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## 3.1.2 TRAFFIC AND CIRCULATION

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### 3.1.2-1 INTRODUCTION

Brooktrails is a unique community from a transportation perspective for several reasons. First, as a subdivided community virtually all of its collector and residential streets are already constructed. Second, although planned as a vacation community, Brooktrails has evolved into a year-round Township with consequences on the anticipated number of people (and cars) present at any one time. Third, the community is located in rugged terrain with only one connection to the outside world: Sherwood Road. Unlike the more recent streets in Brooktrails, Sherwood Road evolved out of an old wagon road as a typical rural facility. Consequently, Sherwood Road is the major existing constraint to future growth and already operates at over capacity for a rural facility.

A second connection to Brooktrails was studied by the County in 1991, with four alternative alignments subject to consideration. The traffic analysis conducted as part of the study of the five land use alternatives (see Section 6, Alternatives) concluded much the same as that study: the Southern Access Route (from Brooktrails to State Route 20) was the preferred alternative unless the U.S. 101 Bypass was constructed. With the U.S. 101 Bypass project, a direct connection to U.S. 101 north of Willits (assuming there was an interchange) was the preferred alternative. Given that the Bypass project is not currently programmed for funding, it is assumed that Brooktrails must proceed as if it will not be constructed within the next 15 to 20 years. Therefore, the Southern Access Route represents the best opportunity to accommodate future growth.

Other specific improvements to Brooktrails include improvements to Sherwood Road (shoulders, left turn lanes, pedestrian pathway), new signalized intersections, streetscape improvements, expansion of transit service including new fixed route service, and continuation of parking policies.

One of the biggest challenges facing Brooktrails is the management of traffic on its local streets, which are projected to increase up to four times current volumes, without changing the essential rural character of the community. The other challenges include providing emergency evacuation options for residents,

maintaining (and expanding) the network of trails, and coordinating growth and required improvements with Willits and Mendocino County.

Fehr & Peers Associates, Inc., Transportation Consultants, completed a Traffic Study in March, 1996 for the Specific Plan area. The following is a summary of the analysis and findings of the study.

### 3.1.2-2 SETTING

Brooktrails Township is located one mile northwest of the city of Willits in Mendocino County (see Figure 2.2 Site Location Map). Developed in the 1960s as a “vacation village”, Brooktrails consists of a subdivision of 6,000 residential lots of which approximately 1,150 are currently developed. The original developers assumed that only 25 percent of the residents would be in Brooktrails at any one time; currently the majority of residents live full-time in Brooktrails, which has long term implications on traffic and other transportation issues.

#### Roadway Network

The township street network was constructed at the time the initial subdivision was created, with the result that some streets do not meet current code requirements. The internal street system conforms to the rugged topography of the area, and consists of nine (9) local streets that connect to Sherwood Road and miles of winding, sometimes steep residential streets that feed from various low density neighborhoods.

Sherwood Road provides the only connection from Brooktrails to U.S. 101 and the town of Willits. A two-lane county maintained facility, Sherwood Road meets U.S. 101 (Main Street) at a signalized intersection on the northern edge of Willits. Aside from being the only access route to Brooktrails, Sherwood Road is characterized by its winding alignment, relatively steep gradients and tight geometries, lack of shoulders, passing lanes, and left turn pockets, and poor sight distances at several intersections.

The lack of a second access route also brings up concerns about evacuation in the event of an emergency. While there is a “back door” on Sherwood Road to the north, in the event of a large fire this route would most likely be quickly be overloaded with vehicles. Therefore, the need for a second access route is both a capacity issue as well as an evacuation issue.

U.S. 101 (Main Street) is a four-lane arterial through the town of Willits, reducing to a two-lane facility before it reaches the Sherwood Road intersection. The intersection with Sherwood Road contains a northbound left turn lane and a three phase signal.

The physical condition of roadways and streets in Brooktrails is good, except for some minor slides that are encroaching on the uphill portions of residential streets. A network of trails provides pedestrians good internal access.

Existing Traffic Conditions

Traffic counts were performed in Brooktrails on Wednesday and Thursday, August 4th and 5th, 1993, from 3PM to 7PM at the following locations (see Figure 3.1.2-1 and Table 3.1.2-1):

1. U.S. 101 and Sherwood Road
2. Sherwood Road and Birch Street
3. Sherwood Road and Brooktrails Drive
4. Sherwood Road and Primrose Drive
5. Sherwood Road and Daphne Way
6. Sherwood Road and Poppy Drive
7. Clover Road and Primrose Drive

TABLE 3.1.2-1  
Existing Conditions - Brooktrails Township  
PM Peak Hour

Location	Intersection Delay (Sec.)	Worst Movement	LOS
1. U.S. 101/Sherwood Road <sup>1</sup>	6.0	—	B
2. Sherwood Road/Birch Street/Birch Terrace	—	EBLT	A
3. Sherwood Road/Brooktrails Drive	—	EBLT	A
4. Sherwood Road/Primrose Drive	—	EBLT	A
5. Sherwood Road/Daphne Way	—	WBLT	A
6. Sherwood Road/Poppy Drive	—	WBLT	A
7. Primrose Drive/Clover Road	—	EBLT	A

1. U.S. 101/Sherwood is the only signalized intersection in the study area.  
EBLT = eastbound left-turn movement  
WBLT = westbound left turn movement

Figure 3.1.2-1

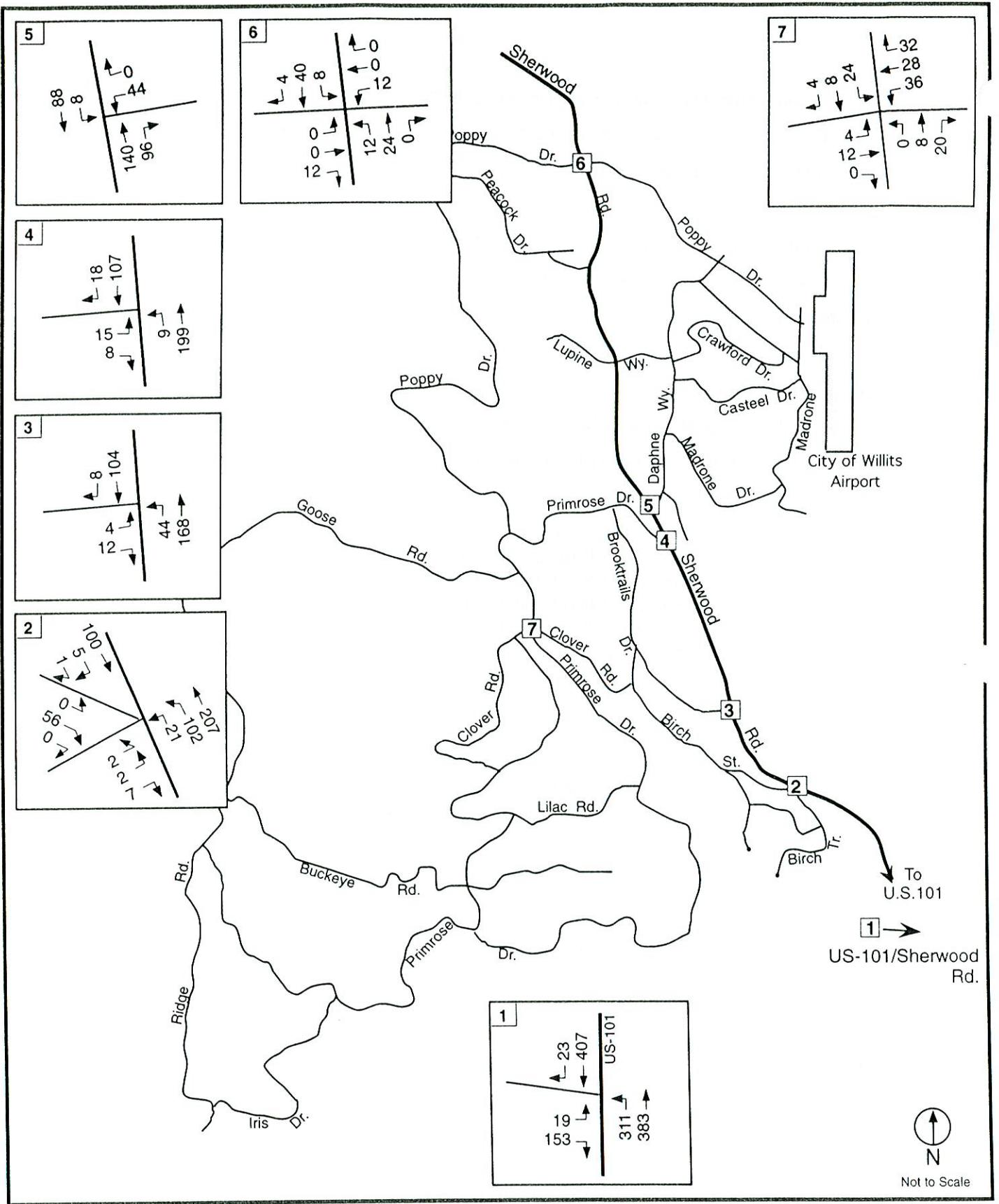


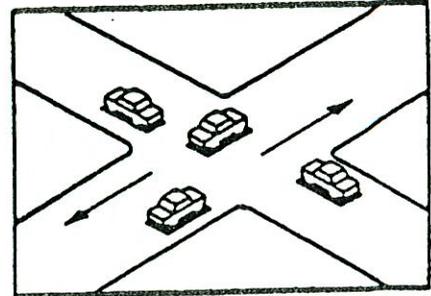
FIGURE 3.1.2-1

**EXISTING TRAFFIC VOLUMES  
PM PEAK HOUR**

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Transportation Consultants

**LEVEL OF SERVICE "A" - V/C = 0 TO 0.60**

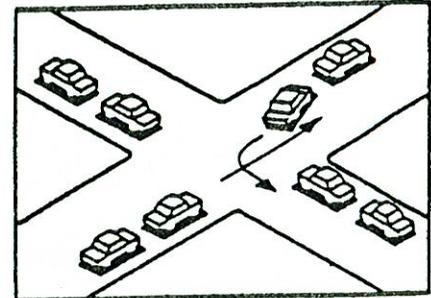
Describes operations with very low delay, i.e., less than 5 seconds per vehicle. This occurs when signal progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.



LOS 'A'

**LEVEL OF SERVICE "B" - V/C = 0.61 TO 0.70**

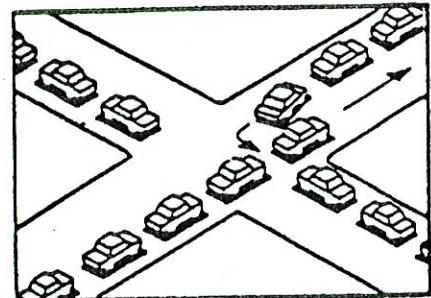
Describes operations with delays in the range of 5 to 15 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS "A", causing higher levels of average delay.



LOS 'C'

**LEVEL OF SERVICE "C" - V/C = 0.71 TO 0.80**

Describes operation with delay in the range of 15 to 25 seconds per vehicle. Occasionally vehicles may wait more than one red signal phase. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.



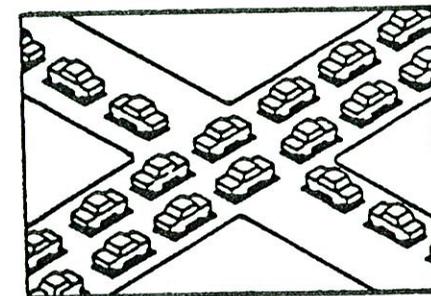
LOS 'D'

**LEVEL OF SERVICE "D" - V/C = 0.81 TO 0.90**

Describes operations with delay in the range of 25 to 40 seconds per vehicle. At LOS "D", the influence of congestion becomes more noticeable. Many vehicles stop, and the proportion of vehicles not stopping declines. Noticeable numbers of vehicles fail to clear signal during the first green phase.

**LEVEL OF SERVICE "E" - V/C = 0.91 TO 1.00**

Describes operations with delay in the range of 40 to 60 seconds per vehicle. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Vehicles frequently fail to clear the signal during the first green phase.



LOS 'F'

**LEVEL OF SERVICE "F" - V/C GREATER THAN 1.00**

Describes operations with delay in excess of 60 seconds per vehicle. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection.

SOURCE: Highway Capacity Manual, 1985.

FIGURE 3.1.2-2

LEVEL OF SERVICE

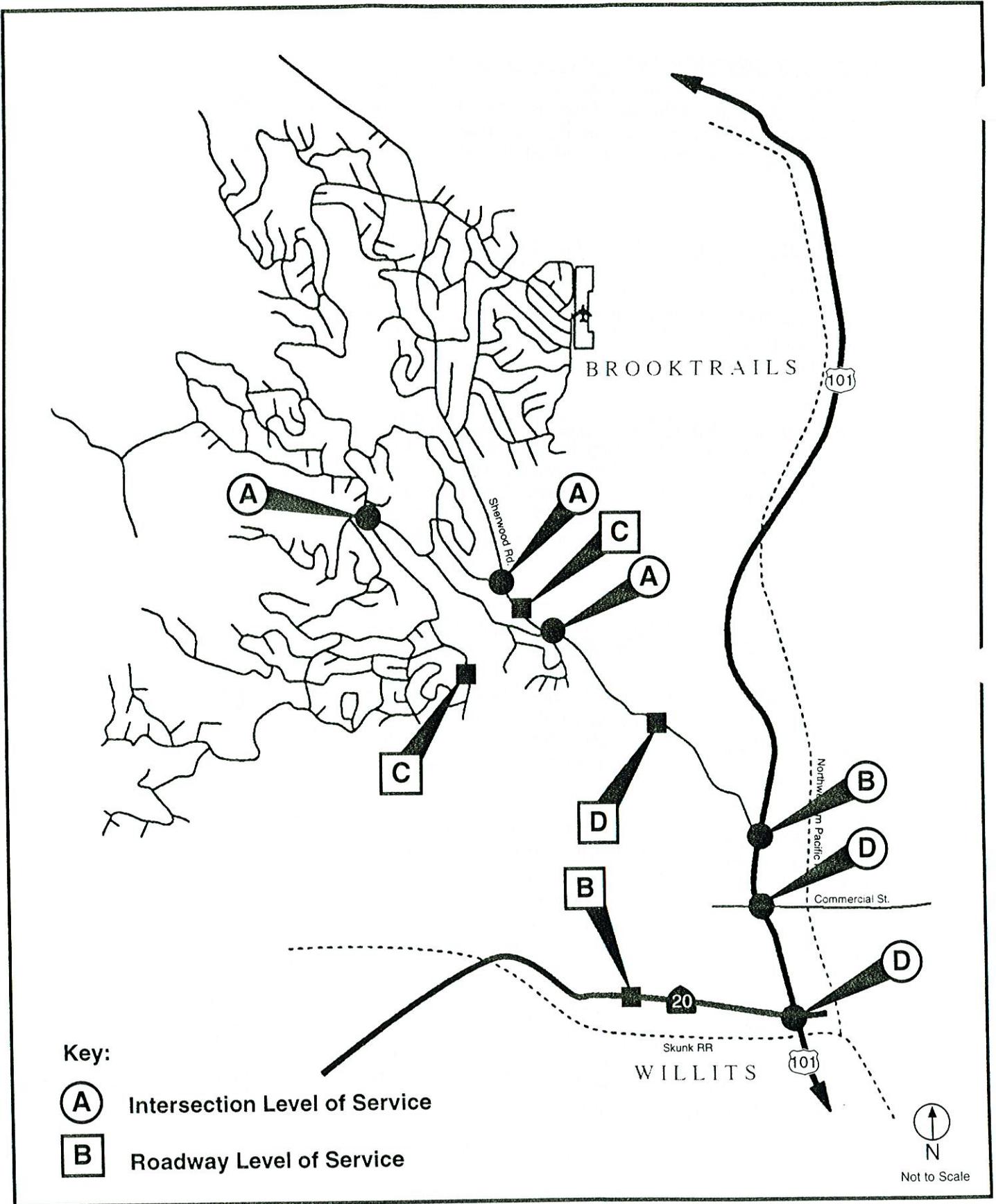


FIGURE 3.1.2-3

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**EXISTING CONDITIONS  
YEAR 1993**

**fp** Fehr & Peers Associates, Inc.  
Transportation Consultants

Level of service (LOS) calculations were performed using Highway Capacity Software (HCS) Operations Method for signalized and unsignalized intersections, and for rural highway facilities (Figure 3.1.2-2). Historic trends and previous data collection efforts indicate that peak traffic volumes occur in the study area during the month of August, hence no adjustments to traffic volumes were used. As seen in Figure 3.1.2-3, all existing signalized and unsignalized intersections in Brooktrails and at the Highway 101/Sherwood Road intersection operate at LOS B or better, using the Highway Capacity Software (HCS) Operations Method.

In contrast, Sherwood Road between U.S. 101 and Birch Street operates currently at LOS D. According to the Institute of Transportation Engineers (ITE), Sherwood Road would be classified as a rural 2-lane highway. The Level of Service designation (LOS D) is predicated on the rural road designation and may overstate the condition due to the fact that Brooktrails is a blend of rural and small town environments and the segment in question is hardly long enough (3 miles) to truly resemble an isolated rural roadway.

Existing local streets in Brooktrails generally carry low levels of daily traffic (under 500 vehicles), with a few exceptions. Birch Street from Clover Road to Sherwood currently carries about 1,600 vehicles daily, while Daphne Way carries approximately 1,500 vehicles per day.

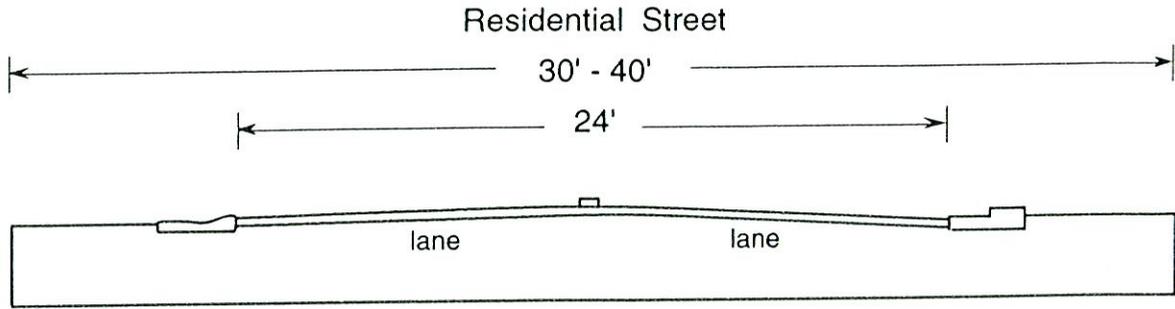
The directional flow of traffic on Sherwood Road during the PM peak hour was 66% northbound and 34% southbound, or quite similar to the directional split of residential land uses as described in the ITE Trip Generation Manual.

#### Parking

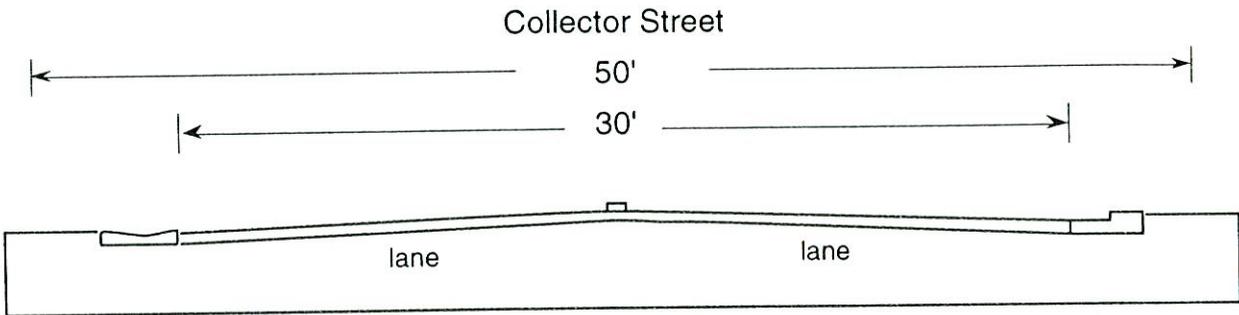
Local streets in Brooktrails have paved widths of 24 to 30 feet (see Figure 3.1.2-4), with no on-street parking allowed per County regulation. When vehicles do park on the street, there is insufficient clearance for a vehicle to pass without passing over the centerline. Traffic signage in Brooktrails is adequate with minor exceptions, including warnings on Sherwood Road of entering traffic and internal directional signing.

