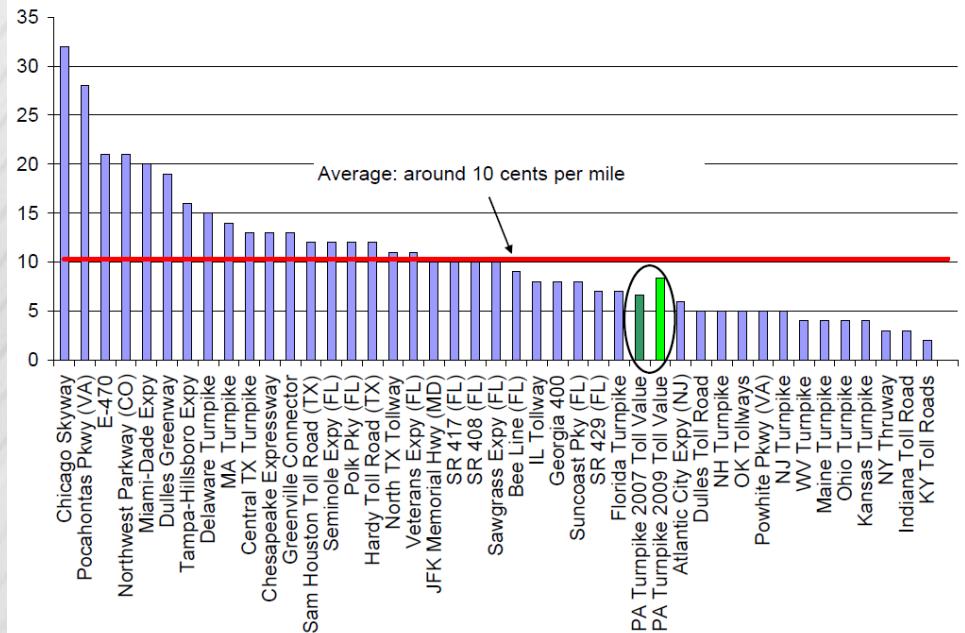
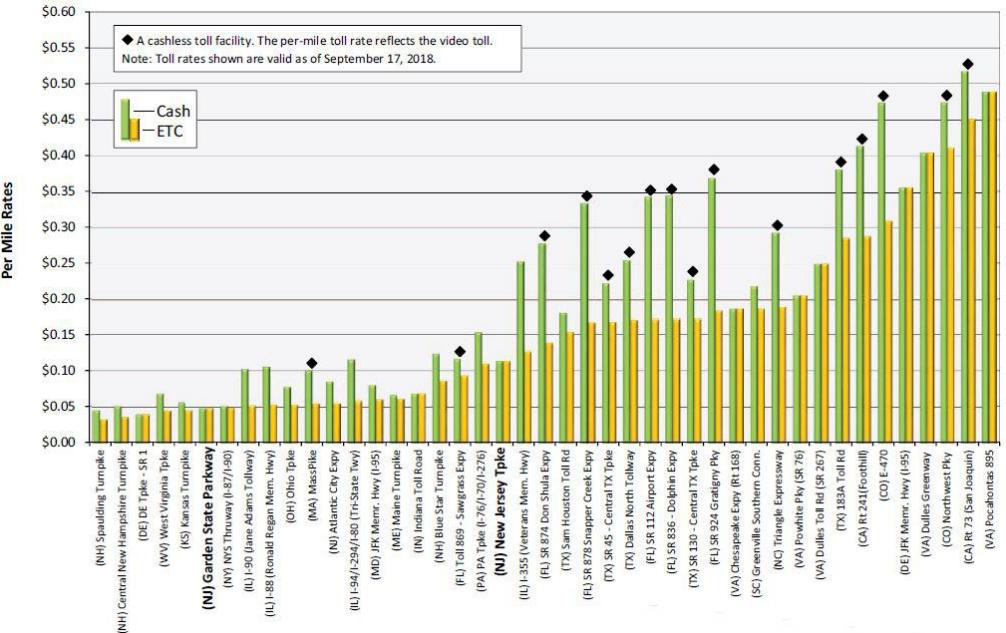
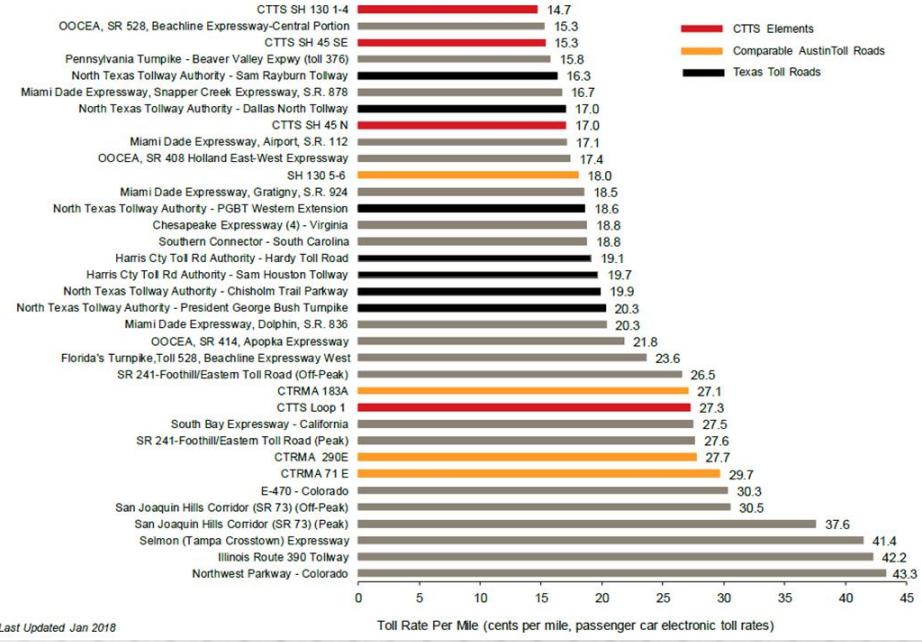
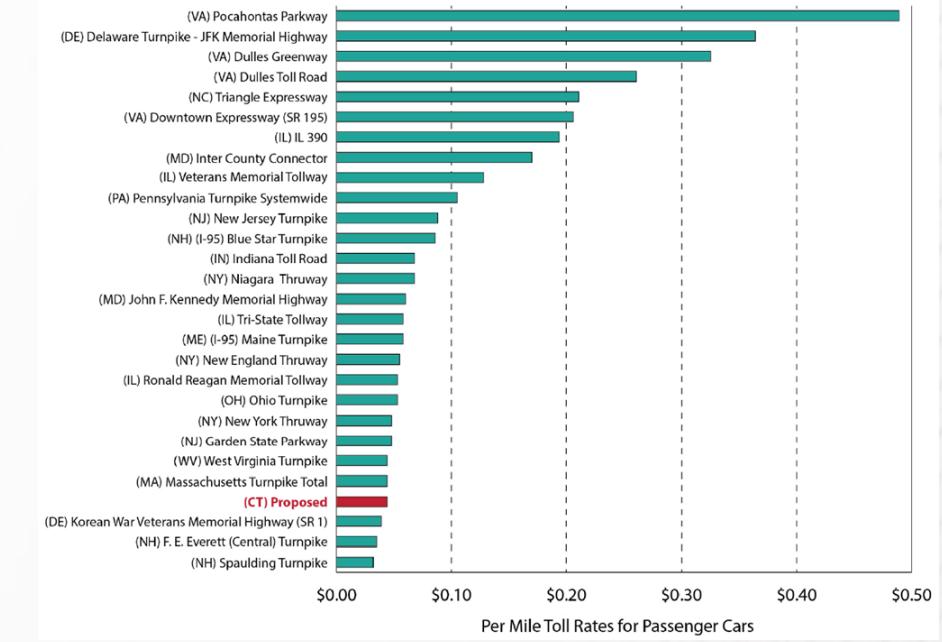


Cost Per Mile Metric Not Fit for Purpose

Robert Bain & Sylvain Sénéchal





Methodological Concerns

- **Secondary Concerns:**

- Asset of interest invariably sits towards the lower end of the reported cost range (!)
- No attempt is made to explain, justify, validate nor defend the benchmarking sample
- Benchmarking samples are not focussed on comparable projects (our analysis)
 - Roads v bridges, privately-financed v state-run operations, radial corridors in affluent suburbs v provincial beltways
 - Commuter v recreational routes, short facilities (under 5 miles) v entire systems (over 500 miles)
- Conclusions being drawn from charts that folks barely understand

- **Primary Concerns:**

- The cost per mile metric is promoted as an indicator of value
 - But consumer value relates to time savings (not per-mile costs)
- Our research: price (cost per mile) is a very poor proxy for value (cost per minute saved)

Does it Matter?

- **Yes**
 - Policy-makers and the public are more likely to support strong value for money (VfM) propositions
 - Rating agencies, lenders & insurers regard good VfM as being credit-positive
 - Equity financiers regard good VfM as investment-positive
- **Cost per mile benchmarking appears in T&R study reports, but is carried forward to...**
 - management reports
 - pitch books
 - equity research reports
 - presentations to credit committees and investment boards
 - bond disclosure documentation



Our Research

- **Research paper published in September →**
- **Objective**
 - Calculate cost per minute saved for a range of toll facilities
 - Place in order and compare with facilities ranked by cost per mile
- **Data + Method**
 - Had to be publicly-available (reproducible research)
 - All toll bridges and tunnels in the US
 - 43 two-way tolls + 25 one-way tolls = 68 facilities
 - By direction $[(43 * 2) + (25 * 1)] = 111$ trips
 - Compare those 111 'toll trips' with the best toll-free alternative
 - Compute time savings and calculate cost per minute saved



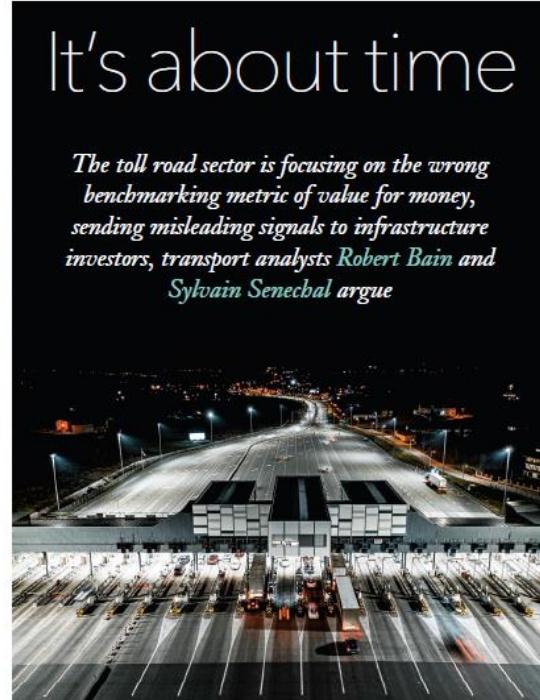
Analysis

Benchmarks are used in infrastructure analysis as independent reference points when evaluating an investment strategy or a particular investment candidate. They can be financial – peer comparisons of EBITDA margins are commonplace – or focused on the sector-specific operational or performance aspects of assets. Over time, best practice emerges based on experience of the attributes and qualities that lead to positive investment outcomes (critical success factors).

In the toll road sector, benchmarks are used to shine a light on the attractiveness of a facility to consumers. In the context of traffic and revenue forecasting, they are commonly cited in support of the more ambitious predictions of demand. In short, they are used to signal value for money – and this has important and widespread implications:

- Policy-makers and the public are more likely to support toll roads that represent a strong value for money proposition;
- Rating agencies, debt providers and insurers regard good value for money as being credit-positive;
- Equity financiers regard good value for money as being investment-positive.

The industry-standard benchmark for value in the toll road sector is cost per mile. How much does travel cost and how does the unit cost of using a specific road, bridge or tunnel stack up against others? This is regularly presented in consultants' reports (see chart 1), accompanied by a reassuring write-up: "This rate per mile is consistent with many... toll facilities"; "The toll



