City of Richmond

Report to Committee

To:	General Purposes Committee	**Date:**	March 30, 2004
From:	Terry Crowe, Manager, Policy Planning	**File:**	
Re:	**Update: 2021 Flood Protection and Management Strategy**		

Staff Recommendation

That the report entitled "Update: 2021 Flood Protection and Management Strategy" from the Manager, Policy Planning dated March 30, 2004, be received for information.

Terry Crowe, Manager,
Policy Planning

FOR ORIGINATING DIVISION USE ONLY	
ROUTED TO: **CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**
Emergency and Environmental Programs Y ☑ N ☐ Engineering ..... Y ☑ N ☐ Roads & Dykes ..... Y ☑ N ☐ Parks Design, Construction & Programs .. Y ☑ N ☐ Development Applications ..... Y ☑ N ☐	

Staff Report

Purpose

The purpose of this report is to provide Council with an update regarding the preparation of the City's 2021 Flood Protection and Management Strategy.

Origin

On September 3, 2003, the General Purposes Committee passed the following motion:

"That, (as per the report dated August 22, 2003, from the Manager, Policy Planning) Phase One of the Work Program for preparing a comprehensive updated City-wide 2021 Flood Protection and Management Strategy be approved."

Findings Of Fact

A City Flood Protection and Management Steering Committee has been working with UMA Engineering Ltd. to prepare the Strategy. The Steering Committee includes representatives from the following City Departments and external agencies:

City Departments
Policy Planning, Urban Development – *Project Lead*
Development Applications, Urban Development
Emergency and Environmental Programs, Community Safety
Engineering and Public Works
Parks Planning and Design, Parks, Recreation and Cultural Services

External Agencies
Richmond Agricultural Advisory Committee
Provincial Dyking Authority, Ministry of Water, Land and Air Protection
City of New Westminster

Study Status

The Strategy is about 75% completed.

At the April 5th, 2004 General Purposes Committee meeting, a short presentation of the preliminary findings will be made (see **Attachment 1**). City staff and Committee can discuss this information.

At this time staff intends to finalize the strategy by:

1. Pursuing the preliminary findings - i.e.
   a) continue with improvements to the perimeter dyke, and;
   b) proceed with the general cost/benefit and feasibility analysis of the interior barrier (floodwall) to be situated along the Highway 99 / Knight Street corridor.

2. Incorporating the suggested elements of an integrated flood management strategy.

3. Report back to Council in mid 2004.

Unless staff are directed otherwise, they will continue as described above.

Financial Impact

None

Conclusion

The City's 2021 Flood Protection and Management Strategy is partially completed.

Staff would like to discuss the preliminary findings with Council before the Strategy is completed, to ensure that it reflects Council's priorities.

David Brownlee
Planner 2 (4200)

TTC:dcb

Richmond Flood Protection and Management Strategy

Project Update

April 5, 2004

1

Meeting Purpose

- Inform Council of progress
- Agree on direction

2

Why is Flood Management Strategy Being Updated?

- City not able to fully implement 1989 agreement with Province
  - Lack of funds
  - Questioning of certain elements (e.g. No 8 Rd. mid-island dyke).
- Current Flood Construction Levels are predicated on concept of internal dyke (e.g. No. 8 Road).
- Commitments made to GVRD and Province to build an internal dyke.
- The Province has changed its requirements therefore the City's dyking responsibilities have changed.
- To create an integrated, up to date management strategy.

3

Project Phases

Phase	Work	Time
1	Strategy Update	2003 – 2004
2	Strategy Implementation	2004 – on
3	a) Dyke Perimeter – ongoing improvements Internal - Pre-design b) Non-dyking initiatives – ongoing	2005 – 2007
4	a) Dyke Perimeter – ongoing Internal - Construct Internal Dyke improvements b) Non-dyking initiatives – ongoing	2008 – on

4

Flood Threats

- Piping (internal erosion creates tunnel or pipe)
- Freshets (high river discharge)
- Extreme sea levels (storm surge)
- Subsidence (a lowering of the ground)
- Earthquake (sudden events – e.g. liquefaction)
- Gradual Sea Level Rise (i.e. global warming)

