the enclosed "site plan" of our report indicates, the L_{dn} sound contours are correct.

I inserted the L_{eq} contours on the "site plan" map from our measurement data. Those contours are approximately 5 dB blow the L_{dn} contours.

The difference between L_{eq} and L_{dn} is shown on the enclosed Figure 2.

The noise at the site during both day and night is the combined noise of trains and traffic. During the day, the traffic noise is higher than during the night. During the night (10PM to 7AM), more trains passed by than during the day.

We were not able to separate the daily activity from the night activity in our statistical analysis measurements. Assumptions were made that the average noise level during the night is 2 dB less than the daily average. Using that data, calculations were made for the contour lines of the L_{dn} data (see Figure 2).

I also want to point out that there is no state or federal law that limits the allowable traffic noise at housing developments. Expensive homes are built along the Burlington Northern Railroad which runs along the north shore of the Columbia River. The Southern Pacific Railroad passes through residential areas in Milwaukie, Portland, Lake Oswego, Tigard, and Beaverton. The tracks along the north shore of Lake Oswego are adjacent to homes valued in the millions. The U.S. Department of Housing and Urban Development recommends that interior sound levels due to exterior noise should not exceed a yearly day-night (L_{dn}) equivalent sound level of 45 dB. Our recommendation for outside walls and windows shall bring the internal L_{dn} level well below 45 dB.

Sincerely,
VAN GULIK/OLIVER, INC.

Elki M. Lahav

Elki M. Lahav, P.E.

EML:rcd
encl.
cc: George Wilhelm

543 Third Street
Lake Oswego, Oregon
97034-3095
(503) 635-3734
Telex: 285767

Van Gulik/Oliver, Inc.
Engineers

March 4, 1991

Kay A. Moore
Vice President of Operations
Southern Pacific Transportation Company
One Market Plaza
San Francisco, CA 94105

File: Q21711

Attn: Transportation Officer

Re: Train Traffic Near Canby, Oregon

A study for housing development, along side the Southern Pacific right-of-way is being made. The proposed development is located one mile north of Canby, Oregon.

To get the approval for this development, the regulators in Clackamas County require the number of trains passing by the development.

We will appreciate your assistance in providing us the average number of Amtrack and freight trains per day. We would also like to know the approximate number of locomotive engines per train, and a train schedule so that we may take sound measurements at the site.

Sincerely,
VAN GULIK/OLIVER, INC.

Elki M. Lahav, P.E.

EML:lkm
cc: George Wilhelm

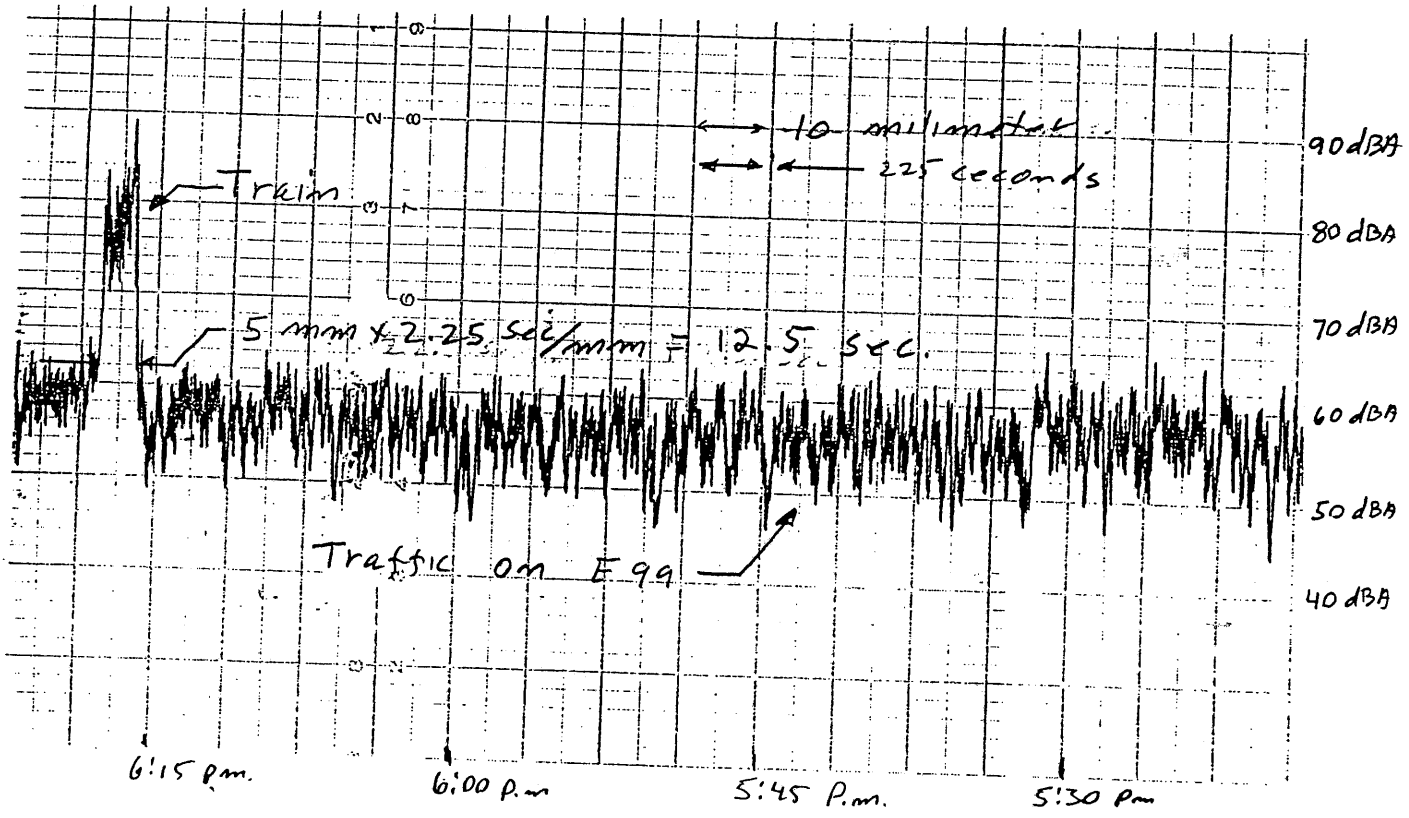


Figure 1

Chart Recorder Data

Sound Level dBA	Number of Avents	Number Grater Than	Percent Exceeded
98	0	0	0.000%
96	0	0	0.000%
94	3	0	0.000%
92	3	3	0.007%
90	8	6	0.014%
88	3	14	0.032%
86	15	17	0.039%
84	11	32	0.074%
82	18	43	0.100%
80	24	61	0.141%
78	40	85	0.197%
76	74	125	0.289%
74	75	199	0.461%
72	81	274	0.634%
70	63	355	0.822%
68	67	418	0.968%
66	58	485	1.123%
64	112	543	1.257%
62	325	655	1.516%
60	1277	980	2.268%
58	3042	2257	5.224%
56	5080	5299	12.266%
54	6109	10379	24.024%
52	6347	16488	38.165%
50	4945	22835	52.856%
48	3822	27780	64.303%
46	2785	31602	73.149%
44	2051	34387	79.596%
42	1591	36438	84.343%
40	2364	38029	88.026%
38	2798	40393	93.498%
36	11	43191	99.975%
		43202	100.000%

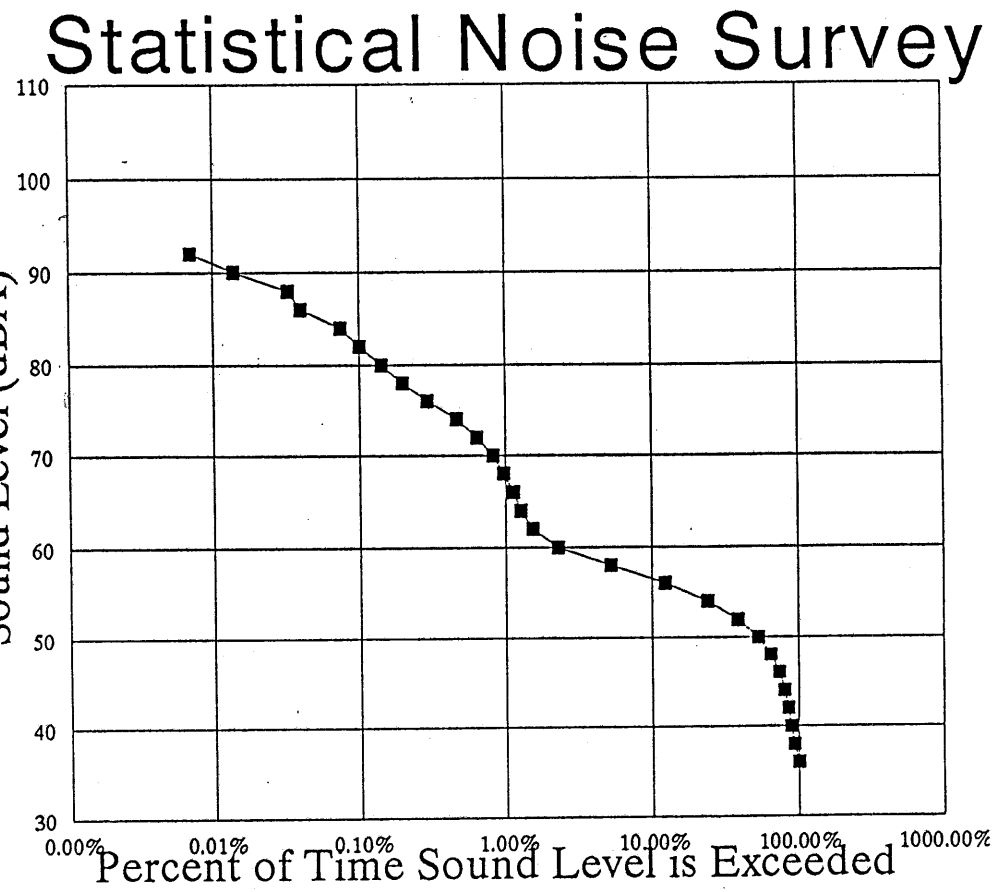
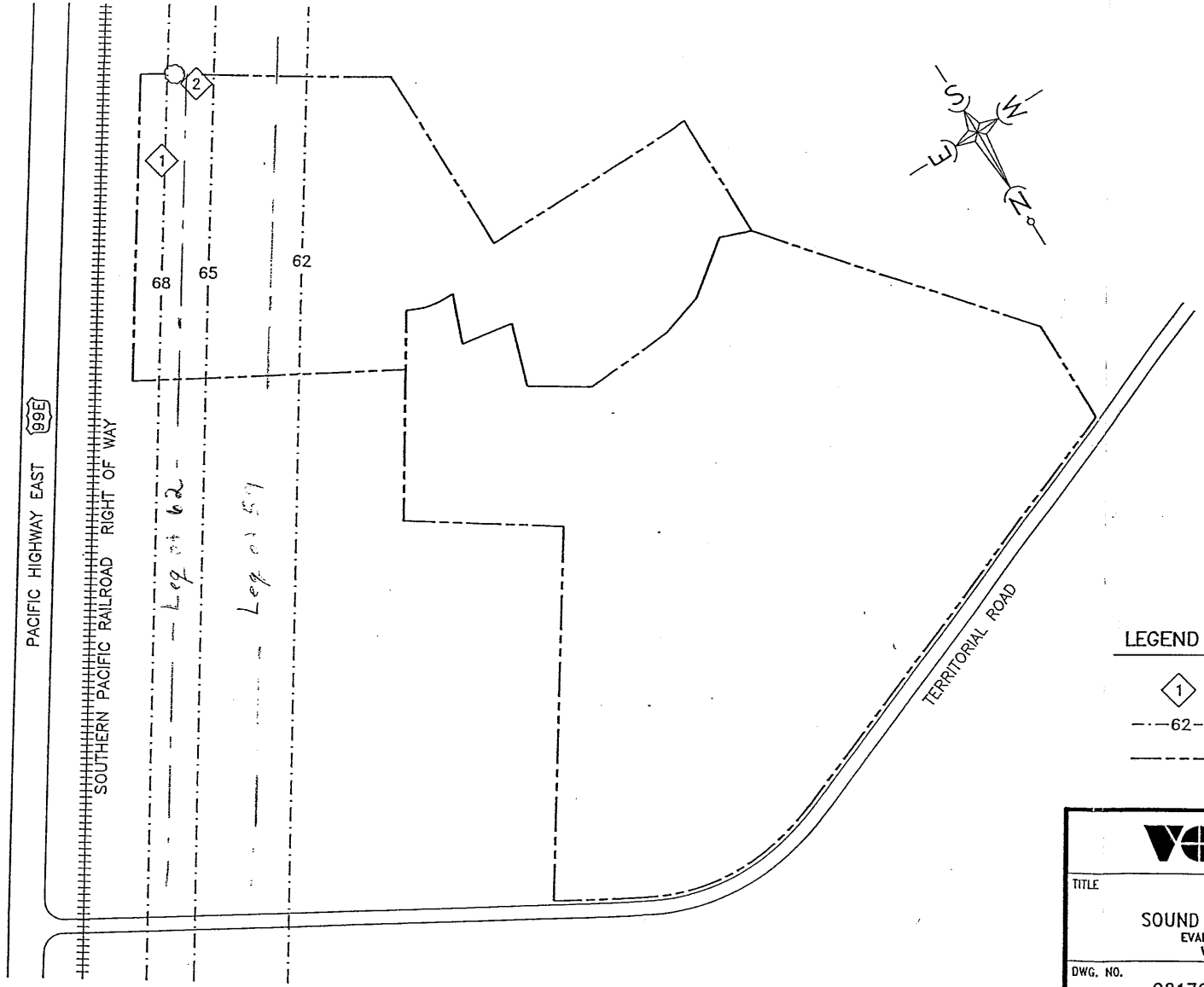


Figure 4.2



LEGEND

◇1	MEASUREMENT POINT
-·-62-·-	L_{dn} NOISE CONTOUR
———	PROPERTY LINE

Van Gulik/Oliver, Inc.
ENGINEERS
Lake Oswego, Oregon

TITLE

SITE PLAN
SOUND LEVEL MEASUREMENTS
EVALUATION OF RAILROAD NOISE
WILHELM ENGINEERS, INC.

DWG. NO.		
Q217C01		–
SCALE	SHEET	DATE	PROJ.NO.
1"=200'	–	–	Q21711

Q217C01 03/20/91 16:45 1=2400.0

Calculation of dBA from Octave Band Sound Pressure Levels — dBA levels are usually determined by means of instruments giving direct readouts. dBA level can also be calculated from octave band sound pressure levels by arithmetically adding an "A-scale weighting factor."

A-Scale Weighting Factors

Octave Band Center Freq. Hz	31.5	63	125	250	500	1K	2K	4K	8K
Weighting factor	-39	-26	-16	-9	-3	0	+1	+1	-1

Example of dBA Calculation from Octave Band Levels

Octave Band Center Frequency, Hz	63	125	250	500	1K	2K	4K	8K
SPL spectrum in dB	83	85	82	81	76	60	50	44
A-scale weighting factor	-26	-16	-9	-3	0	+1	+1	-1
Spectrum Adjusted to A-scale	57	69	73	78	76	61	51	43

logarithmic decibel addition: 69, 79 → 79; 76, 51.5 → 76; 79, 76 → 81 dBA

Equivalent Sound Level - See L_{eq}.

L_d — The equivalent A-weighted sound level between 7 a.m. and 10 . Otherwise known as daytime equivalent sound level (L_{eq}).

L_{dn} — Day-night equivalent A-weighted sound level. Equivalent sound level for a 24 hour period, with an additional 10 dB weighting imposed on levels between 10 p.m. and 7 a.m.

L_{eq} — Equivalent sound level. The dBA level of a steady state sound which has the same dBA weighted sound energy as that contained in the actual time-varying sound being measured over a specific time period.

$L_{eq(x)}$ — L_{eq} over a period of x hours.

L_n — The equivalent A-weighted sound level (L_{eq}) between 10 p.m. and 7 a.m. Also known as nighttime equivalent sound level.

L_x (L_{10}, L_{50}, L_{90}) — That time-varying dBA level which will be expected x percent of the time.

$$\Rightarrow L_{dn} = 10 \log_{10} \frac{1}{24} \left[15 \cdot 10^{\left(\frac{L_d}{10}\right)} + 9 \cdot 10^{\left(\frac{L_n + 10}{10}\right)} \right] \quad \text{(F-1}$$

$$\Rightarrow L_{eq(24)} = 10 \log_{10} \frac{1}{24} \left[15 \cdot 10^{\left(\frac{L_d}{10}\right)} + 9 \cdot 10^{\left(\frac{L_n}{10}\right)} \right] \quad \text{(F-2}$$

Relationships Between L_d, L_n, L_{dn}, and $L_{eq(24)}$ Sound Levels

$L_d - L_n$	Add to L_d for L_{dn}	Add to L_d for $L_{eq(24)}$
-4	10	+2
-2	8	+1
0	6.5	0
2	5	-0.7
4	3.5	-1
6	2	-1.5
8	1	-1.7
10	0	-1.8

Examples:

If L_d = 80, and L_n = 82, then L_{dn} = 88, and $L_{eq(24)}$ = 81

If L_d = 75, and L_n = 75, then L_{dn} = 81.5, and $L_{eq(24)}$ = 75

If L_d = 70 and L_n = 64, then L_{dn} = 72, and $L_{eq(24)}$ = 68.5

all levels are in dBA

Typical L_{dn} Sound Levels at Various Locations

Location	Typical L_{dn}, dBA
Wilderness ambient	35
Rural residential	40
Agricultural crop land	44
Wooded residential	51
Old urban residential	60
Urban row housing on major avenue	68
Urban high density apartment	78
Downtown with some construction activity	79
3/4 mile from touchdown at major airport	86
Apartment next to freeway	88

$L_d = 63 \quad L_n = 61$

$$L_{dn} = 10 \log \frac{1}{24} \left[15 \times 10^{\frac{63}{10}} + 9 \times 10^{\left(\frac{61+10}{10}\right)} \right] = 68$$

Figure 2

L_{eq} and L_{dn} Equation

NOISE IMPACT ANALYSIS OF TRAINS AT THE TEAKWOOD TERRACE CANBY, OREGON

March 21, 1991

Prepared For:

Wilhelm Engineering, Inc.
Canby, Oregon

Our Project No. Q21711

Van Gulik/Oliver, Inc.
ENGINEERS
543 Third Street
Lake Oswego, Oregon 97034
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TABLE OF CONTENTS

1.0 INTRODUCTION

A housing development, Teakwood Terrace, is proposed to be developed about a mile north of Canby, Oregon. The land description of this parcel is:

> Tax lots 100, 800, and a portion of lots 700 and 900; 3S, 1E, 27DB, approximately 32 acres.

Approximately 600' of this parcel, at the southeast segment, is the Southern Pacific right-of-way. Trains will impact the noise level at the housing development. Van Gulik/Oliver, Inc. was asked to conduct a noise study of the noise impact of the trains on the proposed Teakwood Terrace and predict the sound level for future residents of the Teakwood Terrace from impacting trains. We were also asked to compare the projected residential sound level with the U.S. Department of Housing and Urban Development (HUD) Standard to determine if noise levels will comply with those standards.

This report presents the projected noise generated by the railroad traffic, and recommendations to minimize the train noise impact on the residences.

2.0 DESCRIPTION OF THE SITE

The proposed housing development is approximately 32 acres, located west of Pacific Highway East (99E), about a mile north of Canby, Oregon (see attached Site Plan Q217CO1). The portion of the development about which we are concerned is the southeastern section along Highway 99E and Southern Pacific Railroad.

3.0 SOUND LEVEL CRITERIA

The U.S. Department of Housing and Urban Development (HUD) is the lead federal agency setting standards for interior and exterior noise for housing. These standards, outlined in 24 CFR Part 51, establish Site Acceptability Standards for outside sound based on day-night equivalent sound levels. These are presented in Table 3.1

Table 3.1
U.S. Department of Housing
and Urban Development
Site Acceptability Criteria*

	Day-Night Equivalent Sound Level in Decibels (L_{dn})
Acceptable	Not exceeding 65 dB
Normally Unacceptable	Above 65 dB but not exceeding 75 dB
Unacceptable	Above 75 dB

*Taken from 24 CFR PARA. 51.103 Criteria and Standards

In Table 3.1, ranges of L_{dn} are correlated with various dispositions that classify HUD approval procedures and identify the need for noise abatement, either at the site property line or in the building exterior. These have been devised to achieve the HUD goal for interior noise levels of a day-night equivalent noise level not exceeding 45 dB. "Acceptable" sites are those where noise levels do not exceed an L_{dn} of 65 dB. Housing on acceptable sites does not require additional noise attenuation other than that provided in customary building techniques.

"Normally unacceptable" sites are those where the L_{dn} is above 65 dB but does not exceed 75 dB. Housing on normally unacceptable sites requires some means of noise abatement, either at the property line or in the building exterior, to assure that interior noise levels are acceptable. From a practical standpoint, this usually means that buildings must be air-conditioned so that windows can be closed to reduce exterior sound transmission into interior spaces.

"Unacceptable" sites are those where the L_{dn} is 75 dB or higher. The term "unacceptable" does not necessarily mean that housing cannot be built on these sites, but rather that more sophisticated sound attenuation would likely be needed, and that there must exit some benefits that outweigh the disadvantages caused

by high noise levels. Most often, housing on unacceptable sites requires high sound Transmission Los (TL) glazing and air-conditioning.

The American National Standards Institute (ANSI) has published ANSI Standard S3.23-1980 Sound Level Descriptors for Determination of Compatible Land Use. This document focuses on defining basic environmental noise descriptors suggested for use in assessing the acceptability or compatibility of ambient noise for various types of land use.

Among the types of environmental noise descriptors defined are the equivalent sound level and the day-night equivalent sound level. This document uses slightly different nomenclature by referring to the equivalent sound level as the "average sound level" and the day-night equivalent sound level as the "day-night average sound level."

The standard also defines the yearly day-night equivalent sound level which is the energy average sound level over a continuous 365-day period with a 10 dBA penalty applied to sound levels occurring between 10:00PM and 7:00AM. This standard refers to this as the "yearly day-night average sound level."

ANSI 3.23 also presents the bar graph shown in Figure 3.2. The document indicates that this is not part of the standard per se, but is given in an appendix for informational purposes only. It establishes ranges defined as "compatible," "marginally compatible," "compatible indoors with building sound isolation installed," and "incompatible." For each land use, the ranges are expressed as ranges of yearly day-night equivalent (or average) sound level. This document also recommends that interior sound levels due to exterior noise should not exceed a yearly day-night equivalent sound level of 45 dB. This is the same as the interior noise level goal used by the U.S. Department of Housing and Urban Development.

It should also be noted that levels given in Figure 3.2 are in agreement with recommendations of the U.S. Environmental Protection Agency (EPA). As with EPA recommendations, ANSI 3.23 should be viewed as a recommended guideline and is not an enforceable regulation.

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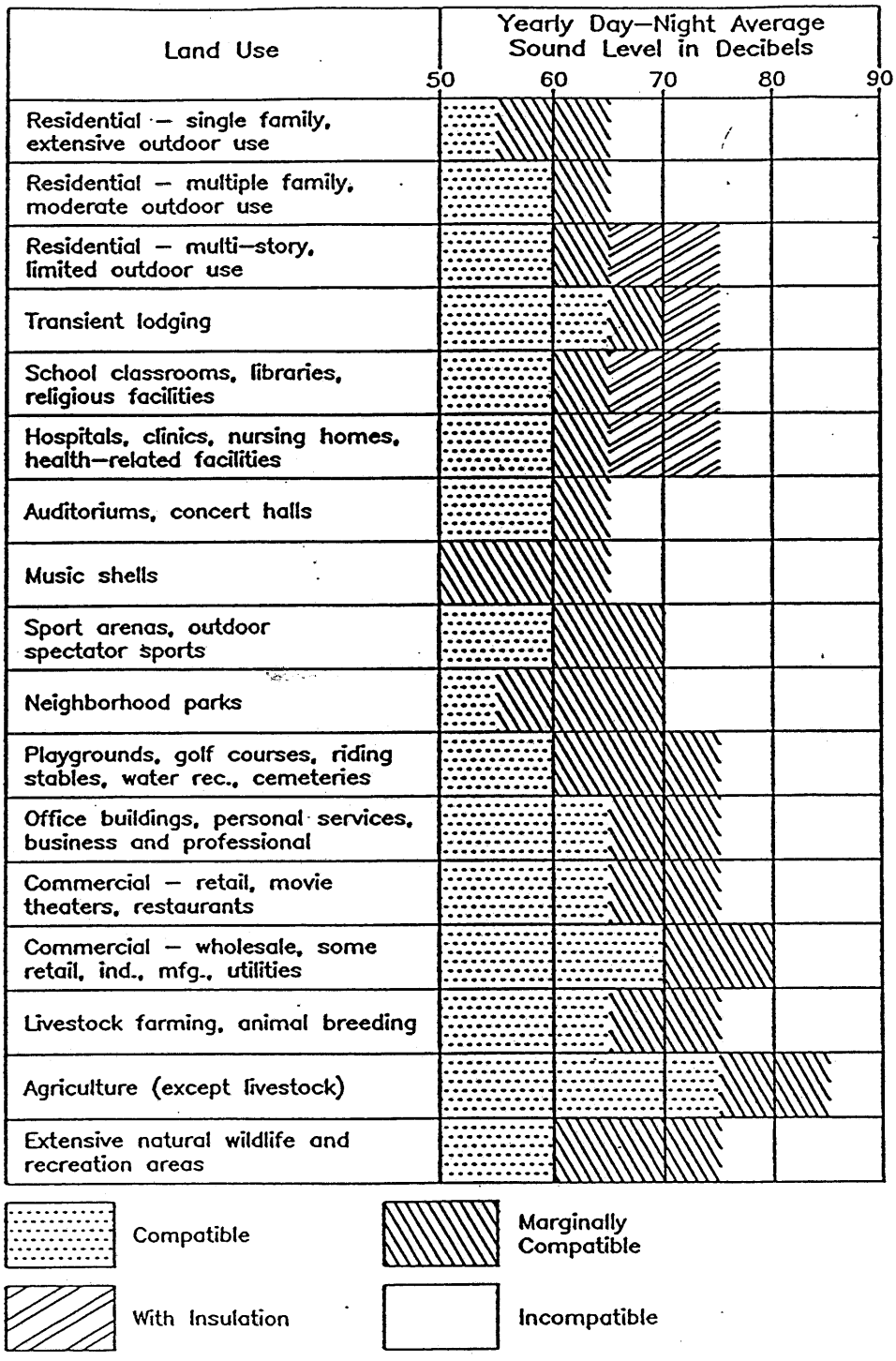

FIGURE 3.2

Land use compatibility with yearly day—night average sound level at a site for buildings as commonly constructed.

TITLE		DWG. NO.		FIGURE 3.2	
LAND USE COMPATIBILITY WITH AVERAGE SOUND LEVELS SOUND LEVEL INVESTIGATION		SCALE NONE	SHEET —	DATE —	PROJ.NO.

4.0 EXISTING SOUND LEVEL

The existing sound environment was monitored at two locations on the Teakwood Terrace site (see attached Site Plan).

The sound level was monitored to determine the hourly L_1, L_{10}, L_{50}, and L_{90} noise level (the level exceeded 1%, 10%, 50%, and 90% of the time, respectively) that currently existed.

Sound measurements at Location 1 were taken from 11:50 to 12:20PM on March 8, 1991, at a distance of 125 feet from the railroad tracks. During these measurement periods, a train did not pass by (see Figure 4.1 for traffic noise).

The sound level was measured for three ten-minute periods. These sample periods were representative of the condition over an hour. The results of the measurements are presented in Table 4.1.

Table 4.1
Existing Teakwood Terrace Sound Level (dBA)

Location	Time	L_1	L_{10}	L_{50}	L_{90}	L_{eq}
1	11:50AM-12:00PM	60	55	50	45	51
2	12:00PM-12:10PM	59	55	50	44	51
3	12:10PM-12:20PM	57	55	51	47	52

Sound sources that influenced the environment during the measurements were:

1. Traffic on Pacific Highway 99E.

2. Birds.

The elevated railroad tracks perform as a berm which blocks the traffic noise.

Measurements at Location 2 (see Site Plan) were conducted from 4:00PM, March 14, 1991 through 4:00PM on March 15, 1991. These measurements were conducted with a Bruel & Kjaer Noise Level Analyzer Type 4426. At every two-second interval, the instrument recorded the sound level in dBA. This data is an event.

Table 4.2 shows the statistical noise of the second measurement.

Table 4.2
Existing Sound Level (dBA)

Location	Time	L_1	L_{10}	L_{50}	L_{90}	L_{eq}
2	4:00PM 3/14 through 4:00PM 3/15/91	67	59	53	41	62

Figure 4.2 shows the sound level, the number of events which were taken every two seconds, and the percent of the events exceeding the sound level (dBA).

The sound sources influencing the environment during the measurements were:

1. Traffic on Pacific Highway 99E.
2. Trains.
3. Birds.

Because the traffic noise never exceeded 60 dBA (see Figure 4.1), I assumed that all noise levels above 60 dBA were caused by passing trains.

As Figure 4.3 indicates, the train noise which is noise of 62 dBA and above is only 1.52% of the time (during 24 hours) or approximately 14 minutes. It takes a train about 3 minutes to pass; therefore, the number of trains which passed during the 24-hour period measurement period was (14/3), about five.

The Amtrac trains pass to the north about 1:00PM, and south about 4:00PM. A freight train south about 9:00AM, and the rest of the trains are mostly passing during the night.

Figure 1 shows the L_{dn} center line from the train impacting the property.

