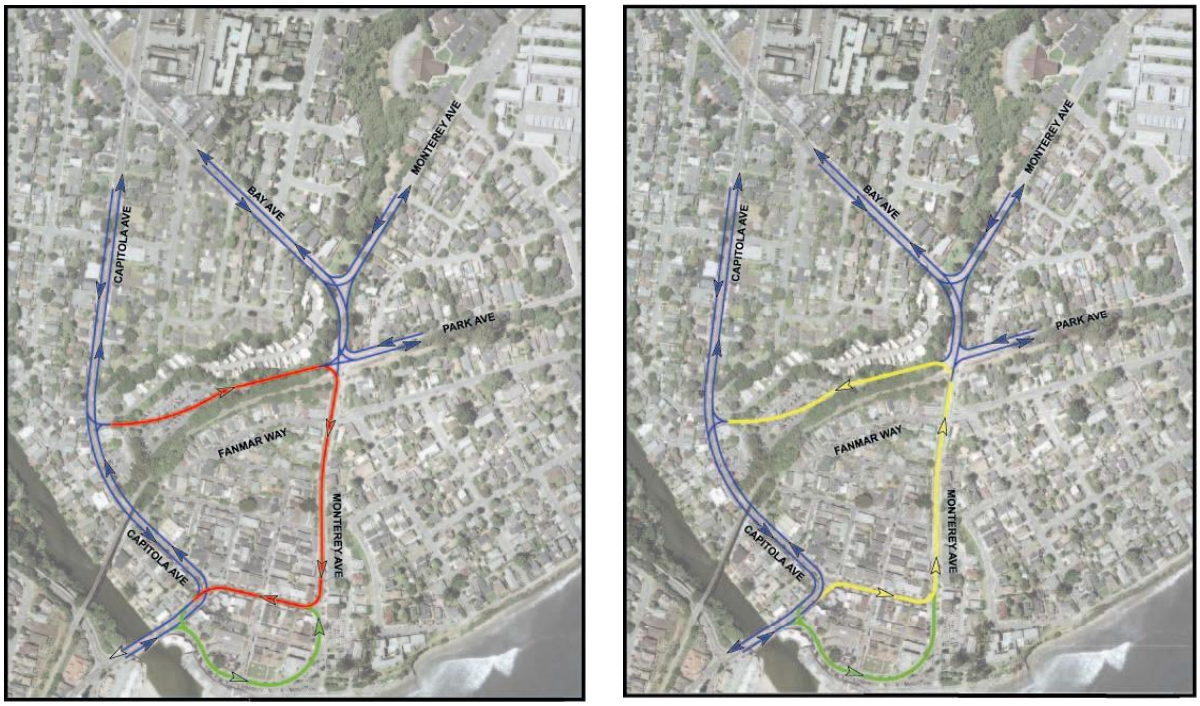
ONE-WAY TRAFFIC ANALYSIS FOR THE CAPITOLA VILLAGE AREA

Prepared for the City of Capitola
Public Works Department



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EXECUTIVE SUMMARY

The City of Capitola Village Area experience traffic congestion during the summer months. Two one-way scenarios were investigated to alleviate traffic congestion for both non-summer and summer times. The following intersections were studied:

1. Monterey Avenue and Park Avenue
2. Monterey Avenue and Capitola Avenue
3. Stockton Avenue and Capitola Avenue
4. Stockton Avenue and Esplanade
5. Capitola Avenue and Riverview Drive-Park Avenue Extension
6. Monterey Avenue and Bay Avenue
7. Capitola Avenue and Bay Avenue

A clockwise one-way alternative and a counter clockwise one-way alternative were evaluated. The counter-clockwise alternative provides the most relief for traffic congestion in the study area. Various improvements would be required at the study intersections as indicated in the report. The improvements would include signalization and/or the construction of roundabouts.

The Pacific Cove Parking Lot was redesigned to accommodate the one-way street network. The redesign of the lot would result in a loss of 79 parking spaces. An additional 28 parking spaces would be provided on Monterey Street and Capitola Avenue where the one-way roadway would be striped for one lane only and diagonal parking would be provided.

The impact of providing one-way streets to emergency response times was evaluated by the Fire Department for each alternative. The response times for both alternatives would increase from 0.25-0.5 minutes to 0.25-1 minute to the Fanmar area for Engine 1 response. The remaining response times would stay about the same.

No changes are recommended to the Esplanade. The City should however implement a parking management plan that includes electronic monitoring of the parking occupancy on the Esplanade and ultimately the Village Area and install CMS signs that provide messages to travelers on parking availability and traffic conditions in the Village area.

1 INTRODUCTION

The City of Capitola Village Area is a highly sought destination for local and regional visitors, especially during the summer season. The Village Area provides a kaleidoscope of recreational activities for tourists, including the beach, specialized retail, and restaurants. During the summer months the roadways are often congested and parking demand exceeds the capacity. The Esplanade serves foot traffic, vehicular through traffic and vehicles looking for a parking space. All foot traffic that goes to the beach from the Village Area has to cross the Esplanade and/or its intersections with the adjacent roadways.

