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City of Grande Prairie

Report

Northwest Traffic Study

December 2014

ISL Engineering and Land Services

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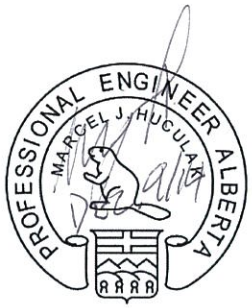

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PERMIT TO PRACTICE
ISL Engineering and Land Services Ltd.
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Date Dec 10, 2014
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The Association of Professional Engineers and Geoscientists of Alberta

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APPENDICES

TABLES

EXHIBITS

1.0 Introduction

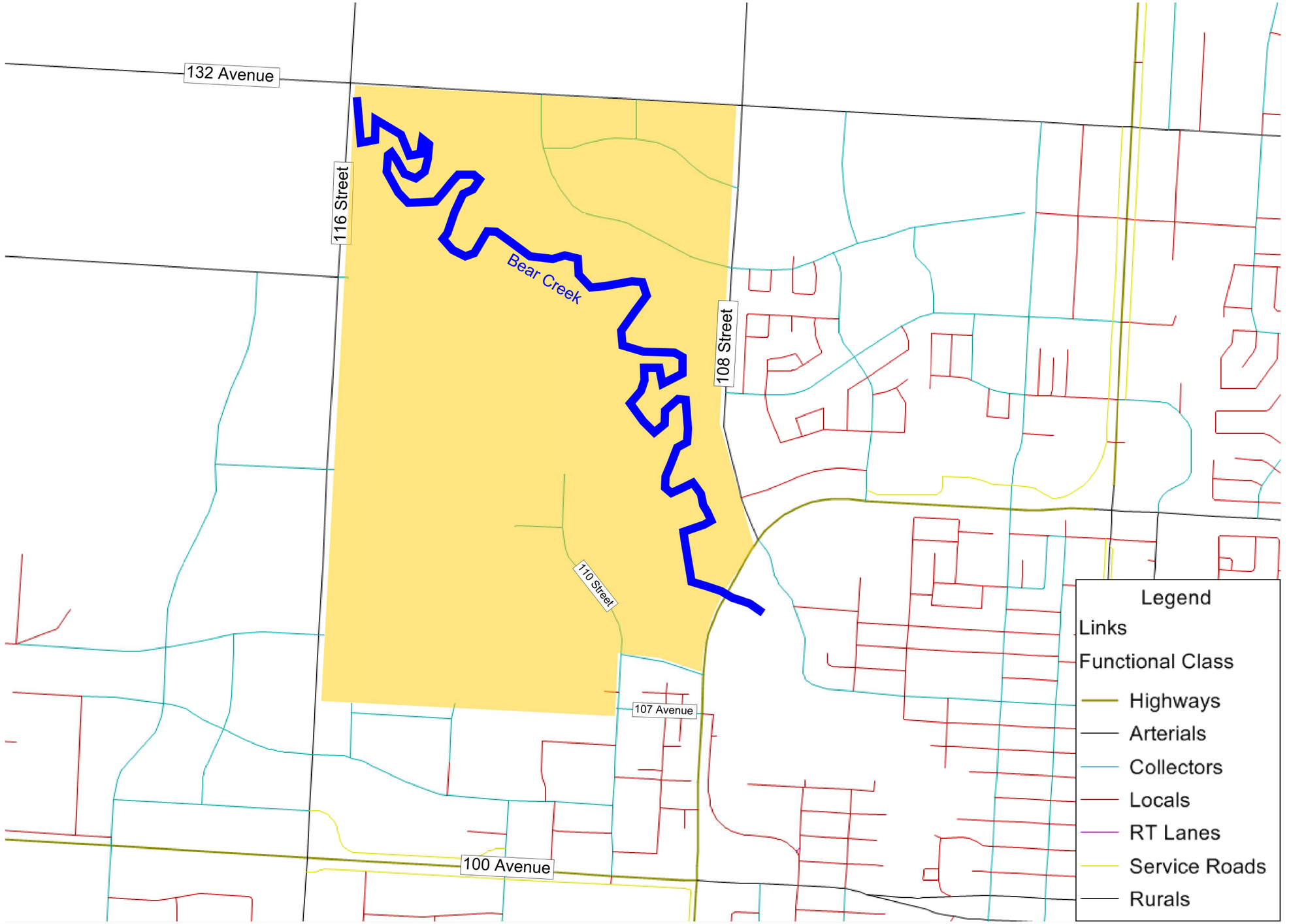
In 2012, the City of Grande Prairie (City) council rescinded the roadway network for the current North West Area Structure Plan (NWASP). The reason council rescinded the network plans was due to the location of the hospital within the plan area and because of their newly updated Transportation Master Plan (TMP). In the previous version of the NWASP the hospital was not located inside the ASP and with the TMP complete the City wanted to revaluate the roadway network using the TMP as a framework for the review. In 2013, the City contracted ISL Engineering and Land Services (ISL) to determine a new roadway plan for the roadways which had been rescinded.

The study area is bounded to the north by 132 Avenue, the west by 116 Street, the east by 108 Street/Highway 43 and to the south by the developments Westgate East and Gateway Commercial. The study area is split into two sections by the Bear Creek. The study area is illustrated in Exhibit 1.1.

1.1 Study Purpose and Methodology

The purpose of this study is to determine a suitable collector roadway network within the study area. One key question which needs to be answered is whether a creek crossing is needed connecting the lands on the north and south sides of Bear Creek. A detailed list of the project tasks include:

Task	Description	
1.0	**Development of Roadway Options**	
1.1	Project Constraints	Constraints for this study include connection to the surrounding roadway network.
1.2	Stakeholder Interviews Round #1	Meet with stakeholders representing land owners within the study area to discuss their preferred roadway network components, including any updates to their use plans.
1.3	Options Development	The project team will develop several roadway options with the purpose of narrowing to four roadway options for analysis. (The number of roadway options were eventually increase to eight)
1.4	Preliminary Analysis	Once the four roadway options are determined these are input in to traffic analysis tool, VISUM, for preliminary analysis.
1.5	Stakeholder Interviews Round #2 (Preliminary results)	The second round of stakeholder interviews is to discuss the roadway options which were developed, including the results of the preliminary analysis
2.0	**Detailed Analysis of Roadway Options**	
2.1	Detailed Analysis	Using the feedback received from the preliminary analysis and discussion by the project team the detailed analysis will be completed.
2.2	Recommended Roadway	Recommend a roadway option based on the results of the analysis.



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City of Grande Prairie
Northwest Traffic Study
Study Area

Exhibit 1.1
Scale: NTS
July, 2014

2.0 Development of Roadway Options

2.1 Project Constraints

At the outset of this study the project team discussed several constraints which will impact the development of roadway network options. Generally, these include connections to the surrounding roadway network. It was determined that the collector intersections on the arterial network are fixed. Also the connections to the south end of the study area have less flexibility due to existing alignments or subdivision. The project constraints are illustrated in Exhibit 2.1.

Other constraints include connections to the college lands and connection to the collector roadways north of the creek. These were added to the project constraints based on feedback which was received through the round #1 stakeholder's interviews. This is described in the next section of this report.

2.2 Stakeholder Meetings Round #1

The purpose of the first round of stakeholder meetings was to discuss the overall project objectives, including the expected project outcomes. Stakeholders were given a chance to provide their comments regarding preferred roadway components and to inform the project team on their roadway plans in the study area.

For this task, ISL developed a comprehensive list of stakeholders, representing land owners within the study area. Meetings were held between ISL and the stakeholders through either in-person interviews or telephone interviews.

The proposed roadway plan which was provided by stakeholders is illustrated in Exhibit 2.2.

2.2.1 Stakeholder Feedback

The following is a summary of stakeholder feedback:

Creek Crossing

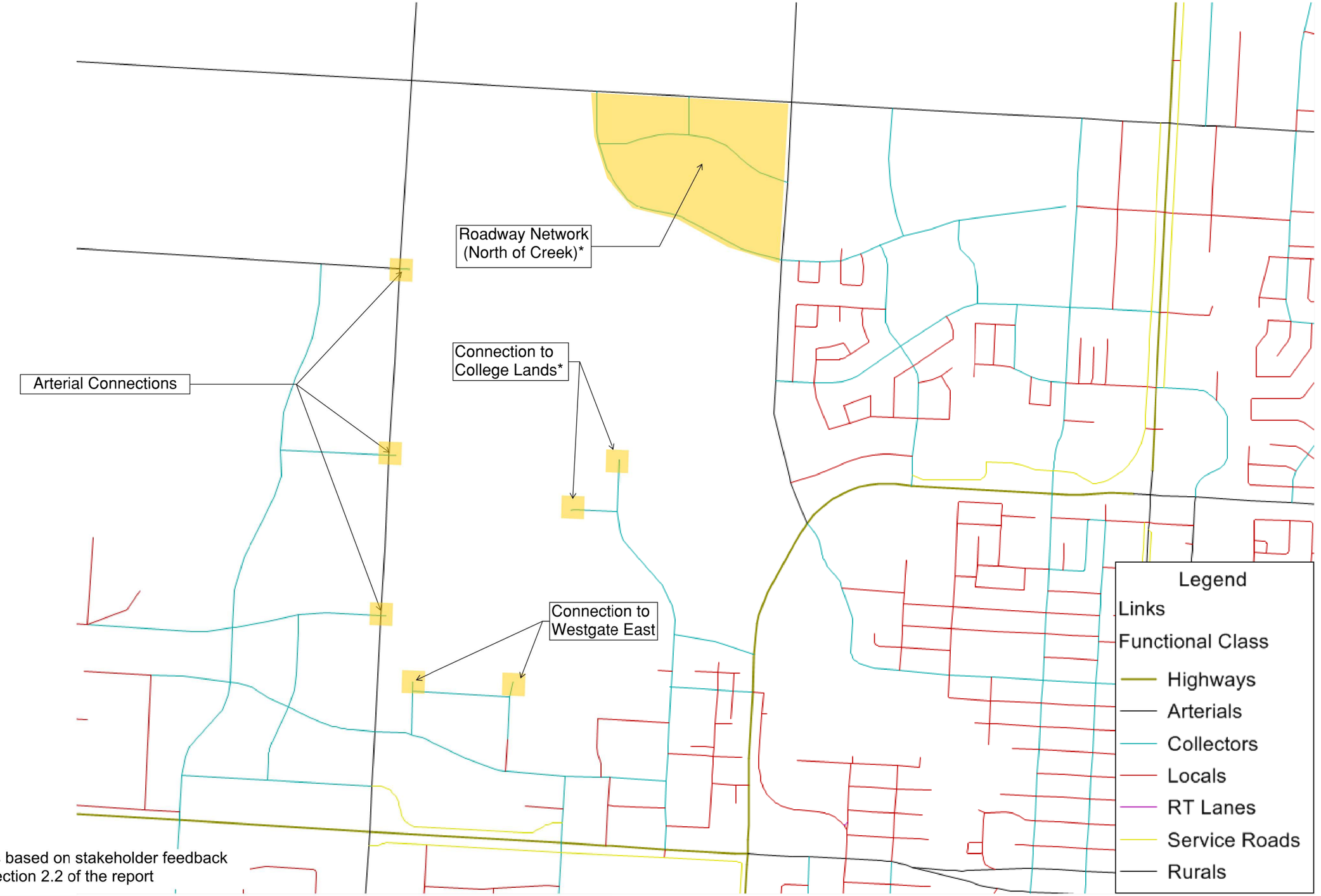
- An single developer responsible for construction cost of the creek crossings is not fair as it will benefit other users
- Creek crossing causes loss of valuable lots backing onto creek
- Creek crossings causes high traffic volume potential, which create neighbourhood issues
- Crossing may not be needed
- A creek crossing is strongly desired. It should be a minor collector with low traffic volumes.
- Potential issue with construction since large setbacks from the creek may be needed

Other Feedback

- Stakeholder roadway plans north of the creek should not be changed
- The land use plan previously established for Hidden Valley is subject to change given
- The study needs to explore the possibility of creating a connection from the hospital access (109 Avenue) to 116 Street, as a new east/west connector
- Connection to the GPRC quarter section is strongly desired
- The study needs to determine whether a more direct connection from the GPRC lands to 116 Street is needed
- The study needs to evaluate whether there needs to be a direct access across the study area
- The study should determine whether the collector roadway volumes are appropriate for the function of the roadway
- Safe connectivity for staff, students and hospital staff between the new hospital and the college.
- GPRC needs an easy flow between the hospital and GPRC for 250 students plus staff.
- High volume pedestrian traffic between sites from September to April.
- Connections to the GPRC lands should not be changed

2.2.2 Summary of Round #1 Stakeholder Feedback

- The collector roadway network north of the creek and the roadway connections to the GPRC quarter sections should not be changed.
- There are serious concerns with a creek crossing and varying opinion of whether this is needed/wanted. Issues include loss of developable land and increase in traffic volumes. Some stakeholders expressed that it would be okay as long as the traffic volumes are of the minor collector roadway nature.
- While the purpose of this study is not to determine cost responsibility of the creek crossing, there were questions over who is ultimately responsible.
- There were concerns with the lack of a directly connecting roadway between 108 Street and 116 Street. There was a desire for this study to evaluate the need for this type of connection.
- The study needs to evaluate roadway volumes to ensure these are suitable for the types of roadway they are intended to be.



*Constraints based on stakeholder feedback round #1, section 2.2 of the report

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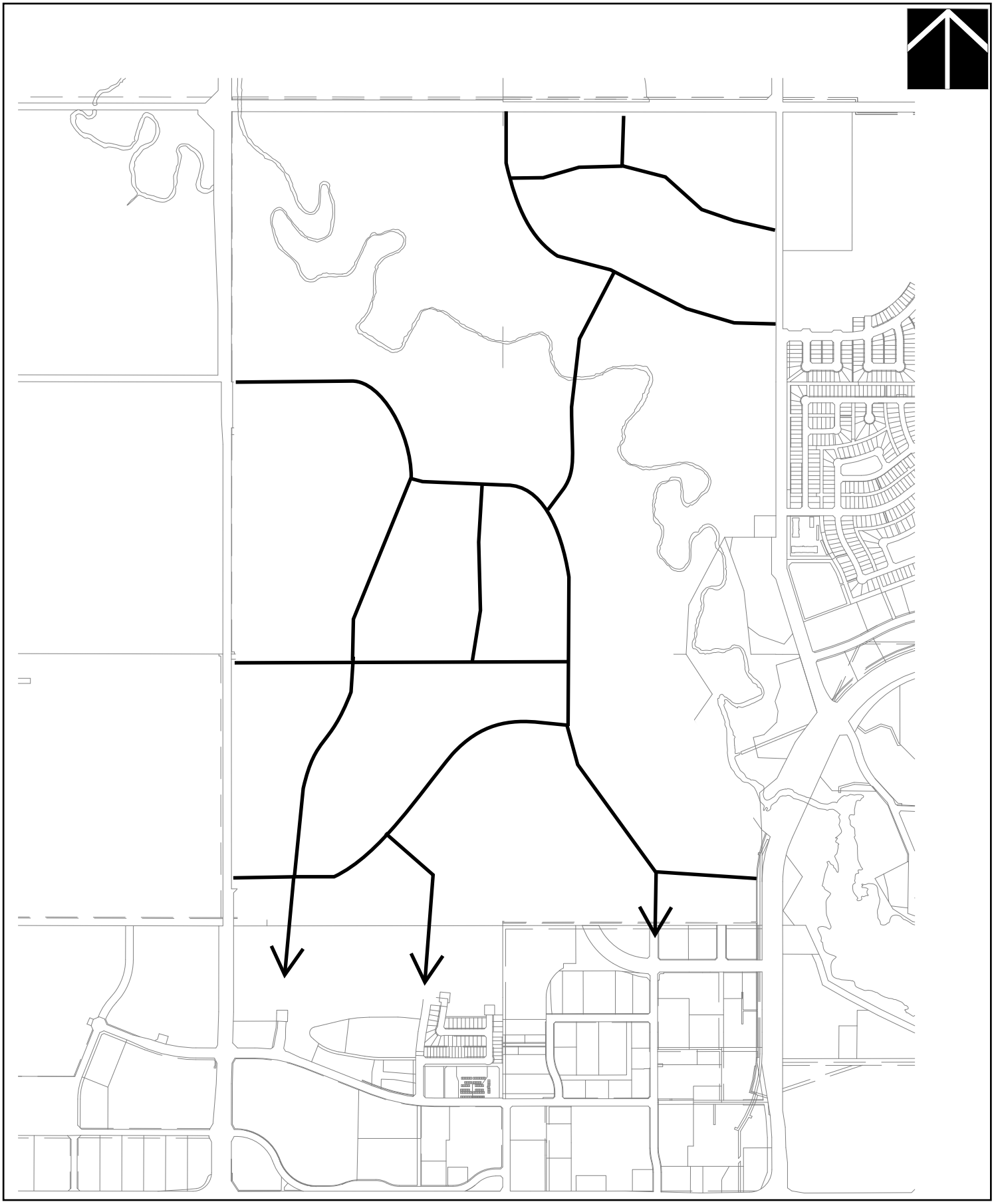
City of Grande Prairie
Northwest Traffic Study
Project Constraints

Exhibit 2.1
Scale: NTS
July, 2014



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City of Grande Prairie
Northwest Traffic Study
Stakeholder Proposed Roadways

Exhibit 2.2
Scale: NTS
July, 2014

2.3 Discussion of Options

Road network options were developed and reviewed by the project team through several rounds of discussion. The purpose was to start with a large number of options, and through the process of elimination, narrow these down to four options. The final four options would be used for the analysis.

In the first round of discussion there were 18 roadway options which were discussed by the project team. These were narrowed down to 5 roadway options. One of these options included the roadway network which was provided by BLK. The initial 18 roadway options are provided in Appendix A. The 5 roadway options which were left over after the initial process are provided in Exhibit 2.3 – 2.7.

The following was concluded based on the discussion of the options shown in Exhibit 2.3 – 2.7.

Option #1 – Not Recommended for test. The project team felt that this was too similar to option #2 in terms of direct connectivity between 108 and 116 Street.

Option #2 – Recommended for testing as this is the best option to test with and without the creek cross as it is quite direct compared to the other options. However, it was discussed that this network will likely cause high short-cutting traffic across the creek crossing and as a result was eliminated for testing.

Option #3 – Recommended for testing. This is a replica of the roadway option provided by BLK, through the first round of stakeholder interviews. Testing this option respects the work which has already been done and the project team felt that it was a reasonable option to test anyway.

Option #4 – At first this was also recommended for test as this option is quite different from the pack and is a strong candidate. Based on discussions with the project team there were concerns that traffic speeds will be high compared to other networks as a result of the long circuitous inner circle. For this reason the network was eliminated from testing.

Option #5 – Recommended for testing given the short segments of east/west roadways which will result in reducing shortcutting volumes through the network. It was also desirable to provide a roadway which parallels 116 Street to provide access to the commercial lands which are expected to locate along 116 Street.

The preliminary options which were used for testing were Option #2 (Exhibit 2.4), #3 (Exhibit 2.5) and #5 (Exhibit 2.7), each with and without the creek crossing (six options in total).

2.4 Traffic Analysis Methodology and Land Use Assumptions

2.4.1 Traffic Analysis Methodology

For each step of the analysis of roadway options ISL used the City's Transportation Master Plan (TMP) travel demand model to complete the analysis of each roadway options. The travel demand model was developed for the TMP by ISL using Vissum 11.03 transportation planning software suite developed by PTS America. This GIS based travel forecasting model is a state-of-the-art transportation planning tool than can efficiently estimate changes in travel patterns and utilization of transportation systems in response to changes in land use, population, and employment and transportation infrastructure. It integrates mapping, land use planning, development projections, future traffic demand and transportation networks to produce reliable traffic forecasts that can be interpreted easily and presented in effective visual formats.

Using the TMP model, ISL started with the 90,000 population model and if the population and/or employment in the traffic zones within the study area and the adjacent traffic zones were not completed full, more was added to reflect full build out. About 20,000 additional persons were added to these zones. The detailed land use statistics which were added to the existing 90,000 model are provided in Appendix B.

The large population increase was due in part to the high densities desired by developers within the study area. These high densities were acceptable for testing a worst case scenario, but the City advised that they may not approve such densities. If so, the volumes reported in this study are likely high. Thus the model results reported in this study are best used when comparing to alternatives rather than using the absolute values (traffic volumes) from a particular model run.

2.4.2 Land Use Densities, Trip Generation Rate and Surrounding Arterial Road Network

Preliminary analysis results showed that several collector roads volumes are higher than would normally be tolerated for a collector road. As discussed above, this may be due to increases in land use and to higher trip generation for the study area. The trip generation rate was checked and found to be correct, meaning that the high traffic numbers are due to the land use densities.

As a result of the densities the model required significant capacity increases on the arterial network. This was done so that the collector networks could be properly tested, otherwise congestion on the arterials could inappropriately induce shortcutting traffic on the collector roads.

These capacity increases should not be interpreted to mean that the City must widen these roads; the increases were done strictly for modeling purposes. In addition, the City agreed with developers to test the worst case scenario in terms of density; therefore there is no need to go back and reduce the densities.

2.5 Preliminary Analysis Results

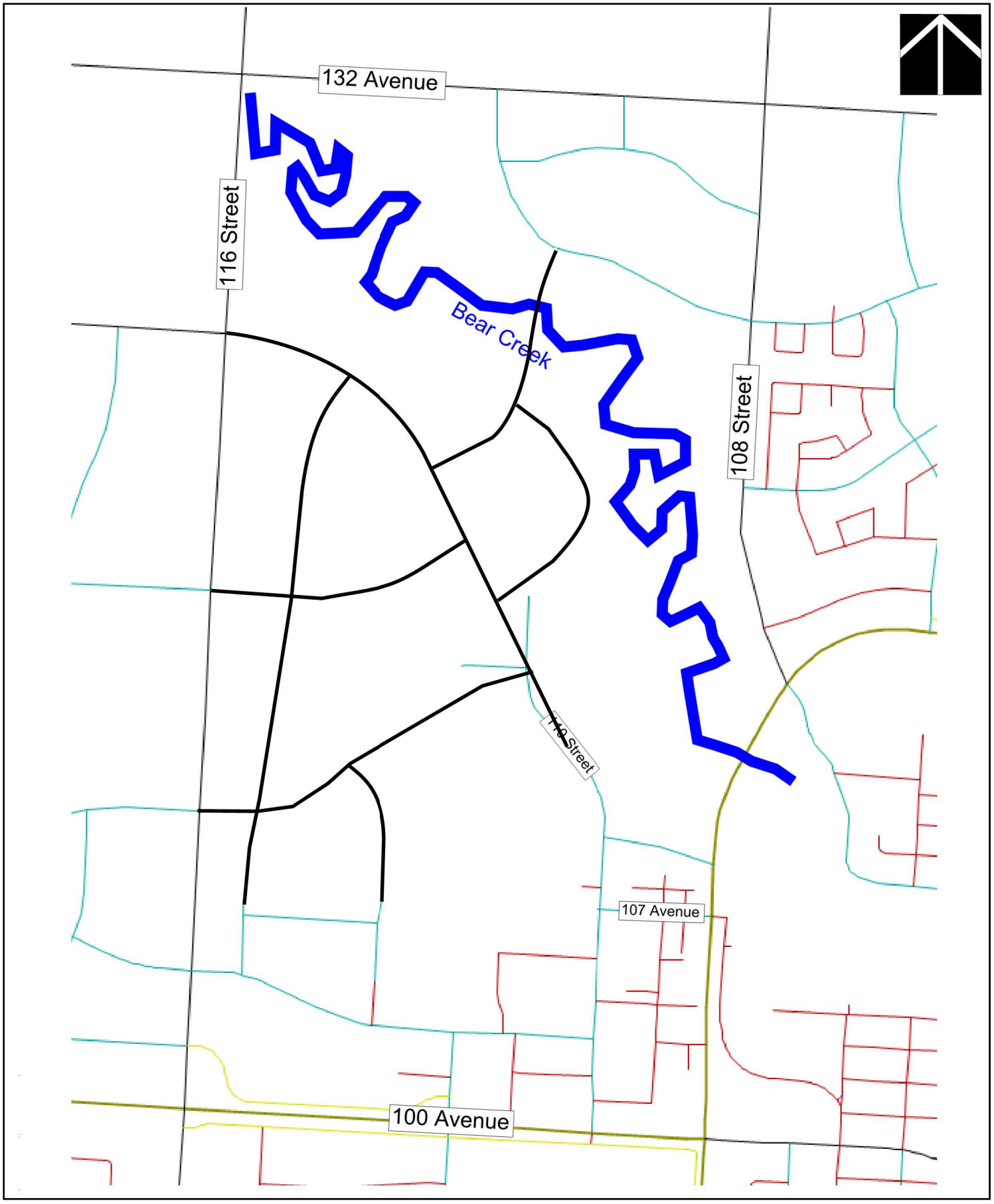
Option #2 (Exhibit 2.4), #3 (Exhibit 2.5) and #5 (Exhibit 2.7) were input to the TMP model and traffic volume maps were created. These are illustrated in Exhibit 2.8 – 2.13 (each option has a sub-option “a” without a creek crossing and a sub-option “b” with a creek crossing.

2.5.1 Short Cutting

When comparing the paired options with and without the bridge link, the bridge reduces volumes on 116 Street by roughly 600 to 700 per hour and by roughly 250 to 360 per hour for 108 Street. The total reduction does not equal the bridge volume, suggesting some trips are using a route beyond 108/116 Street and that there is shortcutting traffic on the bridge (shortcutting = traffic that does not have at least one trip end within the study area).

2.5.2 110 Street Traffic Volumes

110 Street volumes are between 1400 vph (option 5) and 1700 vph (option 2). These are considered too high for the collector roadway suggesting that an additional east/west connector is needed to support 110 Street. Both 107 Avenue and 109 Avenue extensions were discussed. It was determined that 109 Avenue could not be extended due to the GPRC’s Master Plan which shows future buildings within the potential extension. Therefore, this was eliminated as an option. 107 Avenue was considered a more viable option as it would have less impact on future land development.



