Appendix 1

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

BERRIEN ASSOCIATES LTD. — ACCREDITED APPRAISERS & PLANNING CONSULTANTS

ROBERT A. BERRIEN, DAC

EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS

B.Sc. in Animal Science, Montana State University, Bozeman, Montana, 1967-1970
Graduate Studies in Animal Science, University of Saskatchewan, Saskatoon, 1970-1972
Professional Agrologist (P.Ag), 1973 - Retired Status
Licensed Alberta Land Man, 1982
Licensed Alberta Real Estate Agent, 1983 (current with Post Licensing Accreditation through 2017)
Accredited Rural Appraiser (ARA), American Society of Farm Managers and Rural Appraisers, 1984 (Certified through December 31, 2014) Retired Status
Associate Arbitrator, 1987
Designated Appraiser Commercial (DAC), Canadian National Association of Real Estate Appraisers, 2003 (current with continuing competence through 2017)
Licensed Alberta Real Estate Appraiser, 2004 (No. 0361) (current with Post Licensing Accreditation through 2017)
Fellow (FRICS), Royal Institute of Chartered Surveyors 2009 - 2013

CAREER HISTORY

Managed and bred own herd of purebred and commercial cattle, 1973 to 1993
Owner/operator of grain, hay, and grass seed farm operation, 1980 to 1993
Instructor in Animal Science Department at Vermilion College, Alberta, 1973
Instructor in Animal Science Department at Olds College, Alberta, 1973-1974
Agricultural Officer, Canadian Imperial Bank of Commerce, 1974-1977
President, Berrien Associates Ltd., Okotoks, Alberta, 1977 to present
Associate, McKinnon Allen & Associates (Western) Ltd., 1979-1982
President, Rural Properties Ltd., Okotoks, Alberta, 1988 to 1997
President, Berrien Environmental Inc., Okotoks, Alberta, 1990 to 1995
President, Alzona Realty Ltd., Okotoks, Alberta, 1997 to present

EXPERIENCE IN EXPERT TESTIMONY ON TECHNICAL MATTERS

Accepted as an expert in agricultural impacts, land values, routing and right of way matters, livestock and crop damages, as well as suburban land values, planning, surface rights and expropriation compensation.

Court of Queen's Bench, in AB and MB
Court of Queen's Bench, in London, England
Surface Rights Board, of AB, MB, BC, and SK
Land Compensation Board of Alberta
Local Authorities Board of Alberta
Natural Resources Conservation Board of Alberta
Energy Resources Conservation Board of Alberta
Alberta Energy and Utilities Board
Alberta Utilities Commission
Oil and Gas Conservation Board of Manitoba
Alberta Planning Board
Municipal Government Board
Public Health Advisory and Appeal Board
National Energy Board Arbitration Panels in AB, MB, BC, NS, and NB
Various Development Appeal Boards

P.O. Box 578, Okotoks, Alberta T1S 1A7
Phone: (403) 938-2000 Email: alzona@telus.net

PROFESSIONAL ASSOCIATIONS

Alberta Institute of Agrologists (Retired)
Alberta Expropriation Association
Agricultural Institute of Canada (Retired)
American Society of Farm Managers and Rural Appraisers (Retired)
International Right of Way Association (Retired)
Canadian National Association of Real Estate Appraisers

PROFESSIONAL SPECIALIZATIONS

Expert witness testimony and litigation support
Project leader for multi-disciplinary teams dealing with all types of proposed projects
Surface Rights Act appraisals including damage and compensation estimates for power lines, pipelines and well sites
Route planning and Right of way evaluation for power lines, pipelines, canals, and roadways
Evaluation of farm businesses for litigation, involving Matrimonial Property Act, Highway Fatalities Act, and others
First Nations Land Claims appraisals and negotiations
Land appraisal in rural and urban fringe areas, current and V-Day
Rural real estate sales and purchasing
Rural receivership appraisal and management
Insurance claims evaluation and analysis
Rural industrial site selection and analysis
Civil litigation on rural damages and land appraisals
Expropriation Act appraisals - Federal, Provincial, and Municipal
Negotiation and Arbitration of compensation settlements for well site, pipeline, power line, highway and irrigation rights of way
Appraisal of the effects of the industrial/agricultural interface including:
- coal, power, and oil industry effects on farm land and farm businesses
- land reclamation
- effects of sour gas facilities and pipelines on rural land values

Appraisal of environmentally contaminated properties
Land use planning, zoning, and subdivision in various rural municipalities and towns
Land Development Planning and Project Management

OTHER PERTINENT ACTIVITIES

Accrediting Committee, American Society of Farm Managers and Rural Appraisers, 1984 to 1988
Instructor in Rural Appraisal, American Society of Farm Managers and Rural Appraisers, 1985 to 1987
Instructor, International Right of Way Association, 1986, 1988, 1992, 1993, 1999
Instructor, Appraisal Techniques, Alberta Lands and Forests, 1988
Land Agent Advisory Committee, Olds College, 1988 to 1991, Instructor Farm and Ranch Course, 2002
President, Alberta Expropriation Association, 1994
Town of Okotoks, Development Appeal Board, 1994; Chairman 1995
Town of Okotoks, Assessment Review Board, Chairman 1996 - 2009
Invited Speaker – Western Canadian Surface Rights Boards Association 2001
Invited Speaker – IRWA Education Seminar, Vancouver 2001
Invited Speaker – Appraisal Institute of Canada Annual Meeting, Halifax 2001
Real Estate Council of Alberta, Hearing Panel Member 1998 - 2006
Board of Directors and Building Committee, Chairman - Foothills Community Centre, 1998 - 2003
Invited Speaker – Conference Board of Canada Seminar – Landowners Concerns, Calgary 2002
Invited Speaker – Alberta Expropriation Association Annual Conference, 2002, 2005, 2008, 2010, 2012, 2014
Director - Western Sky Land Trust 2007, Board of Directors - Vice Chair 2008, 2009, 2010, 2011
Invited Speaker - Alberta Branch Appraisal Institute of Canada Annual Meeting 2008
Invited Speaker - American Society of Farm Managers & Rural Appraisers Annual Meeting 2008, 2012
Invited Speaker - Canadian National Association of Real Estate Appraisers Annual Meeting 2010

Appendix 2

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

5 GENERAL ALTERNATIVE ROUTES AND TYPES OF TRANSMISSION

5.1 Introduction

A number of interveners suggested general alternative routes which they said were preferable to those proposed by the applicant. This section considers the relative advantages and disadvantages of these routes from various points of view including agricultural impact, cost, environmental impact, communication circuits, jurisdictional constraints and future planning.

The majority of interveners did not specify an exact alternative route but suggested general areas where a transmission line would have less agricultural impact. This reduction in impact would result from the use of non-productive land such as railway or highway rights of way or from the use of land with a lower agricultural capability such as pasture land or foothills. Since the interveners made general comments only, no separate sections of interveners' views are given for sub-sections 5.2 to 5.7.

The applicant commented on most of the interveners' alternatives separately and those comments are included under the separate headings. The Board, in most cases, selected fairly specific routes corresponding to its interpretation of the interveners' general suggestions and examined these in detail. The Board's views are provided separately for each suggested alternative.

In addition to alternative routes, some interveners also proposed alternative types of the transmission and transmission line design. The views of the applicant, interveners and Board on underground transmission, direct current transmission and pedestal towers are included in subsections 5.8 to 5.10.

Figure 1a shows most of the locations and topographical features referred to in this section.

5.2 Adjacent to Railway Lines

Views of the Applicant

The applicant noted that the transmission line should pass by the Blackie substation for electrical supply and planning reasons, and therefore the only railway right of way worth serious consideration was that running from Eltham south through Vulcan. This right of way, however, is generally only 100 feet wide (compared to 200 feet in the Langdon area where CP Rail agreed to a railway alignment proposed by Calgary Power), and CP Rail had indicated to Calgary Power that it would oppose a line on a 100-foot railway right of way. Calgary Power also noted that several towns were situated adjacent to the railway thereby causing problems with routing the transmission line. Finally, the number of bends in the railway would increase the length and cost of the transmission line.

Views of the Board

The Board identified two railway routes, from Herronton to Lomond, and from Eltham to Kipp, which could be utilized for lengthy portions of the transmission line. As well, the Board examined a number of shorter segments which could be used in conjunction with the longer ones.

The route from Eltham to Kipp is reasonably direct. Its total length is approximately the same as the comparable portion of Calgary Power's preferred route and somewhat shorter than its alternative route; however this route contains many bends which would increase the cost of the transmission line, and, in addition, the width of the right of way is only 100 feet. The Board accepts that with only a 100 foot right of way the transmission line would probably have to be located off the right of way where it would likely interfere with agricultural operations as much as the alternatives proposed by the applicant.

The route from Herronton to Lomond is not very direct and therefore longer than the related portion of the applicant's alternative route. This route also contains many bends and the right of way width is only 100 feet. The Board concluded that this alternative was even less desirable than the Eltham to Kipp route.

The shorter segments studied by the Board also have many bends and 100 foot rights of way, and are, therefore, undesirable.

CP Rail and Alberta Government Telephones (AGT) communication circuits, exist along portions of all the routes examined. Most AGT circuits were considered by AGT to be immovable because of their design and the numerous repeater stations. The remaining AGT circuits could be relocated but at a cost of $10 000 per mile.

Since a transmission line could not be located on existing railway right of way, and since a route adjacent to a railway right of way would be significantly more expensive without offering a major reduction in agricultural impact, the Board concludes that this alternative is not preferable to the applicant's routes.

5.3 Along River Beds

Views of the Applicant

With regard to the use of river beds or river banks, Calgary Power stated that Alberta Environment would object because these areas were considered environmentally sensitive and useful for recreation purposes. It also stated that siting the towers would be difficult because of river bank instability and erosion around tower bases.

Views of the Board

The Board considered the Little Bow and Oldman Rivers as the most promising locations; however, because of the meandering channels and indirect routing, a transmission line route along either one of these rivers would be considerably longer and, therefore, more expensive than a line on one of the applicant's routes.

In addition, the Board agrees that environmental conflicts and construction problems would result from a route along a river. Costs would increase because of the number of angle structures required to follow the bends in the river, and in some river bed areas, particularly along the Little Bow River where cultivation is extensive, no reduction in agricultural impact would be realized. The Board concludes that this alternative is not a viable one.

5.4 Through the Foothills

Views of the Applicant

To comment on such a route, the applicant chose a general alignment which was initially southeast to Blackie to allow a future tie-in to the Blackie substation, then west past Black Diamond before turning south, keeping west of the Porcupine Hills, and finally east to Lethbridge. Calgary Power estimated the length of this route at 200 to 210 miles of which 60 per cent would be on land similar to the land on its proposed routes. Since this foothills route was about 90 per cent longer, the applicant suggested that this would not result in a significant overall reduction in the impact on agriculture.

Views of the Board

The Board estimated that if the transmission line was routed through the foothills, the line would be considerably longer than the applicant's routes. This length includes the distance from Calgary to the foothills and from the foothills to Lethbridge. The segments of this route to and from the foothills would cross some prime agricultural land, and would affect as many miles of land with soil in classes 1, 2, and 3 as Calgary Power's alternative route would. Near Lethbridge the transmission line would have to cross some irrigated land, although possibly less than either of Calgary Power's proposed routes. The topography of the north-south portions of the route through the foothills themselves would likely require more angle towers as well as tangent structures, and would result in increased costs.

The Board observes that, if the line was placed in the foothills, the constraints indicated by Calgary Power in relation to the Blackie substation and the Bow City bus would not be satisfied and additional lines might be required in those areas.

Considering the substantial increase in construction cost, the limited reduction in agricultural impact and the disadvantage with respect to the future development of the applicant's transmission system in southern Alberta, the Board concludes that at this time the foothills route is not a practical alternative.

5.5 Parallel to CP 911L

Views of the Applicant

The applicant said that one reason for the locations of its alternative routes was to maintain a separation of 20 to 40 miles from the existing 240 kV line, CP 911L. This separation, according to Calgary Power, would put the lines in different storm zones so that, if a storm damaged the towers on one line, the other line could continue to supply the load. The applicant estimated the length of a line parallel to CP 911L would be 160 miles.

Views of the Board

The Board notes that if the proposed transmission line paralleled CP 911L from Janet to Peigan, then CP 725L to Lethbridge, the length of the line would be somewhat longer than Calgary Power's alternative route. Upon examination of this route, the Board found that because the proposed line would be beside an existing line, and therefore require additional right of way, the inconvenience to farmers and impact on agriculture would be as great as for Calgary Power's routes.

The Board found that additional construction would be needed to connect the line to the Blackie substation and future Bow City bus. This construction would likely cross good agricultural land.

The Board agrees that paralleling the proposed line with the existing line would reduce reliability by increasing the possibility of both lines being damaged by the same storm.

Since agricultural impact would not be reduced and some reduction in reliability would occur the Board rejects this general alternative.

5.6 Unused Road Allowances

Views of the Applicant

The applicant stated that it builds single-pole wood lines on road allowances, but that the cost of relocating such lines, if necessitated by road widening, is not great compared to the cost of relocating a 240 kV line of steel construction.

Calgary Power stated that it made enquiries with several agencies regarding the use of unused road allowance. All those replying indicated that they did not want the line built on unused road allowances because they could not predict the future use of the road allowance, and because conflicts with AGT circuits could occur.

Views of the Board

The Board investigated the possibility of obtaining the permanent closure of unused road allowances, and found that, under current legislation, road allowances could be closed by a county by-law, but that such a by-law could be repealed at any time. The Board agrees with Calgary Power that, because of the cost of relocating a 240 kV transmission line, closure of a road allowance for at least the life time of the line (more than 50 years) would be required.

Contacts with the County of Vulcan indicated that the county had the responsibility of providing roads and could not accurately predict when or where new roads would be requested. Because it is not possible to ensure the permanent closure of any given road allowance, the Board does not believe this to be a practical alternative.

5.7 Upgrading Lower Voltage Lines

Views of the Applicant

Calgary Power considered the possibility of either upgrading an existing 138 kV line or salvaging an existing line and using its right of way for the new line. Regarding the first suggestion, the applicant stated that the wood-pole structures of the 138 kV lines would not be strong enough to support the weight of additional insulators and conductors. Also, the structures were not tall enough or wide enough to provide adequate safety clearance from conductor to conductor or from conductor to ground. Regarding the second suggestion, the applicant commented that the wood-pole 138 kV lines were built mainly on road allowances not allowing sufficient room for a 240 kV tower structure. In any case, Calgary Power planned to continue to use all the existing 138 kV lines to transmit electric energy.

Views of the Board

The Board agrees with Calgary Power's statements that the existing 138 kV poles are not strong enough to carry a 240 kV line and that existing rights of way do not contain sufficient room for 240 kV structures. The Board is satisfied that all existing lines are needed, along with the proposed line, to transmit electric energy, and does not consider this a viable alternative.

5.8 Underground Transmission

Views of the Applicant

The applicant's argument against an underground line was that the cost would be some 20 times greater than that for a conventional overhead line such as the one it proposed.

Views of the Interveners

A number of interveners, including the Milo area group and Mr. T. Hartung, suggested that an underground or underwater (McGregor Lake) type of construction would avoid the farming conflicts and visual impact. Mr. R. E. Moronda commented that, since AGT had been burying its lines, Calgary Power should do the same. Some interveners said they would provide free easement for an underground line rather than have an overhead line built on their property. Others stated that several such underground lines were currently in use.

Views of the Board

The Board agrees that underground construction would avoid most of the visual and agricultural problems associated with electric transmission lines, but finds the cost prohibitively high. From information supplied by Calgary Power in 1973 and Edmonton Power in 1975 and 1977, the Board estimated that a double-circuit, 240 kV, underground transmission line would cost between $1.5 and $2.0 million per mile. This cost would be about 15 times as much as that for an overhead line which costs some $125 000 per mile. On a total project basis this would represent an additional expenditure of roughly $175 million. The Board does not believe that an additional investment of this magnitude can be justified.

5.9 Direct Current Transmission

Views of the Applicant

The applicant did not comment on direct current (D.C.) transmission.

Views of the Interveners

D.C. transmission was proposed by some interveners to avoid the potential hazards such as electric shock from induced currents created by alternating current (A.C.) transmission.

Views of the Board

The Board notes that D.C. transmission is normally considered for the transmission of large blocks of power over relatively long distances (in excess of 300 miles without any intermediate taps), or in unique technical or physical situations such as underwater from mainland British Columbia to Vancouver Island. Further a D.C. transmission line requires reactive support at the load in the form of capacitors and/or synchronous condensers, the costs of which are not included in the cost estimate given below.

The major cost consideration involves the converter stations required at one end of the line to change alternating current from the system to direct current and at the other end to change direct current back to alternating current for distribution. The estimated cost of a back-to-back A.C. - D.C. converter station is some $100 000 per megawatt (MW). The proposed Janet to Lethbridge line, CP 924L, might be required to carry up to 200 MW during an outage on the existing 240 kV line, CP 911L. Therefore an estimate of the cost of the converter stations for a D.C. line built in place of CP 924L would be some $20 million.

The cost of the D.C. transmission line itself would be less than that for an A.C. line if only two conductors were used with the earth serving as the return. Under certain operating conditions this could cause serious corrosion of nearby pipelines. To isolate the line a return conductor would have to be added, meaning that the construction would more closely resemble that for the A.C. line with a cost of some $11 to $13 million. Thus the total cost of the D.C. line and conversion equipment would be approximately $31 to $33 million.

Calgary Power's future plans include lines from Lethbridge to Bow City and later Janet to Bow City. Should these future lines also be D.C., an additional future expense would be incurred. As well, a future tap at the Blackie substation, as planned by Calgary Power, would require another converter station since a high voltage D.C. circuit breaker has not yet been developed. Given the increase in costs to build the proposed line and the possible additional future costs, the Board does not consider D.C. transmission a viable alternative in this situation.

5.10 Pedestal Towers

Views of the Applicant

Calgary Power stated two main objections to steel pedestal towers. The first was the price of some $19 000 each compared to about $4 300 for a conventional steel, lattice tower (tangent type). In addition, the applicant noted that the footing for a pedestal tower would cost an additional $10 000 to $11 000, which the applicant considered expensive although it did not state a comparable cost for a lattice-tower footing. In total Calgary Power estimated that a pedestal-tower line would cost some $224 000 per mile compared to $90 000 to $110 000 per mile for a lattice-tower line.

Calgary Power's second objection was that supply would be a problem because the two Canadian manufacturers can produce only one tower each per day while the major American manufacturer can produce only three per day. Given these production rates the applicant estimated that, together with the time required for tendering and acquiring the steel, some 14 months would be required to obtain all the 600 towers needed. The applicant indicated that Canadian utilities were currently using pedestal towers only in small numbers in urban areas where the area available for a right of way was limited.

Views of the Interveners

The Little Bow Association stated that because of the design of pedestal towers, they could be placed on existing rights of way off farm fields and with only the conductors overhanging the fields. They indicated

that the impact on farming would be reduced because farming around the towers would not be necessary.

Mr. W. Arsene disagreed with Calgary Power's statements about the cost and the availability of the pedestal towers. He said that such towers could be purchased from manufacturers in British Columbia, who could supply them more quickly and cheaply than Calgary Power had indicated.

Views of the Board

The Board agrees with the statements of the Little Bow Association that pedestal towers would reduce the impact on farming. The Board also agrees with Calgary Power's argument concerning the cost and availability of steel pedestal towers.

The Board has received two applications from Edmonton Power proposing short segments using steel pedestal towers. In July 1976 Edmonton Power estimated the cost of a double-circuit, pedestal-tower line to be $398 000 per mile, excluding land, for a 1.5 mile section. This could be compared with Edmonton Power's estimate of $129 000 per mile, excluding land, for an adjacent six-mile section of double-circuit, steel, lattice-tower line. In a more recent application an estimate provided by Edmonton Power in April 1977 indicated that a double-circuit pedestal-tower line would cost $343 000 per mile, excluding land, based on a 2.61 mile section. The Board notes that Calgary Power has shown an average cost of about $95 000 per mile, excluding land, for the single-circuit Janet to Lethbridge line using steel, lattice towers, while the cost of adding a second circuit would be some $24 000 per mile. Therefore the Board believes that by comparison a pedestal-tower line costing $224 000 per mile as estimated by Calgary Power, or up to $398 000 per mile (based on short sections) as estimated by Edmonton Power is not justified by the reduction in agricultural impact that might result from their use. The Board also has reason to believe that Edmonton Power is experiencing some difficulty in obtaining steel, pedestal towers from its supplier.

The manufacturers identified by Mr. Arsene advised the Board that they supplied wood poles, but not steel poles, and they did not know if their wood poles were used for 240 kV, double-circuit lines. One manufacturer indicated to the Board that it would be able to supply very few poles over 110 feet long. Steel, pedestal towers are generally some 130 feet long. No evidence was presented indicating that any electric utility was presently using wood poles for 240 kV double-circuit construction.

The Board does not believe the reduction in agricultural impact would justify the increased cost associated with steel pedestal towers.

5.11 Summary of the Board's Views on the General Alternative Routes and Types of Transmission

As stated in subsection 5.1, the object of this section was to determine if any of the alternatives suggested by the interveners were viable and offered advantages over the applicant's alternative routes and proposed type of transmission. In the Board's view as detailed in the individual subsections, none of the alternatives offer significant advantages and each has major drawbacks particularly with regard to cost and environmental impact.

The Board concludes, therefore, that the routes proposed by the applicant are the most practical and that the proposed type of transmission is preferable to the others suggested.

The Board believes that if a farmer has room to manoeuvre around a tower in his field he will cultivate the area surrounding the tower rather than leave an oval-shaped portion that could cause a weed problem. Therefore, to gain maximum advantage from a boundary route through cultivated land, the towers should be placed up against the boundary line rather than 40 feet from the edge where they may not allow enough room for equipment to pass.

(ii) Alignments in Corridors

The applicant and a number of interveners argued the merits of following existing transmission lines in what might be termed corridors. The Board believes that corridors, as well as diagonal routings, must be considered on an individual situation basis. According to Calgary Power's impact assessment, the land-use impact of a second transmission line parallel to a similar existing line is the same as the impact of the first line, but the visual impact of two lines together is less than the sum of the impacts of two individual lines. Therefore this assessment method implies that there is an advantage to multiple lines in a common corridor. The Board is not satisfied with such a conclusion, and in fact suspects that the converse may be more acceptable. Therefore, where it is proposed to locate more than one line on a right of way, the Board believes that consideration should be given to the impact of the added transmission line in isolation from the existing lines. On the other hand, the Board recognizes the advantages of planned corridors which may contain transmission lines only, or other industrial or transportation facilities as well. In this situation; there may be "dead" areas which could be suitable for a transmission line.

(iii) Quality of Land

The Board agrees with both the applicant and a number of the interveners that, where possible, transmission lines should be located on less productive land in preference to more productive land. Likewise, routes on grazing land are generally preferable to routes on cultivated land. At the same time, unnecessarily crossing miles of highly productive land to reach an area of less productive land does not reduce the impact of the transmission line.

Appendix 3

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

5 SUITABILITY OF ROUTING THE PROPOSED TRANSMISSION LINES IN A COMMON RIGHT OF WAY OR A UTILITY CORRIDOR

Many interveners suggested that, if needed at all, the proposed transmission lines should be located in either a common right of way or a utility corridor. In the latter case the corridor identified comprised the northern route and would include the two existing transmission lines from the Wabamun area to Edmonton. It was contended that either of these approaches would result in lower overall impact and more effective use of the land. It was also contended that the establishment of a utility corridor between the major generating area of Wabamun and Edmonton would meet basic planning criteria.

In the applicant's view, locating both lines in a common right of way would expose Alberta's interconnected system to unacceptable risks. Should the lines fail simultaneously, the interconnected system would be severely affected with possible serious consequences not only to consumers left powerless but to generating plants, which would face a widespread chain reaction of shutdowns.

The Board agrees that utility corridors represent a desirable alternative where a well-defined need exists for utility services between two areas, such as the generating area at Wabamun and Keephills and the load centre in Edmonton. In this respect the Board uses the term "utility corridor" to mean a properly established and officially designated corridor that would properly protect the rights of landowners affected by it. In this particular instance, however, the Board believes that another factor must be recognized, namely the reliability of Alberta's interconnected system and the serious consequences to that system of a common outage of both 500-kV circuits if the proposed transmission lines occupied a common right of way, or a utility corridor

comprising the two existing lines and two proposed lines. The Board has assessed the situation and a summary discussion follows.

The Board considers the probability of a common outage very low but agrees with the applicant that the consequences to the interconnected system of such an event could be so substantial as to be unacceptable. A common outage on the two 500-kV transmission lines would remove up to 3000 MW from the system, or more than one-third of the total peak load in 1991; and could result in power blackouts throughout the province. The situation, of course, would be that much worse if the common right of way formed a part of a utility corridor also occupied by the two existing lines between Wabamun and Edmonton. The Board therefore concludes that locating the two 500-kV transmission lines in a common right of way is unacceptable and that a separate right of way for each line is necessary.

At the hearing the interveners made reference to the inconsistency of Calgary Power's reliability argument since it proposed a common right of way in the Restricted Development Area (RDA) bordering Edmonton. The extent to which a common right of way would apply would vary somewhat depending upon the specific routes selected. Interveners suggested that if a common right of way is acceptable to Calgary Power within the RDA it should be acceptable throughout the full route. Calgary Power contended that it would prefer not to use a common right of way even within the load centre, but that the previous establishment of an RDA and provision for a utility corridor made this appropriate in order to minimize the impact additional rights of way would have on the area.

The Board recognizes the problems of planning for transmission lines within metropolitan areas and agrees that in that type of situation utility corridors are a necessity. The establishment of utility corridors inevitably involves certain trade-offs and one of the disadvantages is the concentration of utilities. The Board agrees that in this particular

case a common right of way in the RDA could have a substantial impact on the reliability of the interconnected system. In the Board's view it would be preferable to avoid routing the two lines in a common right of way in the RDA if at all possible, but in any event the degree to which a common right of way was used should be minimized.

8 OTHER MATTERS

8.1 LOCATION OF TRANSMISSION LINES IN UTILITY CORRIDORS

Several interveners held that the proposed transmission lines should be routed in utility corridors, and particular reference was made to the fact that two transmission lines are already located along the northern route and in effect form a corridor. The Board agrees that under certain circumstances utility corridors are desirable. In some instances it is known that several transmission lines will later be required in which case they will probably be routed close together, as for example in the interconnection of major generating areas and load centres or in the connection of a 500-kV substation to several 240-kV substations. These represent situations having a sound basis for establishment of a corridor. Under such circumstances it would appear appropriate to the Board for the government to consider the desirability of establishing a corridor and providing for suitable compensation or purchase options to the landowners affected. With respect to the specific applications dealt with here, the Board believes the northern route may qualify for this type of consideration and recommends that the government assess its desirability as a corridor.