The City of Capitola retained RBF consulting to investigate the feasibility of implementing a one-way street system in the Village Area to alleviate traffic congestion, especially during the summer months and also to evaluate impacts on parking conditions.

1.1 Project Description

The study area includes the Village between the Esplanade in the south and Bay Avenue in the north, and Monterey Avenue in the east and Capitola Avenue in the west. The following intersections are analyzed for existing and one-way conditions:

8. Monterey Avenue and Park Avenue
9. Monterey Avenue and Capitola Avenue
10. Stockton Avenue and Capitola Avenue
11. Stockton Avenue and Esplanade
12. Capitola Avenue and Riverview Drive-Park Avenue Extension
13. Monterey Avenue and Bay Avenue
14. Capitola Avenue and Bay Avenue

The two one-way alternatives analyses include a clockwise and counter clockwise one-way system. Existing streets would be converted to one ways and a new one-way street (either eastbound or westbound) provided through the Pacific Cove parking lot (Pac Cove lot) behind City Hall and a new street extending westwards from Park Avenue, named Park Avenue Extension. The Pac Cove lot was redesigned to accommodate the new through street.

The clockwise alternative includes the following route: A one-way southbound on Monterey Avenue from Park Avenue, then a one-way westbound on Capitola Avenue up to Stockton Avenue. Capitola Avenue westwards and further northwards would remain a two-way street. Park Avenue Extension would continue westbound from Capitola Avenue at the existing Pacific Cove parking lot and the mobile home park driveway, through the Pacific Cove lot, to the intersection of Park Avenue and Monterey Avenue. Stockton Avenue would remain as a two-way street.

The counter clockwise one-way alternative would continue westwards along Park Avenue extension through the Pac Cove lot to Capitola Avenue. Capitola Avenue would continue as a two way street to Stockton Avenue. From Stockton Avenue, Capitola Avenue would continue eastwards as a one-way street to Monterey Avenue. Monterey Avenue would continue northwards

as a one-way street to Park Avenue. The Esplanade would remain unchanged from it current direction of flow, which is counter clock-wise. Figure 1 shows the project vicinity and the study intersections and Figure 4 and Figure 5 the one-way alternatives.

1.2 Project Goals

The scope of services was specifically developed to identify the potential traffic impacts that may be associated with the one-way alternatives analysis. The City goals with the analysis are as follows:

- Reduce traffic congestion in the Village Area;
- Reduce commute traffic through the Village Area;
- Eliminate grid-lock on the Esplanade;
- Improve emergency response time through the Village Area; and
- Increase/maintain existing parking supply.

1.3 Scope of Work

Traffic data was collected for the study area including turning movement counts at the study intersections and license plate surveys. The license plates surveys present an opportunity to determine the extent of through traffic in the Village Area. Three locations were surveyed during the Friday Peak hour:

- Capitola Avenue at the Trestle Bridge
- Cliff Drive/Stockton Avenue north of Wharf Road at the river crossing
- Monterey Avenue north of Fanmar Way at the railroad crossing

Two alternatives were analyzed for the one-way alternatives. One alternative included a counter-clockwise circulation pattern along Stockton, Capitola, Monterey, Park and Capitola. The second alternative included a clockwise circulation pattern along the same streets. Operational conditions at the intersections for each alternative were analyzed using Synchro traffic engineering analysis software and improvements identified. SimTraffic software was used to provide traffic simulation images that would graphically illustrate the impacts of the alternatives.

The one-way alternatives will change the layout out of the Pacific Cove parking lot, as well as on-street parking in the Village Area. The lot was redesigned conceptually and opportunities on the roadway network identified for providing additional parking spaces.

If the one-way alternatives were implemented traffic patterns would change in the Village Area and could result in traffic intrusion in to the local residential neighborhoods. The following local neighborhoods were evaluated for possible traffic intrusion and measures identified to discourage cut-through traffic.

- Fanmar
- Rosedale

- Pilgrim
- Riverside

The implementation of a one-way street system would impact emergency response times. Capitola Fire Department calculated response times from both fire stations in the City and the change in response times were calculated.

1.4 Traffic Operation Evaluation Methodologies and Level of Service Standards

Intersection traffic operations were evaluated based on the Level of Service (LOS) concept. LOS is a qualitative description of an intersection and roadway's operation, ranging from LOS A to LOS F. Level of service "A" represents free flow un-congested traffic conditions. Level of service "F" represents highly congested traffic conditions with unacceptable delay to vehicles on the road segments and at intersections. The intermediate levels of service represent incremental levels of congestion and delay between these two extremes.

The City of Capitola has established LOS D as the general threshold for acceptable overall traffic operations at study intersections in the Village Area and LOS C everywhere else.

Intersection operations were evaluated using technical procedures documented in the 2000 Highway Capacity Manual (HCM). For signalized intersections, average control delay per vehicle is utilized to define intersection level of service. Delay is dependent on a number of factors including the signal cycle length, the roadway capacity (number of travel lanes) provided on each intersection approach and the traffic demand. *Appendix A1* shows the relationship between vehicle delay and the signalized intersection level of service categories. The Synchro version 6 software program was utilized to calculate the intersection levels of service for most of the study intersections.

