

Multi-Modal School Site Planning, Design and Transportation for Primary Grades (K-8)

Developed by:

Daniel VanPelt – Gorove/Slade Associates
Michael Cynecki – City of Phoenix Streets Department
Jennifer Hefferan – District of Columbia DOT

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The National Center for Safe Routes to School



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- Be prepared to respond to polls.
- All participant phone lines are muted to avoid distractions during presentations.
- Questions can be asked via the Question Pod. Only the instructor and moderator will see the questions submitted.
- Questions & answer session at the end of the presentation or at specific time during the presentation.
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Earn Course Credit

Successful completion of this Web seminar includes:

- Verification of attendance
- Completion of course evaluation
- Verification of learning objectives (online quiz)

These requirements must be met to earn 1.5 PDH or .2 IACET CEU per course.

At the conclusion of the course you will receive an email with directions to the **online quiz** and **course evaluation** (an additional fee may apply)



3

Meet Your Instructors



Daniel VanPelt, P.E., PTOE
Principal
Gorove/Slade Associates, Inc.
dbv@goroveslade.com



Mike Cynecki, P.E.
Traffic Engineering Supervisor
City of Phoenix
Street Transportation Department
mike.cynecki@phoenix.gov



Jennifer Hefferan, ASLA, RLA
Safe Routes to School Coordinator
District of Columbia Department of Transportation
jennifer.hefferan@dc.gov



4

Safe Routes to School Series

1. Identify Barriers and Engineering Solutions to SRTS
2. Overview of SRTS Program
3. School Area Traffic Controls
4. *Multi-Modal School Site Planning, Design and Transportation for Primary Grades (K-8)*



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5

Learning Objectives

At the conclusion of this course participants should be able to:

- Identify key elements in developing a multi-modal school transportation plan.
- Recognize strategies that improve safety and encourage walking and cycling to school.
- Identify key multimodal consideration elements when selecting and designing a school site.



6

Interactivity

How did you get to grade school?

- A) Walk
- B) Bike
- C) School Bus
- D) Family Vehicle
- E) Carpool
- F) Transit



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7

Recent Mode Survey

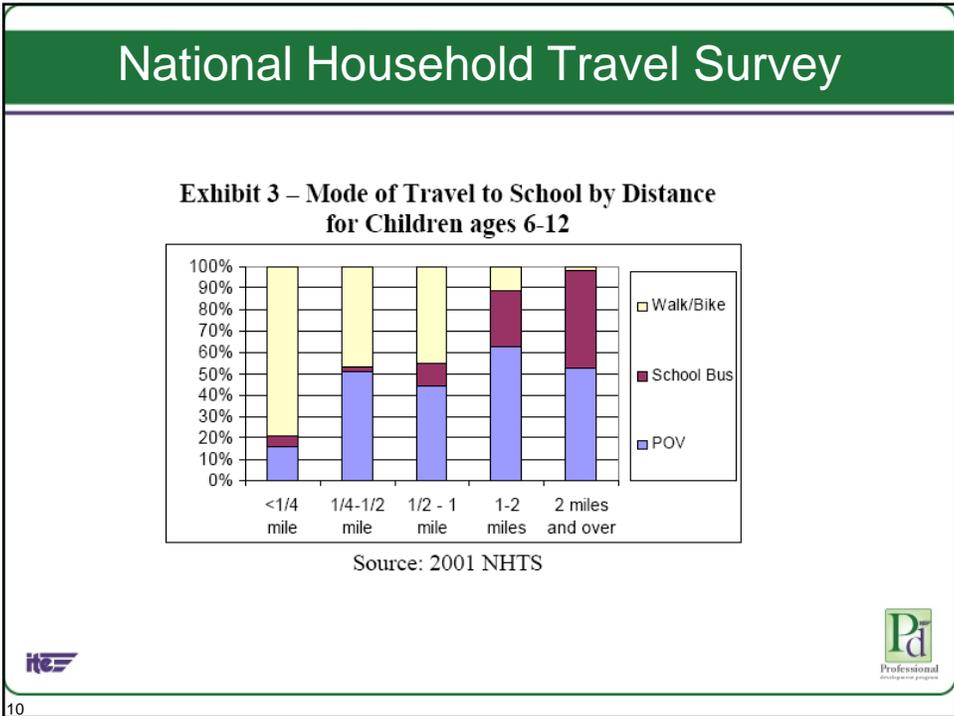
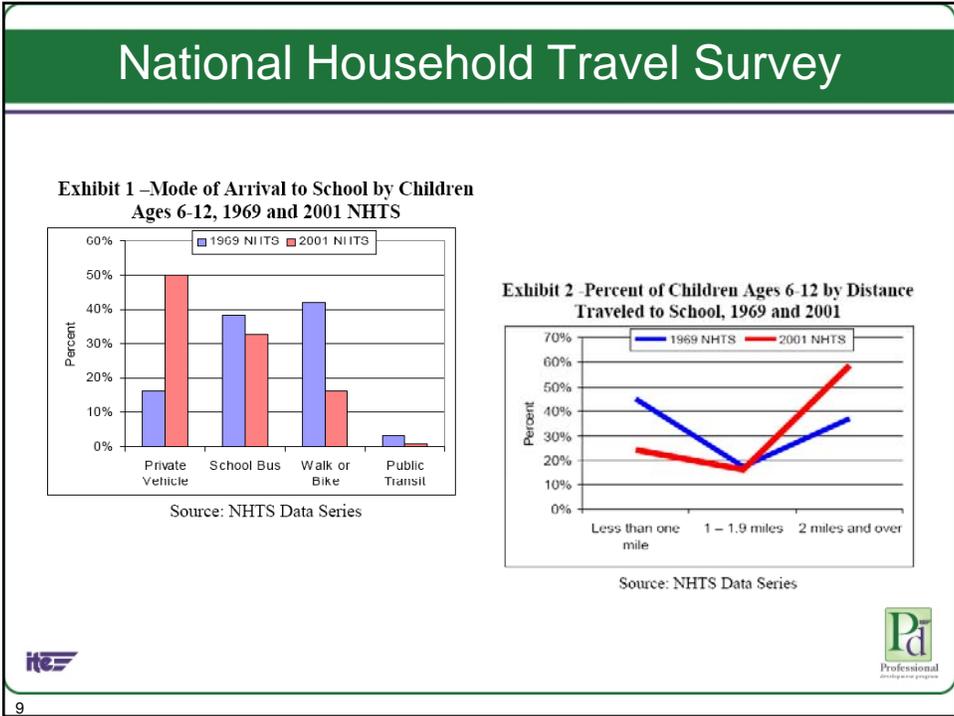
Identifying Factors Affecting the Number of Students Walking or Biking to School –

