1. EXECUTIVE SUMMARY

1.1 Heartland Transmission Project

1. This is an Application to the Alberta Utilities Commission (AUC) pursuant to the *Hydro and Electric Energy Act*, R.S.A. 2000, c. H-16 for permits to construct and licences to operate the following three facility additions:

   a. A 500 kV AC double-circuit transmission line (1206L/1212L) connecting the 500 kV system on the south side of the City of Edmonton to the new Heartland 12S Substation (the 500 kV Line Project);

   b. A 240 kV/500 kV Heartland 12S Substation, located approximately 15 km north east of the City of Edmonton in the Gibbons – Redwater Region (the Heartland 12S Substation Project); and

   c. A 240 kV double-circuit transmission line (1054L/1061L) connecting the 240 kV system in the area to the new Heartland 12S Substation (the 240 kV Line Project).

2. Together, these three facility additions are referred to as the “Heartland Project”.

3. This Application is organized in two parts. Part I of the Application describes the 500 kV Line Project.

4. Part II of the Application describes the Heartland 12S Substation Project and the 240 kV Line Project. An executive summary applicable to the Heartland 12S Substation Project and the 240 kV Line Project is contained in Part II.

1.2 Applicants

5. AltaLink L.P. (AltaLink) and EPCOR Distribution & Transmission Inc. (EPCOR) (collectively, the Heartland Team) are jointly applying for approval of the 500 kV Line Project along the "Preferred East TUC Route", as that route crosses the service territories of both utilities. While the Heartland Team has concluded that the Preferred East TUC Route is superior to other potential routes and is recommending approval of that route, this Application also provides information respecting a second potential route for the 500 kV Line Project – the "Alternate West Route". As the Alternate West Route does not cross EPCOR's service territory, AltaLink would be the sole proponent of the 500 kV Line Project along that route.

6. AltaLink is independently applying for:

   a. The Ellerslie 89S Substation Expansion (ESSE) that is required to interconnect the 500 kV Line Project’s Preferred East TUC Route to the Alberta Interconnected Electric System, as that substation is an existing asset of AltaLink’s, if that route is approved by the AUC.

   b. Should the AUC determine that the Preferred East TUC Route should not be approved, the 500 kV Line Project along the Alternate West Route, as that route is geographically located within AltaLink’s service territory exclusively; and

c. The Heartland 12S Substation Project and 240 kV Line Project, as these projects are geographically located within AltaLink's service territory exclusively.

1.3 Critical Transmission Infrastructure

7. The Heartland Project is Critical Transmission Infrastructure (CTI) as defined in the *Electric Utilities Act,* S.A. 2003, c. E-5.1. Section 2 of the Schedule to the *Electric Utilities Act* describes the following as CTI:

> One double-circuit 500 kV alternating current transmission facility connecting to the 500 kV transmission system on the south side of the City of Edmonton and to a new substation to be built in the Gibbons – Redwater region. (Refer to **Appendix A).**

8. The Heartland Project includes all associated facilities required to interconnect the Heartland Project to the Alberta Interconnected Electric System.

9. Section 13.1(2) of the *Hydro and Electric Energy Act* states as follows:

> The construction, connection and operation of a transmission line or part of a transmission line that is designated as critical transmission infrastructure is required to meet the needs of Alberta and is in the public interest.

1.4 AESO Direction Letter and Functional Specification

10. Pursuant to Section 41.3 of the *Electric Utilities Act,* the Alberta Electric System Operator (AESO) has issued a letter directing AltaLink and EPCOR to prepare a Facility Application to the AUC for the Heartland Project (the Direction Letter). The AESO subsequently issued a Notice to File to AltaLink and EPCOR to file the Facility Application. The Direction Letter dated July 12, 2010 and the Notice to File, dated September 19, 2010 can be found at **Appendix B-1** and **B-2** respectively.

11. In its Direction Letter, the AESO has directed the Heartland Team to address the requirements of the AESO's Heartland Bulk Transmission System Development, Functional Specification Rev. 7, July 13, 2010 (AESO Functional Specification). The AESO Functional Specification can be found at **Appendix C-1**.

12. The AESO also issued AltaLink and EPCOR a Direction Letter relating to the use of underground technology for the 500 kV Line Project (Underground Direction Letter). The Underground Direction Letter dated April 9, 2010 is attached at **Appendix B-3** of this Application. Finally, the AESO issued a Combined Overhead and Underground Transmission Supplemental Functional Specification Rev. 1 on August 13, 2010 (AESO Supplemental Functional Specification). The AESO Supplemental Functional Specification can be found at **Appendix C-2**.

13. AltaLink and EPCOR have prepared this Application in compliance with the AESO's Direction Letters. The Heartland Project facilities described in this Application comply with the AESO Functional Specification.

1.5 Overview of the 500 kV Line Project

14. The Heartland Team is proposing double-circuit vertical lattice transmission towers (Lattice Towers) for the entirety of the 500 kV Line Project along the recommended Preferred East TUC Route.

15. At the request of stakeholders, the Heartland Team examined an underground option (the Stakeholder Requested Underground Option or Underground Option) for a 20 km portion of the Preferred East TUC Route. As stakeholders expressed strong interest in an underground option and this portion of the line is located adjacent to densely populated areas, the Heartland Team has included the Underground Option in this Application for the AUC's consideration.

16. Similarly, in response to concerns raised regarding potential visual impacts of the 500 kV Line Project, the Heartland Team also explored potential tower alternatives over this 20 km portion of the line, and has included an option comprised of monopole structures (the Monopole Option) [1] for the AUC's consideration.