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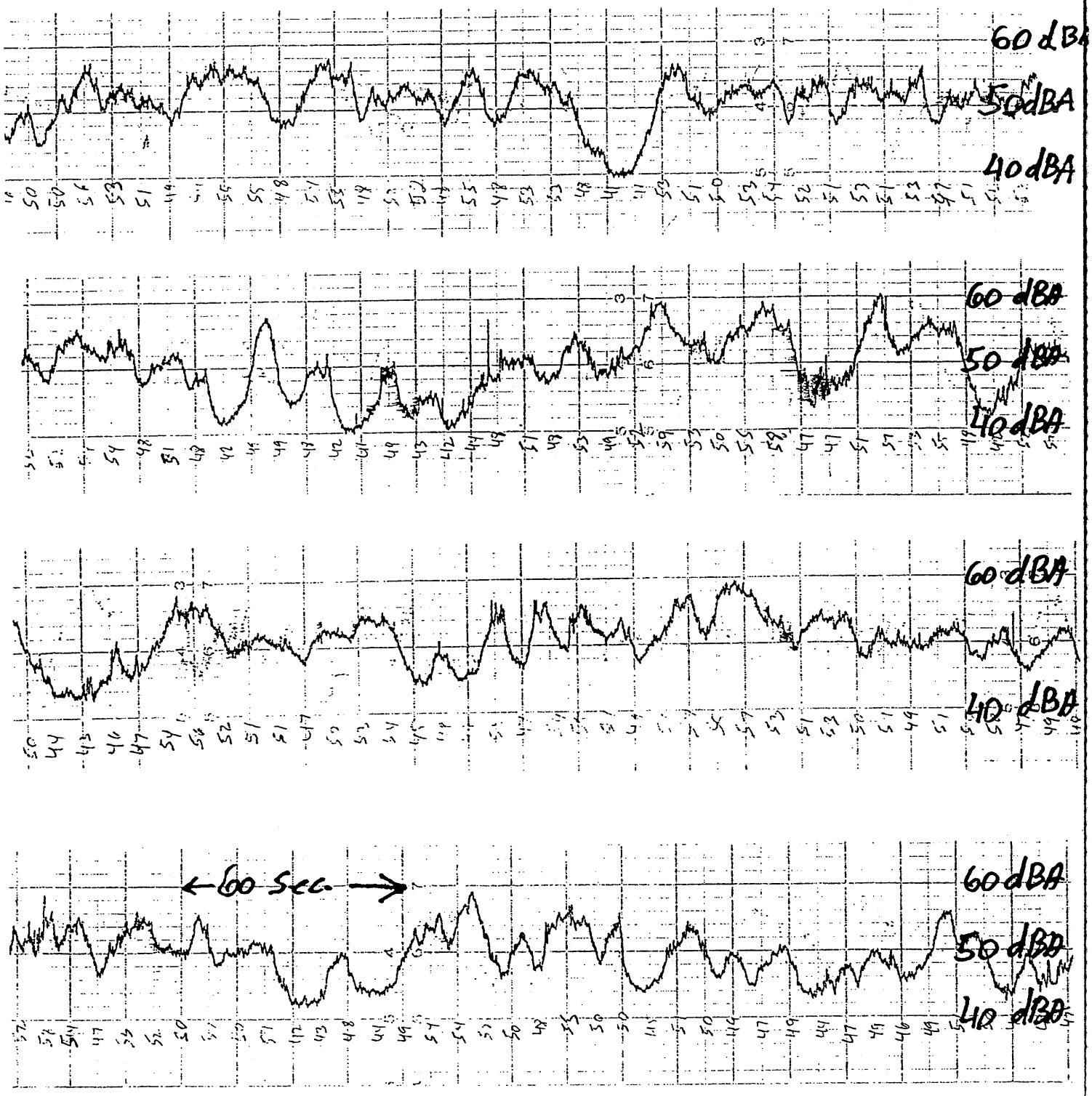

Figure 4.1
Traffic Sound Level Chart

TITLE:	DWG NO.		CONTRACT NO.	
	SCALE	SHEET	DATE	PROJ. NO.

Sound Level dBA	Number of Avents	Number Grater Than	Percent Exceeded
98	0	0	0.000%
96	0	0	0.000%
94	3	0	0.000%
92	3	3	0.007%
90	8	6	0.014%
88	3	14	0.032%
86	15	17	0.039%
84	11	32	0.074%
82	18	43	0.100%
80	24	61	0.141%
78	40	85	0.197%
76	74	125	0.289%
74	75	199	0.461%
72	81	274	0.634%
70	63	355	0.822%
68	67	418	0.968%
66	58	485	1.123%
64	112	543	1.257%
62	325	655	1.516%
60	1277	980	2.268%
58	3042	2257	5.224%
56	5080	5299	12.266%
54	6109	10379	24.024%
52	6347	16488	38.165%
50	4945	22835	52.856%
48	3822	27780	64.303%
46	2785	31602	73.149%
44	2051	34387	79.596%
42	1591	36438	84.343%
40	2364	38029	88.026%
38	2798	40393	93.498%
36	11	43191	99.975%
----------		43202	100.000%

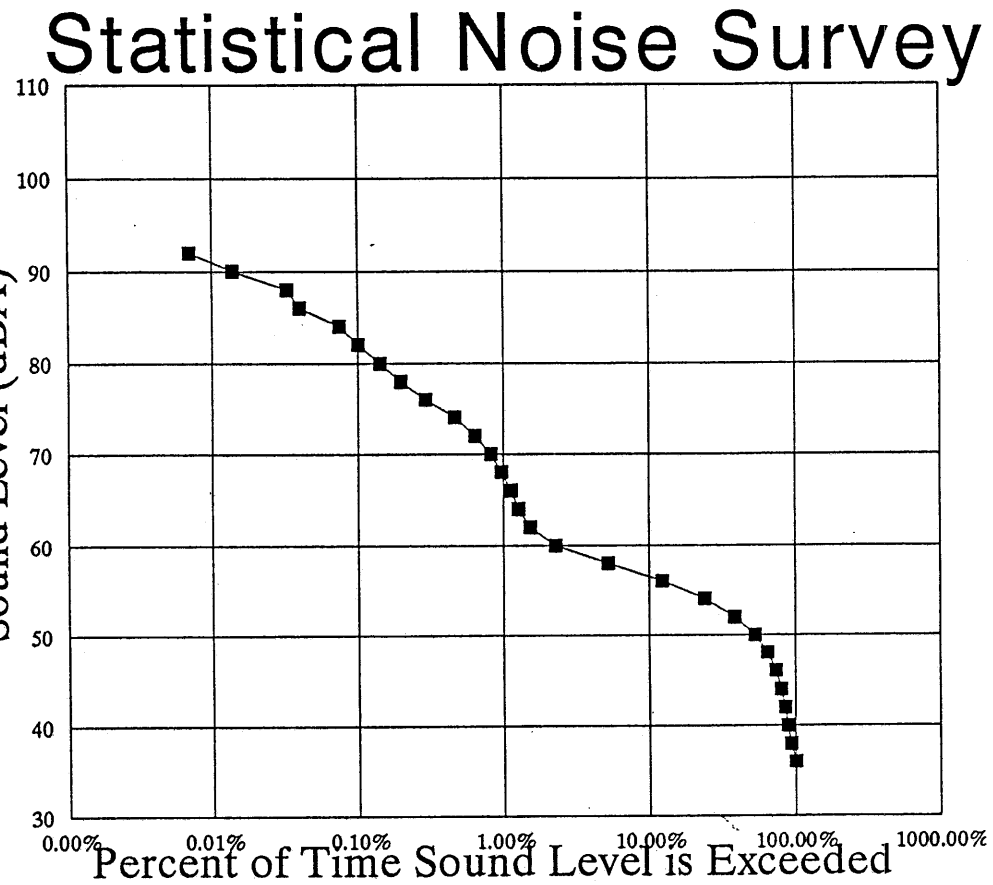

Figure 4.2

5.0 SOUND REDUCTION RECOMMENDATIONS

The first row of houses near the railroad tracks should be constructed with the exterior wall facing the railroad track made to block the train noise.

For this purpose, two types of exterior walls are recommended:

1. Staggered stud wall. This wall is constructed as follows: 2x4 studs staggered on a single 2x6 plate with double 5/8" gypsum board on the inside and siding on 1/2" plywood on the outside with 6 inches of absorber in the wall cavity. This wall has an STC rating of 51.

2. Double stud wall. This wall is constructed as follows: Double 2x4 wood studs on 2x4 plates separated by 1" with double 5/8" gypsum board on the inside and siding on 1/2" plywood on the outside with 3 inches of absorber in both stud cavities. This wall has an STC rating of 56. The double stud wall will reduce the outside noise level by approximately 8 dB over the staggered stud wall.

Figures 5.1 and 5.2 show the type of wall which is recommended for the houses near the railroad facing the track.

The wall facing the railroad track should have windows that are permanently closed. The window should be made of double layers of 1/4" glass.

APPENDIX A

KEY WORD DEFINITION

A-Weighting

Generally, the sensitivity of human hearing is restricted to the frequency range of 20 Hz to 20,000 Hz. The human ear, however, is most sensitive to sound in the 500 to 8,000 Hz frequency range. Above and below this range, the ear becomes progressively less sensitive. To account for this feature of human hearing, sound level meters incorporate a filtering of acoustic signals according to frequency. This filtering is devised to correspond to the varying sensitivity of the human ear to sound over the audible frequency range. This filtering is called A-weighting. Sound pressure level values obtained using this weighting are referred to as A-weighted sound pressure levels, and are signified by the identifier dBA.

An important feature of the human perception of continuous sound is that an increase or decrease in sound pressure level by 3 dB or less is barely perceptible; an increase or decrease of 5 dB is clearly perceptible; an increase or decrease of 10 dB is perceived as a doubling or halving of noise level.

Environmental Noise Descriptors

Besides frequency and level, environmental sounds exhibit a time-varying or temporal characteristic. The temporal character of noise level can be illustrated by considering noise levels that occur near a highway. During the day, noise levels are generally high, increasing to higher peaks when a noisy truck passes, and decreasing to a lower level between vehicle platoons. At night, when traffic volumes are lower, the same variation occurs but is centered around a lower level.

Noise descriptors are quantifications of noise that combine, into a single value, the three chief features of environmental noise: level, frequency, and temporal characteristics. The use of an A-weighted sound pressure level combines the first two characteristics - level and frequency - into a single number. Then, by

averaging A-weighted sound pressure levels over time in various fashions, noise descriptors that combine all three features can be developed

A commonly used descriptor is Percentile Exceeded A-weighted Sound Levels, A-weighted sound pressure levels exceeded for specific percentages of time within a noise monitoring period. For example, the one-hour 50 percentile A-weighted noise level, symbolized as the L_{50} (1 hour), is the A-weighted noise level exceeded a total of 30 minutes out of a continuous 60-minute period. Likewise, the L_{10} (20 minutes) is the A-weighted noise level exceeded a total of two minutes out of a continuous 20-minute period.

Percentile exceeded A-weighted noise levels most often are used to assess the time-varying character of noise. The residual noise level (defined as the nearly constant, low level of noise produced by a distant motor vehicle traffic or industrial activity) is indicative of the lowest level in a monitoring period. Residual noise level is commonly defined as the L_{90}, i.e., the A-weighted sound level exceeded 90% of a monitoring time period. Intrusive noise is characterized as a high noise level that endures for only a short period and is produced by such events as aircraft flyovers and truck passbys. Intrusive noise level is often defined as the L_{10}, i.e., the A-weighted sound level exceeded 10% of a monitoring time period. Although the L_{10} is useful for understanding environmental noise, it is no longer used by any federal agency in setting standards. Instead, the equivalent sound level has become more commonly adopted as discussed below.

Equivalent Sound Level

For several years, the U.S. Environmental Protection Agency (EPA) has encouraged the use of the equivalent sound level: a descriptor that uses the average A-weighted energy and differs significantly from 50th percentile, or average, sound pressure level. Unlike the 50th percentile sound level which is not influenced by peak noise levels of short duration, the equivalent sound level is. Therefore, the A-weighted equivalent sound level combines level, frequency and temporal character into a single-valued descriptor. Equivalent sound level, symbolized as L_{eq}, is always higher than the L_{50}, as it is influenced by noise contributions of high level and short duration such as aircraft flyovers or noisy truck passbys.

Day-Night Average Sound Levels

Noise levels occurring at night generally produce greater annoyance than do the same levels which occur during the day. It is generally agreed that community perception of nighttime noise levels is 10 dBA higher. That is, a given level of environmental noise during the day would appear to be approximately 10 dBA louder at night - at least in terms of its potential for causing community annoyance. This is largely because nighttime ambient environmental noise levels in most areas are approximately 10 dBA lower than daytime noise levels.

This feature of nighttime annoyance has been incorporated into a day-night noise descriptor which uses the equivalent sound level. This descriptor, referred to as the "day-night average sound level" or "day-night equivalent sound level (L_{dn})" applies a 10 dBA 'penalty' to noise levels occurring between 10:00PM and 7:00AM, thus accounting for increased community sensitivity to nighttime noise levels.

Because of their sensitivity to frequency and temporal characteristics of noise, both the L_{eq} and the L_{dn} have become widely accepted for use in environmental noise regulations and criteria. Among the federal agencies using L_{eq} or L_{dn} sound levels are the U.S. Environmental Protection Agency, the Federal Highway Administration, and U.S. Department of Housing and Urban Development, the Federal Aviation Administration, and the Department of Defense.

WILLOW CREEK ESTATES

TRAFFIC ANALYSIS REPORT

March 15, 1991

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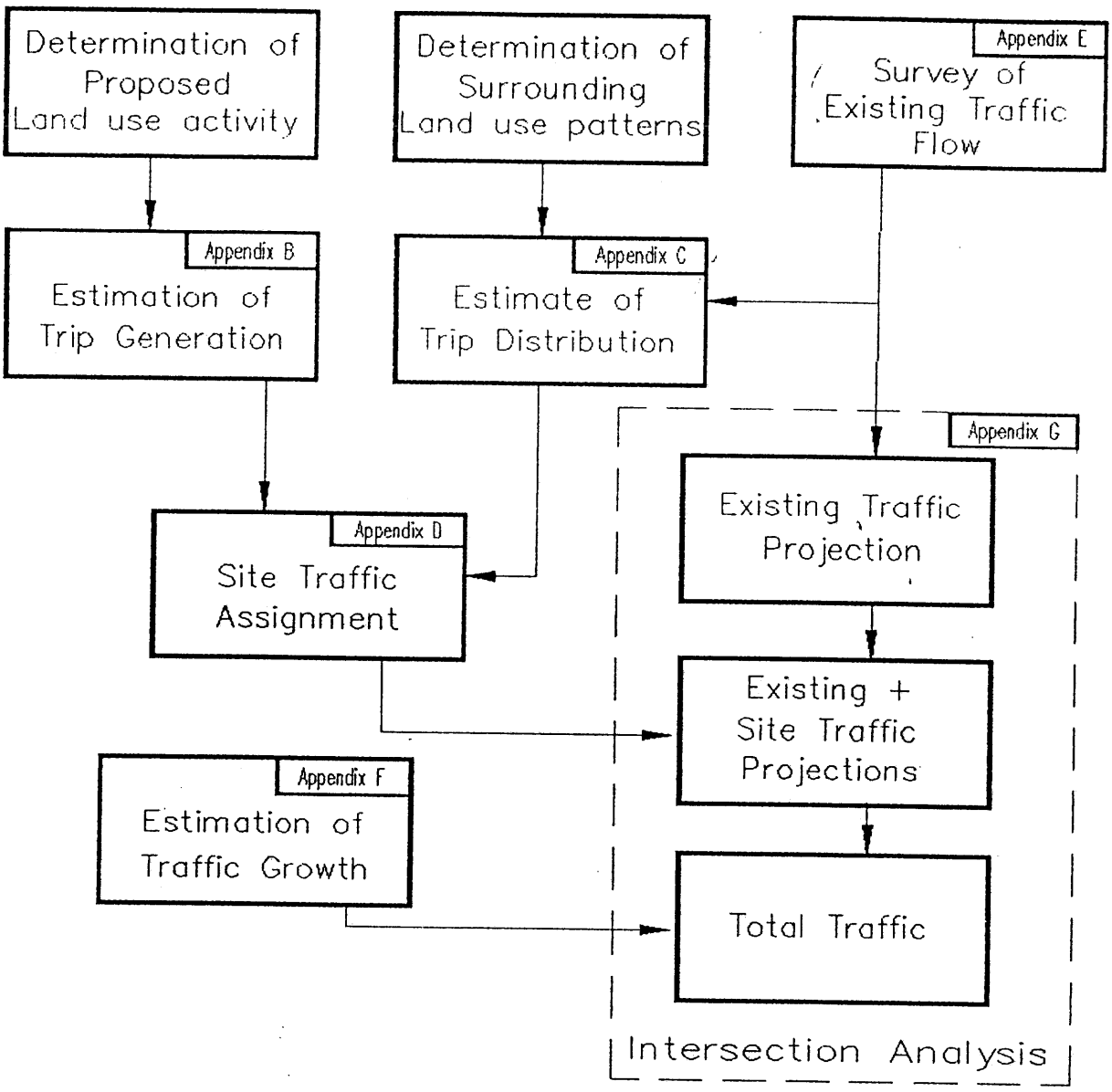
TRAFFIC ANALYSIS OUTLINE



Willow Creek Estates

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WILLOW CREEK ESTATES
TRAFFIC ANALYSIS REPORT
MARCH 29, 1991

Introduction:

This report examines a proposed 143-unit mixed residential complex. This site is located south of Territorial Road, west of Pacific Highway. The site will be built in two phases. The first phase includes 110 residential units, of which 50 are single family. The second phase contains 33 single family units. The total site will contain 60 multi-family units and 83 single family units. Access for the site will be a proposed public street onto Territorial Road (Teakwood Drive).

Area Analysis:

The analysis area includes Territorial Road between Pacific Highway to Redwood Street, and Pacific Highway between Territorial Road and Redwood Street. The intersection of Territorial Road and Pine Street was included in the existing traffic inventory to provide a better understanding of the traffic flow.

Findings:

The existing traffic flow on Territorial Road was observed at about 160 vehicles per hour and 220 vehicles per hour, AM and PM peak hour respectively.

The trip generation for this site is estimated at 866 trips per day and 1,196 trips per day, phase 1 and phase 2 respectively; a peak generation of 124 trips per hour is anticipated during the PM peak hour, when the site is completely built-out.

Currently, the traffic flow level at the Pacific Highway and Territorial Road intersection exceeds the minimum standard for both the Peak Hour and the broader Peak Four Hour Traffic Signal Warrants. The phase 1 site traffic will add 21 vehicles/hour (or about 21%) to the west approach of Territorial Road. This will increase traffic flow to over 30% of the standard necessary to meet minimum traffic signal warrants.

A review of the accident history of the Territorial Road at Pacific Highway intersection indicated 12 angle or turning accidents occurring between January 1987 and December 1989. These accidents caused 12 injuries and 1 fatality. The minimum standard to warrant a traffic signal based on accident experience is 5 reported accidents within a 12-month period. This was exceeded in 1988. No information is available for accidents occurring in 1990 and 1991.

The other intersections in the area of analysis operated at an above level of service "D" (standard of vehicle delay; generally considered acceptable), and will continue to do so in the foreseeable future.

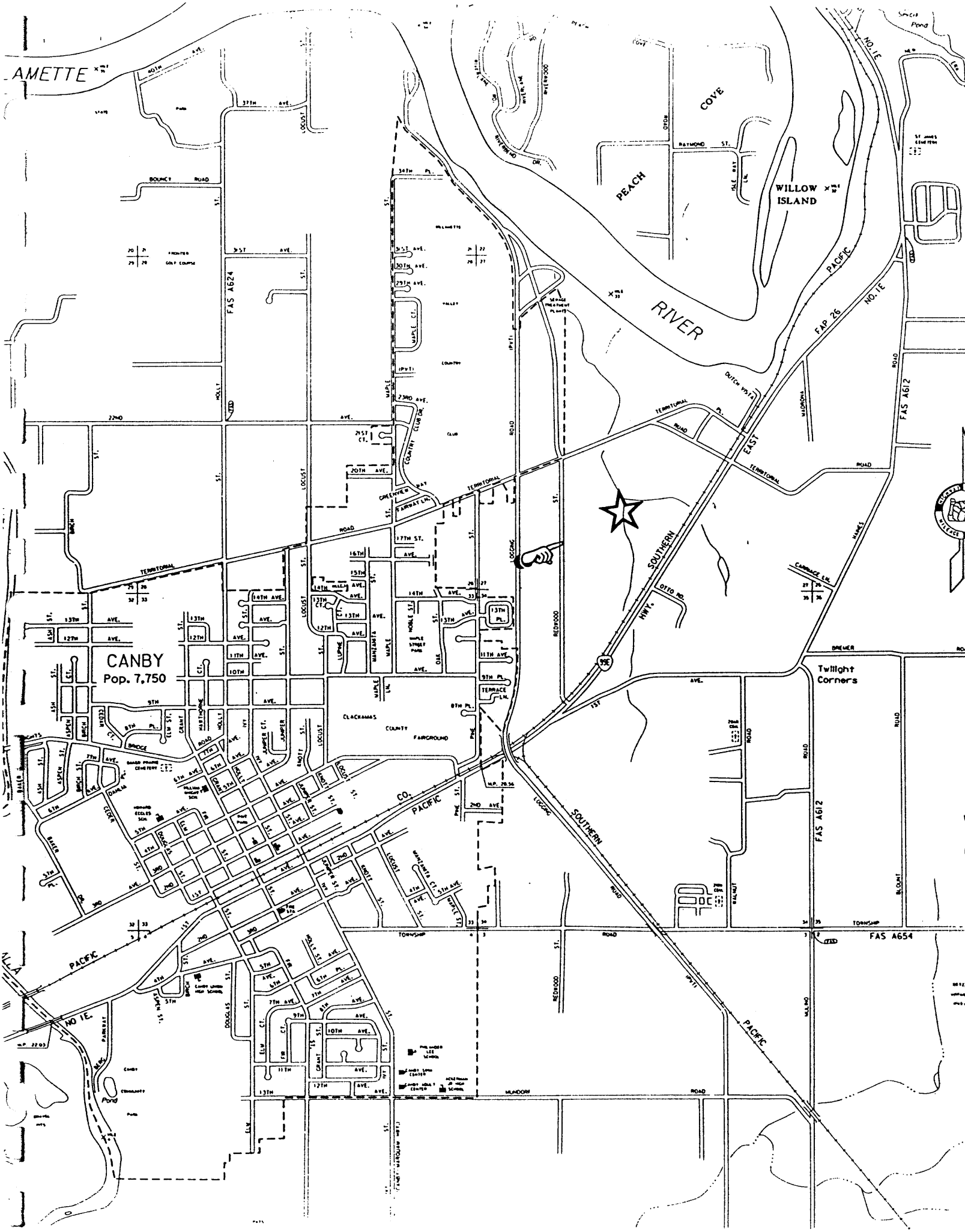
The traffic flow levels of Territorial Road will not be sufficient to warrant a left turn refuge. At the projected maximum left turn movement into the site (32 vehicles/hour), the east bound traffic would have to exceed 500 vehicles/hour or about 4 times the existing level.

Conclusion:

The proposed access is adequate to service the full site without a left turn refuge on Territorial Road.

The intersection of Territorial Road and Pacific Highway currently meets minimum standards for traffic signal warrants for the magnitude of traffic volume and accident experience. Further considerations should be given to improve this intersection, which may include signalization.

Robert Keech, P.E.
Traffic Engineer
P.E. #8822


CANBY
Pop. 7,750
PEACH COVE
WILLOW ISLAND
RIVER
PACIFIC
SOUTHERN
Twilight Corners
FAS A624
FAS A612
FAS A654
FAP 26
NO. 1E
HWY. 99E
CLACKAMAS COUNTY FAIRGROUND
TERRITORIAL ROAD
HOWARD EDDIES SCHOOL
BAKER PRAIRIE CEMETERY
Pond

TRIP GENERATION

	AM IN/OUT/TOTAL	PM IN/OUT/TOTAL	DAILY
PHASE 1	16/53/69	59/31/90	866 TRIPS/DAY
PHASE 2	7/18/25	21/13/34	330 TRIPS/DAY
TOTAL	23/71/94	80/44/124	1,196 TRIPS/DAY

PROJECT SITE TRAFFIC GENERATION
Worksheet

SITE NAME: Willow Creek Estates (Phase 1)
SITE USE: Single Family (ITE Land Use Code 210)
SITE SIZE: 50 Units

UNADJUSTED DAILY VEHICLE TRIP GENERATION RATE:	10.0	trips/unit
ESTIMATED TRANSIT USE:	0.0	
ADJUSTED DAILY VEHICLE TRIP GENERATION RATE:	10.0	trips/unit
TOTAL DAILY GENERATED TRIPS:	500.0	trips/day
PERCENTAGE OF TRIPS OCCURING DURING AM PEAK:	7.5	%
AM PEAK HOURLY GENERATED TRIPS:	37.0	trips/hour
AM ENTER TRIP SPLIT:	0.27	in/total
AM TRAFFIC VOLUME IN:	10.0	trips/hour
AM TRAFFIC VOLUME OUT:	27.0	trips/hour
PERCENTAGE OF TRIPS OCCURING DURING PM PEAK:	10.1	%
PM PEAK HOURLY GENERATED TRIPS:	50.0	trips/hour
PM ENTER TRIP SPLIT:	0.63	in/total
PM TRAFFIC VOLUME IN:	32.0	trips/hour
PM TRAFFIC VOLUME OUT:	18.0	trips/hour

Source: 4th Edition "Trip Generation" (ITE, 1987)

PROJECT SITE TRAFFIC GENERATION
Worksheet

SITE NAME: Willow Creek Estates (Phase 1)
SITE USE: Apartments (ITE Land Use Code 220)
SITE SIZE: 60 Units

UNADJUSTED DAILY VEHICLE TRIP GENERATION RATE:	6.1	trips/unit
ESTIMATED TRANSIT USE:	0.0	
ADJUSTED DAILY VEHICLE TRIP GENERATION RATE:	6.1	trips/unit
TOTAL DAILY GENERATED TRIPS:	366.0	trips/day
PERCENTAGE OF TRIPS OCCURING DURING AM PEAK:	8.7	%
AM PEAK HOURLY GENERATED TRIPS:	32.0	trips/hour
AM ENTER TRIP SPLIT:	0.18	in/total
AM TRAFFIC VOLUME IN:	6.0	trips/hour
AM TRAFFIC VOLUME OUT:	26.0	trips/hour
PERCENTAGE OF TRIPS OCCURING DURING PM PEAK:	11.0	%
PM PEAK HOURLY GENERATED TRIPS:	40.0	trips/hour
PM ENTER TRIP SPLIT:	0.68	in/total
PM TRAFFIC VOLUME IN:	27.0	trips/hour
PM TRAFFIC VOLUME OUT:	13.0	trips/hour

Source: 4th Edition "Trip Generation" (ITE, 1987)

PROJECT SITE TRAFFIC GENERATION
Worksheet

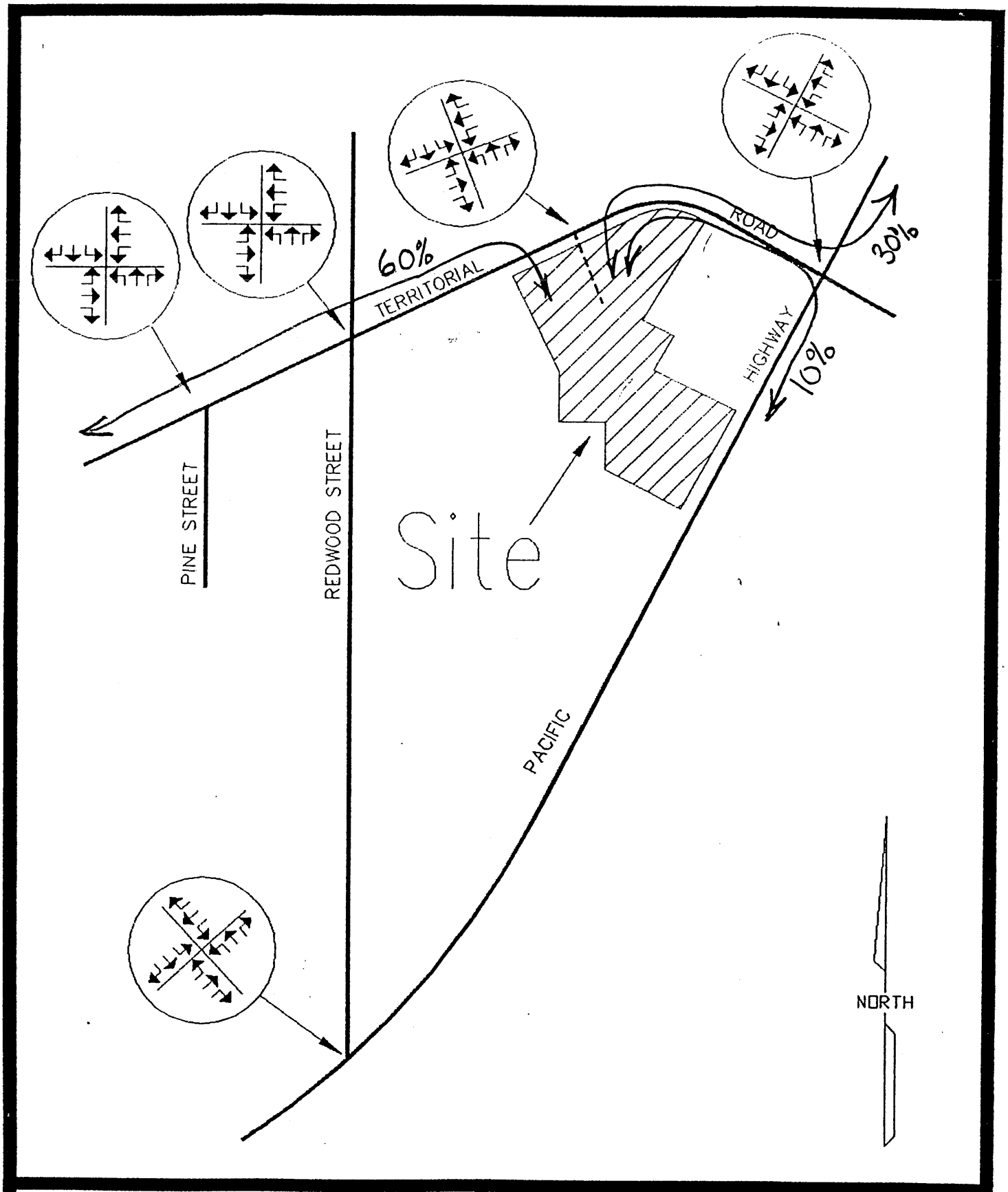
SITE NAME: Willow Creek Estates (Phase 2)
SITE USE: Single Family (ITE Land Use Code 210)
SITE SIZE: 33 Units

UNADJUSTED DAILY VEHICLE TRIP GENERATION RATE:	10.0	trips/unit
ESTIMATED TRANSIT USE:	0.0	
ADJUSTED DAILY VEHICLE TRIP GENERATION RATE:	10.0	trips/unit
TOTAL DAILY GENERATED TRIPS:	330.0	trips/day
PERCENTAGE OF TRIPS OCCURING DURING AM PEAK:	7.5	%
AM PEAK HOURLY GENERATED TRIPS:	25.0	trips/hour
AM ENTER TRIP SPLIT:	0.27	in/total
AM TRAFFIC VOLUME IN:	7.0	trips/hour
AM TRAFFIC VOLUME OUT:	18.0	trips/hour
PERCENTAGE OF TRIPS OCCURING DURING PM PEAK:	10.1	%
PM PEAK HOURLY GENERATED TRIPS:	34.0	trips/hour
PM ENTER TRIP SPLIT:	0.63	in/total
PM TRAFFIC VOLUME IN:	21.0	trips/hour
PM TRAFFIC VOLUME OUT:	13.0	trips/hour

Source: 4th Edition "Trip Generation" (ITE, 1987)

APPENDIX C
Site Traffic Distribution

Site traffic distribution based on observation of existing traffic flows and general land use patterns.