At one and two-way stop controlled intersections, the operating efficiency of vehicle movements that must yield to through movements is analyzed. The level of service for vehicle movements on the controlled approaches is based on the distribution of gaps in the major street traffic stream and driver judgment in selecting gaps. *Appendix A2* shows the relationship between the vehicle delay and level of service for two-way stop controlled intersections. The 2000 HCM calculates the level of service of the minor street approaches. Using this data, an overall intersection level of service was calculated. Both are reported in this study because traffic on the minor street approaches has the lowest priority of right-of-way at the intersection and are the most critical in terms of delay. Generally, LOS F operations on the side street approach are the threshold warranting improvements. The Synchro version 6 software program was utilized to calculate the intersection levels of service at the study intersections.

For all-way (or four-way) stop intersections, average control delay per vehicle is utilized to define intersection levels of service. Delay is dependent on a number of factors, including the roadway capacity (number of travel lanes) provided on each intersection approach and the traffic demand. *Appendix A3* shows the relationship between vehicle delay and the all-way stop intersection level of service categories. The Synchro version 6 software program was utilized to calculate the intersection levels of service at the study intersections.

2 EXISTING TRAFFIC CONDITIONS

This chapter presents a description of the existing traffic network, existing traffic volumes, intersection levels of service, and an overview of traffic flow conditions within the study area.

2.1 Existing Traffic Network

All of the study roadways in the Village Area are currently either one-way or two-way streets and all intersections are Stop controlled. ROW width is restricted and very few opportunities exist for widening the roadways or the intersections.

Monterey Avenue, Capitola Avenue and Stockton Drive provides primary access to the Village Area. The streets are two lane roadways with a 25-mile per hour speed limit. On-street parking is provided along the southerly section of Monterey Avenue, and on Capitola Avenue between Monterey Avenue and the Trestle Bridge. On-street parking spaces alternates between either one side or both sides of Capitola Avenue. No on-street parking is provided along Stockton Avenue.

The Esplanade is a one-way street from Stockton Avenue to Capitola Avenue. From this point northwards the street continues as Monterey Avenue. The Esplanade separates the Village Area from the beach. It also provides access to the local businesses and has angled and parallel parking on both sides of the street. During the summertime it becomes extremely congested due to the fact that it provides the closest parking the beach and there is extensive vehicular and pedestrian conflicts.

Pacific Cove Parking Lot has an access from the intersection off Monterey Avenue and Park Avenue towards the east and a one-way access from Capitola Avenue in the West. This parking lot is heavily utilized during the summer months for overflow traffic from the Village Area. The City of Capitola Staff also uses the parking lot.

Bay Avenue is a two-lane, east-west collector street, providing access to residential, commercial, and retail areas north of the Village Area.

2.2 Existing Traffic Data

To establish existing traffic flow conditions, intersection traffic counts were collected during a Friday PM peak period (i.e. 4:00 – 6:00pm) peak hours at the study intersections on October 5, 2007. During the same period license plate data were recorded to determine cut-through traffic between Stockton Avenue and Capitola Avenue, Capitola Avenue and Monterey Avenue, and Stockton Avenue and Monterey Avenue. The traffic volumes and license plate data was used for existing conditions analysis and also to assign volumes at the intersections for the one-way analysis. The existing October 2007 peak hour traffic volumes at the study intersections are presented in Figure 2.

Since the traffic data was collected in the non-summer months, adjustments were made to analyze typical summer conditions as well. To determine the increase that would be applied to a Friday PM

peak hour versus a Saturday summer peak hour, historic traffic count data was researched and compared to the 2007 Friday PM peak hour data.

The City of Capitola prepared a Village circulation study in 1998 and conducted counts at some of the study intersections also on a Friday and on a Saturday. The report, *Capitola Village Circulation Parking and Streetscape Plan*, prepared by RRM Design Group February 13, 1998 indicates traffic volume data that was collected as part of the study.

The Santa Cruz Regional Transportation Commission maintains a traffic volume count system in the City and data from their database was also compared to the October 2007 counts to estimate summer growth. Table 1 indicates the data.

Table 1: Historic Average Daily Volumes

Location	Average Daily Traffic (Date of Count)		
1. Monterey Avenue s/o Park Avenue	10,190 (Apr 84)	10,046 (Jun 84)	10,829 (98)
2. Capitola Avenue n/o City Hall	9,190 (Jun 84)	11,525 (Jun 05)	
3. Capitola Avenue at trestle bridge	8,289 (Jun 93)	7,894 (Aug 99)	7,434 (Aug 04)
4. Capitola Avenue n/o Bay Ave	5,747 (Jul 95)	3,869(Jul 00)	5,741 (Jul 04)
5. Stockton Ave e/o Wharf Rd	15,922 (May 98)	17,340 (May 03)	20,139 (May 06)
6. Bay Ave e/o Capitola Avenue	13,194 (Dec 98)	8,413 (Jun 03)	
7. Esplanade	3,607 (May 98)	3,7609 (May 04)	3,055 (Jul 07)

Source: SCRTC

Typically volumes vary by about 10% on a daily basis due to fluctuations in travel patterns. Thus changes of less that 10%, unless consistently observed, are not deemed growth, but merely daily and seasonal fluctuations. In general Table 1 indicates that the majority of volumes have stayed fairly consistent, with some growth on Capitola Avenue at City Hall and on Stockton Avenue. The weather and seasonal fluctuations play a major role in traffic count data in the Village Area.

