

# Metamorphosis of Highway 201 Access Management

Sandra Menzies, Senior Transportation Planner, CH2M HILL Limited

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## **Abstract**

In March 2008, Alberta Transportation (AT) commissioned CH2M HILL Canada Limited to review and update the access management requirements for the Southeast Calgary Ring Road – Highway 201. The solutions for access management ranged from simple service road connections to reviewing possible additional interchanges to accommodate the many trucking businesses within the study area. Three government bodies were involved in the study, the City of Calgary (City), Rocky View County (County) and AT. The study morphed from a simple review to a more complex consultation process. The development of access management alternatives required out of the box thinking in an attempt to find a compromise that would address as best as possible the requirements of all interested parties.

The access management plan became part of the documentation provided to proponents who were preparing proposals for the Southeast Stoney Trail Ring Road P3 project (SEST). The implementation of the access management solutions presented in the 2008 detailed access management study have resulted in the further metamorphosis of several of the solutions such that they meet the changing design criteria imposed by the P3 technical requirements as well as the changing character of the areas surrounding the ring road.

This paper is intended to illustrate how access management can morph from one solution during the planning phase to a modified solution during detailed design and in some cases to something else at implementation.

## **Introduction**

The Southeast Stoney Trail (SEST) project located in Calgary, Alberta extends from 17 Avenue SE on the east side of the city to Sun Valley Boulevard SE along the south side of the city. The project started with the 2006 Function Planning Study (FPS) completed in April 2006 entitled “Calgary East Ring Road Functional Planning Study”. This study included areas outside the SEST project north of 17 Avenue SE and only included the SEST project to Deerfoot Trail excluding the rest of the project to the west on the south side to Sun Valley Blvd. Another functional planning study was undertaken between Deerfoot Trail SE to Macleod Trail S titled “South Calgary Ring Road – Functional Planning Study” and was completed in November 2009.

The 2006 FPS considered property access management issues on a global level and did not investigate the more detailed issues that may be associated with the individual areas required for a complete access management plan.

In March 2008 a more detailed access management study was completed by CH2M HILL to address outstanding issues related to access management to and from the Ring Road between 17 Avenue SE and Marquis of Lorne Trail (Highway 22X) due to the construction of the SEST project.

In February 2009 SEST became a Public, Private Partnership (P3) project and the process of selecting a preferred proponent began. In March 2010 the P3 project was awarded and detail design and construction began.

From the time of the detailed access management study in March 2008 until current (2010-2013) construction, some of the access management recommended solutions have undergone a metamorphosis and the solution currently under construction is very different from the original recommended solution.

This paper will describe three of the more significant metamorphosis of access management solutions at 114 Avenue SE, Peigan Trail SE and 17 Avenue SE, illustrating how planning solutions should be flexible as they will not always be the final constructed plan.

## Study Area



**Figure 1 – Study Area Locations**

The area of access management metamorphosis under discussion in this paper is located within the jurisdictions of the City of Calgary and Rocky View County, Alberta.

The study area encompasses a road network consisting of a number of major arterials, industrial, collector, local and minor roadways. The roadways that impacted the access management alternatives for the locations under study are described below.

### 84 Street



84 Street is a two-lane paved urban roadway with a rural cross-section. It currently is a continuous north-south route along the eastern edge of the City from Highway 22X to north of 17 Avenue and is currently one of the City's designated high load corridors. This roadway is adjacent to industrial areas and consequently the traffic flow has a high percentage of trucks of various sizes, from single unit trucks to multi-unit tractor-trailer combinations. The street provides direct access to several industrial properties as well as some agricultural properties. Several of the residential areas within the study area

can only be accessed from 84 Street through an intersecting roadway. Most of the industrial properties within the study area can be accessed from 84 Street or 100 Street; however, the main access is from 84 Street via intersecting roadways, as 100 Street is mainly an unpaved gravel road.

There are signalized intersections located at 17 Avenue, Kleysen Way, 61 Avenue and Glenmore Trail. South of 146 Avenue the road name changes to 88 Street.

Upwards of 15,000 vehicles per day currently use 84 Street within the study area, with high levels of congestion during the peak hours. The road will become discontinuous once SEST is constructed, and most of the through traffic should transfer to SEST. With the current development along 84 Street and future development planned in the area, the major arterial connection points along the road will still be desirable.

### 17 Avenue (Highway 1A)



17 Avenue is located within the City and is situated along the northernmost limit of the study area. It is currently a four-lane divided major arterial through the City and reduces to a two-lane undivided arterial west of the study area at 68 Street. It continues as a two-lane undivided roadway throughout the study area. The intersections with 84 Street and 100 Street are signalized.

17 Avenue is a high-volume roadway that experiences heavy congestion during the peak hours, with long queues experienced in all directions at the intersection with 84 Street.