17. Both the Underground and Monopole Options would commence at the existing Ellerslie 89S Substation and terminate in the Transportation/Utility Corridor (TUC) near Baseline Road on the Preferred East TUC Route. The Heartland Team evaluated both options carefully and is not recommending either Option as each is more expensive than the recommended Lattice Towers.

18. The Lattice Towers and the Monopole Option are described in Section 3: 500 kV Line Project Description. The Underground Option is described in Section 10: Underground Option.

19. Should the AUC determine that the recommended Preferred East TUC Route should not be approved, AltaLink proposes that Lattice Towers be used along the entire Alternate West Route.

1.6 500 kV Line Project Location

20. The 500 kV Line Project is located in the Edmonton area and is illustrated in the overview map in Figure 1-1 below. The Preferred East TUC Route is shown in green. The Alternate West Route is shown in blue.

[1] At some locations with heavy angles, the structures would actually have two poles. Because of wetlands located to the north of Baseline Road, lattice towers are required to span the end of the route. The length of the monopole portion of the route will be approximately 17.6 km.

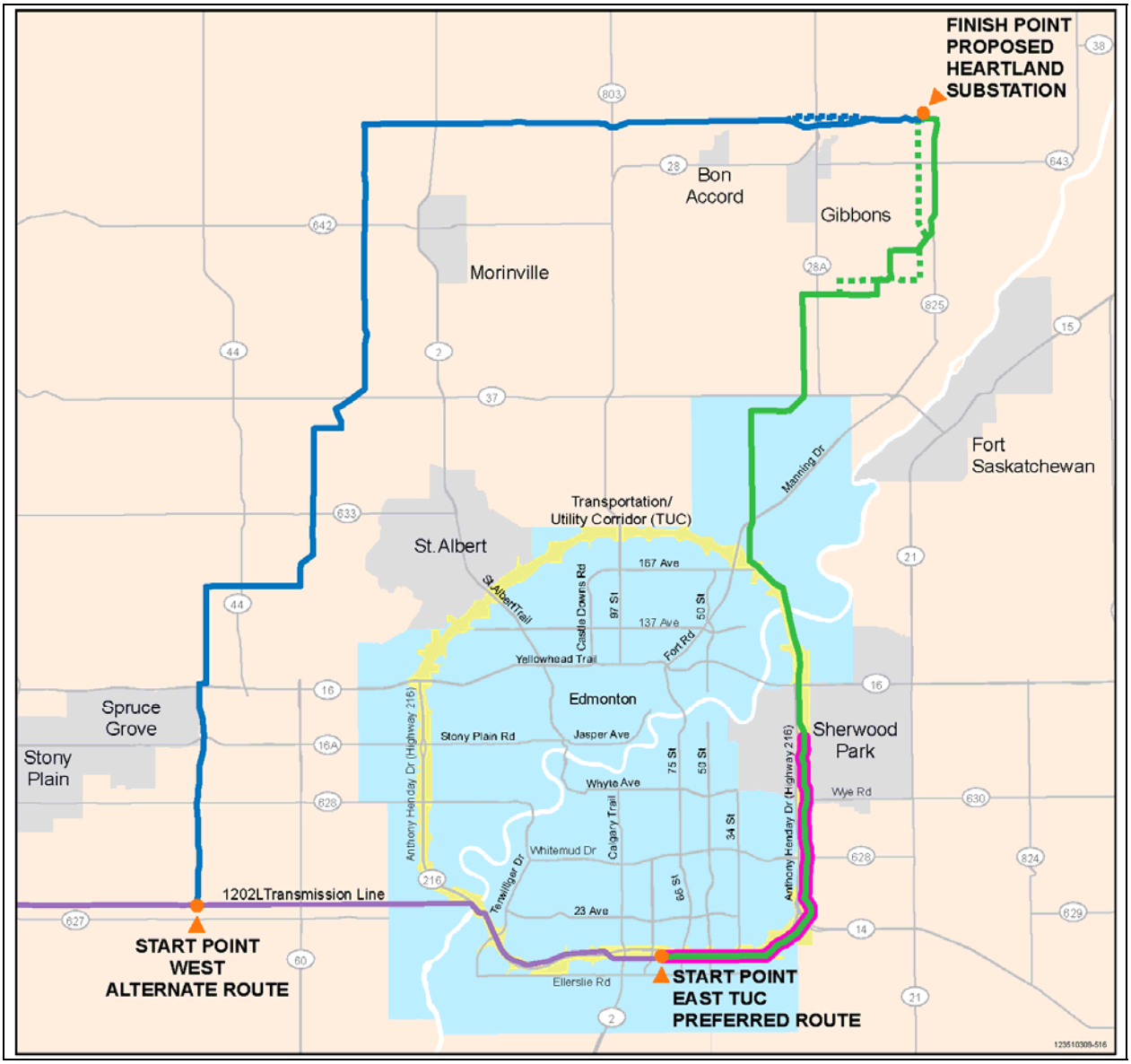

Figure 1-1– Project Location Map

21. To further illustrate the locations of the Preferred East TUC and Alternate West Routes, project maps are attached in a reduced size at the end of this Executive Summary, and in full size in Appendix D:

- Overall Study Area Map **(Appendix D-1)**; and
- Overall Study Area Mosaic Map **(Appendix D-2)**.

22. As noted above, the Heartland Team is recommending approval of the Preferred East TUC Route (shown in green). The red outlined portion of the Preferred East TUC Route in Figure 1-1 is the

20 km portion of the route where the Monopole Option and Underground Option have been included in the Application.

23. Approximately half of the Preferred East TUC Route uses the TUC on the south and east side of Edmonton, then travels generally northeast to the Gibbons-Redwater region, where it connects to the proposed Heartland 12S Substation. The Preferred East TUC Route is approximately 66 km in length.