Conversely the Board sees no advantage to the suggestion that a complete network of utility corridors should now be established throughout Alberta since there is no assurance that over the years such designated corridors would prove to be in the right place to connect as yet undetermined generating plants, load centres, and switching points.

Appendix 4

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Mr. Renard objected to the preferred route on the basis that it would devalue his piece of property located in Section 30, Township 25, Range 1, West of the 5th Meridian and he would not be able to sell the property to B.A.C.M. who now hold an option on his 20 acre parcel.

Mr. Olson appeared on behalf of Mr. Wilson and stated Mr. Wilson's objection to the preferred route because it would pass directly over his house, feed lot and other buildings located on his property in Section 31, Township 25, Range 29, West of the 4th Meridian.

Mr. Speirs stated that the preferred route was the most desirable because of the corridor concept and also because it traverses the Calgary Correctional Institution property. Mr. Speirs indicated that he objected to alternative routes 2, 3 and 4. He stated that Route 4 would have the most effect upon his property located in the Southwest quarter of Section 4, Township 26, Range 2, West of the 5th Meridian. He stated that a development officer of the Municipality of Rockyview indicated that a part of his quarter section could be subdivided. This possible subdivision would be traversed by alternative Route 4. Mr Speirs stated that this would mean a loss of approximately fifteen acres of land and a great financial loss if the transmission line was built on alternative Route 4.

The Bushfield group, consisting of 30 landowners along alternative routes 2 and 3 objected to alternative routes 2 and 3 which they said would have a greater visual impact than the preferred route. The group also stated that most of the land along alternative routes 2 and 3 is good agricultural land and the proposed transmission lines would interfere with and impose hardships and inconvenience upon those who are conducting farming operations. The Bushfield group considered the preferred route as the most acceptable route because of the corridor concept and utilization of the Calgary Correctional Institution land.

Mr. John Church representing 37 landowners along alternative Route 5 stated that they wished to go on record as supporting the preferred route. Mr. Church indicated that the Alberta Land Use Forum had recently held public hearings and at these hearings it was stated over and over again that good agricultural land should be preserved for agriculture. Mr. Church stated that the group's calculations indicated that alternative Route 5 consists of 80 to 85 per cent cultivated land while the preferred route is approximately 75 per cent cultivated. He suggested that if preferred route was selected over alternative Route 5 there would be a net savings of 63 acres of agricultural land. Mr. Church also supported the corridor concept since this would be preferrable to two separate right of ways.

5.23 Views of the Board

In examining the relative merits of the preferred and alternative routes shown in Figure 7 the Board assessed the economic, environmental and technical aspects of each of these routes. In addition it weighed the nature and extent of objections to each route as well as certain planning factors in determining the most desirable route.

The Board generally accepts the cost data presented by Calgary Power for each of the alternatives but notes that the capital cost figures were based on stringing a single circuit on the first set of double circuit towers and on sufficient land for a total of three sets of double circuit towers. As stated in section 4.3 the Board is prepared, based on the evidence to date, to support the acquisition of sufficient right of way for only two sets of towers. The Board has therefore adjusted, on a proportional basis, the land costs presented by Calgary Power for each route. Calgary Power presented the estimated annual operation and maintenance costs for each alternative and the Board has included the total present worth of these costs, over an assumed economic life of 50 years, in its economic comparison. The economic comparison is given in Table 6.

With regard to the environmental impact of the preferred and alternative routes the Board accepts the view expressed by Alberta Environment in Appendix A as to the validity of the basic methodology used by Calgary Power in the preparation of its Impact Assessment. The Board recognizes that the Impact Assessment was prepared to indicate the relative, rather than the absolute, environmental impact of the routes. The present day land use and visual impact of each route was based on three sets of towers on the area surrounding each route, as it currently exists, and although the Board believes that only two sets of towers would ultimately be required, it is satisfied that the present day assessment still indicates the relative ranking of each route with respect to environmental impact. With regard to the future impact the Board does not believe that a possible highway along a portion of the preferred route to alternative Route 4 should be considered as a factor in determining their land use and environmental impact since such a highway, or its location, has not yet been firmly established. The Board, using the applicant's standards of environmental impacts, has adjusted the future impact ratings of the preferred route and route 2, 3 and 4, to remove the influence of the highway. It recognizes that this is a conservative approach in the event the highway is announced in the near future but the Board is satisfied that the adjusted ratings allow a more equitable evaluation of all the routes.

The Board and the Department do not agree with Calgary Power's method of assessing the total impact of those circuits which may serve the City's future facilities, which implies that these circuits would each be located on a new right of way. Based on the applicant's evidence at the hearing that two of the three circuits would be adjacent to existing transmission lines, the Board, using the applicant's environmental assessment standards, has adjusted the total impact assessed against the City circuits to reflect the incremental nature of the impact of these circuits. The Department concurred, as noted in Appendix A, with the Board's adjusted values for the impact of these City circuits.

The Board's basic approach to determining the most desirable route for the proposed line was to compare the five main alternative routes firstly in the present day situation, followed by a separate evaluation based on the future situation, recognizing the advantages and disadvantages in

each case. The economic and environmental data considered by the Board in its decision are summarized in Table 6.

With respect to the present day situation the Board observed that if the routes were arranged in order of lowest cost or lowest environmental impact the resulting order would be the same in both cases. Alternative Route 5 offers the lowest present day cost and environmental impact of the five routes followed by alternative Route 2 which would be about 500,000 dollars more costly and would have a significantly greater environmental impact. On environmental grounds there is little to choose between the preferred route and alternative Route 2, although the preferred route is 200,000 dollars more expensive. Alternative routes 3 and 4 are both more expensive and have a greater environmental impact. Based on the present day situation as far as economics and environmental impact are concerned, the Board considers alternative routes 5, 2 and 1, in that order as the most desirable of the five routes considered.

The future assessment shows that there is little difference between alternative routes 1, 2, 3 and 5 as far as environmental impact is concerned. In economic terms however, the preferred route and alternative Route 2 are the most economic and have a noticable advantage in the order of 750,000 dollars over alternative Route 5. In weighing this cost advantage over alternative Route 5 the Board's figures reflect acceptance of the applicant's claim that if the tie line were built along alternative Route 5 the longer City circuits would be required and the related extra cost for these circuits would be incurred. The Board notes however that there is virtually no cost difference between the preferred route and alternative Route 2 and therefore neither route has a decided economic advantage.

After examining the relative economic and environmental impact merits of the five routes in the present and future situations the Board reviewed each of the most desirable routes over the total time frame having regard for other factors which may influence the choice of route. While Route 5 had a definite environmental advantage in the present day situation it did not maintain this advantage when the future City circuits were considered. Similarly Route 5 had a sizeable economic advantage over all other routes in the present but became the most expensive route as far as the future was concerned. In the Board's views the present day economic and environmental advantages of Route 5 are outweighed by the future situation in which the environmental advantage has disappeared and a significant economic disadvantage is encountered. The Board also notes the argument by the City of Calgary that based on the expected increased load in the north area of the city, and the location of its existing bulk distribution system, the City may in any case for technical reasons require an east-west 240 kV line some four miles north of 80th Avenue to serve this load. It was pointed out that Route 5 would not be a suitable alignment for this purpose and if it were approved the City may, at some point in the future, request a right of way more suited to its needs which would likely be along the approximate route of the preferred route. Although the Board did not consider the possibility of a ring road around

TABLE 6 PRESENT AND FUTURE ECONOMIC AND ENVIRONMENTAL IMPACT ASSESSMENTS OF THE PREFERRED AND ALTERNATIVE ROUTES

	Total Impact (Miles)		Total Cost (1975$ X 10^3)	
Route	Present	Future	Present	Future
1	40.9	59.3	3230	3230
2	39.5	59.0	3030	3240
3	42.1	61.9	3480	3690
4	44.2	64.3	3560	3560
5	33.9	59.4	2550	3980

Calgary as a factor in assessing the environmental impact of the routes it must however, based on the applicant's evidence, recognize the possibility that such a road may be built. In view of the Department's support, as expressed in Appendix A, of the corridor concept for locating linear disturbances, such as roads and transmission lines in a common right of way, the Board does not believe it prudent to pre-empt a potential corridor by approving Route 5 when such evidence as exists indicates that a highway would not likely be located along that route. In addition the Board took account of Alberta Transportation's acceptance of the preferred route as a suitable alignment for a portion of a future possible ring road to the north of Calgary. Since in the long term alternative Route 5 does not appear to have any lesser an environmental impact than the other routes, since it would be the most costly in the future, since it would not lead to the efficient development of a bulk distribution system to serve the northwest portion of the City and since it could eliminate the possibility of a common right of way for a possible highway and transmission lines, the Board concludes that alternative Route 5 does not warrant further consideration.

The remaining alternative routes, 2, 3 and 4, will now be considered in relation to Route 1. The Board notes that the preferred route and alternative Route 2 are about equal in economic and environmental impact in the long term whereas both alternative routes 3 and 4 are much less attractive in both present and future situations particularly with respect to cost. The Board received objections from the majority of landowners affected by section NJK of alternative routes 2 and 3 whereas there were fewer objections involving a smaller portion of the land on which the corresponding section of the preferred, section PBC, would be located. In addition the Board concurs with the view of one intervener who pointed out that there are fewer residences in the "high avoid" and "high visual impact"(4) area along section PB of the preferred route than along the corresponding section NJ, of alternative routes 2 and 3.

Locating some three miles of the preferred route within the jail property, which is not available for private development, represents to the Board a more efficient use of land than disturbing existing privately owned parcels along the corresponding sections of alternative routes 2 or 3. Since the section of alternative routes 2 or 3 east of point N do not appear to offer any advantages over the parallel section of the preferred route and have several disadvantages, the Board has eliminated these routes for the proposed transmission line.

In comparing section AP of the preferred route versus alternative Route 4 the Board notes that alternative Route 4 would be over 300,000 dollars more costly in the long term. Alternative Route 4 would use an additional mile of jail property for right of way but a total of 1.5 miles of private land would be affected versus only one mile in the case of section

---

(4) Terms used in Impact Assessment by the applicant.

AP of the preferred route. The Board is satisfied that the right of way would not cause a more serious land use or visual impact on the residences along AP than would be the case for alternative Route 4. On balance the Board does not see any compelling reason to cause the applicant to follow the more costly route and therefore considers section AP of the preferred route as an acceptable route. It follows that, west of Highway 2, the Board is satisfied that the preferred route is more desirable than any of the alternative routes.

With regard to the east end of the preferred route it is evident that in view of the existing highway reserve through the Prairie Royal Estates development there would not be sufficient right of way for the proposed transmission facilities. Additionally due to the local density of the residences, the open nature of the terrain, and the severe visual impact that would result if the right of way bisected this development, the Board concurs with the Department (see Appendix A) that the right of way should be taken to the north of this residential community and follow route RSTF.

With respect to Mr. Nemetz's proposal that the north-south portion of sub-alternative Route Y (the RS portion of route RSTF) be moved one-half mile west, and Mr. Jorgensen's suggestion that the RF section of the preferred route be placed south of Prairie Royal Estates, the Board is not at this time prepared to approve these alterations since these alternatives were not advertised and the hearing would have to be reopened to consider these possibilities. However, should Mr. Nemetz's client, Mr. Ray, and Mr. Jorgensen come to an agreement with the applicant regarding the proposed changes, the Board would be prepared to accept an application to amend the route.

Based on the foregoing discussion the Board is prepared to approve a right of way along the preferred route except at the east portion of the route where route RSTF is to be followed.

6 WIDTH OF RIGHT OF WAY FOR THE PROPOSED ROUTE

6.1 Views of the Applicant

Calgary Power indicated that it proposed to purchase and obtain title to a right of way of sufficient width to accommodate three double circuit 240 kV transmission lines. The applicant stated that in establishing the right of way width for this particular corridor, the following points were considered; sufficient right of way for reliable service, safety, space for construction and maintenance, cost of land and the environmental considerations, particularly those relating to land use.

Based on the foregoing considerations Calgary Power proposed to acquire a right of way of 240 feet in width in those sections of the approved route and alternative routes 2, 3 and 4 which do not parallel the highway route under consideration by Alberta Transportation. A 300 foot right of way would be obtained where the approved route and alternative routes

FROM:
DECISION 76-F
ENVIRONMENTAL
EVALUATION
by
ALBERTA
ENVIRONMENT
MARCH, 1976

Corridor Concept

Considerable reference has been made in the application to the possibilities of a transmission line - highway corridor which would run for some 12 to 13 miles along the eastern portion of the preferred route. In fact, Calgary Power has considered this corridor concept when it evaluated the impact on future land use and aesthetics along this portion of the route. The corridor concept has been accepted by this and other government departments as a worthwhile method of reducing total environmental impacts accruing from two or more separate utility right-of-way's in the same area.

The Department of Transport and Calgary Power have worked closely over the last year on this corridor concept. Tentative plans drawn up by that department would suggest that were a major highway to be built in the future, it would follow an alignment as shown in Calgary Power's application. For this reason, the Department of the Environment again suggests that the preferred route is the most acceptable in terms of minimizing total environmental impact.

Appendix 5

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

impact on future development to be more significant than the impact on agriculture, and has attached only modest weight to agricultural impact in its comparison of the routes.

o Residential Impact

In its analysis of residential impact, the Board considered both the present and future impacts. The former would consider the impact on existing residents, whereas the latter would consider the impact assuming that the area south of the city was fully developed. Two large urban developments, Daon's Project 80 and West City's Heritage Valley Project are planned for the area south of the city and would be traversed by the proposed alternative routes.

The interveners submitted that a transmission line right of way would have a direct impact on the design and development of an urban area in three respects: the quantity of land consumed by the right of way; the visual and aesthetic effect which could have a direct bearing on the marketability and value of nearby properties; and the constraints placed on the overall design of the development.

The Board agrees that a transmission line right of way could have the described impacts. However, the need for lines such as those proposed is also partly a result of the increased electrical demands created by these types of developments. The Board, therefore, believes that where major urban development is expected, transmission lines cannot be completely eliminated; but agrees with the interveners that the impact can be minimized by proper planning. This matter is discussed further in Section 5.2.

Visual and aesthetic impact were also matters of concern to the interveners. The Board believes the judgement of visual impact to be somewhat subjective and the assigning of quantitative values to compare visual impact on residents difficult, particularly for future urban development. The Board, in its analysis of visual impact, considered such items as the length of line, its location with regard to existing

residences, the configuration of the line (number of corners in the alignment), and conflict with future development.

In this regard, the total length, the length of right of way through future urban developments, the approximate land area within each of the rights of way in the urban areas, and the number of existing residences within 100 metres of each of the alternative routes are shown in the tabulation below.

ROUTE	TOTAL ROW LENGTH (km)	LENGTH OF ROW THROUGH URBAN AREAS (km)	AMOUNT OF URBAN LAND WITHIN ROW (acres)	NUMBER OF RESIDENCES WITHIN 0 to 100 m
West	17.1	8.5	105	3
Centre	14.8	5.5	68	0
East	16.5	14.5	176	1
Makale	17.0	16.0	198	4
Mackenzie A	18.5	18.5	228	11
Mackenzie C	19.7	7.0	86	8

In several of its decision reports, the Board has indicated that it subscribes to the corridor concept and believes it to be in the long-term public interest for utilities such as transmission lines to be located in designated corridors whenever reasonable and practical, in order to reduce impact on residents. The Edmonton Restricted Development Area as shown in Figure 2 has been adopted by the government for use as a utility corridor. However, in order to gain access to this corridor, the proposed urban area south of the city must be traversed in one way or another. These concerns, plus the physical separation of the lines to achieve electrical reliability must also be weighed.

o Environmentally Sensitive Areas

The Board recognizes that the construction of transmission lines in the environmentally sensitive areas of the Whitemud and Blackmud Creeks

could have some impact but believes that it would not be serious and could be minimized by proper clearing and construction practices. Therefore, the Board has decided that it would assign a low weight to these impacts.

o Cost of Facilities

The lengths and 1978 dollar cost of each alternative route are shown in the tabulation below. The West, Centre, East, and Makale routes are from Calgary Power's submission, whereas the Mackenzie routes have been estimated by the Board's staff.

ROUTES	LENGTH (km)	CONSTRUCTION COSTS (thousands $)	ESTIMATED LAND COSTS (thousands $)	TOTAL (thousands $)
West	17.1	3 345	4 684	8 029
Centre	14.8	2 706	3 992	6 698
East	16.5	3 184	4 073	7 257
Makale	17.0	3 081	4 163	7 081
Mackenzie A	18.5	3 350	4 140	7 490
Mackenzie C	19.7	3 557	3 675	7 250

o Electrical Considerations

In Report 80-A, the Board recognized that placing both 500 kV lines in a common right of way in the Restricted Development Area (RDA) could have an impact on the reliability of the interconnected system and, other things being equal, preferred to avoid placing the two lines in a common right of way. Separate rights of way in the area south of Edmonton would increase the impact on urban developments and it therefore is necessary to weigh this disadvantage against the improvement in system reliability.

The Board notes the argument by the City of Edmonton that the proper combination of an additional 500 kV substation, and improvements to the 240 kV system, might eliminate the concerns regarding a common outage on two 500 kV lines in a common right of way in the RDA.

o Special Constraints

There are several special constraints that affect selection of the alternative routes. The Board believes that CJCA's signal pattern would likely be seriously affected by a line along the Makale or Mackenzie routes, and that the radio station could be forced to cease operation and relocate its facilities. CJCA stated that the cost of relocation would be more than 2 million dollars.

The Edmonton International Airport's electronic facilities might also be affected by lines along the Makale or Mackenzie routes.

CBC Radio's signal pattern could be disrupted by lines along Calgary Power's West or Centre routes, however, evidence at the hearing indicated that in these cases mitigating measures were possible.

4.2 Conclusions

Some of the factors assessed by the Board are compared in Table 1. Each of the alternative routes would in one way or another have some impact on the future residential development in the area south of the City of Edmonton, since each alternative would traverse land which would be developed in the future. However, the Board believes that the centre route would have the least overall impact, in part because it is the shortest route and because it parallels an existing pipeline right of way. Also it would remove less land from development than any of the other routes, and the shorter length of line would lessen the visual and aesthetic impacts. The centre route would be the least costly and would not have any significant impact on the operation of any radio station or the international airport. The only significant relative disadvantage of the centre route would be the parallelling of the northern 500-kV transmission line in the RDA.

TABLE 1: ROUTE EVALUATION OF THE EAST END OF THE KEEPHILLS–ELLERSLIE 500–KV TRANSMISSION LINE

IMPACTS ON LAND USE AND RESOURCE FEATURE	ROUTES PROPOSED BY CALGARY POWER			ROUTES PROPOSED BY INTERVENERS		
	WEST	CENTRE	EAST	MAKALE	MACKENZIE A	MACKENZIE C
A) Total ROW Length	17.1 km	14.8 km	16.5 km	17.0 km	18.5 km	19.7 km
B) Length of ROW through urban areas	8.5 km	5.5 km	14.5 km	16.0 km	18.5 km	7.0 km
C) Length of lines on a common right of way in the Edmonton Transportation Corridor	8.05 km	7.25 km	0.8 km	0.8 km	0 km	0 km
D) Number of Residences within 0 - 100 m	3	0	1	4	11	8
E) Route constraints						
i. Radio Station	May affect signal pattern of the CBC radio station.	May affect signal pattern of the CBC radio station.	Slight impact on signal pattern of CJCA radio station.	Will affect signal pattern of CJCA radio station.	Will affect signal pattern of CJCA radio station.	Will affect signal pattern of CJCA radio station.
ii. International Airport	No impact.	No impact.	No impact.	No impact.	No impact.	Impact on International Airport.
F) Natural Environment	Two minor Creek crossings.	Four Creek crossings.	Two minor Creek crossings.	Two minor Creek crossings.	Two minor Creek crossings.	Two minor Creek crossings.
G) Estimated Cost (1978 Dollars)	$8 029 000	$6 698 000	$7 257 000	$7 081 000	$7 490 000	$7 250 000

The Board does not believe that this one disadvantage is sufficient to offset the advantage of using a planned utility corridor and the other advantages mentioned above. It therefore finds the centre route to be the best alternative.

5 OTHER MATTERS

5.1 Joint Ownership

As part of the City of Edmonton's intervention, it submitted that to achieve fair and equitable joint planning and development, it was necessary for it to participate in the ownership of the 500 kV lines, and that it preferred to own one line outright. In order to achieve this, the City of Edmonton requested the Board attach a condition to any approval it issues requiring that satisfactory arrangements be entered into for the joint and mutual development of the transmission facilities, in the form of joint ownership between the City of Edmonton and Calgary Power.

It was the submission of Calgary Power that the sole issue before the Board was one of routing and that the question of ownership was not open for consideration at the hearing.

The Board has stated in Decision Report 80-A that it would expect the currently approved transmission lines to be fully utilized before approval was given to other lines from the Wabamun area to Edmonton. The City of Edmonton should therefore use the currently approved 500-kV transmission lines to connect their proposed Genesee plant to Edmonton, and the Board expects that an application for an interconnection, therefore, would be forthcoming.

The Board is satisfied that ownership of transmission facilities was not within the subject matter of the hearing and accordingly not an issue which was necessary for it to determine. If the City of Edmonton desires that a determination be made on the question of ownership, then an appropriate application may be made pursuant to The Hydro and Electric Energy Act.

5.2 Planning

Many interveners contended that transmission lines and other linear developments are basically incompatible with residential

development. They recognized that such facilities are required in order to meet the needs of residents in expanding communities but contended that they should be provided for through the development of regional plans that specifically include such services. By this means it was argued, urban developers can efficiently accommodate linear facilities.

The interveners recognized that in order for regional plans to include provision for transmission lines and other facilities, it would be necessary to know the long-term requirements for such services. Several of the interveners urged the Board to take the initiative in this long-term planning process.

The Board has considered the suggestions of interveners and agrees in principle that regional and other long-term development plans should provide for linear developments. The Board does not believe, however, that it has any jurisdiction to either inquire into or take any action with respect to any of the facilities or services other than transmission lines and pipelines. It cannot therefore assume the responsibility for developing long-term development plans. On the other hand, it does recognize that it has a responsibility to assess long-term transmission line requirements, and agrees that if this information were available to the Edmonton Regional Planning Commission and other planning bodies, it would facilitate their incorporation of these requirements in the long-term planning process. Having regard to the several suggestions that were made respecting the particular problems in the Edmonton metropolitan area, the Board will consider convening a public hearing to consider the long-term transmission line requirements for that area.

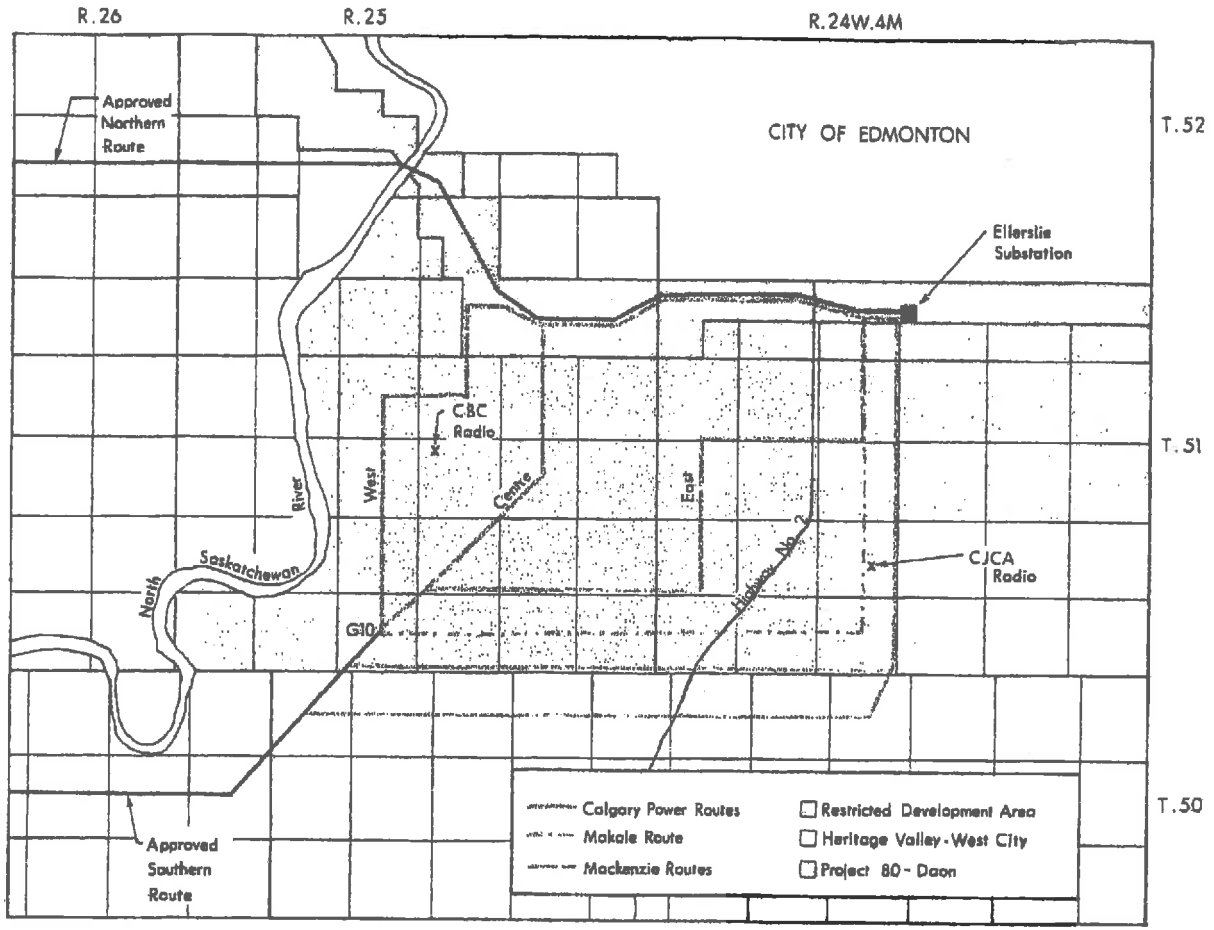


FIGURE 2 ALTERNATIVE ROUTES FOR EAST END OF 500 kV KEEPHILLS-ELLERSLIE TRANSMISSION LINE

Appendix 6

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

The montane area represented by Whaleback Ridge was held out to be an excellent example of a unique ecological area, which would suffer from the intrusion of a transmission line. In the Board's view, the impact would be more visual than environmental; and the location of the line at the base of the ridge in partly forested cover would reduce the impact to the minimum. The line would not be silhouetted against the sky; nor would extensive tree clearing, which tends to emphasize the right of way, be required.

While the Board does not believe that the environmental impact of a transmission line is serious for any of the routes, the eastern route would be less affected than the others. Since the central and western routes are common south of Chain Lakes, the impact would be the same for that portion, but the western route has a slightly higher impact north of Chain Lakes due to the erosion potential.

