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16. Abstract This project piloted ETALYC's HyperFlow platform for system-wide traffic signal performance assessment in the City of Dubuque, Iowa. HyperFlow is a cloud-based software product that fuses crowdsourced connected-vehicle / probe trajectory data with analytics workflows to evaluate intersection and corridor operations without installing new roadside sensors. On July 17, 2023, the Dubuque City Council authorized a funding agreement with the Iowa Department of Transportation under the Iowa STIC Incentive Program (Iowa DOT Agreement ST-018). The City contracted with ETALYC (effective December 23, 2024) to implement the one-year pilot.		
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FINAL PROJECT REPORT

Iowa Statewide Transportation Innovation Council (STIC) Incentive Program

HyperFlow Pilot for Signal Performance Assessment — City of Dubuque, Iowa

Submitted to: Federal Highway Administration — Iowa Division Office
Iowa DOT Agreement No.: ST-018 | CFDA 20.200 — Highway Planning and Construction
Recipient: City of Dubuque | Technology Provider: ETALYC, Inc.
Performance analysis period: May 1, 2025 – April 30, 2026 | Report date: August 2026

1. Project Description

This project piloted ETALYC's HyperFlow platform for system-wide traffic signal performance assessment in the City of Dubuque, Iowa. HyperFlow is a cloud-based software product that fuses crowdsourced connected-vehicle / probe trajectory data with analytics workflows to evaluate intersection and corridor operations without installing new roadside sensors. On July 17, 2023, the Dubuque City Council authorized a funding agreement with the Iowa Department of Transportation under the Iowa STIC Incentive Program (Iowa DOT Agreement ST-018). The City contracted with ETALYC (effective December 23, 2024) to implement the one-year pilot.

HyperFlow provides an online dashboard for reviewing system-wide signalized corridor performance, identifying retiming candidates, quantifying travel-time and event-day impacts, and communicating outcomes to leadership. Anticipated benefits in the City's STIC materials included proactive (vs. complaint-driven) problem identification; improved operational understanding without hardware investment; quantifiable delay/travel-time insights; reduced citizen complaints; safer, smoother operations; and support for measuring the City's STREETS program. Deliverables included continuous monitoring of City signals, onboarding and probe-data integration, quarterly reports/meetings, and a final outcomes report.

Results in this report summarize twelve monthly probe GPS analyses for Dubuque, IA (May 2025–April 2026) processed through a cloud Spark pipeline and rolled into corridor/intersection metrics. The analysis inventory covered 16 corridors and 94 signals.

2. Overall Budget

The project was fully funded through the Iowa STIC Incentive Program with no local cash match. The approved budget under Agreement ST-018 is Federal STIC/TIDP $64,000 (80%), State funds $16,000 (20%), Local match $0, for a total of $80,000 (CFDA 20.205). Iowa DOT was the primary STIC recipient; the City of Dubuque was the local implementing agency; ETALYC was the contracted technology provider. City–ETALYC disbursements tracked onboarding/training, monitoring/dashboard updates, quarterly reporting, and final reporting. No other funds were committed.

3. How the Work Meets Program Criteria

The pilot was an eligible Technology and Innovation Deployment Program (TIDP) activity under 23 U.S.C. § 503(c) via Iowa STIC. It advances program criteria by: (1) aligning with EDC-6 crowdsourcing for operations using probe trajectories instead of new sensors; (2) providing a transferable statewide model (dashboard, ranked metrics, quarterly trends, written/visual reporting) other Iowa agencies can adopt; (3) using Federal-aid-eligible CFDA 20.205 funding at the STIC 80/20 split within incentive limits and with no local match; (4) initiating work promptly after contract execution and expending within the allowable window; and (5) deploying innovation into practice through decision-ready rankings and maps for retiming prioritization without capital hardware.

4. Results of the Project

Implementation ETALYC onboarded Dubuque into HyperFlow; integrated crowdsourced probe data; provided application access and training; and delivered recurring updates culminating in quarterly trends and the HyperFlow Final Performance Report for May 2025–April 2026.

