THE MULTIMODAL TRANSPORTATION INDEX: PURPOSE, USE AND APPLICABILITY

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THE MULTIMODAL TRANSPORTATION INDEX – ABSTRACT

The City of Red Deer wishes to develop a multimodal future. The objective is for all residents – be they on foot, bicycle, in transit or in private vehicle - feel comfortable and safe to travel by their chosen mode. The aim is to provide the space, the design and budget for all modes to travel but without unduly delaying motor vehicles. This is a big task. To shift the space allocations in the public realm to create this future requires deliberate action for the users on the street. To better target the action, an analysis tool was devised.

As an example of the utility of an index, the Canadian Forest Service devised the Fire Weather Index (FWI) to establish a common understanding across forest types and topography of relative 'Fire Weather'.
Likewise, it is well understood how motor vehicle Level of Service (LOS) is used and applied to city streets. Similarly, a new measuring tool envisaged providing an objective 'user view' to gather what is present which helps or hinders the user from achieving their objective – travel along a corridor or through an intersection – in a consistent manner. It was determined that an easy and transparent spreadsheet measuring quantitative elements by mode and by segment is likely to have the greatest utility, support across departments and potentially be useful in engaging with the public to demonstrate decision choices.

As developed, the Multimodal Transportation Index (MTI) measures both the a) current status of a transportation corridor and b) the proposed addition of component parts (elements) users of each mode of transportation require for safety, comfort, quality and connection. It can be used before and after the design process as well as before and after the construction phases.

The presence of the elements contributes to a score of A-F, much like conventional LOS, which will encourage the **safe** and **comfortable** use of each space to **connect** to other parts of the city on **quality** infrastructure. Users of each mode are thereby encouraged to travel these routes with a better experience which translates to higher mode uptake and continued use of the investment.

The critical elements form a basis for the planning and design for each space to provide high quality service to city residents and visitors. The elements are a list including the presence of dual para-ramps, boulevard setbacks from back of curb to vehicle travel, presence of street trees, wayfinding, bicycle facility type and appropriate application to road design speed, transit shelters and their amenities, transit travel time and frequency (head way) and pavement quality, among many others.

It is anticipated that this will lead to achieving many of the co-benefits and policy goals listed in the City of Red Deer's Environmental Masterplan, and the Mobility Playbook; and advances the objectives of the Multimodal Transportation Plan and the Neighbourhood Planning and Design Standards, which the City of Red Deer has set. The MTI is a calculated and measured approach towards using the right of way to provide safe travel options, to a standard (A-F) which is acceptable by council and as a benchmarking tool measuring change over time.

A series of examples of street views and scores will be presented and well as proposed designs and the resulting MTI score change.

BODY

BACKGROUND

The City of Red Deer wishes to develop a multimodal future. The objective is to arrive at a point where mode users – be they on foot, bicycle, in transit or in private vehicle - feel comfortable and safe to travel by their chosen mode. This aim is to provide the space, the design and budget for all modes to travel but without unduly delaying motor vehicles. This is a big task.

To shift the space allocations in the public realm to create this future requires deliberate action for the users on the street. To better target the action, an analysis tool was devised.

As an example of the utility of an index, the Canadian Forest Service devised the Fire Weather Index (FWI)[1,2] to establish a common understanding across forest types and topography of relative 'Fire Weather'. It measures and tracks basic quantities of temperature, relative humidity and wind speed over time to devise a top layer Fine Fuel Moisture Code through to a Drought Code. The FWI creates a rational context for when and where to place more resources (fire-fighting crews, helicopters, water bombing aircraft and other equipment) in anticipation of need.

In a like manner, using a similar strategy, a new tool may be reasonably developed to assess the relative 'multimodality' of an intersection, street or neighbourhood. Similar to the FWI, the developed tool cannot 'put out the fire' but it can predict and prepare the City for the correct allocation of resources (design, capital and operational dollars). Not as an end to itself, the MTI approaches the stated wishes of the city to be increasingly a series of places for walking, cycling and transit use.

