

**YELLOWHEAD COUNTY  
BYLAW NO. 18.01**

*BEING A BY-LAW TO ADOPT AN AREA STRUCTURE PLAN*

**WHEREAS**, the Municipal Government Act, S.A., 1994, and amendments thereto, authorize a Council to adopt an area structure plan for the purpose of providing a framework for subsequent subdivision and development of an area of land;

**AND WHEREAS**, a public hearing was held in respect to the proposed area structure plan on the date written below;

**NOW THEREFORE**, the Council for Yellowhead County, in the Province of Alberta, duly assembled, hereby enacts as follows:

- 1) That the document entitled "Hamlet of Robb Area Structure Plan", dated July 24, 2001 attached hereto as Schedule "A" is hereby adopted as an Area Structure Plan.
- 2) This bylaw comes into force at the beginning of the day that it is passed in accordance with Section 189 of the Municipal Government Act, S.A., 1994.

*M.N.* READ a first time this 24<sup>th</sup> day of July, A.D., 2001.

PUBLIC HEARING held this 28<sup>th</sup> day of August, A.D., 2001.

READ a second time this 11<sup>th</sup> day of September, A.D., 2001.

READ a third time this 11<sup>th</sup> day of September, A.D., 2001.

SIGNED this 11<sup>th</sup> day of September, A.D., 2001.

  
Reeve

Mary Nordstedt  
Municipal Secretary

*copy*

# Hamlet of Robb Area Structure Plan



July 24<sup>th</sup>, 2001

---

## TABLE OF CONTENTS

	<u>PAGE</u>
1.0 INTRODUCTION AND BACKGROUND	1
1.1 Purpose and Scope of the Plan	1
1.2 Location/Setting and History	3
1.3 Plan Preparation Process	4
2.0 EXISTING CONDITIONS	5
2.1 Land Base and Ownership	5
2.2 Natural and Man-made Features/Characteristics	6
3.0 PLANNING VARIABLES/ANALYSIS	7
3.1 Community Characteristics and Expectations	7
3.2 Physical Constraints	8
3.3 Servicing Variables	10
3.4 Future Land Use Issues/ Areas	11
3.4.1 Commercial/Commercial Recreation	12
3.4.2 Residential	13
3.4.3 Community Services/Facilities, Open Space and Recreation	16
3.4.4 Industrial	16
3.4.5 Future Development Areas	17
3.4.6 Transportation and Servicing	17
3.4.7 Horse Holding	18
4.0 FUTURE LAND USE CONCEPTS AND POLICIES	18
4.1 Land Use Concept	18
4.2 Policies	20
General	20
Commercial/Commercial Recreation	21
Residential	21
Community Services/Facilities, Open Space and Recreation	24
Industrial	25
Future Development Areas	25
Transportation and Servicing	26

## TABLE OF CONTENTS (Con't)

PAGE

5.0	IMPLEMENTATION	26
5.1	Municipal Development Plan	26
5.2	Land Use Bylaw	27

## MAPS

AFTER PAGE

1.	Location Map and Plan Boundary	1
2.	Generalized Land Use Concept	18
3.	Existing/Potential Commercial Services & Potential Commercial Recreation Services	21
4.	Residential Infill/Redevelopment Opportunities	21
5.	Existing Zoning	27
6.	Recommended Zoning	27

APPENDIX 1	Hamlet of Robb Floodplain Study: Report and Findings, Associated Engineering
------------	---

---

## 1.0 INTRODUCTION AND BACKGROUND

### 1.1 Purpose and Scope of the Plan

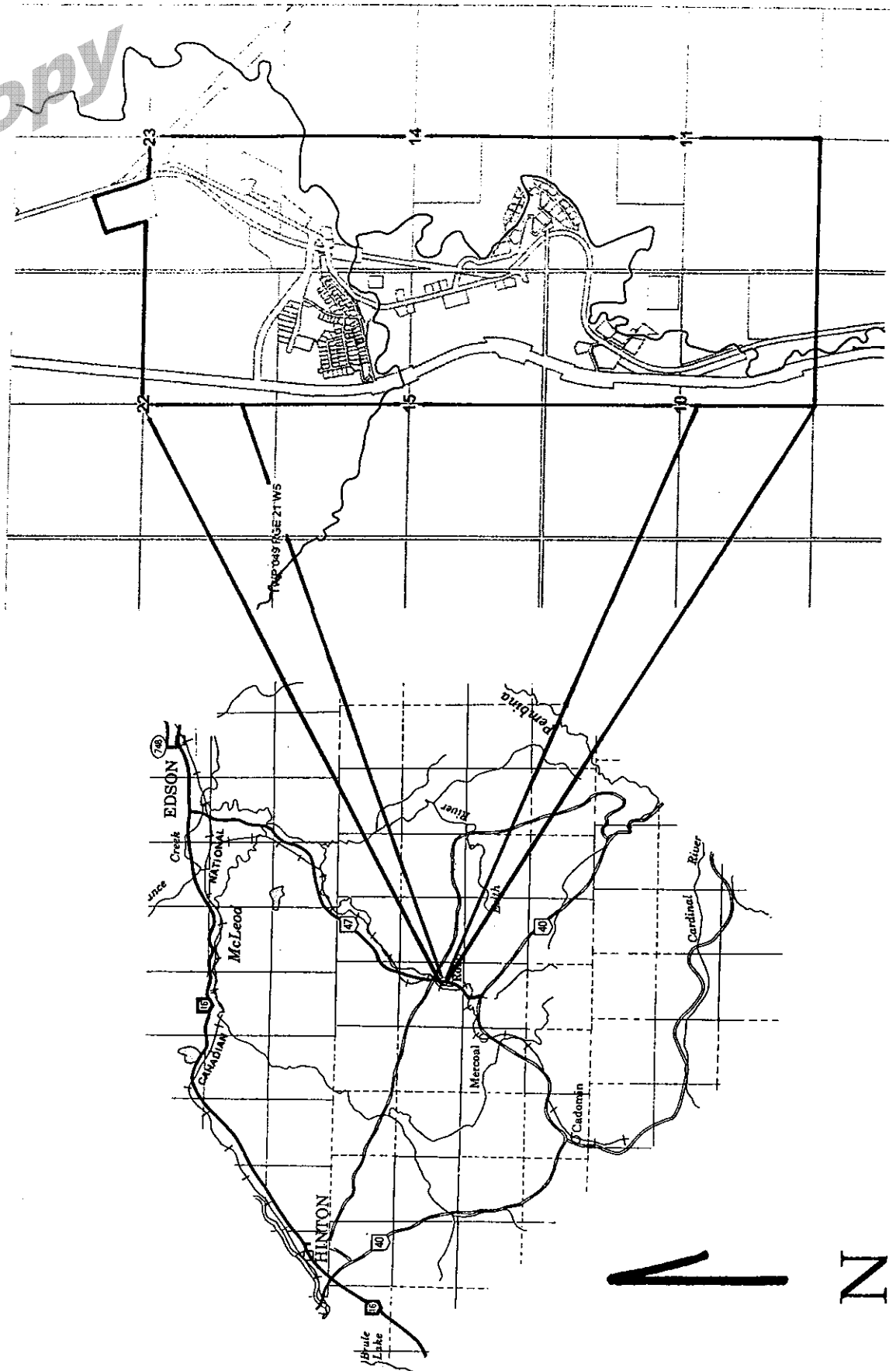
Further to the policies, regulations and land use designations/districting contained in the Yellowhead County Municipal Development Plan and Land Use Bylaw, the Hamlet of Robb Area Structure Plan (hereinafter referred to as the Plan) is for the purposes of providing a framework for future land use, subdivision and development within the Hamlet of Robb. As is indicated on Map 1 entitled “Location Map and Plan Boundary ” following this page, this Plan’s boundary is the same as Hamlet’s boundary.

Where further subdivision and development is deemed appropriate, this Plan, although it provides general policy direction, does not take on a level of design detail (road/lot/servicing layout) such that any subsequent plans of subdivision can be simply submitted and approved. Detailed subdivision and development design would have to be carried out by the proponent.

This Plan also addresses any issues related to existing development raised throughout the public review process or that have been raised by the residents of Robb in recent years. The existing policies related to Robb in the Municipal Development Plan and the list of uses deemed to be appropriate in Robb in terms of the Land Use Bylaw may be both confirmed and altered/refined by this Plan.

According to the terms of reference, the primary focus of this Plan is for the purposes of refining and further specifying the framework for future subdivision and development of land within the Hamlet of Robb. The purpose of the Plan is further expanded to address the following:

Map 1 Location Map and Plan Boundary



- The desirability of further subdivision and development within and, perhaps, in specific areas immediately adjacent to the Hamlet Robb, including additional tourism/recreation/highway commercial subdivision and development;
- The feasibility of further subdivision and development which will include, to the extent required, a reexamination/reconfirmation/updating of known physical constraints such as near surface water table, flooding, slopes, etc. and issues related to on-site and municipal servicing capacity including sewage disposal, groundwater supply, roads and drainage. There will also be an examination of Robb's intersections with Highway No. 47;
- The appropriateness and acceptability of subordinate residential uses (e.g. bed and breakfast, home occupations, etc.);
- Issues related to the existing development in Robb such as non-consolidated lots, non-conforming uses, etc. which need to be addressed;
- The need for any further policy work regarding design guidelines, etc. for existing and future development (residential and commercial);
- Issues related to horse holding and former CN right of way; and,
- Status of and potential to expand community services such as park, open space, community facilities, etc.

In general terms, the feasibility component of this Plan is essentially an engineering exercise to delineate the 1:100 year floodplain of the Embarras River in Lower Robb and Mile 34. Through this exercise, a set of benchmark elevations will be available above which any new residences or significant redevelopment of existing residences must be located.

In light of the foregoing, the policies and concepts of this Plan form the basis of land use, subdivision and development planning for Robb. It refines or specifies further the general policy direction and land use designations provided for Robb within the County's Municipal Development Plan, serves as the basis for new land use districts to be included in the County's Land Use Bylaw and establishes a sound framework for future decisions on subsequent subdivision and development permit applications for the lands situated within Robb. *[Note: the engineering component, as described above, is contained within*

*Appendix 1 and, as such, is attached to and forms part of this Plan.}*

## 1.2 Location/Setting and History

The Hamlet of Robb is comprised of 10 quarter sections located in the heart of the “Coal Branch”, approximately 60 km southwest of Edson and 52 km southeast of Hinton (see Map 1 entitled “Location Map and Plan Boundary”). The Coal Branch is an area in which extensive mining occurred from the 1900's to the 1950's. The Hamlet's development is concentrated primarily on the west bank of the Embarras River with only eight lots on the east side of the River (seven in Lower Robb and one in Mile 34). Highway No. 47 runs along the west boundary of the Hamlet and is accessed at two locations in Upper Robb and at one location in Mile 34.

The area in which Robb is located has had a long and colourful history. One of two remaining communities of the old Coal Branch, Robb is associated with a unique history of resource development. Early prospectors discovered rich veins of coal through the area known as the Coal Branch, an area roughly defined by a triangle extending from Robb, southwest to Cadomin, and southeast to Coal Valley. With the discovery of coal came the building of a 93 km spur line into the Coal Branch.

Two of the claims that Peter Addison Robb, a Coal Branch prospector, staked were Minehead at Mile 33 and Bryan at Mile 32 on the rail line. The company town of Minehead was established when the Minehead Coal Co. went into production between 1915 and 1920. Minehead was bought out by Balkan Coal Co. and the community was renamed Robb after P.A. Robb. The post office retained the name of Balkan until 1923. Nearby, the Bryan Mine began production in 1923.

Production and employment at the two mines fluctuated with the demand for coal. The mines operated on and off through the 1920's to the 1950's. Services to support the mines and the company town were established - a sawmill, a cottage hospital, the Coal Branch School Division. Eventually, roads were built into the Coal Branch to serve the



communities located there. The 1950's brought declining coal markets and the closure of the mines. At the same time oil and gas exploration commenced in the Coal Branch.

With the closure of the mines, Robb became a virtual "ghost town" in the mid-1950's. With the reemergence of a demand for coal, several mines in the Coal Branch reopened in the 1970's and prospects for increased development were good. Robb has become home to those working in the Coal Branch and those who wish to enjoy the rustic environment of the Hamlet, either seasonally or throughout the year.

### **1.3 Plan Preparation**

Formal adoption of this Plan by the County is via Section 692 of the Municipal Government Act (hereinafter referred to as the Act) using the formal public review process outlined therein. These provisions of the Act constitute the formal adoption process. It is important to note, however, that the process used to prepare this Plan relied on more than the formal adoption process required by the Act.

Following Council's adoption of the terms of reference for the preparation of this Plan, a public information meeting was held in April 2000 at the Community Centre in Robb to go over the terms of reference with the residents. Approximately 40 people attended. The proposed planning process was outlined, as were the issues to be addressed in the Plan. There was an active question and answer period following the presentation. It was pointed out that there would be an engineering component to the Plan (delineation of the 1:100 year floodplain of the Embarras River) and that this engineering component would need to fit closely with the planning undertaken.

Instead of providing to Council, and then to the community of Robb, a completed Draft Area Structure Plan, the general policy direction of the Robb ASP was presented first in "Discussion Draft" format. This was to determine if the general direction being pursued was acceptable to Council and the community and was reflective of both Council's and the community's initial input in response to the terms of reference. A discussion draft of the Plan was presented to Council in December 2000 and to the community in January 2001. The Draft Floodplain Report was also presented to the community at the same meeting.

Based on the feedback received regarding the Plan, and refinement of the Floodplain Report, a Draft Area Structure Plan was then prepared and presented to Council, to which they granted first reading on July 24<sup>th</sup>, 2001. With first reading, the Draft Plan was then distributed to the referral agencies for review and comment as stipulated by the Act. A public hearing was held on August 28<sup>th</sup>, 2001. The County granted third reading to the Plan's adopting bylaw in \_\_\_\_\_.

## **2.0 EXISTING CONDITIONS**

### **2.1 Land Base and Ownership**

The Hamlet of Robb is laid out in three distinct enclaves - Upper Robb, Lower Robb and Mile 34. Upper Robb contains the most development consisting of the largest residential area, a commercial store, a hotel, former public school, fire hall, community hall, curling rink, baseball diamonds, children's playground, outdoor skating rink, a highway maintenance yard, a CN yard and the former Alberta Forest Service Ranger Station, which was sold in the late 1990's. The residential component of the former Ranger Station was subdivided from the remainder of the site which has freed-up the developments thereon for commercial recreation use. The waste transfer station and sewage lagoon are located north of the former Ranger Station.

There are just over 100 dwellings in Upper Robb, approximately three quarters of which being occupied by permanent residents with one quarter owned by seasonal residents. While residents in Upper Robb rely on private wells for their water supply, they are served with municipal sanitary sewer.

Lower Robb contains just over 30 residential lots, the majority of which being grouped along the Embarras River. There is a much higher percentage of seasonal residency in Lower Robb (approximately 60%) as compared to Upper Robb. The dwellings in Lower Robb have their own wells and sewage disposal systems.

Mile 34 contain is comprised almost exclusively of seasonal residents and can only be accessed from Highway 47. Again, most of the dwellings are located next to the Embarras River. As with Lower Robb, the dwellings in Mile 34 have their own wells and sewage disposal systems.

The privately held land described above represents a comparatively small portion of the Plan area. The County owns all of the unsubdivided and undeveloped land in Robb. This comprises the vast majority of the Plan area.

## **2.2 Natural Features/Characteristics**

The Plan area can best be described as picturesque yet physically constrained and not easy to develop due to the physical constraints. A significant percentage of the County owned land within the Plan area is steeply sloped, poorly drained, subject to flooding, and so forth. The planning implications of these features are discussed in greater detail in Section 3.2 of the Plan. Although limited opportunities do appear to exist for future subdivision and development, the “lay of the land” in Robb has directly determined how Robb has developed in the past and it will continue to affect how Robb will develop in the future.

### 3.0 PLANNING VARIABLES/ANALYSIS

#### 3.1 Community Characteristics and Expectations

In recent years, based on responses to Land Use Bylaw amendment applications, subdivision/development permit applications, the review of the County's Municipal Development Plan and Land Use Bylaw, and this planning process, it seems the majority of residents in Robb have expressed a desire to see some additional economic development/diversification while preserving the natural surroundings within the Hamlet and the existing quality of life they enjoy in Robb. The community of Robb, like other communities, encompasses a range of interests. In general, however, it seems reasonable to conclude that the community favours balancing limited growth with preservation of existing lifestyle in a desirable setting.

Given the community's early links with the development of very specific and localized resources, Robb's early history was characterized by dramatic fluctuations in population. In more recent years, the population level in Robb has stabilized. The limited future growth that may occur in Robb will likely be closely linked with the growth in tourism and recreation related activities expected in the Coal Branch area. Robb is obviously very strategically located to serve as a staging area for the various recreational activities for which the Coal Branch is well suited and becoming very well known.

It is worth noting that in the late 1990's, the residential lots along the south side of the main entrance road into Upper Robb were allowed to expand toward the rear of the lots to make them more useable. The ability to enlarge their existing lots was welcomed by the affected lot owners and the County would like to offer other property owners in Robb, where possible, the same opportunity. Enlarging lots where possible in areas dependent on on-site sewage disposal would improve the range of disposal options available to the residents should existing systems fail or they simply wish to upgrade. While the County would like to accommodate the desire to enlarge lots, it is important that doing so does not involve the loss of any existing park space (ie: reserves or similar parcels should not be disposed of for this purpose).

### 3.2 Physical Constraints

The potential for significant growth in Robb is severely limited by a number of physical limitations to development including steep slopes and poor soils as well as the 1:100 year floodplain of the Embarras River. There are man-made features as well that represent constraints to development as well such the railway, lagoon and waste transfer site. While some of the following factors listed as constraints would not necessarily preclude development, all would likely increase development/servicing costs.

Robb has many areas where the slope is at least 15% and there are cases where the slope is as much as 30% to 60%. Where developable, steep slopes result in greater costs in constructing and maintaining services, especially roads. Erosion is another hazard, which would prevent development or necessitate considerable mitigative measures.

Although saturated soils are not often a visually obvious constraint in Robb, high water table conditions do exist in places and can cause problems with basement leakages and private sewer system failures. Shrinking and swelling of the soil through frost action or soil shifts due to subsidence after drainage can cause disturbances of underground service lines, all of which contribute to development and maintenance costs.

Robb also has areas of shallow soils making servicing and construction more costly as underground excavations have to be cut into underlying bedrock. The reclamation of shallow soils after a disturbance such as construction is very difficult, particularly if the vegetation has been removed.

Robb also consists of wet areas, including open muskeg and standing water, which preclude development or certainly make development more costly. There are three significant wet areas in the Hamlet. One is located approximately 150 m south of the lagoon, west of the CN tracks; another lies just east of the lift station on the east side of the road; and the third is located in the middle of SE 15.49.21.W5M, between Highway 47 and the road to Lower Robb. Again, areas like this are difficult to develop for most uses.

There is, however, an area immediately south of the lagoon (and slightly to the west as well) that could be utilized for surface storage industrial uses where neither servicing nor significant ground disturbance are required (e.g. pipe and equipment storage).

Robb is near the headwaters of the Embarras River which drains an area of steep bedrock and is subject to high flood peaks due to rapid surface runoff. The projected 1:100 year floodplain of the Embarras River was first identified and mapped in 1976 by Municipal Affairs. The 1:100 year floodplain is the geographic extent of land area that would be inundated by floodwater during a flood event, which may occur once every 100 years and has a one percent (1%) chance of occurrence in any given year.

Associated Engineering has carefully studied the floodplain again as part of this Plan. Both the 1976 study and the recent Associated Engineering Report indicate that the floodplain of the Embarras River affects the existing residential development in both Lower Robb and Mile 34 as well as any redevelopment in these areas. This issue is dealt with further under Section 3.4 below.

Highway 47, Alberta Transportation's regulations and poor terrain all combine to make development difficult in the area west of the existing built-up part of Robb. For these reasons, the notion of developing a highway commercial node along the west side of Highway No. 47 across from and slightly south of the main access into Robb was dismissed as being untenable (too small an area to be feasible and potentially too much impact on the function and integrity of Highway No. 47).

In the north end of the Hamlet, the sewage lagoon and the waste transfer station limit development due to the restrictions and setbacks required by Alberta Environment. From the lagoon, a 500 m setback prohibiting wells, a 300 m development setback for residential uses and a 30 m development setback for commercial and industrial uses is required. From the waste transfer station, a 300 m development setback for residential uses and uses associated with food preparation is required.

The old nuisance grounds (Registered Plan No. 4158 L.Z.), located in SE 22.49.21.W5M also limits development. The site was reclaimed by the Land Reclamation Branch of Alberta Environment in 1990. The building of permanent structures on the site is discouraged by Alberta Environment for safety reasons. Both methane gas and soil subsidence are known to be common on reclaimed sites. The area surrounding this site, however, is both developable and strategically located at the main entrance into the Hamlet. This reclaimed facility must be accounted for in the actual engineering/development conducted on this otherwise strategic site. Since buildings are discouraged, this area could either be left undisturbed as open space or landscaping, used for parking, and so forth.

### **3.3 Servicing Variables**

In 1979, a new sanitary sewage collection and treatment system was installed including a piped system, lift station and lagoon. The system was designed to serve a population of 500 with no allowance made for other than domestic sewage. At present, only dwellings in Upper Robb are served by the sewage system. There is capacity to provide for the 200 or so permanent residents as well as capacity to serve approximately 100 additional dwellings. At peak population (ie: in summer), there may only be capacity to serve approximately 100 additional residents. This capacity would be reduced if commercial or industrial development were also to be served by the sewage system.

Residents in Lower Robb and Mile 34 all use private sewage disposal systems. Extension of the municipal sewer lines to Lower Robb is constrained by cost, distance and terrain, although this Plan does not preclude the extension of this service to the area along the

road to Lower Robb. Extension of the sewer lines to Mile 34 would be prohibitively expensive due to the distance and terrain. At present, no engineering study has been done to examine feasibility.

Water is obtained either through private wells or a public well located at the fire hall, which has a capacity for approximately 75 people. Robb's experience with potable water supplies suggests that there are no major problems with water quality or quantity. Those wells located in the floodplain of the Embarras River, however, may develop problems given the high water table and existing private sewage disposal systems in these areas. Little information is available on the water quality of the private wells in Robb, although the public well has a slightly high concentration of fluoride and some wells have a high iron concentration. A water distribution system would be constrained by cost, distance and the Hamlet's terrain and has not been studied to this point.

The County has located a waste transfer station in the extreme northern part of the Hamlet, has placed streetlights in the Hamlet and has named the streets. Police protection, medical services and educational services are extended from or provided in Edson.

### **3.4 Future Land Use Issues/Areas**

What does the foregoing information mean in terms of future planning? What has emerged from the analysis of the existing conditions information and community input falls into or relates to one of the following categories/planning areas.



### 3.4.1 Commercial/Commercial Recreation

Given the available capacity in the sewage lagoon, there is opportunity to provide for a modest broadening of the hamlet commercial base in a manner consistent with the wishes of the community. The areas on either side of the main entrance from Highway No. 47 seem most suitable for such uses, particularly tourist-oriented, hospitality services including but not limited to motels, hotels, restaurants, shops, etc. As noted earlier, the reclaimed nuisance grounds on the north side of the main entrance must be accounted for in the actual engineering/ development conducted on this otherwise strategic site with the area perhaps left undisturbed as open space or landscaping, used for parking, and so forth.

In addition, there is opportunity to promote the development of commercial recreation opportunities in two separate areas that would be in addition to and complementary with existing and future hamlet commercial development. One of the areas consists entirely of County land while one consists mostly of privately held land with some County land. The idea is to take full advantage of Robb as a four-season staging area for the tourism and recreation opportunities in the Coal Branch. A wide range of such uses is possible from a day use area to a fully serviced campground/RV facility (either publicly or privately operated). It should be noted that the area of private land being referred to here is currently within the DC<sub>1</sub> – District in the Land Use Bylaw and it is intended that the provisions of this Plan are to be additional to and not interfere with or limit the uses already prescribed for these lands in the DC<sub>1</sub> – District.

The Plan encourages improvement of the main access into Robb in terms of entrance features (welcome sign, services listing, orientation map, etc.) and landscaping. There are a number of locations within the area identified to incorporate these elements and provide an aesthetically pleasing gateway to Robb.

As mentioned under Section 3.2 above, the notion of developing a highway commercial node along the west side of Highway No. 47 across from and slightly south of the main access into Robb was dismissed as being untenable. The area is too small to be feasible

and potentially poses too much impact on the function and integrity of Highway No. 47.

### 3.4.2 Residential

Given the available capacity in the sewage lagoon, again, there is opportunity to allow for some residential infill/redevelopment. Specifically, provision can be made for possible additional lots through infill and new subdivision in Upper Robb, possible additional lots through infill and new subdivision outside the 1:100 year floodplain of the Embarras River along the road to Lower Robb (south of the hotel) if sanitary sewer is extended, and possible freehold manufactured housing lots across the road from the former Ranger Station site.

The Plan proposes that a newly drafted HR(R) - Hamlet Residential (Robb) District be included in the Land Use Bylaw in tandem with this Plan. Specifically tailored for Robb, the HR(R) District, first of all, will be applied to existing areas where existing dwellings are unaffected by the 1:100 year floodplain of the Embarras River, secondly, distinguish between areas dependent on on-site sewage disposal and where the lots are or could easily be connected to the existing sanitary sewer system and, lastly, address improved development standards, bed and breakfast operations, home occupations, and so forth.

The nature/extent of home occupations and bed and breakfast operations provided for in this land use district will vary depending on whether or not the lot is connected (or could be easily connected) to the municipal sanitary sewer system. In areas not connected to the sewer system, the implications of on-site sewage disposal need to be carefully considered when permit applications for home occupation and bed and breakfast operations are submitted and decided upon. The integrity and capacity of the existing on-site system must be such that it can support the additional demand or it will need to be upgraded or replaced so that it can. It is prudent to consider only allowing limited home occupations on a discretionary basis in these cases.

There is also the need to continue the program of enlarging the existing residential lots where possible not only to increase the existing lot owners' enjoyment of their properties

but particularly for the purposes of improving on-site servicing. The Plan provides for an area where this has been requested already (the most westerly 7 lots in Upper Robb next to Highway No. 47) but holds out the commitment to consider the option of lot enlargement where possible in the case of any other existing residential lot within the Hamlet. In the case of these 7 lots, and in other cases where appropriate, consideration should be given to preserving a vegetation buffer at the rear of the enlarged lot for aesthetics (e.g. screening from Highway No. 47). Again, it is important that lot enlargement does not involve the loss of any existing park space.

There is the need and opportunity in this Plan to carefully determine and examine the 1:100 year floodplain of the Embarras River as it affects the existing residential development in Lower Robb and Mile 34 as well as any possible redevelopment in these areas. As already mentioned, the Floodplain Report prepared by Associated Engineering Ltd. forms an integral part of this Plan.

Associated Engineering Ltd. indicates the following with respect to Lower Robb:

- 5 of the 25 dwellings have been categorized as being at an elevation where the computed water surface elevation for the 1:100 year flood would be at or above main floor level.
- 13 of the 25 dwellings have been categorized as having “inadequate freeboard” meaning that there is less than 1.0 metre of clearance between the computed water surface elevation for the 1:100 year flood and main floor level.
- 7 of the 25 dwellings are free from the above-described flooding constraints.

Associated Engineering Ltd. indicates the following with respect to Mile 34:

- 3 of the 6 dwellings have been categorized as being at an elevation where the computed water surface elevation for the 1:100 year flood would be at or above main floor level.

- 1 of the 6 dwellings has been categorized as having “inadequate freeboard” meaning that there is less than 1.0 metre of clearance between the computed water surface elevation for the 1:100 year flood and main floor level.
- 2 of the 6 dwellings are free from the above-described flooding constraints.

It is important to note that virtually all of the flood-constrained lots in both Lower Robb and Mile 34 are already developed. The Plan proposes that a newly drafted DC<sub>3</sub> – Direct Control District apply to all lots in both Mile 34 and Lower Robb where existing dwellings are affected by the 1:100 year floodplain of the Embarras River. While providing for the continuation of this existing development, in fairness to the respective landowners, it is prudent that this Plan and the DC<sub>3</sub> – Direct Control District prohibit the creation of any new lots within the floodplain and require that the effects of the computed water surface elevation for the 1:100 year flood be mitigated (e.g. raising the development elevation to 1.0 m above the computed water surface elevation for the 1:100 year flood) prior to the development, substantial redevelopment or significant structural modification of a dwelling.

It is proposed that existing dwellings in Lower Robb and Mile 34 affected by the floodplain can be maintained, repaired or upgraded provided the work undertaken does not increase the “flood-vulnerable” floor space of the dwelling. For example, upgrading insulation, wiring or plumbing would be allowed, as would the installation of a new roof. Although it would not be encouraged, a basement could be installed so long as it was not to be finished (and, therefore, classified as habitable space) or contain any infrastructure (furnace, circuit panel, etc.). As it not desirable to utilize septic fields for sewage disposal in a floodplain, all landowners affected by flooding in Lower Robb and Mile 34 are encouraged to convert to pump out tanks or other safer alternatives for sewage disposal.