24. The Heartland Team has also developed an Alternate West Route (shown in blue in Figure 1.1 above). The Alternate West Route passes east of Spruce Grove, to the west and north of Morinville, then east to the Gibbons-Redwater region, where it connects to the proposed Heartland 12S Substation. The Alternate West Route is approximately 84 km in length. The southern connection is a tie-in to the existing 500 kV 1202L line which is part of the existing 500 kV system on the south side of Edmonton.

1.7 The Preferred East TUC Route and Alternate West Route

25. As noted above, the Preferred East TUC Route is the recommended route for the 500 kV Line Project. The primary factors leading to the selection of the Preferred East TUC Route were:

- A substantial portion of the Preferred East TUC Route (approximately 31 km) will utilize the TUC, which is public land specifically set aside by the Provincial Government for linear infrastructure such as roads, pipelines and power transmission lines.
- The Preferred East TUC Route is the shortest route, resulting in lower costs to ratepayers and lower overall landowner impacts.
- The Preferred East TUC Route will be located on substantially less private land along its length (35 km out of 66 km) compared to other potential routes, thereby requiring less right-of-way (RoW) from private landowners.
- The Preferred East TUC Route results in the lowest amount of agricultural land impacted.
- The Preferred East TUC Route has the lowest number of residences within 150 m of the line, when residences that are in interim use or vacant pending further TUC or industrial development are excluded.[2]
- The Preferred East TUC Route has the least number of individual land parcels where the proposed right-of-way would take up 20% or more of the parcel.
- The Preferred East TUC Route will have the fewest potential adverse environmental effects.
- The Preferred East TUC Route is the lowest cost route.

26. The Alternate West Route has been selected as the alternate route for the 500 kV Line Project. While the Alternate West Route would have a greater overall impact than the Preferred East

[2]The route that has the lowest number of residences within 150 metres depends on whether residences that are in interim use or vacant pending further TUC or industrial development are excluded. Within the TUC, there are 9 residences located within 150 metres of the proposed centerline of the Preferred East TUC Route. These houses are not privately owned. They have been purchased by Alberta Infrastructure to facilitate the development of infrastructure within the TUC. They are owned by the Province and residents have been allowed to continue to reside in the houses until the land is needed for infrastructure development. There are a further 4 residences located within 150 metres of the proposed centerline of the Preferred East TUC Route that are vacant pending future industrial development. If these residences are not included in the calculation, then the Preferred East TUC Route has the fewest number of residences within 150 metres.

TUC Route, the overall impact would be lower than other potential routes. The primary factors leading to the selection of the Alternate West Route as the alternate route were:

- The Alternate West Route has the least number of residences within 150 m[3] and 800 m compared to other potential routes.
- The Alternate West Route has the least number of schools, hospitals or daycares within 800 m of the edge of the RoW.
- The Alternate West Route has the least number of identified historical resources within 800 m of the edge of the RoW.

27. However, the Alternate West Route is less desirable than the Preferred East TUC Route because it will have greater impacts on landowners and ratepayers than the Preferred East TUC Route. These greater impacts are:

- A substantially longer portion of the Alternate West Route would be located on private land (84 km compared to 35 km on the Preferred East TUC Route), thereby requiring more private land for the RoW.
- The Alternate West Route impacts a higher amount of agricultural land (72 km compared to 48 km on the Preferred East TUC Route).
- The Alternate West Route is longer (84 km compared to 66 km), thereby imposing greater costs to ratepayers and greater landowner impacts than the Preferred East TUC Route.
- The Alternate West Route potentially affects a higher number of residences within 150 m of the centerline (when residences that are in interim use or vacant pending further TUC or industrial development are excluded) (10 compared with 6 on the Preferred East TUC Route).
- The Alternate West Route poses a higher level of potential adverse environmental effects.
- The Alternate West Route would be more expensive than the Preferred East TUC Route (approximately $667 million compared to $581 million for the Preferred East TUC Route).

28. Alberta Infrastructure has indicated that it does not object to this Application for the Preferred East TUC Route and has confirmed that the proposed alignment within the TUC is consistent with the Edmonton TUC plans.

1.8 Participant Involvement

29. The Heartland Team conducted an extensive participant involvement program for the 500 kV Line Project. Participant involvement for the Ellerslie 89S Substation Project was completed by AltaLink as the proponent of that project. The participant involvement programs were undertaken in accordance with the requirements of Appendix A of Rule 007: *Applications for Power Plants, Substations, Transmission Lines and Industrial System Designations*, and included landowners, occupants and residents; local businesses; local, regional and provincial government representatives, officials and departments; special interest groups and associations; industry; and other parties expressing interest in the projects.

[3] If residences that are in interim use or vacant pending further TUC or industrial development are included in the calculation for the Preferred East TUC Route. Please see footnote 2.

30. The participant involvement programs for AltaLink's Heartland Substation 12S and 240 kV Transmission Line Projects are described in Part II of this Application. The Heartland Team notes that overall, the participant involvement programs (all phases) for the Heartland Project involved direct consultation with more than 3400 stakeholders, notification regarding the project of more than 240,000 stakeholders through addressed mail and postal code drops, a total of 21 open houses and Information Sessions, as well as consultation with 31 government agencies, 13 municipalities, 80 companies, 21 community groups and 10 other organizations.

500 kV Line Project

31. The bulk of the participant involvement program for the 500 kV Line Project was carried out in two main phases. Phase 1 began in September 2008, and its scope reflected the various potential routes along the general route paths that were initially identified for the transmission line. The focus of Phase 1 was stakeholders who were potentially directly and adversely affected given their proximity to one or more of the potential routes.

