MEETING NOTICE
AND AGENDA

TRANSNET INDEPENDENT TAXPAYER
OVERSIGHT COMMITTEE (ITOC)
The ITOC may take action on any item appearing on this agenda.

Wednesday, November 9, 2005
9:30 a.m. to 3:30 p.m.

SANDAG, Conference Room 8A
401 B Street, Suite 800
San Diego, CA  92101-4231

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Welcome to SANDAG. Members of the public may speak to the TransNet Independent Taxpayer Oversight Committee (ITOC) members on any item at the time the ITOC is considering the item. Also, members of the public are invited to address the ITOC on any issue under the agenda item entitled Public Comments/Communications/Member Comments. Speakers are limited to three minutes. The ITOC may take action on any item appearing on the agenda.

This agenda and related staff reports can be accessed at www.sandag.org under Meetings on SANDAG’s Web site. Public comments regarding the agenda can be forwarded to SANDAG via the e-mail comment form also available on the Web site. E-mail comments should be received no later than noon, two working days prior to the ITOC meeting.

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## ITEM # RECOMMENDATION

1. **MEETING SUMMARIES FOR THE OCTOBER 19, 2005 MEETING AND THE NOVEMBER 2, 2005 SPECIAL MEETING**  
   ACCEPT  
   Meeting summaries for the October 19, 2005 meeting and the November 2, 2005 special meeting will be provided to the ITOC prior to the meeting.

2. **PUBLIC COMMENTS/COMMUNICATIONS/MEMBER COMMENTS**  
   Members of the public will have the opportunity to address the ITOC on any issue within the jurisdiction of the ITOC. Speakers will be limited to three minutes each. Committee members also may provide information and announcements under this agenda item.

3. **DRAFT TransNet PLAN OF FINANCE FOR THE EARLY ACTION PROGRAM**  
   **ACTION**  
   At the last meeting, the ITOC received a presentation on the draft TransNet Plan of Finance. After discussion, the general sense of the committee was to support moving forward assuming the use of bonding to deliver the Early Action Program based on Scenario 3 as outlined in the draft Plan of Finance. However, the ITOC requested that the item be carried over for further discussion at today’s meeting.

4. **INTEREST RATE HEDGING PROPOSAL**  
   **ACTION**  
   The ITOC received a detailed presentation on a proposal that would lock in today’s low interest rate for SANDAG’s long-term debt issue planned for mid-2008 based on the draft Plan of Finance. The ITOC requested that this item be carried over for further discussion and action at today’s meeting.

5. **TRANSPORTATION SYSTEM PERFORMANCE MEASUREMENT**  
   **DISCUSSION**  
   At the October 19, 2005 meeting, the ITOC held an extensive discussion on performance measurement techniques as applied to the freeway system. This item will provide for a discussion of performance measurement as applied to the local street and road network, followed by a discussion of how the ITOC would like to proceed with its work related to performance measurement:
5. CONT’D

A. Overview of Local Street and Road Performance Measurement – Representatives from local jurisdictions will provide an overview of techniques being applied at the city level for monitoring the performance of the region’s local roadways and what improvements may be possible in the future.

B. The ITOC’s Role in Performance Measurement – the ITOC should discuss its future work efforts related to performance measurement. At the last meeting, the Chairman distributed a draft scope of work (copy included in the agenda package) for consulting services for discussion by the ITOC as one possible way to address the committee’s responsibilities in this area.

6. TRANSNET ENVIRONMENTAL MITIGATION PROGRAM INFORMATION

At an earlier meeting, ITOC members requested a presentation on the new Environmental Mitigation Program (EMP) that was included in the TransNet Extension. SANDAG staff will provide an overview of the EMP program and update the ITOC on the status of key activities underway to implement the provisions of the EMP.

7. TRANSNET LOCAL STREET AND ROAD PROGRAM REQUIREMENTS DISCUSSION

There are several new requirements related to local street and road projects as part of the new measure. SANDAG staff will provide an overview of these requirements and the ITOC’s role in this area. SANDAG intends to work with the ITOC and the Cities/County Transportation Advisory Committee (CTAC) on the development of implementation guidelines and polices related to these new requirements. A copy of a CTAC report summarizing these requirements has been included in the agenda package.

8. FUTURE MEETING SCHEDULE AND AGENDA TOPICS ACTION

The dates that follow have been suggested as potential meeting dates from 9:30 a.m. to 3:30 p.m. The next meeting date and time is to be confirmed at the end of each meeting. The ITOC may wish to suggest specific agenda topics for the next meeting. Potential topics for the next meeting include an update on the program management/quarterly reporting process, an overview of the $2,000 per dwelling unit private funding contribution required as part of the TransNet Extension Ordinance, and a presentation on the ASCE’s second annual report card on infrastructure in San Diego County.
ITEM #

8. CONT’D

- December 7, 2005
- January 18, 2006
- February 15, 2006
- March 15, 2006
- April 19, 2006
- May 17, 2006
- June 21, 2006
- July 19, 2006
- August 16, 2006
- September 20, 2006
- October 18, 2006
- November 15, 2006
- December 20, 2006

9. ADJOURNMENT

+ next to an agenda item indicates an attachment

October 19, 2005 Meeting Summary:

Attendance-

Committee Members:  ▪ Maryam Babaki  ▪ Jim Callaghan
                   ▪ Michael Boyle  ▪ John Meyer
                   ▪ Jim Ryan

Ex-Officio Members:  ▪ Gary Gallegos  ▪ Tracy Sandoval

Others:  ▪ Gail Brydges, City of Coronado  ▪ Jack Boda, SANDAG
         ▪ Harvey Goodfriend, San Diego Taxpayers Association  ▪ Richard Chavez, SANDAG
         ▪ Craig Scott, SANDAG

The following summarizes the major actions and key discussion points under each agenda item from the October 19, 2005, meeting.

Item 1 - Meeting Summaries for the September 14, 2005, Meeting and the September 22, 2005, Special Meeting

The meeting summaries for the September 14, 2005, meeting and the September 22, 2005, special meeting were approved as written.

Item 2 - Public Comments/Communications/Member Comments

There were no public comments.
Item 3 – Workshop on Transportation System Performance Measurement and Overview of the Freeway Performance Measurement System (PeMS)

This item was structured as a special workshop for the ITOC on performance measurement conducted by Dr. Pravin Varaiya from U.C. Berkeley, Dr. Karl Petty from Berkeley Transportation Systems, Inc., and Tarek Hatata from System Metrics Group, Inc. The session began with an overview of system management and freeway performance measurement led by Tarek Hatata (see attached PowerPoint slides for greater detail on his presentation). Tarek described the role of system management as part of the overall transportation planning process and the evolution of Caltrans’ efforts in performance measurement leading up to the development of PeMS. He reviewed some of the efforts underway at SANDAG to expand PeMS in the San Diego region beyond the freeway system to include data for transit and local streets and roads.

Karl Petty then went into a more detailed description of PeMS in terms of how it was developed, the kind of data that is used, the types of reports and graphs that are available through PeMS, who uses the information, and what they do with it. He went through several examples of how to drill down through the available data to answer specific questions related to analyzing bottlenecks, level of service plots, average daily traffic (ADT) variations, route planning, and causes of congestion. He presented several dashboard-style reports that are available through PeMS. Dr. Petty led the ITOC through a “hands on” demonstration of several of the key features of PeMS. A copy of Dr. Petty’s PowerPoint slides is attached for further detail on his presentation.

Item 4 – Performance Measurement and the ITOC’s Roles and Responsibilities

Following the PeMS demonstration, Dr. Varaiya reviewed some key findings based on PeMS analysis work conducted on the statewide highway system. He highlighted traffic control measures such as ramp metering and improved traveler information systems as the most cost-effective ways of reducing congestion. He highlighted findings for San Diego’s freeway system as well. The ten worst bottlenecks were estimated to account for 61 percent of all bottleneck-related delay. It was pointed out that nine of the ten areas were slated for improvement as part of the TransNet Extension. The proposed improvements on I-15 were mentioned as good candidates for evaluation through PeMS. The current data being collected for I-15 could be compared against the forecasted improvements expected from the implementation of the HOV/Managed Lane project. Then, after completion, the actual results could be compared against the forecasts to see if the project accomplished what it was expected to accomplish. A copy of Dr. Varaiya’s PowerPoint slides is attached for greater detail on his presentation.