17 Avenue will be widened to four lanes through the Transportation Utility Corridor (TUC) at the time of construction of SEST project. The City plans to complete the four-lane widening of 17 Avenue to a proposed development access just east of 84 Street. Ultimately the City plans to widen 17 Avenue to six lanes.

### Peigan Trail

Peigan Trail currently ends at 52 Street in the City and does not exist in the County. There is no current connection with 84 Street. At the time of the 2006 FPS it was expected that Peigan Trail would connect to SEST with directed ramps on the west side and no extension of Peigan Trail across the freeway into Rocky View County. During the access management study it was realized that the Peigan Trail extension in the County would occur at the same time as SEST construction.

## 61 Avenue



61 Avenue is a two-lane, paved, rural road connecting 84 Street to 100 Street in a developing industrial area within the County. It is a fairly new road that provides access to the adjacent industrial land uses. Truck traffic volumes are high, with trucks ranging in size from small cube vans to multi-unit tractor-trailer combinations. Expansion of the industrial area is ongoing on the south side.

The avenue at the time of the access management study did not connect into the City and there were no plans in the near future for a connection.

## Glenmore Trail (Highway 560)



Glenmore Trail is a major high-volume four-lane divided expressway and is part of the skeletal road network for Calgary. It reduces to two lanes west of 68 Street and continues this way beyond the study area to the east. Studies are currently underway with the City to upgrade Glenmore Trail around 68 Street including an interchange with 68 Street. East of SEST, Glenmore Trail is situated within the City and the County. East of 84 Street,

Glenmore Trail is known as Highway 560.

Glenmore Trail is a designated truck route, a dangerous goods route and high load corridor.

In the future, Highway 560 is planned to be a four-lane divided limited-access freeway standard to Highway 791 east of the study area.

## 114 Avenue



The section of 114 Avenue located within the study area is within the City's jurisdiction and is also known as Beulah Vesta Road. 114 Avenue is a four-lane paved divided arterial in the City from just west of Barlow Trail to approximately 52 Street where it reduces to two lanes. The section of 114 Avenue through the study area has a rural cross-section. The former Hamlet of Shepard, now part of the City, is on the northeast corner of the signalized

intersection of 84 Street and 114 Avenue. Most of the roads within the hamlet connect directly with 114 Avenue. A northern road (Rochon Avenue) connects Shepard directly with 84 Street just north of 114 Avenue. There is no connection to 100 Street from 114 Avenue.

When SEST is constructed, 114 Avenue will be shifting to the south of its' present alignment. From approximately 68 Street on the west side the alignment of 114 Avenue will start to shift south and connect with SEST at the interchange location. On the east

side the existing Beulah Vesta Road (114 Avenue) will remain where it currently is from 84 Street eastward. A new alignment of 114 Avenue will be constructed from SEST interchange eastward and re-join Beulah Vesta Road somewhere to the east. The alignment of this portion of the new 114 Avenue is still under study.

## Access Management Metamorphosis

### 114 Avenue SE

#### Planning

The existing alignment of 114 Avenue will be discontinuous at SEST on opening day. 114 Avenue will be rerouted to the south to accommodate the interchange with SEST with the location of the new alignment of 114 Avenue to the east still to be determined by the City of Calgary. The existing location of 114 Avenue adjacent to the Hamlet of Shepard will remain from just west of 84 Street eastward with the intersection of 84 Street.

The 2006 FPS recommended rerouting 84 Street to maintain a connection with and across the new alignment of 114 Avenue. The recommended alignment of 84 Street rerouted the road such that several properties would be impacted. Since the 2006 FPS, the City of Calgary had undertaken other studies to consider its expansion plans and identify a desirable connection between 84 Street and 114 Avenue that would accommodate growth. The Shepard Wetland plan was also completed for the area south of 114 Avenue and was located directly adjacent and to the south of the 84 Street proposed realignment. The design of the alternative proposed in the 2006 FPS was



**Figure 2 – 114 Avenue Access Management**

reviewed during the detailed access management study to determine alternatives that would minimize property impacts and not impact the new Shepard Wetland Plan. The City owned a parcel of land at the proposed junction of 84 Street and 114 Avenue. A new alignment of 84 Street was proposed that only impacted the City property. The design was reviewed to ensure that the alignment could be contained within the City property while providing proper geometry for truck turning requirements without impacting the Shepard Wetlands. The alternative was also reviewed to determine if it would be compatible with the future connections to the Hamlet of Shepard that are currently under review by the City.

## Construction

The SEST project was selected to be a public private partnership project for the design and construction phases which meant the design parameters for the roadway would be set at a higher threshold than was utilized during the planning phase. The 2006 FPS originally undertook a design for 114 Avenue interchange that used the Alberta Transportation design guidelines in order to design the interchange. The functional design and subsequent detailed access management study were developed using the preference that the typical interchange design is to place the higher classification and higher speed roadway underneath the lower speed road in order to allow vehicles to slow down on the off-ramps and speed up on the on ramps. This type of design was achievable utilizing the design guidelines.