32. Phase 2 commenced on January 6, 2010, coinciding with the announcement of the proposed Preferred East TUC and Alternate West Routes for the transmission line. The focus of Phase 2 was notifying stakeholders of the two routes and the process and rationales leading to their selection, and further consultation with stakeholders who were potentially directly and adversely affected by those routes.

33. In completing the participant involvement program, the Heartland Team sought to ensure that stakeholders were properly and adequately notified about the 500 kV Line Project and its potential adverse effects; were given ample opportunity to ask questions and raise issues and concerns about the Project and have those questions, issues and concerns addressed; and were able to provide input into the Project. In both phases, the Heartland Team used a broad range of communication tools to facilitate effective notification and consultation, including:

- Preparing and distributing Project Information Packages;
- Conducting personal consultation through door-to-door visits and telephone calls, including holding one-on-one meetings and direct discussions with stakeholders whose land would be crossed by each of the four route alternatives (which included the routes that were eventually determined to be the Preferred East TUC and Alternate West Routes) (Phase 1) and the Preferred East TUC and Alternate West Routes (Phase 2);
- Preparing and distributing Project Newsletters (six in Phase 1 and three in Phase 2);
- Conducting Open Houses (seven in each of Phases 1 and 2; six additional information sessions in Phase 2);
- Conducting/participating in group presentations, meetings and discussions;
- Providing written correspondence;
- Establishing and operating Information Centres (six in Phase 1 and four in Phase 2);
- Establishing and maintaining a Project website, a dedicated project information phone number and an email address;
- Placing advertising in print media and on the radio; and
- Responding to requests for information and interviews by the media.

34. At the outset of Phase 1, the Heartland Team sent newsletters to more than 240,000 stakeholders. Once the potential routes had been narrowed somewhat during the course of Phase 1, the Heartland Team sent Project Information Packages to approximately 45,000 stakeholders and personally consulted with approximately 3,200 stakeholders. In Phase 2, the Heartland Team sent Phase 2 Project Information Packages to approximately 47,000 stakeholders (approximately 13,000 to stakeholders along the Preferred East TUC or Alternate West Routes and the remainder to stakeholders along eliminated routes), and personally consulted with approximately 1,200 stakeholders.

35. Throughout the participant involvement process, the Heartland Team endeavoured to ensure that project information materials were straightforward and transparent and that responses to stakeholders' questions and concerns were relevant and helpful. The Heartland Team took stakeholder issues, concerns and input into account in project planning, beginning with the identification of potential transmission line routes, followed by the selection and refinement of the Preferred East TUC and Alternate West Routes. Stakeholder input has also been reflected in line and tower locations, the identification of routing constraints and potential mitigation measures, and construction planning.

36. A detailed description of the objectives, design and results of the participant involvement program for the 500 kV Line Project, including issues, concerns and input raised by stakeholders and the Heartland Team's responses, is provided in Section 4.1: Participant Involvement Program for the 500 kV Line Project. A similar discussion respecting the Ellerslie 89S Substation Project is described in Section 4.2: Participant Involvement Program for the Ellerslie 89S Substation Project. The specific examples of refinements made to the Preferred East TUC and Alternate West Routes in response to stakeholder input are provided in Section 7: Route Selection.

Ellerslie 89S Substation Project

37. If the AUC approves the recommended Preferred East TUC Route, an expansion of the existing Ellerslie 89S Substation will be required. As noted above, AltaLink undertook the participant involvement program for this project.

38. Like the 500 kV Line Project, the Ellerslie 89S Substation Expansion (ESSE) participant involvement program proceeded in two phases. Phase 1 began in December 2009, and involved the provision of project information to persons within a minimum of 800 metres of the proposed project, via postal code drop or direct mail. An open house was also held in January 2010, concurrently with an open house for the Heartland 500 kV Line Project.

39. Phase 2 of the ESSE participant involvement program began in March 2010. Project information was delivered either via hand delivery, or postal code drop to persons residing within a minimum of 800 metres of the proposed project. A further open house was held in April 2010. Personal consultations took place with 209 stakeholders, while notification was provided to approximately 5800 stakeholders residing within a minimum of 800 metres of the ESSE project.

40. Through the ESSE participant involvement program, stakeholders were informed about the ESSE project, and AltaLink took steps to answer any questions or concerns raised by stakeholders in relation to the project.

Consultation with Government Agencies, Companies, and Community Stakeholder Groups

41. Meetings and discussions occurred with representatives of government agencies and local municipalities regarding the 500 kV Line Project. Companies with operations in the vicinity of the line were also notified regarding the Project, and consultation took place with any companies that expressed questions or concerns. Finally, ongoing consultation occurred between members of the Heartland Team and community stakeholder groups. Efforts were made to address the questions and concerns raised.

42. Detailed information regarding this consultation can be found in Section 6: Consultation With Government Agencies, Municipalities, Companies, Community Groups and other Organizations. Some of the more significant outcomes of consultation included the following:

- Ongoing discussions with Alberta Infrastructure resulted in significant portions of the 500 kV Line alignment in the TUC being moved farther away from residences that are adjacent to the TUC;
- In response to stakeholder requests for an underground transmission line, the Heartland Team developed an Underground Option for a 20 km portion of the Preferred East TUC Route and has included this option in Section 10: Underground Option.

Aboriginal Consultation

43. The Heartland Team engaged with First Nations, Métis groups, and a group identified as the Michel First Nation through its Aboriginal Consultation Program. Meetings were held with representatives of these Aboriginal groups, and presentations regarding the Heartland Project were held in Aboriginal communities to provide information, answer questions, and gather input regarding the project. Tours of the 500 kV Line Project area were also offered to Aboriginal groups and a number of First Nations undertook Traditional Land Use studies in the Project area.

