

Britannia Village Flood Control Project

Summary of Background Information –
February 2011

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1) Flood Risks in the Village

The focus here is on risks associated with water spilling overland through low lying portions of the Village from Britannia Bay towards Mud Lake. Risk is the product of **likelihood and consequences**, and any discussion of risk must consider both aspects.

In flood plain management, likelihood is expressed in terms of the **return period** or **probability of occurrence** of water levels – the former is the inverse of the latter. For example, the water level that has a 25 year return period (or a 1/25 = 4% probability of being equalled or exceeded in a given year is approximately 60.4 metres.

Two kinds of consequences are considered:

1) **Financial losses** due to flooding include damage to property (buildings and contents), the cost of temporary lodgings during evacuation, clean-up costs, etc. Financial losses are calculated using flood damage estimation tools that relate the cost of damages to the depths to which buildings would be inundated, for various building styles and qualities of construction. The 1992 Flood Damage Reduction Investigation (Novatech, for RVCA) estimated the **expected annual flood damages** in Britannia Village with no flood protection measures at \$110,000 (1992). Existing measures built in the early 1980’s, if still effective, reduce the expected annual damages to \$35,000 (1992).

indirect measure of public health and safety consequences, we use the depth of water on, and velocity of flow across, local streets. In Ontario, the generally accepted criteria for **safe access** are:

- flood depth < 30 cm, and
- flood depth X velocity < 0.8 m²/sec

In Britannia Village, the 30 cm depth is the more significant criterion since overland flow velocities will generally be less than 2.6 m/sec.

2) **Public Health and Safety** consequences include potential injury or loss of life, as well as more subtle effects such as the mental stress associated with the inconvenience and disruption to the community’s regular routine during flood emergencies. As an

Tables 1 and 2 list the expected water levels on Britannia Bay for a range of return periods, and the corresponding depths of flooding at intersections within the flood vulnerable portion of the Village. Table 1 shows flood depths as they would be without any flood protection works and Table 2 shows flood depths assuming the existing measures will perform as they were intended to when constructed in the early 1980’s.

Table 1 - Depth of Flooding at Street Intersections (m) - without existing flood protection measures

Intersection				Bradford & Jamieson	Bradford & Maud	Bradford & Salina	Kehoe & Jamieson	Kehoe & Maud	Kehoe & Cascades	Kehoe & Salina	Britannia & Salina
Road Elev (m)				60.96	60.04	60.61	59.99	59.85	60.07	59.96	60.5
Return Period	Probability of Occurrence Each Year	Discharge (m ³ /sec)	Lac Deschenes Water Level (m)	<i>flood depth greater than 30 cm is "unsafe"</i>							
2 years	50%	3300	59.40	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>
5 years	20%	4210	59.88	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	0.03	<i>dry</i>	<i>dry</i>	<i>dry</i>
10 years	10%	4770	60.12	<i>dry</i>	0.08	<i>dry</i>	0.13	0.27	0.05	0.16	<i>dry</i>
20 years	5%	5280	60.32	<i>dry</i>	0.28	<i>dry</i>	0.33	0.47	0.25	0.36	<i>dry</i>
26 years	4%	5400	60.40	<i>dry</i>	0.36	<i>dry</i>	0.41	0.55	0.33	0.44	<i>dry</i>
50 years	2%	5920	60.61	<i>dry</i>	0.57	<i>dry</i>	0.62	0.76	0.54	0.65	0.11
100 years	1%	6370	60.77	<i>dry</i>	0.73	0.16	0.78	0.92	0.70	0.81	0.27

Note: Discharge and water level data are from Ottawa River Flood Plain Mapping (MacLaren Plansearch, 1984)

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20 years	5%	5280	60.32	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>
26 years	4%	5400	60.40	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>	<i>dry</i>
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2) Alternative Flood Risk Management Approaches

Effective flood risk management involves the implementation of some combination of **structural** as well as **non-structural** measures, together with **preventive** as well as flood **emergency response measures**. A flood risk management program is currently in place for Britannia Village, but it has limitations that could be addressed by implementing the proposed Britannia Village Flood Control Project.