5

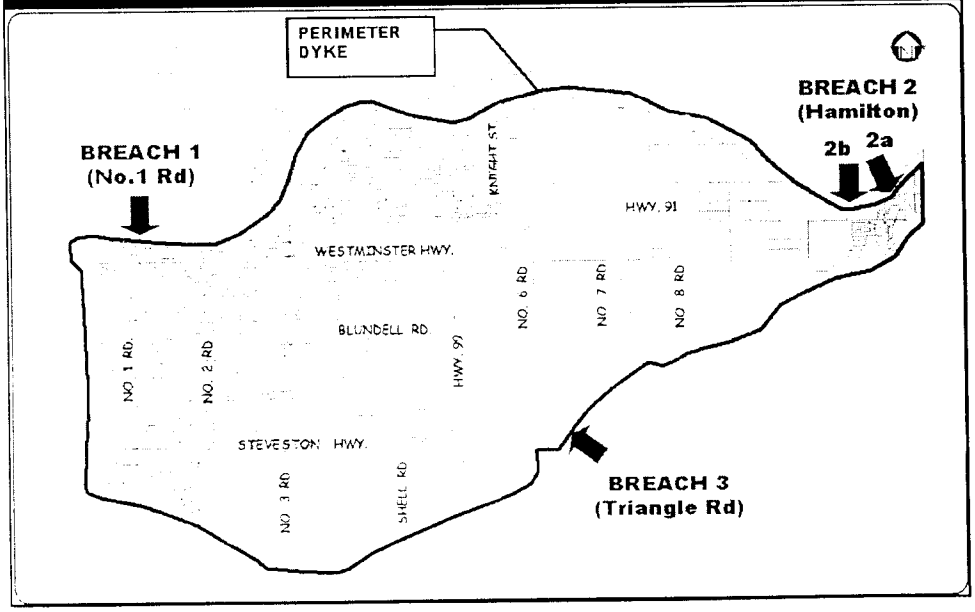
Flood Threats	Probability of Occurrence	Comments
Piping	Any time and any place	Most likely threat
Freshet	Spring – (mainly east half of Lulu Island)	May occur anytime, but mainly seasonal problem
Extreme sea level events (storm surge)	Seasonal - at lower river/ocean front (incl. most of river arms) Winter season	May occur anytime, but mainly seasonal problem
Subsidence	Any time and any place	Slowly or quickly
Earthquake	Any time and any place	Major / Minor
Gradual Sea Level Rise	Ongoing	Sea level rise 3.5mm/year