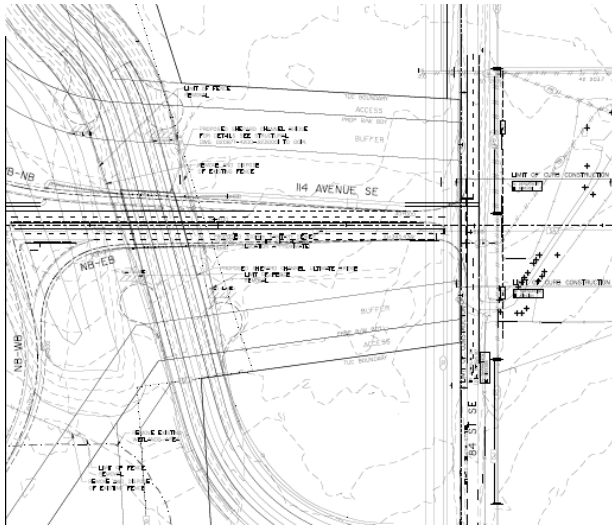
The design parameter modification for the SEST as a P3 project increased various minimum design parameters in order to achieve a more robust design and ensure that there are no minimum to minimum designs. In the area of 114 Avenue this had a significant impact as the vertical design criteria minimums increased by approximately 25% which created a situation where it was impossible to meet the contract design requirements and maintain 114 Avenue as the facility over the higher speed SEST due to the proximity constraints imposed by the CP Rail line to the north and the need to maintain the interchange in the location identified during the planning process.

These significant design modification requirements created the atmosphere for re-examination of the conditions of the 84 Street connection and the possibility to eliminate the curvilinear alignment that was required to maintain a level 84 Street connection with 114 Avenue through the area. The redesign of 114 Avenue to be the under-passing roadway below SEST provided for a 114 Avenue alignment and connecting ramps to be essentially at grade by the time they intersected with 84 Street instead of the original design which had 114 Avenue about 8m above 84 Street at the crossing point. Two proposals for a redesign of the 84 Street and 114 Avenue intersection were put forth by the P3 proponent. The first proposal was to move the 114 Avenue interchange closer to the existing 114 Avenue alignment which was immediately rejected due to the small community to the east of 84 Street, the City's plans for the extension of 114 Avenue and the immediate proximity of the CP Rail tracks.

The second proposal was to reduce the radius of the NB-EB and WB-NB ramps to allow an at-grade intersection at the location of the current 84 Street alignment. This was discussed in detail with the City and Alberta Transportation and a compromised solution resulted as all parties involved agreed that an at-grade intersection at the existing location of 84 Street was preferred to a slight realignment of 84 Street. Some of the issues that were discussed were the 84 Street northbound left turn and how fast the ramp develops after the turn, the future extension of 114 Avenue to the east and how the T-intersection design could be adapted and the proximity of the ramps immediately after the intersection.

The final solution was an at-grade T-intersection that would be unsignalized at opening day. The final design agreed to has the benefits of:

- Benefit to Shepard wetland as ensures no drainage into area
- Avoids private land issue on south
- Less circuitous routing for 84 Street
- Doesn't limit city options for extension and provides more options for connection north to hamlet
- City can signalize the intersection in the future.



**Figure 3 – 114 Avenue Construction Design**

## Peigan Trail

### Planning

The 2006 FPS assumed that, initially, Peigan Trail would partially connect to the west and not be constructed to the east of SEST; 84 Street would remain open through this section. As a result, there would be no access management issues on the opening day of SEST at Peigan Trail. Nor would there be a direct connection to/from SEST at Peigan Trail for the traffic generated by the various developments east of 84 Street in the vicinity of Peigan Trail.

At the time, the industrial area between Peigan Trail and Glenmore Trail was just developing, with businesses that had a significant trucking component consisting of large and heavy vehicles. When SEST is constructed, 84 Street will have a cul-de-sac just north of Glenmore Trail. The 2006 FPS's recommended access option for the area was to use the east-west roadways of 50 Avenue and the newly constructed 61 Avenue. Traffic entering or exiting the area would use these roadways to access 100 Street and then travel south to Glenmore Trail or north to 17 Avenue.



Since the 2006 FPS was completed, Rocky View County (County) received and approved an application for approximately 600,000 ft.<sup>2</sup> of industrial development on 65 ha (160 acres) just south of the future alignment of Peigan Trail. Access to the development would be from 84 Street north of 50 Avenue at a new road, Frontier Road, on the 46 Avenue alignment.