Status Quo

The existing structural flood protection measures in the Village were constructed after the 1979 event which flooded the community. The maximum recorded water level on Britannia Bay during that event was 60.26 metres above sea level. It is understood that the existing measures, consisting of sea walls, earth berms and removable bulkheads at the ends of Rowatt Street and Jamieson Street were intended to provide protection against water levels up to 60.4 metres above sea level. However, they were not designed or built, nor are they maintained, as an integral "system" by any single entity or to any particular standards, so their reliability in the long term is questionable.

Without the existing flood protection measures, the "onset of flooding" in the community would occur when the water level on Britannia Bay reaches approximately 60.0 metres above sea level. At this water level, flooding of streets within the community would begin (the first intersection impacted being at

Kehoe and Maud). The lower levels of some residences within the community (basements or crawl spaces) could be affected at lower water levels than 60.0 m on Britannia Bay, depending on the nature of the soils around the structure, the design of the structure itself and associated drainage facilities. In a field survey of buildings undertaken in 1992, nine residences were found to have lower level openings lower than 60.0 m, but entry of river water through them at that river level would depend on local grades in the vicinity of the structure and the presence of flow pathways to them from the river.

If the existing measures perform as intended, they will provide protection up to the 1:25 year flood level on Britannia Bay. During high wind events combined with moderate water levels, localized wave overtopping of the existing sea walls has occurred, overtaxing the available capacity of the local drainage works at the

time (most recently in 2003). Changes have been made since then to the grading of waterfront properties. The expected consequences of wave overtopping under present-day conditions have not been investigated by the RVCA.

In addition to installing the removable bulkheads on the road allowances at Rowatt and Jamieson, the City of Ottawa provides **emergency flood assistance** to local residents, by making a of supply of sand bags and sand available to be used by residents and volunteers, if necessary to protect their properties. The City also monitors the local drainage system and calls in portable pumping equipment if necessary.

Preventive, non-structural measures are in place, including municipal land use planning policies and zoning, and conservation authority development regulations. These are established to avoid increasing flood risk due to continuing development in the flood

The Proposed Remedial Flood Control Project

The proposed works will consist of a combination of the following:

- modifications to certain components of the existing permanent and removable structural flood control measures (to provide 1:100 year level of protection)
- replacement of other components of the existing structural measures by alternatives
- additional structural measures to ensure that all of its components will perform as an integral system

The improved flood control measures will be designed and built to provide protection against the 1:100 year water surface elevation of the Ottawa River at Britannia Bay (60.8 m). As an added margin of safety, a minimum 30 cm freeboard will be incorporated into the design, such that the top of the structures will be set no lower than 61.1 metres above sea level. The final alignment of the flood control system and its various components will

vulnerable area, in accordance with Provincial planning policies under the *Planning Act* and the *Conservation Authorities Act*. (see page 15)

Also, the RVCA's flood forecasting and warning service recognizes Britannia Village as a flood damage centre. Flood advisory messages will be issued to the community and the City's emergency operations centre when warranted, as determined in consultation with the Ottawa River Regulation Planning Secretariat. The goal is to reduce the consequences of flooding, and therefore flood risk, by providing early warning of impending flood conditions, enabling residents in the vulnerable area to take action.

be determined in consultation with directly affected and adjacent landowners. The design will be optimized to meet several objectives: minimize intrusion into and disturbance of properties, minimize capital and long term maintenance costs, minimize environmental impacts and mitigate any residual impacts that are foreseen during and after construction.

Once constructed, the RVCA will accept responsibility for long term maintenance of the improved flood control measures, in cooperation with the City of Ottawa.

If constructed and properly maintained in the long term, these remedial measures will ensure that safe access to and egress from existing lots of record in the vulnerable area will be available for Ottawa River flood events up to and including the 1:100 year return period. Expected annual flood damages resulting from overland flooding from the Ottawa River will be reduced to zero.

