

Sonoma Marin Area Rail Transit Commission (SMART)

Cloverdale to San Rafael

Commuter Rail Ridership and Revenue Forecast

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In Association with
HDR

March 29, 2002

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EXECUTIVE SUMMARY

BACKGROUND

Commuter rail ridership forecasting is an important input to the development of a system operating plan which in turn provides input to both the type of passenger equipment necessary to achieve projected ridership as well as the quantity of equipment required.

Much of commuter rail service is similar to other public transit services: it is operated by public agencies; fares typically cover far less than the full costs; and passengers frequently use monthly passes. On the other hand, commuter rail service rarely has a passenger profile matching the typical public transit passenger profile. Most passengers on commuter rail service—especially on the western FTA New Start Commuter Rail Services—are workers headed to and from a job site. Most passengers on commuter trains are converts to public transit. Based on the commuter rail new start experiences in northern and southern California typically between 70 –80 percent of initial riders have never used carpools, vanpools or other public transit to get to work prior to switching to commuter rail. These commuters fall into the great class of riders referred to as “drive-alones”.

This report presents a commuter rail ridership estimate for the horizon year of 2007, the year of an anticipated startup of commuter rail service and the year 2020. 2020 is selected because it conforms most closely to the Federal Transit Administration (FTA) requirement that New Start Projects provide a twenty-year forecast of ridership and uses the ABAG region’s 2020 adopted growth forecast used in regional air quality conformity determinations.

EVALUATION

This forecasts evaluates a twelve-station commuter rail system between Cloverdale and San Rafael running on the existing railroad tracks along the congested U.S. Highway 101 Corridor. The corridor length is approximately 68 miles. For evaluation purposes, station locations include: Cloverdale, Geyserville, Healdsburg, Windsor, Santa Rosa, Rohnert Park, Cotati, Petaluma, North Novato, South Novato, San Rafael Civic Center and San Rafael. Important assumptions regarding train operations and the availability of connecting transit service and park and ride lots include the following:

1. The jobs of potential commuter rail riders will be within an approximate 2 – 2 1/2 mile radius or 15-minute shuttle time connection of a station;
2. There will be time-of-arrival, direct short-headway coordinated transit services to employment destinations to and from a station;
3. The U.S. Highway 101 corridor will continue to experience significant peak-hour traffic congestion through service initiation in 2007 and the 2020 time horizon of this forecast;
4. Sufficient and secure parking will be provided at all origin stations;
5. There will be a minimum of three trains during each peak period at each station to meet the requirement of adequate service. ;

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6. There will be at least a single, mid-day round trip between each origin and destination station;

The morning southbound work trip and evening return northbound trip are the primary source for commuter rail patrons. The daily work trip, which begins in the northern portions of the study area (e.g. Cloverdale) with a job in the southern portion of the study area (e.g. San Rafael), would include a return trip at the end of the workday. These trips are referred to as “daily southbound trips.” There are, however, commuters who make a daily northbound trip in the morning with a return southbound trip in the evening. A smaller number of these trips are also potential commuter rail patrons and were estimated separately as “daily northbound trips”.

A multi-step method was used to develop daily patronage, annual passenger miles, and an annual revenue estimate for commuter rail service in U.S. Highway 101 corridor. These methods use available data as a basis for analysis to calculate the daily boardings and alightings by station pair, using a variable mode split percentage. Methods employed in this analysis have been used successfully to predict startup ridership for both the Altamont Commuter Express (ACE) commuter rail service between Stockton and San Jose, and for service on the Southern California Regional Rail Authority’s Metrolink service (Metrolink) in the greater Los Angeles area. Once daily ridership in both “southbound” and “northbound” directions was estimated, the passenger miles traveled between each station pair was calculated. Subsequently, an estimate of passenger revenues was made using an assumption of ten cents per passenger mile.

CONCLUSIONS

Table S-1 presents the total daily ridership estimate, passenger miles traveled and the potential revenue generated from such travel. The 2020 ridership forecast of morning southbound rail commute travel is for a total of 4,562 daily one-way trips. This translates into approximately 2,280 commuters in the morning and 2,280 commuters in the evening. The four highest destination stations are San Rafael, Petaluma, Santa Rosa and the Marin County Civic Center. The four highest origination stations are Santa Rosa, Windsor, Healdsburg and Cloverdale. The average trip length in this corridor is approximately 26 miles.

**Table S-1
Cloverdale to San Rafael Commuter Rail Ridership and Revenue Estimate**

	2007	2020
Daily Home-Based Work Trip Boardings Southbound ¹ .	3,888	4,562
Daily Home-Based Work Trip Boardings Northbound ² .	1,202	1,416
Total Daily Home-Based Work Trip Boardings	5,090	5,978
Total Annual Passenger Miles³.	31,870,800	37,104,000
Total Annual Passenger Revenue⁴.	\$ 3,187,080.00	\$ 3,711,000.00

Source: Schiermeyer Consulting Service

1. Represents a round trip work trip that begins southbound in the morning and returns northbound in the evening.
2. Represents a round trip work trip that begins northbound in the morning and returns southbound in the evening.
3. Based on mileage between station pairs and an annual work year of 238 days.
4. Based on a fare of ten cents per passenger mile.

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Projections for 2007, the year projected for start of commuter rail service, result in a daily total of 3,888 in the southbound direction and 1,202 daily commuter rail trips in the northbound direction. The daily total would be estimated at 5,090 commuter rail trips. Ridership forecasts for both year of startup and 2020 are comparable to estimates of startup service on ACE that have been confirmed in operation. What the analysis indicates is a fairly strong movement of commuters into Marin County locations (52 percent) but an almost equally strong movement of intra Sonoma County trips. Of particular interest is the estimate of almost 2,300 daily morning commuters along the U.S. Highway 101 corridor. This number of vehicles is somewhat more than a peak hour's worth of highway lane capacity, thus suggesting a positive relationship between the new rail service and the overall expansion of interregional transportation capacity through the two-county region.