A second development application for the same area (the second phase of the same overall development project, representing another 600,000 ft.<sup>2</sup> on 65 ha) is under review and would extend Frontier Road through to 100 Street. Plans for construction of Peigan Trail east of SEST have been advanced because of this development application, as well as other ongoing development in the area. The County was expecting to construct Peigan Trail from 84 Street to 100 Street for opening day of the SEST project.

With the proposed construction of Peigan Trail between 84 Street and 100 Street and possibly further east, SEST interchange configurations had to be considered to serve traffic to/from the east as well as the west (i.e., beyond the basic west-oriented right-in/right-out concept from the 2006 FPS). During the detailed access management study, to ensure connectivity for the displaced traffic movements, access management alternatives had to be re-considered for this area.

With a desired connection to both the east and west at Peigan Trail on opening day, several interchange configurations were considered during the detailed access management study, including the ultimate full Parclo A, a modified Parclo, or some combination of direct ramps that could be considered stages to the implementation of the ultimate Parclo A interchange configuration.

The implementation of the ultimate Parclo A interchange configuration was the initial preferred alternative. This configuration would provide all movements to/from SEST. This would eliminate both the requirement to extend 50 Avenue under SEST (as it was immediately adjacent to the CN rail line and needed to stay low) and the need to construct the 68 Street connection to Peigan Trail. However, because of desired intersection spacing requirements and ramp design parameters, 84 Street would be made discontinuous at Peigan Trail. The access to Peigan Trail on the east side of the freeway would instead be along 50 Avenue (or the new Frontier Road, when completed) to 100 Street, then north to an at-grade intersection at Peigan Trail.



**Figure 4 – 17 Avenue Traffic Assessment of split T-intersections**

The area south of Peigan Trail concentrated around 61 Avenue has seen significant industrial development, with the majority of development being highly dependent on goods movement by tractor-trailer combinations. Area businesses, the area trucking industry and some developers in the area (referred to collectively as the area industry) voiced concerns regarding the need for direct access to SEST as a direct connection at 61 Avenue was not considered in the 2006 FPS. As a result, special meetings were held with a group of individuals representing the area industry. In response to the issues raised by this group, a further alternative involving provision of an interchange with SEST at 61 Avenue was developed for consideration. Several 61 Avenue interchange configurations were developed for review, including a full Parclo A, a tight diamond, a Parclo AB with the loops on the north side, and a Parclo AB with a north-side collector-distributor (CD) road. All of the 61 Avenue interchange designs reviewed had varying degrees of substandard design issues and significant negative impacts to the long term operation of SEST due to the less-than-desirable interchange spacing, standards and weave distances. Consequently, no interchange or connection from 61 Avenue to SEST was recommended at the time of the detailed access management study.

To address some of the immediate access issues for the area of 61 Avenue and Peigan Trail, consideration was given to staging the ultimate interchange by maintaining a short-term/temporary at-grade intersection at Peigan Trail and 84 Street initially, prior to construction of the ultimate design. Maintaining an at-grade intersection with 84 Street would only be considered as a viable short-term alternative if design requirements could be achieved; if it could operate without impacting levels of service, operations, or safety on SEST or the interchange ramps; and if the City, County and AT could reach an agreement on the operating conditions and timeframe for construction of the ultimate interchange design.

Consideration was given to a modified Parclo A interchange configuration with a reduced radius on the northbound-to-eastbound right turn ramp. This configuration would provide the minimum weave distance required between the 17 Avenue service

interchange and the Glenmore Trail systems interchange however, there would not be adequate spacing between the east ramp terminal intersection and 84 Street for a free flow ramp design. The tie-in points on Peigan Trail of the northbound-to-eastbound and westbound-to-northbound right-turn ramps would also require slight modifications.



**Figure 5 – Modified Parclo A Alternative**

This interchange configuration would provide a distance of approximately 410 m between ramp terminals and approximately 450 m between the east ramp terminal intersection and the 84 Street intersection. It would not provide for the minimum 150 m spacing required between the ramp tapers and the adjacent intersection at 84 Street. However, this would be mitigated somewhat with signalization of the intersection at 84 Street, and it would not impact the operations of the interchange. The westbound-to-northbound ramp layout could also be modified to provide more space between the intersection and the start of the ramp taper. This configuration also could be easily staged to the ultimate Parclo A as it would only require reconstruction of the two direct right-turn ramps on the east side of the interchange.

Once the design review was completed, traffic operations between the interchange ramps and the at-grade intersection at 84 Street had to be assessed. The intent of this review was to determine if the operation of the signalized intersection at 84 Street would have a negative impact on the flow of traffic on SEST. There could be a high volume of truck traffic making the northbound-to-eastbound right-turn movement onto Peigan Trail and then turning right onto southbound 84 Street. The concern is that poor operation of this movement could result in undesirable queuing of traffic on SEST off-ramp. The other factor influencing traffic operations in the area would be the proximity of the 84 Street/Frontier Road intersection to Peigan Trail. It was critical to understand the area traffic operations to assess the viability of an at-grade intersection at 84 Street and Peigan Trail.