With respect to minor accessory buildings such as vehicle garages, gazebos, garden sheds, and the like, it is proposed that they could be maintained, repaired, upgraded or even replaced. As far as any new, substantial accessory building constituting a significant

financial investment is concerned, a large shop for example, the effects of the computed water surface elevation for the 1:100 year flood would need to be mitigated prior to development/redevelopment (e.g. by raising the development elevation to provide 1.0 m of “freeboard”, providing a report in support of a development permit application bearing the seal and signature of a qualified, registered professional engineer indicating the construction methods and materials to be utilized to mitigate the damage caused by flooding).

Notwithstanding the foregoing, Yellowhead County requires 0.5 m freeboard between the 1:100 year flood level and the main floor building elevation, rather than 1.0 m freeboard as recommended in the Hamlet of Robb Floodplain Study.

#### 3.4.3 Community Services/Facilities, Open Space and Recreation

The current ball diamonds, community hall, curling rink, children's playground, outdoor skating rink, fire hall and informal trail system appear to be sufficient for the immediate future. The Plan should provide for any opportunity to expand existing facilities where it is possible. To this end, the Plan provides an area immediately adjacent (west) to the community hall to enlarge the parking lot, a desire expressed by a number of the participants at the first public meeting.

Anyone who knows Robb is likely quite aware of the fairly elaborate informal trail system within and surrounding the Hamlet. The Plan will commit to working with the community in the future to carefully identify, map and possibly formalize (ie: enhance) specified components of the informal trail system. It is important that any new/infill residential development be connected via a trail system, and vice versa.

#### 3.4.4 Industrial

The Plan not only recognizes the existing highway maintenance operation next to the rail line but provides for its expansion to the north if needed. Another area possibly suitable for limited industrial use is immediately south and southwest of the existing lagoon.

Other uses in this area are constrained by the presence of the lagoon and waste transfer site whereas industrial uses are not as affected. This area could, perhaps, be utilized for surface storage where neither servicing nor significant ground disturbance is required (e.g. pipe and equipment storage).

#### 3.4.5 Future Development Areas

Several areas along the Hamlet's east boundary have some potential for future development. One area along Weldwood's road, east of the Embarras River up to the east boundary, could hold promise for future serviced residential development or unserviced acreages if servicing proves to be too difficult/costly. Another area to the south is comprised of quite a flat hilltop high above the Embarras River overlooking Lower Robb. This area may represent an opportunity, likely in the long term, for acreages or even a resort recreational facility of some kind.

To the east of the proposed new commercial area at the main entrance to the hamlet (north of the entrance road) is another area with potential for development ranging from residential to commercial. This area consists of a strip of land running along side of the entrance road sloping downward from the road in a northwesterly direction to a drainage course. It is difficult at this time to determine precisely how these lands should be used. Perhaps innovative projects mixing both residential and commercial could be considered.

#### 3.4.6 Transportation and Servicing

The existing system of private wells (and the one public well at the fire hall), the existing sewage collection/storage system, the existing road network and the storm drainage system all seem to serve the Hamlet residents well. As far as the publicly owned/operated services are concerned, beyond required maintenance, it is not anticipated that any major capital improvements to any of these systems will be required in the foreseeable future.

The County can continue to provide for and encourage the enlargement of existing lots in

the unserviced areas of the Hamlet where possible to improve/expand opportunities to deal effectively with sewage disposal. An education program could be developed in conjunction with the provincial authorities having jurisdiction (e.g. the public health authority) dealing with the proper installation, use and maintenance of the various disposal systems already in place or now available. The County could consider, where appropriate, a “septic system audit” as part of any application to develop, redevelop or intensify.

It is important that this Plan maintains the main entrance into Robb as the principal access into the Hamlet and that nothing be proposed in terms of the overall land use pattern to alter access management vis a vis Highway No. 47. This is important because Alberta Transportation (the road authority for Highway No. 47) is then in a position to endorse and sign this Plan.

#### 3.4.7 Horse Holding

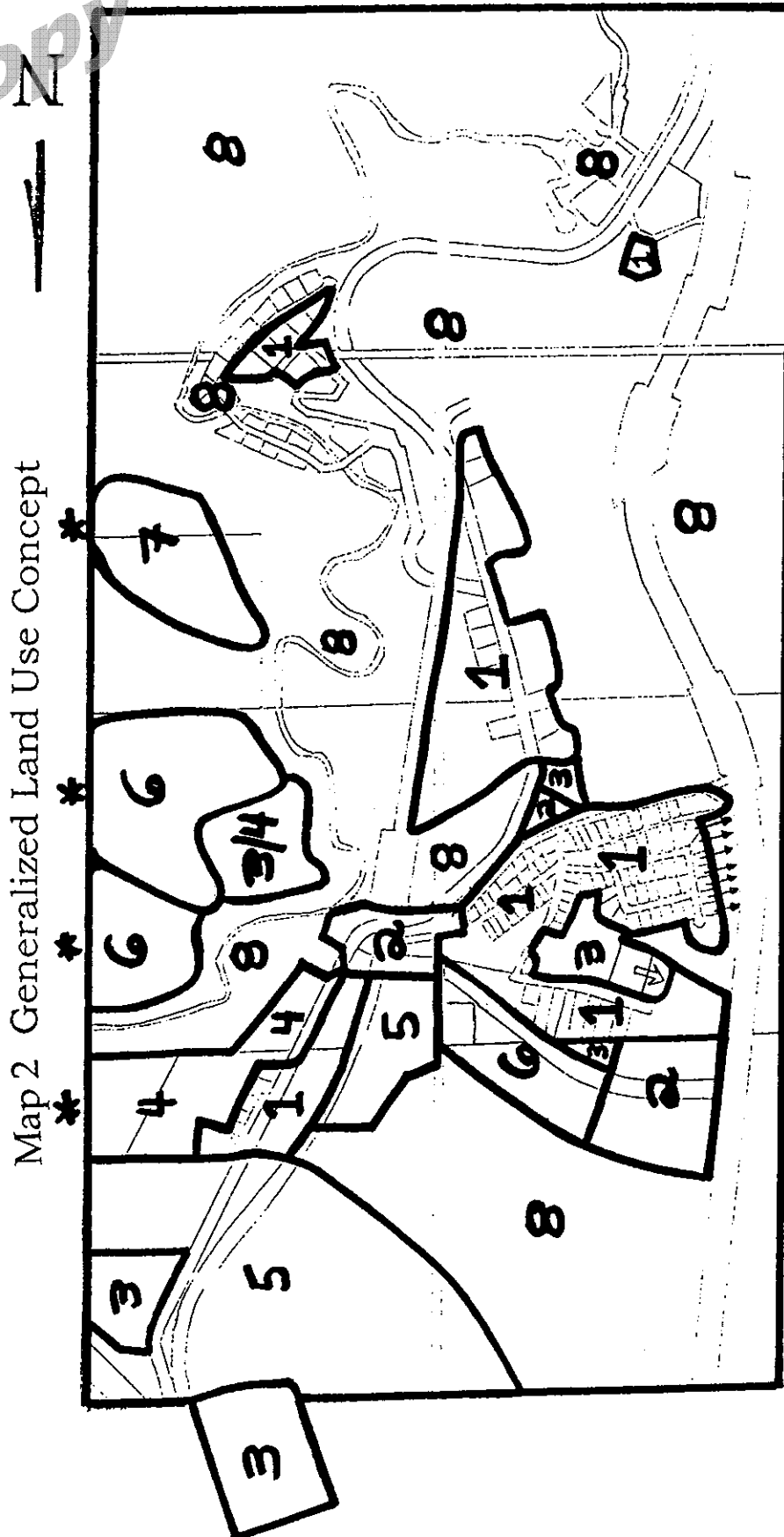
There was very little support expressed at the public meetings, if any, for the keeping of horses within Robb. Thus, this Plan will have the effect of maintaining the status quo regarding the keeping of horses in Robb.

### 4.0 FUTURE LAND USE CONCEPTS AND POLICIES

#### 4.1 Land Use Concept

The future land use concept proposed for the Plan area is depicted in Map 2, entitled “Generalized Land Use Concept” following this page. Note: the two most southerly quarter sections are not shown on this map (or on Maps 3-6 to follow) so that the remaining eight quarter sections within the Hamlet boundary could be shown at a better scale in an 8.5 X 11 inch format. The two excluded quarter sections are very topographically constrained and difficult to access in terms of public road. In terms of the Generalized Land Use Concept, this area is proposed to be within the “Restricted

Map 2 Generalized Land Use Concept



**1** Existing Residential (Opportunities  
may also exist for infill/redevelopment)  
**2** Commercial  
**3** Public/Institutional

**4** Commercial Recreation  
**5** Industrial  
**6** Future Development

**7** Long Term Future Development  
**8** Restricted Development Area  
**\*** Note: Potential Development Area is  
Adjacent to Working Forest



Development Area” designation and it is also proposed that this area would remain within the HRD – Hamlet Restricted Development District in the Land Use Bylaw.

The Yellowhead County Municipal Development Plan establishes the following Guiding Policy for the Hamlet of Robb:

*“The Hamlet of Robb is recognized as having potential for residential, commercial and tourism growth. Controlled growth which maintains the rustic and natural environment of the Hamlet is encouraged.”*

The Concept refines or specifies further the general policy direction quoted above as well as the land use designations provided for Robb in the Municipal Development Plan. It recognizes and reflects the findings of the review of all relevant background information and, in particular, the input that has been received both formally and informally from the community during Plan preparation. The Concept also provides a basis for two new land use district for inclusion in the County’s Land Use Bylaw and establishes a sound framework for future decisions on subsequent subdivision and development permit applications for the lands situated within Robb.

Finally, the Concept responds to and serves the following fundamental objectives:

- To allow for limited growth in Robb balancing the desire for some economic development/diversification with creating a minimum of disturbance to the existing development and lifestyle of the landowners and with a minimum cost to the County.
- For the benefit of all concerned, to carefully plan the use, subdivision and development of a relatively limited developable land base within Robb so that any additional subdivision and development in Robb is governed by sound planning and proceeds only on the basis of a solid base of hydrological/geotechnical information.
- To establish and maintain a higher standard of development both for existing and future uses to ensure that adequate amenities are afforded to the existing and future community of Robb.
- To protect the significant environmental features within the Hamlet for the benefit of the existing and future community of Robb.

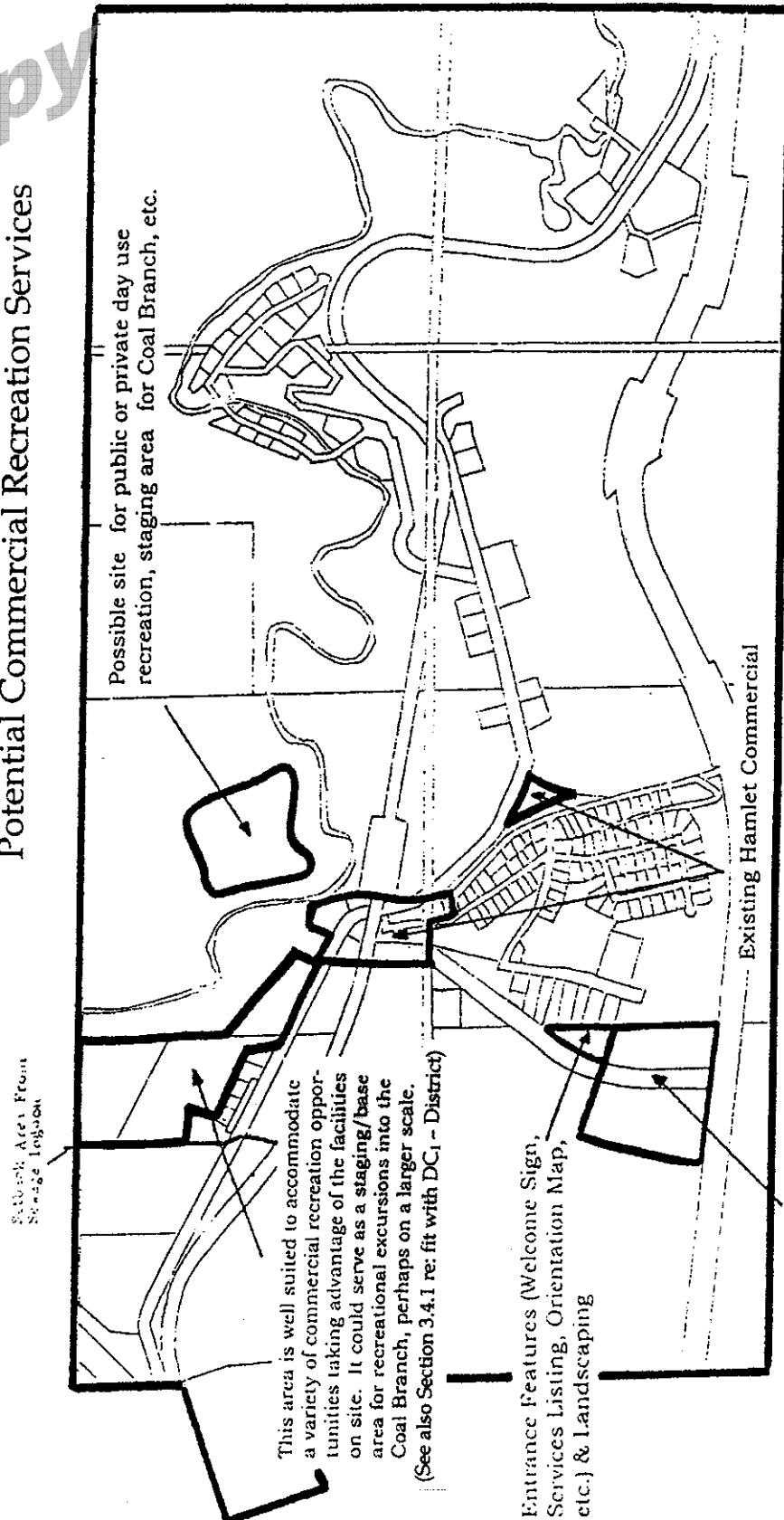
## 4.2 Policies

The following policies are for the purposes of implementing this Plan, refining the general hamlet policy direction and land use designations in the Municipal Development Plan, guiding the preparation of at least two new land use district for inclusion in the County's Land Use Bylaw as well as establishing a sound framework for future decisions on subsequent subdivision and development permit applications.

### General

- Policy 4.2.1 All future use, subdivision and development of lands within the Plan area shall comply with the Generalized Land Use Concept depicted in Map 2 and with the policies listed herein.
- Policy 4.2.2 Only the uses/developments provided for in the HRD - Hamlet Restricted Development District of the Land Use Bylaw will be allowed to occur on the lands designated "Restricted Development Area" on Map 2 of this Plan.
- Policy 4.2.3 This Plan affirms the existing policy which does not allow the keeping of horses within the Hamlet boundaries.
- Policy 4.2.4 The County will endeavour to enforce existing standards and any new standards contained in this Plan and in the land use districts in the Land Use Bylaw developed pursuant to this Plan. The enforcement of said standards (e.g. clean-up of unsightly lots) will also apply to lands owned by the County.
- Policy 4.2.5 The County shall refer to "FireSmart: Protecting Your Community from Wildfire" in their efforts to minimize the risk of wildfire in the wildland/urban interface within the Plan area.
- Policy 4.2.6 Further to Policy 4.2.5, the Plan recognizes and the County shall take full advantage of the Hazard Assessment and Fuels Modification Plan for Robb. Moreover, the County shall work with Alberta Environment (Forest Services) and the F.M.A. holder(s) surrounding Robb to encourage thinning/selective cutting for fuels modification purposes in the areas immediately adjacent to the Hamlet boundary.

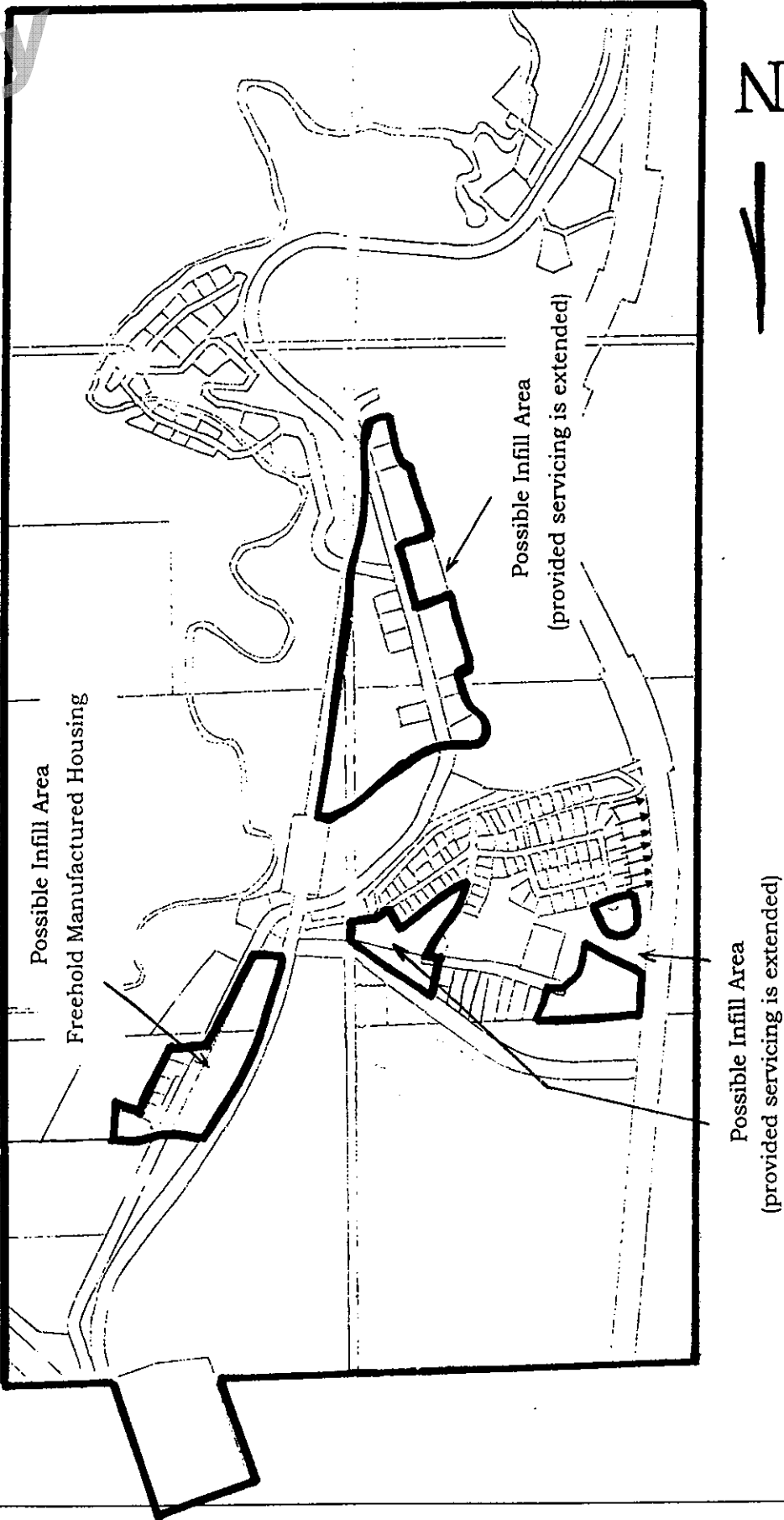
Map 3 Existing/Potential Commercial Services & Potential Commercial Recreation Services



This area is particularly well suited to accommodate tourist-oriented, hospitality services including but not limited to motels, hotels, restaurants, shops, etc.

Hamlet of Robb Area Structure Plan

Map 4 Possible Residential Infill/Redevelopment Opportunities



Commercial/Commercial Recreation

- Policy 4.2.7 As indicated on the Generalized Land Use Concept (Map 2), the Plan recognizes existing commercial operations and provides an area for the expansion of hamlet commercial development along the main entrance road into Upper Robb, complete with enhanced entrance features. It also encourages commercial recreation opportunities. Map 3, entitled "Existing/Potential Commercial Services & Potential Commercial Recreation Services", following this page, further specifies this component of the Generalized Land Use Concept in accordance with Policy 4.2.1.

Residential

- Policy 4.2.8 As indicated on the Generalized Land Use Concept (Map 2), the Plan recognizes the opportunity to allow for some residential infill/redevelopment. Specifically, provision is made for possible additional lots through infill and new subdivision in Upper Robb, possible additional lots through infill and new subdivision outside the 1:100 year floodplain of the Embarras River along the road to Lower Robb (south of the hotel) if sanitary sewer is extended, and possible freehold manufactured housing lots across the road from the former Ranger Station site. Map 4, entitled "Possible Residential Infill/Redevelopment Opportunities", also following this page, further specifies this component of the Generalized Land Use Concept in accordance with Policy 4.2.1.
- Policy 4.2.9 While minor boundary adjustments are permissible, especially to improve developability, no new lots will be subdivided within the 1:100 year floodplain of the Embarras River.
- Policy 4.2.10 While providing for the continuation of existing development, in fairness to the respective landowners, the effects of the computed water surface elevations for the 1:100 year flood of the Embarras River established in Appendix 1 must be mitigated (e.g. by raising the development elevation to provide 1.0 m of "freeboard") prior to the development, substantial redevelopment or significant structural modification of a dwelling. Notwithstanding the foregoing, Yellowhead County requires 0.5 m freeboard between the 1:100 year flood level and the main floor building elevation, rather than 1.0 m freeboard as recommended in the Hamlet of Robb Floodplain Study.

- Policy 4.2.11 Dwellings in Lower Robb and Mile 34 existing at the coming into force of this Plan that are affected by the 1:100 year floodplain of the Embarras can be maintained, repaired or upgraded provided the work undertaken does not increase the "flood-vulnerable" floor space of the dwelling. This may include, as examples, upgrading insulation, wiring or plumbing or the installation of a new roof. A basement may be installed so long as it was not to be finished (and, therefore, be classified as habitable space) or contain any infrastructure (furnace, circuit panel, etc.).
- Policy 4.2.12 Where minor accessory buildings such as vehicle garages, gazebos, garden sheds, and the like, are affected by the 1:100 year floodplain of the Embarras River, they can be maintained, repaired, upgraded or even replaced. In the case of any new, substantial accessory building constituting a significant financial investment, a large shop for example, the effects of the computed water surface elevations for the 1:100 year flood must be mitigated prior to development (e.g. by raising the development elevation to provide 1.0 m of "freeboard", providing a report in support of a development permit application bearing the seal and signature of a qualified, registered professional engineer indicating the construction methods and materials to be utilized to mitigate the damage caused by flooding).
- Policy 4.2.13 The County will subdivide the land between Highway No. 47 and the most westerly existing lots within Upper Robb and provide the adjacent owners with the opportunity to acquire the additional land subject to consolidation with their existing titled area.
- Policy 4.2.14 Further to Policy 4.2.13, and also for the purposes of providing increased opportunities to improve on-site services, the County will, wherever possible, also consider the enlargement of existing residential lots elsewhere in Robb provided the additional land is consolidated with the adjacent existing titled areas. In the case of existing residential lots that already have adjacent to them an area previously subdivided for the purpose of enlarging the adjacent residential lot via consolidation, but where consolidation has not as yet occurred, any future development subject to a development permit under the Land Use Bylaw will require consolidation of the enlargement area with the subject residential lot as a condition of the development permit issued. In no case is the enlargement of a lot to involve the loss of any existing park space (ie: reserves or similar parcels are not to be disposed of for this purpose).

Policy 4.2.15 In the case of the lots referred to in Policy 4.2.13, and in other cases where appropriate, consideration should be given to preserving a vegetation buffer at the rear of the enlarged lot for aesthetics/screening.

Policy 4.2.16 Any existing or future unserved residential properties not affected by the 1:100 year floodplain of the Embarras River may be allowed the opportunity to engage in a limited home occupation and/or bed and breakfast operation in accordance with Policies 4.2.17 through 4.2.19. (Note: the provisions of Policies 4.2.17 through 4.2.19 will be incorporated in the new HR(R) – Hamlet Residential District (Robb) referred to in Policy 5.2.3 under Section 5.0 - Implementation).

Policy 4.2.17 A Limited Home Occupation:

- (a) shall be considered on a discretionary basis only and shall be operated as a secondary use, not change the principal character or external appearance of the dwelling in which it is located and not require any alterations to the dwelling;
- (b) shall not extend beyond the confines of the dwelling and there shall be no outside storage of materials, goods or equipment on the site;
- (c) shall not employ any person not currently residing in the dwelling; and,
- (d) shall not generate pedestrian or vehicular traffic or parking shortage in excess of that which is characteristic of the surrounding properties.

Policy 4.2.18 A Limited Bed and Breakfast Operation:

- (a) shall be considered on a discretionary basis only and shall be operated as a secondary use, not change the principal character or external appearance of the dwelling in which it is located and not require any alterations to the dwelling;
- (b) shall not provide more than one (1) bedroom to accommodate paying guests within the home;
- (c) shall provide one parking space on site for each room being made available for rent to guests; and,
- (d) shall not employ any person not currently residing in the home.

Policy 4.2.19 Provisions Applicable to Limited Home Occupations and Bed and Breakfast Operations:

- (a) If the Development Authority is of the opinion that a proposed limited home occupation or bed and breakfast operation could affect or be affected by the integrity and/or capacity of an existing or proposed on-site sewage disposal system, the Development Authority may refer the application to the provincial authorities having jurisdiction over private sewage disposal systems. As a result of such a referral, the applicant may be required to provide supporting documentation prepared by a qualified person attesting to the integrity and capacity of the existing or proposed on-site sewage disposal system to accommodate the existing and additional demand on the system.
- (b) Further to Policy 4.2.19(a), if it is shown that the existing or proposed on-site sewage disposal system cannot accommodate the existing and additional demand on the system, the Development Authority may not approve the proposed limited home occupation or bed and breakfast operation.
- (c) A limited home occupation or bed and breakfast operation shall not, in the opinion of the Development Authority, be a source of inconvenience or materially interfere with or affect the use, enjoyment or value of neighbouring parcels by way of excessive noise, odour, dust or refuse matter which would not commonly be found in the neighbourhood.
- (d) The Development Authority may issue temporary or time-limited development permit approval with respect to a limited home occupation or bed and breakfast operation.

Community Services/Facilities, Open Space and Recreation

Policy 4.2.20 As indicated on Map 2, this Plan provides for an expansion area to the west of the community hall to enlarge the parking lot.

Policy 4.2.21 If requested, the County will work with the community in the future to identify, map and possibly even formalize (ie: enhance) specified



components of the elaborate, informal trail system within and surrounding Robb.

### Industrial

- Policy 4.2.22 The Plan recognizes the existing highway maintenance operation next to the rail line and, as requested by the landowner, proposes that it be zoned HI – Hamlet Industrial District in the Land Use Bylaw. The area earmarked for industrial use immediately to the south and southwest of the existing lagoon on Map 2 is intended for industrial uses involving surface storage only where neither servicing nor significant ground disturbance is required (e.g. pipe and equipment storage).

### Future Development Areas

- Policy 4.2.23 The two areas shown as “Future Development” on Map 2 adjacent to the Hamlet’s east boundary have some potential for future serviced residential development or unserviced acreages if servicing proves to be too difficult/costly. Council must be mindful of this in considering any application made to it pursuant to the DC – Direct Control District to be assigned to these lands in the Land Use Bylaw.
- Policy 4.2.24 The area shown as “Future Development” on Map 2 along the north side of the main entrance road into the Hamlet has potential to accommodate future development ranging from residential to commercial, including innovative projects combining the two uses. Council must be mindful of this in considering any application made to it pursuant to the DC – Direct Control District to be assigned to these lands in the Land Use Bylaw.
- Policy 4.2.25 The area shown as “Long Term Future Development” may represent an opportunity for acreages or perhaps a resort recreational facility of some kind. Council must be mindful of this in considering any application made to it pursuant to the DC – Direct Control District to be assigned to these lands in the Land Use Bylaw.

Transportation and Servicing

- Policy 4.2.26 This Plan respects the maximum population figure of 500 in terms of the capacity of the existing sewage lagoon.
- Policy 4.2.27 The County will continue to provide for and encourage the enlargement of existing unserviced lots to improve/expand opportunities to deal optimally with on-site sewage disposal. In the case of existing residential lots that already have adjacent to them an area previously subdivided for the purpose of enlarging the adjacent residential lot via consolidation, but where consolidation has not as yet occurred, any future development subject to a development permit under the Land Use Bylaw will require consolidation of the enlargement area with the subject residential lot as a condition of the development permit issued. In no case is the enlargement of a lot to involve the loss of any existing park space (ie: reserves or similar parcels are not to be disposed of for this purpose).
- Policy 4.2.28 The County will also consider working in conjunction with the provincial authorities having jurisdiction to develop and institute an ongoing public awareness program with respect to the proper installation, use and maintenance of the various disposal systems already in place or available alternatives.
- Policy 4.2.28 Development of future roads/lanes shall be to the current County standard.

