



Virginia Center *for* Transportation  
**INNOVATION**  
& **RESEARCH**

*We bring innovation to transportation.*

---

# Innovative Pavement Markings to Facilitate Bicycle Travel

March 26, 2014

Peter Ohlms

*Research Scientist*

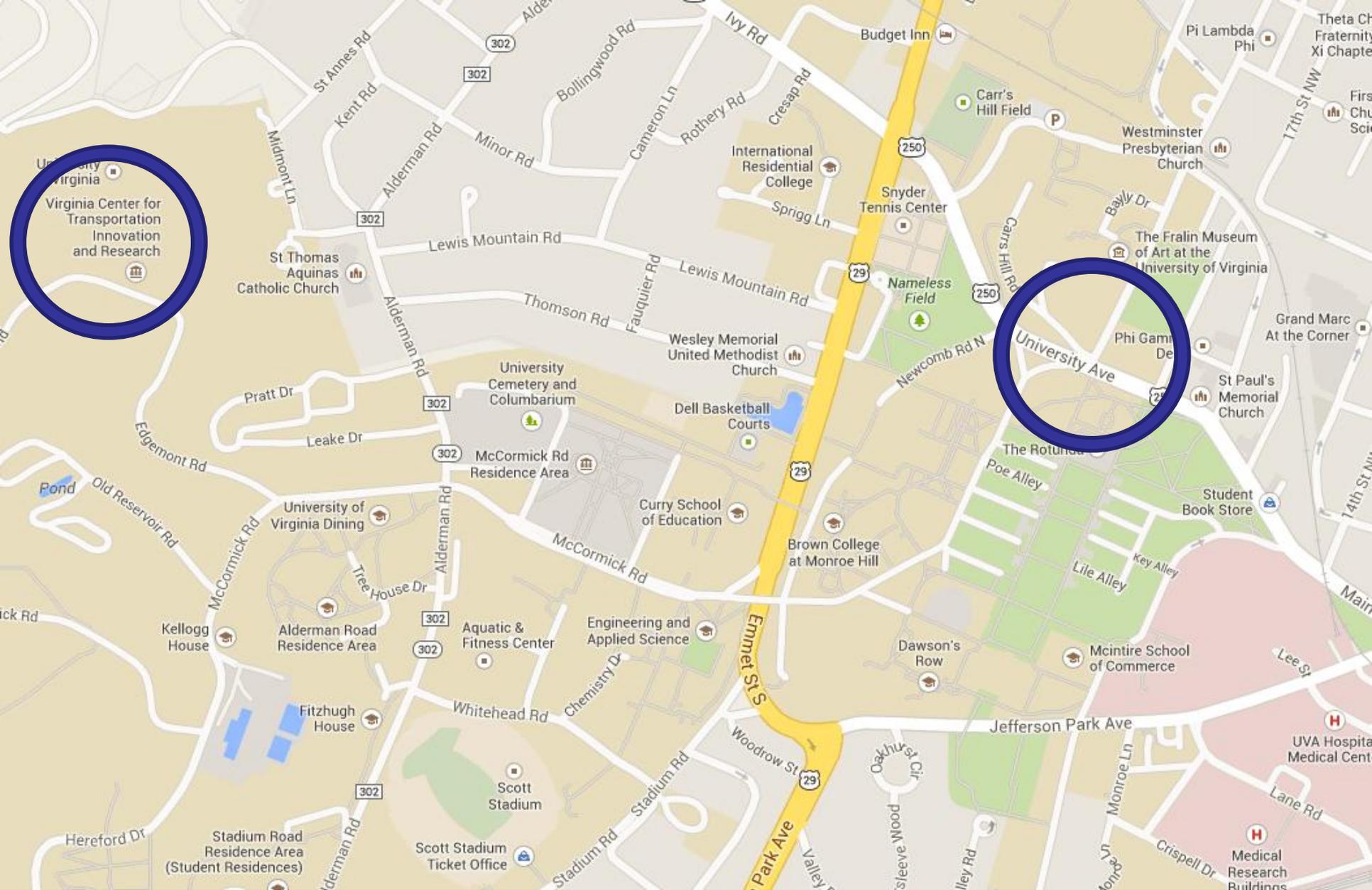
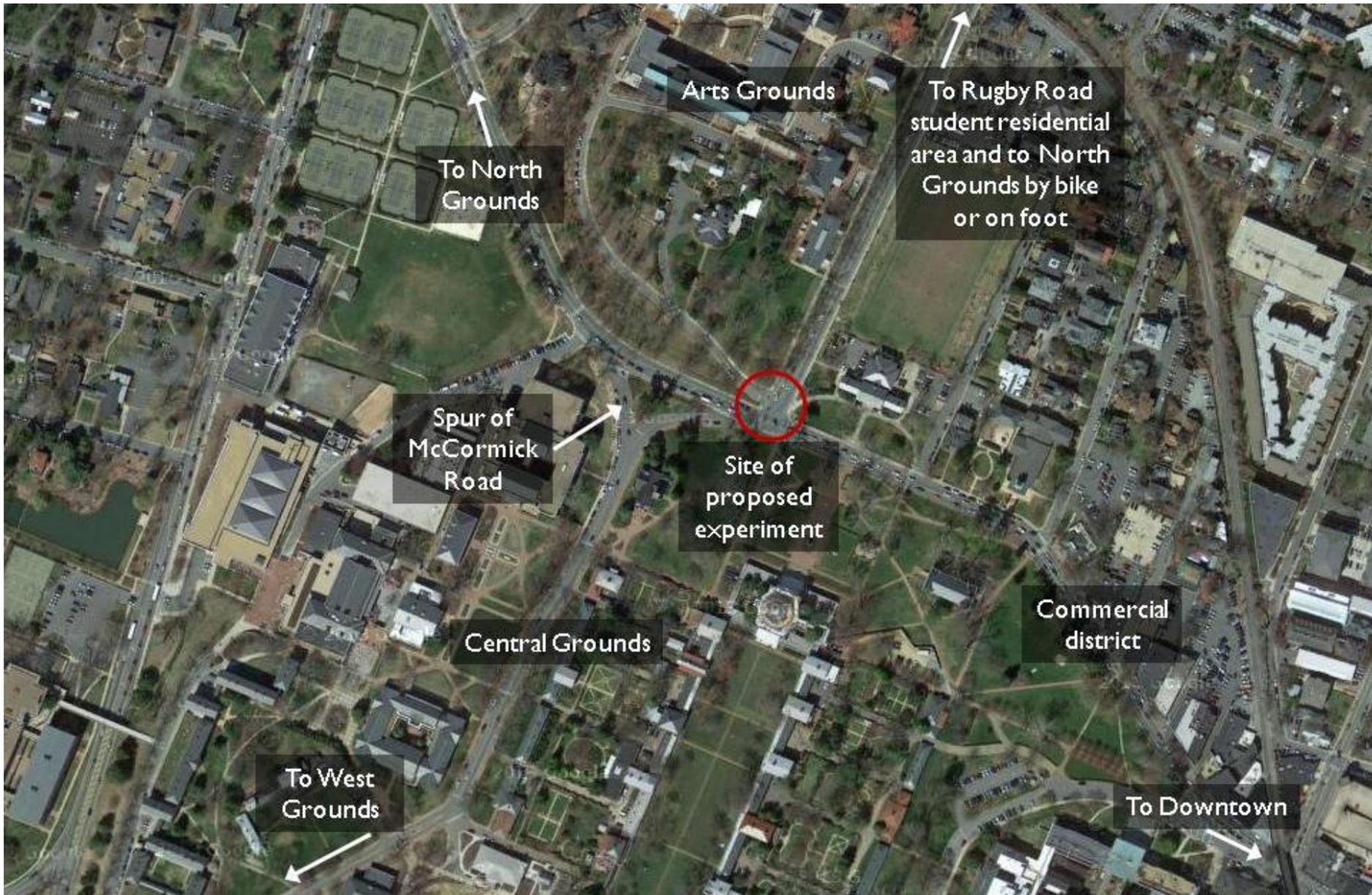