#### Geometry

Sherwood Road is classified as a Major Collector (see Figure 3.1.2-1) according to the County's criteria: it "provides service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intraregional importance (County General Plan, p.III-8). In the near future, Sherwood Road may be upgraded to a Minor Arterial, as it will "link cities and towns above 5,000



**Maximum ADT : 2,000**  
**No On-Street Parking**



**Maximum ADT : 3,500**  
**No On-Street Parking**

FIGURE 3.1.2-4

**EXISTING STREET CROSS SECTIONS  
 BROOKTRAILS TOWNSHIP SPECIFIC PLAN  
 TRAFFIC ANALYSIS**

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population (...) and form an integrated network providing interstate and intercounty service (General Plan, p. III-7). Sherwood Road does not meet current County standards in terms of shoulders or, in some locations, lane width.

Intersection geometries vary widely in Brooktrails due to the rugged topography, i.e., there are few true 90 degree approaches. Due to low traffic volumes and speeds this is generally not a problem, except at a few locations. The intersection of Sherwood Road/Birch Street/Birch Terrace is problematic because of the poor visibility and merge of two residential streets into one street at the intersection. The intersection of Sherwood Road and Poppy Dr. is sub-standard due to an extreme drop on the westbound approach of Poppy Dr. just prior to Sherwood Road, resulting in poor visibility and warning for motorists. The lack of a left turn lane or shoulders on Sherwood Road makes this more of a problem.

All intersections in Brooktrails are either controlled by one or two way STOP signs, or completely uncontrolled. Field observation did not reveal any intersections which should be controlled that are currently uncontrolled.

**Table 3.1.2-2  
COUNTY GEOMETRIC STANDARDS: SHERWOOD ROAD**

	Minor Arteria	Major Collector
Min. ROW Width	80' to 100'	60' to 80'
Min. Lane Width	12'	12'
Min. Shoulder Width	4' to 8'	4' to 8'

*Source: County General Plan, p. III-13*

Accident History

According to the California Highway Patrol Statewide Integrated Traffic Records Systems (SWITRS), there have been a total of 41 reported accidents on Sherwood Road between January 1991 and October 1993. Of these 41 accidents, almost 20% have been located at the intersection of Sherwood Road and Birch Street/Birch Terrace. The accidents resulted in one fatality and injuries to 41 other people. The most

common collision factor reported was “ran off road” (66%), which is either due to operator error, winding roadway conditions, lack of left turn lanes, or a variety of other conditions.

The high level of accidents and injuries on Sherwood Road is significant, as it translates into an accident rate of 1.6 acc/mvm (accidents per million-vehicle-mile) since the typical rate is about 1.2 acc/mvm for a rural 2 to 3-lane road.

On U.S. 101 from its junction with S.R. 20 in Willits to Casteel Lane past Brooktrails, there were 165 reported auto accidents in five years from June 1988 to June 1993. Fifty-nine out of the reported 165 were injury related (36%), and there were no fatalities. The accident rate at this section of U.S. 101 is 6.53 acc/mvm, which is higher than Caltrans had expected. However since late November of 1992, when a northbound left-turn phase was added at the intersection of U.S. 101/Sherwood, the accident rate decreased significantly for the next six months, dropping to 3.34 acc/mvm, much closer to the expected rate of 3.70 acc/mvm.

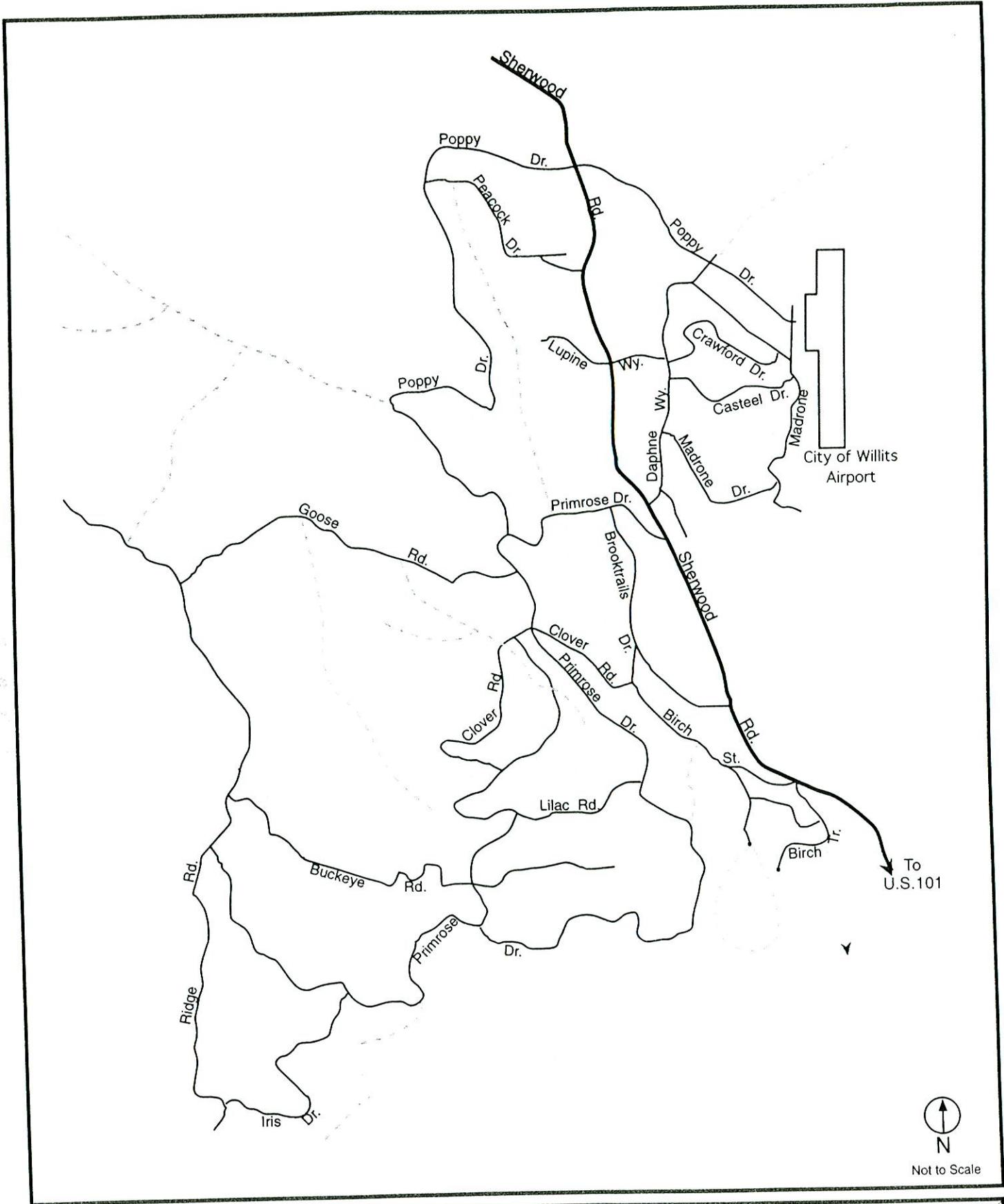
#### Transit Service

Currently, the Mendocino Transit Authority (MTA) provides service ranging from Ukiah to Willits, with the northernmost stop at City Park on Commercial Street. There is also a dial-a-ride service that extends access into Brooktrails, but it is limited only to certain areas inside the Township. Residents of Brooktrails who wish to utilize MTA service would most likely use the City Park stop on Commercial Street, which is within several blocks of the Sherwood Road/Main Street (U.S. 101) intersection.

On weekdays, the Ukiah-bound bus makes six trips each day from the City Park stop to Ukiah: essentially all of them run during the commute rush hours, three in the morning between 7AM and 9AM and returning to Willits with four in the afternoon between 3PM and 4PM. MTA calculates that approximately 47,000 people rode the bus between Willits and Ukiah from July 1992 to June 1993. Ridership tends to be at a minimum during the summer season, when students are on vacation.

#### Non-Motorized Transportation

The original developers of Brooktrails designed the subdivision with an extensive network of greenbelts, open spaces, and trails ( see Figure 3.1.2-5). This network permits relatively good internal circulation by pedestrians off of the street network, along with opportunities for recreation and exercise. The lack of shoulders or sidewalks for pedestrians and bicycles is an issue on Sherwood Road, where any non-motorized movement must take place within the travel lanes.



**FIGURE 3.1.2-5**  
654-16-01

**EXISTING TRAILS**

### 3.1.2-3 IMPACTS AND MITIGATION MEASURES

#### Brooktrails Township Specific Plan Policies

Plan goals specifically related to traffic and circulation in the Plan area appear in the Community Facilities and Services Chapter of the Plan as TRANSPORTATION AND CIRCULATION GOAL FS-7.1-1, and FS-7.1-2. The Policies for implementing the Goals are central to the issue of transportation and circulation and are reiterated here to allow the reader easy reference to the actual language in the Plan.

TRANSPORTATION AND CIRCULATION GOAL FS-7.1-1: Improve vehicular access/egress to/from the Township and ensure adequate circulation within the Township.

POLICY FS-7.1-1A: Construct a new second Brooktrails Township access road extending from State Highway 20 to the Township.

POLICY FS-7.1-1B: Construct improvements at the Sherwood Road/Birch Street intersection.

POLICY FS-7.1-1C: Construct improvements along Sherwood Road to enhance safety and vehicular movement.

POLICY FS-7.1-1D: Construct a trail from the Township to the City of Willits for walking and bicycling.

POLICY FS-7.1-1E: Develop improved vehicular access to the Ells Field airport.

TRANSPORTATION AND CIRCULATION GOAL FS-7.2: Recognize the need for a U.S. Highway 101 Willits bypass.

POLICY FS-7.1-2A: Coordinate Township growth and development with the California Department of Transportation to ensure the adequacy of U.S. Highway 101 improvements.

Standards of Significance

A project would have significant traffic impacts if it causes a substantial increase in traffic relative to the existing and projected traffic relative to the existing and projected traffic volumes and capacity of the street system. The capacity of a particular roadway is dependent on the roadway's designed capacity and functional classification.

According to the Willits Creek Reservoir Project EIR, 1991,<sup>1</sup> the functional classification of the internal Brooktrails street system is as follows:

“Collector Street”	Sherwood Road
“Arterial Streets”	Brooktrails Drive
	Primrose Drive
	Ridge Road
	Goose Road
	Poppy Drive
	Daphne Way

It is assumed that the “arterial” streets described in the Willits Creek Reservoir Project EIR meet the general classification of residential collector streets, with a planning capacity of 3,500 ADT. Other residential streets would have a planning threshold of 2,000 ADT. Traffic levels over 2,000 ADT are typically considered not suitable for streets with residences, and should be minimized to the extent possible. Figure 3.1.2-6 illustrates the existing arterial collector system in Brooktrails based on commonly accepted definitions.

Impacts

Traffic counts performed in Brooktrails (see Figure 3.1.2-1) on a weekday in July 1993 resulted in a total of 569 vehicles being counted during the peak PM period, of which 334 were inbound from U.S. 101, 172 outbound towards U.S. 101, and 63 internal. When divided by the total number of dwelling units (1,200), the result is a PM peak hour trip generation rate of .47 trips per household.

The rate of .47 trips per dwelling unit is substantially lower than the ITE residential rate of 1.01 trips, and higher than the retirement rate of .28 trips. There are several probable explanations for this discrepancy.

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1. Brooktrails Township Community Services District, *Willits Creek Reservoir Project Draft Environmental Impact Report, 1991*.

**Legend**

-  Minor Collector
-  Major Collector

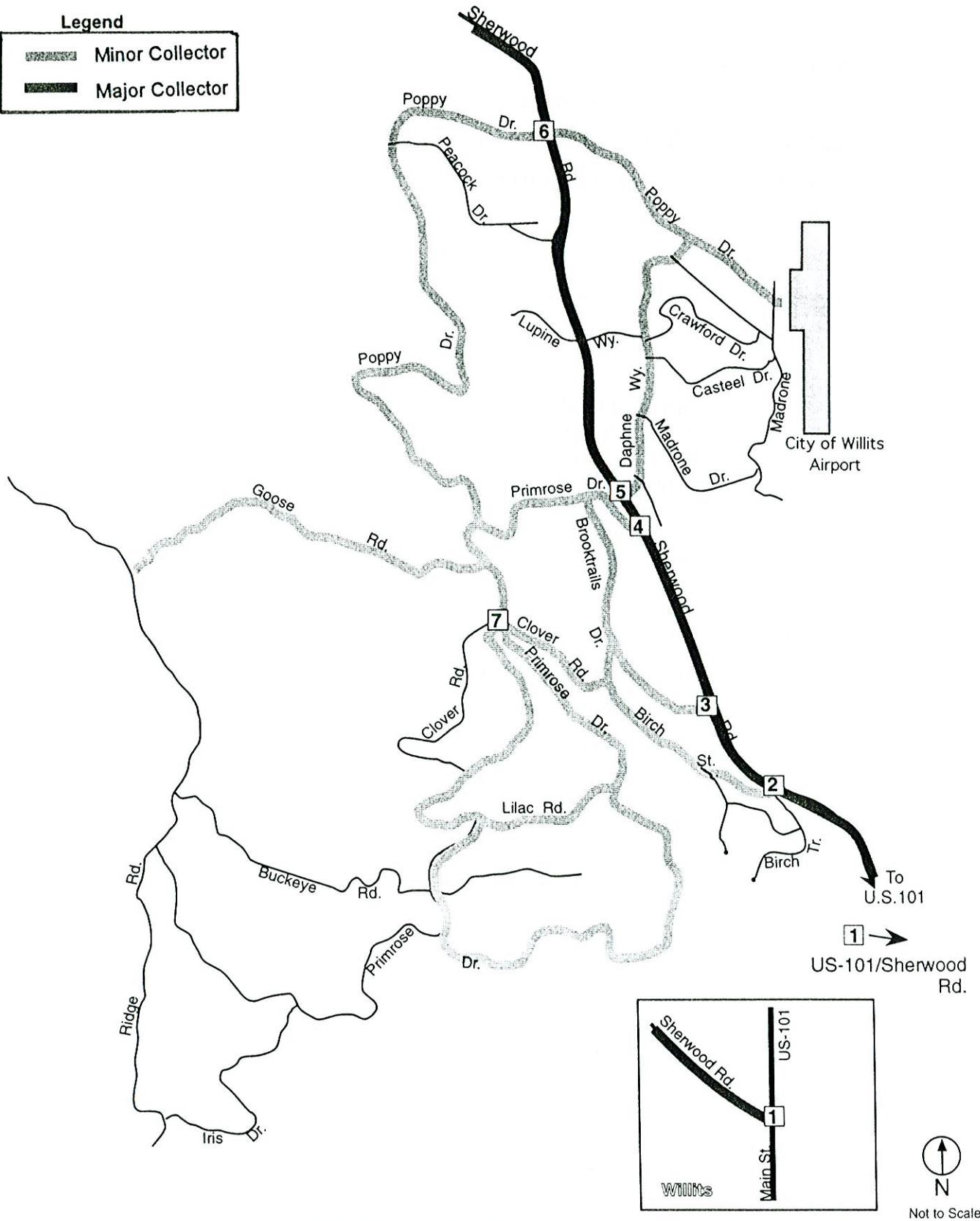


FIGURE 3.1.2-6

**EXISTING ROADWAY DESIGNATIONS**

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1. ITE rates are often more than 20 years old, and typically consist of data from suburban and urban (rather than rural) data sources;
2. Brooktrails may have a higher than average mixture of retirement and/or vacation residences;
3. Due to longer driving distances, Brooktrails residents may combine more trips than average and may have a more extended peak hour than average.

Based on these observations, the existing trip generation rate is rounded to 0.5 PM peak hour trips per household. Applying this factor to the additional residential development allowed under the Specific Plan results in an additional 2000 additional PM peak hour trips. The factor assumed for internal trip generation to and from the proposed commercial area is .2 per dwelling unit. Applying this factor to the number of additional dwelling units allowed under the Specific Plan results in an additional 763 internal trips. Assumed distribution of these trips is presented below.

**TABLE 3.1.2-3**  
**Brooktrails Township Specific Plan: Traffic Analysis**  
**Future Peak Trip Distribution**

Location	Percent
Willits	55%
South of Willits	40%
North of Willits	3%
West of Willits	2%
<b>Total</b>	<b>100%</b>
<i>Source: Brooktrails Access Study, 1995</i>	

The existing Brooktrails roadway network has the following deficiencies:

- Sherwood Road between Birch Street and U.S. 101 is over capacity based on standards for a rural two-lane highway operating at LOS C.
- The Birch Street/Sherwood Road intersection is substandard from a traffic safety perspective
- There is a lack of adequate evacuation routes from many neighborhoods of Brooktrails
- Main Street (U.S. 101) through Willits currently operates at or over capacity during the PM peak period, with summer peak periods resulting in a breakdown of traffic flow

**Table 3.1.2-4  
FUTURE ROADWAY CAPACITIES**

Facility	Designation	LOS C Peak Hour Capacity
State Route 20	4-lane urban arterial	2,720 vph
Southern Access Road	2-lane urban arterial	1,360 vph
Sherwood Road	2-lane rural arterial	745 vph
Primrose Dr.	2-lane collector	610 vph

Future planned improvements to roadway geometrics would result in the following roadway capacities. Using ITE methodology on the existing transportation network, the system currently operates over capacity during the PM peak hour on Sherwood Road between U.S. 101 and Birch Street (LOS D), despite the fact that the preceding intersection, the Sherwood/U.S. 101 intersection, operates at LOS B (little delay).

The intersection of Sherwood Road and Birch Street, an unsignalized intersection currently operates at LOS A. Currently the capacity of local streets in Brooktrails, specifically Birch Street, Daphne Street, and Clover Road are constrained. The theoretical maximum daily volume on a residential street is 2,000 vehicles, and 3,500 on a local collector street. Based on these figures, Birch Street only has an excess peak hour capacity of 39 vehicles before it exceeds the volumes for a residential street and 189 vehicles before it exceeds the volumes for a collector street.

By making improvements to the existing network the capacity of the system rises appreciably. Signal phasing adjustments to the Sherwood Road/U.S. 101 intersection raises the capacity to over 2,000 peak hour vehicles, compared to the 1,300 it currently carries.

The addition of passing lanes and shoulders to Sherwood Road raises the capacity to about 650 peak hour vehicles, 150 over the current volume of 506 vehicles. It is also recommended that this segment LOS method be examined for appropriateness in Brooktrails: many communities only use intersection LOS as an evaluation tool. A breakdown of various capacity scenarios for Sherwood Road is presented below. If LOS D is acceptable as a threshold on Sherwood Road, a reserve capacity of 190 vehicles is available ( $696-506=190$ ).

The signalization and addition of a northbound left turn lane at the intersection of Sherwood Road and Birch Street increases capacity to over 2,000 vehicles per hour, far beyond current needs of 503 peak hour vehicles.

The limits imposed by residential and collector streets within Brooktrails continue to serve as the leading capacity constraint on the system, because there are few means of expanding capacity. It may be necessary to make Birch Street, Daphne Way, and other local streets less inviting to motorists who could use alternative routes (such as Brooktrails Drive, Primrose Drive, and Lupine Way).

Assuming that equal distribution of traffic off of Sherwood Road can be achieved onto the nine through local streets (total peak hour capacity: 1,800 vehicles), it becomes apparent that the second greatest limitation is Sherwood Road itself (maximum peak hour volume with improvements within LOS C: 650 vph) rather than any single intersection.

