TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

3.0 PROJECT INFORMATION

3.1 Project Location

As shown on Figure 3 - 1, the Project is located on the east side of Lake Winnipeg in Manitoba, extending from Provincial Road PR 304 east of Manigotagan, north, approximately 155 km to Berens River. The segment of the road between Manigotagan and Bloodvein will follow the Rice River Road alignment, which generally follows the existing winter road/seasonal road. The segment of the road between Bloodvein and Berens River follows the Revised Shoreline Alignment option.

As shown on Figure 3 - 1, the road begins at STA 00 + 000 (1) in the Hollow Water Area (UTM Coordinates - 5667939.475N 697536.898E). The initial 77 kilometres involves the upgrading of the Rice River Road to the Bloodvein FN community. From just north of the Bloodvein River, at Sta 85+133.231 (UTM Coordinates - 5738481.039N 663125.555E), a new road is then constructed to Berens River terminating at STA 156 +211.731 (UTM Coordinates – 5799349.082N 642855.071E).

3.2 Project Need

3.2.1 Background

In 2000, following on its acceptance of the Consultation on Sustainable Development Implementation Report (COSDI) (July, 1999), the Manitoba Government, through Manitoba Conservation, initiated development of a Broad Area Plan for the east side of Lake Winnipeg. The Plan was initiated recognizing the need for sustainable planning recognizing the uniqueness of the Region, the importance and abundance of natural resources in the area. The COSDI report also provided follow-up on the conclusions of the Climate Change Task Force Report (Institute for Sustainable Development, September 2001) which recognized there are many communities in the Area that do not have access to the transportation networks and economic opportunities that most Manitobans take for granted. It also identified some of the dramatic effects of climate change on winter road and food distribution systems historically relied upon by the remote communities in the Area.

A general conclusion of a report prepared by Dillon Consulting, for Manitoba Infrastructure and Transportation, entitled *East Side of Lake Winnipeg All Weather Road Justification and Scoping Study* *(August, 2000),* was that an all-weather road on the east side of Lake Winnipeg can be justified on the basis of long-term transportation cost savings alone.

Figure 3 - 1: Study Area / Project Components

In November 2004, the East Side Planning Initiative (ESPI), on behalf of the East Side Round Table and the East Side First Nations Council, issued a Status Report, entitled *Promises to Keep*, on the progress being made in advancing the ESPI and the Broad Area Plan for the region on the east side of Lake Winnipeg. An important conclusion of this Report pertaining to transportation initiatives on the east side, stated:

> *"While roads can have both positive and negative implications relative to economic, social and environmental considerations, it can generally be concluded that there is support for upgrading the existing Rice River Road and its extension to the community of Bloodvein, as well as support from most communities for a regional all-weather road network beyond Bloodvein."*

(Source: Status Report "Promises to Keep", East Side Planning Initiative, November 2004)

There were two key recommendations in the *Promises to Keep* document respecting the PR 304 to Berens River All-Season Road (the Project).

> *Manitoba Transportation proceed with its proposed planning process to undertake the Rice River Road upgrade and its extension to the community of Bloodvein;*
>
> *Manitoba Transportation amend its proposed planning process to upgrade the Rice River Road, by extending it to the community of Berens River.*

(Source: Status Report "Promises to Keep", East Side Planning Initiative, November 2004)

3.2.2 Provincial Commitment

On November 20, 2008, following up on the *Promises to Keep* recommendations, the Government of Manitoba made a commitment to the Wabanong Nakaygum Okimawin (WNO), the body charged with the responsibility of carrying on the work of the East Side Planning Initiative, that construction on the PR 304 to Berens River All-Season Road would be initiated in the Fall of 2010.

As identified in the *Promises to Keep* document, the establishment of an all-weather road to link the remote communities on the east side of Lake Winnipeg would result in a number of community benefits such as:

- Reduced transportation costs
- Reduced costs of living,
- Improved social interactions between linked communities
- Improved access to goods and services, and
- Reduced reliance on the increasingly unreliable winter road system;
- Reduced reliance on costly air transportation services.

Recognizing that construction and operation of an all-season road could potentially result in some environmental effects, this Environmental Impact Assessment has been prepared to provide an analysis of the environmental effects that might be expected from development and operation of this all-season road, including commitments to the implementation of measures necessary to manage/control any anticipated adverse effects.

3.3 Project Agreements

3.3.1 Provincial Training Program Agreements

The Northern Development Strategy (NDS) is Manitoba's long term plan to develop the human and natural resources of northern Manitoba. The strategy creates opportunities for social and economic changes to benefit all northern Manitoba.

The strategy is a guide for all government departments. A working-group of senior government officials will co-ordinate the delivery of northern services, assisted by the province's Community and Economic Development Committee of Cabinet.

The strategy is designed to:

- improve quality of life;
- expand education and employment opportunities;
- increase economic opportunities; and
- co-ordinate services and investment in northern Manitoba.

Consistent with the NDS, the Berens River First Nation has recently signed a Memorandum of Understanding (MOU) with ESRA that will provide the community with job training and economic development opportunities.

Under the agreement, ESRA will establish a training program this year in preparation for the construction of the PR 304 to Berens River all-season road, which is set to begin in the fall of 2010.

As a result of the MOU, approximately 50 to 70 Berens River residents will get a chance to obtain labourer and heavy equipment operator training for gravel crushing right-of-way clearing and road construction. A new First Nation-owned company called Pigeon River Contractors Inc., has been formed to undertake some of the road's preparatory work.

Similar MOUs are expected to be signed with the FN communities of Bloodvein, and Hollow Water.

3.4 Project Components and Structures

The length of the proposed PR 304 to Berens River ASR is 155 kilometres with an approximate area of 2000 hectares utilized for the Project.