Based on the available data, a high level estimate of opening day traffic was prepared for use in the analysis of SEST/Peigan Trail interchange which indicated that the east ramp terminal intersection, including the northbound-to-eastbound right-turn ramp, and the Peigan/84 Street and 84 Street/Frontier Road intersections would operate at an acceptable level of service for the opening day conditions ( volume to capacity (v/c) ratio of 0.90 or better, with no individual movement v/c ratio higher than 0.95.). The intersection configuration to attain these operating conditions included two northbound left turn lanes.

To implement a temporary at-grade intersection of Peigan Trail and 84 Street, all three parties would need to agree on the terms for implementation. The traffic operations review, along with the proposed interchange and intersection layout, was provided to the City and the County for their consideration.

Neither the City nor the County wanted a temporary intersection; both stated they would not support this alternative. All parties agreed that the interchange and at-grade intersection of Peigan Trail/84 Street could be designed to meet all minimum design requirements and operate at adequate levels of service. On this basis, it was also agreed by all three parties that the at-grade intersection would be considered a permanent condition.

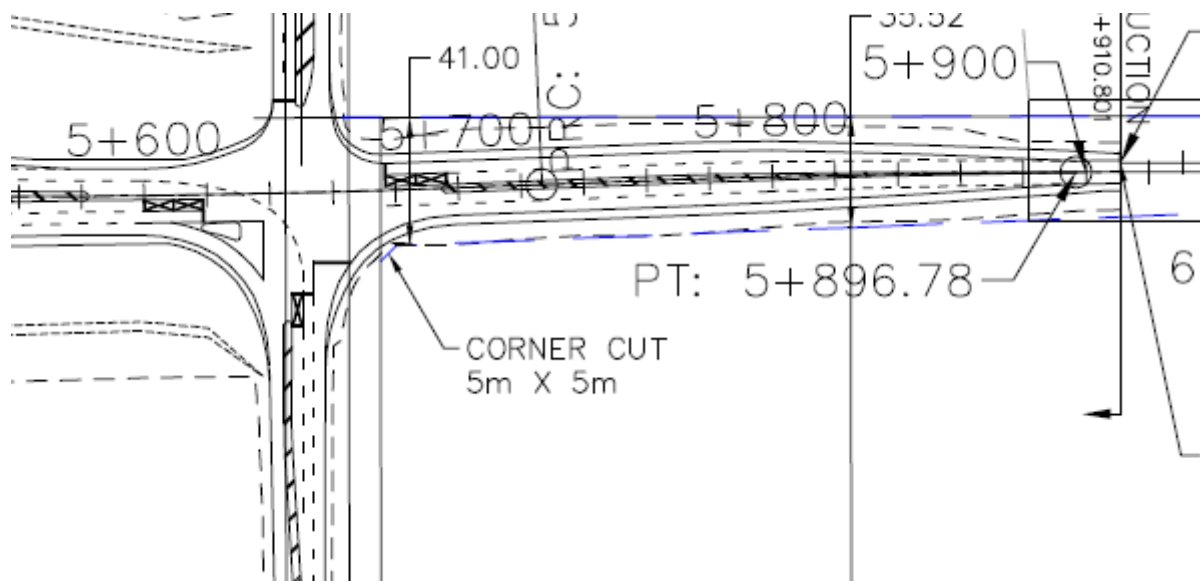
The final opening day design had several constraints, including that Peigan Trail could only be located on the property south of the quarter section line in the County because the property on the north is privately owned and would not be acquired by the City until sometime in the future. The ultimate turn lane configuration was also noted, as this influenced the median requirements as ultimately two left turn lanes would be required westbound and eastbound on Peigan Trail. The design provided a continuous (free-flow) northbound-to-eastbound right-turn lane from SEST northbound-to-southbound 84 Street, a movement that was seen to be one of the critical movements into the area. To ensure no property is required, no channelized westbound right-turn movement would be provided at opening day. This volume is expected to be low, especially since all parties agreed that the portion of 84 Street between Peigan Trail and 17 Avenue would be banned to all truck traffic except local traffic.

## Construction

During the access management study both the City and the County had proposed Peigan Trail to be classified as a major expressway. The intersection with 84 Street and the extension of Peigan Trail to the east had assumed a cross-section of 6 lanes with a 6 metre median as was the standard for an expressway. The sides of the roadway would be rural in nature through the County. During the design phase of the P3 project and the coordination with the County's consultant designing the extension of Peigan Trail beyond the SEST project limits it was discovered that the County had re-classified Peigan Trail to a lower standard. The cross-section of the roadway was being modified to a ultimate 4 lane rural major roadway with a cross-section that had a median width of 19.2 m which was significantly wider than the 6m anticipated originally in the detailed

access management study. The design was modified to have an ultimate 6 lane section with 6m median at the intersection of 84 Street and then widen to connect with the new design. Further coordination was required to ensure the two designs matched at a logical location.