Hillsborough County, Florida

A) Family Vehicle	39.6%
B) School Bus	37.7%
C) Walk	10.9%
D) Carpool	9.5%
E) Bike	2.3%
F) Transit	0%



8



Societal Factors

- Parental concerns about safety and fear of crime
- Higher auto ownership
- Both parents working
- More student and family activities
- Weather



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11

Opportunities

- Reduced traffic congestion
- Improved air quality
- Combat childhood obesity
- Improved livability



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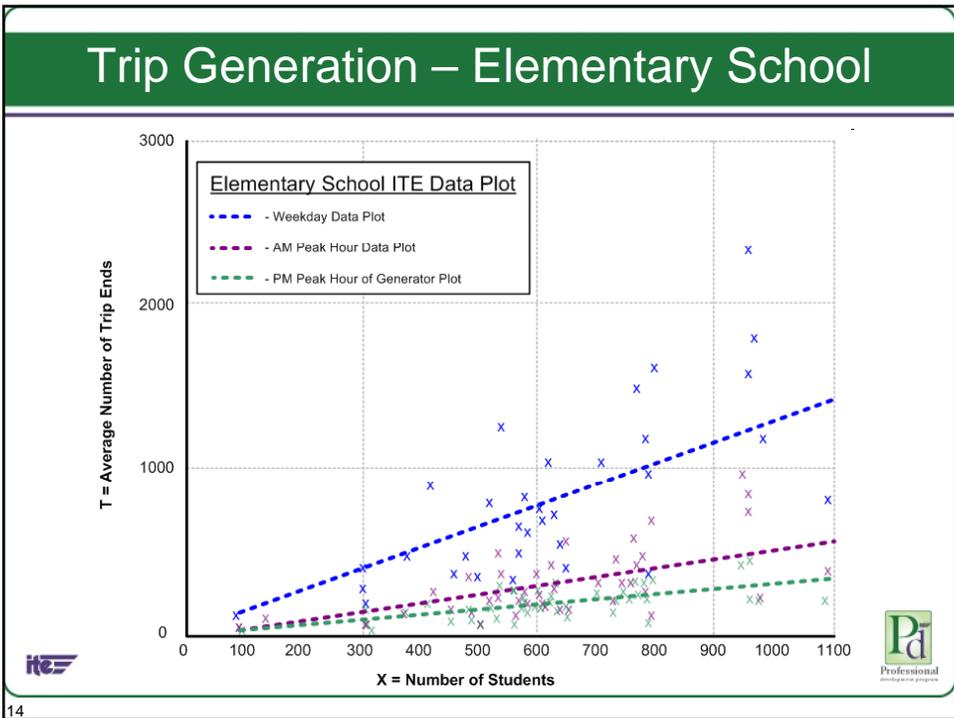
12

ITE Trip Generation

- ITE *Trip Generation* used for estimating vehicle trips
- Trip rates and type vary considerably based on school characteristics, such as bus usage vs. drop-off and pick-up
- No standard for estimating bike/walk trips
- Elementary schools have higher drop-off and pick-up rates than middle schools




13



Trip Generation

Elementary School	Weekday	AM Peak Hour	PM of Generator
Average Students	620	630	645
ITE Trip Equation / Rate	1.29	$\ln(T) = 1.14 \ln(x) - 1.86$	$\ln(T) = 1.09 \ln(x) - 1.92$
Vehicle Trips	800	242	170




15

Trip Generation

Elementary School	Weekday	AM Peak Hour	PM of Generator
Average Students	620	630	645
Private Vehicle Trips	776	230	158
School Bus Trips	24	12	12
Walk/Bike Trips	241	119	122
Public Transit Trips	47	17	17




16

Transportation Demand Management (TDM)

- SRTS is TDM
- Reduce non-single occupancy vehicle trips
- Reduced parking need
- Solutions could include:
 - Walking school bus
 - Carpooling
 - Promotion of alternative modes
 - Staggered classes
 - Transit incentives

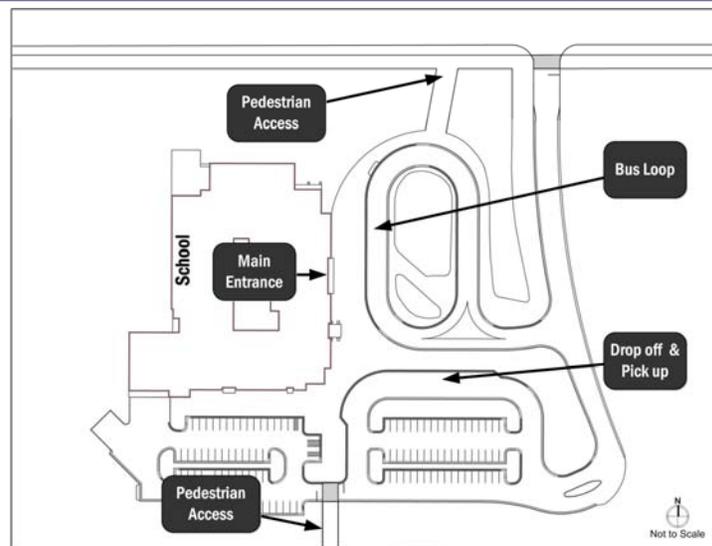


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17

Site Planning Components



Gorove/Slade Associates



18

Site Planning Components

Traffic Operations and Safety at Schools: Recommended Guidelines

- Site selection
- Site requirements and design
- Bus-related design and operations
- Parent drop-off/pick-up zones
- Bicycles and pedestrians
- Driveways
- Turn lanes
- Traffic control, signing and marking
- Parking requirements and design