6.4.4 Visual Impact

The visual impact of the transmission line affects residents living nearby; travellers along intersecting or parallel highways; and hikers, skiers, fishermen, or campers who visit the foothills and mountains to enjoy the scenery. Negative reaction to the visual intrusion of the transmission line was just as strong from farmers and ranchers on the prairies and foothills as it was from interveners who use foothill or mountain areas for recreational purposes. The Board considered the visual impact from many aspects: the lack of screening available on the prairies compared to the opportunities afforded by rolling terrain to screen the line; the transparent or transient nature of the line as the distance between the line and a viewer increases; the higher intrusive effect in areas of high scenic beauty, and the significant impact created by clearing of heavy forest cover to provide the right of way.

Generally, the Board believes that a single transmission line on the prairies produces a moderate visual impact near the line which diminishes rapidly as the distance increases to 3 or 5 km. An advantage of parallelling an existing line is that the second line does not result in doubled visual impact.

Appendix 7

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

APPENDIX III FACTORS USED BY THE BOARD IN THE COMPARISON OF THE ALTERNATIVE ROUTES

The Board examined the three alternative routes from five major angles and from the viewpoint of any special constraints. To ensure its examination was complete the Board compiled and used a checklist that set out under each major component the many issues raised at the hearing and others considered by the Board to be significant.

III.1 Agricultural Impact

- Shared use with other utilities and transmission lines.
- Loss of shelter belts.
- Loss of crops. This would include short-term loss caused by construction, longer-term losses possible from soil erosion, rutting, drainage disturbance, soil mixing, and permanent loss of crop under or adjacent to the tower base.
- Short-term disruption of farming and livestock grazing resulting from construction.
- Risk of collision with tower; damage to equipment, lost time, liability for damage to tower, and secondary liabilities.
- Visual impact - a daily fact of life, no choice of viewing it.
- Psychological impact of line.
- Restrictions on use of aircraft and high-pressure irrigation systems.
- Impact of height restrictions on equipment during field operations.
- Reduced efficiency of field operations.
- Reduction in yield adjacent to towers due to overlapping farming operations and added soil compaction.
- Added cost and inconvenience of weed control under towers.

- Impact on tree farms.

III.2 Residential Impact

- Decrease in property values.
- Visual impact, alteration of the visual character of the area.
- Loss of developable land, and constraints on development.
- Relocation or removal of residents.
- Psychological impact of the line.
- Biological effects.
- Noise and T.V. interference.
- Windbreak and other vegetation removal.
- Conflict with recreation use of acreages.

III.3 Environmental Impact

- Increased public accessibility to wildlife areas.
- Reduction of habitat's winter carrying capacity due to depletion of cover and woody browse.
- Alteration of natural areas and sanctuaries and interferences with outdoor educational opportunities.

III.4 Cost

The cost of each route is shown in Table 7.1 and discussed in section 7.2.1.

III.5 Electrical Considerations

- Separation of the two lines to ensure maximum reliability.
- Proximity of future substations.
- Ease of connection to future generating stations.

III.6 Special Constraints

- Electrical interference with radio transmitting and receiving stations and satellite receiving stations.
- Physical conflict with private and commercial airstrips.
- Electrical/biological effects on The University of Alberta's research station.
- Inductive co-ordination with communication systems.

APPENDIX III FACTORS USED BY THE BOARD TO COMPARE ALTERNATIVE ROUTES

The Board examined the alternative routes considering 6 major aspects and from the viewpoint of any special constraints. To ensure its examination was complete the Board compiled and used a checklist that set out under each major component the many issues raised at the hearing and others considered by the Board to be significant.

III.1 AGRICULTURAL IMPACT

1 Loss of crops. This would include short-term loss caused by construction; longer-term losses possible from soil erosion, rutting, drainage disturbance, and soil mixing; and permanent loss of crop under or adjacent to the tower base.

2 Short-term disruption of farming and livestock grazing resulting from construction.

3 Reduced efficiency of field operations.

4 Restrictions on use of aircraft and high-pressure irrigation systems.

5 Risk of collision with tower; damage to equipment, lost time, liability for damage to tower, and secondary liabilities.

6 Reduction in yield adjacent to towers due to overlapping farming operations and added soil compaction.

7 Added cost and inconvenience of weed control under towers.

8 Impact of height restrictions on equipment during field operations.

9 Psychological impact of line.

10 Loss of shelter belts.

11 Shared use with other utilities and transmission lines.

12 Interference with citizens-band radios.

III.2 RESIDENTIAL IMPACT

1 Decrease in property values.

2 Loss of developable land and constraints on development.

3 Relocation or removal of residents.

4 Psychological impact of the line.

5 Noise and T.V. interference.

6 Windbreak and other vegetation removal.

7 Conflict with recreational use of land holdings.

8 Public versus private land.

III.3 ENVIRONMENTAL IMPACT

1 Increased public accessibility to wildlife areas.

2 Alteration of natural areas and interference with outdoor educational opportunities.

3 Use of the Restricted Development Area.

4 Effect on erosion.

5 Unique ecological areas.

III.4 COST

1 Construction cost.

2 Land acquisition costs.

III.5 ELECTRICAL CONSIDERATIONS

1 Ease of connection to future load areas.

2 Reliability and repairability of the line.

3 Access for construction and maintenance of the line.

III.6 VISUAL IMPACT

1 Visual impact of tree removal as seen from roads and recreational installations.

2 Visual impact on dispersed recreational users such as hikers, fishermen, hunters, scenic viewers, and cross-country skiers.

3 Visual impact of towers and lines as seen from residences, farms, roads, and recreational installations.

III.7 SPECIAL CONSTRAINTS

1. Electrical interference with radio transmitting stations.
2. Physical conflict with private and commercial airstrips.
3. Inductive interference with communication systems.
4. Conflicts with historical sites.
5. Effects on recreational installations such as campgrounds and ski areas.

Appendix 8

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Deer. The eastern boundary was chosen to avoid Miquelon Lake Provincial Park and Bittern, Red Deer and Buffalo Lakes and also to avoid potential scenic viewsheds along the Red Deer River. South of Red Deer the eastern boundary avoids a series of towns including Irricana, Beiseker, Acme, and Linden.

d) East Corridor Alternative

The East Corridor and Ellerslie to Tofield Corridor combine to provide a corridor alternative between Ellerslie and Langdon referred to as the East Corridor Alternative.

i) Ellerslie to Tofield Corridor Boundary Rationale

This corridor passes through an area of high population density and contains several lakes. It was made sufficiently wide to accommodate potential route variations to avoid these constraints as much as possible. The north boundary was chosen to avoid Elk Island National Park and Beaverhill Lake. The south boundary was chosen to avoid the urban centres of Leduc and Camrose and areas of extensive cultivation further south.

ii) East Corridor Boundary Rationale

This corridor is bounded on the east by the existing 240 kV line from Battle River to Sheerness, drawn along the next range line. On the west it is bounded by natural areas such as Rumsey and Buffalo Lake, and by increasing population density and large centres such as Camrose and Stettler. The corridor turns west at its south end and allows for routing options north of Drumheller and as far south as the Hussar area to maintain routing options in the more sparsely populated grasslands of the Special Areas Board.

The East Corridor also allows for a possible future line (not part of this Needs Document) from Fort McMurray to Langdon. Due to this dual purpose, and the length of the Fort McMurray to Langdon line, the corridor is fairly wide.

e) Primary Assessment Criteria

The assessment criteria found in the Board decision for the Keephills-Ellerslie-Genesee 500 kV lines and the Langdon to Phillips Pass 500 kV tie line were used for the high level corridor assessment. Under each of the primary criteria the EUB provided a list of evaluation factors it considered significant for each. The primary assessment criteria and the significant evaluation factors are summarized as follows:

(a) Agricultural Impact – Includes evaluation factors related to the effect on field operations, crop yield reduction, weed control,

height restriction of equipment, risk of collision with towers, visual and psychological impact of lines, loss of shelter belts, and impacts on tree farms.

(b) Residential Impact – Includes evaluation factors related to the decrease in property values, loss of or constraints to developable land, relocation or removal of residents, visual and psychological impact of lines, biological effects, noise and TV interference, removal of windbreak and other vegetation, conflict with recreational land use, and public versus private land.

(c) Environmental Impact – Includes evaluation factors related to increased public access to wildlife areas, alteration of natural areas, erosion effects, unique ecological areas, use of restricted development areas, and reduction of habitat winter carrying capacity.

(d) Cost – Includes evaluation factors related to construction and land acquisition costs.

(e) Electrical Considerations – Includes evaluation factors related to ease of connection for future facilities, proximity to future substations, reliability, reparability, access for construction and maintenance, and separation of circuits.

(f) Visual Impact – Includes evaluation factors related to visual impacts of tree removal, dispersed recreational users, and towers and lines seen from residences, farms, roads, and recreational installations.

(g) Special Constraints - Includes evaluation factors related to electrical interference, conflict with private and commercial airstrips, inductive interference, conflict with historical sites, effects on recreational installations, and electrical/biological effects on research stations.

As stated these factors were considered at a high level when comparing the corridor alternatives. Each of these factors will be considered in a greater level of detail when the TFO prepares its facilities application.

f) Overview Comparison of Corridors

Each corridor was evaluated by application of the primary assessment criteria and the significant evaluation factors to the information and data gathered. These evaluations were then compared to the evaluations of the other corridors to make a relative comparison of corridors. This comparison allowed each corridor to be ranked into one of three categories on a relative comparison basis. The three relative levels of ranking were defined to be as follows:

Least – The corridor is assessed to have the least potential impact overall on a comparative basis. This does not imply that there are no specific impacts within the corridor that may be significant.

Mid – The corridor is assessed to have a midrange of potential impact on a comparative basis.

Appendix 9

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

9 Route Selection

On March 31, 2004 the Alberta Electric System Operator (AESO) filed an application to the Alberta Energy and Utilities Board (EUB) for 240 kV transmission developments in southwest Alberta. The need for the Project is a result of the growing wind generation in that region of the province. In the AESO's application, several electrical options were considered. Ultimately the EUB approved the preferred electrical concept proposed by AESO. As part of the preferred concept, two options were approved. One option considered crossing the Piikani First Nation Reserve and the other option considered bypassing the Piikani First Nation Reserve.

The main criteria for selecting a route include:

- Follow existing linear disturbances (existing transmission line, railway, highways) as much as possible.
- Allow sufficient separation from other facilities such as existing 138 kV transmission lines and developed roads and well sites to maintain safe operations of all facilities in the area.
- Avoid or minimize effect on residences.
- Minimize effects on existing agricultural land uses.
- Minimize environmental effects.
- Avoid conflict with existing distribution lines.
- Minimize conflict with Telus facilities and pipelines to a level that can be reasonably mitigated.
- Avoid paralleling steep slopes and unstable areas.
- Minimize cost as much as practical by minimizing line length and reducing angles.

Very early in the route selection process AltaLink decided to pursue a route across the Piikani First Nation and Kainai First Nation/Blood Tribe lands for the following reasons:

- Going around Piikani First Nation and Kainai First Nation/Blood Tribe to the north is a longer route than across the reserves, which adds costs, and affects more residences and existing land uses.
- The Piikani First Nation and Kainai First Nation/Blood Tribe did not object to the facilities being on their lands.
- Going through the Piikani First Nation and Blood First Nations is shorter, involves less landowners, and minimizes effects on residences and other land uses.
- Pursuing a route around the reserves is unnecessary, given the preference of the Piikani First Nation and Kainai First Nation/Blood Bands for a route through their Reserves.

During the route selection process, several alternatives were considered along the proposed route and they are described in the following sections.

Appendix 10

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Extract from:

Analysis and Report to the Alberta Energy and Utilities Board On A Review of the Montana Alberta Tie Ltd. Routes, Route Selection Criteria, And Impacts from the Line Prospective

Authored by Robert A. Berrien, P.Ag, ARA, DAC, FRICS

SECTION 3: DISCUSSION OF THE BERRIEN ALTERNATE ROUTE (BAR) AND COMMENTARY ON COMPARATIVE FACTORS

The MATL route proposes to traverse some of the most intensively farmed land in Canada. Irrigated row crops and vegetables are found throughout the north end of the MATL preferred corridor. The area is also heavily populated with rural residential development. As noted earlier in their IR responses, MATL acknowledged they did not differentiate between types of agriculture, so their corridor selection process would have been blind to this situation, and indeed, the EIA is virtually silent on the point. Further, responses to the EUB IR's (BR MATL 15.2) and FUR 69 reveal that only one partial route suggested by a landowner was ever looked at further to the east, where irrigation is less plentiful. Hence, to look further into this issue we have determined a route alternative, the Berrien Alternate Route (BAR) that starts at the same substation point, and ends only 1.5 miles east of the existing MATL Preferred Route (MPR) exit point from Canada.

This route was selected with a number of salient criteria in mind.

1. Minimize proximity to human habitation.
2. Minimize interference with established irrigation system.
3. Minimize line length.
4. Minimize the number of 90° and 45° deflection structures required to build the line.
5. Avoid urban areas.
6. Avoid wetlands.
7. Follow existing linear disturbances (i.e. roads and canals) where this would yield a benefit to the adjacent landowners and MATL.
8. Keep access for maintenance as a consideration.
9. Avoid splitting sections if possible, on land with irrigation or irrigation potential.
10. Cross natural water bodies on the perpendicular.

We need to address the crossing of the Chin Coulee, a major component of our route. In the response to BR-MATL 15.2, MATL's review of a proposed Chin Coulee Route, Alberta Sustainable Resource Development notes they would not support the line shown on the map, essentially the same line as in our route. We have nothing but this comment to go on. However, as in all routes, this must be balanced against all the other factors. We specifically note a three wire set of power lines already traverses the dam, and there are numerous other lines immediately southeast, associated with a SMRID power generation facility. Hence, the ASRD comment must be taken with a grain of salt and we are not at all convinced our route is not possible due to this concern.

Appendix 11

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

for their time. In the Commission's view, if consultation with ATCO was essential to the Blums, as they assert, then it would have been reasonable for them to forego the fee they requested. Pursuant to Rule 007, ATCO was not required to pay any consultation fees to the Blums for Mr. Blum's or Mr. Strom's time. The Commission finds that ATCO acted reasonably in denying payment of such fees.

44. The Commission finds that ATCO made reasonable efforts to consult with the Blums, and the Blums, by their own choice, did not accept the opportunity to enter into dialogue with ATCO in an effort to resolve outstanding issues. As such the Commission finds that the Blums' criticisms of the consultation process are unwarranted.

45. In its consultations with the Blums, the Commission finds that ATCO has satisfied the requirements of Rule 007.

4.2 Is the Project Consistent with the Public Interest?

46. It became evident during the course of the proceeding that, apart from the consultation issue, the main objections raised by the Blums' and Danns' were limited to the Proposed Route of the transmission line running adjacent to their respective properties. No objections were raised with respect to other aspects of ATCO's facility Application, including the proposed Updike Substation and upgrades to the Goodfare Substation. Accordingly, the majority of the discussion below of whether the proposed Project is within the public interest focuses on the Proposed Route.

47. Before considering the details of the numerous route options posed by the parties, including the Proposed Route, the Commission finds it useful to first consider ATCO's route selection process as it demonstrates the factors which ATCO took into consideration in reaching its decision on the Proposed Route as the preferred route option. This consideration assists the Commission in assessing whether and to what extent the public interest principle was applied by ATCO in reaching its decision that the Proposed Route is the best route option for the Application.

4.2.1 Views of the Parties

ATCO's Route Selection Process

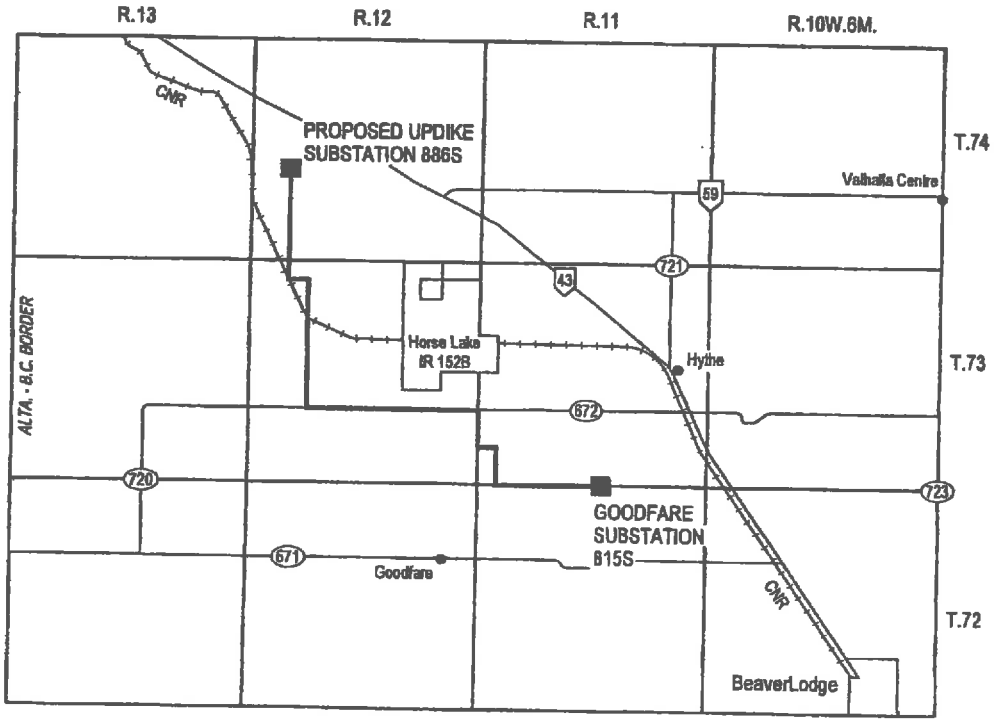
48. In the First Application before the Board, ATCO presented five different routes for the study area, which they referred to as Routes A, B, C, D and DW. Route A was the route for which ATCO unsuccessfully sought approval in the First Application. Route C was the route which the Board in Decision 2007-037 directed ATCO to reconsider. In addition to routes A, B, C, D, and DW, ATCO considered two new route options in the Application namely, Routes AW and BE (collectively, all routes are referred to as Preliminary Routes).[52] A map of the Preliminary Routes is found at Appendix 3 to this Decision.[53]

49. ATCO indicated that the Preliminary Routes were chosen based on technical, economic and environmental and land-use criteria. The general transmission line routing criteria used were:

[52] Pages 13-15 of Application
[53] Page 5 in Attachment 10 of Application

- Minimize impacts with other land uses such as residences, built-up areas and oil and gas facilities;
- Utilize existing linear disturbances to minimize new disturbances and clearing, following existing power lines where possible;
- Follow road allowances where possible, for access, to reduce new clearing and to avoid impacts to agriculture;
- Keep routes as straight as possible, to reduce line length; and
- Avoid environmentally sensitive areas such as watercourses, recreation areas, parks, campgrounds and wildlife habitat; and
- Avoid wet areas and steep slopes for better access and to reduce environmental impacts.[54]

50. The Preliminary Routes were presented to landowners. Based on landholder and agency feedback, adjustments to the preferred route were made,[55] resulting in the Proposed Route illustrated in the map below.



Goodfare to Updike Project - Grande Prairie Area
Application No. 1589611
ATCO Electric

AUC

[54] Page 12 of Application
[55] Page 12 of Application

Appendix 12

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Application No. 1607153
Proceeding ID No. 1069

Eastern Alberta DC Transmission Line

Application to the Alberta Utilities Commission

Volume 2 – Attachment 2
Environmental Impact Assessment

March 2011

ATCO Electric
10035 105 Street
P.O. Box 2426 Station Main
Edmonton, AB T5J 2V6

- avoid locating sites in close proximity to known locations of wildlife habitat, rare plants and archaeological sites.

3.1.3 Construction Camps and Staging Areas

Siting criteria for construction camps, staging areas and any other non-linear temporary workspace required for the Project include:

- use previously disturbed sites;
- locate sites in close proximity to the right-of-way and planned or active work faces;
- locate sites next to existing all-weather access; and
- ensure site is large enough to accommodate Project needs without having to expand the site.

3.2 Routing of Linear Project Components

3.2.1 Transmission Line Routing

3.2.1.1 Routing Control Points

Primary Control Points

The primary control points for the Project included:

- Heathfield Converter Station 2029S located at 21-56-22 W4M; and
- Newell Converter Station 2075S located at 9-18-15 W4M.

Secondary Control Points

Secondary control points for the Project included:

- suitable crossings of large watercourses including the North Saskatchewan, Battle and Red Deer rivers; and
- planned or existing electrical infrastructure including the proposed Heartland Substation 12S located in NE 20-56-22 W4M and the existing and proposed 240 kV circuits located south and east of the existing West Brooks Substation 28S.

3.2.1.2 Transmission Line Routing Criteria

General criteria taken into consideration throughout the route selection process included:

- Minimizing impacts with other land uses such as residences, built-up areas and oil and gas facilities;
- Utilizing existing linear disturbances to minimize new disturbance and clearing, following existing transmission lines where practical;
- Keeping routes reasonably straight to reduce line length and avoid costly corner structures;
- Minimizing length across environmentally sensitive areas such as watercourses, recreation areas, parks, campgrounds and wildlife habitat to the extent feasible; and
- Minimizing length through wet areas and steep slopes for better access and to reduce environmental impacts.

Specific criteria were guided by AUC's Rule 007, Alberta Environment's Environmental Protection Guidelines for Electric Transmission Lines (C&R/IL/95-2), the AESO's functional specification for the project, and factors as determined by the professional judgement of experienced planners. Specific criteria that consider the potential social, cultural, land-use, resource, environmental and technical factors are listed as follows.

- Maintain separation from residences, preferably 150 m or greater;
- Maintain separation from cities, towns, villages, hamlets and other built-up areas;
- Minimize crossing planned and documented residential, commercial and industrial subdivisions, and lands zoned as Country Residential or equivalent;
- Maintain separation from schools, churches, community halls, commercial buildings, other public buildings, cemeteries and other gathering places;
- Minimize routing on private land by utilizing Crown land, where feasible.
- Minimize crossing of existing and planned, documented public recreational areas (*e.g.*, campgrounds, ski areas, golf courses, etc.);
- Avoid routing near lands that are designated scenic areas;
- Minimize clearing of shelter belts;
- Minimize overall length of transmission line to the extent practical;
- Follow quarter-section and other property boundary lines, where feasible;
- Locate the RoW boundaries to avoid creating unusable, fragmented areas, where feasible;
- Parallel existing and planned transmission lines, where feasible;
- Minimize the number of deflections in the line to the extent practical;
- Minimize the number of crossings of existing high voltage transmission lines, particularly those 240 kV and greater;
- Maintain safe separation when paralleling existing transmission lines;
- Minimize locating towers on unstable sites such as slump prone terrain or wet areas;
- Minimize angling across cultivated lands (*e.g.*, annual crop and hay land);
- Minimize routing on cultivated land by utilizing pasture, bush-pasture and native prairie/rangeland/grasslands, where feasible;
- Consider avoiding lands with higher Canada Land Inventory (CLI) soil capability values (*i.e.*, CLI classes 1, 2 and 3) by utilizing lands with lower CLI soil capability values, where feasible;
- Avoid locating tower structures in areas within the swath of pivot irrigation systems;
- Avoid crossing federal lands, National and Provincial Parks, Ecological Reserves and Areas, and Natural Areas;
- Avoid traversing the United Nations Educational Scientific and Cultural Organization (UNESCO) World Heritage Site associated with Dinosaur Provincial Park;
- Avoid crossings of open water, particularly greater than 400 m across;
- Minimize encroaching recommended setbacks of known site-specific habitat features of protected wildlife species;
- Minimize traversing lands within known habitat range of *SARA* Schedule 1 species;
- Minimize routing through designated wildlife areas of concern;
- Minimize routing through Environmentally Significant Areas;
- Crossing lands having a Historic Resource Value (HRV), particularly HRV 1 or 2;
- Minimize length crossing active mines or potential surface minable resources;
- Minimize routing on lands associated with potential energy developments (*e.g.* wind farms and upgrader facilities);

- Maintain required minimum setbacks from existing oil and gas facilities;
- Maintain adequate setback from telecommunication towers; and
- Maintain an adequate separation from the centre line of runways (preferable 1 km) and from the ends of runways (preferably 1.6 km).

For the routing of the 500 kV HVDC transmission line 13L50, primary control points were the north and south terminals:

- Heathfield located at 21-56-22 W4M; and
- Newell located at 9-18-15 W4M.

Secondary control points for the line included:

- Suitable crossings of large watercourses including the North Saskatchewan, Battle and Red Deer rivers; and
- Planned or existing electric transmission infrastructure including the proposed Heartland Substation located in NE 20-56-22 W4M and the existing 240 kV circuit 923L and future 240 kV circuits 1034L/1035L located in the vicinity of the existing West Brooks Substation 28S.

3.2.1.3 Preliminary Transmission Line Route Options

Several preliminary transmission line route options were removed from further consideration due to environmental, social or cultural reasons including:

- avoid interfering with recent and future planned annexation plans involving the communities of Bruderheim, Lamont, Chipman and Tofield;
- reduce the number of residences located within 150 m of the preferred and alternative route options;
- avoid routing in close proximity to airfields located near the communities of Holden and Forestburg;
- avoid routing in close proximity to community halls, churches and other locations where people gather;
- avoid routing through areas with an abundance of centre pivot, wheel roll and flood irrigated lands;
- avoid interfering with existing commercial operations due to close proximity of a preliminary route option;
- avoid multiple crossings of the Battle River;
- avoid routing through lands designated as being Important Bird Areas (IBAs) associated with the Chain Lakes;
- avoid routing between Beaverhill Lake and Elk Island National Park which includes an area that has been identified as a potential UNESCO World Heritage Site;
- avoid routing through Antelope Creek Ranch, an area that has been designated as important wildlife habitat and sensitive native prairie in southeast Alberta;
- reduce the potential impact to facilities (*e.g.*, canals and drainage ditches) owned and operated by the Eastern Irrigation District (EID);
- avoid routing through the valley associated with Paintearth Creek;

Appendix 13

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

AUC

Alberta Utilities Commission

AltaLink Management Ltd. and EPCOR Distribution & Transmission Inc.

Heartland Transmission Project

November 1, 2011

All right. So you're not prepared to agree that it's more an art than a science. Is that what I should take from your answer?

A. MR. FOLEY: You're asking for my opinion. I don't think it's an art form. I'm not saying that there isn't some subjectivity and the role of experience isn't part of it, but it's not like it's a -- no, I wouldn't characterize it as an art form.

Q. Well, you surely appreciate, sir, I was using a turner phrase. I'm not attempting to equate transmission line siting with drawing or painting. You understood that, did you?

A. MR. FOLEY: I understand that, yes.

Q. Okay. You, sir, I take it, among others on the Heartland team, would have reviewed the report prepared for my clients and Mr. Niven's clients and Mr. Carter's clients by Trevor Cline?