It's about time

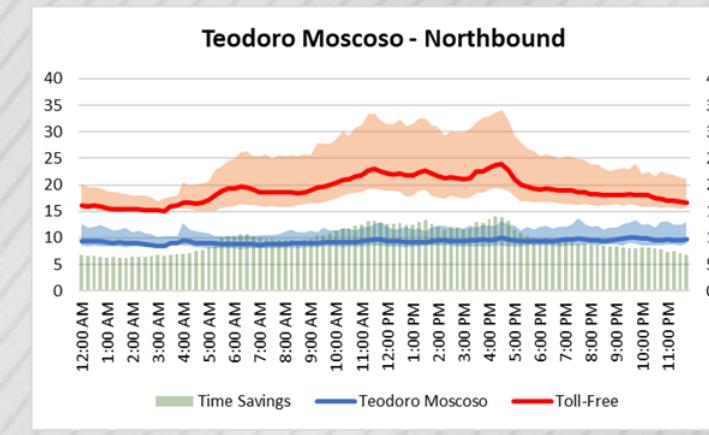
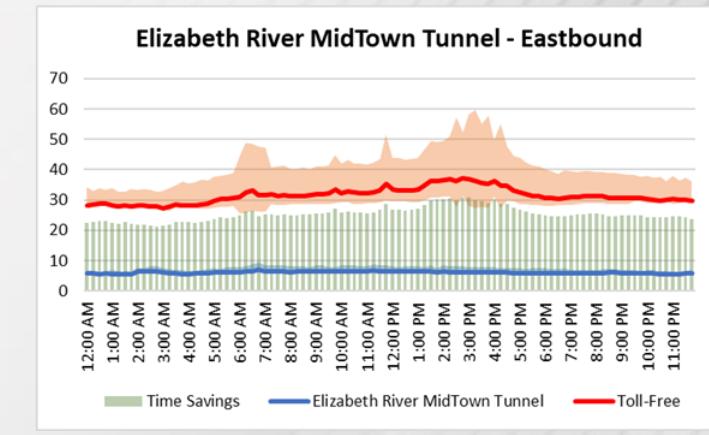
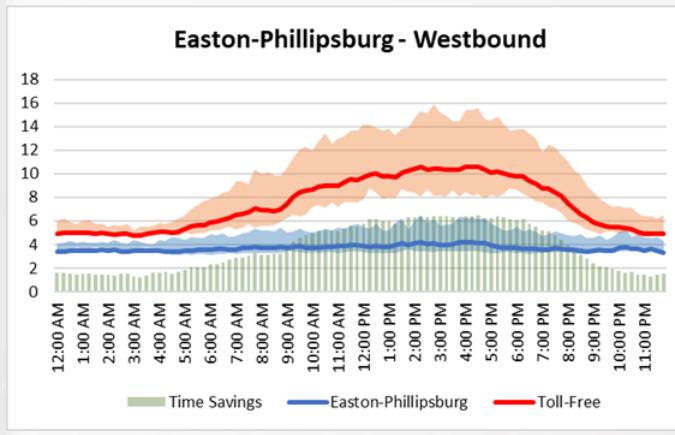
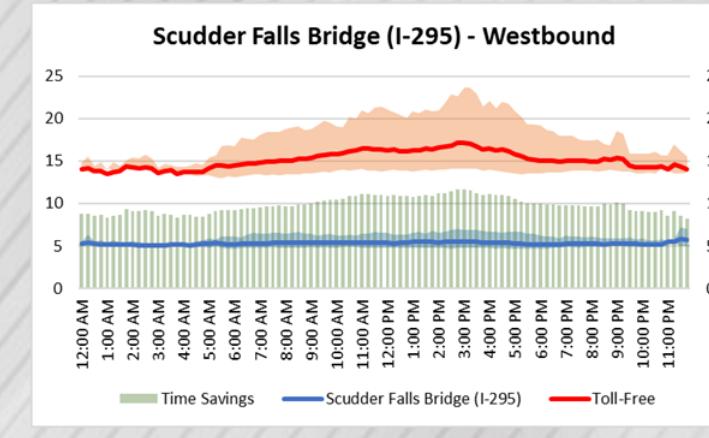
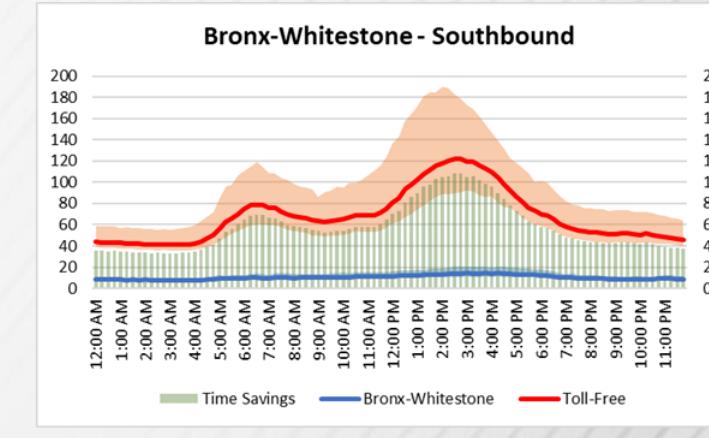
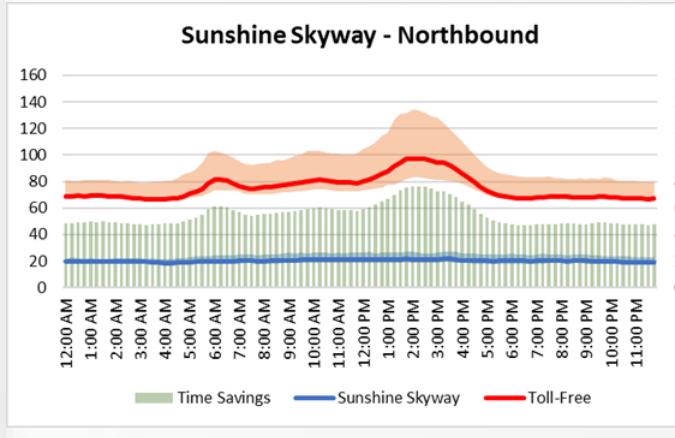
The toll road sector is focusing on the wrong benchmarking metric of value for money, sending misleading signals to infrastructure investors, transport analysts Robert Bain and Sylvain Senecal argue

rates are typical for this type of... facility"; "The passenger car per-mile toll rates... are still very reasonably priced compared to other toll facilities".

At first glance, the cost per mile metric appears to have some attractive qualities. Top of the list is data availability and ease of calculation. All that is needed is the length of the asset and the respective toll price – information generally in the public domain. However, computational convenience and usefulness are two separate matters. And computational convenience quickly falls away when you get into the details. On multi-access facilities, different users make different trips of different lengths. So, what distance should be used? And toll tariffs vary by vehicle class, time of day, payment method, trip length, discount eligibility and so forth – so what cost should be used? For this reason, simplifying assumptions are adopted by benchmarkers, the details of which often remain frustratingly opaque. These data standardisation challenges can be overcome. However, a critical issue remains. Cost per mile – essentially price – is being used as a proxy for value. As we demonstrate later, it is a fundamentally flawed metric in this regard.



We Prepared 111 of These...



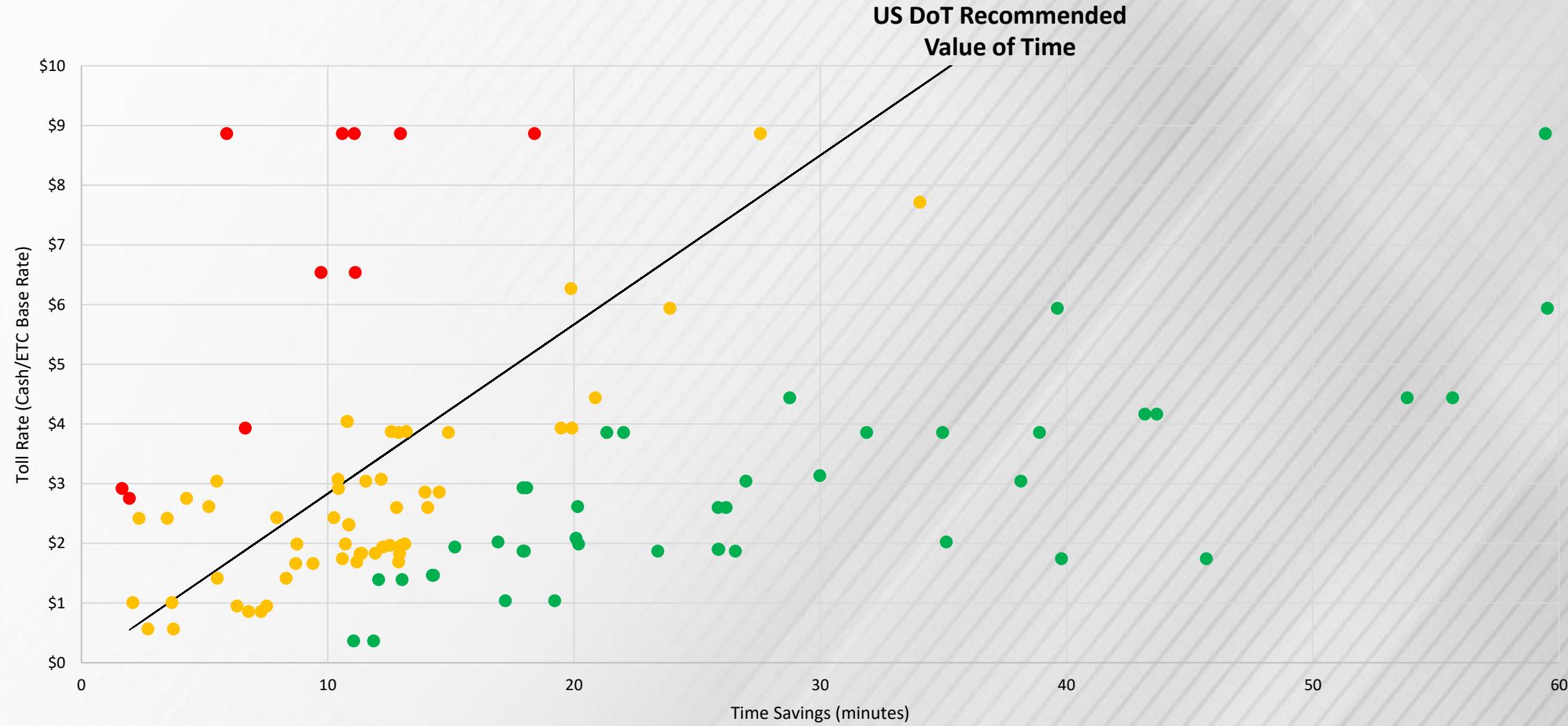
Sample Results ($n = 9$)



Sample Results ($n = 9$)



Full Results ($n = 111$)



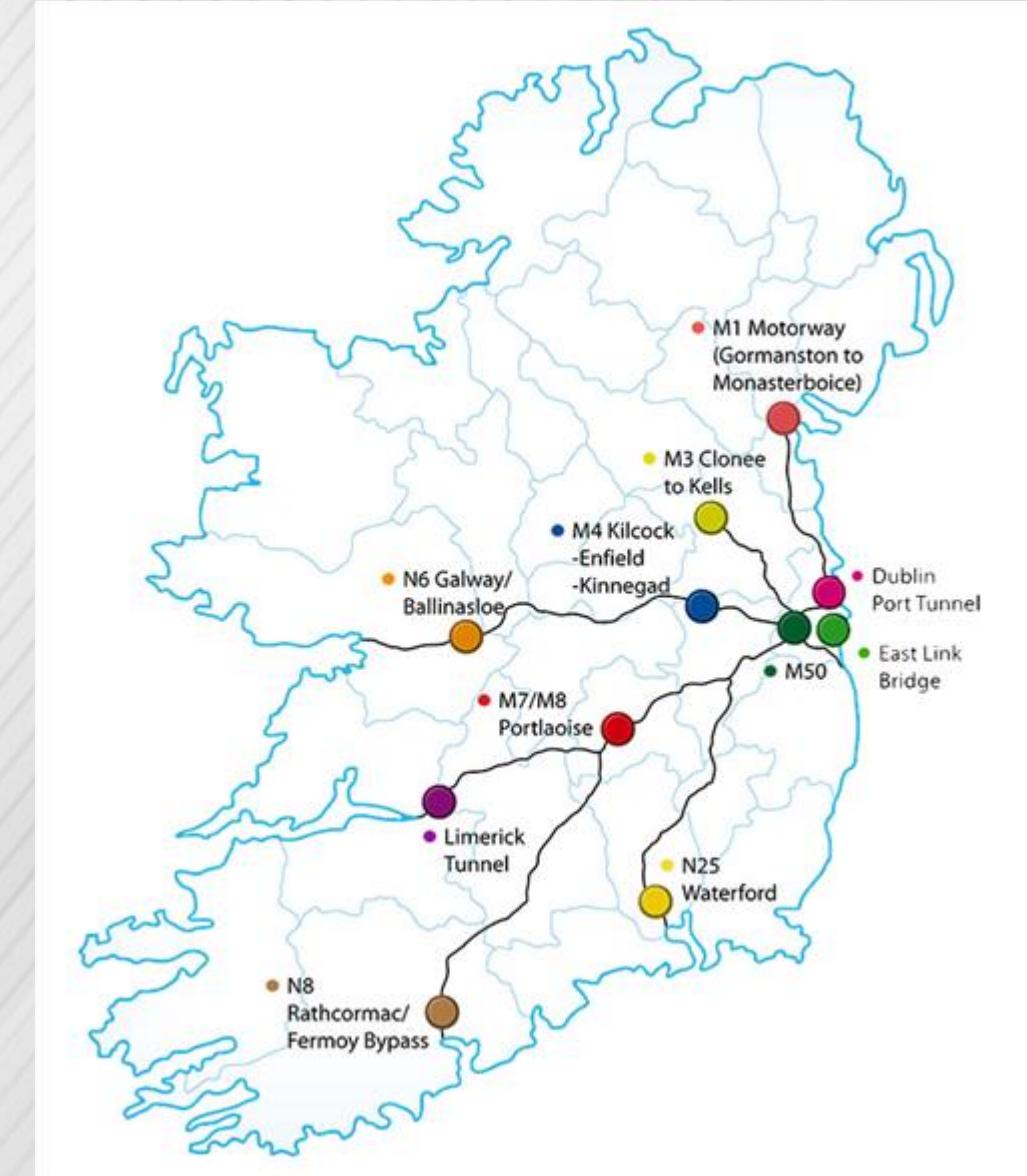
But We're in Dublin...