19

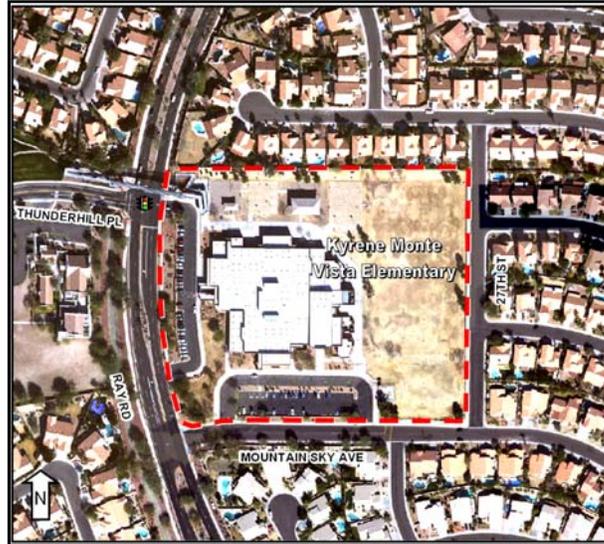
Site Selection

- Situate within the neighborhood
- Avoid primary access from an arterial
- Avoid high volume streets
- Seek multiple street frontages with local streets
- Pedestrian and bike connections on all frontages



20

Poor Site Selection

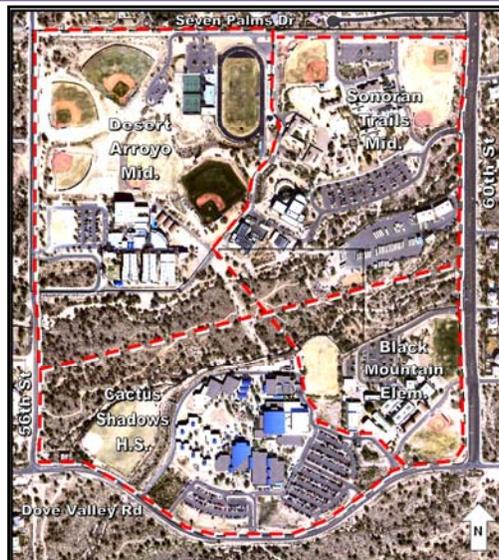


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21

Overly Large Campus



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22

Site Selection

- Seek compact campuses
- Promote interparcel connections
- Coordinate early!



Jennifer Hefferan



23

Interactivity

Are schools being developed in your area for walking and biking?

- Yes, I'm in an urban area with mode options
- Yes, all schools are being planned multimodal
- Somewhat, but we could do more
- No, its not even a consideration



24

Site Requirements

Enough frontage and set backs to:

- Provide adequate driveway spacing
- Allow for adequate loading/unloading
- Accommodate queuing on site



Ben Murch Elementary, Washington, DC -
Jennifer Hefferan




25

Site Requirements

- Out dated site size guidelines from 1970's

School Type	Number of acres (hectares) required CEFPI Guidelines ² (δ)
Elementary (K-6)	10 ¹ (4.05)
Middle (5-8)	20 ¹ (8.1)
Junior High (7-9)	20 ¹ (8.1)
Senior High (9-12)	30 ¹ (12.15)
Vocational Center	10 ¹ (4.05)

¹ Plus 1 acre (0.405 ha) per 100 students on maximum projected enrollment
² Where a school district intends to build two schools on a single site, it is permissible to reduce the total combined acreage by 15% based on the following groupings (elementary/middle, middle/junior high, junior high/senior high, or senior high/vocational center)

- No longer recommended by Council of Educational Facility Planners International (CEFPI), but still being used by some jurisdictions
- Undervalued smaller existing sites
- Pushed schools out to fringe




26

Bus Operations and Design

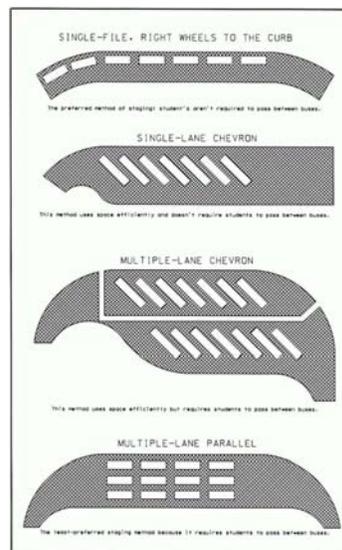
- Separate bus drop off/pick up
- Locate bus exit upstream of automobiles to gain priority and reduce delay
- Drop-off areas should not require backward movement
- One-way, counterclockwise pattern for right-hand loading
- Avoid pedestrian routes



27

Bus Operations and Design

- Rule of Thumb:
5 bus spaces or 2 for every 50 students
- Single-file is preferred
- Loading zones should have two lanes
- Bus parking should be a 15 feet min. width



28

Drop-off and Pick-up

- Not one right way
- Separate buses and cars
- Provide adequate stacking
- Create designated zones to minimize ped/vehicle conflicts
- Load and unload on the right side directly to the curb/sidewalk



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29

Drop-off and Pick-up

- Students safety patrols and loading supervisors should be well trained and wear reflective vests
- Identify short term parking spaces past the student loading area and near the building entrance
- Urban schools may use a public street

Christie McAuliffe Elementary School - Lenexa, KS
Diane Lambert

30

Drop-off and Pick-up

- 1 – Short-term Parking
- 2 – Crosswalks
- 3 – Loading Bays
- 4 – Safety Assistants
- 5 – Waiting Area
- 6 – Advanced ID

The Institute for Transportation Research and Education, North Carolina State University

31

Drop-off and Pick-up

SRTS Guide

Chapter 7

Drop-off and Pick-up Tools

5 E's of SRTS

www.saferoutesinfo.org

This guide was developed by the Division and Bicycle Information Center (DBIC) with support from the National Highway Traffic Safety Administration (NHTSA), Federal Highway Administration (FHWA), Centers for Disease Control and Prevention (CDC) and Institute of Transportation Engineers (ITE). This guide is maintained by the National Center for Safe Routes to School at www.saferoutesinfo.org.