#### Impact 3.1.2-1

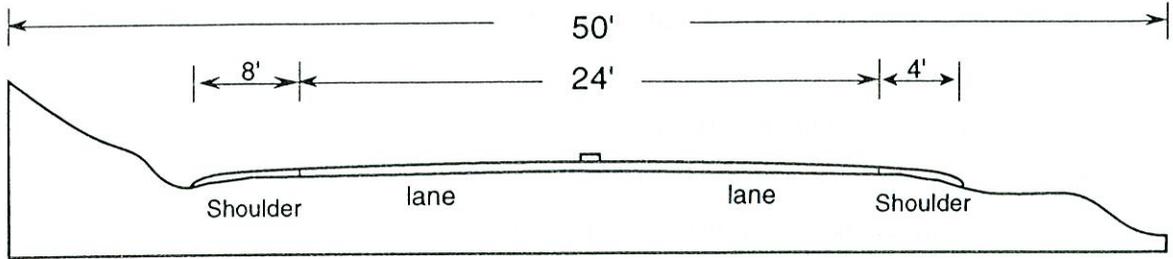
The additional development allowed under the Specific Plan would result in approximately 2,000 additional peak hour external vehicle trips and 763 additional internal vehicle trips. This represents an increase of 380 percent from 1993 levels for external trips, while internal trips are projected to increase 635 percent. This translates into roughly a six fold increase in traffic levels on most internal streets in Brooktrails. These trips would result in increased congestion and safety impacts due to the increased demand on the roadway capacity. (S)

#### Mitigation Measures 3.1.2-1

The following roadway improvements will be required by build-out (4,000 equivalent dwelling units) to accommodate future traffic in and around Brooktrails.

- Sherwood Road - Shoulders and left turn lanes from U.S. 101 to Poppy Drive (see Figure 3.1.2-7A). Pedestrian pathway to be included along entire length. Re-design Birch Street intersection to enhance safety (see Figure 3.1.2-8).
- Southern Access Road - Construct new 2-lane arterial between Primrose Dr. and S.R. 20 to relieve Sherwood Road. Signalize intersection with S.R. 20. The alignment will require the purchase of private property, and an environmental impact report.
- Clover Road/Primrose Dr. - New signal required.
- Primrose Dr./Sherwood Road - New signal required
- Primrose Drive - Traffic volumes on Primrose Drive between the Southern Access Road and Sherwood Road are expected to increase to as high as 900 vehicles during the peak

### Sherwood Road



### Second Access Route

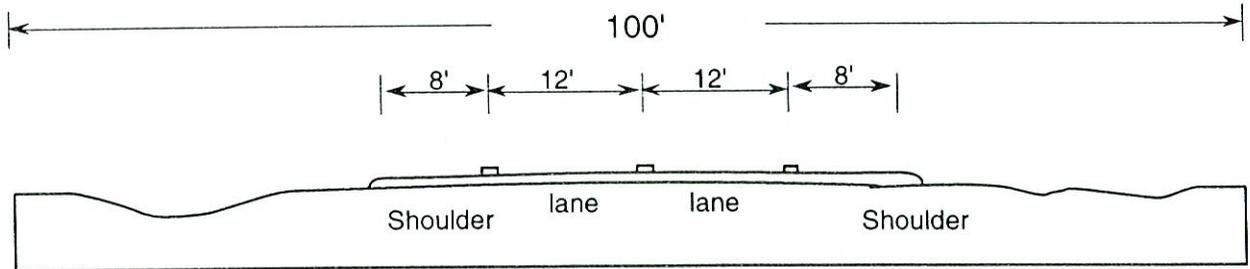


FIGURE 3.1.2-7A

654-31-01

RECOMMENDED STREET CROSS SECTIONS  
BROOKTRAILS TOWNSHIP SPECIFIC PLAN  
TRAFFIC ANALYSIS

**fp** Fehr & Peers Associates, Inc.  
Transportation Consultants

hour, a 25 fold increase. In order to help manage this traffic, Primrose Dr. should be upgraded to enhance safety for residents and vehicles alike. This includes shoulders, pedestrian pathways, left turn bays, and horizontal and vertical geometric improvements especially near Lake Ada Rose.

- State Route 20 - While entirely outside Brooktrails, S.R. 20 between the Southern Access Road and Main Street (U.S. 101) will need to be expanded to a 4-lane arterial by buildout.

Implementation of these mitigation measures would reduce the impacts to insignificant.(I)

#### Impact 3.1.2-2

**Development pursuant to the Specific Plan would increase the number of vehicles and people that would use the existing emergency exit route which could result in a potential safety hazard to human life and property.(PS)**

#### Mitigation Measure 3.1.2-2

Construct new 2-lane arterial between Primrose Dr. and S.R. 20 to relieve Sherwood Road Signalize intersection with S.R. 20. The alignment will require the purchase of private property, and an environmental impact report.

- Implement all of the recommendations in the Brooktrails Evacuation Plan. This includes one new all-weather route along the Meadowlark Trail in northeast Brooktrails, and a new southern access route. These corridors should be maintained to accommodate all vehicles in Brooktrails, and all residents should be notified of the evacuation route to use in the event of an emergency.

Implementation of these mitigation measures would reduce the impacts to an insignificant level.(I)

#### Impact 3.1.2-3

**Additional residential development at Brooktrails could result in additional on-street parking which would result in potential significant impacts to the circulation system. (PS)**

On-street parking is not currently permitted in Brooktrails, although it is not uncommon to see vehicles parked on-street and enforcement is minimal. Due to street widths between 24 and 30 feet, vehicles parked on-street infringe on the travel-way required for two-way circulation. As Brooktrails grows, there will be increased pressure for on-street parking. This will be due partially to demographics (more drivers per household) and the areas of steep topography, which limits the amount of off-street parking that can be provided.

#### Mitigation Measure 3.1.2-3

It is recommended that current off-street parking requirements and on-street regulations be enforced by the Mendocino County Sheriff's Department. In addition, on-street parking bays should be provided throughout the Township where feasible (See Figure 3.1.2-7B). The off-street requirements identified in the Specific Plan (Chapter 10, Community Design) should be implemented.(I)

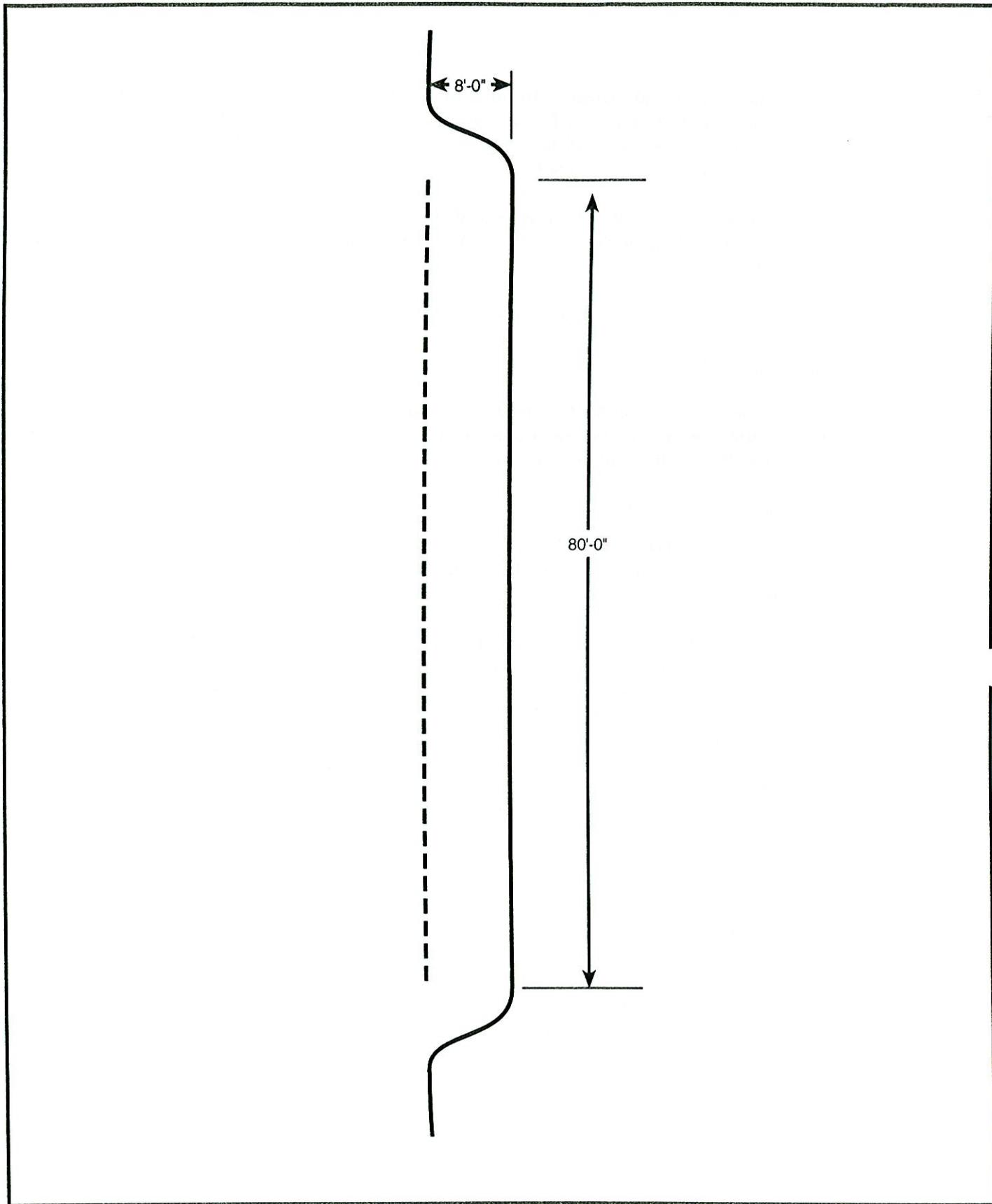


FIGURE 3.1.2-7B

TYPICAL RESIDENTIAL PARKING BAY  
4 SPACES

654-32-01

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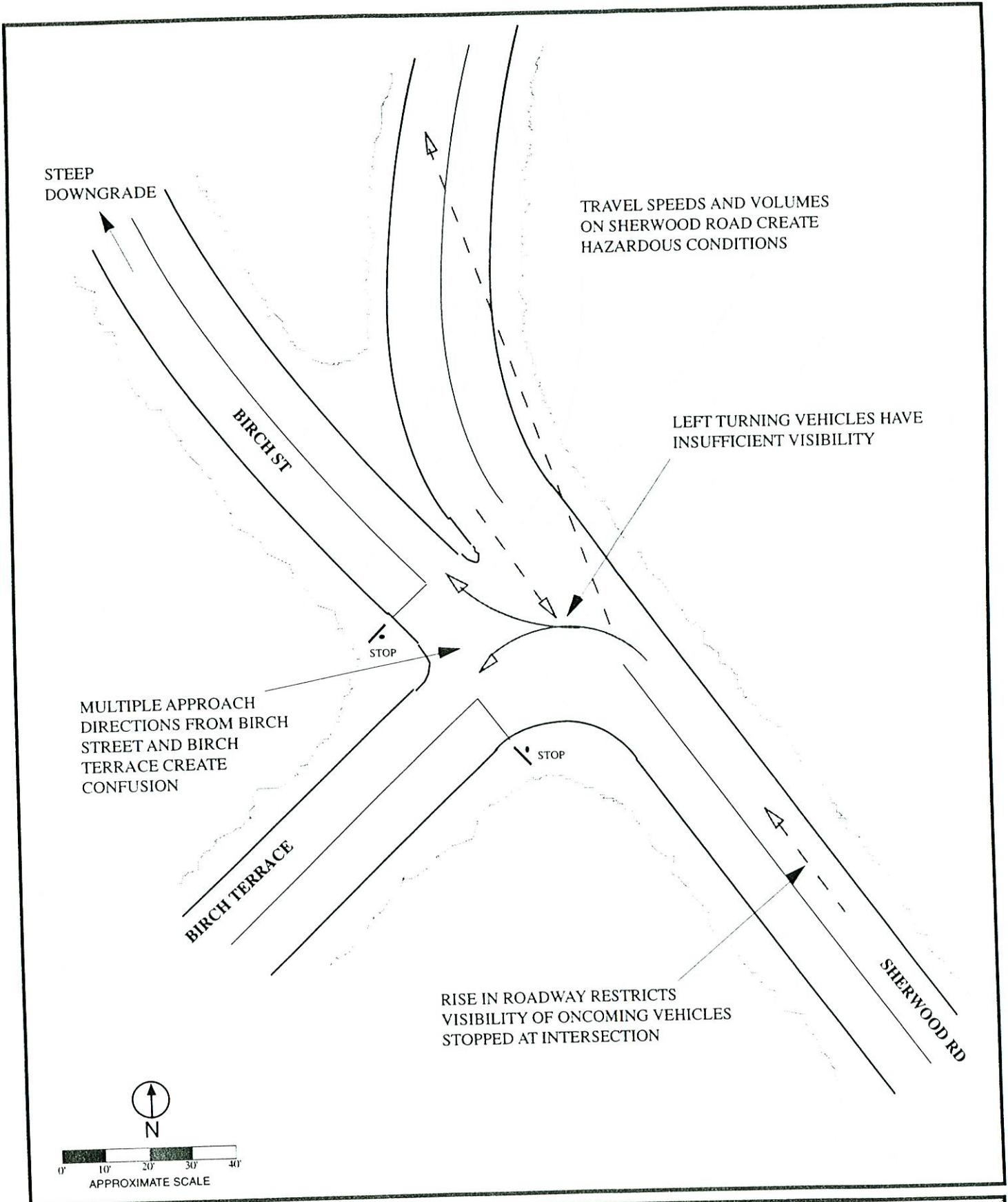


FIGURE 3.1.2-8

**EXISTING CONDITIONS  
INTERSECTION OF SHERWOOD ROAD/  
BIRCH STREET & BIRCH TERRACE**

**fp** Fehr & Peers Associates, Inc.  
Transportation Consultants

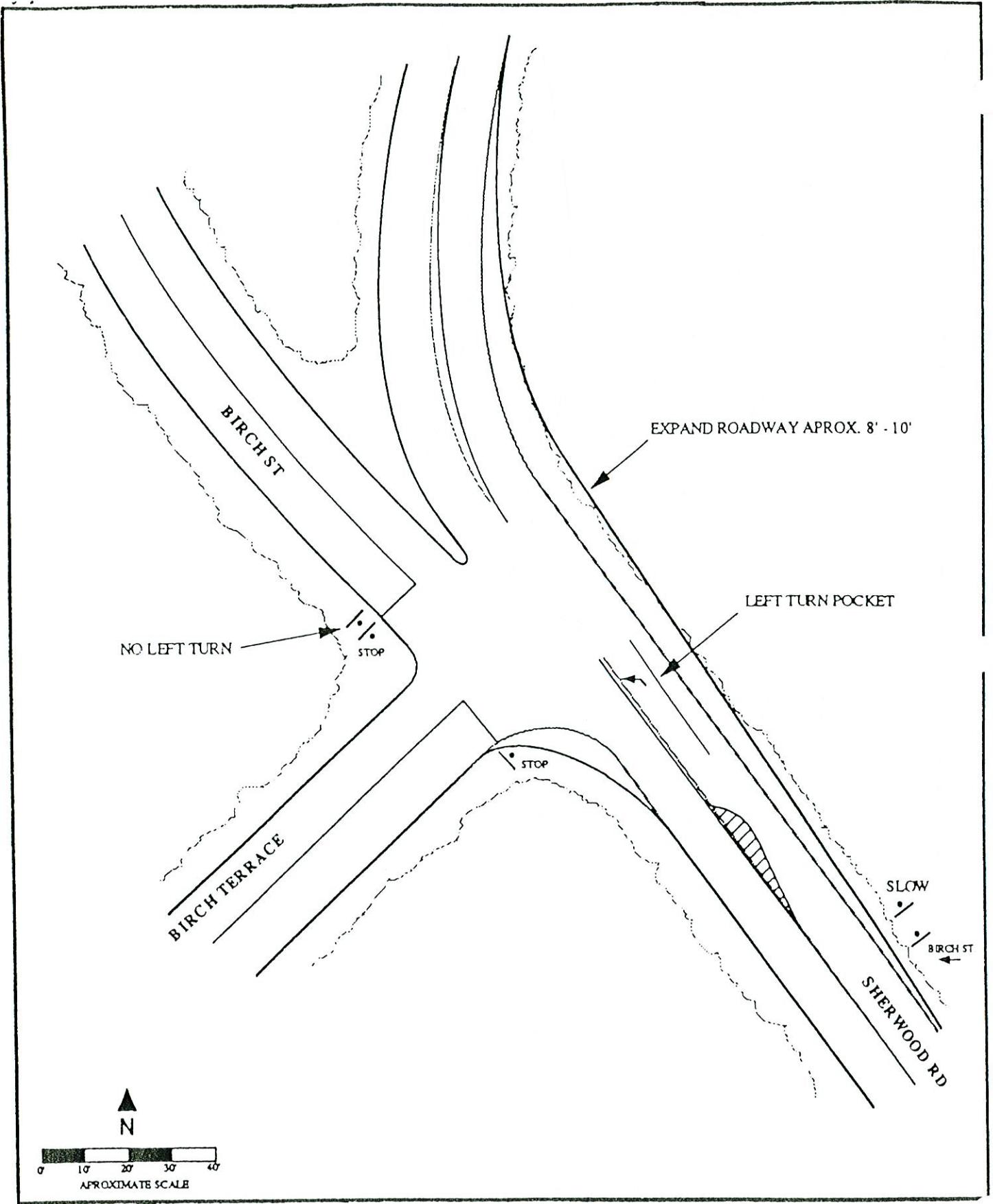


Figure 3.1.2-8B

OPTION 2  
 INTERSECTION OF SHERWOOD RD/  
 BIRCH ST & BIRCH TERRACE

fp Fehr & Peers Associates, Inc.  
 Transportation Consultants

Cumulative Impacts and Mitigation MeasuresImpact 3.1.2-4

**Build-out pursuant to the Specific Plan would generate additional vehicle trips that would contribute to cumulative traffic impacts (Figure 3.1.2-10) which would result in congestion at U.S. 101 and Sherwood Road, U.S. 101 and Commercial Street, U.S. 101 and S.R. 20 and S.R. 20 and planned Southern Access Route (Figure 3.1.2-11) (S).**

Mitigation Measure 3.1.2-4

It is infeasible for the County of Mendocino or the Township to implement possible mitigation measures. The design and implementation of such measures would be under the jurisdiction of Caltrans.(PS)

Long-term Mitigation

A second access route will be needed by 1998 to avoid Sherwood Road exceeding LOS C. An evaluation of potential second access route alignments showed that both routes #1 (Brooktrails Drive Extension) and #3 (S.R. 20 Connection) provide the greatest (and roughly equal) functional benefits to Brooktrails (see Figure 3.1.2-9). The City of Willits General Plan Revision (1992) states a preference for route #3 in combination with an Eastside Bypass connected to Willits via Commercial Street. Notably, this alternative would not provide Brooktrails with a direct connection to the future Bypass. The decision on which access route to select is inextricably linked to traffic conditions in Willits and to the status of the future U.S. 101 Bypass.

**Route #1** has the advantage of serving the greatest number of Brooktrails residents, carrying roughly 50% of all traffic, and of providing the best linkage to a future eastside U.S. 101 Bypass if it were ever built--assuming that an interchange would be constructed at this location. While the route roughly parallels Sherwood Road, its main attraction to residents would be as a safer route to U.S. 101 with greater capacity (flow) than Sherwood Road. Its primary disadvantages are (a) it forces traffic through the most congested part of Willits and (b) it does not provide a good evacuation alternative to Sherwood Road

**Route #2 (Willits Creek)** was rejected because it (a) essentially duplicates Route #3 but would have a greater impact on the riparian corridor, (b) would feed traffic directly onto local Willits Streets, and (c) would force traffic through downtown Willits.