44. The Heartland Project will cross very little Crown land outside of the TUC, and accordingly, will have little or no impact on Treaty rights to hunt, fish or trap. On the Preferred East TUC Route, the RoW would only occupy approximately six hectares of Crown land outside of the TUC. On the Alternate West Route, the RoW would only occupy one hectare of Crown land. Taken together, this represents approximately 0.01% of the Study Area for the Heartland Project.

45. The Heartland Team was able to gather information from Aboriginal groups regarding their concerns about the Heartland Project and has made efforts to address any concerns raised. Following this consultation, the Heartland Team is confident that any issues raised can be dealt with through mitigations. Further information regarding the Heartland Team's consultation with Aboriginal groups can be found in Section 5: Aboriginal Consultation.

1.9 Route Selection

46. The route selection process for the 500 kV Line Project is described in detail in Section 7: Route Selection. The route selection process extended over three years and involved extensive planning, field work and stakeholder engagement. The Heartland Team applied a systematic and staged routing process which began with the development of a Study Area, continued with the development of preliminary and then final routes, and concluded with the selection of a preferred and alternate route. At each stage, steps were taken to identify, measure, and assess the potential environmental, social and economic effects of routing options. Through the application of this process, many potential impacts of the Project have been avoided or reduced.

47. The Heartland Team incorporated extensive stakeholder feedback into its route refinements where reasonably practical. Stakeholder consultation took place over an extended period, and revised routing was presented throughout the process to reflect stakeholder input.

48. Four preliminary routes were initially defined and evaluated through a systematic process that included digital mapping information, constraints analysis, and environmental advice. These four routes were:

- The East Route;
- The East TUC Route;
- The West TUC Route; and
- The West Route.

49. During Phase 1 of consultation, these four preliminary routes were presented to stakeholders, and input was evaluated.

50. During Phase 2 of consultation, a Preferred and an Alternate Route, based on stakeholder feedback and additional information gathered, were presented to stakeholders. More detailed discussions were pursued with stakeholders potentially directly and adversely affected by the Preferred and Alternate Routes. Consultations with many stakeholders involved multiple discussions to arrive at final route alignments.

51. In addition to stakeholder consultation, further detailed assessments were also done at this stage to evaluate potential routes. These included:

- Further environmental review and evaluations;
- Historical Resource Assessments;
- Traditional Land Use Study work;
- Field reconnaissance; and
- Updated data sources.

52. During the final siting stage, the Heartland Team incorporated stakeholders' consultation input and the results from various assessments into the final alignments for the Preferred East TUC Route and the Alternate West Route.

1.10 Environmental Approach and Evaluation

53. The Heartland Team took environmental factors into account in identifying, screening and refining potential transmission line routes, and ultimately selecting and further refining the Preferred East TUC and Alternate West Routes. In selecting a route for the Project, care was taken to avoid environmentally sensitive areas to the extent reasonably practical. Environmental input during the route selection process and preliminary tower placement for the Heartland project allowed the Heartland Team to avoid or reduce potential environmental effects.

54. The Preferred East TUC Route and Alternate West Route were discussed with Alberta Environment (AENV), Alberta Sustainable Resource Development (ASRD), Fisheries and Oceans Canada (DFO) and other environmental regulatory agencies. The Heartland Team has also worked with other provincial agencies, including Alberta Culture and Community Spirit and has committed to carrying out pre-disturbance assessments where required prior to commencement of construction on any route.

55. While an environmental impact assessment is not required for the 500 kV Line or the ESSE Projects, the Heartland Team had Environmental Evaluations conducted by Stantec Environmental Consultants (Stantec). The evaluations are attached in **Appendix J-1** (Lattice), **Appendix J-2** (Monopole) and **Appendix J-4** (Underground) and are further discussed in Section 8: Environmental Evaluation (Overhead), as well as Section 10.3: Underground Environmental Evaluation. The Environmental Evaluation in each case also contained mitigation measures for potential environmental impacts.

56. The Environmental Evaluation concludes, with respect to the Lattice Towers on the Preferred East TUC Route and Alternate West Route that few effects on biophysical resources are expected from the 500 kV Line Project, irrespective of which route is selected, and that potential environmental effects can be managed with the proposed mitigations. Both routes are viable, but from a biophysical perspective, the Preferred East TUC route is more suitable than the Alternate West Route because it is a shorter route with a smaller project footprint, makes use of disturbed land, does not pass through sand dunes, parallels the most existing linear disturbances, and crosses less native vegetation.

57. The Environmental Evaluation concludes that the Monopole Option is viable from a biophysical perspective, and can be expected to have similar levels of potential effects to the Lattice Towers; however, due to the deeper foundations and higher number of monopole structures in or near wetlands, additional mitigation measures must be implemented for the Monopole Option with respect to hydrogeology resources.

58. Similarly, the Environmental Evaluation concludes that the potential environmental effects of the Underground Option can be managed with the proposed mitigations and that it is a viable option from a biophysical perspective.

59. From an environmental perspective, the Environmental Evaluation concludes that the Underground and Lattice Towers are both viable options for the Preferred East TUC Route. However, trade-offs exist between the two design choices. In general, more intensive disturbance occurs during construction for the Underground Option, mostly related to soil

handling and areas of vegetation removal. In contrast, the Lattice Towers have less intensive construction-related effects but have greater operational concerns related to the potential for bird mortality to occur due to collisions with shield wires. Given the project's location in the TUC, which has been subjected to on-going human activity, the Environmental Evaluation concludes that the effects of either option can be mitigated.

60. The Heartland Team is committed to the mitigations to manage the potential environmental impacts of the Heartland Project, as outlined in the Environmental Evaluation. The Heartland Team is also committed to mitigations set out in the Historical Resources Overview Report - FMA Heritage that has been prepared for this project and is attached as **Appendix T-1**.