32

Pedestrians

Provide safe sidewalks

- 8' to 10' wide on campus
- Include "stand back lines"
- Minimum 6' wide around campus
- Maintain sidewalks and clear obstacles



R.E. Miller Elementary School, Phoenix, AZ -
Mike Cynecki



33

Pedestrians

Minimize vehicular and pedestrian conflicts

- Separate driveways from sidewalks
- Buffer sidewalks from vehicles
- Drop off locations should not force children to cross traffic



Roadrunner Elementary School - Phoenix, AZ
Mike Cynecki



34

Pedestrians

Provide safe crosswalks

- On-campus crosswalks should not cross loading areas or parking lots
- Place parking restrictions adjacent to crosswalks
- Set stop bars back from crosswalks
- Reduce crossing distances



National Center for
Safe Routes to School

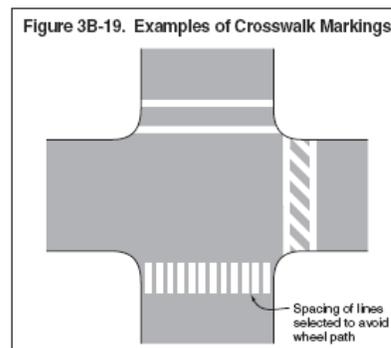


35

Pedestrians

Mark crosswalks

- Where there is substantial conflict between vehicles, bikes and pedestrians
- Where students are encouraged to cross
- To indicate the proper place to cross
- Where motorists and bicyclist would not expect pedestrians



MUTCD 2009 pg 384



36

Pedestrians

New in 2009 MUTCD

- All florescent yellow green
- School children symbol on in-street signs at school crossings
- Overhead ped crossing signs at unsignalized school crossings

Figure 7B-6. In-Street Signs in School Areas

A - In advance of the school crossing

B - At the school crossing

* Reduced size signs:
S1-1 12 x 12 inches
S4-3P 12 x 4 inches
W16-7P 12 x 6 inches
W16-9P 12 x 6 inches

Notes:
1. The use of the STATE LAW legend is optional on the R1-6 series signs (see Section 7B.12).
2. The use of the SCHOOL plaque above the R1-6 and R1-6a signs is optional.

MUTCD pg 741

37

Pedestrians

- The MUTCD has crossing guards standards for qualifications, uniforms and operating procedures in Chapter 7D.

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Bicycles

- Create environment acceptable for inexperienced riders
- Create and distribute bike and pedestrian maps
- Include on-site facilities
- www.saferoutesinfo.org/training/can_webinars.cfm



Jennifer Hefferan



39

Bicycles

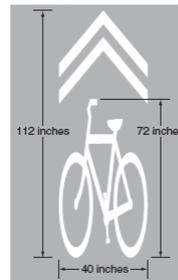
New in 2009 MUTCD:

- Signage must be retroreflectorized
- “Bicycles May Use Full Lane” Sign
- Bicycle Warning Sign
- Combined Bicycle/Pedestrian Signs



R4-11

Figure 9C-9. Shared Lane Marking



MUTCD 2009



40

Driveways

- Minimize major pedestrian crossings at driveways
- Driveways need to conform to local standards
- Located with adequate sight distance
- Typically a minimum of two; one for buses and one for vehicles
- Spacing requirements vary



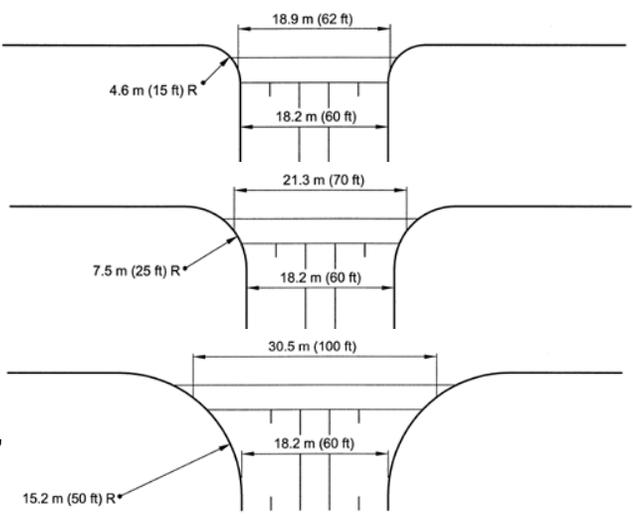

41

Driveways

R = 15'
Crossing = 62'

R = 25'
Crossing = 70'

R = 50'
Crossing = 100'

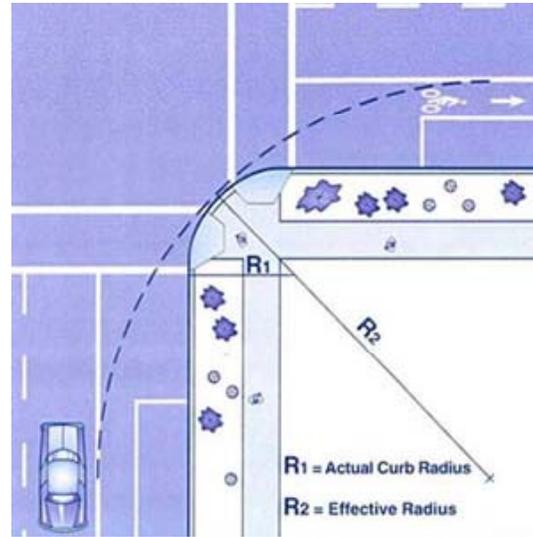




<http://www.tfhr.gov/safety/pubs/04091/09.htm#911>

42

Driveways



Safe Routes to School Guide



43

Turn Lanes

- Follow state and local guidelines
- Requirements converge toward 500-600' for a left turn lane, but not all jurisdictions require them unless warranted
- Utilize traffic study to determine demand
- Avoid defacto turn lanes
- Inadequate length can result in spillback
- Unnecessary turn lanes widen crosswalks



