Why we need access management in today’s economic situation

- Helps preserve capacity
- Significantly reduces the human carnage on the roadway
- Thereby helping prevent the costs and suffering associated with accidents
- Preserving roadway function to reduce the need to re-construct.

What is Access Management

- Managing each point of access to a road.
- Driveways and intersections
- Interchanges and interchange crossroads
- Goals: Smoother traffic flow
- Better travel times
- Less stressful drive
- Fewer accidents

SAFETY is a big component of Access Management
In its simplest form, Access Management is Conflict Management

- If you reduce the rate and severity of conflicts the motorist encounters, you will reduce the crash rate, the injury rate and increase the smooth flow of traffic.

Roadways are the Most Dangerous Public Facilities on the Face of the Earth

- In the US, about 800 people are killed each week
- 16,000 Crashes each day
- 6,500 Injuries each day

- The leading cause of death of a child, age 3 to 14 is a traffic crash.
- 32 fatal week, >3,000 inj.

At the current U.S. crash rate, one child of every 90 born today will die violently in a motor vehicle crash. 70 out of every 100 will be injured at some point in their lives.

AASHTO Strategic Highway Safety Plan, December 2004

Idaho Fatal Rates Higher

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatalities</th>
<th>Total Vehicle Miles Traveled (Millions)</th>
<th>Fatalities Per 100 Million Vehicle Miles Traveled</th>
<th>Total Population</th>
<th>Fatalities Per 100,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>US</td>
<td>41,259</td>
<td>3,802,399</td>
<td>1.26</td>
<td>304,919,724</td>
</tr>
<tr>
<td></td>
<td>Idaho</td>
<td>252</td>
<td>15,782</td>
<td>1.60</td>
<td>1,016,145</td>
</tr>
<tr>
<td>Best State*</td>
<td></td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatalities</th>
<th>Total Vehicle Miles Traveled (Millions)</th>
<th>Fatalities Per 100 Million Vehicle Miles Traveled</th>
<th>Total Population</th>
<th>Fatalities Per 100,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>US</td>
<td>37,251</td>
<td>2,973,909</td>
<td>1.25</td>
<td>304,919,724</td>
</tr>
<tr>
<td></td>
<td>Idaho</td>
<td>232</td>
<td>15,251</td>
<td>1.52</td>
<td>1,521,816</td>
</tr>
<tr>
<td>Best State*</td>
<td></td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Per population: OR = 10.98  WA = 7.96  Utah = 10.05

Fatal Rates, International Comparison

- UK, 6.1 per 100,000 population.
- Japan, 7.0 per 100,000
- Australia, 8.2 per 100,000
- US, 13.69 in 2007

Managing road design

- Do we design for the vehicle?
  - Size, stopping distance
- Or for the driver?
  - Reaction time, speeding, inattentiveness
  - Work load, conflict frequency
  - “6,000 people died last year (2008) in accidents that involved someone texting or talking on their phone. Another 500,000 were injured.” (Dec 2009) Victor Mendez, Administrator, Federal Highway Administration
If no human errors, there should only be 7% of the current crash history. Human error contributes to the other 93%.

Each Year
Idaho crashes drop from 26,000 to 1,800
Injuries drop from 13,000 to 900.
This will not happen.

Again
- Do we design for the vehicle?
  - Size, stopping distance
- Or for the driver?
  - Reaction time, speeding, inattentiveness
- Conflict management is designing for the driver

Driver Work-Load is a Rate
- Speed = increases work load rate
- Conflict frequency = increases work load rate
- High work load = higher crash rate

AM Strategy: Driver Work-Load can be modified by good planning and design

Access Related crashes at driveways and intersections represent over 55 percent of all traffic crashes. 65% to 75% in urban areas.
More than 3.5 million access related crashes annually.
Over 3,500 access related injuries each day.

There is no such thing as a Safe Access.
As the number of access points per mile increase, so does the frequency of total highway collisions.
The crash rate also increases. Each access = 4%
Every Access Point is Fundamentally a Safety Problem
- Issuing an access permit is a decision to diminish public safety and roadway function.