The ITOC discussed ways in which it could take the information provided on performance measures and use it in carrying out the ITOC’s responsibilities. The possibility was discussed of using experts such as those present today to help the ITOC in conducting its work related to performance measurement. After discussion, it was decided to form an Ad Hoc Subcommittee consisting of Mike Boyle, Maryam Babaki, and Jim Ryan to work on a scope of work for the ITOC’s efforts in the performance measurement area. This work effort was to begin after the ITOC heard the results of the PB&J recommendations related to program management.
Item 5 – Bylaws and Implementation Procedures

Maryam Babaki provided an overview of the Bylaw Subcommittee’s efforts in developing the draft bylaws being presented for the ITOC’s consideration. The Subcommittee reviewed the details of the TransNet Ordinance and bylaws developed for other oversight committees as background for preparation of the draft ITOC bylaws. She reviewed several issues that had been highlighted based on comments received to date for further discussion by the ITOC. A number of additional comments were raised by ITOC members. The bylaws were deferred to the next meeting for further discussion and action by the ITOC.

Item 6 – Future Meeting Schedule

The next ITOC meeting was scheduled for November 2, 2005, from 11:00 a.m. to 3:00 p.m. at SANDAG. Future meeting dates have been reserved for November 9, and December 7, 2005. The November 2, 2005, meeting was set as a special meeting to discuss the draft TransNet Plan of Finance, interest rate hedging strategies, and TransNet annual audit procedures. Action on the draft bylaws also was scheduled for that special meeting.

Item 7 – Adjournment

The meeting was adjourned at 3:45 p.m.

Attachments:  System Management and Freeway Performance Measurement PowerPoint slides
            PeMs PowerPoint slides
            San Diego Freeway Congestion PowerPoint slides
System Management and Freeway Performance Measurement

Overview

October 19, 2005
Agenda

➢ What is System Management
➢ Freeway Performance Measurement
➢ Designing for Multi-modal Performance Measurement
What is System Management?
The corridor system management plan is an evolving effort that is consistent with a maturing transportation system.
Its foundation is detailed performance measurement and evaluation related to statewide and regional goals and other priorities

- **Mobility Mission** – Delay, speed, travel time
- **Safety Goal** – Accident Rates
- **Reliability Goal** – Variation of travel time
- **Productivity Goal** – Percent utilization during peak demand conditions
- **Flexibility** – Modal shares of demand (mode split and trend thereof)
- **Preservation Needs**
- **Identification and analysis of bottlenecks**
Maintenance now can save a lot later

- What are current pavement conditions?
- What and when are preservation projects needed?
- What are the repercussions of delaying these projects?
Deferring pavement preservation investment can end up costing the State and region a lot more in the future.

Where is each corridor (or segments thereof) on this graph? How much more will it cost if we wait?

**Chart 5. Pavement Condition vs. Cost of Repair**

- Maintaining pavements in good to excellent condition requires frequent, low cost treatments.

System Metrics Group, Inc.
Demand management relates to policies and strategies that help reduce demand during peak conditions.

- Land use strategies (long term)
- Parking costs, tolls
- HOT Lanes
- Carpooling incentives
- Other
Incidents (including collisions) cause a high percentage of overall congestion – reducing incidents and incident recovery times is critical.

- How many collisions and incidents does the freeway system (or corridor) experience?
- What type of collisions and incidents can be averted and how?
- What can we do to reduce recovery from collisions and incidents?
We also need to evaluate traffic control effectiveness and potential

- What improvements to ramp metering and arterial signal management can directly address congestion?
- What are the resulting freeway improvements?
- What are the impacts on the arterials?
- What are the “Net” impacts?
Operational improvements are targeted investments in (smaller) physical projects that facilitate traffic flow and reduce congestion.

- What operational improvements are targeted at the critical regional freeway bottlenecks?
- Which of these improvements are programmed and planned for?
Expansion projects are generally the most expensive and take a long time to implement

- Major expansion projects on freeways and other modes can reduce congestion on specific corridors.
- The benefit cost ratios (or return on investment) of major expansion projects are generally lower than operational strategies.
Freeway Performance Measurement
Transportation agencies have traditionally focused on delay caused by congestion for freeway performance (e.g., Caltrans’ Highway Congestion Monitoring Report)
... and total congested directional miles

[Diagram showing year-over-year mileage for various districts, with Districts 1 to 12 labeled by color and shape.]

* Year 1997 is marked differently from 1996 and 1998.
The HICOMP also identified locations and associated durations of congestion
The HICOMP also identified locations and associated durations of congestion.
For system management purposes, we need additional performance measurement

- How productive is our system when we need it most (i.e., during peak demand conditions)?
- How variable are travel times on selected corridors, or between selected origin-destination pairs?
- Where are the major bottlenecks on our corridors?
- How much of the congestion is due to accidents and incidents?
In general, freeway productivity can be significantly lower during peak demand conditions than its design capacity.

Source: Performance Measurement System (PeMS) – October 2001
Vphpl: volume per lane per hour
Aggregating productivity losses for a corridor or for a region provides for a sense of how much can be re-captured “theoretically” without expanding the system.
Travel times and variability of travel time (or reliability) can be computed for a corridor or an Origin Destination pair.
Bottlenecks can be identified using speed contour maps.
Note that bottlenecks change in severity from day to day
Bottlenecks change in severity from day to day

Northbound AM

Aggregated Speed (mph) for I-880N
03/12/2003 06:00-10:59
Traffic Flows from Bottom to Top
Bottlenecks change in severity from day to day

Northbound AM

Aggregated Speed (mph) for I-880N
04/30/2003 06:00-10:59
Traffic Flows from Bottom to Top
Once bottlenecks are identified, transportation professionals can identify the reasons for the bottleneck via aerial photos and field observation.

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SB AM</th>
<th>SB PM</th>
<th>NB AM</th>
<th>NB PM</th>
<th>POTENTIAL CAUSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oak/Broadway</td>
<td>hidden</td>
<td></td>
<td></td>
<td></td>
<td>Roadway geometrics; on-ramp merging</td>
</tr>
<tr>
<td>23rd Avenue</td>
<td></td>
<td>YES</td>
<td></td>
<td></td>
<td>Roadway geometrics; poor pavement; low overpass</td>
</tr>
<tr>
<td>98th Avenue</td>
<td></td>
<td>hidden</td>
<td></td>
<td></td>
<td>On-ramps merging</td>
</tr>
<tr>
<td>Davis/Marina</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td>Lane drop from 5 to 4 lanes; on-ramp merging</td>
</tr>
<tr>
<td>SR-238</td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
<td>Off-ramp backup; lane drop 5 to 4 lanes @Washington off; Hesperian off backup</td>
</tr>
<tr>
<td>SR-92</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td>Off-ramp backup to mainline; lane drop from 5 to 4 lanes</td>
</tr>
<tr>
<td>Tennyson</td>
<td></td>
<td>YES</td>
<td>YES</td>
<td></td>
<td>Roadway geometrics; on-ramp merging</td>
</tr>
<tr>
<td>Whipple</td>
<td>hidden</td>
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<td></td>
<td></td>
<td>Vertical grade</td>
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<tr>
<td>Fremont</td>
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<td>hidden</td>
<td>hidden</td>
<td>hidden</td>
<td>Lane drop from 5 to 4 lanes</td>
</tr>
<tr>
<td>SR-84</td>
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<td>YES</td>
<td></td>
<td></td>
<td>On-ramp merging</td>
</tr>
<tr>
<td>South of Mowry</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td>Roadway geometrics</td>
</tr>
<tr>
<td>Auto Mall Parkway</td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>On-ramp merging (Construction)</td>
</tr>
<tr>
<td>Mission Blvd (Rte 262)</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td>Consecutive on-ramp merging (Construction)</td>
</tr>
</tbody>
</table>
Northbound Bottleneck at 23rd Street
Northbound Bottleneck at Tennyson
A preliminary UCB analysis also allows for estimating delay caused by accidents/collisions …
Designing Multi Modal Performance Measurement
SANDAG is developing new management systems that will collect arterial and transit data

- SMG and BTS are developing a design document to enable an interface between these systems and PeMS

- Although such interface is at least a couple of years away, once established, PeMS would be able to report on multi-modal measures that would:
  - Report transit ridership trends
  - Report arterial delays, speeds, volumes
  - Compare modal travel times (Bus Rapid Transit vs. Auto)

- The design document is currently in draft format and will be reviewed by SANDAG and revised as appropriate.
PeMS
The Freeway Performance Measurement System

Improving Management of Freeways

Dr. Karl Petty
Berkeley Transportation Systems, Inc.
Agenda

- PeMS Overview
  - What is PeMS?
  - What data does it collect?
  - Who uses PeMS?
  - How is it used by Caltrans?
  - What can you see?
  - What’s coming?