44

Traffic Controls

- All site and regulatory signage and markings should comply with MUTCD
- MUTCD 2009 applies to all roads “open to public travel”
- Signs should be mounted at standard heights
- SRTS Guide – Chapter 3 Engineering



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45

Traffic Controls

- Paint curbs in drop-off/pick-up areas yellow and no parking red
- Mark curbs with “No Parking or Standing” with the exception of the loading zones
- Provide “Buses Only” at the bus loop



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46

Traffic Controls

- Reduce and control driver's options
- Restrict turning movements during school beginning/ending periods to reduce congestion
- Use traffic cones and other channelizing devices to minimize ped/vehicle conflicts



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47

Parking

- ITE Parking Generation has very limited data
- Interact with school administration
- Need will depend on school location, policies and access to transit



48

Parking

- Separate parking from loading areas
- Mark short term parking
- Staff parking can be located farther from building
- Avoid pedestrian paths through parking lots

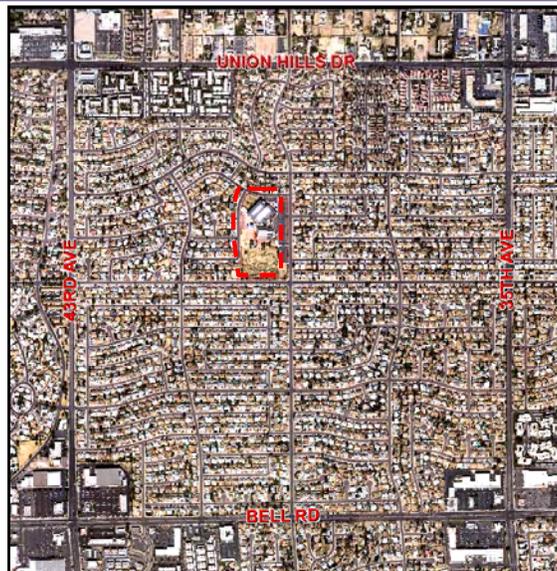


Pedestrian path-retrofit of existing parking lot
Roadrunner Elementary School, Phoenix, AZ -
Mike Cynecki



49

Mirage Elementary School



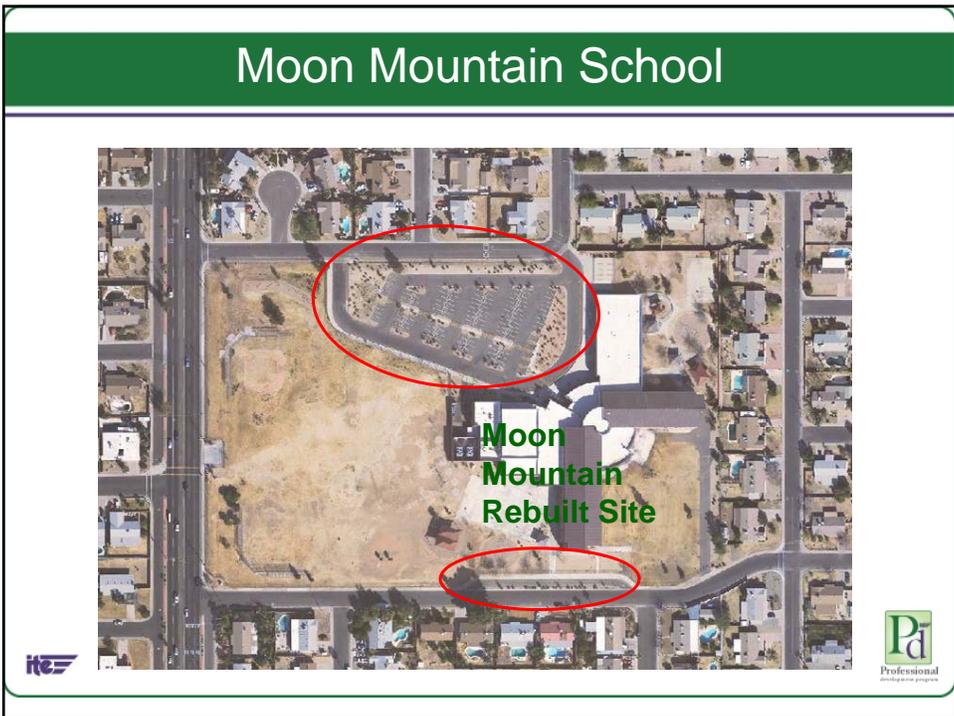
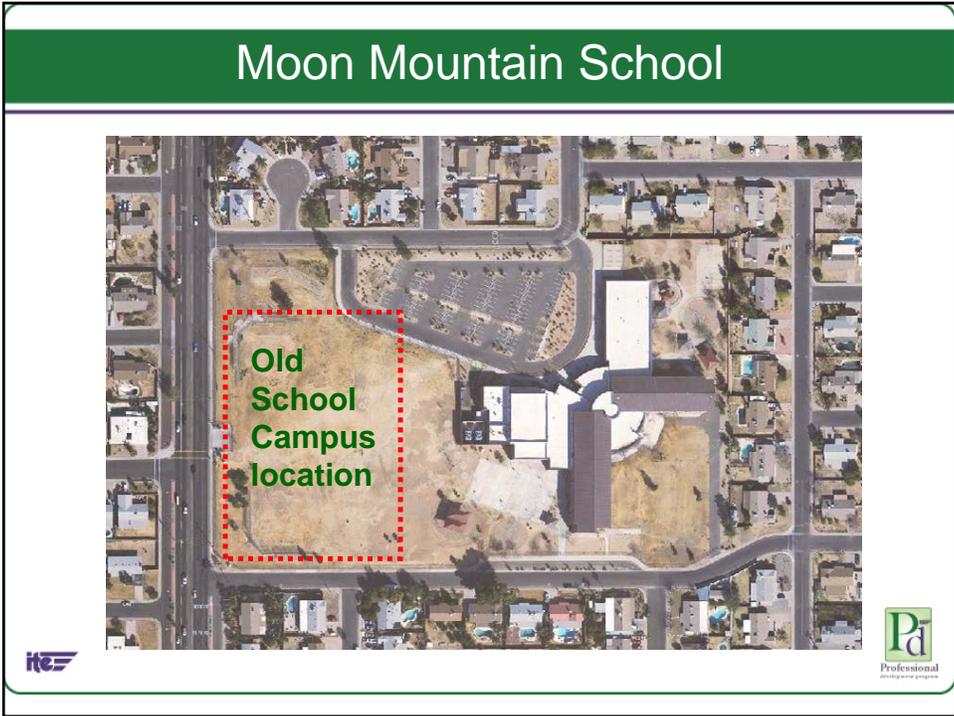
Mirage Elementary School