**5.0 IMPLEMENTATION****5.1 Municipal Development Plan**

- Policy 5.1.1 It is intended that this Plan, its concepts and policies are used in concert with and serve to refine the relevant provisions of the Municipal Development Plan and particularly those pertaining to the Hamlet of Robb. This Plan should guide any required amendments to the Municipal Development Plan as well.

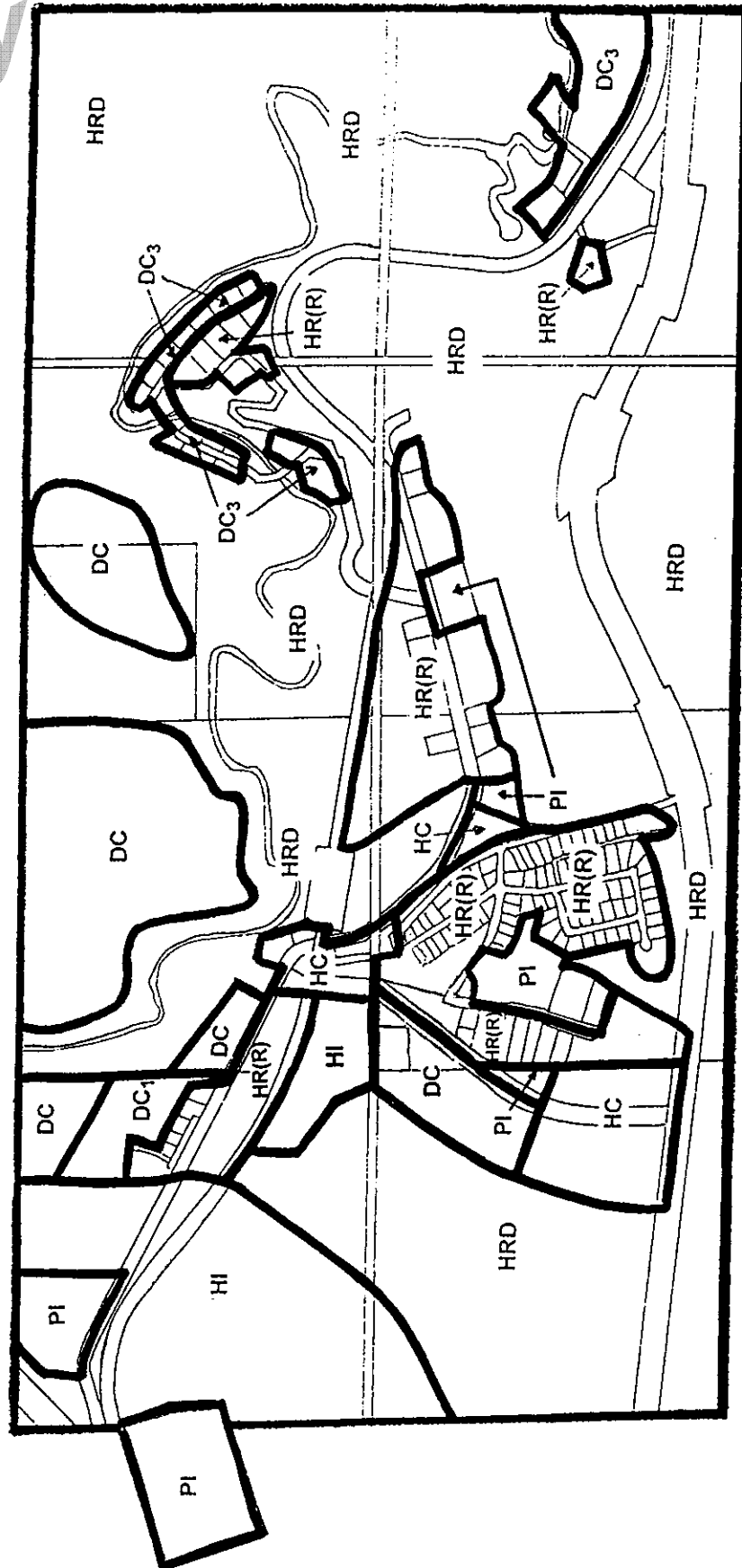
**5.2 Land Use Bylaw**

- Policy 5.2.1 It is also intended that this Plan, its concepts and policies are used in tandem with the relevant provisions of the Land Use Bylaw, particularly

in guiding the exercise of discretion in rendering decisions on subdivision and development permit applications. This Plan will be used to guide any required amendments to the provisions or land use districts in the Land Use Bylaw.

- Policy 5.2.2 Map 6, entitled “Recommended Zoning”, at the end of Section 5.0, shows the zoning recommended as a result of this Plan. As can be seen on Map 6, the provisions of this Plan shall serve as a basis for at least two new land use districts to be included in the Land Use Bylaw. The Plan has also created the need to assign a generic Direct Control zoning to a number of areas. [Note: for comparison purposes, Map 5, entitled “Existing Zoning”, also at the end of Section 5.0, shows the zoning in effect before the coming into effect of this Plan.]
- Policy 5.2.3 The existing HR - Hamlet Residential District in the Land Use Bylaw will be replaced with the HR(R) - Hamlet Residential District (Robb), a land use district specifically tailored to the planning issues and variables associated with the existing serviced and unserviced residential development in Robb not affected by the 1:100 year floodplain of the Embarras River.
- Policy 5.2.4 As Map 6 indicates, the development/lots in Lower Robb and Mile 34 affected by the 1:100 year floodplain of the Embarras River will have a specifically tailored direct control district assigned to them in the Land Use Bylaw. The DC<sub>3</sub> - Direct Control District will be drafted in accordance with this Plan generally and Policies 4.2.9 – 4.2.12 specifically.

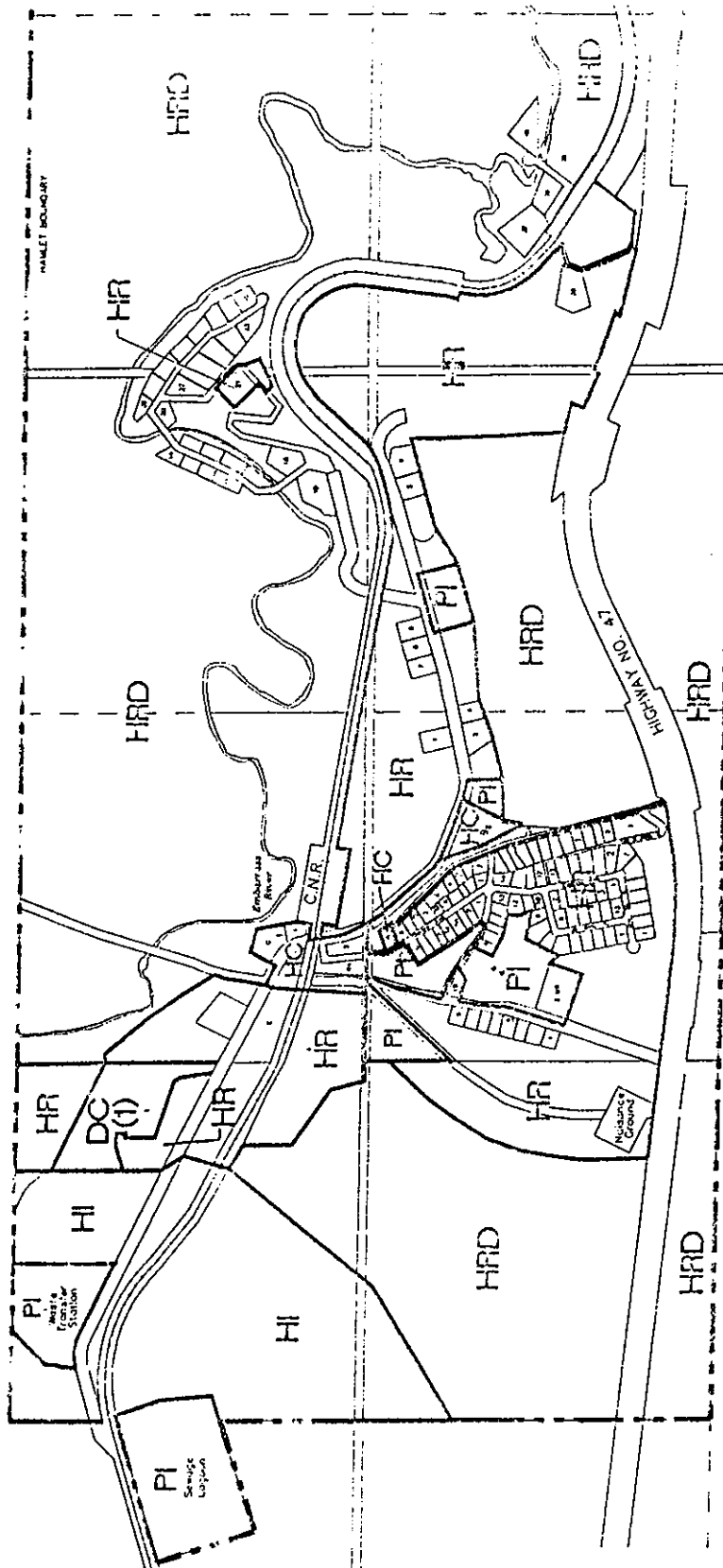
Map 6 Recommended Zoning



- HR(R) – Hamlet Residential District
- HC – Hamlet Commercial District
- HI – Hamlet Industrial District
- PI – Public Institutional District
- DC – Direct Control
- DC1 – Direct Control<sub>1</sub>
- DC3 – Direct Control<sub>3</sub>
- HRD – Hamlet Restricted Development District

COPY

Map 5 Existing Zoning



Hamlet of Robb Area Structure Plan



*copy*

**APPENDIX 1      Hamlet of Robb Floodplain Study: Report and Findings,  
Associated Engineering**

**copy**

R E P O R T

## COUNTY OF YELLOWHEAD

### Floodplain Study for the Hamlet of Robb



July  
2001

copy

#### **CONFIDENTIALITY AND COPYRIGHT**

This document is for the sole use of the addressee and Associated Engineering Alberta Ltd. The document contains proprietary and confidential information that shall not be reproduced in any manner or disclosed to or discussed with any other parties without the express written permission of Associated Engineering Alberta Ltd. Information in this document is to be considered the intellectual property of Associated Engineering Alberta Ltd. in accordance with Canadian copyright law.

This report was prepared by Associated Engineering Alberta Ltd. for the account of COUNTY OF YELLOWHEAD . The material in it reflects Associated Engineering Alberta Ltd.'s best judgement, in the light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Associated Engineering Alberta Ltd., accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



## TABLE OF CONTENTS



SECTION	PAGE NO.
TABLE OF CONTENTS	i
1 INTRODUCTION	1-1
1.1 Objectives	1-1
1.2 Scope of Work	1-2
2 BASIN HYDROLOGY	2-1
2.1 General	2-1
2.2 Data Base	2-1
2.3 Frequency Analysis	2-3
2.4 Design Flows	2-3
3 RIVER HYDRAULICS	3-1
3.1 General	3-1
3.2 HEC-RAS	3-1
3.3 Survey	3-1
3.4 Survey Datum	3-2
3.5 Map Datum	3-3
3.6 Hydraulic Parameters	3-4
3.7 Sensitivity Analysis	3-4
3.8 Computed Water Surface Elevations	3-5
3.9 House Elevations	3-5
3.10 Freeboard	3-6
3.11 Floodplain Extent	3-7
3.12 Flood Fringe	3-7
3.13 Culvert Capacity	3-8
3.14 Flood Risk Map	3-10
4 CONCLUSIONS	4-1
5 RECOMMENDATIONS	5-1

COUNTY OF YELLOWHEAD

TABLE OF CONTENTS

---

copy

6 CLOSURE

6-1

APPENDIX A REGIONAL HYDROLOGY SPREADSHEET

APPENDIX B LOWER ROBB CROSS-SECTIONS AND PROFILE

APPENDIX C MILE 34 CROSS-SECTIONS AND PROFILE

## INTRODUCTION

COPY

### 1.1 OBJECTIVES

Associated Engineering Alberta Ltd was retained by the County of Yellowhead to conduct a flood mapping study of the Embarras River through Robb. The study will assist in land use planning in the hamlet.

Figure 1.1 shows the overall project location. The hamlet of Robb is located in the Rocky Mountain Foothills on Highway 47, approximately 60 km southwest of Edson and 5 km north of the junction of Highways 40 and 47. It is located at the junction of the Embarras River and Bryan Creek.

Figure 1.2 shows the layout of the hamlet and some of the key features within the hamlet. The newer areas of the hamlet are located on higher ground to the north of Bryan Creek. Older areas of the hamlet are located in the floodplain of the Embarras River, further south. The study focussed on these older floodplain areas and was done in two portions known locally as “Lower Robb” and “Mile 34”.

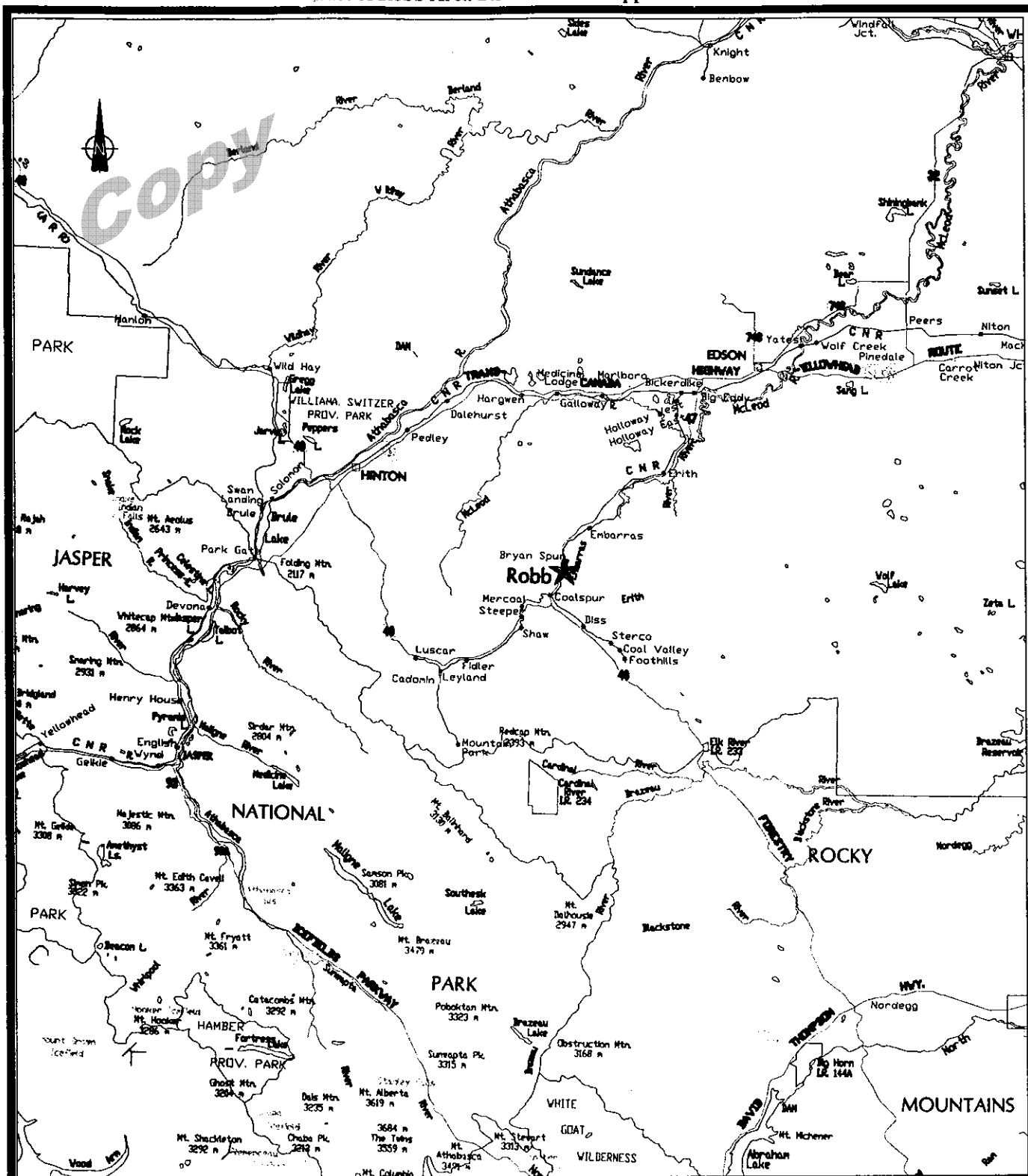
Photo 1.1 provides a typical view of the river channel in Lower Robb. Photo 1.2 provides a typical view of the floodplain in Mile 34.

IBI conducted a previous study of flood levels in the Embarras River floodplain for Alberta Environment Planning Division in 1988. They indicated that 24 homes were located within the flood zone. However, the mapping was done at a small scale and with fairly coarse resolution; base maps were derived from an earlier contour map having 3 m contour intervals. Concerned about the accuracy of the previous mapping, the County requested Associated Engineering to undertake the present work to update the previous study.

Locations of major culverts are shown on Figure 1.2 (numbered 1 to 4). There are also two bridges across the Embarras River in the Lower Robb Area (5 and 6)<sup>1</sup> and one footbridge (7) across the river in the Mile 34 Area. As part of the study we reviewed the capacity of these structures.

---

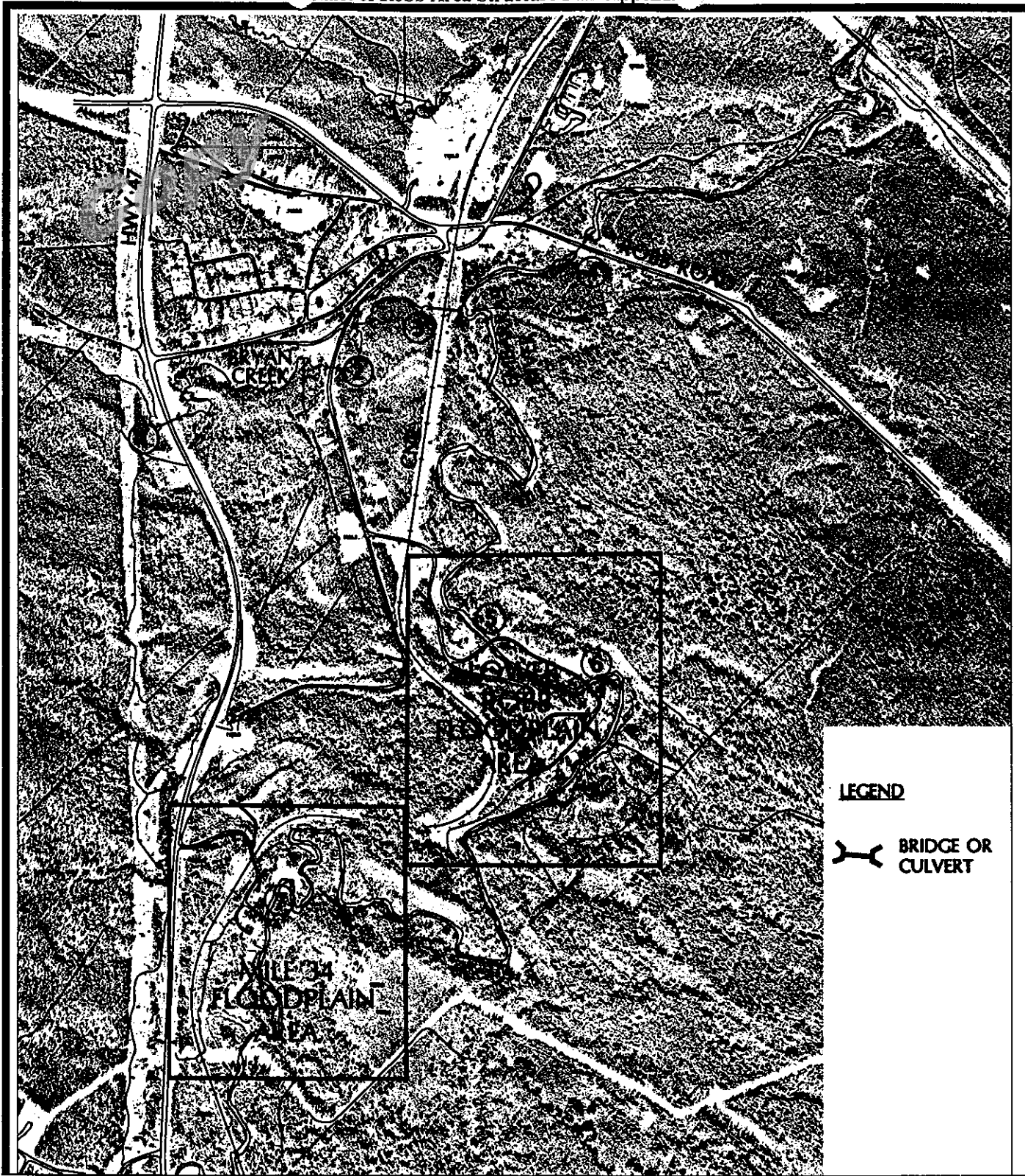
<sup>1</sup>The two bridges are known locally as the Yellow Bridge and the Blue Bridge, respectively, referring to the colour of their superstructure.



# COUNTY OF YELLOWHEAD

## ROBB FLOODPLAIN STUDY

### LOCATION PLAN



COUNTY OF YELLOWHEAD  
ROBB FLOODPLAIN STUDY  
STUDY AREA LOCATION PLAN

Time: 8.30  
Date: 2000/12/7  
Plot Scale: 1"=1' (Paper Space)  
AutoCAD File: 003889\REPORT\3889T02.DWG (BW)

ASSOCIATED  
ENGINEERING



FIGURE 12

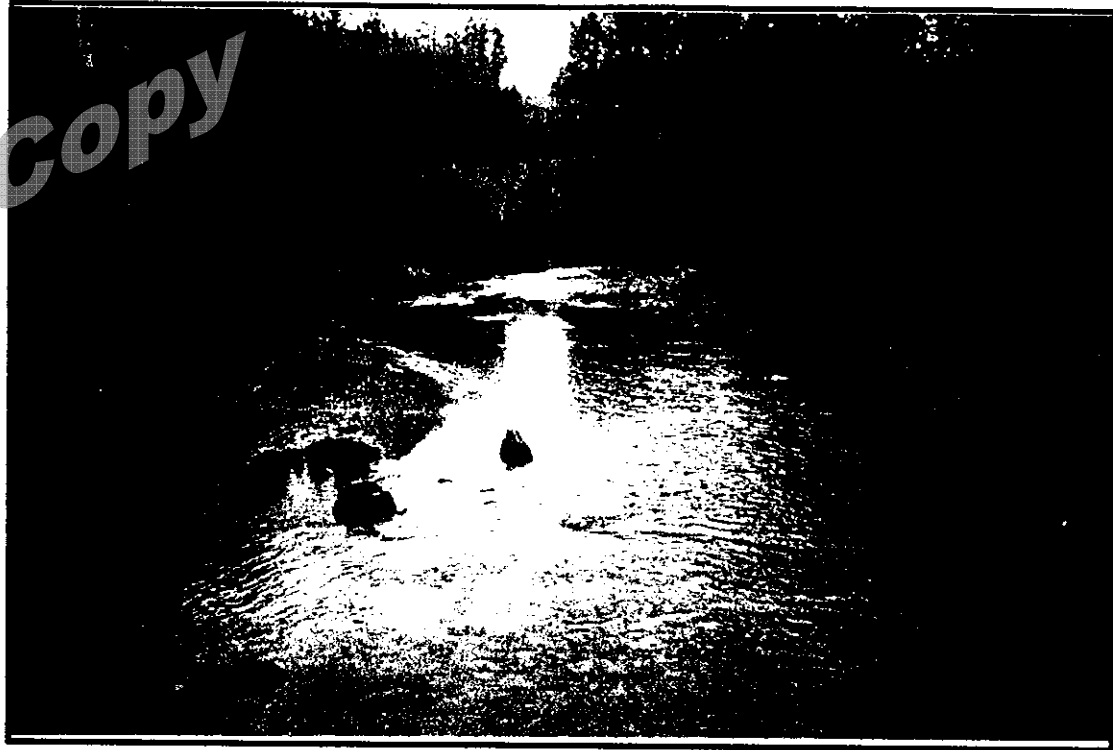


Photo 1.1

Embarass River in the Lower Robb area



Photo 1.2

Embarass River in the Mile 34 area

## 1.2 SCOPE OF WORK

The scope of work included the following:

- A regional flood-frequency analysis to develop 1:100 year flood estimates for the Embarrass River and Bryan Creek.
- Site reconnaissance and survey to determine:
  - river cross-sections and spot elevations on the floodplain
  - grade and sill elevations for each house in the floodplain
  - culvert sizes, elevations, lengths, and type
  - datum correction for digital orthophoto contour maps supplied by UMA
- Backwater modelling to define the 1:100 year flood water levels.
- Mapping of floodway areas.
- Definition of flood risk areas and potential improvements.
- Review of culvert and bridge capacities on Bryan Creek and Embarrass River.
- Preparation of the present report to document the analysis and flood risk assessment.

Initially the project was to cover the Lower Robb area. Subsequently the County requested that the project be expanded to include the Mile 34 area where there is some recent and future development interest. The survey was also expanded to enable the floodplain maps to be related to Geodetic datum as will be discussed below.

A draft report was submitted in February, 2001. Subsequently, Associated Engineering participated in a public open house and an on-site meeting with residents. We reviewed and re-surveyed the house elevations to confirm the main floor elevations, and we revised the backwater model to better represent the overbank spill around the Blue Bridge and to simulate the effect of potential development in the flood fringe. We have updated the report to include the additional information.

## BASIN HYDROLOGY

# SECTION 2

### 2.1 GENERAL

The following section outlines the process of estimating the design flows to be used in the HEC-RAS model. The Embarras River was gauged at Robb for five years (from 1984 to 1988), however the 100 year design flood extrapolated from such a short period of record would not be reliable and therefore a regional analysis was conducted. The regional analysis uses flow data from nearby streams to develop an estimate of the design flow for the study basin.

### 2.2 DATA BASE

We estimated the 100-year return period flow using a regional analysis based on watersheds in similar or adjacent climatic and hydrologic zones. We compared these catchments to the Embarras River and Bryan Creek catchments and ranked them based upon their drainage area, data record length, hydrologic zone, general exposure, average elevation, amount of attenuation, average grade, drainage density, and width-to-length ratio. Appendix A provides the details.

Table 2.1 lists the 5 highest ranking catchments surrounding the Embarras River and Bryan Creek and their salient hydrologic characteristics, as well as the corresponding data for three larger basins that were considered in the analysis.



Table 2.1  
 Regional Flood Hydrology Data

Rank	WSC NO.	Gauge Location	Longitude		Latitude		Drainage Area (km <sup>2</sup> )	Record Length (years)	1:100 Year Discharge (m <sup>3</sup> /s)	Unit Flow (m <sup>3</sup> /s/km <sup>2</sup> )
			Degrees	Minutes	Degrees	Minutes				
1	07AF004	Deerlick Creek near Hinton	53	9	117	15	14	23	17.6	1.26
2	07AF005	Eunice Creek near Hinton	53	9	117	14	17.1	24	16	0.94
3	07AF003	Wampus Creek near Hinton	53	9	117	16	25.4	28	28.2	1.11
4	07BA003	Lovett River near the mouth	53	0	116	39	101	20	121.8	1.21
5	07AF909	Embaras River at Robb	53	13	116	58	123	5	137.9	1.12
Other gauges considered										
	05DC001	North Ram River at Forestry	52	17	116	0	348	19	100	0.29
	07AG003	Wolf Creek at Highway no. 16A	53	36	116	16	805	41	421	0.52
	07AF014	Embaras River near Weald	53	23	116	48	647	12	291	0.45

## 2.3 FREQUENCY ANALYSIS

We used Environment Canada’s “Consolidated Frequency Analysis” (CFA) software to conduct the flood frequency analysis. CFA uses five frequency distributions as follows:

- Generalized Extreme Value
- Three Parameter Log-normal
- Log Pearson Type III
- Wakeby
- the non-parametric method

CFA plotted the annual maximum instantaneous flows against their respective return periods on extreme value plots for each distribution. CFA then applied a line of best fit to the data on each distribution plot and extended the line to obtain the 100-year return period maximum instantaneous flow. The design flows were determined by averaging the 100-year Unit Runoff instantaneous flow obtained from the three parametric distributions.

## 2.4 DESIGN FLOWS

The top five ranking gauges yield flows of similar magnitude, with Deerlick Creek near Hinton providing the most conservative estimate and ranking the highest. Therefore, we estimated the 100-year maximum instantaneous flows for Embarras River and Bryan Creek using data for the Deerlick Creek near Hinton gauge (Station 07AF004). We then pro-rated the flow on the basis of drainage area to estimate the design flows for the study catchment. Table 2.2 provides a summary.