Willow Creek Estates
SITE TRAFFIC DISTRIBUTION

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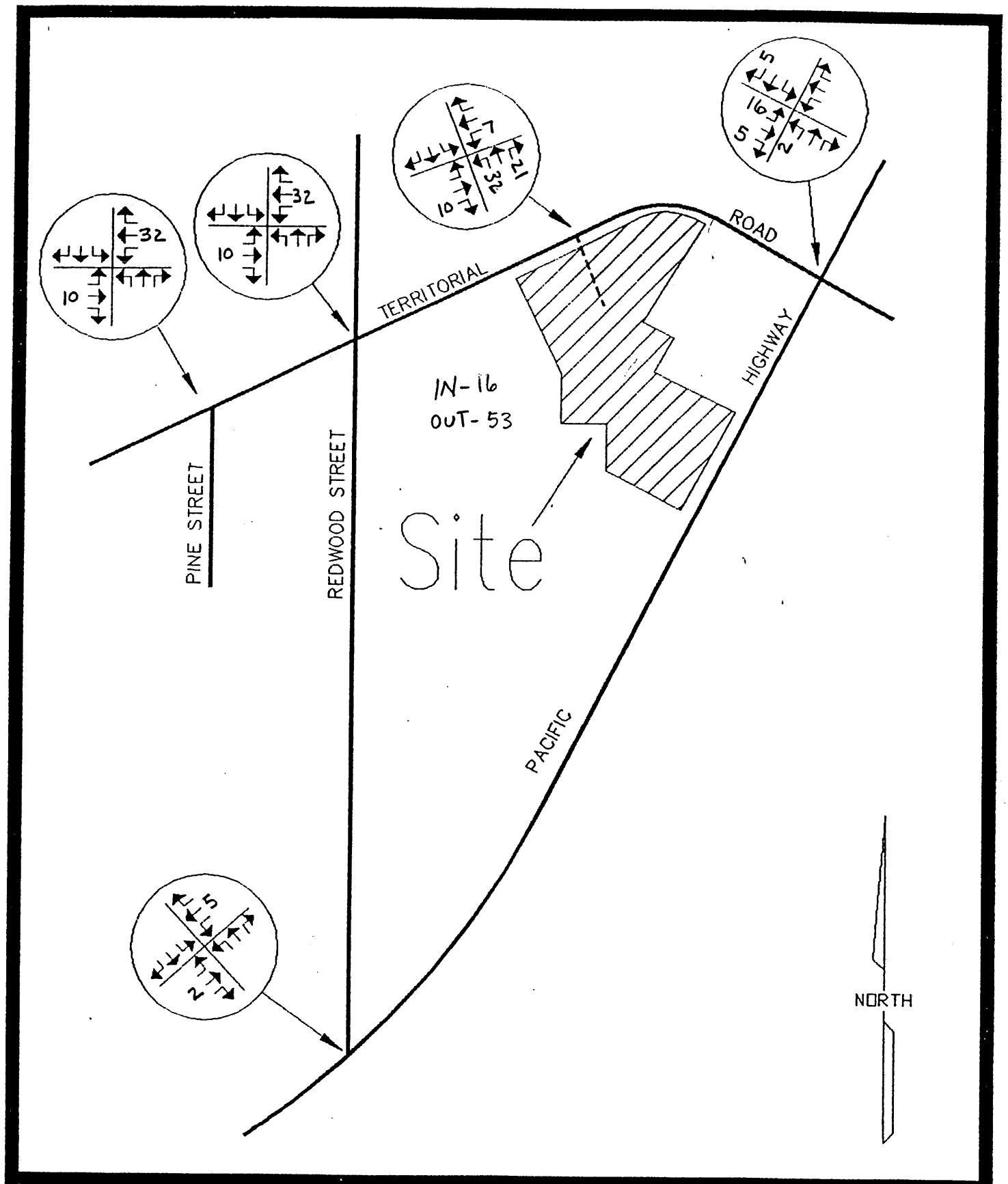

Willow Creek Estates

SITE TRAFFIC ASSIGNMENT

AM PEAK HOUR- Phase 1

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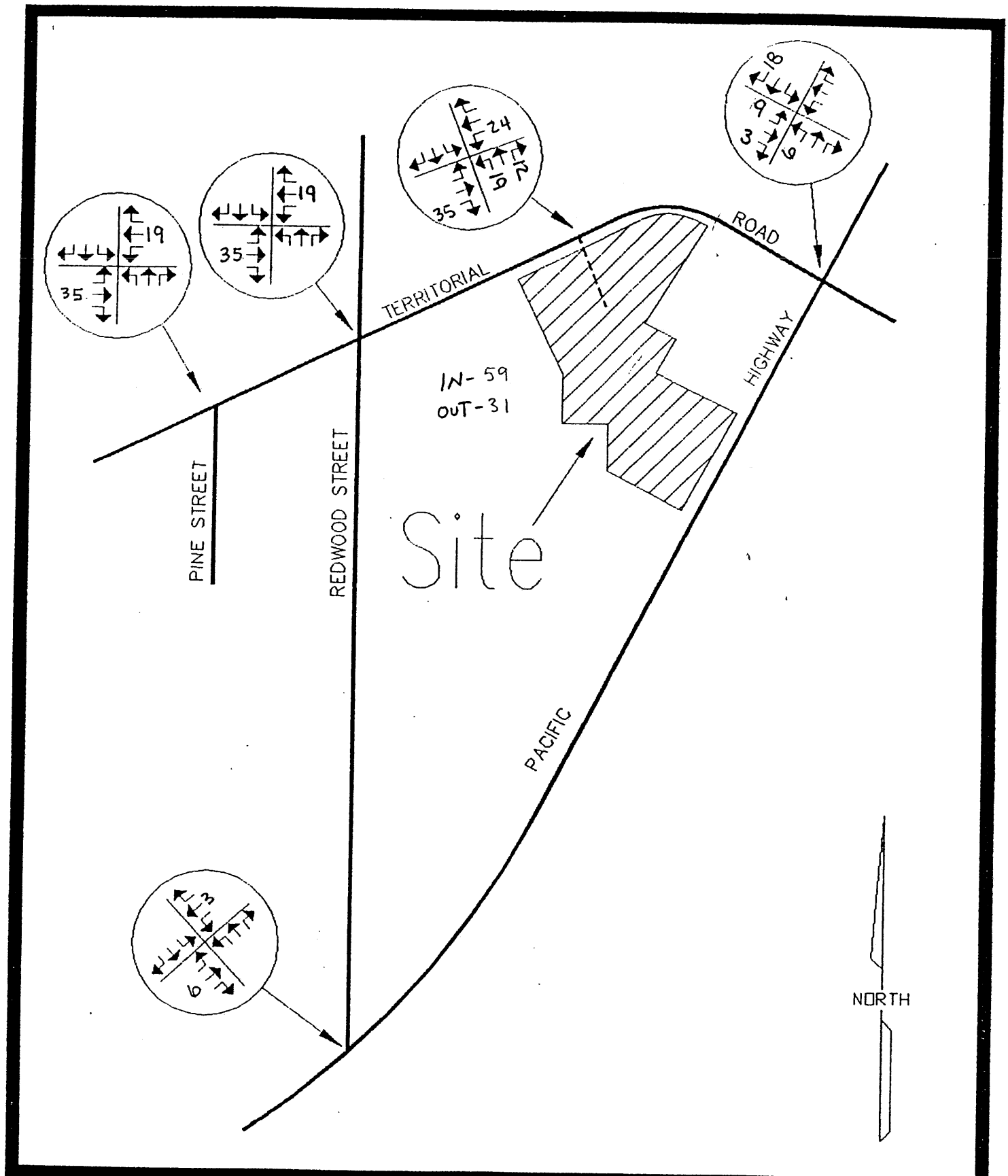

Willow Creek Estates
SITE TRAFFIC ASSIGNMENT
PM PEAK HOUR- PHASE 1

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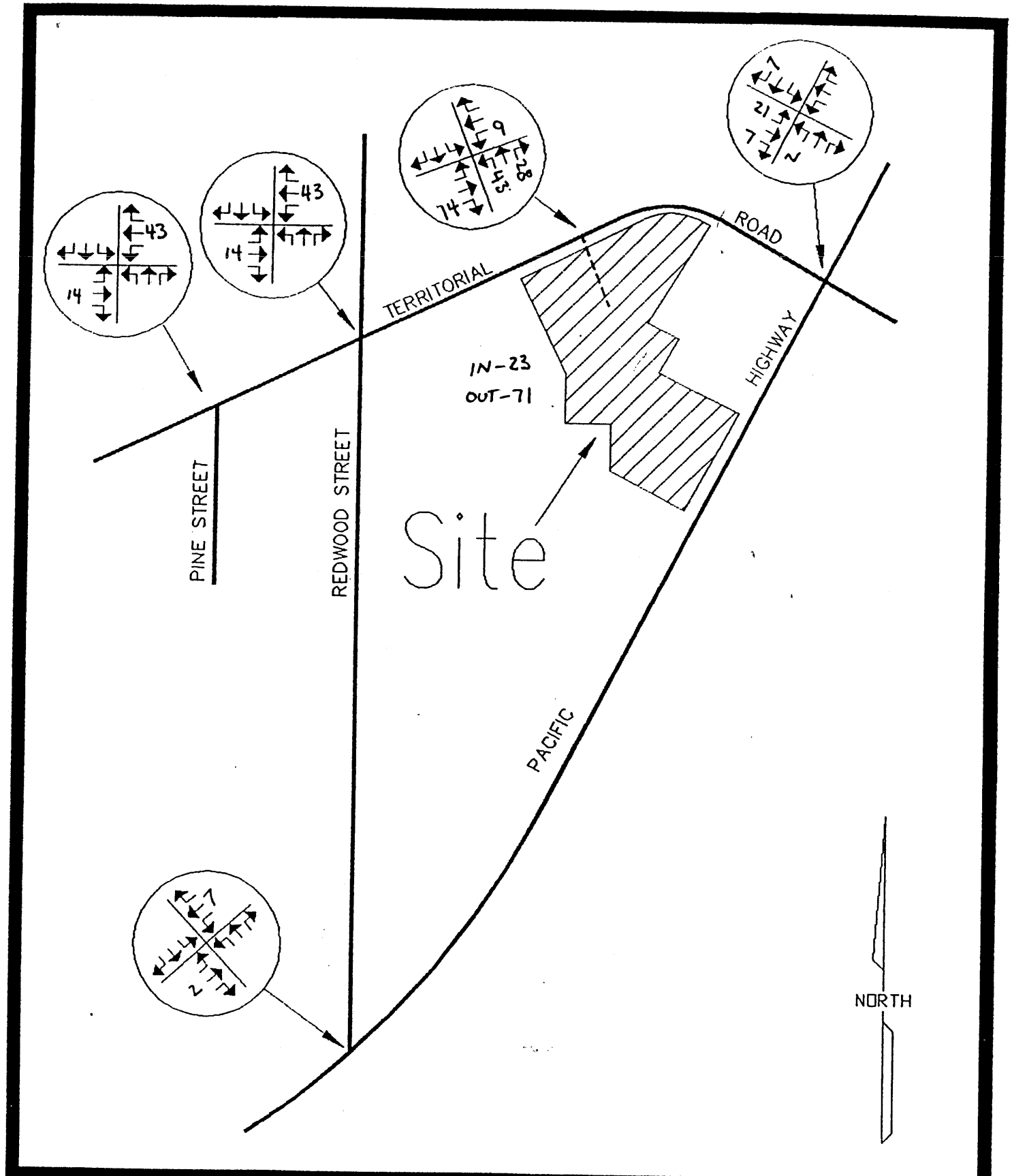

Willow Creek Estates

SITE TRAFFIC ASSIGNMENT

AM PEAK HOUR - Phase 1+2

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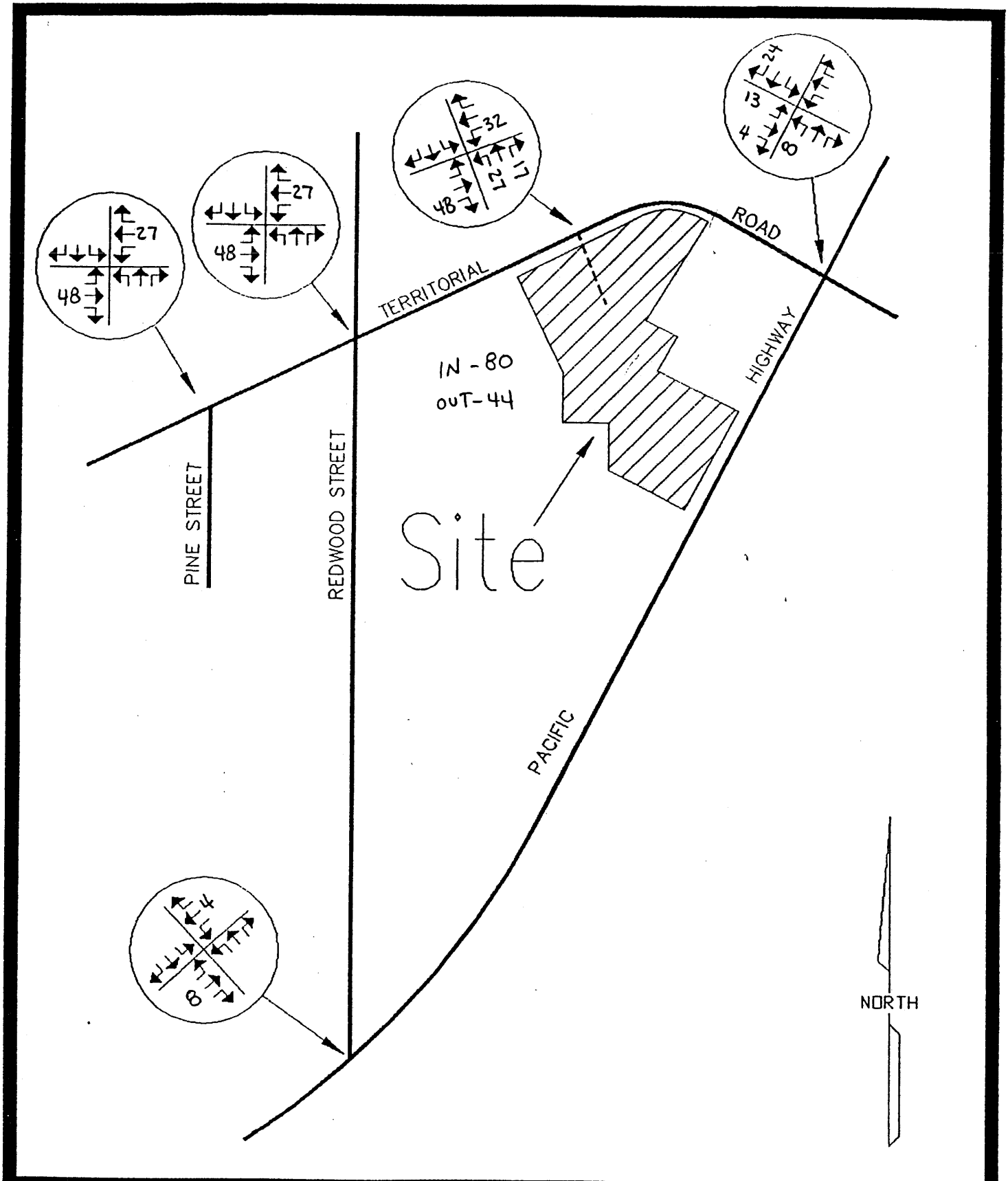
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., SUIT 206, PORTLAND, ORE. (503)641-6333



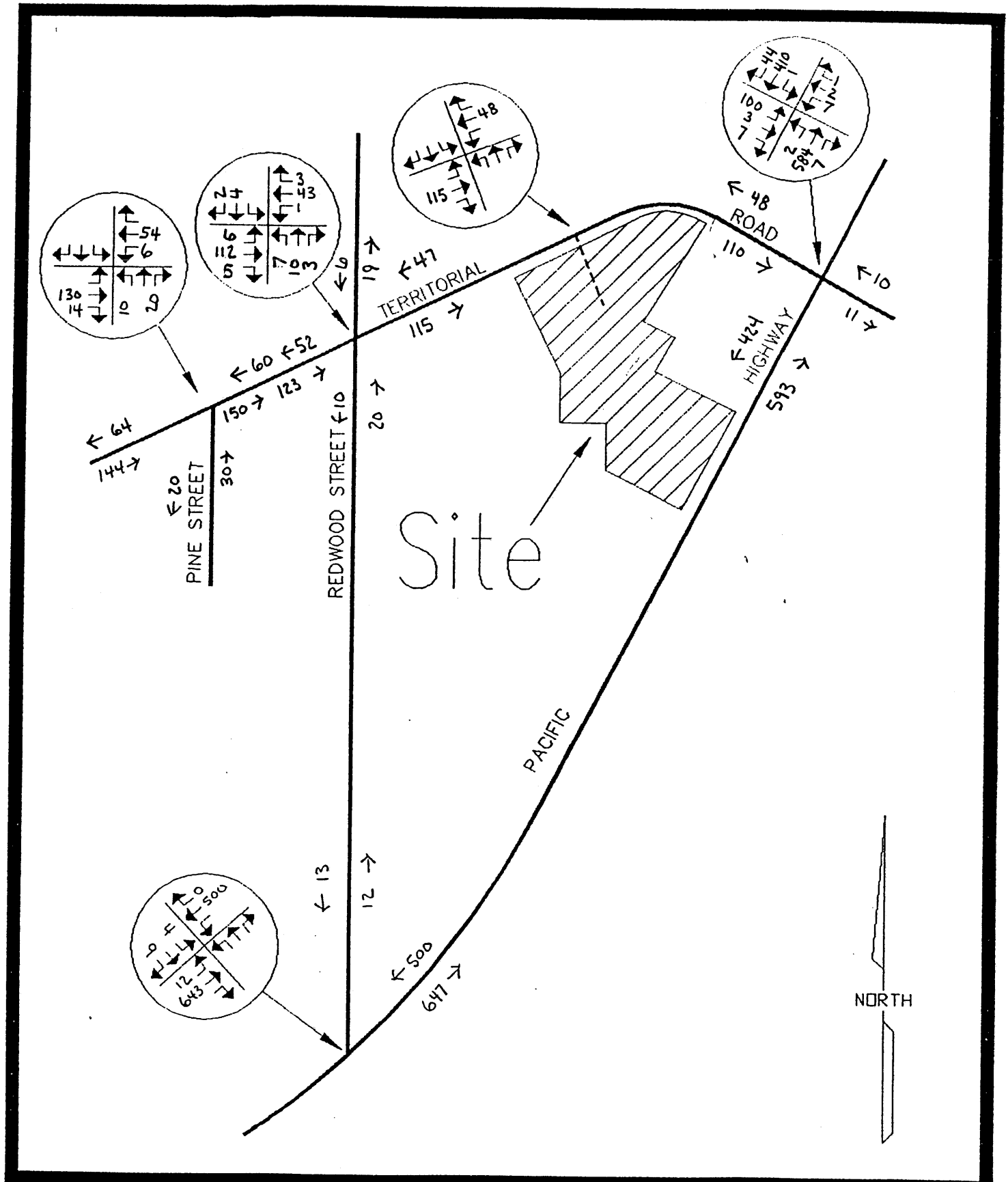
Willow Creek Estates

SITE TRAFFIC ASSIGNMENT
PM PEAK HOUR - PHASE 1+2

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., SUIT 206, PORTLAND, ORE. (503)641-6333

APPENDIX E
Existing Traffic Flow

Existing traffic flow as measured February and March 1991.



Willow Creek Estates

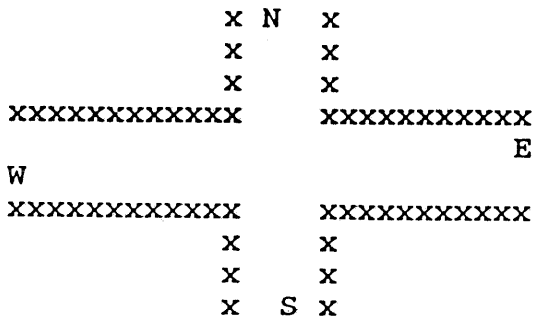
EXISTING TRAFFIC FLOW

AM PEAK HOUR

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., SUIT 206, PORTLAND, ORE. (503)641-6333

TRAFFIC TURNING COUNT SUMMARY REPORT

Territorial @ N. Pine St.



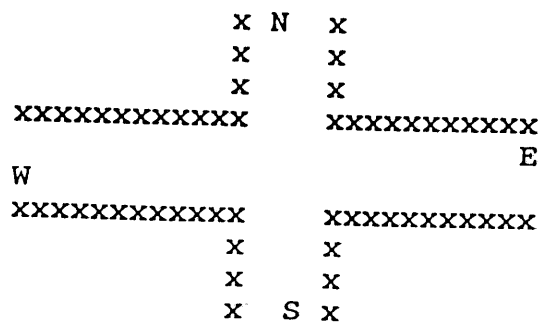
DATE OF COUNT 03/05/91
DAY OF WEEK Tue
TIME STARTED (HH:MM) 06:45
TIME ENDED (HH:MM) 08:45

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
06:45-06:50	0	6	0	0	0	0	0	0	1	1	1	0	9
06:50-06:55	1	7	0	0	0	0	0	0	1	1	2	0	12
06:55-07:00	1	2	0	0	0	0	0	0	0	0	3	0	6
07:00-07:05	0	8	0	0	0	0	0	0	2	1	1	0	12
07:05-07:10	2	6	0	0	0	0	0	0	0	2	3	0	13
07:10-07:15	1	4	0	0	0	0	0	0	1	1	4	0	11
07:15-07:20	1	6	0	0	0	0	0	0	0	0	3	0	10
07:20-07:25	1	11	0	0	0	0	0	0	1	3	6	0	22
07:25-07:30	3	5	0	0	0	0	2	0	0	0	4	0	14
07:30-07:35	1	18	0	0	0	0	0	0	2	0	5	0	26
07:35-07:40	2	9	0	0	0	0	1	0	4	0	4	0	20
07:40-07:45	0	18	0	0	0	0	1	0	2	0	6	0	27
07:45-07:50	1	8	0	0	0	0	0	0	2	0	8	0	19
07:50-07:55	2	10	0	0	0	0	1	0	5	0	4	0	22
07:55-08:00	1	8	0	0	0	0	1	0	1	0	5	0	16
08:00-08:05	1	6	0	0	0	0	1	0	2	0	4	0	14
08:05-08:10	1	20	0	0	0	0	1	0	0	0	2	0	24
08:10-08:15	1	7	0	0	0	0	1	0	1	0	3	0	13
08:15-08:20	0	10	0	0	0	0	1	0	0	3	3	0	17
08:20-08:25	1	8	0	0	0	0	2	0	1	2	4	0	18
08:25-08:30	1	4	0	0	0	0	0	0	1	1	7	0	14
08:30-08:35	1	6	0	0	0	0	0	0	0	0	5	0	12
08:35-08:40	0	6	0	0	0	0	0	0	2	0	2	0	10
08:40-08:45	2	10	0	0	0	0	1	0	1	0	2	0	16
TOTAL SURVEY	25	203	0	0	0	0	13	0	30	15	91	0	
PEAK HOUR	14	130	0	0	0	0	10	0	20	6	54	0	
PHF	.58	.72	0	0	0	0	.83	0	.56	.5	.75	0	
TRUCKS	3	13	0	0	0	0	2	0	3	3	13	0	
% TRUCKS	12	6.4	0	0	0	0	15.4	0	10	20	14.3	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	1	0	
PEDS	0	1	0	0	0	0	0	1	0	0	0	0	

TRAFFIC SMITHY
Traffic Survey Service

TRAFFIC TURNING COUNT SUMMARY REPORT

Territorial Rd @ N Redwood Rd



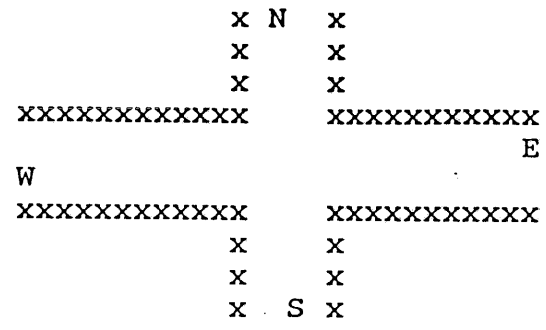
DATE OF COUNT 02/28/91
DAY OF WEEK Thu
TIME STARTED (HH:MM) 06:45
TIME ENDED (HH:MM) 08:45

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<			
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
06:45-06:50	0	5	0	0	0	0	0	0	0	0	1	0	6
06:50-06:55	0	3	0	0	0	0	1	0	0	0	4	0	8
06:55-07:00	0	6	1	0	0	0	1	0	0	2	3	0	13
07:00-07:05	0	7	0	0	0	0	2	0	0	1	3	0	13
07:05-07:10	0	5	0	0	0	0	0	1	2	0	2	0	10
07:10-07:15	0	7	0	0	0	0	1	0	1	0	1	0	10
07:15-07:20	0	12	1	0	0	0	0	0	0	1	6	0	20
07:20-07:25	1	4	0	0	0	0	0	0	0	0	9	1	15
07:25-07:30	0	8	0	0	1	0	0	2	0	0	2	0	13
07:30-07:35	1	13	0	0	0	0	1	0	0	0	4	0	19
07:35-07:40	1	15	0	0	0	0	0	1	2	0	4	1	24
07:40-07:45	1	8	0	0	1	0	0	1	1	0	3	0	15
07:45-07:50	0	9	2	0	0	0	1	1	0	0	3	1	17
07:50-07:55	1	9	2	0	0	0	5	1	0	0	3	0	21
07:55-08:00	0	4	1	0	1	0	0	3	0	0	1	0	10
08:00-08:05	0	10	0	1	0	0	0	1	0	0	2	0	13
08:05-08:10	0	11	0	1	0	0	0	0	0	0	4	0	16
08:10-08:15	0	9	0	1	1	0	0	0	0	0	2	0	13
08:15-08:20	1	10	0	0	0	0	1	0	0	0	3	0	15
08:20-08:25	1	2	0	3	2	0	1	0	0	0	5	0	14
08:25-08:30	1	4	0	2	0	0	0	0	0	1	3	0	11
08:30-08:35	0	11	0	1	0	0	1	0	0	0	1	0	14
08:35-08:40	0	11	0	0	0	0	0	0	0	0	1	0	12
08:40-08:45	0	6	2	0	1	0	0	0	1	0	2	0	12
TOTAL SURVEY	8	189	9	8	7	0	15	11	7	5	72	3	
PEAK HOUR	5	112	6	2	4	0	7	10	3	1	43	3	
PHF	.42	.78	.3	.25	1	0	.29	.5	.25	.25	.63	.38	
TRUCKS	0	10	2	8	2	0	3	0	0	2	15	0	
% TRUCKS	0	5.3	22.2	100	28.6	0	20	0	0	40	20.8	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
PEDS	0	0	0	0	0	0	0	0	0	0	0	0	

TRAFFIC SMITHY
Traffic Survey Service

TRAFFIC TURNING COUNT SUMMARY REPORT

Pacific Hwy @ Redwood St.



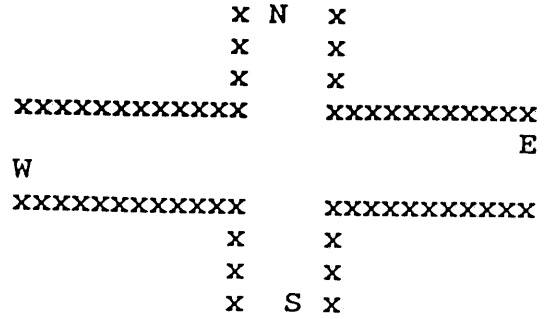
DATE OF COUNT 03/06/91
DAY OF WEEK Wed
TIME STARTED (HH:MM) 06:45
TIME ENDED (HH:MM) 08:45

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
06:45-06:50	0	0	0	0	20	0	0	37	0	0	0	0	57
06:50-06:55	1	0	0	0	25	0	0	39	0	0	0	0	65
06:55-07:00	3	0	0	0	36	0	0	31	0	0	0	0	70
07:00-07:05	1	0	0	0	43	0	1	27	0	0	0	0	72
07:05-07:10	1	0	1	0	41	0	1	40	0	0	0	0	84
07:10-07:15	0	0	0	0	27	0	0	46	0	0	0	0	73
07:15-07:20	0	0	0	0	53	0	0	37	0	0	0	0	90
07:20-07:25	2	0	0	0	52	0	0	44	0	0	0	0	98
07:25-07:30	0	0	0	0	48	0	0	62	0	0	0	0	110
07:30-07:35	0	0	0	0	39	0	0	51	0	0	0	0	90
07:35-07:40	2	0	1	0	51	0	1	59	0	0	0	0	114
07:40-07:45	0	0	0	0	45	0	2	50	0	0	0	0	97
07:45-07:50	0	0	1	0	43	0	3	49	0	0	0	0	96
07:50-07:55	3	0	1	0	29	0	1	47	0	0	0	0	81
07:55-08:00	1	0	0	0	32	0	3	108	0	0	0	0	144
08:00-08:05	0	0	0	0	40	0	1	50	0	0	0	0	91
08:05-08:10	3	0	1	0	30	0	1	26	0	0	0	0	61
08:10-08:15	1	0	0	0	15	0	1	33	0	0	0	0	50
08:15-08:20	0	0	1	0	20	0	2	40	0	0	0	0	63
08:20-08:25	1	0	1	0	21	0	1	26	0	0	0	0	50
08:25-08:30	1	0	0	1	20	0	0	34	0	0	0	0	56
08:30-08:35	0	0	0	0	30	0	1	36	0	0	0	0	67
08:35-08:40	2	0	0	0	25	0	1	31	0	0	0	0	59
08:40-08:45	1	0	0	0	16	0	0	42	0	0	0	0	59
TOTAL SURVEY	23	0	7	1	801	0	20	1045	0	0	0	0	
PEAK HOUR	9	0	4	0	500	0	12	643	0	0	0	0	
PHF	.56	0	.5	0	.82	0	.43	.78	0	0	0	0	
TRUCKS	0	0	0	1	71	0	0	54	0	0	0	0	
% TRUCKS	0	0	0	100	8.8	0	0	5.2	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	1	0	0	1	0	
PEDS	0	0	0	0	0	0	0	0	0	0	0	0	