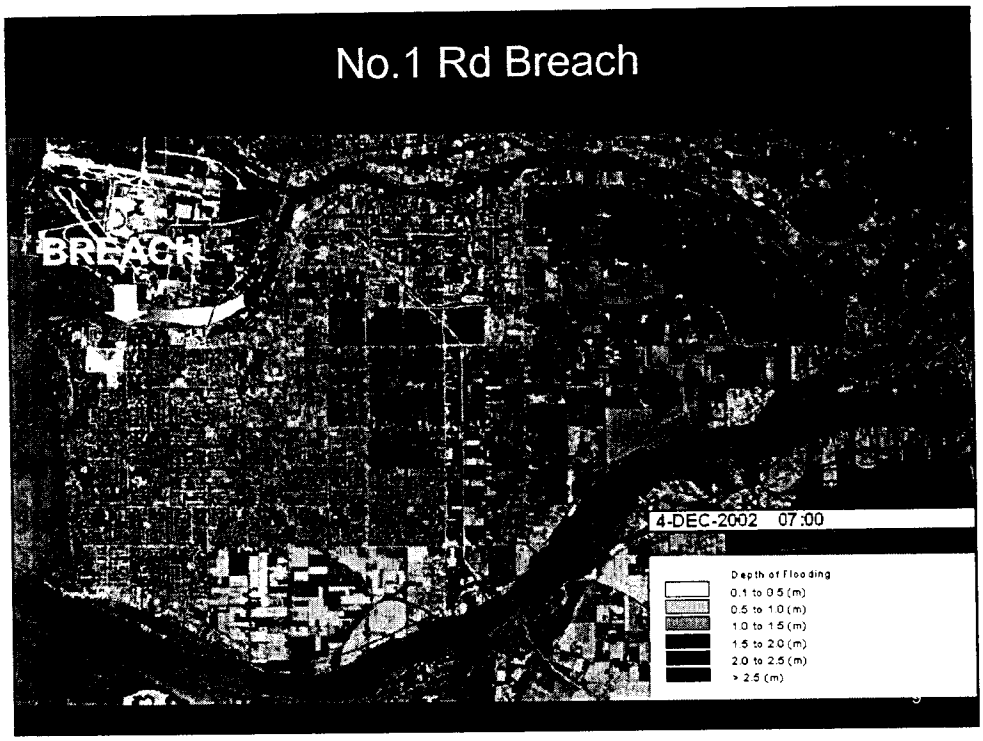
6

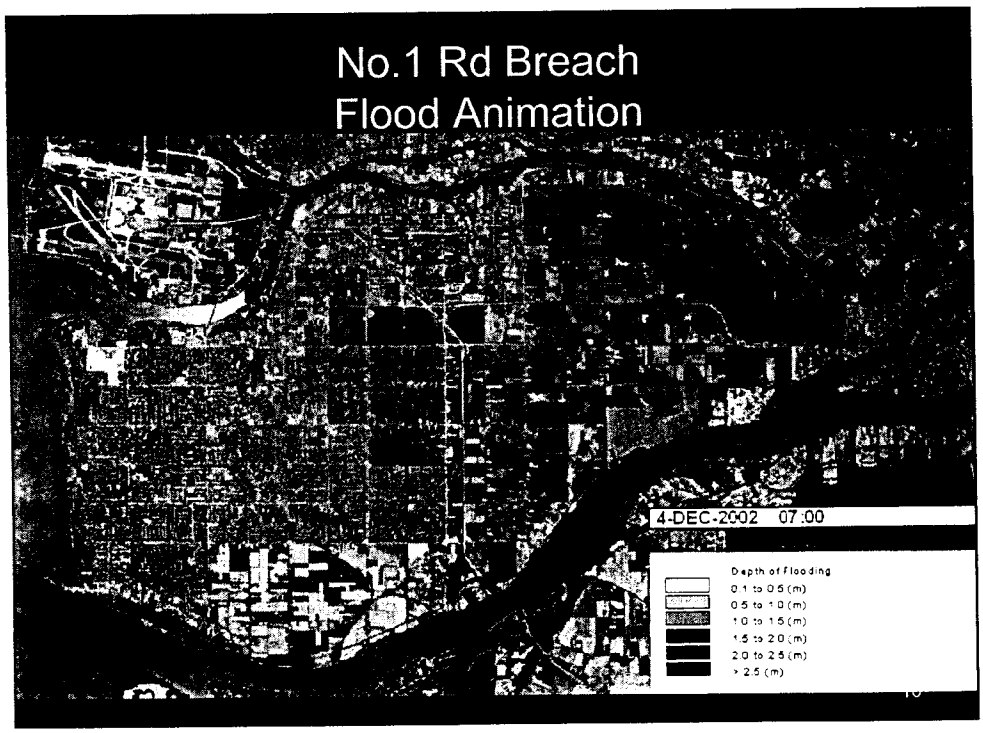
Example of a Piping Dyke Failure in New Westminster (Queensborough)