Table 2.2  
Design Flows for Embarras River and Bryan Creek at Robb

Basin	Drainage Area (km <sup>2</sup> )	1:100 Year Maximum Instantaneous Discharge (m <sup>3</sup> /s)
Bryan Creek at Robb	26	33
Embarras River at Robb	125	158

copy

As a final check we used the CFA computer program to analyse the five years of available flood discharge data for the Embarrass River at Robb (WSC Gauge 07AF909). The available data gave an estimate for the 1:100 year flood of 138 m<sup>3</sup>/s which is comparable to that of the regional analysis (158 m<sup>3</sup>/s). Therefore we adopted the results of the regional analysis, because:

- it is based on a longer period of record and is therefore more reliable,
- it is slightly more conservative and is therefore safer.

The sensitivity of the floodplain mapping to the design flow was subsequently evaluated in the sensitivity analysis to be discussed below.

## RIVER HYDRAULICS

## SECTION 3

### 3.1 GENERAL

We used the US Army Corps of Engineers HEC-RAS Software to calculate the flood water levels in the Embarras River through the hamlet of Robb. We also conducted a sensitivity analysis of the roughness coefficient and the design flow to assess the reliability of the results.

### 3.2 HEC-RAS

HEC-RAS is a graphical, Windows-based version of the US Army Corps of Engineers HEC-2 model. It simulates water levels in a non-uniform channel with a constant flow and gradually varied cross-section conditions. The solution process uses the one-dimensional energy equation to determine water levels, and Manning's equation to evaluate friction losses. It is an iterative process converging when an energy balance is reached between successive sections. The program also evaluates the effects of obstructions, such as bridges.

The model requires geometric data, cross sections, bridge data, culvert data, and hydraulic parameters such as expansion and contraction coefficients and the Manning's roughness coefficient.

### 3.3 SURVEY

A field survey provided the necessary geometric and cross-section data. The survey included:

- Ten cross sections through the Lower Robb reach.
- Twelve cross-sections in the Mile 34 reach.
- A cross-section at each of the two bridges in the downstream reach and one bridge in the upstream reach, plus the locations of their abutments and the elevations of their girders, decks, and approach roadways.
- The elevation of the front door sill of each home located within the floodplain and the ground elevation outside the house.

copy

- Spot elevations on the floodplain to confirm the contours shown in the UMA base maps.

Locations of the surveyed cross-sections are shown in the floodplain maps (Figure 3.1 and 3.2). Appendix B contains the cross-section plots and longitudinal profile for the Lower Robb area. Appendix C contains the same data for the Mile 34 area.

HEC-RAS interpolated a number of sections within our model to assist in the flood mapping process; however the survey was detailed enough that interpolation did not significantly alter the calculated water levels.

#### 3.4 SURVEY DATUM

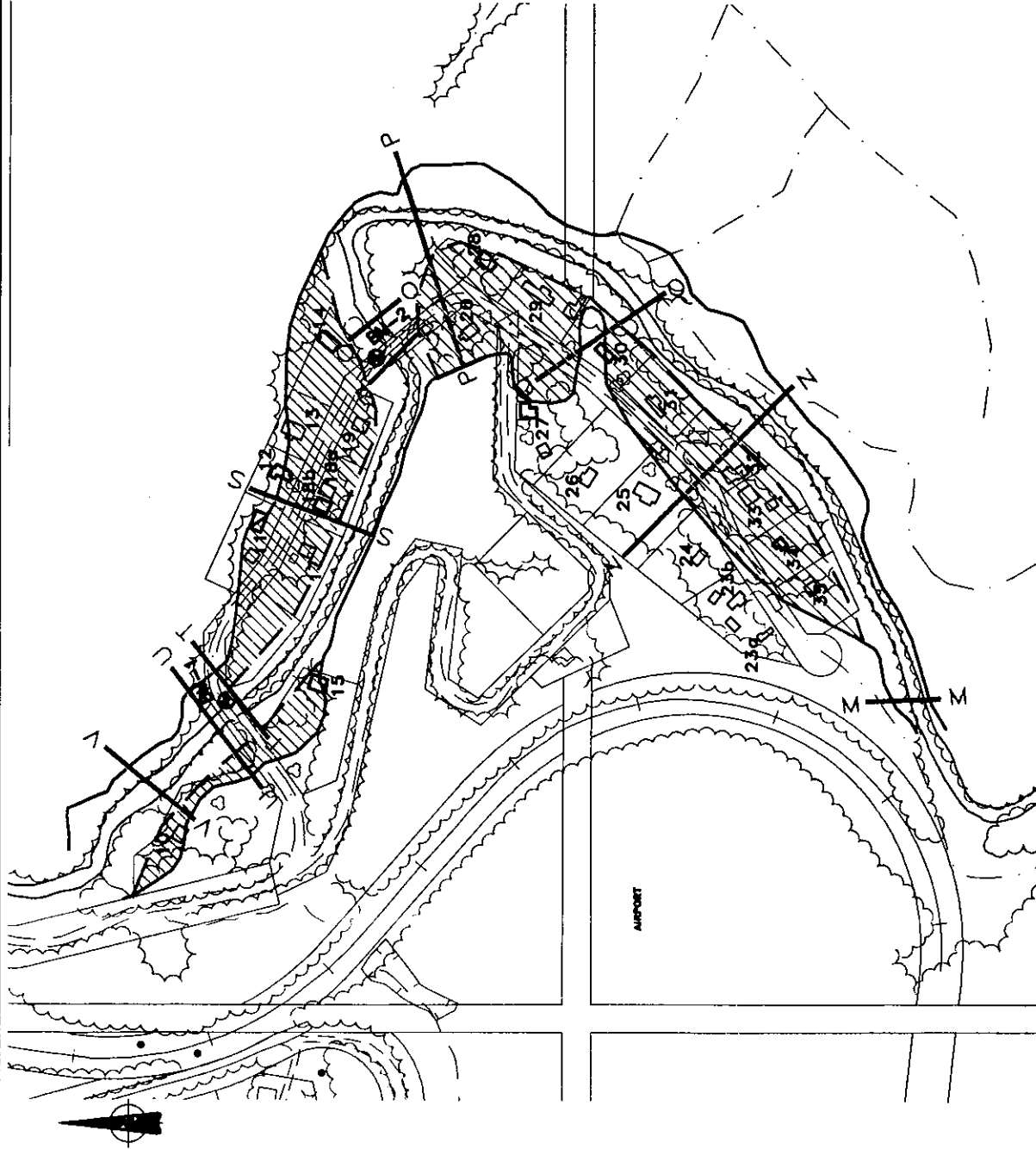
Initially, Associated Engineering surveyed to a local assumed datum as there are no control monuments within the hamlet. Later we engaged Pals Surveys and Associates to carry out a datum survey to convert the survey elevations to Geodetic datum. Pals surveyed the control points by GPS relative to a base station located in Hinton. Pals also established two permanent benchmarks within the hamlet for future reference. Table 3.1 provides the coordinates of the permanent benchmarks including the benchmark in Hinton that served as the source datum for the project.

COUNTY OF YELLOWHEAD  
 ROBB FLOODPLAIN STUDY  
 LOWER ROBB



JULY, 2001

FIGURE 3.1



COUNTY OF YELLOWHEAD  
 ROBB FLOODPLAIN STUDY  
 MILE 34 AREA

**LEGEND**

BENCHMARK  
 FLOODPLAIN LIMIT  
 FLOODWAY LIMIT  
 FLOOD FRINGE  
 HOUSE NUMBER  
 SURVEYED CROSS-SECTION

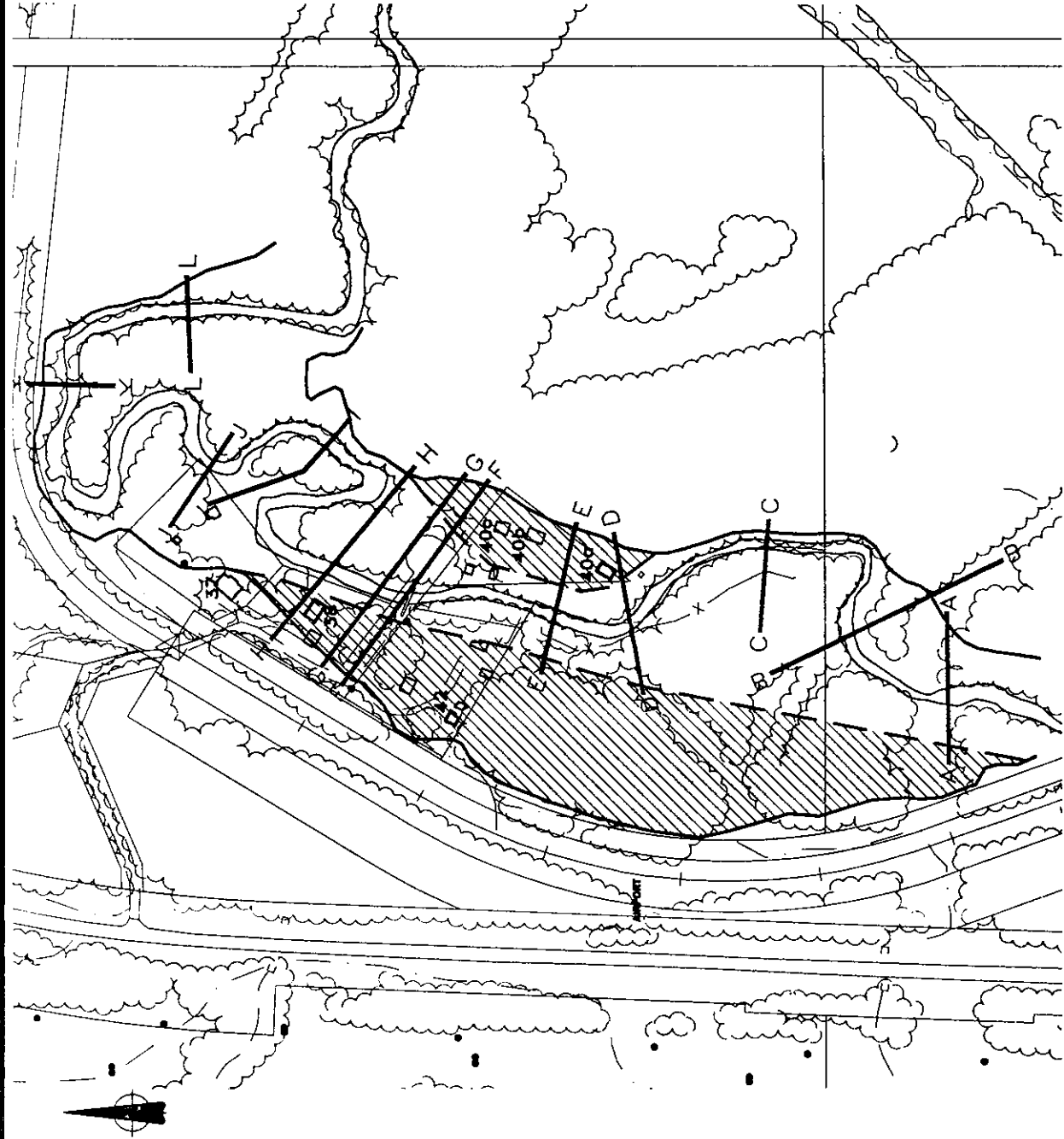
BM-1  
 ---  
 ---  
 24  
 P — P

**SCALE**

0 100  
 METRES

JULY, 2001

FIGURE 32



AE

ASSOCIATED  
 ENGINEERING

copy

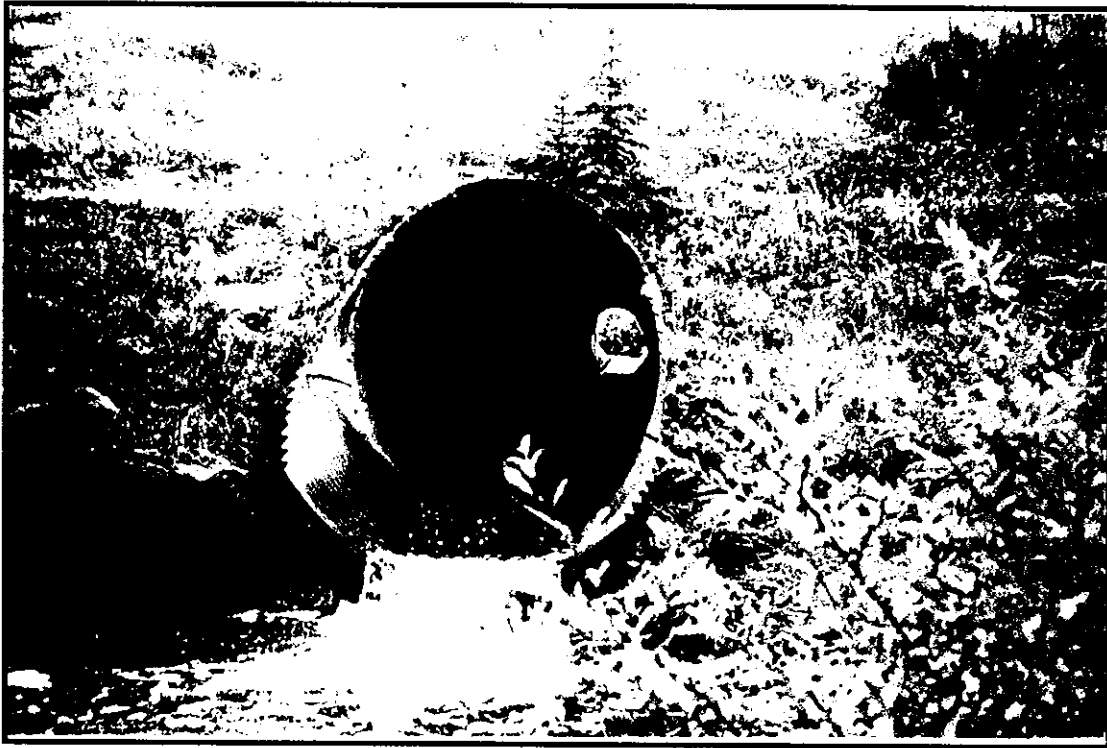


Photo 3.1                      Outlet of 3,500 m diameter culvert on Bryan Creek under Highway 47



Copy



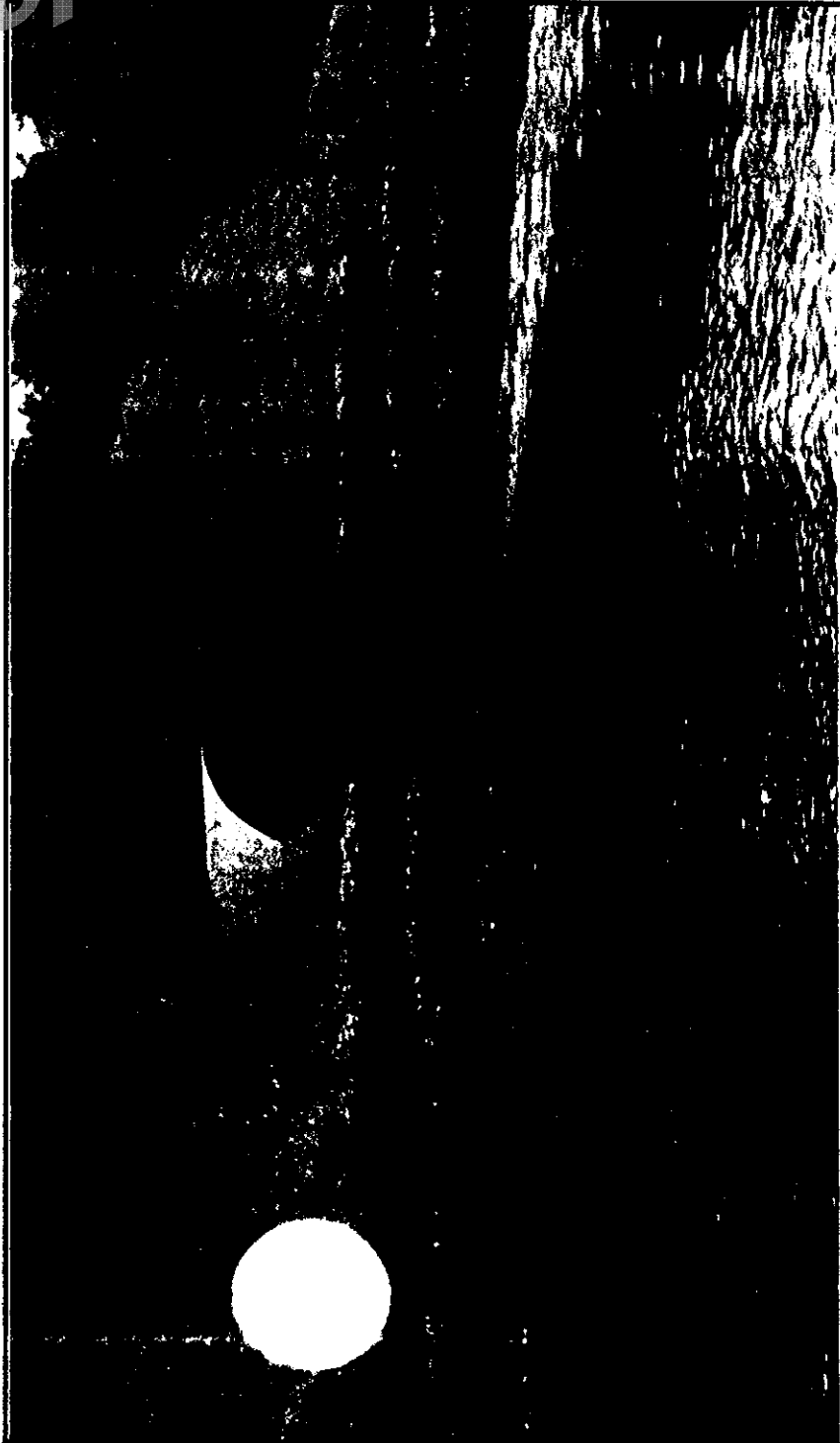
Photo 3.2 Inlet to 3,000 mm CSP culvert on Bryan Creek under Bryan Road. Note struts supporting the roof of the pipe.

copy



Photo 3.3 Large scour hole downstream of Robb Road culvert in the Embarass River.

copy



Gabion slope protection at outlet of Robb Road culvert.

Photo 3.4

*copy*

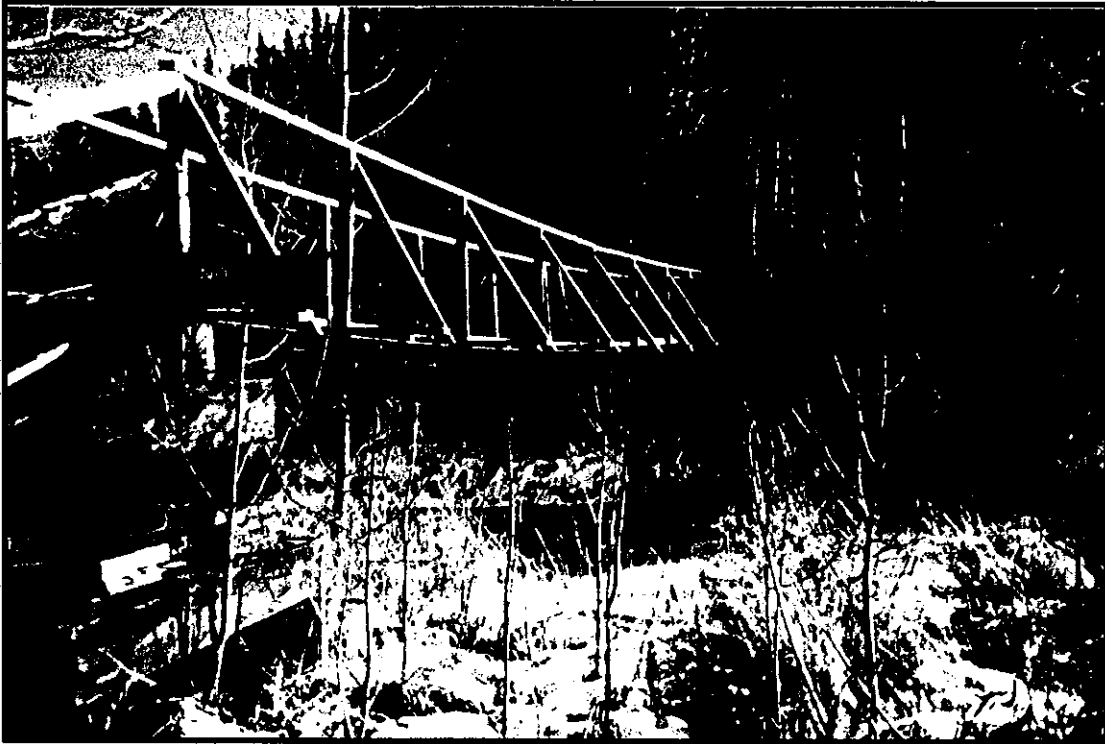


Photo 3.5 Footbridge on the Embarass River in the Mile 34 area.

COPY

Table 3.1  
 Control Monuments for the Survey

Monument	Easting (m, NAD83)	Northing (m, NAD 83)	Elevation (m, Geodetic)	Description
BM1	501871.646	5897166.980	1104.290	0.9 m long piece of angle iron set flush with the ground. 2 m east of bridge abutment, 1 m south of bridge rail, u/s side of the Yellow Bridge.
BM2	502117.916	5897058.306	1105.575	0.9 m long piece of angle iron set flush with the ground. 3 m north of the bridge, 0.3 m east of bridge rail, u/s side of the Blue Bridge.
ASCM 81356	461144.525	5916572.277	1039.803	2 <sup>nd</sup> order ASCM benchmark located near the junction of the Trans-Mountain R/W and Switzer Drive in Hinton (see ASCM sheet for details).

### 3.5 MAP DATUM

Yellowhead County supplied the base map for the project. The base map had been developed by UMA Engineering from 1:20,000 scale aerial photography. The base maps show ground contours with a contour interval of 1.0 m. According to UMA, the map is believed to have a relative accuracy of 1.0 m (i.e. variations in ground elevation should be within 1.0 m of their true values within the area defined by the map sheet). However, as the map had been developed without ground surveys, its accuracy relative to Geodetic datum could not be guaranteed.

We compared the survey elevations and the map elevations at a number of locations to develop an approximate conversion factor to convert the map datum to survey datum. The comparison indicated that the UMA elevations should be reduced by 3.2 m in the Lower Robb area and 4.5 m in the Mile 34 area to match the survey datum.

copy

### 3.6 HYDRAULIC PARAMETERS

We estimated the Manning's roughness coefficient (“n”) from field observation and experience. Manning's “n” is a measure of friction losses that occur due to channel bed composition, vegetation, meandering, and variation in cross sectional shape. It is also dependent on the discharge and sediment transport. We estimate the Manning's n for the Embarrass River at Robb to be 0.042 for the channel and 0.070 for the floodplain.

Photo 1.1 and 1.2 provide a typical view of the channel and floodplain at Robb for reference.

### 3.7 SENSITIVITY ANALYSIS

We were unable to find any record of high water levels in Robb and, therefore, we were unable to calibrate the hydraulic model. However we performed a sensitivity analysis to assess the impact that uncertainty in the model inputs could have on the calculated water levels. In the sensitivity analysis the discharge and Manning's n are varied over a reasonable range to determine the impact that variations in these input parameters may have on the computed water levels.

High and low Manning's “n” values were selected to envelope the range of values that would be expected for such a river (0.035 to 0.050 for the channel and 0.050 to 0.10 for the floodplain). The design flow was also varied to reflect the likely range of flood discharge estimates (140 to 200 m<sup>3</sup>/s). These values represent a variation of approximately 20% in Manning's “n” and 27% in discharge.

We then ran the backwater model for Lower Robb with these ranges of input parameters. Table 3.2 shows the resulting variation in water level at each cross-section from the “best estimate” water level. The results show that water levels could be as much as 0.6 m higher than the computed water levels, on average, and as much as 0.96 m higher at an individual cross-section. The “low” estimate is 0.25 m below the “best” estimate on average and 0.53 m lower at an individual cross-section.

The sensitivity analysis suggests a +/- 0.6 m allowance be given to the calculated water surface elevations.

Table 3.2

Sensitivity of Model Water Levels to Input Parameters

	Low Estimate	Best Estimate	High Estimate	BEST ESTIMATE minus LOW	HIGH minus BEST ESTIMATE
Design Flow (m³/s)	140 m³/s	157.5 m³/s	200 m³/s		
Manning's "n" Channel	0.035	0.042	0.050		
Manning's "n" Floodplain	0.050	0.070	0.100		
Cross-section	Calculated Water Surface Elevation (m)			Deviation (m)	
MM	1110.72	1110.94	1111.41	0.22	0.47
NN	1108.41	1108.56	1109.11	0.15	0.55
OO	1106.98	1107.08	1107.55	0.10	0.47
PP	1105.89	1106.04	1107.00	0.15	0.96
QQ	1105.54	1105.96	1106.90	0.42	0.94
RR	1104.80	1105.33	1105.88	0.53	0.55
SS	1104.06	1104.15	1104.76	0.09	0.61
TT	1102.80	1103.04	1103.79	0.24	0.75
UU	1102.56	1102.86	1103.34	0.30	0.48
VV	1102.13	1102.32	1102.79	0.19	0.47
Average				0.24	0.63

### 3.8 COMPUTED WATER SURFACE ELEVATIONS

Table 3.3 provides the computed water levels and hydraulic properties at each cross-section for the 1:100 year design flow of  $158 \text{ m}^3/\text{s}$  and our best estimate of the Manning's “n” (0.042 for the channel and 0.070 for the floodplain). Elevations are shown to Geodetic datum.

### 3.9 HOUSE ELEVATIONS

Table 3.4 provides an assessment of the risk of flooding for each home in the floodplain. The table includes:

- The elevation of the main floor at each building.
- The computed water surface elevation for the 1:100 year flood.
- An indication of which homes would be flooded in the 1:100 year flood based on the theoretical water surface elevation.
- The height of freeboard (positive values) or the depth of flooding (negative values) measured from the ground surface or the main floor elevation to the computed water level.
- An indication of the degree of flood risk at each building as follows:

Level 1: flood level less than 1.0 m below the main floor elevation

Level 2: flood level above the floor elevation of the building

A blank space in the last column indicates that the home has adequate freeboard above the computed water level.

The results indicate that 8 out of the 31 houses would be flooded above the main floor level. An additional 14 houses are above the theoretical flood levels but have less than 1.0 m of freeboard.



Table 3.3  
 Embarrass River at Robb  
 Hydraulic Properties in the 1:100 Year Flood  
 Existing Conditions  
 (Revised July 2001)

Cross Section	Water Level (m)*	Left Floodplain			Main Channel			Right Floodplain		
		Discharge (m³/s)	Max. Depth (m)	Avg. Velocity (m/s)	Discharge (m³/s)	Max. Depth (m)	Avg. Velocity (m/s)	Discharge (m³/s)	Max. Depth (m)	Avg. Velocity (m/s)
Mile 34										
AA	1128.38	57.7	0.97	0.89	91.1	2.10	2.37	8.8	1.01	0.54
BB	1128.08	37.7	1.02	0.47	85.1	2.69	2.10	34.7	1.52	0.76
CC	1127.45	28.9	0.97	0.57	128.6	2.86	2.39		0.47	
DD	1126.88	18.5	0.64	0.57	115.4	3.46	2.58	23.7	0.87	0.80
EE	1126.84	30.8	0.82	0.46	88.3	3.04	1.73	38.5	1.41	0.62
FF	1126.73	10.2	0.52	0.32	83.1	2.88	1.42	64.3	1.21	0.60
	Bridge									
GG	1126.70	9.6	0.49	0.32	83.9	2.85	1.46	64.0	1.18	0.61
HH	1126.63	0.4	0.44	0.16	85.4	3.23	1.25	71.7	1.36	0.63
II	1125.77	86.6	1.20	0.75	70.9	3.26	2.22		0.00	
JJ	1125.37	30.8	0.62	0.64	121.2	3.24	2.13	5.4	0.75	0.75
KK	1124.75	28.9	2.11	0.99	113.2	3.41	2.19	15.4	1.17	0.70
LL	1123.78	7.0	1.09	0.75	149.5	3.00	3.78	1.0	1.15	0.84
Lower Robb										
MM	1110.95	7.5	1.46	1.01	149.3	2.16	3.84	0.8	1.19	0.89
NN	1108.72	40.1	1.44	0.93	117.4	2.43	3.34	0.0	0.07	0.22
OO	1107.34	6.6	0.90	0.74	149.5	2.52	3.62	1.5	0.23	0.52
PP	1106.06	63.2	0.89	0.83	91.6	2.51	2.71	2.7	0.61	0.74
QQ	1105.68	10.0	1.66	0.37	139.3	2.90	1.54	8.2	0.46	0.32
	Bridge									
RR	1104.92	1.2	0.09	0.44	150.0	2.39	3.19	6.4	0.03	0.44
SS	1104.31		0.00		102.7	3.06	2.26	54.8	1.00	0.78
TT	1103.06	3.5	0.65	0.48	148.0	2.65	3.25	6.0	0.64	0.87
	Bridge									
UU	1102.87	9.9	1.24	0.92	137.0	2.66	3.28	10.6	0.54	0.75
VV	1102.32	8.0	1.04	0.75	143.0	2.40	3.51	6.5	0.54	0.87

\* Geodetic datum

Copy

**TABLE 3.4**  
**ROBB FLOODPLAIN STUDY**  
**RISK OF FLOODING BUILDINGS**  
**1:100 YEAR FLOOD**  
**(Revised July 2001)**

LOCATION	LOT #	MAIN FLOOR ELEVATION (m)	1:100 YEAR WATER LEVEL (m)	HEIGHT OF FLOOR ABOVE FLOOD LEVEL (m)	FLOOD RISK (SEE NOTE)
MILE 34	40a	1126.68	1126.88	-0.2	2
	40b	1126.44	1126.80	-0.4	2
	40c	1126.07	1126.80	-0.7	2
	42	1127.28	1126.80	0.5	1
	38	1128.05	1126.72	1.3	
	37	1127.87	1126.20	1.7	
LOWER ROBB	23a	1112.55	1109.95	2.6	
	35	1110.11	1109.95	0.2	1
	23b	1111.43	1109.53	1.9	
	24	1111.23	1109.00	2.2	
	34	1109.96	1109.53	0.4	1
	33	1109.86	1109.00	0.9	1
	25	1110.82	1108.62	2.2	
	32	1109.36	1108.74	0.6	1
	31	1108.85	1108.03	0.8	1
	26	1110.34	1108.03	2.3	
	27	1108.26	1107.00	1.3	
	30	1108.05	1107.34	0.7	1
	29	1107.70	1106.70	1.0	
	20	1105.83	1106.24	-0.4	2
	28	1106.20	1106.24	0.0	2
	14	1106.75	1105.99	0.8	1
	19	1104.58	1104.50	0.1	1
	13	1104.76	1104.35	0.4	1
	12	1104.18	1104.31	-0.1	2
	18a	1104.65	1104.31	0.3	1
	18b	1103.55	1104.31	-0.8	2
	17	1103.45	1104.10	-0.6	2
	11	1104.65	1104.10	0.6	1
	15	1104.29	1103.35	0.9	1
	10	1102.36	1102.32	0.0	1

**NOTES RE FLOOD RISK:**

1	Less than 1.0 m freeboard	14 homes
2	Water level above main floor	8 homes

### 3.10 FREEBOARD

Freeboard is a factor of safety which is commonly added to the computed water level when setting building elevations or development limits. Freeboard requirements vary with the jurisdiction.

