ASSESSING THE IMPACT OF THE PROPOSED FITZROY NORTH TRAIN STATION ON PUBLIC TRANSPORT ACCESSIBILITY FOR ADDRESSES IN FITZROY

GIS Principles – GEOM1163 – 3/11/2024

EXECUTIVE SUMMARY

This study investigates the impact of introducing a new train station in Fitzroy North, part of the proposed Melbourne Metro 2 (MM2) project, on public transportation travel times for Fitzroy residents and businesses. Using GIS-based network analysis and GTFS data, we modelled both current and proposed scenarios to assess accessibility improvements to key destinations: Southern Cross, Flinders Street, Fisherman's Bend, and Preston. Results indicate significant reductions in travel times, notably to Fisherman's Bend, where average times decrease by 30 minutes, supporting future development. Travel to Southern Cross also improves, while Flinders Street sees minimal change. The analysis highlights the new station's potential to enhance connectivity, reduce congestion, and stimulate urban growth, with recommendations for further analysis involving integrated transport extensions and increased service frequency.

Callum Hampson-Clarke
S4036071

Aim

This study aims to investigate changes in public transportation travel times for the residents of Fitzroy when introducing a new train station in Fitzroy North. This station, part of the Melbourne Metro 2 (MM2) project, will connect Clifton Hill, Fitzroy North, Parkville and extend through the CBD to Fisherman's Bend. The analysis will focus on how the proposed station improves access from Fitzroy to key destinations across the metropolitan area, addressing whether there is a lack of transport accessibility that could be improved.

Research Question

How will the construction of a new train station in Fitzroy as part of the Melbourne Metro 2 project impact public transportation travel times and accessibility for residents of Fitzroy to key destinations in Melbourne?

Introduction

Melbourne's growing population, particularly in the western and northern regions, places significant demands on the city's transport infrastructure. By 2031, the Western and Northern regions are expected to see population increases of 43% and 34%, respectively. This rapid growth necessitates the expansion of Melbourne's rail network, including the proposed Melbourne Metro 2 (MM2) project (Figure 1), a 20.2-kilometre rail tunnel linking Clifton Hill to potentially Newport, passing through the central business district (CBD) and Fisherman's Bend. Designed to enhance capacity on the Werribee and Mernda lines, MM2 is expected to improve connectivity, relieve pressure on existing lines, and support urban development in Melbourne's inner north and western suburbs (The Greens 2018).

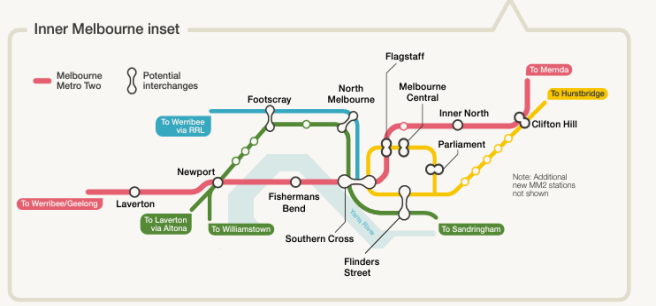


Figure 1: Metro Tunnel 2 (The Greens 2018).

Figure 2: Fitzroy North Train Location (Rail Futures Institute 2019).

A significant component of the MM2 project is the construction of a new underground station in Fitzroy, a rapidly developing area currently underserved by rail services. The proposed Fitzroy station, positioned along Queens Parade between Brunswick and Smith Streets, would bridge the gap in rail accessibility for inner northern Melbourne (Figure 2). This new station is envisioned to enhance connectivity by providing a vital interchange point for trams and trains, thereby increasing accessibility to key educational and employment precincts. Moreover, it aims to promote sustainable urban growth by attracting commercial and residential developments along Alexandra Parade, transforming it into a vibrant boulevard like Victoria Parade or St Kilda Road (Rail Futures Institute 2019). Using GIS-based network analysis such as service area analysis and origin-destination cost analysis, the study will identify the potential improvements in accessibility and transit efficiency for people travelling to and from Fitzroy.

Site Selection

Using publicly available government reports and Metro Tunnel 2 plans, the proposed location for the Fitzroy North train station was decided to be on Alexander Parade based on accessibility and suitability by previous reports (Figure 2). Two stations are also to be in Fisherman's Bend (Figure 3) to take advantage of the rail infrastructure being built and for the trains to reach more addresses. Some plans for MM2 only have one station at Fisherman's Bend. Figure 4 shows the site selection on ArcGIS, mesh blocks are used to identify which suburbs are situated around Fitzroy North Station and are to be impacted by a new train station in Fitzroy North. These are Fitzroy, Fitzroy North, Collingwood, Carlton, Carlton North, Parkville and Clifton Hill. The Vic Railway Corridor feature on the map shows the existing railway corridors surrounding Fitzroy while the proposed stops are shown for MM2 which were created as GTFS Data.

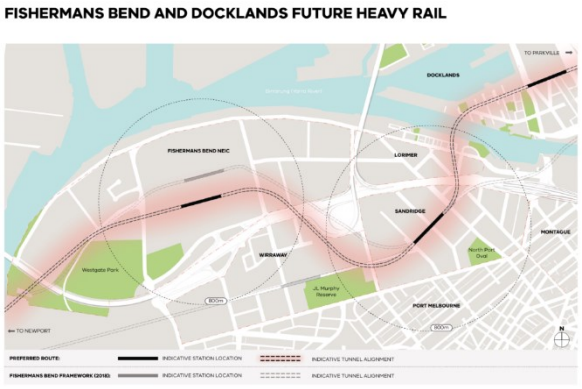


Figure 3: Fisherman's Bend Future Metro Stations (Rail Futures 2019)

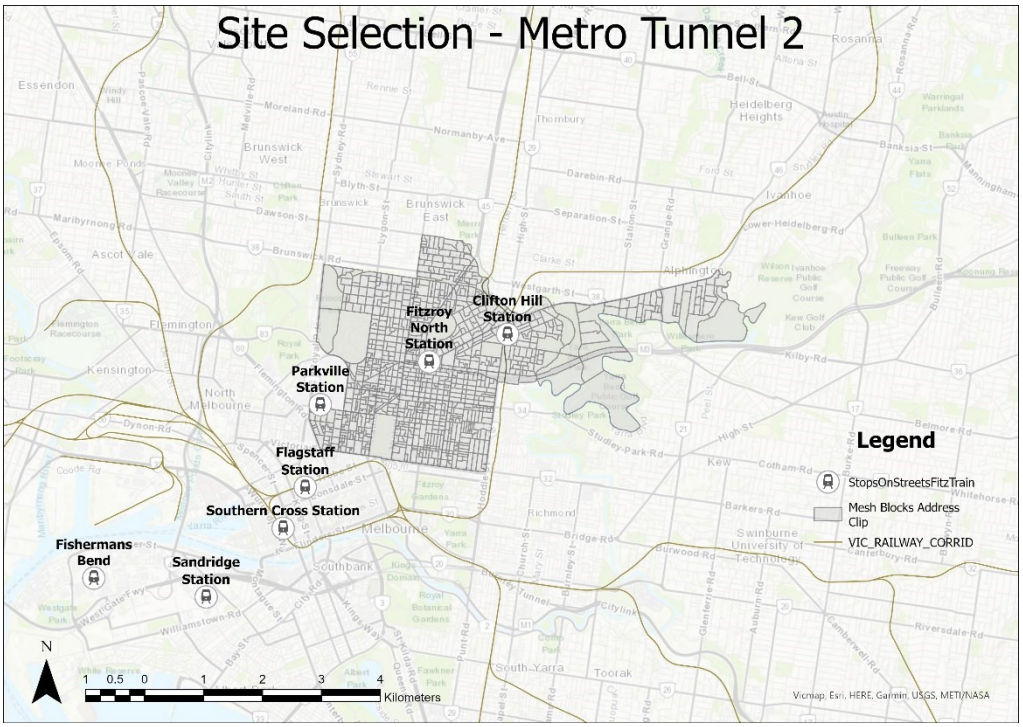


Figure 4: Site Selection

Methodology

The methodology for this study involves a series of analytical processes designed to measure the impact of introducing a new train station in Fitzroy North on travel times for residents commuting to Southern Cross, Flinders St, Fisherman's Bend and Preston Station. This approach combines network analysis, and general transit feed specification (GTFS) data to develop a model of current and proposed travel scenarios.

Step 1. Service Area Analysis

A 15-minute walkability radius was generated around the proposed Fitzroy North station on Alexandra Parade. The time was specified to be 15 minutes based on the urban planning concept to design local areas to have everything civilians need within this 15-minute walking distance to reduce the use of cars and instead promote walking, cycling and the use of public transport (UCEM 2024). In the network dataset walking is set to a speed of 83.33 meters per minute, per the ArcGIS Network Analysis tutorial. This speed is an estimated average derived from relevant guidelines, although this method does not account for slope-induced variation in walking speed, potentially overestimating accessibility for addresses in more elevated areas. Future iterations could consider using elevation-adjusted walking speeds.