Metrics The pilot used: (a) travel-time slowness/delay vs. free-flow reference; (b) corridor stop probability; (c) approach split-failure intensity; and (d) a normalized overall corridor score (higher = worse within Dubuque). Event-day screening identified atypical days for optional exclusion from "normal" summaries.

Priority locations Highest overall corridor scores were JFK, NW Arterial, Hwy 20, Asbury, and Hwy 151/61 (Table 1). Top split-failure intersections included Hwy 20–JFK (Signal #4), Hwy 20–Locust (Signal #27), and JFK–Asbury (Signal #53). Figures 1–3 summarize corridor delay, stop probability, and top split-failure intersections; Figures 4–5 map the highest side-street delay and split-failure locations, which cluster along the Hwy 20 / JFK / NW Arterial / Asbury system—supporting corridor-oriented retiming.

Table 1. Top five corridors by normalized overall score (May 2025–April 2026; higher = worse relative performance).

Corridor	Split Failure	Slowness/Delay	Stop Prob.	Overall
JFK	0.14%	0.48	0.50	2.10
NW Arterial	0.25%	0.41	0.24	1.76
Hwy 20	0.40%	0.22	0.30	1.73
Asbury	0.21%	0.26	0.44	1.60
Hwy 151 / 61	0.12%	0.36	0.33	1.48

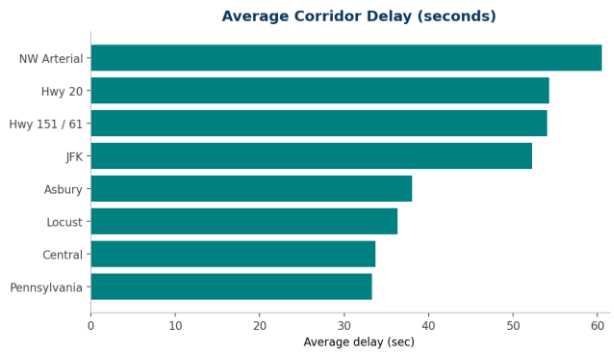

Figure 1. Top corridors by average delay (sec).

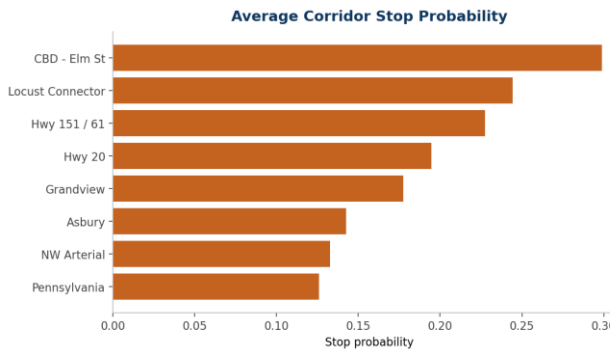

Figure 2. Top corridors by average stop probability.

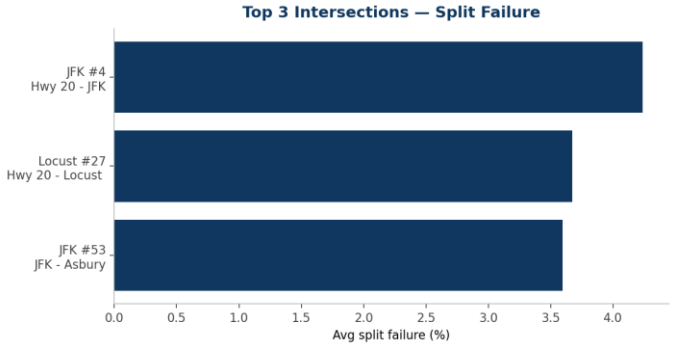

Figure 3. Top three intersections by average split-failure rate.