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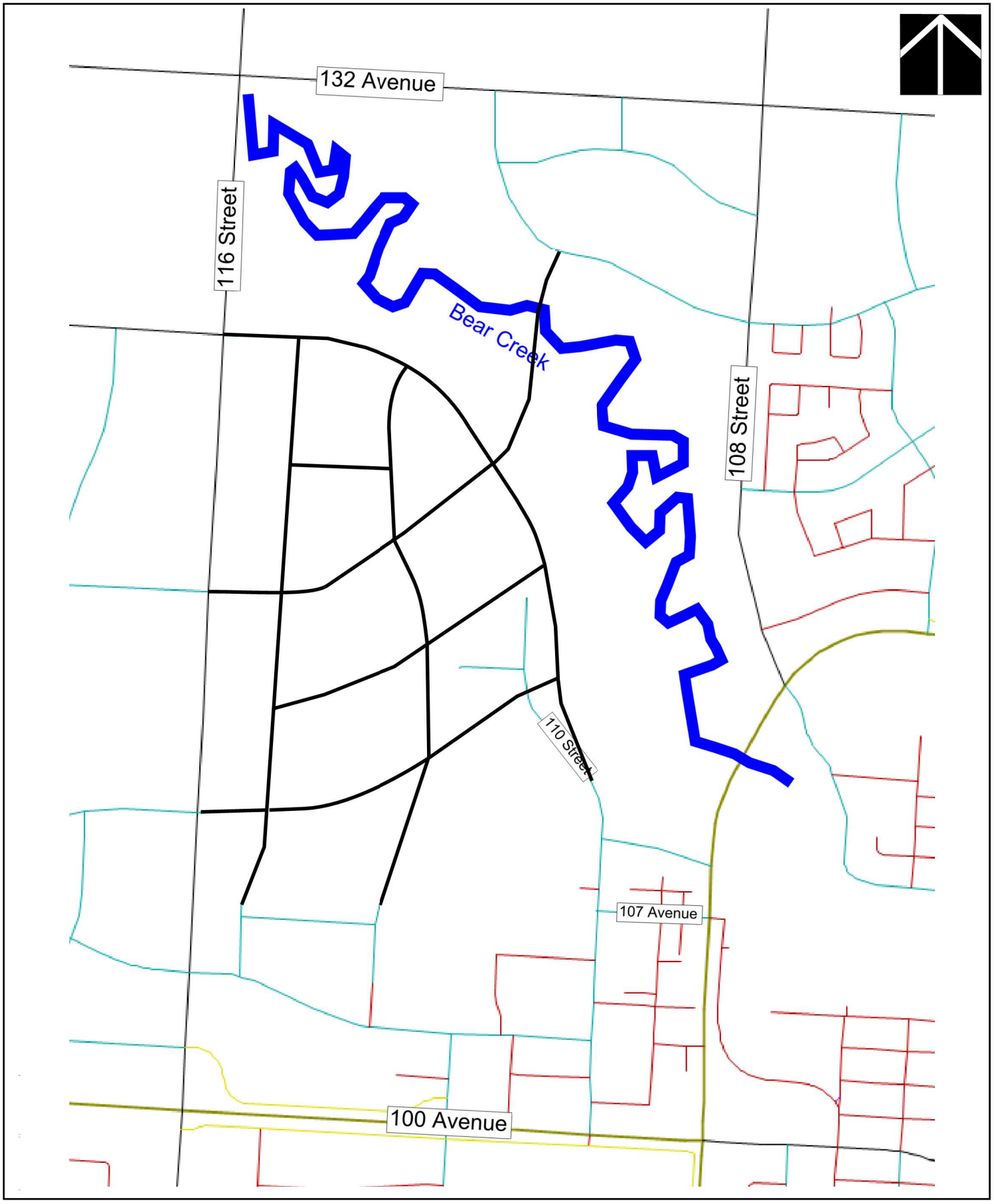
City of Grande Prairie
Northwest Traffic Study
Option 1

Exhibit 2.3
Scale: NTS
July, 2014



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Northwest Traffic Study
Option 2

Exhibit 2.4
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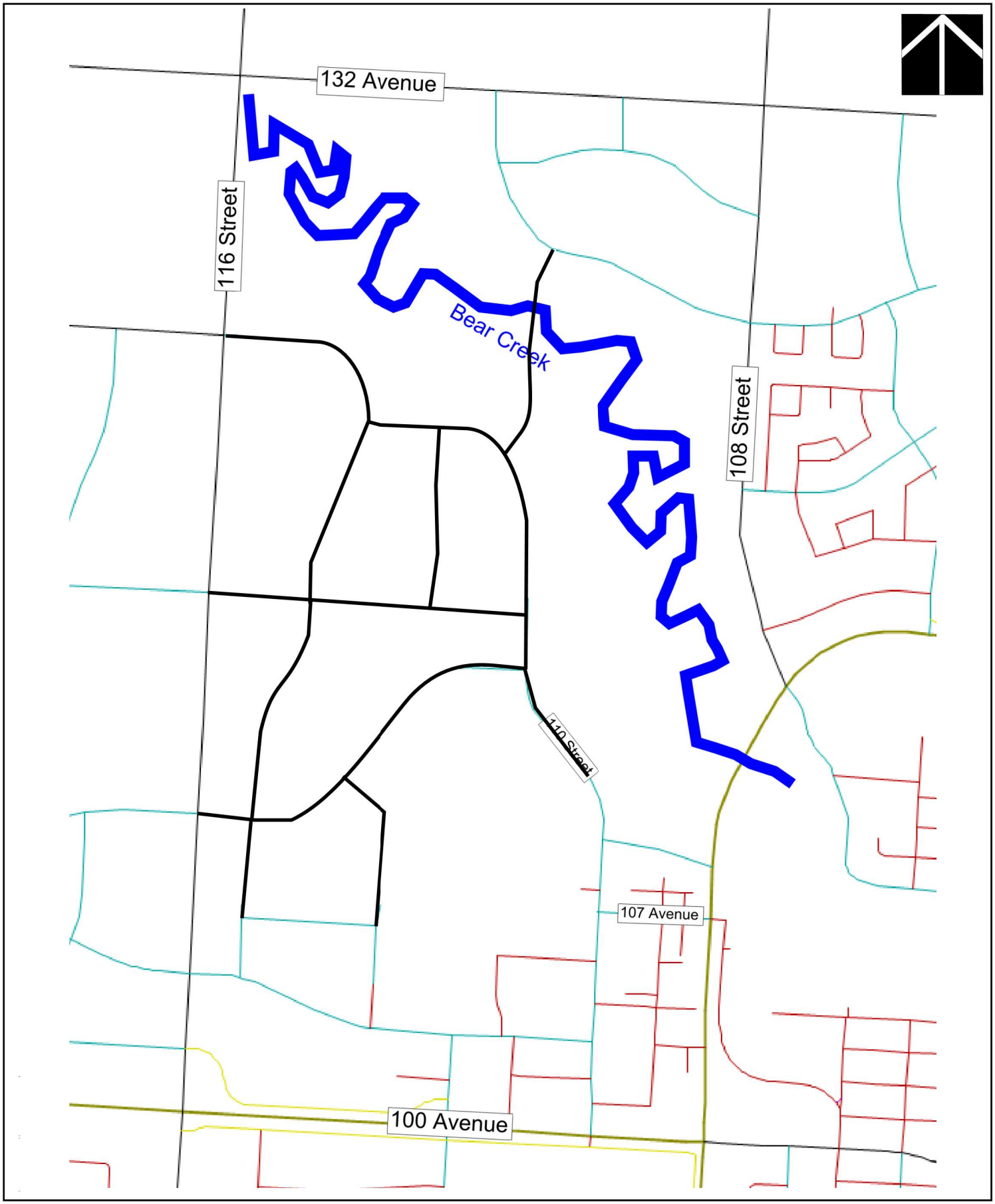

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Northwest Traffic Study
Option 3

Exhibit 2.5
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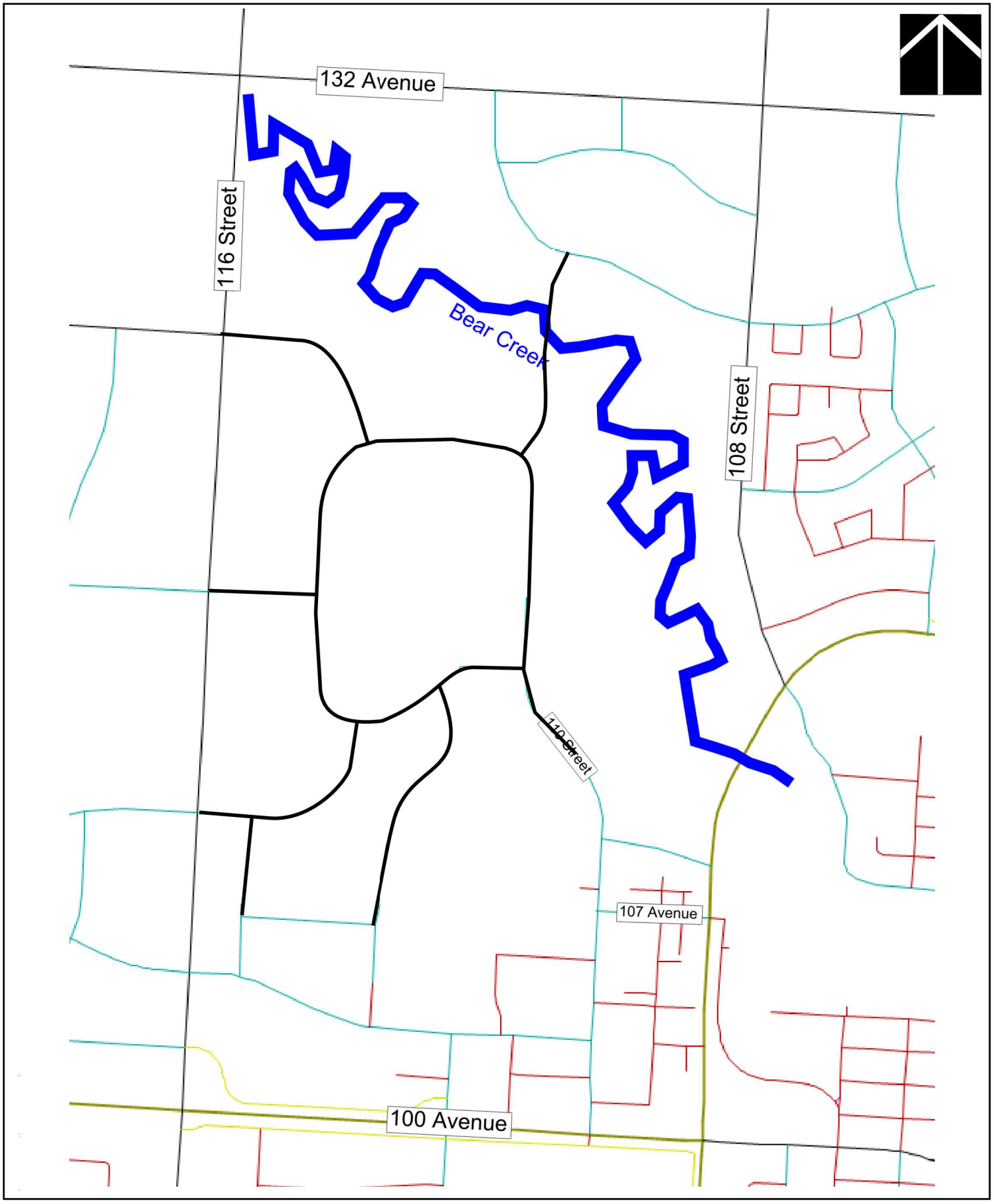
July, 2014



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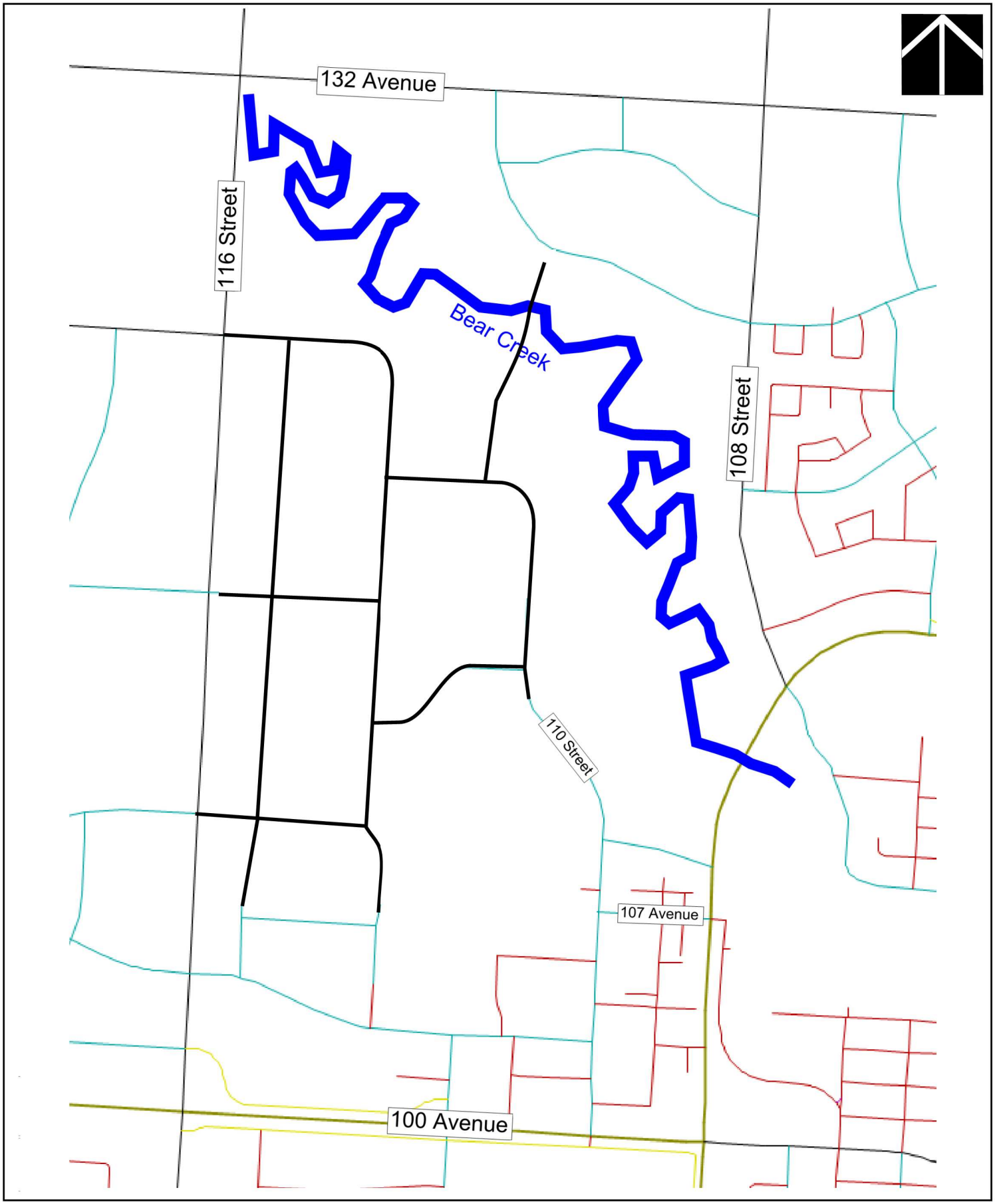
Northwest Traffic Study
Option 4

Exhibit 2.6
Scale: NTS
July, 2014



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Northwest Traffic Study
Option 5

Exhibit 2.7
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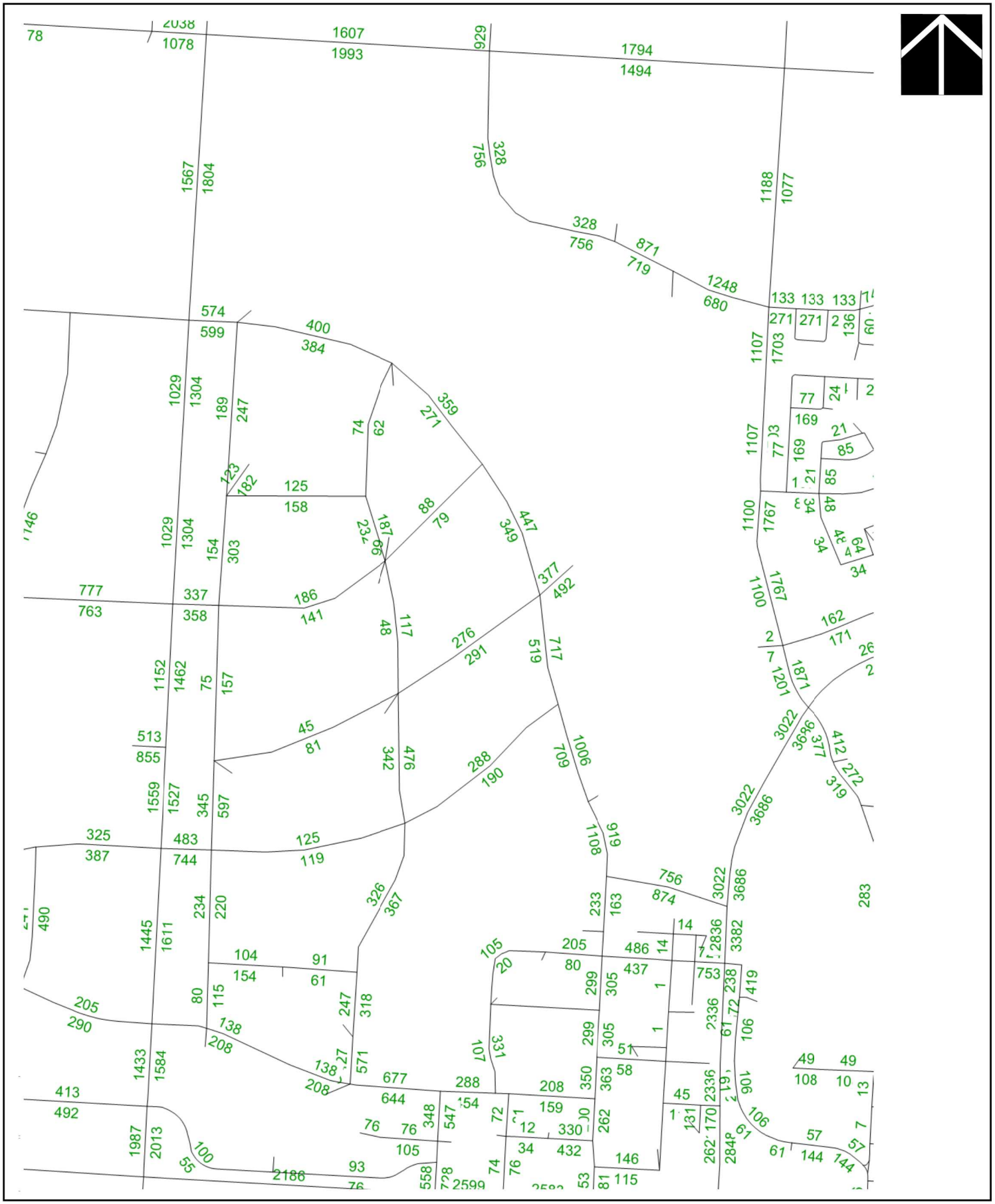
July, 2014



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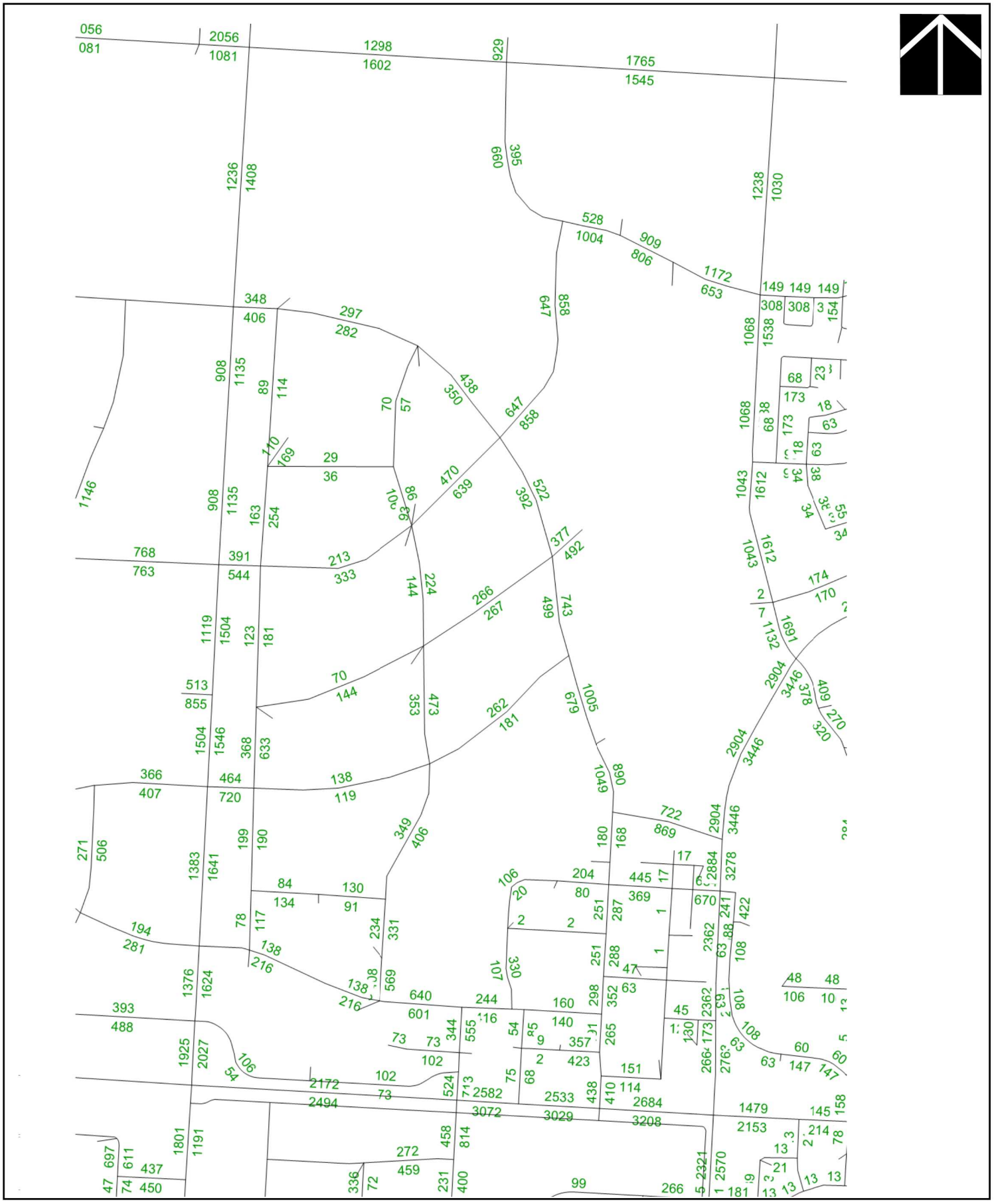
City of Grande Prairie
Northwest Traffic Study
Option 2a - Preliminary Results

Exhibit 2.8
Scale: NTS
July, 2014



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City of Grande Prairie
Northwest Traffic Study
Option 2b - Preliminary Results

Exhibit 2.9
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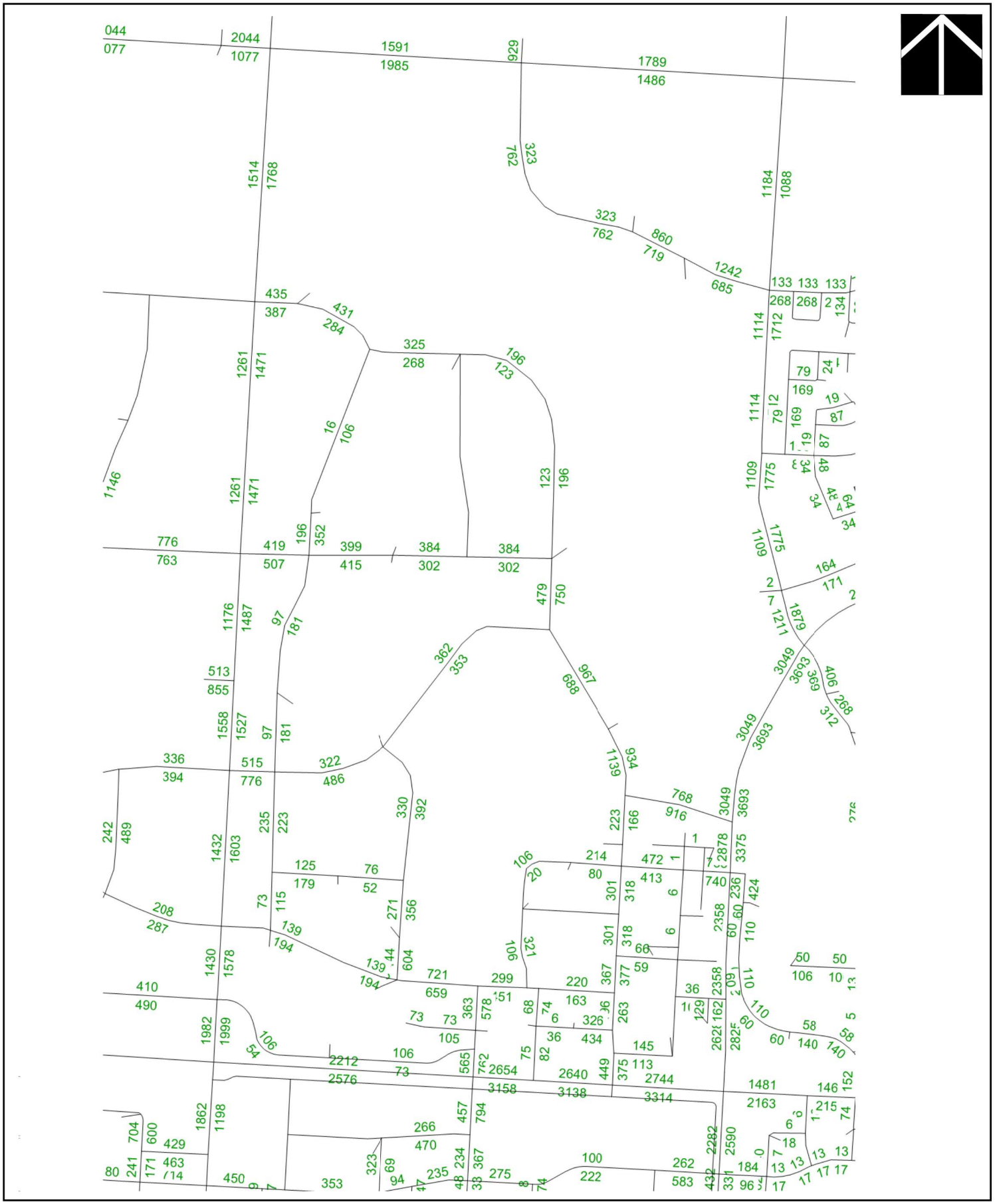
July, 2014



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City of Grande Prairie
Northwest Traffic Study
Option 3a - Preliminary Results

Exhibit 2.10
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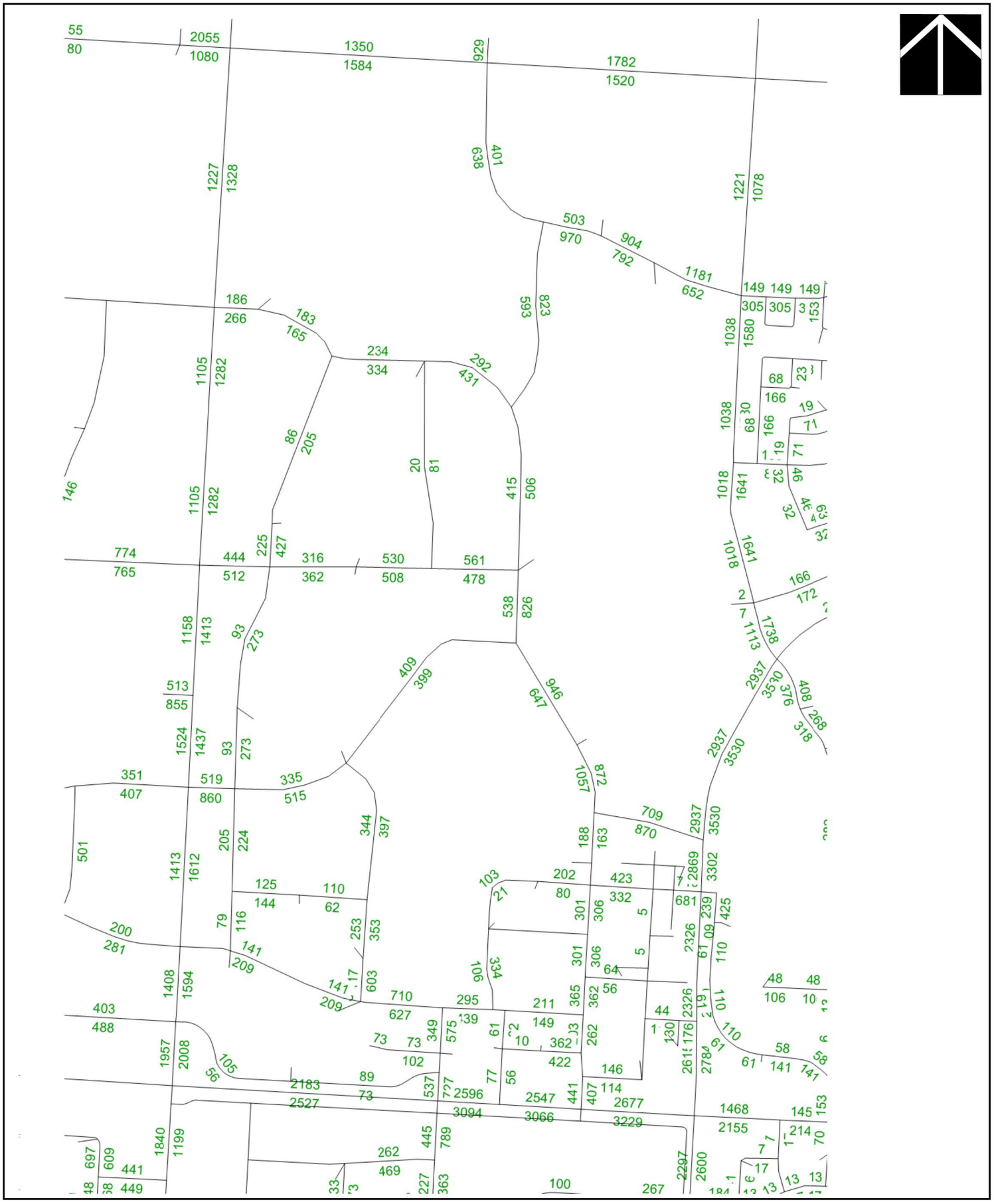
July, 2014