Addresses in Melbourne are clipped to the 15-minute radius defined by the service area analysis. Future Cost matrix analysis will only use the addresses in this radius as these are the residents, businesses and destinations most likely to use the Fitzroy North Train Station.

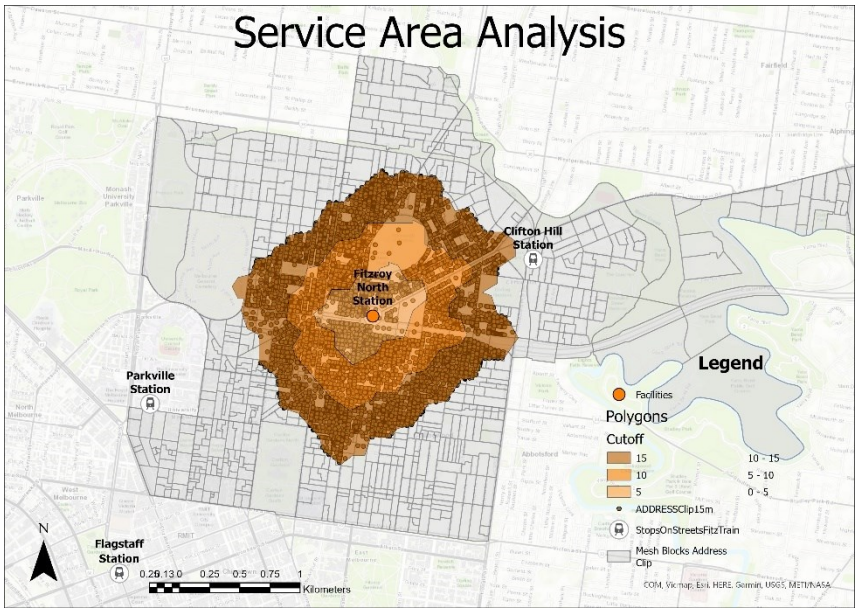


Figure 5: Service Area Analysis

Step 2.1 Creation of Network Datasets.

Two network datasets were developed: one using Melbourne's existing transportation infrastructure and another incorporating the proposed Metro Tunnel 2 with the Fitzroy North train line. When creating the network datasets, I followed the ArcGIS tutorial on how to build a public transit network. Figures 6 to 9 show the key settings of the network dataset.

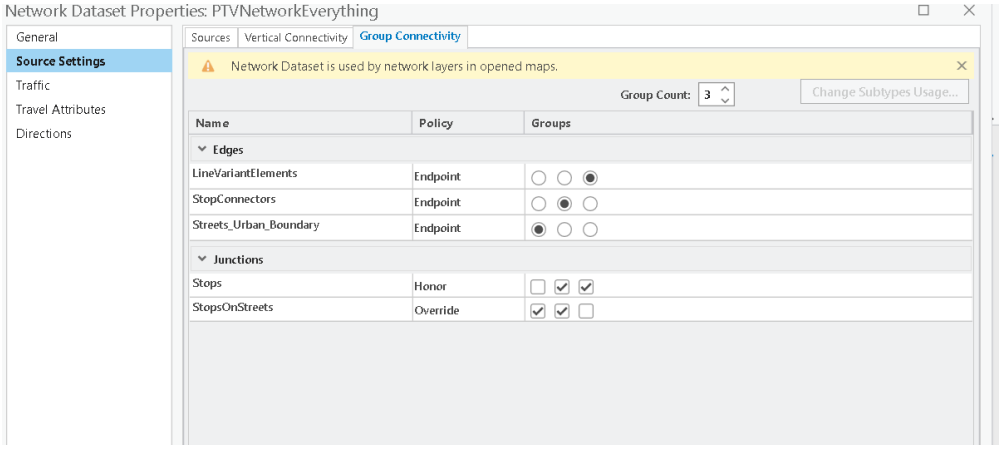


Figure 6: Group Connectivity

Group connectivity: Define policies for how edges connect to other features on the network
Endpoint policy: Specifies that connections are made only at the endpoint of the edges
Honour and Override: Settings define whether transit stops are integrated with the road network or exist as independent points

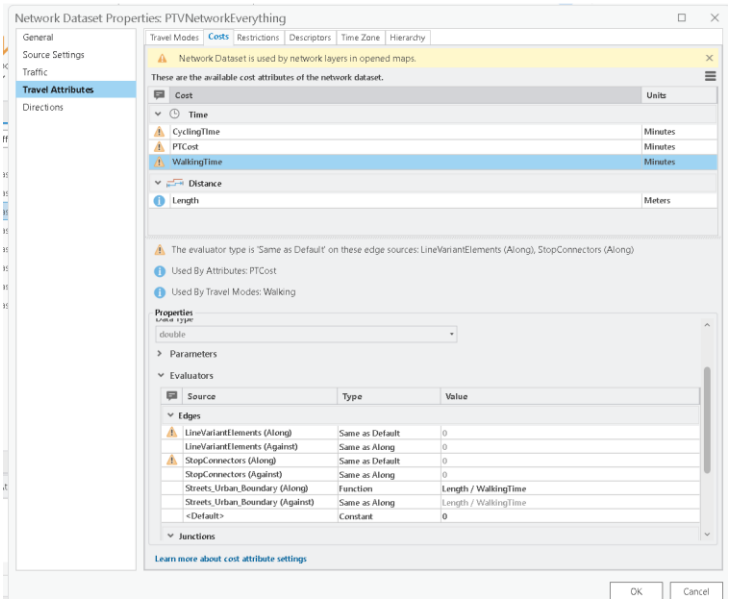


Figure 7: Walking Time Travel Attribute

Walking Time: Represents the time required to travel through the network. Walk time is defined as 83.33 metres per minute. The length/Walk Time function divides the distance by the walking speed to determine travel time for pedestrians.

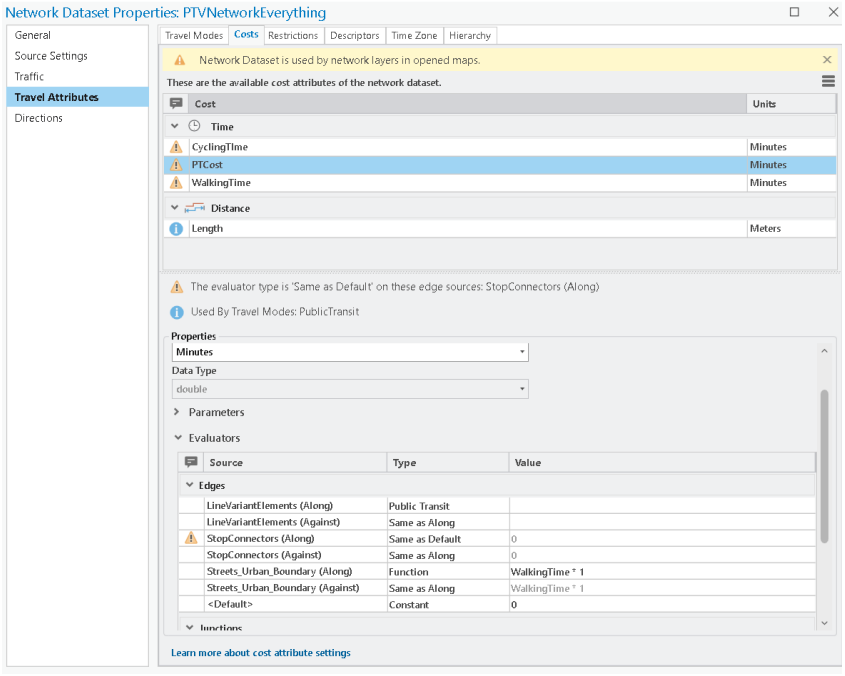


Figure 8: Public Transit Cost

PTCost: Travel times are defined by the GTFS data showing online variants in Figure 8, while the street Urban Boundary edge defines the walking time from the addresses to reach a public transit stop which is walking time (83.33 metres per minute)* 1.