- So let's conduct the same analysis for all toll facilities in the Republic →

- cost per mile (**price**)

versus

- cost per minute saved (**value**)

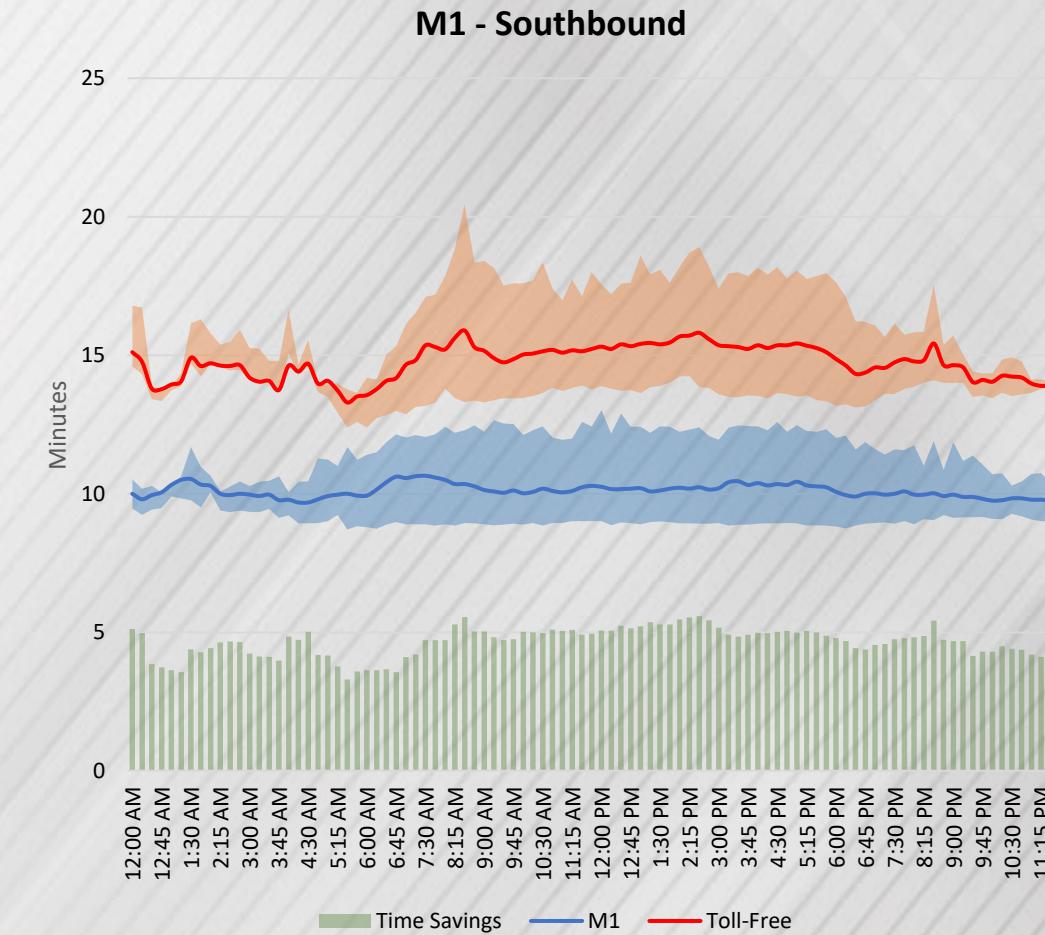
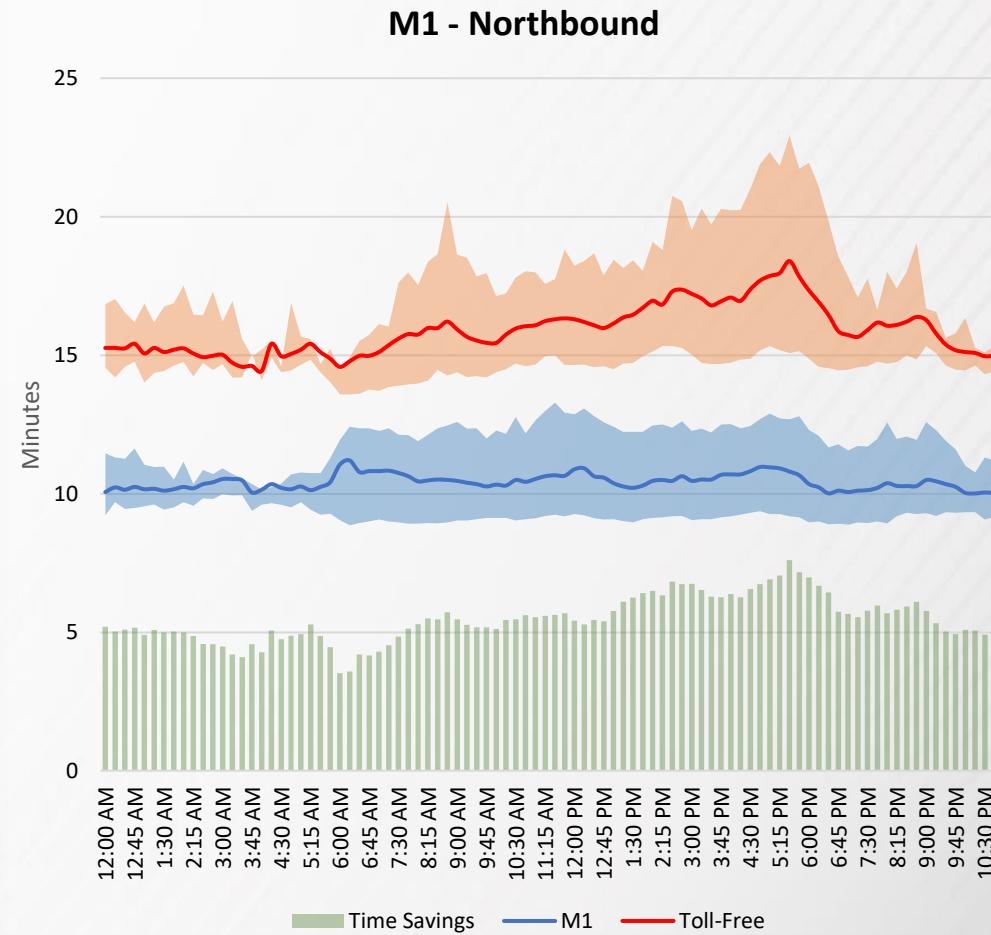




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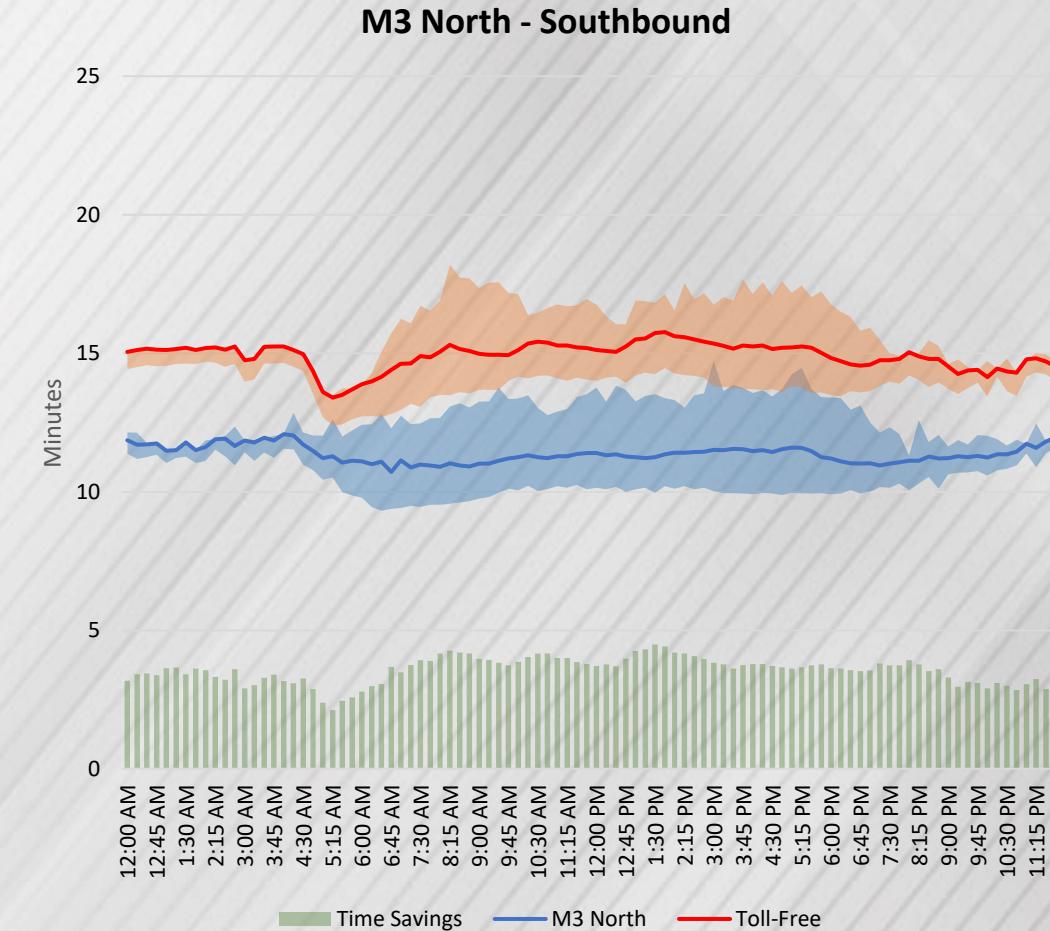
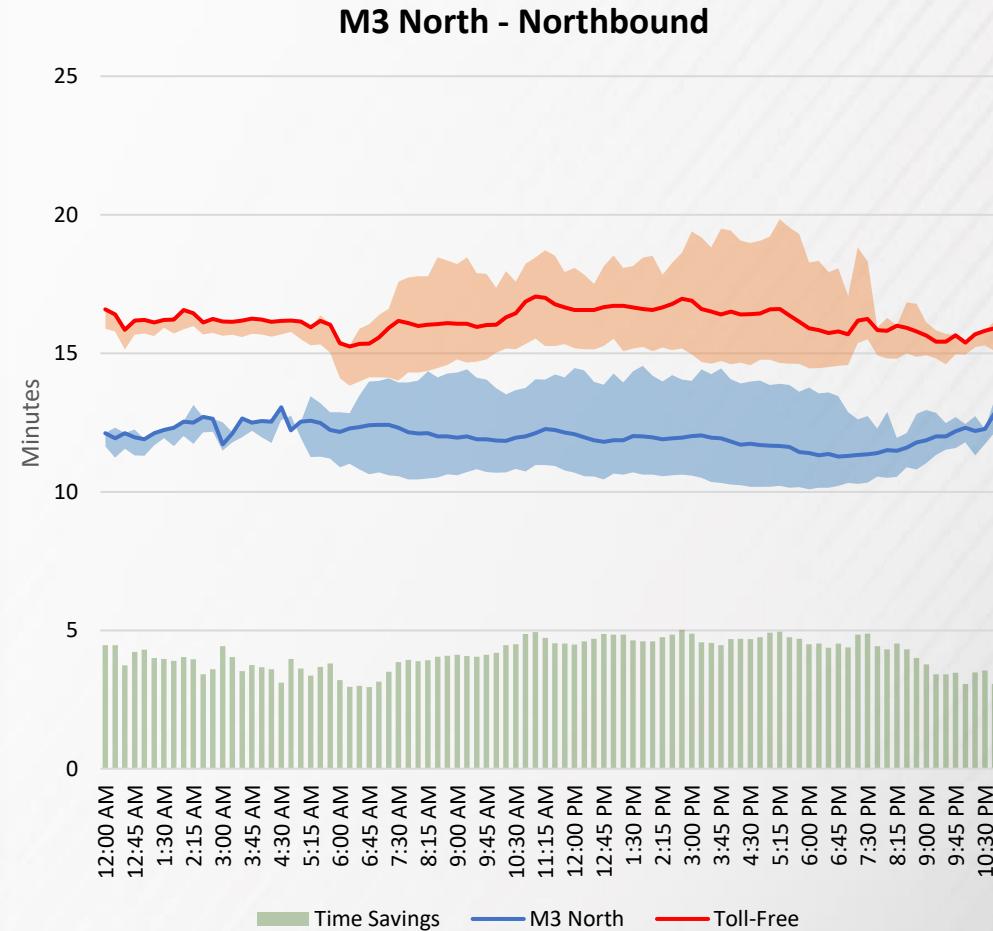
M1 Motorway

