

TECHNICAL APPENDIX 10

PERFORMANCE MONITORING

Highway System Performance

Caltrans and the University of California, Berkeley have recently developed the Highway Performance Monitoring System (PeMS), which collects highway speed and volume data and provides analysis tools through a Web site application. The Web site is located at <http://pems.eecs.berkeley.edu>. PeMS allows the region to better monitor highway performance and evaluate potential near-term solutions to improve congested locations (“pinch points”) on the region’s highway system.

Discussion

PeMS currently contains freeway speed and volume data from mid-June 2002 to today for freeway segments with in-pavement electronic loop detection. Caltrans and UC Berkeley staff is currently adding an additional three years of archived data to PeMS.

Table TA 10.1 shows the average weekday (Monday through Friday) freeway speeds during the peak hour of travel on the region’s freeways by direction. Speed is categorized three different ways: greater than 50 miles per hour (free flow in green), less than 50 miles per hour and more than 35 miles per hour (some congestion in light blue), and less than 35 miles per hour (heavy congestion in dark blue). These are the average weekday speeds over the three-month period between July 1, 2002 and September 30, 2002. Freeway segments without loop detection are shown in light gray, and the freeway limits are shown in dark gray.

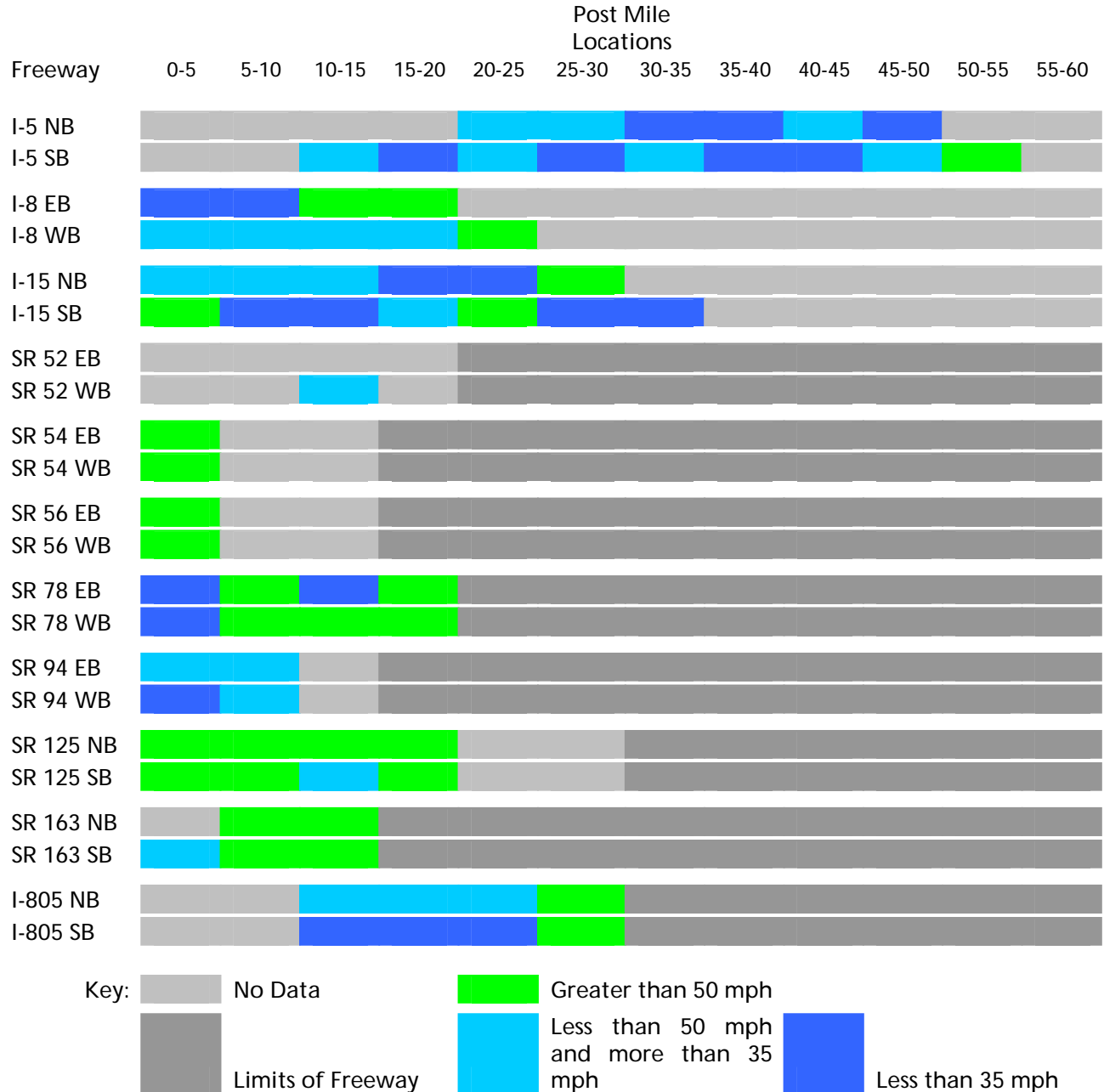
Table TA 10.2 shows greater detail for freeway locations with heavy congestion. The specific locations and the duration of time where the average speeds are less than 35 miles per hour are shown. Yellow indicates duration of heavy congestion between zero and two hours per day, orange indicates between two and four hours, and red indicates greater than four hours. Three of the region’s freeway segments currently have heavy congestion for more than four hours per day. These include: (1) I-5 northbound between Carmel Valley Road and Via De La Valle; (2) I-15 southbound between Centre City Parkway and El Norte Parkway; and (3) SR 78 westbound between I-5 and El Camino Real. The I-5 and I-15 Managed Lane/HOV corridor projects will improve conditions at the first two locations, and the planned freeway connectors at I-5 and SR 78 will improve conditions at the third location.