Under the Federal-Alberta guidelines, Alberta Environment requires at least 0.5 m of freeboard to the main floor elevation. CMHC requires at least 0.3 m to the underside of the main floor joists which corresponds to approximately 0.5 m to the main floor. In the United States, the Federal Emergency Management Agency requires dikes to be at least 1.0 m above the 1:100 year flood level near buildings.

Freeboard allows for the following:

- Uncertainties in the flood discharge and water level estimates.
- Natural variabilities in channel cross-section such as scour, deposition, or debris accumulations in the channel.
- Unforeseen changes (clear-cutting) in the basin and in the project area (development and filling of the floodplain).
- Local variations in cross-section and hydraulics that are not simulated.
- Wave action and turbulence that can occur during a flood.
- The need to provide a feeling of comfort and security to the residents.

Considering these factors and the results of the sensitivity analysis, we recommend that freeboard be provided as follows:

- Ground elevations adjacent to any buildings should be at least 0.5 m above the computed flood level.
- Floor elevations of the buildings should be at least 1.0 m above the computed flood level.

### 3.11 FLOODPLAIN EXTENT

Figure 3.1 shows the extent of the floodplain in Lower Robb based on the 1:100 year calculated water levels.

Likewise, Figure 3.2 shows the extent of flooding in the Mile 34 area.

### 3.12 FLOOD FRINGE

The flood risk zone is divided into two areas; the floodway and the flood fringe. The floodway includes the main channel and that portion of the floodplain which is required to convey the design flood. The flood fringe is that portion of the floodplain which contains stagnant or low-velocity flows and does not actively convey flood waters. The province allows areas within the flood fringe to be filled and developed provided that the encroachment does not cause an unacceptable rise in water levels and that it is not exposed to excessive velocities.

The Canada-Alberta Flood Damage Reduction Program (FDRP) has adopted the following guidelines for delineating the floodway and flood fringe limits:

- The encroachment should not cause water levels in the design flood to rise more than 0.3 m above under the existing condition.
- In general, areas where the depth of flooding exceeds 1 m or the flow velocity exceeds 1 m/s are excluded from the flood fringe unless:
  - a. their inclusion is required to achieve a hydraulically smooth floodway boundary,
  - b. they are backwater areas that do not carry flow even though the depth of flow is greater than 1 m.
- In river reaches where the existing mean channel velocities are excessive, the encroachments for the floodway should be minimized so that the existing velocities are not further increased.
- In reaches of supercritical flow, no encroachment shall be introduced.

Table 3.5  
 Embarrass River at Robb  
 Hydraulic Impacts of Encroachment on the Floodway Fringe

Location	Without Encroachment		With Encroachment		Rise in Water Surface	Rise in Energy Grade Line
	Water Surface	Energy Grade Line	Water Surface	Energy Grade Line		
	(m)	(m)	(m)	(m)	(m)	(m)
<b>Mile 34</b>						
AA	1128.38	1128.57	1128.48	1128.75	0.10	0.18
BB	1128.08	1128.21	1128.04	1128.22	-0.04	0.01
CC	1127.45	1127.69	1127.50	1127.71	0.05	0.02
DD	1126.88	1127.14	1127.06	1127.29	0.18	0.15
EE	1126.84	1126.93	1126.89	1127.12	0.05	0.19
FF	1126.73	1126.79	1126.72	1126.85	-0.01	0.06
<b>Footbridge</b>						
GG	1126.70	1126.77	1126.69	1126.80	-0.01	0.03
HH	1126.63	1126.69	1126.64	1126.69	0.01	0.00
II	1125.77	1125.90	1125.77	1125.90	0.00	0.00
JJ	1125.37	1125.55	1125.37	1125.55	0.00	0.00
KK	1124.75	1124.94	1124.75	1124.94	0.00	0.00
LL	1123.78	1124.47	1123.78	1124.47	0.00	0.00
<b>North Robb</b>						
MM	1110.95	1111.67	1110.97	1111.67	0.02	0.00
NN	1108.72	1109.16	1108.67	1109.33	-0.05	0.17
OO	1107.34	1107.98	1107.50	1108.00	0.16	0.02
PP	1106.06	1106.30	1106.11	1106.76	0.05	0.46
QQ	1105.68	1105.79	1105.98	1106.06	0.30	0.27
	1105.58	1105.75	1105.73	1106.02	0.15	0.27
<b>Blue Bridge</b>						
	1105.20	1105.58	1105.17	1105.70	-0.03	0.12
RR	1104.92	1105.41	1105.02	1105.52	0.10	0.11
SS	1104.31	1104.49	1104.10	1104.71	-0.21	0.22
TT	1103.06	1103.56	1103.06	1103.56	0.00	0.00
	1103.02	1103.51	1103.02	1103.51	0.00	0.00
<b>Yellow Bridge</b>						
	1102.92	1103.43	1102.93	1103.43	0.01	0.00
UU	1102.87	1103.35	1102.89	1103.36	0.02	0.01
VV	1102.32	1102.89	1102.34	1102.93	0.02	0.04

The proposed floodway is shown in Figures 3.1 and 3.2. Computed water levels assuming that no flow occurs in the flood fringe are provided in Table 3.5. The Table shows that the flood levels will raise by about 0.3 m above the existing conditions upstream of the Blue Bridge if the flood fringe were to be completely filled in or if overbank flow is obstructed with fences or structures. An allowance for encroachment has been made in the recommended freeboard as discussed previously.

### 3.13 CULVERT CAPACITY

The culvert capacities through Highway 47, the CNR, the Robb Road, and a local road were checked as part of the present study to ensure that they are adequate to protect the associated roadway fills and upstream areas from being flooded.

Table 3.6 contains a summary of the culvert parameters and the computed water level at the upstream side of the culvert based on inlet control. Water levels and embankment heights are expressed in terms of depth above the upstream invert.

Table 3.6  
Culvert Parameters

No.	Location	Length (m)	Slope (%)	Size & Type	1:100 Year Peak Flow (m <sup>3</sup> /s)	Upstream water level (m above upstream invert)	Height of Fill (m above upstream invert)
1	Hwy 47	55.4	2.2	3.5 m $\phi$ CSP	32.7	3.5	10.7
2	Local Road	34	2.3	3.0 m $\phi$ CSP	32.7	4.8	4.9
3	CNR	87.9	2.7	2.4 x 2.4 concrete box	32.7	5.3	24.2
4	Robb Road	49.7	0.8	4.8 m $\phi$ CSP	190	18.2	12.8

At Culvert 1, Bryan Creek flows under Highway 47 through a 3500 mm diameter corrugated steel pipe (CSP). The analysis shows that the culvert has adequate capacity. The headwater level is at the top of the pipe (3.5 m above the invert). There is some large rock riprap to prevent erosion at the outlet (Photo 3.1).

At Culvert 2, Bryan Creek passes under Bryan Road through a 3,000 mm diameter CSP culvert. Photo 3.2 shows the inlet of the culvert. The culvert has barely enough capacity for the 1:100 year flood; the headwater level comes within 0.3 m of overtopping the road. Large velocities occur at the outlet and have caused some local erosion. Riprap should be added at the inlet and outlet to prevent erosion and damage to the culvert. As a minimum, the culvert should be monitored and corrective action should be taken as necessary. In the longer term the culvert may need to be replaced, as struts have been added, apparently to support the roof of the pipe.

Culvert 3, a 2400 mm concrete box culvert under the CNR railway, is also overloaded. The headwater depth is 2.9 m above the top of the pipe in the 1:100 year flood. However, as the railway fill is very high, 24 m above the creek bed, the culvert is able to pass the design flow under surcharge. High velocities will occur through this culvert (in the order of 6 to 7 m/s) which suggests that Class III riprap ( $D_{50}=700$  kg, based on Alberta Infrastructure specifications) should be placed to prevent erosion at the outlet. However, as there is no evidence of erosion at this site presently, periodic monitoring should suffice unless a problem occurs.

The Embarrass River passes under Robb Road through a 4,800 mm diameter CSP culvert (Culvert 4). This pipe is severely overloaded. A headwater depth of 18 m above the upstream invert is required to pass the design flow, which is 13.4 m above the top of pipe. As the Robb Road is only 12.8 m above the invert it would be overtopped and the water level would actually rise only slightly above the road. Backwater from this culvert would extend upstream past Bryan Road.

High velocities occur at the outlet. Significant scour has already occurred at the outlet as is evident in Photo 3.3. A large scour hole has developed immediately downstream of the culvert, and gabion baskets have been tied into the banks to prevent further erosion (Photo 3.4).

We recommend that the culvert be replaced with a bridge of adequate size to pass the design flow. Alternatively a second 4,800 mm diameter culvert should be added; this would result in a headwater depth of 1.9 m above the top of pipe, which is acceptable, and would prevent the road from being overtopped. Riprap should be added for scour control at the outlet if the culvert alternative is adopted.

There are two bridges in the north section of the flood study as shown on Figure 3.1. The downstream bridge (the “Yellow Bridge”) causes backwater of 0.1 m locally and has no significant impact on any houses. The upstream bridge (the “Blue Bridge”) causes a backwater effect of approximately 0.5 m locally and would be bypassed by spills over the right bank. Our analysis shows that if these overbank spills were prevented (by filling the abutting property or diking on the right bank), the bridge stringers and deck would be overtopped and this would cause water levels to rise by an additional 0.5 m upstream of the bridge. Three houses (numbered 14, 20 and 28 in Figure 3.1) would be impacted. Therefore, this bridge could potentially create a significant barrier to flow, and any modification of the floodplain in the vicinity of the bridge should be done with care.

A pedestrian bridge (7) is located in the south section of the flood study. It has no effect on water levels. However, its supports would be flooded and there is a good chance that the bridge would be washed away in the 1:100 year event. This footbridge is the only means of access to three homes on the right (east) side of the river.

### 3.14 FLOOD RISK MAP

Figures 3.1 shows the extent of flooding in the 100 year design flood for the North Floodplain Area for existing conditions. Figure 3.2 shows the extent of flooding in the South Floodplain Area.

The lateral extent of flooding provides only a guideline as the contours are not exact. For detailed information refer to Table 3.4 which provides the flood elevation at each house to Geodetic datum.

Elevations shown on the UMA contour map should be lowered by 3.2 m in the Lower Robb area and 4.5 m in the Mile 34 area to correct them to Geodetic datum. The contour map was used as a guide in defining the floodplain limits but is not presented in this report in order to avoid confusion in datums.



SECTION  
**4**

## CONCLUSIONS

copy

The analysis indicates that:

- 8 out of the 31 homes which are located in the Embarrass River floodplain in Robb would be flooded in a 1:100 year flood.
- An additional 14 homes have a significant risk of flooding as they have insufficient freeboard above the 1:100 year flood level.
- The Blue Bridge in the Lower Robb Area could potentially create a significant obstruction to flow if the overbank area were raised.
- The 4.8 m diameter culvert at Robb Road is severely overloaded. The culvert is at risk of failing and the road is at risk of overtopping in a flood condition.
- Other culverts through the CNR and a local road across Bryan Creek are marginally overloaded; they may sustain erosion damage at their outlets and consequently they need to be monitored.
- The accuracy of the computed flood water levels is estimated at  $\pm 0.6$  m.
- Elevations shown on the UMA contour map should be lowered by 3.2 m in the north floodplain and 4.5 m in the south floodplain to correct them to Geodetic datum.

## RECOMMENDATIONS

We recommend that:

- No development should be permitted in the flood fringe unless it is above the design flood elevation plus a suitable allowance for freeboard.
- No development or encroachment of any kind should be permitted in the designated floodway.
- The Robb Road culvert should be replaced with a bridge of adequate size to pass the design flow. Alternatively a second 4,800 mm diameter culvert should be added and riprap should be added for scour control at the outlet.
- Riprap should be added at the inlet and outlet of the Bryan Creek culvert at Bryan Road to prevent erosion and damage to the culvert.
- All culverts should be monitored for erosion, and corrective action should be taken as necessary.
- Sufficient freeboard should be applied to the computed water levels to provide an adequate factor of safety. We recommend a minimum freeboard of:
  - 0.5 m vertically from the computed flood level to the finished grade adjacent to any permanent building
  - 1.0 m vertically from the computed flood level to the floor elevation of any permanent building.
- The overbank spill at the Blue Bridge must be maintained; otherwise the bridge should be replaced with a higher and wider structure.

## CLOSURE

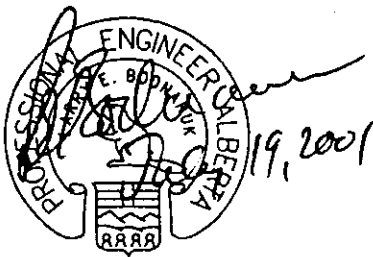
SECTION  
**6**

This report was prepared for the County of Yellowhead to delineate the floodplain and assist in land use planning in the Hamlet of Robb.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

ASSOCIATED ENGINEERING ALBERTA LTD.



<b>PERMIT TO PRACTICE</b>	
ASSOCIATED ENGINEERING ALBERTA LTD.	
Signature	<i>R. Han</i>
Date	<i>Jul 19/01</i>
<b>PERMIT NUMBER: P 3979</b>	
The Association of Professional Engineers, Geologists and Geophysicists of Alberta	

Larry E. Bodnaruk, P.Eng.  
Project Manager

PERMIT

R E P O R T

REGIONAL HYDROLOGY SPREADSHEET

copy



---

R E P O R T

---



LOWER ROBB CROSS-SECTIONS AND PROFILE

COPY

APPENDIX  
**B**

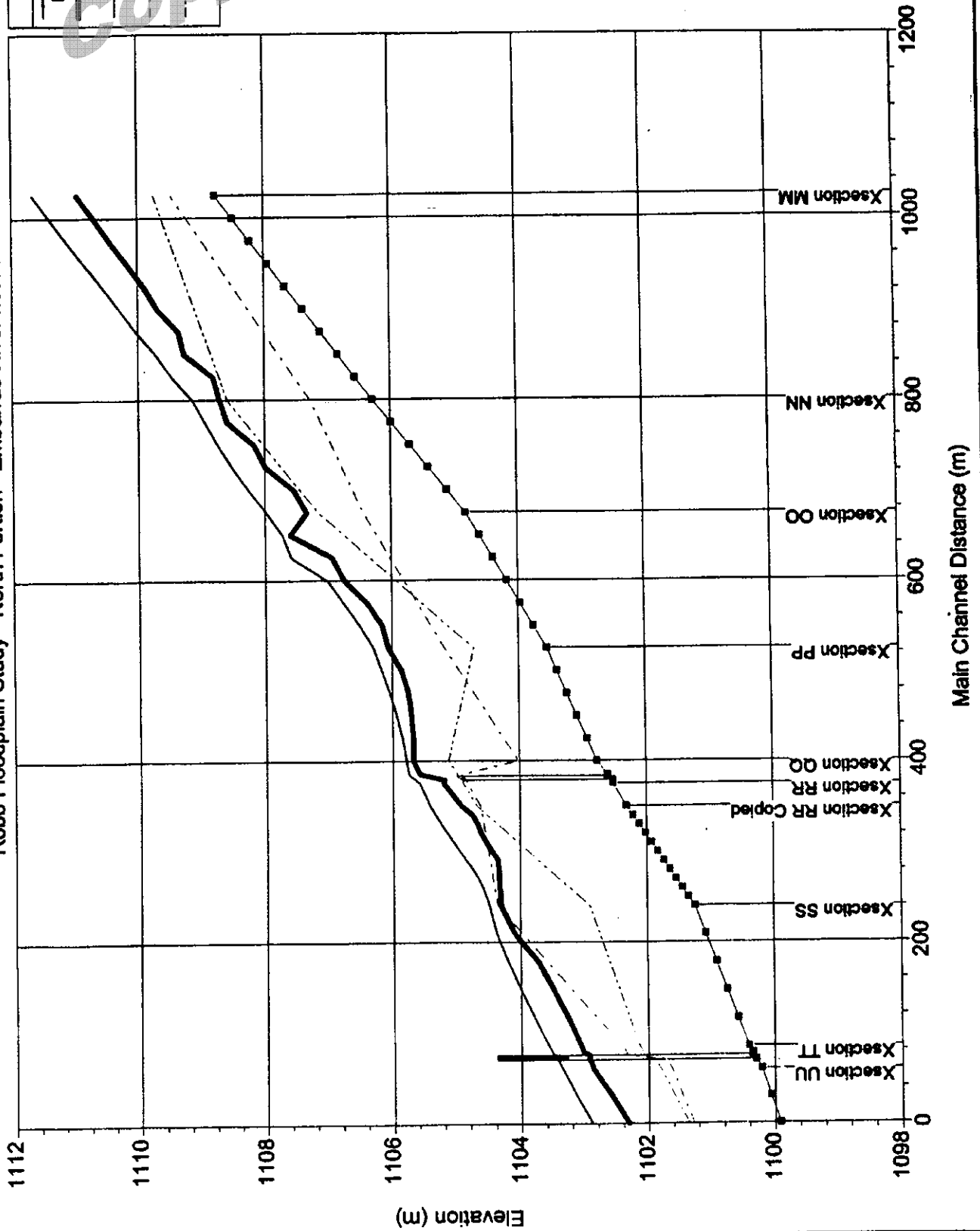
---

R E P O R T

---

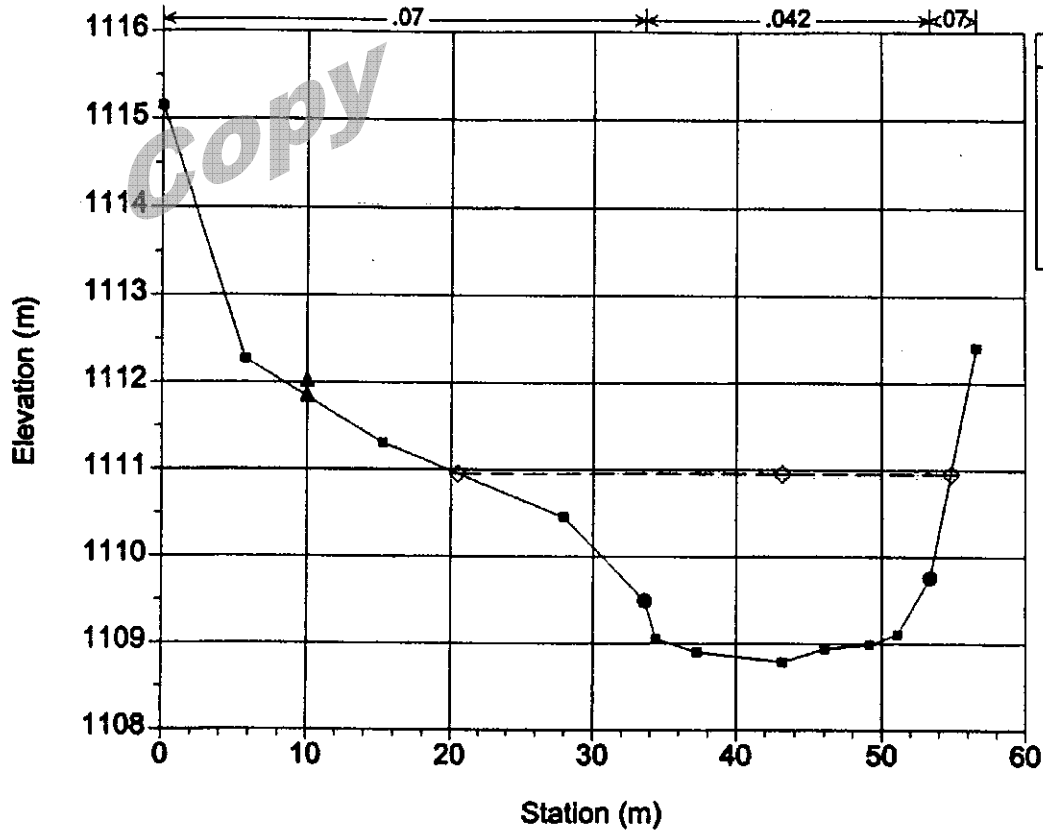
Robb Floodplain Study - North Portion Embarras River near Robb

Legend	
Energy Grade Line	—
100-Year Flood	—
Bottom of Channel	—
Left Bank	- - -
Right Bank	- - -



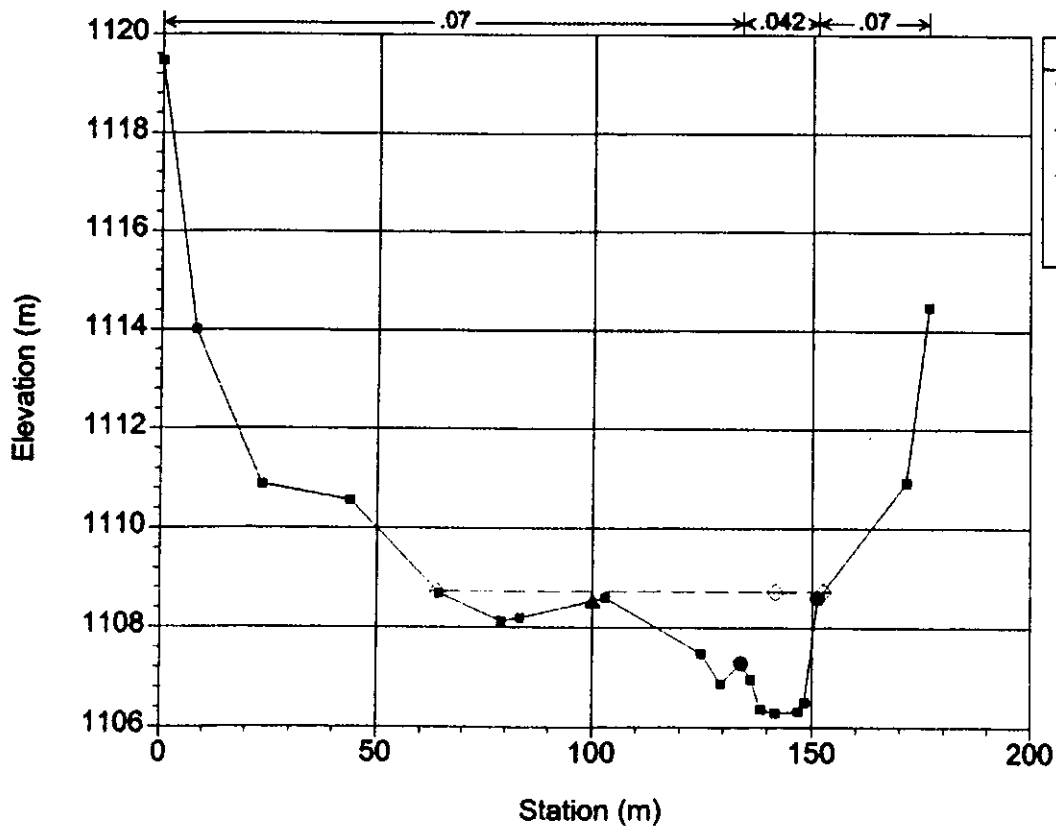
Robb Floodplain Study - North Portion Embarras River near Robb

Xsection MM



Robb Floodplain Study - North Portion Embarras River near Robb

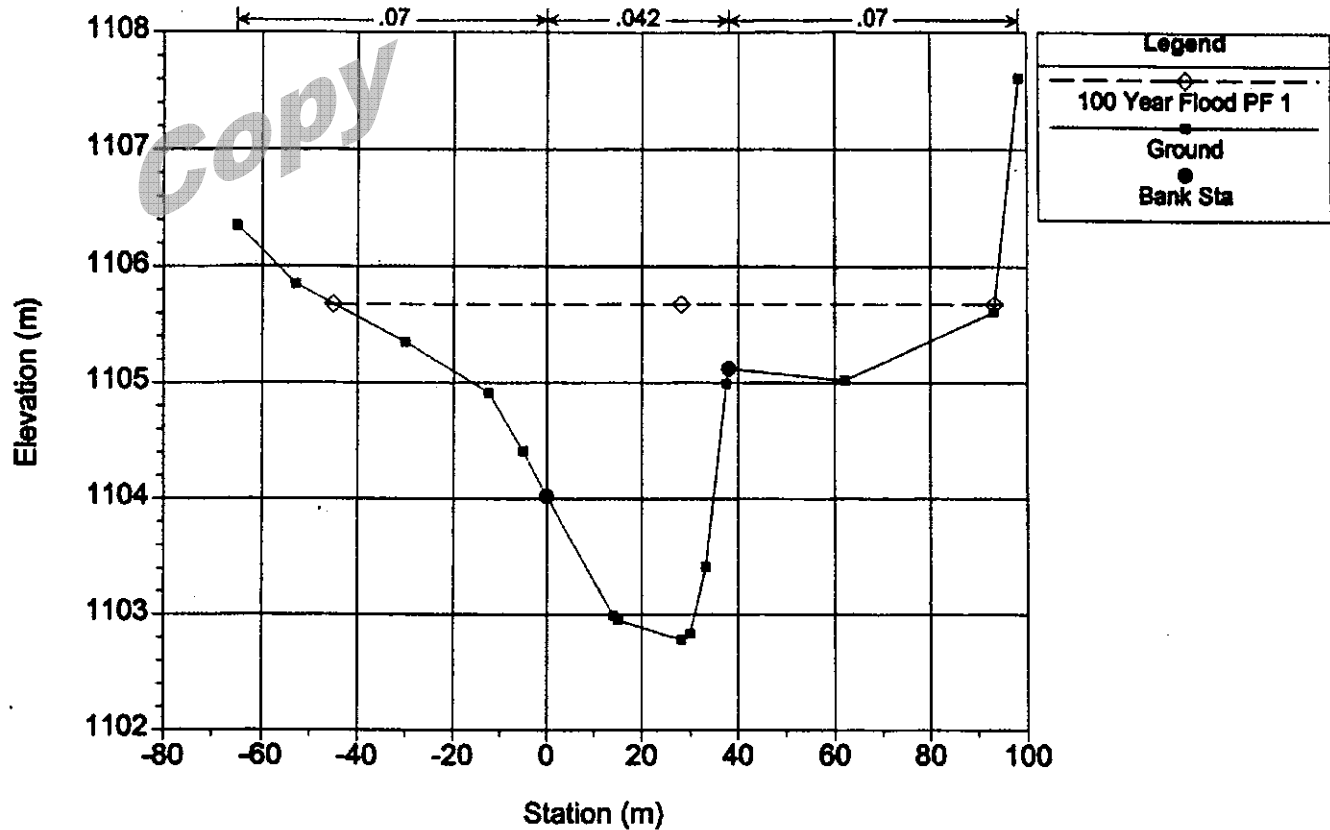
Xsection NN





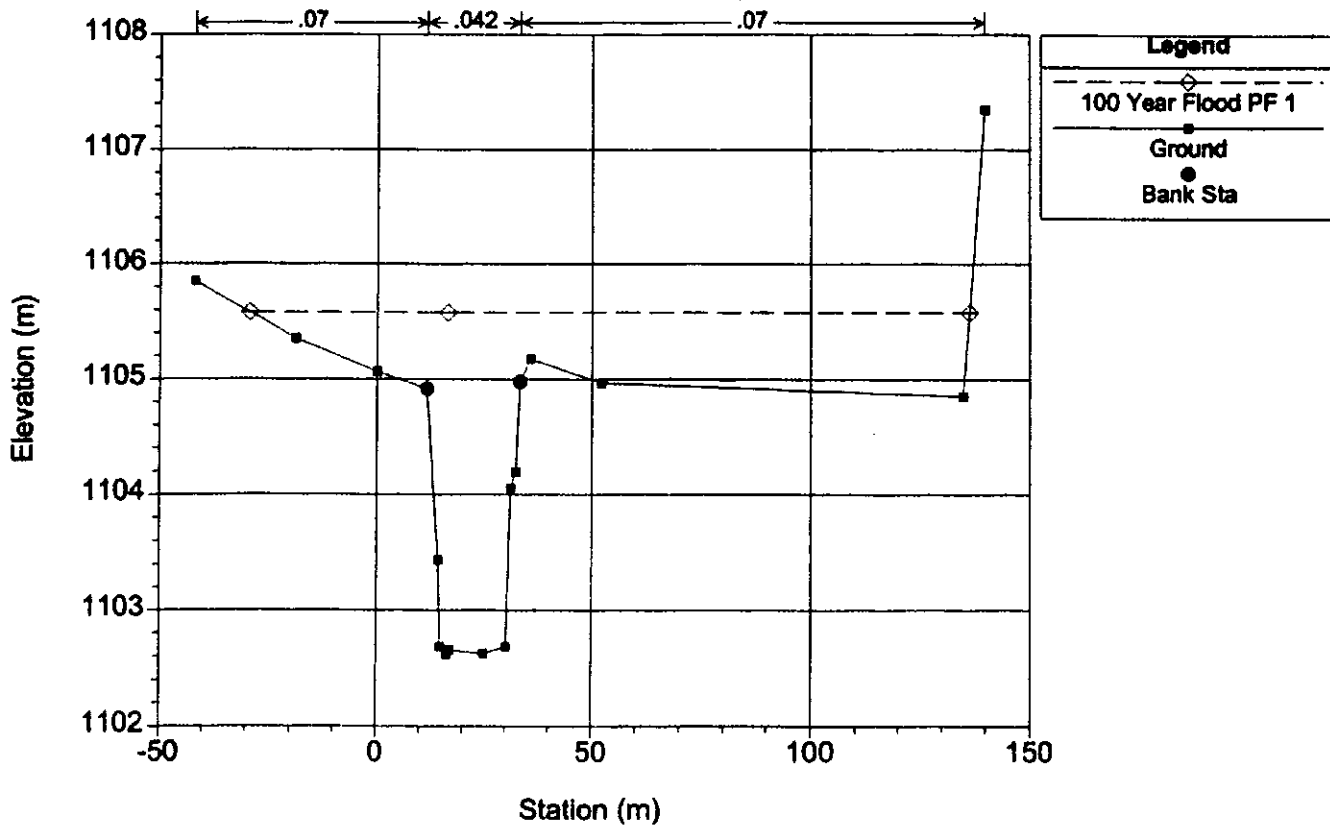
Robb Floodplain Study - North Portion Embarras River near Robb