The 2020 forecast represents only a 35 percent increase in home-based work trips over the 1998 base year—the only other time period for which Marin County had transportation planning data—and would more likely better approximate the actual start-up conditions in 2007 than the earlier forecast. The 2020 forecast was factored back to the 2007 year based on a total work trip ratio in order to provide a “best estimate” of actual ridership at the time of a system startup. Nevertheless, since there will only be a 35 percent growth between the two time periods (1998 and 2020) and since the service start-up will take place approximately mid-period, the projected ridership easily falls into a plus or minus of 20 percent and thus well within any margin for error.

At \$0.10 per mile, total projected annual revenue in 2020 for the southbound estimate is approximately \$2.95 million in 2002 dollars. Total projected annual revenue in 2020 for the northbound estimate is approximately \$755,000 in 2002 dollars. Table S-1 presents the total estimate of the north and southbound annual revenue if a two-way commute service were operated. The total estimated annual revenue under this fare approach would be approximately \$3.2 million in 2007 and \$3.7 million in 2020 with both figures estimated in year 2002 dollars .

This ridership assessment has demonstrated the potential for a very useful commuter rail service along the U.S. Highway 101 corridor. Whether its potential can be realized will depend in very large measure on a satisfactory level of train service during the peak period at all principal destination stations, matched with reliable shuttle connections to the main employment areas area, park and ride site and station location choices.

COMMUTER RAIL RIDERSHIP & REVENUE

RIDERSHIP FORECASTING

Commuter rail ridership forecasting is as much an art as it is a science. Much of commuter rail service is similar to other public transit services: it is operated by public agencies; fares typically cover far less than the full costs; and passengers frequently use monthly passes. On the other hand, commuter rail service rarely has a passenger profile matching the typical public transit passenger profile. Most passengers on commuter rail service—especially on the western FTA New Start Commuter Rail Services—are workers headed to and from a job site. Based on the commuter rail new start experiences in northern and southern California typically between 70 – 80 percent of initial riders have never used carpools, vanpools or other public transit to get to work prior to switching to commuter rail. These commuters fall into the great class of riders referred to as “drive-alones”.

Finally, commuter rail ridership is typically severely hampered by its almost exclusive focus on the peak commute period and with relatively long gaps between trains, especially as compared with high-frequency public transit services in urban areas. Except in more mature commuter (or regional) rail environments such as with Caltrain between San Jose and San Francisco and many of the older eastern services in Chicago and New York, most commuter rail systems have a high preponderance of work-oriented rail trips and far fewer non-work trips by rail.

These characteristics present challenges to the development of credible ridership forecasts. Typical public transit models would predict large ridership for short distance trips. The approach recommended for regional commuter rail forecasting de-emphasizes the short trip and emphasizes the long trip. The results of previous forecasts prepared by Schiermeyer Consulting Services (SCS) for the Southern California Regional Rail Authority’s Metrolink service (Metrolink) and the Altamont Commuter Express (ACE) have validated this approach.

Commuter rail service does not take place in a vacuum. Were there no traffic constraints on major arteries and freeways it is not likely that there would be any appreciable rail ridership for non-transit dependents. If gas were free or priced very cheaply, it is also evident that peak hour commuter rail ridership would be far less attractive. Of course, the converse is true as well: with high fuel prices and congested roadways, peak hour commuter rail service also becomes more attractive.

The fact of the matter is that it is inherently simpler to drive directly from home to work. And this is why so many commuters choose to drive and, for that matter, drive alone. This is the principal pool of commuters from which regional commuter rail draws its riders. To attract such commuters, rail service must be effectively scheduled to meet their needs – with convenient shuttle and/or park and ride facilities available.

ASSUMPTIONS and METHODS

This ridership forecast was developed with a number of critical assumptions and uses methods that have proven highly accurate in SCS's ACE and Metrolink commuter rail patronage forecasts. Assumptions emphasize the nature of the trip destination relative to station location and the nature and timing of connecting transit or shuttle services that would be necessary to induce a "drive alone" commuter to become a rail commuter. Listed below are the assumptions required of this commuter rail ridership forecast:

1. The jobs of potential commuter rail riders will be within an approximate 2 – 2 1/2 mile radius or 15-minute shuttle time connection of a station;
2. There will be time-of-arrival, direct short headway coordinated transit services to employment destinations to and from a station;
3. The U.S. Highway 101 corridor will continue to experience significant peak-hour traffic congestion through service initiation in 2007 and the 2020 time horizon of this forecast;
4. Sufficient and secure parking will be provided at all origin stations;
5. There will be a minimum of three trains during each peak period at each station to meet the requirement of adequate service.
6. There will be at least a single, mid-day round trip between each origin and destination station;
7. The forecast estimates ridership for home-based work trips.
8. Fares will be comparable to industry standards; fares higher than industry standards would depress ridership; fares lower than industry standards could increase ridership by an unknown amount, particularly the short-distance trips.