Likewise, it is well understood how motor vehicle Level of Service (LOS) is used and applied to city streets. The new measuring tool envisaged providing an objective 'user view' to gather what is present which helps or hinders the user from achieving their objective – travel along a corridor or through an intersection – in a consistent manner.

It was determined that an easy to use and transparent spreadsheet measuring quantitative elements by mode and by segment is likely to have the greatest utility, support across departments and potentially be useful in engaging with the public to demonstrate decision choices.

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The presence of the elements contributes to a score of A-F, much like conventional LOS, which will encourage the **safe** and **comfortable** use of each space to **connect** to other parts of the city on **quality**[3] infrastructure. Users of each mode are thereby encouraged to travel these routes with a better experience which translates to higher mode uptake and continued use of the investment.

These critical elements form a basis for the planning and design for each space to provide high quality service to city residents and visitors. The elements are a list including presence of dual para-ramps, boulevard setbacks from back of curb to vehicle travel, presence of street trees, wayfinding, bicycle facility type and appropriate application to road design speed, transit shelters and their amenities, transit travel time and frequency (head way) and pavement quality, among many others.

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[1] Kourtz, P.H. 1980. *Canadian Fire Weather Index.* Environment Canada, Canadian Forestry Service, Petawawa National Forestry Institute, Chalk River, Ontario.
[2] The author has extensively used the FWI in working for the Alberta Forest Service.
[3] Text in bold represents quality criteria determined in consultation with Red Deerians.

PURPOSE

Shifting the physical public realm to create this future requires a move from policy to action for the needs of the users on the street. To help, an analysis tool was devised. As a basis, the FWI served as an example, as was how LOS is used and applied to city streets. These two indexes have proven to be effective and objective means of allocating resources. As dollars are scarce, citizens wishes are many, and right of ways are fairly fixed a new way of balancing all the needs is of great currency.

As a backgrounder to the Red Deer context, there have been several key council approved documents outlining the citizens' concerns and desires. The Multimodal Transportation Plan – of which the Multimodal Transportation Index is part - responds to the policy statements with another level of detail.

6 MOBILITY PLAYBOOK PLAYS AND RESPONSE WITHIN THE MTP

1 - PLAY 1: PUT PEDESTRIANS FIRST

a) Response: Identifying missing asphalt and concrete sidewalks as well as trails
b) Response: Proposing time frames to begin budgeting for the completion of the missing pieces
c) Response: Planning to extend the trail networks including improved crossings at streets

2 - PLAY 2: CREATE A BALANCED NETWORK

d) Response: Creating the MTI so that all routes may be more equitably evaluated, designed and budgeted for
e) Response: Identifying Continuous Active Transportation routes as a cohesive network of travel options at relative low cost

3 - PLAY 3: TIE LAND USE AND MOBILITY TOGETHER

f) Response: Areas of high urban quality are identifiable in the MTI as being conducive to walking, to show how current land use and urban design may positively influence a choice to walk or cycle

4 - PLAY 4: MAKE TRANSIT PART OF THE JOURNEY

g) Response: Propose an overhaul of the route network and purpose to create a fast and frequent network linking origins and destinations.

5 - PLAY 5: CONNECT THE TRAILS

h) Response: identifying the missing gaps and the barriers to travel along trails
i) Response: establishing a list of projects
j) Response: a method of prioritization for the completion of the projects
k) Response: enhancing the trails crossings over city streets

6 - PLAY 6: NURTURE A CULTURE OF CHANGE

l) Response: developing and presenting the MTI as an achievable and understandable suite of criteria applicable to many departments

USE AND USEFULLNESS

Between Policy and Action there is a gap.

To fill this gap a method of objective first-hand observation has been developed. The method's aim is to identify what is missing and what will deliver higher order services to residents and visitors on our streets, sidewalks, trails and bicycle infrastructure. The method uses many key indicators of the physical public realm. The method has been named the Multimodal Transportation Index (MTI). It is a made in Red Deer solution and can be periodically adjusted to reflect changes in values. It finds what is missing in the corridor, intersection or neighbourhood so we can then budget, design and repair the gaps in a transparent, objective method. Even with the MTI the scope and timing of these projects will be set according to budgets, grants, and council direction.