The primary project components include:

- All-Season Road from PR 304 to Berens River (not including access roads on Reserve Lands)[1];
- Water course crossing structures;
- Borrow and quarry areas to support both construction and operations and maintenance requirements;

Project components during construction will include

- Staging areas;
- Maintenance areas;
- Temporary Construction Camp facilities
- Temporary Construction Access Roads.

3.4.1 All-Season Road

The ASR is intended to be gravel surfaced roadway for the foreseeable future and will be centered within a 100 metre right-of-way (ROW). The cleared limit for the roadway will be 60 metres with additional clearing as required to maintain sight distances. The roadway ROW will be combined with the Manitoba Hydro distribution line ROW where applicable to reduce clearing requirements. The roadway will be constructed with two 3.7 metre lanes, 1.0 metre shoulders and a 0.3 metre shoulder rounding allowance. This results in a total roadway top width of 10.0 metres which allows for future roadway surface upgrading without major embankment work.

In areas of rock excavation an 11.0 metre clearance will be provided on each side from overbreak (rockfalls) following blasting. Typical Roadway sections are provided in the Drawings Section at the end of the document.

The Geometric Design Criteria (GDC) to be used for this project was provided by the Manitoba Government. See Table 3.1 for key design component. The standards are based on standards for Secondary Arterial/Collector highways and modified to suit the surrounding conditions and function of the roadway.

[1] There are currently access roads to and within several First Nations Communities

Table 3 - 1: Preliminary ASR Geometric Conceptual Design Criteria [1]

Classification	Secondary Arterial/Collector
Estimated 10 Year Average Annual Daily Traffic	<300
Terrain	Rolling
Design Speed	100 km/h
Gradient – Maximum Percentage	6 %
Posted Speed	50 -80 kph
Minimum Stopping Sight Distance	200 m
Minimum Passing Sight Distance	680 m
Minimum Vertical Curve "K" Values [2]	$K_c = 70$, $K_s = 50$
Curvature – Minimum Radius	440 m
Lane Width and Number	2 lanes at 3.7 m
Shoulder Width	1.0 m each side
Shoulder Edge Treatment	0.30 m each side
Total Right of Way Width	100 m (60m cleared)
Truck Use (Percentage of AADT)	10% Assumed
Truck Haul Type	Supply/Haulage
Roadbed Width	15.4 metres & 13.8 metres
Roadway Fill Slope	4H:1V
Ditch Bottom Width	3.5 min. (4.5 – 6.0 m desirable)
Ditch Back Slope	3H:1V
Clear Roadway Minimum Width on Structure	Short < 60 m, 9.6 m

Note: 1. See General Structures and Section - Drawing RT-06
2. Parabolic curves are defined by the K value: the length of curve divided by its change in grade %.

The proposed ASR involves upgrading the portion of the existing Rice River Road from PR304 to the Bloodvein River, and a new road alignment onwards to the Berens River First Nation.

Based on ground truthing, field surveys and geometric design criteria, the functional alignment originally proposed in the *2005 UMA Functional Design Report: Rice River Road Upgrading and Extension* from Loon Straits to the Bloodvein FN was refined. The new recommended functional alignment from the Bloodvein FN to Berens River FN was initially determined using satellite imagery and then further refined using ortho-corrected aerial imagery.

South of the Bloodvein River, minor adjustments were made to the original alignment to make better use of the existing winter road embankment. The proposed centreline was re-positioned on the surveyed existing winter road centerline to the maximum extent possible so as to minimize disturbance. Based on the ground truthing the alignment was adjusted to minimize areas of unsuitable subgrade and to minimize excessive rock excavation.

For the road segment extending just north of the Bloodvein River to the Bloodvein FN adjustments to the functional alignment were made to minimize clearing of virgin timber, maximize the use of the Manitoba Hydro right of way and to avoid culturally significant areas.

For the section from the Bloodvein FN to the Berens River FN the recommended alignment generally follows the existing winter road and Manitoba Hydro ROW to a location south of the Pigeon River IR (km 132). At this point the alignment turns to the northeast crossing the Pigeon River and the Berens River and terminates just east of the Berens River FN east boundary.

Functional Alignment Drawings of the proposed road from PR304 (km 0) to Berens River FN (km 155) can be found in the drawing section at the end of the document.

In areas of bridge construction additional working room may be required to facilitate the bridge construction. Clearing and grubbing will include the removal of all trees, vegetation, and roots within the 60 metre construction work zone. Trees will be salvaged to the maximum extent possible for merchantable timber and fire wood. Typically clearing and grubbing will take place during the winter periods and predominately during the first winter.

Based on the lane, shoulder, shoulder edge treatment widths, sideslopes and ditch width indicated in the GDC, typical standard cross sections have been developed for each of the various subgrade types to be encountered on Rice River Road. The subgrade types are expected to include; suitable subgrade (gravel, clay, rock), or unsuitable subgrade (peat). Recommendations for embankment construction techniques in areas of unsuitable subgrade are provided. Ranges of anticipated consolidation values are also indicated where the peat may be too thick to be totally excavated. Typical roadway construction practices in conformance with Manitoba Infrastructure and Transportation Standard

Construction Specifications are anticipated to be used in rock excavation areas and areas of suitable subgrade material.

Typical road cross-sections and structures plan/sections can be found in drawing RT 06.

3.4.2 Watercourse Crossings and Bridge Structures

The proposed all-season road will pass through localized rock areas, low-lying lacustrine and marsh environment areas and cross a number of continuously flowing watercourses. There are seven rivers and several creeks, as well as several unnamed watercourses located within the immediate ASR Preferred Alignment.

Currently there is limited geotechnical and hydraulic data available for inclusion into the functional design. Hydraulic and geotechnical work will be conducted to determine channel depths and foundations conditions. Hydraulic analysis will be conducted to determine the size of crossings to meet both provincial hydraulic standards and fish passage requirements.