Other Flood Risk Management Approaches

Land Acquisition

Acquiring flood vulnerable properties and removing buildings from them to reduce flood risk is clearly uneconomical in Britannia Village, considering the high property values compared with the expected annual damages.

Flood-proofing of Individual Residences

Expected annual flood damages have declined over time as older buildings in the flood vulnerable area have undergone renovation and reconstruction with flood-proofing measures incorporated into their designs. This has been done on several properties in the years from 1984, when the vulnerability of the Village was first identified in flood plain mapping.

The expected annual damages in Britannia Village are most likely less than were estimated in 1992 (as quoted above) for this and other reasons. To do a more comprehensive update of expected annual damages would be an expensive undertaking.

Flood-proofing of individual residences reduces flood damage potential but does nothing to improve the accessibility of properties under flood conditions, so the public health and safety aspects of the flood risk remains unaddressed by this approach.

More Substantial Flood Emergency Response Measures

It has been suggested, by some, that instead of building a higher and more reliable permanent flood protection system, the City should explore innovative ways of deploying more effective and substantial temporary flood defense barriers when flood events occur. RVCA does not participate in the delivery of emergency flood combat measures of any kind, so any consideration of this suggestion should be left to the City of Ottawa's discretion.



3) Environmental Assessment Requirements

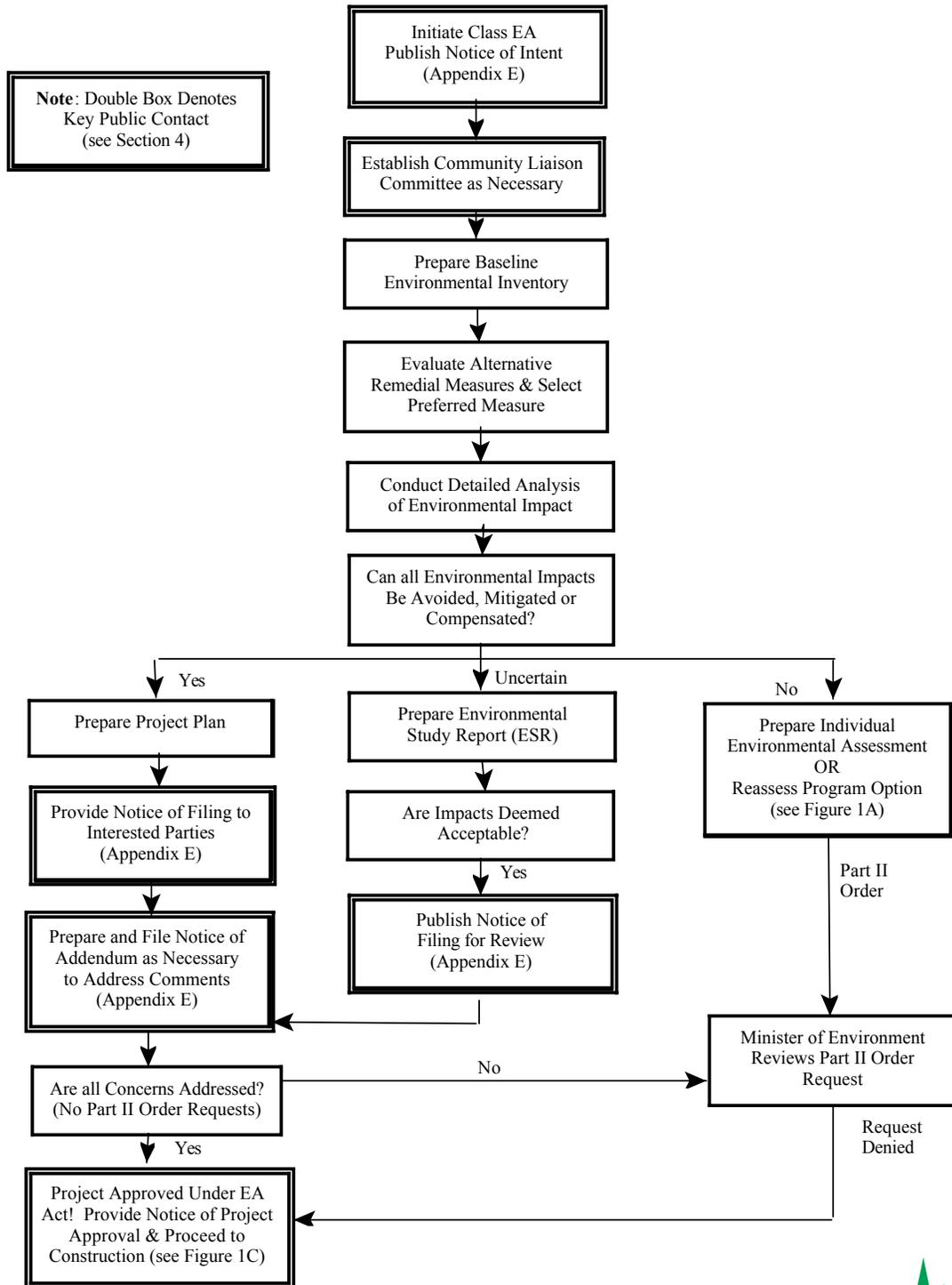
The project is being planned and designed in accordance with the Conservation Ontario Class Environmental Assessment for Remedial Flood and Erosion Control Projects. Details of the prescribed planning and design process can be found on the Conservation Ontario website at www.conservationontario.ca/projects/documents/AmendedCOClasEAAApprovalDocument-September2009.pdf