Furthermore, the City of Santa Cruz has seasonal factors by month for year round traffic counts. These factors are used to convert average and wintertime data to summer time Saturday peaks. The City of Santa Cruz factor for converting November data to average data is 1.1, which means that traffic volumes increase by 10 % on average days when compared to November days. The following table indicates the historic data for daily and Friday PM peak hours.

Table 2: Intersection Count Data Comparison

Location	August 1997 Friday PM Peak	August 1997 Weekend PM	% Change from 1997 PM to Sat	October 2007 Friday PM	% Change from 1997 to 2007 Fri PM
1. Capitola / Bay Avenue	1,392	1,400	0.50%	1,141	-22%
2. Monterey / Park Avenue	1,207	1,157	-4%	1,217	1%
3. Stockton / Capitola Avenue	1,343	1,253	-7%	1,422	6%
4. Monterey / Capitola Avenue	1,021	973	-5%	1,422	2%

Source: Capitola Village Circulation, Parking and Streetscape Plan, RRM 1998

The1997 weekend turning movement counts were actually lower than the Friday PM peak hour counts and thus the Friday would present a worst case alternative. Table 2 shows that there is no change from the Friday and weekend PM hour traffic volumes.

In order to compensate for the traffic growth during the summer months, this analysis has increased traffic volume at all intersections by 10%, except for the intersection of Capitola and Bay Avenue. The traffic volume at the intersection of Capitola and Bay Avenue was increased by 22% for this analysis in order to accommodate for a worst-case volume such as recorded in 1997.

It should also be noted that to provide roadway improvements for only the few busiest days of the year is financially infeasible. The City would have to construct millions of dollars worth of improvements to relieve traffic congestion during the peak summer days and then have spare capacity for the remaining ten months of the year. Thus, a worst-case summer condition was not analyzed, but instead a more typical average summer day. Adjusted summer Friday PM peak hour volumes are indicated in Figure 3.

2.3 License Plate Surveys

A license plate survey was performed on the local street network at three locations in the Capitola Village Area. The survey was designed to measure through traffic in the Village Area. Vehicle license plates were collected from 4:00 PM to 5:00 PM January 2008 at the following locations:

a. Cliff Drive/Stockton Ave at the Esplanade - North & South directions
b. Capitola Ave at the Trestle Bridge – North & South directions
c. Monterey Ave at Fanmar Way – North & South directions

The license plate data was analyzed to establish the amount of through trips traveling through the Village Area with origins and destinations outside of the study area. The results of the license plate survey are summarized on Table 3 below. The top table provides the matched license plates between Cliff / Stockton and Capitola / Trestle Bridge, the center table provides the results for Cliff / Stockton and Monterey / Fanmar, and the lower tables provides the results for Monterey / Fanmar and Capitola / Trestle Bridge.

Table 3: License Plate / Cut -Through Analysis

	Intersection Volume				
	Cliff / Stockton	Capitola / Trestle	Matched Volume	Percentage of Cliff / Stockton Matched	Percentage of Capitola / Trestle Matched
Northbound	639	247	206	32%	83%
Southbound	580	289	107	18%	37%
	Cliff / Stockton	Monterey/Fanmar	Matched Volume	Percentage of Cliff / Stockton Matched	Percentage of Monterey / Fanmar Matched
Northbound	639	445	378	59%	85%
Southbound	580	358	144	25%	40%
	Monterey / Fanmar	Capitola / Trestle	Matched Volume	Percentage of Cliff / Stockton Matched	Percentage of Monterey / Fanmar Matched
Westbound	358	247	79	22%	32%
Eastbound	445	289	113	25%	39%

The highest through-traffic movement can be seen in the northbound direction at the Cliff Drive / Stockton Street location. During the PM peak period 32% of the vehicles observed northbound on Stockton Avenue were observed at the Capitola / Trestle Bridge location, and 59% of the northbound traffic were observed at the Monterey / Fanmar intersection. This indicates heavy through traffic movements with a total of 91% of the cars observed northbound at Stockton Avenue as through-traffic to either the Monterey / Fanmar intersection or the Capitola / Trestle Bridge location during the PM peak hour.

The result of this analysis indicates that the majority of traffic drives through the Village Area between the three survey locations of Stockton Avenue, Capitola Avenue, and Monterey Street to destinations outside of the Village Area. The through-traffic is likely commuter traffic between Santa Cruz and Capitola as the Cliff Drive Bridge is one of the few access points across Soquel Creek connecting Capitola to Santa Cruz. Figure 7 indicates the through traffic graphically.