The crossing structures will be constructed using a combination of CSP culverts, box culverts, clear span and multi-span bridges, where applicable. The culverts may involve either closed or open bottom designs depending on fisheries sensitivities. Where culverts cross fish habitat the culverts will be sized to accommodate fish passage requirements as specified in the *Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat.*

There are four existing temporary bridge structures on the Rice River Road from PR 304 (km 0) to south of the Bloodvein River (km 76.8). These structures will require replacement to both bring them up to Provincial Road Standard and to remove any constraints to the transportation of material and equipment to the northern project area.

The preliminary design is being undertaken for the Wanipigow River Bridge.

The existing bridge structures include:

- Wanipigow River (km 0.8) – Existing Bailey bridge (width restricted, 3.5 m width), rated to 59 tonnes.
- English Brook (km 2.1) – Existing Acrow panel bridge (RTAC loading, 7.3 m width).
- Steeprock Creek (km 16.0) – Existing Acrow panel bridge (RTAC loading, 7.3 m width).
- Rice River (km 30.0) – Existing timber stringers on concrete abutments (HS 25 truck loading, 7.2 m width)

For the section starting south of the Bloodvein River (km 76.8) and going north to Berens River FN, six major structures have been identified:

- Bloodvein River Backwater Channel (km 77.4), (proposed box culvert) ;
- Bloodvein River (km 77.5), main channel (proposed 36 m long, single span bridge structure with 1.5m deep structural steel girders);
- Longbody Creek (km 84) (proposed 42 m long, single span bridge structure with 1.5m deep structural steel girders);
- Bradbury River (km 110), (proposed 116 m long, multi-span bridge structure with 1.5 m deep structural steel girders),
- Pigeon River (km 133), (proposed 91 m long, multi-span bridge structure with 1.5 m deep structural steel girders),
- Berens River (km 155), (proposed 76 m long, multi-span bridge structure with 1.5 m deep structural steel girders),

In addition, locations where large culverts or bridges may be required have been identified as follows:

- Loon Creek (km 53),
- Pakasekan Creek (km 82),
- Petopeko Creek (km 91),
- Creek Crossing 3 (km 91),
- Creek Crossing 10 (km 144) and
- ten other un-named creek crossing locations.

The characteristics and proposed dimensions of the crossings from Bloodvein to Berens River are included in Table 3 - 2.

3.4.3 Quarries and Borrow Areas

Aggregate for the road bed will be derived from local borrow sources and rock quarries established for the project. It is assumed that the supply of this construction material will be through third-party and local Aboriginal suppliers.

Borrow areas identified for local fill, sand, aggregate and crushed rock are shown on the functional alignment drawings that are presented in Section 3.3.7 of this document and as larger scale drawings in Appendix 2. Other borrow pits and quarries may be identified during detailed design. It is intended that many borrow pits and quarries, established for the supply of construction materials, will be closed and rehabilitated prior to road operation.

It should be noted that these drawings show the most promising areas for obtaining the borrow materials. The actual amount to be obtained from individual sources will be determined during the functional design phase of the project based on:

- more detailed grade and profile information is derived from site surveys and geotechnical investigations;
- determination of the cut and fill requirements;
- the determination of the amount of borrow materials required at specific locations;
- more detailed characterization of borrow sources; and
- optimization of haulage requirements in view of the cut and fill requirements.

3.4.4 Construction Staging Areas

Construction staging areas for the mainline road sections will be established at quarry and bridge crossing locations.

The characteristics and proposed dimensions of the crossings from Bloodvein to Berens River are included in Table 3 - 2.

3.4.3 Quarries and Borrow Areas

Aggregate for the road bed will be derived from local borrow sources and rock quarries established for the project. It is assumed that the supply of this construction material will be through third-party and local Aboriginal suppliers.

Borrow areas identified for local fill, sand, aggregate and crushed rock are shown on the functional alignment drawings that are presented in Section 3.3.7 of this document and as larger scale drawings in Appendix 2. Other borrow pits and quarries may be identified during detailed design. It is intended that many borrow pits and quarries, established for the supply of construction materials, will be closed and rehabilitated prior to road operation.

It should be noted that these drawings show the most promising areas for obtaining the borrow materials. The actual amount to be obtained from individual sources will be determined during the functional design phase of the project based on:

- more detailed grade and profile information is derived from site surveys and geotechnical investigations;
- determination of the cut and fill requirements;
- the determination of the amount of borrow materials required at specific locations;
- more detailed characterization of borrow sources; and
- optimization of haulage requirements in view of the cut and fill requirements.

3.4.4 Construction Staging Areas

Construction staging areas for the mainline road sections will be established at quarry and bridge crossing locations.