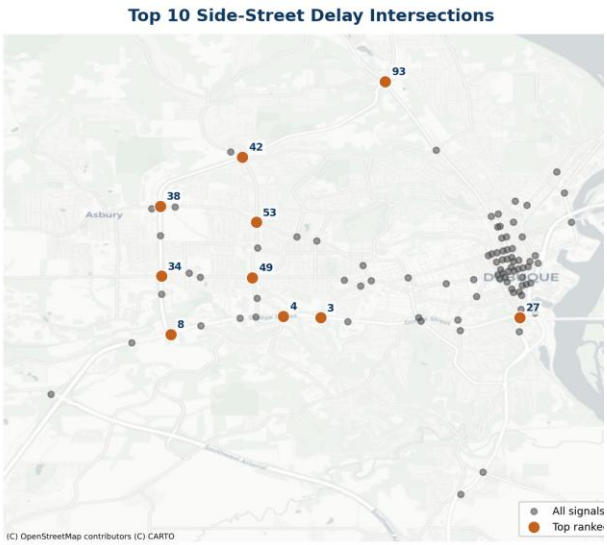

Figure 4. Top side-street delay intersections.

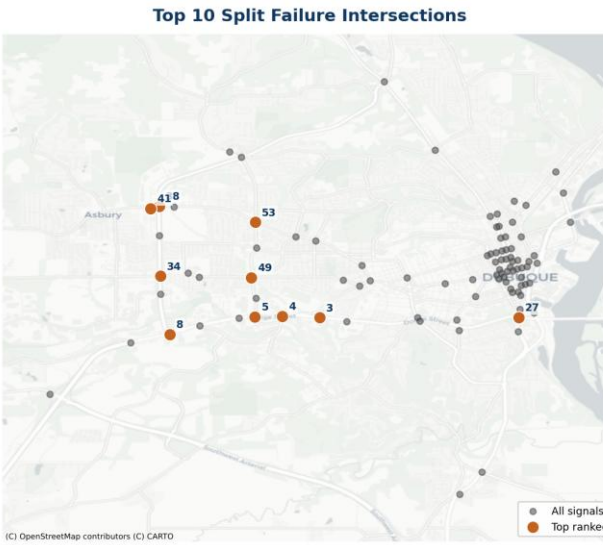

Figure 5. Top split-failure intersections.

Quarterly trends Figures 6–9 show corridors/intersections that remained chronically high-ranked versus those that varied seasonally. Network-average delay and stop probability shifted by quarter, supporting timeframe-specific timing (peak/off-peak and seasonal offsets). Persistent top-ranked split-failure signals are priority candidates for green-time redistribution. From a program-outcomes perspective, these visuals convert continuous crowdsourced monitoring into a prioritized work program City staff can act on without waiting for complaint accumulation. Recommended near-term actions: review offsets/splits on high-delay corridors; improve peak progression where stop probability is elevated; and address chronic split failure beginning with the Hwy 20–JFK area and related junctions.

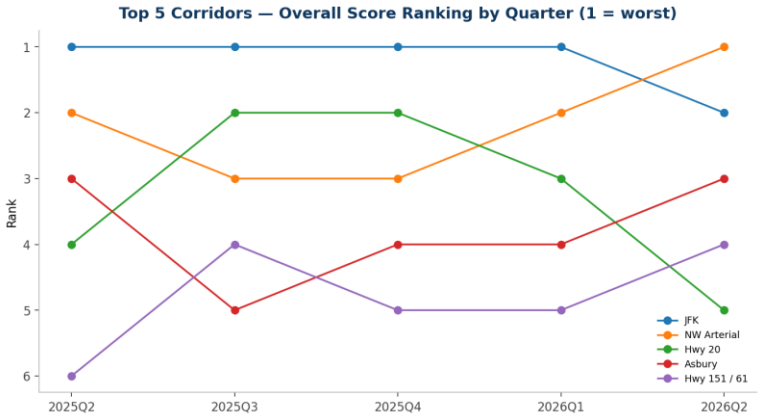

Figure 6. Top 5 corridors — overall-score ranking by quarter (rank 1 = worst).