Xsection QQ

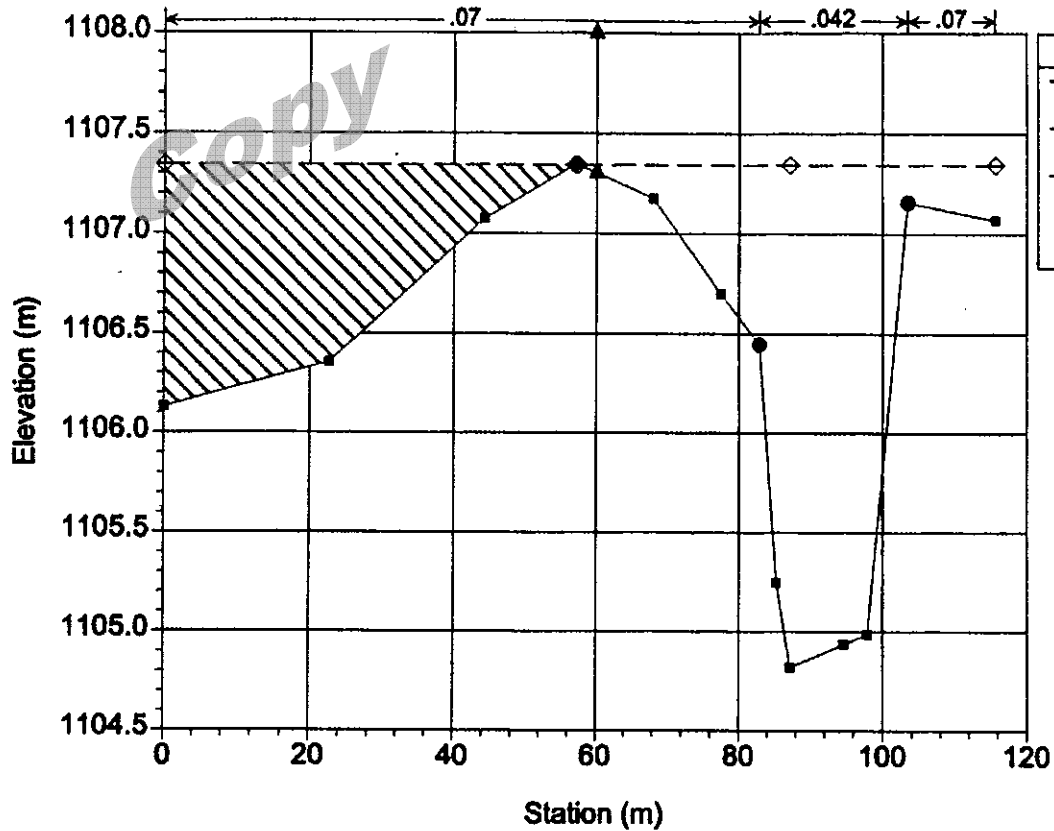


Robb Floodplain Study - North Portion Embarras River near Robb

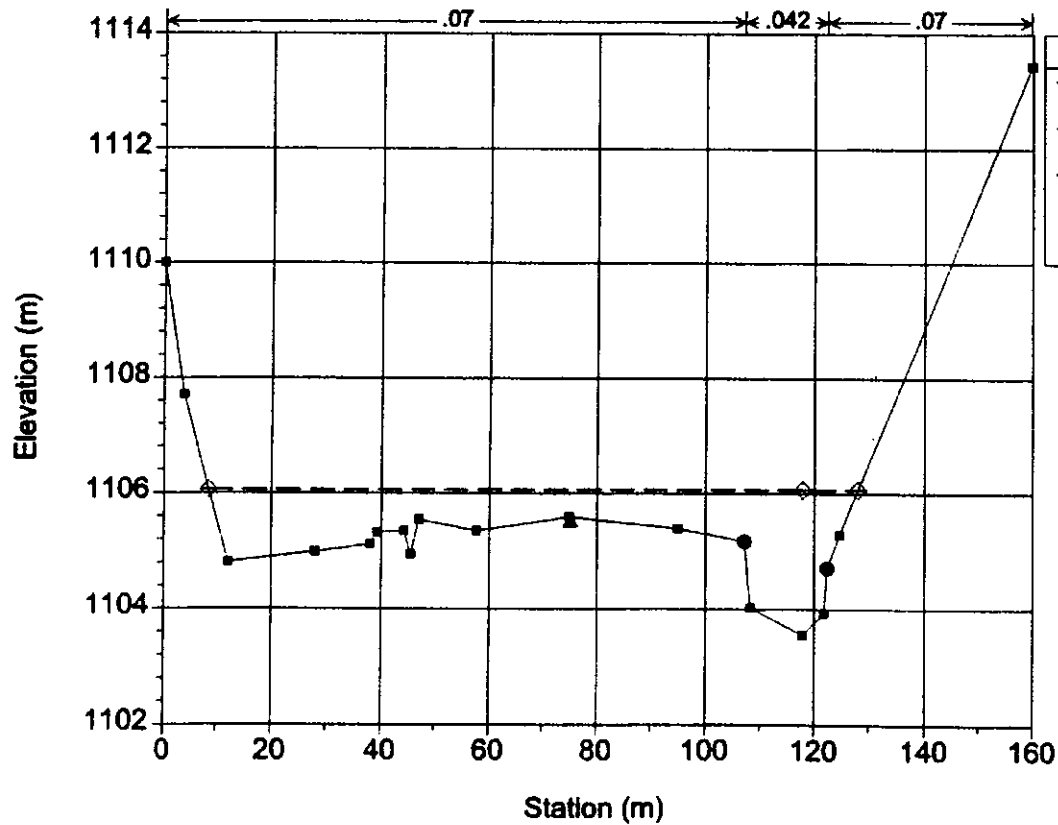
Xsection RR Copied

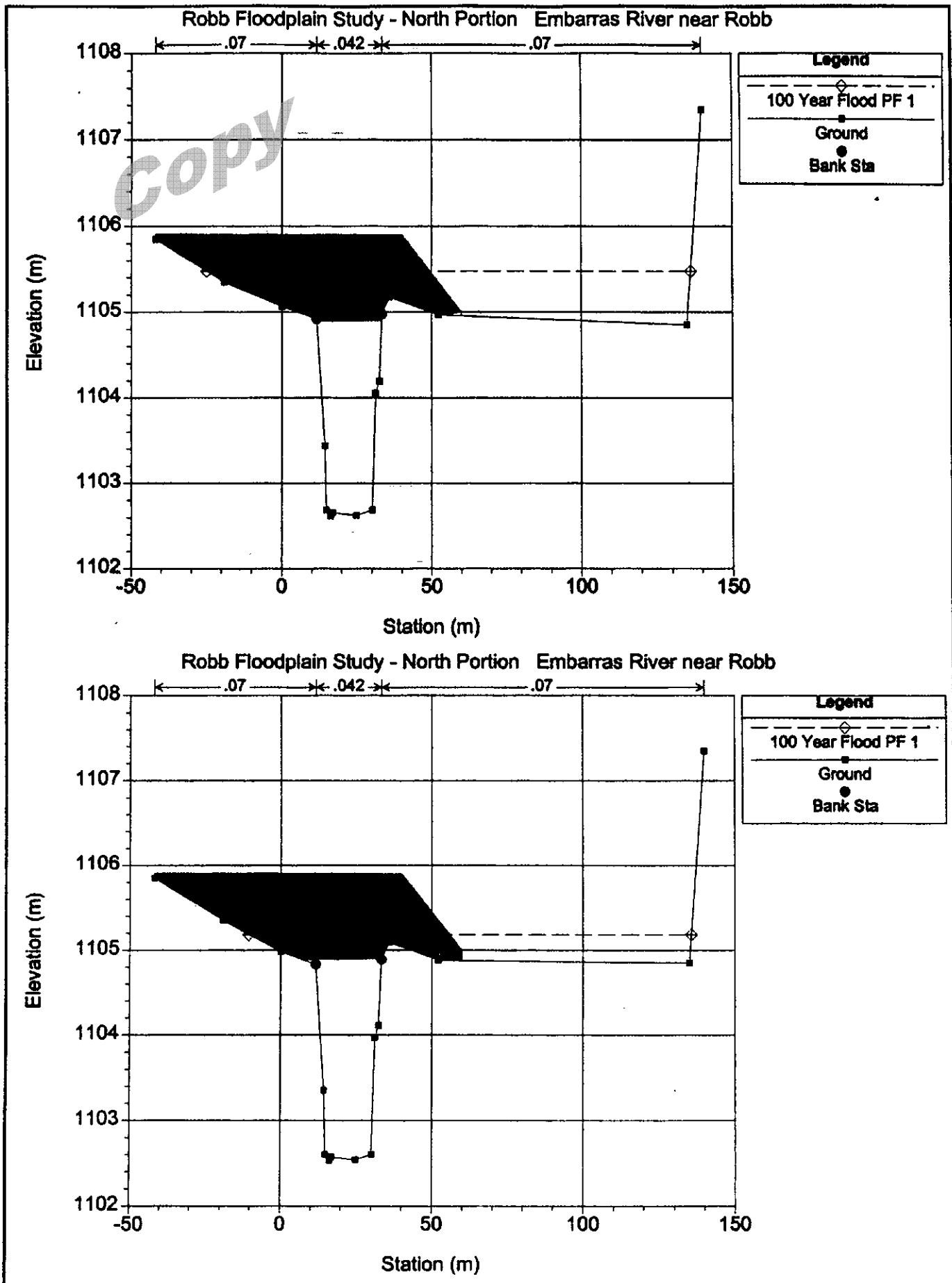


Robb Floodplain Study - North Portion Embarras River near Robb  
Xsection OO

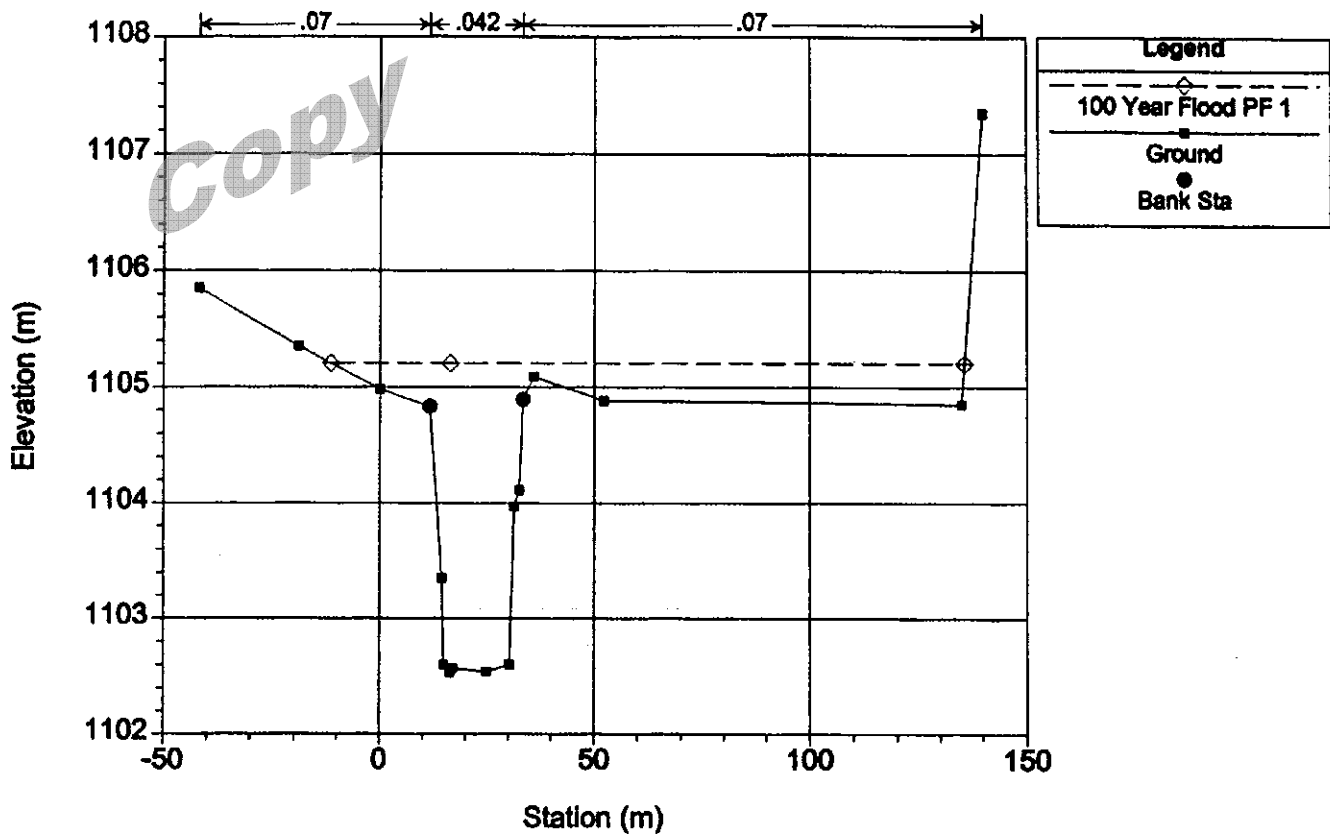


Robb Floodplain Study - North Portion Embarras River near Robb  
Xsection PP

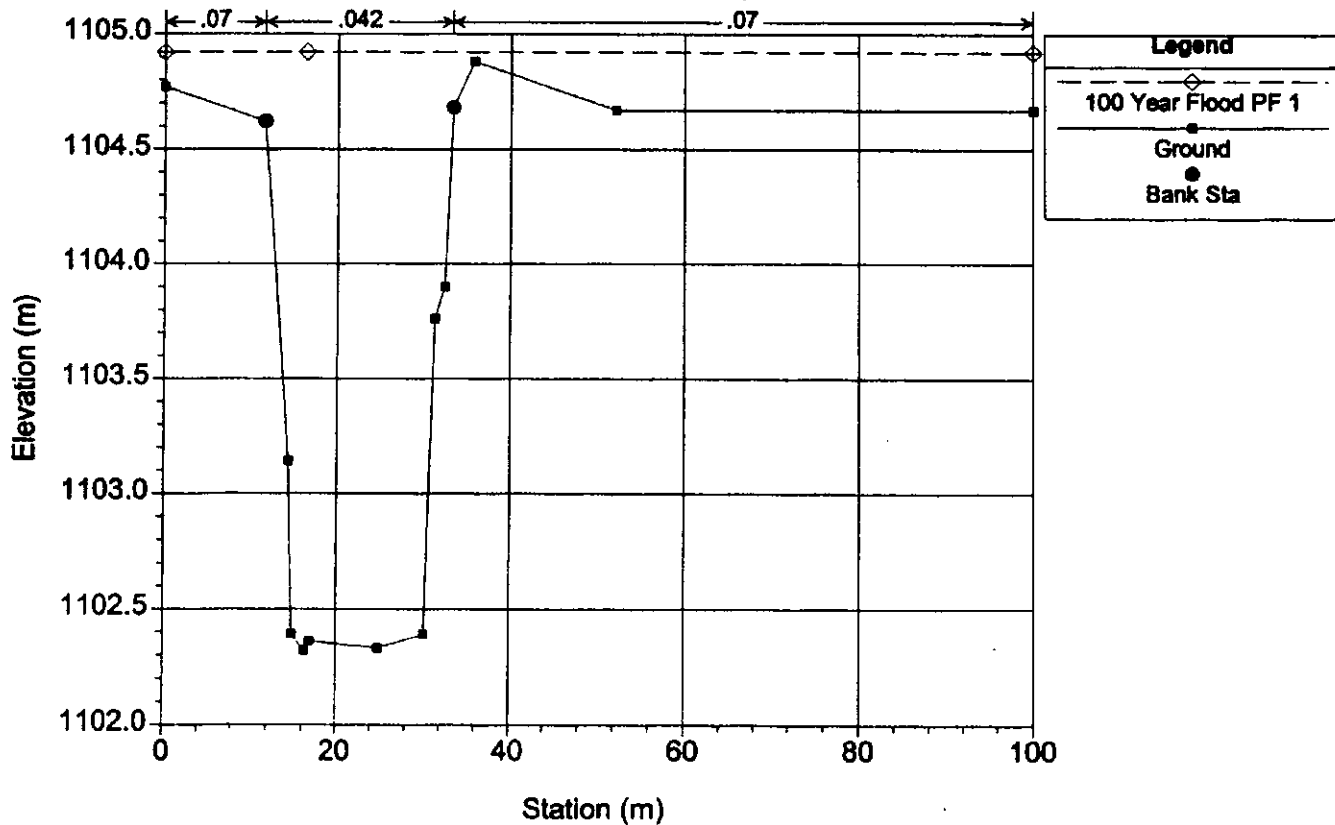




Robb Floodplain Study - North Portion Embarras River near Robb  
 Xsection RR

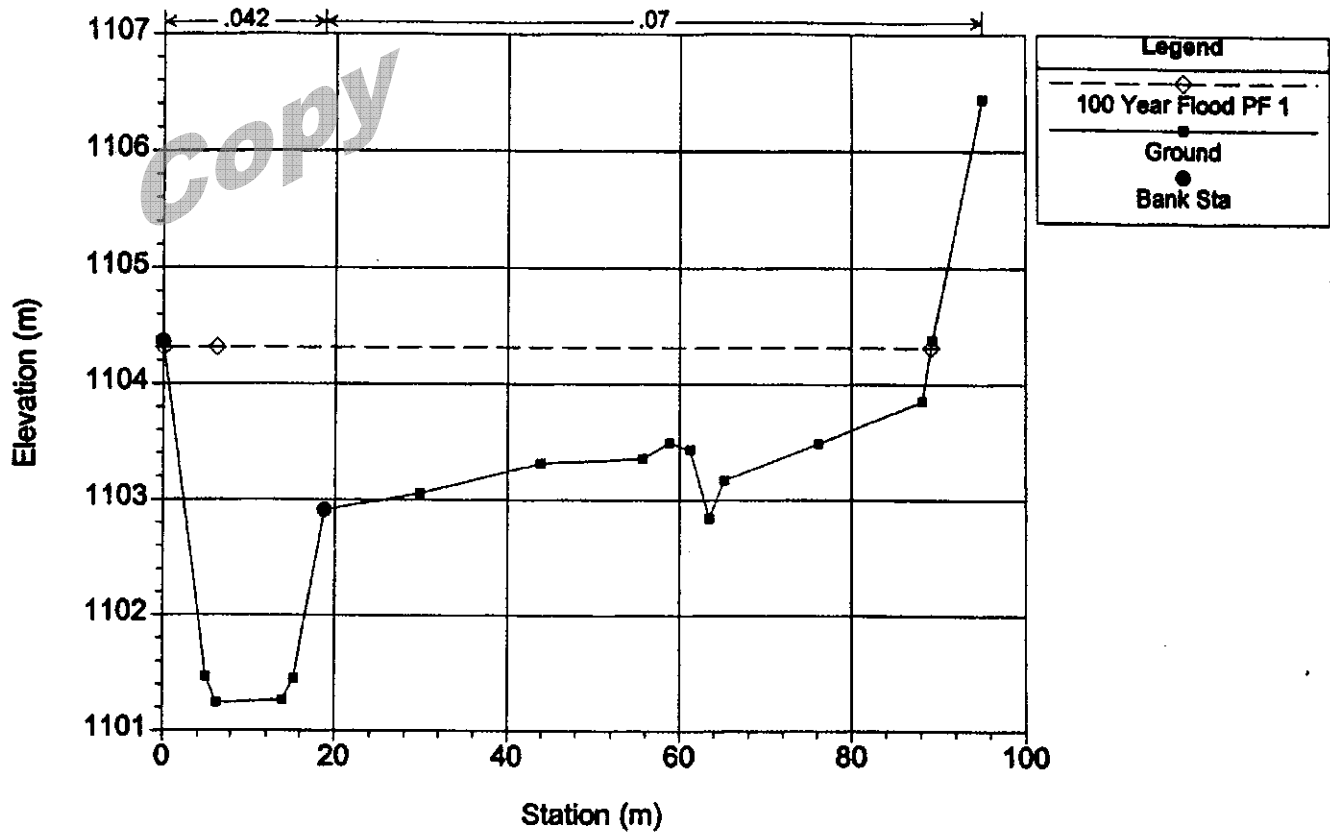


Robb Floodplain Study - North Portion Embarras River near Robb  
 Xsection RR Copied



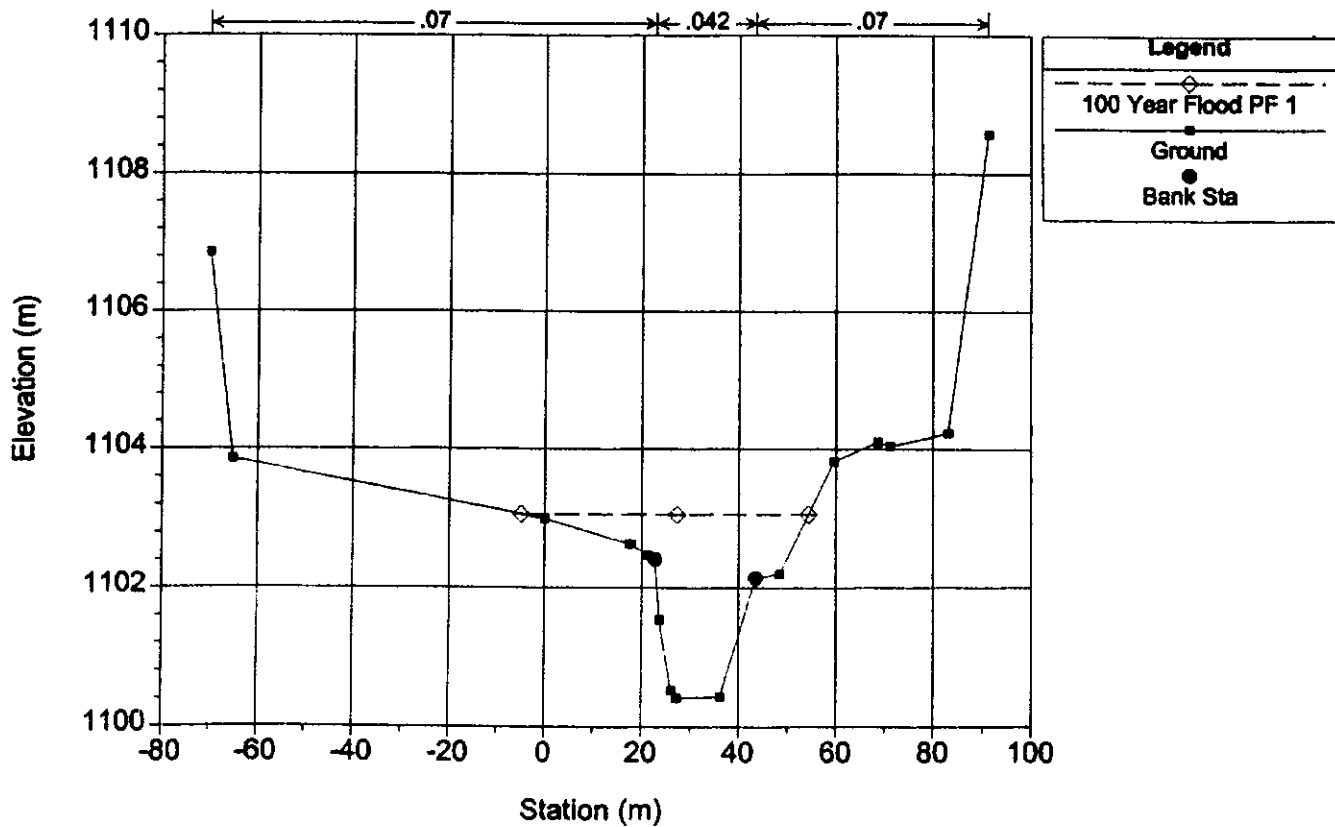
Robb Floodplain Study - North Portion Embarras River near Robb

