WRONG WAY

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Innovative Transportation Solutions

Wrong-Way Driving Countermeasures on SR-18

A Layered Safety Approach: Proposal 3 Implementation
Issaquah–Hobart Rd to C St — King County, WA

What We'll Cover Today

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01 **The Problem**

Wrong-way driving on SR-18: scope & safety risk

02 **The Solution**

Layered countermeasure strategy — Proposal 3 / WW400

03 **System Technology**

WW400, WW100 R5-1a signs, multi-zone radar, dual cameras

04 **Site Coverage**

4 off-ramp locations across King County

05 **Field Installation**

After-photos from June 2025 site walk

06 **Lessons Learned**

Deployment insights for ITE attendees

The Problem: Wrong-Way Driving on SR-18

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4	~500 ft	60+ mph	99.96%
Off-ramp locations identified as high-risk	Avg ramp length before hitting mainline traffic	Mainline speeds where wrong-way collisions occur	WW400 detection accuracy in internal field testing

SR-18 in King County presents a significant wrong-way driving risk due to a combination of rural off-ramp geometry, limited sight lines, and nighttime driving conditions. WSDOT identified four off-ramp locations from C St to Issaquah-Hobart Rd requiring active countermeasures, aligned with the US DOT Safe System Approach — where redundancy is crucial.

Strategy: Alert the driver first. If that fails — detect, validate, and dispatch.

Layered Safety Strategy: Why Proposal 3?

Proposal 1

Continuous Flashing LED Signs

- R5-1 Do Not Enter at ramp entrance
- R5-1a Wrong Way signs in pairs
- Always-on, solar-powered
- No detection or alerting

Proposal 2

Radar-Activated LED Signs

- Same sign placement as Proposal 1
- Single-zone radar activates LEDs
- Event-triggered — more noticeable
- No camera validation or TMC alert

Proposal 3

WW400 Detection & Alert System

- Multi-zone radar + dual cameras
- Active TMC notification
- Green / Yellow / Red zone model
- Full detection, validation & dispatch

✓ SELECTED

Proposal 3 Technology: WW400 System

1

WW400 Detection Unit

MS Sedco Intersector multi-zone radar. Up to 8 zones, 600 ft range, all-weather.

2

WW100 R5-1a Signs

42×30" solar-powered Wrong Way LED signs in wireless pairs. WW400-triggered or continuous.

3

WW100 R5-1 Signs

36" Do Not Enter solar LED sign at ramp entrance. Continuously active. Remote configurable.

4

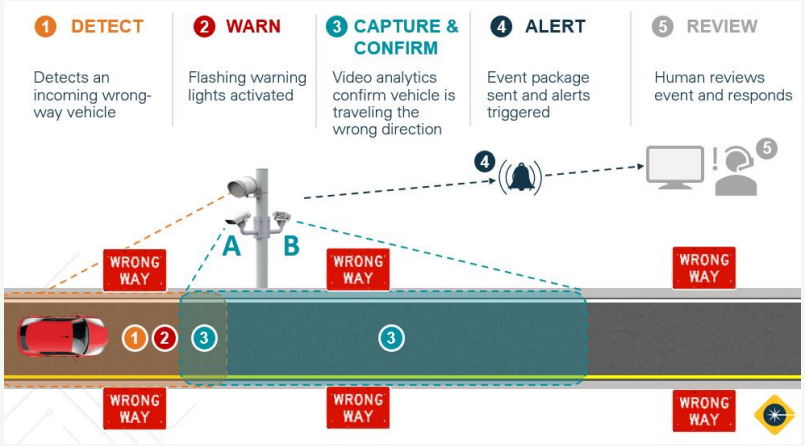
Dual Camera System

Color + IR camera pairs. Camera A captures; Camera B runs video analytics to validate.

5

TMC Integration

Alert packages sent to WSDOT D10 TMC via fiber/ethernet or GPRS/GSM (DIGI IX10). API + NTCIP.



Three-Zone Ramp Safety Model

Green Zone

0–150 ft from intersection

Driver most likely to self-correct. Radar sends Detection Alert to TMC. WW400 activates LED signs.

→ Awareness → Self-Correction → Detection Alert

Yellow Zone

150–350 ft upstream

Driver missed R5-1 and first R5-1a pair. Camera B runs analytics: self-correction or continues to Red Zone?

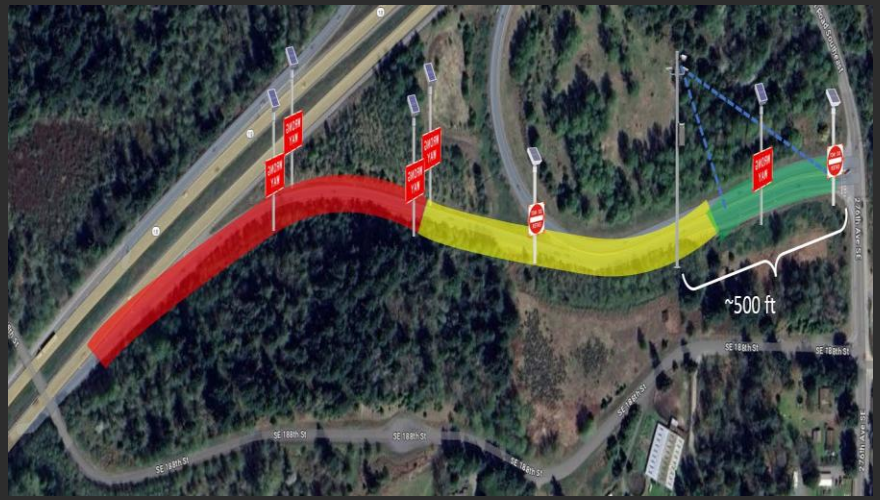
→ Awareness → Validation → Detection Alert

Red Zone

350+ ft — near mainline merge

Wrong-way event confirmed. TMC alerted. VMS boards activated. Emergency services dispatched.