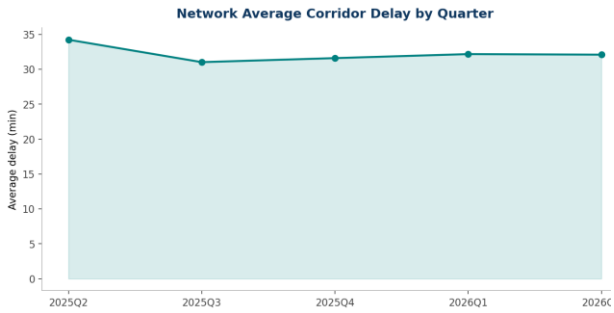

Figure 7. Network average corridor delay by quarter.

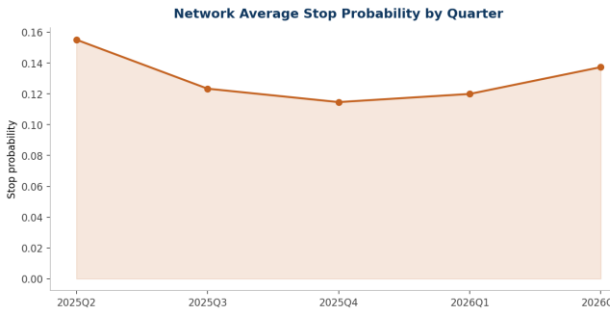

Figure 8. Network average stop probability by quarter.

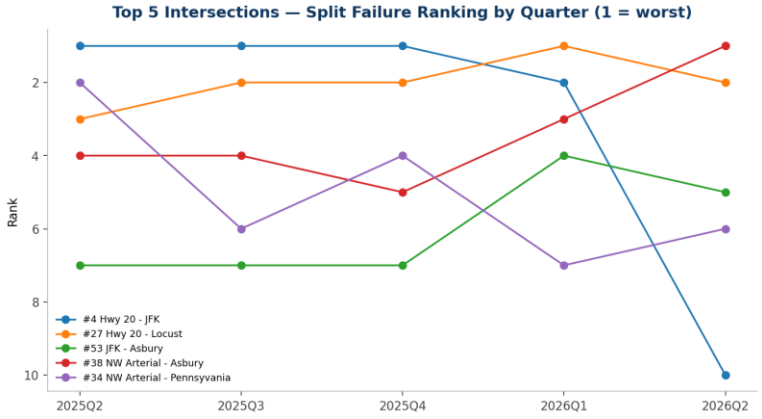

Figure 9. Top 5 intersections — split-failure ranking trend by quarter.

5. Challenges

- Probe coverage varies by corridor, hour, and season; sparse cells required monthly/quarterly aggregation for stable metrics.
- Full-month GPS processing needs substantial cloud compute; geohash prefiltering and efficient Sedona spatial joins were required for practical runtimes.
- Incidents, weather, and events can distort travel times; automated event-day detection helped but residual atypical days can still affect monthly scores.
- Overall scores are network-relative prioritization tools—not absolute national benchmarks or substitutes for traditional turning-movement studies.

6. Lessons Learned

- Crowdsourced probe data can provide actionable citywide signal visibility without new field hardware, validating the STIC/EDC crowdsourcing use case.
- A compact metric set plus ranked tables and maps is more useful to practitioners than large undifferentiated dashboards alone.
- Monthly batches with quarterly trend rollups balance data volume, robustness, and a usable briefing cadence for City staff.
- Spatial prefiltering of GPS ingest keeps continuous monitoring financially sustainable at STIC-scale budgets.
- Metadata governance (complete inventory, naming, main vs. side-street definitions) is as important as algorithms for credible rankings and maps.
- Next steps: retiming pilots on top corridors (JFK, NW Arterial, Hwy 20 junctions), then use HyperFlow before/after views to document benefits for future operations funding.