A multi-step method was used to develop daily patronage, annual passenger miles, and an annual revenue estimate for commuter rail service in U.S. Highway 101 corridor. These methods use available data as a basis for analysis to calculate the daily boardings and alightings by station pair, using a variable mode split percentage. First, daily boardings and alightings between station pairs were calculated. Once the daily boardings were determined, the annual passenger miles were calculated between each station pair. Finally, the revenue per passenger mile was calculated for each station pair and totaled. Although the primary commute pattern is southbound in the morning (AM peak) and northbound in the evening (PM Peak), a small amount of northbound commuter rail ridership is expected as a result of the assumptions in train service and the expectation that train sets would be running reverse direction during the peak periods. Each of the method steps is described more fully in the following paragraphs.

Estimate of Daily Southbound and Northbound Boardings

The commuter rail ridership forecast for SMART has been developed using Marin County's 2020 daily home based work trip table from the county's EMME2 highway and transit model which includes Sonoma County. The Marin County model uses Association of Bay Area Governments (ABAG)/Metropolitan Transportation Commission (MTC) consistent growth data as input to a travel model that details and refines both the highway and transit networks within Marin and Sonoma Counties and maintains cord connections with the greater MTC modeling

region. The transportation analysis zone (TAZ) structure of the Marin County model is more discrete and numerous and therefore more refined than those of the regional model, providing a greater degree of trip information at a smaller aggregate level. TAZ were aggregated around station areas to coincide with logical capture areas of similar distances. Use of the Marin County model permits more discrete analysis while maintaining consistency with adopted regional growth and transportation models and associated air quality conformity findings, a requirement for federal funding.

SCS clustered the Marin County and Sonoma County zones into groupings that corresponded to 1) Destination Stations (i.e. no more than 2.5 mile radius from the destination station coordinate to the outermost TAZ included in that cluster) and 2) those TAZ zones that appeared to have a geographic relationship with each other and lay upon established transportation routes. In the latter category, TAZ lying outside a central core of zones that comprise a station area but through which its residents would have to drive if commuting on U.S. Highway 101, were lumped together. Local area road maps were consulted to determine likely routes from the more outlying areas to U.S. Highway 101 to determine the most likely station for boarding. Thus, as an example, a TAZ zone cluster referred to as Origin Zone 18 Rohnert Park East was created. This TAZ cluster consisted of TAZ zones 257 and 258. These TAZ zones are located beyond the service radius of the Rohnert Park station. Nevertheless, if any residents in these two TAZ zones worked near a destination station along southbound U.S. Highway 101 their most convenient point of access to U.S. Highway 101 and SMART would be in Rohnert Park. Thus, for purposes of calculating trips to those destination stations, Origin Zone 18 Rohnert Park East TAZ zones would be included, but would not be included for any northbound commute trips since their direct travel line would not take them through the Rohnert Park station.

This example brings up a point on methodological approach. Commuters are notoriously leery of any “back-tracking”. From other experiences with the new start-up services at Metrolink in Southern California, commuters will gladly drive towards a commuter rail station if it is generally in the line of travel towards the work place location. However, the resistance to traveling in an opposite direction to the work place location in order to reach a commuter rail station is very significant. SCS has tried to incorporate this reality in its clustering of TAZ zones for this study. This phenomenon may also have tangible applications for SMART as it seeks to finalize its ultimate station locations. Stations should be located to minimize local arterial access for morning boardings and they should be located as close to employment clusters as possible in order to minimize shuttle travel time. Some special shuttles (e.g. for students at Marin College or the Lucas Sound and Light facility) may be needed.)

Marin County’s modeling staff provided a year 2020 home based work daily person trip table squeezed into the TAZ groupings described above. The data resulting from the squeeze provides trip pairs of potential ridership between origin and destination station locations as well as from more outlying areas. Information provided by Marin County’s modeling staff indicated that 89 percent of daily home-based work trips occur during the peak periods. All applicable trip pairs were first reduced to the 89 percent that would be expected to occur during the peak periods when commuter rail service would operate.

Trip pairs were then further reduced to reflect the likelihood of those commutes that could be attracted to commuter rail service. This approach is done in lieu of the traditional EMME2 mode choice model components due to the nature of commuter rail services. Table 1 indicates the mode split by trip distance applied to the home based work trip pairs. What does a mode split of 15 percent mean when it refers to a trip between Rohnert Park and San Rafael? For this report it means that 15 percent of the commuters who live in a zone convenient to the proposed Rohnert Park station and who works in downtown San Rafael (or within easy shuttle distance of downtown San Rafael) will take the train. 85 percent of the other pool of commuters who live in Rohnert Park but work in San Rafael will continue to use other means to get to work.

Table 1
Mode Split Factors

Origin Station to Destination Station (miles)	Mode Split Percentage Applied
10 - 15	2.5%
15 - 20	5%
20 - 30	10%
30 - 35	15%
35 - 40	20%
40 +	25%

Source: Schiermeyer Consulting Services

The actual pool of commuters who live in Rohnert Park and work in San Rafael may be relatively small. In fact, the longer the trip to any destination is, the correspondingly smaller the absolute number of commuters. Thus, despite an apparently high mode split, the actual number of commuters involved with that trip may be relatively small. The mode choice factors used have been used in other commuter rail patronage estimates in both Northern and Southern California and have proven exceptionally accurate when compared with ridership achieved in actual service startups.

In prior ridership analyses SCS has totally discounted any potential rail trip of less than 15 miles. In practical terms for Marin County this would mean that there would be no trips between Novato and either the San Rafael Civic Center station or downtown San Rafael. And while most current drivers will likely continue to use their private vehicle for this trip, actual experience with Metrolink suggests there will be some rail use. Thus, given the very high freeway congestion in this and other areas of the corridor SCS is including some diversion to commuter rail for trips falling into the nine or ten to 15 mile range. The mode split for this distance (2.5 percent) is slight but could even be improved were there greater service frequencies. On the other side of the equation, most distance-based commuter fare methodologies include a “boarding charge” in the base fare and that has the impact of making short distance trips relatively expensive.