When access principles are applied to a specific Corridor
- Crashes reduced by 30 to 60 percent
- Capacity increased by 20 to 40 percent

If a roadway program or project can reduce the crash rate from 12.5 to 3.5 per MVM

Goals of Access Management
- Separate Turning Vehicles from through traffic

Goals of Access Management
- Separate conflict points

Source: Florida DOT

<table>
<thead>
<tr>
<th>For a Typical 3 Mile Section of 4 Lanes at 37,000 daily traffic</th>
<th>Top Highway</th>
<th>Bottom Highway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Conflict points</td>
<td>1,641</td>
<td>324</td>
</tr>
<tr>
<td>Number of Crashes Expected in 5 years</td>
<td>2,435</td>
<td>680</td>
</tr>
<tr>
<td>Cost of Crashes in 5 years</td>
<td>$26.5 M</td>
<td>$7.5 M</td>
</tr>
<tr>
<td>Average Speed</td>
<td>25 MPH</td>
<td>44 MPH</td>
</tr>
</tbody>
</table>
Goals of Access Management:

• Limit access conflicts

Source: Florida DOT

Goals of Access Management:

• Keep private access off arterials

Source: Florida DOT

Goals of Access Management:

• Safer residential access

Source: Florida DOT

New Flag lots in Virginia

A M is not just access permits, ideally, it starts with long range planning

Why is Access Management Difficult to Execute

• Legal considerations – Property rights
• Crosses professional and agency organizational lines
• Reluctance of highway agencies to deal with land side issues
• Failure of elected officials to put into practice what is necessary for safety

A Guidebook for Including Access Management In Transportation Planning. NCHRP 548
Successful Programs have Three Major Elements

1) A hierarchical access classification system for all roadways to align the level of access control with the intended function of the road.
2) Specific design and engineering criteria to determine access location and design.
3) Procedures that guide the application, evaluation and decision process for a permitting program.

System Wide Access Classification System

- Sets the system hierarchy
- The access classification determines the answer to the question:
- May I have access to the roadway?

Access Categories to Manage by Function

<table>
<thead>
<tr>
<th>Arizona State Highway Access Management Categories</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HW (freeway)</td>
<td></td>
</tr>
<tr>
<td>MR (major regional)</td>
<td></td>
</tr>
<tr>
<td>R1 (rural principal)</td>
<td>U1</td>
</tr>
<tr>
<td>R2 (rural secondary)</td>
<td>U2</td>
</tr>
<tr>
<td>U3 (urban secondary)</td>
<td></td>
</tr>
<tr>
<td>SF (service and frontage roads)</td>
<td></td>
</tr>
</tbody>
</table>

Pinal County

Decision Flow Chart For Permit Decision:
1. Qualify?
2. Location
3. Mitigate
Decision
Flow Chart
For Permit
Decision:
1. Qualify
2. Location?
3. Mitigate

Location Determination
• First – Decision Sight Distance (AASHTO)

<table>
<thead>
<tr>
<th>Posted speed in MPH</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance in feet</td>
<td>625</td>
<td>715</td>
<td>800</td>
<td>890</td>
<td>980</td>
<td>1125</td>
<td>1220</td>
<td>1275</td>
<td>1385</td>
<td>1455</td>
</tr>
</tbody>
</table>

• Second – Spacing from other accesses

<table>
<thead>
<tr>
<th>Posted speed in MPH</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach Spacing</td>
<td>200</td>
<td>250</td>
<td>360</td>
<td>425</td>
<td>495</td>
<td>570</td>
<td>645</td>
<td>730</td>
<td>820</td>
<td>910</td>
</tr>
</tbody>
</table>

• Bottom line – stopping sight distance (adj for design speed)

<table>
<thead>
<tr>
<th>Posted speed in MPH</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sight distance (in ft)</td>
<td>100</td>
<td>210</td>
<td>285</td>
<td>320</td>
<td>365</td>
<td>455</td>
<td>530</td>
<td>610</td>
<td>685</td>
<td>705</td>
</tr>
</tbody>
</table>

Arizona Turn Lane Warrants
(2008 draft)