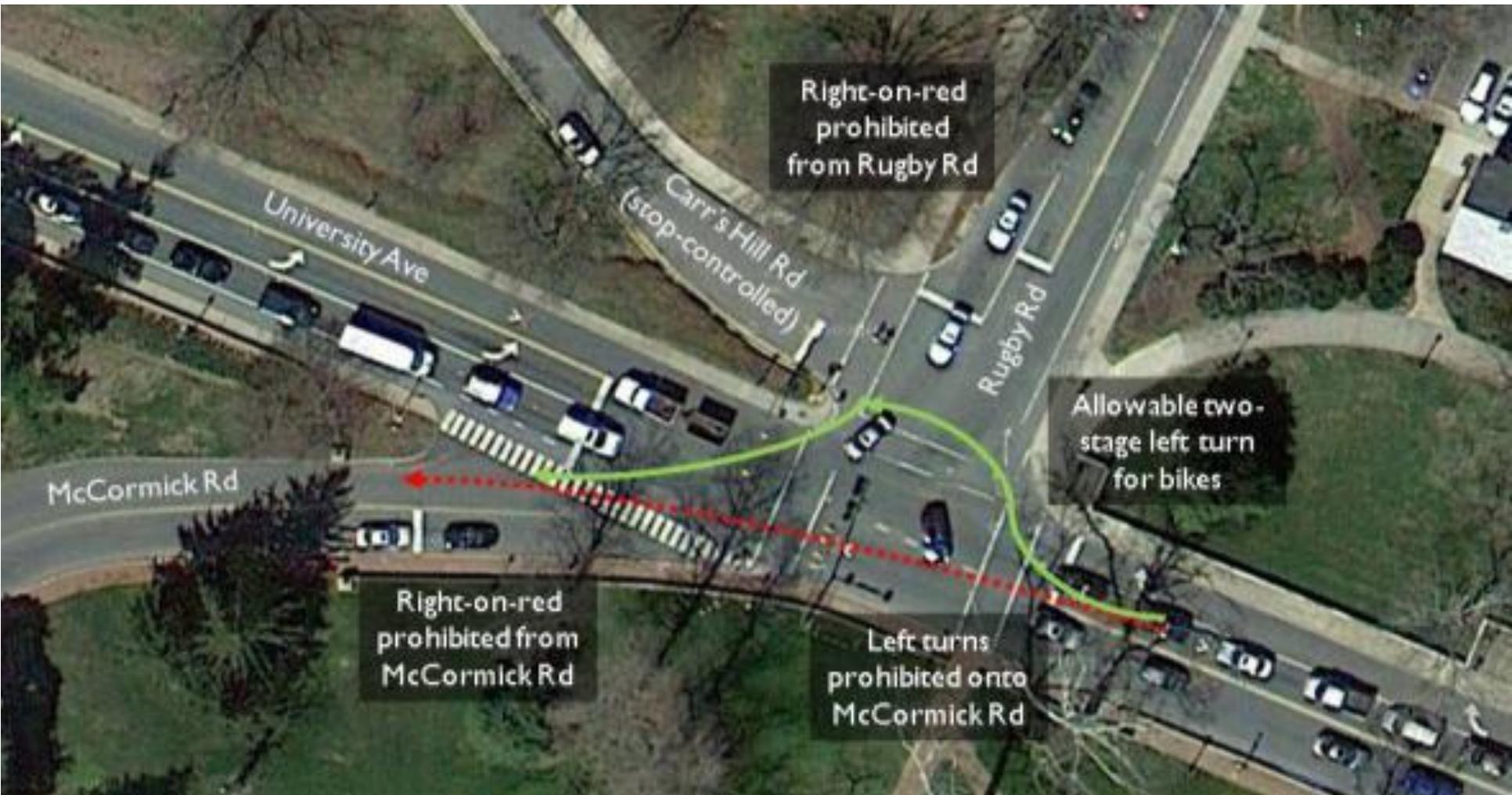
Image from Google Maps; Map data ©2013 Google





