An Examination of Current Practices in Roundabout Lighting

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Background

- FHWA/AASHTO International Scan on Road Lighting (2000)
- High interest in U.S. for roundabouts
- No U.S. standard practice for roundabout lighting (ref. IESNA)

Study Goals

1. Review current practices in roundabout lighting.
2. Compare with known design criteria from elsewhere (e.g. FR, UK, AUS).
3. Provide information to IESNA Roundabout Lighting Subcommittee for consideration in U.S. standards development.

Study Focus

Single lane roundabouts in suburban and rural areas.

Study Methodology

- Review various lighting configurations
  - No lighting
  - Peripheral without approach lighting
  - Peripheral with approach lighting
- Videos, photos, and light levels
- Data Analysis

Data Analysis

- Crash Data Review
- Subjective analysis
  - visibility of overall roadway, pedestrians, others.
- CCD meter color spectrometry
  - comparative analysis across roundabouts.
- Computer-based models
  - detailed review of lighting balance, uniformity and visibility of roundabout features and users.

Existing Guidance

FHWA-RD-00-067 Roundabouts: An Informational Guide

Street Classification	Area Classification	Average Maintained Illuminance Values	Illuminance Uniformity Ratio (Average to Minimum)
Arterial	Commercial	17 lx (1.7 fc)	3 to 1
	Intermediate	13 lx (1.3 fc)	
	Residential	9 lx (0.9 fc)	
Collector	Commercial	12 lx (1.2 fc)	4 to 1
	Intermediate	9 lx (0.9 fc)	
	Residential	6 lx (0.6 fc)	
Local	Commercial	9 lx (0.9 fc)	6 to 1
	Intermediate	7 lx (0.7 fc)	
	Residential	4 lx (0.4 fc)	

- Illumination recommended for all roundabouts but not mandatory (rural with no other lighting)
- 80m transition lighting
- Recommends perimeter lighting and approach lighting
- Level should be sum of intersecting street levels

Existing Guidance

International References

Centre d'Etudes des Transports Urbains – Illumination of Roundabouts

- Approach or center lighting acceptable ranging from 23 to 35 lux

Australian / New Zealand Standard

- Recommends approach lighting
- Ranges from 5 to 20 lux minimum illuminance

Placement/Level Comparison

Center Mounted Lighting
8-400W HPS

Approach Mounted Lighting
8-250W HPS

Center Lighting

Approach Lighting

Site Selections

- Daytime review of 20+ roundabouts in Maryland.
- Several selected for nighttime review.
- Four used in final analysis.

Folly Quarter Roundabout

- Newly constructed rural single lane roundabout.
- Lighting not activated.