TRAFFIC SMITHY
Traffic Survey Service

TRAFFIC TURNING COUNT SUMMARY REPORT

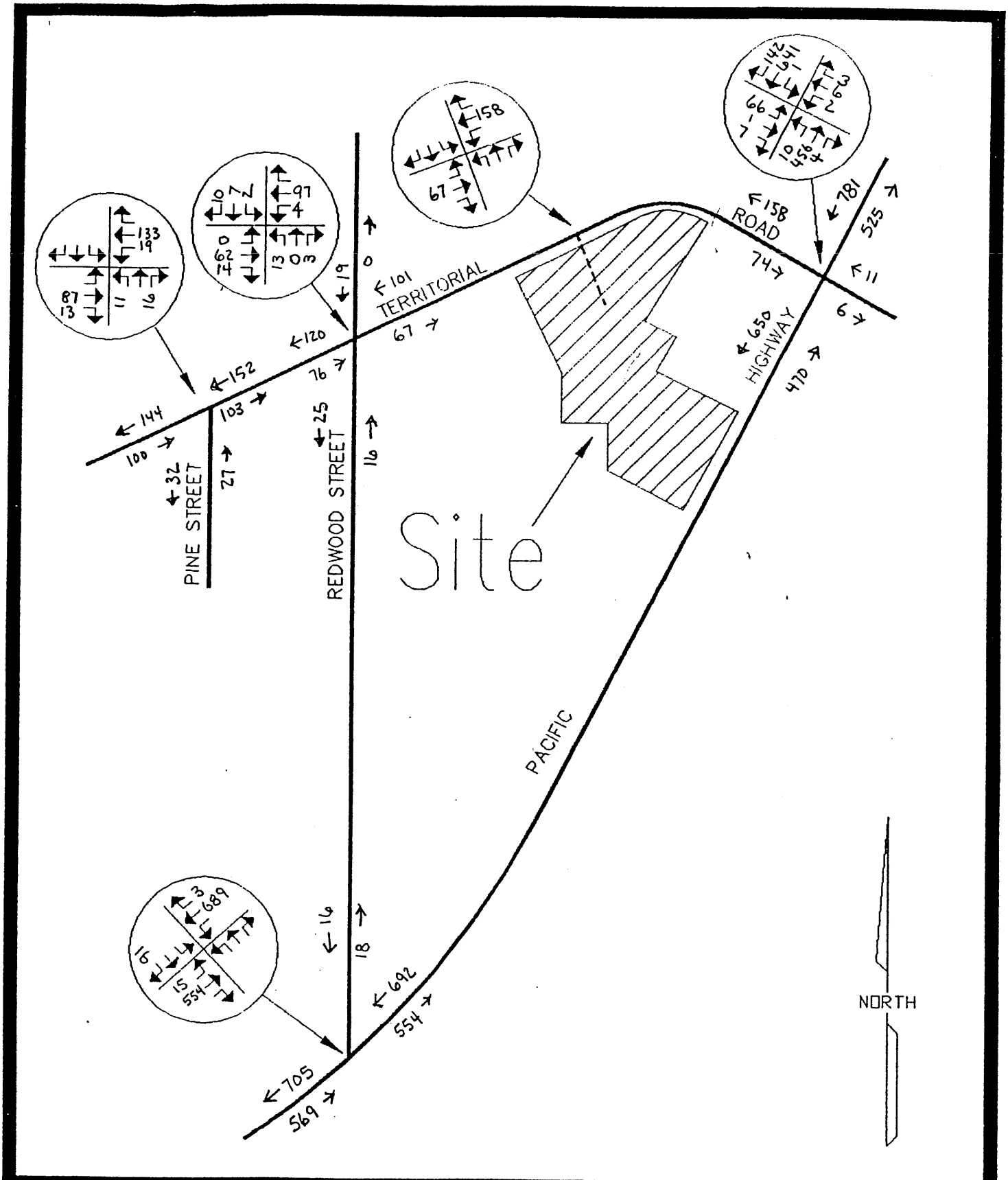
Territorial Rd @ Pacific Hwy



DATE OF COUNT 02/27/91
DAY OF WEEK Wed
TIME STARTED (HH:MM) 06:44
TIME ENDED (HH:MM) 08:44

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
06:44-06:49	0	0	14	2	27	0	0	47	0	1	0	1	92
06:49-06:54	0	1	2	1	29	0	0	31	0	0	0	0	64
06:54-06:59	0	1	3	1	25	0	0	34	0	1	0	0	65
06:59-07:04	0	0	5	6	32	1	1	33	0	0	0	0	78
07:04-07:09	1	0	7	2	24	0	0	47	0	1	0	0	82
07:09-07:14	1	0	5	2	36	0	0	36	1	0	0	1	82
07:14-07:19	1	1	5	4	42	0	1	52	0	2	1	0	109
07:19-07:24	1	0	12	1	43	1	0	48	0	0	1	0	107
07:24-07:29	1	0	6	2	50	0	0	52	1	0	0	0	112
07:29-07:34	0	0	9	7	31	0	0	55	1	1	0	0	104
07:34-07:39	0	1	9	2	27	0	0	56	0	0	0	0	95
07:39-07:44	0	0	12	3	34	0	0	50	0	0	0	0	99
07:44-07:49	1	0	12	8	32	0	0	52	1	1	0	0	107
07:49-07:54	1	0	7	2	32	0	0	54	1	1	0	0	98
07:54-07:59	0	1	5	7	30	0	0	49	1	1	0	0	94
07:59-08:04	0	0	11	4	29	0	1	33	1	0	0	0	79
08:04-08:09	0	0	7	1	29	0	0	40	0	0	0	0	77
08:09-08:14	0	0	9	2	19	0	1	36	0	0	0	0	67
08:14-08:19	1	0	13	3	19	0	0	44	0	0	0	0	80
08:19-08:24	0	1	6	4	21	0	0	35	0	0	0	0	67
08:24-08:29	0	0	6	2	19	0	1	37	0	0	0	0	65
08:29-08:34	0	1	5	3	17	0	0	29	1	1	0	0	57
08:34-08:39	0	0	9	3	20	0	0	24	0	0	0	0	56
08:39-08:44	0	0	6	2	21	0	1	40	0	1	0	0	71
TOTAL SURVEY	8	7	185	74	688	2	6	1014	8	11	2	2	
PEAK HOUR	7	3	100	44	410	1	2	584	7	7	2	1	
PHF	.58	.75	.76	.65	.76	.25	.5	.9	.58	.58	.25	.25	
TRUCKS	0	0	2	9	56	1	2	68	3	0	0	0	
% TRUCKS	0	0	1.1	12.2	8.1	50	33.3	6.7	37.5	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	1	0	0	0	0	
PEDS	0	2	0	0	0	0	0	0	0	0	1	0	

TRAFFIC SMITHY
Traffic Survey Service



Willow Creek Estates

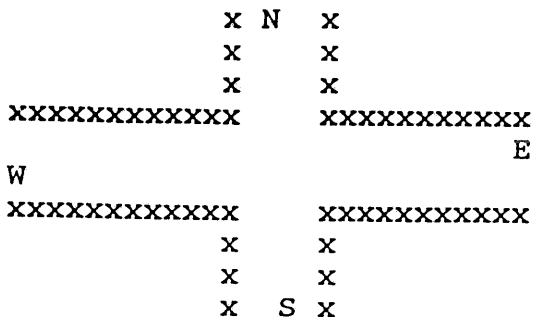
EXISTING TRAFFIC FLOW

PM PEAK HOUR

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., SUIT 206, PORTLAND, ORE. (503)641-6333

TRAFFIC TURNING COUNT SUMMARY REPORT

Territorial @ N. Pine St.



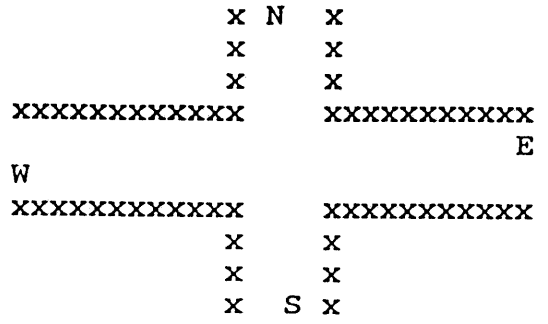
DATE OF COUNT 03/05/91
DAY OF WEEK Tue
TIME STARTED (HH:MM) 16:00
TIME ENDED (HH:MM) 18:00

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
16:00-16:05	1	1	0	0	0	0	0	0	1	3	6	0	12
16:05-16:10	1	3	0	0	0	0	0	0	1	2	5	0	12
16:10-16:15	0	5	0	0	0	0	0	0	2	0	7	0	14
16:15-16:20	1	2	0	0	0	0	1	0	4	0	7	0	15
16:20-16:25	2	4	0	0	0	0	1	0	1	1	5	0	14
16:25-16:30	0	3	0	0	0	0	0	0	0	3	6	0	12
16:30-16:35	0	5	0	0	0	0	1	0	2	2	8	0	18
16:35-16:40	3	6	0	0	0	0	0	0	0	1	11	0	21
16:40-16:45	1	5	0	0	0	0	0	0	2	2	11	0	21
16:45-16:50	0	3	0	0	0	0	0	0	1	3	3	0	10
16:50-16:55	1	8	0	0	0	0	0	0	0	5	14	0	28
16:55-17:00	1	6	0	0	0	0	1	0	2	1	13	0	24
17:00-17:05	2	11	0	0	0	0	4	0	0	1	9	0	27
17:05-17:10	2	5	0	0	0	0	1	0	1	2	13	0	24
17:10-17:15	1	10	0	0	0	0	0	0	1	0	14	0	26
17:15-17:20	2	7	0	0	0	0	0	0	0	4	6	0	19
17:20-17:25	0	6	0	0	0	0	0	0	1	0	14	0	21
17:25-17:30	3	6	0	0	0	0	2	0	2	0	14	0	27
17:30-17:35	1	5	0	0	0	0	2	0	1	1	10	0	20
17:35-17:40	0	6	0	0	0	0	0	0	4	2	10	0	22
17:40-17:45	0	10	0	0	0	0	0	0	2	2	6	0	20
17:45-17:50	0	7	0	0	0	0	1	0	2	1	10	0	21
17:50-17:55	0	9	0	0	0	0	0	0	1	0	7	0	17
17:55-18:00	1	8	0	0	0	0	0	0	2	0	4	0	15
TOTAL SURVEY	23	141	0	0	0	0	14	0	33	36	213	0	
PEAK HOUR	13	87	0	0	0	0	11	0	16	19	133	0	
PHF	.65	.84	0	0	0	0	.46	0	.5	.68	.88	0	
TRUCKS	2	17	0	0	0	0	0	0	4	4	15	0	
% TRUCKS	8.7	12.1	0	0	0	0	0	0	12.1	11.1	7	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
PEDS	0	2	0	0	2	0	0	0	0	0	1	0	

TRAFFIC SMITHY
Traffic Survey Service

TRAFFIC TURNING COUNT SUMMARY REPORT

Territorial Rd @ N Redwood Rd



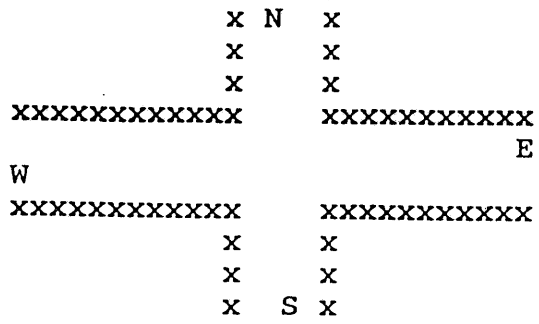
DATE OF COUNT 02/28/91
DAY OF WEEK Thu
TIME STARTED (HH:MM) 16:00
TIME ENDED (HH:MM) 18:00

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
16:00-16:05	0	7	0	1	0	0	1	0	0	0	7	0	16
16:05-16:10	0	8	3	0	0	0	2	0	0	0	8	0	21
16:10-16:15	0	3	0	0	0	0	0	0	0	0	7	1	11
16:15-16:20	0	4	2	0	0	0	0	0	0	0	9	0	15
16:20-16:25	0	5	0	0	0	0	1	1	0	0	3	0	10
16:25-16:30	0	9	0	2	1	0	1	0	0	0	7	0	20
16:30-16:35	1	1	0	4	4	2	1	0	0	0	6	0	19
16:35-16:40	1	5	0	4	1	0	0	0	0	2	10	0	23
16:40-16:45	2	6	0	0	0	0	2	0	0	0	8	0	18
16:45-16:50	2	10	0	0	0	0	2	0	0	0	9	0	23
16:50-16:55	2	7	0	0	0	0	0	0	0	1	9	0	19
16:55-17:00	0	1	0	0	0	0	1	0	0	0	5	0	7
17:00-17:05	0	3	0	0	0	0	4	0	1	0	9	0	17
17:05-17:10	0	9	0	0	1	0	2	0	0	0	13	0	25
17:10-17:15	2	1	0	0	0	0	0	0	1	0	9	0	13
17:15-17:20	0	3	0	0	0	0	0	0	1	1	4	0	9
17:20-17:25	4	7	0	0	0	0	0	0	0	0	8	0	19
17:25-17:30	1	4	0	0	0	0	0	0	0	0	12	0	17
17:30-17:35	2	3	0	0	0	0	0	0	0	0	14	0	19
17:35-17:40	0	3	0	0	0	0	1	0	0	0	12	0	16
17:40-17:45	1	7	0	0	0	0	1	0	0	0	7	0	16
17:45-17:50	0	7	0	0	0	0	0	0	1	0	10	0	18
17:50-17:55	0	6	0	0	0	0	1	0	0	0	19	0	26
17:55-18:00	0	4	0	0	0	0	0	0	0	0	10	0	14
TOTAL SURVEY	18	123	5	11	7	2	20	1	4	4	215	1	
PEAK HOUR	14	62	0	10	7	2	13	0	3	4	97	0	
PHF	.58	.67	0	.25	.29	.25	.46	0	.38	.5	.78	0	
TRUCKS	1	12	5	2	1	0	0	1	1	0	11	1	
% TRUCKS	5.6	9.8	100	18.2	14.3	0	0	100	25	0	5.1	100	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	1	0	
PEDS	0	0	0	0	0	0	0	2	0	0	0	0	

TRAFFIC SMITHY
Traffic Survey Service

TRAFFIC TURNING COUNT SUMMARY REPORT

Pacific Hwy @ Redwood St



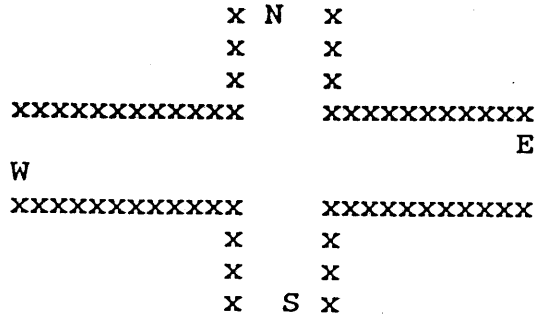
DATE OF COUNT 03/06/91
DAY OF WEEK Wed
TIME STARTED (HH:MM) 16:00
TIME ENDED (HH:MM) 18:00

APPROACH	>>>>>>>A<<<<<<<				>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
16:00-16:05	1	0	0	0	64	0	1	40	0	0	0	1	107
16:05-16:10	0	0	0	1	59	0	2	56	0	0	0	0	118
16:10-16:15	1	0	1	0	49	0	3	43	0	0	0	0	97
16:15-16:20	0	0	0	0	57	0	1	46	0	0	0	0	104
16:20-16:25	0	0	0	0	52	0	1	37	0	0	0	0	90
16:25-16:30	2	0	0	0	53	0	0	40	0	0	0	0	95
16:30-16:35	5	0	0	0	52	0	0	53	0	0	0	0	110
16:35-16:40	1	0	0	0	61	0	1	51	0	0	0	0	114
16:40-16:45	0	0	0	1	42	0	1	46	0	0	0	0	90
16:45-16:50	1	0	0	0	62	0	1	39	0	0	0	0	103
16:50-16:55	0	0	0	0	49	0	1	38	0	0	0	0	88
16:55-17:00	1	0	0	0	57	0	2	34	0	0	0	0	94
17:00-17:05	2	0	0	0	61	0	1	52	0	0	0	0	116
17:05-17:10	0	0	0	1	57	0	2	44	0	0	0	0	104
17:10-17:15	1	0	0	0	61	0	0	50	0	0	0	0	112
17:15-17:20	1	0	0	0	66	0	1	37	0	0	0	0	105
17:20-17:25	1	0	0	0	63	1	3	57	0	0	0	0	125
17:25-17:30	3	0	0	1	58	0	2	53	0	0	0	0	117
17:30-17:35	2	0	0	1	51	0	1	46	0	0	0	0	101
17:35-17:40	0	0	0	1	39	0	7	43	0	0	0	0	90
17:40-17:45	2	0	0	2	47	0	3	35	0	0	0	0	89
17:45-17:50	1	0	0	0	43	0	2	38	0	0	0	0	84
17:50-17:55	1	0	0	0	53	0	1	42	0	0	0	0	97
17:55-18:00	0	0	0	0	45	0	1	35	0	0	0	0	81
TOTAL SURVEY	26	0	1	8	1301	1	38	1055	0	0	0	1	
PEAK HOUR	16	0	0	3	689	1	15	554	0	0	0	0	
PHF	.67	0	0	.75	.91	.25	.63	.92	0	0	0	0	
TRUCKS	1	0	0	1	72	0	0	71	0	0	0	0	
% TRUCKS	3.8	0	0	12.5	5.5	0	0	6.7	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
PEDS	0	0	0	0	0	0	0	0	0	0	0	0	

TRAFFIC SMITHY
Traffic Survey Service

TRAFFIC TURNING COUNT SUMMARY REPORT

Territorial Rd @ Pacific Hwy



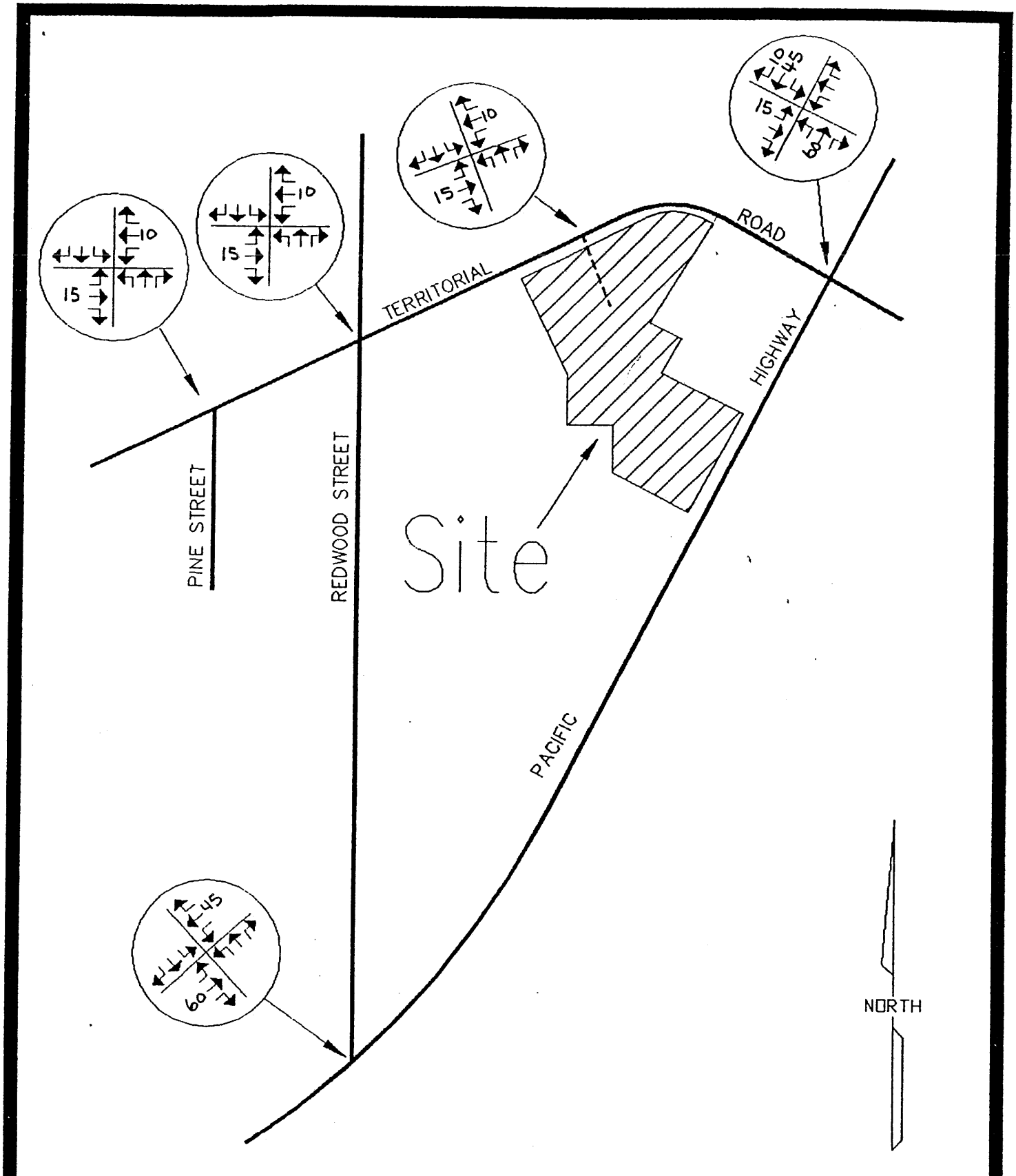
DATE OF COUNT 02/27/91
DAY OF WEEK Wed
TIME STARTED (HH:MM) 15:59
TIME ENDED (HH:MM) 17:59

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	WR	WT	WL	NR	NT	NL	SL	ST	SR	EL	ET	ER	ALL
15:59-16:04	1	0	6	10	63	1	0	41	1	1	0	1	125
16:04-16:09	1	0	12	10	38	1	0	43	0	1	0	0	106
16:09-16:14	1	0	3	7	54	0	2	46	1	1	0	0	115
16:14-16:19	0	0	5	4	55	0	1	41	2	0	0	1	109
16:19-16:24	1	0	6	2	49	0	0	38	2	0	0	0	98
16:24-16:29	1	0	2	5	44	1	1	49	0	2	1	0	106
16:29-16:34	0	0	1	6	53	0	1	39	0	0	1	0	101
16:34-16:39	1	0	9	8	63	0	0	41	0	1	0	0	123
16:39-16:44	0	0	5	9	57	0	1	36	0	0	1	0	109
16:44-16:49	1	2	9	4	48	1	0	47	0	0	1	0	113
16:49-16:54	1	0	2	2	49	0	0	36	1	0	0	0	91
16:54-16:59	0	0	4	9	43	0	1	37	1	0	0	0	95
16:59-17:04	0	0	6	9	63	0	1	37	1	0	1	0	118
17:04-17:09	1	0	7	16	53	0	0	45	0	0	0	0	122
17:09-17:14	1	1	10	3	60	0	0	33	2	0	1	0	111
17:14-17:19	0	0	3	10	61	0	0	47	0	0	0	1	122
17:19-17:24	0	0	2	14	51	0	0	32	0	0	0	0	99
17:24-17:29	0	0	6	10	60	0	1	46	0	1	0	0	124
17:29-17:34	2	0	6	14	51	1	5	30	0	0	0	0	109
17:34-17:39	0	0	3	19	57	0	0	35	1	1	1	1	118
17:39-17:44	0	0	6	14	48	0	1	44	0	0	1	0	114
17:44-17:49	2	0	6	14	45	0	0	45	0	0	0	0	112
17:49-17:54	0	0	5	8	42	0	0	26	0	0	0	1	82
17:54-17:59	1	0	6	11	50	0	2	36	0	0	2	0	108
TOTAL SURVEY	15	3	130	218	1257	5	17	950	12	8	10	5	
PEAK HOUR	7	1	66	142	641	1	10	456	4	2	6	3	
PHF	.58	.25	.72	.76	.91	.25	.42	.91	.33	.25	.75	.75	
TRUCKS	2	0	11	20	79	1	1	56	0	1	1	0	
% TRUCKS	13.3	0	8.5	9.2	6.3	20	5.9	5.9	0	12.5	10	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
PEDS	0	1	0	0	2	0	0	2	0	0	0	0	

TRAFFIC SMITHY
Traffic Survey Service

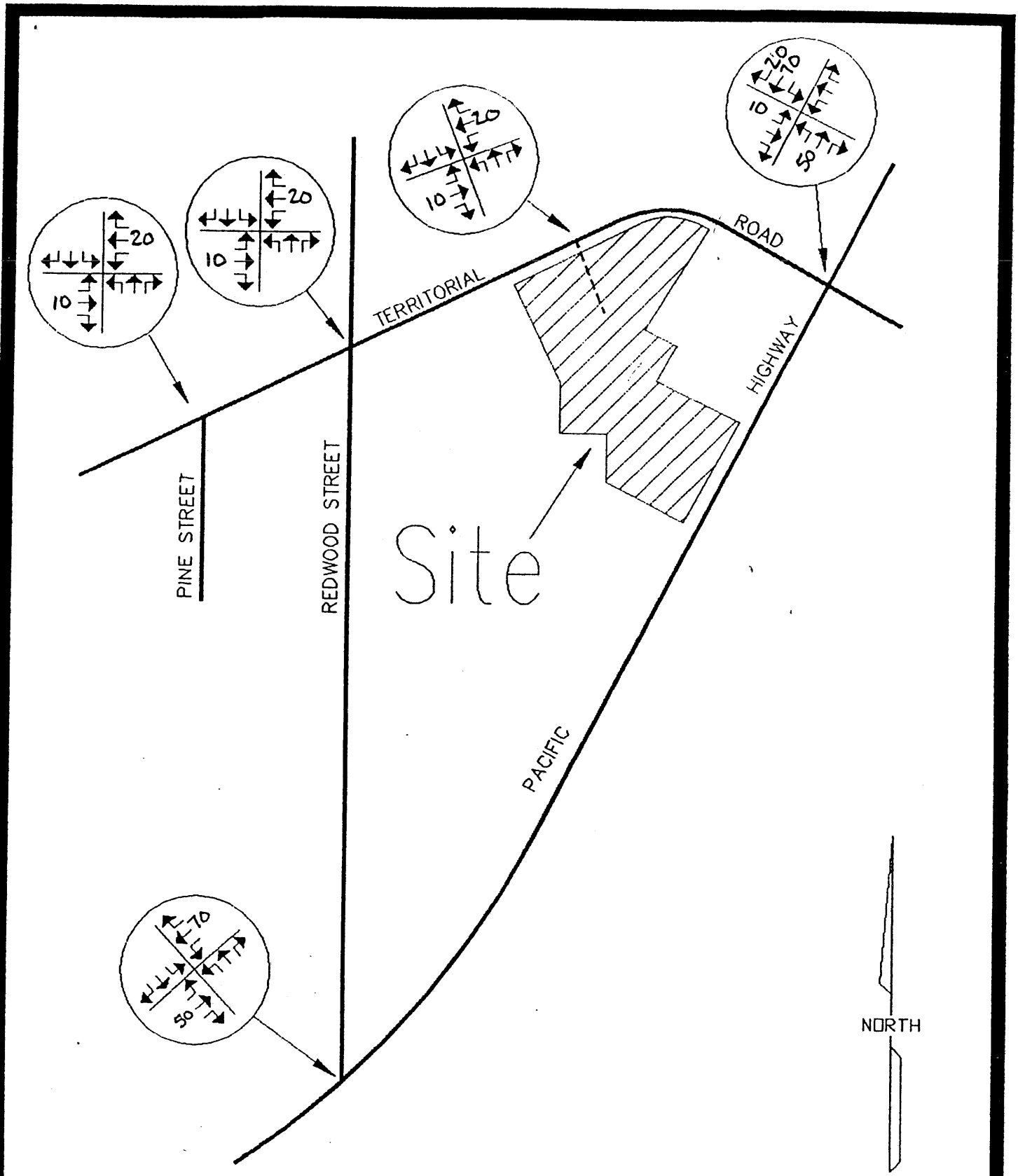
APPENDIX F
Traffic Growth

The traffic growth was assumed at a 10% increase for traffic on Pacific Highway and Territorial Road. This increase is used to provide a level of service comparison for the immediate future.



Willow Creek Estates
TRAFFIC GROWTH
AM PEAK HOUR

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., SUIT 206, PORTLAND, ORE. (503)641-6333



Willow Creek Estates
TRAFFIC GROWTH
PM PEAK HOUR

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., SUIT 206, PORTLAND, ORE. (503)641-6333

APPENDIX G
Intersection Analysis

Traffic Projections:

Estimated Existing - Estimated Existing traffic flow from field measurements conducted February and March 1991.

Existing + Phase 1 - Existing plus site generated traffic flow for Phase 1 (50 single-family and 60 multi-family dwelling units).

Existing + Phase 1 & 2 - Existing plus site generated traffic flow from both Phase 1 and 2 (83 single-family and 60 multi-family dwelling units).

Total Traffic - Existing and site plus traffic growth. Traffic growth is assumed at a 10% increase over existing traffic flow level.

LEVEL OF SERVICE CRITERIA
FOR
UNSIGNALIZED INTERSECTIONS

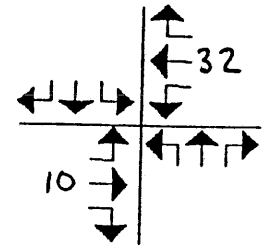
Reserve Capacity(1) vehicles/hour	LOS	Expected Delay to Minor Street Traffic
>400	A	Little or no delay
300-399	B	Short traffic delays
200-299	C	Average traffic delays
100-199	D	Long traffic delays
0-99	E	Very long traffic delays
*	F	*

(1) Reserve Capacity = Adjusted Capacity - Demand

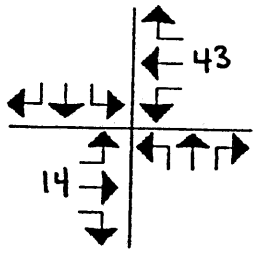
LOS = Level of Service

*When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement to the intersection.

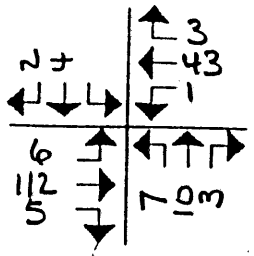
Source: "Highway Capacity Manual"; Special Report 209; Transportation Research Board (1985).