<table>
<thead>
<tr>
<th>Access Category</th>
<th>Left-turn Decel Lane</th>
<th>Right-turn Decel Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Above 45 MPH</td>
<td>Below 45 MPH</td>
</tr>
<tr>
<td></td>
<td>Above 45 MPH</td>
<td>Below 45 MPH</td>
</tr>
<tr>
<td>MR</td>
<td>10 AADT</td>
<td>10 AADT</td>
</tr>
<tr>
<td>U1</td>
<td>10 VPH</td>
<td>10 VPH</td>
</tr>
<tr>
<td>U2</td>
<td>10 VPH</td>
<td>15 VPH</td>
</tr>
<tr>
<td>U3</td>
<td>10 VPH</td>
<td>25 VPH</td>
</tr>
<tr>
<td>R1</td>
<td>10 VPH</td>
<td>10 VPH</td>
</tr>
<tr>
<td>R2</td>
<td>10 VPH</td>
<td>15 VPH</td>
</tr>
<tr>
<td>SF</td>
<td>10 VPH</td>
<td>25 VPH</td>
</tr>
</tbody>
</table>

Deceleration Lane Length Options

<table>
<thead>
<tr>
<th>Speed in MPH</th>
<th>35</th>
<th>45</th>
<th>55</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deceleration Length, Ft.</td>
<td>215</td>
<td>345</td>
<td>510</td>
<td>710</td>
</tr>
</tbody>
</table>

10 mph speed differential for normal arterial

<table>
<thead>
<tr>
<th>Speed in MPH</th>
<th>35</th>
<th>45</th>
<th>55</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deceleration Length, Ft.</td>
<td>350</td>
<td>630</td>
<td>810</td>
<td>1060</td>
</tr>
</tbody>
</table>

Zero mph speed differential For major arterial, expressway

Deceleration turn-lane length by access category

<table>
<thead>
<tr>
<th>Posted Speed Limit</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed in MPH</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>60</td>
<td>65</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>Deceleration</td>
<td>210</td>
<td>280</td>
<td>350</td>
<td>430</td>
<td>500</td>
<td>570</td>
<td>640</td>
<td>710</td>
<td>790</td>
<td>870</td>
<td>950</td>
</tr>
<tr>
<td>Speed in MPH</td>
<td>110</td>
<td>180</td>
<td>250</td>
<td>320</td>
<td>390</td>
<td>460</td>
<td>530</td>
<td>600</td>
<td>670</td>
<td>740</td>
<td>810</td>
</tr>
<tr>
<td>Deceleration</td>
<td>105</td>
<td>145</td>
<td>185</td>
<td>225</td>
<td>265</td>
<td>305</td>
<td>345</td>
<td>385</td>
<td>425</td>
<td>465</td>
<td>505</td>
</tr>
<tr>
<td>Transition Taper</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Length, Ft.</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>

Values above are taper and decel length
Storage length is added to above values
Minimum Design

- Minimum design means
  - minimum capacity
  - minimum safety
  - minimum costs.
- Permits should act to minimize the impacts of the new access
- Don’t allow a minimum design.

Legal Issues in Access Management

- Property rights do not include the right to create safety problems on public facilities

Legal Issues in Access Management

- Owners have a right to access their property.
- They have a right to demand clear and concise requirements and procedures.

Police Power

- The power of the government to act in furtherance of the public good to promote the public health, safety, morals and general welfare, without incurring liability for the resulting injury to private individuals.

Can We Manage Access without Compensation?

- Allowing uncontrolled access would not be a concern if there no safety or operational problems.
- What do we know about the need manage access and justify standards?
TURN Lanes

- Are critical for both capacity and public safety

No left turn has greatest impact

Adding left turn bays reduced the crash rate (Vancouver BC)

- Vancouver, B.C.
  - Left-Turn Bays
    - Increase Capacity 20% or more
    - Decrease Crash Rates 25% to 50%

Adding painted left turn compared to raised left turn

Driveways impact flow and conflict

No Right Turn lane reduces signal capacity, increases delay
When turn lanes are too short, they impact flow and safety

Why Designing for Average Queue will cause some failures

Average queue = 2 cars 40% failure rate

Source: Florida DOT

Speed differential is a conflict

• Speed differential = speed of through traffic minus the speed vector of the right turning vehicle (not its ‘speed’)

Combining Storage and Decel defeats speed differential mitigation

Source: Florida DOT
New Boise subdivision without right-turn lane

Goal – Good Turn Lanes

Lack of driveway throat

Using Medians to Improve Operation and Safety

Left Turns Dominate Crash History

Raised or Painted Median?