A. MR. FOLEY: Yes.

Q. I don't want you to go there, but I want to ask you if you remember Mr. Cline, in his discussion of transmission line siting methodology, whether you remember him siting the EPRI model, that's EPRI?

A. MR. FOLEY: Yes, the EPRI GTC model.

Q. And I previously, through your counsel, gave you a copy of two printouts, which I just stapled together, from Georgia

Transmission. Did you have a chance to look at that?
A. MR. FOLEY: Yes, I have.
THE CHAIR: We'll make this Exhibit 909.
EXHIBIT 909 - TWO PRINTOUTS FROM GEORGIA TRANSMISSION.
Q. MR. FITCH: Sir, I take it as a transmission line professionally you understand EPRI is an acronym for electric power research institute?
A. MR. FOLEY: Yes.
Q. And so the document I provided you is a printout from the website of Georgia Transmission. I gather that's a transmission line company in the state of Georgia, among other places. And it's, as you know from reviewing it, contains a very brief, high level discussion of the GTC EPRI siting model; correct?
A. MR. FOLEY: Yes.
Q. And I note if we turn to the fact sheet, which is the second set of the document, so that would be the third and fourth page, it outlines this four-step process. Do you see that?
A. MR. FOLEY: Yes.
Q. So the first step in the GTC EPRI siting model is to identify macro corridors; right?
A. MR. FOLEY: Yes.
Q. And I see there that it says essentially using GIS, the

planning staff identifies beginning points and end points where a new power line is needed; right? And then they use satellite imaginary, road data, terrain, et cetera, existing transmission lines. And they come up with a map that's comprised of a grid of 100 square foot cells; right?

A. MR. FOLEY: **Yes.**

Q. Prior to reading this, would you have been familiar with the EPRI methodology?

A. MR. FOLEY: **Yes.**

Q. Okay. So this is not new to you; right?

A. MR. FOLEY: **No.**

Q. All right. And then it goes on to say: Each cell on the map is ranked. Features such as residential land use, agricultural and wetlands are ranked from 1, which is most suitable, to 9, which is least suitable. And it goes on to say: Using the cell values, a computer algorithm calculates optimal paths for three type of suitability surfaces, the first being locating with existing transmission lines; the second being locating with existing road rights-of-way, and the third being crossing less developed areas. And then optimal paths are identified; right?

So my question to you simply is the methodology that AltaLink used in this application, did you do anything like assigning values? You know, 1 for most suitable to 9 for least suitable, to a series of different

features like residential, land use, agriculture, and wetlands?

A. MR. FOLEY: No, we didn't apply specific weighting.

Q. Okay. And EPRI says, and of course this is them talking about their own model, so we all know what conclusions they're going to come to; but they say that the reason they developed this was to -- and now I'm looking at the first page of the handout under benefits -- was to produce siting decisions that are more quantifiable, consistent, and defensible.

And let me tell you how I sort of interpret this document, sir, and you tell me if you agree. And it goes back to this art versus science question. The way I understand what EPRI has done is they've tried to make it more of a science and less of an art by assigning these values to all these various different, what they call features.

Would you generally agree with that characterization?

A. MR. FOLEY: Generally, yes.

Q. Okay. So AltaLink didn't do that?

A. MR. FOLEY: We didn't assign specific weighted values, no. The primary difference between what we did and what this particular one model did -- and again the

EPRI model is one of many. It's used by some utilities in the States, but there are a lot of other methodologies and processes that are out there.

I will say that we drew upon the EPRI model for some degree of guidance, but the primary difference is that the EPRI model deals with a lot of upfront loading, I guess is one way to describe it, of the process where they involve a lot of focus groups or different types of stakeholder groups to help them develop a list of considerations and then to assign subsequent weights based on that feedback and then carry that through the selection process.

A large difference that we have here, at least in the province of Alberta, from a jurisdictional perspective, is in some of our consultation requirements here. We talked to a lot of people within 800 metres, along our centre line. I would go so far as to suggest that it's a lot more rigorous than you see in most other typical jurisdictions. What we've endeavoured to do through our process is to try to build all of that work into our siting process as much as possible.

So while we didn't assign specific weightings, we definitely took some guidance from this EPRI siting model, and not just this model but other models that are out there, to try to get stakeholder feedback incorporated into our

process as we moved through that.

We talked about this within the application as well where we did have community advisory task groups at the get-go providing some input into what they thought were the important issues around siting transmission lines.

We identified some metrics, such as schools, hospitals and day cares, and then, again, continued to feed that stakeholder feedback into our siting process as we went through that, through our two phrases.

In the EPRI model -- I'm not saying -- it's a model. It's applied in different ways in different jurisdictions. For the most part, this model helps with front-end loading to carry decisions through to the end and then make them defensible without, I would suggest, the same degree of consultation or stakeholder engagement that you see in Alberta, where we are.

Q. Would you agree with me, sir, that if you don't use weighting - so you don't do something like what is done in EPRI, where you assign values to these different features - that it throws you back onto relying more on judgment and makes it more subjective?

A. MR. FOLEY: I would suggest -- I would agree to a certain point. However, even in our process while we didn't have any numerical weightings or statistical analysis applied, we did show deference to certain

constraints.

So, for example, we identified the avoidances of residences as quite a high priority. As we say in the application, we link it to that preliminary feedback we got from stakeholders, which, again, was confirmed as we went through our project what those main concerns were that people had around visual impact, health, and environment, land value, and so forth. And we drew a correlation between those main concerns raised by stakeholders that by avoiding houses or trying to get as far away from them as we can, we can address those or attempt to address that input or those concerns.

So we definitely gave I would call it a higher weighting to that particular constraint as we went through the process.

Q. Does AltaLink's model or methodology for siting transmission lines have a name?

A. MR. FOLEY: Not really. We don't tend to refer to just the route selection process. Some people calling it a funnelling process. Again, it's not -- nothing unique. A lot of what we do from a process perspective is fairly normal, I guess. You start at kind of a landscape level and slowly progressively work your way down.

Q. All right. Well, let's try to drill down a little bit then into what AltaLink did by talking about sort of some

fundamental principles you tried to apply when you did your route selection process. I was looking last night, I couldn't find the reference, but I'm sure I've read or heard that one thing AltaLink has striven -- has strived to do in this process is make its route selection process transparent. Did I get that right?

A. MR. FOLEY: We certainly tried to do that, yeah. Definitely as the route evolves, yeah.

Q. I just want to be clear. Was that an objective? Let's put it that way. Was that one of AltaLink's objective, was that its route selection process is transparent for stakeholders?

A. MR. FOLEY: Yeah. I would say that one of our objectives is to make sure that it's understood to the greatest degree possible by all stakeholders how we develop our routes, yes.

Q. Okay. So --

A. MR. FOLEY: And what the background is for decisions as they're made.

Q. Would you agree with me, then, sir, that anyone reading your application should be able to tell, without asking a whole bunch of questions, why AltaLink selected its preferred route and why alternatives it assessed were rejected? Is that fair?

A. MR. FOLEY: Yes.

Q. I think it's well understood by this point in the proceeding that one of the criteria that AltaLink applied and seemed to accord a significant degree of weight to is avoiding people; right?

A. MR. FOLEY: We certainly try to, yes.

Q. Okay. So I take it, then, that you wouldn't disagree with the general proposition that it's preferable to locate transmission lines away from people where you can?

A. MR. FOLEY: Where we can. I mean, an obvious exception in this project would be the TUC, where we're in the middle of a city. There's not much that we could do there.

Q. Well, you could not go in the TUC; right?

A. MR. FOLEY: Well, again, you and I will disagree on that. We view the TUC as a very valid spot that was set aside specifically for this type of development.

Q. But the general proposition I put to you, would you agree, that generally you try to the extent practical to locate transmission lines away from people?

A. MR. FOLEY: Generally, yes.

Q. Okay. So let's go directly to Table 7-8 in chapter 7 of the application. And that's, of course, where you compare -- where AltaLink compares the preferred and the alternative route.

A. MR. WATSON: I have it as pdf 324.

Q. Thank you. So, Mr. Foley, when I look at Table 7-8, the first -- I think it's six rows are described as generally number of residences, schools, day cares, and hospitals. Do you see that?

A. MR. FOLEY: Yes.

Q. Okay. Clearly that's a group of metrics relating to proximity to people; right?

A. MR. FOLEY: For the most part, yes.

Q. So if we look at the first residences within 150 metres of the centre line, including only the first row of -- no, let's not look at that one. Let's look at the second one. Just residences within 150 metres of the centre line, all urban residences. So I want to start just with a point of clarification. There's three numbers there. Six and then it says 9 in TUC and four on Suncor?

A. MR. FOLEY: Yes.

Q. I take it that that means there are nine residences right now in the TUC that are occupied?

A. MR. FOLEY: Yes. They've been bought out, if you will, by Alberta Infrastructure, who owns the --

Q. So they're tenants?

A. MR. FOLEY: They're tenants, yeah. They're given a lease that's renewed.

Q. Okay. So there's nine occupied residences in the TUC that will be within 150 metres of the centre line; right?

Appendix 14

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

7.4 Commission findings

523. The Commission examined the proposed Langdon to Janet transmission line siting on the basis of residential impacts, visual impacts, agricultural impacts, electrical considerations, environmental impacts and of cost.

524. The number of residences within 150 metres and 800 metres of the transmission line favours the alternate route. However, many of the residences on the preferred route are on the other side of the existing transmission line and would be no closer to a transmission line if the preferred route were chosen. Furthermore, because the preferred route parallels the 936L/937L line, the potential impacts on the residences that are within 150 metres would be incremental, as opposed to those residences within 150 metres on the alternate route.

525. The Commission finds that paralleling the existing transmission line corridor south from the Janet substation to the Shepard corner and then paralleling the 936L/937L line east of the Langdon substation favours the preferred route because the proposed right-of-way only requires an addition to the existing right-of-way rather than a new right-of-way. As a result, the potential impacts are reduced from an environmental perspective because the land has been previously disturbed. The preferred route has less potential for environmental impacts than the alternate route because the alternate route attempts to follow the future Shepard Regional Drainage Plan, which is designed to follow low-lying areas and wetlands. The preferred route parallels an existing transmission line for almost the entirety of the route.

526. The Commission acknowledges that tree clearing around the existing transmission line would increase the view of the transmission line, as stated by members of the Mattson group, and also recognizes that the alternate route for the Langdon to Janet transmission line would have a significant number of dead-end towers with varying heights and widths.

527. There is generally less incremental visual impact of the additional transmission line paralleling the existing 936L/937L line to the east of route marker B280, and the transmission line corridor to the north of route marker B280 than that of the mainly greenfield option of the alternate route.

528. In addition, the preferred route parallels existing transmission lines of comparable size throughout the transmission line length, which results in an incremental impact. AltaLink is committed to staggering the towers to match the existing 936L/937L line to mitigate some of the potential impacts throughout the length of the line.

529. The preferred route has less of an agricultural impact because it crosses less cultivated land and results in less fragmentation of land as it requires an addition to the width of the existing right-of-way, instead of new right-of-way.

530. The Commission also finds that the preferred route is superior to the route variant option. The route variant option would require the removal and relocation of a 1.5-kilometre section of the 936L/937L line as it enters the Crossings substation. The removal and relocation of the 936L/937L line would place it in close proximity to three residences to the north of the current routing.

531. The preferred route costs approximately $14 million less than that of the alternate route if schedule delays are factored in, but will cost $9 million less without the inclusion of any delays.

532. The Mattson group argument, that the proposed paralleling of the preferred route results in a reliability issue, was not persuasive because no evidence was tendered in this regard and the AESO has ascertained that the proposed routes meet the Alberta Reliability Standards.

533. Based on the above, the Commission concludes that the preferred route for the proposed Langdon to Janet transmission line has less of an overall impact than the alternate route and is therefore in the public interest.

534. The Commission chooses the monopole option past the property of Mr. Mattson. This option would span monopole structures from route marker B260 to route marker B265 across the northwest quarter of Section 13, Township 23, Range 28, west of the Fourth Meridian. This option was put forth to reduce the impacts on Mr. Mattson, his family and his business. The monopole option will not require a right-of-way on Mr. Mattson's property and has the potential to reduce the tower heights. The monopoles range in height from 41 metres to 44 metres while the lattice structures are between 46 metres and 58 metres.[98] Should Mr. Mattson agree to a buyout of his property before measures are taken to implement the monopole option, the Commission directs AltaLink to use lattice towers for this section of the transmission line.

8 AltaLink Application No. 1608637 - north Foothills transmission development

8.1 The preferred and stakeholder-proposed Foothills substation site selection

8.1.1 Introduction

535. AltaLink's preferred site, identified as the D8 site, for the new Foothills 237S substation is located at NW 35-18-28-W4M, southeast of High River. AltaLink has acquired the entire quarter section of land on which the substation site would be located to provide room for expansion. This site was chosen based on the parcel's suitability in relation to the substation footprint, the interconnection of proposed and future 500-kV and 240-kV transmission lines, the 138-kV connection to High River and Okotoks, and the 240-kV interconnection of local generation.

536. AltaLink amended its application to include a stakeholder-proposed Foothills 237S substation site, identified as the D12 site, as an alternate site for the substation, which is located in the NW 8-19-27-W4M. This site was within one of the substation target areas originally identified during AltaLink's preliminary and detailed routing stages, but was dropped from consideration because the preferred D8 site would provide a better opportunity to reuse existing infrastructure to connect to local generation with the least amount of new 240-kV line, and would result in a better environmental route option to connect to the High River 65S and Okotoks 678S substation. While this evaluation still applies, AltaLink believed that the stakeholder-proposed D12 site represents a viable alternative and, therefore, added it for the Commission's consideration.

[98] Transcript, Volume 11, pages 2184-2185, lines 15-25, 1-3.

preferred route and that the visual impact is similar along both routes, given the subjective nature of visual impacts. Despite the fact that more residences are situated along the CERC route than the preferred route, the Commission finds that the CERC route would generally result in incremental residential and visual impacts due to the existence of the 911L line. Further, the preferred route is a greenfield route, which would result in new residential and visual impacts.

781. The Commission finds that the environmental impact is slightly greater on the preferred route because it crosses more wetlands and is longer. The preferred route is also a greenfield route, despite the fact that a future highway will be situated nearby.

782. The Commission encourages the paralleling of existing linear disturbances because it reduces impacts. The CERC route parallels the 911L line for the entire length. While the preferred route moves away from the 911L line near the town of Claresholm, it will be parallel to the future Highway 2 bypass. The Commission agrees with AltaLink and the Town of Claresholm that transmission lines are compatible with commercial and industrial land uses. The Commission does not agree with CERC that the transmission line will interfere with commercial and industrial development because it views them as compatible developments.

783. CERC argued that there is uncertainty that the Highway 2 bypass will be built and that the transmission line could impede the highway because it would be built first. The Commission has not heard evidence regarding the status of the highway project, but notes that Alberta Transportation supports the preferred route. Further, AltaLink's evidence is that it has worked, and will continue to work, with Alberta Transportation on the alignment of the transmission line with the highway.

784. The Commission finds that AltaLink's preferred route may be the lower impact route of the two, given its lesser residential impact. In the longer term, the preferred route will be paralleling a major linear structure; whereas, the CERC route will not. The preferred route also more adequately aligns with the Town of Claresholm's development plans and is supported by the M.D. of Willow Creek. The preferred route is however a greenfield route, in a location where an existing transmission line is not present, while the CERC route would be situated next to an existing transmission line where land use has evolved with the presence of the line. The Commission does find the argument for the CERC route to be compelling, because the route parallels the 911L line as it passes the town of Claresholm, resulting in a shorter and less expensive route. Further, the Commission took into account the submissions of AltaLink regarding the paralleling of the 911L line and the reduction in impacts in relation to a greenfield route. The Commission considers that paralleling an existing transmission line or using an existing right-of-way results in fewer impacts as discussed above and finds merit in the CERC submissions. However, as AltaLink did not apply for the CERC route, additional information on this route such as stakeholder consultation is not on the record. Consequently, while the Commission approves the preferred route over the alternate route in this area, the Commission also directs AltaLink to examine the CERC route in accordance with the requirements of AUC Rule 007.

785. AltaLink is directed to file a report with the Commission describing the progress of this investigation by December 31, 2013. If the CERC route can be achieved with a reduction in overall impact, the Commission will determine whether AltaLink will be required to file an amendment to the permit and licence.

Appendix 15

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

work with Brion. Although Brion asserts that minimizing impacts to it can only be achieved by routing outside of the MRCP, Alberta PowerLine maintains that routing through the MRCP is overall the route with the least impact.

7.10 Commission findings

390. The Commission has historically relied upon six criteria for route selection: agricultural impacts, residential impacts, environmental impacts, cost, electrical considerations and visual impacts. Some impacts, such as agricultural impacts, are not practically mitigated and should instead be compensated for. In certain circumstances, the Commission considers special constraints, which are factors that are unique to the particular area.

391. The Commission's objective is to determine whether the applications as filed are in the public interest and, if not, what changes should be ordered to most effectively balance the public interest factors it must consider. In determining the public interest, the Commission considers the respective social, economic and environmental impacts of the routes proposed by Alberta PowerLine. In doing so, the Commission assesses the following routing criteria: agricultural impacts, residential impacts, visual impacts, electrical considerations, environmental impacts and cost.

392. Despite the differences in opinions on proposed routes and route segments, the routing experts who appeared at the hearing all agreed on the fundamental considerations required in routing a transmission line: avoid home sites; follow existing linear disturbances; minimize impacts on agriculture, minimize impacts on the environment; minimize line length and costs. Alberta PowerLine and the parties to the proceeding identified the criteria they considered relevant to choosing a route and their views of the relative importance of the criteria in this application. Parties relied primarily on metrics referred to in past applications and Commission decisions.

393. The Commission recognizes Mr. Berrien as an independent expert witness on routing based on his experience as outlined in his curriculum vitae. Mr. Berrien applied his routing experience to suggest routing variations on the west route option for Burnco to avoid gravel operations. However, he did not have the benefit of landowner input and the Commission agrees with Alberta PowerLine that this input is an essential ingredient in routing a transmission line. In this regard, it is notable that Burnco did not endorse Mr. Berrien's BAR No. 1 from an operational point of view[233] and that some of the members of ERLOG were also not supportive of his suggested variations.

394. Mr. Argenal testified that his work for ENMAX in the planning and design of distribution and transmission system included routing of transmission lines[234] and that he was appearing as an independent expert. The Commission accepts that Mr. Argenal has experience in the routing of transmission lines and recognizes him as an expert witness in this area.

395. Although Mr. Neufeld's curriculum vitae indicates he has experience in urban planning, he did not appear to understand the responsibilities of an expert witness. Mr. Neufeld was unable

[233] Transcript, Volume 11, page 2238, lines 12 to 17.
[234] Transcript, Volume 16, page 3321, lines 1 to 15.

Appendix 16

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Agreement on the Siting of Power Transmission Lines on Farms and in Woodlands

December 2000

Summary

Introduction

Electricity is associated with modernity and new technologies and it occupies a key place in Québec's energy profile. In 1998, Hydro-Québec had nearly 3.6 million customers. The government corporation must satisfy Quebecers' needs, ensure that everyone receives the same improved quality of service and implement a plan to develop sources of electricity. To this end, the utility relies on the energy of rivers and transmits the electricity over considerable distances to major consumption centres in Québec City, Montréal and south of the St. Lawrence River.

Over 90% of Hydro-Québec's installed capacity is generated by hydroelectric power plants that are frequently located more than 500 km from consumers. To reach its clientele, Hydro-Québec has had to construct a unique power transmission system. In 1998, it encompassed 32,144 km of high-voltage lines, mainly from northeastern and northwestern Québec. Most Québec farming is practised in the St. Lawrence Lowlands, running from east to west, which explains why power transmission lines must cross farms.

Since the early 1980s, Hydro-Québec has ensured participation by the public and its representatives in the project study and design process. Principle 5 of the utility's environment policy clearly stipulates that "Hydro-Québec ensures that the individuals, groups and organizations concerned are involved in the planning, design and implementation of its activities."

One of the processes advocated is cooperation between Hydro-Québec and the Union des producteurs agricoles (UPA). In 1986, the two organizations signed an agreement on the siting of transmission and subtransmission lines on farms and in woodlands (*Entente Hydro-Québec—UPA sur le passage des lignes de transport et de répartition en milieu agricole et forestier*). In 1997, the Hydro-Québec—UPA liaison committee asked a working committee made up of representatives of both parties to review certain facets of the agreement in order to make it more functional and better adapted to current needs.

While incorporating this form of participation in transmission line projects, Hydro-Québec continues to submit the projects for government approval.

This summary describes the how and why of collaboration between Hydro-Québec and the UPA. It summarizes the agreements concluded between the two bodies and describes the establishment of a standing committee to interpret the provisions of the agreement.

Overview of cooperation

Hydro-Québec and the UPA have established a consultation committee so that both parties understand and accept the constraints and problems inherent in power infrastructure projects, on the one hand, and farming, on the other hand.

The parties agreed to divide the main topics for discussion into five groups:

- the impact of Hydro-Québec structures on farms and in woodlands;
- the location of Hydro-Québec structures on farms and in woodlands;
- mitigation measures respecting farms and woodlands and the cultivation of rights-of-way;
- maintenance of the transmission system on farms and in woodlands;
- compensation for the installation of Hydro-Québec structures on farms and in woodlands.

The members of the consultation committee met more than 40 times over a period of several months. Their deliberations led to the signing, in 1986, of the *Entente Hydro-Québec—UPA sur le passage des lignes de transport et de répartition en milieu agricole et forestier.*

The agreement was reviewed in the fall of 1988, primarily with a view to renegotiating certain compensation measures.

In 1996, the Hydro-Québec—UPA liaison committee assessed the usefulness of making the agreement more functional and adapting it to the two parties' needs, without altering the principles governing financial compensation. In 1997, after internal consultations, Hydro-Québec and the UPA announced those facets of the agreement that could be modified. Once the liaison committee was apprised of the number and nature of the requested changes, it advocated the establishment of a special committee to review the agreement. This committee, made up of three representatives from either side, began its deliberations in the fall of 1997 and concluded them in the spring of 1998.

The agreement is now called the *Agreement between Hydro-Québec and the UPA respecting the Siting of Electric Power Transmission Lines on Farms and in Woodlands.*

Highlights of the agreement

Impact

In light of the problems and complaints raised by farmers and forest producers, Hydro-Québec and the UPA have agreed on two types of impact arising from Hydro-Québec's practices on farms and in woodlands:

- **temporary impacts** associated with the building of the structures, which can be reduced or eliminated through the implementation of mitigation measures;
- **permanent impacts** arising from the presence of the structures, which can be reduced through better siting or adequately compensated.

Siting

Hydro-Québec and the UPA have established:

- criteria governing the siting of power transmission lines and substations on farms;
- criteria governing the type of support structure used;[1]
- procedures concerning the UPA's participation in studies and decisions;
- participation by landowners in the siting of support structures on their land.

The main **siting criteria** are indicated below.

- Favor the siting of substations or power lines on the boundaries of or outside agricultural zones protected under the *Act respecting the preservation of agricultural land and agricultural activities.*
- Favor siting on agricultural land with the lowest potential in the study area, according to maps of potential prepared by the ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ).
- Protect sugar bushes, orchards, plantations, woodlands under development, windbreaks and other high- and average-quality woodlands in the study area,

1. The term "support structure" refers to all structures designed to bear overhead line conductors, i.e., towers, portals and poles.

Impacts of Hydro-Québec Structures

1.1 Introduction

Hydro-Québec and the Union des producteurs agricoles (Québec farmers' association, or UPA) have drawn up a list of the impacts that power lines and substations can have on farmlands. These can be subdivided into two broad categories.

Impacts of the first category are associated with the actual construction of the line or substation. Such impacts vary according to the type of structure and farm operation and, to a certain extent, according to the nature of the soil. They can be reduced considerably or eliminated altogether through the implementation of appropriate preventive or remedial mitigation measures (see Part 3, Mitigation).

Impacts of the second category stem from the presence of the substation or power line in the environment. They too differ according to the type of facility and farm operation. Although these impacts cannot be eliminated, they can be attenuated in some cases by selecting optimal sites and by choosing the type and location of support structures according to the kind of farming involved (see Part 2, Siting).

1.2 Types of impacts

1.2.1 Temporary impacts during construction

Following are some of the impacts that can arise during the construction phase:

- impacts associated with the staking of rights-of-way;
- reduced crop yields due to soil compaction;
- disturbance of the topsoil layer (rocks and inert soil mixed in with the topsoil);

- alteration of underground or surface drainage systems;
- alteration of irrigation systems;
- damage to ditches;
- broken fences, which can hinder livestock control;
- noise produced by construction machinery, which can affect poultry and fur-bearing animals;
- disruption of crop operations;
- loss of time (during negotiations, for example);
- loss of revenue (cash flow) while awaiting compensation;
- impacts on areas or elements located outside the right-of-way, such as:
  - damage to farm roads;
  - debris from tree felling;
  - ruts and soil compaction;
  - damaged trees;
  - waste materials;
- construction debris and other waste materials.

1.2.2 *Permanent impacts arising from the presence of the structures*

Impacts stemming from the presence of the substation or power line in the environment include:

- loss of farmland or woodland;
- loss of revenue, which could compromise the operation's profitability;
- loss of time (time spent in negotiations or driving around the structures, for example);
- risk of farm machinery running into the structures;
- creation of enclaves;
- usage restrictions and other limitations associated with easements;
- alteration of irrigation systems;
- changes to crop operations;
- impossibility or increased danger of using airplanes for agricultural purposes;

- limitations regarding land improvements (leveling, ditching and other mechanical operations, for example);
- proliferation of weeds;
- risk of windthrow and desiccation along rights-of-way in wooded areas;
- induced currents in fences, buildings, machinery, etc.;
- visual impact;
- noise from substation operation.

Studies are being conducted in Québec and in other parts of the world to identify and analyze the biological impacts of electromagnetic fields on human and animal health.

Siting of Hydro-Québec Structures

2.1 Introduction

This section of the Hydro-Québec–UPA Agreement summarizes the main criteria which apply to the siting of power lines and substations on farmlands.

In determining the best location for its facilities, Hydro-Québec strives to reduce their impact on the various elements in the host environment to the greatest extent possible. This involves several steps in the draft-design phase, namely: taking an inventory of the area, analyzing line corridors and areas suitable for substation sites, establishing potential line routes and substation locations, choosing the most appropriate types of structures, and deciding on the optimal line routes and substation sites. However, the exact location of support structures for power lines is only determined during project implementation, more specifically during the engineering and construction phases.

In projects involving farmlands, Hydro-Québec consults the UPA during each of the phases outlined above through the association's regional federations, as set forth in the company's environment policy. Other parties can also be consulted during this process.