Estimate of Northbound and Southbound Annual Passenger Miles

Once the daily passenger trips between stations have been calculated, the annual passenger miles traveled is calculated. The actual train miles between stations measure trip distance. These

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distances were calculated based on the track milepost location of each station. Table 2 indicates the distance between each of the proposed stations on this corridor. Figure 1 displays the locations of these stations. The total number of daily trips for each origin and destination station pair was multiplied by the distance between the two stations. The resulting daily passenger miles were then increased to an annual amount by using an annual number of travel days. The annual number of days that a commuter was expected to travel was assumed to be 238 days. This number is based on assumptions of an annual work year of 50 weeks, and an additional 12 holidays. These generous assumptions result in a conservative estimate of passenger miles.

**Table 2
Distance Between Stations**

Origin Station (Mile Post)	Destination Station								
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor
San Rafael (MP 17.0)									
Civic Center (MP 19.7)	2.7								
South Novato (MP 24.6)	7.6	4.9							
North Novato (MP 28.8)	11.8	9.1	4.2						
Petaluma (MP 38.5)	21.5	18.8	13.9	9.7					
Cotati (MP 46.1)	29.1	26.4	21.5	17.3					
Rohnert Park (MP 47.4)	30.4	27.7	22.8	18.6	8.9				
Santa Rosa (MP 53.8)	36.8	34.1	29.2	25	15.3	7.7			
Windsor (MP 62.9)	45.9	43.2	38.3	34.1	24.4	16.8	15.5	9.1	
Healdsburg (MP 68.0)	51.0	48.3	43.4	39.2	29.5	21.9	20.6	14.2	
Geyserville (MP 75.8)	58.8	56.1	51.2	47.0	37.3	30.7	28.4	22.0	12.9
Cloverdale (MP 85.2)	68.2	65.5	60.6	56.4	46.7	39.1	37.8	31.4	9.4

Source: Schiermeyer Consulting Services

Estimate of Gross Annual Passenger Revenue

The final step in the methodology was to calculate the gross annual passenger revenue that might be expected from patronage estimates. For the SMART system, SCS has merely calculated the total passenger rail miles and multiplied that total by \$0.10/mile. Calculations assume current 2002 dollars and have not been escalated. Using this approach, a 50-mile trip would cost \$5.00 (SCS assumes this would be the monthly pass discount price; the one-way, one-day ticket would be actually priced higher). Even at \$5.00 the tariff would be priced somewhat lower than the Southern California Metrolink tariff. A more detailed justification of this approach is included in the discussion of annual passenger revenues later in this report. The average trip length in this corridor is approximately 26 miles.

Figure 1
Cloverdale to San Rafael Potential Commuter Rail Station Locations

NOTE: This page is a place holder for the map and should not be removed from the electronic file as it controls the Figure name in the Table of Contents and effects page numbering of the balance of the document. The Map is a separate document at this time.

SMART RIDERSHIP FORECAST

For purposes of estimating the maximum potential ridership on the Cloverdale-San Rafael route SCS has prepared ridership estimates for travel in both directions. Thus the southbound estimate refers to morning travel oriented from north to south along the U.S. Highway 101 corridor. The northbound estimate refers to morning travel oriented from south to north along the U.S. Highway 101 corridor.

Morning Southbound/ Evening Northbound Ridership Estimate

The 2020 ridership forecast of morning southbound rail commute travel is for a total of 4,562 daily one-way trips. This translates into approximately 2,280 commuters in the morning and 2,280 commuters in the evening. As shown on Table 3, “2020 Daily Ridership for Morning Southbound/ Evening Northbound Commuters”, the four highest destination stations are San Rafael (693 AM arrivals), Petaluma (486 AM arrivals), Santa Rosa (298 AM arrivals) and the Marin County Civic Center (259 AM arrivals). The four highest origination stations are Santa Rosa (733 AM boardings), Windsor (504 AM boardings), Healdsburg (312 AM boardings) and Cloverdale (207 AM boardings).

**Table 3
2020 Daily Home Based Work Ridership for
Morning Southbound/ Evening Northbound Commuters**

Origin Station	Destinations									Total Boardings by Origin
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	
San Rafael										
Civic Center										
South Novato										
North Novato	132	56								188
Petaluma	101	21	12	7						141
Cotati	106	30	17	14						167
Rohnert Park	223	63	36	30						352
Santa Rosa	504	213	80	135	533					1,465
Windsor	190	80	36	46	241	107	119	188		1,007
Healdsburg	79	33	19	25	100	89	99	179		623
Geyserville	17	7	4	6	32	29	32	77	2	206
Cloverdale	34	14	8	14	65	57	64	153	4	413
Total Boardings by Destination	1,386	517	212	277	971	282	314	597	6	4,562

Source: Schiermeyer Consulting Services

Based on 89 percent of Marin County EMME2 squeeze of 2020 daily home-based work trip table.

Represents a round trip work trip that begins southbound in the morning and returns northbound in the evening.

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What the analysis indicates is a fairly strong movement of commuters into Marin County locations (52 percent) but an almost equally strong movement of intra Sonoma County trips. Of particular interest is the estimate of almost 2,300 daily morning commuters along the U.S. Highway 101 corridor. This number of vehicles is somewhat more than a peak hour's worth of highway lane capacity, thus suggesting a positive relationship between the new rail service and the overall expansion of interregional transportation capacity through the two-county region.