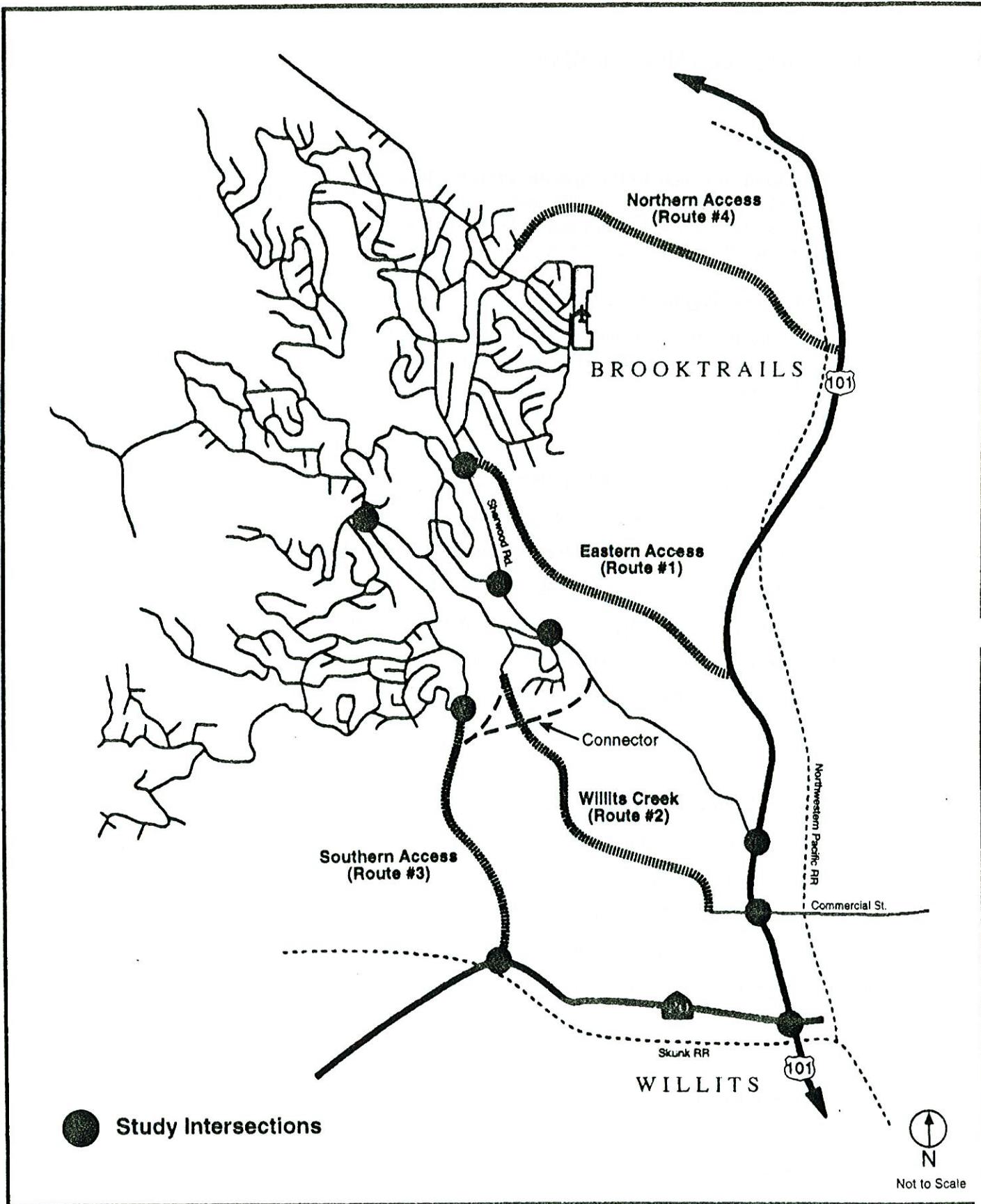


FIGURE 3.1.2-9

ACCESS ALTERNATIVES

fp Fehr & Peers Associates, Inc.  
Transportation Consultants

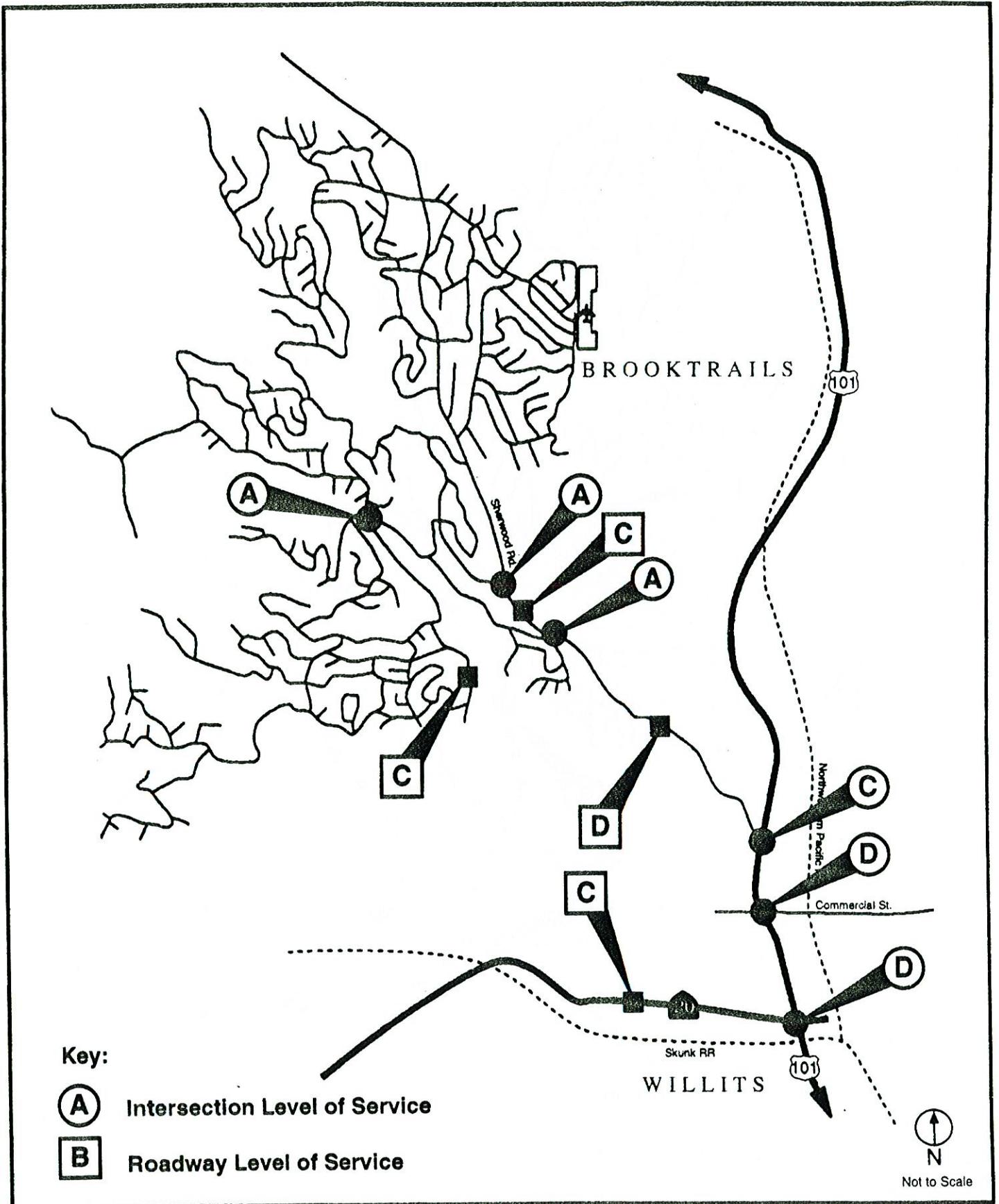


FIGURE 3.1.2-10  
654-23-01

**YEAR 2020  
WITHOUT PROJECT**

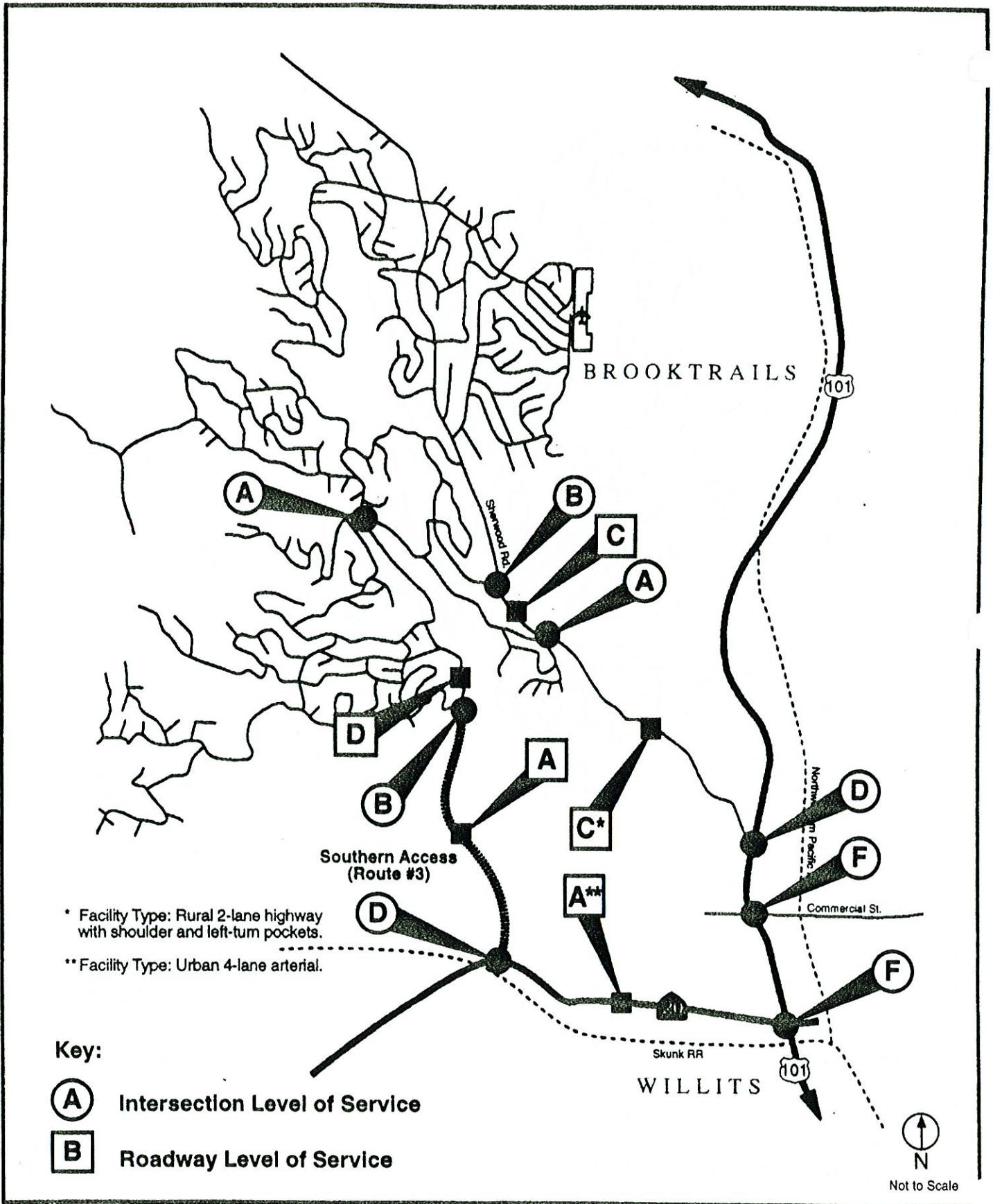


FIGURE 3.1.2-11

YEAR 2020  
SCENARIO 3B

**Route #3 (Southern Access)** would serve approximately 40% of all Brooktrails residents, would bypass part of downtown Willits, and is the shortest route to construct. One of the chief disadvantages is that it would result in substantially increased traffic on Primrose Drive and some other local roads.

**Route #4 (North Airport)** was rejected because it would serve only 30% of all Brooktrails traffic and would continue to force traffic through downtown Willits. If the Eastside Bypass were built, Route #4 would be one of the top options for a second access route. Conversely, Route #4 would offer the least functional benefit to Brooktrails if the Bypass were not built.

Based on this evaluation, Route #3 is selected as the preferred second access route largely because it provides immediate relief to Sherwood Road, bypasses the most congested part of Willits, and would provide a good second evacuation route for residents. A new signalized intersection would be required at the junction with S.R. 20, and the S.R. 20/Main Street intersection would require phasing adjustments. The new southern access route would be approximately 1.4 miles long and be designed as a two-lane divided arterial with shoulders, left turn lanes, and possibly passing lanes all within a 100 foot wide right of way. Peak hour capacity would be 1,360 vehicles per hour at LOS C, or roughly twice the capacity of Sherwood Road.

Route #1 would be an acceptable second access route in the event Route #3 could not be built. Much of the value of Route #1 is related to a possible direct linkage to the Eastside Bypass: funding for both the Bypass and an interchange are not being programmed for the long term at this juncture.

The Southern Access Road has been identified as a required improvement to accommodate increases in traffic within the short to mid term. Given the long term nature of implementing a roadway of this magnitude, it is recommended that the Township begin proceeding with implementation immediately. Some of the first steps are to (a) come to an agreement with the City of Willits and Mendocino County on the need for, location of, and timing of the access route, (b) have the route adopted as part of each jurisdiction's general plan process, (c) work with Caltrans in the implementation, funding, and coordination with the U.S. 101 Bypass project, and (d) beginning the environmental impact report process for the new southern Access route.

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## 3.1.3 VISUAL QUALITY AND COMMUNITY CHARACTER

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### 3.1.3-1 INTRODUCTION

This section of the EIR addresses the visual quality and community character of the Township and its environs. The discussion evaluates the potential visual impacts associated with Township buildout as envisioned in the Specific Plan.

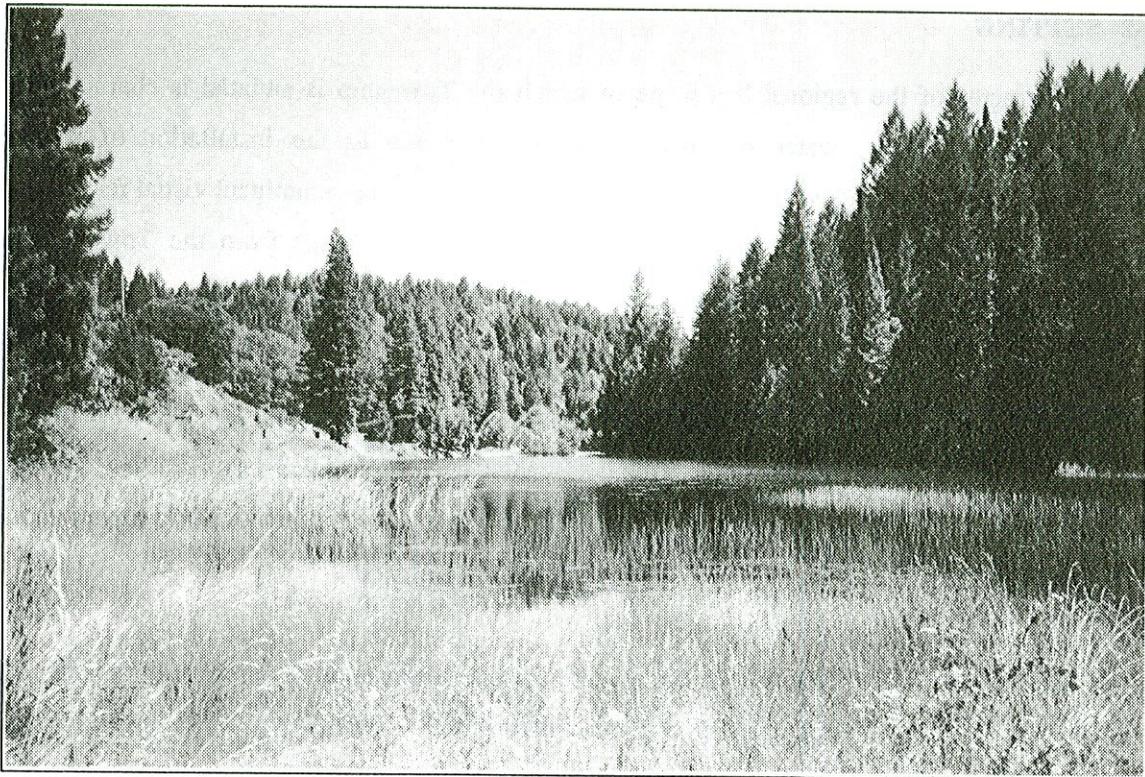
It should be noted that there are few objective or quantitative standards for accurately determining the aesthetic or visual quality of the environment because individuals respond differently to changes in their surroundings. Accordingly, judgments as to the significance of a particular effect may be expected to differ among viewers.

### 3.1.3-2 SETTING

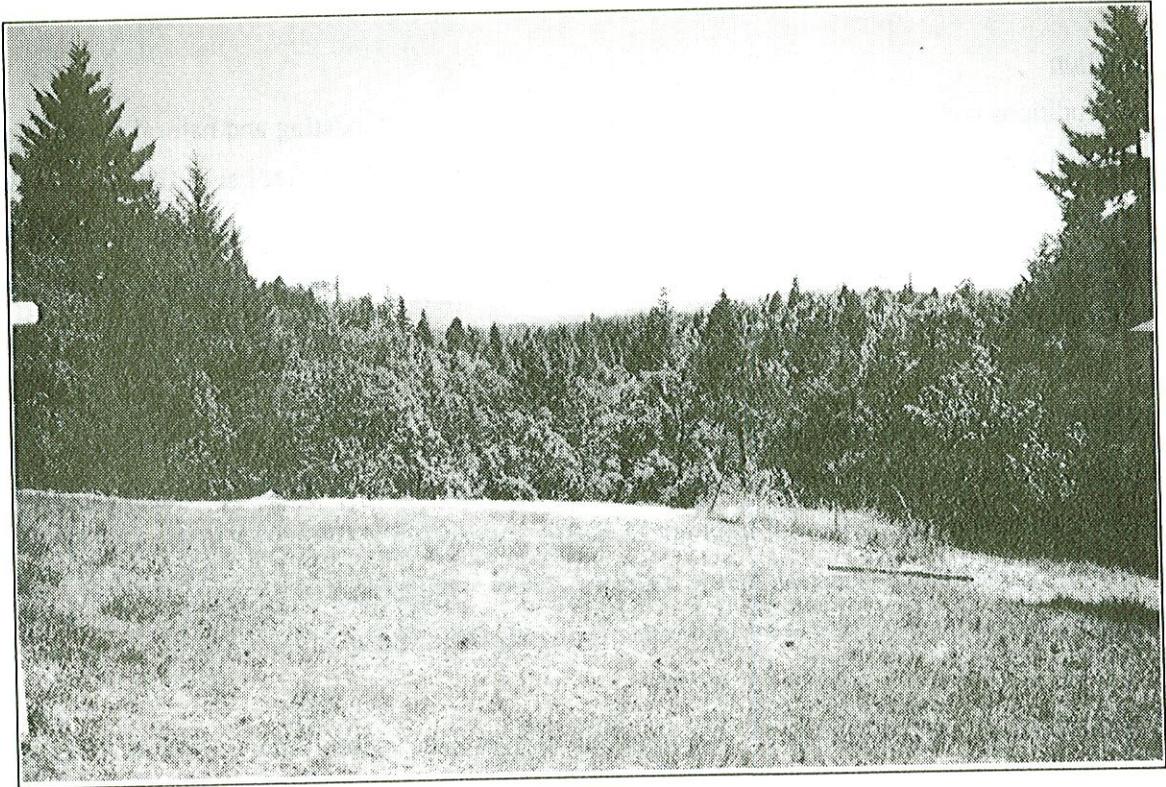
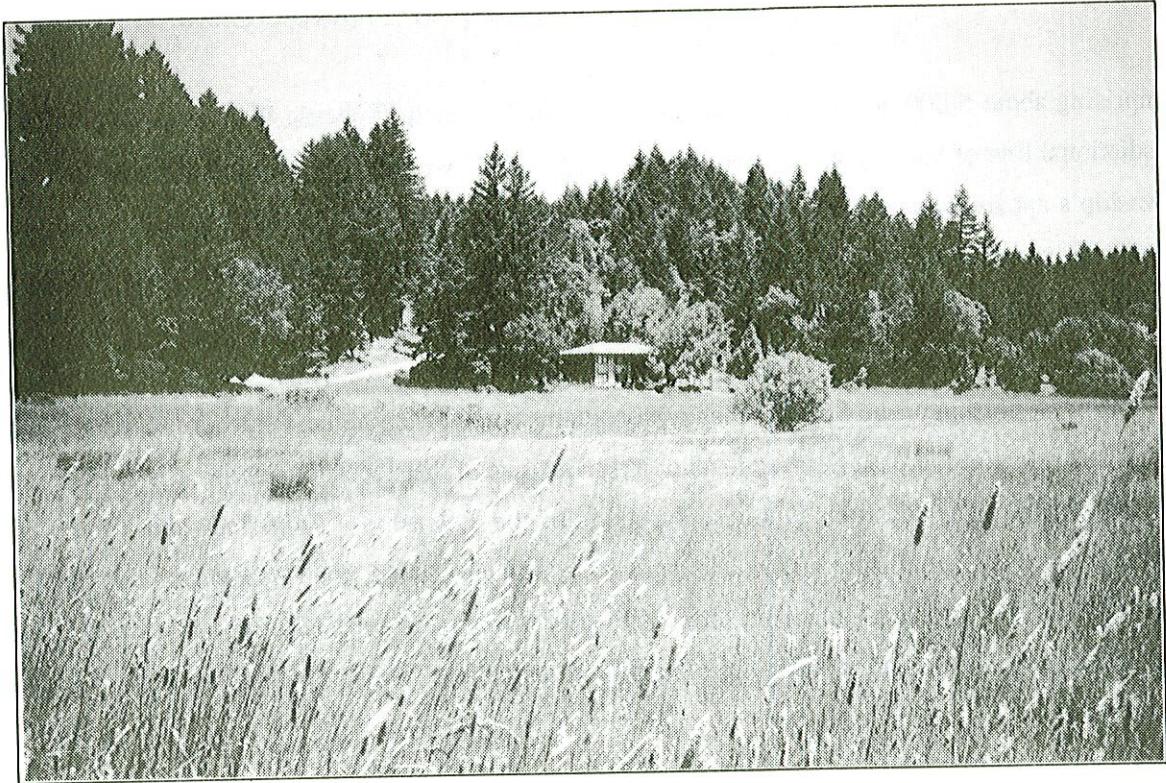
The visual character of the regional landscape in which the Township is situated is characterized by landform, vegetative cover, water features and disturbance due to the installation of roads and development. Rugged terrain and extensive coniferous forests are the predominant visual features of the region. This landscape character continues for a considerable distance from the Township in all directions, eventually giving way to the Pacific Coast, 24 miles directly to the west.