- Generally, > 25,000 daily means higher collision rate
- Painted medians are cheaper
- Paint does not control left turns
- Painted medians do not allow signs
- Raised medians have lower crash rates
Median Types

- Painted medians often need ‘short’ medians (for left turn bays)

Overlapping Left-Turn Movements on TWLTL

TWLTL has limits

Mixed Median use in Phoenix

Median eliminates all left turns and the related problems

Source: Florida DOT
3/4 th opening / no left out

Source: Florida DOT

U-turns are safer

A study in Orlando shows most customers do not find U-turns an inconvenience.

18% total crash rate reduction
27% injury facility crash rate reduction

U-turns are often much safer than direct left turns, especially on high-volume, high-speed, or congested roadways.

Full movement driveways increase bike and ped hazards

Medians reduce bike and ped conflicts
Decreasing crash rates by adding medians

Florida DOT

Source: Florida DOT

Post Project – Memorial Drive

• 37 % drop in Total Accident Rate
• 48 % drop in Injury Rate
• 59 % drop in Mid-block Injury Rate
• 40 % drop in Intersection Injury Rate
• Project has saved at least 15 lives and has prevented thousands of accidents since completion.

Traffic Signals and Spacing

Traffic signals produce and greatest amount of Conflict and Workload
Similar Capacity

- 4 lane divided roadway with 1/2 mile signal spacing
- 6 lane divided roadway with 1/4 mile signal spacing

Capacity Benefits

Signals create rear-end conflicts

Without Exception, Traffic Signals are hazardous

- They may be less hazardous than the current situation
- They are not a safety enhancement.
- They allow safer left turns

**Effects of minimum spacing requirements between signalized intersections**

<table>
<thead>
<tr>
<th>Signals per Mile</th>
<th>Accidents per Million Vehicle-Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 2</td>
<td>2.6 - 3.8</td>
</tr>
<tr>
<td>2.01 - 4.00</td>
<td>3.9 - 8.2</td>
</tr>
<tr>
<td>4.01 - 6.00</td>
<td>4.8 - 8.7</td>
</tr>
<tr>
<td>&gt; 6</td>
<td>6.0 - 9.5</td>
</tr>
</tbody>
</table>

from Gluck et al., NCHRP Report 420
Relative crash frequency

- RURAL intersections
  - 0.7 per year unsignalized
  - 4.8 per year if signalized

- URBAN intersections
  - 1.4 per year unsignalized
  - 6.2 per year if signalized

Signals Increase Accidents

Are Traffic Signals Obsolete?

Why Roundabouts

Why are they replacing traffic signals?

The Modern Roundabout As A Signal Alternative

Roundabouts replaces traffic signals in Golden and Avon CO
Avon, Colorado

Crash reductions - Golden CO (3 years before & after)
- Commercial strip, 4 + TW LTL
- 60% drop in Crashes (mvm)
- 94% drop in injuries
- Only 1 vehicular injury crash in 3 years (previous 3 years were 31)
- No Pedestrian crashes

La Jolla before

Context Sensitive – Rebuilt 1940s arterial using 5 Roundabouts (21k adt)
- Bend Oregon, pop 65,000 has 23 single lane roundabouts
- Carmel Indiana, Pop 70,000, has over 50 roundabouts
- Colorado Spgs CO pop 450k has 44+ roundabouts
- Over 220 in Colorado

NYSDOT- “Signal Policy”
“When the analysis shows that a roundabout is feasible, it should be considered the Department’s preferred alternative due to the proven substantial safety benefits and other operational benefits.”
Many states are replacing isolated rural signals with roundabouts.

Increased Traffic Capacity

- Will typically outperform a traffic signal in terms of delays and queues.

Provides new alternatives (Kansas)

Averaged Delay for Roundabout

Hi-speed rural in Lafayette, Louisiana
Ten more urban ones in design

Completed RBT
(Mark Johnson MTJ Engineering)
Access Control and Roundabouts

- Are traffic signals obsolete?
- Roundabouts achieve 70 to 90% injury crash reduction compared to signal.
- Roundabouts with non-traversable medians between – the best AM solution.