1.11 Project Cost

61. The 500 kV Line Project cost estimates for the Preferred East TUC and Alternate West Routes are:

- Preferred East TUC Route with Lattice Towers - $580 Million ;
- Preferred East TUC Route with Monopole Option - $658 Million;
- Preferred East TUC Route with Underground Option - $1.09 Billion; and
- Alternate West Route with Lattice Towers - $666 Million.

62. All estimates have a +20%/-10% accuracy, with the exception of the Underground Option. Because very few 500 kV AC underground lines exist in the world, information regarding the cost of materials and manufacture time has less certainty than transmission line options that are more common. Further, there is some cost risk associated with unknown subsurface conditions. The accuracy of the estimated cost of the 20 km underground transmission line section of the Underground Option is therefore estimated at +30%/ -30%.

63. Project cost estimates are further described in Section 12: Economic Assessment, and the Heartland Team has included a completed Appendix B-1, pursuant to AUC Rule 007, for each of the route alternatives and design options applied for.

1.12 Project Schedule

64. AltaLink and EPCOR are seeking the requested permits and licences from the AUC to commence construction for the 500 kV Line Project by July 2011.

65. If permits and licences for the Preferred East TUC Route with the Lattice Towers are received by this date, the Heartland Team anticipates that construction and RoW clearing will start in October 2011 and transmission lines 1206L/1212L will be placed into service in March 2013.

66. For a more detailed proposed schedule for the 500 kV Line Project, see Section 11: Proposed Project Schedule.

1.13 Recommended Design

67. Many stakeholders, throughout the participant involvement program, requested that the 500 kV line be constructed underground rather than overhead. Their key concerns were the visual

impacts of overhead lines, concerns that overhead lines would decrease property values, and concerns regarding Electric and Magnetic Fields (EMF).

68. The Preferred East TUC Route is located adjacent to a densely populated area. Given this, the Heartland Team has taken the concerns of stakeholders seriously and has developed, evaluated, and presented an Underground Option and a Monopole Option in this Application. However, the Underground Option and Monopole Option are not recommended. As noted above, the key concerns raised with respect to overhead Lattice Towers were visual impacts, property values and EMF. The Heartland Team has reviewed each of these concerns, as summarized below. The Heartland Team does not believe that the increased cost of either Option is justified.

Visual Impacts

69. The Heartland Team retained Truescape Limited (Truescape) to prepare accurate photo simulations of the 500 kV Line Project with both the Lattice Towers and the Monopole design options. Reduced versions of these photo simulations are found at **Appendices Y-1, Y-2, and Y-3**. A video simulation of the towers is also attached at **Appendix Y-5**. The methodology used by Truescape is attached at **Appendix Y-6**.

70. The Lattice Towers will be more visible than an underground installation. However, the Heartland Team took steps to locate the 500 kV Line away from residences within the TUC and does not believe that the resulting potential visual impacts of the Lattice Towers justify the cost of the Monopole Option or the Underground Option.

Property Value

71. The Heartland Team retained Serecon Valuations Inc. (Serecon) of Edmonton to conduct a study respecting the potential effects of high voltage overhead lines on property values in an urban setting. Serecon worked with Dr. David Ryan, a Professor of Economics from the University of Alberta, to conduct the study, and to provide a report, which is included as **Appendix X**.

72. As described in detail in the report, Serecon used two proven methods (paired sales analysis and multiple regression analysis) for determining potential property value impacts, which involved analyzing market reaction through the eyes of buyers and sellers of residential and urban development properties. The study was based on both qualitative and quantitative analyses of urban property sales over the period May 2005 to May 2009, along existing 240 kV and 500 kV overhead transmission lines located in Edmonton, St. Albert, Red Deer, Calgary, Devon and Chestermere.

73. The Serecon study found that the effect of proximity to a high voltage transmission line varies from neighbourhood to neighbourhood, that being located next to a high voltage transmission line does not necessarily reduce property values, and that where a statistically significant effect on property values was found, it was small. The study also concluded that the question of whether the effects on property values are positive or negative is in part dependent on the characteristics of the corridor that the transmission line is placed in (e.g. the transmission line and homes are also immediately adjacent to a busy roadway).

EMF

74. The Electric and Magnetic Field (EMF) levels, for the 500 kV Line Project will be lower than international guidelines for the general public at the RoW edge for EMF (such as those from the International Commission on Non-ionizing Radiation Protection) regardless of the design option selected.

75. For the Lattice Towers, the highest electric field levels at the RoW edge are expected to be about 1.2 kV per metre (kV/m), which is lower than the International Commission on Non-ionizing Radiation Protection guideline of 4.2 kV/m. The magnetic field levels at the RoW edge for the Lattice Towers are expected to be about 12 milligauss (mG), which is also lower than the International Commission on Non-ionizing Radiation Protection guideline of 833 mG. At 100-150 m from the center of the RoW, the levels of magnetic field (for the Lattice Towers) are expected to be less than 1 mG under average load conditions and similar to typical residential background magnetic field levels.

76. EMF levels for the Underground Option are also expected to be lower than international guidelines, although the EMF profile for the Underground Option is different from the Lattice Towers and Overhead Option. At the centerline of the RoW the Underground Option has greater than twice the magnetic field as the Lattice Towers or Monopole Option, but EMF levels fall off more quickly with distance from the centerline than they do for the Lattice Towers or Monopole Option. With all options, at 100-150 m from the centre of the RoW and under average loading conditions, the EMF levels are expected to be similar to typical residential background levels.