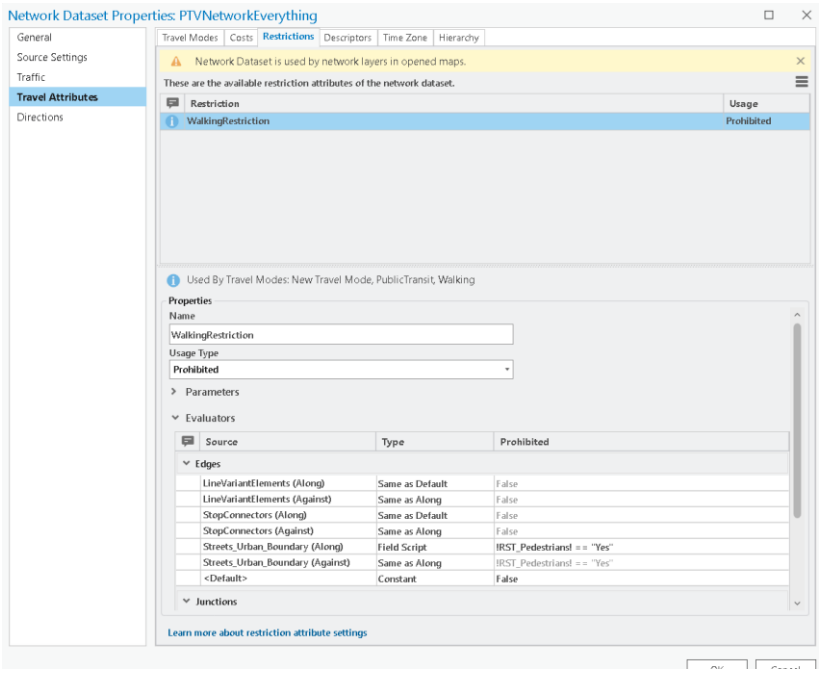


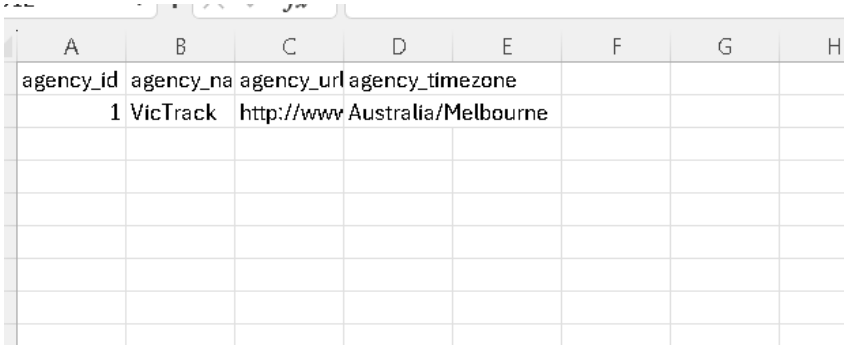
Figure 9: Walking Restriction

Walking Restriction**:** Restrictions are set in the network dataset for pedestrians to not walk on certain roads and pathways. This was set by adding a field to the road attribute table and populating the field to say yes for road classes that are highways and ferry routes. A field script is then placed on the urban boundary (Figure 9) on the network dataset to enforce this restriction.

Step 2.2: Load and Create GTFS Data

Public Transport Network datasets were created with the use of General Transit Feed Specification (GTFS) data which defines a common format for public transport schedules and associated geographic information. GTFS data provides static timetable data and geographic information. Data Victoria provides GTFS data which contains scheduled information for all metropolitan and regional trains, buses and metropolitan tram services (Data Vic 2024). To generate the GTFS data for a new train line several text files are created referencing Melbourne's current GTFS dataset and validated through the GTFS Schedule Validation Report.

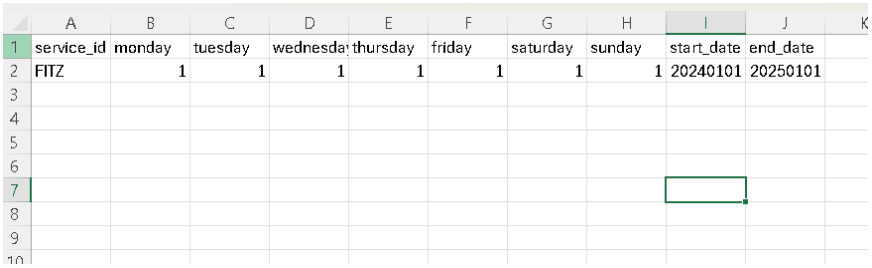
Agency: Provides information about the public transportation agency responsible for the transit service. for our layer, we used the identical fields for existing GTFS Data in Melbourne.



agency_id	agency_na	agency_url	agency_timezone
1	VicTrack	http://www	Australia/Melbourne

Figure 10: Agency Txt

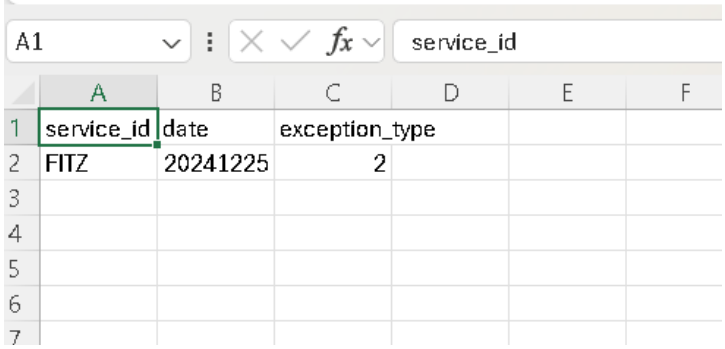
Calendar: This layer defines the days of the week the specific transit service operates. For the Fitzroy line, the service runs 7 days a week. '1' means the service runs on that day while a '0' would mean it does not.



service_id	monday	tuesday	wednesday	thursday	friday	saturday	sunday	start_date	end_date
FITZ	1	1	1	1	1	1	1	20240101	20250101

Figure 11: Calendar Txt

Calendar Dates: This layer specifies exceptions to the regular services schedule. For this exercise, we specified Christmas too have no trains running.

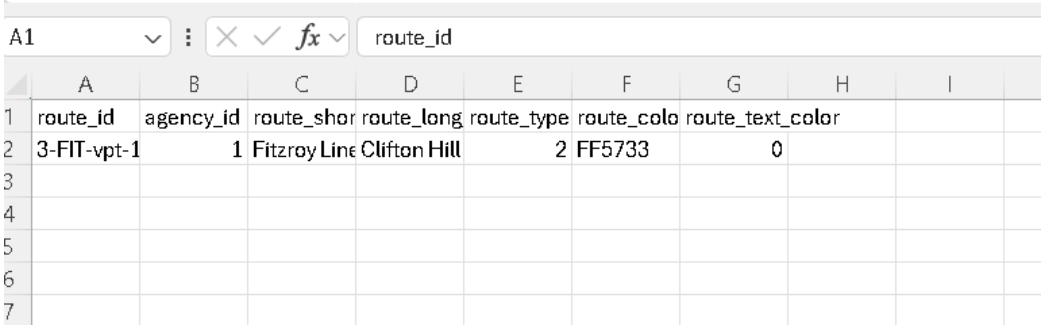


A1 | service_id

service_id	date	exception_type
FITZ	20241225	2

Figure 12: Calendar Dates txt

Routes: This layer provides detailed information about the transit routes, including the route name, type (2 for rail) and how it should be visually represented.

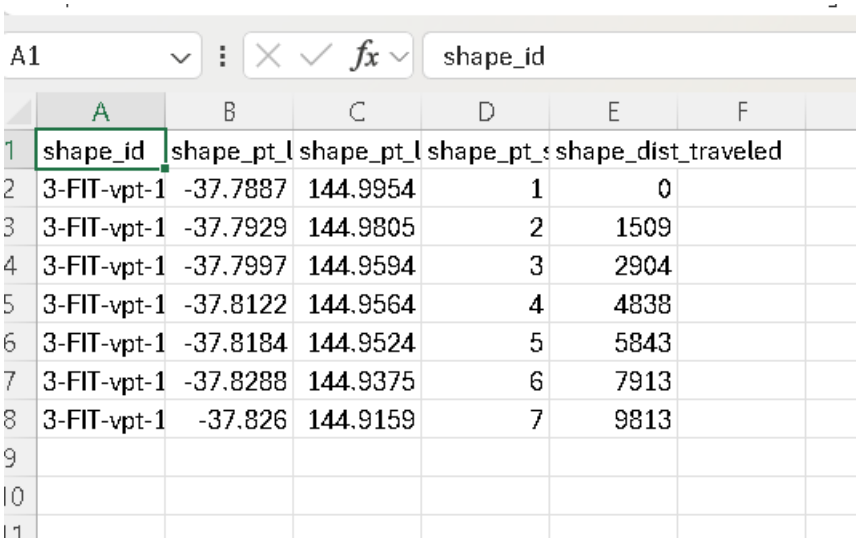


	A	B	C	D	E	F	G	H	I
1	route_id	agency_id	route_shor	route_long	route_type	route_colo	route_text_color		
2	3-FIT-vpt-1	1	Fitzroy Line	Clifton Hill	2	FF5733	0		
3									
4									
5									
6									
7									

Figure 13: Routes txt

Shapes: This layer describes the path that a transit vehicle follows for a specific trip. It provides a set of geographic points that outline the shape of the route on the map. Shape id identifies each shape, shape_pt_lat and pt_lon identify the latitude and longitude coordinates of the stations, shape_pt_sequence identifies the order in which points are connected to and from (both forward and backward routes are identified in the GTFS layer), shape_dist_travelled: indicates the cumulative distance along the shape path from start to end point. Station locations were integrated using latitude and longitude values from Rail Futures resources, and track distances were measured in ArcGIS using approximate straight-line measurements between stations. Due to limited data on travel speeds for the new line, estimated speeds were calculated based on segments comparable to the Upfield Line as it features outer suburban and city loop travel times.