While it should not be encouraged for new development, it helps in retrofit situations

TRB National Roundabout Conference
Next: May 2011, Carmel Indiana

For Previous conference materials go to www.teachamerica.com/roundabouts/ra_conference.htm

Access Management Planning
- A plan for a specific segment
- Joint effort to set function and purpose
- Determine performance measures
  - Safety, capacity, efficiency
- Level of allowable private access
- Locations of public intersections
- Final joint agreement for all access permitting.

US 20/26 Preservation Study
US 20/26 from I-84 to Eagle Road (15 mi)
* Crash History (January 1999 - July 2005)
  - Total Crashes: 500
  - Fatal Crashes: 8
  - Injury Crashes: 230
  - Access Related Crashes: 338 (67%)
  - 73% of Injury Crashes were Access Related
  - 62% of Fatal Crashes were Access Related

Traffic Growth Estimates

<table>
<thead>
<tr>
<th>U.S. 20/26 Traffic Volumes</th>
<th>2005</th>
<th>2030*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eagle Road to I-84 (Caldwell)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eagle to Black Cat</td>
<td>14,000 – 21,400</td>
<td>38,000 – 52,000</td>
</tr>
<tr>
<td>Black Cat to Midland</td>
<td>12,000 – 15,000</td>
<td>24,000 – 32,000</td>
</tr>
<tr>
<td>Midland to I-84</td>
<td>10,000 – 12,000</td>
<td>19,000 – 23,000</td>
</tr>
</tbody>
</table>

*Based on Community Planning Association of Southwest Idaho demographics

From RBCI

- We thought we would suggest ½ mile
- Resounding public wanted 1 mile
- Strong interests in maintaining travel time.
- No other nearby route available.

What will SH 44 look like after 20 years of growth?
Lengthy queues and delay

RBTs are safer
- Medians and RBTS are safest
- Circulation parallel.
- How can we integrate RBTs and medians into our “old” thinking?
- Can we just flip a switch? Yesterday signals and today RBTs? Why not?

Access Control and Roundabouts
- Are traffic signals obsolete?
- Roundabouts achieve 70 to 90% injury crash reduction compared to signal.
- Roundabouts with non-traversable medians between – the best AM solution.
Draft network to support employment, residential, and airport growth

Fairview, W of Orchard, widening, more capacity and managed access.

Draft Concept for a Portion of Fairview

Source: Parametrix

Interchange Access Planning

No Plan, No Vision, No Controls

Source: Parametrix
How Can Local Governments Institute Access Management Strategies

- Local Comprehensive Plan
- Land development and subdivision regulations
- Roadway & access design standards
- Site plan review criteria
- Corridor management plans

Federal Highway Administration
Office of Operations Washington, DC
www.ops.fhwa.dot.gov/access_management

CD with report and movie is available:
Neil Spiller at FHWA
Neil.Spiller@dot.gov

COMPASS is the MPO for the Boise/Nampa urbanized area - Idaho (2006)

Access Management Toolkit
Prepared by Community Planning Association of Southwest Idaho

Access Management Manual
Transportation Research Board of the National Academies

Stover, V.G. and Koepke, F. J.,
Key Resources

- Large collection of reports, presentations, references and conference proceeding, [http://www.accessmanagement.info](http://www.accessmanagement.info)

Movie from the Insurance Institute for Highway Safety

Site Design and Access Control

Florida DOT
Questions
Philip Demosthenes
Principal Planner
303-349-9497
pdemos@ecentral.com
www.pdemosthenes.com

Hierarchy
- Local  Speeds 12 to 30
- Collector  Speeds 25 to 35
- At grade Arterial  Speeds 35 to 65
- Freeway  Speeds 55 to 75
Why there is a hierarchy

- No one wants driveways on a freeway
- No one wants freeway traffic on a residential street.
- Freeway shouldn’t be narrow and residential streets shouldn’t be wide
- Separating the driving purposes
- Separating the capacity demands
- Separating the speed demands
- #1 allows the design to fit the purpose