Xsection SS

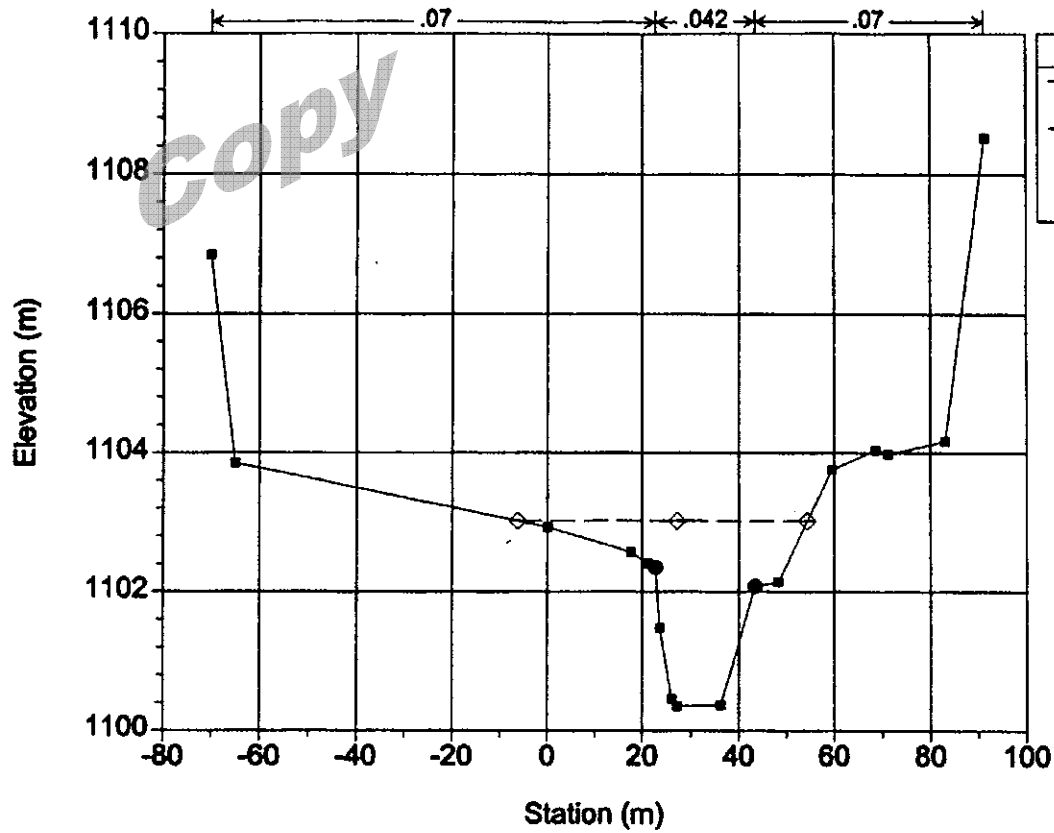


Robb Floodplain Study - North Portion Embarras River near Robb

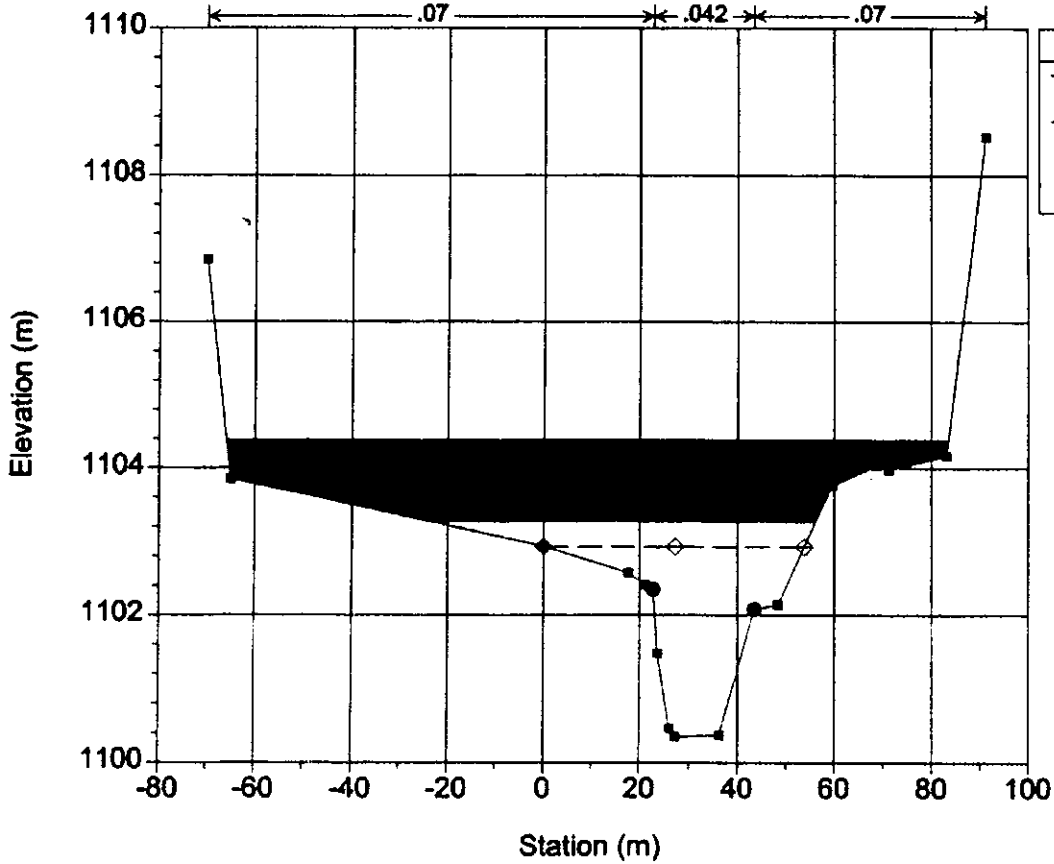
Xsection TT

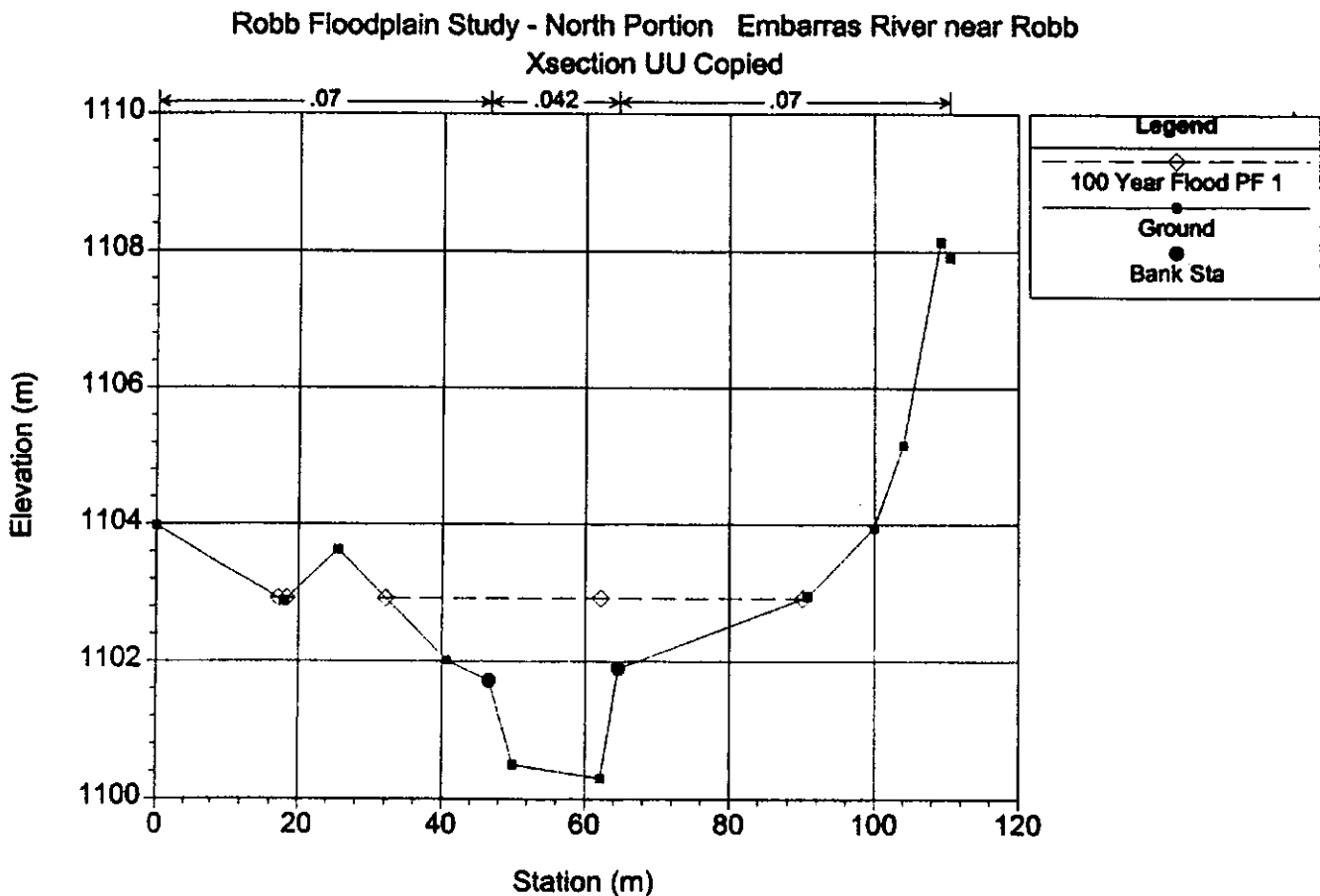
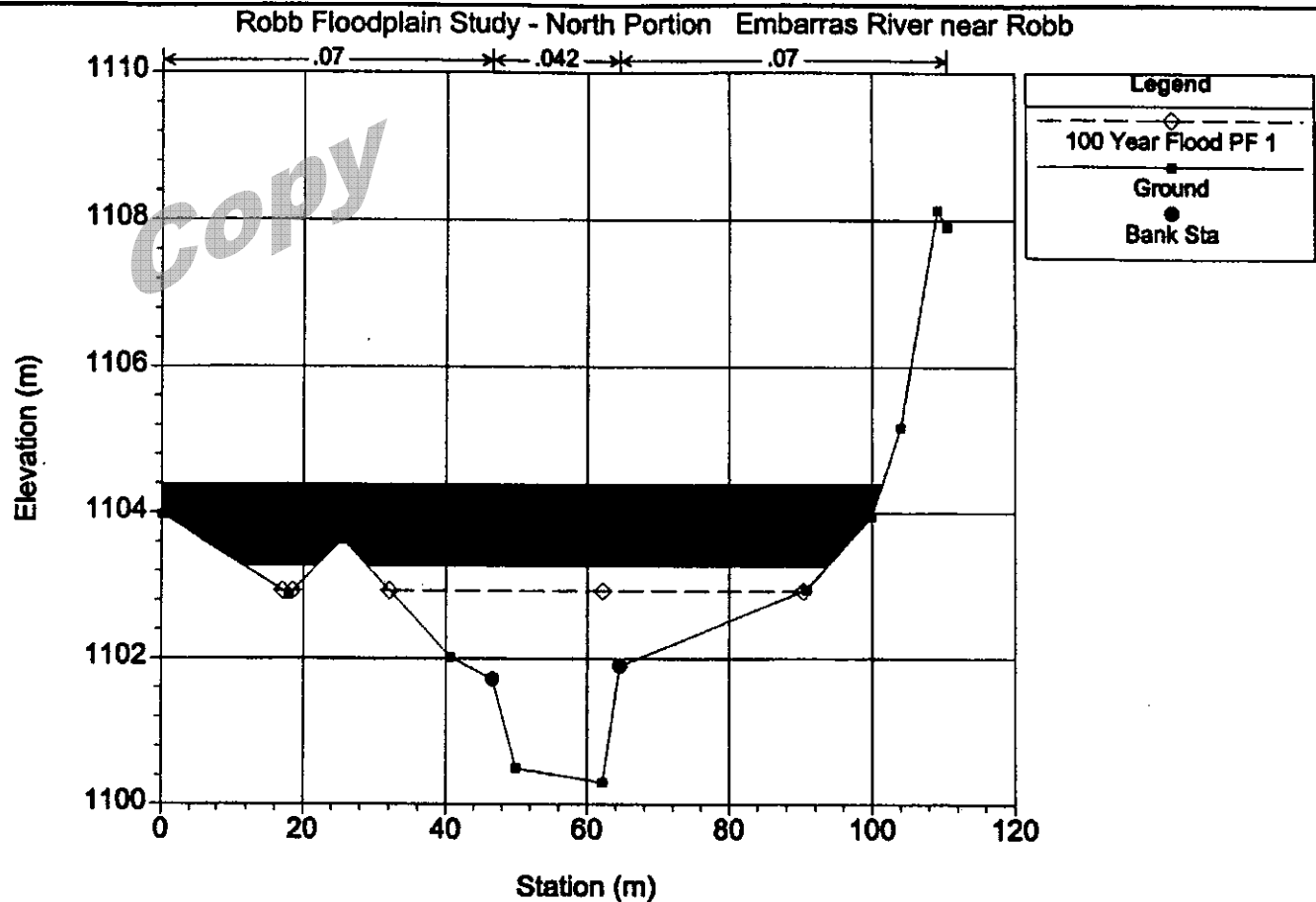


Robb Floodplain Study - North Portion Embarras River near Robb  
 Xsection TT Copied



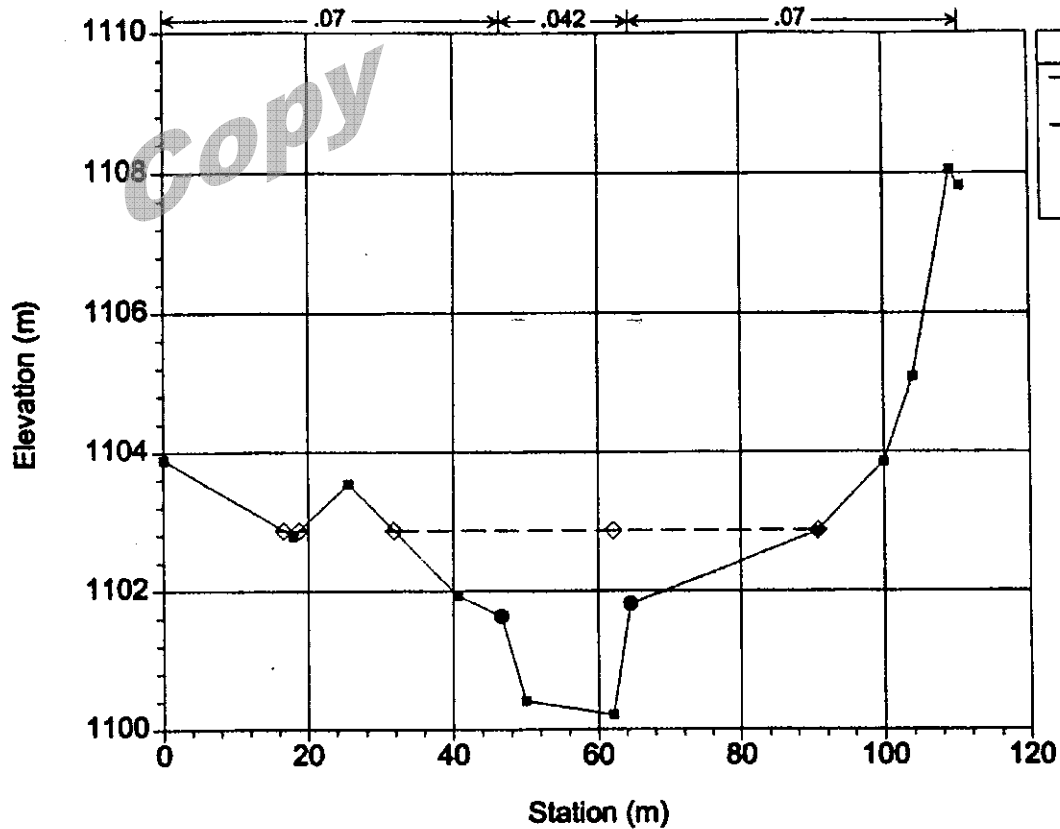
Robb Floodplain Study - North Portion Embarras River near Robb





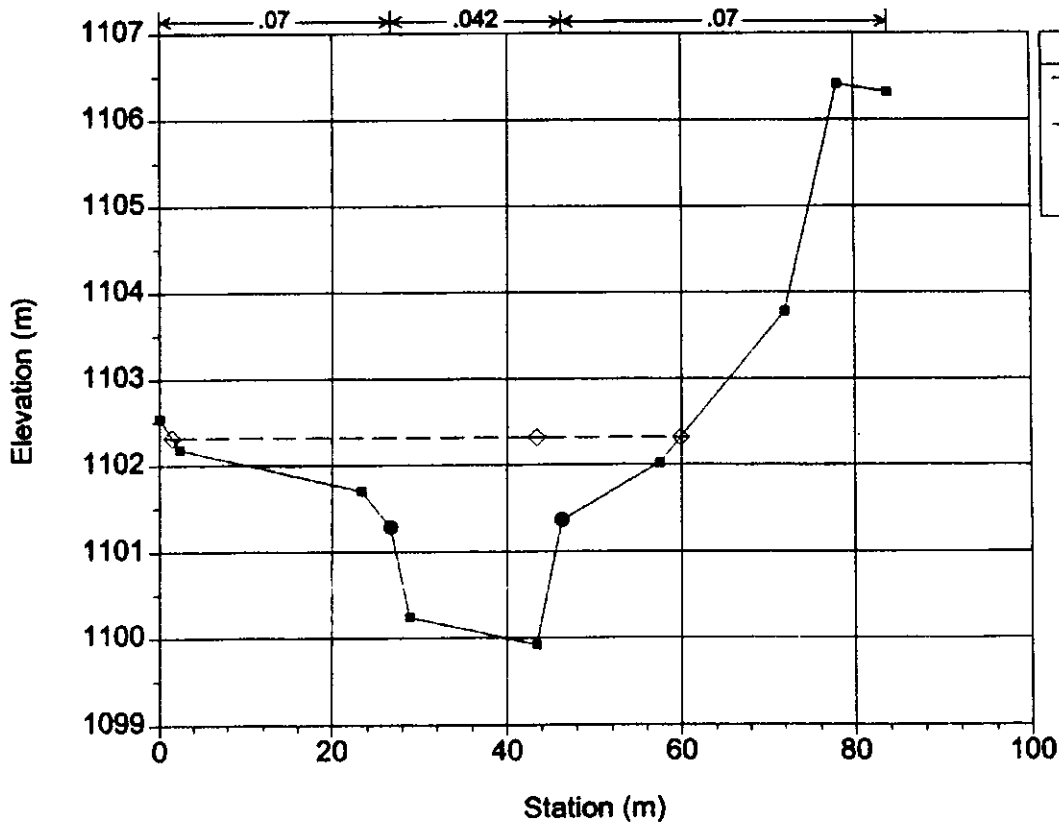
Robb Floodplain Study - North Portion Embarras River near Robb

Xsection UU



Robb Floodplain Study - North Portion Embarras River near Robb

Xsection VV





## MILE 34 CROSS-SECTIONS AND PROFILE

copy

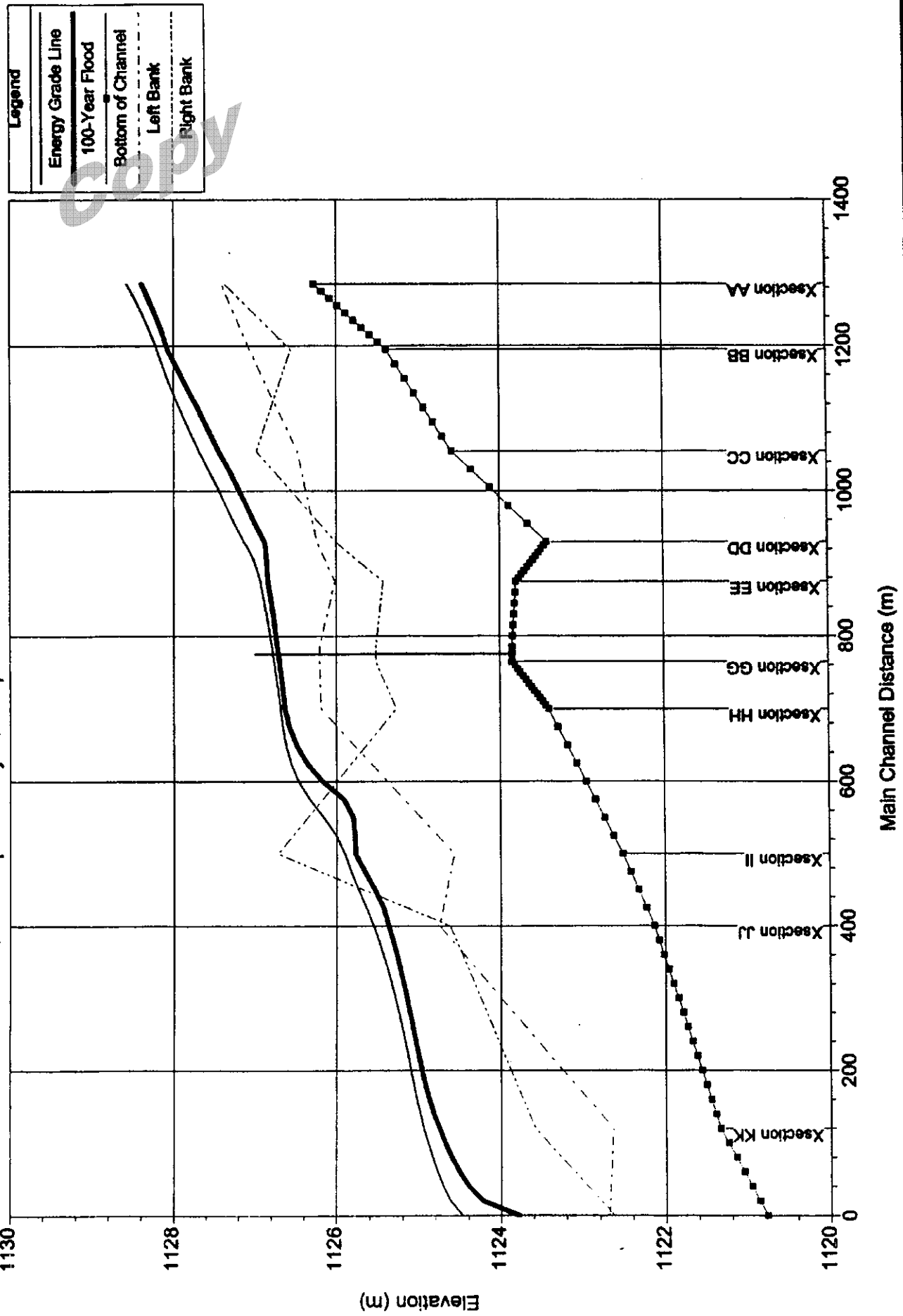
APPENDIX  
C

---

R E P O R T

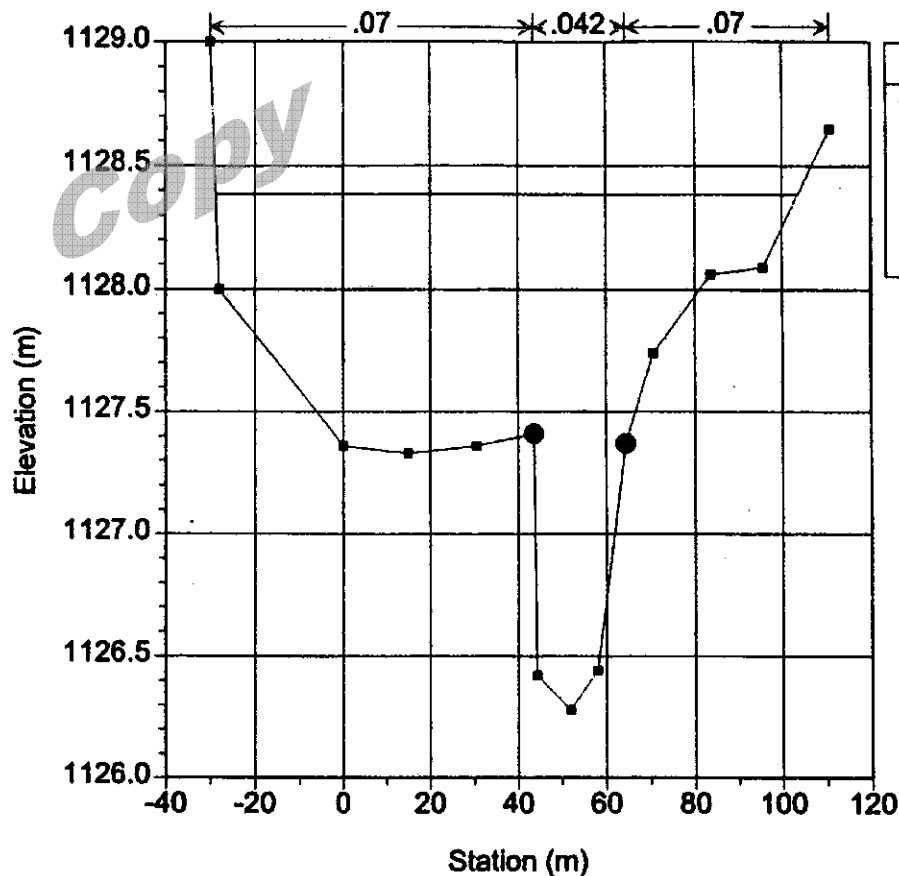
---

Robb Floodplain Study - South portion Embarras River near Robb



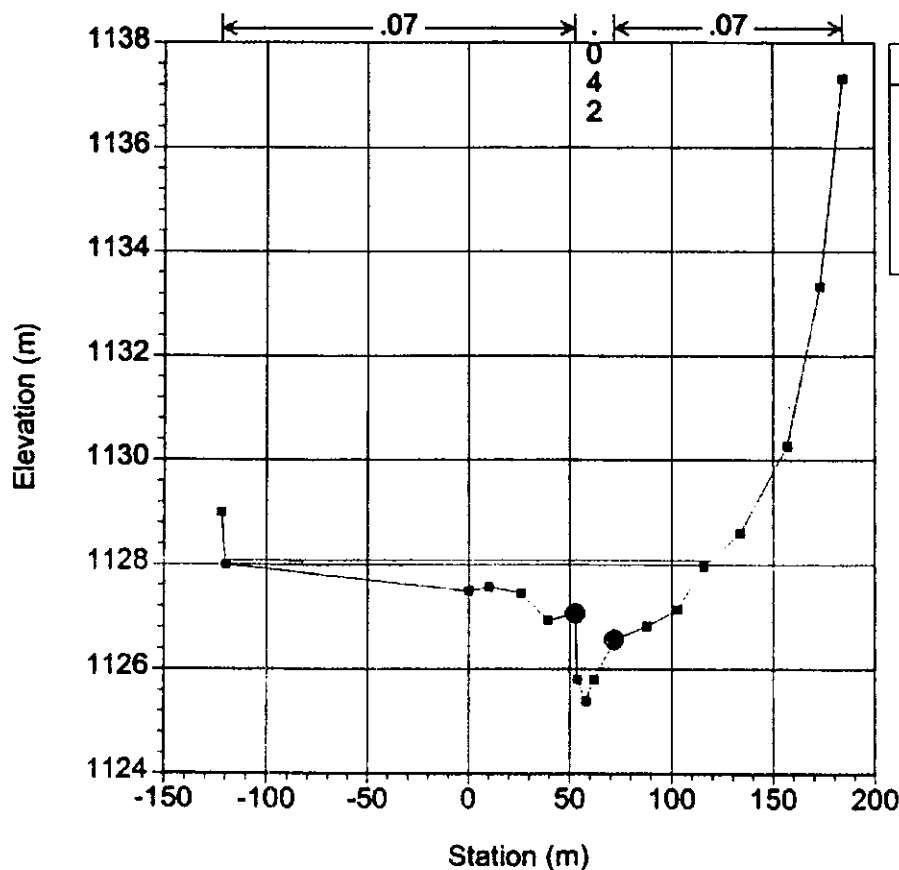
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection AA



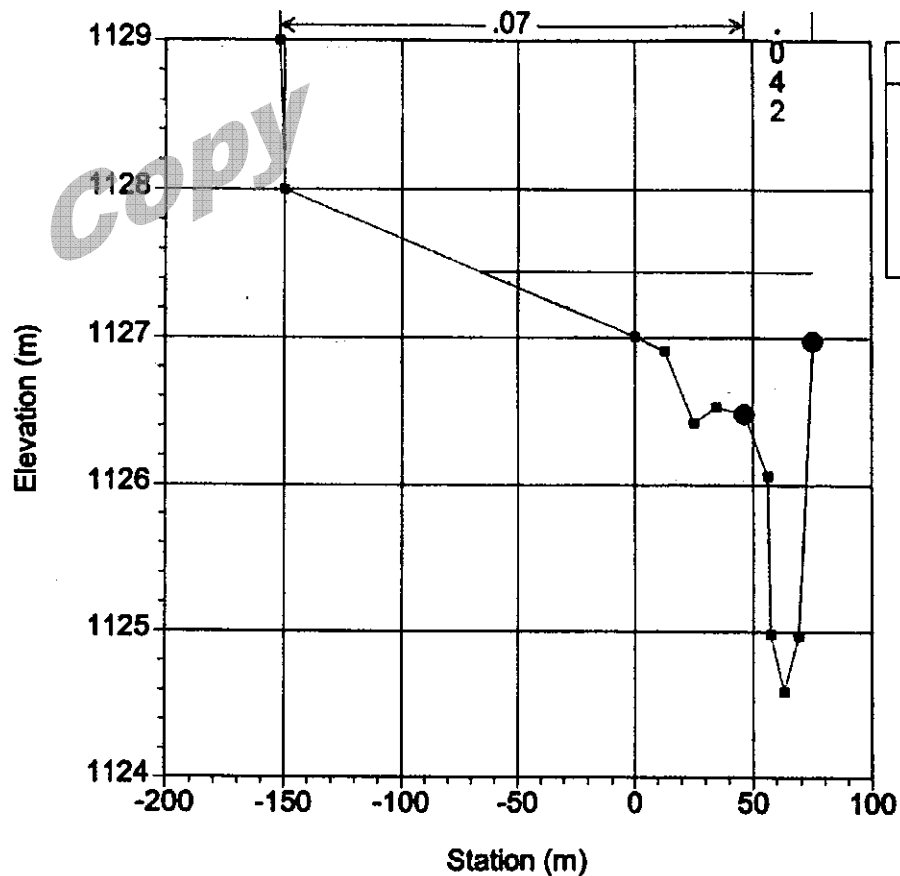
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection BB