Limitations: Exact travel times remain uncertain, and straight-line measurements may introduce inaccuracies in distance calculations. The estimated speeds based on similar lines may not fully capture the unique characteristics of the new route.



	A	B	C	D	E	F
1	shape_id	shape_pt_l	shape_pt_l	shape_pt_s	shape_dist_traveled	
2	3-FIT-vpt-1	-37.7887	144.9954	1	0	
3	3-FIT-vpt-1	-37.7929	144.9805	2	1509	
4	3-FIT-vpt-1	-37.7997	144.9594	3	2904	
5	3-FIT-vpt-1	-37.8122	144.9564	4	4838	
6	3-FIT-vpt-1	-37.8184	144.9524	5	5843	
7	3-FIT-vpt-1	-37.8288	144.9375	6	7913	
8	3-FIT-vpt-1	-37.826	144.9159	7	9813	
9						
10						

Figure 14: Shapes txt

Stop times: This layer provides the timing details for each stop on a specific trip key fields include arrival and departure time, stop id, stop sequence and distance travelled. Stop times are to be every 10 minutes in peak time and every 20 minutes when not in peak time.

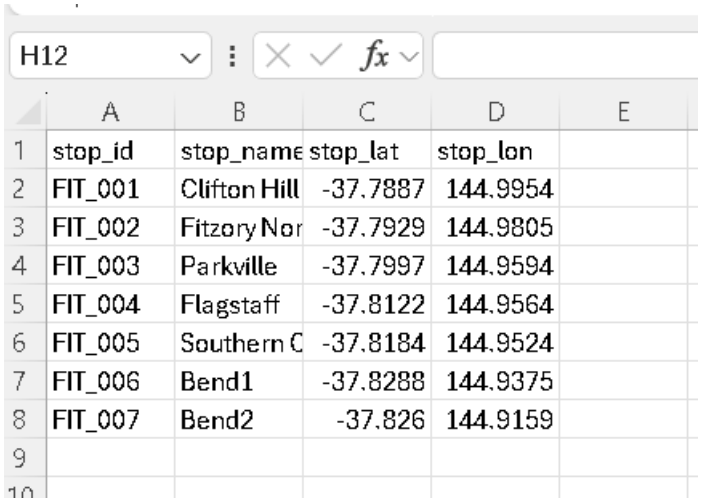
Limitations: Upon reflection, trains would be likely to be more frequent than what is presented in this created GTFS dataset.

	A	B	C	D	E	F	G	H
1	trip_id	arrival_tim	departure_	stop_id	stop_sequ	pickup_typ	drop_off_ty	shape_dist_tr
2	1.T-FIT.vpt	4:48:00	4:48:00	FIT_001	1	0	0	0
3	1.T-FIT.vpt	4:50:00	4:50:00	FIT_002	2	0	0	1509
4	1.T-FIT.vpt	4:53:00	4:53:00	FIT_003	3	0	0	2904
5	1.T-FIT.vpt	4:57:00	4:57:00	FIT_004	4	0	0	4838
6	1.T-FIT.vpt	4:59:00	4:59:00	FIT_005	5	0	0	5843
7	1.T-FIT.vpt	5:02:00	5:02:00	FIT_006	6	0	0	7913
8	1.T-FIT.vpt	5:05:00	5:05:00	FIT_007	7	0	0	9813
9	1.T-FIT.vpt	5:10:00	5:10:00	FIT_001	1	0	0	0
10	1.T-FIT.vpt	5:12:00	5:12:00	FIT_002	2	0	0	1509
11	1.T-FIT.vpt	5:15:00	5:15:00	FIT_003	3	0	0	2904
12	1.T-FIT.vpt	5:19:00	5:19:00	FIT_004	4	0	0	4838
13	1.T-FIT.vpt	5:21:00	5:21:00	FIT_005	5	0	0	5843
14	1.T-FIT.vpt	5:24:00	5:24:00	FIT_006	6	0	0	7913
15	1.T-FIT.vpt	5:27:00	5:27:00	FIT_007	7	0	0	9813
16	1.T-FIT.vpt	5:30:00	5:30:00	FIT_001	1	0	0	0
17	1.T-FIT.vpt	5:32:00	5:32:00	FIT_002	2	0	0	1509
18	1.T-FIT.vpt	5:35:00	5:35:00	FIT_003	3	0	0	2904
19	1.T-FIT.vpt	5:39:00	5:39:00	FIT_004	4	0	0	4838
20	1.T-FIT.vpt	5:41:00	5:41:00	FIT_005	5	0	0	5843
21	1.T-FIT.vpt	5:44:00	5:44:00	FIT_006	6	0	0	7913
22	1.T-FIT.vpt	5:47:00	5:47:00	FIT_007	7	0	0	9813
23	1.T-FIT.vpt	5:50:00	5:50:00	FIT_001	1	0	0	0
24	1.T-FIT.vpt	5:52:00	5:52:00	FIT_002	2	0	0	1509
25	1.T-FIT.vpt	5:55:00	5:55:00	FIT_003	3	0	0	2904
26	1.T-FIT.vpt	5:59:00	5:59:00	FIT_004	4	0	0	4838
27	1.T-FIT.vpt	6:01:00	6:01:00	FIT_005	5	0	0	5843

stop_times

Figure 15: Stop Times txt

Stops layer: This layer contains information about individual stops, including station names and geographic coordinates.

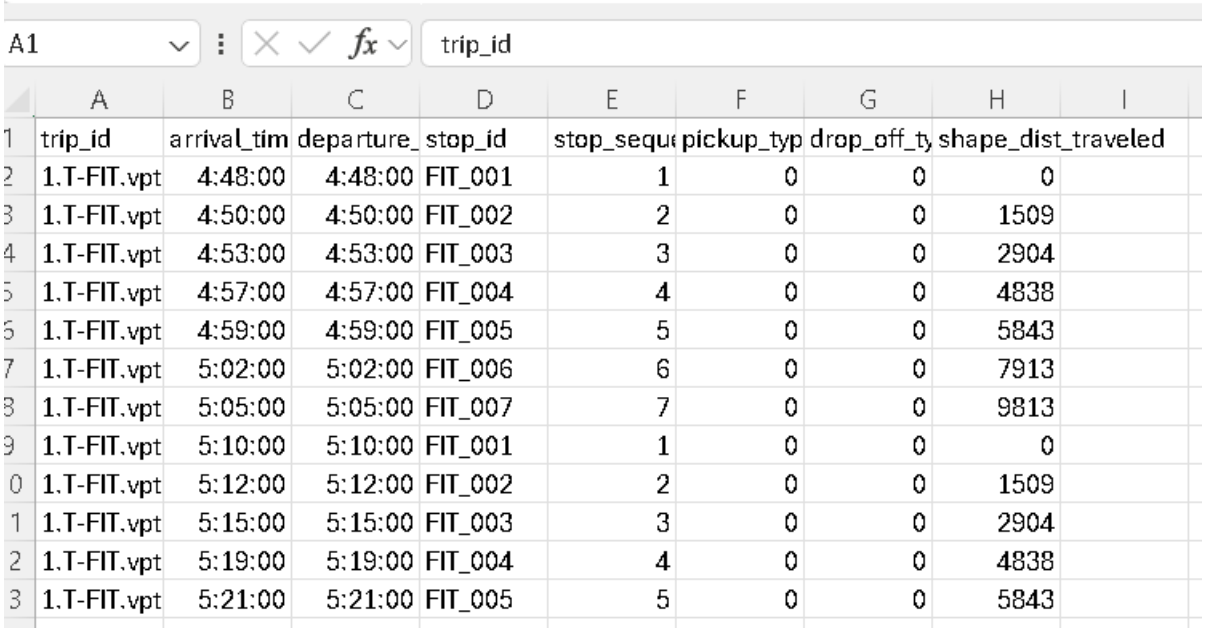


H12

	A	B	C	D	E
1	stop_id	stop_name	stop_lat	stop_lon	
2	FIT_001	Clifton Hill	-37.7887	144.9954	
3	FIT_002	Fitzory Nor	-37.7929	144.9805	
4	FIT_003	Parkville	-37.7997	144.9594	
5	FIT_004	Flagstaff	-37.8122	144.9564	
6	FIT_005	Southern C	-37.8184	144.9524	
7	FIT_006	Bend1	-37.8288	144.9375	
8	FIT_007	Bend2	-37.826	144.9159	
9					

Figure 16: Stops txt

Trips Layer: This layer details individual trips along a route, including the sequence of stops and the shape of the path taken.