7

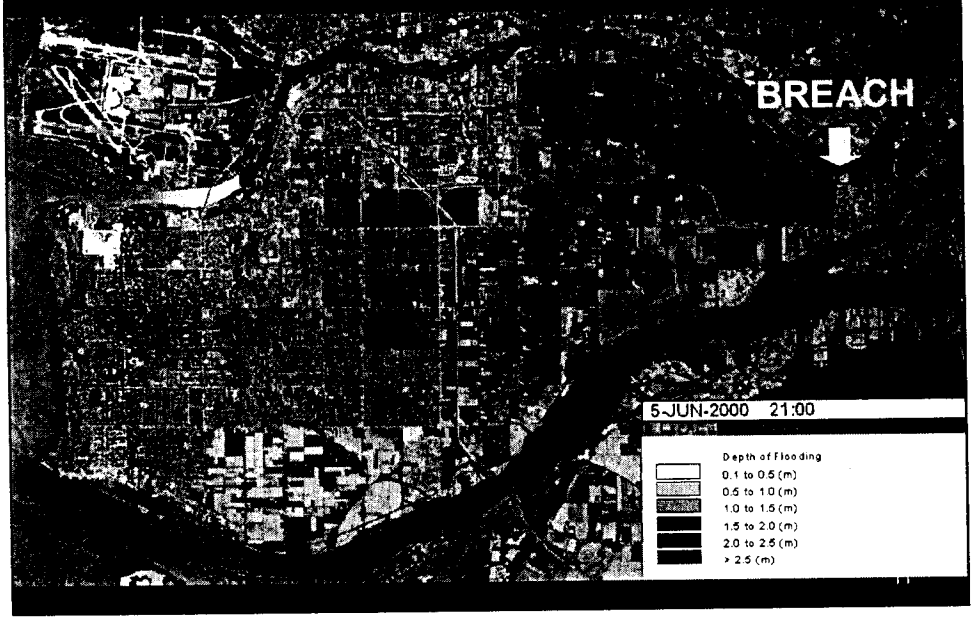
Modeling Analysis: Breach Locations



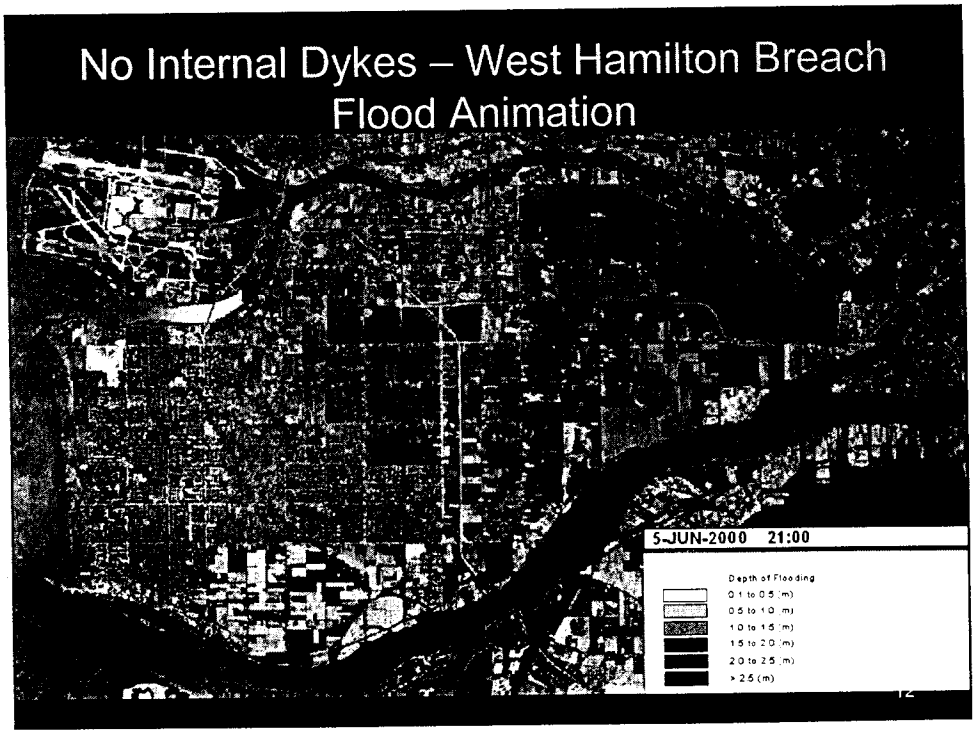

No.1 Rd Breach
BREACH
4-DEC-2002 07:00
Depth of Flooding
0.1 to 0.5 (m)
0.5 to 1.0 (m)
1.0 to 1.5 (m)
1.5 to 2.0 (m)
2.0 to 2.5 (m)
> 2.5 (m)