Gormanston to Monasterboice Toll Road





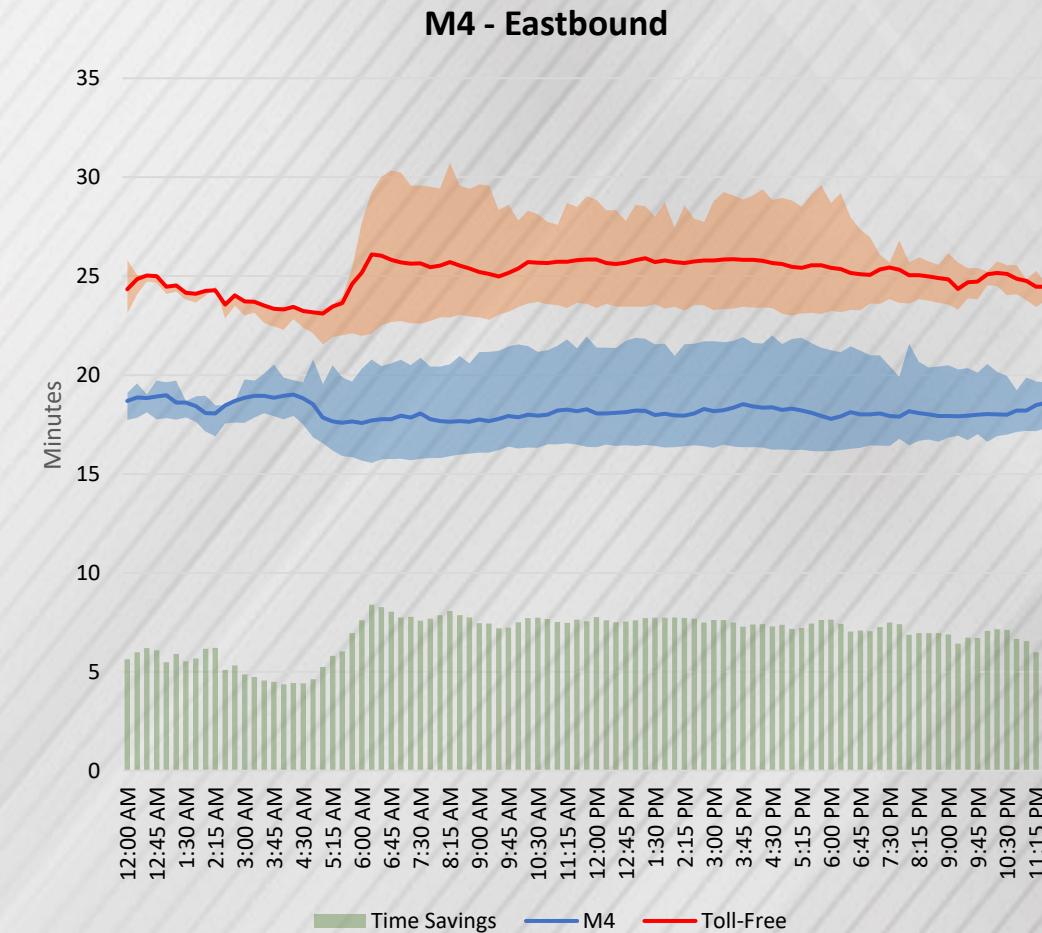
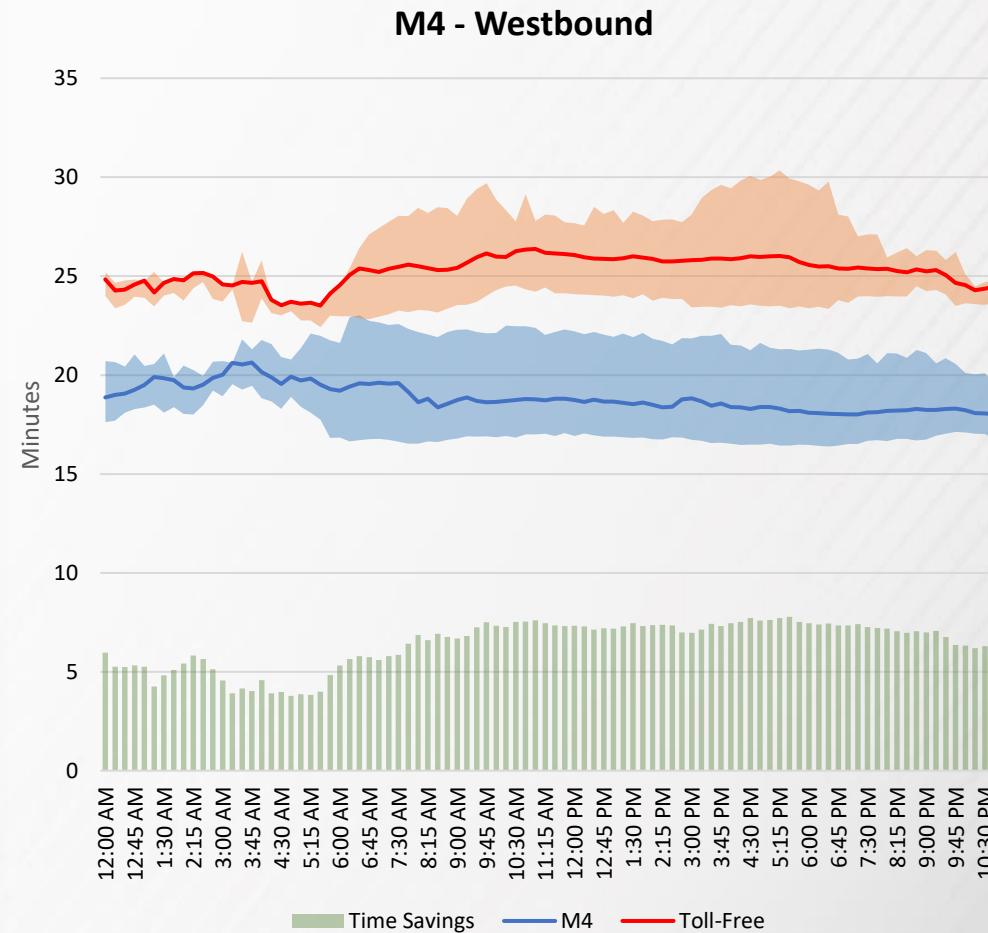
M3 Clonee-Kells Grange Toll Plaza (Northern)





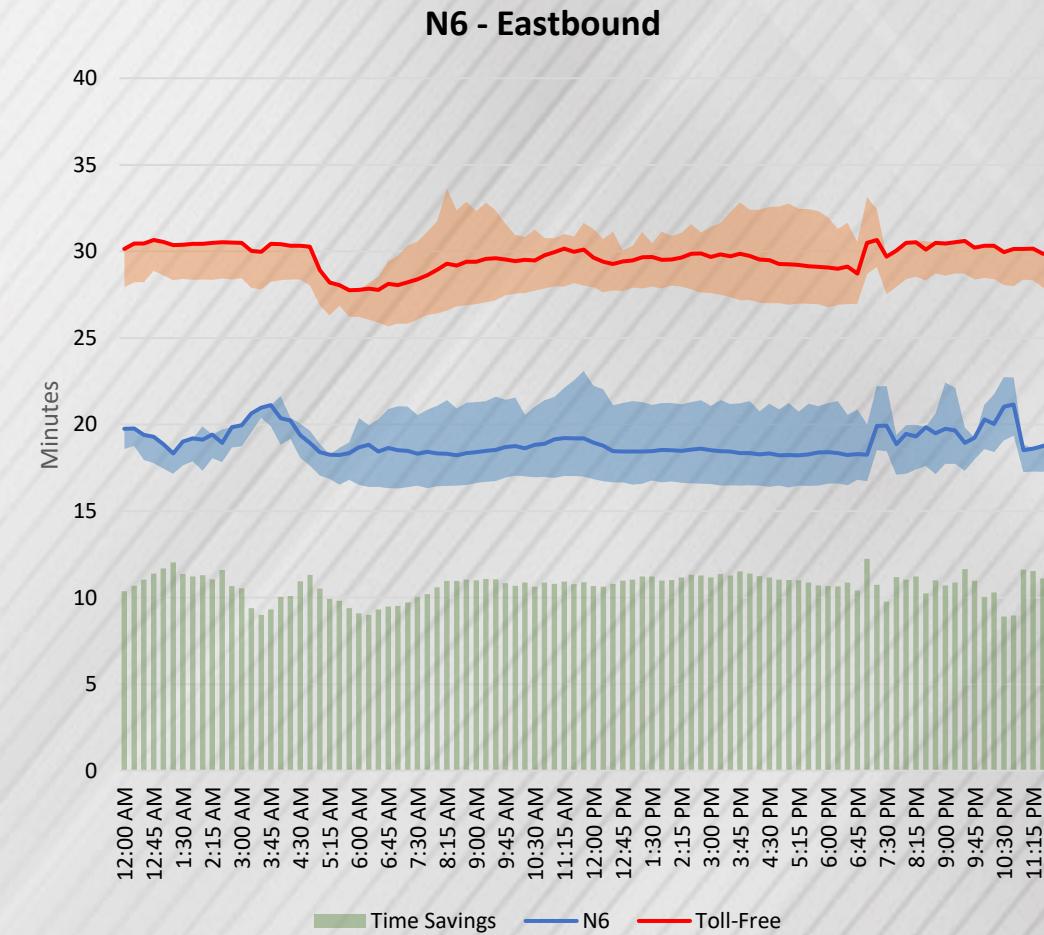
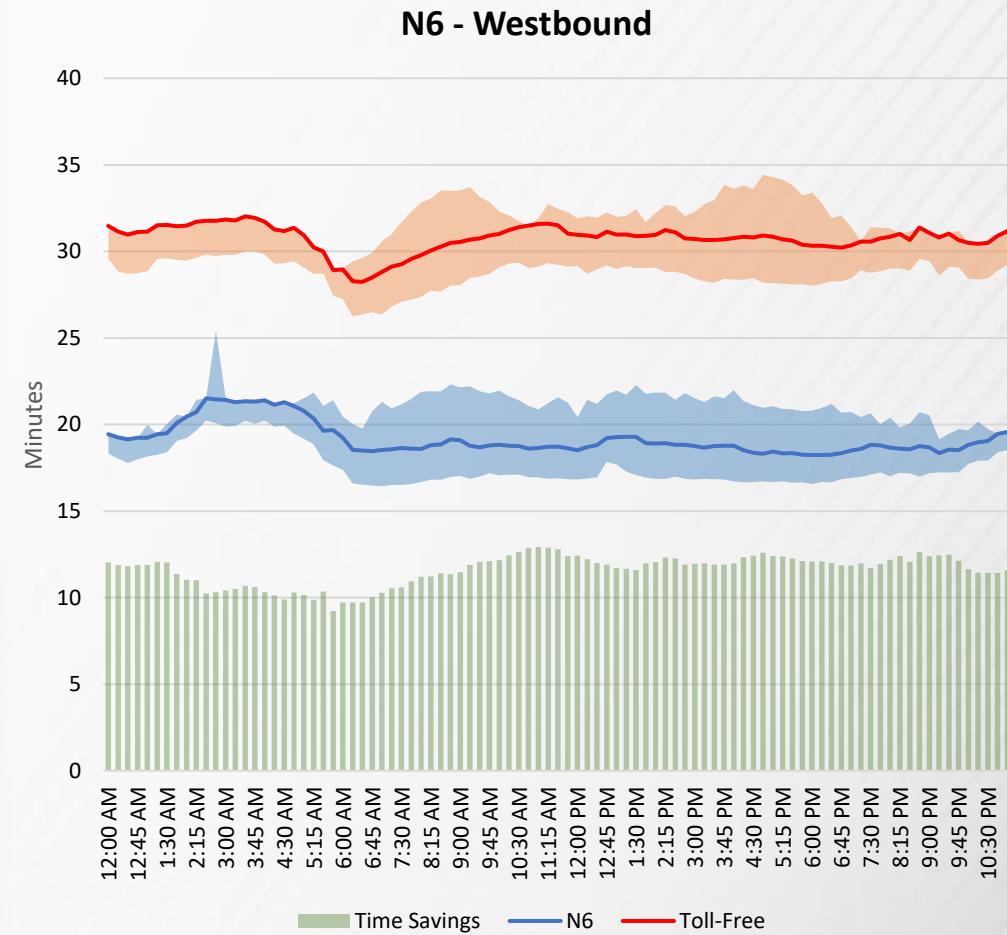
M4

Kilcock - Enfield - Kinnegad Motorway



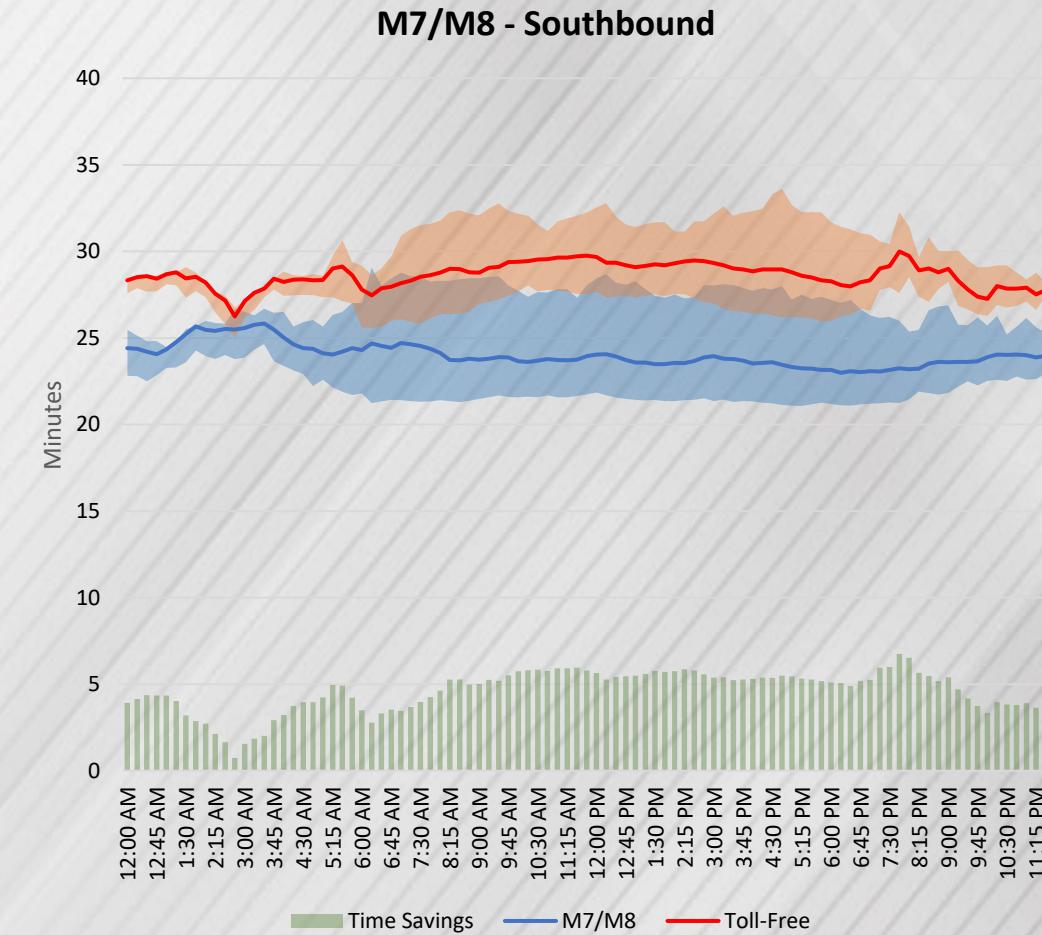
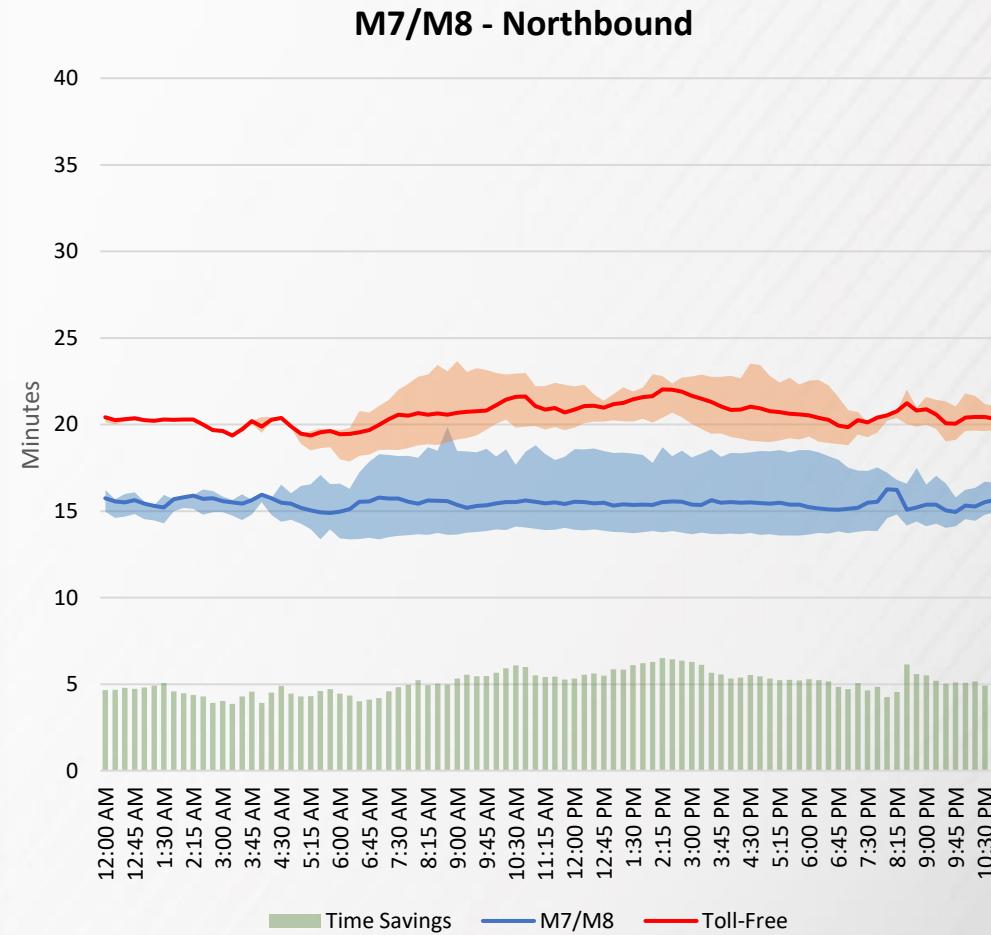
N6