Good Campus Site & Layout –
Vehicle access on three sides.
Pedestrian and Bike access on all four sides



Christa McAuliffe School





Moya Elementary School



**Planned
School
Site:
No Neighborhood
Access**

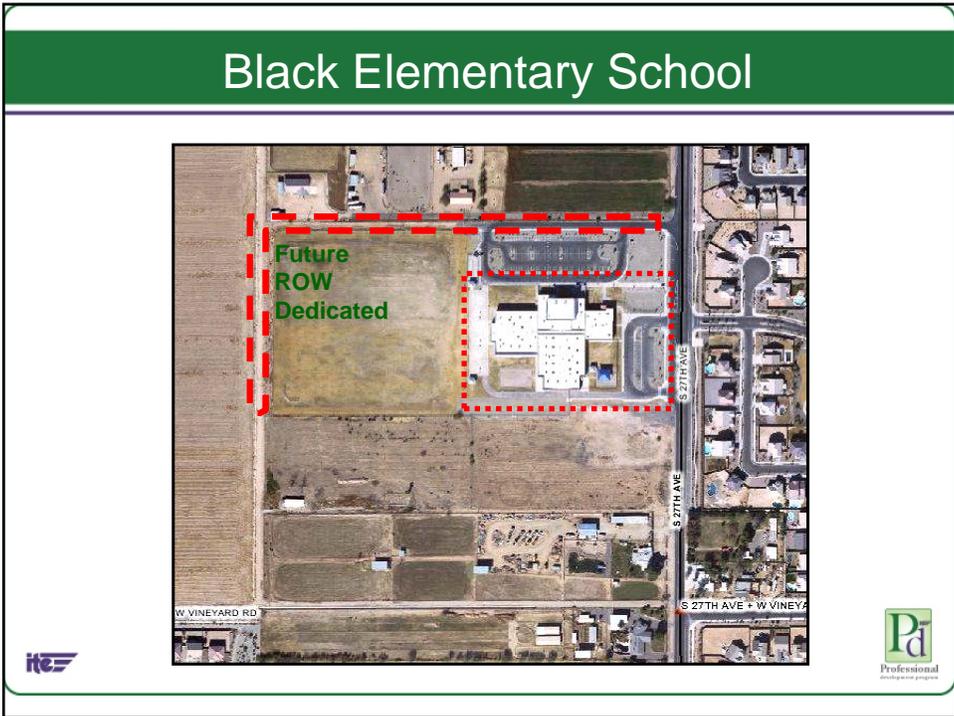
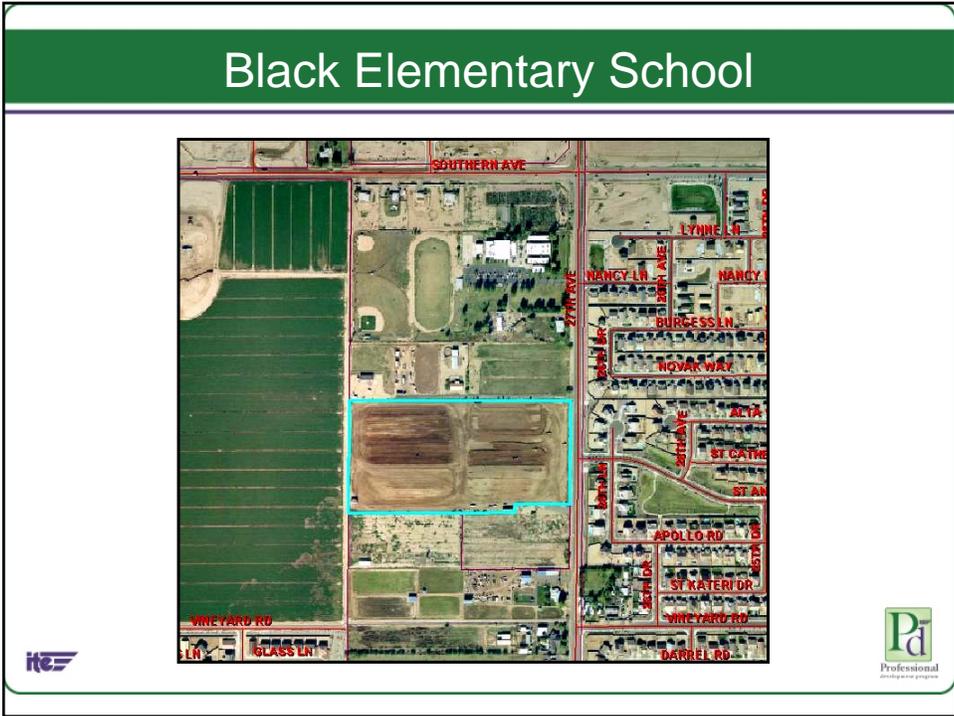