No.1 Rd Breach
Flood Animation
4-DEC-2002 07:00
Depth of Flooding
0.1 to 0.5 (m)
0.5 to 1.0 (m)
1.0 to 1.5 (m)
1.5 to 2.0 (m)
2.0 to 2.5 (m)
> 2.5 (m)

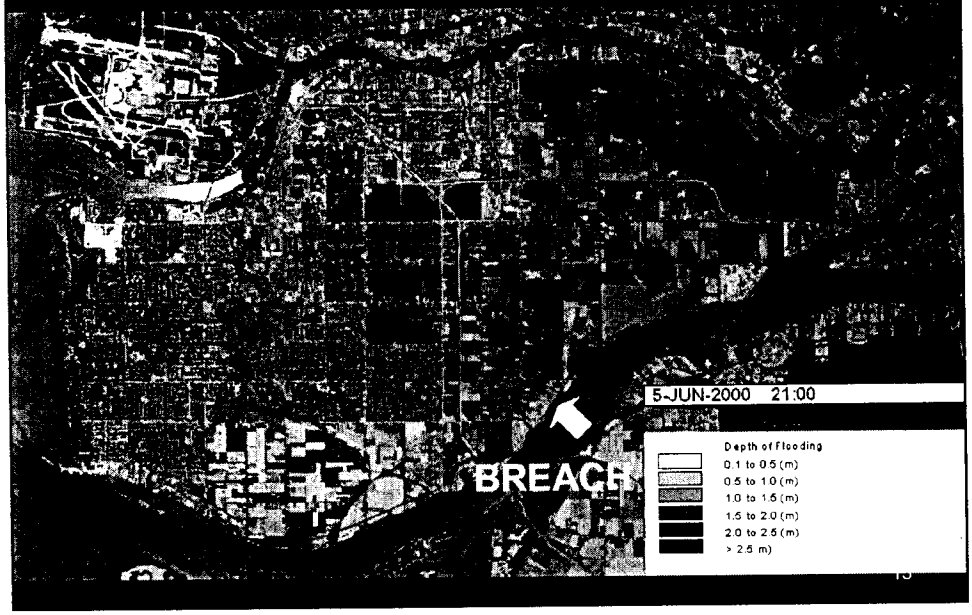
No Internal Dykes – West Hamilton Breach



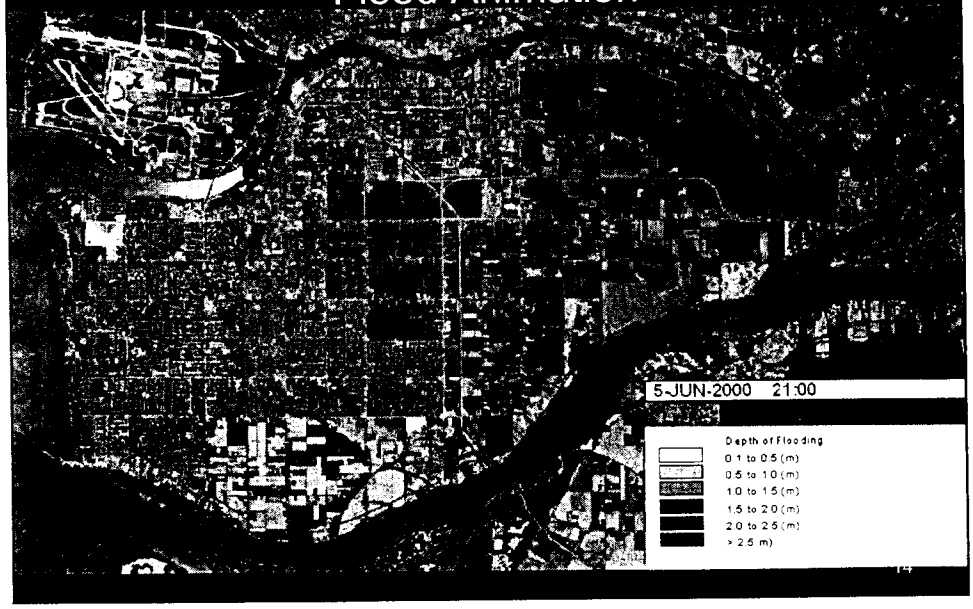
No Internal Dykes – West Hamilton Breach Flood Animation