The MTI identifies the elements in the designed public realm required to achieve the existing policy goals for safe, comfortable, connected and quality transportation infrastructure for all modes.

The MTI objectives:

a) Objectively measure the current conditions in any corridor or at any intersection for each mode in any neighbourhood.
b) Make a transparent list of the physical quantities and qualities which we may budget, design and build towards. Though education and developing a culture of change can go a long way, we do need to diversify the design and delivery of what is available for Red Deer's residents to use.
c) Over time we can measure the improvements from a current base score to a higher score. This allows us to view correlations with changes in mode share splits, increased safety and reduced accidents, improvement in health outcomes such as obesity and diabetes, reductions in CO_2, city reputation ranked for liveability or other appropriate measurements.

The MTI method:

a) First-hand objective observation is critical to evaluating the need as a user experiencing the weather, volume and speed of car, walking over the curbs, looking for directions and so forth. An evaluator travels to an area at question, be it a single block of sidewalk, a four-way intersection, a mid-block crossing, a stretch of street, a cycle lane, or an entire neighbourhood.
b) This evaluator identifies which modes are provided for on a corridor, and to what degree, by using the evaluation sheet. If certain items are not present, such as a crosswalk or a signal light, then a score of zero (0) is assigned. Or, critical elements may exist but either not it good condition, incorrectly placed for the use of the pedestrian or transit user, or deficient in some other manner and will score partial marks. If it is in perfect condition, appropriately placed, sufficient in scale and appealing from the user perspective then these elements receive full marks.
c) A degree of subjective evaluation is expected. Being there first-hand, experiencing the space as a pedestrian/cyclist/transit user/driver of the space means the evaluator has placed themselves in the position of the user. Travel is inherently a subjective experience; our experience is our own. This tries to make for an objective evaluation of a subjective experience to arrive at a place of common understanding.
d) The resulting score, subjective though it may be even with an objective evaluation, is to identify what gaps exist, and to provide sufficient detail to describe as a part of a capital or operational budget line item. As a line item it can then be designed, constructed and used by residents. The concept of a multimodal city is then no longer theoretical or rhetorical but becomes fact over time.

Without these physical components, the network cannot be completed. Without a network resident cannot use what has already been built. Much like in any infrastructure network, if the network is broken anywhere then connections (potential walking/cycling/transit trips) will not be made. If these trips cannot be made then policy goals (for mobility, environment or for connected neighbourhoods) are not being achieved and capital and operational dollars already spent are not able to produce the results expected.

APPLICABILITY

The applicability is to render the high-level policy or ideals into actionable tangible assets people can use. This helps remove uncertainty, brings focus onto the user/resident as an agent capable of deciding what is in their best interest in circulating within the city. Rather than expecting everyone to drive in an environment dedicated to motor vehicles, this will build in choice as a part of the budgeting process.

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AN EXAMPLE OF THE MTI IN USE:

In the example below, an avenue in downtown Red Deer, is evaluated as a link between City Hall/Downtown to the Recreation Centre/Museum/Golden Circle.

- From a **pedestrian**'s point of view, it receives an 'E' score due to the presence of sidewalks and a few street trees. Though these elements exist with very narrow and not offset sidewalks, it is **not** consistent with safe crosswalks, dual curb ramps, pedestrian activated lights, pedestrian scaled lighting, street trees, attractive building frontages, wayfinding signs and other considered criteria.
- This same street receives an 'F' (fail) score for **cycling** due to a lack of continuous cycle lane markings, no bike parking, and no consideration for the needs of cyclists despite this being a designated 'bike route'. While there are lane markings designating bike lanes, they are interrupted.
- **Transit** and park's **trails** do not exist on this stretch of street, so these also receive an 'F' or a N/A score though physical elements could be placed here to help the resident navigate to nearby transit and trails.
- However, an 'A' score (high) is uncovered for the **motor vehicle** as all the required criteria for the driver and car is present and serves to facilitate the safe and connected trip along this street.
- This is but one example of how the MTI serves to uncover what is missing and what design work leads to the construction of a safe, connected, quality and comfortable multimodal transportation network.