2.4 Existing Conditions Intersection Operations

Operating conditions at the study intersections were analyzed using Synchro software. Levels of service analyses present a qualitative evaluation of traffic conditions at intersections. Intersection turning movements are indicated in Figure 2. The *2000 Highway Capacity Manual*, Transportation Research Board methodologies were utilized in Synchro for the analysis, and are consistent with City requirements for analyzing traffic conditions on roadways. Existing Levels of Service (LOS) are summarized in Table 4. Table 4 indicates the October 2007 and summer conditions level of service at each of the study intersections for both one-way scenarios.

Table 4: Existing Conditions Levels of Service

			October 2007 counts		Summer Volumes	
			Existing			
	North-South Street	East-West Street	Friday PM Peak Hour Delay (sec)	Level of Service (LOS)	Friday PM Peak Hour Delay (sec)	Level of Service (LOS)
1	Monterey Ave.	Park Ave.	**20.4**	**C**	**29.8**	**D**
		Improvement			6.9	Install Roundabout A
2	Monterey Ave.	Capitola Ave.	**22.0**	**C**	**33.2**	**D**
3	Stockton Ave.	Capitola Ave.	**24.8**	**C**	**38.8**	**E**
		Improvement Option 1			42.7	Signalize however Westbound traffic queue creates gridlock conditions D
		Improvement Option 2			15.5	Install Roundabout C Need extensive right of way
4	Stockton Ave.	Esplanade	**0.4**	**A**	**0.4**	**A**
5	Capitola Ave.	Riverview Dr.	**0.5**	**A**	**0.5**	**A**
		Worst Approach	14.4	B	14.4	B
6	Monterey Ave.	Bay Ave.	**4.6**	**A**	**4.8**	**A**
			12.4	B	13.3	B
7	Capitola Ave.	Bay Ave.	**14.1**	**B**	**21.4**	**C**

NOTES:
1. Analysis performed using 2000 Highway Capacity Manual methodologies.
2. Highlighted levels of serivce (LOS) represent an intersection with failing operations

The operating conditions for existing conditions are acceptable at all intersections using the October 2007 volume, but fails at the intersections of Monterey Avenue / Park Avenue and Stockton Avenue / Capitola Avenue using the summer volumes.

2.5 Intersection Improvements Required

Monterey Avenue / Park Avenue

The Monterey Avenue / Park Avenue intersection currently operates at LOS D during the summer period. The intersection is currently all-way-stop controlled. It is recommended to change the control to a roundabout in order to improve the failing operating conditions. Constructing the roundabout would improve the existing configuration during summer conditions to an acceptable LOS C. The LOS worksheets are attached in ***Appendix B***.

Stockton Avenue/Capitola Avenue

The Stockton Avenue / Capitola Avenue intersection currently operates at an unacceptable LOS E during the summer peak hours. Two improvement options were evaluated at this intersection. Option 1 is to signalize the intersection, which will improve the intersection to an acceptable overall LOS D. The level of service on the westbound approach is however F and vehicles back up to Monterey Street. The simulation indicates the back up and resulting congested conditions.

Option 2 is to convert the intersection to a roundabout. However, this improvement would require extensive right-of way acquisition that would not be feasible and is thus not recommended for implementation.

3 ONE-WAY CONDITIONS ANALYSIS

This section describes the level of service analysis for two one-way distribution scenarios; clockwise and counterclockwise. With each one-way alternative, traffic to and from the Village Area, as well as traffic through the Village Area, would have longer overall trip lengths. This is a typical occurrence with one-way street networks. However, at the intersections, less traffic conflicting movement exist and thus the capacity increases, providing opportunities to improve traffic flow conditions. Figure 2 and Figure 3 indicate the traffic flows for the two one-way alternatives.

3.1 Intersection Operations

Intersection levels of service under the proposed clockwise and counterclockwise circulation scenarios are shown in Table 5.

The proposed conditions include the clockwise and counterclockwise scenarios. The traffic volumes within the Village Area have been redistributed to reflect the proposed circulation scenarios and the resulting intersection LOS data is calculated above. The analysis includes both the existing October 2007 data and the projected Summer 2007 volumes.

Clockwise Circulation

Under the clockwise circulation scenario with no improvements the intersection operations at the Monterey Avenue / Park Avenue and Stockton Avenue / Capitola Avenue intersections will fail

during the October and Summer 2007 Friday PM peak hour and will operate at an LOS F during both periods. The City standard is LOS D.

All other intersections would operate at acceptable levels of service during the October and Summer 2007 periods. The LOS calculation sheets can be found I Appendix C.

Counter Clockwise Circulation

Under the counter-clockwise with no improvements circulation scenario the following two intersection operations fail during both the October and Summer 2007 peak Friday PM hour: Stockton Avenue / Capitola Avenue and Capitola Avenue / Riverview- Park Avenue Extension Drive. Both intersections will operate at LOS E during the October and LOS F during the summer periods respectively. All other intersections would operate at acceptable conditions during the Friday PM peak hour for both October 2007 and summer conditions. The LOS calculations can be found in *Appendix D*.

3.2 Intersection Improvements

Clockwise Configuration

Monterey Avenue / Park Avenue

The Monterey Avenue / Park Avenue intersection would operate at LOS F without improvements during both the October and summer periods. It is recommended to convert the control at the intersection to a roundabout in order to improve the unacceptable operating conditions. Constructing the roundabout would improve the existing configuration during both October and summer conditions. to an acceptable LOS C.