77. Details of the EMF calculations can be found in **Appendix K-1**.

78. The Heartland Team retained E^{x}ponent[4] to prepare a report on the health effects of EMF. Included at **Appendix K-3** is the E^{x}ponent report called "Status Report on Electric and Magnetic Field Health Research". The report also includes a detailed summary of "Corona Ions" research. The report concludes that:

> *In summary, research published since the time of the WHO review did not provide strong evidence to alter the conclusions of the WHO review. Thus, the conclusions of national and international health agencies that there is not a scientific basis to project any adverse health effects as a result of ELF EMF found in ordinary environments, including those near transmission lines, is still appropriate.*
> *The absence of a clear adverse effect of ELF EMF after continued testing increases the certainty that there is not an adverse effect, or that any possible risk associated with exposure is small. The nature of scientific investigation dictates that no review panel can ever completely rule out the possibility that ELF EMF might have some adverse effect. While recent scientific research does*

[4] Exponent Inc. is a multidisciplinary organization of scientists, physicians, engineers, and regulatory consultants which performs in-depth investigations in more than 90 technical disciplines. These disciplines include evaluation of complex human health and environmental issues, including exposure assessment which is the science of estimating human exposure to agents such as EMF.

reflect some advancement in knowledge, the issues identified in the WHO review have yet to be sufficiently clarified. Therefore, this report presents the precautionary principle as recommended by the WHO and by agencies of the Canadian government as a reasonable approach to address the small degree of uncertainty about a potential relationship between ELF EMF and health. Given the amount and quality of research that has been conducted thus far, however, the opinion is strong that there is not a cause-and-effect link or that any possible risk is small.

Other Considerations

79. From a reliability perspective, both the overhead and underground design options have sufficient reliability and availability. Although there are few examples of operating underground 500 kV systems to draw on, the AESO has determined that the Underground Option is technically feasible, subject to cable testing for cold weather conditions. The Undergound Option is expected to have fewer but longer outages whereas the overhead Lattice Towers may have more outages, but of shorter duration. Both underground and overhead solutions are therefore viable.

1.14 Conclusion

80. As described in detail in this Application, the Heartland Team has taken a comprehensive approach to the development of the proposed 500 KV Line Project. The Heartland Team conducted an extensive participant involvement program which provided stakeholders with ample opportunity to understand the Project and its potential effects, and provide input into the Project's design and location. The Heartland Team undertook a detailed route selection and refinement process that ensured that all relevant factors were taken into account, including concerns and issues raised by stakeholders and information respecting each "aspect" described in AUC Rule 007. In response to stakeholder input, the Heartland Team made numerous routing refinements and also developed and evaluated the Underground and Monopole Options for a portion of the Preferred East TUC Route. Detailed information has been included in this Application on both design options for the AUC's consideration.

81. Having undertaken this work, the Heartland Team is recommending that the 500 kV Line be constructed along the Preferred East TUC Route using Lattice Towers. The Preferred East TUC Route is the shortest route, it uses the TUC (which is intended for linear infrastructure like transmission lines) over a substantial portion of its length, and has the least overall adverse impact considering all relevant factors. It is also the least cost alternative.

82. The Heartland Team has carefully considered, and has included detailed information in this Application respecting the Underground and Monopole Options. However, these Options are not recommended. Although stakeholders may believe that one or both of these Options would mitigate concerns with respect to potential visual, property value and EMF impacts, the Heartland Team believes that, based on the information and studies provided in this Application, the additional cost of either Option is not justified.