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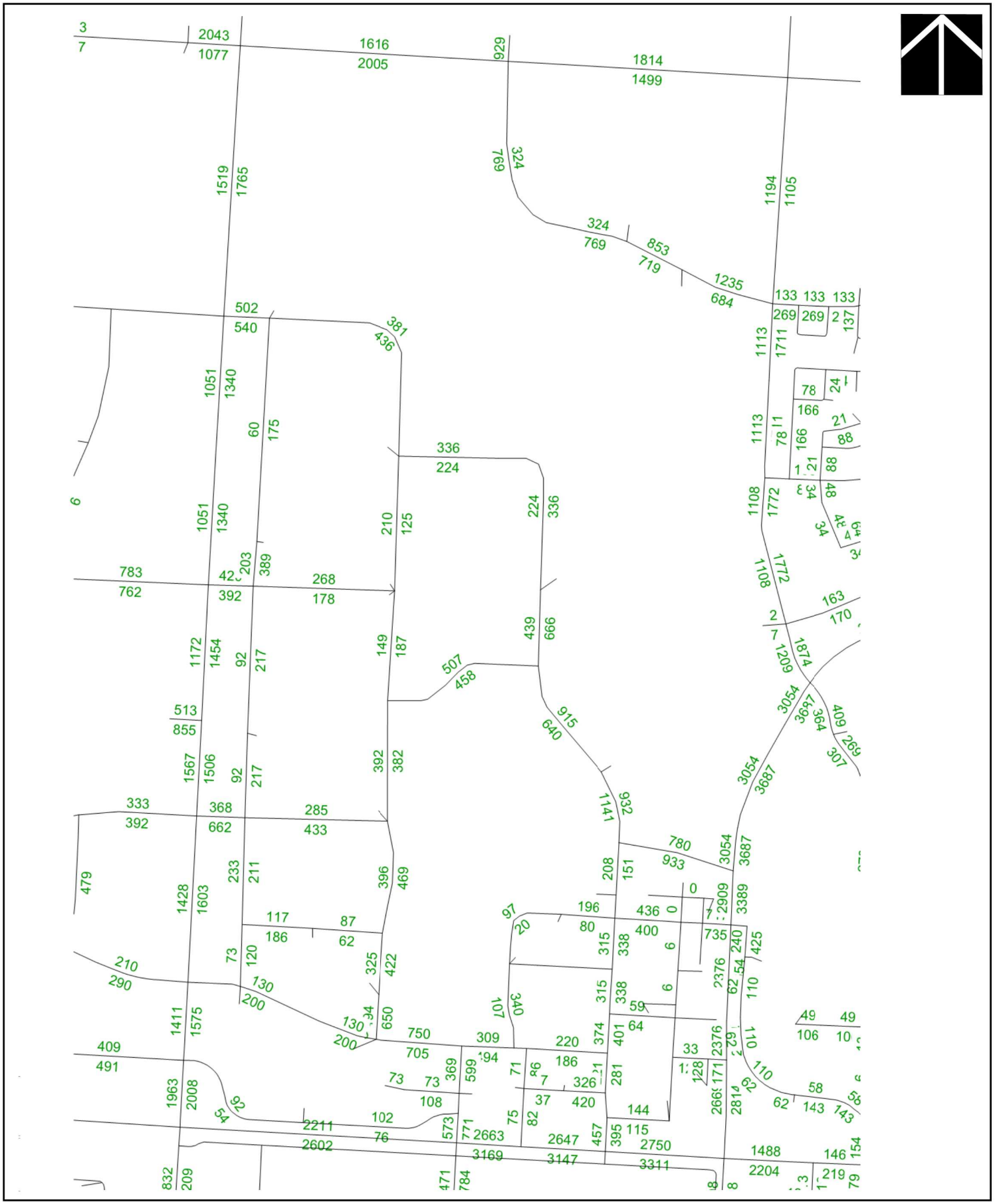
City of Grande Prairie
Northwest Traffic Study
Option 3b - Preliminary Results

Exhibit 2.11
Scale: NTS
June, 2014



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City of Grande Prairie
Northwest Traffic Study
Option 5a - Preliminary Results

Exhibit 2.12
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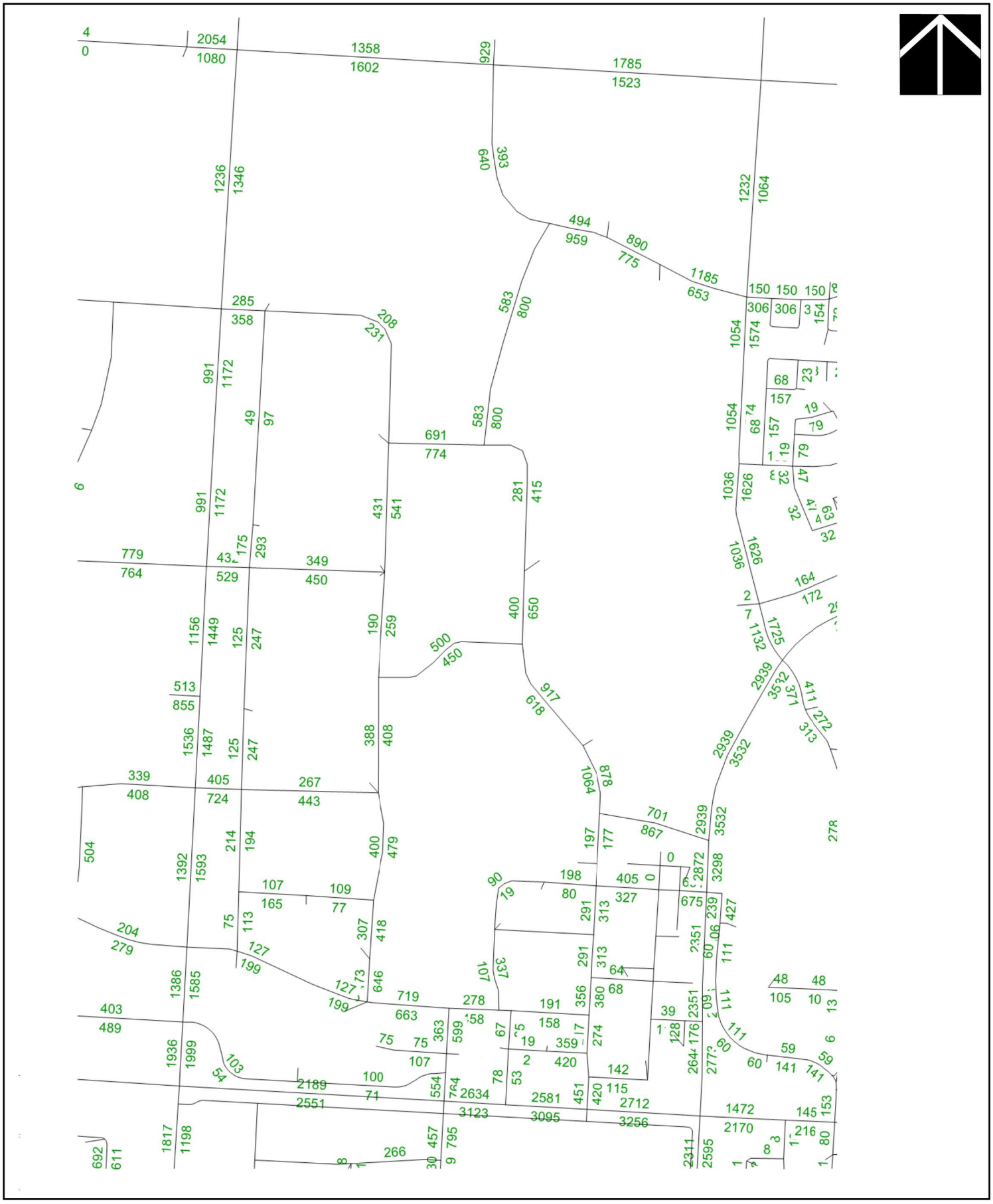

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City of Grande Prairie
Northwest Traffic Study
Option 5b - Preliminary Results

Exhibit 2.13
Scale: NTS
July, 2014

2.5.3 Elimination of Option 2, Addition of 107 Avenue

It was found that creek crossing volumes for option 2 were higher than any other option. Given this and that it is more of a direct route option 2 was eliminated from further testing by the project team. As a trade-off the project team felt that the impact on 110 Street was of concern and that extending 107 Avenue should be considered. There were two options to include 107 Avenue, to swing it north creating a 'T' intersection or to extend it west as a more direct route.

2.5.4 Summary of Preliminary Results

The following is a summary of the preliminary results discussion:

- Option 2 was eliminated as it is more direct and has higher creek crossing volumes than any other option
- 107 Avenue extension was added with the option to swing it north creating a 'T' intersection or to extend it west as a more direct route.

It was determined that the following options be reanalyzed and the results to be discussed for the second round of stakeholder meetings.

- Option 3
  - With and without the creek crossing
- Option 5
  - With and without the creek crossing
  - With and without 107 Avenue (North/South and East/West)

2.6 Stakeholder Meetings Round #2

The following is a summary of the feedback received through the second round of stakeholder meetings.

- Need to include the 107 Avenue extension with option 3
- North/south 107 Avenue extension does not provide a lot of benefit (underutilized)
- Option 3 (with and without creek crossing) provides more developable land along the creek
- Option 5 (all) are more developer friendly, more right angles
- Options that reduce 110 Street volumes are favourable
- Potential for additional access created by the west extension of 107 Avenue

Generally, there was no real consensus on whether the creek crossing is needed. Stakeholders did not prefer one option over another, except that 107 Avenue should be extended to the west, not north.

2.7 Recommended Options

The following options were recommended for detailed analysis, based on the results of the preliminary analysis and the second round of stakeholder meetings.

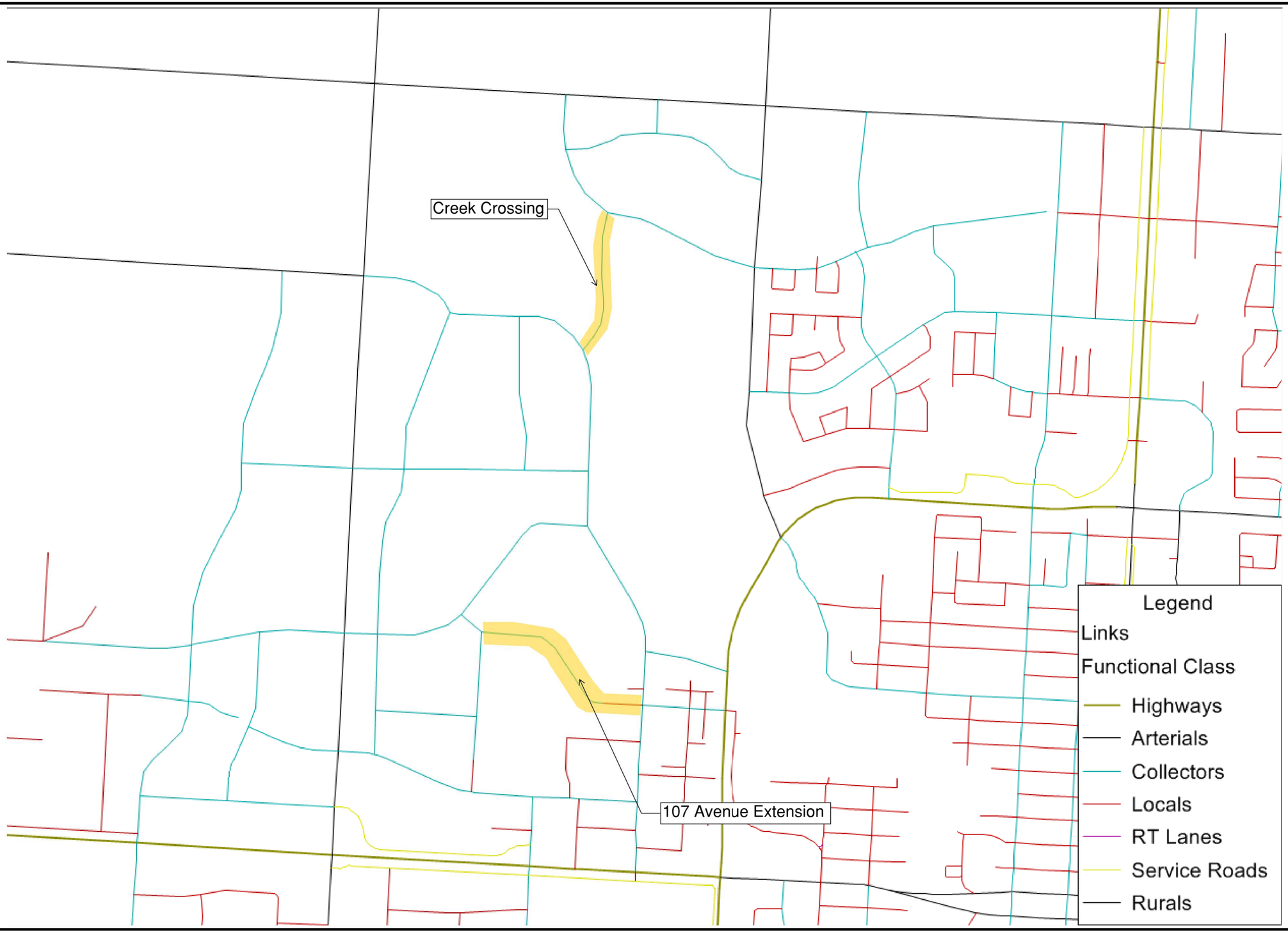
- Option 3 No Bridge, No 107 Avenue
- Option 3 With Bridge
- Option 3 With 107 Avenue
- Option 3 With 107 Avenue and Bridge
- Option 5 No Bridge, No 107 Avenue
- Option 5 With Bridge
- Option 5 With 107 Avenue
- Option 5 With 107 Avenue and Bridge

While the detailed alignment of 107 Avenue will require further evaluation, the project team felt these were the best options to take forward for to the second round of stakeholder interviews.

For the forthcoming sections of the report, the above options are referred to as:

- Option A (Option 3) and B (Option 5) with or without 107 Avenue and/or the Creek Crossing

These are illustrated in Exhibit 2.14 and 2.15.



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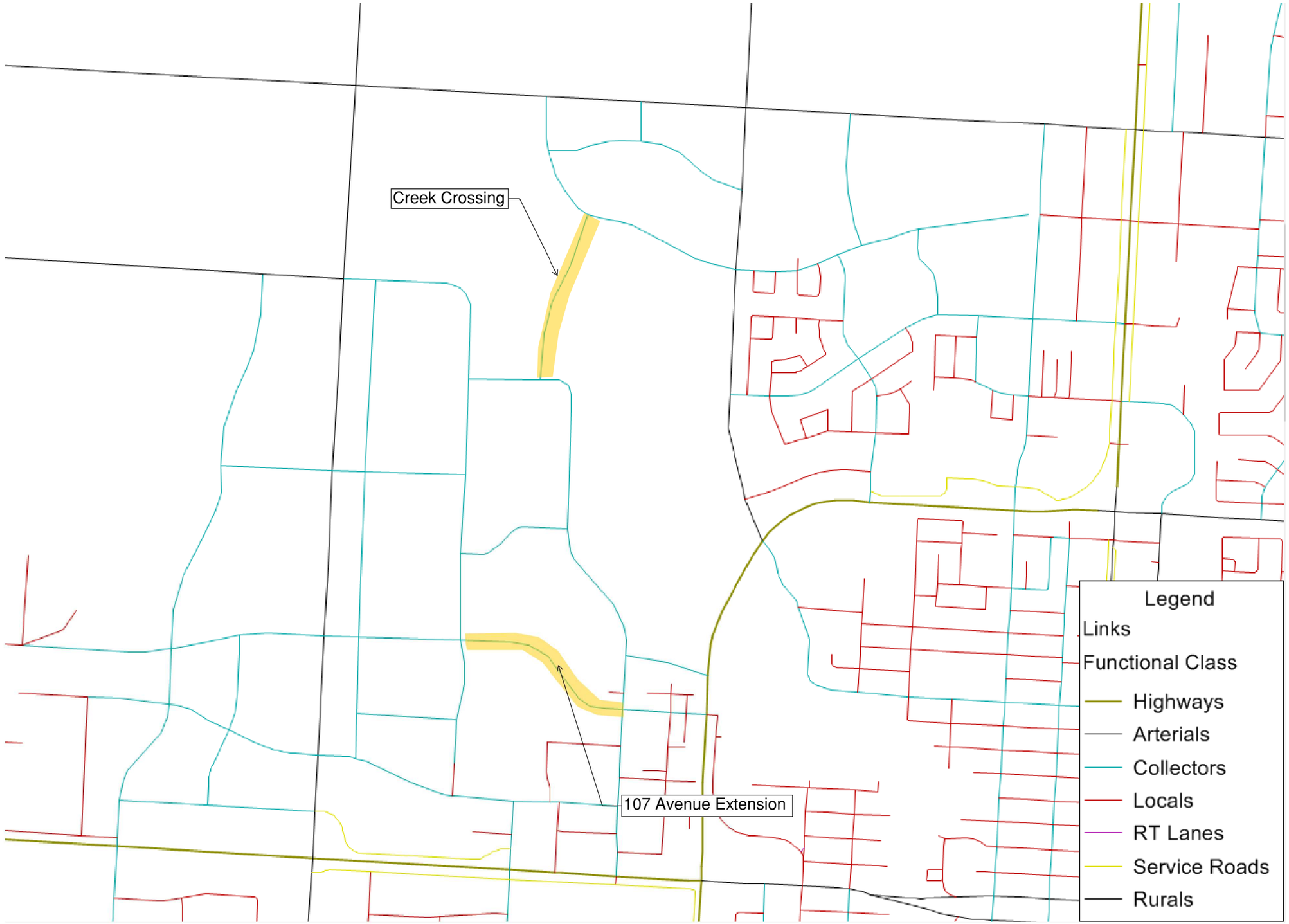
City of Grande Prairie
Northwest Traffic Study
Option A

Exhibit 2.14
Scale: NTS
July, 2014



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City of Grande Prairie
Northwest Traffic Study
Option B

Exhibit 2.15
Scale: NTS
July, 2014

3.0 Detailed Network Analysis

Evaluation of the roadway options was based on criteria which was discussed throughout the process. These include:

- Traffic Volumes
  - Shortcutting Traffic Volumes
- Costs Implications
- Stakeholder Input
- Connectivity

3.1 Traffic Volume Comparison

3.1.1 Traffic Volumes and Land Use Densities

As discussed in Section 2.3.1, the land use densities which were used to update the VISUM model are high and are considered the worst case scenario, in terms of traffic volumes generated. The high densities were acceptable for testing a worst case scenario, but the City advised that they may not approve such densities. Therefore, the model results reported in this study are best used when comparing to alternatives rather than using the absolute values from a particular model run.

3.1.2 Traffic Volume Comparison

Traffic volumes within the study area and on the surrounding roadway network were compared. The locations of each traffic volume location is illustrated in Exhibit 3.1. Traffic volumes at each location are illustrated in Exhibit 3.2 – 3.9. Table 3.1 shows detailed traffic volumes.

Table 3.1: Traffic Volume Comparison, PM Peak Hour Traffic Volumes

Option		A		B		A		B	
107 Avenue		No		No		Yes		Yes	
Creek Crossing		Yes	No	Yes	No	Yes	No	Yes	No
#	Segment Description	Traffic Volumes							
1	116 Street (South of 132 Avenue)	3671	4406	3888	4382	3663	4178	3890	4338
2	110 Street (Front of Hospital)	1605	1653	1440	1559	1328	1416	910	1055
3	110 Street (107 – 109 Avenue)	978	1004	967	989	1174	1191	1088	1225
4	108 Street Bridge (HWY 43)	6119	6388	6116	6420	6159	6490	6107	6491
5	107 Avenue (East of 110 Street)	303	316	318	354	687	724	1368	1108
6	104 Avenue (West of 112 Street)	1050	1099	1192	1209	695	696	757	769
7	100 Avenue @ 112 Street	4040	4028	4027	4031	4006	4020	4005	3976
8	107 Avenue Extension	0	0	0	0	901	958	1232	1285
9	112 Street and 132 Avenue	1152	1006	1222	1017	1147	997	1234	1016
10	128 Avenue and 108 Street	1068	917	997	910	1016	919	979	905
11	128 Avenue and 116 Street	441	774	454	681	430	671	467	670
12	116 Avenue and 116 Street	922	923	840	978	939	1057	715	917
13	107 Avenue and 116 Street	1172	1204	1086	1174	1196	1224	1111	1140
14	109 Avenue and 108 Street	2216	2439	2088	2347	2166	2467	1487	2201
15	Bridge Crossing	1096	0	1009	0	1058	0	1039	0
16	Bridge Crossing @ Collector	679	187	711	189	682	185	716	188

Option		A		B		A		B	
107 Avenue		No		No		Yes		Yes	
Creek Crossing		Yes	No	Yes	No	Yes	No	Yes	No
#	Segment Description	Traffic Volumes							
17	115 Street Connector Road	439	460	398	463	423	433	370	397
18	113 Street Connector Road	551	551	775	772	361	346	468	449
19	132 Avenue	4295	4902	4461	4905	4287	4766	4492	4869
20	108 Street	2536	2608	2198	2290	2536	2617	2197	2262

Location 1 (116 Street)

Traffic volumes on 116 Street decrease by approximately 10 – 17 %, depending on whether there is a creek crossing or 107 Avenue. A larger decrease in traffic volumes implies a higher percentage of traffic using the internal roadway network. Neither decrease however is enough to justify a decrease in the number of lanes needed on 116 Street. While there will be some reduction to arterial road volumes due to the creek crossing the effects are felt over a large number of large roadways, throughout the entire City network.

Location 2 (110 Street, Hospital Road)

Traffic volumes on 110 Street in front of the hospital are reduced by 5 – 10% with the addition of the creek crossing. The largest reduction is with the addition of 107 Avenue, which reduce these volumes by 15% in option A and 33% in option B. This is likely due to 107 Avenue being more direct in option B compared to option A.

Location 3 (110 Street, 107 – 109 Ave)

Traffic volumes on this segment of road increase by approximately 20% for both option A and B with the addition of the 107 Avenue extension. This could be because traffic to/from the college lands are heading to the 107 Avenue extension instead of using the 110 Street roadway in front of the hospital.

Location 4 (108 Street Bridge, HWY 43)

Traffic volumes on this bridge decrease by approximately 3 – 5%, depending on whether there is a creek crossing. This reduction is not high enough to justify a reduction in the number of lanes needed on the bridge.

Location 5 (107 Avenue, East of 110 St.)

Traffic volumes on this segment increase substantially with the addition of the 107 Avenue extension. The traffic volumes increase by a magnitude of 2 in option B, with the creek crossing. This is likely a result of option B having a more direct 107 Avenue connection.

Location 6 (104 Avenue @ 112 Street)

Traffic volumes through this section decrease by approximately 50 – 60% with the addition of 107 Avenue.. This is the case with and without the bridge crossing.

Location 7 (100 Avenue @ 112 Street)	Traffic volumes through this section of roadway do not change substantially with any of the options.
Location 8 (107 Avenue Extension)	Traffic volumes through this section of roadway are highest with option B compared to option A. Adding the creek crossing reduces the volumes by approximately 5% for both options.
Location 9 (112 Street and 132 Avenue)	Traffic volumes on this link increase by about 20% with the addition of the bridge crossing.
Location 10 (128 Avenue and 108 St.)	Traffic volumes on this section of roadway increase by approximately 10% with the addition of the bridge crossing.
Location 11 (128 Avenue and 116 St.)	Traffic volumes decrease by approximately 50% with the addition of the bridge crossing. This is not a large enough decrease to justify reducing the number of lanes on this section of roadway, since it is already a 2 lane collector roadway. The reduction may reduce the number of turning lanes required at the intersection and reduce the overall level of traffic congestion.
Location 12 (116 Avenue and 116 St.)	Traffic volumes are generally similar on this section of roadway for every option except option B with the bridge crossing and 107 Avenue. For this option traffic volumes decrease by approximately 20%. The reduction is likely a result of adding the creek crossing.
Location 13 (107 Avenue and 116 St.)	There is no significant change with any of the options on this section of roadway.
Location 14 (109 Avenue and 108 St.)	Traffic volumes are similar for every option except option B with the bridge crossing and 107 Avenue. Adding 107 Avenue reduces the volumes by 6% and adding the creek crossing further reduces volumes by 31% for a total reduction of 37%. This will result in less turning lanes required at the intersection of 108 Street and 109 Avenue and overall less traffic congestion, in comparison to the other options.
Location 15 (Creek Crossing)	Traffic volumes on the creek crossing are similar for all options.
Location 16 (Creek Crossing, North)	Traffic volumes on this section of roadway increase by a magnitude of 3.5 with the creek crossing. The result may change the feel and character of the roadway from a local collector with front driveways to a busier more heavily travelled collector with alley driveways.

Location 17 (115 Street)	Traffic volumes on 115 Street reduce by 2 – 15% by adding the creek crossing, with the larger reduction with option B. By adding 107 Avenue traffic volumes reduce by 6 – 14%, with the larger reduction with option B. By adding by the bridge and 107 Avenue traffic volumes reduce by 8 % in option A and 20% in option B.
Location 18 (113 Street)	Traffic volumes on 113 Street do not change substantially by adding the creek crossing to either option. However, adding 107 Avenue to either option reduces volumes by approximately 37%.
Location 19 (132 Avenue)	Traffic volumes on 132 Avenue do not change substantially by adding 107 Avenue to either of the options. However, traffic volumes are reduce by 9 – 12% by adding the creek crossing.
Location 20 (108 Street)	Traffic volumes on 108 Street reduce by approximately 4% by adding the creek to either option but there is no substantial change by adding 107 Avenue.

3.1.3 Conclusions Regarding Traffic Volumes

C.1 – Adding the creek crossing or 107 Avenue will not reduce the number of lanes required on the surrounding arterials. While there will be some reduction to arterial road volumes the effects are spread over a large number of large roadways and any impact, if any, is small.

C.2 – A benefit of adding the creek crossing is to reduce the traffic volumes at 128 Avenue and 116 Street. The reduction will be approximately 50% and will result in less congestion at the intersection compared to not having the creek crossing. This will only impact the number of turning lanes needed at the intersection but not the number of lanes needed on 128 Avenue.

C.3 – Another benefit of adding the creek crossing is that the volumes on 109 Avenue will be reduce by 30%, but only in option B and only with 107 Avenue. Otherwise, the volume reduction will be much smaller at approximately 10%.

C.3 – The greatest disbenefits of adding creek the crossing is that it will cause an increase in the traffic volumes at the connections to the north side roadway network compared to not having it. The impacts of this will be felt downstream at the arterial road connections (location 9 and 10).

C.4 – The increase in traffic volumes on the north side roadway as a result of the creek crossing will cause a change in the feel and character of those effected roadways. This will change these roadways rom a quite a local collector with front driveways to a busier more heavily travelled collector with alley access (no front driveways). The result will be similar on the south side of the creek crossing. Also, pedestrian crossings of these streets will be more challenging in the high volume scenarios.

C.5 – Adding 107 Avenue reduces the traffic volumes on several collector roadways within the study area, these include:

- 115 Street connector volumes are reduced by up to 20% (option B)
- 113 Street by 37% (option A and B)
- 110 Street (in front of the hospital) the traffic volumes are reduced by 15% (option A) and 33% (option B).
- 104 Avenue (west of 112 Street) the traffic volumes decrease by 50 – 60 % (option A and B)

C.6 – Adding 107 Avenue increases the traffic volumes at the 107 Avenue, east of 110 Street. This may require that additional turning lanes be installed at 108 Street to accommodate this increase in traffic volume.

C.7 – 107 Avenue volumes at 116 Street have little variation with any of the roadways options. This implies that there are little to no shortcutting volumes added as a result of adding 107 Avenue.

3.1.4 Shortcutting Traffic Volumes

Shortcutting traffic volumes were analysed in detail using a select link analysis in the VISUM software. It was found that short cutting traffic on the bridge and 107 Avenue only amounted to approximately 5% of the total traffic volumes for any option.