Galway - Ballinasloe



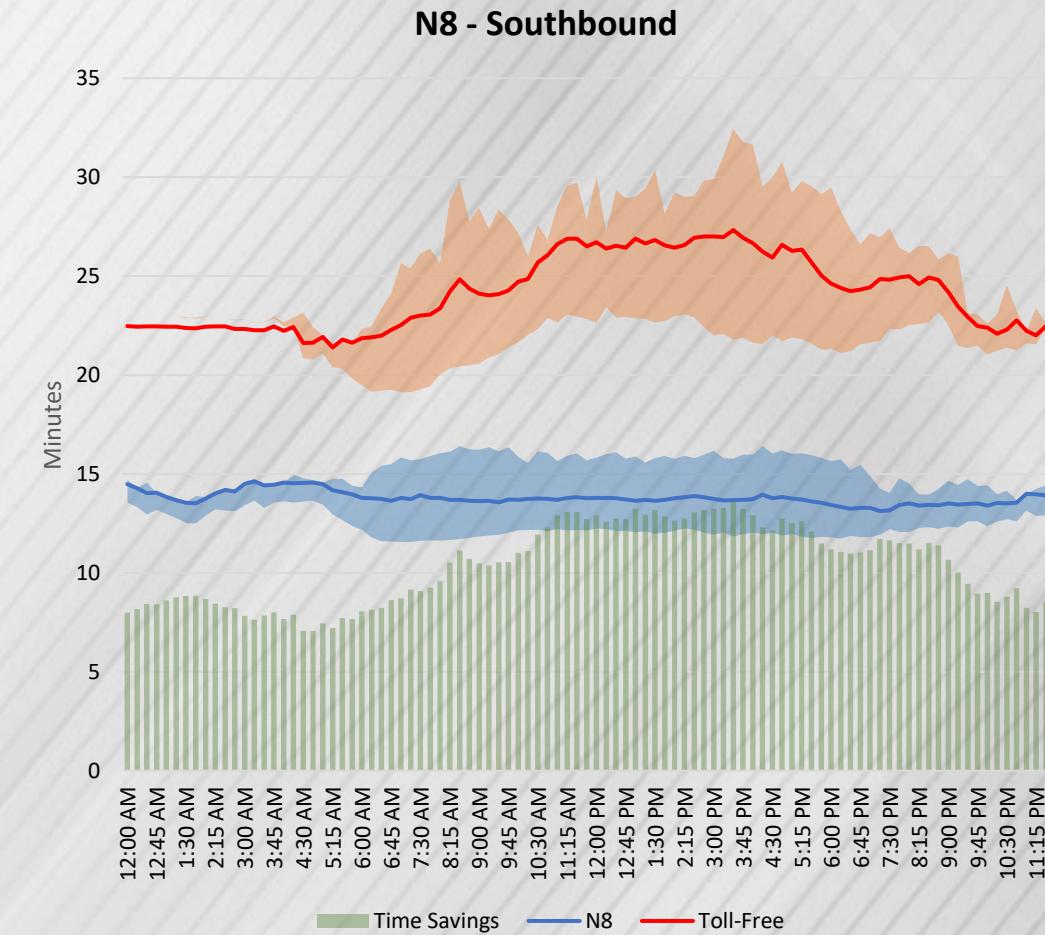
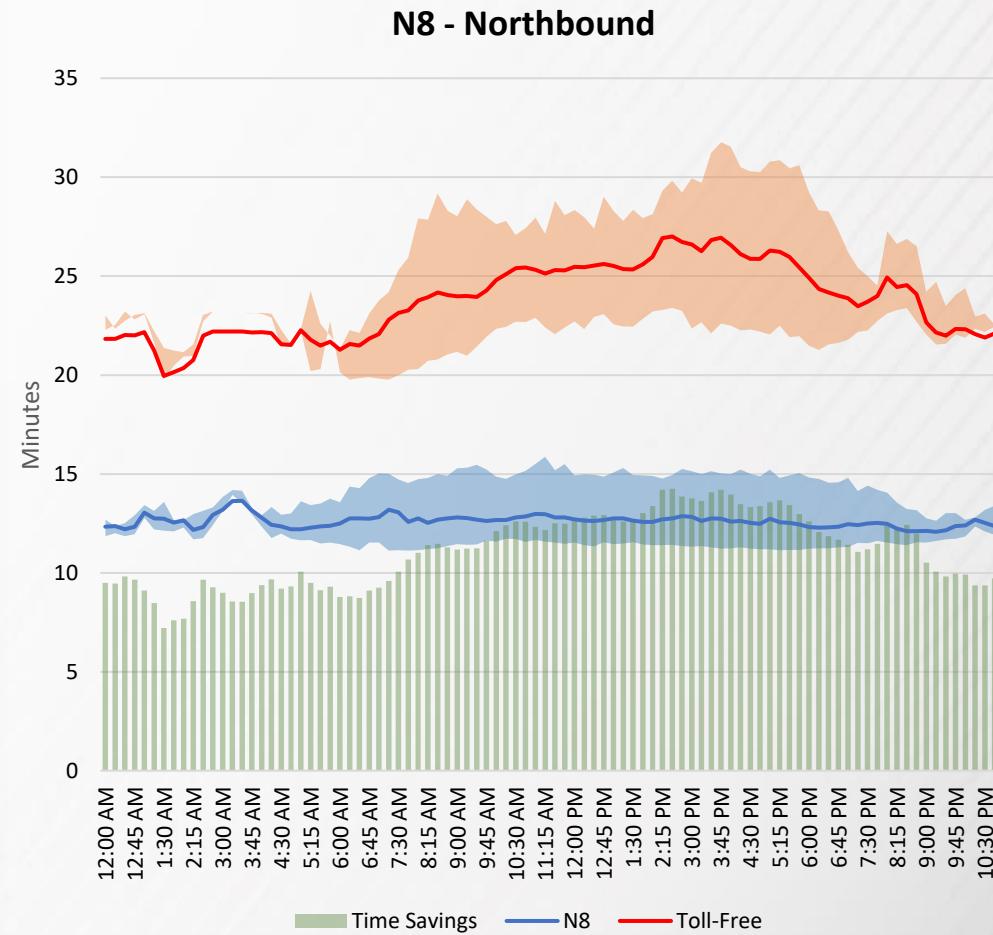
M7/M8

Portlaoise - Castletown/Portlaoise - Cullahill

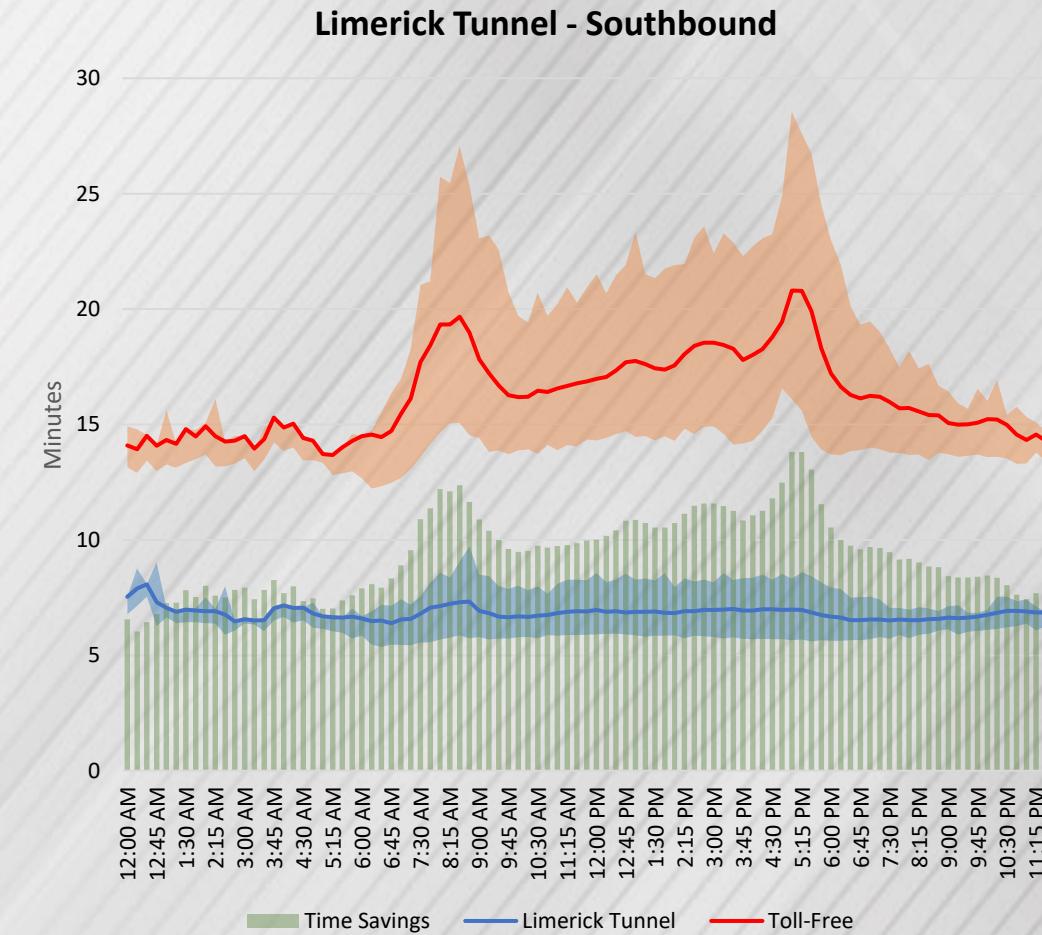
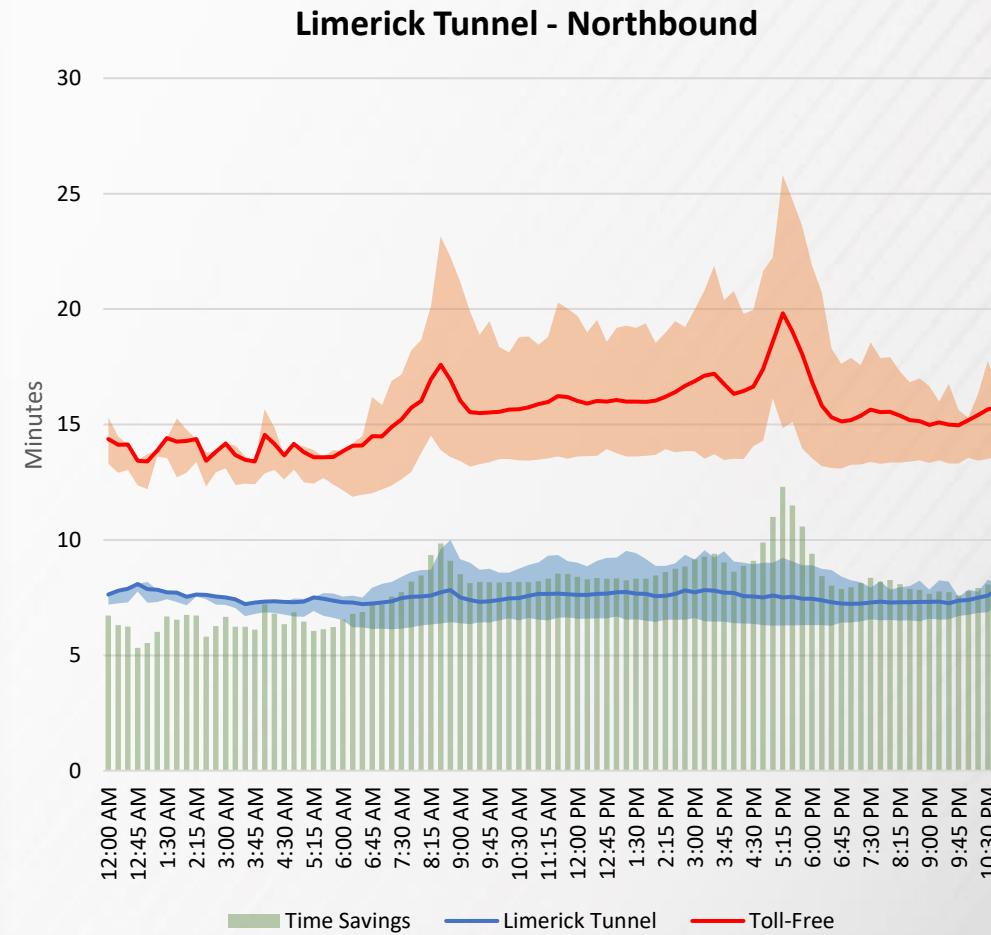