- Hands On Demo
  - How do we navigate in PeMS?
  - What can we see?

- Note:
  - Normally this is a two-day class
  - I’ll skip a number of details
  - Please ask questions if something is fuzzy
Context: Systems Management

- Transportation network is a system
- At one level, vehicle hours are the input with vehicle miles as output
- There are many levels/types of inputs and outputs
- Proper collection and analysis of the outputs is necessary for efficient management and control

“If you cannot tell the VMT on your system yesterday, you cannot hope to manage your system today;”

attributed to Dolf May, 1961

Berkeley Transportation Systems, Inc.
Fact:
- Proper transportation management decisions require a huge amount of data

State of Affairs:
- Collected data is usually not stored
- Stored data is not retrievable or too hard to access
- Difficult to create correct views of data

Results:
- Very few engineers utilize data in control actions
- Long-term studies and management action rely on estimated values (if any)
- Because of this neglect, generating the correct view/plot of data is difficult
- Results in “Analytical Darkness”
- This is fostering exactly the wrong culture
PeMS Provides Feedback

Traveling Public

Freeway System

PeMS (rt-ADMS)

Input (VHT) → Raw Data

Sensor Maintenance Strategies

Capacity Preservation Strategies

Long-Term Capacity Improvements

Maintenance Organization

Freeway Operations Organization

Planning Organization

Detailed Sensor Health

Quantity and Quality of Travel

Long-Term Performance Measures

Long-Term System and Organizational Performance

DOT

Resource and Funding Decisions

Policy Making Organization

Performance Reports

Travel Time, Reliability And Predictions

Berkeley Transportation Systems, Inc.

PeMS Provides Feedback
PeMS is an Archived Data Management System (ADMS)
Also has a role in supporting Traffic Management
What is PeMS?

- PeMS is a real-time Archive Data Management System (rt-ADMS)
- PeMS collects detailed freeway information
  - Fixed sensor: lane-by-lane, 20/30-second values
  - Incident: detailed reports
- Processes these values in real-time, performing:
  - Detector diagnostics
  - Imputation
  - Speed calculations
  - Aggregations
  - Performance measurement calculations
- Has a huge number of reports and tools
- Accessed via a browser
- In California:
  - Collects data from 6 districts (> 23,000 sensors)
  - Holds 4.5TB of data
  - 55 Billion samples/year

Berkeley Transportation Systems, Inc.
PeMS Tools In a Nutshell

Real-time Archive Data Management System

- Focused on helping agencies plan for operations
- Allows for direct empirical measurements of freeway performance
- Moves users out of “Analytical Darkness”
- Links together
  - Traffic data archival systems
  - Real-time operational strategies
  - Freeway performance measurement
Fundamental Parts of PeMS

1. Raw Data Collection
2. Calculations in PeMS
   - Algorithms: Diagnostics, imputation and speed estimation
   - Calculations: Aggregation and performance measures
3. Reports
Organize detectors according to physical layout on the freeway.

For historical reasons we refer to a lane detector as a “loop”, but it could be radar, double loop, etc.

Sensors report flow, occupancy, and, depending on type, speed every 30 seconds.
Calculations in PeMS

- Performs detector diagnostics
  - Every lane-detector every day; stores results for analysis
- Imputes for data that is missing or bad
  - Bad is determined by detector diagnostics
  - Missing is due to communication failures
- Calculates performance measures
  - Rolls data up over space and time; stores results for queries
  - Performs calculations, including imputation, in real-time
- Presents many types of displays for different users
  - Maintenance, operations, planners, decision makers, public
- All calculations are done in real-time
The calculations section (grinding) is the link between the raw data and the reports.

There are many types of reports that leverage the work of the grinding.

Berkeley Transportation Systems, Inc.
There are many analytical tools and reports in PeMS.

- Today we’ll cover only a few of the tools
- Typical training course takes 2-3 days
- Sample drawn from four groups of users

1. Decision makers
   - High-level reports showing short and long term trends

2. Freeway Operations
   - Investigating quality and quantity of travel
   - Bottleneck identification and analysis
   - Safety analysis with incidents

3. Planners
   - High-level quality (LOS)
   - HOV lane analysis
   - Average Daily Traffic (ADT) analysis

4. Maintenance Personnel
   - Detector diagnostics
Decision Makers – Short Term

- This ‘dashboard’ shows performance statistics for today
- Shows VMT, VHT and detector health
- Shows measured values up until “now”, prediction for rest of day
- Each plot allows users to drill in further for analysis
Decision Makers – Today vs Avg

- Example of drilling down
- Can compare today with average
- Green line is today until 9am
- Red line is prediction for rest of today
- Blue lines show min, mean, max of weekdays over past month
- We are higher (more demand) today than normal

Berkeley Transportation Systems, Inc.
Decision Makers – Long Term

- Instantly get district-wide views of performance
- This view shows last 30 days
- Shows performance measures on top, detector health on bottom
- Can see daily trends
- Information always at fingertips

Berkeley Transportation Systems, Inc.
Freeway Ops – Data Plots

- Individual loop plots
- Plot of a particular quantity (flow, occupancy, speed, etc) over time
- Can roll up data over time to hour, day, week, month
- Can roll up data over space to freeway, city, county, district and state
- This plot is of flow versus time over two days
- Shows two lanes and the aggregate

Berkeley Transportation Systems, Inc.
Freeway Ops – Variation

- Plot quantities over time of day and day of week to see temporal trends
- This is a plot of flow at a particular loop over the time of day
- In this plot, we selected only weekdays and non-holidays
- Plotting avg, min, max (can also plot median, 25th and 75th percentiles)

Berkeley Transportation Systems, Inc.
Freeway Ops – Perf. Measures

- Example of spatial and temporal rollup
- Plot of delay per month for a section of freeway in D11 (San Diego)
- Covers almost six years
- Shows a clear trend that delay is increasing on this freeway and the performance is decreasing
- Provides clear, easy-to-obtain measurements of performance measures

Berkeley Transportation Systems, Inc.
The PeMS Bottleneck Identification Algorithm:

- Look for spatial, persistent drops in speed
- For each detector, compare speed to upstream detector
  - If difference is above a threshold mark it as a potential bottleneck
  - Walk upstream until speed difference
  - Record spatial extent
  - Compute performance measures (delay)
- Store for each detector for each shift (AM, Noon, PM)
- Roll up data over time to produce displays
For a given region, show the sorted list of bottlenecks.

This shows in D11 (San Diego) all of the AM bottlenecks during the first two months of 2003.

Shows number of days bottleneck is active, spatial and temporal extent, and delay generated.

Links allow users to drill down to investigate characteristics and causes of bottlenecks.