Table 3 - 2: Watercourse Crossing Details

UID	Crossing	Station	Northing	Easting	Estimated Channel Width (m)	Assumed Water Width (m)	Abutment Offset (m)		Total Length (m)	Catchment (km^2)	Flow (m^3/s)		Structure Type	Culverts		
							North	South			10%	1%		Single	Double	Triple
1	Wanipigow River	0+576.500	5668408.496	697496.620	12	9	7	7	23	1,466	77.44	136.04	Single Span Structure	-	-	-
2	English Brook	2+035.147	5669819.276	697370.790	20	15	15	15	45	343	22.83	36.04	Single Span Structure	-	-	-
3	Steeprock Creek	17+072.000	5681073.135	688203.723	9	7	4	4	15	30	3.82	5.84	Single Span Structure, Box or Multiple Culverts	-	1800	1500
4	Rice River	30+827.200	5692216.950	681253.980	11	7	1.48	1.48	9.96	587	33.82	53.41	Single Span Structure	-	-	-
5	Loon Creek	53+100.800	5710554.284	672094.622	16	7	4	4	15	77	8.94	15.71	Open or Closed Bottom Structure or Multiple Culverts	-	-	2400
6	Creek	61+954.800	5717441.070	667025.863	10	7	4	4	15	87	9.77	17.16	Open or Closed Bottom Structure or Multiple Culverts	-	-	2400
7	Bloodvein Backwater Channel	77+402.326	5731067.063	663955.193	13	10.515	n/a	n/a	10.515	1	0.22	0.40	Open or Closed Bottom Structure or Multiple Culverts	900	600	
8	Bloodvein River	77+490.600	5731155.310	663957.385	30	28	4	4	36	9,091	295.01	518.26	Single Span Structure	-	-	-
9	Pakasekan Creek	82+923.266	5736322.689	663344.288	10	7	4	4	15	57	7.16	12.58	Open or Closed Bottom Structure or Multiple Culverts	-	-	2200
10	Longbody Creek	84+528.451	5737883.472	663362.133	30	28	7	7	42	318	25.24	44.35	Single or Multi Span Structure	-	-	-
11	Creek	85+191.011	5738534.762	663104.286	34	12	4	4	20	1	0.10	0.18	Culvert	600		
12	Petopeko Creek	90+908.187	5743626.958	660674.101	25	22	7	7	36	14	2.21	3.97	Single Span Structure, Box or Multiple Culverts	2200	1500	
13	Creek	91+312.577	5744059.297	660568.827	28	22	7	7	36	2	0.35	0.64	Single Span Structure, Box or Multiple Culverts	1200	900	600
14	Pond	92+911.775	5745485.499	659969.111	65	12	4	4	20	19	2.86	5.07	Single Span Structure, Box or Multiple Culverts	2400	1800	1500
15	Pond	93+514.382	5746008.294	659669.411	26	12	4	4	20	9	1.50	2.69	Box or Multiple Culverts	1800	1500	1200
16	Creek	99+723.057	5748972.215	654724.209	26	12	4	4	20	0	0.03	0.06	Culvert	600		
17	Pond	109+392.942	5757876.944	653053.667	199	12	4	4	20	1	0.16	0.30	Single or Multiple Culverts	900	600	
18	Bradbury River	110+326.470	5758705.263	652708.115	80	77	7	7	91	556	37.94	65.69	Multi Span Structure (minimum 2 river piers anticipated)	-	-	-
19	Creek	121+748.960	5768094.861	646795.389	15	12	4	4	20	2	0.31	0.56	Single or Multiple Culverts	900		600
20	Creek	123+839.320	5769130.541	644990.182	16	12	4	4	20	5	0.81	1.47	Box or Multiple Culverts	1500	1200	900
21	Creek	125+244.522	5770034.09	643933.828	48	12	4	4	20	2	0.35	0.64	Box or Multiple Culverts	1200	900	600
22	Creek	129+231.324	5773830.180	642749.020	15	12	4	4	20	28	3.97	6.94	Multiple Culverts	-	2000	1800
23	Pond	131+385.695	5775952.728	642380.097	31	12	4	4	20	7	1.18	2.12	Box or Multiple Culverts	1800	1200	
24	Creek	132+749.678	5777283.301	642094.451	15	12	4	4	20	10	1.56	2.82	Box or Multiple Culverts	1800	1500	1200
25	Creek	139+811.353	5784108.086	641781.541	17	12	4	4	20	0	1.56	2.82	Box or Multiple Culverts	1800	1500	1200
26	Pigeon River	140+581.862	5784770.476	642159.702	75	72	12	7	91	16,000	445.29	771.12	Multi Span Structure (minimum 1 river pier anticipated)	-	-	-
27	Creek	142+469.527	5786468.179	642152.269	25	12	4	4	20	2	0.38	0.68	Single or Multiple Culverts	1200	900	600
28	Creek	144+955.930	5788766.793	642241.688	24	22	7	7	36	4	0.69	1.24	Box or Multiple Culverts	1500	900	
29	Creek	145+472.300	5789281.031	642288.536	15	12	4	4	20	12	1.86	3.35	Single Span Structure, Box or Multiple Culverts	2000	1500	1200
30	Creek	151+194.366	5794723.499	643906.899	15	12	4	4	20	3	0.51	0.92	Single or Multiple Culverts	1200	900	
31	Creek	152+187.247	5795714.984	643859.487	17	12	4	4	20	4	0.56	1.01	Single or Multiple Culverts	1200	900	
32	Creek	155+263.296	5798429.624	642708.365	16	12	4	4	20	1	0.14	0.25	Single or Multiple Culverts	900	600	
33	Berens River	155+761.990	5798915.696	642734.893	55	52	12	12	76	16,000	445.29	771.12	Multi Span Structure (minimum 1 river pier anticipated)	-	-	-

Each of the major bridge crossing areas will also have a construction staging area to store equipment and materials brought in during the winter periods that will be used during construction during the rest of the year. Staging for these locations will be confined to the proposed right-of-way, where possible.

The actual number and location of staging areas will be determined during detailed/ functional design studies and details will be provided (where required) in support of any fisheries authorizations.

3.4.5 Access Routes

The Preferred ASR Alignment is situated in close proximity to segments of the existing Rice River and existing Winter Road eliminating the fragmentation of the existing natural areas by establishing new rights-of-way. The existing winter road will also provide a means of accessing the right-of way during the early stages of construction. Other access roads will be identified and built for the construction period only.

Local access routes will be established to access the borrow pits and quarry sites to provide construction aggregate and fill for the road base (as shown on the alignment drawings in Section 3.3.7 and in Appendix 2).

Examination of alignment drawings RT 01 to RT 06 indicates that several potential quarries are adjacent to or within approximately 1,000m of the proposed alignment location. A quarry source in the area of the Pigeon River, and situated approximately 2.5 km from the alignment is the exception.