A1 trip_id

	A	B	C	D	E	F	G	H	I
1	trip_id	arrival_tim	departure_	stop_id	stop_seque	pickup_typ	drop_off_ty	shape_dist_traveled	
2	1.T-FIT.vpt	4:48:00	4:48:00	FIT_001	1	0	0	0	
3	1.T-FIT.vpt	4:50:00	4:50:00	FIT_002	2	0	0	1509	
4	1.T-FIT.vpt	4:53:00	4:53:00	FIT_003	3	0	0	2904	
5	1.T-FIT.vpt	4:57:00	4:57:00	FIT_004	4	0	0	4838	
6	1.T-FIT.vpt	4:59:00	4:59:00	FIT_005	5	0	0	5843	
7	1.T-FIT.vpt	5:02:00	5:02:00	FIT_006	6	0	0	7913	
8	1.T-FIT.vpt	5:05:00	5:05:00	FIT_007	7	0	0	9813	
9	1.T-FIT.vpt	5:10:00	5:10:00	FIT_001	1	0	0	0	
10	1.T-FIT.vpt	5:12:00	5:12:00	FIT_002	2	0	0	1509	
11	1.T-FIT.vpt	5:15:00	5:15:00	FIT_003	3	0	0	2904	
12	1.T-FIT.vpt	5:19:00	5:19:00	FIT_004	4	0	0	4838	
13	1.T-FIT.vpt	5:21:00	5:21:00	FIT_005	5	0	0	5843	

Figure 17: Trips txt

To construct the GTFS data, an Entity Relationship Diagram (Figure 18) was used to ensure that each text file's data was properly referenced through primary and foreign keys. To validate the integrity of the GTFS files and ensure the public transit model would function correctly, I used the Canonical GTFS Schedule validator. The initial validation, shown in Figure 19, revealed numerous errors. However, Figure 20 illustrates the final, fully functional GTFS model, demonstrating successful data referencing and corrections. Original errors encountered were coordinates not matching up, invalid stop sequences and foreign key violations.

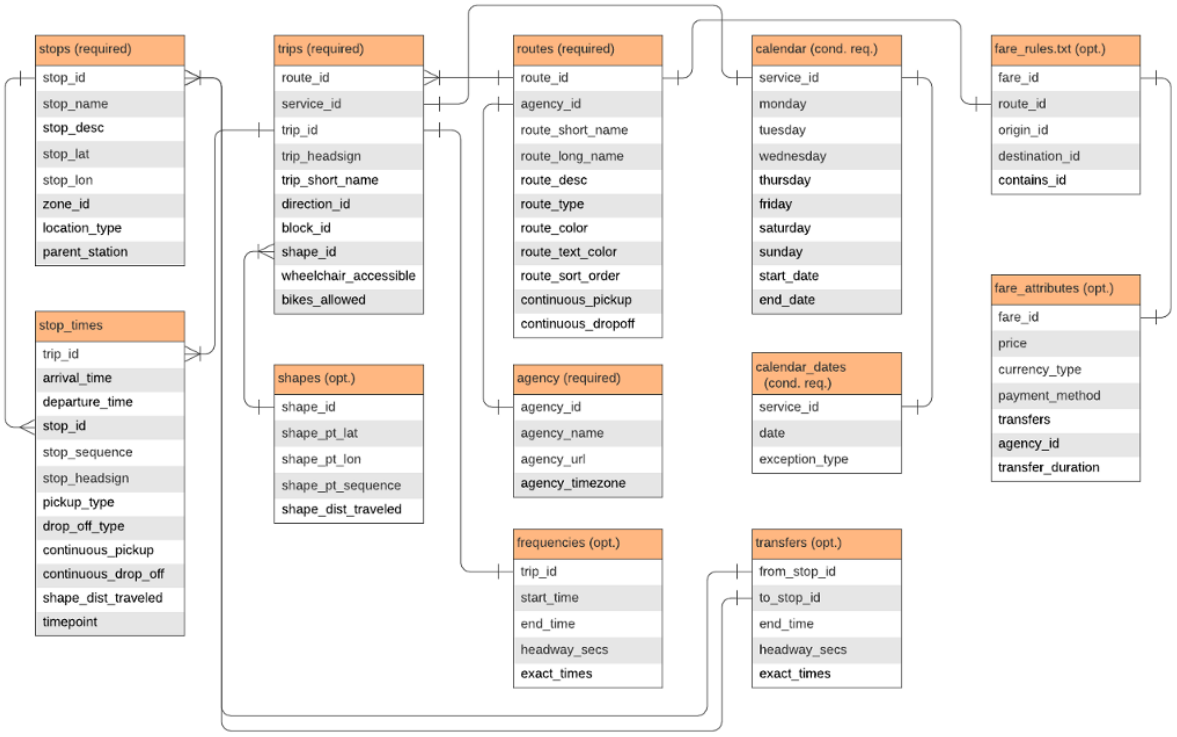
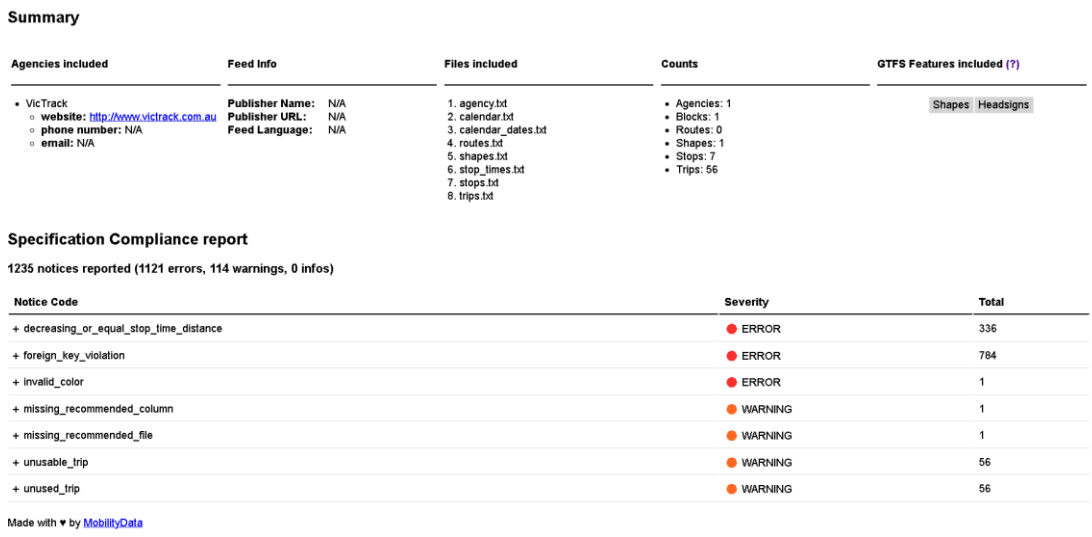


Figure 18: Entity Relationship Diagram (Liu et al., 2024).



Summary

Agencies included	Feed Info	Files included	Counts	GTFS Features included (?)
• VicTrack ◦ **website:** http://www.victrack.com.au ◦ **phone number:** N/A ◦ **email:** N/A	**Publisher Name:** N/A **Publisher URL:** N/A **Feed Language:** N/A	1. agency.txt 2. calendar.txt 3. calendar_dates.txt 4. routes.txt 5. shapes.txt 6. stop_times.txt 7. stops.txt 8. trips.txt	• Agencies: 1 • Blocks: 1 • Routes: 0 • Shapes: 1 • Stops: 7 • Trips: 56	Shapes Headsigns

Specification Compliance report

1235 notices reported (1121 errors, 114 warnings, 0 infos)

Notice Code	Severity	Total
+ decreasing_or_equal_stop_time_distance	ERROR	336
+ foreign_key_violation	ERROR	784
+ invalid_color	ERROR	1
+ missing_recommended_column	WARNING	1
+ missing_recommended_file	WARNING	1
+ unusable_trip	WARNING	56
+ unused_trip	WARNING	56

Made with ♥ by MobilityData

Figure 19: First GTFS Validation Report

Summary

Agencies included	Feed Info	Files included	Counts	GTFS Features included (?)
• VicTrack ◦ **website:** http://www.victrack.com.au ◦ **phone number:** N/A ◦ **email:** N/A	**Publisher Name:** N/A **Publisher URL:** N/A **Feed Language:** N/A	1. agency.txt 2. calendar.txt 3. calendar_dates.txt 4. routes.txt 5. shapes.txt 6. stop_times.txt 7. stops.txt 8. trips.txt	• Agencies: 1 • Blocks: 1 • Routes: 1 • Shapes: 1 • Stops: 7 • Trips: 113	Shapes Route Colors Headsigns

Specification Compliance report

6 notices reported (0 errors, 6 warnings, 0 infos)

Notice Code	Severity	Total
+ missing_recommended_column	WARNING	1
+ missing_recommended_file	WARNING	1
+ stops_match_shape_out_of_order	WARNING	2
+ unusable_trip	WARNING	1
+ unused_trip	WARNING	1

Made with ♥ by MobilityData

Figure 20: Final GTFS validation Report

Step 3: OD Cost Matrix

A Cost Matrix is then run from the addresses within the service area to four different destinations: Flinders Street Station, Southern Cross Station, Preston, and Fisherman's Bend Station. The Cost Matrix measures travel times from all addresses in the service area to these destinations.