The MTI is intended to identify the user needs and the details for budget consideration to achieve The City's policies.

Figure 1 A Downtown Avenue – Current. Source: Google Streetview

The current MTI scores are as follows with some brief commentary on what may be reasonably designed into the corridor to make improvements.

Figure 2 - A Downtown Avenue - Potential Future. Source: Cole Hendrigan

A few elements represented in this conceptual rendering of a MTI score of C or B:

- Pedestrian scale lighting is installed along the back of the new wide sidewalk/multi-use trail,
- Benches are placed to the back of the sidewalk as well,
- A new line of trees on a new boulevard, and banner poles are erected with banners to help 'scale down' the street,
- Bicycle lane marking are made more continuous and with slightly better buffering from car doors (though this can be improved),
- Car parking numbers remains as is but with updated, zoned, digital, app-based meters as a part of a larger parking meter program.

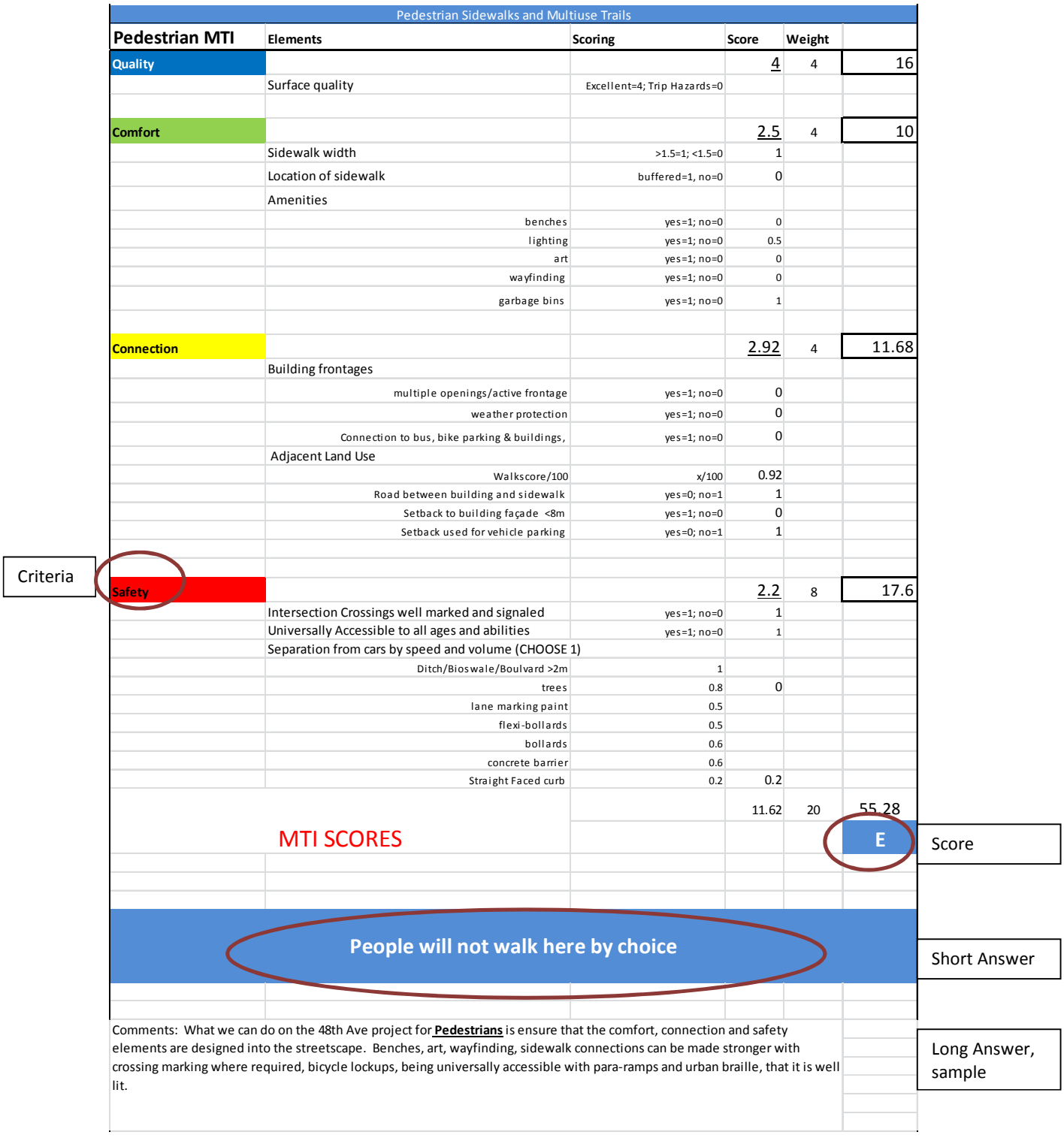
A few more elements still missing in this rendering:

- Wayfinding devices,
- Improved bicycle facilities from one of the new standard cross sections in the Alberta Bicycle Facility Design Guide (forthcoming) for this type of downtown 'collector',
- Public art as a 'placemaking' device,
- Bringing more public activity and 'eyes on the street' from buildings closer to the street.

CONCLUSION

It is anticipated that this will lead to achieving many of the co-benefits and policy goals listed in the Environmental Masterplan, and the Mobility Playbook; and advances the objectives of the Multimodal Transportation Plan and the Neighbourhood Planning and Design Standards, which the City of Red Deer has set. The MTI is a calculated and measured approach towards using the right of way to provide safe travel options, to a standard (A-F) which is acceptable by council and as a benchmarking tool measuring change over time.

An example of the MTI spreadsheet follows along with an extract from an explanatory poster.



Pedestrian Sidewalks and Multiuse Trails

Pedestrian MTI	Elements	Scoring	Score	Weight	
Quality			4	4	16
	Surface quality	Excellent=4; Trip Hazards=0			
Comfort			2.5	4	10
	Sidewalk width	>1.5=1; <1.5=0	1		
	Location of sidewalk	buffered=1, no=0	0		
	Amenities				
	benches	yes=1; no=0	0		
	lighting	yes=1; no=0	0.5		
	art	yes=1; no=0	0		
	wayfinding	yes=1; no=0	0		
	garbage bins	yes=1; no=0	1		
Connection			2.92	4	11.68
	Building frontages				
	multiple openings/active frontage	yes=1; no=0	0		
	weather protection	yes=1; no=0	0		
	Connection to bus, bike parking & buildings,	yes=1; no=0	0		
	Adjacent Land Use				
	Walkscore/100	x/100	0.92		
	Road between building and sidewalk	yes=0; no=1	1		
	Setback to building façade <8m	yes=1; no=0	0		
	Setback used for vehicle parking	yes=0; no=1	1		
Safety			2.2	8	17.6
	Intersection Crossings well marked and signaled	yes=1; no=0	1		
	Universally Accessible to all ages and abilities	yes=1; no=0	1		
	Separation from cars by speed and volume (CHOOSE 1)				
	Ditch/Bioswale/Boulvard >2m	1			
	trees	0.8	0		
	lane marking paint	0.5			
	flexi-bollards	0.5			
	bollards	0.6			
	concrete barrier	0.6			
	Straight Faced curb	0.2	0.2		
			11.62	20	55.28
	MTI SCORES				E

People will not walk here by choice

Comments: What we can do on the 48th Ave project for **Pedestrians** is ensure that the comfort, connection and safety elements are designed into the streetscape. Benches, art, wayfinding, sidewalk connections can be made stronger with crossing marking where required, bicycle lockups, being universally accessible with para-ramps and urban braille, that it is well lit.