Berkeley Transportation Systems, Inc.
Freeway Ops – Bottlenecks

- Jumps to delay versus time of day for this location
- Can now see when the bottleneck starts and end
- Allows users to investigate the variability of the bottleneck on users
- Is it a one-time event?
- In this example we can see that the bottleneck is very predictable – every day we have similar delay patterns.
Freeway Ops – Bottlenecks

- Jumps to spatial contour plots
- This is showing speed versus space and time
- Allows users to investigate the spatial and temporal extent of the bottleneck on a single day
- We mark on the plot where we think the bottleneck was activated for this day

Berkeley Transportation Systems, Inc.
Freeway Ops – Bottlenecks

- Can jump to a map view of the location of the bottleneck
- We color and size the dots according to the delay caused and the number of days activated
- For Caltrans we tie map to other types of media
- They have a video record of every freeway in the state (PhotoLog)
- Users can see the bottleneck through these movies
- PeMS folds in all of the Caltrans and CHP incidents
- For this plot the geographic segment is all of District 7 (LA)
- Shows breakdown of incidents over freeways (top 15 only)
- Can specify incident type and location
Freeway Ops – Incidents

- Shows average frequency of incidents over a space-time grid over many days.
- This plot is a section of 405N from PM 0 to PM 50 in D7.
- Helps identify when and where incidents occur on a freeway.
- Relates to questions about safety.

Berkeley Transportation Systems, Inc.
Berkeley Transportation Systems, Inc.

Freeway Ops – Incidents

- Can show standard statistics of incidents versus freeway performance measures
- This shows # accidents/VMT for all of LA for each day
- Relatively stable value of 3.4 accidents/MVMT
- Can narrow down to a particular freeway
- Can show this over long periods of time
- Helps investigate unsafe freeway sections, or changes in the safety over time
Planners – Level of Service

- Ability to perform many types of common transportation planning analysis functions
- Shows breakdown of Level of Service (LOS) over entire District during weekdays
- LOS ranges from A-F and represents driving conditions
- “A” is completely clear; “F” is completely packed
- We can see that the worst conditions are during the afternoon rush hour
- Can see the percentage of drivers experiencing each level of service

Berkeley Transportation Systems, Inc.
Can monitor lane utilization across flow regimes.

This plot shows for a single detector station the ratio of vehicles in each lane as a function of flow.

We can clearly see that lane 2 holds approximately 50% of the traffic all the time.

Vehicles shift from lane 3 to lane 1 during heavy demand.

Berkeley Transportation Systems, Inc.
More interesting to look at effect of HOV

Both plots are for a location that has time-activated HOV lanes

Top plot covers mid-day from 10am-3pm (no-HOV)
- Lanes are evenly balanced over all flow regimes
- Lane 1 has approximately 25% of the flow

Bottom plot covers AM peak from 7am-9am (HOV on)
- Lane 1 has significantly less flow than the other lanes
- Approximately 14% of flow

Note slightly different x-axis scales

A starting point into investigating HOV effectiveness

Berkeley Transportation Systems, Inc.
Planners – ADT Variation

- Shows variation in ADT over day of week
- Shows standard box and whisker plot with outliers:
  - 25th, 50th (median), and 75th percentile
  - 1.5*IQR
  - Outliers
- See the same trends everywhere:
  - M, T, W, T are the same
  - F is high
  - Sa, Su different
- Can investigate any location, any time range

Berkeley Transportation Systems, Inc.
This plot shows the statistics for the monthly ADT.

See similar trends in many locations:
- Demand is high in the summer
- Drops in fall

Does this mean that the roads are “more congested” in August?
Can view long time ranges
This covers 1/2000 through 4/2005
Excellent input for growth models
Can see slight growth over time
Can see all of the holidays as outliers
Can also do linear regression to get simple projections (when looking at yearly values)
Growing at 0.89% per year

Berkeley Transportation Systems, Inc.
PeMS performs diagnostics on every lane detector in the system every night.

Store these results and use as basis for detector health programs.

The display here is for the entire D7 (LA) region.

Shows summary status of every freeway on one day.

Gives % good and bad.

Allows user to drill in.
Maintenance – Diagnostics

- Section of freeway
- Shows diagnostic status of all loops on one day
- Quick view of entire stretch of freeway
- Can pick different days to see changes
- Allows user to drill in (718151)

Berkeley Transportation Systems, Inc.
PeMS Roadmap
Dashboards:
- State-wide
- District – realtime
- District – historical

This is the statewide
Shows summaries for entire state and details for each district
- This is the district real-time dashboard
- Top row are plots of performance measures predicted over rest of day
- Middle row shows bottlenecks and chp incidents
- Bottom row shows detector health status
Routes

- Creation wizard
- Configuration page
- Travel time graphing
- Travel time variation
Congestion Pie

- Identify causes of congestion
  - Accidents
  - Excess demand
  - Inefficient ramp metering
- Give breakdown per District and per freeway-direction
- Done per quarter
Hands On PeMS Demo

http://pems.eecs.berkeley.edu/
Segments and Plots

- Plots available are a function of geographical segment type
  - Geographical segments are simply nested areas
- Geographical/Spatial segments:
  - State, District, County, City, Freeway
  - Can plot values which make sense averaged over space
    - VMT, VHT, Delay, Q (VMT/VHT), TTI (1/Q)
- Point segments:
  - Individual detector location
  - Can plot values at a single point
    - All spatial ones as well as Speed, Flow, Occupancy
    - All diagnostics: number of samples, number of bad samples, number of imputed samples
Aggregation Levels

- PeMS aggregates over space and time
- Lowest level of data is raw (lane-by-lane 30-second data)
- Base levels (filled in):
  - Lane-by-lane, 5-minute values
  - Aggregate (over lanes), 5-minute values
  - Hourly station aggregate
  - Daily station aggregate
  - County-Hour aggregate
Segments and Plot Types

Different Segments

Major types of displays for this particular segment

Minor display types
Segments and Plot Types

Bread crumbs: shows segment and major display type. They are clickable!

As you drill in, the segments indent. Reflect what's available below this segment.
Plot Types are a Function of Segment

Segment is individual detector (313111)

Indented all the way in to detector level

Added ‘Capacity Analysis’ and ‘Download 30-sec’ screens, but lost ‘HICOMP’ screen

Note: Incidents don’t show up at this level
Different views of data

- Can always see a plot, table, export to text or spreadsheet

- Different ways to see the same data: plot, table, text, spreadsheet

- Values displayed in first few columns

- Data quality is available for some plots. Shows number of points, % observed, % mixed, % imputed
Navigation Paradigms

For Individual Detector Stations

1. Know the detector ID number
   - You can search for the detector with the search box
2. Know where the detector is located
   - You can navigate geographically via lists to the detector
3. Know what kind of detector you’re looking for
   - Like a detector by a city, or major intersection
   - Use the map to pan and zoom around to find a detector that’s appropriate

For Other Geographical Segments

1. Only navigate geographically
Know the Detector Location

- Detector: D11, 5-S, Encinitas, by Birmingham Drive (or CA PM R39.6)

- Start at top of site, and drill in by geography:
  1. Select the district
  2. Select the freeway in the district
  3. Select the list of detectors on the freeway
  4. Look for the detector in the list by either the number, or the freeway crossing, or the postmile

- Always drilling in starting with largest, or highest, segment
Know Detector Location

- Many ways to start to drill down
  - Click on “Districts” on left hand side. Will jump to table of districts in the state.
  - Click on the District on the map. This will jump to another map of just D11.
Know Detector Location

This is the District Splash Page. Click on “Freeways” on left hand side. Will jump to table of freeways in district.

Click on number in the “# Fwys” column (ie: 24). Will jump to table of freeways in district.
Know Detector Location

- This is a common place to start for any plots
- Many ways to start drilling down

Click on number under “Miles w/ML Loops” to jump to “spatial” plots down the freeway

Click on number under “# VDS” column. Will jump to a table of VDS detectors on that freeway
Know Detector Location

- Now you have a list of detectors on the selected freeway
- The green bands are freeway crossings
- Almost all of the information that we know about the detectors is here

Look for VDS in this list. Check for Cal PM, or freeway crossing. Click on VDS number to jump to configuration page for that detector.