Any reduction to arterial road volumes due to the addition of 107 Avenue or the creek crossings were found to be caused by increase internal/external trips and external/internal trips within the study area. These are resulting from trips related to the study area and are considered shortcutting. An internal/external trip has a start point within the study area and an end point outside the study area in which the trip involve travel across the bridge. An external/internal trip has a start point outside the study area and an end point.

3.2 Cost Implications

3.2.1 Total Roadway Lengths

The lengths for option A and B, 107 Avenue and the creek crossing are provided in Table 3.2. The segment lengths are illustrated in Exhibit 3.7 and 3.8. Lengths are approximate.

Table 3.2: Roadway Lengths

Description	Length
Option A	5890 m
Option B	6030 m
107 Avenue	650 – 700 m
Creek Crossing	700 m

As shown in Table 3.2, the roadway lengths are similar for both options, therefore there is no significant cost saving for one option compared to the other in terms of total length to construct.

3.2.2 107 Avenue

In general, adding 107 Avenue reduces traffic volumes on several collector roadways as identified in Section 3.1, conclusion #5. The reduction in traffic volumes will be especially beneficial through collector roadways where lower traffic volumes are more suitable. However, there will likely be no reduction in the number of collector road lanes needed as a result of adding 107 Avenue, therefore, no cost savings.

The most significant benefit of adding 107 Avenue is that a reduction is traffic volumes will lessen the need to construct traffic calming improvements. This will be especially beneficial through 110 Street as this will be a high pedestrian corridor where lower traffic volumes will be more suitable.

Adding 107 Avenue to either roadway option will reduce traffic volumes on 110 Street, however, the largest increase is experienced with option B. This roadway option is more effective in reducing volumes on 110 Street likely due to a more direct connection of 107 Avenue to option A. Similar results would be expected if 107 Avenue was more direct in option A.

Any cost reductions of adding 107 Avenue may be offset by the need to construct additional lanes at the intersection of 108 Street and 107 Avenue in order to accommodate an increase in traffic volumes. This will require further detailed analysis prior to the construction of 107 Avenue.

3.2.3 Creek Crossing

The cost of adding the creek crossing is around $4 million based on information provided by the City. Benefits include a reduction to the traffic volumes on 128 Avenue at 116 St, which may reduce the number of turning lanes needed at the intersection. However, any cost savings will be offset by an increased need to install traffic calming improvements due to higher traffic volumes at each end of the creek crossing, as identified in Section 3.1, conclusion #3.

If the City chooses to apply roadway option B and 107 Avenue, adding the creek crossing will reduce the traffic volumes on 109 Avenue at 108 Street by 30%. This could reduce the number of turning lanes required at the intersection.

3.2.4 Conclusions Regarding Costs

C.8 – No significant difference in lengths between option A and B, therefore no significant difference in costs, assuming cost per meter is the same for both.

C.9 – Adding 107 Avenue will reduce the need for traffic calming improvements on several collector roadways but will increase the traffic volumes on 107 Avenue, east of 110 Street. Additional turning lanes may be need at the intersection of 108 Street and 107 to accommodate an increase in traffic volumes.

C.10 – Adding the creek crossing will cost around $4 million and will possibly reduce the number of lanes needed at the intersection of 128 Avenue and 116 Street. Any cost saving will likely be offset by the need for traffic calming improvements within the neighbourhoods connecting to each end of the crossing.

C.11 – There may be a reduction in the number of turning lanes required at the intersection of 109 Avenue and 108 Street by adding the creek crossing, but only with option B and 107 Avenue.

3.3 Stakeholder Input

The following is a summary of stakeholder feedback received which impacts the choice of roadway option and whether 107 Avenue and/or the creek crossing should be included. Also, included is the feedback received at the public open house which was held on March 18, 2014.

Table 3.3: Stakeholder Feedback

Feedback Received
Stakeholder Meetings (General Comments) • Options that reduce volumes on 110 Street are favored, because they are less likely to give congestion around the hospital, which otherwise will impact emergency access. • An advantage of 107 Avenue (on 110 Street) is that a main access could be built into the campus area from 107 Avenue, further reducing the volumes on 110 Street. • Do not support options with 107 Avenue which do not provide significant traffic reduction on 110 Street • Concern over the amount of land which will be used for the 107 Avenue option, which bisects the southwest corner of the GPRC lands • There is great value to the community in ensuring there is a foot/bike trail over Bear Creek. • Option A has more buffer from the creek, more development potential • Option A may be less attractive and less friendly for developing due to the number of curvilinear roadways • Option B has more right angles which are easier from a development perspective • The creek crossing is favourable • Would like to see an option with connection of 109 Avenue to 116 Street • If the volume change on collector roads feeding the bridge is significant with the addition of the bridge crossing it will change the character of the road and the Neigbourhood – Not in favour of the creek crossing for this reason • 107 Avenue is at capacity now and any further volumes added to 107 Avenue will not be realistic as there is no space capacity. There should be an option which connects 109 Avenue east/west because there is ability to widen 109 Avenue for improved capacity • Who pays will have a more significant impact on whether the bridge should be constructed than the results of the traffic analysis • In all scenarios the bridge crossing traffic volume is high (10000 vpd based on factoring the vph by 10) and will result in the connecting collector roads being overloaded. As a result this will split the Neigbourhood on each side of the collector roadway. • Generally acceptable to option A. • A more direct link between 108 Street and 116 Avenue is needed, whether it is 107 or 109 Avenue.
Open House • Option A = 5 Yes Option B = 3 Yes • Bridge Crossing = 8 Yes, 0 No • 107 Avenue = 8 Yes, 0 No • Creek crossing absolutely necessary • Lower traffic volume is more desirable for cyclists, pedestrians and overall traffic safety. • If no creek crossing, improve 108 Street bridge.

3.3.1 Conclusions from Stakeholder Input

C.12 – Generally, most stakeholders agreed that a roadway which connects 108 Street to 116 Street is needed. There were concerns with the right of way requirements through existing lands

C.13 – There were serious concerns regarding the volumes of traffic on the creek crossing by some stakeholders, however there were others who were in favour of having the creek crossing to increase connectivity

C.14 – There was 100 % support for both the 107 Avenue extension and the bridge crossing, from the open house.

C.15 – Option A is considered more aesthetic and provides more buffer from the creek, but may be less friendly to develop due to the number of curved roads.

C.16 – Option B has more right angles and may be friendlier to develop.

C.17 – There was 63% support for option A and 37% support for option B, from the open house.

3.4 Connectivity and Intersection Layout

Option A	Direct connection from 116 Street to the center. Less direct connect of 107 Avenue. Tighter layout of the roadway network compared to option A, which could induce less balancing of traffic volumes over the entire network.
Option B	Less direct east/west connection from 116 Street to the center. 107 Avenue is much more direct compared to option A. More evenly spaced intersection compared to option A which could result in better distribution of traffic volumes over the roadway network. Longest north/south segments compared to option A, which could induce speeding and/or the need for traffic calming improvements.
Creek Crossing	Provides internal connectivity between each land use, north and south of the creek. Potential to be used as an emergency access if required.
107 Avenue	Provides east/west connection between 108 Street and 116 Street, which was a concern of stakeholders.

3.5 Pros and Cons, Option A, B, 107 Avenue and the Creek Crossing

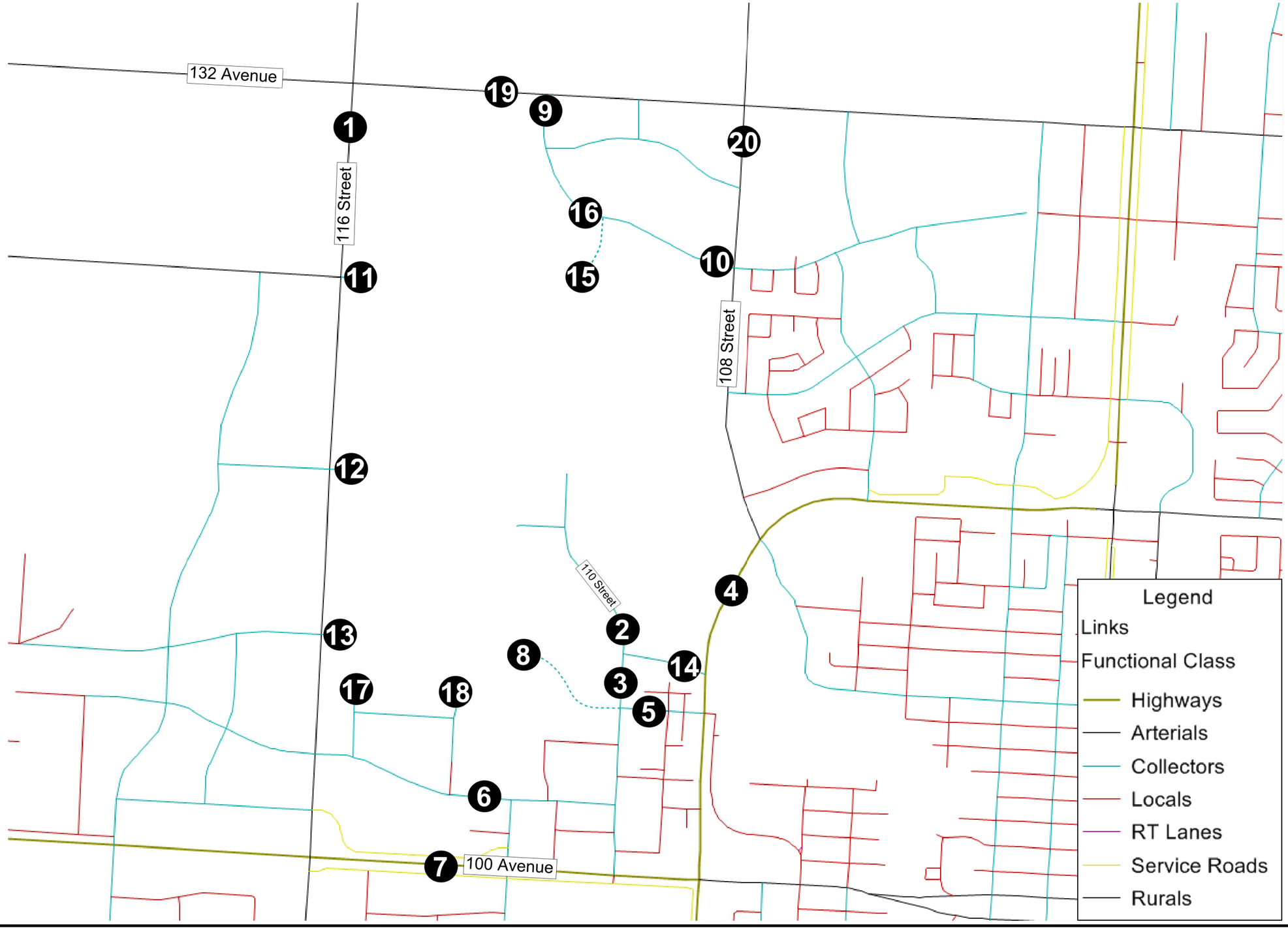
The pros and based on the detailed analysis, cost implications, stakeholder input and discussions with the project team are provided in Table 3.4 and 3.5.

Table 3.4: Option A and B, Pros/Cons

Option A	**Technical Pro**	**Technical Con**
	Less direct version of 107 Avenue and may result in less perceived short cutting issues.	Closer intersection spacing which could result in less distribution traffic volumes over the roadway network
	Direct connection to the center	Less effective at reducing collector road volumes with 107 Avenue compared to option B.
	Non-technical Pro	**Non-technical Con**
	The roadway network would not cause an adjustment to the land owners plans since this option is based on their plan	Curves are less developer friendly
	Received 63% support at the public open house, however it was a small sample size (8).	
	More curvilinear roadways and may be more aesthetic	
	Provides at larger buffer from the creek and as a result increase the development potential.	
Option B	**Technical Pro**	**Technical Con**
	Greatest reduction in traffic volumes on 110 Street in front of the hospital with the 107 Avenue extension.	Would force the land owner to adjust their roadway plan.
	More evenly spaced intersections compared to option A resulting in better distribution of the roadway network.	Less direct to the hospital lands.
	The road network is less direct east/west, north of 109 Avenue, which may result in less short cutting issues.	Potential issues with longer north/south segments compared to option A.
	Non-technical Pro	**Non-technical Con**
	Received 37% support at the public open house, however it was a small sample size (8).	
	More 90 degrees, making this more developer friendly.	

Table 3.5: 107 Avenue and Creek Crossing, Pros/Cons

107 Avenue	**Technical Pro**	**Technical Con**
	Reduces the traffic volumes on 110 Street in front of the hospital significantly and reduces the need for additional lanes or need to apply traffic calming features.	Need to analysis whether the intersection of 107 Avenue and 108 Street can accommodate increase in traffic volumes
	Reduces the traffic volumes on 109 Avenue	Does not reduce the number of lanes need on any of the surrounding arterials.
	Reduces the traffic volumes on 104 Avenue by approximately 50%	
	Provide east/west connectivity, between 108 Street and 116 Street	
	Does not induce a significant amount of shortcutting, 5% or less	
	Non-technical Pro	**Non-technical Con**
	Received 100% support at the public open house	Impacts the southeast parcel of the GPRC lands. This impact needs to be discussed with the college.
	Responds to stakeholders concerns that there needs to be east/west connectivity	
Bridge Crossing	**Technical Pro**	**Technical Con**
	Provides connectivity from the north side of the neighbourhood to the south side of the neighbourhood.	Increases the amount of traffic volumes on the connecting collector roadways at each end of the crossing. The result will change the character of the neighbourhood within the affected areas.
	Reduces the traffic volume at 128 Avenue and 116 Street	Does not reduce the number of lanes need on the surrounding arterials, 116 Street or 108 Street.
	Will greatly reduce traffic volumes on 109 Avenue if installed in combination with option B and 107 Avenue	Much higher cost to construct per meter than any other roadways, due to the bridge crossing component.
	Does not induce a significant amount of shortcutting, 5% or less.	
	Non-technical Pro	**Non-technical Con**
	Received 100% support at the public open house	Divided support for the bridge by stakeholders.
	Divided support for the bridge by stakeholders	



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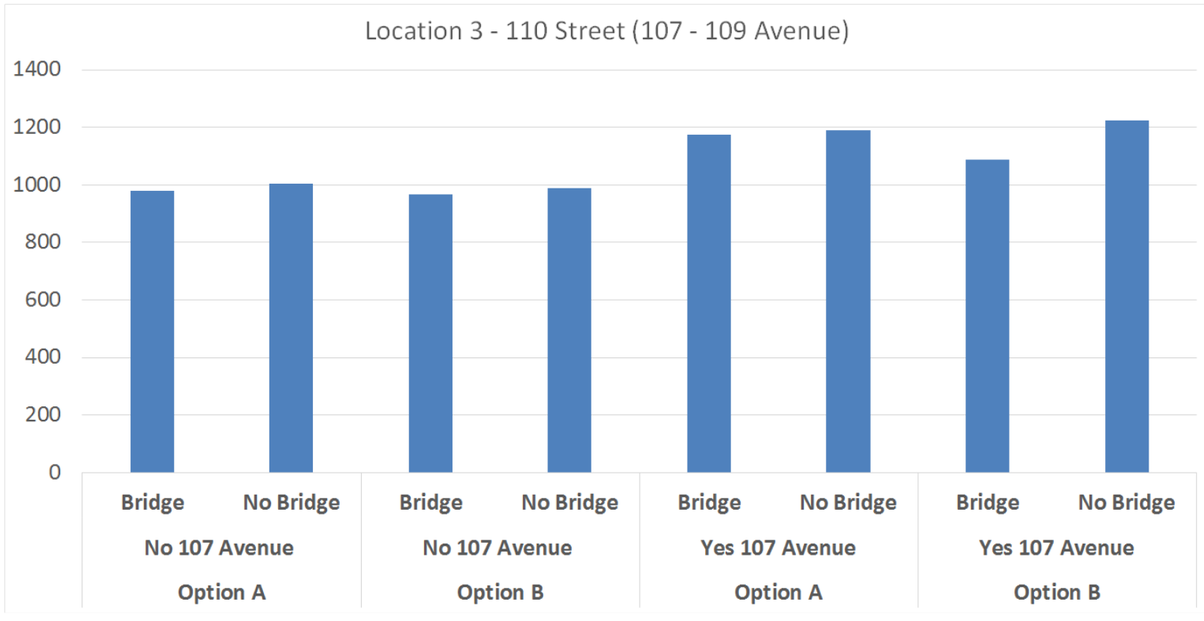
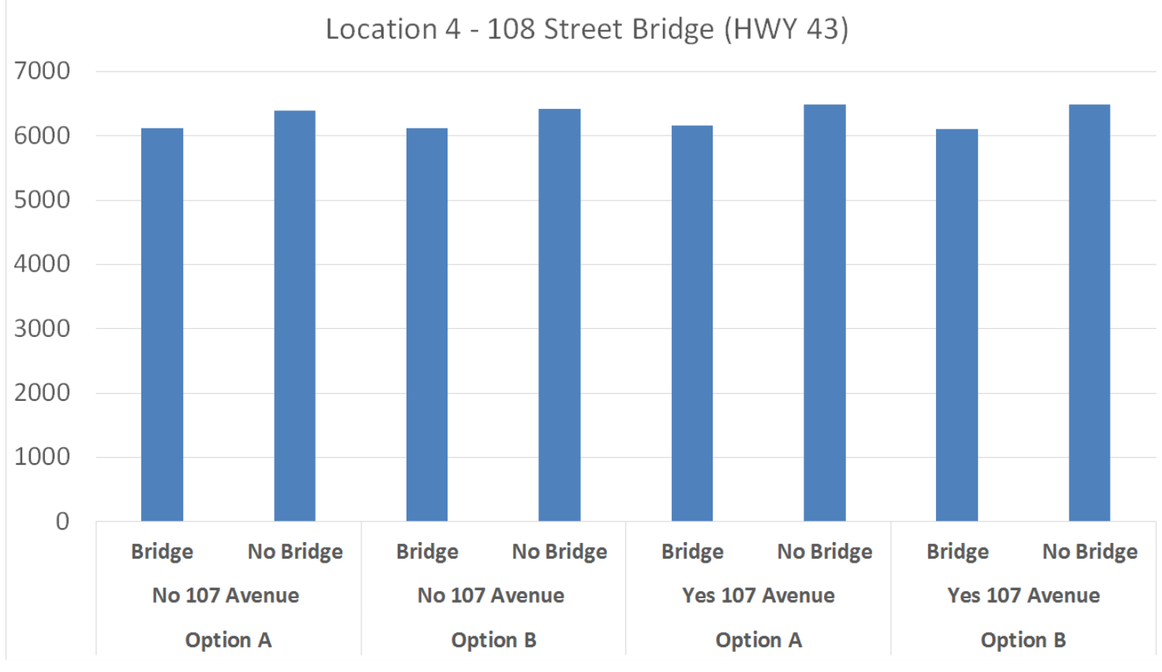
City of Grande Prairie
Northwest Traffic Study
Traffic Volume Locations

Exhibit 3.1
Scale: NTS
July, 2014





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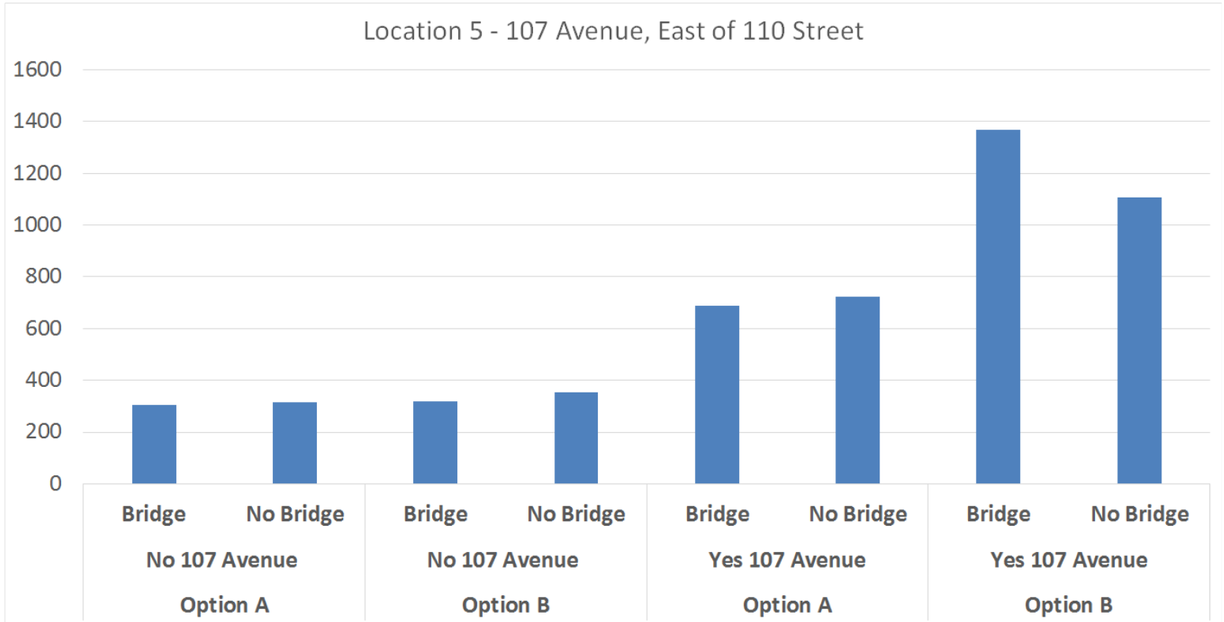
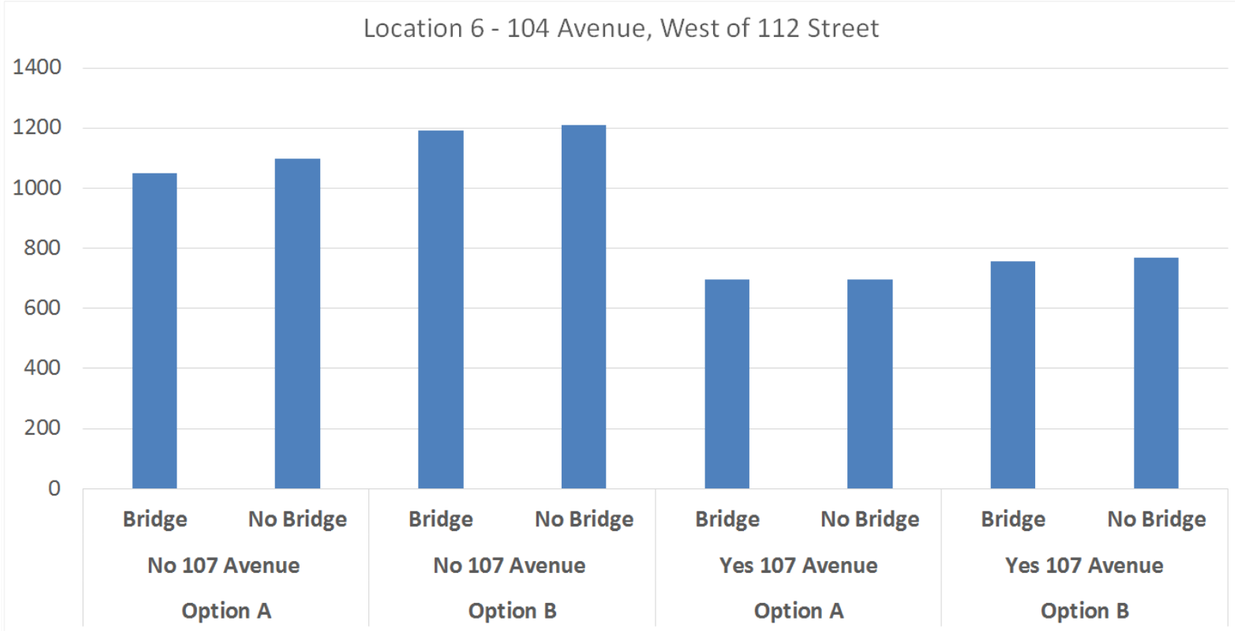
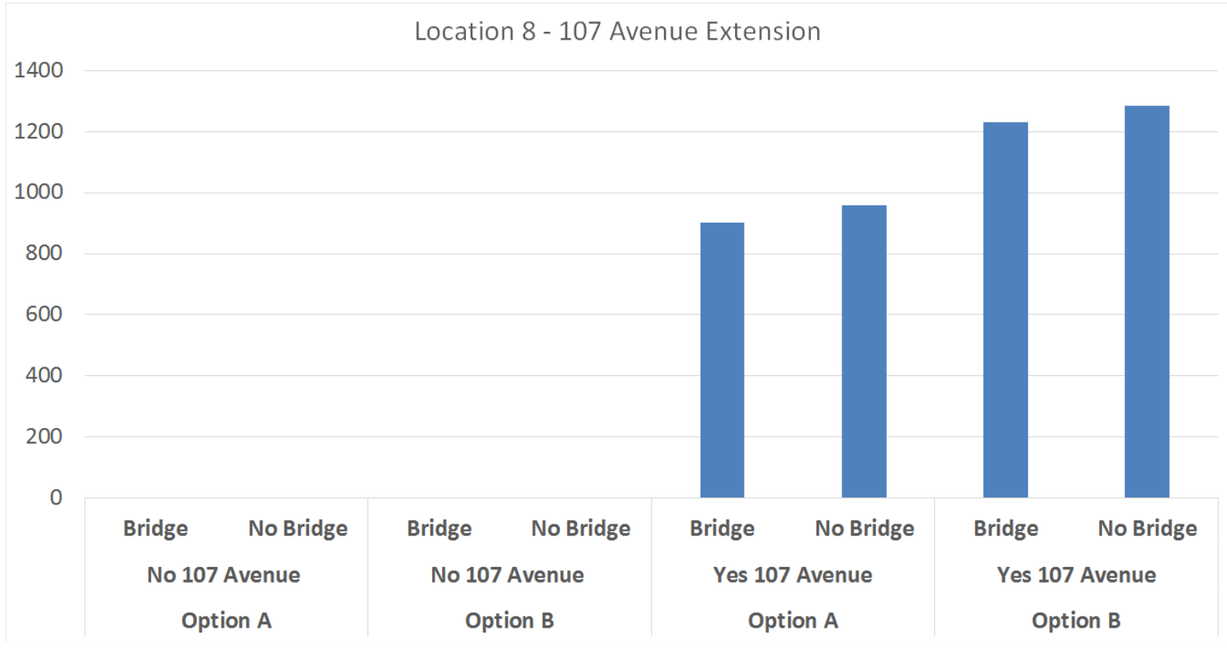
City of Grande Prairie
Northwest Traffic Study
Traffic Volume Comparison - PM Peak Hour