Hydro-Québec is ultimately responsible for the siting of its facilities. The company must submit its final decision for approval by the competent authorities. These include municipalities, regional county municipalities (RCMs), the Commission de protection du territoire agricole (Québec farmland protection commission, or CPTAQ), the ministère de l'Environnement du Québec (Québec department of the environment), and the ministère des Ressources naturelles du Québec (Québec department of natural resources, or MRN), among others.

2.2 General considerations

The UPA and Hydro-Québec acknowledge that the application of siting criteria can vary from region to region depending on the type of project as well as the existing and foreseeable use of the area in question. Choices must therefore be made in cooperation with stakeholders in the agricultural industry.

As a general rule, siting criteria must be applied in such a way as to cause the least inconvenience to farmers while striving to establish the shortest possible route and to limit the number of angles between the two points to be connected. Longer routes result in higher costs and, in most cases, additional impacts (a greater number of landowners affected, more support structures, more trees cut, etc.).

2.3 Siting criteria applicable to farmlands

The choice of substation locations and line routes on farmlands must comply with the following criteria:

- Favor the siting of substations or power lines on the boundaries of or outside agricultural zones protected under the *Act respecting the preservation of agricultural land and agricultural activities*.
- Favor siting on agricultural land with the lowest potential in the study area, according to maps of potential prepared by the ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (Québec department of agriculture, fisheries and food, or MAPAQ).
- Protect sugar bushes, orchards, plantations, woodlands under development, windbreaks and other high- and average-quality woodlands in the study area, bearing in mind however that a right-of-way in this type of woodland could be developed for uses other than a right-of-way.
- Favor siting in poor-quality woodlands rather than on cultivated land.
- Where possible, favor orientation along lot, concession or any other cadastral lines and avoid running power lines diagonally across crops.
- Limit the number of support structures on cultivated land. Instead, endeavor to locate them in residual spaces, groves or strips of woodland.
- Protect lands that have underground drainage or will have it in the short or medium term according to data available from the MAPAQ.
- Install infrastructure away from farm buildings and fish breeding ponds.
- Follow existing line corridors when they meet the criteria set forth above.
- Avoid areas subject to erosion.

The foregoing criteria are not listed in order of importance. Their application shall vary from one region to another depending on the nature of the project and the site (existing and foreseeable).

The shortest line routes with the fewest angles possible must be chosen in cooperation with agricultural stakeholders.

2.4 Choice of structure

The type of structure can sometimes have a bearing on the magnitude of the impact. For example, rigid (self-supporting) block-foundation towers[1] such as tubular poles reduce the impact of power lines on farmlands.

However, given the technical constraints associated with these towers, Hydro-Québec cannot commit to using them systematically on farmlands.

Cost is another factor which Hydro-Québec must take into account.

In each power-line project, Hydro-Québec's studies therefore include an assessment of the most appropriate type of structure. When towers are being considered, Hydro-Québec evaluates the use of both rigid block-foundation towers, such as tubular poles, and conventional lattice towers.

In addition, Hydro-Québec is conducting studies to determine the most cost-effective yet technically feasible way of reducing the dimensions of towers on farmlands as well as the need to circumvent them. These studies should lead to the design of towers which better meet the criteria governing the siting of structures on farms and provide for optimal use of arable land.

2.5 Cooperation

Hydro-Québec deems the UPA and its regional federations to be the preferred stakeholders in matters regarding farmland.

As regards the siting of power facilities, Hydro-Québec and the UPA have agreed to cooperate in accordance with the guidelines set forth below.

---

1. Rigid block-foundation tower: a generic term encompassing all towers which comprise solid concrete foundations and are not held up by guy wires.

Cooperation shall take place during each of the four stages normally included in siting studies, with a view to progressively restricting the study area:

1. Establish line corridors and identify areas suitable for substation sites.

2. Establish potential line routes and substation sites.

3. Choose definitive line routes and substation sites.

4. Determine where to install support structures for power lines.

Accordingly, the people in charge of carrying out the studies shall meet with the regional federations as follows:

1. During the first stage, to discuss draft maps, proposed line corridors and substation siting areas as well as the elements which will form the basis for comparison.

2. During the second stage, to review draft maps, proposed line routes and substation sites as well as the preliminary results of the comparative analysis.

3. During the third stage, to review draft maps of the adopted routes and sites in order to optimize them, to have them approved and to identify ways of mitigating the structures' impacts.

4. During the fourth stage, to discuss the spacing of support structures once the route has been approved.

In determining the spacing of support structures, Hydro-Québec shall consult landowners individually so as to take into account constraints associated with their particular land and crops, within the guidelines set forth in the applicable agreements.

In cases where requested changes would have an impact on a number of landowners, Hydro-Québec shall organize meetings on a segment-by-segment basis and invite all landowners concerned.

All drawings and specifications produced as a result of meetings with landowners must comply with agreements between Hydro-Québec and the UPA. If required, these are appended to the requests seeking government approval of the project.

During the consultation process, and at least at the end of the third stage, the UPA shall advise Hydro-Québec in writing of its approval of line routes and substation sites.

It should be noted that if the area is given in acres, the formula becomes:

$$P = E_a (s_a + n_a) + E_f (s_f + \frac{n_f}{2})$$

5.2.2 Compensation for the easement and right of way (C_2)

5.2.2.1 On farms

The compensation paid for all land subject to an easement shall be equivalent to 100% of the market value of the area required.

An increment of 50% of the market value of land subject to an easement shall be granted in consideration of the small surface area used.

5.2.2.2 In woodlands

Compensation for the easement and right of way in a private forest used for production is based on the value of the woodlands affected, according to generally accepted methods and principles in forestry assessment.

The main criteria for assessing a forest are:

- the specific composition, distribution, development and volume of wood in the forest;
- the local and regional value of forest products in relation to requirements respecting dimension and quality and the use to which the products are put. Tables or lists of the prices used for each region of Québec are published annually (in early July) in the joint plans approved by the Régie des marchés agricoles;
- for the purpose of this agreement, the value of standing timber is estimated at 50% of the roadside price.

The compensation paid to the owner of any woodland subject to an easement is made up of four components.

Forest inventory

Compensation in respect of the forest inventory subject to an easement is equivalent to 100% of the market value of the forest inventory (cleared) of the area in question. An increment of 50% shall be granted in consideration of the small surface area used.

5.2.3 Compensation for the presence of support structures (C_3)

5.2.3.1 On farms

On cultivated land, encumbrance resulting from support structures is compensated by taking into account the arable land surface lost, the additional cost of driving around them and the cost of maintaining the uncultivated space. Documents submitted to the UPA[1] indicate the method of calculating such compensation.

The compensation can be paid in two ways:

- in the form of a single payment calculated by using a capitalization rate of 3.5%;
- in the form of an annual payment.

If the parties agree on an annual payment, the amount of the payment is subject to review every five years, bearing in mind the choice of crops. The annuity is calculated by multiplying the amount of the single payment by a rate equal to the interest rate on a 12-month term deposit at the National Bank of Canada. This rate is revised once a year and reflects the interest rate in effect on the last Friday in January. The annuity is transferable to another buyer of the land in question. The annual-payment option may be converted into a single payment at the end of any five-year period or when the ownership of the property is transferred.

5.2.3.2 In woodlands

The owner of a woodland shall receive, as compensation for the presence of support structures, $100 per support point and anchor point, up to a maximum of $500 per support structure.

When the initial negotiations take place, Hydro-Québec shall provide the landowner with details of the compensation pertaining to elements C_1, C_2 and C_3.

5.2.3.3 Addition or replacement of support structures

When a support structure is added, the compensation shall be calculated according to the same procedures as in 5.2.3.1 (on farms) and 5.2.3.2 (in woodlands).

If the number of support structures remains the same but their location or dimensions are changed, in the case of a permanent easement on a farm the compensation shall be calculated according to the differential between the old and

1. Hydro-Québec, *Méthode d'indemnisation pour les supports en milieu agricole*, November 21, 1985, 4 pages.
   Hydro-Québec, *Compensation pour pertes de récoltes et inconvénients durant la construction*, November 21, 1985, 7 pages.

Appendix 17A

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Report of the Solandt Commission

A public inquiry into the transmission of power
between Lennox and Oshawa
April 1975

of the study area continues to be given over to agriculture, "Rural growth has [generally] resulted from an increase in rural residential population. . . . over 25 per cent of the farms in the western part of the study area are part-time or residential. Farms are fewer, but larger and more specialized."[16] Area farming ranges from general agriculture to specialization in dairy, beef and tobacco. Taken as a whole, the study area has begun to reflect the pressures and demands of economic, and particularly urban growth, upon established rural and agricultural communities.

The OH/CAI Study Method

Commonwealth Associates Inc. were retained by Ontario Hydro to do an environmental study of the area between Lennox and Oshawa and to recommend a preferred route for the 500 kV transmission line through this area. Having had previous experience with a computer technique for transmission corridor selection, CAI elected to use a similar method again in this study. The method is briefly described in the main OH/CAI report and is more fully described in a companion volume to the main report which is entitled "Technical Report - Corridor Selection Methodology". This second volume has been available since the main report appeared but has not been widely circulated and probably not extensively read. Anyone interested in details of the method should consult both volumes.

The CAI method involves two phases. The first phase in which a computer was used resulted in printed maps upon which the corridors were selected visually. The second phase, or right-of-way selection, was done by more familiar methods using maps, air photos and ground and air reconnaisance. The following brief description of the method is mainly taken verbatim from the OH/CAI Summary Report and the Environmental Report.

> PHASE I - CORRIDOR SELECTION
>
> The objective of Phase 1 was the identification of several 750 metre wide alternative corridors. This task presented a formidable problem; for aside from environmental considerations, just the task of connecting two points in a geographic region has virtually an infinite number of possible

16 OH/CAI Summary Report, p. 11.

> solutions. Therefore, a systematic procedure was utilized to limit the number of solutions to a manageable few and then evaluate each to determine the single best.
>
> The corridor selection methodology was developed from the rational planning techniques commonly employed by urban and regional planners, and resource analysis methods. The main features of this hybrid combination are:
>
> - Specification of a number of objectives necessary to the realization of the goal of establishing a minimum impact corridor;
> - In-depth data collection by uniform cells located within a specific study area;
> - Evaluation of the data to determine to what degree various locations in the study area respond to each objective;
> - Generation of alternative corridor locations by differential emphasis of the objectives; and
> - Evaluation of the alternatives in terms of the objectives and in terms of the political, social and economic considerations outside the process, but brought to it by the involvement of a multi-disciplinary group of individuals.[17]

The method is based on a matrix with a list of selected objectives across the top and a list of variables relevant to each objective down the side. A new matrix is created to embody the special characteristics of each study area. Ontario Hydro and CAI prepared tentative lists of both objectives and variables based on their own experience and discussed these with the public at meetings in each township between February 8th and March 7th, 1974.

The objectives that were finally used in the computer study were:

---

17 OH/CAI Summary Report, p. 13.

a) minimize damage to natural systems;
b) minimize conflict with existing land uses;
c) minimize conflict with proposed land uses;
d) minimize conflict with culturally significant features;
e) maximize potential for right-of-way sharing;
g) minimize conflict with capability analysis (proposed transmission facility should avoid those areas of high land capability as designated by the Canada Land Inventory).

Objective f) was to minimize visual exposure but in the final analysis this was considered to be part of objective b).

The variables that were considered were topography, surface hydrology, existing land use, existing road ways, communications and utilities, proposed land use, unique features, outdoor recreation capabilities, average soil capability for agriculture and capability for water fowl.

Information on all variables was assembled for the entire study area. The next problem was to decide on the form in which this material would be fed into the computer. Computer programs which use mapping techniques and can deal with variable areas of any size and shape are in the process of development but are not yet widely used. A much more commonly used plan is to divide the entire area into small square cells and to tell the computer the value for each of the variables in each of these cells. Obviously, in the use of this type of computer analysis one of the most important decisions is the selection of cell-size. The ideal cell-size is so small that even small objects like houses or barns can be identified and coded. Unfortunately, the use of such a small cell-size would result in an impossibly large coding task so a compromise must be reached. In this case a cell-size of 250 metres square containing 15.45 acres per cell was chosen. Even at this size approximately 60,000 cells were required to cover the study area.

Appendix 17B

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Appendix D: List of Study Area Criteria and Indicators

Criteria	Indicators	Rationale
A. NATURAL ENVIRONMENT		
Environmentally Significant Areas	• Area of PSWs traversed (NHIC, 2005a)	• Provincial designation • Potential for short and long-term effects on PSW habitat
	• Area of Provincially Significant ANSIs traversed (NHIC, 2005a)	• Provincial designation • Potential for short- and long-term effects on natural features
	• Area of Environmentally Sensitive/Significant Areas (ESAs) traversed, e.g., municipal ESAs and designated Natural Areas, Niagara Escarpment Plan Natural Areas (NEC, 2005)	• Potential for short- and long-term effects on environmentally significant features
	• Number of occurrences of SAR (OMNR, 2006; COSEWIC, 2007) and provincially significant species (NHIC, 2005b)	• Provincial designation • Potential for short- and long-term effects on SAR habitat
	• Area of Significant Woodlands traversed	• Potential for short-and long-term effects on Significant Woodlands
	• Area of Non-provincially Significant and/or Unevaluated Wetlands traversed	• Potential for short- and long-term effects on wetland habitats
	• Area of significant wildlife habitat traversed	• Potential for short- and long-term effects on significant wildlife habitat
	• Area of Hazard Lands traversed • Area of significant valleylands traversed	• Potential for flooding or erosion effects on the transmission line
	• Migratory bird flyways, feeding and resting areas	• Potential for short- and long-term effects on migratory birds and their habitat
Potential effects on Forest Resources	• Number of woodlands > 2 Ha traversed • Area of woodlands > 2 Ha traversed	• Potential for short and long-term effects on woodlands
Water Bodies, Fish	• Number of coldwater streams traversed	• Provincial designation

Criteria	Indicators	Rationale
Habitat and Aquatic Ecosystems		• Potential for short- and long-term effects on fisheries resources and habitat
	• Number of other streams traversed	• Potential for short- and long-term effects on fisheries resources and habitat
Aggregate Resource Deposits	• Area of significant aggregate resources traversed	• Potential loss of mineral aggregate resources for long-term use and adherence to PPS
B. SOCIO-ECONOMIC ENVIRONMENT		
Existing Land Use	• Area of existing land uses traversed	• Potential for conflict with existing land uses and adherence to the PPS
Commercial Activities	• Number and types of business and tourism related activities affected	• Potential to disrupt or displace businesses and tourist attractions
Mineral And Aggregate Resources	• Area of mines • Area of pits/quarries	• Potential effects on existing operations
Human Settlements	• Number of potential property purchase (buyouts)	• Hydro One Policy prohibits family residences or other structures being located within transmission line ROW
	• Number of potentially affected properties	• Crossings of properties are disruptive to family residences and businesses
Community Services	• Number of health care facilities traversed	• Potential for Project to displace or disrupt facilities
	• Number of educational facilities traversed	• Potential for Project to displace or disrupt educational facilities
	• Number of parks and recreation facilities traversed	• potential for Project to displace or disrupt recreational activities
Community and Regional Infrastructure	• Gas pipelines, roads and railways traversed; proximity to airports	• Potential effects on operations and maintenance
Landscape and Visual	• Number of residences (receptor locations) and	• Proximity and visual effect of proposed alternative routes

Criteria	Indicators	Rationale
assessment	viewing opportunities within 1 km distance from Reference Route and Refinement Alternatives. • Identification of recreation areas, trails, waterways and roadways. • Scenic quality/ranking of visual units in existing landscape setting	to receptor locations and recreational users (of scenic landscapes/features) which could potentially affect viewer expectations in the vicinity of the facility.
Built and Cultural Heritage Resources	• Proximity to buildings and/or structures and Cultural Heritage Landscapes 40 years or older in age. • Proximity to building and/or structures and Cultural Heritage Landscapes recognized by one or more levels of government, e.g., listed, designated, or included on a register of heritage properties, or commemorative plaque.	• Identify built and cultural heritage landscape resources of cultural interest or value requiring protection from displacement and/or disruption effects.
Archaeological Resources	• Area with high archaeological potential traversed	• Identify areas requiring protection due to their important archaeological value
D. AGRICULTURAL		
Soil Capability and Land Use	• Area of Class 1, 2 and 3 agricultural lands traversed	• PPS requires that use of Class 1, 2, 3 lands for a transmission line be avoided as much as practicable
	• Distance of Class 1, 2, and 3 agricultural lands crossed	• Provincial Policy requires that use of Class 1, 2, 3 lands for a ROW be avoided as much as practicable
Livestock Production	• Number of livestock facilities in proximity (using a 0.5 km potential zone of influence) • Type of Facility • Type of livestock present	• Livestock production could be impacted by construction activities or relocation of farm operations (using a 0.5 km potential zone of influence)
Speciality Crop Production	• Area of specialty crop land traversed	• Specialty crops could potentially be affected by the widened ROW

Criteria	Indicators	Rationale
Tile Drains	• Area of tile drained (systematic, random)	• Agricultural drainage could be potentially affected by the widened ROW

Appendix 17C

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

SUPPLY TO ESSEX COUNTY TRANSMISSION REINFORCEMENT PROJECT

CLASS ENVIRONMENTAL ASSESSMENT (EA)

HYDRO ONE WORKSHOP ON TRANSMISSION LINE ROUTE ALTERNATIVES

OCTOBER 29, 2009
COMBER COMMUNITY CENTRE

November 30, 2009 | Final Workshop Report

Prepared by Lura Consulting
for Hydro One Networks Inc.

LURA

Table 2: Prioritization of Route Evaluation Criteria

Importance	Criteria	Considerations
High	Landscape and Visual Assessment. (10 dots)	Front views are more important than back views (e.g. property owners would prefer to see the transmission line in their back yard as opposed to their front yard).
	Proximity to Residential Dwellings. (10 dots)	Property owners would prefer that the transmission line be located as far as possible from residences for various reasons, including potential electric and magnetic field effects, noise (buzzing of conductor in certain conditions), and potential interference with electronic equipment.
	Health / Noise effects from transmission line†	Potential health impacts are considered more important than noise impacts. However, it was noted that noise can affect health.
Middle	Tiled fields. (6 dots)	Property owners would prefer minimizing the area of drainage tile affected by the route.
	Electronic Interference from transmission lines. † (5 dots)	Potential electronic interference should be mitigated.
	Line Orientation. (5 dots)	If the transmission line crosses a field diagonally, it would have a greater impact on the property than if it crosses the field on a straight line.
	Tower base. (5 dots)	Linked to whether the right-of-way was in the middle of a field or on a fence line (preferred).
Low	Affected Properties. (3 dots)	Minimizing the number of properties over which the proposed hydro line right-of-way crosses. (Hydro One noted that the blue route crosses five more properties than the red route.)
	Specific crops. (2 dots)	There were two organic farmers present at the workshop.
	Paralleling Infrastructure. (2 dots)	Property owners felt that it does not matter whether the transmission route runs parallel to the road, gas pipeline or drainage ditch.
	Landscape and Visual Assessment. (3 dots)	The impacts on the view of the landscape while driving down the road does not matter.

† denotes new criteria suggested by participants.

3.3 Additional Considerations

Following the discussion on route evaluation criteria, Ms. Hall asked if there were any other issues raised during the small group discussions. The following main issues were raised:

- Concerns such as property devaluation, potential change in zoning of property and fear that property taxes will go up as a result of a transmission line.

- Property compensation paid by Hydro One is not similar to compensation being offered by Wind Project Developers and Telecommunications Companies. Also land owners would prefer annual rather than lump-sum payments and mentioned that they would prefer long-term easements (e.g. 40 years) rather than an easement in perpetuity.

- Property compensation packages negotiated by Hydro One should be updated to reflect modernized farming methods with larger and more sophisticated equipment. Farming around towers is more difficult for a modern farming operation. The trend toward more organic farming also needs to be recognized, as these operations do not use pesticides or herbicides.

3.4 Workshop Outcomes and Conclusions

High level recommendations and considerations that resulted from the workshop were as follows:

1. Using the strengths and weaknesses discussion and the evaluation criteria developed at the workshop, the blue route was preferred over the red route.

2. The participants considered the following evaluation criteria most important:

    a. Landscape and Visual Assessment,

    b. Proximity to Residential Dwellings, and

    c. Impact on Health / Noise from Transmission lines.

3. Additional considerations raised by participants included:

    a. Recommendation that an alternative transmission route following the municipal utility corridor (underground or overhead) through the community of Staples should be reconsidered.

    Hydro One reiterated that this option was previously considered and discounted for the reasons previous explained, and that it will not be re-evaluated as an option for the proposed transmission line.

    b. Compensation for property rights is a critical factor for landowners and needs to address the valuation of a property resulting from the installation of transmission towers or a right-of-way on private property. Participants recommended that Hydro One consider comprehensive and annual payments in the range of $6,000 - $10,000 similar to what is offered by wind developers.

    Hydro One's Real Estate Coordinator explained that each property affected by a transmission line is appraised by an independent accredited appraiser, and that this up-to-date appraisal forms the basis for negotiating a property compensation

Appendix 18A

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

POPLAR RIVER TO PASQUA 230 kV TRANSMISSION LINE ENVIRONMENTAL IMPACT STATEMENT

Submitted to:
Saskatchewan Ministry of Environment
Environmental Assessment Branch

Submitted by:

SaskPower

April 2009

Prepared by:

SaskPower

J.D. Mollard and Associates Limited
AMEC Earth & Environmental Limited (Regina)

EXECUTIVE SUMMARY

Introduction

Saskatchewan Power Corporation (SaskPower) is proposing to construct a 160 km overhead 230 kilovolt (kV) electrical transmission line from the Poplar River Switching Station near Coronach to the Pasqua Switching Station near Moose Jaw.

Project Need/Justification

The purpose of this project is to:

- Reinforce the existing transmission system to meet North American Reliability Standards;
- Deliver additional power from the Poplar River Power Station. The Poplar River Power Station is capable of producing an additional 20 MW of power as a result of refurbishments that were completed in 2008;
- Lower SaskPower's operating costs by reducing transmission losses; and
- Reinforce the high-voltage transmission system in the Moose Jaw area.

Addition of the 230 kV transmission line, along with other planned facilities, will reinforce the existing transmission system to meet North American reliability standards for delivery of the existing Poplar River Power Station capacity (562 MW), and allow for the delivery of its additional capacity to the system. The design life of the project is 50 years.

Due to the size of this project, SaskPower and the Saskatchewan Ministry of Environment (MoE) are of the opinion that the project constitutes a "development" as defined in the Environmental Assessment Act (EAA) and thus requires an Environmental Impact Assessment (EIA) pursuant to the aforementioned Act. This requirement thus defines the need for a project-specific EIA. The assessment was carried out in accordance with Project Specific Guidelines issued by MoE in January 2008.

SaskPower considered two primary options that could meet the North American Reliability Standards for the provincial transmission system. The first option included construction of a new 138 kV transmission line between the Regina South Switching Station (located near Regina) and the Pasqua Switching Station, and the addition of voltage support equipment at Pasqua. The second option included construction of the Poplar River to Pasqua 230 kV transmission line as an alternative to the Regina to Pasqua 138 kV line.

The Poplar River to Pasqua 230 kV option was chosen over the Regina to Pasqua 138 kV option based on system performance and economics. The 230 kV line provides better reliability performance, and is the lowest cost option.

To minimize the impact of the construction of transmission lines, SaskPower is following environmental safeguards to ensure that environmental impacts are adequately addressed early in the project and which reinforces the support for design flexibility provided by corridor approval.

Examples of environmental safeguards prior to construction are:

- Use of SaskPower's Environmental Screening System and secondary screening results to provide information for identifying alternative corridors;
- Identification of alternative corridors which focuses on capitalizing on opportunities to mitigate impacts for an environmental, agricultural, social and economic nature;
- Identification of effective mitigation strategies to address potential impacts within alternative corridors under consideration and minimize residual impacts; and
- Implementing a public consultation program.

Examples of environmental safeguards during the project implementation phase are:

- Identification of the RoW and structure placement focuses on opportunities to mitigate environmental, agricultural, social and economic impacts within the approved corridor;
- Environmental mitigation commitments, conditions of approval and environmental best practices are included in the construction specifications given to the construction contractor; and
- Environmental monitoring program throughout the construction phase.

Study Area

The study area boundaries defined for this assessment encompass the connection points for the proposed transmission line, specifically the Poplar River Power Station in the south and the Pasqua Switching Station in the north. East and west study boundaries were selected to encompass the existing 230 kV P2C Poplar River-Condie transmission line on the east side and the existing 230 kV P2A Poplar River-Assiniboia and 138 kV A1P Assiniboia to Pasqua transmission lines on the west side. Moreover, a general objective in selecting the study area boundary was to facilitate consideration of all viable routing options.

The study area can be characterized as dominantly rural with a small number of widespread larger urban centres. Approximately 82% of the persons live within 29 defined urban municipalities. The largest population centre is the City of Moose Jaw and the next largest community is the Town of Assiniboia. The remaining communities all have populations below 1,000 persons. Transportation infrastructure is well developed throughout most of the study area.

The majority of land in the study area is cultivated for crops. Forage lands are generally restricted to locations where the topography and/or soils conditions make crop cultivation difficult or uneconomic. Four land use types dominate the study area — cultivated, forage/grassland, urban areas and waterbodies. The study area contains several important natural resources, including bentonite and kaolin clays, sodium sulphate, potash, oil and gas reservoirs, and substantial reserves of lignite coal.

Physiography of the study area is dominated by the Missouri Coteau upland which is located across the north central part of the study area, oriented in a northwest-southeast direction. The Moose Jaw River, East Poplar River, Cookson Reservoir, Lake of the Rivers and Willow Bunch

Lake are dominant hydrographic features in the study area. The study area is located within the Southwest Tourism Region of Saskatchewan, an area rich in history and culture.

The study area lies within the Prairies Ecozone, a broad expanse of open grassland that occupies much of southern Saskatchewan, Alberta and Manitoba. The Prairies Ecozone has a subhumid to semi-arid climate, made all the more pronounced by long cold winters, short dry summers, and high winds. The dry conditions restrict the growth of trees, allowing hardier grasses to flourish. The native vegetation in the ecozone is primarily mid-grasses growing in mixed stands with short grasses such as blue grama grass. There are eight ecodistricts in the study area. Two of these ecodistricts are associated with the Moist Mixed Grasslands Ecoregion; the remaining six are associated with the Mixed Grass Ecoregion.

Public Consultation

SaskPower undertook two rounds of public consultation for the proposed Poplar River to Pasqua 230 kV Transmission Line Project, in addition to media advertising, mail correspondence and maintaining a 1-800 contact phone number for project inquiries. The first round of public consultation focused on people and municipalities located within areas crossed by the three alternative corridors.