<table>
<thead>
<tr>
<th>Detector Location</th>
<th>Ground Location</th>
<th>Type</th>
<th>Lat</th>
<th>Long</th>
<th>Offset</th>
<th>Description</th>
<th>City</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>R39.987</td>
<td>39.845</td>
<td>Off Ramp</td>
<td>1</td>
<td>1003</td>
<td>108123</td>
<td>BIRMINGHAM DR</td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>SB OFF TO BIRMINGHAM DR (R39.987)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R39.606</td>
<td>39.464</td>
<td>Mainline</td>
<td>4</td>
<td>1108</td>
<td>108123</td>
<td>BIRMINGHAM DRIVE</td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>SB ON FRM BIRMINGHAM DR (R39.906)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R38.788</td>
<td>38.646</td>
<td>Off Ramp</td>
<td>1</td>
<td>1003</td>
<td>108122</td>
<td>MANCHESTER AVE</td>
<td></td>
<td>108</td>
</tr>
</tbody>
</table>
Know Kind of Detector (Use map)

- Click on district map on splash page to jump to dynamic map
- Note: dynamic maps have no district (can pan anywhere)
- Use different stats to paint circles
- Tool tips when zoomed in, can click on detector to jump to plot
- Label detectors with different ID schemes
- Can jump directly to other districts
Special Features

- Jumps to top of web site
- Links to Papers and System-wide help area
- Edit user account info and logout
- Help for just this screen, changes for every page. Best place to look if you have questions about a particular plot or table.
Timeseries Plots

- Main plot types are under “Aggregates”
- Timeseries plots are the foundation of PeMS
- From configuration page (or any page), can jump there directly

Click on “Aggregates -> Timeseries” to jump to the default timeseries plot for a detector.
Timeseries Plots

- This is the default timeseries plot for a detector
- Shows daily flow over last 7 days
- You can modify the parameters to produce different types of plots
- This is the starting point for investigating this detector

Modify any parameters and then click “Draw Plot” to see different plots.
Hands On Examples

1. What percentage of detectors are working D11? Is this going up or down?
2. What freeway in D11 has the lowest percentage of working detectors?
3. What’s the median speed on I-5 Southbound by Encinitas on weekdays at 8am in October 2005? Jan 2005?
4. For the last two months, has the total delay in D11 been going up or down?
Let’s plot the delay on the freeway segment “SR 78 – Westbound” over the last four years

- Need to use the “Freeway Segments -> Aggregates” report
- Look at a granularity of a month
- Two types of reports:
  - Timeseries Sum: add up the delay on every day
  - Timeseries Avg: the average delay on every day
Solution

- Use “Timeseries Avg”
- Look at “Delay (V_t = 60)”
- Granularity of a year

Only weekdays

Key shows 25th, 50th and 75th percentiles
San Diego freeway congestion
**Statewide findings**

1. Congestion occurs when traffic density increases beyond $\rho_{cr}$ causing switch from high-volume, high-speed free flow state to low-volume, low-speed congestion state. In 2004, congestion delay was 158 million VHT or 11.7 percent to total VHT.

2. 46% of congestion occurs at 595 recurrent bottlenecks, 74 of which account for 58% of the delay. Ramp metering at 595 bottlenecks can eliminate 25% of total congestion.

3. 28% of congestion is caused by collisions, 10% of which account for 90% of collision-induced delay. Quick detection and clearance of the worst collisions can significantly reduce this congestion.

4. All other causes account cause remaining 26% of congestion delay.
Findings (contd)

5. Congestion increases travel time mean and variance. Travel time prediction based on real-time data significantly reduces this variance.

6. HOV activation increases total congestion, does not measurably reduce number of vehicles. HOV lanes suffer capacity reduction. Although underused, ‘excess’ HOV capacity cannot support toll-paying or hybrid vehicles. Carpooling is insensitive to travel-time savings.

7. Traffic control offers the most cost-effective means to reduce congestion.
Causes of congestion

- Recurrent bottlenecks—mitigated by metering, traveler information
- Collisions—mitigated by quicker response
- Weather
  - Special events—traveler information
  - Lane closure—traveler information
  - etc.

Challenge is to quantify these effects
San Diego bottlenecks

For San Diego Co, 270 miles of 7 freeways, 0500-2200, 64 workdays in April-June 2003, algorithm finds

- 1733 bottleneck activations at 160 locations

- causing 1.2 million VH of delay = 64% of all delay in county

- 10 worst bottlenecks account for 61% of all bottleneck delay
## San Diego’s top bottlenecks

<table>
<thead>
<tr>
<th>ID</th>
<th>Location (postmile)</th>
<th>Frequency</th>
<th>Delay (v-h/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>I-5 NB@Loma Santa Fe Dr. (37.51)</td>
<td>97%</td>
<td>1617</td>
</tr>
<tr>
<td>B</td>
<td>I-5 SB@Loma Santa Fe Dr. (37.26)</td>
<td>94%</td>
<td>1678</td>
</tr>
<tr>
<td>C</td>
<td>I-8 EB@College Ave. (8.34)</td>
<td>80%</td>
<td>447</td>
</tr>
<tr>
<td>D</td>
<td>I-15 NB@Pomerado Rd. (26.05)</td>
<td>92%</td>
<td>2692</td>
</tr>
<tr>
<td>E</td>
<td>I-15 SB@Miramar Rd. (14.4)</td>
<td>78%</td>
<td>542</td>
</tr>
<tr>
<td>F</td>
<td>I-15 SB@Pomerado Rd. (25.91)</td>
<td>97%</td>
<td>2137</td>
</tr>
<tr>
<td>G</td>
<td>I-805 NB@SR-52 (24.60)</td>
<td>78%</td>
<td>696</td>
</tr>
<tr>
<td>H</td>
<td>I-805 SB@47th Street (11.5)</td>
<td>88%</td>
<td>834</td>
</tr>
<tr>
<td>I</td>
<td>I-805 SB@SR-52 (24.33)</td>
<td>94%</td>
<td>464</td>
</tr>
</tbody>
</table>
Verification

- No ground truth

- But, results confirmed by
  - experts in Caltrans and research community (Fred Rooney, James Banks)
  - SANDAG’s prioritization of highway projects (Regional highway project evaluation website, Sept. 2000)
Collision-caused delay on I-15

Collisions create temporary bottlenecks, causing additional delay

Difficulty: To estimate collision-caused delay, must predict delay in absence of collision

Algorithm

- Step 1: Determine space-time region of impact of collision and total delay in region
- Step 2: Estimate delay in absence of collision, using nearest neighbor prediction of flow and speed on non-collision days
- Step 3: Collision-caused delay = delay (step 1) - delay (step 2)
I-15N San Diego, Sept 2-Oct 31, ‘02 collision + traffic data

High congestion

High crash rate
10-90 rule: 10% of collisions account for 90% of collision-caused delay. Can one quickly predict these outliers?
Savings from ramp metering on I-15

- Algorithm identified the following two time and location of bottleneck activations

- Location 5 at postmile 7.581, 6:45 AM - 8:25 AM

- Location 19 at postmile 24.511, 5:40 PM - 6:00 PM

- Metering these locations leads to savings shown in next slide
Congestion pies for I-15N

- Total delay = Collision delay + IMP savings + Ramp delay + other
- Total exposure = Free flow state + Congestion state
Congestion and travel time

- Travelers experience congestion as increase in travel time mean and variation

- Real time travel time prediction has a very low variance, conditioned on current data, because of high temporal correlation
Predicting travel times along two alternative routes

Scatter plot of $T_1(t)$, $T_2(t)$, departing at t every 17 min, 0500-2200, weekdays, 1-31 August, 2002 shows two equally good routes
Value of real-time prediction

- Left: Best $E\{T_i(t)|D(t)\}$, given real-time data up to $t$ vs. best $ET_i(t)$, based on historical data
- Right: Best $E\{T_i(t)|D(t)\}$, given real-time data up to $t$ vs. best $T_i(t)$, based on clairvoyance
Real-time prediction reduces uncertainty

- Prediction is accurate to 2 minutes on 23 minute trip
- More than 50% reduction in uncertainty in peak hours
A possible use

Karl,

I'd like to use information on average speed throughout the day along the SD I-15 corridor to help us recommend and set shift change times for our plant in Rancho Bernardo ... Can you help?