N8

Rathcormac - Fermoy Bypass

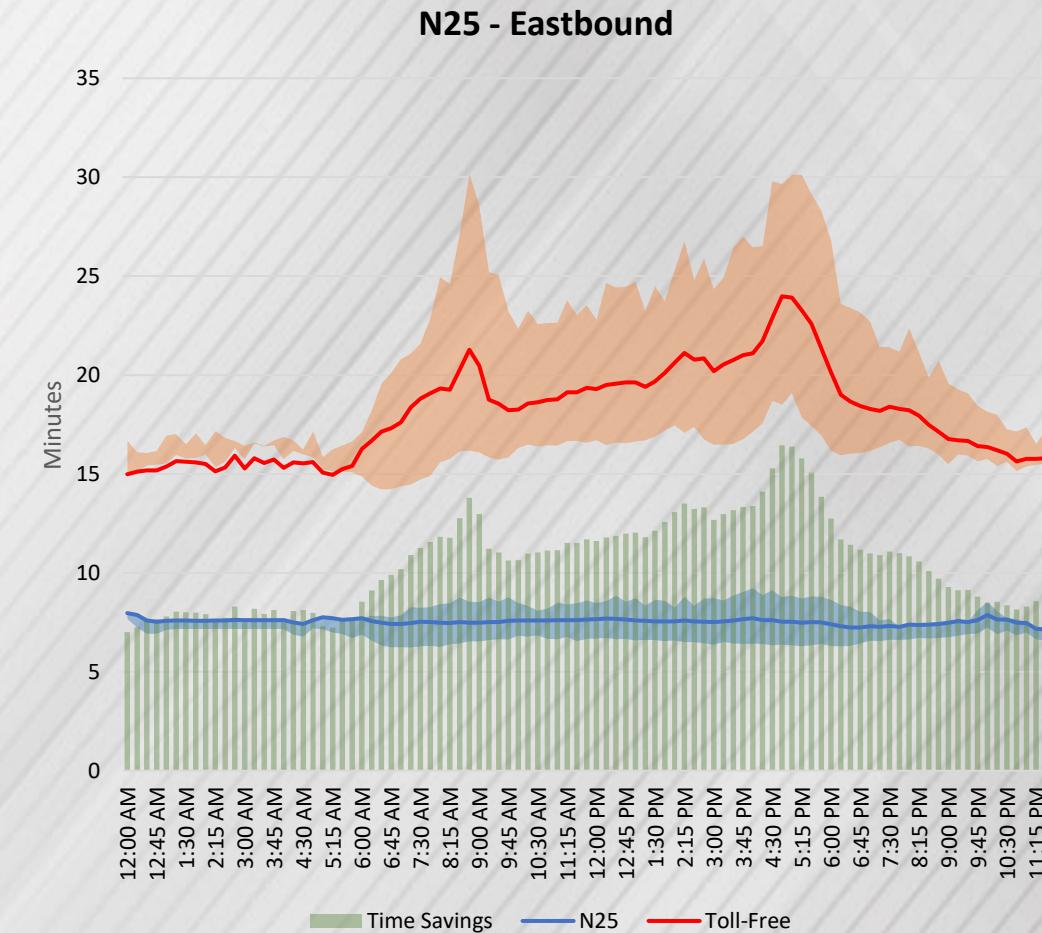
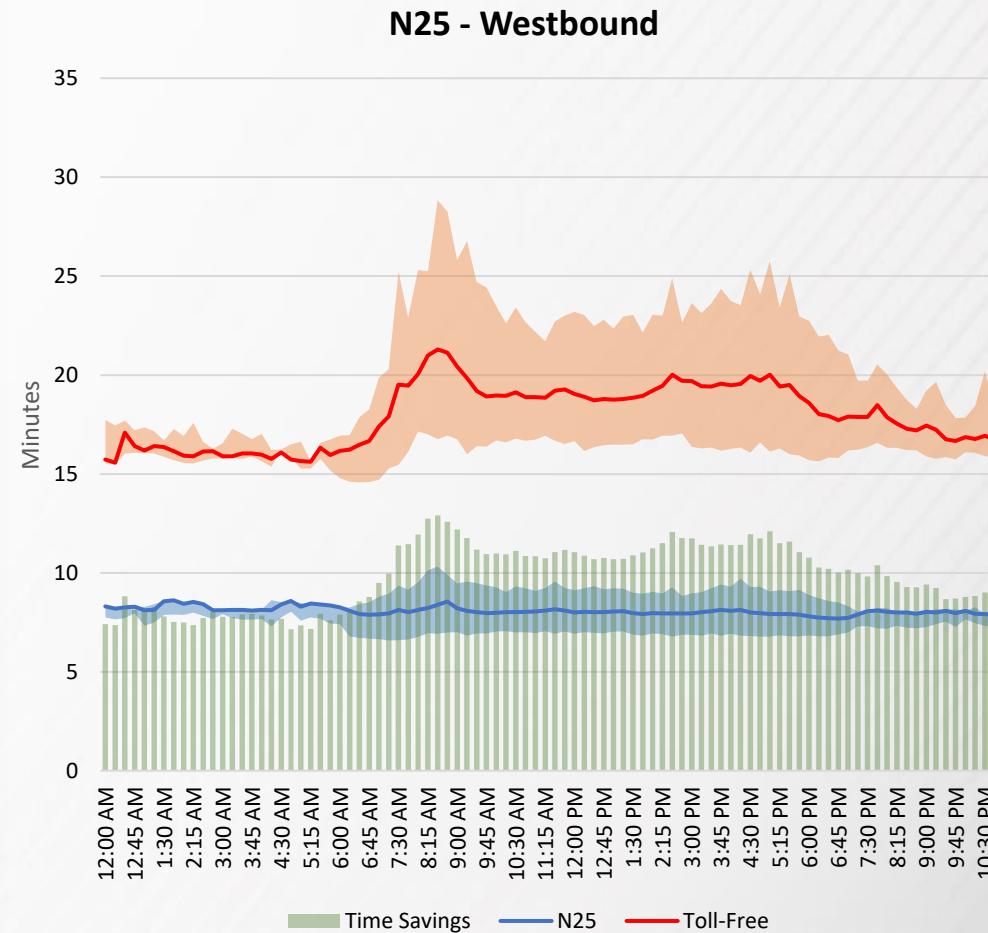


Limerick Tunnel

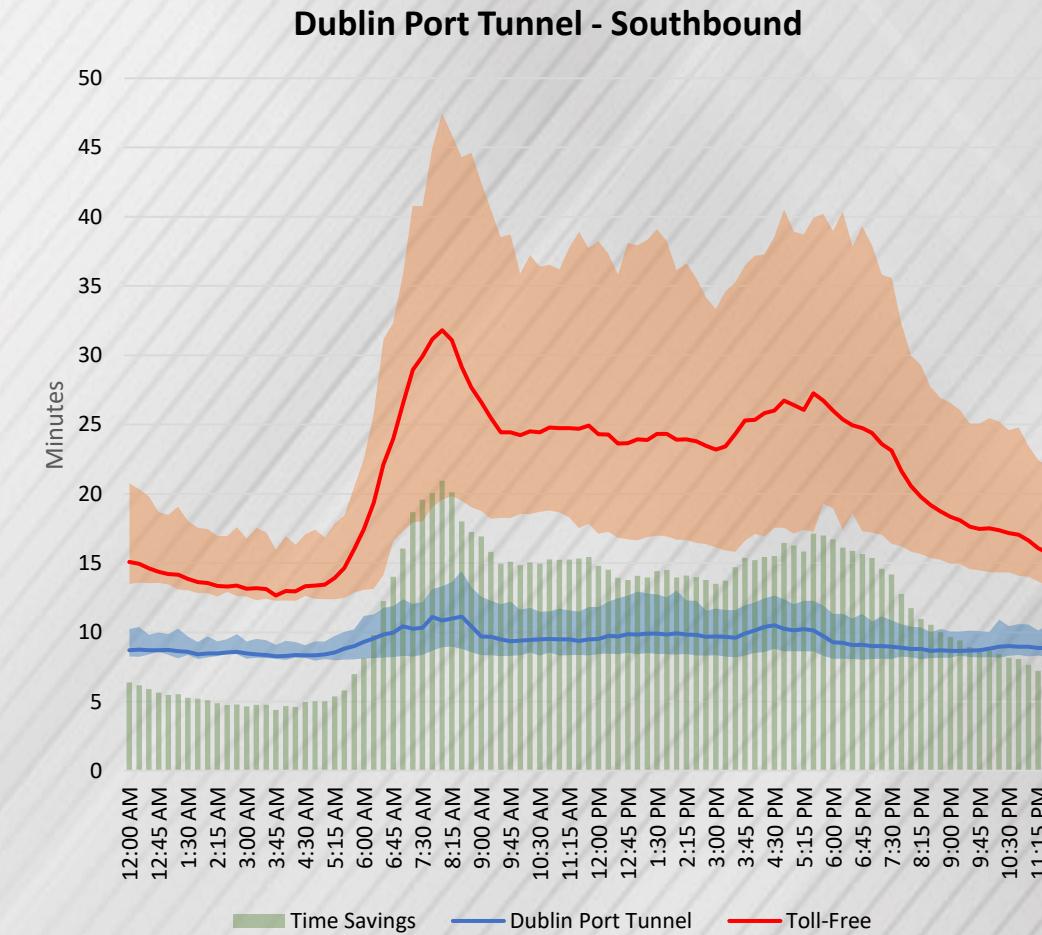
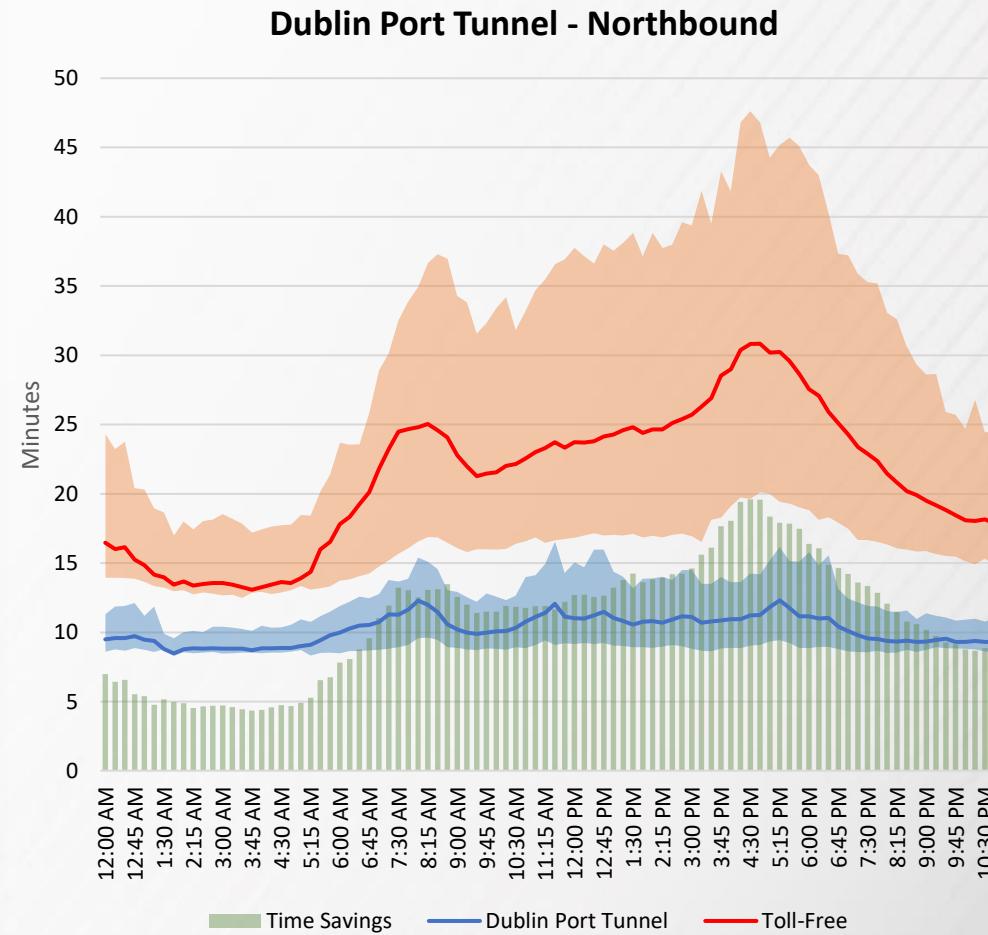