Table 4, "2007 Daily Home-Based Work Ridership for Morning Southbound/Evening Northbound Commuters" presents the start of service ridership levels estimated for the year 2007. To estimate the 2007 start of operation ridership, SCS conducted telephone interviews with Marin County transportation modeling staff involved in regional trip-making analyses within this area. Simple ratios of the predicted 2020 commuter rail ridership and total home based work trips were applied to the 1998 total home based work trips. Distributing the growth in these trips equally over the 22 years between the 1998 base year and 2020 forecast year, would result in an annual increase of 53 trips per year in the southbound direction and 16 trips per year in the northbound direction. Table 4 presents the 2007 daily ridership that begins the commute in a northbound direction and returns in a southerly direction within the corridor.

**Table 4
2007 Daily Home Based Work Ridership for
Morning Southbound/ Evening Northbound Commuters**

Origin Station	Destinations									Total Boardings by Origin
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	
San Rafael										
Civic Center										
South Novato										
North Novato	112	48								160
Petaluma	99	18	10	6						133
Cotati	90	25	14	12						141
Rohnert Park	189	53	31	25						298
Santa Rosa	428	181	68	115	452					1,244
Windsor	161	68	31	39	205	91	101	160		856
Healdsburg	67	28	16	21	85	78	84	152		531
Geyserville	14	6	3	5	27	25	27	65	2	174
Cloverdale	29	12	7	12	55	48	54	130	4	351
Total Boardings by Destination	1,189	439	180	235	824	242	266	507	6	3,888

Source: Schiermeyer Consulting Services

1. Represents a round trip work trip that begins southbound in the morning and returns northbound in the evening.

The 1998 base year transportation model has estimated a daily home based work trip volume of slightly more than five million daily trips and with predicted growth patterns a 2020 daily home based work trip volume of approximately 6.76 million trips (Marin County Transportation

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Model). Thus, for the Sonoma-Marin area, the growth from 1998 to 2020 will be approximately 35 percent in total home-based work trips. The common judgment among modeling staff is that transportation growth is occurring at a pace consistent with future projections.

Table 5, “2020 Annual Southbound Morning/Northbound Evening Passenger Miles”, tells the same story in a slightly different way. The approximately 2,300 daily roundtrips generate a total of 29.5 million passenger miles each year, of which slightly more than 19 million are to destinations in Marin County. This represents approximately 65 percent of total southbound passenger miles. Thus, while the passenger trips are split relatively evenly between the two counties, the trips destined for Marin County are longer than the trips destined for Sonoma County. Since many of these passenger miles currently take place in single-occupant vehicles, the calculation of 29.5 million passenger rail miles may represent a very significant reduction in air pollution generated by cars.

**Table 5
2020 Annual Southbound Morning/Northbound Evening Passenger Miles**

Origin Station	Destination Stations									Total Passenger Miles from Origin Station
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	
San Rafael										
Civic Center										
South Novato										
North Novato	591,500	121,300								712,800
Petaluma	516,000	95,600	39,700	16800						668,100
Cotati	736,000	188,500	86,500	58,400						1,069,400
Rohnert Park	1,615,900	415,400	192,700	132,200						2,356,200
Santa Rosa	4,411,600	1,731,400	557,300	802,300	1,941,300					9,443,900
Windsor	2,075,600	825,800	329,400	370,500	1,397,500	427,000	440,600			5,866,400
Healdsburg	956,100	383,700	195,400	235,800	702,400	463,000	487,000	605,000		4,028,400
Geyserville	236,600	95,100	48,800	75,500	285,600	208,700	216,000	402,000	235,700	1,804,000
Cloverdale	473,300	190,100	97,600	151,000	571,200	417,500	432,000	804,000	471,400	3,608,100
Total Passenger Miles Southbound	11,612,600	4,046,900	1,547,400	1,842,500	4,898,000	1,516,200	1,575,600	1,811,000	707,100	29,557,300

Source: Schiermeyer Consulting Services

Based on daily trips, a 238-day work year and the distance between stations,

Table 6 “2007 Annual Southbound Morning/Northbound Evening Passenger Miles” presents the slightly lower annual mileage for start of service operations in the southbound direction. The nearly 25.5 million passenger miles reflect the slightly lower ridership expected at the start of operations.

**Table 6
2007 Annual Southbound Morning/Northbound Evening Passenger Miles**

	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	Total
San Rafael										
Civic Center										
South Novato										
North Novato	314,500	104,000								418,500
Petaluma	506,600	80,500	33,100	13,900						634,100
Cotati	623,300	157,100	71,600	49,400						901,400
Rohnert Park	1,367,500	349,400	168,200	110,700						1,995,800
Santa Rosa	3,748,600	1,469,000	472,600	684,200	1,645,900					8,020,300
Windsor	1,758,800	699,100	282,600	316,500	1,190,500	363,900	372,600	346,500		5,330,500
Healdsburg	813,200	321,900	165,300	190,900	596,800	406,600	411,800	513,700		3,420,200
Geyserville	195,900	80,100	36,600	55,900	239,700	182,700	182,500	340,300	6,100	1,319,800
Cloverdale	470,700	187,100	101,000	161,100	611,300	446,700	485,800	971,500	9,000	3,444,200
Total	9,799,100	3,448,200	1,331,000	1,582,600	4,284,200	1,399,900	1,452,700	2,172,000	15,100	25,484,800

Source: Schiermeyer Consulting Services

Based on daily trips, a 238-day work year and the distance between stations,

Morning Northbound/ Evening Southbound Ridership Estimate

The southbound estimate includes virtually all TAZ zones within reasonable reach of the U.S. Highway 101 corridor from Cloverdale south. All commuters are assumed to travel to the closest access point to the U.S. Highway 101 corridor and thus, by inference, to a SMART station.