SANDAG will continue to use PeMS to monitor the region’s highway system. SANDAG also will continue to work with Caltrans and the UC Berkeley to refine and expand the role of PeMS. Priorities are to input additional data into PeMS, such as including missing freeway segments, conventional highways, arterials, and transit data (i.e., ridership, on-time performance, percentage of standing transit riders), and freeway ramp meter wait times. Once these data are collected and input into PeMS, we can begin to more comprehensively monitor the region’s transportation network. In the interim, PeMS will be used to identify opportunities for near-term improvements to the highway system.

















Caltrans has developed a highway “pinch point” candidate project list for solving some of the region’s highway operational deficiencies. The candidate project list is shown in Table TA 10.3 and is depicted in Figure TA 10.1. These projects are designed to provide near-term solutions, providing congestion relief in the interim before the more comprehensive long-term freeway connector and corridor widening projects are implemented. SANDAG will




work with Caltrans to expand and prioritize the “pinch point” candidate projects for future fund allocation and implementation. The list of candidate projects will be expanded in an effort to address as many of the “pinch points” throughout the region as possible.

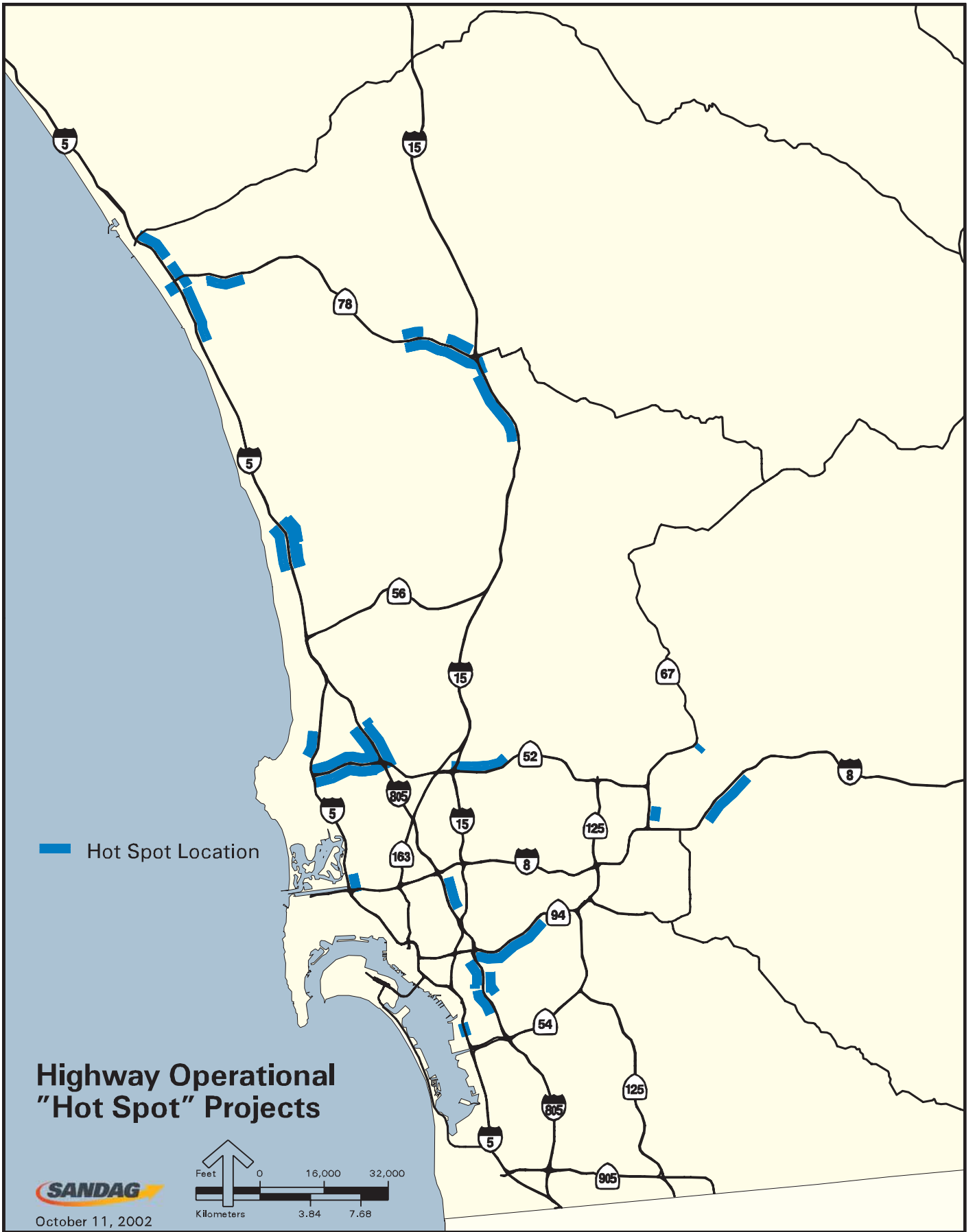
**TABLE TA 10.1—AVERAGE WEEKDAY FREEWAY SPEEDS DURING PEAK HOUR
JULY 1, 2002 TO SEPTEMBER 30, 2002**



**TABLE TA 10.2—FREEWAY LOCATIONS WHERE AVERAGE WEEKDAY SPEEDS ARE LESS THAN 35 MPH
JULY 1, 2002 TO SEPTEMBER 30, 2002**

Highway	Post Mile		From	To	Duration
	From	To			
I-5 NB	33	36	Carmel Valley Rd	Via De La Valle	
I-5 NB	46	49	Palomar Airport Rd	Tamarack Ave	
I-5 SB	15	18	Pershing Dr	Washington St	
I-5 SB	26	29	SR 52	Genesee Ave	
I-5 SB	38	45	Manchester Ave	Poinsettia Lane	
I-8 EB	3	7	Mission Center Rd	Waring Rd	
I-15 NB	16	24	Mira Mesa Blvd	Pomerado	
I-15 SB	8	11	Aero Dr	SR 163	
I-15 SB	27	32	Centre City Pkwy	El Norte Pkwy	
SR-78 EB	1	2	Jefferson St	El Camino Real	
SR-78 EB	11	13	Rancho Santa Fe Rd	Twin Oaks Valley Rd	
SR-78 WB	0	2	I-5	El Camino Real	
SR-94 WB	1	2	I-5	28th St	
I-805 NB	10	12	SR 54	Imperial Ave	
I-805 NB	14	16	SR 94	El Cajon Blvd	
I-805 NB	21	23	Balboa Ave	Clairemont Mesa Blvd	