Thanks,--Jon
Other examples

<table>
<thead>
<tr>
<th>O-D trip</th>
<th>Peak hour average travel time (min)</th>
<th>Peak hour prediction error $\sigma$ (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Historical</td>
<td>Prediction</td>
</tr>
<tr>
<td>San Diego 1</td>
<td>13.0</td>
<td>12.9</td>
</tr>
<tr>
<td>San Diego 2</td>
<td>22.7</td>
<td>20.9</td>
</tr>
<tr>
<td>Orange Co. 1</td>
<td>32.4</td>
<td>32.3</td>
</tr>
<tr>
<td>Orange Co. 2</td>
<td>34.0</td>
<td>33.4</td>
</tr>
<tr>
<td>LA Co.</td>
<td>45.4</td>
<td>44.2</td>
</tr>
</tbody>
</table>

San Diego 1: from I-5 and I-805 to downtown (I-5 and I-163)
San Diego 2: from SR-125 and I-8 to downtown
Orange County 1: from I-5 and I-405 to I-5 and SR-91
Orange Co 2: from I-5 and I-405 to I-405 and I-605
LA County: from I-10 and I-210 to downtown
Effectiveness of high-occupancy vehicle (HOV) lanes

- San Francisco Bay Area HOV lanes are activated 5:00-9:00 AM, 3:00-7:00 PM; used as general-purpose lanes at other times

- **Impact of HOV**
  - HOV vehicles enjoy lower travel time than GP vehicles because of lower demand
  - HOV activation imposes *capacity penalty* on HOV lane, and *congestion penalty* on non-HOV lanes
  - HOV persons/hour flow *not measurably larger* than GP persons/hour flow
  - HOV activation *increases* total travel time
  - Carpooling *insensitive* to travel-time savings
November 2, 2005 Special Meeting Summary:

Attendance -

Committee Members:  
- Maryam Babaki  
- Hamid Bahadori  
- Michael Boyle  
- Jim Callaghan  
- John Meyer

Ex-Officio Members:  
- Gary Gallegos

Others:  
- Keith Curry, PFM  
- Christine Fay, PFM  
- Richard Chavez, SANDAG  
- Grace Barvin, Merrill Lynch  
- Marney Cox, SANDAG  
- Ian Parker, Merrill Lynch  
- Sookyung Kim, SANDAG  
- Tim Romer, Goldman Sachs  
- Jim Linthicum, SANDAG  
- Allan Kosup, Caltrans District 11  
- Renee Wasmund, SANDAG  
- Christine Valle, Caltrans District 11  
- Craig Scott, SANDAG

Item 1 - Public Comments/Communications/Member Comments

There were no public comments.

Item 2 - ITOC Bylaws

The Bylaws had been deferred from the previous meeting. The discussion focused on the changes that had been made to the draft Bylaws based on the comments raised at the previous meeting.

**ACTION:** The ITOC approved the bylaws unanimously with one additional change, which was to add the following language to Section C(5) regarding the selection of Chair and Vice-Chair: “The selection shall be made at the first regular meeting following the commencement of the SANDAG fiscal year.”

Item 3 - Draft TransNet Plan of Finance for the Early Action Program (EAP)

Craig Scott provided a PowerPoint presentation (copies provided in the agenda package for the November 9th meeting) regarding the major findings and recommendations of the draft TransNet Plan of Finance. He reviewed the key assumptions that were made regarding the costs and revenues provided as input to the cash flow model used in developing the plan. He also summarized the financial scenarios developed for the plan and the results of the financial analysis. The staff recommendation was to proceed with the development of a final Plan of Finance based on one of the bonding scenarios (Scenario 3) with set asides of TransNet and state and federal matching funds for other non-EAP projects.

The discussion by the ITOC members focused on some of the key areas of risk related to the assumptions made for the Plan of Finance, including the risk that project costs could escalate at a higher rate than assumed and that state and federal funds could be impacted by actions such as future raids on Proposition 42 funds or the redirection of funding due to Hurricane Katrina relief efforts. There were questions related to other competing needs for the revenues assumed for the
EAP projects. Staff emphasized the importance of monitoring all of the key assumptions in the plan over time and, as issues arise in the future, the financial strategy may have to brought back to the ITOC, the Transportation Committee, and the Board of Directors for review and potential amendment.

It was suggested that an ITOC member attend the November 4, 2005, Transportation Committee meeting and indicate that the general sense of the ITOC was to support the use of bonding to accelerate project implementation and to support Scenario 3 as the most balanced, flexible approach to deliver the EAP program while maintaining funding for other high priority non-EAP uses. This item was to be discussed further at the next ITOC meeting.

**Item 4 - Interest Rate Hedging Proposal**

Keith Curry from Public Financial Management (PFM), SANDAG’s Financial Advisor, provided a PowerPoint presentation (copies distributed to ITOC members) regarding a proposal to lock in today’s historically low interest rates for SANDAG’s planned long-term debt issuance in 2008. He outlined the proposed structure for $600 million in interest rate swaps, which, based on current rates, could achieve a total “all-in” cost of financing of 3.86 percent. The proposed structure would result in annual debt service savings of over $3.1 million per year, or nearly $95 million over 30 years. Mr. Curry reviewed the risks associated with the proposed strategy and strongly recommended moving forward with the proposal.

The ITOC raised several questions regarding the mechanics of the interest rate swaps and how the swaps would be affected by changing market conditions. The ITOC carried this item over to the next meeting for further discussion and potential action.

**Item 5 - TransNet Annual Audit and Related Requirements**

Renee Wasmund, Director of Finance, provided an overview of the annual audit requirements related to the TransNet program, how SANDAG is handling the audit process for the current TransNet program, and how the requirements will be changing as the audit process is turned over to the ITOC for Fiscal Year (FY) 2008-09 and beyond. She described the new policy regarding strengthening the requirements related to completing the audit process in a timely manner each year. The policy was recently approved by the Transportation Committee for consideration by the Board of Directors at the November meeting.

The ITOC’s discussion focused on the cost of the annual audit process and the amount of time required in reviewing the audits each year. Although the ITOC’s role in the audit process will not become effective until FY 2008-09, the staff offered to keep the ITOC informed regarding the audit process, including key activities such as the establishment of the new Maintenance of Effort (MOE) requirement based on the provisions of the new measure.

**Item 6 - Future Meeting Dates and Agenda Topics**

Several items were discussed as future agenda topics. John Meyer expressed interest in having ITOC meetings held in other parts of the county on a periodic basis. Members thought the idea had merit and should be investigated further.
Regarding potential future agenda items, the ITOC’s role in specific project issues, such as the proposed elimination of the SR 78/Rancho Del Oro interchange and the Nobel Drive Coaster Station, was discussed. Members questioned the ITOC’s involvement in projects that are not part of the TransNet program. It was decided that an item to discuss how and when the ITOC should get involved in these types of specific project issues would be considered for the December agenda.

Chairman Boyle distributed a draft scope of work for potential consultant services related to performance measurement. An Ad Hoc Subcommittee consisting of Mike Boyle, Maryam Babaki, and Jim Callaghan was appointed to meet prior to the next meeting to discuss the scope of work in more detail and refine the concept for further discussion at the next meeting.

The next meeting was set for November 9, 2005, from 9:30 a.m. to 3:30 p.m. at SANDAG. Agenda items were to include the draft Plan of Finance, interest rate hedging strategies, performance measurement on the local street and road system, and ITOC’s role in performance measurement.

