PW- 2014-038

To: Mayor and Members of Council

From: Public Works, Engineering and Enforcement

Date: 2014-07-08

Subject: Caledon East Flood Mitigation Study

RECOMMENDATION

That Report PW-2014-038 Caledon East Flood Mitigation Study be received, and;

That Option #4 - Flood Proofing (structure protection) contained within the Sanchez Engineering Report dated November 2013, be adopted as the preferred Town of Caledon solution for new development/re-development in the Village of Caledon East flood plain.

EXECUTIVE SUMMARY

In December 2013 Report 2013-054 The Caledon East Flood Mitigation Study was presented to Council. The report was deferred by Council to allow staff the time required to address issues raised by a Delegation to Council. This report addresses the concerns that were raised at the December Council meeting and in a subsequent meeting and follow-up correspondence with the Delegate.

In early 2012, the Town requested proposals from engineering consultants for the Caledon East Flood Mitigation Study. The Terms of Reference for this study required the Consultant to complete an analysis of the various flood mitigation options available that would permit the intensification of the core commercial area in Caledon East through the reduction, and if possible, the elimination of the restrictions imposed by the Caledon East Flood plain. Town staff selected Sanchez Engineering Inc. as the consultant to undertake this study.

The objectives of the study were to provide viable and affordable options that would allow for intensified commercial development in the Caledon East core commercial area by mitigating flooding in the areas that have historically been affected by flooding. Mapping showing the core area of Caledon East and the Study Area is attached as Schedule A.

The scope of work included

1. an analysis of the various flood events from a 2-Year Storm event up to and including a Regional Storm event;
2. an analysis of the various flood mitigation options that would permit intensification of the commercial core area in the existing flood plain; and
3. an estimate of the cost associated with implementing the various mitigation options.

The study identified six (6) potential options, of which flood proofing of existing buildings, (Option #4 – Structure Protection) was recommended by the Consultant due to it being the option that was economically viable, and the least intrusive to the natural

environment. Schedule B, attached, shows the buildings for which flood proofing is being recommended.

It is staff's recommendation that Option #4 Flood Proofing of existing structures as presented in the Sanchez report be adopted as the preferred Town solution for dealing with flooding in the Caledon East.

DISCUSSION

Background

Flooding has long been an issue in Caledon East, with the first report being completed in 1968 by James F. MacLaren, entitled "Report on Flood Control in the Village of Caledon East". This report was prepared for the Metropolitan Toronto and Region Conservation Authority, now called the Toronto Region Conservation Authority, (TRCA).

In 1994, KMK Consultants completed a storm drainage report on behalf of the Town of Caledon and the Region of Peel. This report outlined methods to upgrade roads and to alleviate drainage problems caused by road drainage being allowed to drain across private property. The construction of this project coincided with the Region of Peel's sanitary servicing project in Caledon East.

In March 2003, Aquafor Beech completed an additional study for the TRCA entitled " Caledon East Flood Study Humber River Watershed". This report examined flooding issues, identified affected structures, reviewed the existing drainage system, and completed flood line mapping of the area. The Aquafor Beech report outlined preliminary options for flood control, but did not undertake the preliminary design and/or analysis of any flood mitigation measures.

On 3 September 2004, the TRCA attended a Town Council meeting to discuss the Aquafor Beech study and to discuss potential options to mitigate flooding within the commercial core area of Caledon East. At that meeting, Council expressed concern that flooding in the commercial core makes it difficult for the Town to promote new development and re-development opportunities in Caledon East. At that time TRCA staff provided an overview of the findings of their study, but indicated that the detailed analysis, feasibility, and design of flood mitigation measures were beyond the scope of this study.

After the TRCA Council presentation, Town staff met with the Local and Regional Councilors, TRCA staff and some of the business owners in Caledon East to discuss the flooding issues and its impact on development. At that meeting, the TRCA indicated that a comprehensive plan was needed to address flooding in the downtown core and to avoid upstream impacts or worsening of the flooding from Centreville Creek.

In February 2012, the Town requested proposals from Consulting Engineering firms for the Caledon East Flood Mitigation Study. Of those submitted Sanchez Engineering was selected and a contract was entered into in March 2012.