- Flinders Street Station and Southern Cross Station were chosen because they are two key hubs in Melbourne's transportation network. Flinders Street Station services lines that run east and south, while Southern Cross Station connects lines that run north and west.
- Fisherman's Bend is selected to evaluate the impact of the proposed new train station at this location, providing insights into improved accessibility and connectivity.
- Preston is included because it lies on the Mernda Line, which will connect to Clifton Hill. The new train station in Fitzroy North could make travel to Preston more efficient, offering an important measure of the line's potential benefits.

The departure times are set to 9:00 AM on Wednesday, 22nd October, for trips to Flinders Street, Southern Cross, and Fisherman's Bend, and 5:00 PM on the same day for trips to Preston. Both the current network and the proposed network, which includes the new Fitzroy North train line, are analysed. The results will compare travel times between the existing network and the new network to understand the improvements in accessibility with the addition of the Fitzroy train line.

Results

Travel Time (TT) in Minutes for Existing Travel Network Via Public Transport

Destination	Southern Cross Station 9am	Flinders St 9am	Fisherman's Bend 9am	Preston 5pm
Mean TT	26.5	21.1	61.75	31.96
Median TT	27.5	21.99	63.36	30
Standard Div TT	3.82	3.59	4.86	3.9
Minimum TT	20.5	15.99	53.36	20.99
Maximum TT	34.5	29	72.364	42

Table 1

Travel Time (TT) in Minutes with the new Metro Tunnel 2.

Destination	Southern Cross Station	Flinders St 9am	Fisherman's Bend 9am	Preston 5pm
Mean TT	24.71	21.014	30.73	30.49
Median TT	26	21.99	32	30
Standard Div TT	3.3	3.54	3.37	5.37
Minimum TT	15.99	15.99	22	20.99
Maximum TT	26	29	32.1	42

Table 2

Southern Cross Station (9 AM)

- The mean travel time decreased from 26.5 minutes to 24.71 minutes, showing a moderate improvement.
- The variability in travel times was slightly reduced, as indicated by the decrease in the standard deviation from 3.82 to 3.3 minutes.
- The minimum travel time was significantly reduced from 20.5 minutes to 15.99 minutes.

Flinders Street Station (9 AM)

- The mean travel time remained relatively unchanged, moving from 21.1 minutes to 21.014 minutes, indicating minimal impact.
- Standard deviation remained consistent, showing similar variability in travel times.

Fisherman's Bend (9 AM)

- The mean travel time showed a decrease from 61.75 minutes to 30.73 minutes, nearly halving the travel duration.
- The standard deviation decreased from 4.86 to 3.37, suggesting more consistent travel times.
- The minimum travel time improved significantly, dropping from 53.36 minutes to 22 minutes.

Preston (5 PM)

- The mean travel time reduced slightly from 31.96 minutes to 30.49 minutes.
- The standard deviation increased from 3.9 to 5.37 minutes, indicating more variability in travel times in the proposed network.
- The minimum and maximum travel times remained unchanged.

Southern Cross Station:

The introduction of the Fitzroy North train station significantly reduces travel times for commuters travelling to Southern Cross Station. The minimum travel time decreased to 16 minutes, highlighting the efficiency of the new connection. The mean travel time of 24.71 minutes suggests that the new station is effectively reducing the overall average, although there is potential for further reduction with increased frequency of train services. This allows addresses in Fitzroy to have quick travel times to train stations interchanging at Southern Cross commonly associated with the Northern and Western Suburbs of Melbourne.

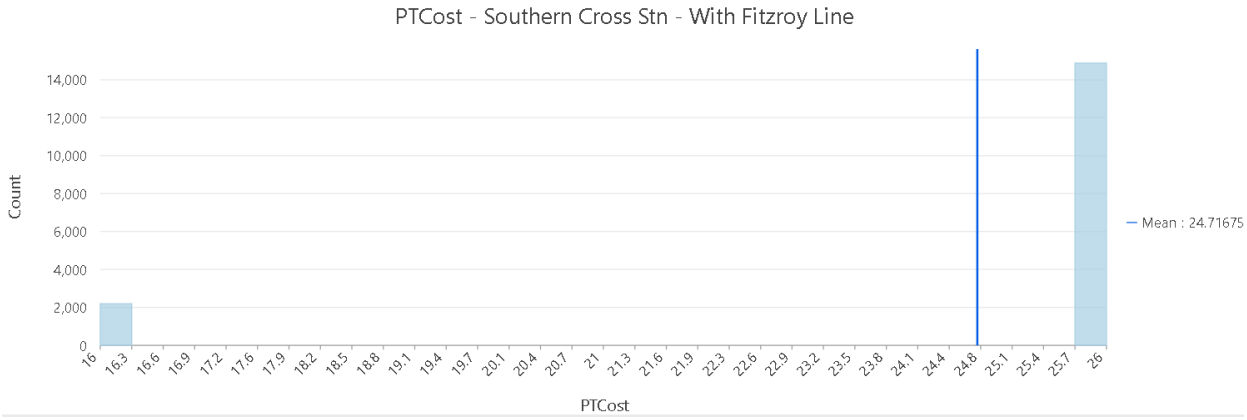


Figure 21: PTCost w/ Fitzroy line

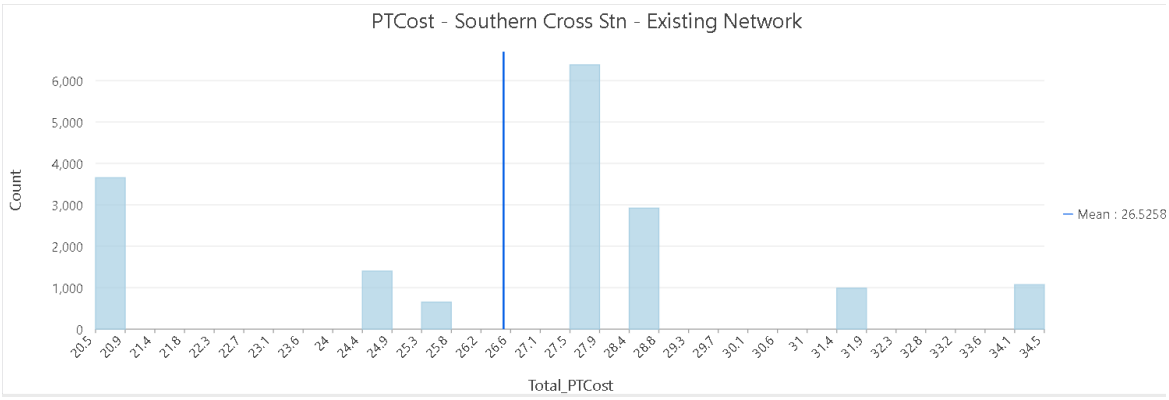


Figure 22: PTCost Existing Network

Flinders St Station:

The impact of the new Fitzroy North Train Station on travel times to Flinders Street Station is minimal. The data suggests that commuters from Fitzroy North still prefer using existing tram and bus services to reach Flinders Street. This minimal change is primarily because the new train line is designed to link to Flagstaff Station, then to Southern Cross, and subsequently to Fisherman's Bend, making it less direct for travellers heading to Flinders Street.