Exhibit 3.2
Scale: NTS
July, 2014







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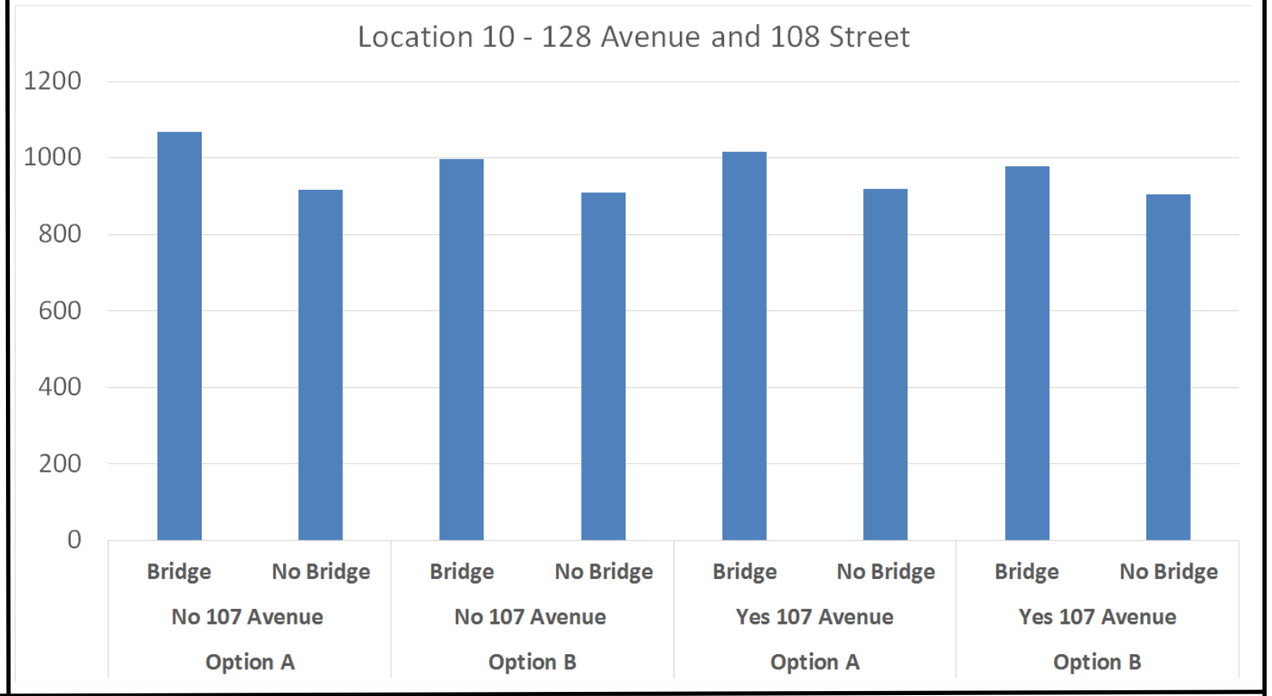
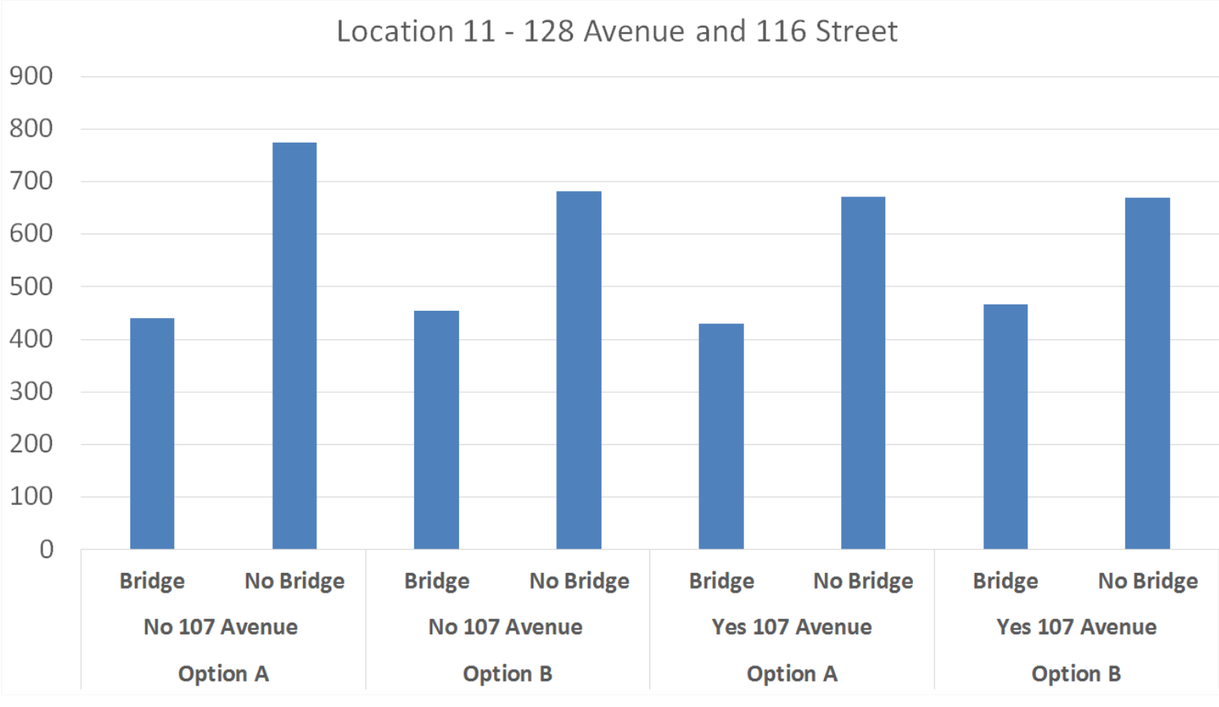
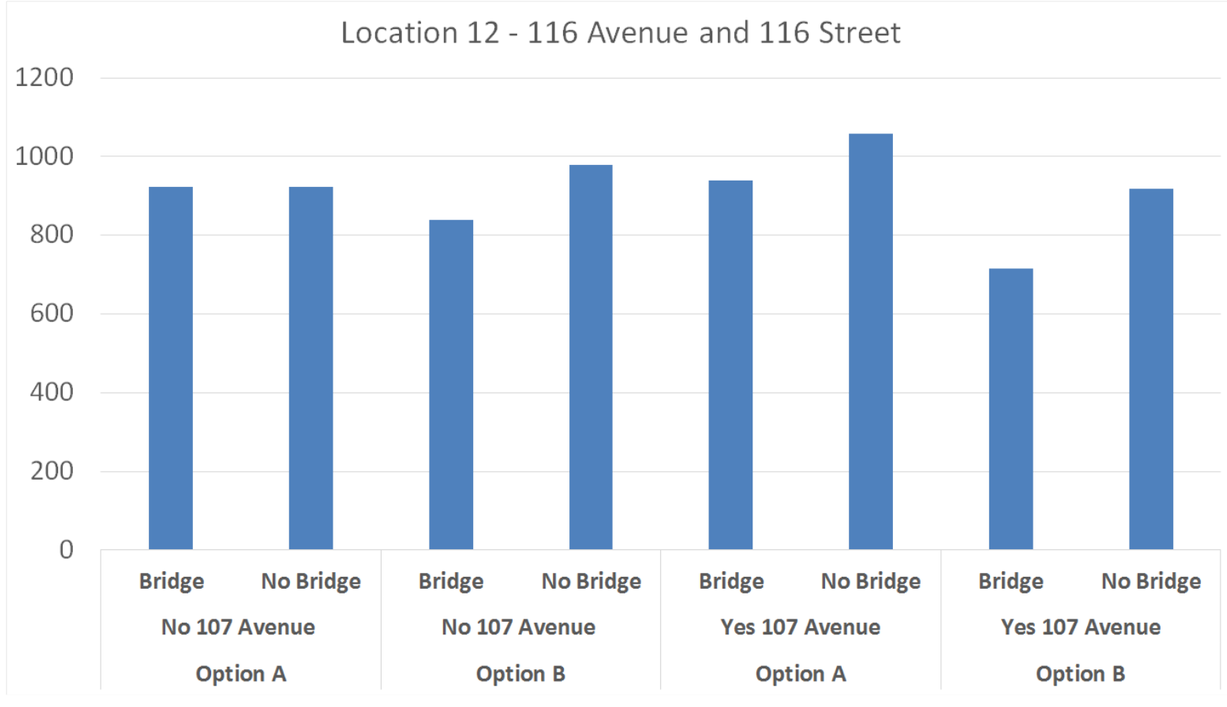
City of Grande Prairie
Northwest Traffic Study
Traffic Volume Comparison - PM Peak Hour

Exhibit 3.3
Scale: NTS
July, 2014







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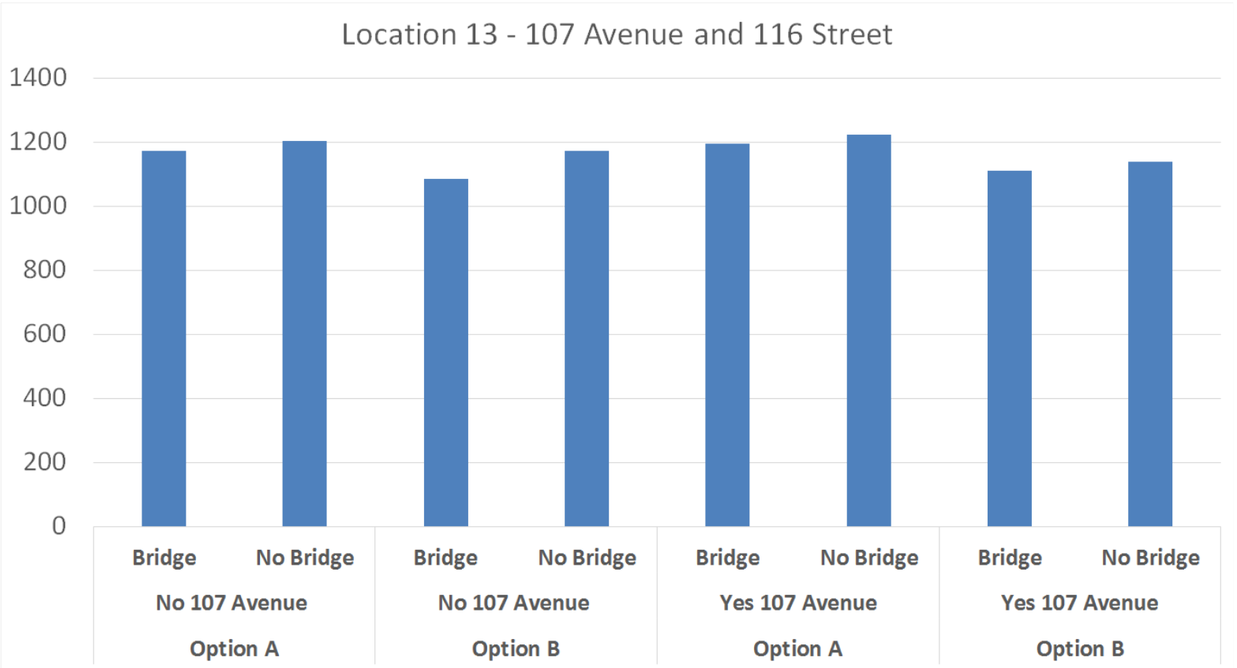
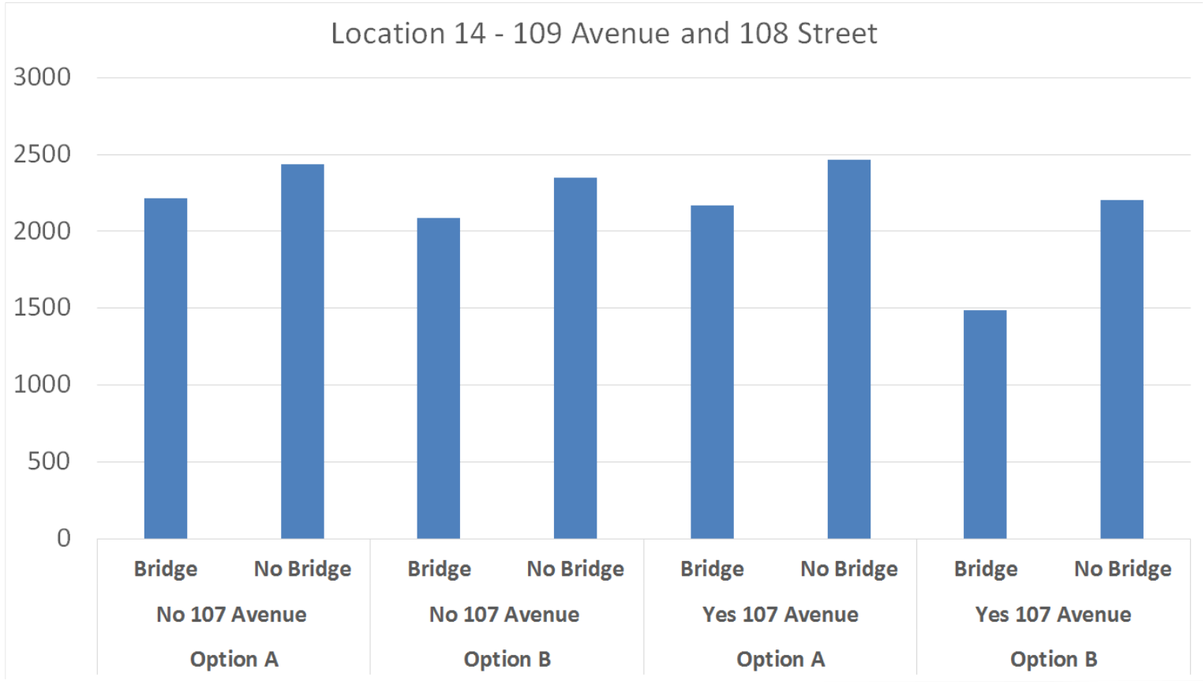
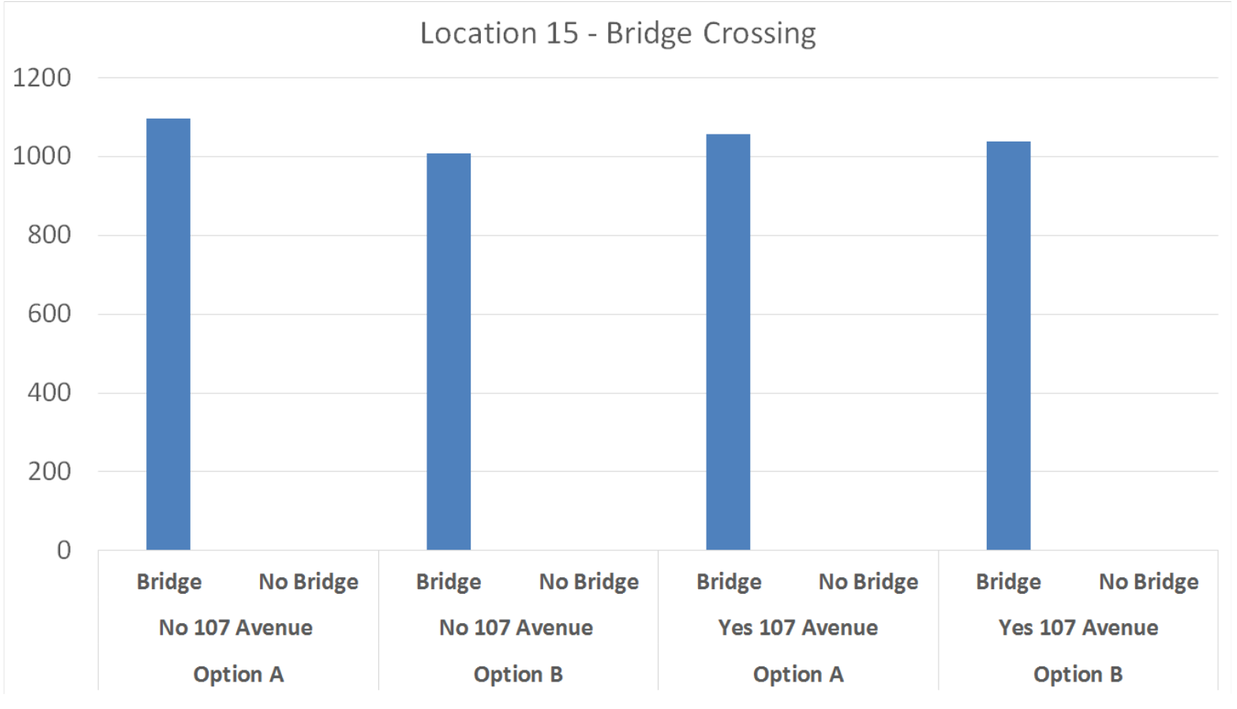
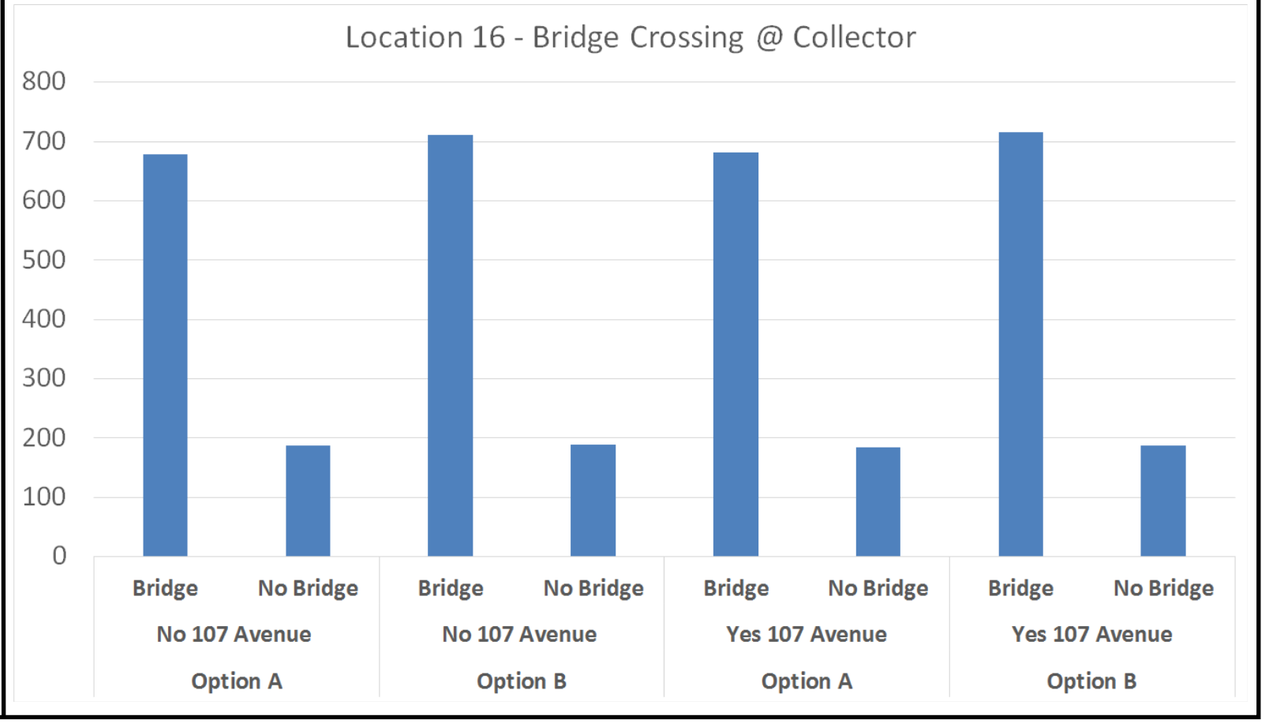
City of Grande Prairie
Northwest Traffic Study
Traffic Volume Comparison - PM Peak Hour

Exhibit 3.4
Scale: NTS
July, 2014









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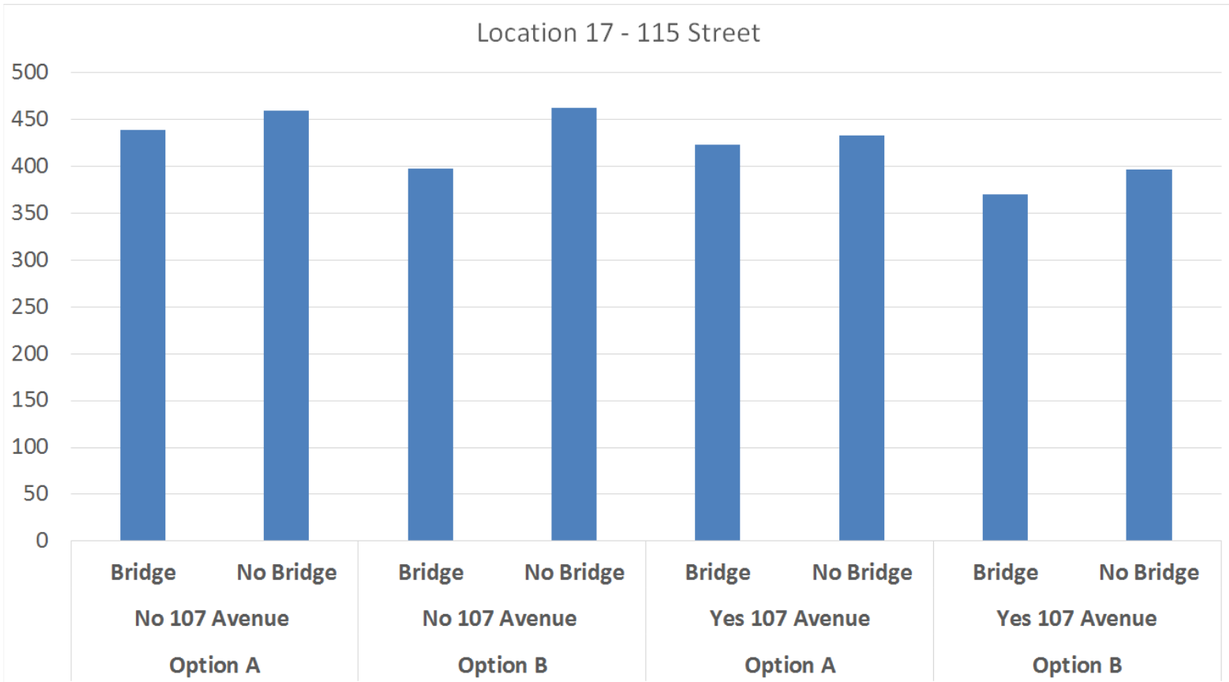
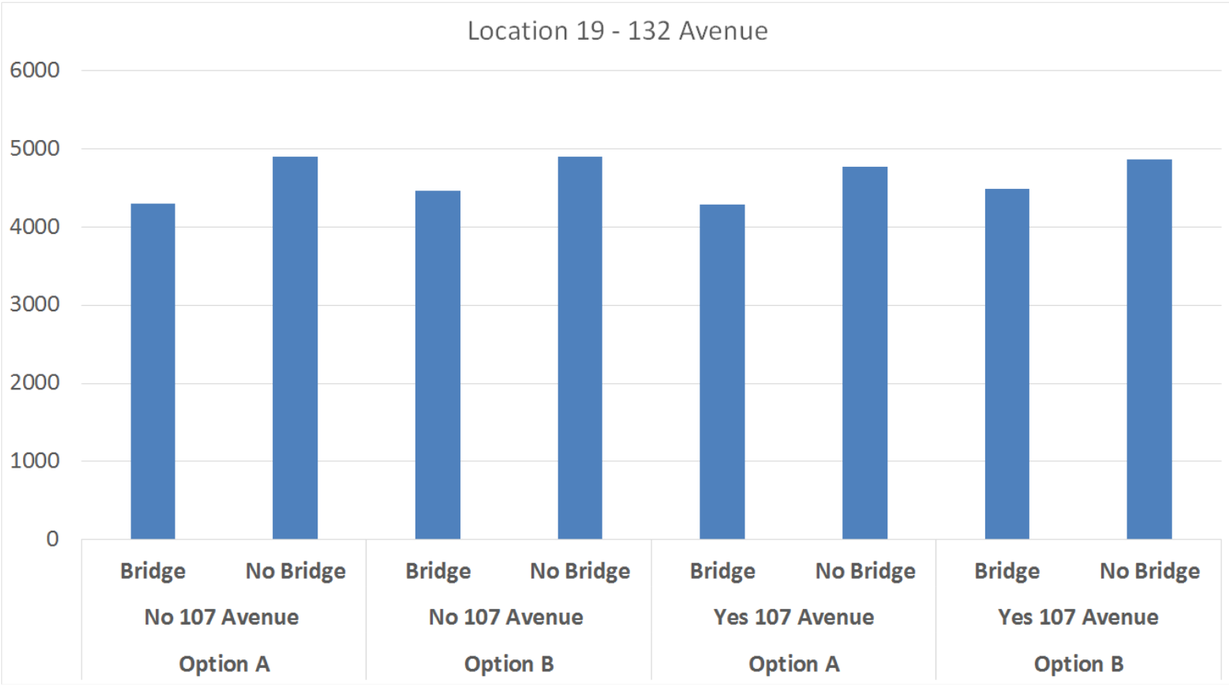
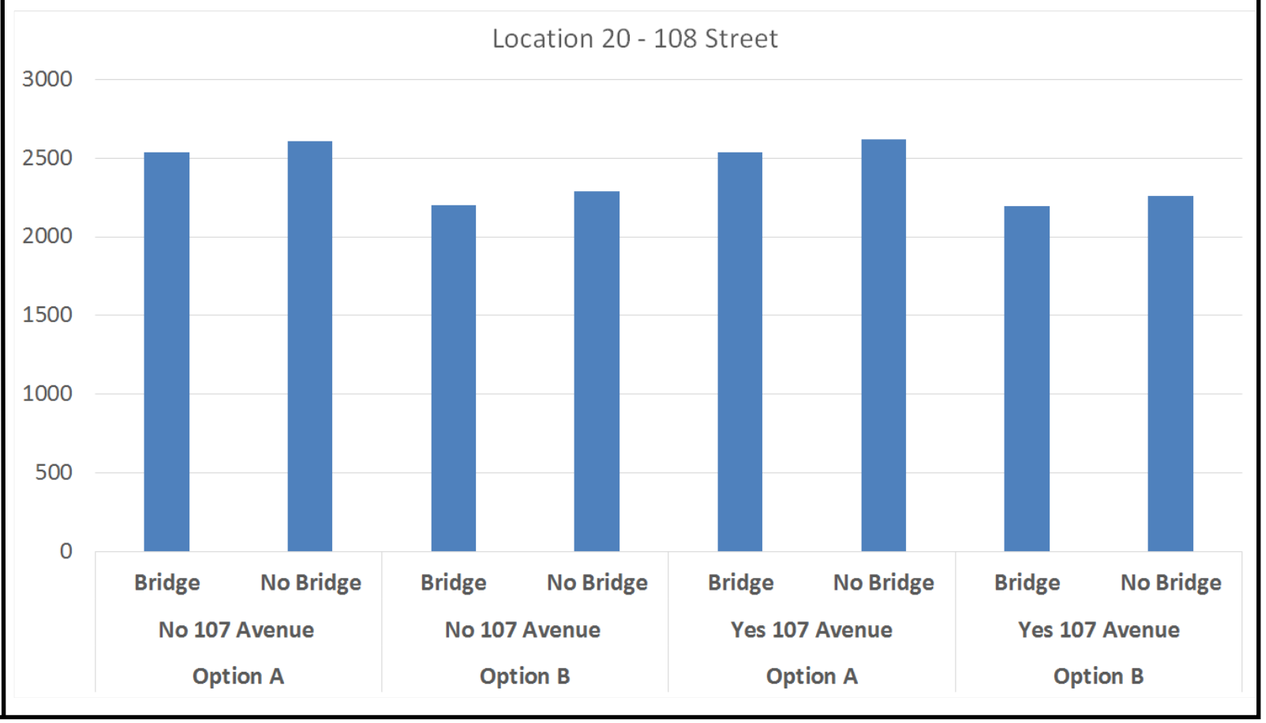
City of Grande Prairie
Northwest Traffic Study
Traffic Volume Comparison - PM Peak Hour

Exhibit 3.5
Scale: NTS
July, 2014







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City of Grande Prairie
Northwest Traffic Study
Traffic Volume Comparison - PM Peak Hour

Exhibit 3.6
Scale: NTS
July, 2014

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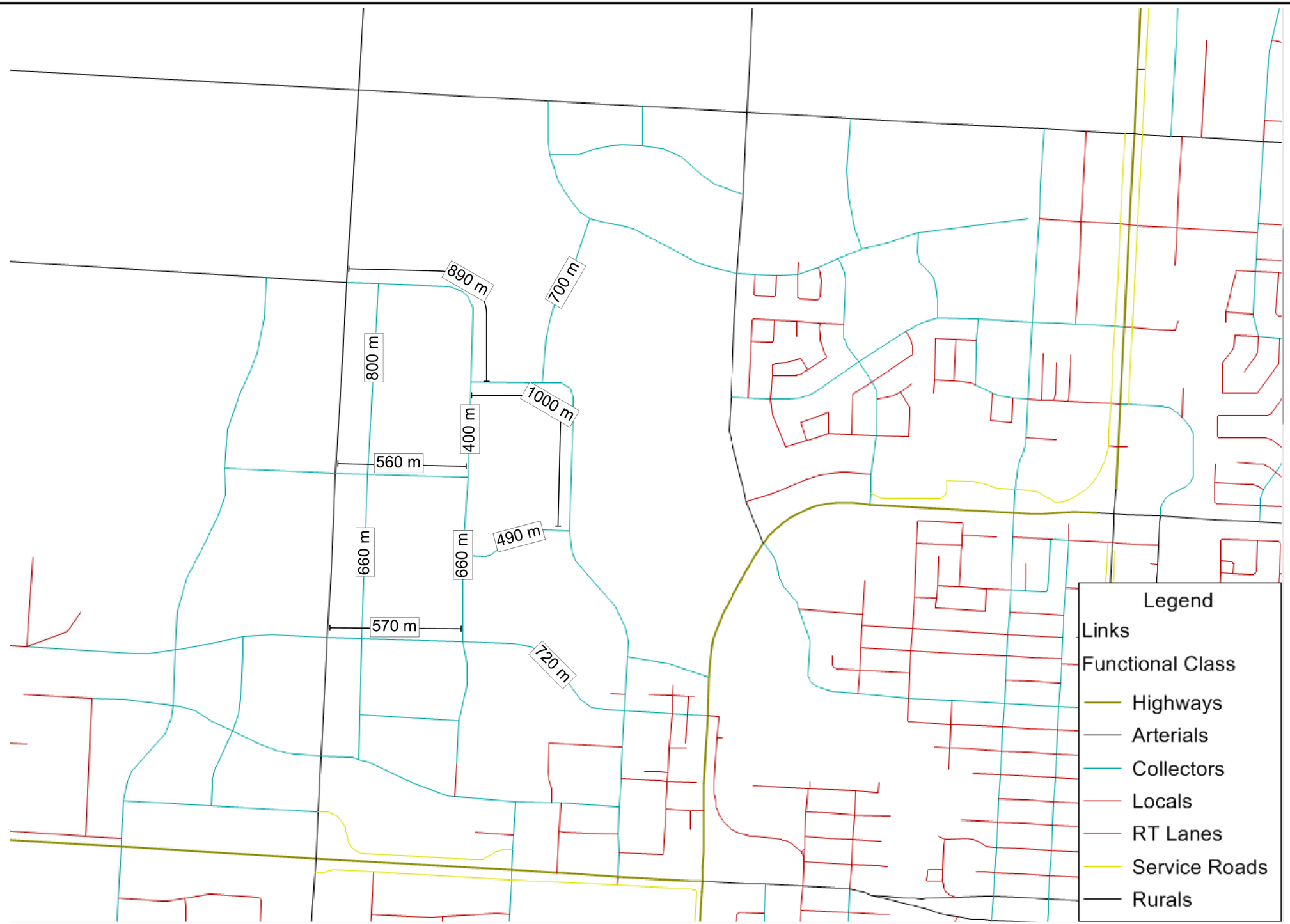
City of Grande Prairie
Northwest Traffic Study
Option A

Exhibit 3.7
Scale: NTS
July, 2014



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City of Grande Prairie
Northwest Traffic Study
Option B

Exhibit 3.8
Scale: NTS
July, 2014

4.0 Other Network Considerations

4.1 Alternative Modes

The preceding analysis emphasises traffic volumes as the key measure to evaluate alternative networks. Of course many other measures could be used, whether they be related directly to transportation or to land use or other subject areas.