Moya Elementary School



**Ultimate
School Site**

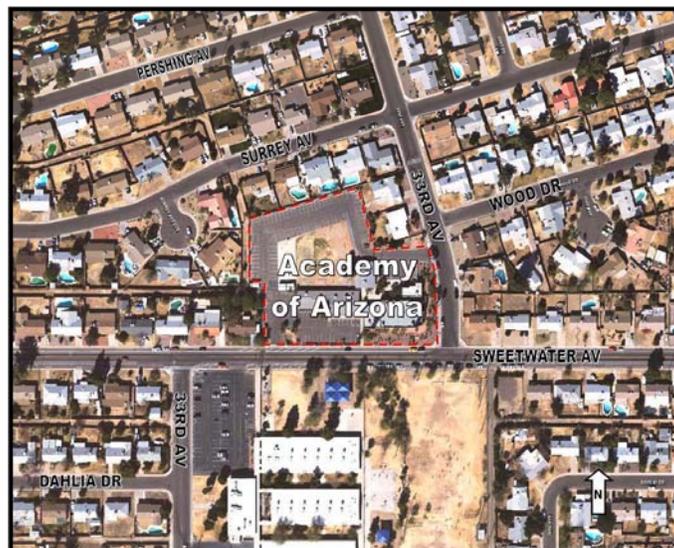




Chancelor Charter School



Academy of Arizona



Urban School Case Studies

Washington, DC Context

- Very small sites
- Tiny parking lots
- Existing network of pedestrian facilities
- Limited school buses