Letters were mailed to approximately 500 landowners potentially affected by the three alternative corridors in June 2007 introducing the proposed transmission project and inviting people to attend one of four public open house information sessions held later that month. SaskPower also contacted affected rural municipalities, towns, villages and cities to introduce the project and to arrange presentations to their respective councils. Four public open house meetings were advertised and then held in Coronach, Willow Bunch, Bengough and Moose Jaw. Following selection of a preferred corridor, a second round of public meetings was conducted with elected officials and a second set of open houses was held to inform stakeholders about the selection of the preferred corridor and to discuss the rationale for the decision. The second round of public consultation was conducted in February 2008.

Many questions were raised during the public consultation process. SaskPower provided information on various issues throughout the consultation phases, and the issues raised were evaluated and taken into consideration during the corridor evaluation process. SaskPower's responses to the issues raised are detailed in the Environmental Impact Statement (EIS).

Based on comments received at the open houses, in personal conversations, phone calls and in meetings, it appeared that the reaction to the preferred corridor from the majority of affected landowners and others was favourable. SaskPower believes that the stakeholders in the study area are generally supportive of the selected corridor. Stakeholders seemed to understand the need for the new line, and although there were several issues raised and pertinent questions asked, the information provided by the project team seemed to satisfactorily address all the issues and concerns.

Corridor Selection Methodology and Preferred Corridor Selection

SaskPower has historically applied for and been granted approval from MoE to construct major electrical transmission lines within a defined variable width corridor, most commonly 1.6 km in width. This approach provides the required flexibility to make RoW and structure placement adjustments that address potential environmental, agricultural, social and economic issues which arise during the Project Regulatory Approval Phase and the Project Implementation Phase.

The process of defining the preferred transmission line corridor initially entailed identification and evaluation of a large number of corridor alternatives within the study area to ensure that no viable options were overlooked. Alternative corridors were identified on air photos, and by viewing GIS-based satellite imagery as well as environmental, infrastructure, land use and terrain data sets. Project-specific corridor selection criteria were developed to capitalize on opportunities to mitigate potential agricultural, environmental, land use and economic impacts related to construction, operation and maintenance of the proposed transmission line. These alternative corridors were then reviewed by the project team to select the best options for follow-up evaluation.

Three alternatives corridors were identified for further study and presentation to the public which provided balanced consideration of potential environmental, agricultural, social and economic concerns within the study area. Three alternative corridors with the best characteristics were selected for further study by the project team and for discussion with the public during the first round of public consultation. These corridors are referred to as the East, Central and West alternative corridors.

Following evaluation of more detailed corridor data during the secondary project screening phase, the project team recommended the West corridor as the preferred corridor. The West corridor has significantly lower agricultural impacts and more double circuit construction than the Central and East corridors. Potential residual environmental impacts in all three corridors were judged to be low. Slightly higher estimated capital costs potentially incurred by SaskPower for the West corridor are considered a reasonable investment to help reduce overall impacts of the transmission line on agricultural operations.

Description of the Preferred Corridor

Section 6 gives a detailed description of the geographical, socio-economical and environmental aspects of the preferred corridor. To facilitate its overview, the preferred corridor is divided into six segments from the Poplar River Power Station in Coronach located at the southern most point of the proposed line, to the most northern point at the Pasqua Switching Station.

Each segment is presented on a detailed satellite imagery map, providing the opportunity to see the most recent state of the land use.

Open house attendance statistics are provided in Table 14.

Table 14: Open House Attendance Statistics

	June 2007 Project Introduction	February 2008 Preferred Corridor Selected
Coronach	25	28
Willow Bunch	41	54
Bengough	18	N/A
Moose Jaw	46	41
Total in Attendance	130	123

4.4 Issues Raised and SaskPower Responses to the Issues

The following questions were raised during the public consultation process through phone calls, questionnaires, council meetings and the public open houses. SaskPower provided information on various issues throughout the consultation phases, and issues raised were evaluated and taken into consideration during the corridor selection process. SaskPower's responses to the issues raised follow each question below. Section references are provided for topics discussed in this report.

4.4.1 Project Need

- **Why is the new powerline needed at this time?**

The 230 kV transmission line will reinforce Saskatchewan's existing transmission system to meet North American Reliability Standards for delivery of the energy generated at the Poplar River Power Station. The line, along with switching station improvements, will prevent system overloads and low voltage conditions in the event of loss of one of the existing Poplar River 230 kV lines. The new line will also deliver an additional 20 MW of capacity to the system from the recently refurbished Poplar River generating units. Additional information on project need is contained in Section 2.2 of this report.

- **Will the new line improve reliability in local areas?**

The new 230 kV line will reinforce the transmission system in the Moose Jaw area, which will improve bulk power reliability. It will also facilitate the interconnection of potential generation projects in the Coronach, Assiniboia and Moose Jaw areas.

- **What alternatives, if any, were considered other than building this line?**

Other transmission options were considered prior to deciding to construct the line connecting the Poplar River Power Station to the Pasqua Switching Station. There were other 230 kV and 138 kV transmission options that also prevented system overloads in the event of the loss of one of the existing Poplar River 230 kV lines; however, the Poplar River to Pasqua transmission line was the lowest cost option that met all of the technical requirements, including delivery of refurbished Poplar River capacity prevention of system overloads in the event of the loss of one of the existing Poplar River 230 kV lines and lower operating costs due to reduced energy and power losses on the existing transmission system. Section 2.3 provides additional detail on project options examined.

Results of Public Consultation on Analysis of Corridor Alternatives

The results of SaskPower's Public Consultation process that described Corridor Alternatives (undertaken at several Public Meetings) are described in Section 4.0.

Cost Comparison

Table 17 summarizes the estimated capital, incremental maintenance and incremental line loss costs for the West, Central and East corridors.

Table 17: Corridor Cost Comparison

Corridor	Capital Cost ($)	Incremental Maintenance Cost ($)	Incremental Line Loss Cost ($)	Total Cost ($)
West	36,467,000	404,000	235,000	37,106,000
Central	35,435,000	207,000	0	35,642,000
East	34,357,000	0	663,000	35,020,000

Note:
Dollar amounts listed above are in present worth dollars, as this is the first occurrence of the comparison of the corridor costs; All subsequent mention of corridor costs in Sections 5 & 6 are also in present worth dollars

Incremental maintenance and line loss costs are calculated as the difference between the total maintenance and line loss costs for each alternative, and the lowest total maintenance and line loss costs.

Maintenance costs are based on a 50-year life for the line, 1.0% of capital cost/year for maintenance, and a real interest rate of 4.71% (escalation = 2.0% and interest = 6.8%).

Line loss costs are based on a 15-year average marginal energy cost of $44.5/megawatt hour (MWh), resulting in a total line loss cost of $98,000/km.

Total cost is calculated as the sum of the total capital cost, and the increment maintenance and line loss costs. Based on these estimates, the East corridor has the lowest estimated total cost and the West corridor has the highest estimated total cost.

5.3 Selection of a Preferred Corridor

The process of selecting a preferred corridor entailed a more detailed assessment of routing factors within the West, Central and East corridors. Factors considered in this assessment are outlined in Section 5.3.1. and discussed in Sections 5.3.3 to 5.3.7. The secondary environmental screening process and results are discussed in Sections 5.3.2 and 5.3.8, respectively. Comparison of the three alternative corridors is presented in Section 5.4.

5.3.1 Factors Used to Compare Alternative Corridors

Factors used to compare corridors are:

- habitat/land cover;
- endangered species information;

- ranking of environmental lands;
- land use factors;
- estimated capital, incremental maintenance and incremental line loss costs; and
- public involvement and regulatory issues.

Subfactors within these categories were defined and tabulated from data compiled during the primary and secondary screenings.

5.3.2 Secondary Environmental Screening Process

Secondary environmental screening was carried out to further assess the advantages and disadvantages of the East, Central and West corridors. Secondary screening involved the following activities.

- Land cover and land use mapping to identify habitat types occurring within the corridors, including their relative abundance and distribution.
- Comparison of institutional environmental land designations within each corridor.
- Literature review to identify species (flora and fauna) and habitats that may be found within the corridors, with special attention to rare and endangered species.
- Contacting regulator representatives, government departments and agencies, biologists, nongovernment organizations and other knowledgeable persons regarding the occurrence of rare and endangered species and their habitats within the corridors.
- Public consultation to:
    - inform the public about the project, and request input regarding advantages and disadvantages of the corridors;
    - gather additional information about the occurrence of rare and endangered species;
    - document concerns regarding potential impacts; and
    - identify additional information that may be required.

5.3.3 Habitat Assessment Based on Land Cover and Land Use Mapping

Habitat within the corridors was assessed based on land cover and land use mapping results. Land cover and land use were mapped from panchromatic and multispectral SPOT satellite imagery with reference to video acquired from a helicopter flyover, field observations, stereoscopic airphotos, digital soils map data, digital elevation model data, hydrographic data, rural municipality maps and electrical distribution data (to identify occupied versus unoccupied residences).

Satellite imagery used for land cover and land use mapping was acquired in May 2006. Image resolution is 2.5 m for panchromatic bands and 10-20 m for multispectral data. Helicopter video of the alternative corridors was acquired on May 10, 2007, from an altitude of approximately 200 m.

possible or not practical, SaskPower commits to conducting further archaeological and palaeontological site assessment and, where necessary, mitigation programs in consultation with the Heritage Branch.

In addition to the above, SaskPower may conduct subsurface testing or construction monitoring at locations with a high potential for unrecorded buried heritage resources, in consultation with the Heritage Branch. This will also be done after the line design phase, once structure locations are known.

9.5 Impacts on the Project from the Environment

During construction, it is possible that weather may cause delays to the schedule. Construction crews may be shut down for certain time periods due to temperature extremes (either heat or cold), amount of snow or rain and/or high winds, for example. Consideration for the safety of workers and preservation of the environment must be given in these instances.

In the unlikely event of vandalism or an extreme weather condition (e.g., ice storm, tornado) affecting this transmission line after it has been put into service, customers may experience power disruption. SaskPower personnel will ensure that any repairs to the line are completed in a safe, timely manner.

9.6 Socio-Economic Issues and Impacts

Potential socio-economic issues and impact evaluation are addressed in this section. These can be assessed at the study area level or at the preferred corridor level depending on the issue. Existing socio-economic conditions of the study area and within the preferred corridor, including population demographics, local infrastructure and activities, are described in detail in Sections 3 and 6 respectively.

SaskPower implements a number of safeguards during the regulatory approval and implementation phases. Identification of alternative corridors (and finally RoW and structure placement) focuses on capitalizing on opportunities to mitigate environmental, agricultural, social and economic impacts.

9.6.1 Land Use & Designations

A table and comprehensive maps which describe the current land use and special designations of the lands along the preferred corridor are located in Appendix 20. These are shown by quarter sections. Special designations include WHPA Lands, Agricultural Crown Lands (formerly SAF Lands), organic lands, etc.

9.6.2 Potential Impacts to Land Use

To minimize impacts on the land and environment, it was concluded that the Poplar River to Pasqua 230 kV transmission line will be built with double-circuit capabilities in cultivated areas with existing high-voltage transmission lines. In these locations, the existing transmission line will be moved to the new structures and the original structures removed. Utilizing double-circuit

construction where practical contributes in minimizing impacts on land use because it reduces the number of structures and transmission line RoWs.

During the final design phase, there will be a number of opportunities applied to mitigate impacts on land use, including some of the following.

- Long span construction (230 kV tubular steel bundled conductor tangent design):
  - single circuit – average span = 315 m (approximately 2-3 structures per ¼ section); and
  - double circuit – average span = 245 m (approximately 3-4 structures per ¼ section).
- Structure placement:
  - utilize pasture land versus cultivation where practical;
  - route along quarter lines, blind lines or parallel to crop lines where practical;
  - place transmission line structures on fence lines, crop lines, field windbreaks, at the edge of poorly drained areas and bluffs of trees, strips of unbroken lands, and on the edge of road allowances in order to reduce interference with farm machinery operation;
  - when this is not feasible, provide a 30 m reservation between any of the above obstacles and the nearest pole or anchor of the structure to allow farm machinery to pass; and
  - provide adequate clearance to outbuildings.

Land impacts will also be mitigated by constructing the line during fall and winter, using low-impact construction techniques and by centreline or structure placement adjustments to minimize impacts.

Due to the short duration of construction and the small footprint of the transmission line structures, it is anticipated that there will be minimal residual impacts on land use. A very small area of land will be disturbed during construction for structure installation, and a small area of land will be considered out-of-production after construction is complete (particularly if the structure is located in a cultivated area). Compensation is negotiated with landowners on an individual basis, based on the specific impacts to the particular piece of property (i.e., cultivated vs. forage land, number of structures on private property, footprint of structure, etc.).

9.6.3 Potential Impacts to Rural Municipalities and Communities

SaskPower attempts to design facilities that will have minimal impacts on private property and communities. The preferred transmission line centreline will ensure accordance with all safety and industry standards.

Communities in the areas adjacent to the transmission line may experience a small increase to their population for a short duration of time due to the required workforce. SaskPower estimates that there may be 30-50 people working on the line contract during the 5-6 month construction phase. Communities and local businesses will see a positive economic impact from providing food services and lodging to the construction crews. Local material suppliers (for such items as crushed rock) may be called upon by the line contractor, as well as local people for certain labour requirements.

Environmental Issue	Type of Impact	Mitigation Options	EIS Reference Section(s)
		rerouted or diverted to approved temporary crossings and accesses or appropriate measures will be taken to minimize soil impacts when possible • stockpiling areas, where practical, will be located on existing disturbances or on areas lacking native vegetation	
Fisheries	**Deleterious Substances.** Potential harm to fish and fish habitat from the release of deleterious substances into the water. Such substances could come from heavy machinery working adjacent to the water through accidental spills, hydraulic leaks, or external grease exposed to surface water. Pole installation will lead to exposed ground surfaces and spoil materials which could lead to erosion and sedimentation into fish-bearing waterbodies.	• Maintain vegetation non-disturbance from waterbodies which are not crossed by the transmission line in accordance with DFO and Sask MoE guidelines, including as follows: 90m for watercourses with permanent fish populations or those capable of supporting fish populations by stocking; 30m for watercourses with seasonal fish populations; and 15m for watercourses that do not support permanent or seasonal fish populations • SaskPower will implement a spill contingency plan to deal with the accidental release of deleterious substances by machinery upland of waterbodies • Erosion and sediment control measures will be implemented where exposed soils from structure installation occurs upland of waterbodies	9.3.2
Fisheries	**Direct Loss of Habitat.** Loss, alteration or disruption of fish habitat due to construction or operation activities, such as clearing of riparian vegetation near waterbodies during construction or damage to banks and streambeds during equipment crossings	• Reclamation of riparian areas cleared during construction • Established watercourse crossings will be used whenever possible to minimize streambed and bank impacts	9.3.2
Fisheries	**Increased Fishing Pressure.** Increased fishing pressure due to improved access to fish-bearing waterbodies via transmission line right-of-way	• Permanent road or trail access along the right-of-way will not be maintained during operations • Lands along the RoW will remain private lands with restricted access	9.3.2
Heritage Resources	**Protection of Heritage Resources.** Protection of archaeological or paleontological historical sites	• An archaeological Heritage Impact Assessment (HRIA) was conducted on the preferred corridor. • SaskPower will continue to work in consultation with the Heritage Branch throughout the construction of this project.	9.4
Socio-Economic	**Land Use Impacts.** Potential impacts to land use such as interference with agricultural	• Double-circuit construction in cultivated areas with existing high-voltage transmission lines	9.8.1

Environmental Issue	Type of Impact	Mitigation Options	EIS Reference Section(s)
	operations or loss of productive agricultural or pasture land	• Where practical, routing along quarter-section lines, section blind lines, or parallel to existing crop lines • Where practical, routing along fence lines, crop lines, field wind breaks, at the edge of poorly drained areas and bluffs of trees, strips of unbroken lands, or on the edge of road allowances • Where placement on cultivated land is unavoidable, ensure a 30m reservation between RoW and nearest obstacle to allow farm machinery to pass • Provide adequate clearance to outbuildings • Where practical, autumn or winter construction to reduce interference with seeding/harvest operations • Use of low-impact construction techniques • Movement of structures during design phase to allow for avoidance of obstacles / problems such as those listed above • Financial compensation negotiated with landowners (on individual basis) based on specific impacts to their property (number of structures, structure footprint, *etc*)	
Socio-Economic	**Impacts to Rural Municipalities and Communities.** Potential impacts to communities and rural municipalities, both during construction phase and in long-term, including effects on aesthetics and perceived value of property, increased local business purchases by construction crews, possible increased employment and	• Transmission line will be designed to minimize impacts on private property • Construction and operation of transmission line will be in accordance with all safety and industry standards	9.6.3
Socio-Economic	**Transportation Infrastructure.** Impacts to existing transportation infrastructure, including increases in traffic volume on roads, temporary blockage or obstruction of traffic flow on certain roads for safe construction activities, or roadway damage during materials / equipment movement,	• No road or bridge upgrades are expected for access purposes • SaskPower will be in contact with affected parties (Ministry of Highways, Rural Municipalities, local landowners) to resolve any damages incurred on roads due to construction • Temporary access road approaches or temporary culverts and fill required for the project will be removed upon construction completion, unless otherwise requested by the landowner	9.6.4
Socio-Economic	**Community Infrastructure and Services.**	• Where practical, and at the discretion of the line	9.6.4

Appendix 18B

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Appendix 15B

REASONS FOR DECISIONS

ENVIRONMENTAL ASSESSMENT APPROVAL

REASONS FOR DECISION

ENVIRONMENTAL ASSESSMENT APPROVAL

SASKPOWER
POPLAR RIVER TO PASQUA 230 kV TRANSMISSION LINE
CONSTRUCTION AND OPERATION

Introduction

The Environmental Assessment Act ("the Act") states that a person shall not proceed with a development (as defined in the Act), until Ministerial Approval has been received. It further sets requirements for a process of environmental impact assessment intended to inform the Minister of the potential impacts of a development prior to making a decision regarding the development.

I am satisfied that the proponent has met the requirements of the Act.

Public notice of the assessment was first given pursuant to section 10 of the Act.

In seeking approval for the Poplar-Pasqua 230 kV Transmission Line (hereinafter called "the development"), SaskPower, Transmission and Distribution Division (hereinafter called "the proponent") in accordance with the Act, conducted an environmental impact assessment (EIA) and prepared and submitted an environmental impact statement (EIS or "Statement") entitled, *Poplar River to Pasqua 230 kV Transmission Line Environmental Impact Statement*, dated April, 2009.

The EIS underwent technical review by provincial and federal ministries, departments and agencies and comments were compiled by the Environmental Assessment Branch into a Technical Review Comments document (TRC). The EIS and TRC were then made available for public review from June 24 to July 27, 2009 pursuant to section 12 of the Act.

Having made my decision to issue a Ministerial Approval, the Act requires me, pursuant to subsection 15(2), to state the reasons for the decision.

Background

The proposed transmission line will be approximately 160 km long, connecting the Poplar River Switching Station, near Coronach, with the Pasqua Switching Station on the south side of the Trans Canada highway east of Moose Jaw. The purpose of the line is to:

. . . 2

- Reinforce the existing transmission system to meet North American Reliability Standards;
- Deliver additional power from the Poplar River Power Station which was improved in 2008 to produce an additional 20 megawatts of output;
- Reduce transmission line losses; and
- Reinforce the power supply to the Moose Jaw area.

Reasons for Decision

The Statement submitted by the proponent describes the development, the rationale for carrying out the development and its potential impacts on the environment. The study area for the proposed development, and three alternative corridors for the power line, are shown on the attached map (Figure 19 from the EIS).

The application was for approval of a transmission line corridor, approximately 1500 m wide. The actual routing of the line would occur within the approved corridor, according to terrain and environmental limitations. Within the EIA, the proponent describes environmental and mitigation measures which will be undertaken in developing the final line routing and Right of Way (RoW) within the corridor.

The EIS presents three options for transmission line corridors, referred to as East, Central and West. The proponent has selected the West Corridor as the preferred option, with rationale presented to justify the decision. While the West option crosses slightly more uncultivated land (61.7 km) than the Central (55.5 km) or East (52.7 km) corridors, it has the advantage of allowing double circuit construction on 31.3 km of cultivated land. Thus the net amount of cultivated land affected by new pole placement in the West Corridor is about 60 km vs. 70 km in the Central option and over 100 km in the East option.

Considering the small amount of land area actually impacted by pole placement (approximately 14 m^2) at each pole location, and the environmental protection measures specified in the EIS to protect native habitat values during the construction process, I agree that the West Corridor is the preferred option of the three presented.

Native Vegetation

Effects on native vegetation will be minimized through a combination of:

- Proponent will conduct rare plant surveys in native pastures in advance of construction, once the RoW has been determined;
- Environmental Monitors will mark rare plant species populations to enable construction crews to avoid or otherwise minimize impacts;
- Structure footprints are fairly small, and there is some flexibility in locating structures which may be utilized to reduce impacts; and
- Where practical, construction in native habitat will take place after freeze-up and before spring thaw, when plants are dormant (see **Timing of Construction Activities** below, for additional discussion of this mitigation measure).

. . . 3

Wildlife

SaskPower is committed to a number of steps to reduce potential effects of the project on wildlife, including:
Setback distances from water bodies of 45 m (non fish-bearing) or 90 m (fish bearing), unless authorization obtained from the relevant authority;

- Environmental monitors will advise on course of action (and may consult Ministry of Environment staff), if an active denning site, nest, or other significant wildlife value is encountered;
- Waterbodies in proximity to the RoW will be assessed for potential waterfowl concentrations and, in consultation with Ministry of Environment, aerial ball markers may be added;
- Timing and setback distances for construction activities, as per the Saskatchewan Activity Restriction Guidelines for medium disturbance will be followed; and
- Any construction between March 15 and August 31 in grassland will be preceded by a field check for Sprague's Pipit and sharp-tailed grouse leks.

Overall, construction activities in any one location are expected to be of short duration and disruption to local wildlife should be temporary, with no residual effects.

Fisheries

There are no anticipated residual impacts to fisheries resources. There are no instream work requirements. Most crossings will be dry or frozen during the construction period. All watercourse crossings will comply with the DFO Saskatchewan Operational Statement – *Overhead Line Construction* (Version 3).

Land Use

As mentioned above, the corridor selection is balanced between cultivated and uncultivated land. Transmission line construction and power pole placement has the potential to impact land use in cultivated areas by interfering with the efficient movement of farm machinery. SaskPower is proposing to minimize these effects through methods such as: long span construction, structure placement in areas where cultivation is already obstructed, and double circuiting where there is an existing line (i.e., the existing poles will be removed and replaced by larger structures which can support both the new 230 kV line and the pre-existing 138 kV line). Opportunities for double circuiting are maximized in the West (preferred) corridor option.

Public Consultation by SaskPower

SaskPower conducted considerable public consultation through 2007 and 2008. The EIS reports that that the issues raised were responded to, that the principal issue was the potential effect on farming operations and that based on comments received SaskPower believes that the stakeholders in the study area are generally supportive of the West Corridor option (which is estimated to have the least negative effect on farming activities).

. . . 4

The EIS points out that the recommended clearance to habitable buildings for a 230 kV line is 60 m, but wherever practical they will try to exceed that distance. Reference material in the EIS indicates that electro-magnetic field (EMF) levels associated with power lines drop off quickly with distance and that by 40 m from the line EMF levels are equivalent to Saskatchewan residential background levels.

SaskPower does not anticipate any residual impacts with regards to various parks, historic sites, recreation opportunities and other cultural, historic or tourist attractions within the study area since the preferred corridor does not affect any of those sites.

There was no specific consultation activity targeted at First Nations; however, there are no First Nations Reserve lands or Treaty Land Entitlement Lands within the study area. The nearest such land is east of the study area, and about 40 km east of the West Corridor option. Most of the land in the study area is privately owned or leased Agricultural Crown Land.

Timing of Construction Activities

SaskPower plans to complete as much construction as possible during the winter months, in order to reduce environmental impacts such as:

- Rutting from the movement of trucks and equipment;
- Effects of equipment on plants in uncultivated habitat, which should be minimized when the ground is frozen and the plants are dormant;
- Access to or through wetland areas, or stream crossings;
- Disruption of nesting birds.

However, there are many factors which can alter the construction schedule, such as material supply, contractor availability, and weather. The commitments in the EIS to work outside of the nesting season, to utilize existing roads and trails, and to work under dry and frozen conditions, are generally qualified with the phrase "whenever practical".

It is impossible to predict how many exceptions to the mitigation measures may occur over the course of the project, due to practicality. There may be none, or many. Since SaskPower will be required to rehabilitate any disturbed sites, at some expense, it is expected that the mitigation guidelines will, for the most part, be followed.

In order to better evaluate projects of this nature in the future, as a condition of the approval SaskPower will be required to provide a detailed post-construction report on every aspect of the construction, including pole placement, line stringing, ground testing, and clean-up/rehabilitation, measuring each activity and location against the mitigation options and commitments summarized in Table 45 of the EIS. Details of the content and format of the report will be determined by Environmental Assessment Branch, Fish and Wildlife Branch and the Swift Current Field Office, in consultation with the Environmental Programs Division of SaskPower.

. . . 5

Public and Technical Review Process

The Project Specific Guidelines for the EIS were made available for public comment from October 13 to November 13, 2007. Three comments were received – one from a landowner concerned about potential line location near to a dwelling, and two from interested parties in British Columbia, with concerns about possible negative aesthetic impacts on tourism values, with particular reference to the Big Muddy Badlands area.

The EIS and the Technical Review Comments were available for public comment from June 24 to July 27, 2009, with copies of both documents being provided to municipal offices and libraries throughout the study area, as per section 11 of the Act. One submission was received, from a person apparently knowledgeable about electricity generation and transmission, who indicated that the addition of the 230 kV line would be a benefit for the environment. He posed some questions regarding environmental safeguards and reliability of equipment at the switching stations, which is outside the purview of the EIS but which were forwarded to SaskPower.

Saskatchewan Ministry of Environment and review agencies are satisfied that, if the mitigative and environmental protection measures outlined in the EIS are implemented, and if appropriate conditions are imposed as presented in my Approval, adverse effects can be minimized and benefits enhanced. This conclusion is based on the proponent's commitments as documented in the Statement, on my ability as Minister of Environment to impose specific conditions at this time, and on the knowledge that additional environmental protection requirements that can be imposed through terms and conditions forming part of permits and licenses required by provincial legislation.

I have concluded that any adverse environmental effects associated with SaskPower's Poplar-Pasqua 230 kV Transmission Line can be eliminated or minimized. Approval under the Act, therefore, has been granted to the proponent for the development as described in the Statement.

The Ministerial Approval for the development includes terms and conditions designed to promote the elimination and control of adverse environmental effects associated with the project. Included are requirements that the proponent:

(a) proceed with the development in accordance with the Statement;

(b) provide notification of any change; and

(c) follow the requirements of the laws and regulations of the Province of Saskatchewan respecting the design, construction, operation, maintenance and decommissioning of the development.

. . . 6

These conditions, plus the measures proposed in the Statement and the regulatory framework applicable to the development, now and in the future, are adequate to address all issues related to the development.