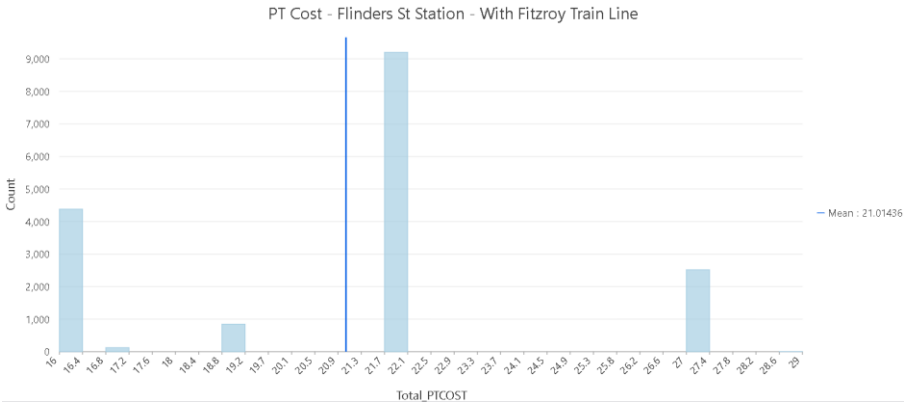


Figure 23: PTCost w/ Fitzroy Line

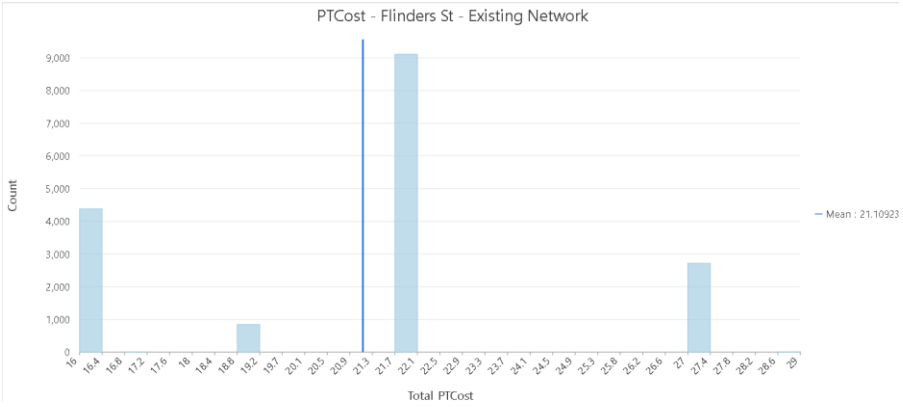


Figure 24: PTCost w/ Existing Network

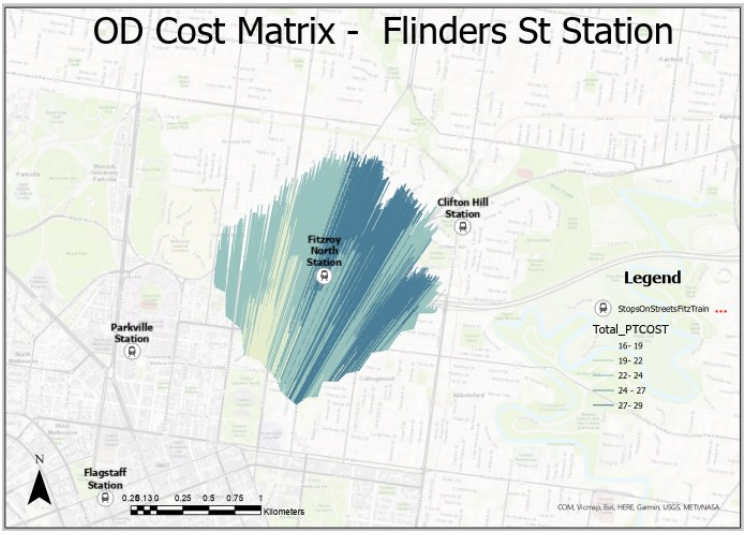


Figure 25: OD Cost Matrix Flinders St Station. Addresses in Fitzroy are preferring to use Tram over the new train line indicated by low PT Cost on Nichalson St.

Fisherman's Bend:

The travel time reductions to Fisherman's Bend are among the most significant changes introduced by the new train line. With the addition of two new train stations at Fisherman's Bend, mean travel times from Fitzroy decrease dramatically, from 61.75 minutes to just 30.73 minutes. This substantial reduction nearly halving the previous travel time has the potential to transform accessibility and attract both residential and commercial developments to Fisherman's Bend. From the map and graphs in Figure 26 we can see that travel times are less for those living closer to the proposed train station faster travel times may occur with more frequent services.

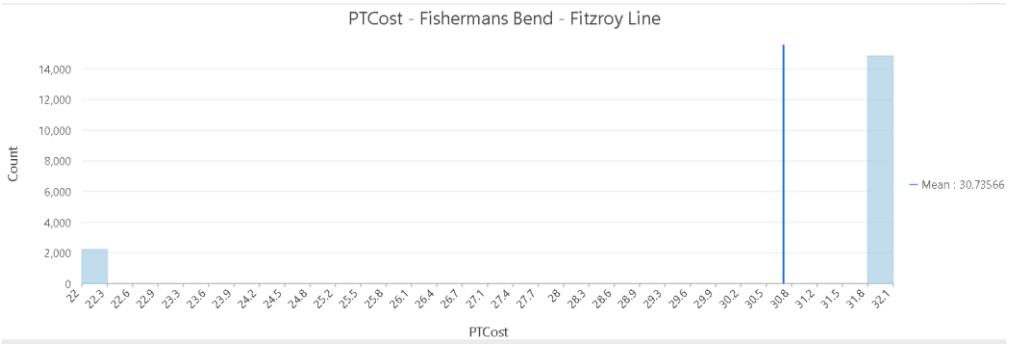


Figure 26: PTCost w/ Fitzroy Line

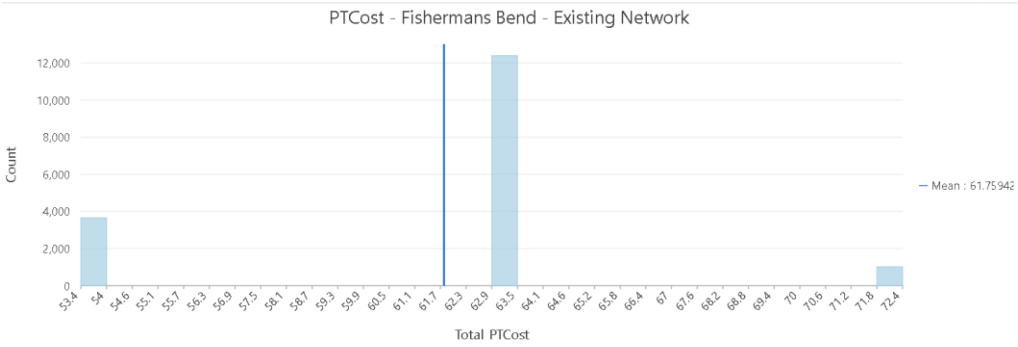


Figure 27: w/ Existing Network

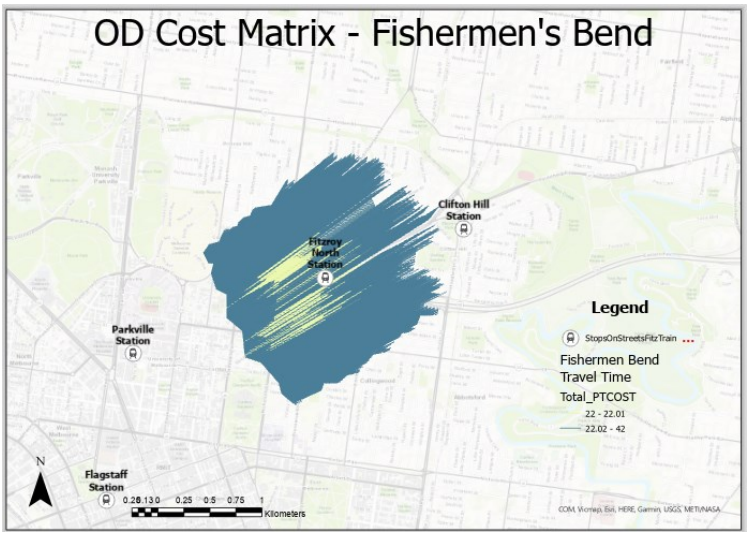


Figure 28: OD Cost Matrix - Fisherman's Bend

Preston:

The introduction of the Fitzroy North train line also brings significant benefits for commuters travelling to Preston. More passengers are now using the Fitzroy North Station to connect to Clifton Hill Station and onward to Preston, particularly during the evening peak hours. The potential for a direct service from Fitzroy to Clifton Hill, and possibly beyond, could make this route even more efficient.

The data indicates that around 2,500 addresses experience a travel time reduction from 30-36 minutes to just 21 minutes. This is a notable improvement, making the commute to Preston much faster and more convenient for several residents. More frequent services would have more addresses experiencing trips of 21 minutes.