Key:  0-2 hours  2-4 hours  4+ hours



**TABLE TA 10.3—HIGHWAY “PINCH POINT” CANDIDATE PROJECTS
(2002 DOLLARS)**

HIGHWAY	LOCATION	LANE ADDITION/MODIFICATION	COST (MILLIONS)
I-5	24th St to Harbor Dr	Northbound & Southbound lanes	\$2
I-5	I-8 to Sea World Dr	Northbound lane	\$25
I-5	Nobel Dr to Gilman Dr	Southbound lane	\$15
I-5	Via de la Valle to Manchester Ave	Northbound & Southbound HOV lane	\$30
I-5	Via de la Valle to Manchester Ave	Northbound lane	\$25
I-5	Cannon Rd to SR 78	Northbound lane	\$55
I-5	Las Flores Dr	Southbound lane	\$10
I-5	SR 78 West to I-5 North	Widen Connector	\$15
I-5	Oceanside Blvd to SR 76	Northbound lane	\$25
I-8	Greenfield Dr to Los Coches Rd	Eastbound lane	\$20
I-15	Via Rancho Pkwy to Valley Pkwy	Southbound lane	\$55
I-15	SR 78 East to I-15 South & I-15 South to Valley Pkwy	Separate (braid) ramps	\$25
SR 52	I-15 to east of Santos Rd	Westbound lane	\$20
SR 52	I-5 to I-805	Westbound & Eastbound lanes	\$60
SR 67	Broadway Ave to Bradley Ave	Northbound lane	\$10
SR 67	Channel Rd to Mapleview St	Extend Northbound right turn lane	\$5
SR 76	Olive Hill Rd	Eastbound and Westbound lanes	\$4
SR 78	El Camino Real to College Blvd	Eastbound lane	\$3
SR 78	Twin Oaks Valley Rd to I-15	Eastbound & Westbound lanes	\$65
SR 94	I-805 to College Ave	Eastbound lane	\$40
I-805	SR 54	East to South Connector	\$10
I-805	SR 94 to Plaza Blvd	Southbound lane	\$40
I-805	Division St to Imperial Ave	Northbound lane	\$15
I-805	Adams Ave to University Ave	Northbound lane	\$35
I-805	SR 52 to La Jolla Village Dr	Northbound & Southbound lanes	\$40
TOTAL			\$649

SOURCE: Caltrans District 11

Transit System Performance

For more than 20 years, SANDAG has counted passenger boardings and alighting and measured on-time performance of each of the region’s fixed transit routes. This program is based upon guidelines from the Federal Transit Administration required for National Transit Database reporting. These data also are used to measure the performance and productivity of existing transit services.

Discussion

Transit ridership and on-time performance data available through SANDAG’s Passenger Counting Program have become a valuable and widely used tool for system planning and operations analysis and monitoring. Individual route reports and year-end performance data, now available online at www.sandag.org, provide data on passenger

boardings and alightings at the stop, trip, route, and system level. Data related to on-time performance of routes at timepoints also are available.

Each fixed-route transit trip operated in the region (excluding rural routes) is counted once a year. A consulting firm, under contract to SANDAG, schedules passenger counters to ride each transit route and count passengers as they board and alight from the vehicle. Passenger counters also record arrival and departure times from scheduled timepoints.

In addition to every weekday trip, about 15 percent of weekend trips also are monitored. In order to comply with federal statistical reliability guidelines, the order in which NCTD and San Diego Transit routes are counted is randomly determined. Once all trips on a route are counted, this information is then reviewed and validated and compiled into a series of reports. Because each trip is counted only once, care is taken not to schedule counts on days such as holidays, when ridership and on-time performance can vary considerably from the norm.

Tables TA 10.4 and TA 10.5 show sample reports on on-time performance from the Passenger Counting Program for San Diego Transit Route 8. Table TA 10.4 summarizes the proportion of trips that are either late arriving to the timepoint ("Percent Slow") and early leaving the timepoint ("Percent Hot") for four time periods throughout the weekday (AM for the 6 a.m. to 9 a.m. period, MID for the 9 a.m. to 3 p.m. period, PM for the 3 p.m. to 6 p.m. period, and OTHER for the 6 p.m. to 6 a.m. period). Data are monitored for both directions of the Route 8, including eastbound and westbound.

Table TA 10.5 details the on-time performance for each trip on the route. A negative number indicates the number of minutes a transit vehicle is late arriving to the timepoint. A positive number individual the number of minutes the vehicle left the timepoint ahead of the scheduled time. As is the case with Table TA 10.4, each direction of the route is monitored.