Stockton Avenue/Capitola Avenue

The Stockton Avenue / Capitola Avenue intersection would operate at an unacceptable LOS F during the summer peak hours without improvements. Two improvement options were evaluated at this intersection. Option 1 is to signalize the intersection. Unfortunately this alternative will not improve the operations during either the October or summer periods and the intersection will continue to operate at unacceptable levels of service.

Option 2 is to convert the intersection to a roundabout, which would improve conditions to acceptable levels. However, this improvement would require extensive right-of way acquisition, which is not feasible at this time

Counter-Clockwise Configuration

Stockton Avenue/Capitola Avenue

The Stockton Avenue / Capitola Avenue intersection would operate at an unacceptable LOS E during the October period and LOS F during summer peak period. It is recommended to signalize

the intersection. Operating conditions would improve the intersection to an acceptable LOS B during October and LOS A during summer.

Capitola Avenue/Riverview Drive.

The Capitola Avenue / Riverview Drive intersection would operate at LOS E during the October conditions and LOS F during the summer conditions without improvements. It is recommended to convert the existing two-way stop to an all-way-stop intersecting in order to improve the failing operating conditions. This improvement would improve the intersection to LOS C during both the October and summer periods. No all-way stop warrants were performed since data is not available per the MUTCD requirements and is outside the scope of this study.

Capitola Avenue/Bay Avenue

The overall LOS at the intersection is C. However, due to the skew configuration, the simulation indicates congestion on the northbound approach towards the end of the simulation hour. To improve the traffic conditions, it is recommended to install a roundabout at the intersection. The roundabout would however require the acquisition of right–of-way.

Recommendation

The analysis indicates that the counter-clockwise alternative generates the best operating results for alleviating traffic congestion in the Village Area.

Table 5: One-Way Levels of Service

Levels of Service Results								
		October 2007 Counts				Summer 2007 Volumes			
		Clockwise		Counter-Clockwise		Clockwise		Counter-Clockwise	
North-South Street	East-West Street	Friday PM Peak Hour Delay (sec)	Level of Service (LOS)	Friday PM Peak Hour Delay (sec)	Level of Service (LOS)	Friday PM Peak Hour Delay (sec)	Level of Service (LOS)	Friday PM Peak Hour Delay (sec)	Level of Service (LOS)
1 Monterey Ave.	Park Ave.	**54.7**	**F**	**15.7**	**C**	**104.8**	**F**	**20.8**	**C**
	Improvements	23.9 13.5	Install: C - Roundabout or B - All Way Stop			Install Roundabout 26.7	D		
2 Monterey Ave.	Capitola Ave.	**8.5**	**A**	**17.7**	**C**	**8.9**	**A**	**22.9**	**C**
3 Stockton Ave.	Capitola Ave.	**196.1**	**F**	**46.1**	**E**	**247.0**	**F**	**71.4**	**F**
	Improvements Option 1	Signalize, however Northbound & Southbound Traffic Queue Create Gridlock 42.1	D	Install Traffic Signal 11.6	B	Install Signal 192.7	F	Install Traffic Signal & Remove South Bound Thru Lane 9.7	A
	Improvements Option 2	Install Roundabout 13.2	B			Construct Roundabout 19.9	C		
4 Stockton Ave.	Esplanade	**0.3**	**A**	**0.4**	**A**	**0.3**	**A**	**0.4**	**A**
5 Capitola Ave.	Riverview Dr. Worst Approach	**1.0** 18.3	**A** C	**37.2** 93.2	**E** F	**0.4** 13.4	**A** B	**80.8** 208.2	**F** F
	Improvements			Install All Way Stop 16.3	C			Install All Way Stop 22.7	C
6 Monterey Ave.	Bay Ave.	**4.6** 12.4	**A** B	**4.6** 12.4	**A** B	**4.8** 13.3	**A** B	**4.8** 13.3	**A** B
7 Capitola Ave.	Bay Ave.	**14.1**	**B**	**14.1**	**B**	**21.4**	**C**	**21.4**	**C**
	Improvement					Simulation indicates back-up on Approaches Construct Roundabout		Simulation indicates back-up on Approaches Construct Roundabout	

NOTES:
1. Analysis performed using 2000 Highway Capacity Manual methodologies.
2. Highlighted levels of serivce (LOS) represent an intersection with failing operations.

4 VILLAGE PARKING

4.1 Pacific Cove Lot One-Way Redesign

The two one-way alternatives analyses will require a new one-way street (either eastbound or westbound) to be provided through the Pacific Cove parking lot (Pac Cove lot) behind City Hall and would continue between Monterey Avenue and Capitola Avenue.

The first alternative was keeping the roadway in the existing location, immediately north of City Hall. The second alternative is to build a new road between City Hall and the Capitola Historical Museum. This alternative would however require extensive retaining walls and earthwork import and opinion of probable cost estimates range between $750,000 and $850,000. Also, the roadway would intercept Capitola Avenue on a bend with substandard sight distance to the south and may cause accidents. Due to this sight distance constraint this alternative was not further evaluated.