The majority of these borrow areas will be rehabilitated upon the completion of construction except for those borrow areas that will be retained to supply material for road maintenance purposes.

The major water courses and sections of the existing winter road(s) may also serve as a means of access to the bridge work sites and adjacent areas by workers involved in the construction works.

3.4.6 Temporary Construction Camp Facilities

Temporary Camp facilities will be constructed at various locations along the ROW. These facilities may include associated ancillary water and waste water holding or treatment facilities, and waste management facilities or services for domestic wastes. These temporary camps will be located at accessible points to that potable water can be delivered to site storage tanks, and waste generated from the camp can be removed through a waste services contractor for disposal at an approved facility.

3.4.7 Proposed Route – Preliminary Alignment Drawings

Preliminary alignment drawings are shown on Functional Alignment Plans:

- Figure 3-2 (RT 01) Proposed Horizontal Alignment STA 00+000 STA 34+000

- Figure 3-3 (RT 02) Proposed Horizontal Alignment STA 34+000 STA 67+000
- Figure 3-4 (RT 03) Proposed Horizontal Alignment STA 67+000 STA 100+000
- Figure 3-5 (RT 04) Proposed Horizontal Alignment STA 100+000 STA 133+000
- Figure 3-6 (RT 05) Proposed Horizontal Alignment STA 133+000 STA Berens River

The preliminary alignments shown on these drawings will be further modified in some areas based on field surveys, geotechnical and hydraulic investigations, detailed design work. Fisheries and Navigable Waters Authorizations could potentially affect the final alignments and/or crossing procedures.

RT 01

RT 02

RT 03

RT 04

RT 05

3.5 Structure Design Criteria and Assumptions

The general design criteria and assumptions used for the bridges and structures are to be in accordance with American Association of State Highway and Transportation Officials (AASHTO) – Load and Resistance Factor Design (LRFD) Bridge Design Specifications (Latest Edition) as required by the Government of Manitoba. Additionally, the structure designs will have a design loading to Hydraulic Steel Structures (HSS) 40 and comply with the Manitoba Government Structures Design Guide.

The following design criteria and assumptions were referenced for bridges greater than 30 m over the large river crossings:

- Channel widths were taken from ortho-corrected aerial mosaics and field surveys were possible.
- Depth from water to underside of girder was assumed to be approximately 3 m to allow for navigation of small watercraft, increased flood flow and nominal freeboard.
- Bridges assume an abutment offset 7 m from the waters edge.
- On bridges where crossing locations are much narrower than the upstream and downstream channel, a 12 m abutment offset is assumed onto land outcroppings.
- Total bridge length is the sum of the river water width, abutment offset, and river width added for hydraulic assumptions.
- Floodplain/marsh width is estimated based on aerial imagery and hydraulic modeling where applicable.
- Bridge width is assumed to be 10 m plus two 0.6 m curbs/guardrails.
- Rock fill approaches are assumed.
- River crossing bridges are assumed to be multi-span for the larger crossings.

For creek crossings using smaller bridges and large culverts the following design criteria was referenced:

- For channel widths less than 15 m, a water width of 12 m plus a 4 m offset for each abutment was assumed for a total length 20 m.
- For channel widths between 15 m to 25 m a water width of 22 m on average plus a 7 m offset for each abutment was assumed for a total length of 36 m.
- Bridge clear width is assumed to be 9.6 m plus two 0.6 m curb/guardrails.
- All bridges for creek crossings are assumed to be single span. However, multi-span bridges may be selected based on the site conditions and bridge costs.

- All crossings are assumed to be small bridges but many crossings could potentially be large multi-cell concrete culverts or multiple large steel culverts.

Preliminary culvert locations have been identified from the limited hydraulic modeling undertaken using existing data (see Table 3.2).

A description of the typical structures and road sections for this project is presented on Figure 3-7 (Drawing RT – 06).

All crossings at or downstream of fish habitats will be designed to meet Department of Fisheries and Oceans Canada (DFO) criteria for provision of fish passage. Due to available flexibility in the setting of the final PR 304 to Berens River ASR alignment, efforts will be made to avoid any in-stream construction at habitats determined to be critical fish habitat through field studies and discussion with the DFO.

RT 06

3.6 Project Activities

Detailed Design of the PR 304 to Berens River ASR is scheduled to take place in winter/spring of 2010 and tendering in spring 2010. Project approvals are anticipated to enable start of construction in the fall of 2010. Construction is expected to extend over a period of approximately 42 months, with substantial completion by March 2014. However, it is anticipated there will be segments of the ASR completed and operational prior to March 2014. Table 3-3 summarizes the construction and operational phases of the project.

Table 3 - 3: Project Activities Construction and Operation

Phase	Activity	Detail
Construction	Mobilization	• Equipment and Supplies • Set-up, staging areas, laydown areas • Temporary camps (potable water, power, sewage, waste) • Temporary fuel delivery and storage • Winter road access
	Construction	• Surveying – geotechnical investigations • ROW clearing • Brush and timber disposal • Grubbing • Quarrying/crushing • Blasting • Borrow pits (sand and granular materials) • Road bed excavation and ditching • Construction equipment maintenance • Petroleum, oils and lubricants – transport, storage depots and handling • Bridge and culvert replacement(s) • Culvert installations • Slope works (cuts and fills) • Watercourse crossings (temporary) • New bridge crossings (abutments and approaches) • Foundation works (piers and abutments) • In-stream works (dredging, coffer dams, diversions) • Erosion and sediment control • Construction site restoration/rehabilitation • Accidents and malfunctions involving construction equipment or vehicles (i.e. Collisions, malfunctions, fuel or lubricant spills, fires or explosions which may affect wildlife or people. Also accidents related to worker health and safety.)
	Decommissioning	• Borrow sources/quarries • Temporary camps/staging areas