The work program undertaken by the consultant was as follows:

- Background Data review, which entailed reviewing data provided by the Town and design drawings of Airport Road provided by the Region of Peel
- A detailed survey based on geodetic benchmark was completed, which allowed for accurate delineation of the flood lines

- All culvert structures were identified and the inverts, size and location were entered into the computer model database which was used in determining the flood lines
- The natural environment was also examined to determine whether there were any aspects that would require special precautions and consideration
- From the computer models that were analyzed the flood lines were delineated
- Cost of flood damages were calculated using the MNR standard flood damage curves and updated using the construction cost index
- Develop alternative flood remedial measures
- Calculate flood damage reduction
- Calculate economic benefits
- Evaluate alternatives
- Prepare conceptual design

The Sanchez report undertakes the preliminary design and analysis of flood mitigation measures.

Several Status Reports were submitted by Sanchez in 2012 and a draft final report was provided for review in June 2013.

The TRCA being the Town's technical advisors were involved from the onset and provided their review and approval of the Sanchez report in August 2013.

As a first step, the Sanchez report re-examined recommendations for the reduction of flooding that were included in the 2003 Aquafor Beech Report. It was determined that for the most part the recommendations would be relatively ineffective in reducing the flood levels, too costly, or would result in significant environmental damage.

The Sanchez Study also looked at Flood Damages. The results from the existing flood plain mapping in conjunction with the Flood Damage Estimation Guide, Ministry of Natural Resources, 1989 were used to determine the potential flood damages caused by each of the individual storm events. The calculation of flood damages included damages to structures and their contents, landscaping, public damage and indirect damage. Public damage includes damage to public infrastructure, such as bridges, roads and utilities. Indirect damage includes loss of business, flood protection, clean up etc. The Sanchez Report has concluded that the "Average Annual Expected Flood Damage" was estimated to be $494,000.

The Sanchez Report also noted that the calculated flood damages do not appear to be congruent with the current actual experience of flooding in Caledon East. This is accepted but again the calculation was an average – one heavy flooding can make up for many years of no losses. The report went on to say that the flood damages reflect the future land uses in the watershed.

The Sanchez report identified six (6) possible flood mitigation options for Caledon East, these included:

1. Option 1 - Interceptor sewers, which would intercept flows in Allison Creek and Walker Road East catchment to convey the flows to Centreville Creek
2. Option 2 - Flood control berms be constructed parallel to Centreville Creek to prevent the Regional Storm flood backwater from affecting the area north of Centreville Creek
3. Option 3 - Combining option 1 and 2

4. Option 4 - Flood proofing existing buildings to prevent inflow to the buildings and to protect the building from damage by flood waters. In order to protect property, imported fill would be placed to raise the grade of the property above the Regional Storm water levels
5. Option 5 - Centreville Creek channelization, which would lower the creek channel and flood plain to reduce the backwater effect
6. Option 6 - Upstream storage, which would require the construction of a facility north of Walkers Road to reduce peak flows through the study area.

Option #1 - Interceptor Sewers

This option would involve the construction of two separate large underground sewers with the capacity to convey the flood waters from a Regional Storm from Walkers Road to Centreville Creek and thereby by-passing the core area of Caledon East. These sewers reduce the flooding from Allison Creek and the Walker Road East catchment, but would not alleviate the backwater from Centreville Creek.

The cost of construction of the sewers plus all related costs was estimated to be in the range of $13,400,000. This option has a pay-back period of 27 years.

As a result this option was not examined any further.

Option #2 – Flood Control Berms

This option requires the construction of Flood Control Berms along Centreville Creek. This option resolves the flooding caused by Centreville Creek, but does not address the flooding caused by Allison Creek or the Walker Road East catchment.

The cost of construction of these berms plus all related costs was estimated to be in the range of $580,000. These berms would also cause extensive environmental damage.

As a result this option was not examined any further.

Option #3 – Combination of Option 1 & 2

This option is a combination of Option 1 & 2 above. The combination of the sewers and berms addresses the flooding from Centreville Creek, Allison Creek and the Walker Road catchment area.

The estimated cost of construction is $14,000,000. Based on the average annual expected flood damages of $494,000, this capital outlay has an estimated pay-back period of 28.3 years and as such is not supportable.

As a result this option was not examined any further.