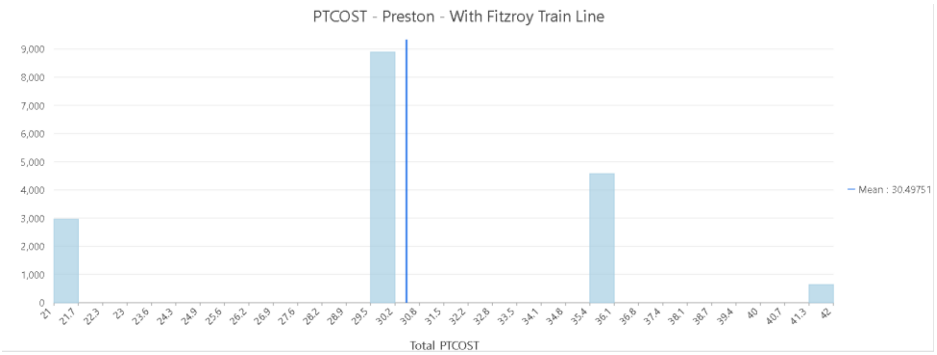


Figure 29: PTCost w/ Fitzroy line

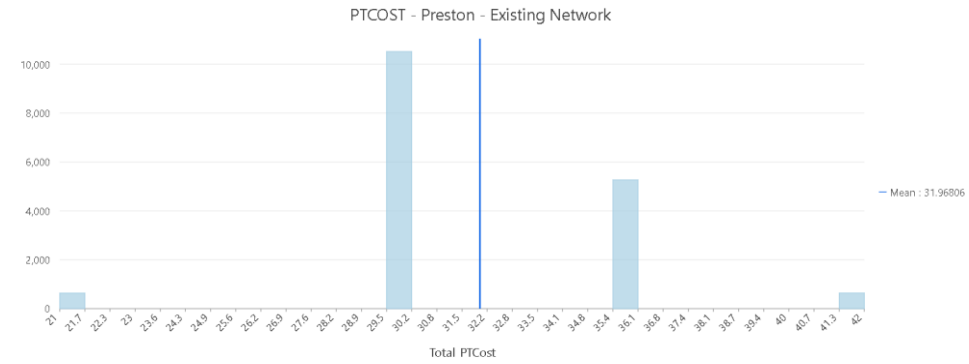


Figure 30: PTCost - Existing Network

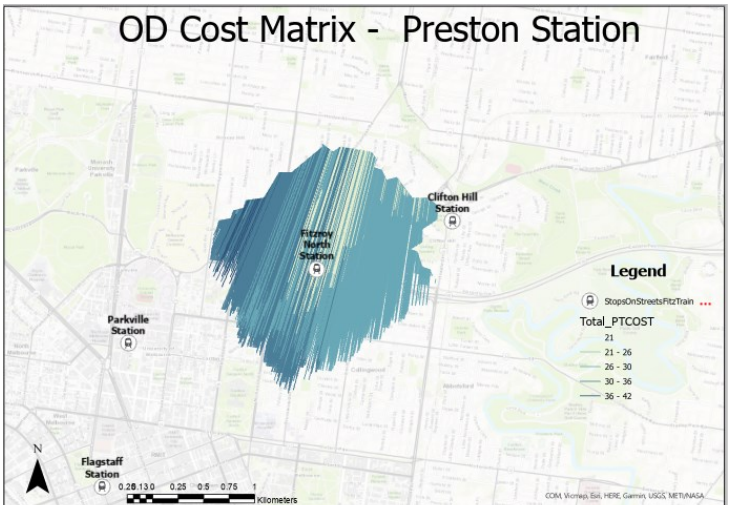


Figure 31: OD Cost Matrix Preston

Discussion and Recommendation

The introduction of the new train line with a station in Fitzroy North would have many benefits for Fitzroy as well as Metropolitan Melbourne. Firstly, the new train line provides faster access not only to Southern Cross Station but also enables efficient transfers to other major lines that serve Northern and Western suburbs, such as the Werribee and Upfield lines. This connectivity is crucial for reducing bottlenecks and enhancing the commuter experience, especially during peak travel times. The layout of the new line favours connections to stations west and north of the city centre rather than directly south and east. Consequently, trams remain the preferred mode of travel to Flinders Street for residents in Fitzroy.

While the mean travel time is already improved, future scheduling adjustments, such as more frequent services could further decrease travel times and make routes more appealing. It could be expected that the frequency of services may be more than what is currently presented in the GTFS data which is a train every 20 minutes not in peak times and trains every 10 minutes in peak times.

For Fisherman's Bend the improved access could be a major catalyst for development in a region that has historically been underserved by public transit. By cutting travel times by 30 minutes, the new train line makes Fisherman's Bend a more viable location for people to live and work, stimulating economic growth and urban expansion.

Although the current GTFS data does not yet account for possible extensions of the new line to continue along the Mernda or Hurstbridge lines, the potential for further improvements is high. If the new Fitzroy line were to provide a continuous, uninterrupted route to Preston, travel times could decrease even further. This would eliminate the need for transfers at Clifton Hill, offering a seamless and efficient journey for commuters.

Further expansion of this analysis should edit other GTFS datasets to implement continuous trains through to the Mernda or Hurstbridge lines as well as integrate Metro Tunnel 1, likewise the Suburban Rail Loop. Furthermore, there are adjustments to trams and bus routes that could integrate with the train stations proposed in this assessment.

References

Data Victoria. (2024) *Timetable and Geographic Information (GTFS)*. Available at: https://discover.data.vic.gov.au/dataset/timetable-and-geographic-information-gtfs Accessed - 02/10/2024.

Greens. (2018) *MM2 Initiative*. Available at: https://greens.org.au/sites/default/files/2018-08/Greens%20MM2%20Initiative.pdf Accessed 28/11/2024.

MobilityData. (2024) *GTFS Validator*. Available at: https://github.com/MobilityData/gtfs-validator Accessed 14/10/2024

Rail Futures Institute. (2019) *Melbourne Rail Plan 2050: The Rail Network for a Growing Melbourne*. Available at: https://www.railfutures.org.au/wp-content/uploads/2019/09/15329_MRP2050main_FinalPages.pdf Accessed 28/11/2024

UCEM. (2024) *What Is a 15-Minute City?* Available at: https://www.ucem.ac.uk/whats-happening/articles/15-minute-city/#:~:text=Rather%20than%20making%20an%20entire,and%20use%20of%20public%20transport Accessed 28/11/2024

Project Journal

Week 1 - 3 (September 2nd - September 22nd)

Date: September 2nd - September 22nd
Focus: Initial Plan - DEM Analysis
Original Plan: My initial proposal focused on conducting a DEM slope analysis to determine suitable areas for constructing Fitzroy North Train station and tunnel alignment from Fitzroy Station. The idea was to highlight gradients that could impact station construction as well as conduct a demographic analysis of Fitzroy to identify suitable areas for the train station.
Issues Addressed: As I began working with DEM data, I realised that my approach was fundamentally flawed for analysing underground tunnelling. The DEM analysis provided surface elevation data, but for underground infrastructure, this method did not yield the insights I needed. The lack of engineering-grade geological data made it impossible to accurately map potential tunnelling paths or understand subsurface conditions.
Solutions Proposed: After discussing with Gang-Jun, I pivoted my focus away from DEM analysis. The realisation led me to reframe my analysis of network and public transport analysis.
Self-Reflection: This was a humbling learning experience. Understanding the limitations of GIS tools for certain types of analysis, particularly those that require specialized engineering data, made me reconsider my approach.

Week 4 - 6 (September 23rd - October 13th)

Date: September 23rd - October 6th
Focus: Transition to Public Transport Dataset
Revised Plan: Having abandoned the DEM-based analysis, I attempted to create a network dataset using existing transportation infrastructure. However, I found that this method also had limitations, as it did not fully capture the complexity of public transit routes and timetables. I spoke to Le-Anne about this, and she pointed out to me that she found a tutorial by ArcGIS to create a public transport network dataset. This led me to consider using a public transport dataset, specifically GTFS data, which would allow for a more detailed simulation of travel times and accessibility. I made some attempts over a few days to include elevation when considering walking but struggled to get accurate results so I resorted to a base measure of walking speeds.
Solutions Proposed: I relied heavily on tutorials and peer discussions to understand the GTFS structure. I systematically debugged the errors by cross-referencing with the GTFS validator going from 500+ errors to just a few errors that were irrelevant.
Self-Reflection: The shift from a DEM analysis to public transport modelling was a significant pivot that ultimately made the project more feasible and relevant.

Week 7 (October 14th - October 20th)

Date: October 7th - October 13th
Issues Addressed: Comparing travel times for both existing and new networks, dealing with extensive data outputs that were difficult to interpret and compare effectively. Unfortunately, didn't have enough work done in time for the class presentation.
Solutions Proposed: Streamlined the data comparison process by running multiple Origin-Destination (OD) Cost Matrices and organizing data outputs systematically. Used statistical methods to analyse differences.
Self-Reflection: Felt more in control of the data but acknowledged that visualizing differences effectively is crucial. Reflected on the importance of accurate GTFS Data.

Week 8 (October 21st – Current Date)

Date: October 21st - October 28th
Issues Addressed: Final validation of the network model and preparation for final report. Ensured all data was accurate and visualizations were polished.
Solutions Proposed: Checked every layer and GTFS component to ensure no errors remained. Finalized results for travel time analysis.
Self-Reflection: Felt confident presenting the findings. The project taught me invaluable lessons about the intricacies of transport modelling and data accuracy. Time management was key, and I'm satisfied with how well I kept to the schedule getting the analysis done over a week before the due date leaving plenty of time to write up this report. Overall greatly enjoyed working with public transit network analysis and would consider enhancing the report for future study.

Additional Reflection on Peer Collaboration (October 1st - October 28th)

Throughout the last month of the project, even after classes officially ended, I consistently met up with peers to collaborate and share insights. These sessions were instrumental in refining our analyses and troubleshooting issues with our GIS models, especially when working with complex GTFS data and public transit modelling.
Key Focus: During these collaborative sessions, we exchanged feedback on network analysis techniques, discussed solutions to common problems, and shared ideas for effective data visualisation. The sense of community and support greatly contributed to the project's progress and our collective learning experience.
Self-Reflection: The collaboration not only enriched my understanding of GIS concepts but also highlighted the value of teamwork in tackling complicated tasks. It was reassuring to work alongside peers who were equally committed to achieving excellence, and their insights often sparked new approaches I hadn't considered.