Lake Emily and Lake Ada Rose, which supply water to Township residents, are two principal water features adding variety in visual conditions to the landscape (see Figures 3.1.3-1 and 3.1.3-2, *Brooktrails Township Area Photographs*). At the current time, due to sparse development, the dominant character of the Brooktrails area and its surroundings today is rural to semirural.

Extensive clearing within the Township is not evident because only about 33 percent of the Township is built out, assuming a maximum potential of approximately 4,000 dwelling units as envisioned in the Specific Plan. Some clearing has occurred to accommodate the 26-acre Brooktrails nine-hole golf course; however, the golf course retains a park-like setting because of the redwood trees that predominate throughout.



BROOKTRAILS TOWNSHIP SPECIFIC PLAN EIR  
**Figure 3.1.3-1**  
**Brooktrails Township Area Photographs**



BROOKTRAILS TOWNSHIP SPECIFIC PLAN EIR  
Figure 3.1.3-2  
Brooktrails Township Area Photographs

### 3.1.3 VISUAL QUALITY AND COMMUNITY CHARACTER

Comprising about 5,000 acres of surface land area, the Township (Specific Plan area), is bounded by a jurisdictional line of varying configuration. Although the Township may be limited by boundaries, the Township's apparent area, particularly towards the west, is visually increased because of the redwood and mixed evergreen forests, open meadows/marshland areas, lakes and curving roadways extending into the distance visible from ridgetops.

The northwest portion of the Specific Plan area contains some of the highest elevations (over 2,000 feet) and longest ridgelines, creating strong focal points. Because of the steep slopes, vision is directed upward to hilltops from many locations within and outside of the Township. Ridgelines and hilltops viewed against the sky and cloud formations, elements of continual change, then become part of the setting. More intimate views are available in meadow and valley areas in the northeastern portion of the Township that focus toward a unique feature, for example a marshland, isolated stands of trees, or geologic outcroppings.

#### 3.1.3-3 IMPACTS AND MITIGATION MEASURES

##### Introduction

Visual conditions within the Specific Plan area today are the result of existing and natural conditions, and development within the existing setting. This includes activities of prior forest harvesting and the current generation of forest regrowth to be found within the Township. The future appearance (and thus visual quality and community character), of the Specific Plan area will be the result of existing conditions plus future development under the 4,000 unit buildout scenario.

##### Brooktrails Township Specific Plan Policies

Plan goals specifically related to visual quality and community character in the Plan area appear in the Environmental Resources Chapter of the Plan as VISUAL QUALITY GOAL ER-6.2. The Policies for implementing the Goal are central to the issue of visual quality and community character and are reiterated here to allow the reader easy reference to the actual language in the Plan.

VISUAL QUALITY GOAL ER-6.2: Preserve and enhance the natural and semi-rural character of Brooktrails Township to the extent feasible through appropriate zoning ordinances and design standards for all housing, commercial, and other uses.

POLICY ER-6.2A: Ensure desirable community appearances are achieved through the provision

### 3.1.3 VISUAL QUALITY AND COMMUNITY CHARACTER

of updated community design standards and criteria.

POLICY ER-6.2B: Ensure adequate landscaping of all new commercial development to enhance the scenic qualities of the Township.

POLICY ER-6.2C: Establish design standards for private parcels which encourage developing sites in a manner that considers existing visual resources.

POLICY ER-6.2E: Ensure that new development and new road linkages are in keeping with the natural terrain.

#### Standards of Significance

Visual quality is the perceived aesthetic value of an area based on a combination of inherent natural features and physical modifications over time. The analysis of scenic quality considers natural elements which establish the character of the scene: these include landforms, existing vegetation, water, color and light among other considerations. In addition, alteration or disturbance of the natural scene over time is considered.

The standards for determining the significance of visual impacts from development include the following:

- 1) Visual impact at full buildout would be measured by the amount of visual change affecting the Specific Plan area's aesthetic value.
- 2) Visual impact would include the compatibility of visual change of the Specific Plan area as compared to the surrounding environment.
- 3) Visual impacts of the developed Specific Plan area would be derived from project site grading, vegetation removal, the physical layout of residences with respect to each other, building bulk and height, the density of building placement, lot landscaping, parking areas and other features of development.

Viewpoint distance and altitude (viewpoint location), would also influence visual impact perception. It is expected that the elements of building configuration, building size, architectural style, open space and landscaping details would have the greatest influence from close-in viewpoints. As one moves away from an area or the field of view becomes less framed and more expansive, specific development details would become less important in defining visual impact features within the field of view.

### 3.1.3 VISUAL QUALITY AND COMMUNITY CHARACTER

#### Buildout Potential and Visual Effects

At buildout, and as envisioned in the Brooktrails Township Specific Plan, the Specific Plan area would contain 3,815 residential units (4,000 SFRs) housing a population of 9,919 individuals. There would also be expected an increase in commercial space within the Township to serve the local residents, although the rate and amount of commercial construction cannot be predicted at this time; properties zoned for commercial use would be so utilized consistent with the provisions of the Specific Plan. There would also be three additional fire stations, a new dam impounding 1,600 acre-feet of water and two new access roads into the community (the dam and access roads would be covered under separate environmental review as explained previously).

This compares to an existing count of about 1,280 dwellings (see Table 3.1.1-1, *Breakdown of Brooktrails Township Land Area by Zoning District*), housing a population of approximately 3,600 individuals and two fire stations with community center. Under either scenario, there would be 2,817 acres of Public Facilities open space greenbelt land. Thus, as indicated previously, the Township can essentially be considered as 33 percent built out at this time from a residential standpoint, the primary land use within the Township (excluding Public Facility open space).

Buildout of the Specific Plan area would have three visual effects. First, additional development within the Township would increase urbanization because of development on lots that are currently not developed, and in most cases forested. Second, additional residential construction within the Township would increase the level of urbanization because of increased development intensity. Third, additional development within the Township would introduce urban land uses to what is predominantly viewed as an area semi-rural to rural in character at the current time. In addition, signalization of some intersections would add to the suburban character of the Township. Overall, Specific Plan buildout would extend suburban (residential) development throughout the Township, increasing the geographic distribution of intensified land uses.

This form of development would be consistent with the Specific Plan goals and policies regarding growth and development. Because the Brooktrails Township area is hilly and much of the area is forested, residential construction would be expected to entail hillside grading, the alteration of hilly terrain, tree removal or other alteration of site features that could constitute visual impact. At buildout, the change in visual conditions to occur is difficult to predict because it cannot specifically be determined which lots would be improved, what style of architecture would be provided on each lot, or the amount of grading

or tree removal that would be required on each lot to allow construction. It would be the cumulative total of these conditions that would determine degree of visual change and degree of visual impact.

#### Impact 3.1.3-1

**Collectively, buildout of the Specific Plan area would convert land parcels that currently appear semi-rural to rural in character to a suburban condition. This development would constitute a potentially significant change in visual conditions within Brooktrails Township. (PS).**

Buildout of the Specific Plan area would extend residential development throughout the geographic area of the Township. There would be an approximate 66 percent increase in development density and intensity throughout the Township. It would be expected that most structures to be constructed within the Specific Plan area would be one to two stories in height, consistent with other existing residences within the Specific Plan area. However, with increased densities and development of currently undeveloped parcels, views of developed lots from adjacent roadways and lots would predominate. The sense of open space that currently exists in many portions of the Specific Plan area would be lost. Vistas would increasingly be relegated to street corridors between developed parcels in more densely developed locations. However, subdivision growth within the Township would tend to protect the scenic qualities of outlying rural areas where residential construction could otherwise occur.

The appearance of construction equipment, excavations and materials stockpiling at individual construction sites would be short-term in duration and localized, lasting during the actual period of construction. The number of trees that would need to be removed coincidental with construction on any given lot cannot be determined at this time in the absence of development details. Because existing trees visually frame and enclose existing roadways, mitigate views to some properties and structures that are unused and provide vertical emphasis within the landscape, their removal would reinforce the sense of a suburban community, detracting from the forest environment.

Individual lot landscaping to be provided with new residential and commercial development would visually screen and reduce and the amount of perceived development in the Specific Plan area, and provide visual amenities enhancing localized views. It is important to note that while the Specific Plan provides for development within the Township, the overall change in visual conditions affecting the existing setting at 4,000 residential units would remain less significant than if buildout to over 6,000 residential units were envisioned in the Specific Plan. While the impact would not occur at one time, visual change would occur over a period of years and be gradual.

### 3.1.3 VISUAL QUALITY AND COMMUNITY CHARACTER

Because of topography and forestation, development at Brooktrails would not be seen from well travelled area highways such as State Route 20 and U.S. 101, and infill development or redevelopment would be important to determining visual quality and sense community character to be gained primarily within the Township proper itself. In terms of land use, new residential development would be consistent with existing residential development.

#### Mitigation Measure 3.1.3-1

The planning and design of projects slated for construction within the Township should conform to the goals and policies for Community Design as contained within the Community Design chapter of the Brooktrails Township Specific Plan. Conformance review would occur with each development proposal and decisions under the provisions of the Community Design chapter of the Specific Plan, inclusive of the Design Guidelines and Site Development Standards. Conformance review would occur during the Township's design review process consisting of the Architectural Review Commission and District Architect, prior to the issuance of grading and construction permits by the County of Mendocino. (PS).

Mitigation Measure 3.1.3-1 will be important to ensuring community planning that meets the goals and policies of the Specific Plan. However, the visual impact as described above would still remain potentially significant because of the extent of visual change. From a planning and design perspective, the Community Design Chapter of the Specific Plan is intended to initiate the Township design review process as a means to achieve specific goals with respect to maintaining visual quality and community character for development within the Specific Plan area.

Special issues related to site development and design are included in the Chapter, among other considerations. With adoption of the Specific Plan by the Mendocino County Board of Supervisors, there would be in place a series of requirements and standards that would directly influence the visual nature and community character of future residential and commercial development in the Township. The Specific Plan Community Design chapter includes consideration of building height and scale, design appearance, street setbacks, landscaping, grading, erosion control, tree retention, preservation of visual amenities, lighting and other planning, design and construction features.

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## 3.1.4 UTILITIES

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### 3.1.4-1 INTRODUCTION

This section addresses potential impacts on utilities generated by the implementation of the proposed Brooktrails Township Specific Plan. This section addresses water supply, wastewater, electrical, and communication services, as well as the anticipated demands of a build-out of up to 4,000 equivalent residential dwelling units would place upon their service capacity. The build-out scenario of 4,000 units also contains the approximately 1,350 existing dwelling units in the Township. The Brooktrails Township provides water and wastewater collection services. Communications and electricity services are provided by outside sources.

### 3.1.4-2 SETTING

#### Water Supply

The existing water supply in the Brooktrails Township is provided by the Township's Lake Emily and Lake Ada Rose reservoirs. The combined capacity of the reservoirs is approximately 400 acre-feet (one acre foot equals 325,851 gallons). Water is distributed to all Township residents. The Township also operates a water treatment plant with the capacity to treat 1.2 million gallons of water per day. The existing water supply capacity is estimated to be able to serve a maximum of about 2,000 residential dwelling units. Water mains are located under the existing streets in the Township.

The water supply infrastructure, as identified in the *Brooktrails Township Specific Plan*, is planned for expansion with a new dam and reservoir capable of storing about 1,600 acre feet of water. The water infrastructure expansion includes water treatment commensurate with the level of demand. A new raw water main will connect the new reservoir with the existing raw water main at Lake Emily. The existing Brooktrails water treatment plant is planned for expansion at its current site to accommodate the anticipated community growth to 4,000 residential units.

The typical single-family residence in Brooktrails (or its equivalent) is estimated to consume an average of about 220 gallons of water per day. This relatively low water usage is attributed to the fact that

Brooktrails residences do not have the extent of managed exterior landscaping typically found in other suburban subdivisions, and thus require less water for landscape maintenance. In addition, many Brooktrails residents have installed various types of water saving devices in their homes.

#### Wastewater

Wastewater collection is provided to most Brooktrails residents by the Township. At present, there about 660 unsewered lots in Brooktrails, most located at areas of higher elevation. About 616 of these lots are unimproved and the approximate 44 improved lots are on septic systems.

Wastewater collected within Brooktrails Township is treated at the City of Willits Wastewater Treatment Plant. The Township has a contractual agreement with the City of Willits to use up to 37.5 percent of the treatment plant's capacity and pays a portion of the annual operating cost of the plant. The Township is also responsible for providing hookups and maintenance of the system within Brooktrails. The Township is presently using a portion of its wastewater treatment allocation at the Willits treatment plant. It is estimated that the Township could allow for the development of about 900 additional units before reaching the limit of its allotment at the Willits Wastewater treatment plant.<sup>1</sup> The City of Willits is currently planning to expand their wastewater facility to meet excess capacity criteria of the Regional Water Quality Control Board (RWQCB) requirements. According to the *Willits General Plan Revision, Vision 2020*, the treatment facility will have sufficient capacity to accommodate both Brooktrails and Willits planned growth.

Sewer line capacity for the connection between Brooktrails Township and the City of Willits is presently limited at about 2,000 residential units. Development beyond 2,000 units would require the expansion of sewer line capacity for this link.

No additional internal sewer lines are included for the few areas of the Township that presently lack sewer service, including the undeveloped lots on Ridge, Iris, Blue Lake and Alcott. These are local to individual benefit areas, which could be constructed and funded through assessments specific to these areas at such time as when the appropriate petitions are submitted.

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<sup>1</sup> Brooks and Vogel, Civil Engineers, Management Plan Update for Brooktrails Township, November 1993. Calculation based on ten years of growth at about 100 units per year. Pages 1-1 and 7-4.

### Electricity

PG&E is the electrical service provider to the Brooktrails Township. Electrical distribution and service lines extend throughout the Township. Although PG&E electrical capacity is sufficient to serve Brooktrails to full buildout of 4,000 residential units, upgrades to existing conductors and electrical substations serving the Township would be required from time to time as the community grows.

Natural gas service is presently not available in Brooktrails because no natural gas lines exist in the Township. Brooktrails residents use either propane, heating oil, electricity or wood fuels for heating. Installation of natural gas service in Brooktrails is not presently being contemplated.

### Communications

Pacific Bell is the primary telephone service provider in Brooktrails Township. Brooktrails is linked to a Pacific Bell telephone switch in Willets that adequately accommodates existing service needs. To service development to full buildout, Pacific Bell would reinforce its cable facilities between the Willets switching station and Brooktrails. Pacific Bell has instituted a monitoring system, which allows them to install equipment in anticipation of growth, to provide for timely service for new hookups and to prevent long delays in service should significant growth occur in a short period of time. There are presently areas of Brooktrails that have limitations on data transmission which will need to be addressed by Pacific Bell as the Township increases in population.

Century Cable provides cable TV services to some areas of Brooktrails. The expense of covering the 65-mile length of roads in the area limits the availability of cable services. Many residents in Brooktrails use satellite dishes instead of cable services.

## **3.1.4-3 IMPACTS AND MITIGATION MEASURES**

### Introduction

Assessments of significant impact are made for a given public utility when additional resources would be required to serve the proposed project at accepted service standards or when serving the project under current resources would reduce services to the existing public below accepted or current standards. Service standards include technical or engineering standards, standards required by law, or they may be embodied in a general plan or other land use tool. The relevant information in these regards is developed for each service addressed in this section.

Brooktrails Township Specific Plan Policies

Plan goals specifically related to the provision of water and wastewater treatment in the Plan area appear in the Community Facilities and Services Chapter of the Plan as GOAL FS-7.3-1. The Policy for implementing the Goal are central to the issue of utilities and are reiterated here to allow the reader easy reference to the actual language in the Plan.

UTILITIES GOAL FS-7.3-1: Support and maintain adequate water supply, sewage treatment and disposal, and storm drainage facilities to serve existing and future residents and businesses.

POLICY FS-7.3-1A: Provide adequate new water storage and upgrade existing treated water storage facilities consistent with growth in a fiscally responsible manner.

Standards of Significance

Township buildout would have a significant adverse impact on utilities if the proposed development and uses would:

- increase demand for potable water to the extent that expansion of water supply, treatment or distribution facilities is required beyond that which is planned for;
- require substantial expansion of wastewater treatment and distribution capacity beyond that planned by local jurisdictions;
- require the use of electrical and communication services beyond the capacities of the service providers.

Water Supply

The existing water supply and distribution system in Brooktrails Township has a capacity at about 2,000 residential units. The *Brooktrails Township Specific Plan* has anticipated the buildout of 4,000 residential units and has adopted *Utilities Policy FS-7.3-1*, to support and upgrade treated water facilities in the Township. Under this policy, the Township will develop a new 1,600 acre foot reservoir, an expansion of water treatment capabilities, and a new raw water main to connect the new reservoir to existing water facilities. Implementation of the new and upgraded facilities would accommodate growth to 4,000 units. In that the water needs of buildout to 4,000 units is anticipated and provided for in the *Specific Plan*, buildout would not adversely impact water supply and distribution systems.

Wastewater

Although the present capacity of the City of Willits wastewater treatment facility is limited, the City is planning to upgrade the facility to accommodate larger capacities. The Township would re- negotiate their agreement with the City of Willits for treatment capacity allocations sufficient to accommodate the planned development. Appendix 11.200 of the *Willits General Plan Revision, Vision 2020*, states that the expanded facility will have sufficient capacity to accommodate both Brooktrails and Willits Growth, and consequently wastewater treatment capabilities would not be impacted. Development beyond 2,000 units in Brooktrails: however, will require the replacement or paralleling of the existing trunk sewer main line between the Township and the City of Willits. This expansion of sewer capacity is anticipated and provided for under *Utilities Goal FS-7.3-1* of the *Brooktrails Township Specific Plan*, and therefore no adverse impact to sewer systems would occur as a result of the planned development.

#### Electricity

##### Impact 3.1.4-1

**Upgrades to existing PG&E conductors and electrical substations serving Brooktrails Township would be required from time to time to accommodate the community's electrical needs as it grows. This would be an insignificant impact. (I)**

Electrical capacity is sufficient to provide for Brooktrails needs at buildout; however, PG&E would need to upgrade their delivery facilities in order to convey electricity to the Township. This would be an insignificant impact in that such upgrades are a normal part of PG&E business operations to provide and maintain service to its customers.

##### Mitigation Measure 3.1.4-1

Where possible, allow for off-grid energy systems. (I)

#### Communications

##### Impact 3.1.4-2

**Pacific Bell would need to reinforce its cable facilities between their Willits switching station and the Township to accommodate full buildout. This would be an insignificant impact. (I)**

In order to provide adequate telephone service to the additional customers in Brooktrails, additional cables would have to be installed to provide the necessary capacity. This upgrading would be an insignificant impact because it would be a normal part of Pacific Bell business operations to maintain sufficient service capacity to their customers. What impact that there might be would be further offset by the Pacific Bell

\*

monitoring system, which would allow for the anticipation of such service and equipment reinforcements to be provided for in a timely manner.