The Class EA requires the RVCA as proponent of the project to undertake environmental monitoring and reporting during construction.

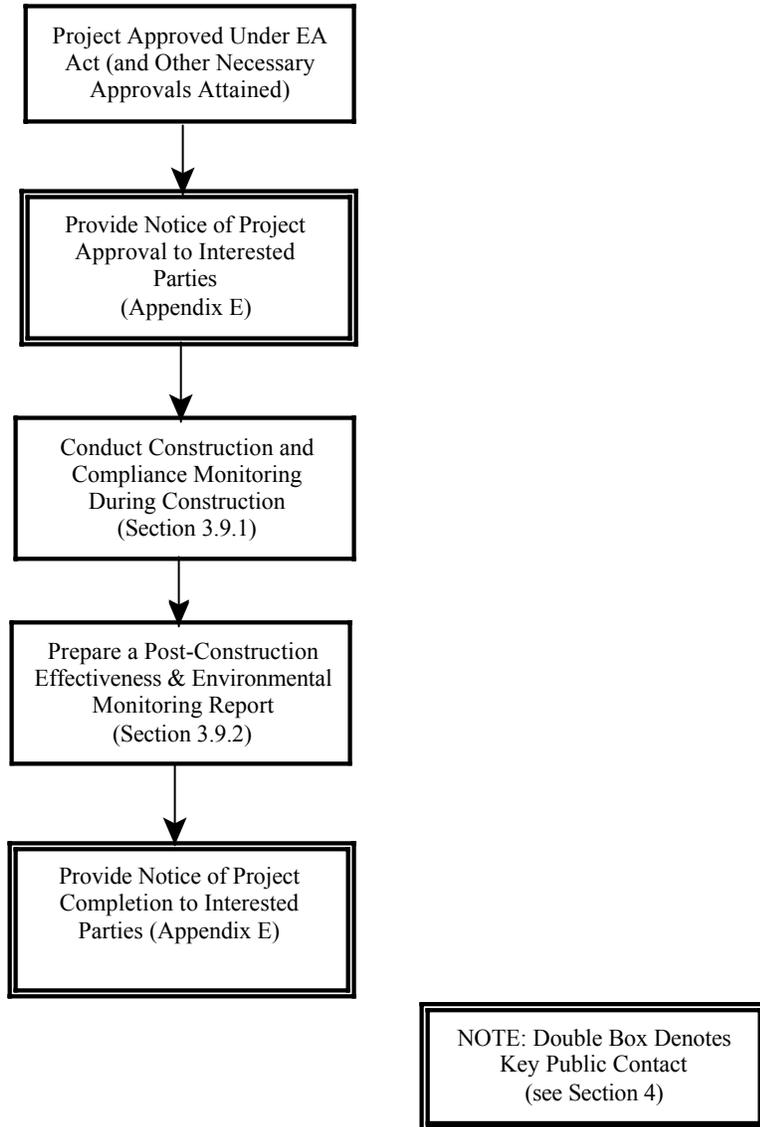
The requirements are summarized in two flow charts – Figures 1B and 1C – from the Class EA.