An additional transportation consideration is modes other than auto. This is particularly important in the NW ASP because it has a rich mix of commercial, residential, institutional, and educational mixes, as well as the Bear Creek ravine. This mix provides natural opportunities for walking, cycling, and transit.

Generally a small block development best suits these alternative modes. While none of the road networks tested explicitly considered small block developments, it is possible to adapt these networks to allow a finer grain block system that supports other modes.

There are three main benefits of supporting these alternative modes:

1. Travel Demand Management (TDM)
2. Sustainability
3. Traffic Safety

In terms of TDM supporting the alternative modes will reduce auto trips. This reduces the City's infrastructure costs and helps support increased land use density.

With regard to sustainability the reduced auto trips reduces greenhouse gas emissions, while the increase alternative modes produce less emissions.

Finally, in terms of traffic safety, supporting the alternative modes with proper infrastructure will reduce motor vehicle speeds. Even a small reduction in speed will yield a relatively large reduction in collisions, as shown in Exhibit 4.1 (from *Speed management: a road safety manual for decision-maker and practitioners*. Geneva. Global Road Safety Partnership, 2008).

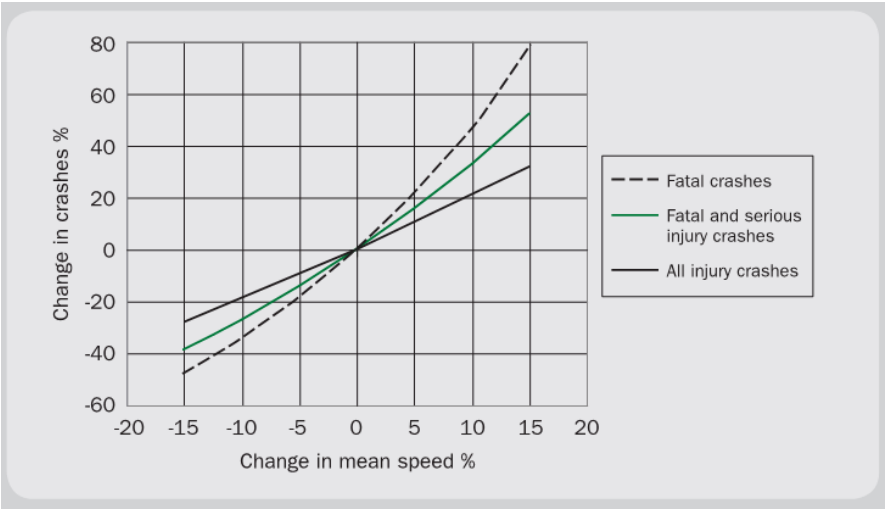


Exhibit 4.1: Relationship between Speed and Crashes

4.2 Traffic Calming

The NW ASP is two square miles without an arterial road which increases travel distances on collector roads to connect to arterial roads. Drivers are likely to travel at higher speeds. It also contributes to higher arterial volumes. In addition, promoting alternative modes potentially increases conflict between motor vehicles and other modes. Therefore, traffic calming is necessary.

Higher traffic volumes can still accommodate other modes well provided the design appropriately reduces vehicle speeds. Measures to reduce vehicle speeds include:

1. Regularly breaking the right of way for any collector road, by using roundabouts or T-intersections. This requires drivers to slow a conflict points with other drivers as well as pedestrians and cyclists.
2. Use raised crosswalks for midblock pedestrian crossing and for major intersections.

Placed at reasonably frequent intervals, such as 100m to 200m, these measures ensure the traffic uses appropriate speed given the presence of pedestrians and cyclists.

Using traffic calming not only ensures appropriate speeds by motor vehicles, it significantly improves pedestrian survivability in the event of a collision. Exhibit 4.2 shows that the probability of a fatal pedestrian injury decreases from 85% to 10% if the impact speed reduces from 50 km/h to 30 km/h (from *Speed management: a road safety manual for decision-maker and practitioners*. Geneva. Global Road Safety Partnership, 2008).

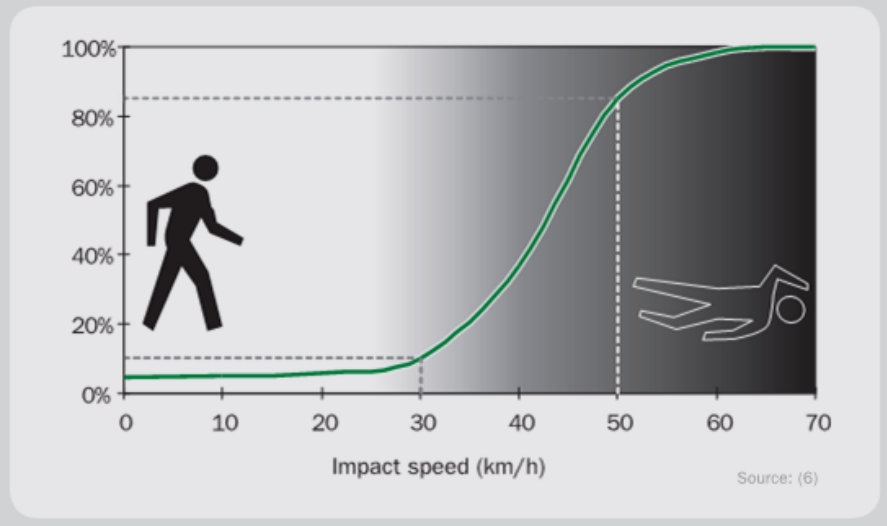


Exhibit 4.2: Relationship between Probability of Pedestrian Fatality and Impact Speed

5.0 Conclusions and Recommendations

With respect to the traffic model built for this study we draw the following conclusions:

C1. This study considered a total of 18 road network options; of these four were modelled (four with a creek crossing and four without a creek crossing).

C2. The model uses land use from the Grande Prairie TMP 90k model, plus additional densities in and around the study area. The densities are high and considered a worst case (highest volume) scenario.

C3. The model built for this study performs best when used to compare between options.

With respect to the need for the Bridge (Bear Creek crossing) we draw the following conclusions:

C4. Concerns were expressed about volumes induced on roads north of the creek to the degree that the character of the road environment changes.

C5. The model showed significant volume increases on roads north of the creek. The increases will change the character of the road environment.

C6. Stakeholders were concerned with how the bridge will be funded.

C7. Less than 5% of the bridge traffic is shortcutting (vehicle route connects arterial roads on either side of the bridge, such as 116 Street and 108 Street).

With respect to the need for a 107 Avenue connection from 108 to 116 Street we draw the following conclusions:

C8. Adding 107 Avenue substantially reduces volumes on 110 Street. Option B had substantially lower volumes on 110 Street than all other options and would be best suited to a campus atmosphere.

C9. Adding 107 Avenue significantly increases volumes on existing 107 Avenue east of 110 Street.

C10. Adding 107 Avenue significantly decreases volumes on 104 Avenue at 112 Street.

C11. Volumes on 100 Avenue do not change appreciably whether 107 Avenue is added or not.

With respect to other considerations we draw the following conclusions:

C12. The NW ASP has a rich mix of commercial, residential, institutional, and educational mixes, as well as the Bear Creek ravine. This mix provides natural opportunities for walking, cycling, and transit.

C13. While none of the road networks tested explicitly considered small block developments, it is possible to adapt these networks to allow a finer grain block system that supports other modes (walking, cycling, and transit).

C14. There are three main benefits of supporting alternative modes (walking, cycling, and transit):

1. Travel Demand Management (TDM)
2. Sustainability
3. Traffic Safety

C15. The NW ASP's relatively large area without an arterial road may encourage excessive speed on collector roads and contributes to higher volumes on collector roads.

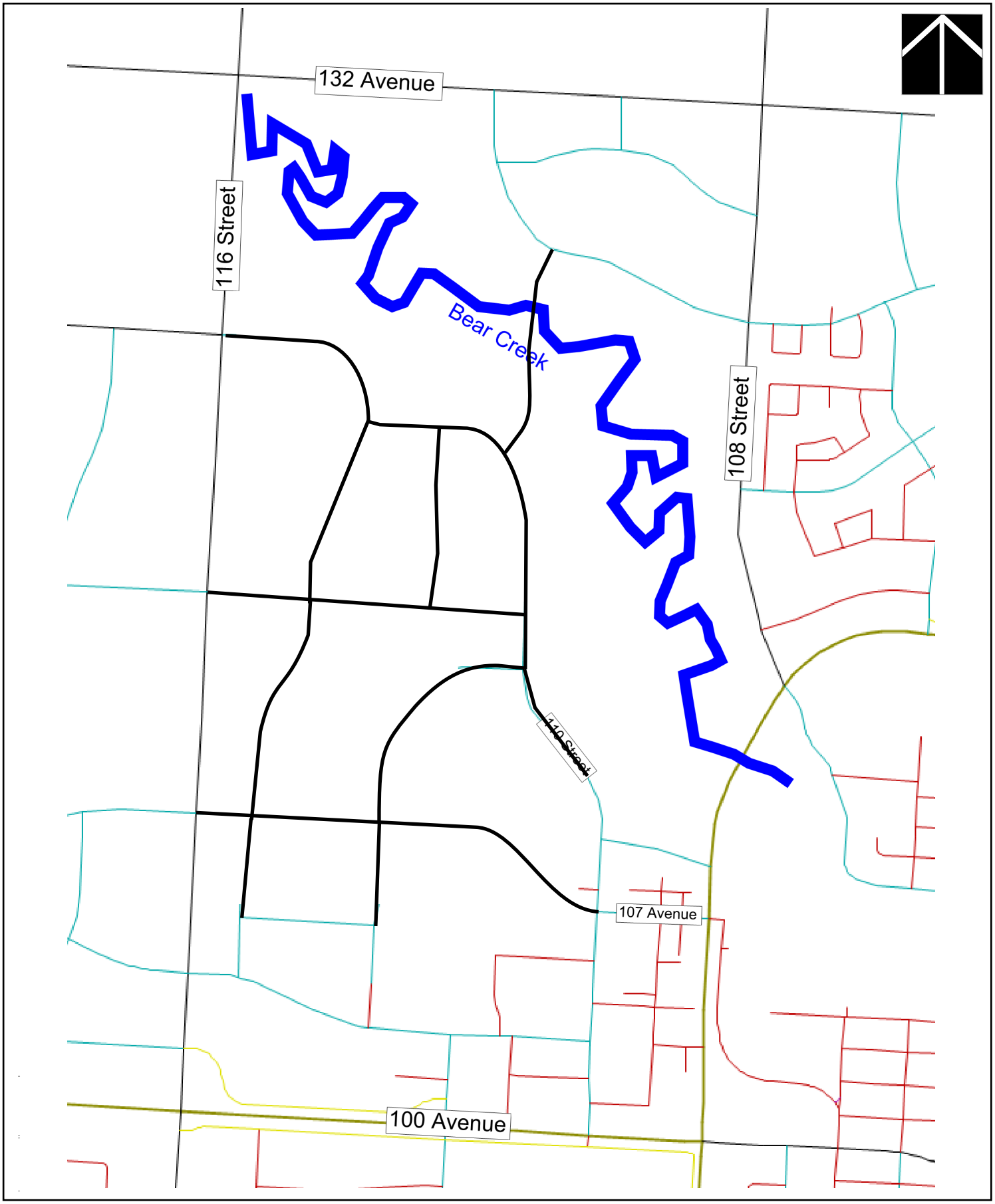
Based on the above findings we recommend the following:

R1. A creek crossing for pedestrians and bicycles should be implemented and connect to a strong trail/sidewalk network to key destinations such as the Hospital, the College, schools, and commercial developments. A creek crossing for motor vehicles should be implemented only if the benefits of the crossing, such as community connectivity and emergency access, outweigh the impacts, such as the large volume increase on the surrounding collector road network, the high costs of a vehicle bridge, and determination of how it is funded.

R2. Select option A with a more direct 107 Avenue route. The recommended plan is provided in Exhibit 5.1.

R3. Future planning of the ASP should include a detailed pedestrian network that allows direct pedestrian connectivity between uses and deploys small block development. The future plans should also identify a bicycle and a transit network.

R4. The road network requires traffic calming measures to ensure appropriate vehicle speeds and minimal shortcutting.