61

Patterson Elementary



62

Patterson Elementary



South Capitol Terrace

South Capitol Street

School Entrance

Patterson Elementary School

Functional Classification

- Local Street
- Minor Arterial



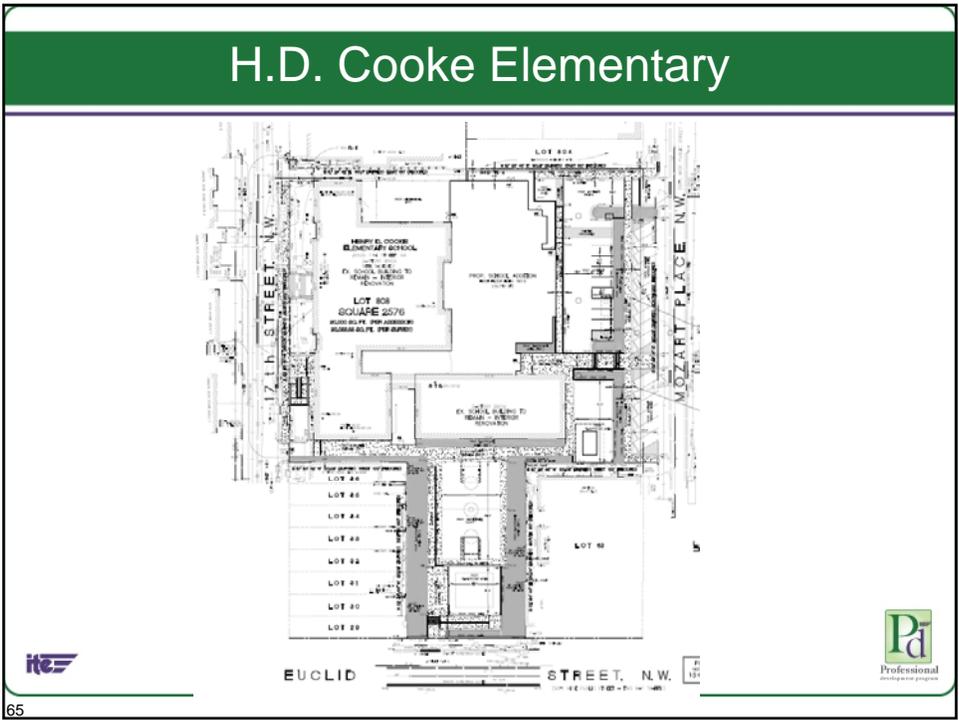
63

H.D. Cooke Elementary

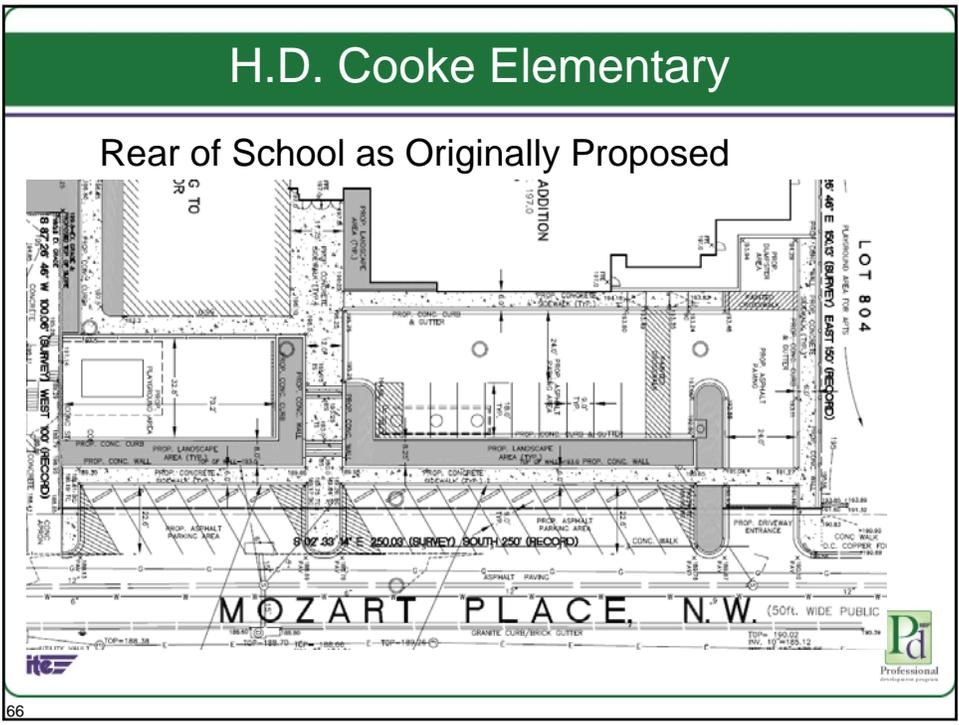




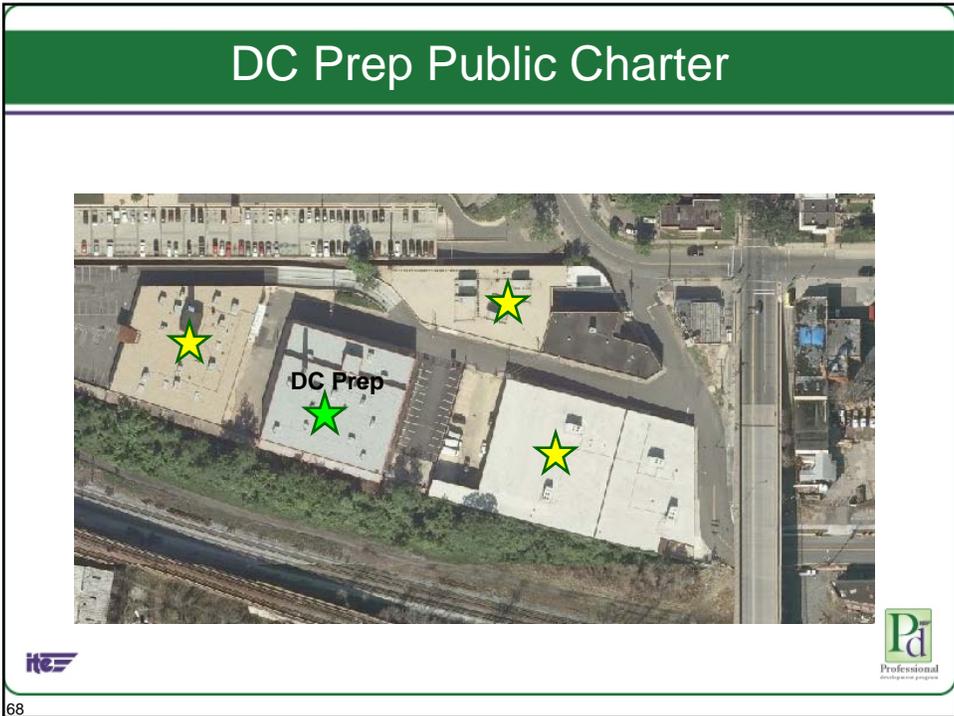
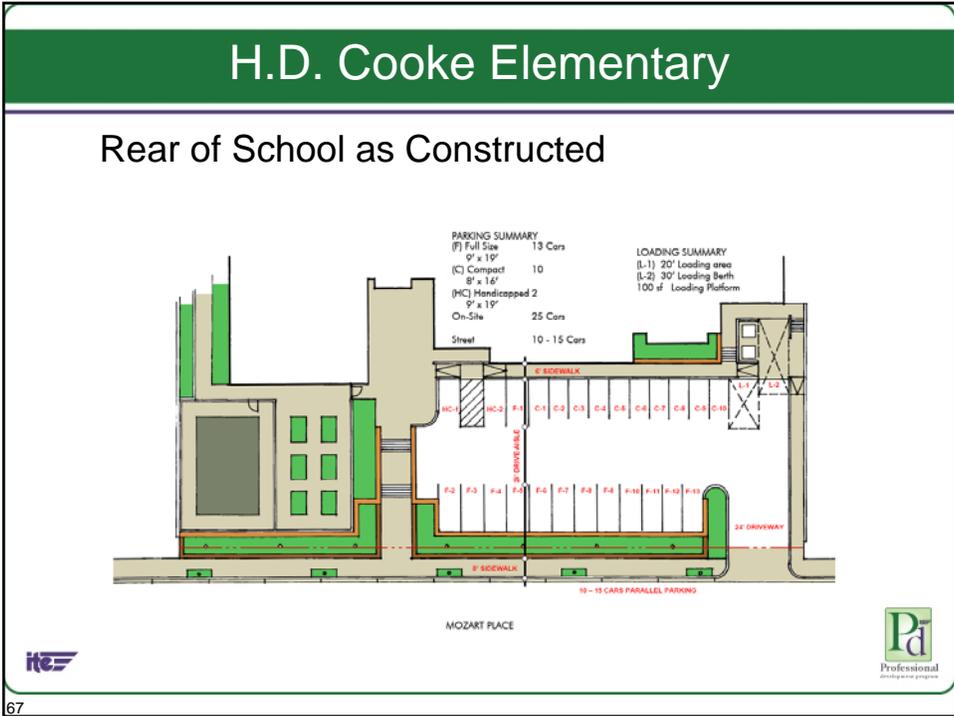
64



65



66



DC Prep Public Charter



The photograph shows a multi-story brick building with large windows, identified as DC Prep Public Charter. In the foreground, there is a parking lot with several cars parked. An inset image on the left provides a closer view of the building's facade and the parking area.



69

DC Prep Public Charter



An aerial photograph of the DC Prep Public Charter campus. A green star marks the building labeled "DC Prep". A green arrow points from the building towards a "Large Parking Lot" with the text "Covered Pedestrian Walkway to Large Parking Lot" above it. Another green arrow points from the building towards a "New Trail" located near a railway track.



70

EL Haynes Public Charter





71

EL Haynes Public Charter





72

EL Haynes Public Charter



73

Summary

- 50% that live within $\frac{1}{4}$ - $\frac{1}{2}$ mile still drive
- Societal factors have played a role
- Trip gen. data varies widely – need more multi-modal data
- School facilities and local conditions vary
- Old design guidelines still in use
- Compact sites in the neighborhood are preferred
- Certain sites may never be multi-modal
- Coordinate early



74

Summary

- Separate buses and cars
- Drop-off/pick-up in counterclockwise pattern
- Manage drop off/pick up to encourage walking/biking
- Provide safe sidewalks and crosswalks
- Minimize pedestrian and bike conflicts with vehicles
- Avoid pedestrian routes through parking lots



75

Summary

- Minimize intersection crossing lengths
 - Avoid unnecessary turn lanes and wide lanes
 - Avoid large radii
- All traffic controls must comply with MUTCD
- Determine parking needs based on local factors
- SRTS Guide is a helpful resource
- Case studies wanted



76

Questions



77

Thank You

Please provide your feedback. A link to an online Web seminar evaluation and quiz will follow in an e-mail to Web seminar registrants. Please distribute this email to participants at your site. The assessment and evaluation will close in one week.

Questions/Comments
Professional Development Department
ITE
1627 I Street, NW, Ste 600
Washington, DC 20006
202-785-0060; pdinfo@ite.org



78