Folly Quarter Roundabout
Luminaires not operating

Folly Quarter Roundabout

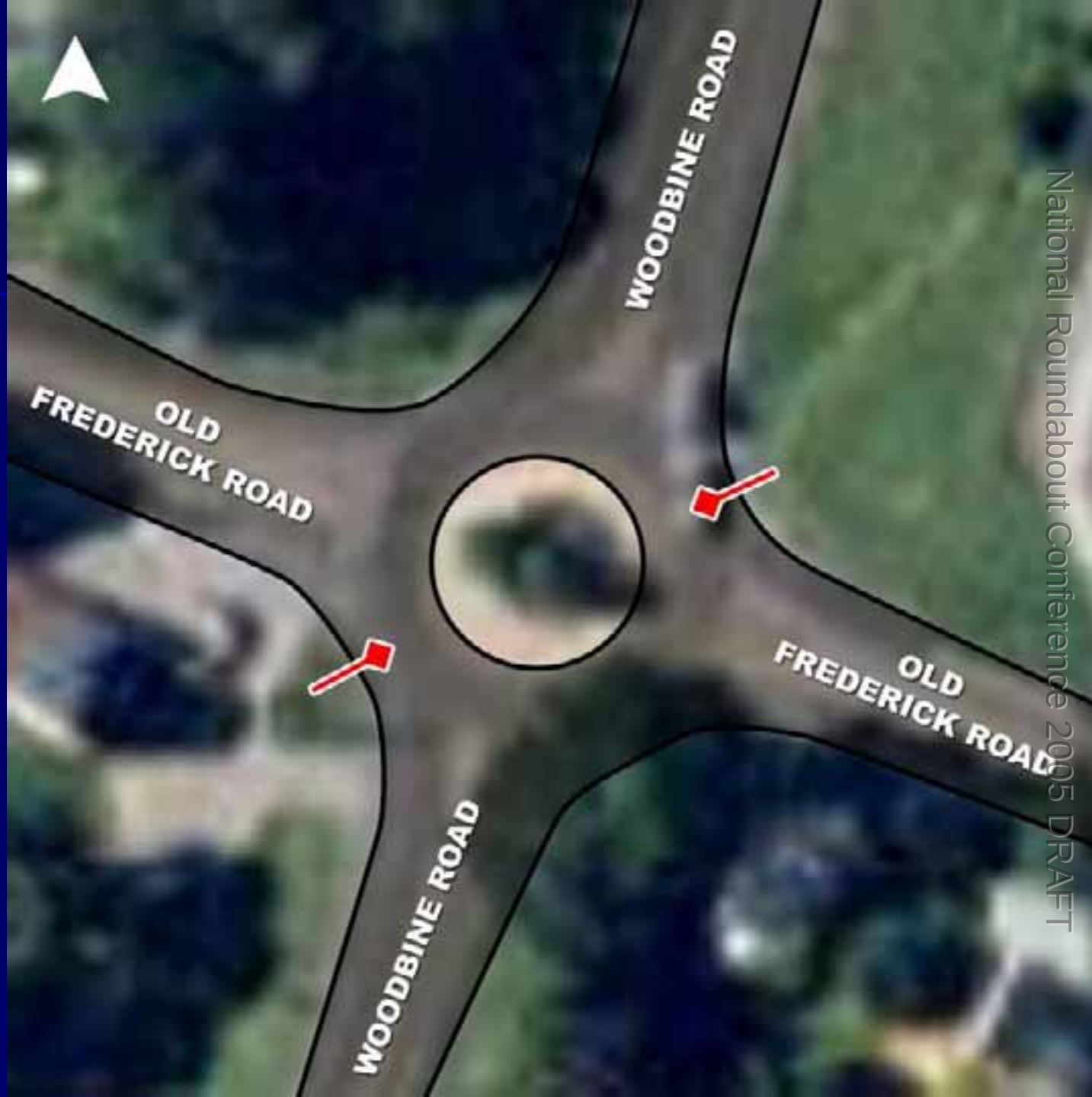
Findings
Folly Quarter Roundabout

- Roundabout lighting is important and necessary especially in the absence of any other light sources.
- Well-designed, high quality signs and markings have a significant safety value. Even with well-lit roundabouts.

Woodbine Road and Old Frederick Road

- Rural single lane roundabout.

Two light fixtures located diagonally across the roundabout.



North Lisbon Roundabout
2-250W HPS Cobra Head Luminaires

North Lisbon Roundabout
2-250W HPS Cobra Head Luminaires
8 to 12 lux

Woodbine Road and Old Frederick Road

Findings
Woodbine Road and Old Frederick Road

- Overcomes worst aspects of no lighting.
- Lack of uniformity in the lighting.
- Does not make the pedestrian visible in at least half of the crosswalks.
- Considering typical maintenance cycles, negative effects of burnouts are far greater than with other lighting configurations.