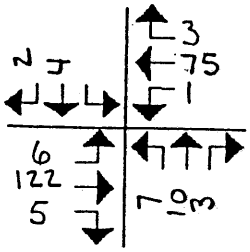
Site(Phase 1)



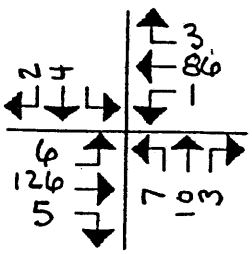
Site (Total)



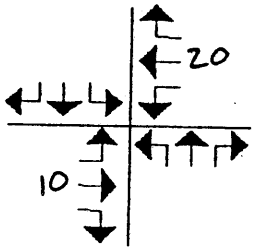
EXISTING



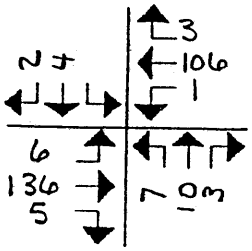
Existing+Phase 1



Existing+Total



TRAFFIC GROWTH



Total Traffic

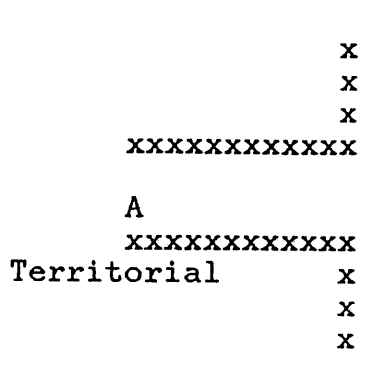
AM Peak Hour

Willow Creek Estates

REDWOOD AT TERRITORIAL

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503) 641-6333

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Territorial



Date of Count: Existing
Day of Week: Weekday
Time of Day: AM Peak Hour
Prevailing Speed: 35
# of lanes on major street: 2
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<	>>>>>>>D<<<<<<<	>>>>>>>C<<<<<<<	>>>>>>>B<<<<<<<									
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	6	112	5	0	4	2	7	10	3	1	43	3
PCH	7				4	2	8	11	3	1		

RIGHT TURNS FROM C (CR)
CONFLICTING FLOW .5AR+AT= 114.5 — CAPACITY 1083
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1083
CAPACITY USED= .28% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 3

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 44.5 — CAPACITY 1156
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1156
CAPACITY USED= .17% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 2

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 46 — CAPACITY 1241
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1241
CAPACITY USED= .56% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 7

LEFT TURNS FROM B (BL)
CONFLICTING FLOW AR+AT= 117 — CAPACITY 1173
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1173
CAPACITY USED= 9.000001E-02% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 1

THRU MOVEMENT FROM C (CT)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 167.5 — CAPACITY 926
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 926
CAPACITY USED= 1.19% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 11

THRU MOVEMENT FROM D (DT)
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 168.5 — CAPACITY 925
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 925
CAPACITY USED= .43% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 4

LEFT TURNS FROM C (CL)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 173.5 — CAPACITY 822
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 822
CAPACITY USED= .97% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 8

CAPACITY OF SHARED LANES FOR APPROACH C 902 — DEMAND (LOS=A) 22
CAPACITY OF SHARED LANES FOR APPROACH D 991 — DEMAND (LOS=A) 6

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Territorial

```
                  x D  x Redwood        Date of Count: Existing+Site
                  x    x                Day of Week: Weekday
                  x    x                Time of Day: AM Peak Hour
       xxxxxxxxxxxxx   xxxxxxxxxxxxx    Prevailing Speed: 35
                                   B    # of lanes on major street: 2
       A                                APPROACH GRADES:
       xxxxxxxxxxxxx   xxxxxxxxxxxxx      A 0%:B 0%:C 0%:D 0%
 Territorial       x   x                SHARED LANES:
                   x   x                  APPROACH C: none
                   x  C x                 APPROACH D: none
```

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<	
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	6	122	5	0	4	2	7	10	3	1	75	3
PCH	7				4	2	8	11	3	1		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 124.5	CAPACITY	1071
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1071
CAPACITY USED= .28% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	3
RIGHT TURNS FROM D (DR)		
CONFLICTING FLOW .5BR+BT= 76.5	CAPACITY	1124
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1124
CAPACITY USED= .18% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	2
LEFT TURNS FROM A (AL)		
CONFLICTING FLOW BR+BT= 78	CAPACITY	1211
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1211
CAPACITY USED= .58% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	7
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 127	CAPACITY	1163
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1163
CAPACITY USED= 9.000001E-02% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 209.5	CAPACITY	880
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	880
CAPACITY USED= 1.25% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	11
THRU MOVEMENT FROM D (DT)		
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 210.5	CAPACITY	879
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	879
CAPACITY USED= .46% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	4
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 215.5	CAPACITY	782
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	782
CAPACITY USED= 1.02% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	8

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

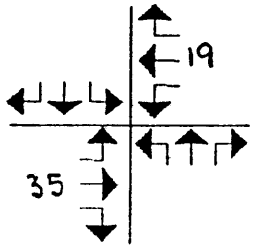
UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Territorial

```
                x D  x Redwood        Date of Count: Existing+p1&p2
                x    x                Day of Week: Weekday
                x    x                Time of Day: AM Peak Hour
     xxxxxxxxxxxx    xxxxxxxxxxxx     Prevailing Speed: 35
                                  B    # of lanes on major street: 2
     A                                APPROACH GRADES:
     xxxxxxxxxxxx    xxxxxxxxxxxx       A 0%:B 0%:C 0%:D 0%
Territorial     x    x                SHARED LANES:
                x    x                  APPROACH C: all
                x  C x                  APPROACH D: all
```

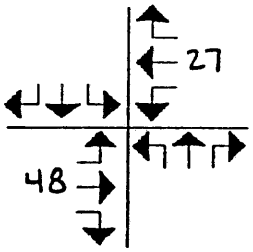
APPROACH	>>>>>>>A<<<<<<<		>>>>>>>D<<<<<<<		>>>>>>>C<<<<<<<		>>>>>>>B<<<<<<<				
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	6	126	5	0	4	2	7	10	3	1	86	3
PCH	7				4	2	8	11	3	1		

RIGHT TURNS FROM C (CR)			
CONFLICTING FLOW .5AR+AT= 128.5		CAPACITY	1066
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	1066
CAPACITY USED= .28% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	3
RIGHT TURNS FROM D (DR)			
CONFLICTING FLOW .5BR+BT= 87.5		CAPACITY	1113
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	1113
CAPACITY USED= .18% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	2
LEFT TURNS FROM A (AL)			
CONFLICTING FLOW BR+BT= 89		CAPACITY	1200
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	1200
CAPACITY USED= .58% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	7
LEFT TURNS FROM B (BL)			
CONFLICTING FLOW AR+AT= 131		CAPACITY	1159
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	1159
CAPACITY USED= 9.000001E-02% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)			
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 224.5		CAPACITY	864
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	864
CAPACITY USED= 1.27% IMPEDANCE CREATED= .99		DEMAND (LOS=A)	11
THRU MOVEMENT FROM D (DT)			
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 225.5		CAPACITY	863
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	863
CAPACITY USED= .46% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	4
LEFT TURNS FROM C (CL)			
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 230.5		CAPACITY	769
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	769
CAPACITY USED= 1.04% IMPEDANCE CREATED= .99		DEMAND (LOS=A)	8
CAPACITY OF SHARED LANES FOR APPROACH C 848		DEMAND (LOS=A)	22
CAPACITY OF SHARED LANES FOR APPROACH D 933		DEMAND (LOS=A)	6

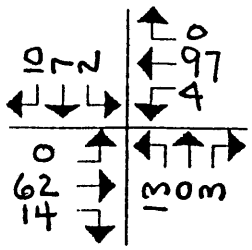
LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH



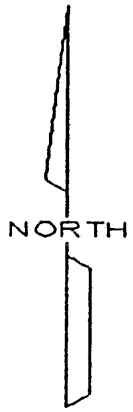
Site(Phase 1)

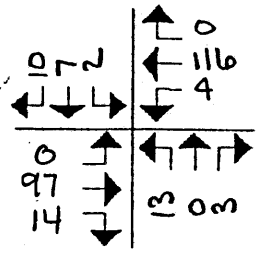


Site (Total)

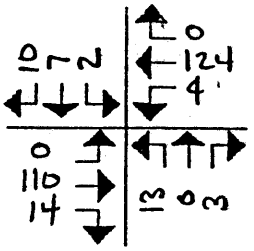


EXISTING

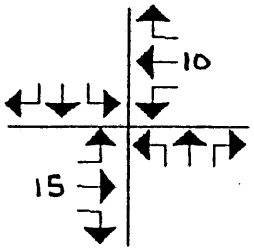




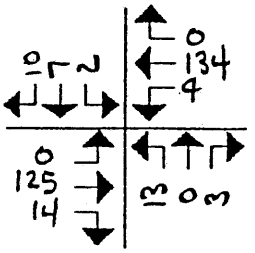
Existing+Phase 1



Existing+Total



TRAFFIC GROWTH



Total Traffic

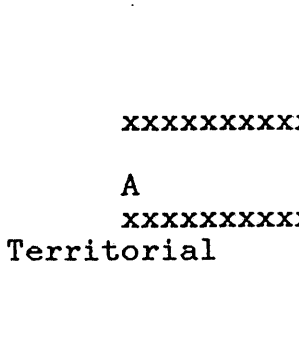
PM Peak Hour

Willow Creek Estates

Redwood at Territorial

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503) 641-6333

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Territorial



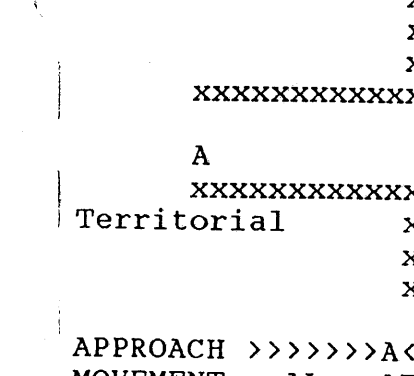
Date of Count: Existing
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 35
# of lanes on major street: 2
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	62	14	13	0	3	2	7	10	4	97	0
PCH				14		3	2	8	11	4		

RIGHT TURNS FROM C (CR)			
CONFLICTING FLOW .5AR+AT= 69		CAPACITY	1131
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	1131
CAPACITY USED= .97% IMPEDANCE CREATED= .99		DEMAND (LOS=A)	11
RIGHT TURNS FROM D (DR)			
CONFLICTING FLOW .5BR+BT= 97		CAPACITY	1103
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	1103
CAPACITY USED= .27% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	3
LEFT TURNS FROM B (BL)			
CONFLICTING FLOW AR+AT= 76		CAPACITY	1213
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	1213
CAPACITY USED= .33% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	4
THRU MOVEMENT FROM C (CT)			
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 170		CAPACITY	923
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	923
CAPACITY USED= .87% IMPEDANCE CREATED= .99		DEMAND (LOS=A)	8
LEFT TURNS FROM C (CL)			
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 173		CAPACITY	822
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	822
CAPACITY USED= .24% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	2
LEFT TURNS FROM D (DL)			
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 194		CAPACITY	801
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .98		ADJUSTED CAPACITY	785
CAPACITY USED= 1.78% IMPEDANCE CREATED= .99		DEMAND (LOS=A)	14
CAPACITY OF SHARED LANES FOR APPROACH C 1008		DEMAND (LOS=A)	21
CAPACITY OF SHARED LANES FOR APPROACH D 827		DEMAND (LOS=A)	17

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Territorial



Date of Count: Existing+Site
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 35
# of lanes on major street: 2
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: none
APPROACH D: none

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<	
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	97	14	2	7	10	13	0	3	4	116	0
PCH				2	8	11	14		3	4		

RIGHT TURNS FROM C (CR)
CONFLICTING FLOW .5AR+AT= 104
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= .27% IMPEDANCE CREATED= 1

CAPACITY	1095
ADJUSTED CAPACITY	1095
DEMAND (LOS=A)	3

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 116
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 1.02% IMPEDANCE CREATED= .99

CAPACITY	1081
ADJUSTED CAPACITY	1081
DEMAND (LOS=A)	11

LEFT TURNS FROM B (BL)
CONFLICTING FLOW AR+AT= 111
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= .34% IMPEDANCE CREATED= 1

CAPACITY	1179
ADJUSTED CAPACITY	1179
DEMAND (LOS=A)	4

THRU MOVEMENT FROM D (DT)
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 231
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= .93% IMPEDANCE CREATED= .99

CAPACITY	857
ADJUSTED CAPACITY	857
DEMAND (LOS=A)	8

LEFT TURNS FROM C (CL)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 241
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .98
CAPACITY USED= 1.88% IMPEDANCE CREATED= .99

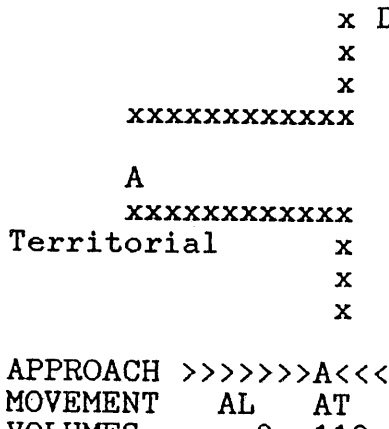
CAPACITY	760
ADJUSTED CAPACITY	745
DEMAND (LOS=A)	14

LEFT TURNS FROM D (DL)
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 234
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= .26% IMPEDANCE CREATED= 1

CAPACITY	766
ADJUSTED CAPACITY	766
DEMAND (LOS=A)	2

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Territorial



Date of Count: Existing+P1&p2
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 35
# of lanes on major street: 2
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<

MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	110	14	13	0	3	2	7	10	4	124	0
PCH				14		3	2	8	11	4		

RIGHT TURNS FROM C (CR)
CONFLICTING FLOW .5AR+AT= 117 — CAPACITY 1080
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1080
CAPACITY USED= 1.02% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 11

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 124 — CAPACITY 1071
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1071
CAPACITY USED= .28% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 3

LEFT TURNS FROM B (BL)
CONFLICTING FLOW AR+AT= 124 — CAPACITY 1166
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1166
CAPACITY USED= .34% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 4

THRU MOVEMENT FROM C (CT)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 245 — CAPACITY 843
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 843
CAPACITY USED= .95% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 8

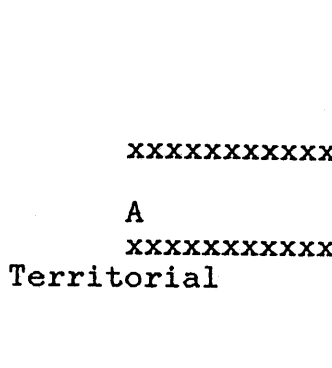
LEFT TURNS FROM C (CL)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 248 — CAPACITY 754
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 754
CAPACITY USED= .27% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 2

LEFT TURNS FROM D (DL)
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 269 — CAPACITY 736
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .98 — ADJUSTED CAPACITY 721
CAPACITY USED= 1.94% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 14

CAPACITY OF SHARED LANES FOR APPROACH C 941 — DEMAND (LOS=A) 21
CAPACITY OF SHARED LANES FOR APPROACH D 765 — DEMAND (LOS=A) 17

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Territorial



Date of Count: Total Traffic
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 35
# of lanes on major street: 2
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	125	14	13	0	3	2	7	10	4	134	0
PCH				14		3	2	8	11	4		

RIGHT TURNS FROM C (CR)
CONFLICTING FLOW .5AR+AT= 132 — CAPACITY 1062
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1062
CAPACITY USED= 1.04% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 11

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 134 — CAPACITY 1059
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1059
CAPACITY USED= .28% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 3

LEFT TURNS FROM B (BL)
CONFLICTING FLOW AR+AT= 139 — CAPACITY 1151
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1151
CAPACITY USED= .35% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 4

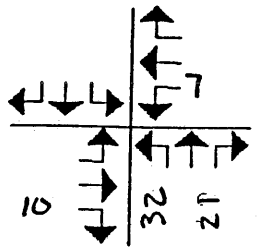
THRU MOVEMENT FROM C (CT)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 270 — CAPACITY 817
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 817
CAPACITY USED= .98% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 8

LEFT TURNS FROM C (CL)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 273 — CAPACITY 733
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 733
CAPACITY USED= .27% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 2

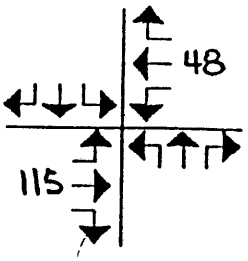
LEFT TURNS FROM D (DL)
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 294 — CAPACITY 715
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .98 — ADJUSTED CAPACITY 701
CAPACITY USED= 2% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 14

CAPACITY OF SHARED LANES FOR APPROACH C 918 — DEMAND (LOS=A) 21
CAPACITY OF SHARED LANES FOR APPROACH D 745 — DEMAND (LOS=A) 17

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

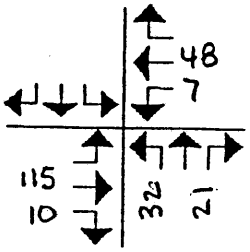


Site(Phase 1)

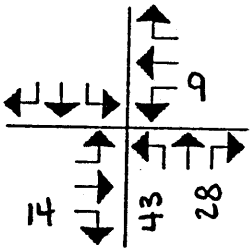


EXISTING

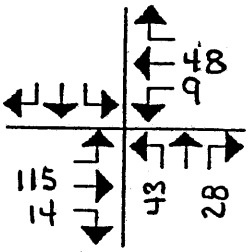
NORTH



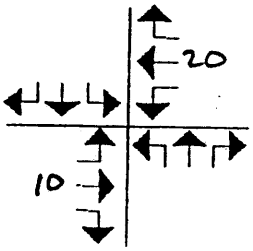
Existing+Phase 1



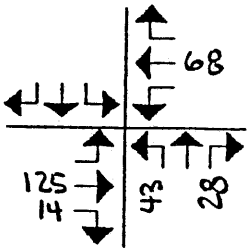
Site (Total)



Existing+Total



TRAFFIC GROWTH



Total Traffic

AM Peak Hour

Willow Creek Estates
TERRITORIAL AT TEAKWOOD

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503) 641-6333

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Teakwood

```
                                          Date of Count: Existing+p1
                                          Day of Week: Weekday
                                          Time of Day: AM Peak Hour
      xxxxxxxxxxxxxxxxxxxxxxxxxxxx        Prevailing Speed: 35
                                    B     # of lanes on major street: 2
      A
      xxxxxxxxxxxx     xxxxxxxxxxxx      APPROACH GRADES:
Territorial      x     x                   A 0%:B 0%:C 0%
                 x     x                 SHARED LANES:
                 x  C  x Teakwood          APPROACH C: none
```

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	115	10	0	0	0	26	0	19	7	48	0
PCH							29		21	8		

RIGHT TURNS FROM C (CR)
- CONFLICTING FLOW .5AR+AT= 120 — CAPACITY 1076
- CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1076
- CAPACITY USED= 1.95% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 21

LEFT TURNS FROM B (BL)
- CONFLICTING FLOW AR+AT= 125 — CAPACITY 1165
- CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1165
- CAPACITY USED= .69% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 8

LEFT TURNS FROM C (CL)
- CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 175 — CAPACITY 820
- CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 820
- CAPACITY USED= 3.54% IMPEDANCE CREATED= .98 — DEMAND (LOS=A) 29

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territoral at Teakwood

```
                                        Date of Count: Exiting+P1
                                        Day of Week: Weekday
                                        Time of Day: AM Peak Hour
     xxxxxxxxxxxxxxxxxxxxxxxxxxxxx      Prevailing Speed: 35
                                   B    # of lanes on major street: 2
     A                                  APPROACH GRADES:
     xxxxxxxxxxxx    xxxxxxxxxxxx         A 0%:B 0%:C 0%
Teritorial       x    x                 SHARED LANES:
                 x    x                   APPROACH C: none
                 x  C x Teakwood
```

APPROACH	>>>>>>>A<<<<<<<<<<<<<<D<<<<<<<<<<<<<<C<<<<<<<<<<<<<<B<<<<<<<											
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	115	10	0	0	0	32	0	21	7	48	0
PCH							35		23	8		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 120	CAPACITY	1076
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1076
CAPACITY USED= 2.14% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	23
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 125	CAPACITY	1165
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1165
CAPACITY USED= .69% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	8
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 175	CAPACITY	820
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	820
CAPACITY USED= 4.27% IMPEDANCE CREATED= .97	DEMAND (LOS=A)	35

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Teakwood

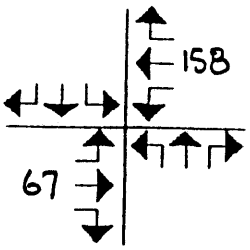
Date of Count: Total Traffic
Day of Week: Weekday
Time of Day: AM Peak Hour
Prevailing Speed: 35
# of lanes on major street: 2
APPROACH GRADES:
A 0%:B 0%:C 0%
SHARED LANES:
APPROACH C: none

```
      xxxxxxxxxxxxxxxxxxxxxxxxxxxx
                                  B
      A
      xxxxxxxxxxxx     xxxxxxxxxxxx
Territorial      x     x
                 x     x
                 x  C  x Teakwood
```

APPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<												
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	125	14	0	0	0	43	0	28	9	68	0
PCH							47		31	10		

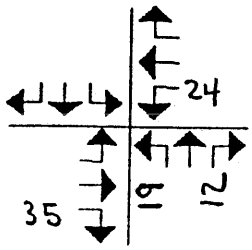
RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 132	CAPACITY	1062
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1062
CAPACITY USED= 2.92% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	31
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 139	CAPACITY	1151
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1151
CAPACITY USED= .87% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	10
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 209	CAPACITY	787
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .99	ADJUSTED CAPACITY	779
CAPACITY USED= 6.03% IMPEDANCE CREATED= .96	DEMAND (LOS=A)	47

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

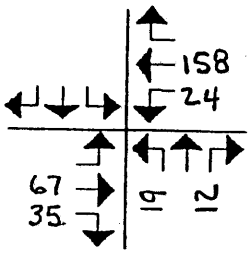


EXISTING

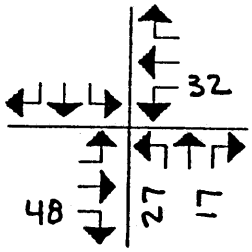
NORTH



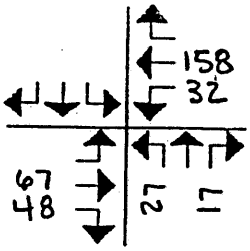
Site(Phase 1)



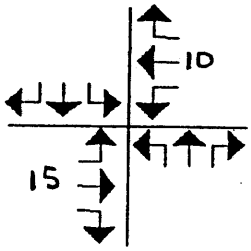
Existing+Phase 1



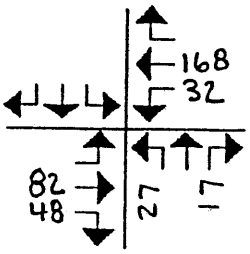
Site (Total)



Existing+Total



TRAFFIC GROWTH



Total Traffic

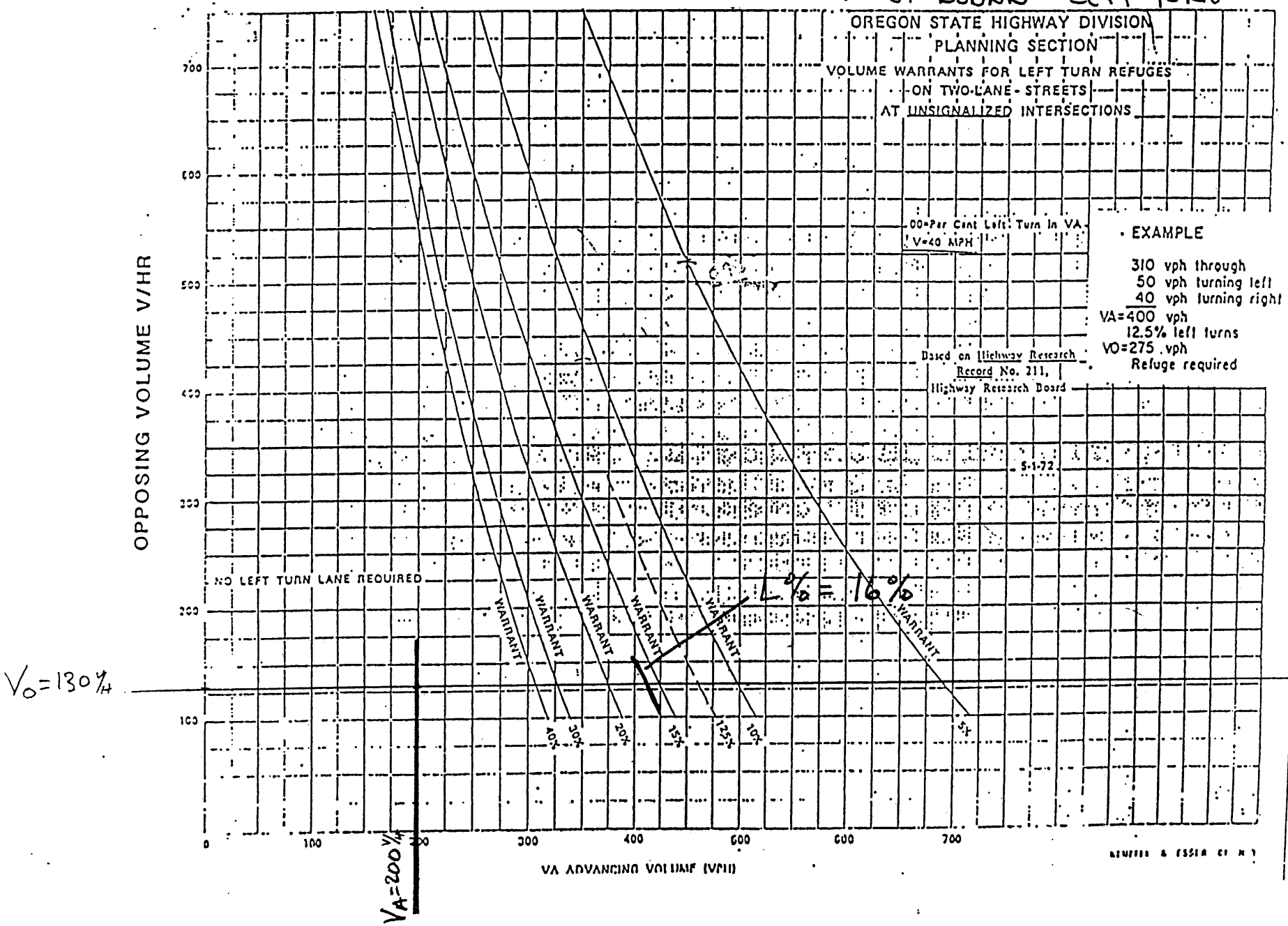
PM Peak Hour

Willow Creek Estates

Territorial at Teakwood

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503) 641-6333

Territorial at Teakwood
total traffic / PM Peak Hour
West Bound Left Turn



$V_O = 130$ vph

$V_A = 200$ vph

L% = 16%

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Teakwood

```
                                        Date of Count: Existing+p1
                                        Day of Week: Weekday
                                        Time of Day: PM Peak Hour
     xxxxxxxxxxxxxxxxxxxxxxxxxxxx       Prevailing Speed: 35
                                  B     # of lanes on major street: 2
     A                                  APPROACH GRADES:
     xxxxxxxxxxxx    xxxxxxxxxxxx         A 0%:B 0%:C 0%
Territorial     x    x                  SHARED LANES:
                x    x                    APPROACH C: none
                x  C x Teakwood
```

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	67	32	0	0	0	19	0	12	21	158	0
PCH							21		13	23		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 83	CAPACITY	1117
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1117
CAPACITY USED= 1.16% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	13
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 99	CAPACITY	1191
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1191
CAPACITY USED= 1.93% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	23
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 262	CAPACITY	742
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .99	ADJUSTED CAPACITY	735
CAPACITY USED= 2.86% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	21

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territoral at Teakwood

```
                                        Date of Count: Exiting+P1
                                        Day of Week: Weekday
                                        Time of Day: PM Peak Hour
      xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx    Prevailing Speed: 35
                                    B   # of lanes on major street: 2
      A                                 APPROACH GRADES:
      xxxxxxxxxxxxx     xxxxxxxxxxxxx     A 0%:B 0%:C 0%
Teritorial        x     x               SHARED LANES:
                  x     x                 APPROACH C: none
                  x  C  x Teakwood
```

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	67	35	0	0	0	19	0	12	24	158	0
PCH							21		13	26		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 84.5	CAPACITY	1116
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1116
CAPACITY USED= 1.16% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	13
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 102	CAPACITY	1188
CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	1188
CAPACITY USED= 2.19% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	26
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 266.5	CAPACITY	738
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .98	ADJUSTED CAPACITY	723
CAPACITY USED= 2.9% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	21

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Teakwood

```
                                          Date of Count: Total Traffic
                                          Day of Week: Weekday
                                          Time of Day: PM Peak Hour
      xxxxxxxxxxxxxxxxxxxxxxxxxxxx        Prevailing Speed: 35
                                   B      # of lanes on major street: 2
      A                                   APPROACH GRADES:
      xxxxxxxxxxxx     xxxxxxxxxxxx         A 0%:B 0%:C 0%
Territorial      x     x                 SHARED LANES:
                 x     x                   APPROACH C: none
                 x  C  x Teakwood
```

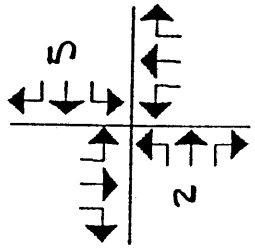
APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<	
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	0	82	48	0	0	0	27	0	17	32	168	0
PCH							30		19	35		

RIGHT TURNS FROM C (CR)
- CONFLICTING FLOW .5AR+AT= 106 — CAPACITY 1093
- CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1093
- CAPACITY USED= 1.74% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 19

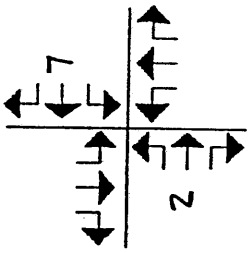
LEFT TURNS FROM B (BL)
- CONFLICTING FLOW AR+AT= 130 — CAPACITY 1160
- CRITICAL GAP= 4.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 1160
- CAPACITY USED= 3.02% IMPEDANCE CREATED= .98 — DEMAND (LOS=A) 35

LEFT TURNS FROM C (CL)
- CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 306 — CAPACITY 705
- CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= .98 — ADJUSTED CAPACITY 691
- CAPACITY USED= 4.34% IMPEDANCE CREATED= .97 — DEMAND (LOS=A) 30

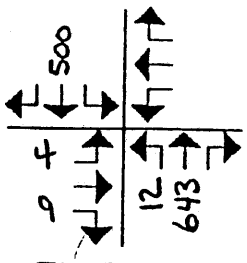
LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH



Site(Phase 1)

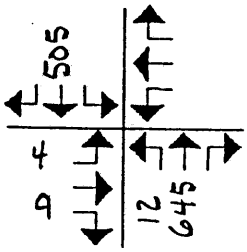


Site (Total)

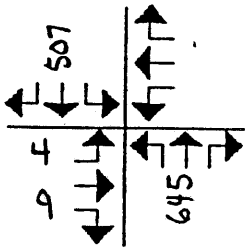


EXISTING

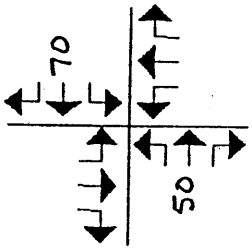
NORTH



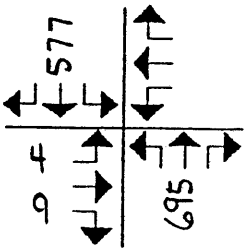
Existing+Phase 1



Existing+Total



TRAFFIC GROWTH



Total Traffic

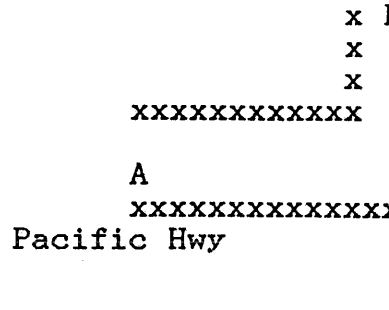
AM PEAK HOUR

Willow Creek Estates

REDWOOD AT PACIFIC HIGHWAY

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503) 641-6333

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Hwy



Date of Count: Existing
Day of Week: Weekday
Time of Day: AM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:D 0%
SHARED LANES:

APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	12	643	0	4	0	9	0	0	0	0	500	0
PCH	13			4		10						

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 375 — CAPACITY 643
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 643
CAPACITY USED= 1.56% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 10

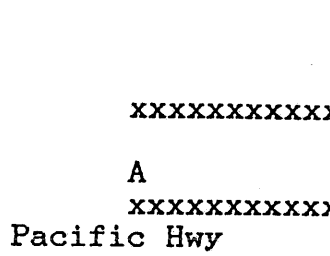
LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 375 — CAPACITY 721
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 721
CAPACITY USED= 1.8% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 13

LEFT TURNS FROM D (DL)
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 869.25 — CAPACITY 182
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .99 — ADJUSTED CAPACITY 180
CAPACITY USED= 2.22% IMPEDANCE CREATED= .98 — DEMAND (LOS=D) 4

CAPACITY OF SHARED LANES FOR APPROACH D 371 — DEMAND (LOS=B) 14

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Hwy



Date of Count: Existing+p1
Day of Week: Weekday
Time of Day: AM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:D 0%
SHARED LANES:

APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	12	645	0	4	0	9	0	0	0	0	505	0
PCH	13			4		10						

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 378.75
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 1.56% IMPEDANCE CREATED= .99

CAPACITY	639
ADJUSTED CAPACITY	639
DEMAND (LOS=A)	10

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 378.75
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 1.81% IMPEDANCE CREATED= .99

CAPACITY	718
ADJUSTED CAPACITY	718
DEMAND (LOS=A)	13

LEFT TURNS FROM D (DL)
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 874.5
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .99
CAPACITY USED= 2.25% IMPEDANCE CREATED= .98

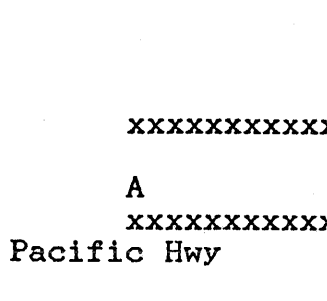
CAPACITY	180
ADJUSTED CAPACITY	178
DEMAND (LOS=D)	4

CAPACITY OF SHARED LANES FOR APPROACH D 367

DEMAND (LOS=B)	14

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Hwy



Date of Count: Existing+p1&p2
Day of Week: Weekday
Time of Day: AM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:D 0%
SHARED LANES:

APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	12	507	0	4	0	9	0	0	0	0	645	0
PCH	13			4		10						

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 483.75 — CAPACITY 561
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 561
CAPACITY USED= 1.78% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 10

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 483.75 — CAPACITY 633
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 633
CAPACITY USED= 2.05% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 13

LEFT TURNS FROM D (DL)
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 876 — CAPACITY 180
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .99 — ADJUSTED CAPACITY 178
CAPACITY USED= 2.25% IMPEDANCE CREATED= .98 — DEMAND (LOS=D) 4

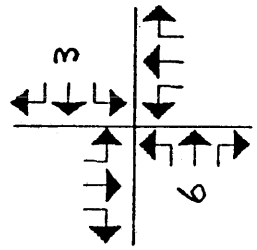
CAPACITY OF SHARED LANES FOR APPROACH D 347 — DEMAND (LOS=B) 14

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

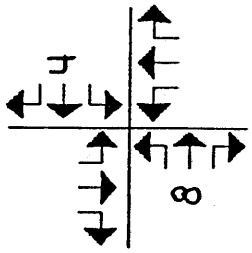
UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Hwy

```
                x D  x Redwood        Date of Count: Total Traffic
                x    x                Day of Week: Weekday
                x    x                Time of Day: AM Peak Hour
    xxxxxxxxxxxx     xxxxxxxxxxxx     Prevailing Speed: 45
                                  B    # of lanes on major street: 4
    A                                  APPROACH GRADES:
    xxxxxxxxxxxxxxxxxxxxxxxxxxxx         A 0%:B 0%:D 0%
acific Hwy                             SHARED LANES:

                                         APPROACH D: all

PPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<
MOVEMENT   AL   AT   AR   DL   DT   DR   CL   CT   CR   BL   BT   BR
VOLUMES    12  577    0    4    0    9    0    0    0    0  695    0
CH         13              4         10


IGHT TURNS FROM D (DR)
 CONFLICTING FLOW .5BR+BT= 521.25                  CAPACITY              535
 CRITICAL GAP= 6SEC.  IMPEDANCE ADJUSTMENT= 1      ADJUSTED CAPACITY     535
 CAPACITY USED= 1.87% IMPEDANCE CREATED= .99       DEMAND (LOS=A)         10
EFT TURNS FROM A (AL)
 CONFLICTING FLOW BR+BT= 521.25                    CAPACITY              605
 CRITICAL GAP= 5.5SEC.  IMPEDANCE ADJUSTMENT= 1    ADJUSTED CAPACITY     605
 CAPACITY USED= 2.15% IMPEDANCE CREATED= .98       DEMAND (LOS=A)         13
LEFT TURNS FROM D (DL)
 CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 966   CAPACITY              144
 CRITICAL GAP= 8SEC.  IMPEDANCE ADJUSTMENT= .98    ADJUSTED CAPACITY     141
 CAPACITY USED= 2.84% IMPEDANCE CREATED= .98       DEMAND (LOS=D)          4


APACITY OF SHARED LANES FOR APPROACH D 297         DEMAND (LOS=C)         14
```

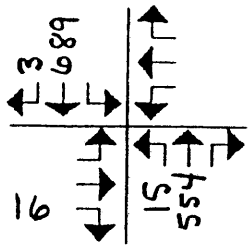
LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH



Site(Phase 1)

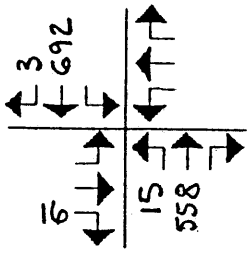


Site (Total)

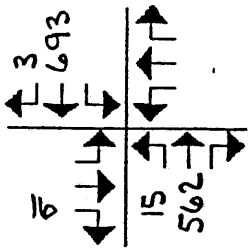


EXISTING

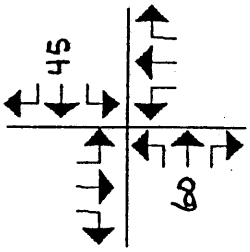
NORTH



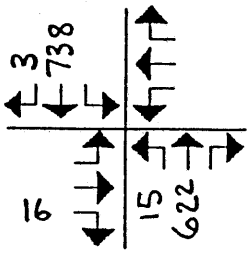
Existing+Phase 1



Existing+Total



TRAFFIC GROWTH



Total Traffic

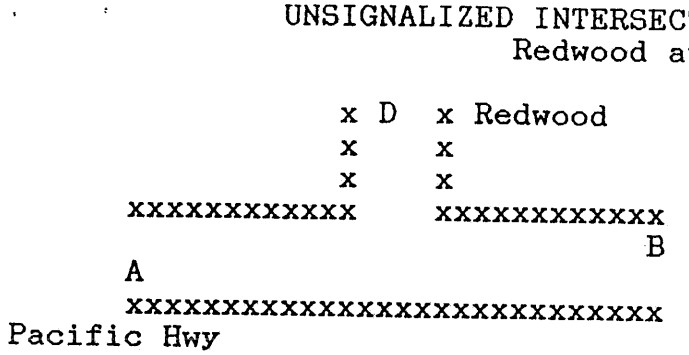
PM PEAK HOUR

Willow Creek Estates

REDWOOD AT PACIFIC HIGHWAY

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503)641-6333

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Hwy



Date of Count: Existing
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:D 0%
SHARED LANES:

APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	15	554	0	0	0	16	0	0	0	0	689	3
PCH	17					18						

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 517.875
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 3.35% IMPEDANCE CREATED= .98

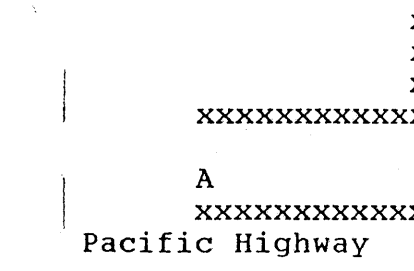
CAPACITY 537
ADJUSTED CAPACITY 537
DEMAND (LOS=A) 18

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 519
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 2.8% IMPEDANCE CREATED= .98

CAPACITY 607
ADJUSTED CAPACITY 607
DEMAND (LOS=A) 17

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Highway



Date of Count: Existing+P1
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 35
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:D 0%
SHARED LANES:

APPROACH D: none

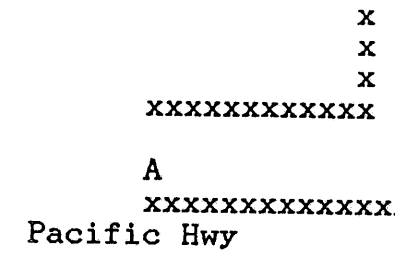
APPROACH	>>>>>>>A<<<<<<<<<<<<<D<<<<<<<<<<<<<C<<<<<<<<<<<<<B<<<<<<<											
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	15	558	0	0	0	16	0	0	0	0	692	3
PCH	17					18						

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 520.125 — CAPACITY 690
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 690
CAPACITY USED= 2.61% IMPEDANCE CREATED= .98 — DEMAND (LOS=A) 18

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 521.25 — CAPACITY 689
CRITICAL GAP= 5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 689
CAPACITY USED= 2.47% IMPEDANCE CREATED= .98 — DEMAND (LOS=A) 17

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Hwy



Date of Count: Existing+p1&p2
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:D 0%
SHARED LANES:

APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	15	562	0	0	0	16	0	0	0	0	693	3
PCH	17					18						

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 520.875
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 3.36% IMPEDANCE CREATED= .98

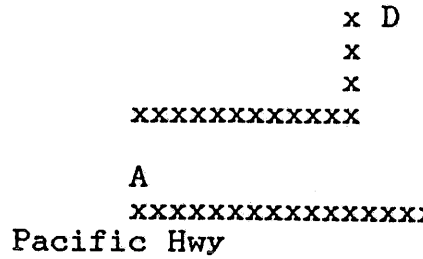
CAPACITY	535
ADJUSTED CAPACITY	535
DEMAND (LOS=A)	18

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 522
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 2.81% IMPEDANCE CREATED= .98

CAPACITY	605
ADJUSTED CAPACITY	605
DEMAND (LOS=A)	17

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Redwood at Pacific Hwy



Date of Count: Total Traffic
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:D 0%
SHARED LANES:

APPROACH D: all

APPROACH	>>>>>>>A<<<<<<<			>>>>>>>D<<<<<<<			>>>>>>>C<<<<<<<			>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	15	622	0	0	0	16	0	0	0	0	738	3
PCH	17					18						

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 554.625
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 3.52% IMPEDANCE CREATED= .98

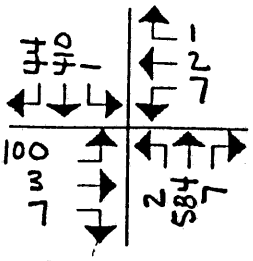
CAPACITY	512
ADJUSTED CAPACITY	512
DEMAND (LOS=A)	18

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 555.75
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1
CAPACITY USED= 2.93% IMPEDANCE CREATED= .98

CAPACITY	581
ADJUSTED CAPACITY	581
DEMAND (LOS=A)	17

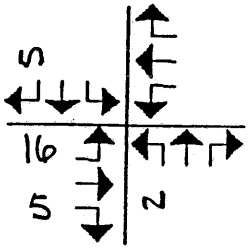
[redacted]

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

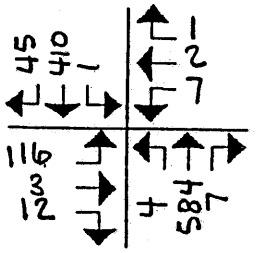


EXISTING

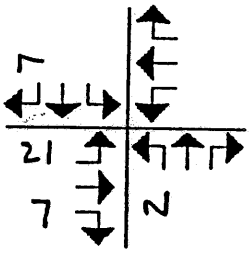
NORTH



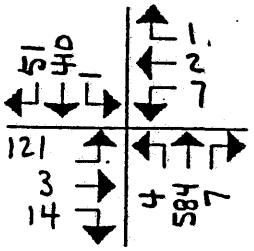
Site(Phase 1)



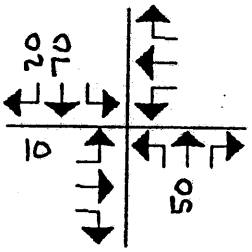
Existing+Phase 1



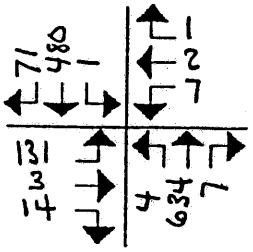
Site (Total)



Existing+Total



TRAFFIC GROWTH



Total Traffic

AM Peak Hour

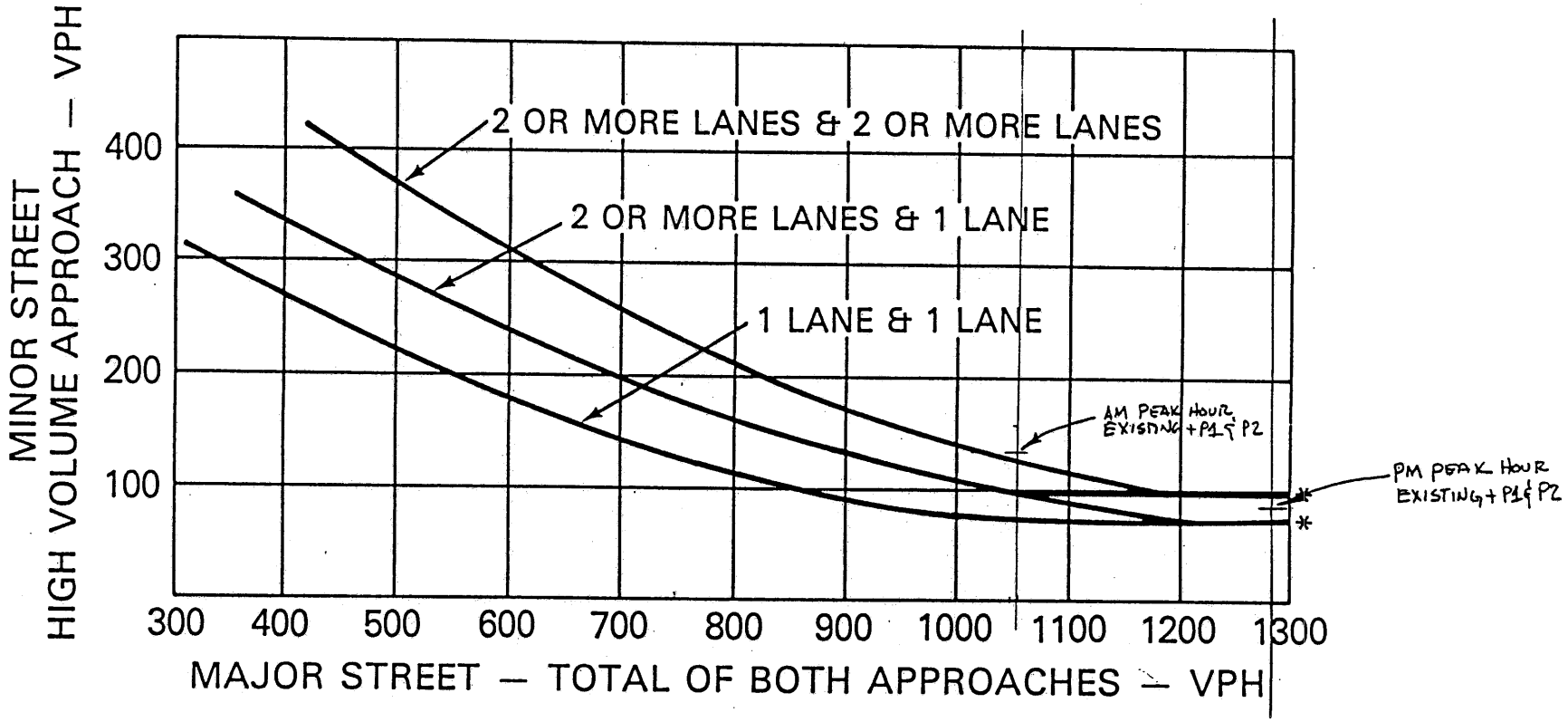
Willow Creek Estates

TERRITORIAL AT PACIFIC HIGHWAY

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503) 641-6333

FIGURE 4-6. PEAK HOUR VOLUME WARRANT

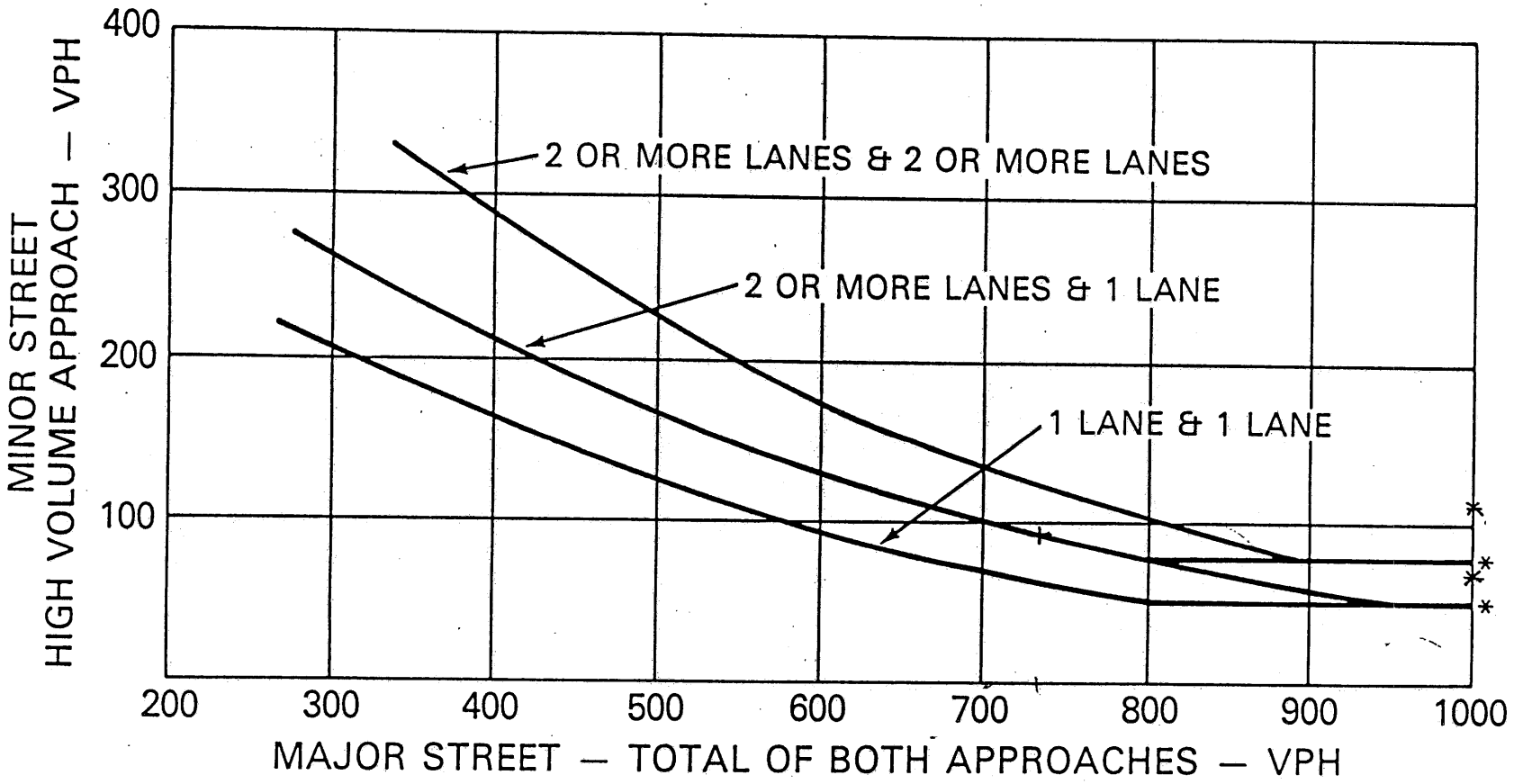
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*NOTE: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

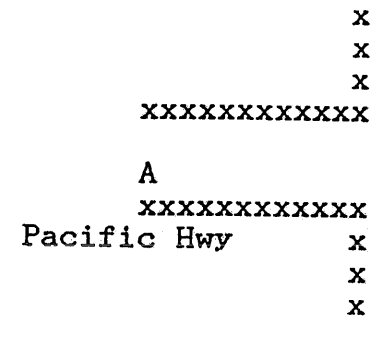
FIGURE 4-8. FOUR HOUR VOLUME WARRANT

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*NOTE: 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 60 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Pacific Highway



Date of Count: Existing
Day of Week: Weekday
Time of Day: AM peak hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<												
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	2	584	7	100	3	7	7	2	1	1	410	44
PCH	2			110	3	8	8	2	1	1		

RIGHT TURNS FROM C (CR)
CONFLICTING FLOW .5AR+AT= 440.625 — CAPACITY 592
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 592
CAPACITY USED= .17% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 1

RIGHT TURNS FROM D (DR)
CONFLICTING FLOW .5BR+BT= 324 — CAPACITY 688
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 688
CAPACITY USED= 1.16% IMPEDANCE CREATED= .99 — DEMAND (LOS=A) 8

LEFT TURNS FROM A (AL)
CONFLICTING FLOW BR+BT= 340.5 — CAPACITY 751
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 751
CAPACITY USED= .27% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 2

LEFT TURNS FROM B (BL)
CONFLICTING FLOW AR+AT= 443.25 — CAPACITY 665
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 665
CAPACITY USED= .15% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 1

THRU MOVEMENT FROM C (CT)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 784.125 — CAPACITY 246
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 246
CAPACITY USED= .81% IMPEDANCE CREATED= .99 — DEMAND (LOS=C) 2

THRU MOVEMENT FROM D (DT)
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 770.25 — CAPACITY 250
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 250
CAPACITY USED= 1.2% IMPEDANCE CREATED= .99 — DEMAND (LOS=C) 3

LEFT TURNS FROM C (CL)
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 794.12 — CAPACITY 212
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .98 — ADJUSTED CAPACITY 208
CAPACITY USED= 3.85% IMPEDANCE CREATED= .97 — DEMAND (LOS=C) 8

LEFT TURNS FROM D (DL)
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 773.25 — CAPACITY 221
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .99 — ADJUSTED CAPACITY 219
CAPACITY USED= 50.23% IMPEDANCE CREATED= .59 — DEMAND (LOS=D) 110

CAPACITY OF SHARED LANES FOR APPROACH C 228 — DEMAND (LOS=C) 11
CAPACITY OF SHARED LANES FOR APPROACH D 230 — DEMAND (LOS=D) 121

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Pacific Highway at Territorial Road

```
                x D  x Territorial    Date of Count: Existing+P1
                x    x                Day of Week: Weekday
                x    x                Time of Day: AM Peak Hour
      xxxxxxxxxxxx   xxxxxxxxxxxx     Prevailing Speed: 45
                                  B    # of lanes on major street: 4
      A                               APPROACH GRADES:
      xxxxxxxxxxxx   xxxxxxxxxxxx       A 0%:B 0%:C 0%:D 0%
Pacific Hwy     x    x                SHARED LANES:
                x    x                  APPROACH C: all
                x  C x                  APPROACH D: all
```

APPROACH >>>>>>>A<<<<<<<<<<<<<D<<<<<<<<<<<<<C<<<<<<<<<<<<<B<<<<<<<												
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	4	584	7	116	3	12	7	2	1	1	410	45
PCH	4			128	3	13	8	2	1	1		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 440.625	CAPACITY	592
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	592
CAPACITY USED= .17% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
RIGHT TURNS FROM D (DR)		
CONFLICTING FLOW .5BR+BT= 324.375	CAPACITY	688
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	688
CAPACITY USED= 1.89% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	13
LEFT TURNS FROM A (AL)		
CONFLICTING FLOW BR+BT= 341.25	CAPACITY	750
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	750
CAPACITY USED= .53% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	4
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 443.25	CAPACITY	665
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	665
CAPACITY USED= .15% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 786.875	CAPACITY	245
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	245
CAPACITY USED= .82% IMPEDANCE CREATED= .99	DEMAND (LOS=C)	2
THRU MOVEMENT FROM D (DT)		
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 772.625	CAPACITY	250
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	250
CAPACITY USED= 1.2% IMPEDANCE CREATED= .99	DEMAND (LOS=C)	3
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 801.87	CAPACITY	209
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .98	ADJUSTED CAPACITY	205
CAPACITY USED= 3.9% IMPEDANCE CREATED= .97	DEMAND (LOS=D)	8
LEFT TURNS FROM D (DL)		
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 775.62	CAPACITY	220
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .99	ADJUSTED CAPACITY	218
CAPACITY USED= 58.72% IMPEDANCE CREATED= .51	DEMAND (LOS=E)	128
CAPACITY OF SHARED LANES FOR APPROACH C 225	DEMAND (LOS=C)	11
CAPACITY OF SHARED LANES FOR APPROACH D 233	DEMAND (LOS=E)	144

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Pacific Highway

```
                  x D  x Territorial    Date of Count: Existing+p1&p2
                  x    x                Day of Week: Weekday
                  x    x                Time of Day: AM peak hour
       xxxxxxxxxxxx    xxxxxxxxxxxx     Prevailing Speed: 45
                                   B     # of lanes on major street: 4
       A                                 APPROACH GRADES:
       xxxxxxxxxxxx    xxxxxxxxxxxx       A 0%:B 0%:C 0%:D 0%
Pacific Hwy       x    x                SHARED LANES:
                  x    x                  APPROACH C: all
                  x  C x                  APPROACH D: all
```

APPROACH	>>>>>>>A<<<<<<<		>>>>>>>D<<<<<<<		>>>>>>>C<<<<<<<		>>>>>>>B<<<<<<<		
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	4	584	7	121	3	14	7	2	1	1	410	51
PCH	4			133	3	15	8	2	1	1		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 440.625	CAPACITY	592
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	592
CAPACITY USED= .17% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
RIGHT TURNS FROM D (DR)		
CONFLICTING FLOW .5BR+BT= 326.625	CAPACITY	686
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	686
CAPACITY USED= 2.19% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	15
LEFT TURNS FROM A (AL)		
CONFLICTING FLOW BR+BT= 345.75	CAPACITY	746
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	746
CAPACITY USED= .54% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	4
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 443.25	CAPACITY	665
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	665
CAPACITY USED= .15% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 791.375	CAPACITY	243
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	243
CAPACITY USED= .82% IMPEDANCE CREATED= .99	DEMAND (LOS=C)	2
THRU MOVEMENT FROM D (DT)		
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 774.875	CAPACITY	249
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	249
CAPACITY USED= 1.2% IMPEDANCE CREATED= .99	DEMAND (LOS=C)	3
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 808.37	CAPACITY	207
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .97	ADJUSTED CAPACITY	201
CAPACITY USED= 3.98% IMPEDANCE CREATED= .97	DEMAND (LOS=D)	8
LEFT TURNS FROM D (DL)		
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 777.87	CAPACITY	219
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .99	ADJUSTED CAPACITY	217
CAPACITY USED= 61.29% IMPEDANCE CREATED= .48	DEMAND (LOS=E)	133
CAPACITY OF SHARED LANES FOR APPROACH C 221	DEMAND (LOS=C)	11
CAPACITY OF SHARED LANES FOR APPROACH D 233	DEMAND (LOS=E)	151

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Pacific Highway

```
                  x D  x Territorial    Date of Count: Total Traffic
                  x    x                Day of Week: Weekday
                  x    x                Time of Day: AM Peak Hour
       xxxxxxxxxxxx    xxxxxxxxxxxx     Prevailing Speed: 45
                                   B     # of lanes on major street: 4
       A                                 APPROACH GRADES:
       xxxxxxxxxxxx    xxxxxxxxxxxx       A 0%:B 0%:C 0%:D 0%
Pacific Hwy       x    x                SHARED LANES:
                  x    x                  APPROACH C: all
                  x  C x                  APPROACH D: all
```

APPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<

MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	4	634	7	7	2	1	131	3	14	1	480	71
PCH	4			8	2	1	144	3	15	1		

RIGHT TURNS FROM C (CR)
- CONFLICTING FLOW .5AR+AT= 478.125 — CAPACITY 565
- CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 565
- CAPACITY USED= 2.65% IMPEDANCE CREATED= .98 — DEMAND (LOS=A) 15

RIGHT TURNS FROM D (DR)
- CONFLICTING FLOW .5BR+BT= 386.625 — CAPACITY 632
- CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 632
- CAPACITY USED= .16% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 1

LEFT TURNS FROM A (AL)
- CONFLICTING FLOW BR+BT= 413.25 — CAPACITY 689
- CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 689
- CAPACITY USED= .58% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 4

LEFT TURNS FROM B (BL)
- CONFLICTING FLOW AR+AT= 480.75 — CAPACITY 635
- CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 635
- CAPACITY USED= .16% IMPEDANCE CREATED= 1 — DEMAND (LOS=A) 1

THRU MOVEMENT FROM C (CT)
- CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 896.375 — CAPACITY 197
- CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 197
- CAPACITY USED= 1.52% IMPEDANCE CREATED= .99 — DEMAND (LOS=D) 3

THRU MOVEMENT FROM D (DT)
- CONFLICTING FLOW .5BR+BT+BL+AL+AR= 872.375 — CAPACITY 207
- CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= 1 — ADJUSTED CAPACITY 207
- CAPACITY USED= .97% IMPEDANCE CREATED= .99 — DEMAND (LOS=C) 2

LEFT TURNS FROM C (CL)
- CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 899.37 — CAPACITY 170
- CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .99 — ADJUSTED CAPACITY 168
- CAPACITY USED= 85.71% IMPEDANCE CREATED= .19 — DEMAND (LOS=E) 144

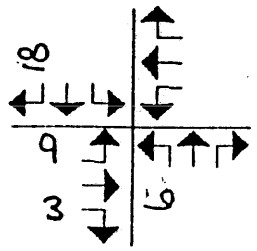
LEFT TURNS FROM D (DL)
- CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 889.37 — CAPACITY 174
- CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .97 — ADJUSTED CAPACITY 169
- CAPACITY USED= 4.73% IMPEDANCE CREATED= .97 — DEMAND (LOS=D) 8

CAPACITY OF SHARED LANES FOR APPROACH C 180 — DEMAND (LOS=E) 162

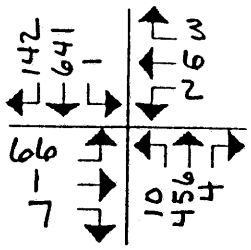
CAPACITY OF SHARED LANES FOR APPROACH D 188 — DEMAND (LOS=D) 11

LOS = Level of Service (11/89)

On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

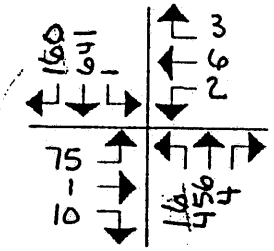


Site(Phase 1)

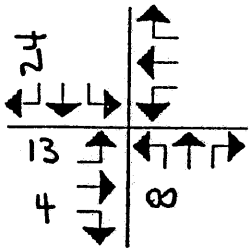


EXISTING

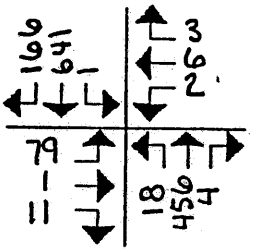
NORTH



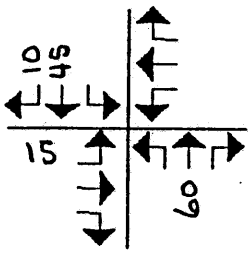
Existing+Phase 1



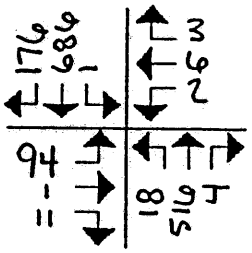
Site (Total)



Existing+Total



TRAFFIC GROWTH



Total Traffic

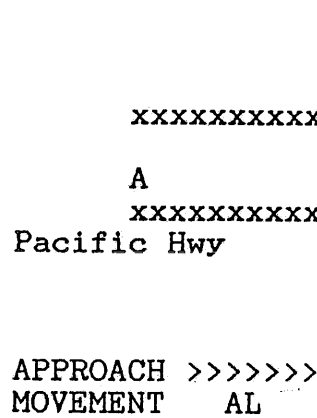
PM Peak Hour

Willow Creek Estates

Territorial at Pacific Highway

Robert
KEECH ASSOCIATES, INC.
CONSULTING TRAFFIC ENGINEER
1225 NW MURRAY BLVD., #206, PORTLAND, OREG. (503) 641-6333

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Pacific Highway



Date of Count: Existing
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<

MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	10	456	4	66	1	7	2	6	3	1	641	142
PCH	11			73	1	8	2	7	3	1		