Dated at Regina, Saskatchewan this 24th day of September, 2009

Original signed by:
Nancy Heppner
Minister of Environment

SaskPower
Poplar River – Pasqua 230 kV Transmission Line
April 2009

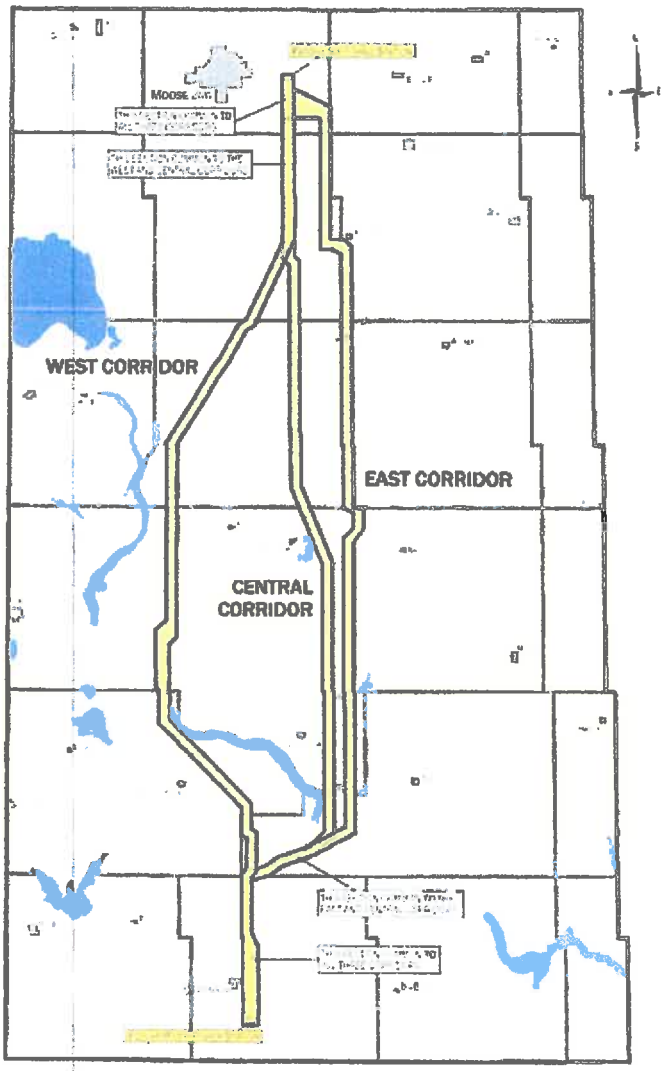


Figure 19: Locations of Three Alternative Corridors Selected for Secondary Screening and Public Consultation

Appendix 18C

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Appendix 15C

SASKATOON AREA REINFORCEMENT PROJECTS

Saskatoon Area Reinforcement Projects

Updated March 2012

In order to address the electrical capacity and reliability issues in and around Saskatoon as well as to help meet the growing electrical needs of Saskatchewan's potash industry, SaskPower is proposing several new construction projects:

- a new switching station and substation north of Saskatoon in the Martensville area,
- a new switching station northeast of Saskatoon in the Aberdeen area,
- a 230 kilovolt (kV) transmission line connecting these two stations,
- a 230kV transmission line from the new Aberdeen Switching Station to the existing Wolverine Switching Station, and
- a 138kV transmission line connecting the Martensville switching station to the City of Saskatoon.

Details of the preferred corridors

Aberdeen to Wolverine:

- The preferred corridor is approximately 104km long and is a combination of two previous routes presented at the March 2011 Open Houses.
- The route is the furthest from the important whooping crane critical habitat areas identified by the Canadian Wildlife Service.
- It allows the centerline to be constructed further from residential (existing and planned) developments, particularly between Aberdeen and Elstow.
- The portion of the route between the Elstow and Wolverine Switching Stations will follow the existing 138kV transmission line. The existing 138kV line will be removed and, generally, there will be fewer structures with the new double circuit line.
- This is one of the lowest cost options at approximately $23.6 million.

Aberdeen to Martensville:

- The preferred corridor is approximately 35km long and almost the entire centerline could be constructed along ¼ section lines.
- The transmission line would cross the river just south of the existing railway bridge and, in doing so, would avoid disturbing large areas of irrigated land west of the river.
- It allows the centerline to be constructed further from residential (existing and planned) developments, particularly between Aberdeen and the river.
- The approximate cost is $10.5 million.

Martensville to Saskatoon:

- This preferred corridor has been slightly modified from what was initially presented to the public in 2011. It crosses the highway at a better location with respect to highway intersections.
- The corridor follows an existing railway right-of-way.
- This corridor has the fewest residences in close proximity to the preferred corridor.
- The approximate cost is $2.5 million.

In developing these options, SaskPower works to:

- Minimize agricultural impacts
- Minimize environmental impacts
- Minimize social and other impacts (such as land use)
- Minimize economic impacts (construction cost, maintenance, operation and impacts to landowners, communities and other stakeholders)
- Construct on favorable topography and foundation conditions

138kV right-of-way width

H-frame single circuit standard width – 30 to 35 metres (98 feet)

H-frame double circuit standard width – 35 to 40 metres (131 feet)

230 kV right-of-way width

H-frame standard width — 40 metres (130 feet)

Project schedule

January – February 2011	Alternative corridors selection
March 2011 – September 2012	Public consultation
May 2011 – September 2012	Environmental field studies
February 2012	Preferred corridor selection
March 2012	Second round of public consultation
October 2012	Submit project proposal to Ministry of Environment (MoE)
2012	Engineering design
2013	Construction
December 2013	Energization

saskpower.com

SaskPower
Powering the future

Appendix 19

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

6.7 Agriculture

6.7.1 Identification of Key Issues

The VITR Project route crosses through lands within the ALR and other agriculturally designated lands in Delta, on Salt Spring Island and in North Cowichan within an existing transmission ROW. Removal of the existing overhead structures, construction of the new foundations, erection of the new overhead structures and operational inspections will require trucks and heavy equipment to work within these agricultural fields. As a result of these activities, key issues related to potential effects on agriculture include:

- disturbance to agricultural land uses, including grazing and crop production during construction and operational activities;
- soil disturbance and compaction during construction;
- loss of crops due to construction activities on and access to the ROW; and
- effects on farm worker safety during construction and operation of facilities including the potential for induced or stray voltage in wire trellis systems used to support crops.

6.7.2 Assessment Boundaries

Geographic boundaries for the Agriculture Assessment Area are defined as all lands within the ALR or other designated agricultural properties crossed by or adjacent to the Project ROW (Figure 6.7-1 through 6.7-3). Access to the ROW through some private lands will be required during construction and operation at specific locations along the corridor.

Administrative jurisdiction in the Agriculture Assessment Area is exercised by provincial, regional and local government bodies. Provincial government departments and agencies include the Ministry of Agriculture and Lands and the ALC. Under the *Agricultural Land Commission Act* (2002), Project works within the ALR that are both within and outside of the existing ROW, may require an application to the ALC for permissions of non-farm uses.

Various regional and local bodies, such as regional districts and local municipalities, are also involved in agricultural land use management and policy matters. Regional agricultural land use designation in various segments of the Agricultural Assessment Area is administered by regional districts (Islands Trust Area, CVRD, and GVRD) and local governments through their OCPs and zoning bylaws (*e.g.*, municipality of North Cowichan, Corporation of Delta, Salt Spring Island Local Trust Committee).

Agricultural properties described in this section are those within the ALR and/or land designated for agricultural uses by local governments. Parts of the VITR Project that will be routed through the existing ROW across agricultural land include:

- from ARN to TSW, approximately 8.0 km of ROW through the ALR or an agriculturally designated area;
- on Salt Spring Island, approximately 3.0 km of ROW through the ALR or an agriculturally designated area; and
- on Vancouver Island, approximately 5.0 km of ROW through the ALR or agriculturally designated area.

6.7.3 Baseline

For the purposes of this Section, the agricultural portion of the VITR route has been broken into three segments, starting from ARN and ending at VIT as follows:

- Segment 1 - ARN to Tsawwassen Substation – Structures 1/1 to 8/3;
- Segment 2 - Salt Spring Island, Structures 47/3 to 49/4 and 51/4 to 52/1; and
- Segment 3 - Vancouver Island, Structures 60/2 to 65/1.

No agriculturally designated lands are crossed on Galiano and Parker Islands.

6.7.3.1 Segment 1 – Delta

The agricultural portion of this segment of the VITR corridor consists of 8.0 km of ROW, from Tower 1/1 to Tower 8/3. Within the ROW, there are six existing sets of transmission lines: 1L17, 1L18, 60L58, 60L59, DC1/2 and one metallic ground return that heads in an easterly direction out of the ROW at 28th Avenue. Transmission lines DC1 and DC2, and transmission lines 60L 58 and 60L 59, which service TSW and Deltaport, and the ground return, are not affected by the Project. The ROW passes through 24 agricultural properties from ARN to TSW as described in Table 6.7-1.

Access to the ROW in agricultural areas is dependent on using the existing municipal road system and permission to cross farmers' fields. The access will need to be capable of permitting movement by heavy equipment, delivery vehicles, machinery and personnel required to remove the existing 138 kV circuit and construct the new 230 kV circuit.

The preliminary access assessment (BC Hydro Engineering 2005a) indicates that 19 of the 34 sites of new and existing structures in the Agricultural Assessment Area will require access through agricultural land outside of the ROW. The other 14 sites will be accessed from within the ROW from the existing municipal road network. Overhead structures 1/1, 3/5 through 5/5, 6/4, 6/5, 8/2 and 8/3 can be accessed via existing roads, road allowances and the ROW. Structures 1/2 through 3/4, 6/1 through 6/3 and 7/1 to 8/2 will require access through the ten properties described in Table 6.7-2. In several cases, one access route may be used to provide construction access to several existing structures that are being removed and/or installed at proposed new tower sites. This means that some access roads may be subject to extended periods of relatively intense construction traffic.

Table 6.7-1 ARN to TSW – Agricultural Ownership and Land Use

Parcel Identifier	Owner	Address	Area (ha)	Agricultural Crops and Land Uses
1	Harlos, D. (in trust)	4462 – 64 Street	3.92	Horses & pasture
2	626092 BC Ltd.	4364 – 64 Street	9.60	Pasture
3	Vaupotic, J.	4138 – 64 Street	44.73	Hay
4	Sherrell Trucking Co. Ltd.	3820 – 64 Street	54.45	Hay & vegetables
5	McAlister, E.	3450 – 64 Street	40.48	Hay & vegetables

Parcel Identifier	Owner	Address	Area (ha)	Agricultural Crops and Land Uses
6	Dipak, V.	3240 – 64 Street	19.02	Idle
7	Provincial Crown	3020 – 64 Street	31.34	Vegetables
8	Konyk, B. & A.	4451 – 66 Street	2.41	Pasture
9	Tittler, C.	4441 – 66 Street	2.03	Pasture
10	Yap, M.	4409 – 66 Street	1.94	Horses & pasture
11	592091 BC Ltd.	6166 – 34B Avenue	43.51	Potatoes & grass
12	BC Hydro & Power Authority	5900 – 34B Avenue	25.71	Hay
13	Dhaliwal, A. & A.	5376 – 34B Avenue	25.32	Vegetables
14	Townsend, R. & M.	3028 – 53 Street	24.01	Grass & hay
15	Dosanjh, B.	5635 – 28 Avenue	20.47	Vegetables
16	Harbot, S. & T.	2494 – 52 Street	4.05	Vegetables
17	Flaming, A.	2380 – 52 Street	10.50	Hay
18	467773 BC Ltd.	ESec.15Twp5NWD, LMP 41477	8.48	Hay
19	Felix Farms Ltd.	2250 – 52 Street	8.48	Vegetables
20	Felix Farms Ltd.	2150 – 52 Street	8.48	Hay & vegetables
21	Guichon, M. (in trust)	2601 – 56 Street	33.42	Vegetables
22	McDonald, G. & Jenkins, L.	2447 - 56 Street	10.01	Vegetables
23	Hsu's Greenhouse Co. Ltd.	2327 – 56 Street	13.70	Vegetables
24	Alpha-Beta Developments Ltd.	2105 – 56 Street	7.19	Idle

1 **Table 6.7-2 ARN to TSW - Properties Affected by Access Outside of ROW**

Property Identifier	Structure/Pole No.	Access to ROW Required across Private Agricultural Land
3	1/2, 1/3, 1/4	Through yard, across field and along field margin
4	2/1, 2/2, 2/3	Through yard, across field and along field margin
5	2/4, 3/1, 3/2	Through yard and along field margin
6	3/3	Through yard and across field
7	3/4 and corner structure	Diagonally across field
14	6/1, 6/2	Through yard and along field margin
15	6/3	Diagonally across field
17	7/2, 7/3	Along field margin
20	7/4, 8/1	Across field
21	7/1	Across field

6.7.3.2 Segment 2 – Salt Spring Island

The agricultural portion of this segment of the Project is approximately 2.65 km long and consists of:

- 0.1 km in the corridor in the vicinity of Structure 46/1;
- 2.15 km in the corridor from Structure 47/3 to Structure 49/4; and
- 0.4 km in the corridor from Structure 51/4 to Structure 52/1.

On Salt Spring Island, there are three existing sets of transmission lines within the existing ROW: 1L17; 1L18 and DC1/2. The DC transmission circuit is not affected by this Project. The ROW passes through 17 agricultural properties in the Salt Spring Island corridor as described in Table 6.7-3.

The preliminary access assessment (BC Hydro Engineering 2005a) indicates that only two of the existing structures and the construction of one new structure (49/4) will require access through private land to reach the ROW. This access will occur though one property currently used for hay production/pasture.

Table 6.7-3 Salt Spring Island – Agricultural Ownership and Land Use

Parcel Identifier	Owner	Address	Area (ha)	Agricultural Crops and Land Uses
101	Andreae, J.	521 Mansell Road	27.96	Hay, pasture
102	Staarup, I.	150 Leisure Lane	6.88	Garlic farm, pasture
103	Svendson, P. & J.	180 Leisure Lane	1.21	Idle
104	Turner, B.	134 Howell Lane	1.24	Idle
105	Coates, P.	171 Leisure Lane	1.30	Idle
106	Tepper, I.	154 Howell Lane	1.13	Idle
107	Plumpton, S.	117 Howell Lane	0.93	Hay, pasture
108	Not in agriculturally designated area			
109	McKitka, R.	121 Norton Road	2.31	Scrubland
110	Bishop, R. & Zovi, D.	164 Norton Road	3.81	Vineyard
111	VMHP Holdings Ltd.	135 Brinkworthy Road	14.17	Hay
112	Not in agriculturally designated area			
113	Giverny Gardens Ltd.	160 Atkins Road	12.91	Hay, pasture
114	Cornwall, D.	171 Sharp Road	3.91	Hay, pasture
115	Mowatt, G. & K.	195 Sharp Road	2.75	Hay, pasture
116	Dodds, R. & C.	200 Sharp Road	3.04	Hay, pasture
117	Magnus, E.	420 Rainbow Road	11.62	Hay, pasture
118	Charron, R.	Rainbow Road	3.40	Hay, pasture
119	Unknown	310 Toynbee Road	16.1	Hay, pasture

6.7.3.3 Segment 3 – Vancouver Island

The agricultural portion of this segment of the transmission corridor consists of approximately 4.1 km in the existing BCTC ROW from Structure 60/2 to Structure 65/1. From Structure 60/2 to Structure 64/5 in this segment, there are two existing sets of transmission lines within the ROW: 1L17 and 1L18. At Structure 64/5, the ROW expands to include DC 1/2, which converges from a more northerly ROW. Transmission line DC1/2 is not affected by this Project. The ROW passes through 16 agriculturally designated properties on Vancouver Island as described in Table 6.7-4.

The preliminary access assessment (BC Hydro Engineering 2005a) indicates that about 50% of the existing structures and the construction of new overhead structures will require access through private agricultural land to reach the ROW. These structures include 62/3 through 63/4, and 64/2 through 65/1, a total of 11 structures.

Table 6.7-4 Vancouver Island – Ownership and Agricultural Land Use

Parcel Identifier	Owner	Identifier / Folio #:	Area (ha)	Agricultural Cropping and Land Uses
201	Munic. of North Cowichan	9024-000	18.94	Scrubland
202	Thomson, DY	9183-020	2.10	Cultivated
203	Kirby, B. & V.	7073 Rice Road	0.86	Pasture
204	Ryzak, M.	7085 Rice Road	1.97	Pasture
205	Dinsdale, RK & K.	7112 Rice Road	6.98	Pasture
206	McDonald, J. & M.	7053 Richards Trail	10.10	Pasture
207	Weisner, D.	7095 Richards Trail	2.01	Scrubland
208	Kusters, J.	7088 Richards Trail	10.01	Pasture/ Hay
209	Kusters, G. & J.	Tom Windsor Road	13.23	Hay
210	Hayes, D.	7003 Mays Road	32.86	Scrubland/ Hay beef
211	Cloudcroft Farms Corp.	7041 Mays Road	24.79	Pasture/ Hay
212	Gibson, E. & M.	7004 Mays road	6.41	Scrubland/pasture
213	Carey, P. & L.	7078 Mays Road	7.18	Pasture, horses
214	Part of 212	7004 Mays Road	7.53	Scrubland/pasture
215	Gibson, E. & M.	Section 10, Range 7, EP29337, Except Plan PCL A B C D	15.94	Pasture/ Hay scrubland
216	Mellor, E. & E.	2677 Herd Road	20.66	Pasture/ Hay

6.7.3.4 Health and Safety Requirements

Requirements for working on high voltage systems are set out in the *Occupational Health and Safety Regulation*, Part 19. Any work on high voltage equipment and power systems must be performed by qualified and authorized workers in accordance with written safe work

procedures acceptable to WorkSafe BC and must comply with the safe work procedures set out by BCTC.

The WCB has issued guidelines relating to high voltage electrical safety. Since farmers and farm workers are not working on high voltage systems, the guidelines are concerned with working safely around these systems.

The key safety factor is keeping a safe distance from overhead transmission lines and preventing safety issues from arising. The minimum limit of approach for unqualified workers around 75 kV to 250 kV voltage conductors is 4.5 m, indicating that workers must not violate this limit with their tools or equipment.

Farmers undertaking building construction, irrigation pipe movement and vehicle movement in the vicinity of the ROW must ensure that their farm workers are informed about the handling of any tools and equipment that may conduct electricity and take steps to avoid entering the limits of approach. WorkSafe BC guidelines and BCTC safety requirements indicate that all workers must know the safe limits of approach, supervisors must know the location and voltage of all systems in the work area, and written records of pre-job safety (tailboard) meetings must be kept.

6.7.4 Residual Effects Evaluation Criteria

Residual effects are defined as effects that remain after mitigation and compensation has been applied. Residual effects of the Project on agriculture have been rated according to the definitions outlined in Table 6.7-5.

Table 6.7-5 Residual Agricultural Effects Evaluation Criteria

Criterion	Description	
Magnitude	L	Low: Localized disturbance of agricultural lands over a short period of time with no permanent disruption or alteration of quality or quantity of production.
	M	Moderate: Alteration of agriculture such that quality or type of use may change.
	H	High: Permanent disruption to or alteration of agricultural land use such that the current uses cannot be retained.
Geographic Extent	S	Site-Specific: Environmental effects restricted to the right-of-way or temporary workspace.
	L	Local: Environmental effects restricted to land within and immediately adjacent to right-of-way and temporary workspaces.
	R	Regional: Environmental effects extend beyond land immediately adjacent to right-of-way and temporary workspaces
Duration	ST	Short term: Effects are measurable for < 2 year.
	MT	Medium term: Effects are measurable for 2 to 5 years.
	LT	Long term: Effects are measurable for > 5 years
	P	Permanent

Appendix 20

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Project component. In addition, consistent with pre-application goals set forth in the June 7, 2013 Presidential Memorandum on Transforming our Nation's Electric Grid, Minnesota Power believes it is important to facilitate interagency discussions and integrate pre-application processes with the goal to enhance coordination and collaboration amongst federal agencies, State, local and tribal governments, non-governmental organizations and the public. At the request of USDOE, an all- State and federal agency meeting was held in December 2012 to provide a Project update and to begin the interagency coordination and discussions for the Project. In all, 16 State and federal agencies attended at least one Project meeting. In addition, Minnesota Power collaborated with agency officials about the routing process and the methods by which stakeholder and agency feedback would be incorporated into that process.

The Application listed the agencies met with between June 2012 and April 2014. Since that time, regular all-agency meetings have continued, as well as State and federal agencies including USDOE, EERA, DNR, ACOE and the USFWS, to name a few. Beyond the requirements for obtaining individual agency approvals or permits, Minnesota Power will continue to provide State and federal agencies Project updates and information consistent with the overall Project development approach.

VI. ROUTE ALTERNATIVES PRESENTED

A. Minnesota Power's Route Selection Process

1. Guiding Principles

The Company developed routing factors for the Project based on extensive stakeholder feedback, transmission line siting experience and knowledge of applicable

federal and State regulations.[53] Those routing factors guided the route development process and included consideration of the following:

- Constraints - Constraints are resources or conditions that could limit or prevent transmission line development. Constraints might include areas restricted by regulations, or areas where impacts on resources will be difficult to mitigate and include areas with special legal status such as Indian lands; federal, State, and locally designated environmental protection areas; existing land uses such as homes, agriculture, religious facilities, and schools; sensitive habitats or areas identified by private conservation organizations; cultural resources such as national landmarks and archaeological sites; and public infrastructure such as airports and aeronautical and commercial telecom structures.[54]

- Opportunities - Opportunities are resources or conditions that will facilitate Project development. They include pre-existing infrastructure or other features (for example, roads, transmission lines, and public land survey divisions of land) along which Project development will be particularly compatible.[55]

- Technical Guidelines - Technical Guidelines are the specific engineering requirements and objectives associated with the construction of the Project. For example, one engineering requirement included as part of the Technical Guidelines is the maintenance of at least 200 feet of separation between centerlines when paralleling other electric transmission lines of 230 kV or above. Another engineering objective, included

[53] Ex. 36, pp. 6-8.
[54] *Id.*, p. 7.
[55] *Id.*, pp. 7-8.

as part of the Technical Guidelines, is to minimize the overall length of the line. These Technical Guidelines are specific to the Project and provide the technical limitations related to the design, right-of-way ("ROW") requirements, and reliability concerns. The Technical Guidelines include consideration of: regulatory requirements and guidelines; technical expertise of engineers and other industry professionals responsible for the reliable and economic construction, operation and maintenance of the 16 Project, and other electric system facilities; applicable codes and standards including the National Electrical Safety Code ("NESC"); North American Electric Reliability Corporation ("NERC") reliability standards; and industry best practices.[56]

2. Stakeholder Feedback, Including the Working Group

The Company, working together with HDR and stakeholders, including federal, State, and local officials and the general public, identified the proposed Route Alternatives through an iterative process that used carefully selected routing factors to narrow the initial Study Area first into Study Corridors, then into Preliminary Route Alternatives, and finally into Refined Route Alternatives.[57]

The initial Study Area began at the Minnesota-Manitoba border and included three potential international border crossings near U.S. Highway 59 in Kittson County, County State Aid Highway 24 along the Kittson-Roseau County border, and Minnesota Trunk Highway 89 in Roseau County. The extent of this portion of the Study Area generally headed in a southeasterly direction, terminating at the Blackberry Substation in Itasca

[56] *Id.*, p. 8.
[57] *Id.*, p. 9; the route development process is described in detail in Ex. 2, pp. 4-1 through 4-26.

Appendix 21

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

LEGISLATIVE RESEARCH COMMISSION

PROGRAM REVIEW
AND
INVESTIGATIONS
COMMITTEE

Siting of Electric Transmission Lines

Research Report No. 348

Prepared by

Christopher T. Hall; Colleen Kennedy; and
Greg Hager, Ph.D., Committee Staff Administrator

Table 4.5
Kentucky Model: Final Calibration for Features and Weightings of Layers

Built Environment Perspective		Natural Environment Perspective		Engineering Perspective	
Proximity to Buildings 16.8%		Floodplain 4.6%		Linear Infrastructure 86.2%	
Background	1	Background	1	Parallel existing transmission lines	1
900-1,200 feet	3.4	100-years floodplain	9	Rebuild existing transmission lines (good)	2.2
600-900 feet	5.7	Streams/Wetlands 29.2%		Background	4.4
300-600 feet	8	Background	1	Parallel interstates ROW	4.7
0-300 feet	9	Streams less than 5 cfs + regulatory buffer	6.2	Parallel roads ROW	5.4
Building Density 8.4%		Wetlands + 30 foot buffer	8.7	Parallel pipelines	5.6
0-0.5 buildings/acre	1	Outstanding state resource waters	9	Future state transportation plans	5.6
0.05-0.2 buildings/acre	3	Public Lands 17.7%		Parallel railway ROW	6.1
0.2-1 buildings/acre	5.6	Background	1	Road ROW	7.2
1-4 buildings/acre	8.5	WMA–not state owned	5.1	Rebuild existing transmission lines (bad)	8.6
More than 4 buildings/acre	9	U.S. Forest Service (proclamation area)	6.2	Scenic highways ROW	9
Proposed Development 3.9%		Other conservation land	7.8	Slope 13.8%	
Background	1	U.S. Forest Service (owned)	9	0-15%	1
Proposed development	9	State-owned conservation land	9	15-30%	4
Spannable Lakes and Ponds 4.0%		Land Cover 19.8%		30-40%	6.7
Background	1	Developed land	1	Greater than 40%	9
Spannable lakes and ponds	9	Agriculture	4.6		
Land Use 35.9%		Forests	9		
Commercial/Industrial	1	Wildlife Habitat 28.7%			
Agriculture (crops)	3.5	Background	1		
Agriculture (other livestock)	4.6	Habitat for species of concern	9		
Silviculture	6				
Other (forest)	6.7				
Equine agri-tourism	8				
Residential	9				
Proximity to Eligible Historic and Archaeological Sites 31.0%					
Background	1				
900-1,200 feet	4.6				
600-900 feet	7.9				
0-300 feet	8.6				
300-600 feet	9				

Note: ROW=right-of-way, cfs=cubic feet per second, WMA=wildlife management area.
The suitability scale ranges from 1 (most suitable) to 9 (least suitable). The weightings of the variables (shaded cells) add to 100% within each perspective.
Source: Photo Science G-17.