Similarly the northbound estimate includes all TAZ zones within reasonable reach of the U.S. Highway 101 corridor from Marin County locations south of San Rafael to Santa Rosa. For purposes of this northbound estimate SCS is not including any home-based work trips to the following potential destinations: Windsor, Healdsburg, Geyserville and Cloverdale. These four stations were omitted from a calculation of northbound ridership because the TAZ in those areas covered a geographic area far greater than just an area 2.5 miles on either side of the SMART station. SCS determined that the inclusion of a ridership estimate into those four stations would introduce too much uncertainty into the assessment.

While there may be some regional jobs in Windsor and the other stations, in practical terms the impact of omitting these four stations as destinations is likely to be minor on the overall northbound ridership estimate. For the service as a whole, these four stations collectively account for 49 percent of the southbound trips and an even higher share of passenger rail miles (revenue and air quality benefits). Thus their importance to the regional system is demonstrated, whether or not they are important employment destinations for northbound commuting.

There are far fewer commute trips northbound in the morning than there are southbound. This reality is dramatically illustrated in Table 7, “2020 Total Daily Northbound Morning/Southbound Evening Passenger Trips.”

**Table 7
2020 Daily Northbound Morning/Southbound Evening Passenger Trips**

Origin Station	Destination Stations									Total Northbound Passenger Trips by Origin
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	
San Rafael				75	44	45	51	275		490
Civic Center				81	17	18	20	58		194
South Novato					3	6	13	82		104
North Novato					3	7	8	28		46
Petaluma								582		582
Cotati										
Rohnert Park										
Santa Rosa										
Windsor										
Healdsburg										
Geyserville										
Cloverdale										
Total Northbound Passenger Trips by Destination				156	67	76	92	1,025		1,416

Source: Schiermeyer Consulting Services

Using the SCS methodology, there are approximately 1,400 total daily one-way trips to northbound destinations. This translates into 700 morning and 700 afternoon commuters. Of these commuters, the overwhelming majority (72 percent) commute to Santa Rosa. The next most important northbound destination is a station in North Novato, with 156 total one-way daily trips. Petaluma, with 291 morning commuters, is the most important AM boarding location for this service, with downtown San Rafael the second most important potential boarding location with 245 AM commuters. San Rafael is only a “potential” boarding location because current plans do not call for any parking at that station. Lacking parking it is not likely that more than 10-20 percent of the potential can be realized at that station, thus reducing the total northbound ridership. Table 8 presents the 2007 start of service daily passenger trips that are generally northbound in the morning and return southbound in the evening. The largest destination station in the northerly commute is Santa Rosa with approximately 115 passengers arriving in the morning and returning to the San Rafael station in the evening, and slightly less than 250 passengers leaving Petaluma in the morning for Santa Rosa and returning in the evening.

**Table 8
2007 Daily Northbound Morning/Southbound Evening Passenger Trips**

	Destination Stations									Total Northbound Passenger Trips by Origin
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	

SMART Cloverdale to San Rafael Commuter Rail Ridership and Revenue Forecast

Origin Stations	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	
San Rafael				64	37	38	43	233		415
Civic Center				69	14	15	17	49		164
South Novato					3	5	11	70		89
North Novato					3	6	7	24		40
Petaluma								494		494
Cotati										
Rohnert Park										
Santa Rosa										
Windsor										
Healdsburg										
Geyserville										
Cloverdale										
Total North bound Trips by Destination				133	57	64	78	870	0	1,202

Source: Schiermeyer Consulting Services

Total annual northbound passenger miles are estimated at more than 7.5 million miles in 2020 and 6.4 million miles in 2007. This is approximately 25 percent of the passenger miles generated by the southbound morning commute service. Table 9, “Annual 2020 Northbound Morning/Southbound Evening Passenger Miles,” and Table 10, “2007 Annual Northbound Morning/Southbound Evening Passenger Miles” indicates the passenger miles generated by trips to each station for the two forecast years.

REVENUE

For the SMART system, SCS has merely calculated the total passenger rail miles and multiplied that total by \$0.10 per mile. There is no single approach to setting passenger fares on commuter rail systems. Virtually every commuter system has a slightly different approach. Some, like Caltrain between San Jose and San Francisco, have a relatively low-cost fare structure. For example, a one-way, one-zone trip of five miles will cost \$1.25 but if the commuter purchases a monthly pass (assumed 40 trips per month) that same trip will be reduced to \$0.89. This type of fare structure encourages shorter trips. The five-mile trip can cost as little as \$0.18 per mile.

On Metrolink in Southern California, a ten-mile, one-way, one-zone trip will cost \$4.00 but only \$2.16 if the commuter purchases a monthly pass. This ten-mile trip can cost as little as \$0.22 per mile. Yet, at \$0.04 cents per mile per passenger, this difference can yield much greater revenue.