Phase	Activity	Detail
Operations and Maintenance	Operations	• Road usage
	General Maintenance	• Quarrying/crushing • Borrow pits (sand and granular materials) • Normal road supervisions (road patrols, traveler assistance) • Normal road maintenance (grading, erosion control etc)
	Seasonal Maintenance	• Snow clearing and ice control • Bridge maintenance • Culvert maintenance
	Special Maintenance Activities	• Slope failures • Culvert washouts • Road settlement/break-up • Third party damage due to accidents (i.e. Guard rail repair and signate repairs etc.)
	Accidents	• Construction equipment and/or vehicular collisions associated with road usage (wildlife, people) • Material/product spills • Fires • Explosions

3.6.1 All-Season Road

The PR 304 to Berens River All-Season Road (ASR) is proposed to be constructed along the east side of Lake Winnipeg from the current terminus of PR304 to Berens River. Currently the Government of Manitoba has tendered a Heavy Maintenance contract to replace several culverts and haul, place and grade Traffic Gravel Class D material on the segment from km 0 (PR 304) to km 48.5 (Loon Straits Access Road).

From Bloodvein River to Berens River, clearing of a new right-of-way will be required.

The detailed road design and preliminary bridge design for the segment from Loon Straits (km 48) to the Bloodvein First Nation (km 88) is underway. The proposed functional alignment from the Bloodvein FN to Berens River (km 88 to km 158) crosses a variety of rivers and creeks and has been developed identifying the location of the road right-of–way (ROW), bridge crossings and large culverts.

Final road structure consists of a crushed rock subgrade (maximum aggregate size of 150 mm), a sand layer and a surface type of a graded aggregate.

3.6.2 Crossing Structures

Bridge and crossing construction activities will vary depending on structure type, site access and foundation conditions. Typically clearing and grubbing of tress and organic materials will occur, foundation construction through excavation and drilling and assembly and installation of steel girders and bridge deck. Other activities will include erosion and sediment control and installation of rip-rap during construction and re-vegetation monitoring post construction. Materials will be hauled, placed, graded and compacted using various loaders, trucks, graders, dozers, compaction and crane equipment.

3.6.3 Temporary Facilities

During construction, temporary support infrastructure including access roads, staging areas, quarries and camps will be located near or adjacent to the ASR alignment. During the construction the site will be cleared and any topsoil from the site will be stripped and stored for later use. There may be opportunities to transfer ownership of certain facilities (e.g. camps) to ESRA after construction ceases.

3.6.4 Construction Activities

Road

For road construction in the Canadian Shield typical construction techniques involve the clearing and grubbing of the trees and organic materials. In areas where timber can be salvaged, chainsaws or mechanical cutting and equipment will be used. For areas where it is not necessary to re-use the trees, mechanical brushing equipment (i.e. hydro-axes) will be used, and dozers, excavators and trucks used to remove the overburden.

The material for the road fills consists of blasting and crushing of granite materials in sufficient quantities to maximize the cut/fill balance while minimizing overhaul distances. Typical equipment used in the quarry operations include primary and secondary crushers fed using large front end loaders and stockpiled using a combination of loaders and trucks. The quantity of these units is variable based on the Contractors schedule, rock type and crusher hourly capacity. Typically a single shift will utilize up to 4 to 6 people to operate a single crusher.

For excavation, large excavation equipment will be utilized to remove the unsuitable material to competent subgrade. Depending on the time of year, schedule and type of unsuitable material, the size and number of these units will vary. In some areas that are difficult to access, long boom equipment (e.g. large drag lines) will be used to cast and remove unsuitable material. The road is then advanced using blast rock hauled by large trucks and moved into place with dozers. These operations involve up to 50 or more people per shift for a given location.

The material for the final road structure construction consists of crushed rock, sand and a surface type of a graded aggregate. The crushed rock and graded aggregate will be provided by the various quarries along the alignment. Blasting will occur at these locations. If sand is scarce or cannot be found within the project limits, it will be necessary to haul sand materials from an external site.

These materials will be removed, hauled, placed, graded and compacted using various loaders, trucks, graders, dozers and compaction equipment, typically involving up to 50 people per shift.

Bridges

Bridge construction at the key watercourses will require more specialized crews than the general road construction crews (e.g. foundation specialists, crane operators, and form assembly specialists, etc.). The number of workers at each bridge location will vary depending upon the tasks being undertaken. The number of workers at bridge construction sites could typically range between 10 – 50 workers.

The list below provides typical forestry and construction equipment that will be used for various activities on this project.

Right of Way – Forest Clearing

- Chain saws;
- Mechanical cutters;
- Hydroaxes;
- track driven mulchers
- Feller bunchers;
- Skidders;
- Crawler tractors;
- Log loaders;
- Conventional off-highway logging trucks
- Low bed trailers (equipment transport);
- Construction site and storage trailers;
- Service trucks (mechanical/equipment repairs);

Road Construction Equipment

- Portable generators (gensets);
- Air compressors;
- Pneumatic rock drills;
- Hydraulic rock drills;
- Primary and secondary crushing equipment;
- Jack hammers;

- Hydraulic excavators (backhoes);
- Wheel Tractor Scrapers (for large scale earth movement);
- Dozers;
- Graders;
- Heavy duty dump trucks;
- Articulated tractor/trailer haulage trucks
- Drag Lines;
- Soil compactors;
- Cement trucks
- Hydraulic cement pumping trucks (bridge and culvert construction)
- Cranes (concrete form and girder placement);
- Tanker trucks (for fuel supply, water supply, septage disposal, etc)
- Temporary fuel storage tanks;
- Temporary water storage (potable water supplies);
- Holding tanks (grey water. septage)
- Portable water pumps, and sump pumps;
- Construction site and storage trailers

3.6.5 Decommissioning

The ASR is expected to operate for at least the next 50 to 100 years so decommissioning activities will not be required in the foreseeable future.