The design modification was further complicated when it came to light that the County and the developer had not yet come to terms regarding the land acquisition requirement for the extension of Peigan Trail. Originally a 36 m right-of-way had been expected and the design of the intersection would require a corner cut acquisition beyond the 36 m strip. With the uncertainty of the land acquisition it was determined that the best solution was to develop the intersection as proposed just without the eastern leg creating a T-intersection, with the assumption that the property would be obtained at some point in the future. This would allow design and construction to proceed without delay to the P3 proponents' schedule. Prior to the actual construction and grading for the roadway, the County obtained a portion of the right-of-way with a 41m width at 84 Street narrowing to 30m right-of-way which was smaller than the 36m width originally anticipated. The P3 proponent was requested to ensure that the previous full intersection design could be accommodated in the obtained right-of-way envelop and construct the full intersection to the project limits as per the contract.



**Figure 6 – Peigan Trail/84 Street Construction Solution**

## 17 Avenue SE

### Planning

The SEST corridor has an interchange located at 17 Avenue between 70 Street and 84 Street along the existing alignment of 17 Avenue. The east side ramps for the interchange extend beyond the existing 84 Street intersection requiring the closure of 84 Street north and south of 17 Avenue.

The 2006 FPS assumed that 84 Street would be discontinuous at 17 Avenue due to the required ramp geometry of the interchange and reviewed the area's road network at a high level and determined an alternate connection to 17 Avenue. The recommended access management for the area south of 17 Avenue was to extend the existing parallel Garden Heights Road from 84 Street easterly to 100 Street which connects to 17 Avenue directly at a signalized intersection.

Since the 2006 FPS was completed, development applications have been submitted for property on the north side of 17 Avenue. One of the developments that has since obtained been approved proposed a realignment of 84 Street to the east in a curvilinear design to an intersection with 17 Avenue approximately 500 m east of the interchange ramps. This distance meets both the minimum design guidelines for access management spacing between intersections of 400 m and the minimum spacing of 150 m from end of ramp taper. The development also proposed a future extension to the south that would see the continuation of the curvilinear road alignment connecting directly to 84 Street in the south. This proposed immediate realignment of 84 Street on the north side of 17 Avenue with the new intersection connection and the possibility of a future south connection from this new intersection raised the possibility of realigning the south portion of 84 Street to this proposed immediate T-intersection to the north for the development.

Further consideration that lead to a re-examination of the access management solution of Garden Road extension was the fact that the City owns a parcel of land in the southeast corner at the existing intersection of 84 Street and 17 Avenue and that the connect might be able to be considered as a short term connection since the developer had plans for expansion to the south with a revised alignment of 84 Street. The City owned parcel extends from the existing 84 Street to approximately the middle of the developer proposed 4-lane divided road on the north side of 17 Avenue.

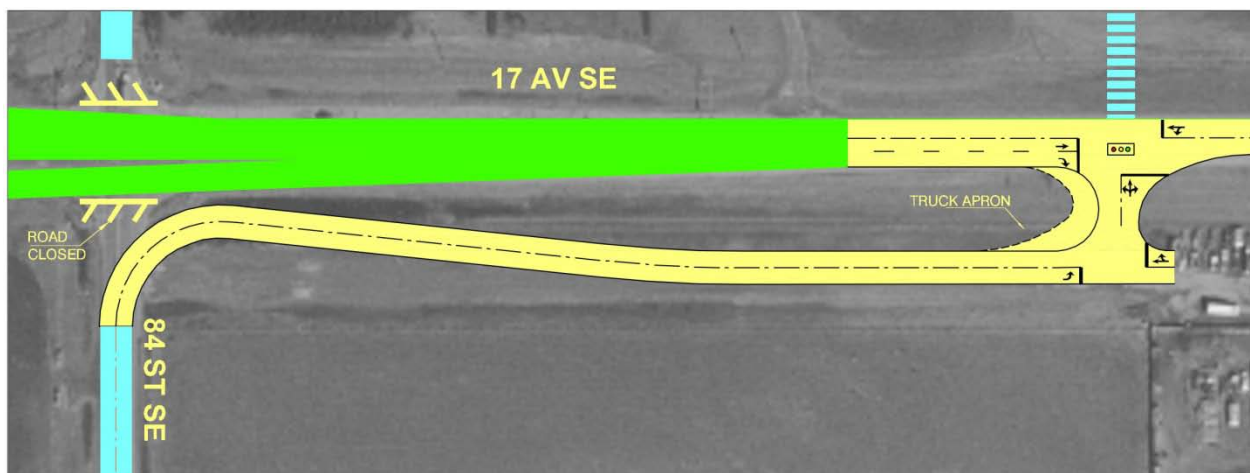
The possibility of an interim connection of 84 Street on the south side of 17 Avenue to the developer intersection was examined during the detailed access management study. The study assumed that only the two west lanes (southbound) of the 4-lane ultimate 84 Street roadway would be constructed on the north side of 17 Avenue per was the developers' plans at the time of the detailed access management study. Alternatives for a direct connection on the south side of 17 Avenue were therefore developed to be centred across from these two lanes, which would allow for the intersection to be located within the City's property. The City and AT agreed that the direct connection would be temporary, until the full curvilinear realignment of 84 Street south of 17 Avenue could be established by the developer.