Item 7 - Adjournment

The meeting was adjourned at approximately 3:20 p.m.
San Diego Association of Governments - TransNet Program

INDEPENDENT TAXPAYER OVERSIGHT COMMITTEE

November 9, 2005

AGENDA ITEM NO.: 5

Action Requested: DISCUSSION

TRANSPORTATION SYSTEM PERFORMANCE MEASUREMENT File Number 1110200

Attachments related to this item include:

- A scope of work for consultant services distributed by Chairman Boyle at the November 9, 2005 ITOC Meeting.
- Summary of the major ITOC responsibilities from the TransNet Extension Ordinance. Paragraphs 6 and 7 relate to performance measurement. Paragraph 6 focuses on performance measures as part of the development of the long-range Regional Transportation Plan (RTP), while Paragraph 7 focuses on performance measurement of the existing system.
CONSULTING SCOPE OF WORK FOR
TRANSNET ITOC PERFORMANCE MEASUREMENT
(Proposed)

The ITOC is charged, at least in part, with performance measure development. In order to accomplish this complex and cutting edge task the ITOC will require assistance in carrying out its tasks from consultants having the requisite knowledge, training and experience. Principally taken from Paragraphs 6 & 7 of the TransNet ordinance covering the ITOC the consulting scope of work will include:

- The charge from voters that the governing principle is to increase regional mobility (decrease congestion);
- Extending real time data collection and analysis capabilities from the freeway system to all transportation modes (local streets/roads & transit);
- Evaluation of existing reports on the performance of the regional transportation system;
- Design and production of performance reports to the SANDAG Transportation Committee, Board and public on the performance of the public's transportation investment;
- Development of a “cost/benefit” analysis applied to evaluate the effectiveness of the public's investment in its transportation infrastructure;
- Evaluate the cost/benefit of proposed TransNet Projects and provide recommendations for possible improvements and/or modifications.
ITOC Responsibilities

The ITOC shall have the following responsibilities:

1. Conduct an annual fiscal and compliance audit of all TransNet-funded activities using the services of an independent fiscal auditor to assure compliance with the voter-approved Ordinance and Expenditure Plan. This annual audit will cover all recipients of TransNet funds during the fiscal year and will evaluate compliance with the maintenance of effort requirement and any other applicable requirements. The audits will identify expenditures made for each project in the prior fiscal year and will include the accumulated expenses and revenues for ongoing, multi-year projects.

2. Prepare an annual report to the SANDAG Board of Directors presenting the results of the annual audit process. The report should include an assessment of the consistency of the expenditures of TransNet funds with the Ordinance and Expenditure Plan and any recommendations for improving the financial operation and integrity of the program for consideration by the SANDAG Board of Directors. This consistency evaluation will include a review of expenditures by project type for each local jurisdiction. The ITOC shall share the initial findings of the independent fiscal audits and its recommendations with the SANDAG Transportation Committee 60 days prior to their release to resolve inconsistencies and technical issues related to the ITOC’s draft report and recommendations. Once this review has taken place, the ITOC shall make any final amendments it deems appropriate to its report and recommendations and adopt its report for submission directly to the SANDAG Board of Directors and the public. The ITOC shall strive to be as objective and accurate as possible in whatever final report it adopts. Upon completion by the ITOC, the report shall be presented to the SANDAG Board of Directors at its next regular meeting and shall be made available to the public.

3. Conduct triennial performance audits of SANDAG and other agencies involved in the implementation of TransNet-funded projects and programs to review project delivery, cost control, schedule adherence, and related activities. The review should include consideration of changes to contracting, construction, permitting, and related processes that could improve the efficiency and effectiveness of the expenditure of TransNet revenues. These performance audits shall be conducted using the services of an independent performance auditor and should include a review of the ITOC’s performance. A draft of the ITOC’s report and recommendations regarding the performance audits shall be made available to the SANDAG Transportation Committee at least 60 days before its final adoption by the ITOC to resolve inconsistencies and technical issues related to the ITOC’s draft report and recommendations. Once this review has taken place, the ITOC shall make any final amendments it deems appropriate to its report and related recommendations and adopt its report for presentation directly to the SANDAG Board of Directors and the public. The ITOC shall strive to be as
objective and constructive as possible in the text and presentation of the performance audits. Upon completion by the ITOC, the report shall be presented to the SANDAG Board of Directors at its next regular meeting and shall be made available to the public.

4. Provide recommendations to the SANDAG Board of Directors regarding any proposed amendments to the Ordinance and Expenditure Plan.

5. Provide recommendations as part of the 10-year review process. This process provides an opportunity to undertake a comprehensive review of the TransNet program every ten years and to make recommendations for improving the program over the subsequent ten years. This review process should take into consideration the results of the TransNet-funded improvements as compared to the performance standards established through the Regional Transportation Plan and the Regional Comprehensive Plan.

6. Participate in the ongoing refinement of SANDAG’s transportation system performance measurement process and the project evaluation criteria used in development of the Regional Transportation Plan (RTP) and in prioritizing projects for funding in the Regional Transportation Improvement Program. The focus of this effort will be on TransNet-funded projects. Based on the periodic updates to the RTP, as required by state and federal law, the oversight committee shall develop a report to the SANDAG Transportation Committee, the SANDAG Board of Directors, and the public providing recommendations for possible improvements and modifications to the TransNet program.

7. On an annual basis, review ongoing SANDAG system performance evaluations, including SANDAG’s “State of the Commute” report, and provide an independent analysis of information included in that report. This evaluation process is expected to include such factors as level of service measurements by roadway segment and by time of day, throughput in major travel corridors, and travel time comparisons by mode between major trip origins and destinations. Such information will be used as a tool in the RTP development process.

8. Review and comment on the programming of TransNet revenues in the Regional Transportation Improvement Program (RTIP). This provides an opportunity for the ITOC to raise concerns regarding the eligibility of projects proposed for funding before any expenditures are made. In addition to a general eligibility review, this effort should focus on significant cost increases and/or scope changes on the major corridor projects identified in the Ordinance and Expenditure Plan.

9. Review proposed debt financings to ensure that the benefits of the proposed financing for accelerating project delivery, avoiding future cost escalation, and related factors exceed issuance and interest costs.

10. Review the major Congestion Relief projects identified in the Ordinance for performance in terms of cost control and schedule adherence on a quarterly basis.

In carrying out its responsibilities, the ITOC shall conduct its reviews in such a manner that does not cause unnecessary project delays, while providing sufficient time to ensure that adequate analysis can be completed to allow the ITOC to make objective recommendations and to provide the public with information about the implementation of the TransNet program.
November 9, 2005

Action Requested: INFORMATION

TransNet ENVIRONMENTAL MITIGATION PROGRAM

Attachments related to this item include:

- A fact sheet summarizing the key features of the new TransNet Environmental Mitigation Program (EMP).
TransNet Environmental Mitigation Program

In 1987, voters approved the TransNet program—a half-cent sales tax to fund a variety of important transportation projects throughout the San Diego region. This 20-year, $3.3 billion transportation improvement program expires in 2008. In November 2004, 67 percent of the region’s voters supported the extension of TransNet to 2048—thereby generating an additional $14 billion for highway, transit, and local road projects and other transportation improvements.

A unique component of the extension is the creation of an environmental mitigation program (EMP), which goes beyond traditional mitigation for regional and local transportation projects. While the EMP includes an allocation for the estimated direct costs for mitigation of upland and wetland habitat impacts for regional and local transportation projects, it also includes additional funding for habitat acquisition, management, and monitoring activities. The EMP will help implement the Multiple Species Conservation Program (MSCP) and the Multiple Habitat Conservation Program (MHCP).

The ballot measure identified $850 million to be used for the EMP. The EMP principles state that two funds shall be established. The first one, a “Transportation Project Mitigation Fund” covers direct mitigation costs for regional and local transportation projects estimated to be $650 million ($450 million for regional projects, $200 million for local projects).

These funds will be used for the mitigation needs of the major transportation infrastructure improvement projects and programs identified in the SANDAG Regional Transportation Plan. Although the extension does not begin until April 2008, an “early action program” has been designed to address priority projects. Satisfying the mitigation requirements for these priority projects will be addressed.
comprehensively rather than on a project-by-project basis in order to maximize early land acquisition opportunities.

The early action TransNet projects include: the widening of SR 76 between Melrose Drive and I-15; the extension of SR 52 from SR 125 to SR 67; the Mid-Coast regional transit extension from Old Town onto the UCSD campus and over to University City; the I-15 Managed Lanes from SR 78 to SR 163; the SR 52 reversible Managed Lanes from I-15 to SR 125; the I-5 North Coast Corridor projects; and the I-805 corridor projects.

The second fund, a “Regional Habitat Conservation Fund,” will be approximately $200 million ($150 million for regional projects and $50 million for local projects). These funds will be made available for regional habitat acquisition, management, and monitoring activities necessary to implement the MSCP and the MHCP. Funds are estimated based on the economic benefit derived from purchasing land with the “Transportation Project Mitigation Fund” in advance of need in larger blocks at a lower cost, and with mitigation ratios predetermined and held constant over time for each of the habitat conservation plans. The Environmental Mitigation Program guidelines identify up to $30 million in financing costs allocated from the expenditure plans.