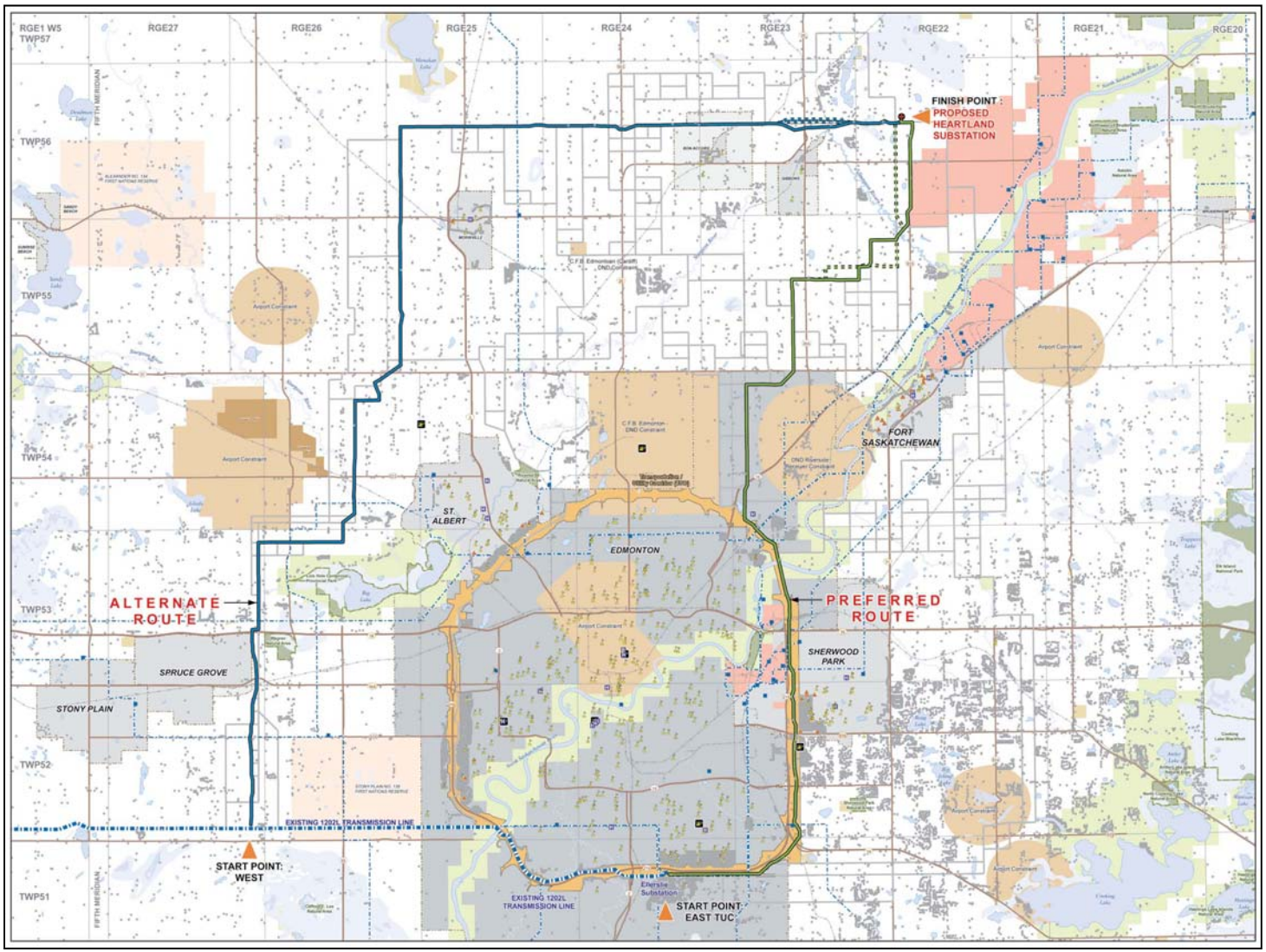

Figure 1-2 – Overall Study Area Map

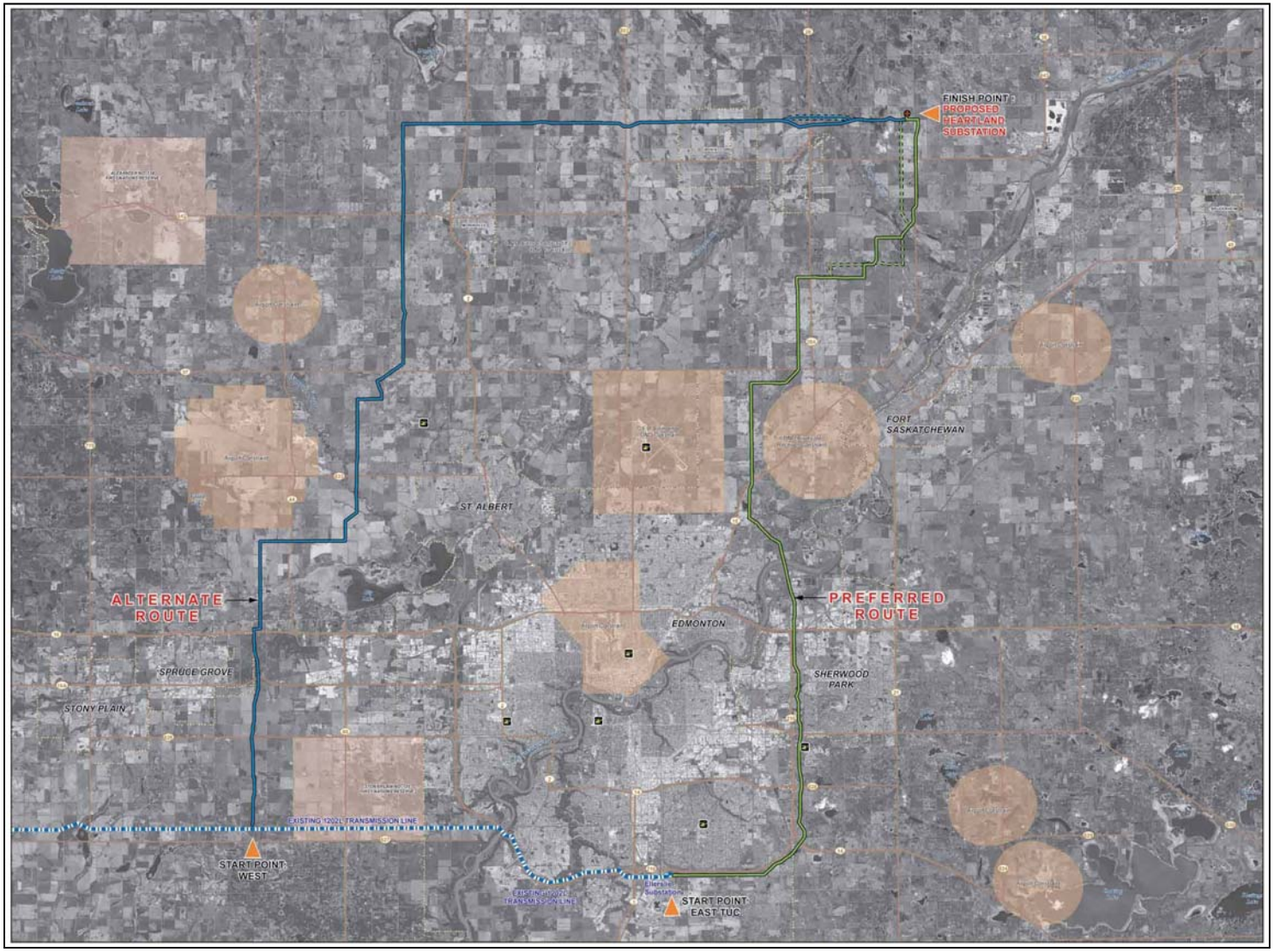

Figure 1-3 – Overall Study Area Mosaic Map