The direct access to 17 Avenue was recommended because it was convenient for those accessing the area; however, implementation issues associated with the direct access alternative had to be addressed for it to be viable. The main design consideration was ensuring that the connection could accommodate at least WB21 trucks turning to and from 17 Avenue and the connecting roadway to 84 Street.

Because of its proximity to 17 Avenue, the direct connection through the City's property would not provide an ideal intersection alignment. Furthermore, an alignment within the City's property would only be viable with the existing conditions along 17 Avenue and would not be compatible with future widening of 17 Avenue.

The connection within the City's property would require the roadway to be curvilinear. Using a WB21 truck as the design vehicle and assuming a 30 m road right-of-way, some property would be required along the southeast corner of the road. Additional property would also be required for the connection on the southern property along 18 Avenue. The area believed to be a road right-of-way for 18 Avenue is only 20 m wide, narrower than the desired 30 m road right-of-way width being considered for the access management alternatives.

The investigation of access management alternatives at Peigan Trail (discussed previously) resulted in a recommendation for restricted truck access on 84 Street between 17 Avenue and Peigan Trail. With the truck restriction and the temporary nature of the connection, the direct connection could be designed for a smaller vehicle type than the WB21 truck. It could also be assumed that no tractor-trailer combination vehicles would be using the 17 Avenue direct connection to access 84 Street. If a WB21 truck were using the realigned intersection on 17 Avenue, it would only be accessing the property on the southeast corner of the intersection. With this assumption, the design vehicle for the direct connection was reduced to a single unit truck or bus for the realigned 84 Street. This allowed the design to be refined and resulted in the proposed direct connection to 17 Avenue being contained within the City's property. The direct connection design allowed for aprons on the south portion of the intersection at 17 Avenue so that, on the rare occasion that a larger tractor-trailer unit required access to the property on the southeast corner, it could be accommodated.



**Figure 7 – 17 Avenue Access Management**

## Construction

During the end of the P3 proponent selection phase and into the design phase of SEST project, the developer for the proposed development on the north side of 17 Avenue and future development on the south side was undergoing discussions with the City of Calgary to obtain the permissions required for the implementation and construction of the realigned intersection of 84 Street and 17 Avenue. The City reviewed the intersection as part of the development permit application and due to the slight offset between the north side of the intersection into the development and the south side connector proposed in the detailed access management study, the City restricted the through movement and would only allow right turn and left turn movement out of the development. The requirements of the development also indicated that dual left turns would be required from 17 Avenue eastbound north into the area.

The City's plans for 17 Avenue also were modified to a 4 lane parkway with median transit lanes to the west of the SEST project which was expected to be continued through and to the east to at least the new development intersection.

The contractually proposed 17 Avenue and 84 Street connection developed during the detailed access management study had several issues and limitations. These issues included a limit on the size of vehicle that would be able to be accommodated for the turns to and from the south connector and the connection for the driveway to the adjacent property which had a very steep grade and more of the property would be required to provide that driveway connection than originally considered based on the proponents design. The negotiations with the property owner for acquisition of a sliver of the private property to accommodate the driveway connection did not go well and it was concluded during the design phase that the acquisition of property would not be going forward. A new issue that arose during the design phase was the discontinuity for traffic coming from the north as they would no longer be able to continue south due to the new restriction imposed by the City on the developer for excluding the through vehicle movements.