Appendix 22

to Analysis and Report to the
Clean Environment Commission on
Manitoba Minnesota Transmission Project (MMTP)
Route Selection Criteria, Routes, and Impacts

Prepared by: Robert A. Berrien, DAC

Example of an Uncultivated (UNC) Tower Placement Within a Cultivated Field

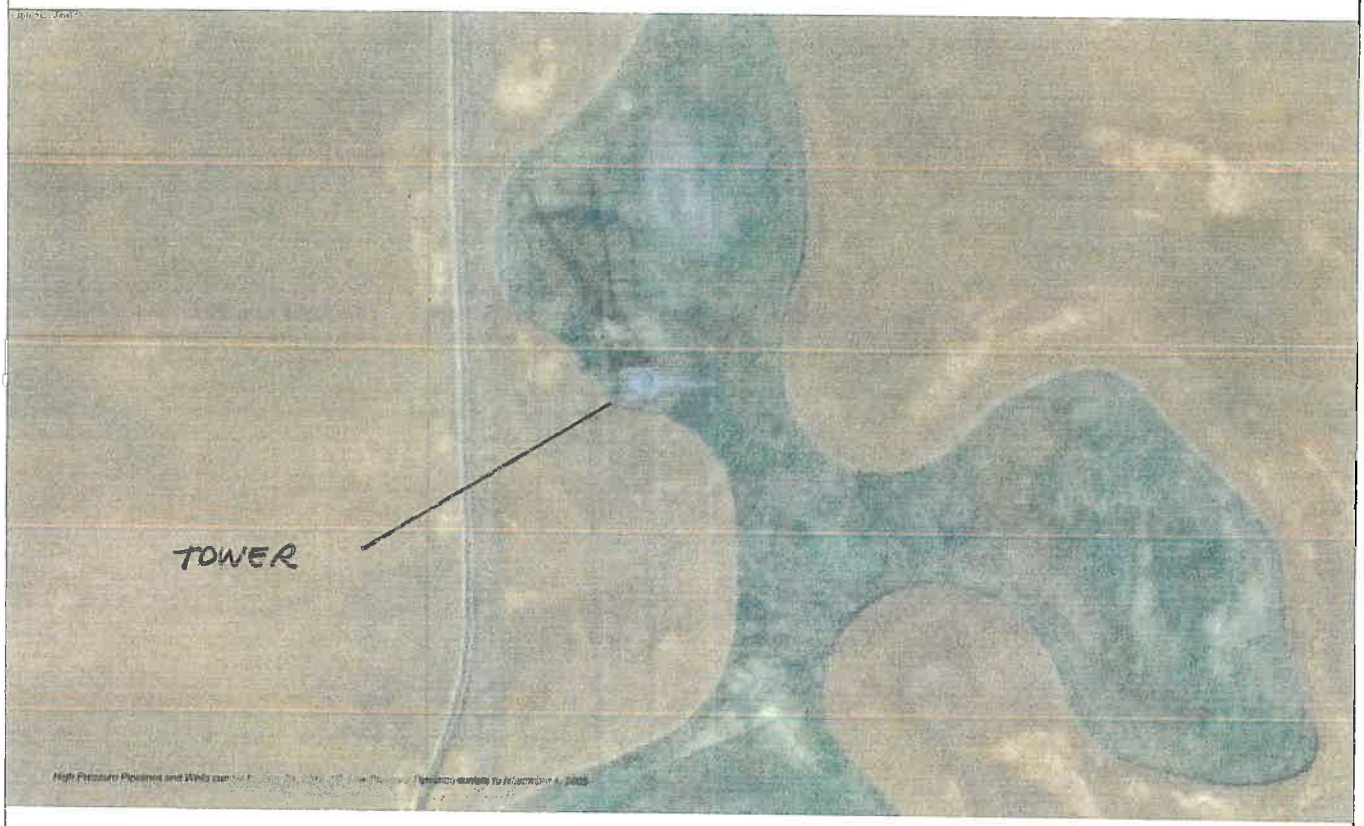


PHOTO 1

N

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Example of True Headland Placement (HL)

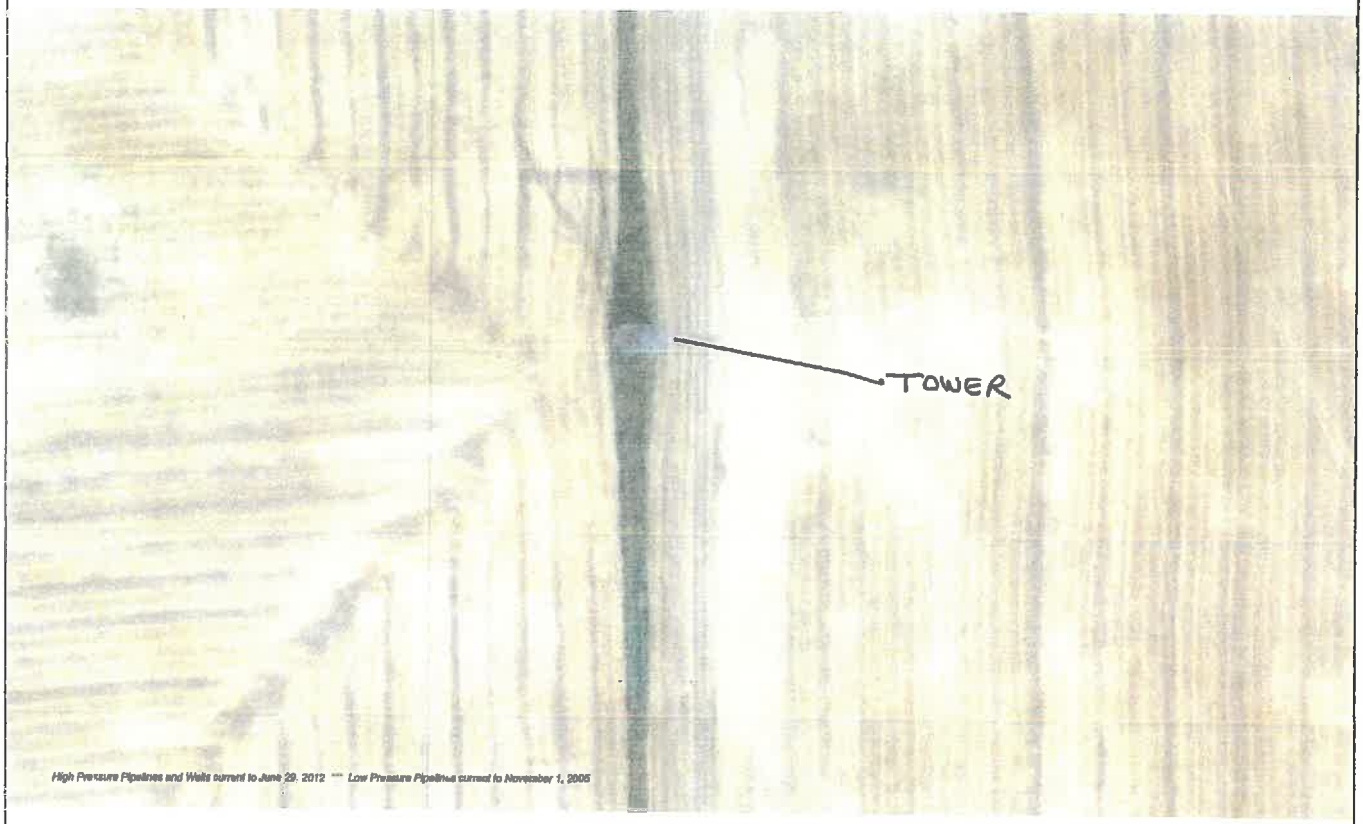


PHOTO 2

N

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Example of True Headland Placement (HL) Beside a Road

PHOTO 3

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Aerial Photo of a Tower in a Headland-one side position (HL-OS)

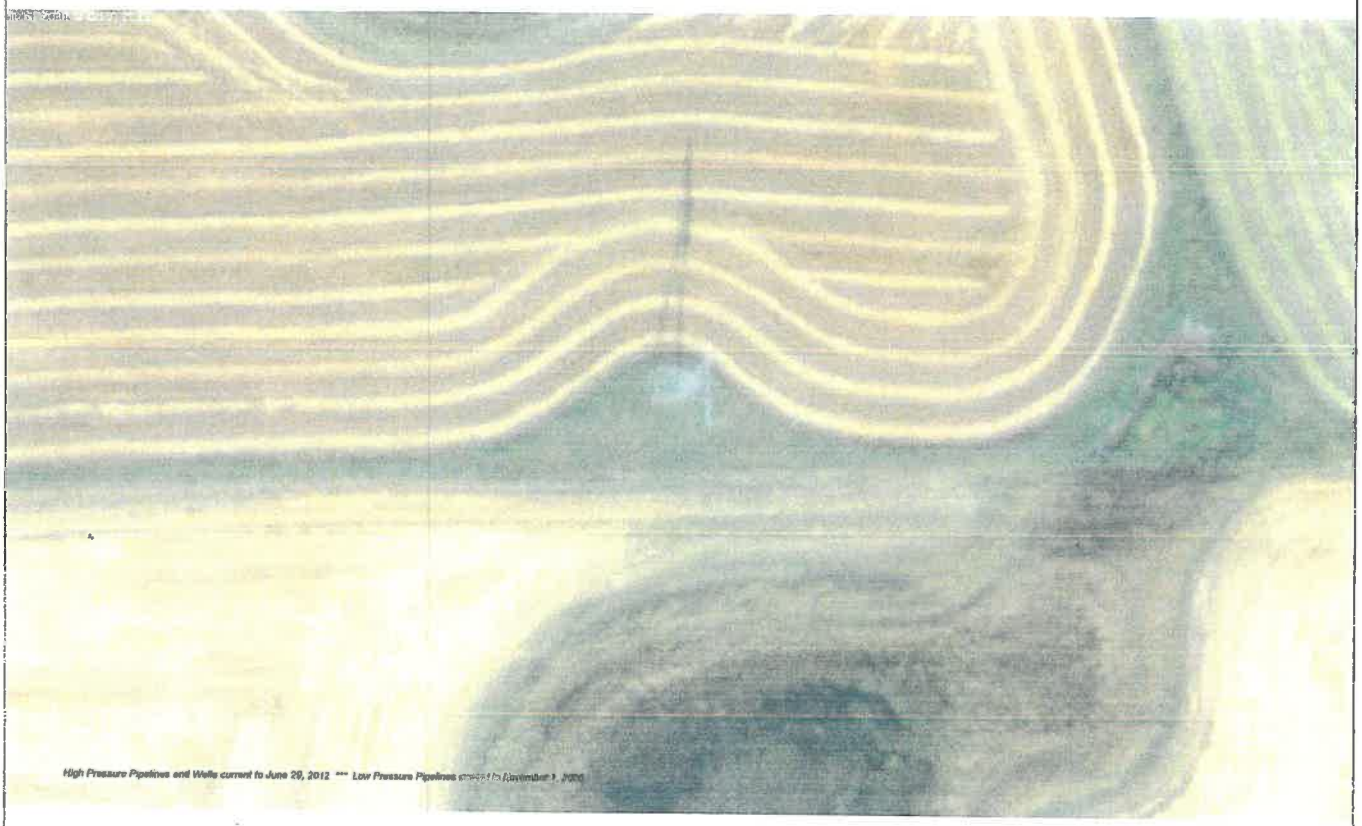


PHOTO 4

N

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Aerial Photo of 2 Towers in a Headland-one side position (HL-OS)

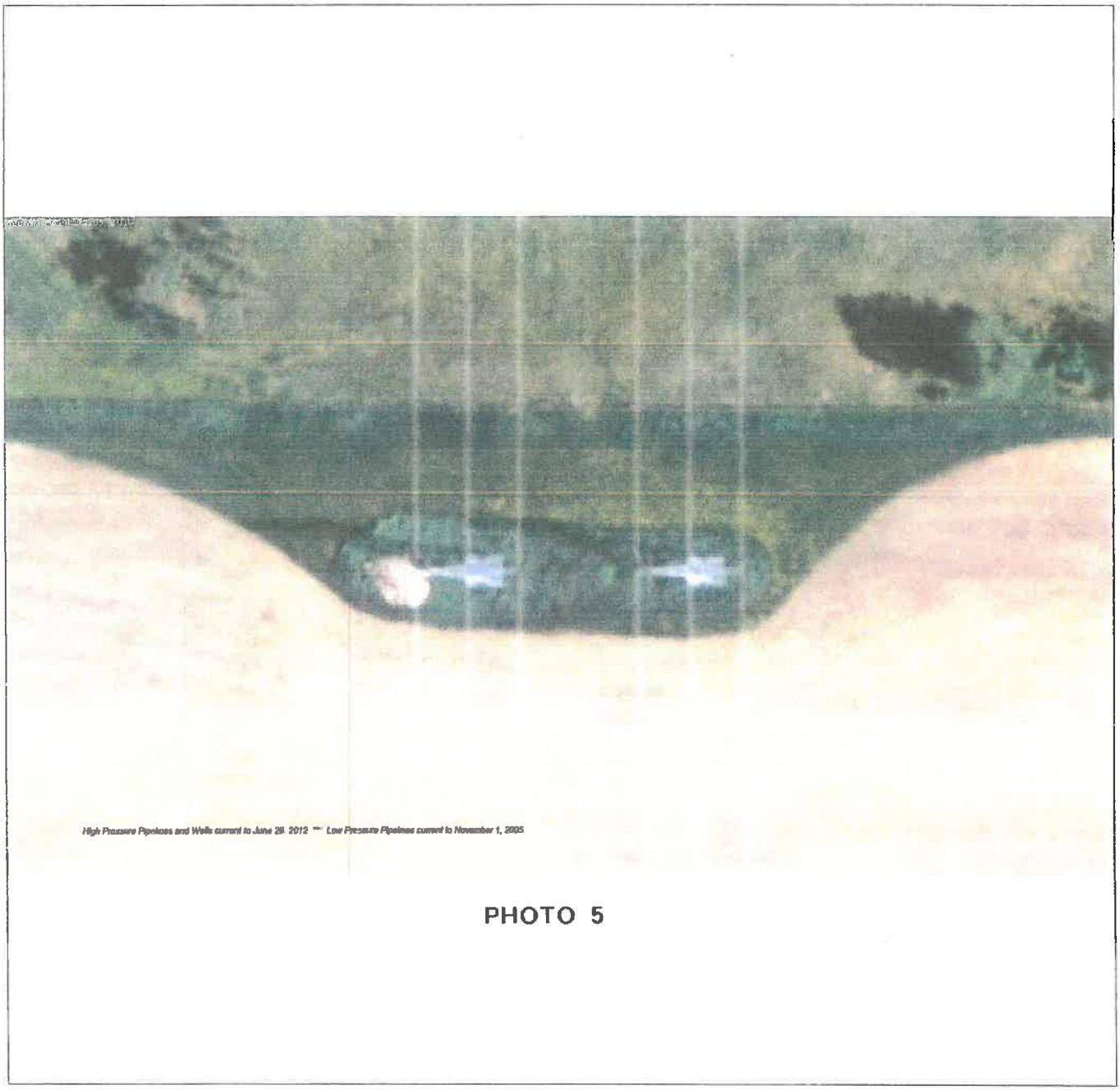


PHOTO 5

N

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Example of One Tower Midfield (MF) and One Headland-One Side (HL_OS)

PHOTO 6

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Aerial Photo of Midfield Tower beside an ELD

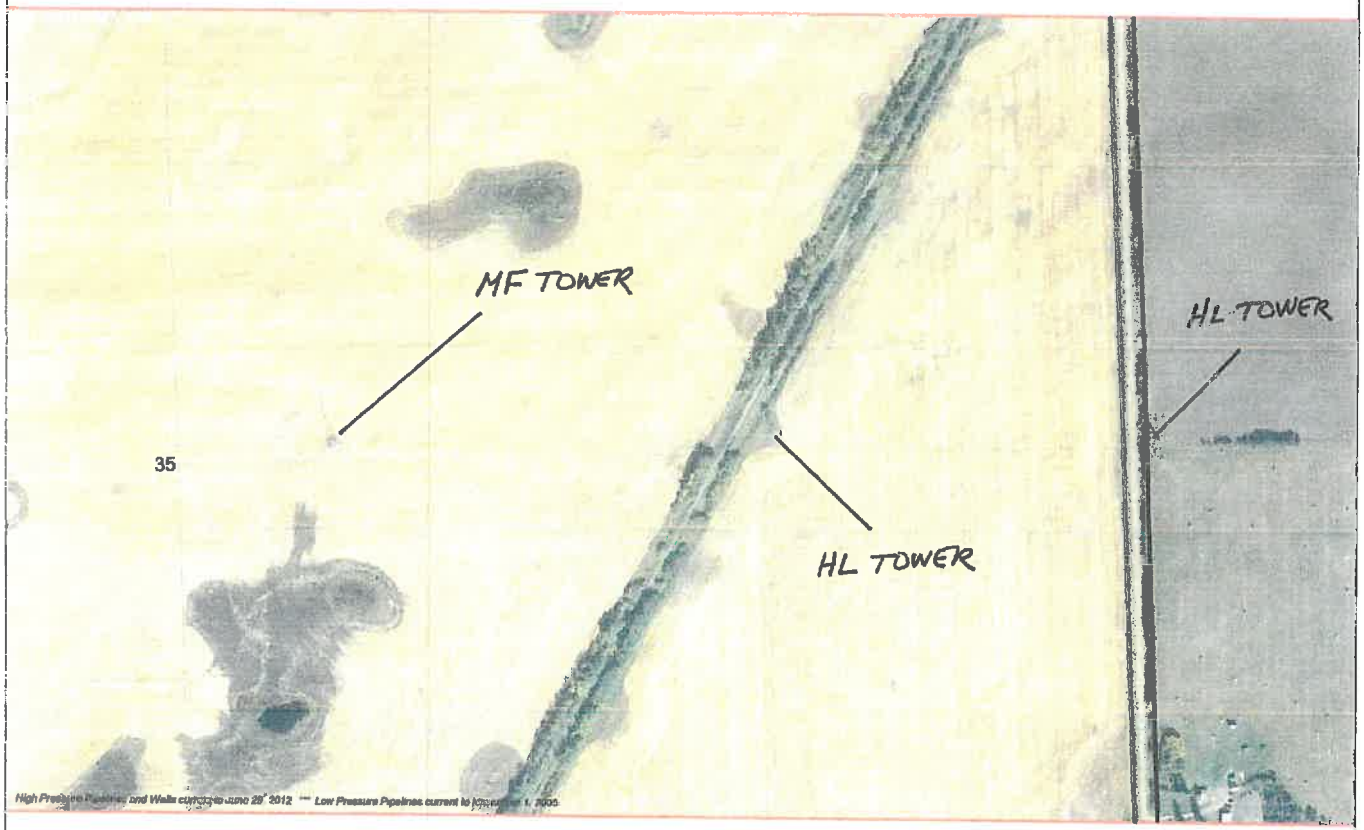


PHOTO 7

N

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Headland (HL) Placement of Towers in Irrigated Field

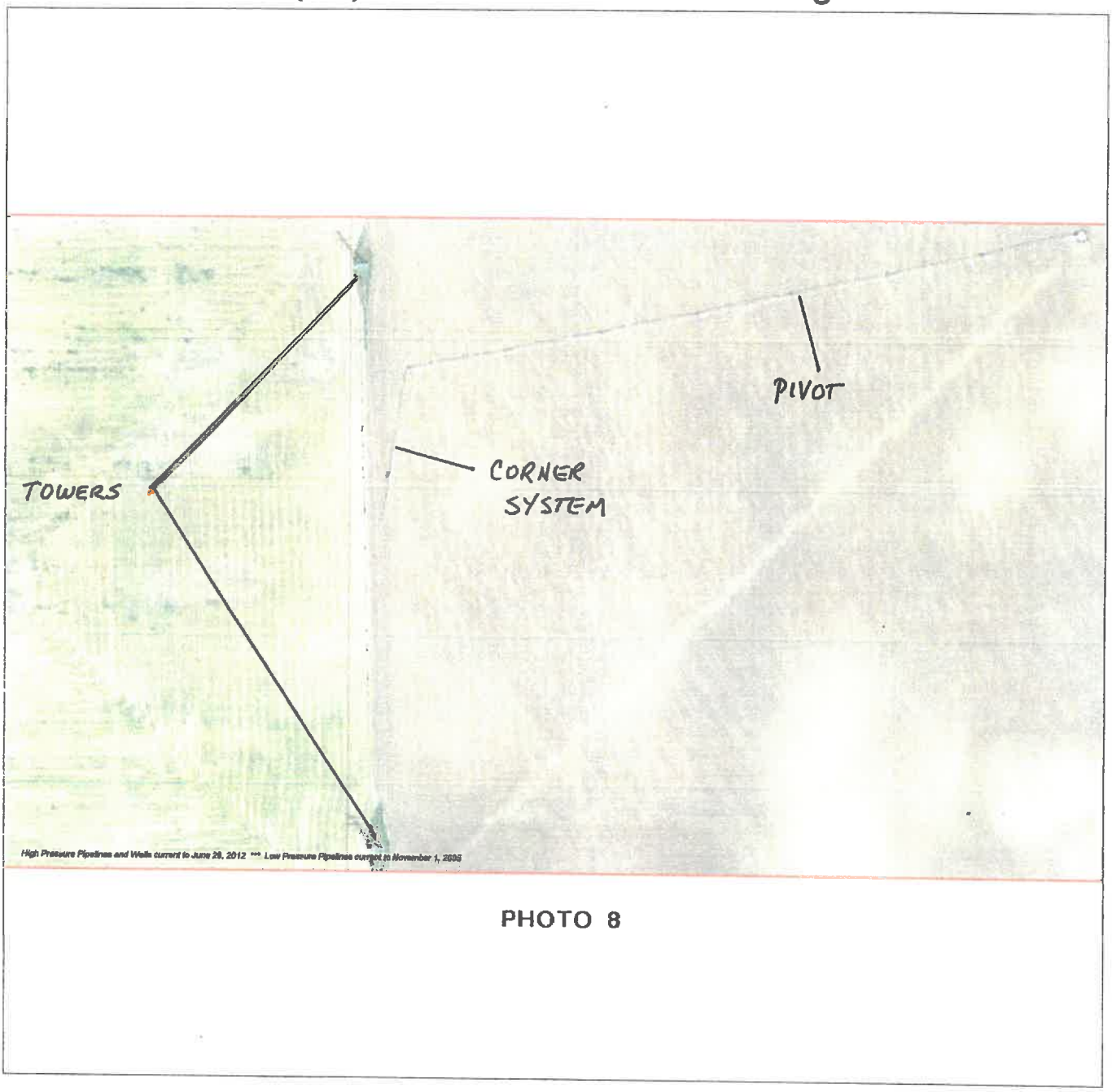


PHOTO 8

N

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Irrigated Field with Towers at Ends and Middle to Accommodate Pivot

PHOTO 9

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline

Detail of Headland (HL) Placement of Tower to Accommodate Pivot and Wheelmove Irrigation

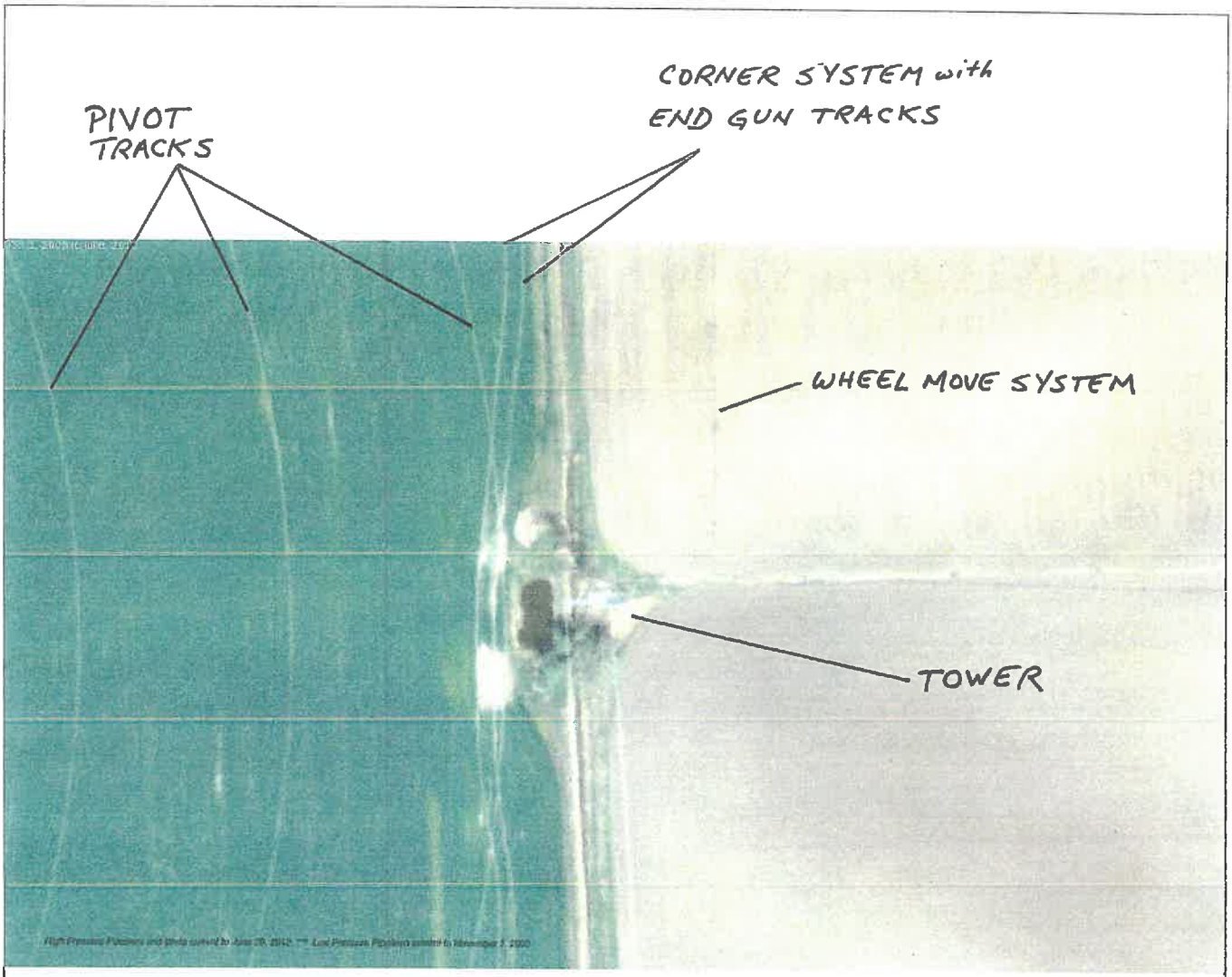


PHOTO 10

N

Wellheads
- Abandoned Wellhead
- Suspended Gas Wellhead
- Suspended Oil Wellhead
- Flowing Gas Wellhead
- Location Wellhead
- Flowing Oil Wellhead
- Miscellaneous Wellhead
- Water Wellhead
- Well Downhole Location
- Newly Licenced Well
- Newly Spudded Well

High Pressure Pipelines
- Gas Pipeline
- Oil Pipeline
- Water Pipeline
- LVP/HVP Pipeline
- Foreign Pipeline (Only when a company is specified.)

Low Pressure Pipelines
- Gas Co-op Pipeline