The Pacific Cove lot was conceptually redesigned to accommodate a new one-way street extending from the existing entrance at Monterey and Park Avenue through the center of the Pacific Cove lot to Capitola Avenue along the north side of City Hall. The counter clockwise alternative was used in the design. If the clockwise alternative were selected, the number of spaces would remain the same and only face at an opposite angle due to the change in direction of travel. The new access at Capitola Avenue would require an all-way stop intersection due to LOS impacts and sight distance concerns. The conceptual design is shown in Figure 6.

Table 6 indicates the decrease in number of spaces in the Pac Cove parking lot due to the provision of the one-way street through the lot.

The revised Pac Cove parking lot would provide pedestrian access to both Capitola Avenue and Monterey Avenue and subsequently access to the Village Area and the Beach. The number of parking spaces in the lot will decrease from 234 to 155 spaces, a loss of 79 spaces, with reconfiguring the lot. Opinion of probable cost estimates for reconstruction of the lot is estimated at $480,000 to $580,000. The construction work would include a new roadway through the lot, repaving the lot, provision of new parking meters and landscaping, sidewalk and striping.

4.2 On-street One-Way Parking

The proposed one-way configuration would eliminate the need for two traffic lanes along Capitola Avenue through the Village and allow for additional on street parking spaces to be created.

Table 6 shows the total existing number of parking spaces and proposed total parking spaces with the proposed one-way configuration. The parking spaces along Monterey Avenue would be provided along the west side and on Capitola Avenue along either side. The grade on Monterey Avenue may however be troublesome to park for many drivers and the City may consider not providing parking altogether or alternatively provide 9 feet wide by 25 feet long parallel spaces, that

would make the maneuver easier, especially since parking is prime in the Village Area. The provision of the one-way alternatives would result in a net loss of 51 spaces in the Village area.

Table 6: Total Parking Spaces

Location	Existing Spaces	One-way Spaces	Increase (Decrease)
Capitola between Monterey and Stockton	14	26	12
Monterey between Capitola and Fanmar	12	28	16
Pac Cove Lot	234	155	(79)
Total	260	209	(51)

5 EMERGENCY RESPONSE TIMES

Table 7 summarizes the Emergency Response Times of the existing and proposed clockwise and counter-clockwise circulation scenarios. The table indicates response time for the Capitola Fire station locations, labeled as 1st Engine and 2nd Engine. The change in response time will occur with the 1st Engine response to the Fanmar area, the response times to the Esplanade area will remain unchanged. The proposed clockwise and counter-clockwise scenarios will add approximately 30 seconds to the overall response time to the Fanmar area. *Appendix F* indicates the fire response times graphically.

Table 7: Emergency Response Times

	Existing		Clockwise		Counter-Clockwise	
	Fanmar (min)	Esplanade (min)	Fanmar (min)	Esplanade (min)	Fanmar (min)	Esplanade (min)
1st Engine	0.25 to 0.5	0.25 to 1	0.25 to 1	0.25 to 1	0.25 to 1	0.25 to 1
2nd Engine	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3

*Source: Central Fire Protection District

6 NEIGHBORHOOD TRAFFIC

The goal of this study is too investigate two one-way street systems to improve traffic flow in the Village Area. Changes in traffic patterns, especially when congested roadway conditions prevail, would result in traffic spillover onto adjacent street networks. Implementation of the one-way street systems thus also has the potential for traffic spillover into the adjacent neighborhoods. These neighborhoods include the Fanmar, Rosedale, Riverview, Cherry and Pilgrim Neighborhoods.

If the existing congested conditions would continue with the implementation of a one-way street alternative, the probability of spillover is higher when compared to a roadway alternative that alleviates traffic congestion.

The implementation of one-way streets results in longer travel times, which also could result in a spillover of cut through traffic onto adjacent streets.

Also, congested traffic conditions at certain intersections could result in cut through traffic. Fanmar Way and Cherry Avenue are candidates for spillover traffic in the Fanmar neighborhood for existing and the two one-way alternatives. Pilgrim Drive and Beulah Drive are candidates for spillover traffic in the Pilgrim neighborhood for both existing and the two one-way alternatives. Pilgrim Drive and Beulah Drive are candidates for spillover traffic in the Pilgrim neighborhood and Rosedale Avenue is a candidate for spillover traffic in the Rosedale neighborhood if congestion would occur at the Capitola Avenue/Bay Avenue intersection. Riverview Avenue is a candidate for spillover traffic for existing and one-way traffic conditions. Since the preferred alternative is the counter-clockwise one-way system, only this alternative and the existing street system scenarios are discussed.

Daily counts were conducted on the candidate streets at the following locations indicated in Table 8.