Because of installation cost factors, cable TV services are presently only available in some areas of Brooktrails. The buildout is not expected to change the pattern of cable TV availability in the Township. No significant impacts to cable TV services are expected as a result of the buildout.

Mitigation Measure 3.1.4-2

Allow for new technologies such as satellite delivery systems and improved accommodation for digital communication. (I)

Sources

*Brooktrails Township Specific Plan, Administrative Draft.* Brooktrails Township Community Services District and Mendocino County. March 1996.

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## 3.1.5 PUBLIC SERVICES

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### 3.1.5-1 INTRODUCTION

This section addresses the potential impacts of the proposed Brooktrails Township Specific Plan on the providers of public services and their ability to provide such services. The subject areas include police protection, fire protection, schools and solid waste disposal. Brooktrails is an unincorporated Mendocino County community which is organized into Brooktrails Township. The Township provides fire protection services, while the remaining public services are provided by the County of Mendocino, Willits Unified School District and private companies.

### 3.1.5-2 SETTING

#### Police Protection

Police services for Brooktrails Township are provided primarily by the Mendocino County Sheriff's Department, with some assistance from the California Highway Patrol. The County Sheriff is responsible for the enforcement of State laws and County ordinances, crime prevention and apprehension of criminals in the unincorporated areas of the County, such as Brooktrails Township. The Sheriff also operates the County jail facilities, assists with various court functions, and performs coroner investigations. The County Sheriff's Department operates sub-stations in Willits and Fort Bragg, and retains resident deputies in Boonville, Covelo, Gualala, Laytonville, Leggett, Philo and Point Arena.

The Willits substation is located approximately three miles from the Brooktrails Township, 125 East Commercial Street. This station serves the area between Ridgewood Grade (south of Willits) to the Humboldt County line. Response times for the County Sheriff's sub-station at Willits are hampered by the size of the patrol area and the terrain. Response times can vary from ten minutes to an hour depending on officer location and shift. There are a total of ten sworn officers assigned to the Willits sub-station. The evening shift consists of four deputies who are stationed along the Highway 101 corridor and to as many as four deputies in Covelo (depending upon conditions there) approximately one and one-half hours north of Willits. A supervisory sergeant travels throughout the area five nights a week. During the day shift, three deputies are on patrol; they are assigned respectively to Willits, Laytonville and Covelo,

with two officers remaining at the sub-station. The Mendocino County Sheriff's Department currently maintains a total of 59 sworn officers (including the Sheriff) in a county with a population of about 75,000.<sup>1</sup> Therefore, the ratio of Sheriff's officers to residents is 1 to 1,271.

The Sheriff's Department has identified the current Brooktrails area as utilizing approximately 15 percent of their resources and expressed concerns regarding the public safety aspects of buildout to 4,000 residential units, and the corresponding change in demographics. However, the Sheriff's office recognizes that this growth would occur over many years and does not see the Specific Plan as having an immediate concern for increased law enforcement in the Brooktrails area. The Sheriff's Department has further stated that the implementation of increased staffing, due to the increased population base that buildout would generate, would have to be reviewed on a yearly basis, until the number of new residences has stabilized.<sup>2</sup>

#### Fire Protection

Fire protection in Mendocino County is provided by twenty-one fire districts and volunteer organizations, the California Department of Forestry and the U.S. Forest Service. Assistance with inspections and arson investigations is available from the Office of the State Fire Marshall.

Brooktrails maintains a fire department to meet the fire protection needs of the Township and the two nearby subdivisions of Sylvandale and Spring Creek. The Township is responsible for the protection of structures, rather than wildfires. The California Department of Forestry (CDF) is responsible by law for fire suppression on all wild lands, including those that are privately owned, and the 2,500 acres of Greenbelt located in Brooktrails Township.

The Brooktrails Fire Department and the CDF cooperate in serving a mutual protection area which includes Brooktrails, Sylvandale and Spring Creek subdivisions and occasionally areas outside of these developments. All Mendocino County fire districts participate in a mutual protection agreement which

- 
1. Sergeant Hudson and Sergeant Stapleton, County of Mendocino Office of the Sheriff-Coroner, telephone conversations with Richard Sykes, EIP Associates, March 26, 1996.
  2. Sheriff James Tusso, County of Mendocino Office of the Sheriff-Coroner, written correspondence to Ted Adams, EIP Associates, October 26, 1996.

provides for backup in the case of large fires. During the summer, both the Brooktrails Fire Department and the CDF respond to all fires. During the winter, the Brooktrails Fire Department responds to all fires because the CDF has a lower response capability. CDF is manned only in the daytime during the winter.

The Brooktrails Fire Department currently maintains two stations. The main station is located at 24680 Birch Street in Brooktrails. This station is staffed by a full-time chief and approximately 24 volunteers. It also contains three fire engines, a squad truck and the Chief's vehicle. Township staff provide an additional seven auxiliary firefighters. A second station is located at the intersection of Ridge Road and Blue Lake Road in the Spring Creek subdivision. This station has six volunteer firefighters and two fire engines. The Township also has a contract with the City of Willits to dispatch fire calls. At present, about 50 percent of the Brooktrails Fire Department responses are to fires located outside of its District. Response times can be up to twenty minutes, depending upon road and weather conditions.

The Brooktrails Fire Department current five year plan calls for the addition of equipment, personnel, and a new fire station to be located at the Ells Field airport. Although this station is not planned as a result of growth in Brooktrails, it is planned in conjunction with the City of Willits and the nearby community of Little Lake to improve response times within the area. This station would not be manned full time.

Two additional stations are planned as a result of community growth. The first station is planned for a location north of the Spring Creek Subdivision, north of Brooktrails, outside of the Specific Plan area. The other station will be located in the south-central portion of the Specific Plan area at a site to be determined. Planned Fire Department equipment additions include an ambulance, a replacement of the Chief's vehicle, a new water tender, three fire engines, a utility vehicle and a squad vehicle.

### Schools

Brooktrails Township is served by the Willits Unified School District. The District maintains a total of nine schools which could be attended by Brooktrails students. However, Brooktrails students would normally attend the following schools: Brookside (grades K-2); Blosser Lane (grades 3-5); Baechtel Grove (grades 6-8); and Willits High School (grades 9-12). In addition, the District has a Continuation High School, an Independent Study Program (home study), and three small "necessary" schools, which are

located in remote areas of the District. Total enrollment of the Willits Unified School District for the 1995-96 school year is 2,643 students.<sup>3</sup>

After experiencing a steady increase in enrollments in the late 1980's and early 1990's, the District has currently been experiencing more stable enrollments. Population growth in the area has slowed because of decreasing employment. There are presently no plans for new school construction, although the District has purchased the parcel adjacent to the Blosser Lane School as a contingency should the school need to expand in the future. There are presently no plans to develop this parcel. The District's main concerns regarding facilities at present involve the rehabilitation of existing facilities. The District has been avoiding building or expanding schools because of so many people leaving the area to seek employment.<sup>4</sup>

Table 3.1.5-1 summarizes the Willits Unified School District student enrollment and capacities for the schools which would be mostly attended by Brooktrails students. Three of the schools (Brookside, Blosser Lane and Baechtel Grove) are above the capacity of their permanent facilities. Excess students are housed in portable classrooms. Willits High School is the only school currently with available capacity.

**TABLE 3.1.7-1  
WILLITS UNIFIED SCHOOL DISTRICT  
STUDENT ENROLLMENT**

School	Capacity	1995-96 Enrollment	Excess Students <sup>1</sup>
Brookside	524	528	4
Blosser Lane	511	554	43
Baechtel Grove	474	539	65
Willits High School	791	663	(128)

1. Students in excess of permanent enrollment  
*Source:* Willits Unified School District, March 26, 1996

3. Myra Hoffman, Office of the Superintendent, Willits Unified School District, telephone conversation with Richard Sykes, March 26, 1996.

4. Ibid.

Solid Waste

Brooktrails Township is currently serviced by Solid Wastes of Willits, Inc., a private garbage hauling company in Willits, for garbage collection and disposal for approximately half of the residences in the Township. The other Township residents self-haul their solid waste to the Willits landfill.

The City of Willits and Mendocino County jointly operate the Willits landfill, which is located about eight miles from downtown Willits. The Willits landfill receives approximately 18,000 tons of solid waste per year. Brooktrails is currently estimated to generate about 3,159 tons per year, approximately 18 percent, of the total solid waste accepted at the Willits landfill. The Willits landfill is scheduled for closure in mid-1997. Options being considered as to where Willits/Brooktrails-area solid waste would be disposed of after the closure of the Willits landfill include either using another landfill, or hauling the waste to an out-of-county location, yet to be determined.<sup>5</sup>

Other landfills in the area include the Ukiah landfill, approximately 30 miles to the south of Willits. The Ukiah landfill is scheduled for closure in late 1998 or early 1999. All Mendocino County landfills are expected to be exhausted and closed by some time in 1999, at the latest. Long term County solid waste management plans are for out-of-county disposal. No new landfills are planned for Mendocino County. The location of any new disposal sites are presently undetermined. Studies to identify new disposal sites and methods are currently underway. The accommodation of the solid waste disposal needs of the growing communities in Mendocino County, including Brooktrails Township, are included in these studies.<sup>6</sup>

The Mendocino Solid Waste Management Authority is planning to build a transfer station in Ukiah, scheduled to open after the Ukiah landfill closes. The transfer station would accept solid waste from both commercial haulers and self-haulers. The waste would then be hauled by either truck or railroad to an out-of-county location, yet to be determined. According to the Mendocino County Solid Waste Management Authority, the transfer station will have sufficient capacity to allow for the solid waste generated by the buildout at Brooktrails, as well as other communities in the area.<sup>7</sup>

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5. Dave Madrigal, Director of Willits landfill, telephone conversation with Richard Sykes, EIP Associates, March 27, 1996.

6. Ibid.

7. Mike Sweeney, Mendocino Solid Waste Management Authority, telephone conversation with Richard Sykes, EIP Associates, March 27, 1996.

### 3.1.5-3 IMPACTS AND MITIGATION MEASURES

#### Introduction

Under CEQA, public services impacts are considered social or economic impacts, not environmental impacts. Effects on facilities or services are not automatically regarded as significant effects of a project. The changes must be related to, or caused by physical changes. However, economic or social effects of a project may be used to determine the significance of physical changes caused by a project. Where a physical change is caused by economic or social effects of a project, the physical change may be regarded as a significant effect in the same manner as any other physical change resulting from the project. For example, if a new housing development in an area were to increase demands for fire protection services to the degree that a department could no longer provide adequate protection with available resources and the department must build new stations or purchase equipment in order to maintain sufficient service, or otherwise expose residents to unacceptable risks. This situation would require a finding of significance.<sup>8</sup> Similar situations could arise which would affect the level of service of police protection. Substantial adverse affects to the public could also arise from inadequate provision of schools facilities and solid waste disposal capabilities.

#### Brooktrails Township Specific Plan Policies

Plan goals specifically related to public services in the Plan area appear in the Community Facilities and Services Chapter of the Plan as GOAL FS-7.2-1 and FS-7.2-2. The Policies for implementing the Goals are central to the issue of providing public services and are reiterated here to allow the reader easy reference to the actual language in the Plan.

**FIRE AND POLICE PROTECTION GOAL FS-7.2-1:** Support and maintain adequate fire protection, police protection, ambulance service and other community services.

**POLICY FS-7.2-1A:** Establish brush reduction and fire abatement programs consistent with the existing ecosystem and accepted forestry management practices.

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8. Recent CEQA litigation indicates that selecting the method for responding to increased demands on public services or facilities is the responsibility of the public agency providing the service or facility. If new construction is required to meet the increased needs, responsibility for mitigating resulting physical impacts may also fall on that public agency (*Goleta Union School District v. The Regents of the University of California*).

POLICY FS-7.2-1B: Evaluate whether potential building density affords suitable fire protection. Consider weather, fuel and slope in determining the level of fire risk.

SOLID WASTE GOAL FS-7.2-2: Facilitate efficient solid waste disposal to ensure a safe and sanitary community.

POLICY FS-7.2-2A: Promote recycling of consumer and business waste to reduce landfill requirements and lengthen service of existing landfills, and to meet mandatory waste stream reduction requirements established by State law.

#### Standards of Significance

Township buildout would have a significant adverse impact on public services if proposed development and uses would:

- require a substantial increase in the demand for police or fire service such that meeting the demand would require additional staff, equipment or stations in excess of what is planned by the affected jurisdictions;
- create a substantial increase in solid waste generation that would require the expansion of solid waste disposal facilities beyond foreseeable capacity; or
- generate a substantial increase in student enrollments that causes local school districts to physically expand existing facilities, or build new schools, in order to adequately provide services.

#### Police Protection

##### Impact 3.1.5-1

**The full buildout of Brooktrails Township could require additional staff and equipment to maintain acceptable law enforcement services both in the Township and in the surrounding area. This would be a significant impact. (S)**

The County Sheriff's Department has expressed concern over the long-term consequences of providing adequate law enforcement in the Brooktrails area. The Sheriff's assessment of the situation acknowledges that the Plan presents no immediate concerns for law enforcement in the area. The full buildout would occur over approximately twenty or more years.

##### Mitigation Measure 3.1.5-1

Any requirements for increased Sheriff's Department staffing due to the increase of population presented by full buildout would have to be determined from reviews conducted on a yearly basis, until the number of new residences in Brooktrails has stabilized. The Township would coordinate with the Sheriff's Department as they conduct their yearly reviews to assure that any mutual concerns are addressed. Additional funding for additional manpower and/or equipment may only be provided by the Township as the need is identified in the Sheriff's Department reviews. This mitigation would reduce this impact to insignificant levels. (I)

#### Fire Protection

No adverse impacts on the provision of fire protection services are anticipated as a result of Township buildout. Full buildout of the Township would not be expected to generate any fire protection needs that have not been provided for in the *Brooktrails Township Specific Plan*. The Brooktrails Township has planned for the addition of two fire stations to meet the fire protection demands of planned community growth. The first fire station would be implemented before Township development reaches 2,000 residential units and would support development up to about 3,500 residential units. The second fire station would be implemented the full buildout fire protection needs for 4,000 residential units.

The Township takes precautions to prevent firestorms from occurring. Firestorms are a result of the buildup of fuel mixed with the right atmospheric conditions and a fire source. The key is to reduce the buildup of fuel and minimize the number of fire sources within the Township.

During the period of 1983 through 1985, the California Division of Forestry cut several fuel breaks in the Brooktrails Greenbelt area (see Figure 3.1.1-2, *Existing Zoning Map*). Since the late 1980's the Brooktrails Fire Department has taken specific steps toward minimizing the Township's fire exposure. For example the Department began writing Hazard Abatement Notices on vacant parcels, and entered into a Prescribed Burning Agreement with the California Department of Forestry.

Other measures being investigated include developing additional access into the Township (second access route as called for in the Specific Plan), continuation of the present program of enforcement of hazard abatement as described further below, the use of State forces on a limited charge basis, and expanding the fuel reduction program to beyond the Township's borders.

Annually, the Brooktrails Fire Department conducts a 12 hour course on wildland fire fighting and safety for all Brooktrails fire fighters. Areas covered include safety, wildland safety gear, fire behavior, use of the fire shelter, instruction in fire hose and fitting handling, use of hand tools and related fire fighting

activities. This training is followed up with drills throughout the spring and summer seasons. The Fire Department also trains extensively in the incident Command System (ICS) which is the Command System used by all progressive fire departments. ICS is the only system that can be used effectively during a large scale disaster. As a result of the Oakland, California fire, Chief Thomen attended a new course entitled "Wild land Interface Fire Fighting Essentials for Chief Officers", first conducted in October of 1992.

The Brooktrails evacuation plan would be put into use during a major wildland fire in Brooktrails. Class "A" fire rated roofing is now required on all new structures within the Township. Managing the Greenbelt to improve fire safety will be part of the *Redwood Park Management Plan* update as noted in the Specific Plan (see Chapter 8, *Public Safety*).

### Schools

#### Impact 3.1.5-2

**The proposed buildout would potentially increase the Township population over the long-term to possibly require additional facilities for the Willits Unified School District. This is considered a potentially significant impact. (PS)**

The Willits Unified School District uses a student generation rate of 0.5 students per dwelling unit. Applying this rate, the buildout of 4,000 residential units would generate up to a maximum of 2,000 students. In that the buildout could occur over 20 years or more, the potential increase in students is expected to occur quite slowly and no immediate need for additional school facilities is anticipated. The long-term potential enrollment situation for the Willits Unified School District is uncertain at present, in that the District's main concern is to be able to hold the line on their resources while being faced with possible declines in student enrollments resulting from families leaving the area to seek jobs.<sup>9</sup> It is also uncertain if buildout would actually generate sufficient new students to induce the need for new or expanded facilities. Given the long period to buildout, it is also possible that the District may need to expand their facilities during this period in order to meet enrollment growth from sources other than Brooktrails. Should the need for new or expanded facilities occur as a result of buildout, this would be considered a potentially significant impact.

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9. Myra Hoffman, Office of the Superintendent, Willits Unified School District, telephone conversation with Richard Sykes, March 26, 1996.

Mitigation Measure 3.1.5-2

In the event that buildout would generate the need for expanded or new school facilities, those responsible for new construction in the Township would pay a per unit impact fee, in accordance with the Willits Unified School District requirements, to provide a local share for funding the necessary expansions. This mitigation would reduce this impact to an insignificant level. (I)

According to the information at hand, it was not determined necessary to reserve a site for a school within the Township at this time. Should it be determined that a school site would be needed at Brooktrails as the Township develops into the next century, this would be so noted in a periodic update of the Specific Plan, and the Township would need to work with the School District to identify a future school site. Periodic five year updates are called for in the Specific Plan.

Solid WasteImpact 3.1.5-3

**Full buildout would increase the solid waste stream to Mendocino County solid waste management facilities by approximately 9,360 tons per year. Because buildout would occur over approximately 20 years, Brooktrails impact as a percentage of the total solid wastestream cannot be quantified at this time. All Mendocino County landfills are projected for closure no later than 1999.**

Brooktrails Township solid waste is presently accepted at the Willits landfill, which is scheduled for closure in 1997. Between 1998 and 1999, all other landfills in the area and throughout the county will be exhausted and closed. Mendocino County plans for all solid waste to be disposed of outside of the county after 1999, at yet to be determined locations. County solid waste planners presently intend for all solid waste generated after the landfill closures in the Brooktrails and Willits area to be hauled to a new transfer station in Ukiah, where it will then be hauled out of the county and disposed of. The proposed growth at Brooktrails is being taken into account in the County's solid waste planning process.

Mitigation Measure 3.1.5-3

Policy FS-7.2-2A of the **Brooktrails Township Specific Plan** requires the Township to "promote recycling of consumer and business waste to reduce landfill requirements and lengthen service of existing landfills, and to meet mandatory wastestream reduction requirements established by state law." The Township Board of Directors had adopted Resolution No. 1996-12, which specifies District policy for waste reduction and directs the Township General Manager to implement those policies, inclusive of the following:

- 1) Establish waste recycling bins at the following District facilities:
  - Office complex
  - Summer Lake
  - Lake Emily
  - Lake Ada Rose
- 2) Require that future copiers acquired by the District have two-sided printing option.
- 3) Require that District Offices use recycled content copy paper when it is cost effective.
- 4) Provide for recycling bins at all future multiple-family and commercial units as a part of development.

Such measures would serve to reduce Brooktrails contribution to the total wastestream. Quantification of any potential reductions of the Township's future solid waste generation through the application of these measures to buildout cannot be estimated at this time. In addition, the District is in the process of entering into a Solid Waste Franchise Agreement.

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## 3.1.6 CULTURAL RESOURCES

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### 3.1.6-1 SETTING

#### Archaeology and Prehistory

The prehistoric chronological sequence in Mendocino County is little known, and is based on work at a small number of sites. The "Mendocino Complex" was initially established based on work at the CA-MEN-500 site in the Russian River drainage. Distinctive elements of this complex include large, lanceolate, concave base and side-notched projectile points, as well as the occurrence of both mano and metate and mortar and pestle grinding stones. This Complex dates from about 3000 B.C. to 500 B.C. (Morotto, 1984:522). There is conjecture that the wide-stem projectile point tradition is indicative of a culture that predated the appearance of the Pomo Indians in Mendocino and Lake counties. The Pomo are linked to the appearance of concave-based projectile point styles.