Option 4 – Structure and Property Protection

Option #4A – Structure Protection

Flood proofing of buildings is effective in removing commercial flood damages up to and including the Regional Storm.

The cost of this alternative is $1,900,000 and as it involves retrofitting buildings, this would be at the cost of the owner. A total of eight buildings were identified as requiring flood proofing and are shown in Schedule B. The report identified the need to construct

water tight foundations and exteriors, openings will be fitted with either water tight doors or windows and structure drainage (foundation drains and sanitary hook-ups) will be protected against backwater flooding.

This portion of Option #4 requires further examination.

Option # 4B (Property Protection)

Ideally new buildings will use imported fill to raise buildings above the Regional Flood Plain and they will be constructed on shallow slabs without basements. The rules used by the MNR and other Agencies to determine if flood waters are hazardous to pedestrians or general parking, or site uses consists of a maximum depth of 0.8m, a maximum velocity of 1.7 m/sec or the product of these two not exceeding 0.37 m^2/sec. Emergency access requirements only allow for a maximum depth of 0.3m.

The flood proofing of property requires the importation of fill, which will result in increased water levels in upstream reaches of Allison Creek and will increase the flow velocities at Airport Road. In addition, all work within the Conservation Authorities Regulated Area would require a permit in accordance with Ontario Regulations.

This portion of the flood proofing Option #4 was not examined any further.

Option #5 – Channelization of Centreville Creek

This option proposes the channelization of Centreville Creek. This option is only effective in removing flooding from Centreville Creek and undertaking such work would result in significant environmental damage to the creek corridor. This would require a separate Environmental Assessment and would probably meet with considerable opposition.

As a result, Option #5 was not examined any further.

Option #6 – Construct New facility North of Walker Road

This option proposes the construction of a new facility north of Walker Road. This option would not address the flooding from Centreville Creek, and would result in extensive environmental damage.

As a result, Option #6 was not examined any further.

Conclusions/Recommendations

The flood proofing of buildings, Option #4A, does not eliminate the flooding caused by Centreville Creek, Allison Creek and the Walker Road East catchment area, but it does eliminate the commercial damage caused by the flooding, and would cost approximately $1,900,000. The result of flood damage reduction and other economic benefits is estimated to be in an amount of $5,100,000. This alternative may be implemented without the need of an Environmental Assessment but will require permits from the TRCA as this area is within the TRCA's regulated area.

It must be noted that the TRCA has indicated that if any filling within the flood plain is being proposed, a flood study will be required to demonstrate that the proposed fill will have no impacts and not increase flood levels off site. For buildings within the floodplain, additions to the building would require fill and by default a flood study would be required.

Prior to the expenditure of funds to flood proof an existing building, the property owner should ensure that their property meets the MNR guidelines with respect to depth and velocity for pedestrian and emergency access. This was one of the concerns raised by the delegation in December 2013. With respect to this issue, we have been in contact with the consultant and Conservation Authority, and we have been informed that the methodology and analysis undertaken by the consultant is correct.

Subsequent to the submission of the original report, new information has been obtained which could aid in reducing costs to the landowners for the flood proofing of existing buildings. The report indicated that water tight doors and windows are to be installed in building openings. An alternative would be the installation of metal plates in water tight slots that are permanently attached to the door or window frame. These plates are easily installed or removed, can vary in height and have a proven track record.

For those owners whose structures have basements, they should contact the Region of Peel to see if they qualify for the rebate program as identified in the report to Region Council in April 2014. For further information on the "Backwater Valve Subsidy Program" owners need to contact the Region of Peel at 905-791-7800 extension 4409.

A brief overview of the properties along Airport Road that are affected by the Regional flood lines and the steps that need to be taken to protect these buildings and the information that would be required for any re-development applications is attached as Schedule C to this report. This information will be retained against these properties in AMANDA for planning staff use as re-development applications are submitted to the Town for review and approval.

Financial Implications

There are no immediate financial implications to the Town of Caledon. The options and recommended improvements in this report relate to private property so the costs will be borne by the individual property owners.

Applicable Legislation and Requirements

MNR and TRCA Regulations

COMMUNITY BASED STRATEGIC PLAN

Strategic Objective 1A-partner with Land Owners to Protect Natural Resources and Agriculture.