MD180 and MD17

- Single lane rural roundabout

Four light fixtures placed symmetrically

MD180 and MD17

Findings
MD180 and MD17

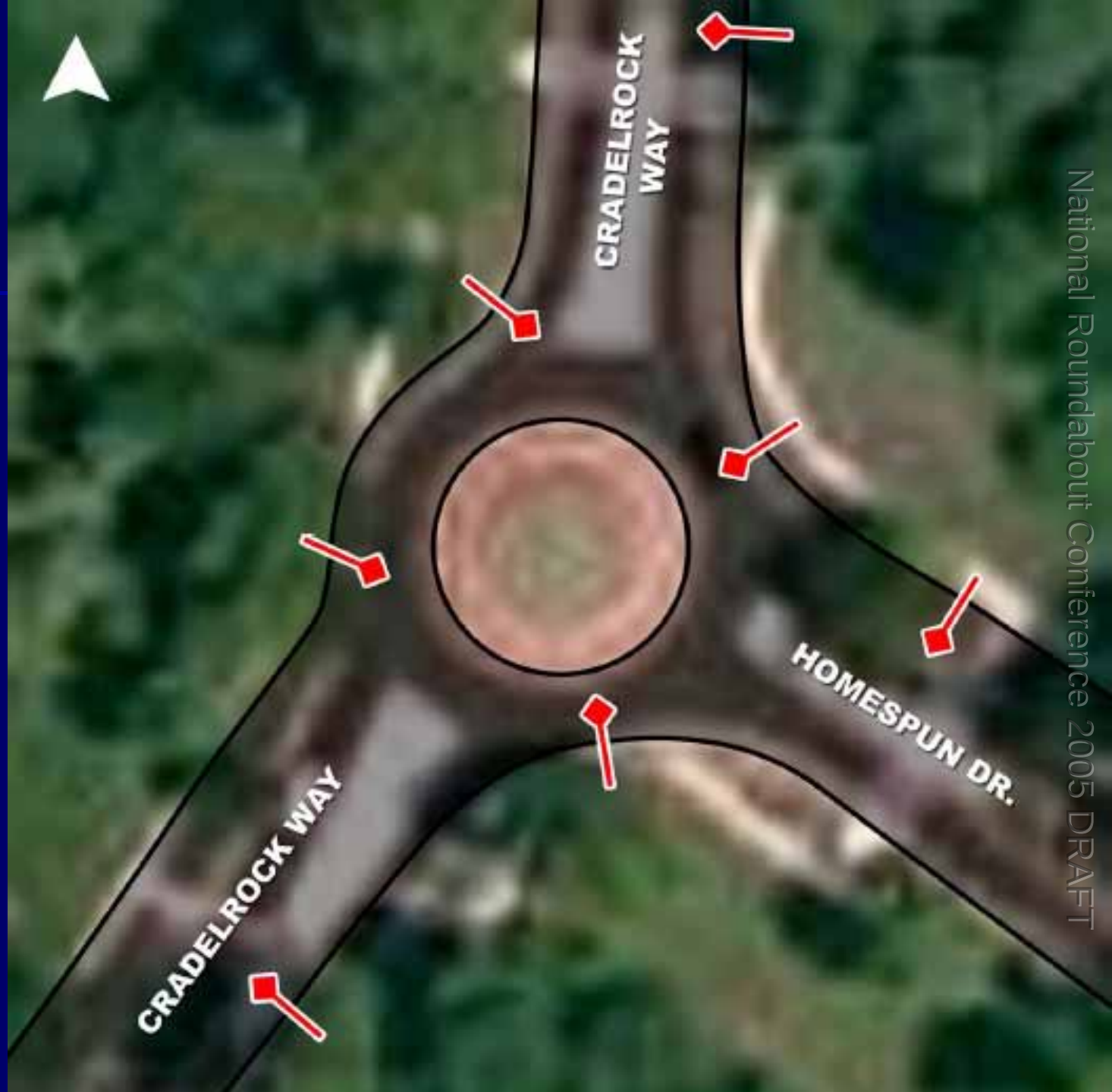
- After close evaluation of photos, videos and CCD meter output, it was determined that the site was not suitable for drawing meaningful conclusions with regard to the roadway lighting and environment.