Figure 3 An example of the MTI score sheet in use for Pedestrians – theoretical scenario

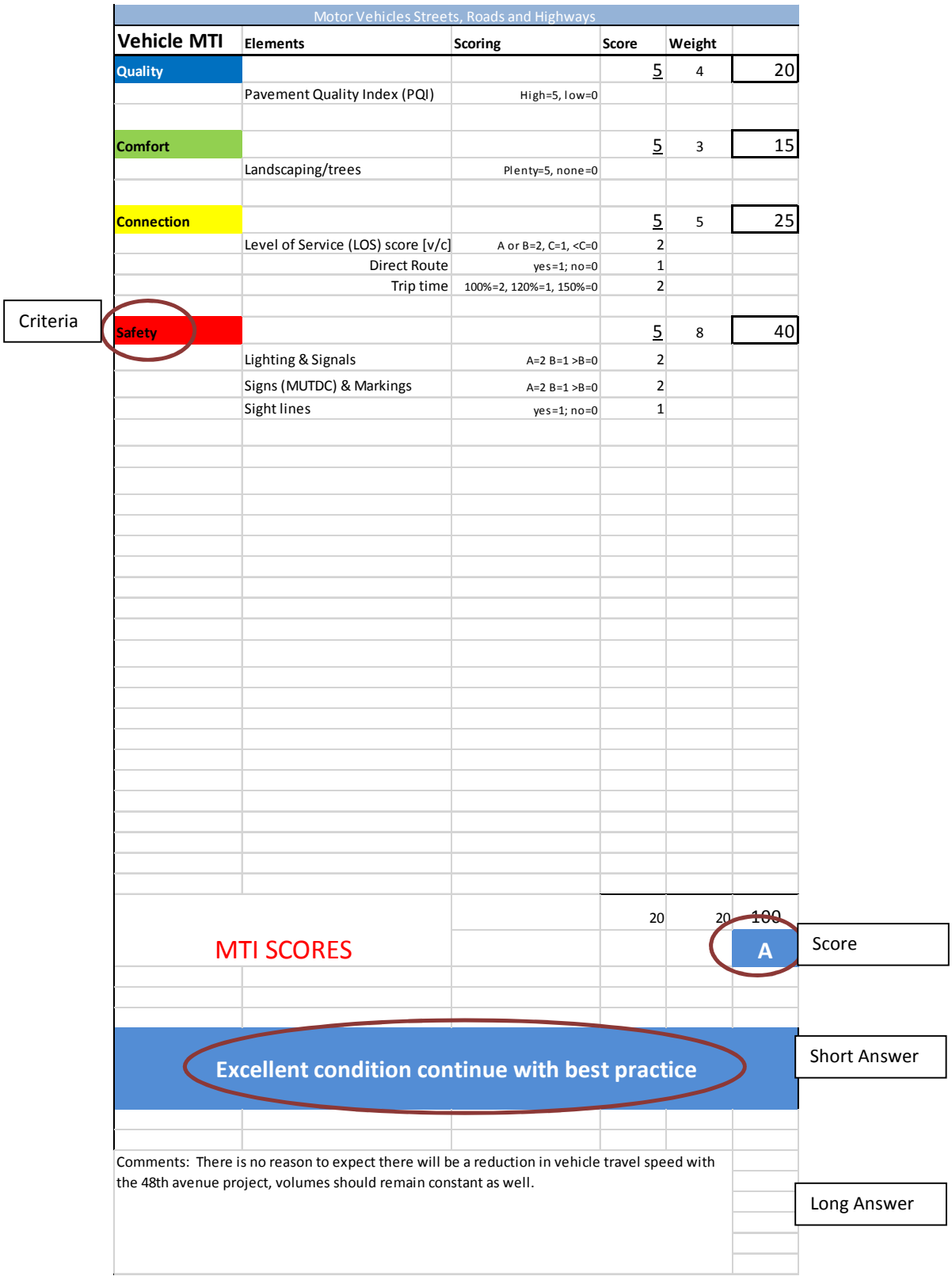


Figure 4 An example of the MTI score sheet in use for Motor Vehicles – theoretical scenario

Figure 5 an entire corridors Multimodal Transportation Index example