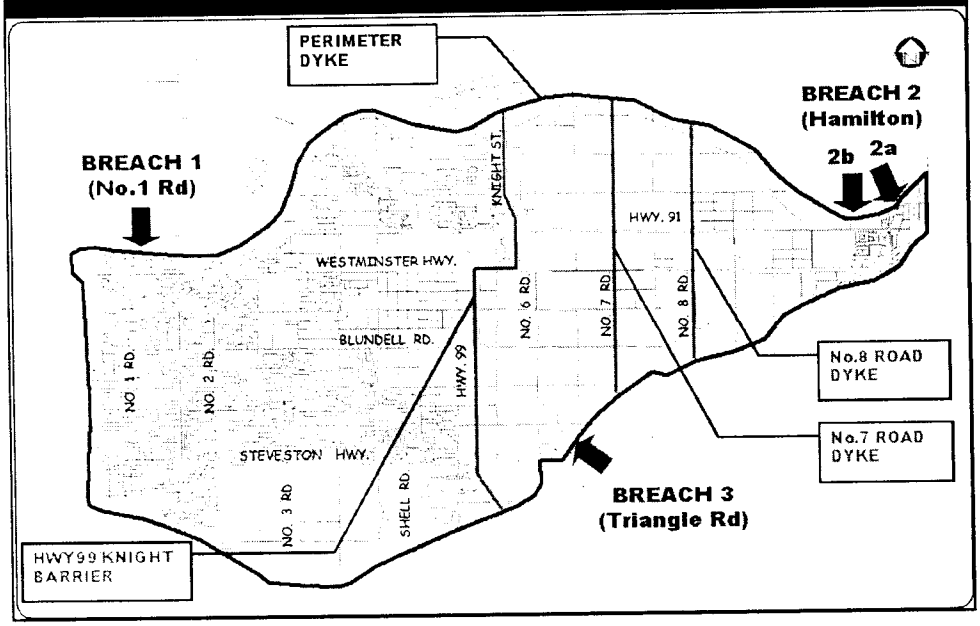
No Internal Dykes – Triangle Rd Breach



No Internal Dykes – Triangle Rd Breach Flood Animation



Modeling Analysis: Internal Dykes and Breach Locations



Flood Barriers vs Standard Dyke Structures

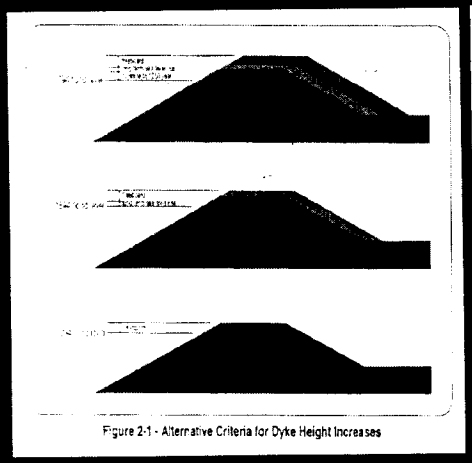
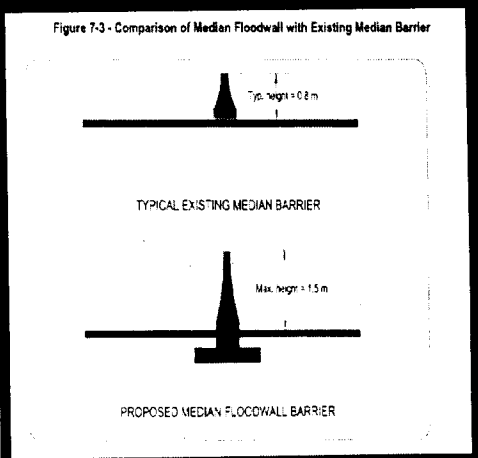
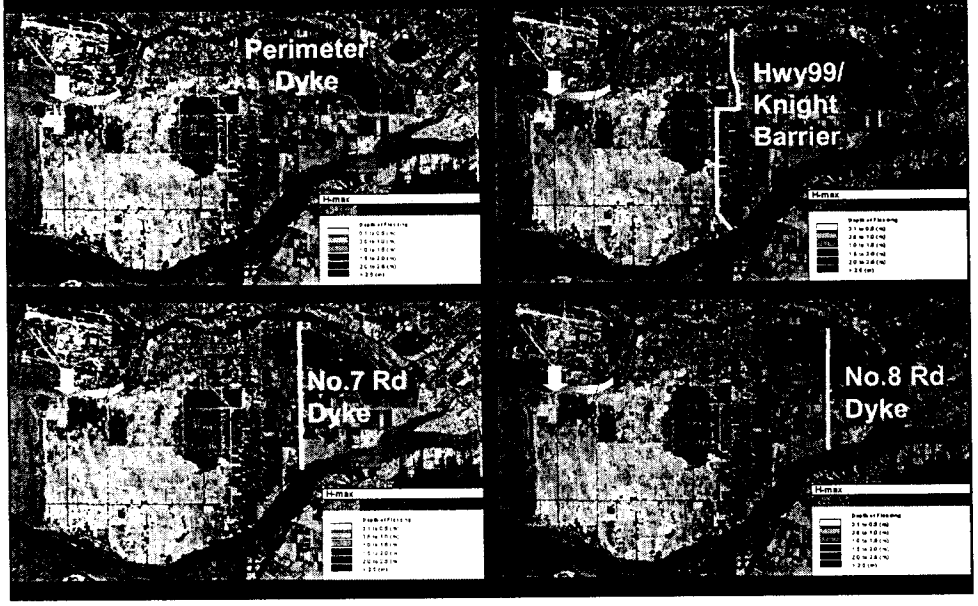