**Table 9
2020 Annual Northbound Morning/Southbound Evening Passenger Miles**

	Destination Stations
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SMART Cloverdale to San Rafael Commuter Rail Ridership and Revenue Forecast

Origin Station	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	Passenger Miles from Origin Station
San Rafael				212,000	225,000	315,000	368,300	2,409,800		3,530,100
Civic Center				175,000	78,100	113,500	133,800	467,000		967,400
South Novato					9,400	30,300	72,000	572,100		683,800
North Novato					16,800	28,800	34,500	167,300		247,400
Petaluma								2,118,100		2,118,100
Cotati										
Rohnert Park										
Santa Rosa										
Windsor										
Healdsburg										
Geyserville										
Cloverdale										
Total Passenger Miles Northbound				387,000	329,300	487,600	608,600	5,734,300		7,546,800

Source: Schiermeyer Consulting Services

Based on Daily Trips, a 238-day year, and distance between stations

**Table 10
2007 Annual Northbound Morning/Southbound Evening Passenger Miles**

	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	Total
San Rafael				179,700	189,300	263,200	311,100	2,040,700		2,984,000
Civic Center				149,400	62,600	94,200	112,100	397,700		816,000
South Novato					9,900	25,600	59,700	486,500		581,700
North Novato					6,900	24,700	31,000	142,800		205,400
Petaluma								1,798,900		1,798,900
Cotati										
Rohnert Park										
Santa Rosa										
Windsor										
Healdsburg										
Geyserville										
Cloverdale										
Total				329,100	268,700	407,700	513,900	4,866,600	0	6,386,000

Source: Schiermeyer Consulting Services

Based on Daily Trips, 238 days per year and distance between stations.

For the longer trips there are differences as well. For the 47.5-mile, five-zone trip from San Jose Diridon Station to San Francisco, the one-way ticket cost will be \$5.25 or \$3.54 if the commuter purchases a monthly pass.

SMART Cloverdale to San Rafael Commuter Rail Ridership and Revenue Forecast

On Metrolink, a similar five-zone (though slightly more distant) trip from Riverside to Los Angeles will cost \$8.00 or \$5.63 if the commuter purchases a monthly pass. There is a large difference in the revenue generated for similar trips between Caltrain and Metrolink.

Many commuter systems impose a basic “boarding charge” ranging from \$1.00 to \$1.50 no matter the length of the trip. In addition to the boarding charge commuters are then charged approximately \$0.08 to \$0.10 per mile for each mile traveled. Consequently with this style tariff, shorter trips will cost relatively more on a mileage basis than will longer trips.

Since the experience at both Metrolink and ACE is that a significant percentage of commuter rail riders are former drive-alone commuters it would appear that fare elasticity might be somewhat less sensitive than one might expect. Consequently, a higher fare structure than the Caltrain fare structure may not necessarily depress ridership. The former drive-alone commuters see the train as a trade-off for the car and do not necessarily require massive discounts to use the train, although like all consumers commuters appreciate a bargain.

At \$0.10 per mile, total projected annual revenue in 2020 for the southbound estimate is approximately \$2.95 million in 2002 dollars (see Table 11 below). Total projected annual revenue in 2020 for the northbound estimate is approximately \$755,000 in 2002 dollars (see Table 12). If a two-way commute service were operated, total estimated annual revenue under this fare approach would be approximately \$3.7 million in 2002 dollars. Revenue estimates for 2007 in each direction are lower than those of 2020, reflecting the lower patronage expected at startup. Tables 13 and 14 present the 2007 annual revenues anticipated in the southbound and northbound daily rail commutes.

SMART Cloverdale to San Rafael Commuter Rail Ridership and Revenue Forecast

Table 11
2020 Annual Southbound Revenue Estimate
 (in 2002 Dollars*)

Origin Station	Destination Stations									
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	Total
San Rafael										
Civic Center										
S. Novato										
N. Novato	\$59,150	\$12,129								\$71,279
Petaluma	\$51,598	\$9,557	\$3,975	\$1,680						\$66,810
Cotati	\$73,598	\$18,845	\$8,653	\$5,845						\$106,941
Rohnert Park	\$161,595	\$41,541	\$19,270	\$13,218						\$235,624
Santa Rosa	\$441,157	\$173,137	\$55,728	\$80,227	\$194,127					\$944,375
Windsor	\$207,560	\$82,584	\$32,938	\$37,054	\$139,754	\$42,703	\$44,061			\$586,653
Healdsburg	\$95,605	\$38,366	\$19,535	\$23,581	\$70,235	\$46,296	\$48,697	\$60,503		\$402,818
Geyserville	\$23,665	\$9,506	\$4,880	\$7,550	\$28,562	\$20,874	\$21,596	\$40,201	\$23,572	\$180,406
Cloverdale	\$47,329	\$19,013	\$9,761	\$15,099	\$57,123	\$41,748	\$43,193	\$80,401	\$47,144	\$360,812
Total	\$1,161,256	\$404,680	\$154,739	\$184,254	\$489,801	\$151,621	\$157,546	\$181,105	\$70,717	\$2,955,719

Source: Schiermeyer Consulting Services

*Assumes 10 cents per passenger mile in 2002 dollars. Some differences may occur due to rounding.

Table 12
2020 Annual Northbound Revenue Estimate
 (in 2002 Dollars*)

Origin Station	Destination Stations									
	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	Total
San Rafael				\$21,202	\$22,497	\$31,498	\$36,833	\$240,982		\$353,012
Civic Center				\$17,502	\$7,805	\$11,352	\$13,378	\$46,697		\$96,734
South Novato					\$942	\$3,028	\$7,196	\$57,213		\$68,379
North Novato					\$1,680	\$2,877	\$3,447	\$16,734		\$24,737
Petaluma								\$211,805		\$211,805
Cotati										
Rohnert Park										
Santa Rosa										
Windsor										
Healdsburg										
Geyserville										
Cloverdale										
Total				\$38,704	\$32,924	\$48,755	\$60,854	\$573,431		\$754,668

Source: Schiermeyer Consulting Services

*Assumes 10 cents per passenger mile in 2002 dollars. Some differences may occur due to rounding.