The Environmental Mitigation Program will be a collaborative effort among SANDAG, the cities, the county, the wildlife agencies (California Department of Fish and Game and the US Fish and Wildlife Service), and other regulatory agencies (Coastal Commission, US Army Corps of Engineers, US Environmental Protection Agency, and the Regional Water Quality Control Board) as well as representatives of various stakeholder groups, including the environmental community and the science/technical community.

What do we mean by “Economic Benefit?”

With today’s rising land prices, we know that if we buy land today, it will cost less than if we wait and buy it later. Smart investors know this, which is why land in Southern California is at a premium.

Transportation projects will be built during the next 30 years. Whenever a project impacts sensitive habitats, mitigation lands must be acquired prior to the issuance of permits. If land is purchased in advance of need, with mitigation ratios held constant over time, an economic benefit is derived because the mitigation obligation is known and the land is purchased at today’s prices. The savings derived by purchasing land today, rather than at some time in the future, constitutes the economic benefit.

Fifty acre wetland mitigation site at Route 76 and Pilgrim Creek in Oceanside

Before

After
INDEPENDENT TAXPAYER
OVERSIGHT COMMITTEE

November 9, 2005

AGENDA ITEM NO.: 7

Action Requested: DISCUSSION

TransNet LOCAL STREET AND ROAD PROGRAM REQUIREMENTS File Number 1110200

Attachments related to this item include:

- Excerpts from a report to the Cities/County Transportation Committee (CTAC) summarizing the key requirements related to the local street and road portion of the TransNet program.
TransNet Ordinance: Local Streets and Roads Program

SECTION 2
EXPENDITURE PLAN SUMMARY:

C.1 Local Street and Road Program: An estimated $3,950 million will be allocated on a fair and equitable basis, using the formula specified in Section 4(D)(1), to each city and the County of San Diego (hereinafter referred to as local agencies) to supplement other revenues available for local street and road improvements. In developing the biennial list of projects to be funded with these revenues as required under Section 5(A), local agencies shall give high priority in the use of these funds to improvements to regional arterials, grade separation projects, and related facilities contributing to congestion relief. At least 70% of the revenues provided for local street and road purposes should be used to fund direct expenditures for construction of new or expanded facilities, major rehabilitation and reconstruction of roadways, traffic signal coordination and related traffic operations improvements, transportation-related community infrastructure improvements to support smart growth development, capital improvements needed to facilitate transit services and facilities, and operating support for local shuttle and circulator routes and other services. No more than 30% of these funds should be used for local street and road maintenance purposes. A local agency desiring to spend more than 30% of its annual revenues on local street and road maintenance-related projects shall provide justification to the Commission as part of its biennial project list submittal. The Commission shall review each local agency's biennial project list submittal and make a finding of consistency with the provisions of this Ordinance and with the Regional Transportation Plan prior to approving the local agency's project list for funding. The Independent Taxpayer Oversight Committee shall also review the proposed project lists and make recommendations to the Commission.

SECTION 4
EXPENDITURE PLAN PURPOSES:

E.3 All new projects, or major reconstruction projects, funded by revenues provided under this Ordinance shall accommodate travel by pedestrians and bicyclists, except where pedestrians and bicyclists are prohibited by law from using a given facility or where the costs of including bikeways and walkways would be excessively disproportionate to the need or probable use. Such facilities for pedestrian and bicycle use shall be designed to the best currently available standards and guidelines.

SECTION 5
EXPENDITURE PLAN PROCEDURES:

A. Each local agency shall biennially develop a five-year list of projects to be funded with revenues made available for local street and road improvements under Section 4(D). A local public hearing on the proposed list of projects shall be held by each local agency prior to submitting its project list to the Commission for approval pursuant to Section 6.
B. All projects to be funded with revenues made available under Section 4 must be consistent with the Regional Transportation Plan (RTP). Project priorities or phasing shall also be consistent with the RTP. The Expenditure Plan shall be reviewed for consistency with RTP following each major update of the RTP as required by state or federal law. The Expenditure Plan shall be amended as necessary to maintain consistency with the Regional Transportation Plan. If funds become available in excess of the amount allocated in the Expenditure Plan, additional projects shall be added to the Expenditure Plan consistent with the priorities in the Regional Transportation Plan. Any amendments to the Expenditure Plan shall be made in accordance with the procedures for amending this ordinance as provided for in Section 16.

SECTION 8
MAINTENANCE OF EFFORT:
It is the intent of the Legislature, as stated in the Act, and the Commission that revenues provided from this measure be used to augment, not supplant existing local revenues being used for the purposes set forth in Section 4 herein. Each local agency receiving revenues pursuant to Section 4(D) shall annually maintain as a minimum the same level of local discretionary funds expended for street and road purposes on average over the last three fiscal years completed prior to the operative date of this Ordinance (Fiscal Years 2000-01, 2001-02, 2002-03), as was reported in the State Controller's Annual Report of Financial Transactions for Streets and Roads and as verified by an independent auditor. The maintenance of effort level as determined through this process shall be subject to adjustment every three years based on the Construction Cost Index developed by Caltrans. Any increase in the maintenance of effort level based on this adjustment shall not exceed the growth rate in the local jurisdiction's General Fund revenues over the same time period. The Commission shall not allocate any revenues pursuant to Section 4(D) to any eligible local agency in any fiscal year until that local agency has certified to the Commission that it will include in its budget for that fiscal year an amount of local discretionary funding for streets and roads purposes at least equal to the minimum maintenance of effort requirement. An annual independent audit shall be conducted to verify that the maintenance of effort requirement for each agency was met. Any local agency which does not meet its maintenance of effort requirement in any given year shall have its funding under Section 4(D)(1) reduced in the following year by the amount by which the agency did not meet its required maintenance of effort level. In the event that special circumstances prevent a local agency from meeting its maintenance of effort requirement, the local agency may request up to three additional fiscal years to fulfill its requirement. Such a request must be approved by the Commission. The Independent Taxpayer Oversight Committee shall also review such requests and make recommendations to the Commission. Any local street and road revenues not allocated pursuant to the maintenance of effort requirement shall be redistributed to the remaining eligible agencies according to the formula described in Section 4(D)(1). The maintenance of effort requirement also shall apply to any local agency discretionary funds being used for the other purposes specified under Section 4. In addition, revenues provided from this Ordinance shall not be used to replace other private developer funding that has been or will be committed for any project.

SECTION 9
REGIONAL TRANSPORTATION CONGESTION IMPROVEMENT PROGRAM (RTCIP):
A. New Development Exactions Starting on July 1, 2008, each local agency in the San Diego region shall contribute $2,000 in exactions from the private sector, for each newly constructed residential
housing unit in that jurisdiction to the RTCIP. These exactions shall ensure future development contributes its proportional share of the funding needed to pay for the Regional Arterial System and related regional transportation facility improvements, as defined in San Diego Association of Governments’ (SANDAG’s) most recent, adopted Regional Transportation Plan. New residential housing units constructed for extremely low, very-low, low, and moderate income households, as defined in California Health and Safety Code Sections 50105, 50106, 50079.5 and 50093, will be exempted from the $2,000 per unit contribution requirement. The amount of contribution shall be increased annually, in an amount not to exceed the percentage increase set forth in the Engineering Construction Cost Index published by the Engineering News Record or similar cost of construction index. Each local agency shall establish an impact fee or other revenue Funding Program by which it collects and funds its contribution to the RTCIP. Each local agency shall be responsible for establishing a procedure for providing its monetary contribution to the RTCIP. The RTCIP revenue will be used to construct improvements on the Regional Arterial System such as new or widened arterials, traffic signal coordination and other traffic improvements, freeway interchange and related freeway improvements, railroad grade separations, and improvements required for regional express bus and rail transit. This action is predicated on the desire to establish a uniform mitigation program that will mitigate the regional transportation impacts of new development on the Arterial system. While the RTCIP cannot and should not fund all necessary regional transportation network components and improvements, the RTCIP will establish a new revenue source that ensures future development will contribute its pro rata share towards addressing the impacts of new growth on regional transportation infrastructure.