Figure 2-1 - Alternative Criteria for Dyke Height Increases

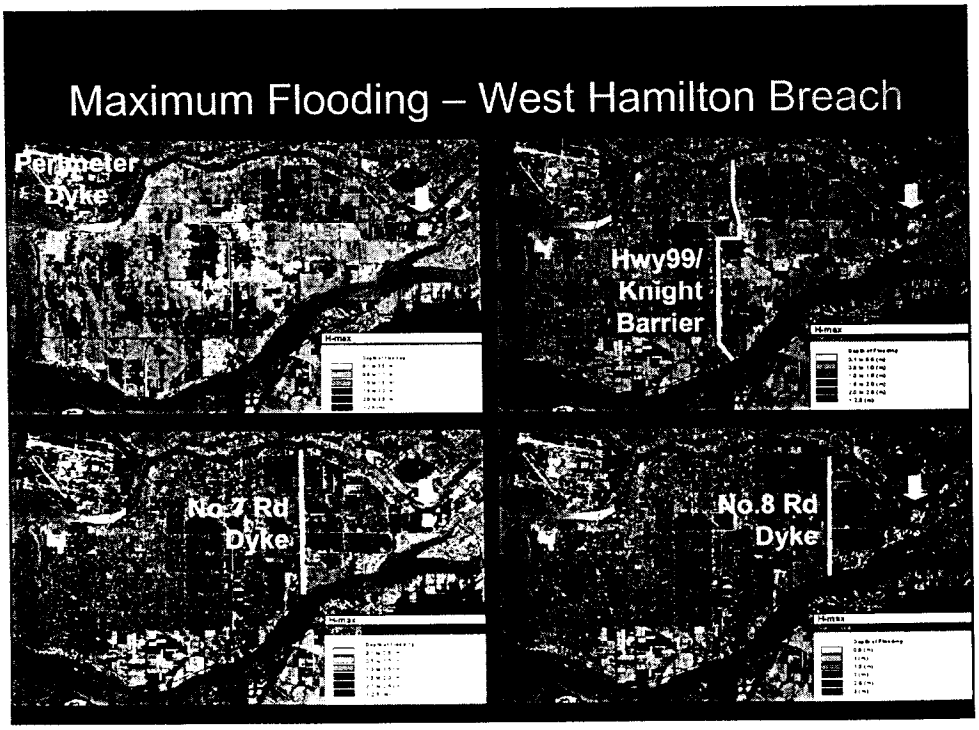


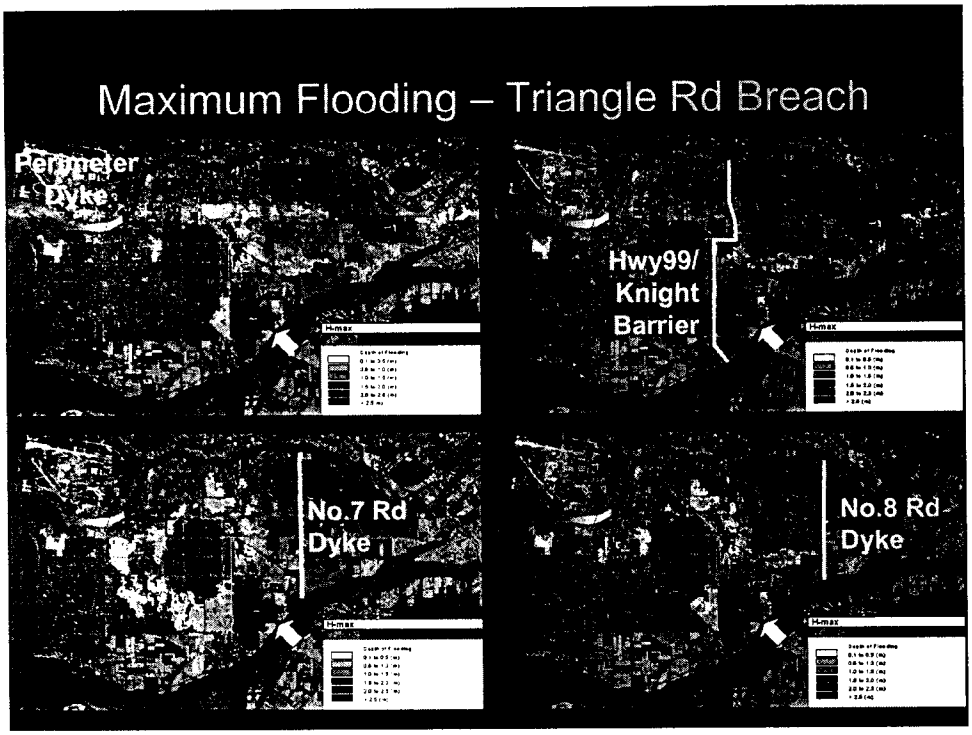
16

Maximum Flooding – No.1 Rd Breach



Maximum Flooding – West Hamilton Breach





Cost Summary

Dyke	Order of Magnitude Cost
Perimeter Dyke Improvements	TBD (review after vulnerability assessment – est. about $90 million for raising of dyke only – 48 km)
No. 8 Road	$15 million (5 km) + property
No. 7 Road	$20 million (6 km) + property
Highway 99/ Knight floodwall barrier	$15 million (7 km) (no property required)

Caveats:

- *No property costs included*
- *No mitigation considered*
- *Not based on geotechnical design of dykes*
- *Costs include 40 to 60% contingency*

20

Summary

- Internal dykes not effective for breach of perimeter dyke near north end No. 1 Road
- Internal dykes do minimize flood damage from dyke breaches in Hamilton area
- Strategy based on construction of internal dykes is dependent on location of dyke breach (minimizes damage in only part of community)
- Highway 99/Knight represents a most effective option

21

Preliminary Findings

- Continue with improvements to perimeter dyke (proceed to assess dyke vulnerability due to liquefaction and piping failures; complete geotechnical studies)
- Proceed with general cost/benefit and feasibility analysis of interior barrier (floodwall) to be situated along Highway 99/Knight Street Corridor

22

Elements of an Integrated Flood Management Strategy

- Legal Role
- Planning
- Research
- Partnerships
- Dredging
- Dyking
- Exempt areas
- Education / communication
- Building Standards
- Environmental measures
- Emergency planning & response
- Recovery Plans

23

Next Steps

- Report back to Committee / Council in mid 2004 with the final report and to receive further direction.

24