The ethnographic inhabitants of the Willits vicinity were the Northern Pomo. They were a group of interrelated tribelets stretching across Mendocino County from Fort Bragg in the west to Clear Lake in the east. The most detailed account of Pomo come from the works of Barrett (1908), Kroeber (1970), Stewart (1943), and McLendon and Oswalt (1978).

The nearest known Pomo village to the town of Willits was called *Tsaka'* and was defined by Barrett (1908:148) as a principal village, although Kroeber (1970: Plate 36) listed the location simply as an "other village". The site is believed to be near the entrance to Brooktrails at Sherwood Road. Most permanent villages appeared to be located inland from dense redwood forests, with smaller, temporary settlements perhaps having been located within the forests. Smaller subsistence-related settlements tended to be tied to larger villages by kinship, economic and social attributes. Inland groups of Pomo travelled to the coast along principal trails which often followed ridgelines, as access was enhanced in those areas.

The redwood forest provided food and raw materials in the form of deer, roosevelt elk, small mammals, and bark for clothing and houses, whereas rivers provided fish and mussels. Stands of Tan Oak and buckeye also provided edible vegetable foods in the appropriate season, most notably acorns, while the coast yielded fish, sea lions, shellfish, seaweed, salt and other food and raw materials.

### History

The first contact between Pomo and non-Indian groups may have occurred during the visits of Sir Francis Drake to the coastal Mendocino area in 1579. European trade goods were entering the Pomo area in the late 1700's, and later, Spaniards were raiding the southern Pomo area for labor and potential converts (Bean and Theodoratus, 1978:299).

At about the same time, the Russians had been exploring the Mendocino coastline, eventually establishing a foothold at Fort Ross in 1811. Local Pomoans were employed as farm workers by the Russians, ultimately picking up some cultural and linguistic traits.

By the 1830's, following Mexican takeover of the southern Pomo area the, Indian population began to decline. Disease, enslavement, displacement, massacres, and Anglo-European settlement by the 1850's led to rapid decimation of the Pomo culture. Native Americans of Pomo ancestry still occupy Mendocino, Lake and Sonoma countries, and some reside on Pomo Rancherias, continuing to follow traditional rituals and cultural practices to varying degrees.

The Willits Creek vicinity was first logged in the 1860's by the Blosser Brothers, who built a sawmill "two and one-half miles up Willits Creek" (Mahan, 1975). The sawmill was initially powered by water, then steam. Mr. H.L. Norton took over the Blosser operation in 1877, and soon thereafter was cutting 20,000 board feet a day, totalling nearly 3 million board feet before legal complications shut down the mill.

After several idle years, Northwestern Redwood Company bought part of the land in 1901 and built 40,000 square foot mill which subsequently burned down the following year. It was rebuilt in 1903. By 1909, lumber at Willits invoiced at 10 million board feet. Completion of the Northwestern Pacific Railroad through Willits added to the overall progress of the area, with the town of Willits fairly revolving around the mill at Brooktrails. It closed in 1924 and led to major economic downturn in the local economy (Mahan, 1975).

### Current Conditions

The various project components associated with the proposed Willits Creek Reservoir project were surveyed on November 5 and 6, 1990.<sup>1</sup> The sites surveyed included the proposed reservoir area, dam site, access roads and rock borrow areas. A survey transect interval of 15 meters was used in all relatively level, exposed areas. Hillslopes over 20% were given only cursory examination; the majority of acreage in the project area is sloped over 20%. The only evidence of cultural resources noted was that of circa-1900 logging in the area indicated by numerous hand-cut redwood stumps.

A record search of the entire Specific Plan area was conducted at the California Archeological inventory at Sonoma State University in August of 1993. One Native American site, CA-MEN-383, has been recorded in the Specific Plan area. This site, originally recorded by Omar Stewart in 1935, is believed to be the ethnographic village site of Tsaka', part of the Mitom group of Pomo. The site is located near Sherwood Road and Brooktrails Drive. At the time of recording (1935), the site consisted of two large and nine small housepits, with sweathouse and dwelling pits clearly visible. Burials were reported at the site as well. According to Stewart (1943), the site was abandoned before 1850.

The California Historic Landmark Registry (1982), California Inventory of Historic resources (1976), and National Register of Historic Places (1979) were all consulted as part of the investigation completed for the Willits Creek Reservoir EIR; no resources are recorded for the Brooktrails area.<sup>2</sup>

### **3.1.6-2 IMPACTS AND MITIGATION MEASURES**

#### Brooktrails Township Specific Plan Policies

The Plan goal specifically related to cultural resources in the Plan area appear in the Cultural Resources Chapter of the Plan as GOAL CR-9.1. The Policies for implementing the Goal are central to the issue of cultural resources and are reiterated here to allow the reader easy reference to the actual language in the Plan.

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1. Brooktrails Township Community Services District, *Willits Creek Reservoir Project Draft Environmental Impact Report, 1991*.
  2. Brooktrails Township Community Services District, *Willits Creek Reservoir Project Draft Environmental Impact Report, 1991*. p. 4.8-4.

CULTURAL RESOURCES GOAL CR-9.1: Preserve historical and archaeological resources within the Township.

POLICY CR-9.1A: Establish procedures to be followed in the event that historical resources may be required to be removed or altered to make way for new development.

POLICY CR-9.1B: Establish procedures to be followed in the event that historical or archaeological artifacts or other archaeological resources are unearthed.

#### Standards of Significance

The significance criteria used to assess potential impacts of the Specific Plan project on cultural resources come from several sources. Generally, a project would have a significant effect on a cultural resource if it would disrupt or adversely affect a "unique" prehistoric or historic archaeological site or a property of historic or cultural significance to a community, ethnic or social group. A "unique archaeological resource" is defined in Appendix K of the State California Environmental Quality Act Guidelines as one which:

- is associated with an event or person of recognized significance in California or American history, or recognized scientific importance in prehistory;
- can provide information which is both of demonstrable public interest and useful in addressing scientifically consequential questions;
- has a special quality such as older, best example, largest or last surviving example of its kind;
- is at least 100 years old and possesses substantial stratigraphic integrity; or,
- involves important research questions that historical research has shown can be answered only with archaeological methods.

The record search performed at the California Archeological Inventory did not identify any known historic or prehistoric sites recorded within the Specific Plan area. One Native American site, CA-MEN-383, has been recorded in the area.

The field survey completed for the Willits Creek reservoir project included several areas within the specific plan boundaries. In this area, Native American archaeological sites are usually situated in small valleys on terraces adjacent to seasonal and perennial watercourses, on midslope terraces near seasonal drainages and springs, and on ridgelines and associated spurs. Many of the areas surveyed for the Willits Creek reservoir project were representative of these settings. This investigations did not reveal evidence

of cultural resources. The only evidence of previous human activity in the area is the numerous, hand-cut redwood stumps indicative of logging that initially occurred in the 1860's.

There is one recorded Native American site in the Specific Plan area. Given the large size of the Specific Plan area, it is possible that additional Native American resources could be located within the Specific Plan area. However, many of the areas that have the qualities (such as a watercourse) likely to support Native American habitation, would not be affected by development that might result from implementation of the Specific Plan.

Impact 3.1.6-1

**Construction and grading related to the potential widening of Sherwood Road, could affect cultural resources located on site CA-MEN-383. (PS)**

Mitigation Measure 3.1.6-1

Any construction, grading and/or excavation within a 300 meter radius of the MEN-383 site location shall be monitored by an archaeologist. In the event that artifacts or features are discovered, the appropriate disposition of such materials as determined by the archaeologist should be coordinated with local Native American representatives and in accordance with the implementation policies of Chapter 9 of the Specific Plan, Cultural Resources. (I)

Impact 3.1.6-2

**Unknown cultural resources may be encountered during ground disturbance activities associated with development in the Specific Plan area. (PS)**

Mitigation Measure 3.1.6-2

Should any historic or prehistoric cultural resources be encountered during construction, work should halt temporarily while a qualified archeologist assesses the significance of the find and develops a suitable mitigation plan, if required, in accordance with the implementation policies of Chapter 9 of the Specific Plan, Cultural Resources. (I)

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## 3.2.1 GEOLOGY, SOILS AND SEISMICITY

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### 3.2.1-1 SETTING

This section describes geologic, soils, and seismic conditions in the Brooktrails Township Specific Plan area, and potential development constraints that may exist because of site-specific geotechnical characteristics.

#### Regional Geology

Mendocino County is in the northern portion of the Coast Ranges geomorphic province, a group of mountain ranges that extends about 600 miles from Santa Barbara County to the California/Oregon border. The Coast Ranges lie between the Central Valley and the Pacific Ocean, trend approximately north-northwest, and are about 65 miles wide at the latitude of Willits. The structure of the Coast Ranges is the result of global-scale crustal movements (plate tectonics), while the shape of the ranges is caused by local forces (landsliding and erosion). The Coast Ranges, on the North American tectonic plate, are separated from the Pacific plate to the west by the San Andreas fault zone, and from the Great Valley province to the east by a series of high-angle faults called the Coast Ranges.<sup>1,2</sup>

The Mendocino Range, near the center of which Brooktrails Township is located, is composed almost entirely by rocks of the Franciscan Assemblage, deposited about 140 million years ago and deformed by ongoing tectonic forces. In the vicinity of Brooktrails, the Franciscan Assemblage is represented by *melange* (a term used here to indicate a mixture of sandstone, mudstone, shale and chert, in which fossils are rare and rock types vary greatly over short distances) and greywacke (a term used here to indicate undifferentiated, weak to very strong, intensely fractured to massive, moderately to deeply weathered clastic sedimentary rocks, including arkosic sandstone, conglomerate, shale, with localized occurrences of greenstone). Two other types of geologic units occur in the area: continental basin deposits and Recent alluvium. The basin deposits are a heterogenous mixture of loosely cemented gravel, sand, silt and clay,

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1. Farrar, C. D., *Groundwater Resources in Mendocino County, California*, U.S. Geological Survey Water-Resources Investigation Report 85-4258, Sacramento, CA, July 1986.
  2. Olsborg, E.E. (CEG # 1072), and G.F. Sitton (GT # 784), *Willits Creek Dam, Brooktrails Township, Mendocino County, California*, prepared for Brooktrails Community Services District, by BACE Geotechnical, Windsor, CA, 16 December 1994, BACE project number 10315.3.

deposited between 0.5 and 4 million years ago in the structural basin now occupied by Little Lake Valley. The Recent alluvium is unconsolidated gravel, sand, silt and clay deposited in the last 11,000 years, along most of the stream channels in the County.<sup>3</sup>

#### Seismicity and Faulting

Because the northern Coast Ranges are adjacent to the boundary between two tectonic plates, they are subject to continuing seismic activity. Most seismic activity affecting Mendocino County occurs along four fault zones: the Coast Range Thrust zone on the eastern edge of the County, the offshore Mendocino fracture zone to the northwest, the Healdsburg-Rodgers Creek fault zone to the south, and the Maacama fault zone, which passes through the center of the County and across the northeast corner of Brooktrails Township. The fault zones trend north-northwest, approximately parallel to the general geologic structure of the Coast Ranges (Figure 3.2.1-1). Two major fault zones need to be considered in the Brooktrails area: the San Andreas and the Maacama. The San Andreas fault zone is widely known because it is historically active (during the last 200 years) and has produced numerous damaging earthquakes. It consists of a series of fault segments of various length, and passes through Mendocino County about 40 miles southwest of the Township. It is capable of generating a maximum credible earthquake (MCE) of Richter magnitude (M) 8.3. Despite its distance from the study area, it caused exceptionally intense groundshaking in Willits during the April 1906 earthquake.<sup>4</sup> The earthquake epicenter was nearly 100 miles south of Brooktrails, but caused strong ground motion in the area because the deep alluvium in Little Lake Valley amplified the effects of the seismic waves.<sup>5</sup>

The Maacama fault zone passes through the central part of Mendocino County and crosses Brooktrails Township along the valley of Upp Creek. Several structural basins, including Little Lake Valley, are associated with fault traces in this zone. The fault zone is active, as demonstrated by the M4.8 earthquake of November 1977, which caused moderate property damage in the Willits area.<sup>6</sup> The epicenter of the quake was near Willits, and led to speculation that an unknown trace of the fault passed through the town. However, there is no observed connection between this inferred fault trace and the

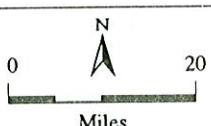
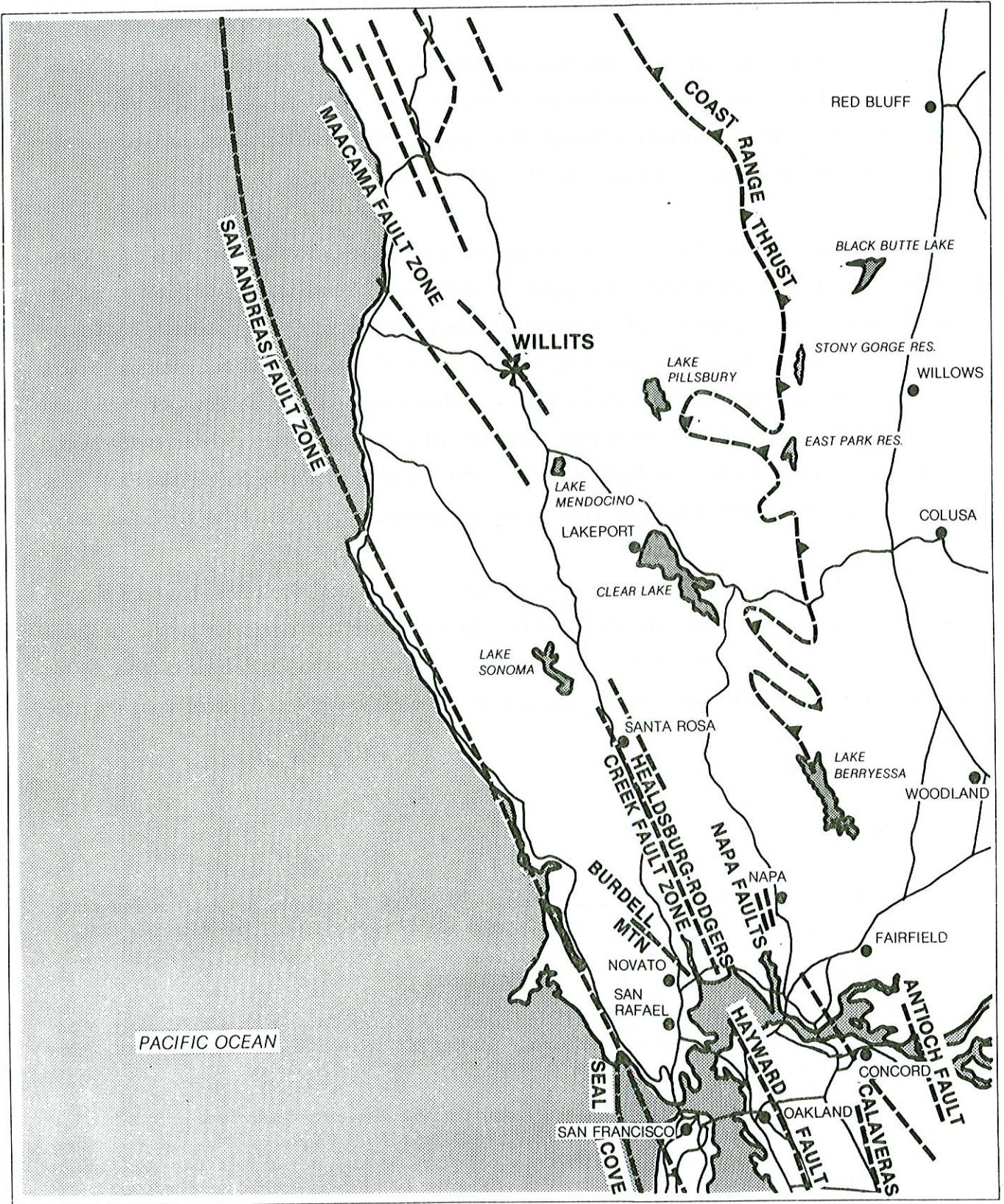
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3. Farrar, 1986, *op. cit.*

4. Olsborg and Sitton, 1994, *op. cit.*

5. Huffman, M.E. and C.F. Armstrong, *Geology for Planning in Sonoma County*, California Division of Mines and Geology, Special Report 120, 1980, 31 pages, 5 plates, map scale 1:62,500.

6. Farrar, 1986, *op. cit.*



\* = Brooktrails Township

BROOKTRAILS TOWNSHIP SPECIFIC PLAN EIR  
 Figure 3.2.1-1  
 Regional Fault Map

Source: EIP Associates



known traces of the Maacama fault. The Maacama fault is capable of generating an MCE of M7.6.<sup>7</sup> Although the MCE for the Maacama fault is lower than that of the San Andreas fault, it would produce intense groundshaking in the vicinity of Brooktrails because of the proximity of the earthquake epicenter to the Township, and because of the depth of alluvium in Little Lake Valley.<sup>8</sup>

The state legislation dealing with large-scale construction near known active fault traces is the Alquist-Priolo Earthquake Fault Zoning Act.<sup>9</sup> The purpose of the Act is to reduce the hazards posed by surface rupture of a fault. Maps prepared by the California Division of Mines and Geology delineate Earthquake Fault Zones of appropriate width to include known active traces of all major faults in California. Traces of the Maacama fault are in an Earthquake Fault Zone that passes through the Town of Willits and crosses the northeast corner of Brooktrails along the valley of Upp Creek. Structures for human occupancy, other than small single-family homes, are not permitted within the Earthquake Fault Zone until a geologic investigation demonstrates that the construction site is not crossed by an active fault trace.

A fault trace that extends beyond the Maacama Alquist-Priolo Earthquake Fault Zone has been mapped northwest of Willits, extending along Sherwood Road to Twin Lakes and continuing parallel to Dutch Henry Creek through the northeast corner of Brooktrails. Evaluation of this fault trace in 1981, by the California Division of Mines and Geology, determined that no movement had occurred along the trace during the last 11,000 years.<sup>10</sup>

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7. Wesnousky, S. G., "Earthquakes, Quaternary Faults, and Seismic Hazard in California," in *Journal of Geophysical Research*, volume 91, number B12, pages 12,587 through 12,631, 10 November 1986.

8. Huffman and Armstrong, 1980, *op. cit.*

9. *Alquist-Priolo Earthquake Fault Zoning Act*, California Public Resources Code, Division 2. "Geology, Mines and Mining," Chapter 7.5 "Earthquake Fault Zones," Sections 2621 through 2630; as amended, 1994; signed into law 22 December 1972.

In 1972 the State of California began delineating earthquake fault zones around active and potentially active faults in the state. The zones are revised periodically, and extend 200 to 500 feet on either side of identified fault traces. No structures for human occupancy, as defined by the Act, may be built across an identified active fault trace. An area of 50 feet on either side of an active fault trace is assumed to be underlain by the fault, unless proven otherwise. Proposed construction within the Earthquake Fault Zone is permitted only following the completion of a fault location report prepared by a California Registered Geologist. Single-family wood frame dwellings not exceeding two stories, and not part of a development of four or more dwellings, are exempt from the provisions of the Act, unless local legislation is passed applying those provisions to them.

10. Olsborg and Sitton, 1994, *op. cit.*, page 16.

### Site Topography

Most of Brooktrails is composed of hillsides that are moderately steep (20 to 40 percent slopes) to very steep (greater than 40 percent) slopes. Some gently sloping to flat-lying areas (0 to 20 percent slopes) exist on the ridge crests and in the valley bottoms. Overall topographic relief is approximately 1,200 feet, with elevations ranging from a high of about 2,680 feet above mean sea level (+2,680 feet msl) near the southwest corner of the Township to a low of about +1,480 feet msl at the southeastern corner.

The most prominent topographic feature is the relatively sharp, north to northwest-trending main ridge crest along the Township's western boundary, containing numerous southwest to southeast-trending spur ridges and intervening swales. Northwest-trending valleys occur along the southeast-flowing Willits and Dutch Henry Creeks. Willits Creek, flowing toward Little Lake Valley, has incised a steep valley approximately along the center line of the community. The Willits Creek valley, upstream from its confluence with Dutch Henry Creek at Lake Emily Reservoir, is fairly typical of the Brooktrails area. It is about 750 feet deep, lying between ridges of Franciscan rocks that rise to more than +2400 feet msl. The valley walls are forested slopes, varying in steepness from 2.5:1 (horizontal to vertical) to 1:1, with slightly flattened ridgetops. The valley floor contains the creek channel, and varies in width from about 10 feet to about 60 feet. It has a gradient between 1.5 percent and 5 percent.