The RVCA believes that all potential environmental impacts from the project can be avoided, mitigated or compensated for. Accordingly, the published documentation of the planning and design process will be in the form of a **Project Plan** to be made available for public review and comment for a minimum period of 30 calendar days, commencing on the date of Notice of Filing to be sent to parties who have expressed an interest in the project.

**FIGURE 1B
PLANNING AND DESIGN PROCESS
CLASS ENVIRONMENTAL ASSESSMENT**



**FIGURE 1C
PLANNING AND DESIGN PROCESS
CONSTRUCTION AND MONITORING**



4) Estimated Costs and Benefits

City Council has approved proceeding with the project provided that its overall cost can be kept within a budget of \$670,000.

At this early stage in the planning and design process there is significant uncertainty about some of the cost components, so the following estimates are considered to be planning level estimates suitable for budget setting purposes, and they include contingency allowances accordingly.

Capital Cost

Costs associated with acquiring access to and easements over lands that will be occupied by the structures are a significant component of overall cost, and will vary according to the number of agreements that will need to be negotiated. A minimum of seven easement agreements will need to be finalized, and depending on the final alignment of the flood control system, as many

as 22 agreements could eventually be required. As detailed in the following tables, the overall project cost is expected at this time to fall in the range of \$600,000 to \$650,000 – **assuming that the RVCA will be able to negotiate easements with all directly affected landowners for nominal considerations (i.e. \$1).**

Table 3 - Breakdown of Overall Costs

7 directly affected landowners

Engineering Services	116,300
RVCA labour and disbursements	20,000
Legal Fees	7,000
Appraiser's Fees	5,000
Surveying Fees - Crown Land boundaries	53,560
Surveying Fees - R-Plan for Easement Limits	10,000
Construction	390,000
Total	601,860

Table 4 - Breakdown of Overall Costs

22 directly affected landowners

Engineering Services	120,000
RVCA labour and disbursements	20,000
Legal Fees	22,000
Appraiser's Fees	5,000
Surveying Fees - Crown Land boundaries	53,560
Surveying Fees - R-Plan for Easement Limits	10,000
Construction	420,000
Total	650,560

Operation and Maintenance Costs

RVCA will recover its annual costs in operating and maintaining the flood control system from flood control operations transfer payments from the Province of Ontario, and from the City of Ottawa as benefitting municipality. RVCA anticipates average annual routine O&M costs will be in the order of \$2,000 per year, covering annual inspections and minor repairs when required.

The RVCA also recommends that the City and the community should put funds aside annually in a reserve fund for major maintenance and repairs. This is especially

important for any components of the flood control system that may be expensive to replace or repair at the end of their service life (such as modified concrete retaining wall elements). Doing so is necessary in order to assure the long term performance of the flood control system, if the flood control system is going to be relied upon to support a “flood fringe” designation for the protected areas (see discussion of regulatory and planning policies below).

Benefit – Cost Ratios

As noted earlier, the expected annual flood damages in the community were estimated in 1992 at \$110,000 (with no flood control measures in place), and reduced to \$35,000 if the existing flood control measures successfully protect the community to a flood level on the river of 60.4 metres. These expected annual damage values are equivalent to \$154,000 and \$49,000 in 2010 dollars, respectively.