RIGHT TURNS FROM C (CR)			
CONFLICTING FLOW .5AR+AT= 343.5		CAPACITY	671
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	671
CAPACITY USED= .45% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	3
RIGHT TURNS FROM D (DR)			
CONFLICTING FLOW .5BR+BT= 534		CAPACITY	526
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	526
CAPACITY USED= 1.52% IMPEDANCE CREATED= .99		DEMAND (LOS=A)	8
LEFT TURNS FROM A (AL)			
CONFLICTING FLOW BR+BT= 587.25		CAPACITY	559
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	559
CAPACITY USED= 1.97% IMPEDANCE CREATED= .99		DEMAND (LOS=A)	11
LEFT TURNS FROM B (BL)			
CONFLICTING FLOW AR+AT= 345		CAPACITY	747
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1		ADJUSTED CAPACITY	747
CAPACITY USED= .13% IMPEDANCE CREATED= 1		DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)			
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 941.75		CAPACITY	180
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .99		ADJUSTED CAPACITY	178
CAPACITY USED= 3.93% IMPEDANCE CREATED= .97		DEMAND (LOS=D)	7
THRU MOVEMENT FROM D (DT)			
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 890		CAPACITY	200
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .99		ADJUSTED CAPACITY	198
CAPACITY USED= .51% IMPEDANCE CREATED= 1		DEMAND (LOS=D)	1
LEFT TURNS FROM C (CL)			
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 949.75		CAPACITY	150
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .98		ADJUSTED CAPACITY	147
CAPACITY USED= 1.36% IMPEDANCE CREATED= .99		DEMAND (LOS=D)	2
LEFT TURNS FROM D (DL)			
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 899		CAPACITY	170
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .96		ADJUSTED CAPACITY	163
CAPACITY USED= 44.79% IMPEDANCE CREATED= .64		DEMAND (LOS=E)	73
CAPACITY OF SHARED LANES FOR APPROACH C 209		DEMAND (LOS=D)	12
CAPACITY OF SHARED LANES FOR APPROACH D 175		DEMAND (LOS=E)	82

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Pacific Highway at Territorial Road

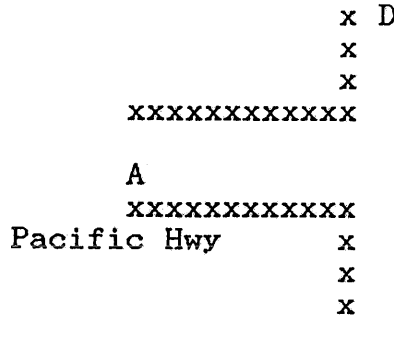
```
                  x D  x Territorial    Date of Count: Existing+P1
                  x    x                Day of Week: Weekday
                  x    x                Time of Day: PM Peak Hour
       xxxxxxxxxxxx    xxxxxxxxxxxx     Prevailing Speed: 45
                                   B     # of lanes on major street: 4
       A                                 APPROACH GRADES:
       xxxxxxxxxxxx    xxxxxxxxxxxx       A 0%:B 0%:C 0%:D 0%
 Pacific Hwy       x    x                SHARED LANES:
                   x    x                  APPROACH C: all
                   x  C x                  APPROACH D: all
```

APPROACH >>>>>>>A<<<<<<<<<<<<<<D<<<<<<<<<<<<<<C<<<<<<<<<<<<<<B<<<<<<<												
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	16	456	4	75	1	10	2	6	3	1	641	160
PCH	18			83	1	11	2	7	3	1		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 343.5	CAPACITY	671
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	671
CAPACITY USED= .45% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	3
RIGHT TURNS FROM D (DR)		
CONFLICTING FLOW .5BR+BT= 540.75	CAPACITY	521
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	521
CAPACITY USED= 2.11% IMPEDANCE CREATED= .99	DEMAND (LOS=A)	11
LEFT TURNS FROM A (AL)		
CONFLICTING FLOW BR+BT= 600.75	CAPACITY	549
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	549
CAPACITY USED= 3.28% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	18
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 345	CAPACITY	747
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	747
CAPACITY USED= .13% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 961.25	CAPACITY	174
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .98	ADJUSTED CAPACITY	171
CAPACITY USED= 4.09% IMPEDANCE CREATED= .97	DEMAND (LOS=D)	7
THRU MOVEMENT FROM D (DT)		
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 902.75	CAPACITY	194
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .98	ADJUSTED CAPACITY	190
CAPACITY USED= .53% IMPEDANCE CREATED= 1	DEMAND (LOS=D)	1
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 972.25	CAPACITY	141
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .97	ADJUSTED CAPACITY	137
CAPACITY USED= 1.46% IMPEDANCE CREATED= .99	DEMAND (LOS=D)	2
LEFT TURNS FROM D (DL)		
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 911.75	CAPACITY	165
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .95	ADJUSTED CAPACITY	157
CAPACITY USED= 52.87% IMPEDANCE CREATED= .56	DEMAND (LOS=E)	83
CAPACITY OF SHARED LANES FOR APPROACH C 200	DEMAND (LOS=D)	12
CAPACITY OF SHARED LANES FOR APPROACH D 171	DEMAND (LOS=E)	95

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Pacific Highway



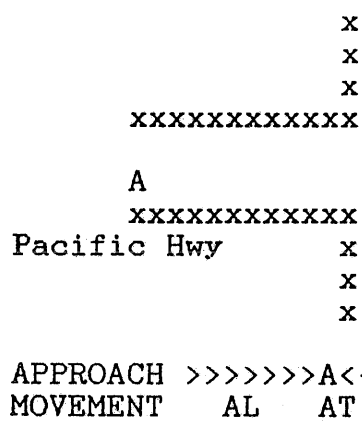
Date of Count: Existing+p1&p2
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<												
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	18	456	4	79	1	11	2	6	3	1	641	166
PCH	20			87	1	12	2	7	3	1		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 343.5	CAPACITY	671
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	671
CAPACITY USED= .45% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	3
RIGHT TURNS FROM D (DR)		
CONFLICTING FLOW .5BR+BT= 543	CAPACITY	520
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	520
CAPACITY USED= 2.31% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	12
LEFT TURNS FROM A (AL)		
CONFLICTING FLOW BR+BT= 605.25	CAPACITY	546
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	546
CAPACITY USED= 3.66% IMPEDANCE CREATED= .97	DEMAND (LOS=A)	20
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 345	CAPACITY	747
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	747
CAPACITY USED= .13% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 967.75	CAPACITY	171
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .97	ADJUSTED CAPACITY	166
CAPACITY USED= 4.22% IMPEDANCE CREATED= .97	DEMAND (LOS=D)	7
THRU MOVEMENT FROM D (DT)		
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 907	CAPACITY	193
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .97	ADJUSTED CAPACITY	187
CAPACITY USED= .53% IMPEDANCE CREATED= 1	DEMAND (LOS=D)	1
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 979.75	CAPACITY	138
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .95	ADJUSTED CAPACITY	131
CAPACITY USED= 1.53% IMPEDANCE CREATED= .99	DEMAND (LOS=D)	2
LEFT TURNS FROM D (DL)		
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 916	CAPACITY	164
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .94	ADJUSTED CAPACITY	154
CAPACITY USED= 56.49% IMPEDANCE CREATED= .53	DEMAND (LOS=E)	87
CAPACITY OF SHARED LANES FOR APPROACH C 194	DEMAND (LOS=D)	12
CAPACITY OF SHARED LANES FOR APPROACH D 169	DEMAND (LOS=E)	100

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

UNSIGNALIZED INTERSECTION CAPACITY WORKSHEET
Territorial at Pacific Highway



Date of Count: Total Traffic
Day of Week: Weekday
Time of Day: PM Peak Hour
Prevailing Speed: 45
# of lanes on major street: 4
APPROACH GRADES:
A 0%:B 0%:C 0%:D 0%
SHARED LANES:
APPROACH C: all
APPROACH D: all

APPROACH >>>>>>>A<<<<<<<>>>>>>>D<<<<<<<>>>>>>>C<<<<<<<>>>>>>>B<<<<<<<												
MOVEMENT	AL	AT	AR	DL	DT	DR	CL	CT	CR	BL	BT	BR
VOLUMES	18	516	4	94	1	11	2	6	3	1	686	176
PCH	20			103	1	12	2	7	3	1		

RIGHT TURNS FROM C (CR)		
CONFLICTING FLOW .5AR+AT= 388.5	CAPACITY	630
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	630
CAPACITY USED= .48% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	3
RIGHT TURNS FROM D (DR)		
CONFLICTING FLOW .5BR+BT= 580.5	CAPACITY	494
CRITICAL GAP= 6SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	494
CAPACITY USED= 2.43% IMPEDANCE CREATED= .98	DEMAND (LOS=A)	12
LEFT TURNS FROM A (AL)		
CONFLICTING FLOW BR+BT= 646.5	CAPACITY	517
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	517
CAPACITY USED= 3.87% IMPEDANCE CREATED= .97	DEMAND (LOS=A)	20
LEFT TURNS FROM B (BL)		
CONFLICTING FLOW AR+AT= 390	CAPACITY	709
CRITICAL GAP= 5.5SEC. IMPEDANCE ADJUSTMENT= 1	ADJUSTED CAPACITY	709
CAPACITY USED= .14% IMPEDANCE CREATED= 1	DEMAND (LOS=A)	1
THRU MOVEMENT FROM C (CT)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR= 1054	CAPACITY	149
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .97	ADJUSTED CAPACITY	145
CAPACITY USED= 4.83% IMPEDANCE CREATED= .97	DEMAND (LOS=D)	7
THRU MOVEMENT FROM D (DT)		
CONFLICTING FLOW .5BR+BT+BL+AL+AR= 989.5	CAPACITY	164
CRITICAL GAP= 7.5SEC. IMPEDANCE ADJUSTMENT= .97	ADJUSTED CAPACITY	159
CAPACITY USED= .63% IMPEDANCE CREATED= 1	DEMAND (LOS=D)	1
LEFT TURNS FROM C (CL)		
CONFLICTING FLOW .5AR+AT+AL+BL+BT+BR+DT+DR= 1066	CAPACITY	120
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .95	ADJUSTED CAPACITY	114
CAPACITY USED= 1.75% IMPEDANCE CREATED= .99	DEMAND (LOS=D)	2
LEFT TURNS FROM D (DL)		
CONFLICTING FLOW .5BR+BT+BL+AL+AT+AR+CT+CR= 998.5	CAPACITY	131
CRITICAL GAP= 8SEC. IMPEDANCE ADJUSTMENT= .94	ADJUSTED CAPACITY	123
CAPACITY USED= 83.74% IMPEDANCE CREATED= .22	DEMAND (LOS=E)	103

CAPACITY OF SHARED LANES FOR APPROACH C 170	DEMAND (LOS=D)	12
CAPACITY OF SHARED LANES FOR APPROACH D 134	DEMAND (LOS=E)	116

LOS = Level of Service (11/89)
On major streets with 4 lanes, conflicting voluume equals0.75 of PCH

Loverna Wilson, Environmental Consultant Botany / Plant Ecology

1835 N.E. Steele Avenue, Corvallis, Oregon 97330 (503) 752-4156

WETLAND REPORT FOR THE WILLOW CREEK ESTATES SITE CANBY, OREGON

Prepared for

Wayne Scott
c/o Wilhelm Engineering, Inc.
546 SE Township Road
Canby, Oregon 97013

Prepared by

Loverna Wilson Environmental Consultant
1835 N.E. Steele Avenue
Corvallis, OR 97330

and

Scoles Associates, Inc.
Post Office Box 3558
Portland, Oregon 97208-3558

March 1991

WETLAND DETERMINATION SUMMARY

SITE: Willow Creek Estates (proposed)
LOCATION: T 3S., R 1E., S. 27, SW 1/4
CLIENT: Wayne Scott, c/o Wilhelm Engineering, Inc, 546 SE Township Road, Canby, Oregon 97013
SIZE OF SITE: 32 Acres
METHOD: Intermediate Level, On-site Determination Method, Disturbed Condition, Field study conducted on February 27, 1991 by Loverna Wilson and Phil Scoles.

PROPOSED USE: Residential subdivision, 83 single family lots and 4 multi-family lots (15 units each)
PRESENT USE : low intensity agricultural (sheep grazing)
ADJACENT LAND USE - NORTH: Agriculture (cultivated)
SOUTH: Railroad tracks and Hwy. 99E, small farms beyond
EAST: small farms (mostly forested)
WEST: proposed nursing home, residential

DETERMINATION: The jurisdictional wetlands within the study area include the main creek, two tributary creeks, and the nearly-level footslopes adjacent to the creeks. Approximately 6 acres of wetland were flagged during the field study. The surveyed acreage was not yet available at the completion of this report.

HYDROLOGY: The main creek originates beyond the east boundary and unevenly divides the site into north-south and east-west sections. This creek is fed by normal ground water drainage and two small tributaries from the south and west. The site has no apparent seeps or springs. There has been considerable alteration to the hydrology of the north portion of the creek where the previous land owner constructed side channels and ponds retained by several weirs. Wetland indicators noted at the site included hydric soil appearance, wetland drainage patterns, and ground water saturation.

SOIL: The main soil types found on the site are the Amity silt loam, McBee Variant loam, and Quatama loam. The Amity is a somewhat poorly- to very poorly-drained soil formed in stratified glaciolacustrine deposits and mixed alluvium on terraces and floodplains. The McBee Variant is a somewhat poorly-drained soil formed in mixed alluvium on floodplains. The Quatama loam is a moderately well-drained soil formed in stratified glaciolacustrine deposits of terraces. Also noted at the north end of the site was the Newberg fine sandy loam soil type. None of the soils are on the list of hydric soils for Clackamas County. Hydric soil characteristics of the Amity and McBee Variant soils including aquic moisture regime, and to some extent, low chroma matrix and mottling. These soils occurred adjacent to the creeks and at the base of the hillsides.

VEGETATION: The site has two major upland plant communities: a maple/alder woodland in the northeastern part of the study area, and a bentgrass meadow community on most of the rest of the study area. The wetland areas consist of ash/willow woodland and sedge/rush/bentgrass wet meadow. Both of these smaller communities occur in the lowlands along the creek and its tributaries. The transition from wetland to upland vegetation is usually marked by reduction or absence of sedges and rushes in the understory.

PROJECT STAFF: Loverna Wilson, Environmental Consultant, botanist
Phil Scoles, Scoles Associates, Inc., soil and water scientist
Juli Sampson, Scoles Associates, Inc., technical writer

WETLANDS REPORT FOR THE WILLOW CREEK ESTATES SITE CANBY, OREGON

INTRODUCTION

This report, prepared for Wayne Scott (developer), is intended to assist in site planning by defining the location and extent of jurisdictional wetlands. The 32-acre project site is bounded by N.E. Territorial Road, Highway 99E, and N. Redwood Street in northeast Canby, Oregon (Figure 1). Presently, the land at the site is used for sheep pasture. Land use to the north, south and east is low- to moderate-intensity agriculture. To the west are residential sites as well as the site of a planned nursing home.

The consultant team finds that the site contains approximately 6 acres of wetland which fall within the jurisdiction of the Oregon Division of State Lands (DSL) and the U.S. Army Corps of Engineers (CE), Portland District, and is subject to restrictions and permits required by the state and Section 404 of the Clean Water Act. The wetland boundary was flagged during the field study, but the surveying results were not yet available at the writing of this report.

WETLANDS BACKGROUND INFORMATION

Wetlands are defined by the CE and DSL as "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" (33 CFR 323).

Wetlands, whether they are marshes, bogs, wet meadows or bottomlands, can provide essential habitats for wildlife, provide flood protection through absorption of storm water, improve water quality by retention of sediments and add scenic diversity and aesthetic value to the landscape. To curb loss of wetland acreage, federal and state legislation exists to preserve wetland values and functions. The CE has jurisdiction over filling of wetlands through the Clean Water Act and the U.S. Environmental Protection Agency is responsible for reviewing all CE fill permit decisions. The DSL also has jurisdiction over filling and dredging of wetlands and issues a concurrent permit with the CE.

METHODS

This wetland determination was made using the techniques described in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands. (Federal Interagency Committee for Wetland Delineation, 1989). The manual focuses on defining the three criteria listed below that must be met in order for an area to be considered a jurisdictional wetland:

1. A wetland must be inundated or saturated with water at some time during the growing season of the prevalent vegetation (usually seven days or more); and,

2. A wetland must have hydric soils, which are soils that are saturated or flooded long enough during the growing season to develop anaerobic conditions; and,

3. A wetland must support a prevalence of hydrophytic (water-loving) vegetation that has more than 50 percent of the plant species adapted to wet soil conditions.

Under undisturbed circumstances, all three of these parameters must be met to classify an area as jurisdictional wetland. There are some exceptions to these criteria in cases where one or more of the original components (hydrology, soils or vegetation) have been disturbed or altered. The Willow Creek Estates site was evaluated as a disturbed site due to on-going sheep grazing. Hydrology and soil conditions were relied on more heavily for the final determination.

Site conditions were studied in December 1990 and on February 27, 1991 by the consultant team. Field observations were recorded on data sheets (Appendix A), and the wetland determinations are summarized in the following report text. Most of the site lacks wetland hydrology, hydric soil and hydrophytic vegetation (in particular the northeast and southeast areas). These areas have been logged, farmed and grazed for many decades. A relatively narrow creek system dissects the site and the associated floodplain qualify as jurisdictional wetland. Therefore, five transects were established to document existing site conditions and locate the wetland boundary. Transect 1 was located at the north edge of the southeast pasture, on the south side of the main creek. Transect 2 was set in the southwest corner of the site, east of an existing road crossing, south of the main creek and west of the south tributary creek. Transect 3 was set in the center of the site on the north side of the main creek, just south the large fenced pasture that surrounds the farm house and barn. Transect 4 was located north of Transect 3, on the north side of the main creek, at the edge of the floodplain, north of a solitary oak tree, and south of the barn. Finally, Transect 5 was placed in the north-center of the the site, in the meadow west of the house and on the east (also north) side of the main creek. Figure 2 shows the approximate location of the transects and current geographical features.

For each transect and sample point, the intermediate-level survey method was used to visually estimate percent vegetative cover for each plant species observed within a 5-foot radius for herbaceous ground cover and a 30-feet radius for trees and shrubs. Only species which cover more than 20 percent of area within the sampling radius were considered dominant and were recorded. Soils and hydrology were evaluated at each of these points using a tile spade to retrieve soil samples and observe ground water levels (where present). The wetland boundary was flagged at the site for future surveying.

RESULTS AND DISCUSSION

Hydrology

Hydrology is considered the driving force of wetland ecology. The criteria for wetland hydrology requires that the water table must saturate either the upper 6, 12 or 18 inches of the soil depending on the soil drainage class, texture and permeability. In all cases, saturation must occur for a significant period during the growing season, usually a week or more. Positive indication of wetland hydrology includes visual observation of inundation, soil saturation, oxidized living root zones, water marks, drift lines, water-borne sediment deposits, water-stained leaves, surface scoured areas, wetland drainage patterns, morphological plant adaptations and hydric soil characteristics.

Existing Environment

The topography of the Willow Creek Estates property consists of an alluvial terrace of the Willamette River which slopes generally to the north. The main creek originates beyond the east boundary and unevenly divides the site into north-south and east-west sections. This creek is fed by two small tributaries originating south and west off-site near the center of the property. The site has no apparent seeps or springs, and the source of water in the creeks is ground water drainage and runoff both from the property and from off-site sources. The north end of the main creek is controlled by several weirs just south of N.E. Territorial Road. The previous owner land owner excavated several ponds and side channels here which remain filled due to these weirs. These ponds and side channels have become silted in and the maintained water level is about 12 inches lower than intended due to broken slats on the control structures.

Wetland Hydrology Determination

Wetland hydrology is defined by the presence of permanent water inundation, seasonal inundation or soil saturation near the surface sometime during the growing season. The areas where wetland hydrology is present include the main creek, the two tributary creeks, and the nearly-level footslopes adjacent to these creeks. Wetland hydrology indicators noted in these areas were wetland drainage pattern, soil saturation, and hydric soil appearance. The areas having wetland hydrology were distinguished from the adjacent upland mainly by topography, in addition to the lack of ground water saturation in the upper 18 inches of the soil profile.

Soils

Hydric soils usually develop certain indicative morphological characteristics due to prolonged wetness. In order to be considered a hydric soil, the soil must: (1) have an aquic suborder; and (2) show evidence of soil saturation in the control depth, which is the upper 6 inches of the profile for sandy, somewhat poorly-drained soils, the upper 12 inches for sandy poorly-drained and silty somewhat poorly-drained soils and the upper 18 inches for silty poorly-drained and other very poorly-drained soils. In all cases, saturation must occur for a significant period during the growing season, usually a week or more. Many of these criteria are the same as for wetland hydrology; however, the positive indicators of hydric soils include accumulation of organic material, hydrogen sulfide odor, aquic moisture regime, gleying, low chroma matrix, distinct mottling, and iron and manganese concretions.

Existing Environment

The soils for the study area were mapped by the Soil Conservation Service (SCS) as Latourell loam (mapping unit 53) and McBee silty clay loam (mapping unit 56). These soils are described in detail in the Soil Survey of Clackamas County Area, Oregon (Gerig, 1985). On-site conditions varied significantly because the soils resemble the Amity silt loam (mapping unit 3), Quatama loam (mapping unit 71), Newberg fine sandy loam (mapping unit 67) soil types instead. The Amity silt loam is a deep, somewhat poorly-drained soil, formed in stratified glaciolacustrine deposits and mixed alluvium on terraces and floodplain. The surface layer of the Amity series at the site is a very dark gray brown (10YR 3/2) loam with very faint mottling below 13 inches. Depth of this layer is usually about 18 inches. The subsoil is a gray brown and light olive brown

(10YR 5/2 and 2.5Y 5/4) silty clay loam. The substratum, greater than 60 inches deep, is a silty clay loam. This soil is classified as Xeric Argialbolls, which means it is a dark-colored soil with a layer of clay accumulation and which developed in climates with wet winters and dry summers. It is not listed as hydric by the Soil Conservation Service (SCS, 1989). The Amity silt loam, wet phase, is very similar to the Amity silt loam, except that it is poorly- to very poorly-drained and has dark yellowish brown (10YR 3/4-6) mottles below 10 to 12 inches in the profile. This soil occurs primarily in the creek channels and lowlands in the north portion of the site. Both phases of this soil type have an ash subsoil horizon that restricts infiltration and perches percolating precipitation. In terms of hydric characteristics, the Amity soil has a low chroma matrix, distinct mottles and an aquic moisture regime.

The McBee Variant is a deep, somewhat poorly-drained soil, formed in mixed alluvium on floodplains. The surface layer of the McBee Variant series at the site is a very dark gray brown to dark gray brown (10YR 3/2-3) loam with dark brown (7.5YR 3/4) mottles below 6 inches. Depth of this layer is usually about 16 inches. The substratum is a very dark gray (5Y 3/1) loam to clay loam with common medium distinct dark brown (7.5YR 3/4) mottles. This soil is classified as Fluvaquentic Haploxerolls, which means it is a dark, mottled soil that developed in alluvial deposits where winters are wet and summers dry. It is not listed as hydric by the Soil Conservation Service (SCS, 1989). This soil occurs primarily in the channel channel and lowlands in the center and south portion of the site. In terms of hydric characteristics, the McBee Variant soil has an aquic moisture regime, low chroma matrix, and distinct mottling.

The Newberg fine sandy loam is a deep, somewhat excessively drained soil, formed in mixed alluvium on floodplains. The surface layer of the Newberg series at the site is a dark brown (7.5YR 3/2) fine sandy loam that extends to a depth of 18 inches. The substratum is a dark gray brown, brown , and dark brown (10YR 4/2-3, 10YR 3/3) fine sand and very gravelly sand. This soil is classified as Fluventic Haploxerolls, which means it is a dark soil that developed in alluvial deposits where winters are wet and summers dry. It is not listed as hydric by the Soil Conservation Service (SCS, 1989). This soil occurs in the north portion of the site, east of the farm house, and surrounding the Amity silt loam, wet phase soil type. The Newberg soil has no evident hydric indicators.

The Quatama loam is a deep, moderately well drained soil, formed in stratified glaciolacustrine deposits on terraces. The surface layer of the Quatama series at the site is a dark brown (10YR 3/3) loam with no mottling. Depth of this layer is usually about 8 inches. The substratum is a dark brown (10YR 3/3) and dark gray brown (2.5Y 5/2) loam to sandy loam with occasional faint dark yellowish brown and yellowish brown mottling. In some areas (towards the north-center), part of the subsoil includes an ash layer that tends to restrict infiltration, but generally lacks hydric characteristics. This soil is classified as Aquultic Haploxeralfs, which means it is a mottled soil with a layer of clay accumulation that developed under a moisture regime of wet winters and dry summers. It is not listed as hydric by the Soil Conservation Service (SCS, 1989). This soil occurs on the remainder of the site's hillside. The Quatama soil has no apparent hydric indicators.

Hydric Soil Determination

Jurisdictional wetlands must have hydric soils, which are soils that are saturated or flooded long enough during the growing season to develop anaerobic conditions. At the time of the field

study, soil saturation at or the near the surface was apparent along the creeks and on the nearly-level footslopes adjacent to the creeks. In terms of hydric soil characteristics, The wetland areas had an aquic moisture regime, low matrix chroma and sometimes distinct mottling; whereas, the upland areas had no positive indicators or soil saturation in the upper 18 inches of the soil profile.

Vegetation

Individual plant species can tolerate different ranges of soil moisture. For the purposes of determining wetland or hydrophytic vegetation, plants are classified into five categories based on their frequency of occurrence in wetlands. The categories are obligate wetland plants (OBL), facultative wetland plants (FACW), facultative plants (FAC), facultative upland plants (FACU) and obligate upland plants (UPL). A positive (+) or negative (-) symbol used in conjunction with one of the facultative indicator classes relates to a species preference to either the drier (-) or wetter (+) end of its indicator class. There are two other designations; no indication (NI) is for those plants for which there is a lack of sufficient information on their frequency of occurrence in wetlands and not listed (NL) is for those species that are not included in the National List of Plant Species That Occur in Wetlands (Reed, 1988). It is frequently inferred that NL species are UPL. The criteria for determining if a site, under normal conditions, has hydrophytic vegetation is that the site must have more than 50 percent dominance by OBL, FACW and/or FAC species.

Existing Environment

Field studies for this site were conducted in December 1990 and February 1991, so plant communities on the site can be described only by species that are identifiable in the winter. In addition, the area has been and is currently being grazed by sheep. Grazing disturbance often affects plant community composition, increasing the pioneer and/or introduced species and decreasing the less competitive native species. These two factors, winter assessment and grazing history, change the informational value of the vegetation parameter for assessing wetland boundaries. Identifying the plant community composition is necessary for the wetland assessment, but was not weighted as heavily as soils and hydrology parameters in making boundary determinations.

There are two major plant communities on the site. One is a maple/alder woodland in the northeastern part of the study area. Most of the rest of the study area supports a bentgrass meadow community. There are two smaller communities also present on the study area. One is an ash/willow woodland, and the other is a sedge/rush/bentgrass wet meadow. Both of these smaller communities occur in the lowlands along the creek.

The maple/alder woodland occupies the upper terrace and adjacent slopes on the northeastern part of the study area. Bigleaf maple (Acer macrophyllum, FACU) and red alder (Alnus rubra, FAC) dominate the canopy, with scattered Douglas fir (Pseudotsuga menziesii, NL) and western red cedar (Thuja plicata, FAC) as associated species. Grazing appears to have reduced the understory to scattered tufts of swordfern (Polystichum munitum, NL) and Dewey's sedge (Carex deweyana, FAC). This stand was once dominated by Douglas fir, but these were logged years ago. There is one small remnant Douglas fir stand near the middle of the property.

The rest of the upland slopes and terraces on the site are planted to pasture grasses. Bentgrasses (Agrostis spp.) appear to dominate, although this is difficult to assess in winter. Common forbs include clover (Trifolium spp.), dandelion (Taraxacum officinale, FACU), and Canada thistle (Cirsium arvense, FACU). Himalayan blackberry (Rubus discolor, FACU) frequently occurs in hedgerows.

An ash/willow community occupies the bottomland along the creek near the north end of the study area. Oregon ash (Fraxinus latifolia, FACW) and willow (Salix, FAC-OBL) are the dominant wood species. Some red alder (FAC) and western red cedar (FAC) are also present. Typical understory species include slough sedge (Carex obnupta, OBL), soft rush (Juncus effusus, FACW), creeping buttercup (Ranunculus repens, FACW), and mixed grasses.

Sedge/rush/bentgrass wet meadows cover the rest of the bottomlands along the creek. This community is often a mosaic made of patches of various species. The predominant species are slough sedge (OBL), soft rush (FACW), another rush which is probably spreading rush (Juncus patens, FACW), small-fruited bulrush (Scirpus microcarpus, OBL), and bentgrasses (Agrostis spp.).

At the south end of the study area, before the creek enters the lowlands of the 100-year flood plain, it flows through a steeper part of the study area. Here the stream is a narrow channel often with steeply sloping banks. Along this reach of the stream, wetland vegetation is limited to a narrow strip along the edge of the stream or in the stream. Common species include waterparsley (Oenanthe sarmentosa, OBL), skunk cabbage (Lysichitum americanum, OBL), watercress (Rorippa nasturtium-aquaticum, OBL), and California false-hellebore (Veratrum californicum, FACW). Red alder (FAC) and Himalayan blackberry (FACU) line the banks.

Hydrophytic Vegetation Determination

Jurisdictional wetlands must have more than 50 percent dominance by OBL, FACW, and/or FAC species. On the study site, these are the areas supporting the ash/willow woodland, the sedge/rush/bentgrass wet meadow, and a narrow strip along the creek banks at the south end of the study area. Most of the lowlands within the 100-year flood plain meet this requirement. The transition between wet meadow or ash/willow woodland and upland meadow is generally marked by a shift from the presence of sedges and/or rushes to the absence of these species. As stated earlier, species dominance can only be approximated during a winter assessment.

SUMMARY OF WETLAND DELINEATION

Jurisdictional wetlands are defined by the "common area" where all three parameters -- wetland hydrology, hydric soil and hydrophytic vegetation -- are present. At the Willow Creek Estates site, vegetation was disturbed by the grazing of sheep and the communities were evaluated only on the basis of plants identifiable during winter. Therefore, while the vegetation was considered as a factor in the wetland determination, it was not weighted as heavily as soils and hydrology in making boundary determinations. The following areas satisfy the wetland parameters:

Δ the main creek (incised slightly at the east boundary and wide spread at the north edge),

Δ the south and west tributary creeks, and

Δ footslopes adjacent to the main creek and the small tributaries.

Figure 3 shows the approximate lateral extent of jurisdictional wetland boundaries as determined by the consultant team. The size of the overall jurisdictional wetland is estimated at 6 acres, but the surveyed acreage was not yet available at the writing of this report.

Wetland functions and values of the Willow Creek Estates site were evaluated and determined to have low to moderate value for wildlife habitat, sediment trapping, flood storage / desynchronization for on-and-off-site runoff and groundwater modification, passive recreation, and food chain support. The remaining wetland values and functions reviewed in the evaluation process, including active recreation, endangered species habitat, unique/ rare wetland, fisheries habitat, nutrient retention removal, and shoreline stabilization, have low or no functional value.

The wetlands on the site fall under the jurisdiction of the U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act, and the Oregon Division of State Lands under state law. Any project proposed on this site that results in impacts to these wetland resources will require permit applications to these agencies. As currently proposed, the Willow Creek Estates subdivision would impact the jurisdictional wetland along the east side of the main creek where homes or multi-family dwellings would presumably require filling. The primary subdivision street (especially the N.E. 18th Avenue segment) would also impact the wetland in the southwest corner of the site. A permit from the DSL and CE will be required to build as currently proposed.

REFERENCES CITED

Federal Interagency Committee for Wetland Delineation. 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, 1989. 76 pp. plus appendices.