In many places the Willits Creek valley follows the boundary between two rock units. The north side of the valley consists of massive, very hard, weathered graywacke, overlain by 10 to 20 feet of colluvium and residual soil. The south side of the valley consists of intensely fractured and highly weathered mudstone, shale and minor thinly bedded graywacke, overlain by 30 to 40 feet of residual soil.

Development that has caused topographic alteration in Brooktrails includes two reservoirs impounded by earth fill dams, approximately 1,280 single-family residences, a paved street network, community center, fire station, lodge and golf course. There is a network of unpaved logging roads throughout undeveloped areas of the Township. A former aggregate quarry in the northeastern portion of the Township is adjacent to the intersection of Sherwood Road and Lupine Way. Grading performed to construct these developments and for past logging activities have created some large cuts and fills on moderately steep to very steep hillsides. The logging road cuts generally are oversteepened and unstable. A massive earth slide occurred above the spillway (eastern dam abutment) on the Brooktrails 3N Dam in January 1971. Remedial grading was performed following the slide, and tiltmeters and survey monuments were installed to monitor slide movement.

Site Geology<sup>11</sup>

Brooktrails Township is in the Mendocino Range west of Little Lake Valley. The area is underlain by graywacke and melange of the Franciscan Assemblage. Unconsolidated surficial deposits are generally thin to nonexistent along the ridge crests and upper hill slopes, but thicken toward the base of hill slopes, in swales, and in the creeks and other drainages in the Township.

The Franciscan greywacke consists of weak to very strong, intensely fractured to massive, moderately to deeply weathered clastic sedimentary rocks. Rock types included in this unit are arkosic sandstone, conglomerate, shale, with localized occurrences of greenstone (basalt, metagreywacke, schist and chert). The Franciscan melange consists of a similarly ancient sheared and altered sandstone and shale matrix, with localized inclusions of ultramafic rocks (serpentine, serpentized ultramafics, and greenstone). The sheared matrix is often weak, highly erodible, and susceptible to landsliding even on relatively gentle hill slopes. The ultramafic rocks generally occur in masses too small to be shown separately on geologic maps of the Township.

Unconsolidated surficial deposits include colluvium, alluvium, and landslides. Colluvium consists of Recent hillside deposits which are a heterogeneous mixture of cobbles, gravel, sand, silt, and clay, with occasional boulders. Colluvium generally occupies swales and blankets lower hill slopes, locally forming colluvial fans. It also occurs on some Recent and dormant landslide deposits. Colluvium is generally massive, moderately to highly permeable, forms relatively unstable slopes in exposed cuts, and may be easily eroded and incised. Colluvial deposits grade down-slope into, and interfinger with, alluvium. Colluvium-filled swales are a potential source of debris flows on steep slopes.

Alluvium consists of crudely stratified Recent stream deposits of cobbles, gravel, sand, silt, and clay. It occurs in the relatively flat-lying valleys along Willits and Dutch Henry Creeks, and locally along tributary drainages in the Township.

Landslide deposits range in size from very small to very large, and may contain any of the materials previously discussed. They range in age from Quaternary (past 1.6 million years) to historic (past 200 years), and include predominately large bedrock and soil slumps, debris flows, debris slides, and soil

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11. Harlan Tait Associates, *Reconnaissance Engineering Geologic Investigation, Brooktrails Township Community Services District, Mendocino County, California*, R.H. Wright, Ph.D., CEG #962 and D.S. Kieffer, Geologist, Principal Investigators, HTA Job #1171.01, 20 September 1993, 22 pages, mapscale 1 inch = 500 feet.

slips.

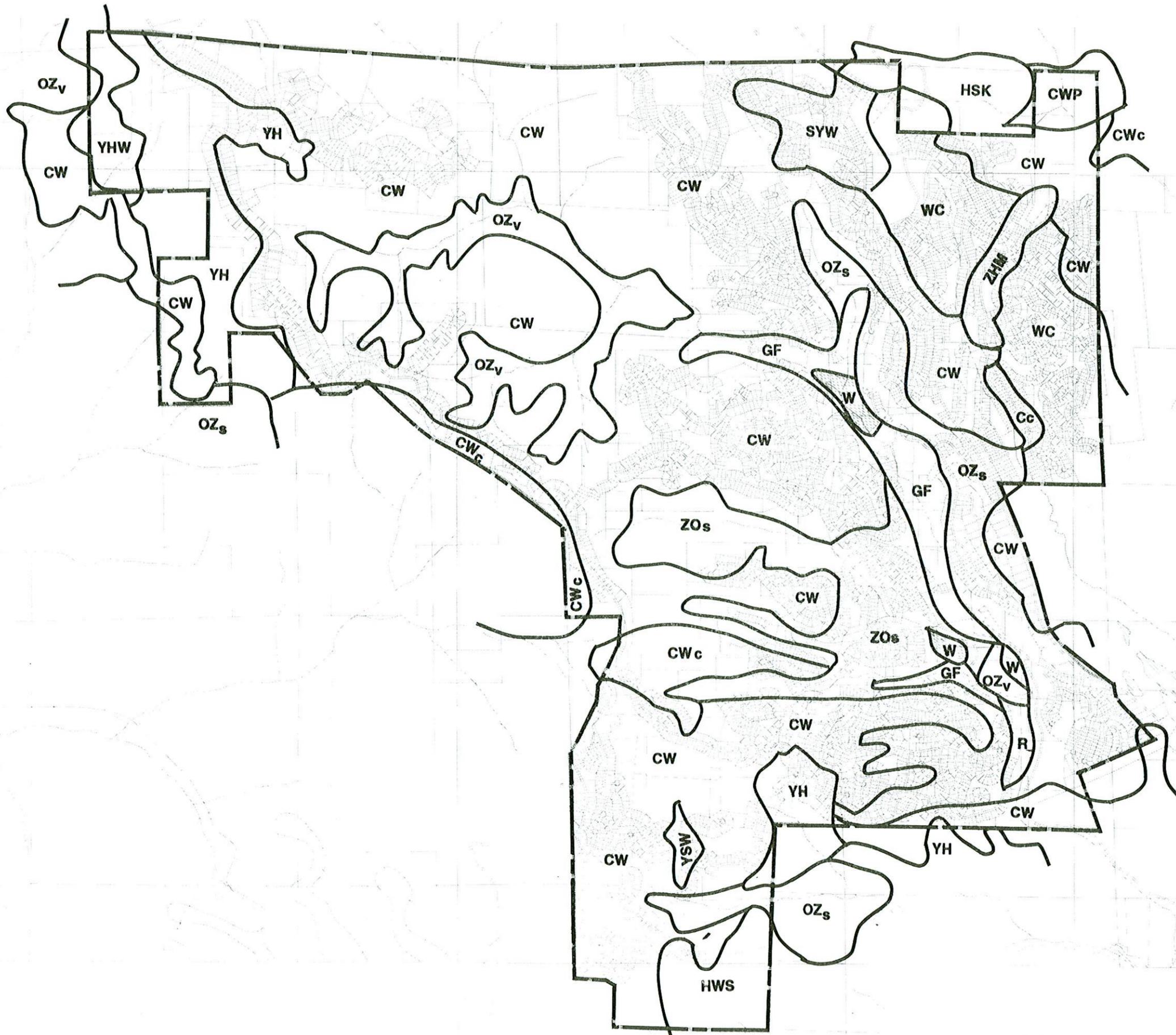
Small, shallow (less than about 5 feet) to moderately deep (5 to 15 feet) debris flows and debris slides generally occur along cut slopes, creek banks, and in colluvium-filled swales. The large, deep (greater than 15 feet) bedrock and soil slumps occur on the steeper slopes.

Existing fill generally is associated with the earth fill dams, roadways, and building pads in Brooktrails. Most fills are too small to be shown on geologic maps of the Township, with the exception of the dams. The material usually is a combination of gravel, sand, silt and clay, placed in layers and compacted to provide a stable surface.

The most prominent structural geologic feature in Brooktrails is the active northwest-trending Maacama fault zone, which traverses the northeastern portion of the Township, and separates Franciscan melange and ultramafic rocks from greywacke. A generally northeast-trending bedrock thrust fault in the southern portion of the Township also separates melange from greywacke. There are several discontinuous, northwest-trending bedrock faults in Brooktrails, but they are not considered active by the State of California. The bedrock in the Township generally strikes northwest (but in some places to the northeast), with dips generally to the southwest and northeast ranging from gently dipping to vertical (and locally overturned) in the southern portion of the Township. There are several discontinuous northwest-trending bedrock folds in the Township.

### Soils

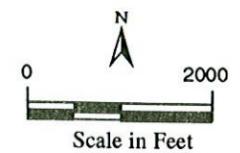
Soils in the vicinity of Brooktrails Township consist of one major association, the Casabonne-Wohly loam, and several minor associations, of which the Zeni-Orboun loam is the most widespread (Figure 3.2.1-2). The soils are in many respects similar. They have developed on steep slopes underlain by sandstones or sandstone/shale mixtures, and they tend to be moderately deep to deep and are well-drained. Runoff is rapid and erosion hazard is high, particularly if the soils are stripped of vegetative cover. Both soil associations break down under heavy use of tracked vehicles, and roads in the Casabonne-Wohly loams may become impassable during the rainy season. The Casabonne-Wohly loams



**Legend:**

SYMBOL	NAME	APPROX. % of GREENBELT	PARENT MATERIAL
OZs	Zeni-Ombaun loams 30 - 50% slopes	8.1	Sandstone
OZv	Zeni-Ombaun loams 50 - 75% slopes	10.6	Sandstone
GF	Gschwend-Frenchman complex	0.8	Sandstone
CW	Casabonne-Wohly loams	69.7	Sandstone/Shale
CWc	Casabonne-Wohly complex	3.3	Sandstone/Shale
CWP	Casabonne-Wohly- Pardaloe complex	1.8	Sandstone/Shale/Siltstone
ZHM	Zenia-Henneke- Montara complex	0.6	Serpentine/Peroditite
HWS	Hopland-Witherell- Squawrock complex	2.9	Sandstone/Greywacke
YH	Yorkville-Hopland loams	1.9	Greywacke/Schist/Sandstone
YSW	Yorkville-Squawrock- Witherell complex	0.3	Greywacke/Schist/Sandstone
Cc	Cole clay loam	0.0	Sandstone/Shale
HSK	Hopland-Sanhedrin Kekawaka complex	0.0	Sandstone/Shale/ Siltstone
R	Russian loam	0.0	Sandstone/Shale
SYW	Shortyork-Yorkville Witherell complex	0.0	Schist/ Shale/ Greywacke/Sandstone
WC	Wohly-Casabonne loams	0.0	Sandstone/Shale
YHW	Yorktree-Hopland Woodin complex	0.0	Greywacke/Shale/ Sandstone
W	Water		

SOURCE: L.D. Camp & Associates, 1984; USDA-SCS, 1991.



BROOKTRAILS TOWNSHIP SPECIFIC PLAN EIR  
Figure 3.2.1-2  
Soils

tend to have a higher clay content than the Zeni-Orboun loams, and are less permeable.<sup>12</sup>

### Hazards

Geologic and seismic conditions in Brooktrails Township are complex, but not unique. They are similar to conditions in other areas in the Coast Ranges of northern California. Geo-seismic constraints to development in the Township include hazards related to seismicity (groundshaking, landsliding and, possibly, liquefaction), to faulting (surface rupture along a trace of an active fault), to slope instability (landsliding), and to soil characteristics (settlement, erosion, impermeability).

The direct effects of seismically induced groundshaking result from a combination of the cyclic horizontal and vertical movements of the ground during an earthquake, the coherence of the geologic material (rock, soil, compacted fill) being shaken, and the quality of construction supported on that material. Seismic ground motions range from such low intensities that they cannot be detected, except by specialized equipment, to such high intensities that buildings are, literally, shaken apart and heavy objects are thrown into the air. One earthquake may create the entire range of effects, depending on the geologic conditions at a given site, the site's distance from the source of the earthquake, and the design of structures on the site. Bedrock formations, such as the Franciscan greywacke and melange that form the hills at Brooktrails, tend to be less affected by groundshaking than unconsolidated sediments, such as the mixtures of sand, silt, and clay that blanket the bases of the hills and fill the creek valleys in the Township.<sup>13</sup>

As a general rule, the intensity of groundshaking increases with proximity to the source of the earthquake. However, given similar location and seismic energy output, the least amount of damaging vibration would occur on a site that was completely composed of bedrock. A site underlain by major thicknesses of sediments (such as the alluvium in the valleys) would experience more severe vibration because of the

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12. a) Lawrence D. Camp & Associates, *Management Plan for the Brooktrails Community Services District Greenbelt Area Located in Mendocino County*, September 1984.

b) United States Department of Agriculture, Soil Conservation Service (USDA, SCS), *Soil Survey of Mendocino County, Eastern Part, and Trinity County, Southwestern Part, California*, R.F. Howard and R.H. Brown, Principal Investigators, 1991.

13. Greensfelder, R.W., "Seismicity, Groundshaking and Liquefaction Potential," in: M.E. Huffman and C.F. Armstrong, *Geology for Planning in Sonoma County*, California Division of Mines and Geology, Special Report 120, 1980, pages 5-14.

sediments' tendency to deform to a greater degree than the bedrock.<sup>14</sup> For structures supported on sediments, the combination of ground deformation and susceptible building design appears to determine the extent of seismically caused damage, with well-constructed buildings founded on dense undisturbed native deposits performing considerably better than moderately or poorly constructed buildings on loose soil or unengineered fill.<sup>15</sup>

Earthquake-induced landsliding of steep slopes can occur in either bedrock or unconsolidated deposits. Firm bedrock usually can stand in steeper, more stable slopes than soils are able to maintain, but rock type, grain size, degree of weathering, and angle of the beds all contribute to the strength or weakness of a bedrock hillside. Some bedrock types, such as deeply weathered Franciscan melange, are more susceptible to slope failures than others, such as unfractured Franciscan greywacke.<sup>16</sup>

Liquefaction is a response to severe groundshaking that can occur in loose, saturated soils. This transformation from a solid to a liquid ("quicksand") state can cause ground settling, landsliding, or lateral spreading. Earthquake-induced liquefaction does not affect bedrock; however, it does affect certain types of alluvium under conditions of saturation. The characteristics of a liquefaction-prone deposit include: (1) uniformly fine sand or sandy fill; (2) saturated conditions, usually caused by groundwater, but can be from other causes, such as reservoir inundation or water-supply system failure; (3) loose to moderately dense compaction; (4) little or no silt- and clay-sized particles to act as binders. If these conditions occur within about 30 to 40 feet below the ground surface, vibration sufficiently violent to increase pore pressure beyond the shear strength of the sand particles could cause such soils to liquefy. Any structures supported on these soils would be subject to tilting or settlement (sometimes very violent and rapid) as the supporting capability of the soil diminished.<sup>17</sup>

Surface rupture of a trace of the Maacama Creek fault cannot be prevented, nor can its time of occurrence

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14. Borcherdt, R.D., J.F. Gibbs and K.R. Lajoie, *Map showing maximum earthquake intensity predicted in the southern San Francisco Bay region, California, for large earthquakes on the San Andreas and Hayward faults*, United States Geological Survey, Miscellaneous Field Studies Map MF-709, 1975, accompanied by 11 pages of text, map scale 1:125 000, see p. 11 and Sheet 2.

15. Montgomery, D.R., "Representative Damage Photographs from the Loma Prieta Earthquake," *in: The Loma Prieta (Santa Cruz Mountains), California, Earthquake of 17 October 1989*, S.R. McNutt and R.H. Sydnor, editors, California Division of Mines and Geology, Special Publication 104, 1990, pp. 113 through 120, see p. 117.

16. Huffman and Armstrong, 1980, *op. cit.*

17. Greensfelder, 1980, *op. cit.*

be predicted. Damage to road surfaces, foundations, and utilities crossed by the fault would be severe, but localized. Damage due to surface rupturing is limited to the actual location of the fault-line break. Various structural designs to resist the effects of seismic groundshaking are readily available, but there is a limited range of design elements capable of withstanding fault rupture. The safest approach is to avoid building across the fault trace, but where this is not possible, measures may be incorporated in designs to limit damage and to facilitate repair.<sup>18</sup>

Static slope instability is the major cause of landslides in the Coast Ranges. Saturated slide-prone geologic material is the basis of most slope instability, but other natural processes and human activities may initiate landslides in otherwise stable areas.<sup>19</sup> Geologic material, such as clay minerals, have a great capacity to absorb water, causing reduction of the strength of rocks containing the clays. The force of gravity, can cause landslides when saturated clays reduce the strength of a rock unit below its minimum stability threshold. The sheared and fractured matrix of the Franciscan melange contains clay minerals that tend to make this rock type unstable in very steep slopes. Another unstable situation exists where the bedding or planes of rock layers are parallel to the surface slope of the ground. In this case the potential exists for rock units to slip along the weak plane.<sup>20</sup>

Several other conditions can cause, or contribute to, slope instability. Fault zones contain weakened rock, crushed by the repeated motion along the fault. Heavy rains can saturate a slope, reducing its strength. Stream cuts along the base of a slope can induce sliding by removing needed support from weak zones during high flood stages. Chemical and mechanical weathering can break down rock materials, and the seepage from high groundwater levels can increase water concentration, thus reducing strength.

The steepness of a slope is a major component of instability because of the unsupported weight of rock and soil that may bear on a weak zone. Such human activities as making road cuts, diverting surface runoff or impounding water can reduce the natural strength of slopes and generate landsliding in areas of normally low susceptibility.<sup>21</sup>

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18. Huffman and Armstrong, 1980, *op. cit.*

19. Greensfelder, 1980, *op. cit.*

20. Huffman, M.E., *Geology for Planning on the Sonoma County Coast Between the Russian River and Estero Americano*, California Division of Mines and Geology, Preliminary Report 20, 1973.

21. Huffman and Armstrong, 1980, *op. cit.*

There are six soil conditions in Brooktrails Township that could affect development under the Specific Plan: impermeability, compressibility, shrink-and-swell potential, erosion, liquefaction and landsliding (Table 3.2.1-1). Soils with moderately slow percolation rates that are relatively impermeable during the wet season are the dominant soil types in the Township. Compressible and expansive layers are common in these soils; erosion hazards are high throughout the area. Soil strength throughout Brooktrails is fair at best. Combined with steep hillsides and shallow soil-depths to bedrock, this indicates generally low slope-stability even under static conditions. Liquefaction potential generally is low, but the variability of the soil conditions make generalization inappropriate when dealing with specific localities.<sup>22</sup>

Impermeability, or a very slow rate of percolation, is an asset for the construction of storage reservoirs and dam cores. These structures would be intended to retain water, and not to act as recharge areas. However, impermeability can produce structural problems if water collects beneath or within the foundations of structures or roads. Positive drainage must be established to prevent supporting soils from becoming weakened by saturation.

Compressiveness, or the potential to collapse under loading, is another fairly common feature of soils containing any substantial amount of clay. This characteristic would not be an asset for the construction of building or roadway foundations because the soils do not provide adequate support unless they are specially treated. Sometimes they must be removed entirely and replaced with engineered backfill. If left untreated, these soils can cause unacceptable amounts of settlement. The effects can range from the nuisance level (sticking doors and windows) to the major structural damage level (shifted or collapsed foundations). Combined with seismic loads, the effect could be sufficient to make the difference between survival and destruction of a component of the foundation or building during a major earthquake.

Expansiveness, or the potential to swell and shrink with repeated cycles of wetting and drying, is another fairly common feature of clayey soils. This characteristic would be an asset for pond liners because the swollen soils would inhibit the absorption of water. However, like compressiveness, it would not be an asset for the construction of building or roadway foundations because such soils tend to be weak and compressible. Treatment to remediate this condition is similar to that described for compressive soils. If left untreated, these soils can cause unacceptable amounts of settlement, as previously described.

Erosion potential is high throughout the area. This is especially true for the soils on the steep slopes.

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22. USDA, SCS, 1991, *op. cit.*