Table 8: Total Daily Traffic Volumes

	Direction	*Volume*	*Total Volume*
Fanmar west of Monterey	Eastbound	257	436
	Westbound	179	
Riverview north of Stockton	Northbound	312	608
	Southboud	296	
Rosedale north of Monterey	Northboud	526	975
	Southbound	449	

Fanmar Neighborhood

The most congested intersection in all the alternatives analyzed is Capitola Avenue /Stockton Avenue. Congestion at this intersection, combined with congestion on the Esplanade during the summer months, would result in traffic spillover onto Fanmar Way. It is recommended to implement the following street design features in order to minimize the amount of spillover traffic from the existing street network onto Fanmar:

- Make the intersection of Fanmar Way and Capitola Avenue and inbound only movement onto Fanmar Avenue. This could be accomplished by adding a bulbout curb feature to the intersection, which would only allow traffic to enter Fanmar and prohibit traffic from exiting onto Capitola Avenue.
- Place a "Local Residents Only" sign at the intersection of Monterey Avenue and Fanmar Way.

For the counter clockwise scenario, cut-through traffic would enter Fanmar Way from the west at Capitola Avenue and from the east at Monterey Avenue. Traffic entering the Fanmar area would either travel along

Fanmar Way as cut-through traffic between Monterey and Capitola Avenues or disperse out into the neighborhood. In order to discourage the movement of through-traffic through the Fanmar neighborhood it is recommended to install the following measures to limit access to Fanmar Way:

- Add a "Local Residents Only" sign on Fanmar Way at both the Monterey Avenue and Capitola Avenue intersections.
- Construct a bulbout at Fanmar Way and Monterey Avenue that would prohibit north bound left turns on Fanmar.

Rosedale Neighborhood

The Rosedale neighborhood is situated to the north of Bay Avenue. The analysis indicates that the intersection of Capitola and Bay operate at an LOS B during the clockwise scenario and LOS C during the counterclockwise scenario. In order to minimize cut through traffic in the Rosedale neighborhood it is recommended to close Rosedale Avenue at either Hill Street or Plum Street. This may however not be supported by the community, since it results in traffic diverting onto other streets, which causes new issues. Also, emergency response times would increase and may not be acceptable either. Additional studies would be required to evaluate the impact of the road closure.

Improving the Capitola Avenue/Bay Avenue intersection by constructing a roundabout would most likely discourage traffic cutting through along Rosedale Avenue, since traveling along Bay Avenue and Capitola Avenue would be more convenient/faster.

Pilgrim Neighborhood

The Pilgrim neighborhood is directly north of the Pacific Cove parking lot. The City has expressed concerns about cut-through traffic onto Pilgrim Drive. It appears to be highly unlikely that traffic would utilize Pilgrim Drive due to the irregular and multiple turn street layout and the indirect path to the adjacent collectors. It is recommended to study Pilgrim Drive for possible cut-through traffic after the proposed one-way changes are completed. The after study can then determine if cut-through traffic is a concern. If through-traffic does prove to be a concern it is recommended to prohibit movements from Pilgrim Drive to Burlingame Avenue. This could be accomplished with the construction of a curb bulb that allows southbound right turn traffic only at the intersection, which would prevent drivers from making a right turn onto Burlingame Avenue.

Riverside Neighborhood

Riverside Drive provides an alternative to Capitola Avenue. The road is however narrow and only vehicle can pass underneath the Trestle structure. It is not foreseen that cut-troughs traffic will use the roadway regularly, however, if the Stockton Avenue/Capitola Avenue intersection is congested, cut-through traffic could use this road. It is recommended that the left turns from eastbound Stockton onto Riverview Drive and left turns out from Riverview Drive onto Stockton Avenue be prohibited.

7 ESPLANADE

The Esplanade provides access to the beach and the local businesses and has the highest density parking in the Village Area. Subsequently the demand for parking is high and gridlock occurs in the summer when vehicles waiting for parking, block through traffic. Pedestrian traffic between the Village Area and the beach crosses the Esplanade. The Esplanade thus functions almost as a parking lot combined with a drop off to the beach, and has a high concentration of pedestrians. To accommodate through traffic two separate travels ways would have to be provided; one travel lane for through traffic and one for traffic searching or waiting for a parking space. The travel ways would be divided by a raised median barrier. This measure may reduce gridlock, but pedestrians-vehicular conflicts raise safety concerns, since through traffic would likely travel at higher speeds compared to the existing conditions. This alternative would also eliminate one side of the on street parking along the Esplanade.

With the counter clockwise alternative, it is recommended that the Esplanade flow direction remain in the counter-clockwise configuration. This configuration would direct vehicles northwards along Monterey Avenue through the Pac Cove lot, where parking would be more readily available. If the circulation on the Esplanade and Capitola Avenue were clockwise, a circular route would be established and result in increased traffic volumes and more gridlock.

It is recommended that the City manage parking and access to the Esplanade by implementing a parking management plan that includes electronic parking monitoring and a Changeable Message Signing (CMS) at the intersection of Stockton Avenue/Esplanade to indicate the availability of parking on the Esplanade. The information on this sign would also be repeated at a second CMS sign facing east at the intersection of Monterey Avenue/Park Avenue and north at the intersections of Capitola Avenue/Bay Avenue. If the Esplanade parking occupancy is at or over 90%, the sign could also indicate a message “Esplanade Congested”, since street traffic would start circulating when parking occupancy is over 90%, which causes gridlock. These signs could also be used to provide additional information on available parking in the Pac Cove Lot and the Crossroads Lot. The parking management plan could eventually be expanded to include overall parking in the Village area and off site parking lots.