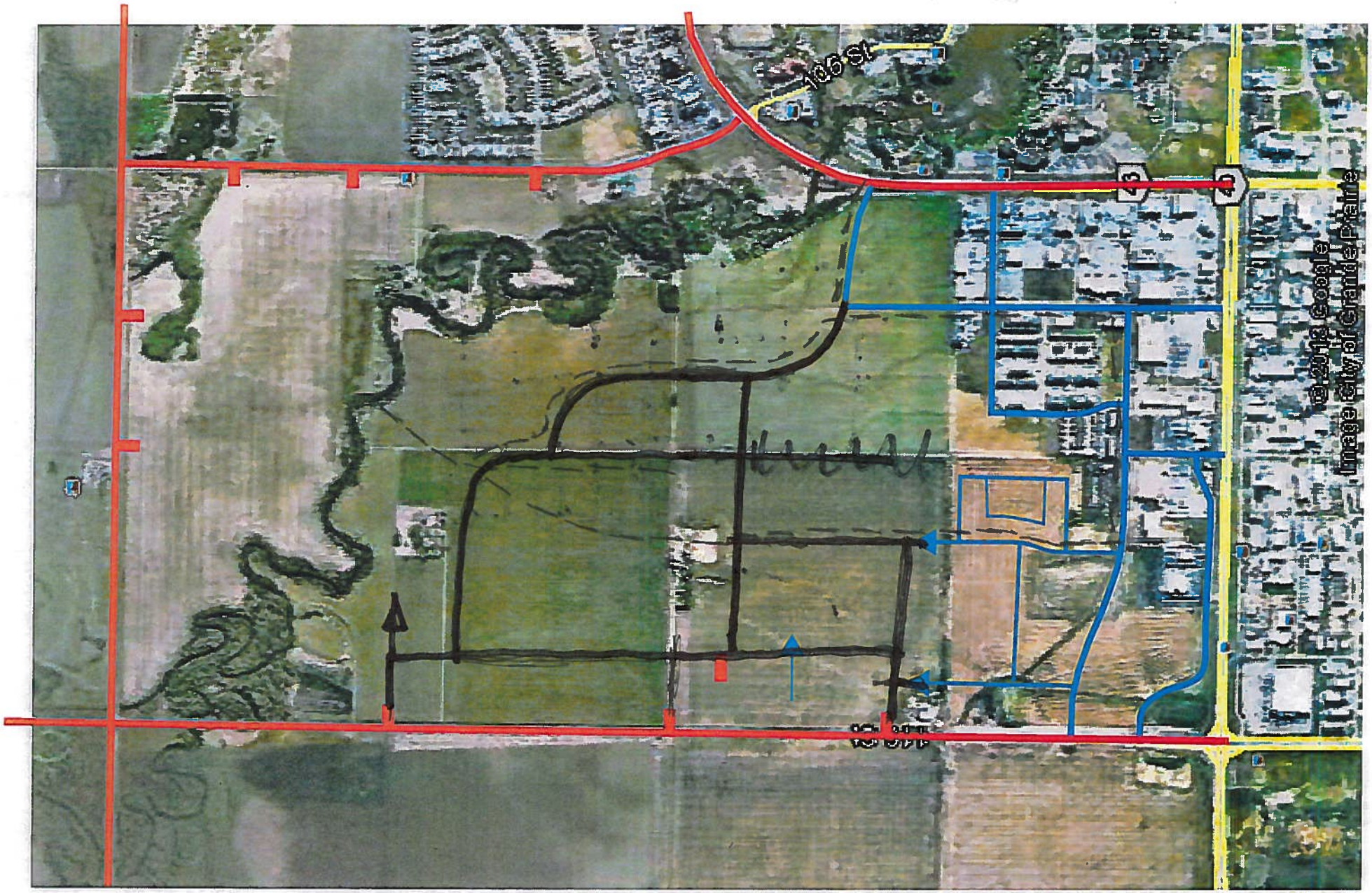
ISL Engineering and Land Services

City of Grande Prairie
Northwest Traffic Study
Recommended Option

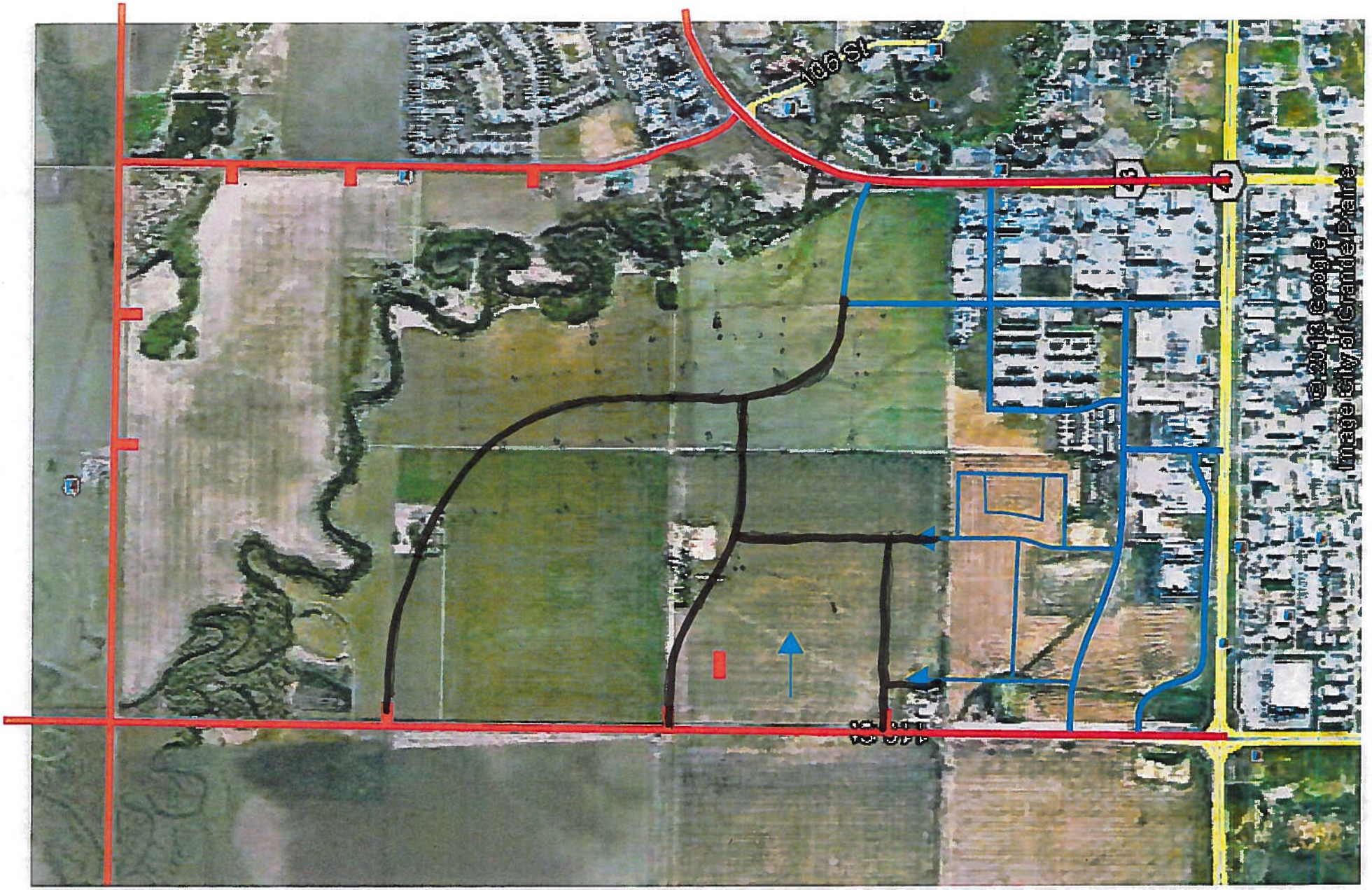
Exhibit 5.1
Scale: NTS
July, 2014

Appendix A

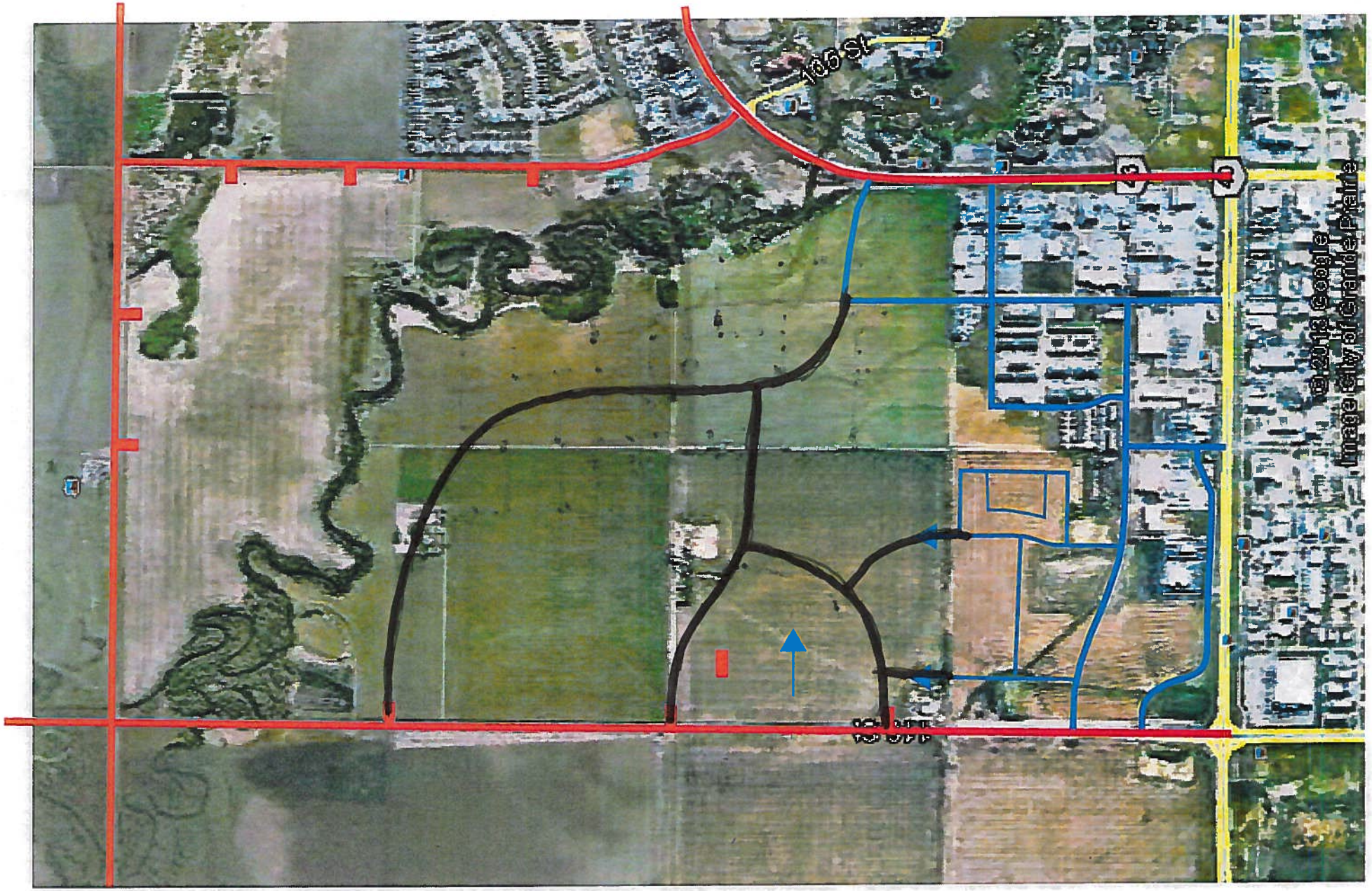
Preliminary Roadway Options



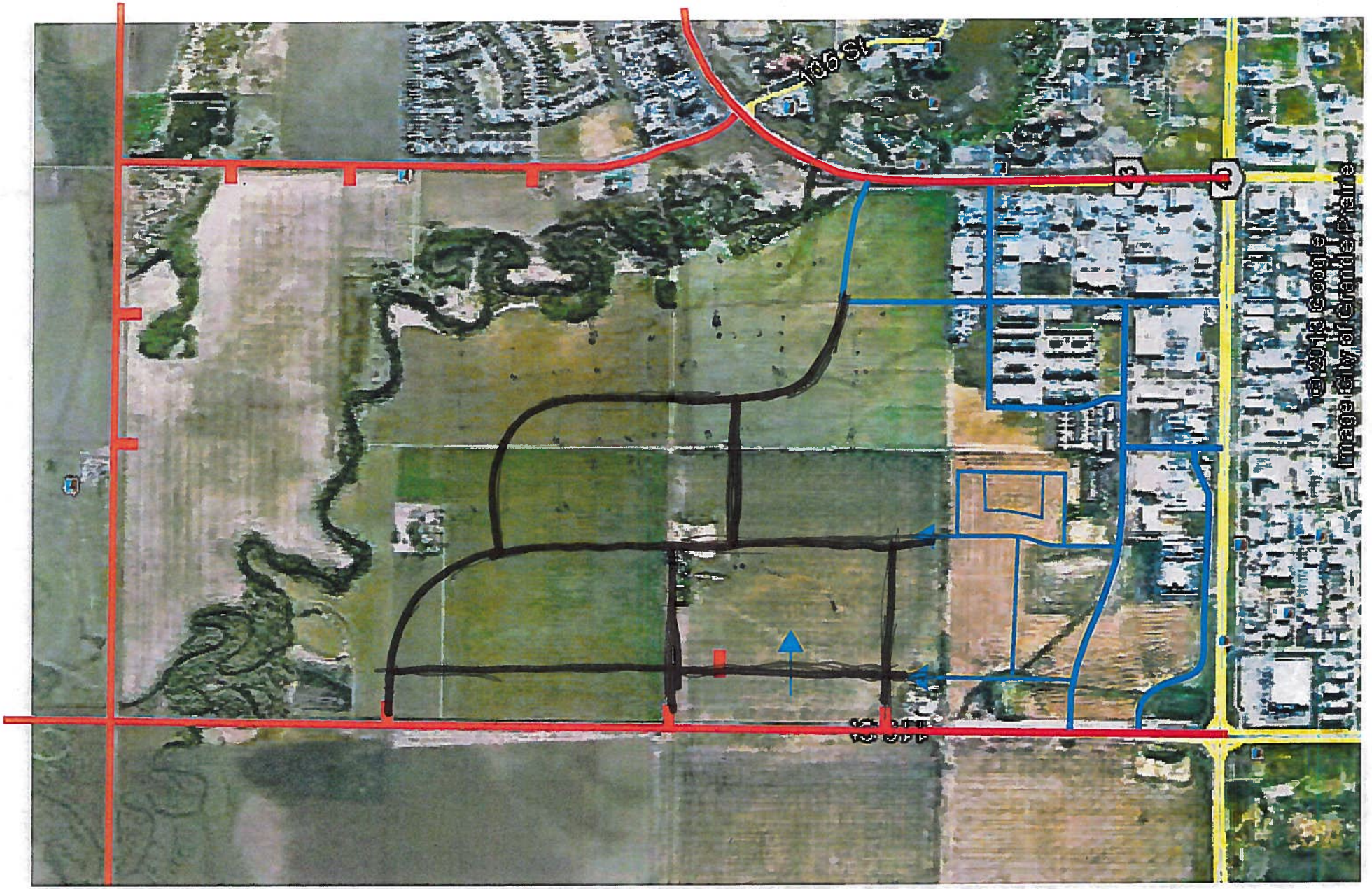
T- INTERSECTIONS, DISCOURAGING THROUGH TRAFFIC



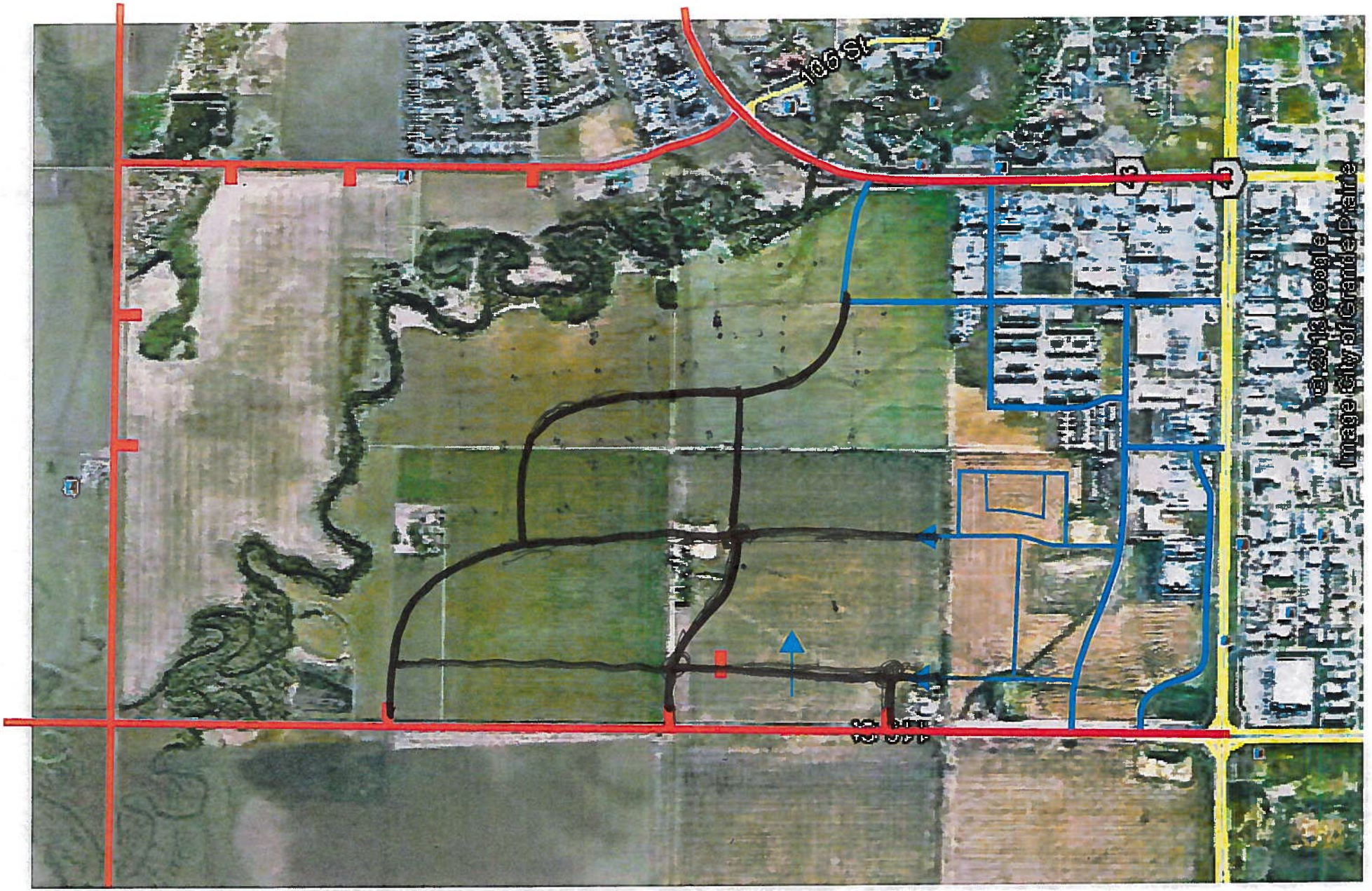
DIRECT ROUTE E/W.



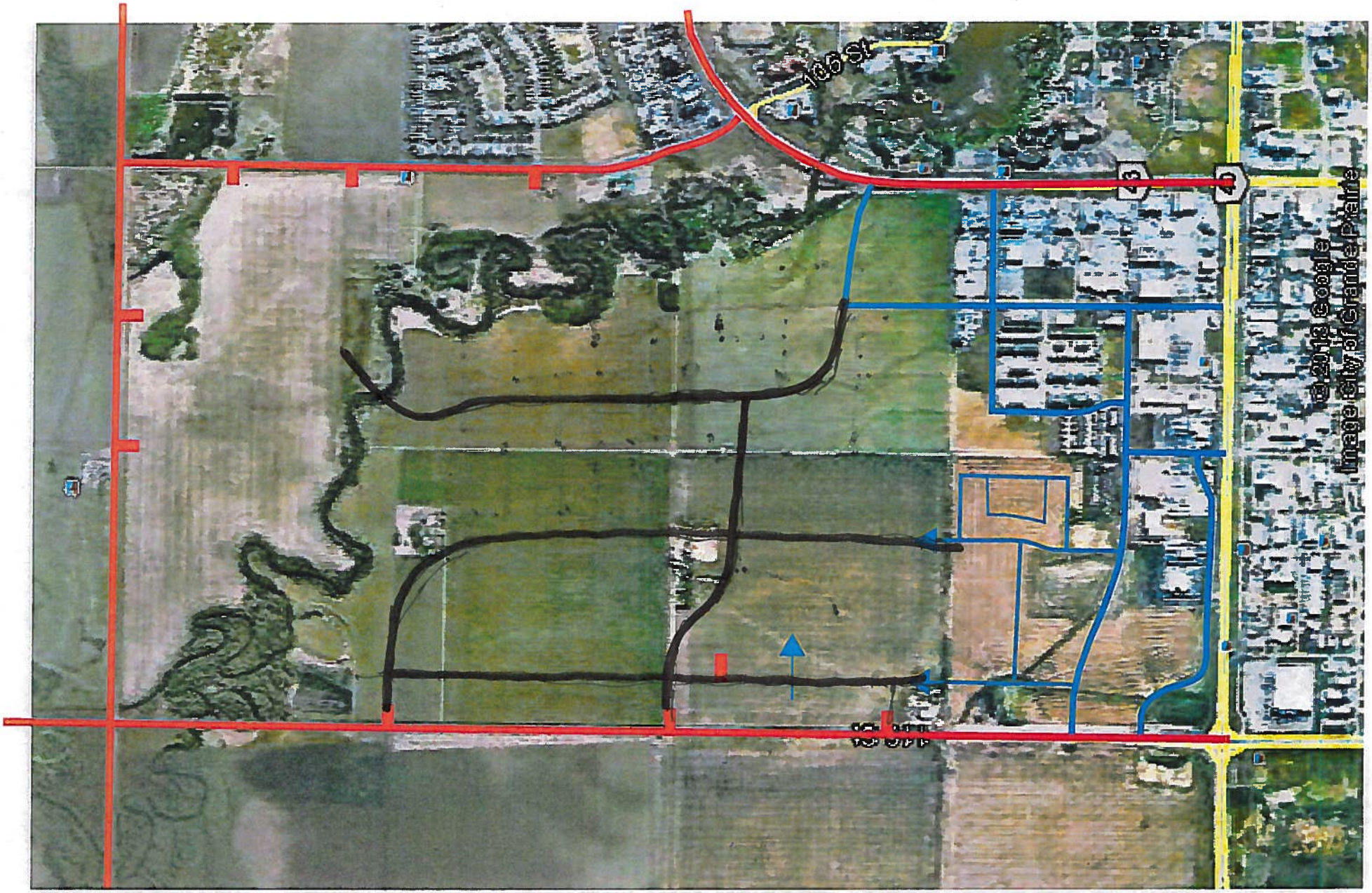
DIRECT ROUTE E/W.



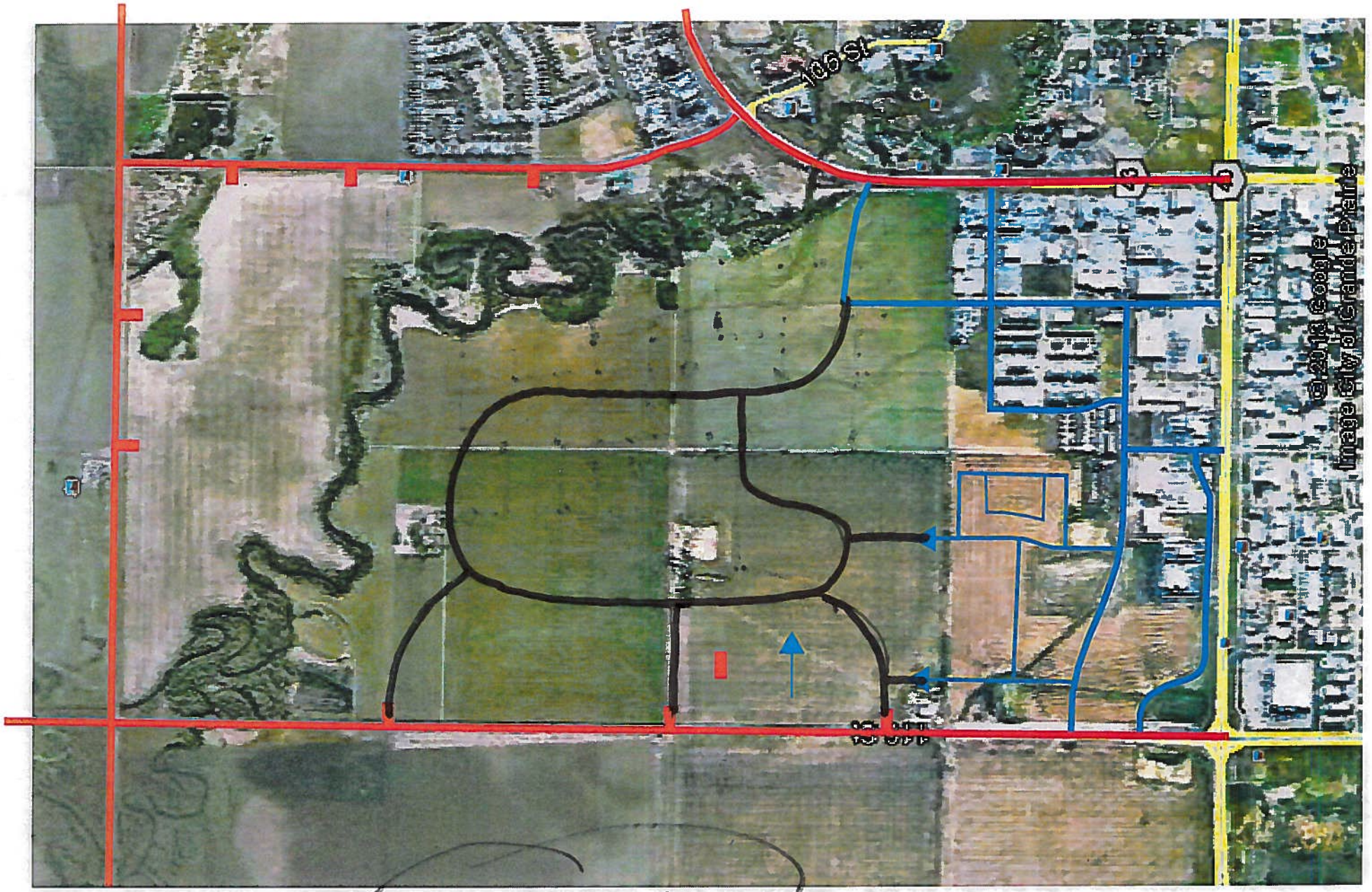
E/W CELLS WITH 2 CONNECTORS



E/W COL W/ 2 CONNECTORS

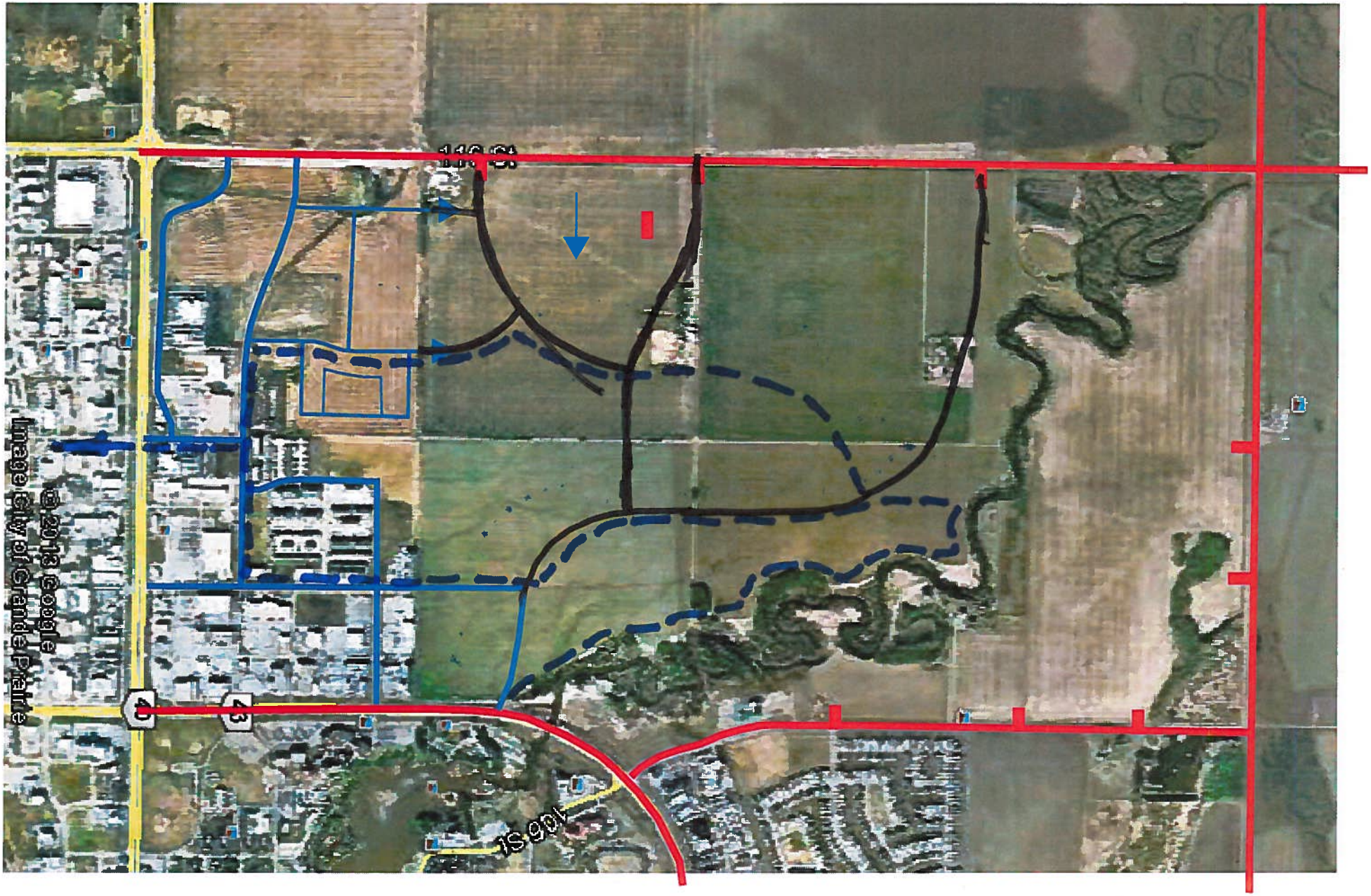


E/W COLLS W/ 1 CONNECTOR

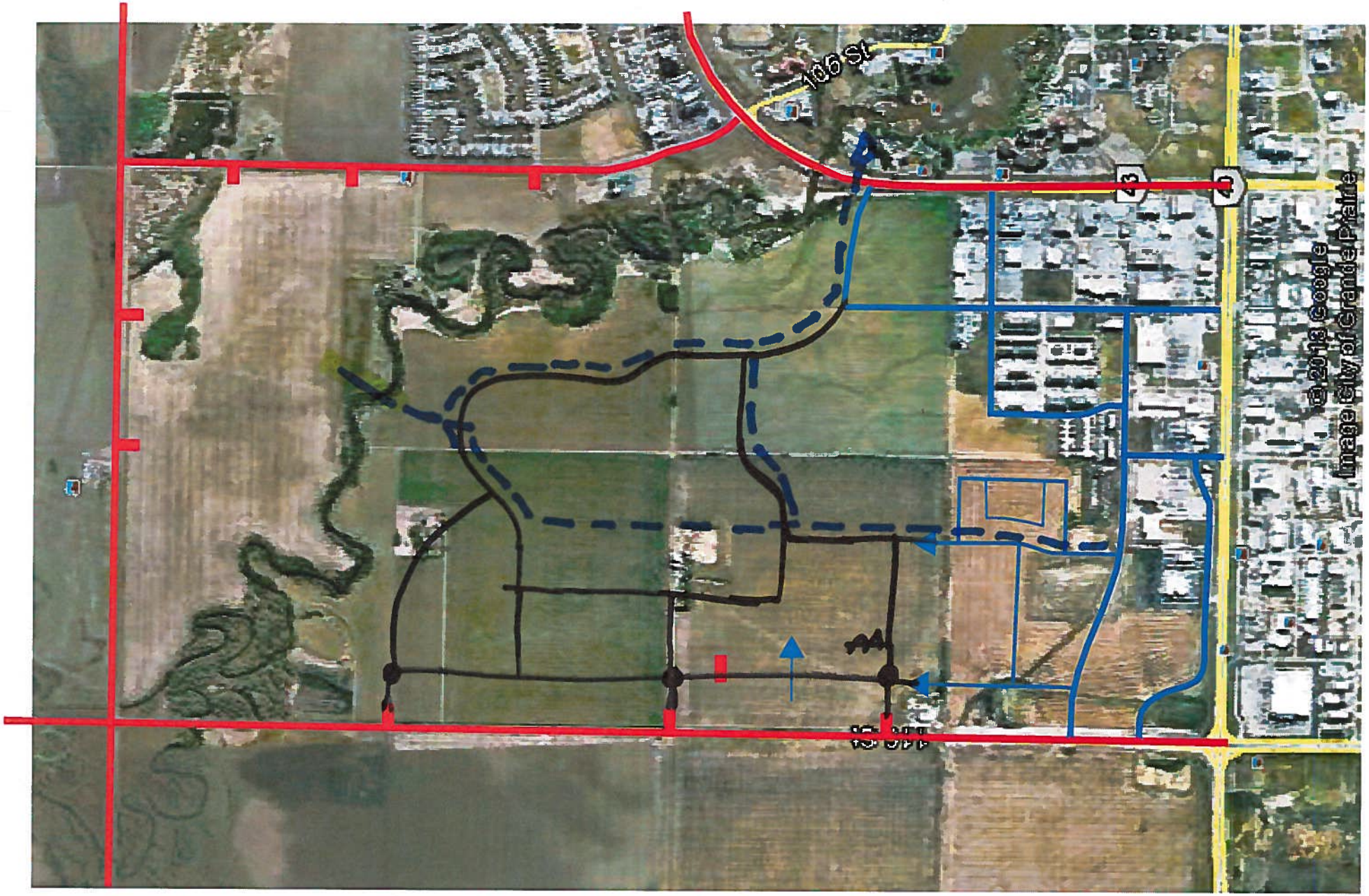


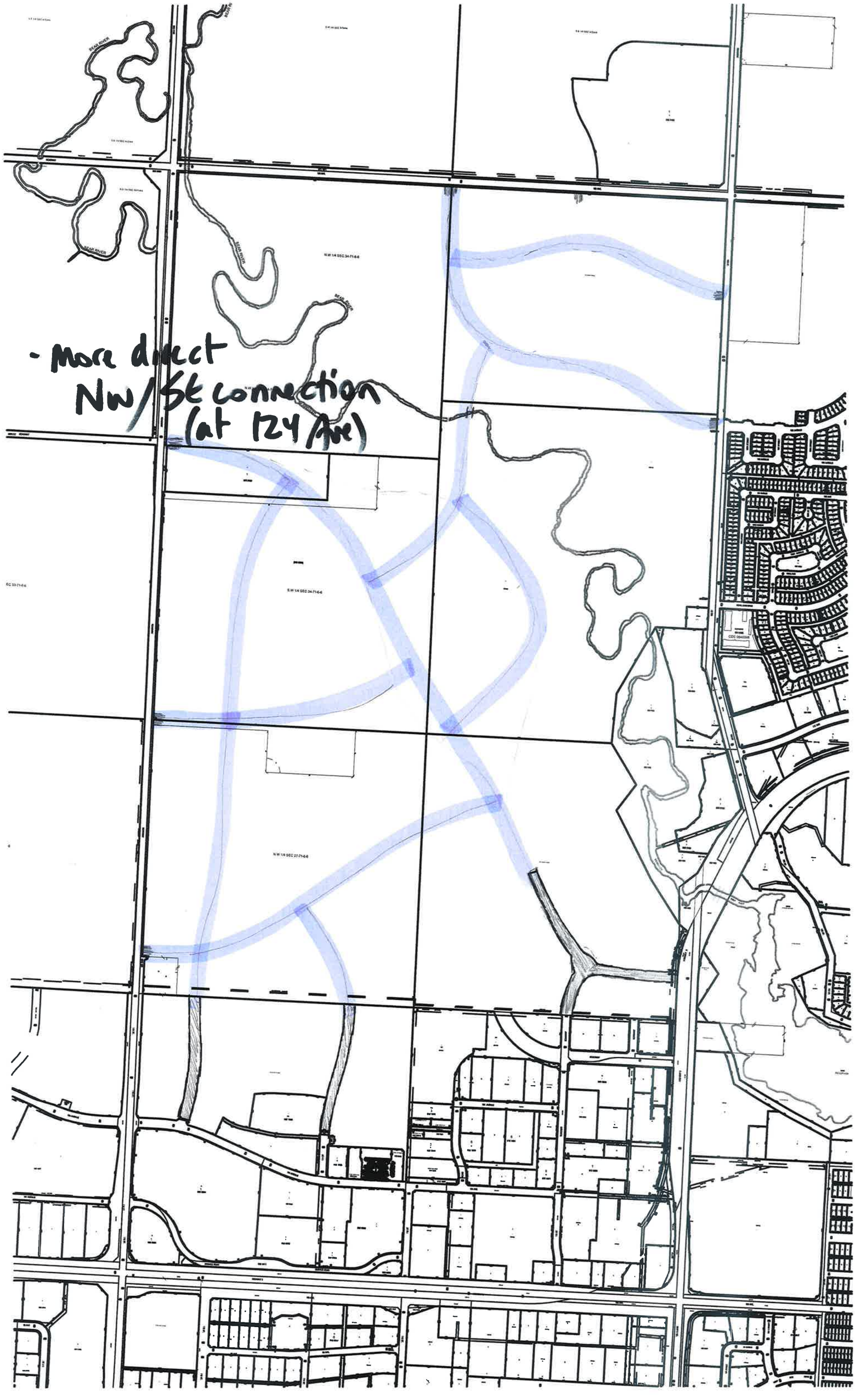
CENTRAL LOOP.

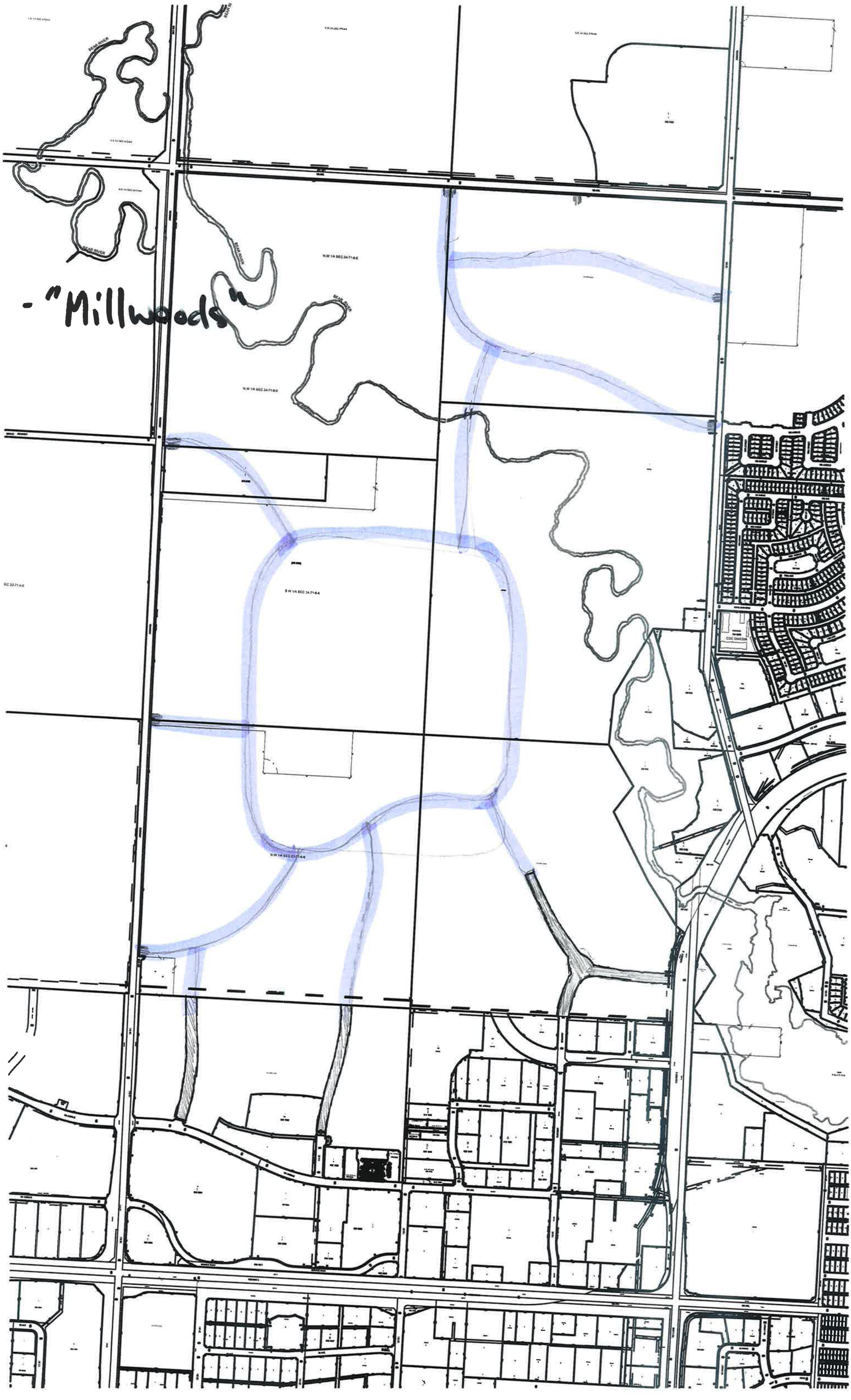
Big collections- smooth flow.