N25

Waterford City Bypass

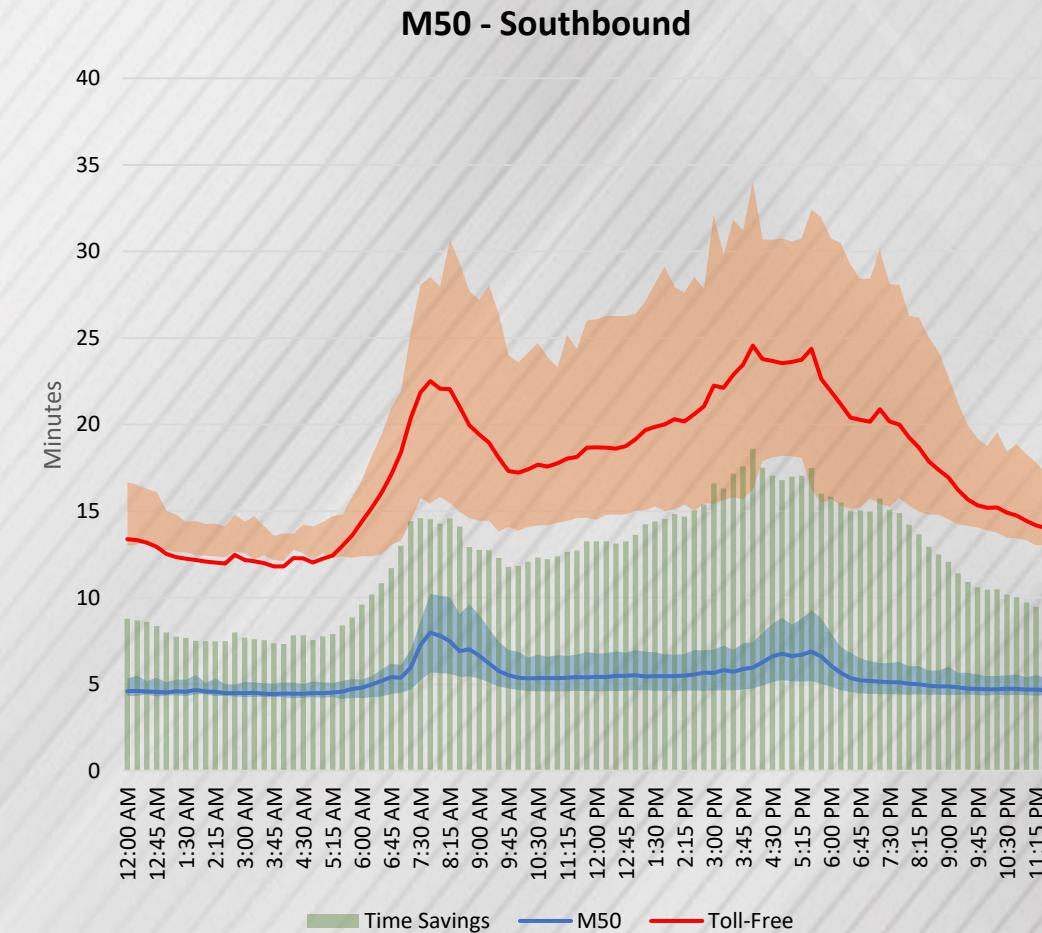
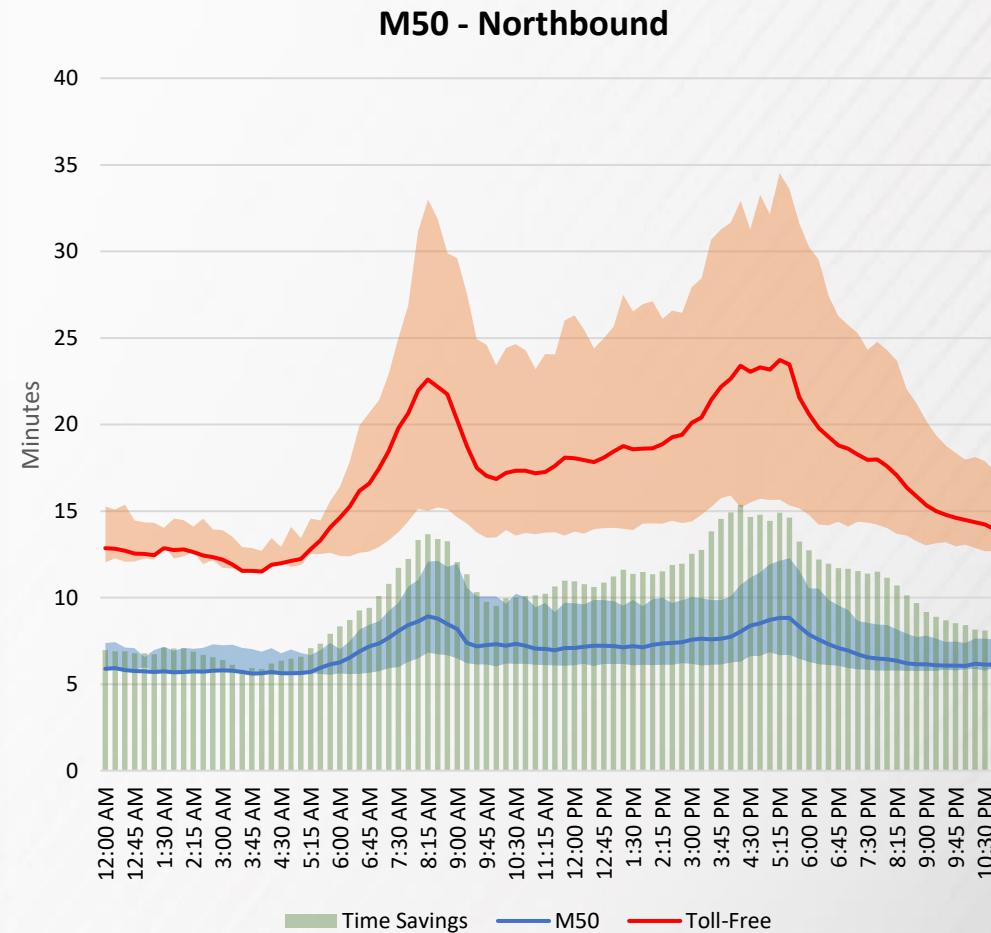


Dublin Port Tunnel

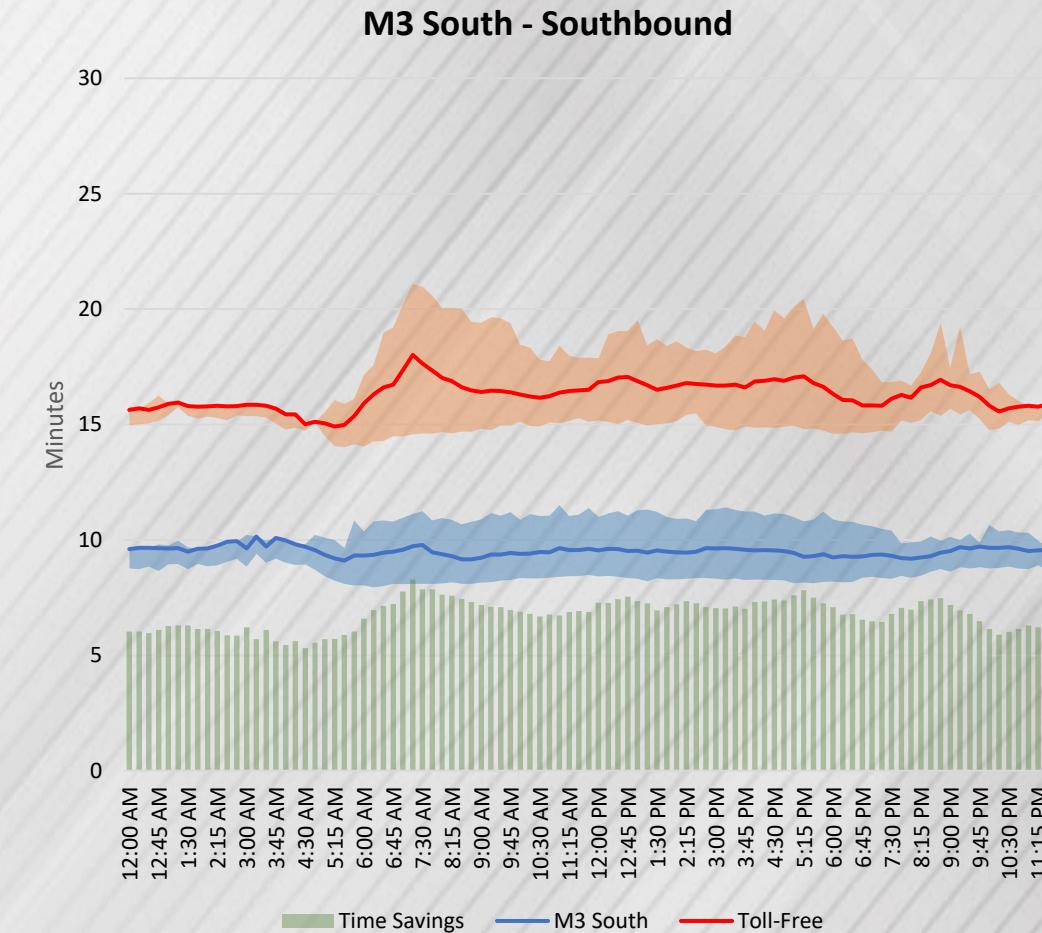
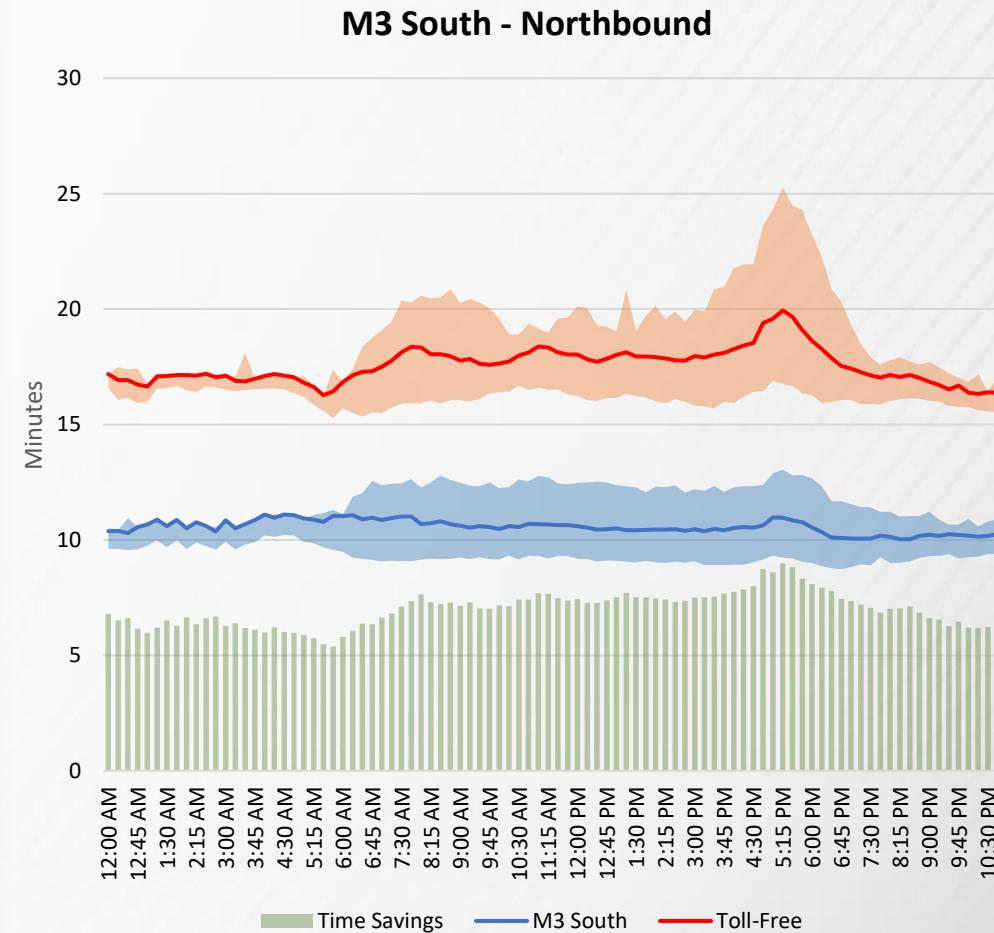