Google Maps imagery © 2013 Commonwealth of Virginia, DigitalGlobe, USDA Farm Service Agency





# Two-Stage Left Turn

1. Approaching on a green signal, proceed to designated bicycle waiting area.



2. Proceed across intersection when cross street has green signal.



# Bike Box

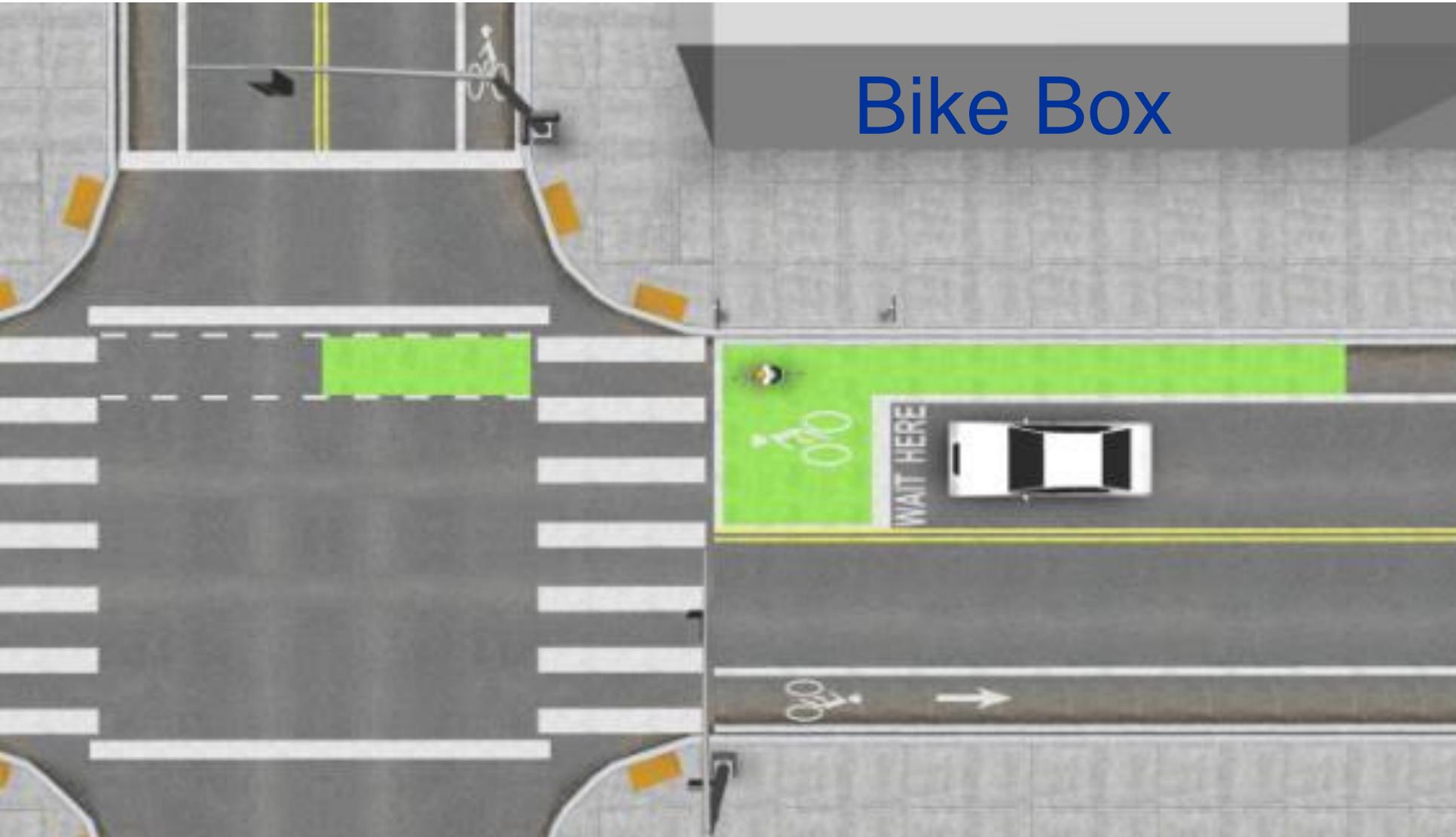
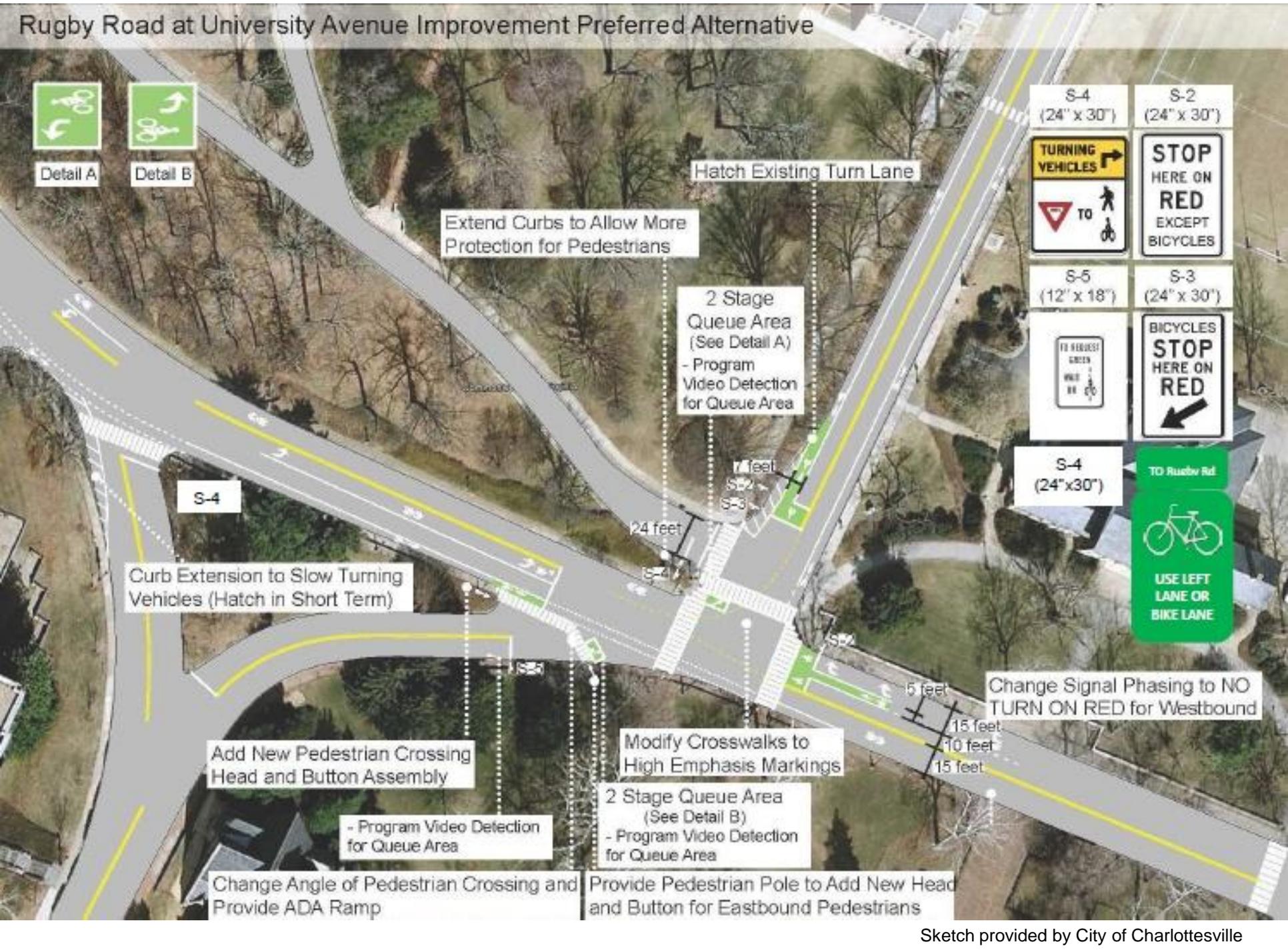


Image from <http://nacto.org/cities-for-cycling/design-guide/intersection-treatments/bike-boxes/>.