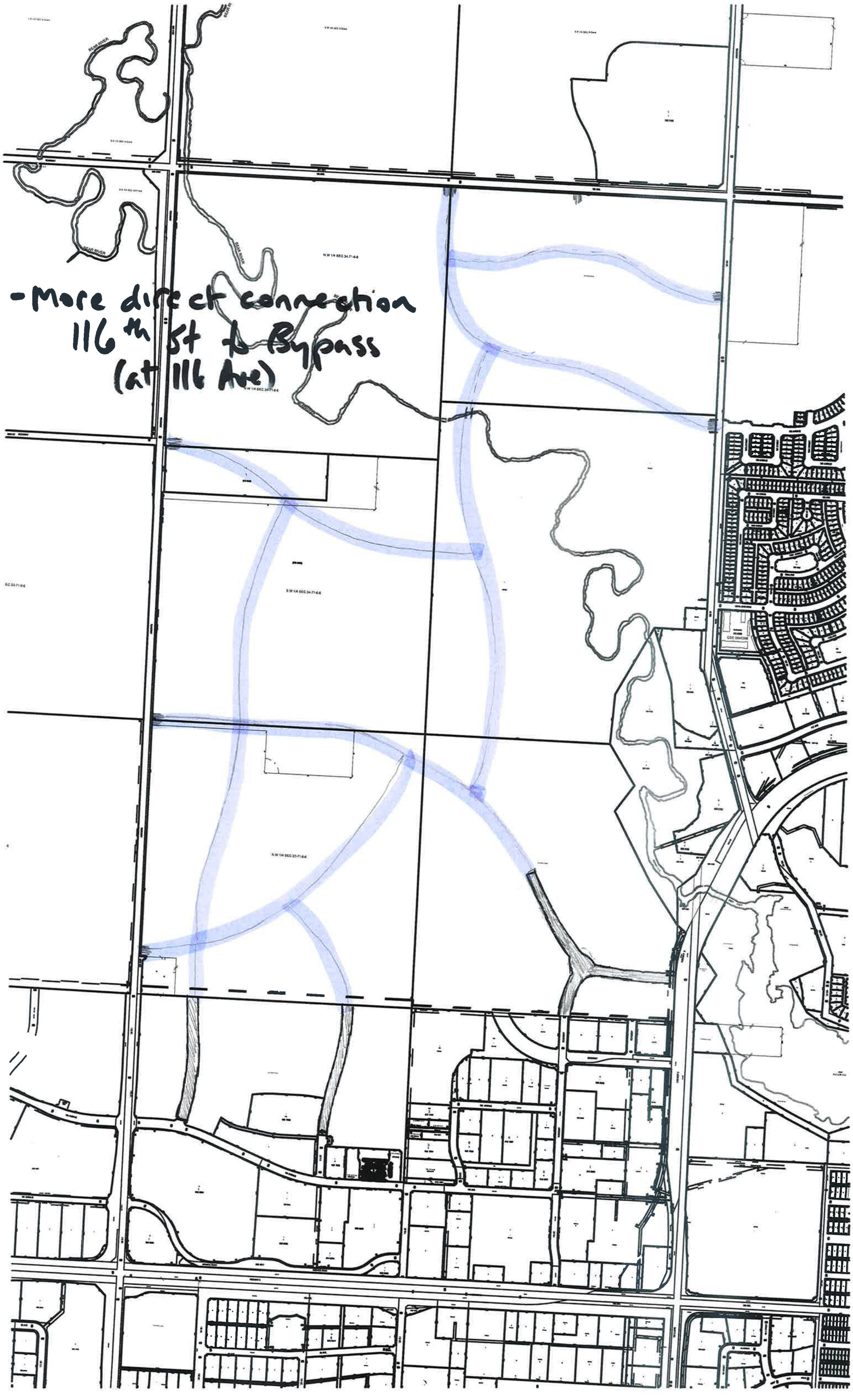


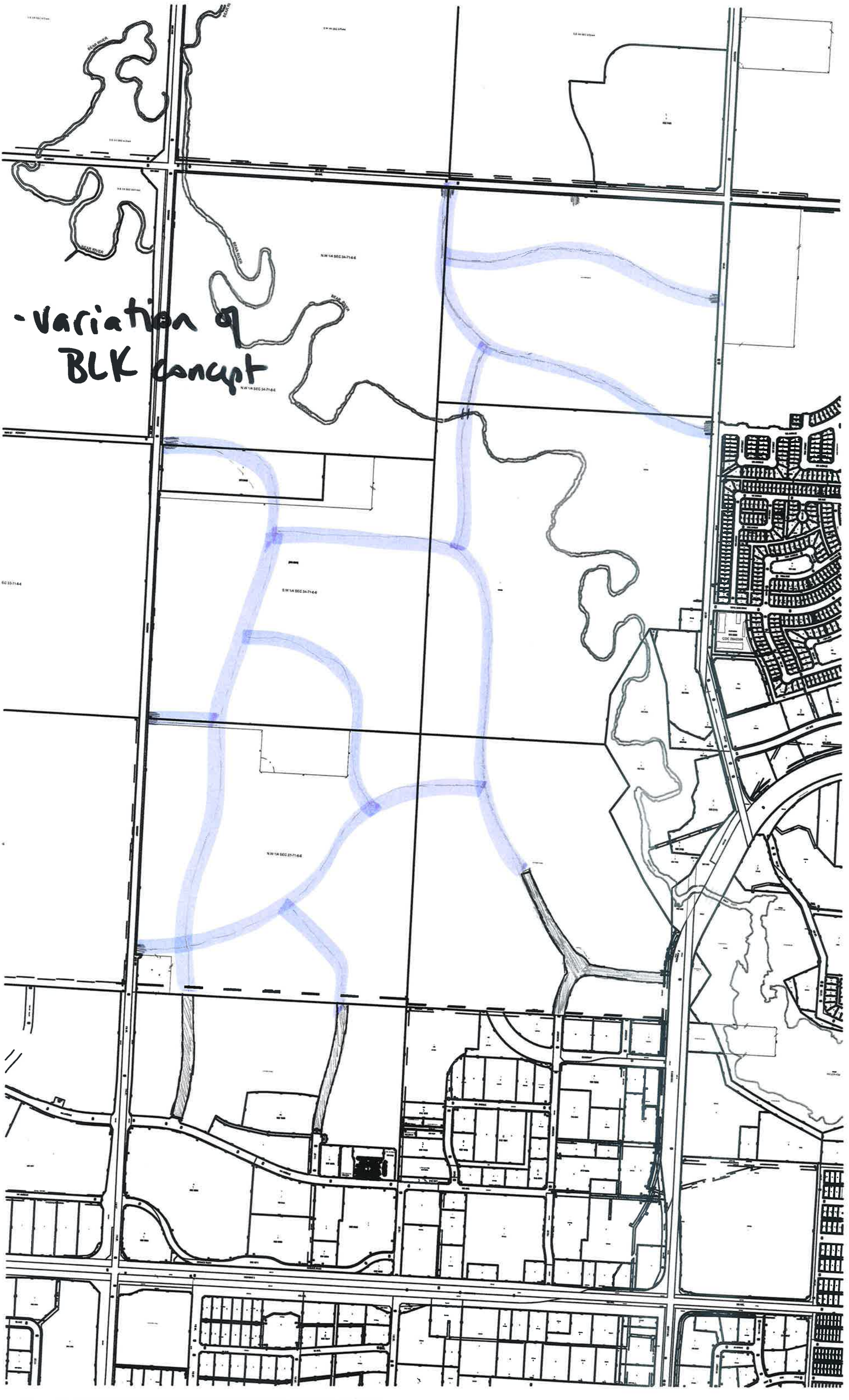
SMALL DISCONTINUOUS COLLECTORS

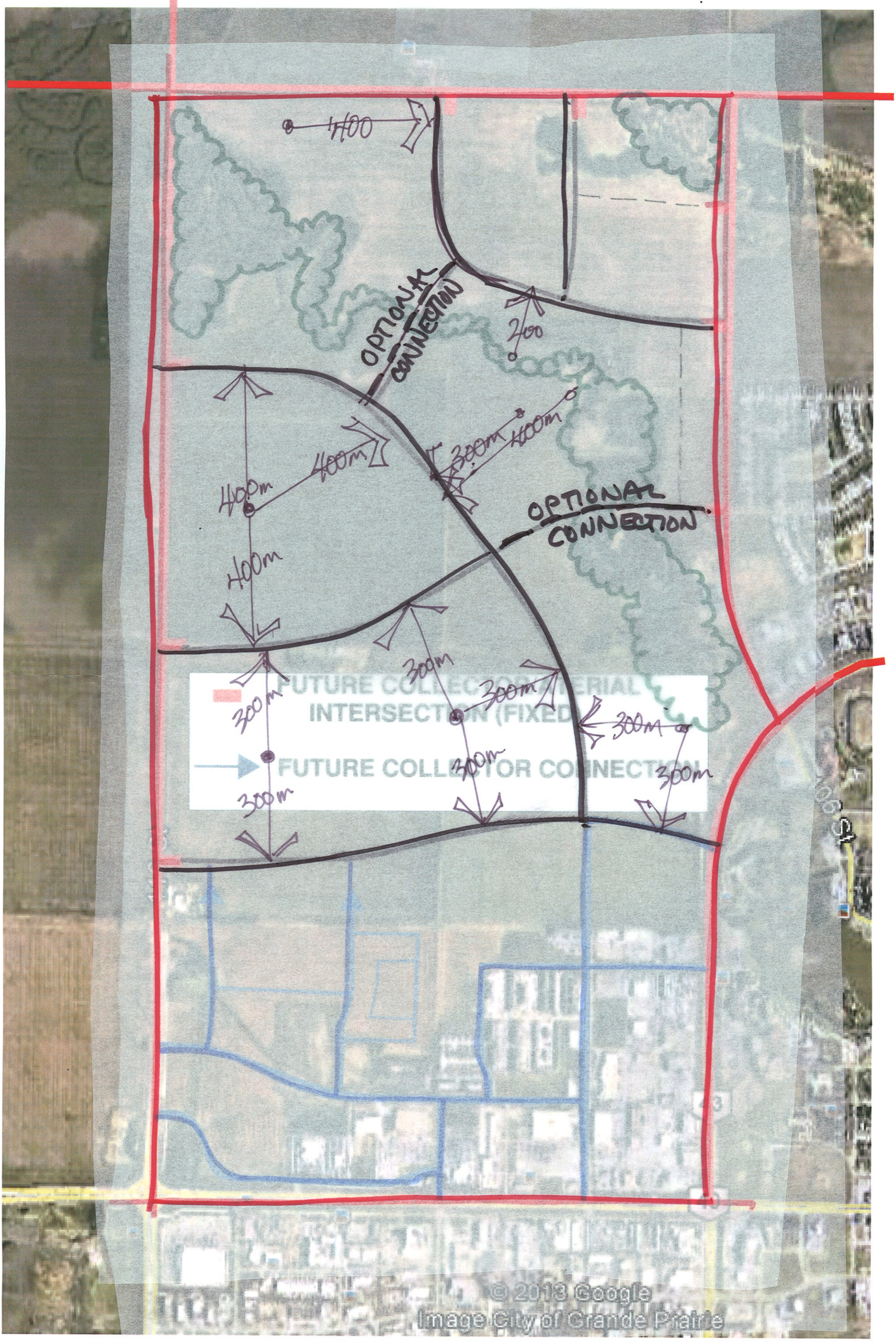



- More direct
NW/SE connection
(at 124 Ave)

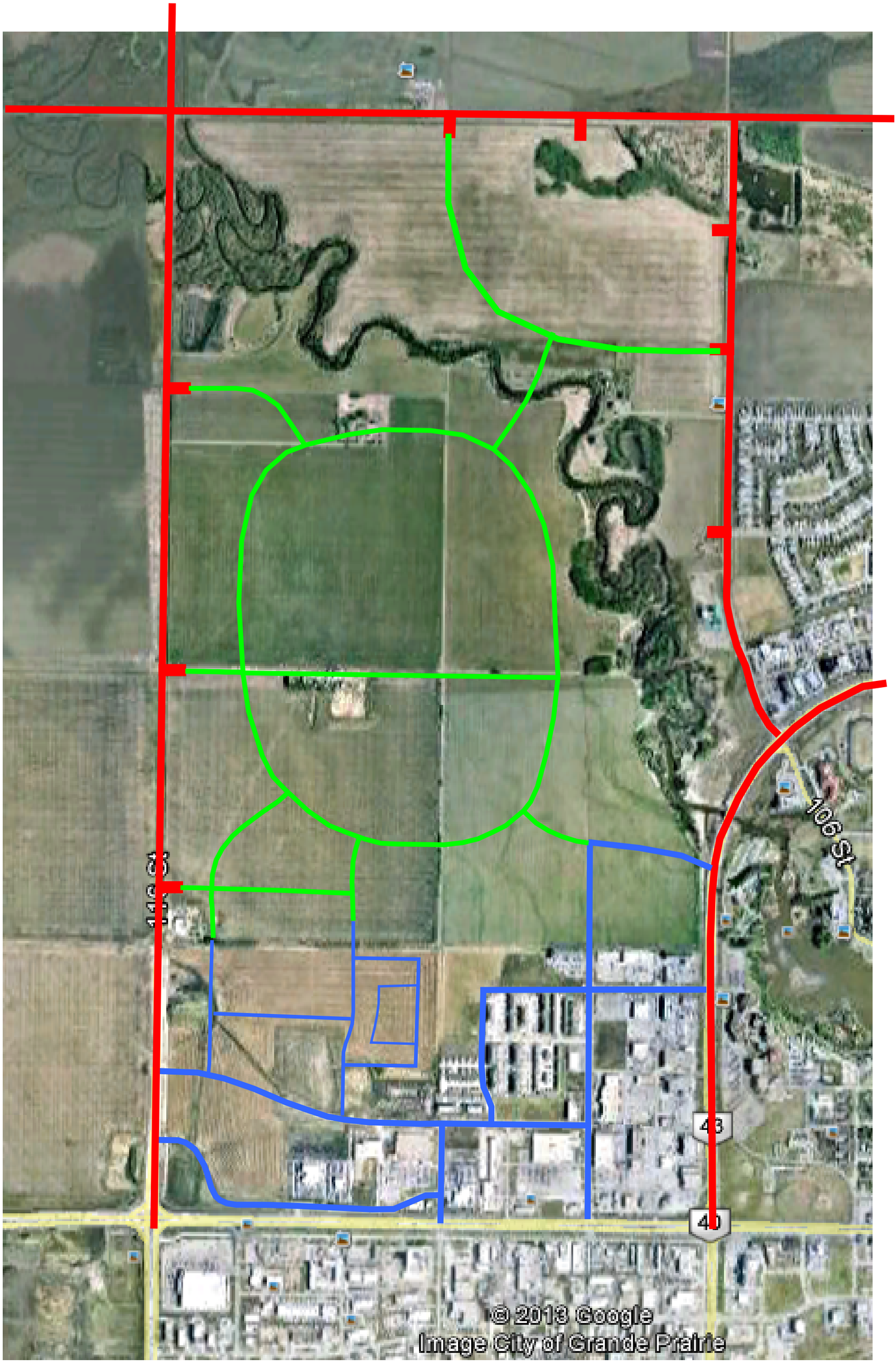

- "Millwoods"


- More direct connection
116 th St to Bypass
(at 116 Ave)


- Variation of
BLK concept


1400
OPTIONAL CONNECTION
200
400m
400m
300m
400m
OPTIONAL CONNECTION
400m
300m
300m
300m
300m
300m
300m
300m
FUTURE COLLECTOR/ARTERIAL INTERSECTION (FIXED)
FUTURE COLLECTOR CONNECTION
© 2013 Google
Image City of Grande Prairie

OPTIONAL CONNECTION
OPTIONAL CONNECTION
FUTURE COLLECTOR/ARTERIAL INTERSECTION (FIXED)
FUTURE COLLECTOR CONNECTION
106 St
© 2013 Google
Image City of Grande Prairie

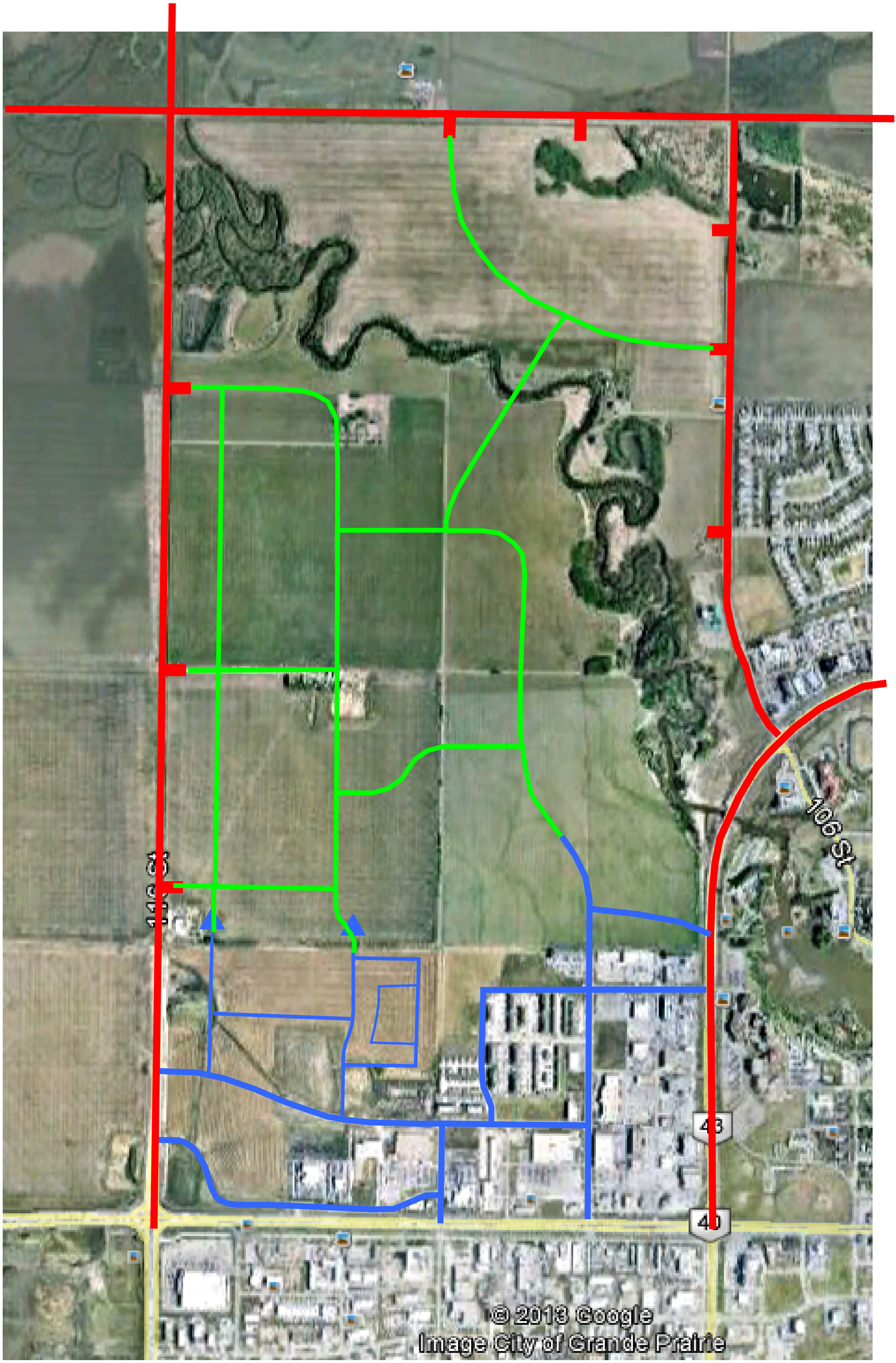

108 St
43
40
© 2013 Google
Image City of Grande Prairie

106 St

43

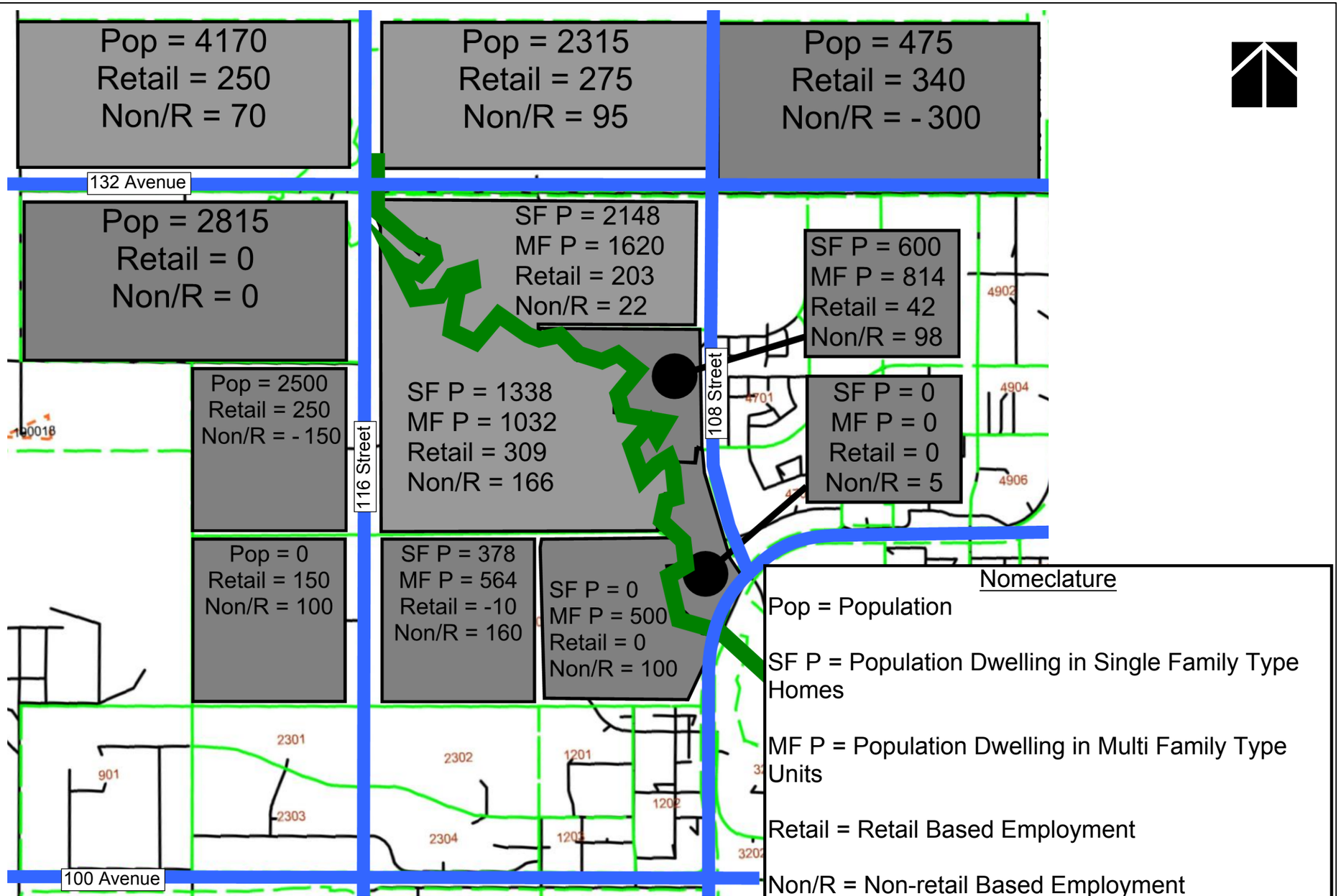
40

© 2013 Google
Image City of Grande Prairie


108 St
43
40
© 2013 Google
Image City of Grande Prairie

Appendix B

Growth Beyond 90,000



ISL Engineering and Land Services

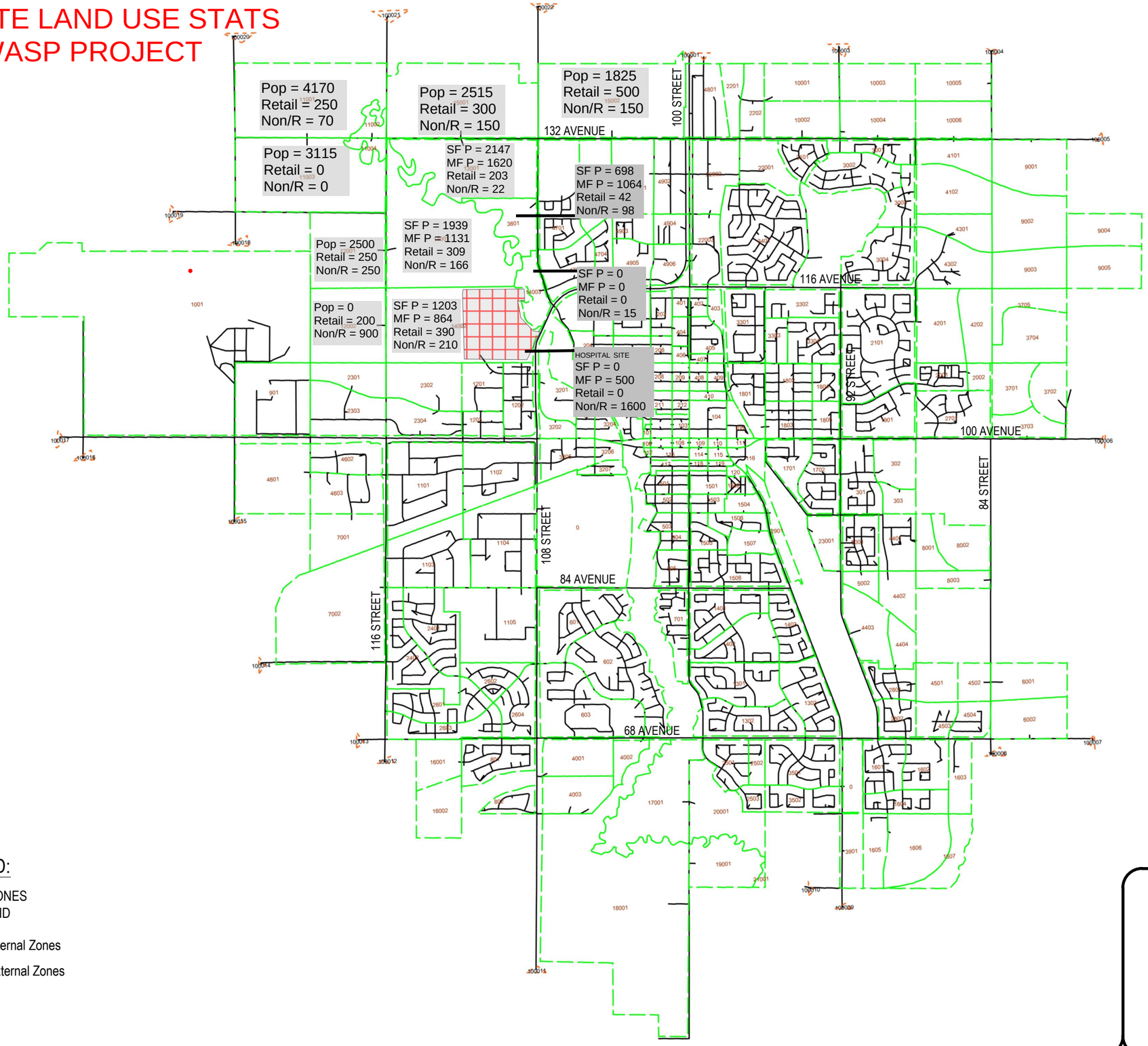
NWASP TRAFFIC STUDY
GP TMP ASSUMPTIONS
Growth Beyond 90 K

EXHIBIT X.X

September, 2013

ULTIMATE LAND USE STATS FOR NWASP PROJECT

Exhibit 3.1



LEGEND:

IMPORT ZONES
IMPT-TAZ_ID

Internal Zones

External Zones

CITY of GRANDE PRAIRIE
TRANSPORTATION MASTER PLAN

Traffic Analysis Zone System

ISL Engineering and Land Services