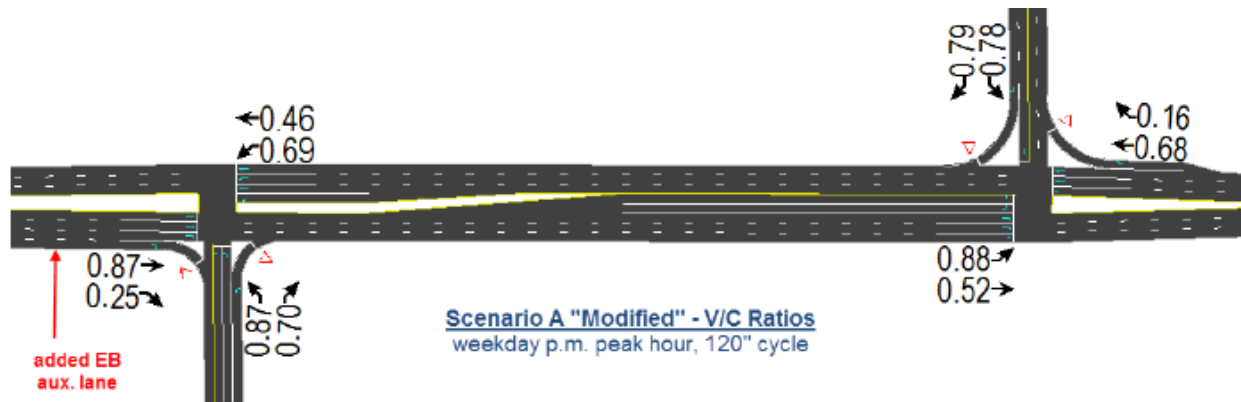
All of the issues and changes since the time of the detailed access management recommended solution required a revision to the contractual intersection realignment and connection and a re-examination of the alternatives available for this area. The modifications of the area and the result of the Peigan Trail and 84 Street discussions provided the potential for new intersection solutions to be considered.

A couple of options were considered including making a new connection midway between the interchange and the development access which would maintain the inability for drivers to continue south on 84 Street and an intersection reconfiguration at the existing 84 Street intersection which would allow all movements to continue through the split T-intersections but would require compromises to the interchange ramp designs.



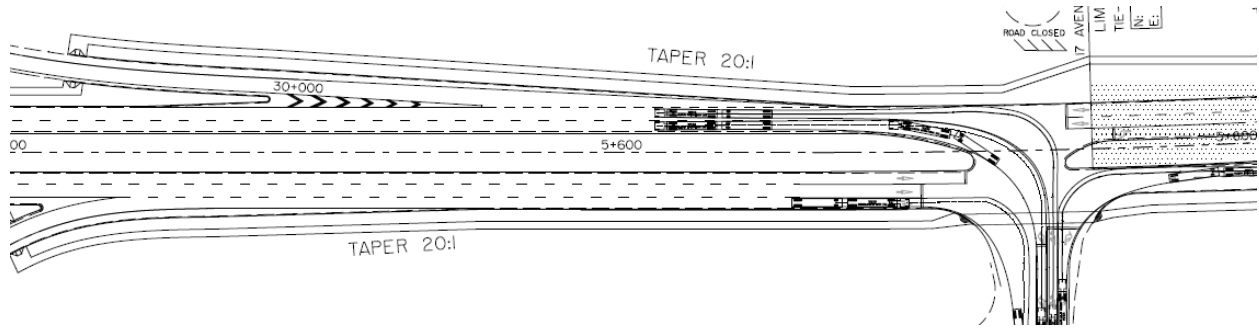
The P3 proponent proposed a T-intersection at 17 Avenue as a preferred alternative. This alternative was the better alternative as it would provide access for the southbound traffic on 84 Street to continue southbound by way of the new intersection, it ensured all movements of traffic were being undertaken at two signalized intersections improving safety of the network and it would not impact the existing access to the private property in the southeast corner of the development intersection. The main issue for the alternative was acceptance by the City for this temporary intersection arrangement until such time as the developer expanded to the south side of 17 Avenue and would be required to build the full intersection at the realigned location.

The main concern for the City was operational. A traffic assessment was undertaken using the current City model traffic volumes to provide comfort to the City that the intersection would function acceptably until such time that the developer expanded to the south. The assessment indicated that the two intersections would work within reasonable parameters with the addition of an auxiliary lane from the interchange to the channelized right turn channelized at the intersection with 84 Street.



**Figure 8 – 17 Avenue Traffic Assessment of Split T-intersections**

This configuration also allowed the design vehicle (WB36) of the project to be accommodated and would allow the originally proposed truck ban on this section of 84 Street to be removed if desired by the City. The City and AT came to a mutually agreeable position and the intersection will be constructed at the current location of 84 Street with the recommended additional lanes eastbound and northbound.



**Figure 9 – 17 Avenue and 84 Street Intersection Design**

### **Conclusion**

As can be seen by the three examples discussed within this paper, what is planned is not always what is designed and what is designed is not always what is constructed. There needs to be considerations for design and construction during planning and consideration of construction during design. Functional designs as well as detailed designs need to be flexible as what is planned in the initial stages may not work when it comes to the time of design and what is designed may not work when it comes to construction due to changes in development, politics, characteristics of the area, traffic patterns, guidelines or design requirements.

Don't be rigid. As this paper has shown, much can change between the planning and the implementation.