# Rugby Road at University Avenue Improvement Preferred Alternative



Extend Curbs to Allow More Protection for Pedestrians

Hatch Existing Turn Lane

2 Stage Queue Area (See Detail A)  
- Program Video Detection for Queue Area

S-4

Curb Extension to Slow Turning Vehicles (Hatch in Short Term)

Add New Pedestrian Crossing Head and Button Assembly

- Program Video Detection for Queue Area

Change Angle of Pedestrian Crossing and Provide ADA Ramp

Modify Crosswalks to High Emphasis Markings

2 Stage Queue Area (See Detail B)  
- Program Video Detection for Queue Area

Provide Pedestrian Pole to Add New Head and Button for Eastbound Pedestrians

S-4 (24" x 30")	S-2 (24" x 30")
TURNING VEHICLES TO BICYCLES	STOP HERE ON RED EXCEPT BICYCLES
S-5 (12" x 18")	S-3 (24" x 30")
TO REQUEST CROSS WALK BE BICYCLES	BICYCLES STOP HERE ON RED
S-4 (24" x 30")	TO RUGBY RD. USE LEFT LANE OR BIKE LANE

Change Signal Phasing to NO TURN ON RED for Westbound

# Conflict Analysis

- Surrogate for crash analysis
- Apparent conflicts (legal violations)
  - Bicyclist making an illegal left turn
  - Motorists illegally turning right on red
  - Bicyclists proceeding on a red signal indication
- Actual conflicts between bicyclists and other road users
  - Precautionary or emergency braking
  - Precautionary or emergency change of direction
  - Full stop





Virginia Center *for* Transportation  
**INNOVATION**  
& **RESEARCH**

*We bring innovation to transportation.*

# Innovative Pavement Markings to Facilitate Bicycle Travel

**Peter Ohlms**  
*Research Scientist*

## **Technical Review Panel**

John Bolecek, VDOT TMPD (co-champion)  
Harry Campbell, VDOT TED (co-champion)  
Ben Cottrell, VCTIR SOTE  
Martha Kapitanov, FHWA Virginia  
Jon Monceaux, UVA Parking & Transportation  
Dan Painter, VDOT Culpeper  
Amanda Poncy, City of Charlottesville