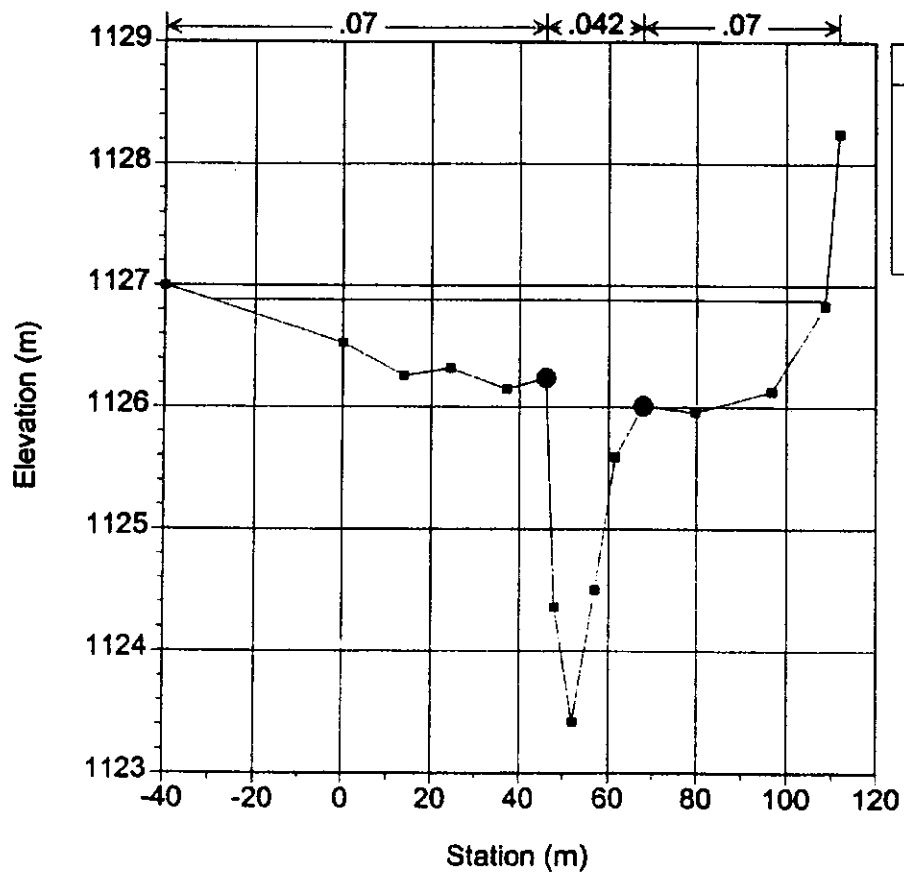
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection CC



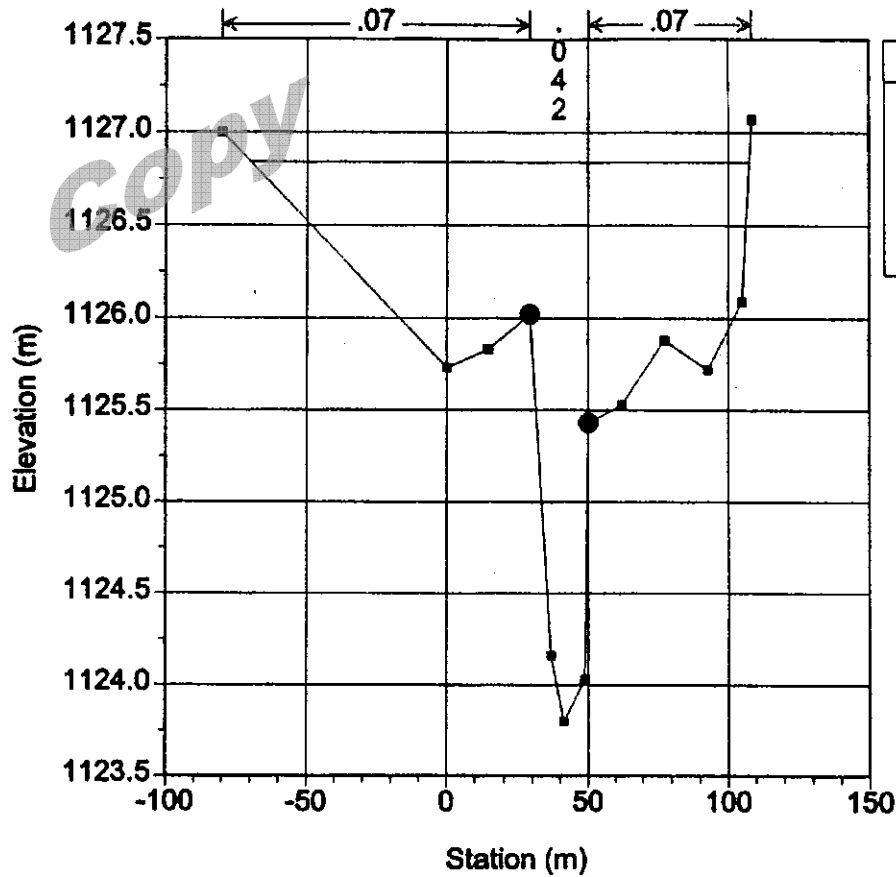
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection DD



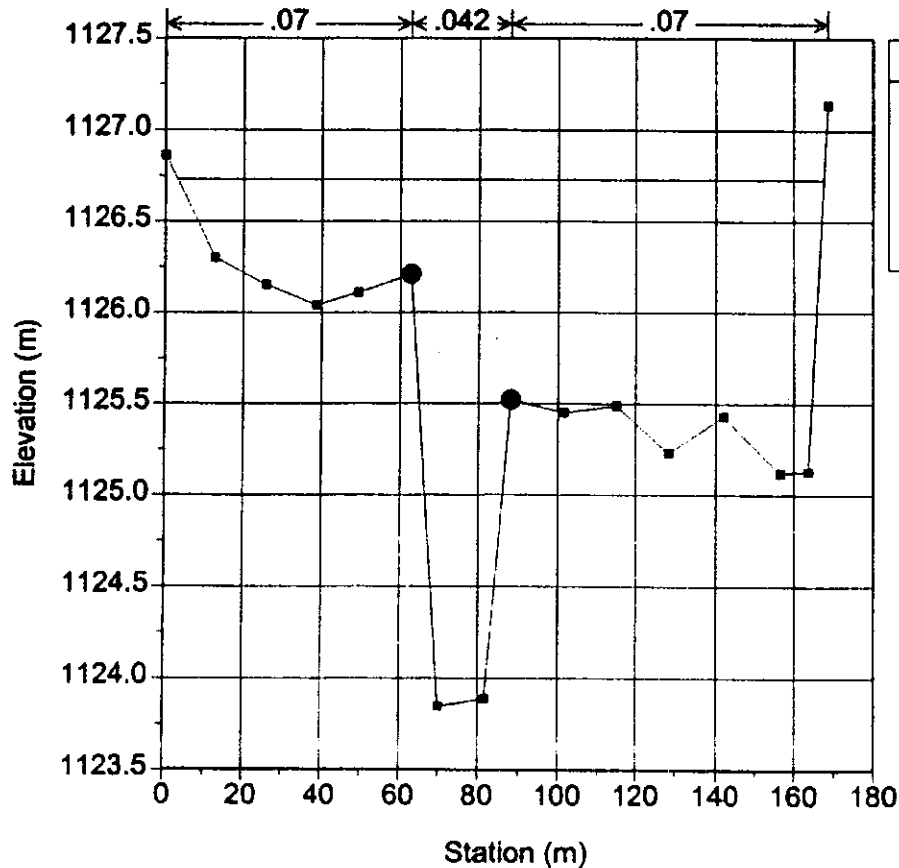
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection EE



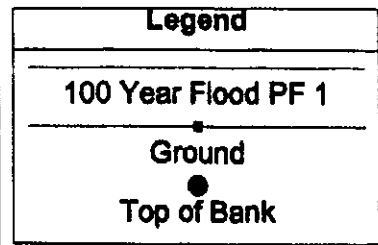
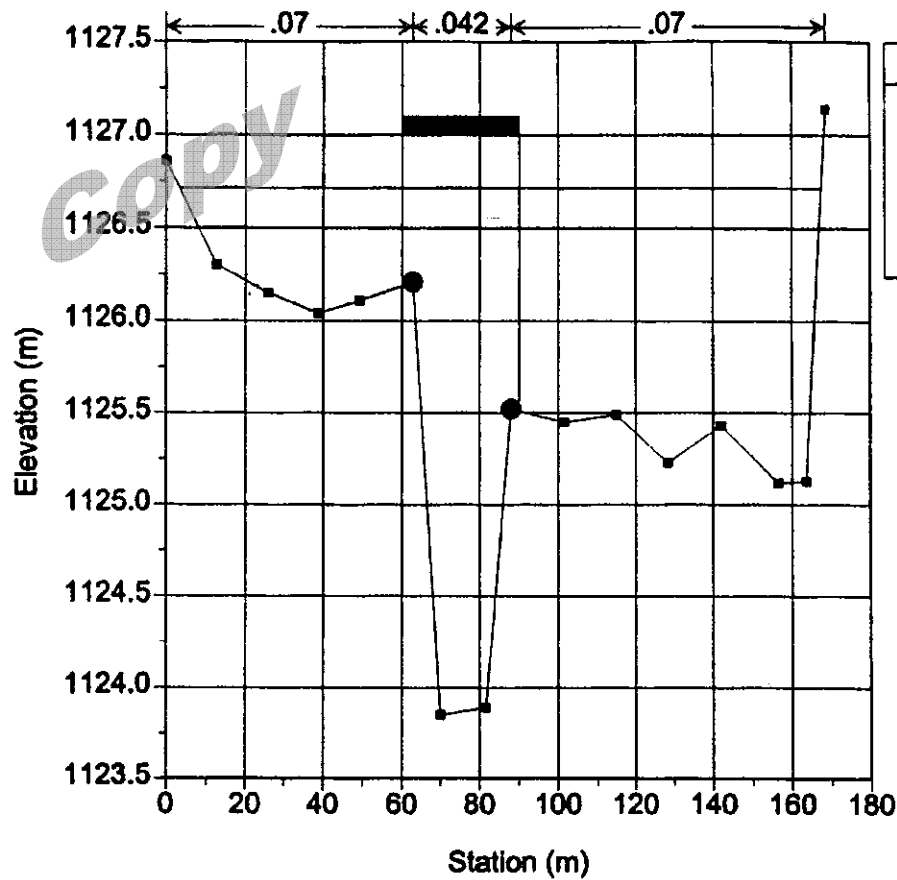
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection FF (GG copied)



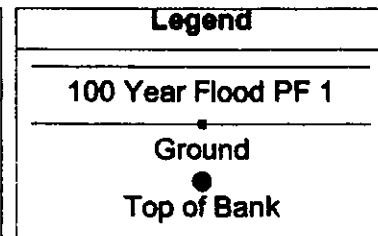
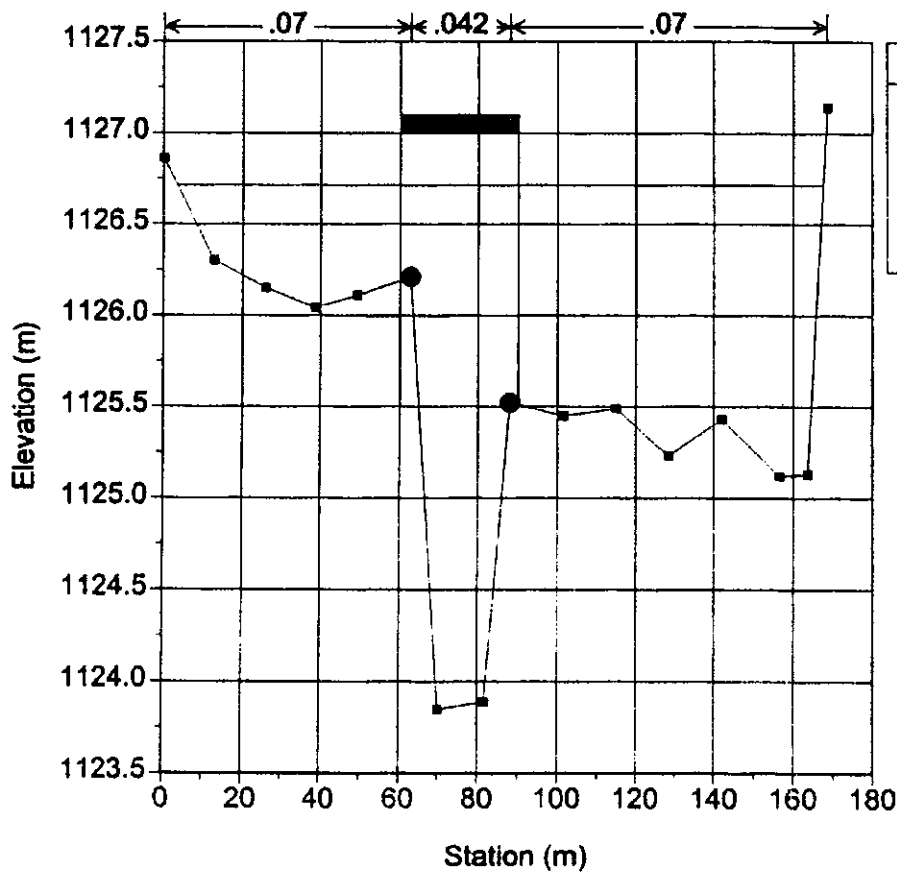
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb



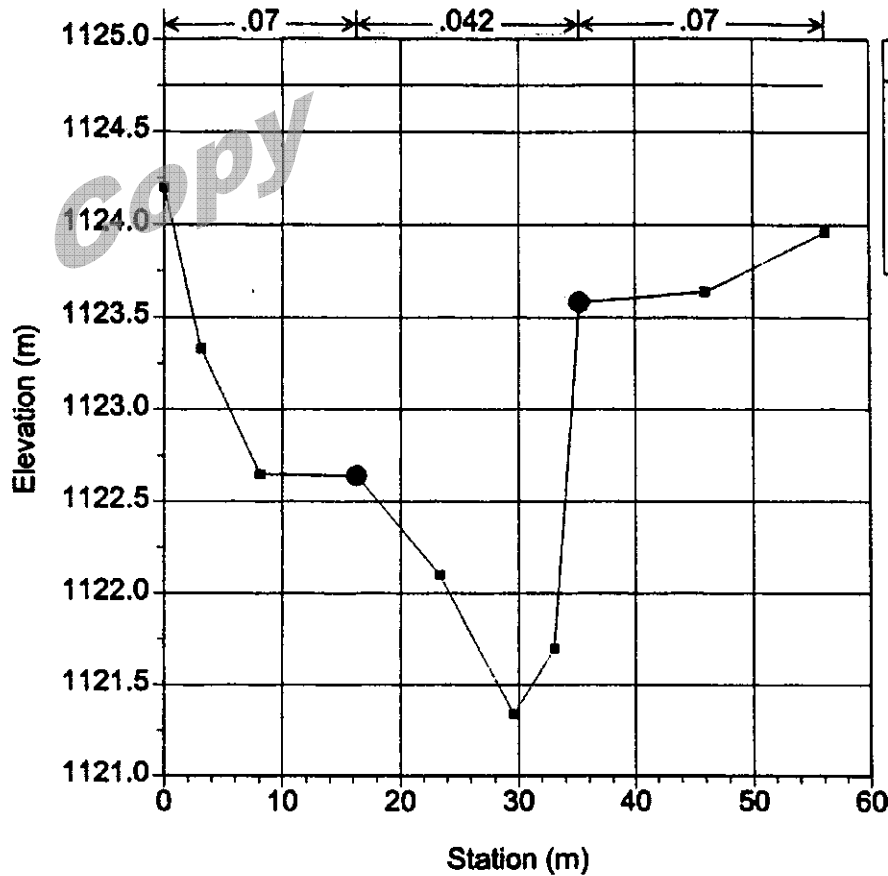
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb



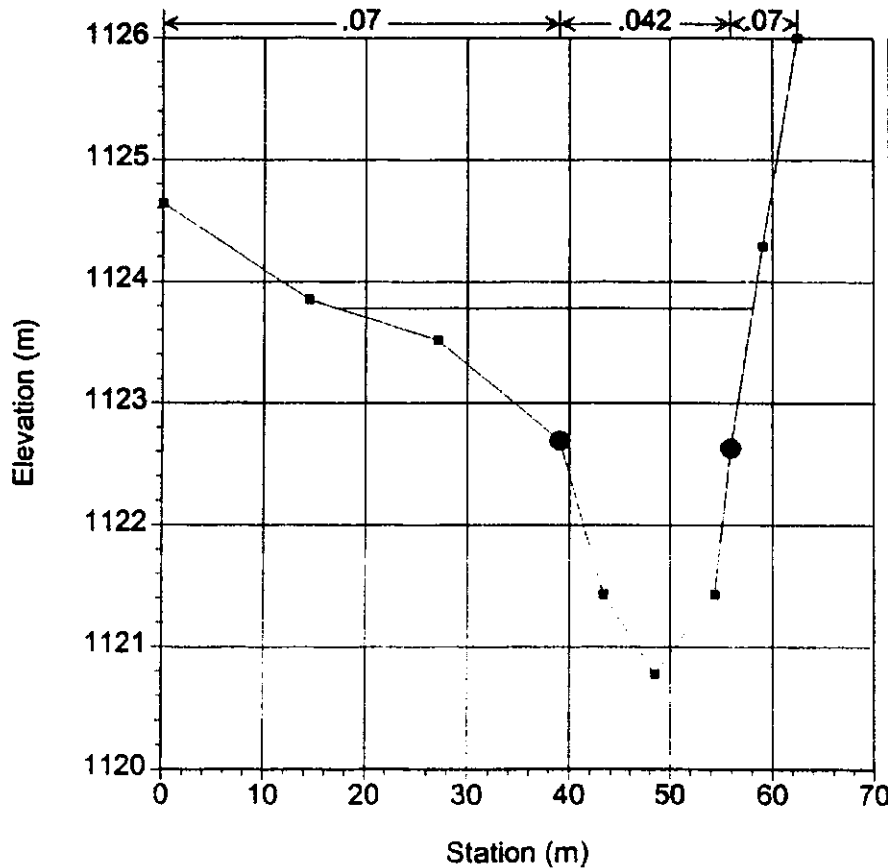
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection KK



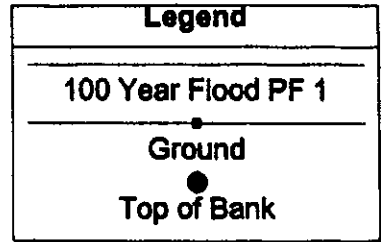
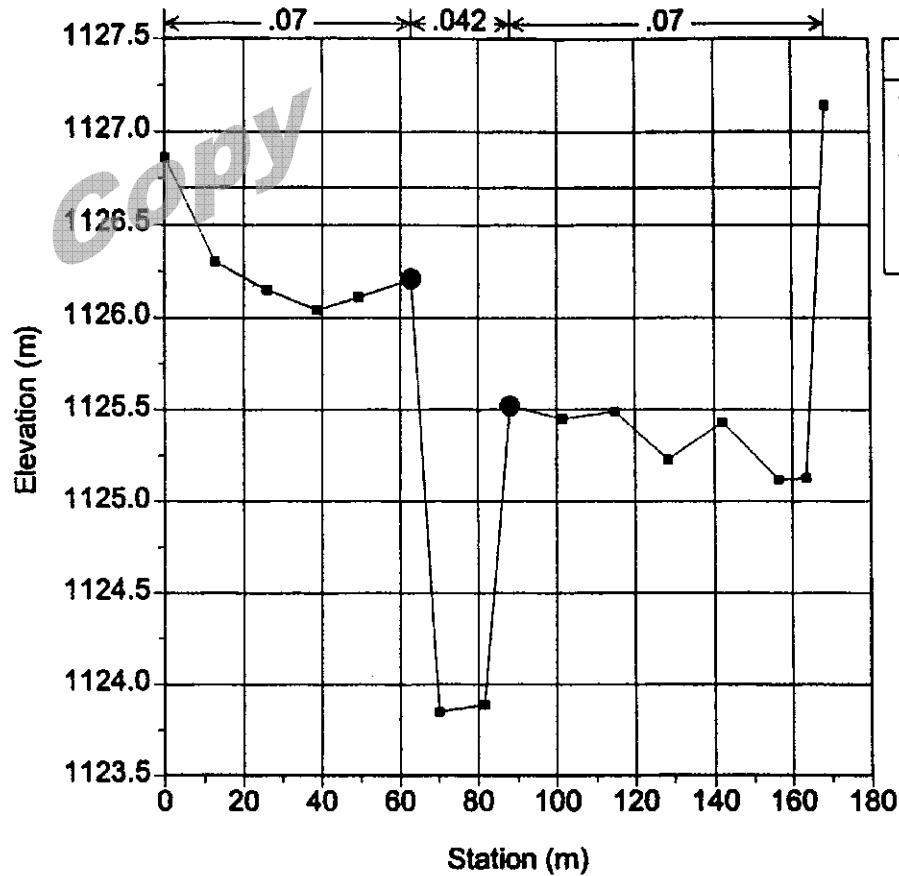
## Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection LL



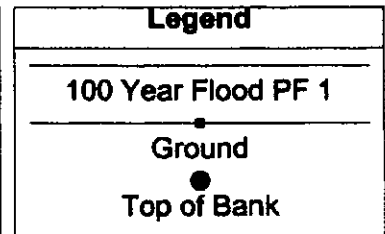
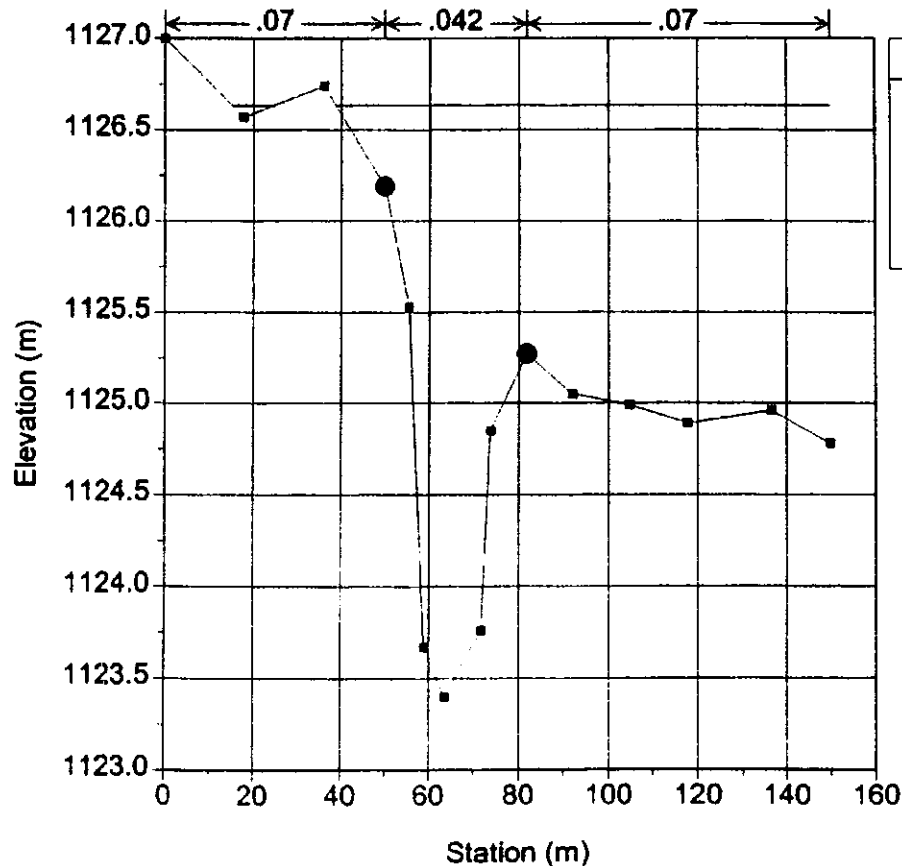
# Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection GG



# Robb Floodplain Study - South portion

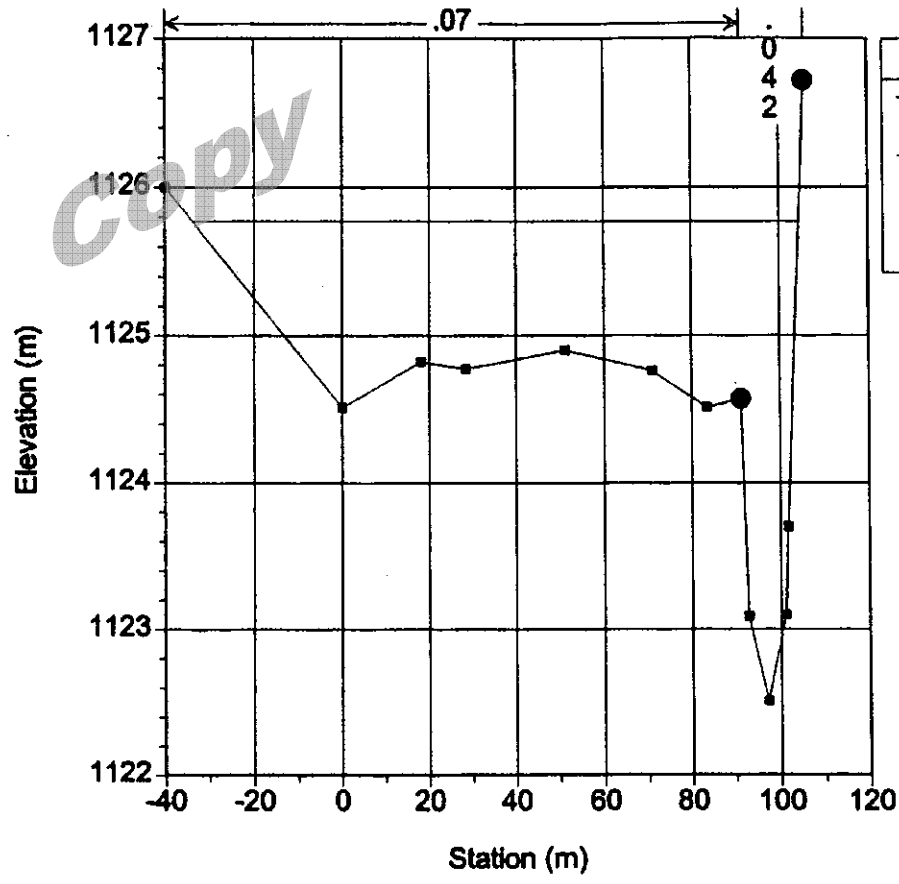
River = Embarras River Reach = Robb Xsection HH





# Robb Floodplain Study - South portion

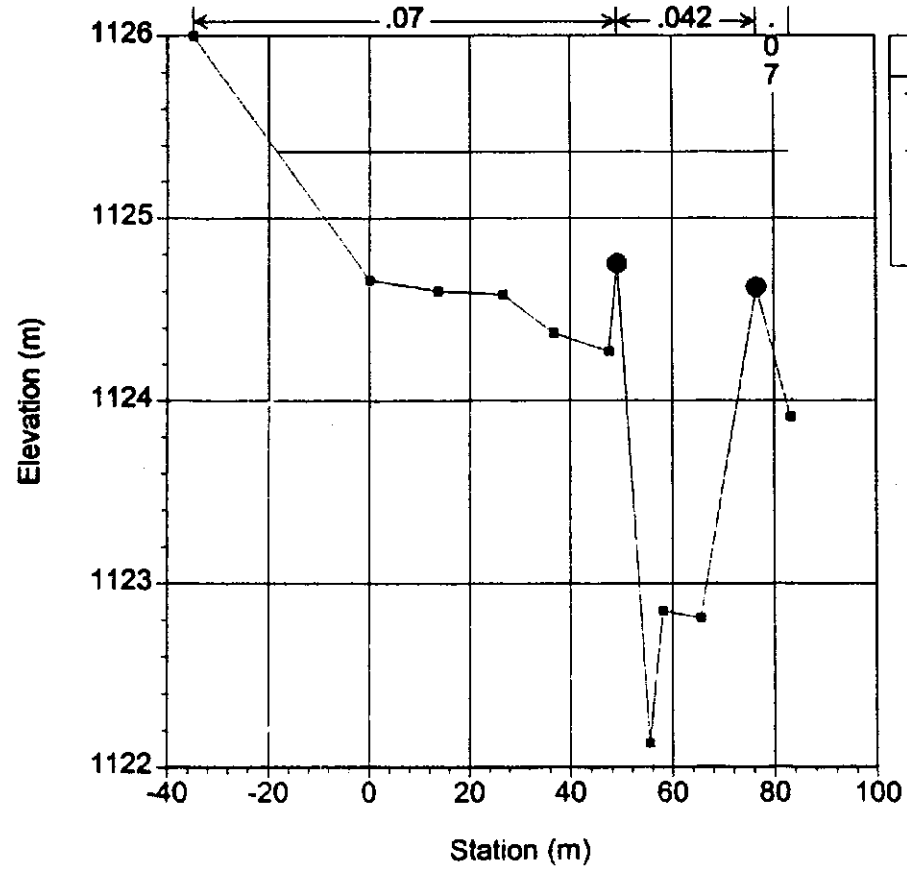
River = Embarras River Reach = Robb Xsection II



Legend
100 Year Flood PF 1
Ground
Top of Bank

## Robb Floodplain Study - South portion

River = Embarras River Reach = Robb Xsection JJ



Legend
100 Year Flood PF 1
Ground
Top of Bank