→ Validation Alert → VMS → Emergency Dispatch



Four Treatment Locations on SR-18

King County, Washington — C St SW to Issaquah-Hobart Rd SE | Proposal 3: WW400 + WW100 R5-1a/R5-1

1 Issaquah-Hobart Rd SE

NE Bound Off-Ramp

Ramp: ~500 ft | WW400: 1 | R5-1a: 5 | R5-1: 2

WW400 + R5-1a pairs + R5-1 | Solar-powered | TMC-integrated

2 C St SW

East Bound Off-Ramp

Ramp: ~300 ft | WW400: 1 | R5-1a: 4 | R5-1: 2

WW400 + R5-1a pairs + R5-1 | Solar-powered | TMC-integrated

3 SE 304th St

NE Bound Off-Ramp

Ramp: ~500 ft | WW400: 1 | R5-1a: 5 | R5-1: 2

WW400 + R5-1a pairs + R5-1 | Solar-powered | TMC-integrated

4 Auburn-Black Diamond Rd

SW Bound Off-Ramp

Ramp: ~300 ft | WW400: 1 | R5-1a: 4 | R5-1: 1

WW400 + R5-1a pairs + R5-1 | Solar-powered | TMC-integrated

Site 1: SR-18 at Issaquah-Hobart Rd — EB Ramps

After

WW100 R5-1a — Red Zone, looking SW

WW100 R5-1a — Yellow/Red Zone, looking West

WW100 R5-1 — Yellow Zone, looking West

WW400 — Green/Yellow Zone, looking West

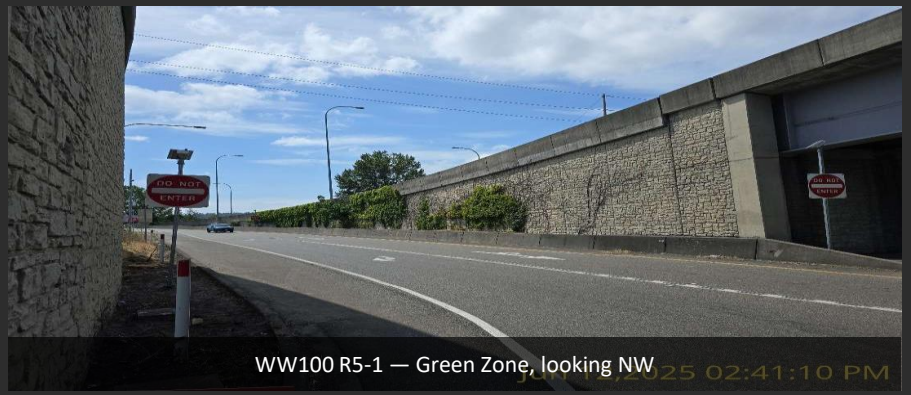
Site 2: SR-18 at C St — WB Ramps

After

WW100 R5-1a — Red Zone, looking SE

WW100 R5-1a — Green/Yellow Zone, looking SW

WW400 — Green Zone, looking SW



WW100 R5-1 — Green Zone, looking NW

Site 3: SR-18 at SE 304th St — EB Ramps

After

WW100 R5-1a — Red Zone, looking SW

WW100 R5-1a — Yellow Zone, looking NW

WW100 R5-1 — Yellow Zone, looking North

WW400 — Green Zone, looking North

Site 4: SR-18 at Auburn-Black Diamond Rd — WB Ramps

After

WW100 R5-1a — Red Zone, looking NE

WW400 + WW100 R5-1a — Yellow Zone, looking SE

WW100 R5-1 — End of ramp, Green Zone, looking South

Deployment Summary

4	18	7	8
WW400 Detection Units	WW100 R5-1a Wrong Way Signs	WW100 R5-1 Do Not Enter Signs	Dual Camera Systems Installed

System Highlights

- All WW100 signs are solar-powered — no grid power required for signs
- WW400 units require AC power (120–240 VAC, 5A circuit per pole)
- TMC alert integration via fiber/ethernet or cellular GPRS/GSM (DIGI IX10 modem)
- System accuracy: 99.96% across 124,000+ events in Carmanah internal field testing
- Florida DOT independently verified 100% detection rate in 200-lap TERL track test
- Deployed in Utah, Florida, Montana, Nevada, Connecticut, and Texas DOTs

Lessons Learned & Takeaways

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1 Pole height & sightlines

WW400 radar must mount 15–20 ft from grade. Clear sightlines to all zones are essential — verify before finalizing pole placement.

2 Solar orientation on rural ramps

WW400 panels need unobstructed southern exposure. Wooded SR-18 ramps required additional survey time for solar viability.

3 Cellular backup for remote sites

Fiber was unavailable at two locations. DIGI IX10 GPRS/GSM modem with static IP provided reliable TMC connectivity as fallback.

4 Zone model simplifies approvals

Green/Yellow/Red zone language resonated immediately with stakeholders and TMC operators — strong visual shorthand for escalating response.

5 Plan photo documentation early

Legislative proviso required field photo verification per sign. Build documentation into the project schedule from the start.

6 Redundancy validates the design

When a sign was temporarily unavailable, remaining zones continued functioning independently — confirming the layered approach works as designed.

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Questions?

WSDOT SR-18 Wrong-Way Driving Countermeasures — Proposal 3

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4 sites | 18 signs | 4 WW400 units | 8 cameras

Technology: Carmanah WW400 + WW100 | Solar | TMC-Integrated