Cradlerock Way and Homespun Drive

- Single lane, 3-leg, suburban roundabout

Cradlerock Roundabout
7-250W HPS Cobra Head Luminaires

Light fixtures placed in close approximation to the French Roundabout Lighting Guide



Cradlerock Roundabout
7-250W HPS Cobra Head Luminaires
30 to 40 lux

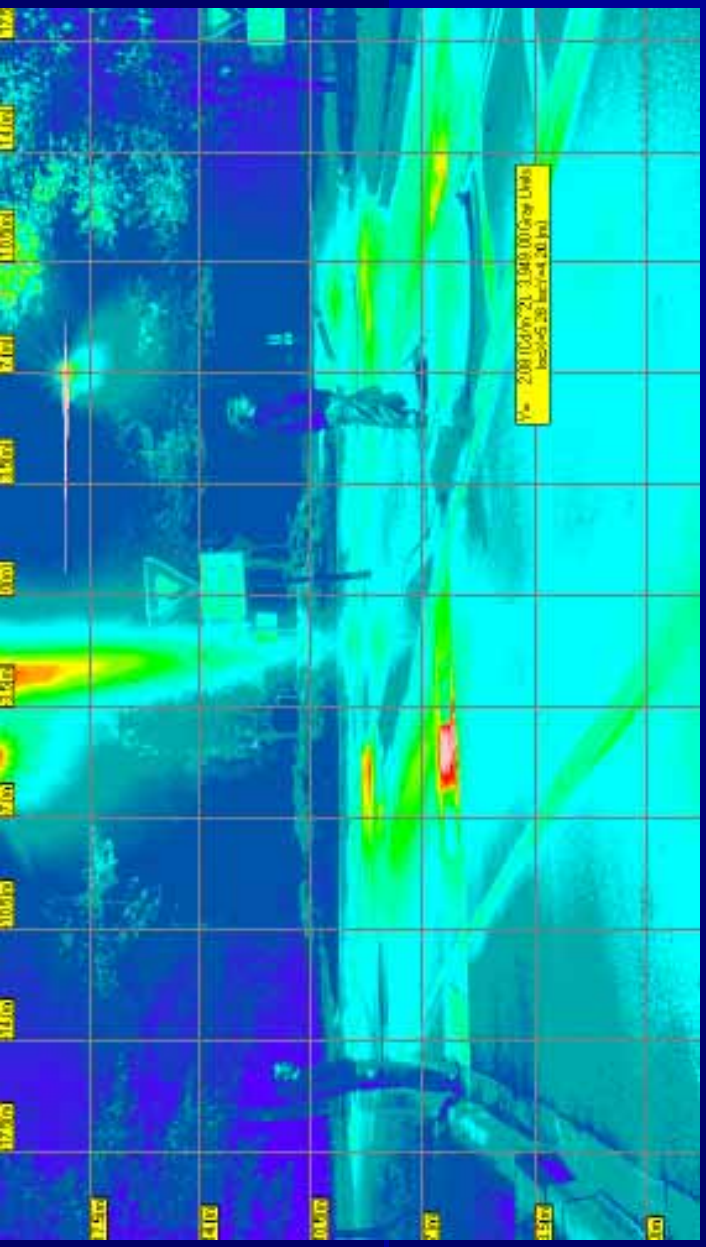
Cradlerock Way and Homespun Drive

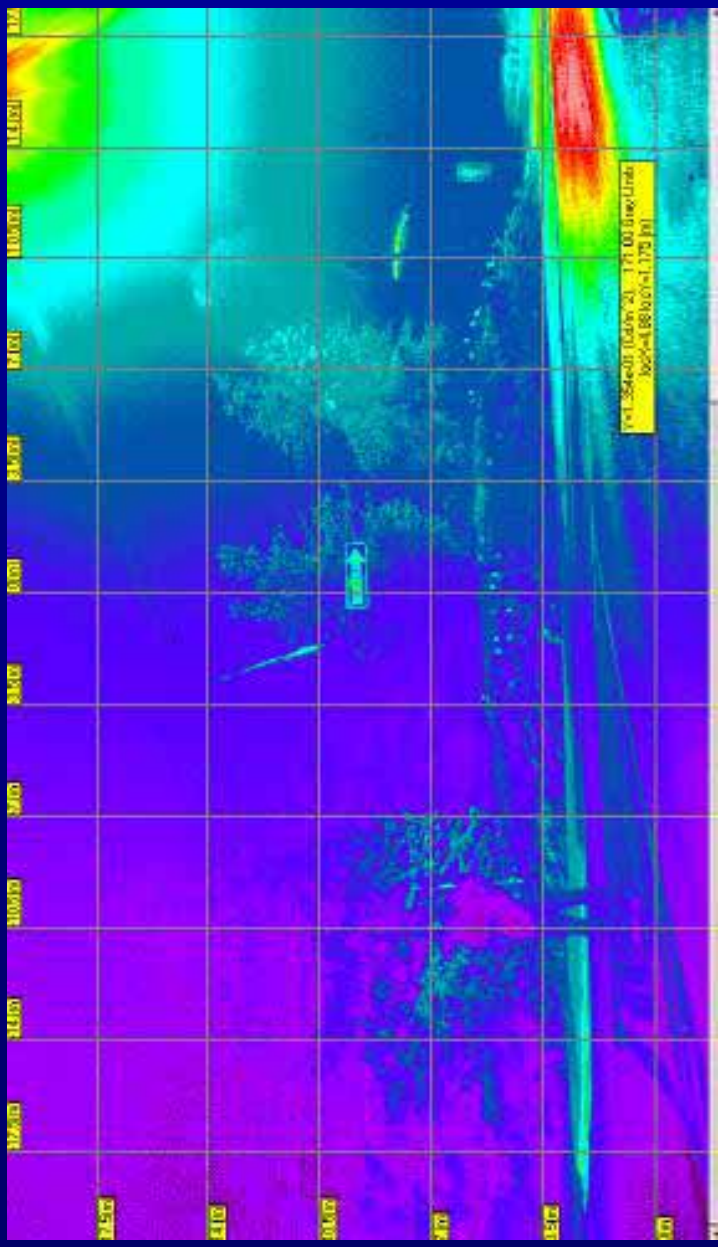
Findings
Cradlerock Way and Homespun Drive

- Approaching, features clear and conspicuous.
- All crosswalks are clearly identifiable and pedestrians in the crosswalk are visible.
- On the circular roadway, can clearly see around the roadway and anticipate entering or exiting vehicles as well as pedestrians.

Findings - Pedestrians
Cradlerock Way and Homespun Drive

- Distinct differences in the visibility of pedestrians comparing roundabout only lighting and approach lighting.
- Contrast values for pedestrians were higher for the roundabout with approach lighting.





Conclusions

- Lighting should be provided for all roundabouts.
- Approach lighting for a roundabout appears to be critical, particularly with the presence of a pedestrian crosswalk.
- The importance of good signing and pavement markings was reinforced.

Conclusions