The economic benefit from implementing the project is computed as the present value of the flood damage reduction achieved less the annual operating and

maintenance cost. The table below shows two estimated Benefit-Cost ratios for the project — one that would be applicable if there were no existing flood control measures in place, and one that would be applicable if the existing flood protection works were deemed to be reliable, and assuming:

- the maximum overall project cost of \$670,000 that has been approved by City Council
- a 25 year service life for the proposed works
- an average discount rate of 5% over the life of the project

Table 5

Benefit/Cost	NO existing Flood Control Measures	Existing Measures are Reliable
Capital Cost	\$670,000	\$670,000
Reduction in Annual Flood Damages (1992 Dollars)	\$110,000	\$35,000
Reduction in Annual Flood Damages (2010 Dollars)	\$154,000	\$49,000
Annual O&M Costs	\$2,000	\$2,000
Net Annual Benefits	\$152,000	\$47,000
Present Value of Benefits	\$2,170,467	\$690,603
Benefit/Cost	3.2	1.0

5) Operation & Maintenance Responsibilities and Easement Requirements

Responsibility for the operation and maintenance of the flood control measures will be shared between the RVCA and the City of Ottawa:

The City will continue to install the removable bulkheads in the Rowatt Street and Jamieson Street road allowances, while the RVCA will maintain the earth berm and sea wall components, and any associated drainage facilities on private lands.

RVCA will undertake inspections of the structures twice annually to identify any maintenance or repairs necessary to ensure the integrity of the flood control system.

For those components that will occupy private properties, the RVCA and City need to enter into agreements with the landowners, setting out the terms and conditions under which the owners will grant permanent easements. Through these easement agreements, the property owners would grant to the RVCA and City a legal right to maintain the flood control works on their lands, in perpetuity. Once registered in the Land Registry Office, the easements will “run with the deed” and continue to be in place after resale of any of the properties.

The areas that would be subject to easements will depend on the final alignment and dimensions of the structures, and will be identified on completion of the final design. The project will only proceed to construction if the RVCA is successful in obtaining the easements on “willing purchaser -willing vendor” basis.

The estimated project costs in Tables 3 and 4 above include allowances to cover the cost of land surveys, appraisal services and legal fees, including the reasonable legal expenses incurred by the directly affected landowners in obtaining independent legal advice in the matter. They do not include any allowances for cash compensation payments associated with the transfer of easements.



6) Effect on Land Use and Development Restrictions

In accordance with the Ontario's "Provincial Policy Statement" under the *Planning Act* and MNR's supporting *Natural Hazards Guides*, the RVCA and City have established restrictions on development and redevelopment of properties within the flood vulnerable portion of Britannia Village. Approved policies allow no development on vacant lots and only very minor additions to existing buildings, unless "safe access" is available to the subject property under 1:100 year flood conditions (using the 30 cm flood depth criterion).



If the proposed flood control measures are constructed, and arrangements are made to ensure their reliable performance in the long term, the protected area will be designated an **"area of reduced flood risk"** under the RVCA's regulatory policies, and "flood fringe" under Ottawa Official Plan policies. In such areas, redevelopment and in-fill development projects on existing lots of record will be permitted provided that they incorporate on-site flood-proofing measures, and do not involve a change in use or an increase in the number of dwelling units within the area of reduced flood risk.

Construction of the flood control project will enable the designation of a flood fringe area, but it is **not a prerequisite** for doing so. The Provincial Policy Statement and MNR's *Natural Hazards Guides* do provide for the application of the so-called "two-zone concept" in flood plain management by municipalities and conservation authorities, if doing so can be justified against a set of nine factors:

- Frequency of flooding
- Physical characteristics of valley/flood plain
- Local need
- Impacts of proposed development
- Feasibility of flood-proofing
- Constraints to the provision of emergency services
- Ingress/egress
- Changes in land use
- Administrative capability

An evaluation of these factors and the applicability to the two zone concept for the existing situation in Britannia Village has not been undertaken by the City or the RVCA.