Table 13
2007 Annual Southbound Revenue Estimate
 (in 2002 dollars)

	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	Total
San Rafael										
Civic Center										
South Novato										
North Novato	\$31,450	\$10,400								\$41,850
Petaluma	\$50,660	\$8,050	\$3,310	\$1,390						\$63,410
Cotati	\$62,330	\$15,710	\$7,160	\$4,940						\$90,140
Rohnert Park	\$136,750	\$34,940	\$16,820	\$11,070						\$199,580
Santa Rosa	\$374,860	\$146,900	\$47,260	\$68,420	\$164,590					\$802,030
Windsor	\$175,880	\$69,910	\$28,260	\$31,650	\$119,050	\$36,390	\$37,260	\$34,650		\$533,050
Healdsburg	\$81,320	\$32,190	\$16,530	\$19,090	\$59,680	\$40,660	\$41,180	\$51,370		\$342,020
Geyserville	\$19,590	\$8,010	\$3,660	\$5,590	\$23,970	\$18,270	\$18,250	\$34,030	\$610	\$131,980
Cloverdale	\$47,070	\$18,710	\$10,100	\$16,110	\$61,130	\$44,670	\$48,580	\$97,150	\$900	\$344,420
Total	\$979,910	\$344,820	\$133,100	\$158,260	\$428,420	\$139,990	\$145,270	\$217,200	\$1,510	\$2,548,480

Source: Schiermeyer Consulting Services

*Assumes 10 cents per passenger mile in 2002 dollars. Some differences may occur due to rounding.

Table 14
2007 Annual Northbound Revenue Estimate
 (in 2002 dollars)

	San Rafael	Civic Center	South Novato	North Novato	Petaluma	Cotati	Rohnert Park	Santa Rosa	Windsor	Total
San Rafael				\$17,970	\$18,930	\$26,320	\$31,110	\$204,070		\$298,400
Civic Center				\$14,940	\$6,260	\$9,420	\$11,210	\$39,770		\$81,600
South Novato					\$990	\$2,560	\$5,970	\$48,650		\$58,170
North Novato					\$690	\$2,470	\$3,100	\$14,280		\$20,540
Petaluma								\$179,890		\$179,890
Cotati										
Rohnert Park										
Santa Rosa										
Windsor										
Healdsburg										
Geyserville										
Cloverdale										
Total				\$32,910	\$26,870	\$40,770	\$51,390	\$486,660	\$0	\$638,600

Source: Schiermeyer Consulting Services

*Assumes 10 cents per passenger mile in 2002 dollars. Some differences may occur due to rounding.

CONCLUSION

SMART Cloverdale to San Rafael Commuter Rail Ridership and Revenue Forecast

While there are many factors that may contribute to a region’s decision to proceed in the development of a commuter rail line – capital costs, environmental concerns, funding availability, as well as ridership – on the ridership issue this proposed route appears to more than meet minimum threshold levels, with a total of 5,978 daily one-way trips. Table 15 presents the total estimates for both directions for the 2007 start of operations and the 2020 forecast year.

Table 15
Cloverdale to San Rafael Commuter Rail Ridership and Revenue Estimate

	2007	2020
Daily Home-Based Work Trip Boardings Southbound ¹ .	3,888	4,562
Daily Home-Based Work Trip Boardings Northbound ² .	1,202	1,416
Total Daily Home-Based Work Trip Boardings	5,090	5,978
Total Annual Passenger Miles³.	31,870,800	37,104,000
Total Annual Passenger Revenue⁴.	\$ 3,187,080.00	\$ 3,711,000.00

Source: Schiermeyer Consulting Service

- 5. Represents a round trip work trip that begins southbound in the morning and returns northbound in the evening.
- 6. Represents a round trip work trip that begins northbound in the morning and returns southbound in the evening.
- 7. Based on mileage between station pairs and an annual work year of 238 days.
- 8. Based on a fare of ten cents per passenger mile.

Ridership levels predicted in this analysis are comparable to four of the six operating routes in the Metrolink system. These four are established routes and their average daily February 2002 ridership ranges from 3,010 to 5,882 passengers. The predicted ridership is also comparable to the ridership on ACE system’s three daily round trips between the San Joaquin Valley and the Silicon Valley area of Santa Clara County that carry approximately 3,800 to 4,000 riders (one-way trips).

As noted in the introduction of this analysis, detailed TAZ information for all of Sonoma County was not available. Further, it should be noted that many Sonoma County cities are currently updating their General Plans, notably Santa Rosa and Rohnert Park. Most of these plans will assume traffic growth forecasts significantly above the Marin County model assumptions for all trips originating and destined for Sonoma County. For example, southbound am trips in the Marin County model are only expected to grow by 17% between 2007 and 2020. Sonoma County cities, however, are predicting traffic increases of approximately 35% within that same time period. This patronage forecast, therefore, is conservatively based on currently available traffic zone data. It is anticipated that Sonoma County will have updated travel forecast data, by traffic zones, by the end of this year. When that information becomes available, and has received the appropriate regional review, it should be included in the upcoming SMART environmental impact analysis work.

Last, this ridership assessment has demonstrated the potential for a very useful commuter rail service along the U.S. Highway 101 corridor. Whether its potential can be realized will depend in very large measure on a satisfactory level of train service during the peak period at all principal destination stations, matched with reliable shuttle connections to the main employment areas area, park and ride site and station location choices.

ACKNOWLEDGEMENTS

Schiermeyer Consulting Service wishes to acknowledge the generous assistance of the Marin County Public Works Department and particularly the very helpful advice and assistance of Mr. Tho Do P.E., Assistant Civil Engineer, and Marin County Department of Public Works.