A Decommissioning Plan related to temporary construction facilities will be developed during design and a complete and a comprehensive decommissioning plan will be prepared early during construction, specifying the activities that will be undertaken during the decommissioning and abandonment phase of the project.

All facilities and works areas that will not be retained for future maintenance activities will be decommissioned. This will be done at various stages progressively during construction as areas (e.g. staging areas, borrow pits, access roads etc.) become available and at the end of road construction activities.

Construction related sites to be decommissioned and reclaimed will be recontoured and restored so that the pre-disturbance conditions (e.g. vegetation) can re-establish itself in a short period of time. Reclamation will be limited to disturbed areas of the site.

Close attention will be paid to areas where erosion potential is high. Large plots of land such as staging areas, borrow pits, and main camp sites will be re-vegetated and maintained until plant growth is established. Disturbed areas where temporary construction facilities existed will be returned to natural contours where possible.

3.7 Proposed Schedule

The Project will be constructed in stages as proposed in the following sections and as illustrated on Figure 3-2.

Figure 3 - 2: Alignment and Staging

3.7.1 Staging and Implementation

As indicated in the *UMA 2005 Functional Design Report*, the Rice River Road project was originally broken down into four Stages involving the section of roadway from the Bloodvein First Nation (Station 88+511.30) south to PR 304 (Station 0+100). Due to the increased scope of the work a refinement of the initial staging plan has been proposed in order to address the extension of the project to include works north of the Bloodvein FN to the Berens River FN. A revised staging plan is as follows:

Stage 1

Once all necessary documentation and agreements have been concluded, clearing and grubbing of the ROW of the recommended alignment could begin at the Berens River FN (km 155) and work south towards the Pigeon River (km 141). Clearing would also be required for the access road and work area for a proposed new quarry site south of the Berens River.

Once access to the quarry site has been completed blasting and mobilization of crushing equipment to the quarry site south of Berens River could begin. Additionally new quarry sites could be developed and crushing operations could begin south of the Pigeon River crossing location (km 133). It has been proposed that a new camp site be set up at the location of the old Abitibi site just south of the Pigeon River to accommodate quarry operation personnel.

Clearing and grubbing could also begin along the recommended alignment from the Bloodvein FN (km 85.1) towards Petopeko Creek (km 90.9) and the Bradbury River (km 110.3).

This stage also includes as part of an external stand-alone project, a Heavy Maintenance Contract currently underway by Government of Manitoba, which includes mechanical brushing of the existing Rice River Road ROW, minor culvert replacement and gravelling of the existing roadway surface, from PR 304 (km 0) to the Loon Straits access road (km 48.5).

Stage 2

This stage would involve the construction of approximately 9.9 km of a new All-Weather Road (AWR) from Bloodvein First Nation (km 85.1) along a new alignment south to intersect the existing Winter Road at km 75.2. This stage would include construction of bridges at Longbody Creek (km 84.5) and the Bloodvein River (km 77.5) and larger box culverts at Pakasekan Creek (km 82.9), the Bloodvein backwater channel (km 77.4) and Loon Creek (km 53.1).

It also includes the upgrading and realignment of approximately 28.3 km of the existing Rice River Road from the end of the existing Winter Road (km 75.2) south to the Loon Straits access road (km 48.5).

Stage 3

During this stage construction of the ASR could begin at the Berens River FN working south towards the Pigeon River including the construction of the larger structure at Creek Crossing 28 (km 145) and the smaller crossings. As well, replacement of the bridges and reconstruction of the road south of the Loon Straits access road (km 48.5) to PR304 (km 0) could be undertaken.

Stage 4

Once access to the Pigeon River crossing is established, construction of the Pigeon River Bridge (km 140.6) could begin. Additionally, work on the construction of the ASR could continue south from the Pigeon River and north from the Bloodvein FN. This would include construction of the larger creek crossings at Petopeko Creek (km 90.9), Creek Crossing 13 (km 91.3) and the smaller crossings.

Stage 5

This stage could involve the construction of new structures at the Berens River (km 155.8), the Bradbury River (km 110.3) and completion of the remaining ASR sections.

3.7.2 Preliminary Schedule

Based on the proposed functional staging a preliminary schedule has been developed and presented in Table 3-4. This schedule will be revised through detailed design, the review of logistical constraints, and the organization of construction work packages. The schedule will also be reviewed and adjusted on an annual basis.

Table 3 - 4: Preliminary Construction Schedule

Construction Stage	Start	Finish	Duration
Stage 1			
ROW Clearing	Fall 2009	Fall 2010	12 months
Crushing	Fall 2009	Spring 2011	18 months
Heavy Maintenance Work km 0 to km 48.5	Fall 2008	Fall 2009	12 months
Quarry Access Roads	Fall 2009	Winter 2009/2010	6 months
Camp Site Development at Pigeon River	Winter 2009/2010	Spring 2010	6 months
Stage 2			
ROW Clearing	Winter 2009/2010	Spring 2010	6 months
Crushing	Winter 2009/2010	Fall 2010	9 months
Bridge Culvert Works	Fall 2010	Spring 2012	18 months
Quarry Access Roads	Winter 2009/2010	Spring 2010	6 months