**TABLE TA 10.4—ON-TIME PERFORMANCE OF SAN DIEGO TRANSIT ROUTE 8
BY WEEKDAY TIME PERIOD (SAMPLE)**

Report 5a: On-Time Percentages

Company: MTDB Contract Routes FY: 2002
Route: 908 Direction: East Bound -- week days

	PERCENT SLOW	PERCENT HOT
AM	1.515	3.030
MID	22.917	5.556
PM	20.833	22.222
OTHER	6.061	46.970
TOTAL	15.230	16.379

Buses are considered slow when more than 5 minutes late
or hot when departing early.

Totals actual run time hours: 35.87 (58 trips counted)
Passengers/Revenue Hour: 41.4

**TABLE TA 10.5—ON-TIME PERFORMANCE OF SAN DIEGO TRANSIT ROUTE 8
WESTBOUND TRIPS (SAMPLE REPORT)**

Report 5 - ON TIME SUMMARY: Difference Schedule Time and Arrival Time
 Company: MTDB Contract Routes PY: 2002
 Route: 908 Direction: West Bound - Week Days

	33RD ST & UNIVERS ITY AV	UNIVERS ITY AV & 30TH ST	UNIVERS ITY AV & PARK BL	UNIVERS ITY AV & 6TH AV	WASHING TON & PACIFIC HWY	OLD TOWN TRANSIT CENTER
5:25	-1	-1	0	-1	-1	0
5:48	-1	0	0	-1	0	0
6:03	-1	-1	-1	-1	-1	0
6:18	-3	-1	0	0	-1	0
6:33	-1	-1	0	-1	0	-1
6:48	0	0	0	1	0	0
7:03	0	0	-1	0	-3	-3
7:18	-2	-2	1	0	-2	-2
7:32	-2	-2	-2	-2	-5	-2
7:47	0	0	1	1	-6	-2
8:02	0	-1	0	0	-1	0
8:17	-1	0	0	0	-1	0
8:32	-1	-1	0	-1	-3	-1
8:47	-1	-1	0	-1	-2	0
9:02	-1	-1	-1	-1	-3	0
9:17	-2	-2	-1	-1	-2	-1
9:32	-1	-1	0	0	-1	0
9:47	0	0	0	0	-1	0
10:02	0	0	0	-2	-4	0
10:17	-1	-1	0	-1	-2	0
10:32	-2	-3	-4	-5	-6	-2
10:47	0	1	2	2	2	0
11:02	-1	-1	0	-1	-2	0
11:17	-1	0	0	0	-3	0
11:32	-1	0	-1	-3	-4	-3
11:47	-4	-4	-4	-5	-11	-8
12:02	-3	-3	-4	-8	-13	-10
12:17	0	-2	-1	-2	-2	-1
12:32	-1	-2	0	-1	-4	0
12:47	-6	-10	-8	-18	-19	-16
13:02	-3	-2	-1	-4	-5	-2
13:17	-8	-8	-8	-11	-18	-18
13:32	-2	-1	-1	-2	-4	0
13:47	0	-3	-3	-6	-11	-6
14:02	-1	0	-2	-4	-6	-3
14:17	-6	-6	-7	-11	-16	-13
14:32	-4	-2	-1	-2	-4	0
14:47	1	2	3	1	-6	0
15:02	-11	-10	-10	-10	-11	-6
15:17	-2	0	0	0	-2	0
15:32	-2	0	0	-9	-10	-7
15:47	-11	-8	-4	-11	-13	-7
16:02	2	3	3	2	0	0
16:17	0	2	2	0	-1	0
16:32	-2	0	1	-1	-3	0
16:47	0	0	0	0	-2	-1
17:02	-3	-2	0	-4	-4	0
17:17	-2	-1	1	-2	-1	0
17:32	0	2	3	1	3	0
18:05	0	2	3	1	1	0
18:35	-1	-1	0	0	0	0
19:05	1	3	3	1	2	0
19:35	1	3	2	1	0	0
20:05	-2	-1	0	0	0	0
20:35	1	3	3	2	3	0
21:05	0	2	3	1	2	0
21:35	-3	0	1	1	1	0
22:05	1	3	3	3	3	0
AVG	-1.6	-1.0	-0.5	-2.0	-3.5	-2.0