Virginia Center *for* Transportation  
**INNOVATION**  
& **RESEARCH**

*We bring innovation to transportation.*

---

# Overview of VCTIR Research Program

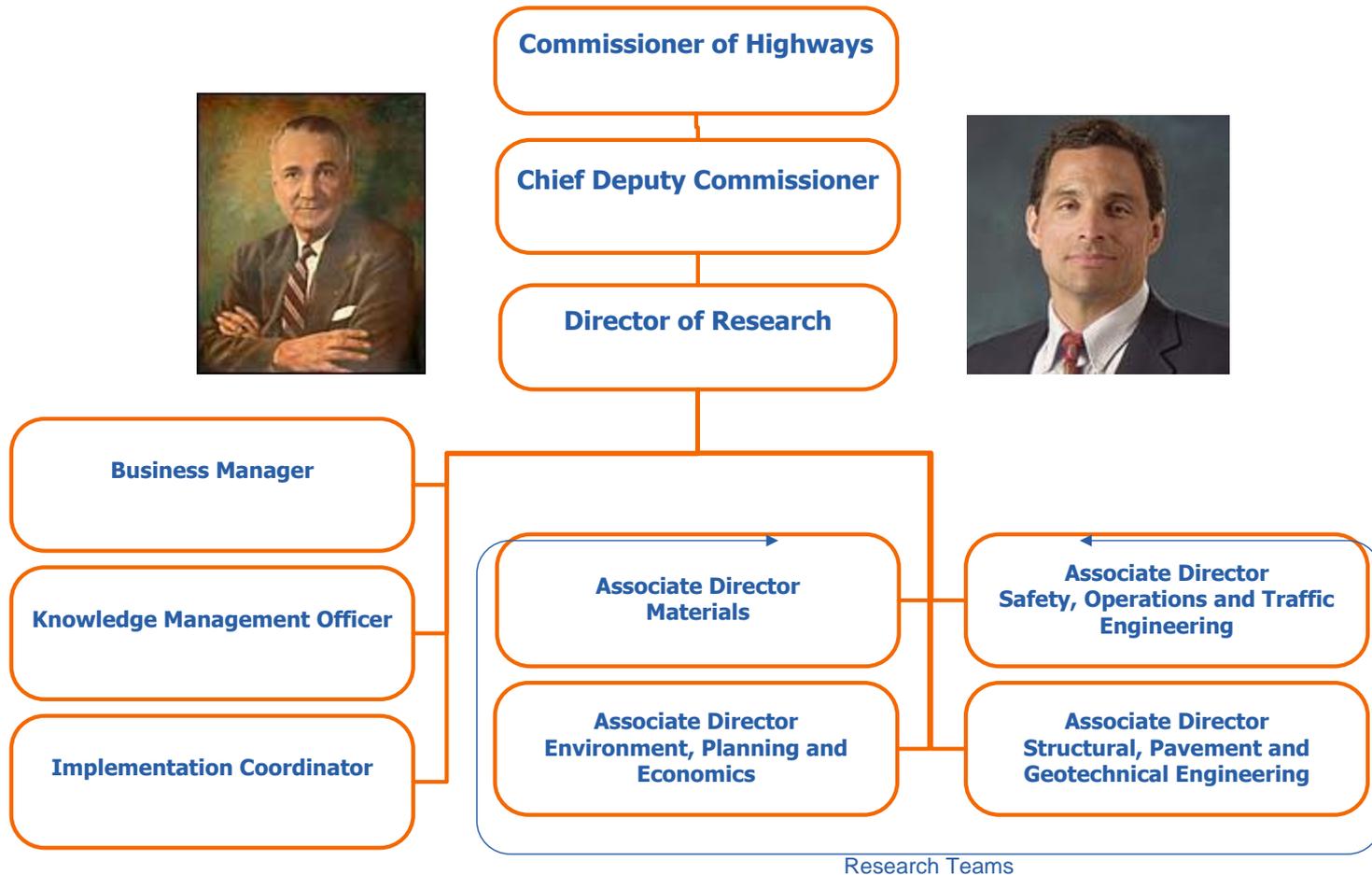
BPAC

3/26/2014

# VCTIR



# VCTIR Leadership Team

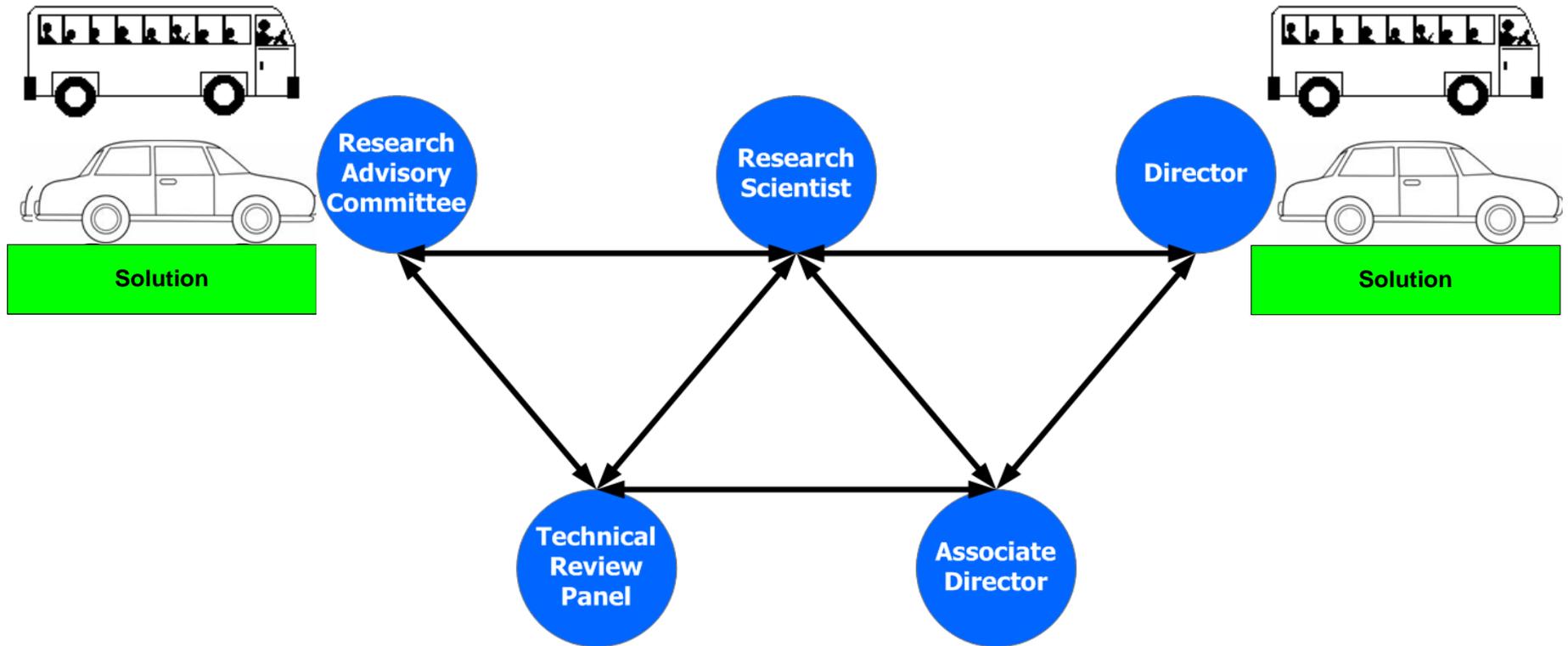


# Core Functions

- Develop and deliver an applied research program that supports the VDOT mission
- Provide expert consultation to VDOT Operations
- Provide post-research implementation support
- Provide educational opportunities for future professionals through graduate assistantships
- Provide technical oversight of university contract research



# VDOT's Research Bridge to Solutions



# How We Get the Research Done

- In-house staff (50 full-time employees)
- University faculty and graduate students through contract research



# Implementation

- Research focuses on implementation from the beginning
  - Benefits
    - Monetary (short- and long-term)
    - Other (safety, efficiency, etc.)
  - Resources needed
    - Money
    - People and roles
  - Field demonstration (if applicable)



# FY 12 Funding Sources

- State \$1,181,477 (state project and Mid-Atlantic University Transportation Center)
- State Planning and Research (federal allocation) \$5,752,604
- Grants \$5,703,841
- Other Sources \$2,682,372
- **TOTAL FY12 \$15,320,294**



# Contract Research

Note: The reported figures are total lifetime value of active contracts

- **State** \$107,657
  - **SPR** \$2,798,512
  - **Grants** (Bridge programs, Pooled Fund Studies, FHWA earmarks, universities/ state agencies) \$14,236,910
  - **Other Sources** \$3,861,192
- TOTAL (Lifetime)** \$21,004,271



# Universities Play Key Role

- Expansion of the research program
- Partnerships to leverage resources, attract grants for collaborations
- Shared laboratories
- Effective access to faculty and students





Virginia Center *for* Transportation  
**INNOVATION**  
& **RESEARCH**

*We bring innovation to transportation.*

For more information:

**Peter Ohlms**

**Peter.Ohlms@vdot.virginia.gov**

Director of Research:

**Jose Gomez**

**Jose.Gomez@vdot.virginia.gov**