Construction Stage	Start	Finish	Duration
All Weather Road km 48.5 to km 88.5	Fall 2010	Spring 2012	18 months
Stage 3			
ROW Clearing	Fall 2010	Spring 2011	6 months
Crushing	Spring 2011	Spring 2013	24 months
Bridge Culvert Works	Fall 2011	Spring 2013	18 months
All Weather Road km 141 to km 155	Fall 2010	Fall 2011	12 months
All Weather Road km 0 to km 48.5	Spring 2012	Fall 2013	18 months
Stage 4			
Bridge Culvert Works	Fall 2011	Fall 2012	18 months
All Weather Road km 110.5 to km 141	Fall 2012	Fall 2013	12 months
Stage 5			
Bridge Culvert Works	Fall 2013	Spring 2014	12 months
All Weather Road km 88.5 to km 110	Spring 2013	Spring 2014	12 months

3.8 Resource Material Requirements

3.8.1 Specialized Production Requirements

Production processes associated with this project will include the development of new quarry sites. Blasting and crushing of granite materials at new quarry sites will be undertaken to provide construction materials for the roadway and access roads to the quarry sites. Certain select quarry sites will remain operational after construction has been completed to provide materials for road maintenance.

3.8.2 Raw Materials Required

Based on terrain type analysis, aerial photography and the geometric design criteria, a Class D quantity estimate was prepared to identify the scope of materials that may be used in the construction of the 156 km All Season Road (ASR) from PR 304 to Berens River. Note that the first 76 km is comprised mainly of the existing winter road and it is expected that the proposed road will generally follow the alignment provided by the *2005 UMA Functional Design Report*. This road will consist of a mass/balance of cut and rock/composite fills primarily sourced within the existing right-of-way (ROW). For the preferred alignment from km 76 (Bloodvein River) to km 141 (Pigeon River), it again generally follows the alignment of the existing winter road. In this section however it is expected that some of the rock quantity required for fill will be sourced from various quarry sites adjacent to and within the proposed ROW. The section from km 141 (Pigeon River) to km 156 (Berens River will be constructed on a new location through rock, fen and swamp areas). It will also require suitable rock material sourced from quarries adjacent to the ROW.

Energy requirements will be typical for construction activities including fuel for machinery as well as small quantities to generate electrical power and heat at work camp locations and construction sites. Portable solar power at work camps and construction sites may also be used as appropriate. Where feasible, hydro electric power from grid sources will be accessed for electrical needs.

Small quantities of typical building materials including timber, concrete, steel, etc. may be used to construct work camps, field stations and other structures.

Water from local water sources may be utilized for dust control.

3.8.3 Quantity Estimate

Table 3.4 in Appendix 1.5 provides a quantity estimate of earthwork materials for the Project. It is estimated that nearly 3 million tonnes of crushed rock will be required for the construction of the road structure. For fill material it is estimated that over 1 million cubic meters of blast rock will be required. In areas of unsuitable subgrade it is estimated that nearly 2.7 million cubic metres of rock and composite excavation will be required.

3.9 Waste Management and Disposal

The project will draw a significant number of workers from the local FN communities which will minimize the number of temporary construction camps that will be required.

Waste will be collected and stored temporarily in bins located at each temporary construction camp. Recyclable materials will be segregated and stored in designated areas for removal as conditions permit from each of the camp areas.

Small waste disposal sites (landfills) may be established to address waste that can not be removed from the camp sites along the right-of-way or from accessible waterways during the initial stages of road construction.

Septage from small temporary camps would be disposed of in accordance with provincial regulations.

3.9.1 Hazardous Material Management and Disposal

Hazardous materials used during construction principally involves the fuel and lubricants used by the construction vehicle fleet, portable gensets, and other portable equipment (e.g., pumps). Waste oils and lubricants derived from vehicle and equipment will be collected and stored until removed from site for recycling or disposal through a waste services company.

Soils contaminated through spills during any construction activity will be addressed through clean-up procedures and removal where practical. Bioremediation sites may be established subject to the approval of regulatory authorities.

3.10 Watercourse Crossings

3.10.1 Major Watercourses

Crossings will be required at the following major water bodies along the Preferred ASR Alignment:

- Bloodvein River
- Pigeon River
- Berens River
- Wanipigow River
- Rice River

A description of the water bodies is provided in Section 7.1.3.

3.10.2 Navigable Waters

As part of the original environmental assessment studies conducted in 2005 for the Rice River Road, Transport Canada provided determinations that the following watercourses are navigable, and, therefore, subject to the provisions of the Navigable Waters Protection Act (NWPA) at the proposed crossing locations:

- Wanipigow River
- English Brook
- Steeprock Creek
- Rice River
- Loon Creek
- Bloodvein backwater channel
- Bloodvein River
- Pakasekan Creek
- Longbody Creek

Whereas confirmation has not yet been obtained from Transport Canada, it is anticipated that four or more watercourses along the alignment from Bloodvein to Berens River will be deemed navigable, including:

- Petopeko Creek
- Bradbury River
- Pigeon River

- Berens River

All crossings of streams determined as navigable by Transport Canada will be designed in accordance with the provisions of the NWPA and specific direction by Transport Canada.

3.11 Atikaki Provincial Park

Atikaki Provincial Park was established in 1985 in the Manitoba provincial park system for the purpose of preserving a representative area of the natural Lac Seul Uplands to provide opportunities for a range of outdoor recreational experiences and to promote public appreciation and understanding of the park's natural features and cultural heritage. The park covers an area of 398,100 ha which includes corridors along the Pigeon, Leyond and Bloodvein Rivers and provides winter and summer habitat for the woodland caribou. Figure 3-3 shows the location of the park in reference to the study site. Atikaki Provincial Park is also included in the proposed UNESCO World Heritage Site.

A 12 ha adjustment to the provincial park boundary will be required at the northwest section of the park on the Bloodvein River in order to accommodate construction of the Bloodvein River crossing. The adjustment of the park boundaries is considered a secondary component of the project and details are provided in Section 8.10.4.

Figure 3 - 3: Atikaki Provincial Park