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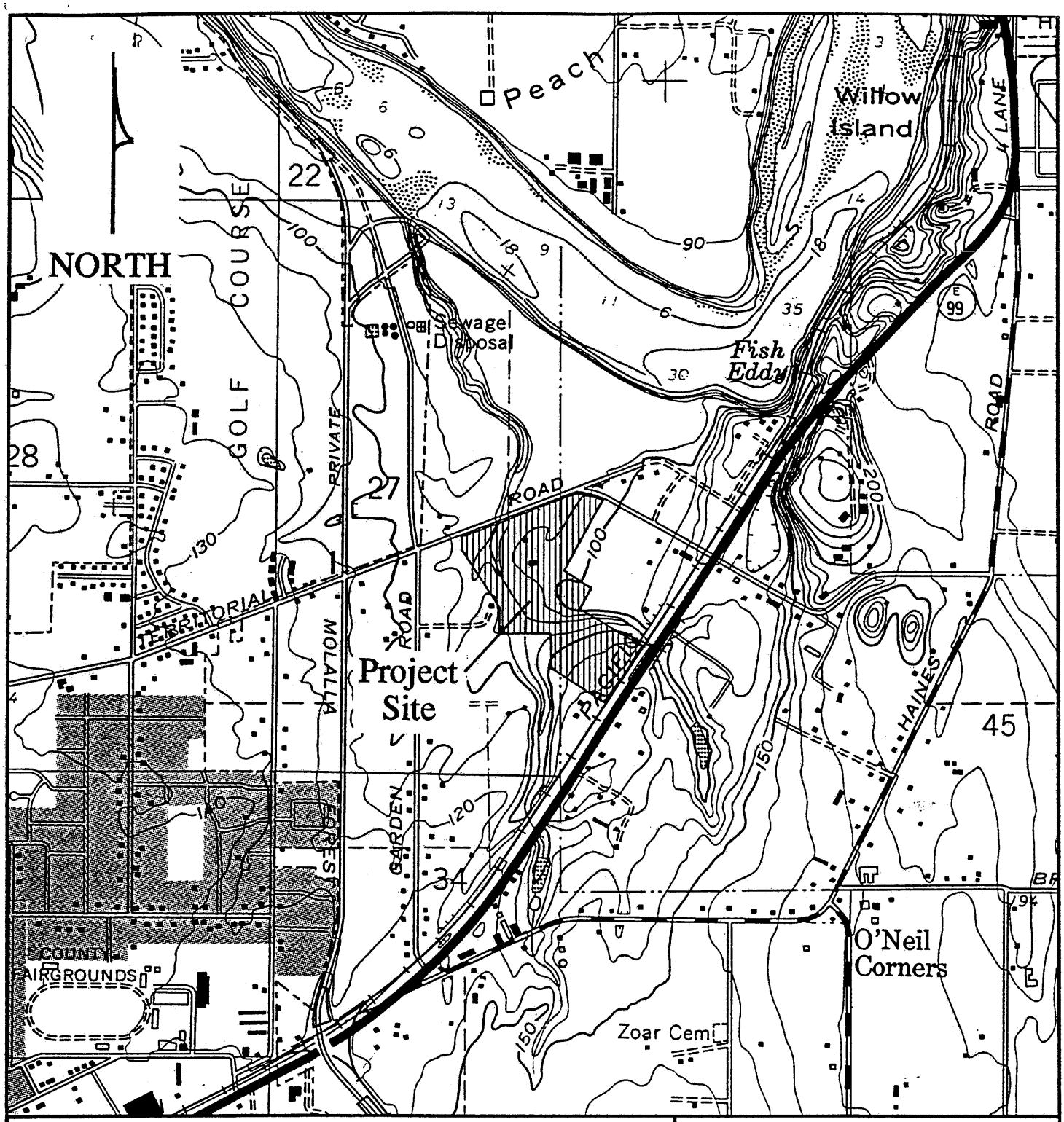
LIST OF FIGURES



SCOLES ASSOCIATES, INC.

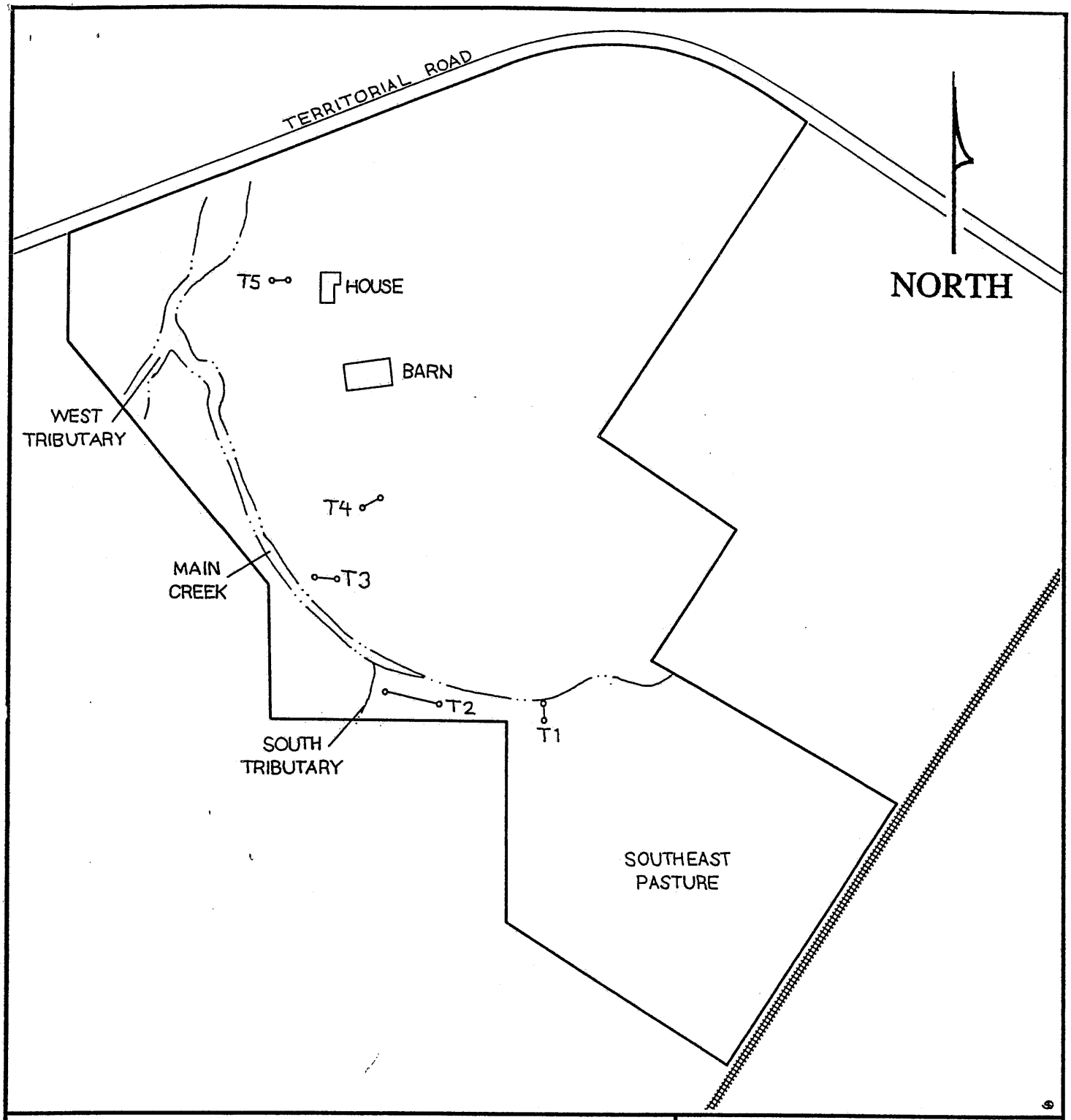
Soil, Water & Wetland Scientists

434 N.W. Sixth Avenue, Suite 305, P.O. Box 3558, Portland, OR 97208-3558

PROJECT: Willow Creek Estates Subdivision SA-910227
DATE: March 1991
SCALE: not calculated

FIGURE 1

Vicinity map of the Willow Creek Subdivision. Map adapted from the Canby, Oregon USGS Quadrangle map.



SCOLES ASSOCIATES, INC.

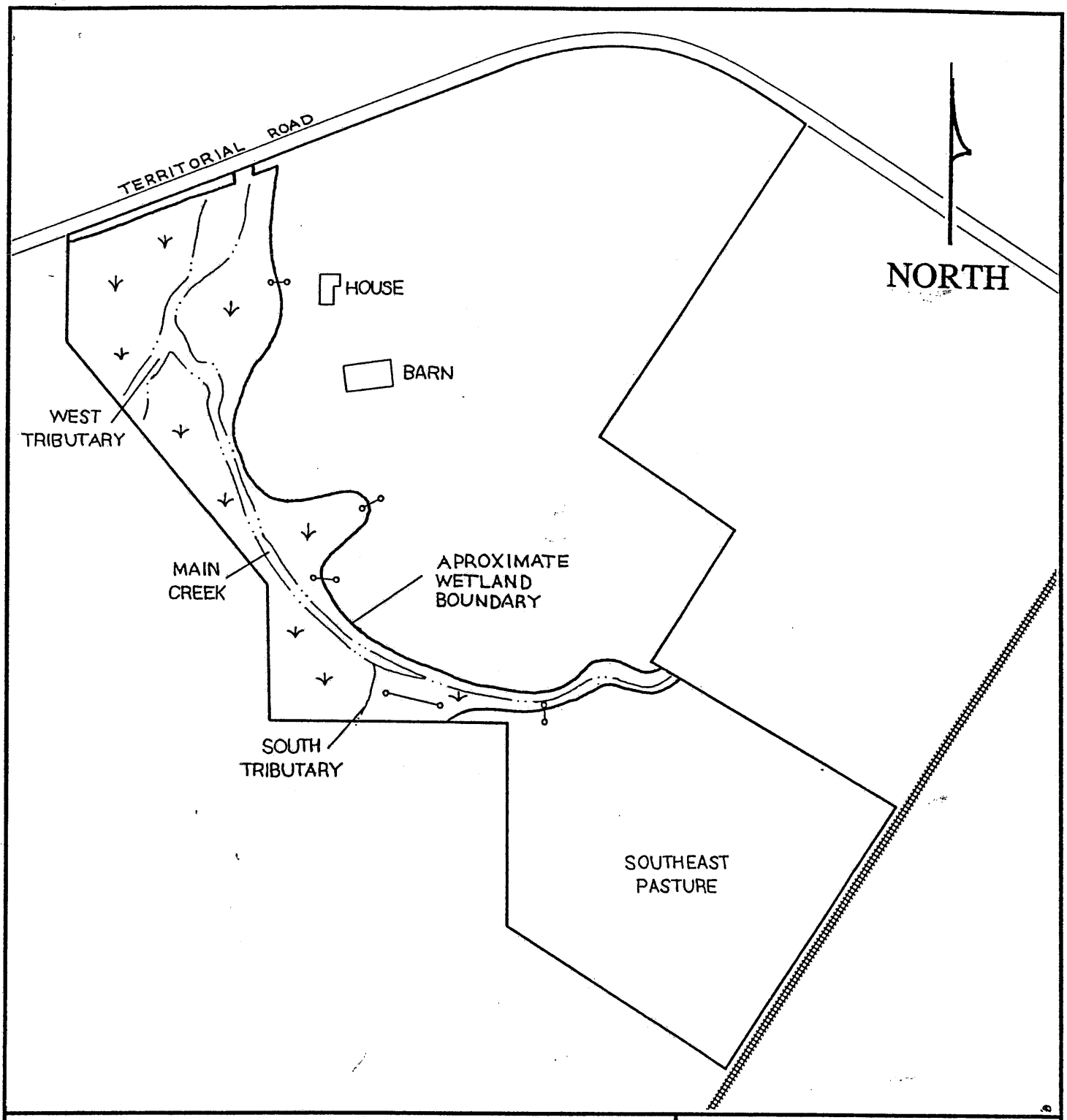
Soil, Water & Wetland Scientists

434 N.W. Sixth Avenue, Suite 305, P.O. Box 3558, Portland, OR 97208-3558

PROJECT: Willow Creek Estates Subdivision SA-910227
DATE: March 1991
SCALE: 1 inch = approximately 260 feet

FIGURE 2

Site map of the Willow Creek Estates Subdivision showing area features and sampling transects. Map adapted from Wilhelm Engineering, Inc. master plan - tentative plat (Dec. 19, 1990).



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434 N.W. Sixth Avenue, Suite 305, P.O. Box 3558, Portland, OR 97208-3558

PROJECT: Willow Creek Estates Subdivision SA-910227
DATE: March 1991
SCALE: 1 inch = approximately 260 feet

FIGURE 3

Site map of the Willow Creek Estates Subdivision showing the approximate (unsurveyed) jurisdictional wetland boundary. Map adapted from Wilhelm Engineering, Inc. master plan - tentative plat (Dec. 19, 1990).

APPENDIX A

DATA FORMS FOR HYDROLOGY, SOILS AND VEGETATION

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project: Willow Creek Estates County, State: Clackamas County, OR
Applicant: Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013
Field Date: 91 02 27 T, R, S: T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location: T1-P1 Condition: disturbed by sheep grazing
Area Description: southeast end of creek drainage, southeast portion of site

HYDROLOGY

Landform/Topo.: footslope
Inundation: none Depth of Surface Water: none
Soil Saturation: none Depth to Soil Saturation: none

Positive Indicators: none apparent
Hydrology Alter.: none apparent for sampling
Determination: non-wetland, site lacks ground water saturation or positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-8 in.	7.5YR 3/2	none, loam, moist
8-14 in.	7.5YR 3/3	none, loam, moist
>14 in.	10YR 3/2-3	none, loam, many black highly decayed organic fragments

Positive Indicators: none apparent in control depth
Drainage Class: moderately well-drained Histosol: no
Control Depth: 0.5 feet from surface Histic Epipedon: no
Series/Classific.: Quatama silt loam, Aquultic Haploxeralfs
Hydric Soils List : no
Determination: non-hydric, positive indicators not evident in control depth

VEGETATION

Forbs: <5% Canada thistle (Cirsium arvense, FACU), 30% clover (Trifolium spp., FACU), < 5% creeping buttercup (Ranunculus repens FACW+), 10% dandelion (Taraxacum officinale, FACU)
Grasses: 60% meadow grasses, including bentgrass (Agrostis sp., NL)
Shrubs: none
Vines: none
Saplings: none
Trees: none

Determination: disturbed by grazing, likely non-hydrophytic, dominance is less than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.: non-wetland, hydrology and soil parameters lack positive indicators
Comments: winter evaluation

Field Investigators: P. Scoles, L. Wilson Compiled by: JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project:	Willow Creek Estates	County, State:	Clackamas County, OR
Applicant:	Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013		
Field Date:	91 02 27	T, R, S:	T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location:	T1-P2	Condition:	disturbed by sheep grazing
Area Description:	southeast end of creek drainage, on creek bank, 10 ft. north of T1-P1		

HYDROLOGY

Landform/Topo.:	floodplain		
Inundation:	none	Depth of Surface Water:	none
Soil Saturation:	yes	Depth to Soil Saturation:	16 in.

Positive Indicators:	wetland drainage pattern
Hydrology Alter.:	none apparent
Determination:	wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-6 in.	7.5YR 3/2	none, loam, moist
6-9 in.	10YR 3/2	common medium faint 7.5YR 3/4, loam, very moist
9-16 in.	10YR 3/1-2	7.5YR 3/4 and 4/6, sandy loam, lots of organic debris, very moist
>16 in.	5Y 3/1	mottles too faint to distinguish, sand, saturated

Positive Indicators:	aquic moisture regime, low chroma matrix, distinct mottling		
Drainage Class:	poorly-drained	Histosol:	no
Control Depth:	1.5 feet from surface	Histic Epipedon:	no
Series/Classific.:	best resembles McBee variant, Fluvaquentic Haploxerolls		
Hydric Soils List :	no		
Determination:	hydric, positive indicators evident in control depth		

VEGETATION

Forbs:	upslope vegetation same as T1-P1, downslope to creek : 20% small-fruited bullrush (Scirpus microcarpus, OBL), 30% soft rush (Juncus effusus, FACW), 30% creeping buttercup (Ranunculus repens, FACW); 80% water parsley (Oenanthe sarmentosa, OBL) in stream
Grasses:	none
Shrubs:	none
Vines:	none
Saplings:	none
Trees:	red alder (Alnus rubra, FAC)
Determination:	hydrophytic, dominance is 100% FAC, FACW or OBL

SUMMARY

Wetland Determ.:	wetland, all parameters have positive indicators
Comments:	winter evaluation, sampling point marks boundary of wetland

Field Investigators:	P. Scoles, L. Wilson	Compiled by:	JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project: Willow Creek Estates County, State: Clackamas County, OR
Applicant: Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013
Field Date: 91 02 27 T, R, S: T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location: T2-P1 Condition: disturbed by sheep grazing
Area Description: southwest corner of site, east of T-1, south side of creek, west of existing road crossing and east of south tributary

HYDROLOGY

Landform/Topo.: footslope
Inundation: none Depth of Surface Water: none
Soil Saturation: yes Depth to Soil Saturation: 12 in.

Positive Indicators: wetland drainage pattern, hydric soil appearance
Hydrology Alter.: none apparent
Determination: wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-8 in.	10YR 3/3	few fine faint 7.5YR 3/4, loam, very moist
8-16 in.	10YR 3/2	common medium faint 10YR 3/4, loam, saturated,
16->18 in.	5Y 3-4/1	common medium distinct 7.5YR 3/4, sandy clay loam (due to perched ground water), saturated

Positive Indicators: aquic moisture regime, low chroma matrix, distinct mottling
Drainage Class: poorly-drained Histosol: no
Control Depth: 1.5 feet from surface Histic Epipedon: no
Series/Classific.: best resembles McBee variant, Fluvaquentic Haploxerolls
Hydric Soils List : no
Determination: hydric, positive indicators evident in control depth

VEGETATION

Forbs: none
Grasses: 30% soft rush (Juncus effusus, FACW+), 30% spreading rush (Juncus patens, FACW)
Shrubs: none
Vines: none
Saplings: none
Trees: 50% Oregon ash (Fraxinus latifolia, FACW)
Determination: hydrophytic, dominance is greater than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.: wetland, all parameters have positive indicators
Comments: winter evaluation

Field Investigators: P. Scoles, L. Wilson Compiled by: JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project:	Willow Creek Estates	County, State:	Clackamas County, OR
Applicant:	Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013		
Field Date:	91 02 27	T, R, S:	T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location:	T2-P2	Condition:	disturbed by sheep grazing
Area Description:	southwest corner of site, east of T-1, south side of creek, east of existing road crossing and west of south tributary, west of T2-P1		

HYDROLOGY

Landform/Topo.:	footslope / floodplain		
Inundation:	nearby	Depth of Surface Water:	none
Soil Saturation:	yes	Depth to Soil Saturation:	4 in.

Positive Indicators:	wetland drainage pattern, hydric soil appearance
Hydrology Alter.:	none apparent
Determination:	wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-15 in.	5Y 3/1	none, silt loam, saturated
>15 in.	5Y 4-5/1	few faint 10YR 4/4, silty clay loam, saturated, ash

Positive Indicators:	aquic moisture regime, low chroma matrix, distinct mottling		
Drainage Class:	very poorly-drained	Histosol:	no
Control Depth:	1.5 feet from surface	Histic Epipedon:	no
Series/Classific.:	best resembles Amity silt loam, wet phase, Xeric Argialbolls		
Hydric Soils List :	no		
Determination:	hydric, positive indicators evident in control depth		

VEGETATION

Forbs:	40 % creeping buttercup (Ranunculus repens, FACW)
Grasses:	30% mixed grasses, possibly (Agrostis sp., NL) and 30% velvetgrass (Holcus lanatus, FAC); 20% soft rush (Juncus effusus, FACW+), 20 % spreading rush (Juncus patens, FACW)
Shrubs:	none
Vines:	none
Saplings:	none
Trees:	50 % Oregon ash (Fraxinus latifolia, FACW)
Determination:	hydrophytic, dominance is greater than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.:	wetland, all parameters have positive indicators
Comments:	winter evaluation
Field Investigators:	P. Scoles, L. Wilson
Compiled by:	JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project:	Willow Creek Estates	County, State:	Clackamas County, OR
Applicant:	Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013		
Field Date:	91 02 27	T, R, S:	T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location:	T3-P1	Condition:	disturbed by sheep grazing
Area Description:	Center of site, just north of tributary confluence, north of T2 and south of T4		

HYDROLOGY

Landform/Topo.:	floodplain		
Inundation:	none	Depth of Surface Water:	none
Soil Saturation:	yes	Depth to Soil Saturation:	8 in.

Positive Indicators:	wetland drainage pattern, hydric soil appearance
Hydrology Alter.:	none apparent
Determination:	wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-10 in.	10YR 3/1	none, silt loam, saturated
>10in.	5Y 4-5/1	few faint 10YR 4/4, silty clay loam, saturated, ash layer

Positive Indicators:	aquic moisture regime, low chroma matrix, distinct mottling		
Drainage Class:	very poorly-drained	Histosol:	no
Control Depth:	1.5 feet from surface	Histic Epipedon:	no
Series/Classific.:	best resembles Amity silt loam, wet phase, Xeric Argialbolls		
Hydric Soils List :	no		
Determination:	hydric, positive indicators evident in control depth		

VEGETATION

Forbs:	none
Grasses:	20 % mixed grasses, including bentgrass (Agrostis sp., NL), 60% slough sedge (Carex obnupta, OBL), 20 % soft rush (Juncus effusus, FACW+)
Shrubs:	none
Vines:	none
Saplings:	none
Trees:	none
Determination:	hydrophytic, dominance is greater than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.:	wetland, all parameters have positive indicators
Comments:	winter evaluation
Field Investigators:	P. Scoles, L. Wilson Compiled by: JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project:	Willow Creek Estates	County, State:	Clackamas County, OR
Applicant:	Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013		
Field Date:	91 02 27	T, R, S:	T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location:	T3-P2	Condition:	disturbed by sheep grazing
Area Description:	center of site, just south of tributary confluence, north of T2 and south of T4, east of T3-P1		

HYDROLOGY

Landform/Topo.:	footslope at edge of floodplain		
Inundation:	none	Depth of Surface Water:	none
Soil Saturation:	yes	Depth to Soil Saturation:	14 in.

Positive Indicators:	wetland drainage pattern, hydric soil appearance
Hydrology Alter.:	none apparent
Determination:	wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-13 in.	10YR 3/1	none, silt loam
>13 in.	5Y 4-5/1	few, very fine distinct 10YR 3/6, silt loam, ash layer

Positive Indicators:	aquic moisture regime, low chroma matrix, distinct mottling		
Drainage Class:	poorly-drained	Histosol:	no
Control Depth:	1.5 feet from surface	Histic Epipedon:	no
Series/Classific.:	best resembles Amity silt loam, wet phase, Xeric Argialbolls		
Hydric Soils List :	no		
Determination:	hydric, positive indicators evident in control depth		

VEGETATION

Forbs:	5% creeping buttercup (Ranunculus repens, FACW)
Grasses:	bentgrass (Agrostis sp., NL), 5% soft rush (Juncus effusus, FACW+)
Shrubs:	none
Vines:	none
Saplings:	none
Trees:	60% western red cedar (Thuja plicata, FAC)
Determination:	hydrophytic, dominance is greater than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.:	wetland, all parameters have positive indicators
Comments:	winter evaluation
Field Investigators:	P. Scoles, L. Wilson
Compiled by:	JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project: Willow Creek Estates County, State: Clackamas County, OR
Applicant: Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013
Field Date: 91 02 27 T, R, S: T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location: T3-P3 Condition: disturbed by sheep grazing
Area Description: center of site, just north of tributary confluence, north of T2 and south of T4, east of T3-P2

HYDROLOGY

Landform/Topo.: footslope
Inundation: none Depth of Surface Water: none
Soil Saturation: none Depth to Soil Saturation: none

Positive Indicators: none apparent
Hydrology Alter.: none apparent
Determination: non-wetland, ground water saturation not evident in control depth

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-10in.	10YR 3/3	none, loam, moist
10-14 in.	10YR 3/3	too faint to read, loam, moist
14-18 in.	2.5Y 4/2	few fine faint 10YR 4/6, loam, very moist to saturated
>18 in.	2.5Y 5/2	few medium faint 10YR 5/6, sandy loam, saturated

Positive Indicators: none apparent in control depth
Drainage Class: somewhat poorly-drained Histosol: no
Control Depth: 1.0 feet from surface Histic Epipedon: no
Series/Classific.: Quatama silt loam, Aquultic Haploxeralfs
Hydric Soils List : no
Determination: non-hydric, positive indicators not evident in control depth

VEGETATION

Forbs: none
Grasses: 80 % mixed grasses, including bentgrass (Agrostis sp., NL)
Shrubs: none
Vines: none
Saplings: none
Trees: 60 % western red cedar (Thuja plicata, FAC), 20 % douglas fir (Pseudotsuga menziesii, NL)
Determination: non-hydrophytic, dominance is less than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.: non-wetland, all parameters lack positive indicators
Comments: winter evaluation

Field Investigators: P. Scoles, L. Wilson Compiled by: JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project: Willow Creek Estates County, State: Clackamas County, OR
Applicant: Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013
Field Date: 91 02 27 T, R, S: T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location: T4-P1 Condition: disturbed by sheep grazing
Area Description: center of site, north side of stream, south of barn, north of T3

HYDROLOGY

Landform/Topo.: floodplain
Inundation: none Depth of Surface Water: none
Soil Saturation: yes Depth to Soil Saturation: 12 in.

Positive Indicators: wetland drainage pattern, hydric soil appearance
Hydrology Alter.: none apparent
Determination: wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-6 in.	10YR 3/2	none, loam, moist
6-12 in.	10YR 3/1	too faint to read, loam, very moist
12-17 in.	5Y 4/1	common medium distinct 7.5YR 3/4, sandy clay loam, saturated
>17 in.	5Y 4-5/1	few fine faint 7.5YR 4/6, sandy clay loam, saturated

Positive Indicators: aquic moisture regime, low chroma matrix, distinct mottling
Drainage Class: poorly-drained Histosol: no
Control Depth: 1.5 feet from surface Histic Epipedon: no
Series/Classific.: best resembles Amity silt loam, wet phase, Xeric Argialbolls
Hydric Soils List : no
Determination: hydric, positive indicators evident in control depth

VEGETATION

Forbs: none
Grasses: 60% bentgrass (Agrostis sp., NL), 20 %soft rush (Juncus effusus, FACW+), 20 % spreading rush (Juncus patens, FACW)
Shrubs: none
Vines: none
Saplings: none
Trees: none
Determination: hydrophytic, dominance is greater than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.: wetland, all parameters have positive indicators
Comments: winter evaluation

Field Investigators: P. Scoles, L. Wilson Compiled by: JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project: Willow Creek Estates County, State: Clackamas County, OR
Applicant: Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013
Field Date: 91 02 27 T, R, S: T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location: T4-P2 Condition: disturbed by sheep grazing
Area Description: center of site, north side of stream, south of barn, upslope from T4-P1, north of T3, east of T4-P1

HYDROLOGY

Landform/Topo.: footslope
Inundation: none Depth of Surface Water: none
Soil Saturation: none Depth to Soil Saturation: none

Positive Indicators: none apparent
Hydrology Alter.: none apparent
Determination: wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-13 in.	10YR 3/2	none, loam, organic debris
13-18 in.	2.5Y 3/2	common but too faint to read, loam, very moist

Positive Indicators: none apparent in control depth
Drainage Class: somewhat poorly-drained Histosol: no
Control Depth: 1.0 feet from surface Histic Epipedon: no
Series/Classific.: Amity silt loam, Xeric Argialboll
Hydric Soils List : no
Determination: non-hydric, positive indicators not evident in control depth

VEGETATION

Forbs: none
Grasses: 60 % mixed grasses, including bentgrass (Agrostis sp., NL)
Shrubs: none
Vines: none
Saplings: none
Trees: none
Determination: non-hydrophytic, dominance is less than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.: non-wetland, all parameters lack positive indicators
Comments: winter evaluation

Field Investigators: P. Scoles, L. Wilson Compiled by: JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project: Willow Creek Estates County, State: Clackamas County, OR
Applicant: Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013
Field Date: 91 02 27 T, R, S: T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location: T5-P1 Condition: disturbed by sheep grazing
Area Description: north-center of site, west of house, east side of creek, northwest of T-4

HYDROLOGY

Landform/Topo.: footslope / floodplain
Inundation: none Depth of Surface Water: none
Soil Saturation: yes Depth to Soil Saturation: 13 in.

Positive Indicators: wetland drainage pattern, hydric soil appearance
Hydrology Alter.: none apparent
Determination: wetland, site has ground water saturation and positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-8 in.	7.5YR 3/2	none, sandy loam
8-18 in.	5Y 2.5/1	many coarse prominent 10YR 3/4-6, sandy clay loam, saturated, mottles disappear at approx. 14 in.

Positive Indicators: aquic moisture regime, low chroma matrix, distinct mottling
Drainage Class: poorly-drained Histosol: no
Control Depth: 1.5 feet from surface Histic Epipedon: no
Series/Classific.: best resembles Amity silt loam, wet phase, Xeric Argialbolls
Hydric Soils List : no
Determination: hydric, positive indicators evident in control depth

VEGETATION

Forbs: none
Grasses: 40 % mixed grasses, including bentgrass (Agrostis sp., NL), 30 % soft rush (Juncus effusus, FACW+), 30 % spreading rush (Juncus patens, FACW)
Shrubs: none
Vines: none
Saplings: none
Trees: none
Determination: hydrophytic, dominance is greater than 50% FAC, FACW or OBL

SUMMARY

Wetland Determ.: wetland, all parameters have positive indicators
Comments: winter evaluation

Field Investigators: P. Scoles, L. Wilson Compiled by: JS

DATA FORM FOR HYDROLOGY,SOILS AND VEGETATION

INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD

Project: Willow Creek Estates County, State: Clackamas County, OR
Applicant: Wayne Scott, c/o: Wilhelm Engineering, Inc., 546 SE Township Road, Canby, OR 97013
Field Date: 91 02 27 T, R, S: T.3S, R.1E, S.27, SW1/4, N1/2
Transect/Location: T5-P2 Condition: disturbed by sheep grazing
Area Description: north-center of site, west of house, east side of creek, northwest of T-4, northernmost transect

HYDROLOGY

Landform/Topo.: footslope
Inundation: none Depth of Surface Water: none
Soil Saturation: none Depth to Soil Saturation: none

Positive Indicators: none apparent in control depth
Hydrology Alter.: none apparent
Determination: non-wetland, site lacks ground water saturationand positive indicators

SOILS

Depth	Matrix Color	Mottle Contrast & Color, Texture, Moisture, Other Characteristics
0-18 in.	7.5YR 3/2	none, sandy loam, slightly moist

Positive Indicators: none apparent in control depth
Drainage Class: moderately well-drained Histosol: no
Control Depth: 0.5 feet from surface Histic Epipedon: no
Series/Classific.: Newberg fine sandy loam, Fluventic Haploxerolls
Hydric Soils List : no
Determination: non-hydric, positive indicators not evident in control depth

VEGETATION

Forbs: none
Grasses: 60 % mixed grasses, including bentgrass (Agrostis sp., NL)
Shrubs: none
Vines: none
Saplings: none
Trees: none
Determination: indefinite

SUMMARY

Wetland Determ.: non-wetland, hydrology and soil parameters lack positive indicators
Comments: winter evaluation

Field Investigators: P. Scoles, L. Wilson Compiled by: JS

PLANNING COMMISSION

SIGN-IN SHEET

Date: 5-13-91

NAME (Please Print)	ADDRESS (Please Print)
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Wayne Scott	11310 S Macksburg
George W. Thelma	546 SE Township Rd.
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