M50

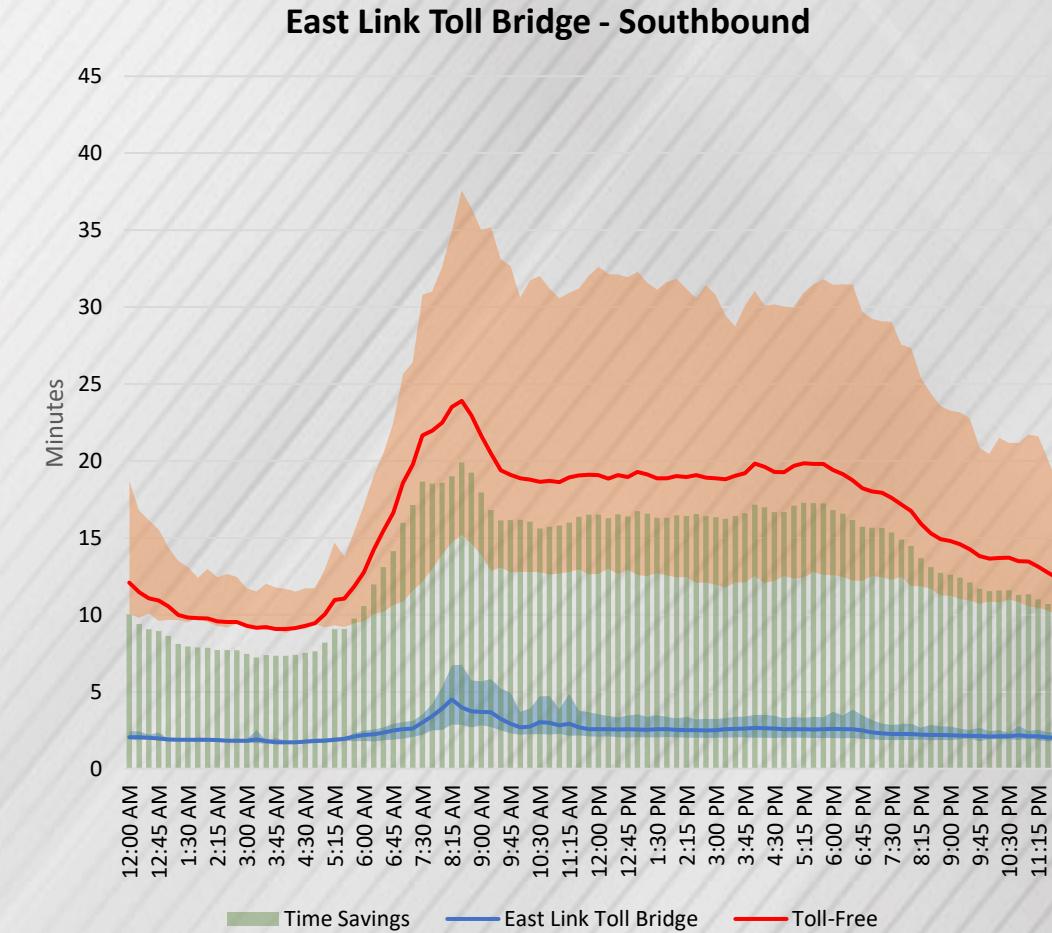
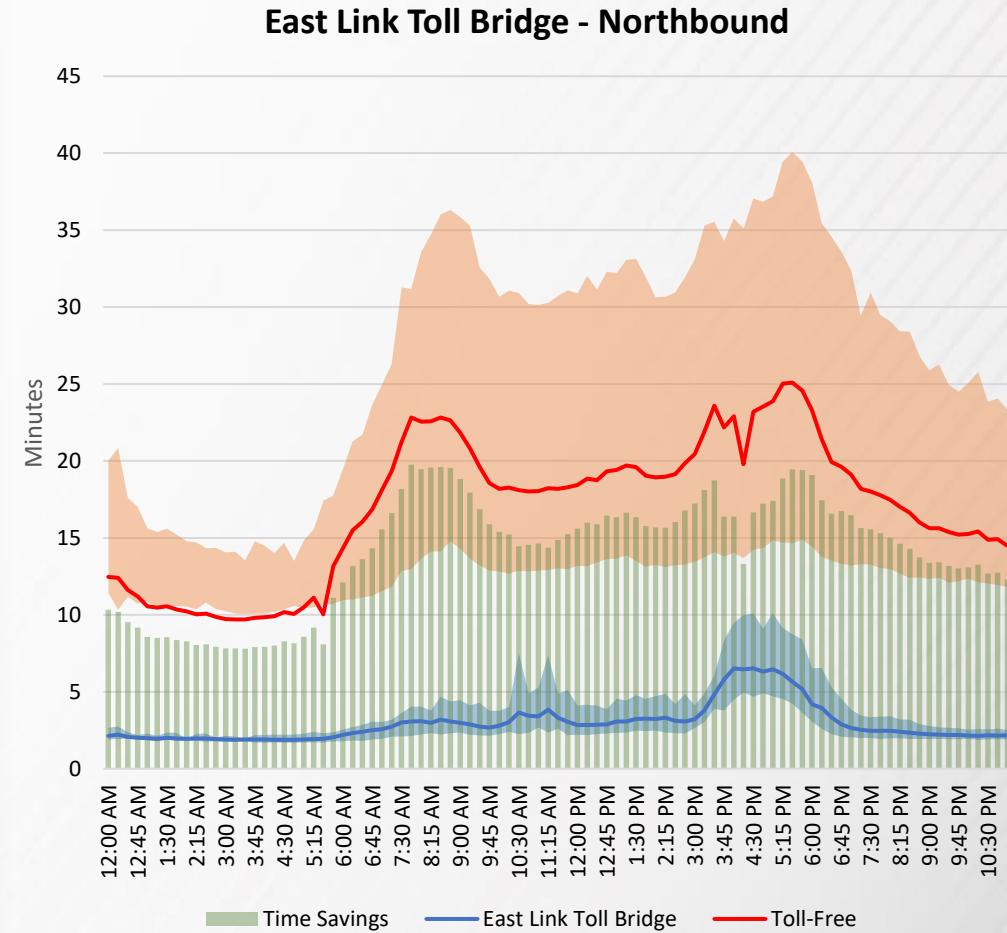
Barrier Free Tolling



M3 Clonee-Kells Blackbull Toll Plaza (Southern)

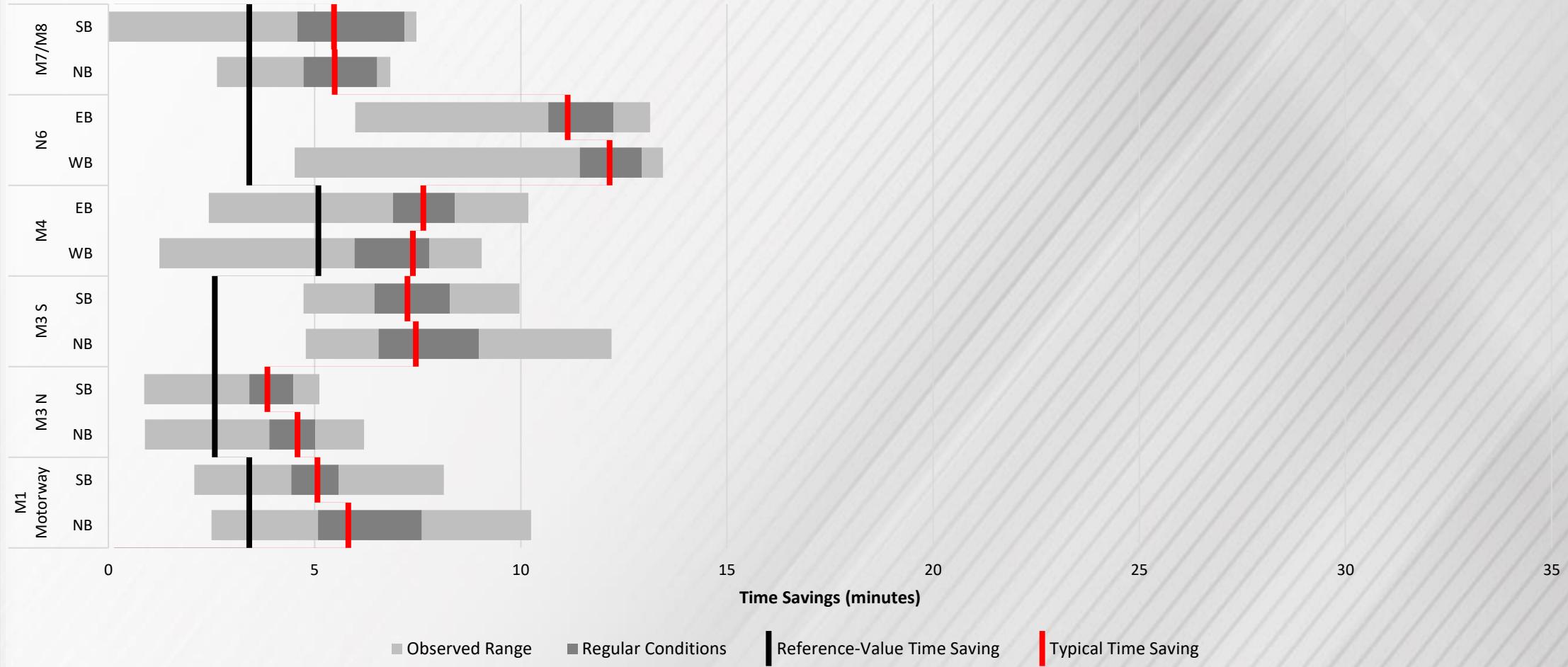


East Link Toll Bridge



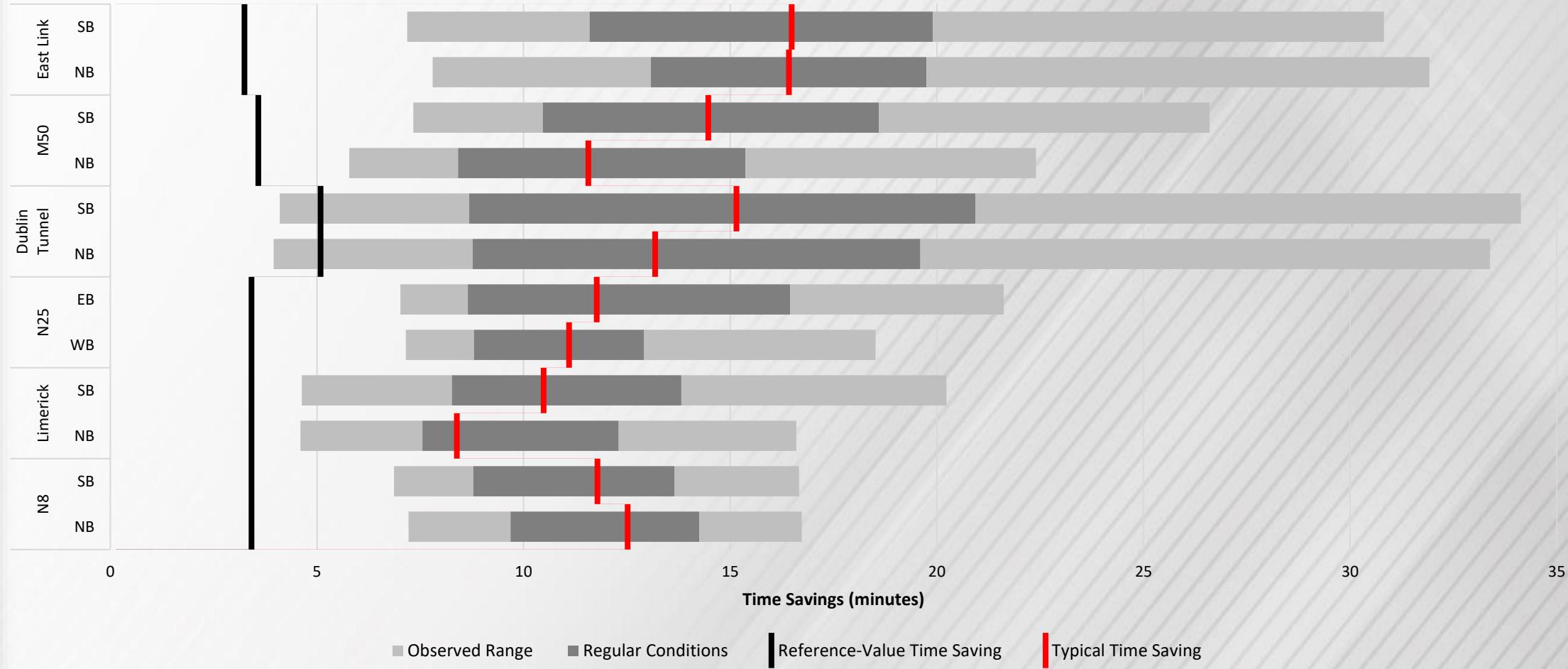
Travel Time Savings

Typical v Reference Value (TII-Recommended Value of Time)*



Travel Time Savings

Typical v Reference Value (TII-Recommended Value of Time)*



Conclusion: Price ≠ Value

Toll Road	Cost/mile		Cost/min	
	Cost/mile	Rank	Cost/min	Rank
East Link Toll Bridge	€ 1.90	12	€ 0.12	1
Dublin Port Tunnel	€ 0.67	11	€ 0.21	7
Limerick Tunnel	€ 0.17	10	€ 0.21	8
N8	€ 0.11	9	€ 0.17	3
N25	€ 0.09	8	€ 0.18	5
M4	€ 0.09	7	€ 0.40	12
M3 South	€ 0.06	6	€ 0.21	6
M3 North	€ 0.06	5	€ 0.36	9
M7/M8	€ 0.05	4	€ 0.37	10
M50	€ 0.05	3	€ 0.16	2
N6	€ 0.04	2	€ 0.17	4
M1	€ 0.04	1	€ 0.37	11

In terms of value, the East Link Toll Bridge is #1 (lowest cost/minute saved), yet it ranks #12 in terms of price (highest cost/mile)

In terms of price, the M1 is #1 (lowest cost/mile), yet it ranks #11 in terms of value (high cost/minute saved)

Irish Toll Facilities: 6 Take-Aways

- **Time savings vary (sometimes significantly) by time of day**
 - Yet toll prices - generally - remain constant.
- **Perhaps more important, travel time variability varies (often significantly) by time of day**
 - Elevate the status of journey time reliability in marketing materials?
- **'Cost per minute saved' benchmarking permits all types of toll facilities to be compared directly**
 - Roads v bridges v tunnels. Require separate consideration in cents/mile discussions.
- **The more expensive facilities (cost/mile) were - unsurprisingly - bridges and tunnels**
 - They represent mixed value for money propositions; one (very) good, others not so good.
- **All of the Irish toll facilities represent value for money**
 - Time savings exceed the respective toll tariffs (converted into their time-equivalent), by a factor of 3x or 4x in some cases. Sector average = 2.6x.
 - Do the public, drivers, motoring organisations etc. appreciate this?
- **The best value Irish toll facility - by our consumer-focussed criteria - is East Link Toll Bridge**
 - Congratulations to the team involved!