- 10 lux minimum values with good uniformity will likely result in average of 20 lux or above as a design value.
- Vertical illuminance also seems to be a strong consideration and the 20 to 40 lux values also subjectively appear to provide adequate visibility.

What's Next

- **Illuminating Engineering Society of North America - Draft Guide**
- **Transportation Association of Canada –Draft Guide**

What's Next

Transportation Association of Canada – Draft Guide

Roadway Classification	Average Maintained Illuminance at Pavement by Pedestrian Conflict (lux)			Average-to-Minimum Uniformity Ratio
	High	Medium	Low	
Arterial/Arterial	34.0	26.0	18.0	≤ 3.0
Arterial/Collector	29.0	22.0	15.0	≤ 3.0
Arterial/Local	26.0	20.0	13.0	≤ 3.0
Collector/Collector	24.0	18.0	12.0	≤ 4.0
Collector/Local	21.0	16.0	10.0	≤ 4.0
Local/Local	18.0	14.0	8.0	–
Partial/Dileniation	10.0	8.0	6.0	–

- Vertical illumination at 1.5 meters equal to horizontal values
- Approach Lighting
- Full cutoff lighting

Thank You

The authors acknowledge the invaluable support and assistance of:

Mr. Mike Niederhauser, Maryland State Highway Administration

Mr. Parris Zirkenbach, Howard County, MD

Mr. Jeff Stratmeyer, Harford County, MD

Dr. Ronald Gibbons, Virginia Tech