NEXT STEPS

To meet with the landowners to discuss the report and implications for re-development.

ATTACHMENTS

Schedule A – Mapping of Caledon East and Study Area
Schedule B – Structures Requiring Flood Proofing

Prepared by: Geoff Hebbert

Approver (L1): David Loveridge

Approver (L2): Carey deGorter

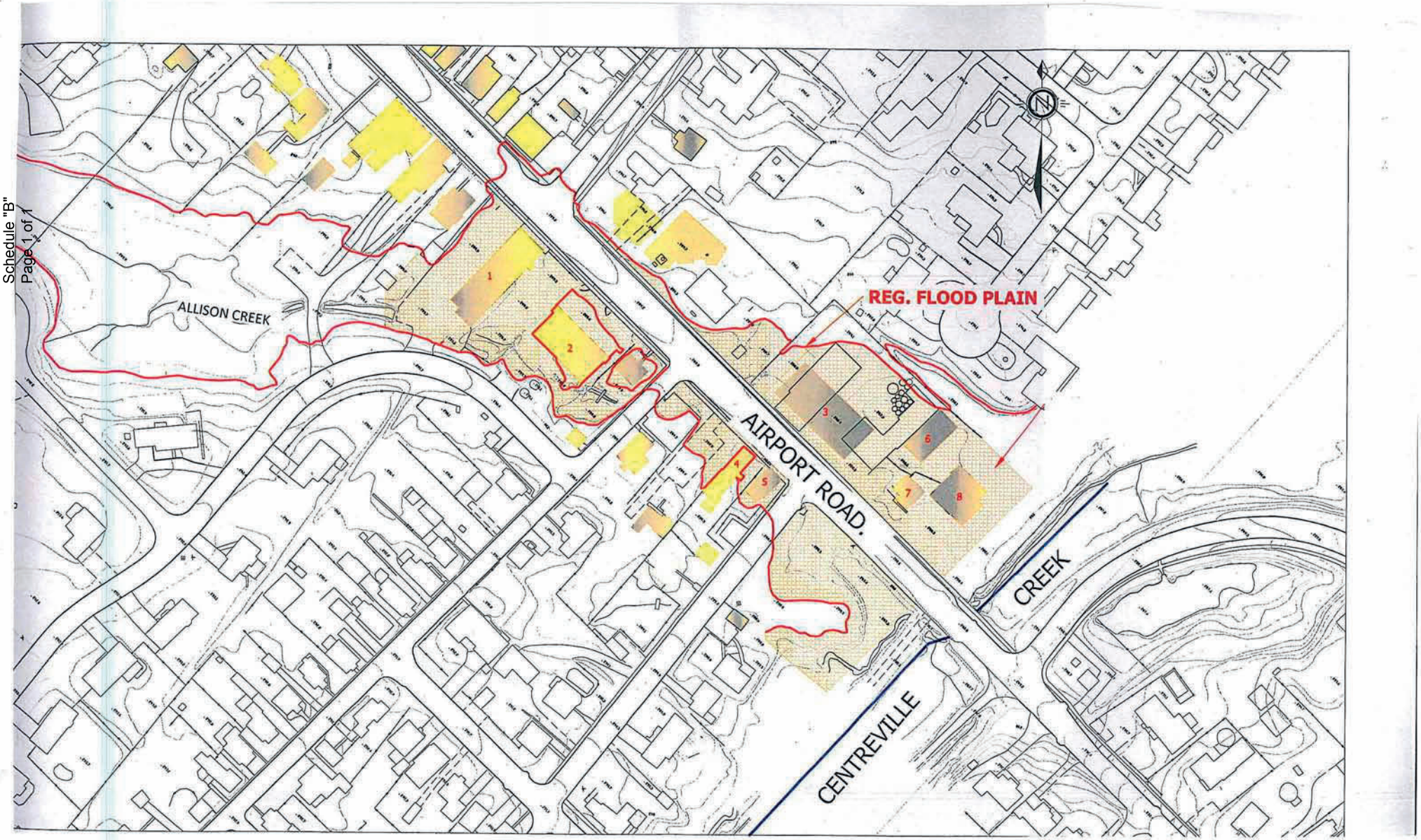
Approver (L3) Douglas Barnes

Approver (L4):

Approver (L5):

SANCHEZ ENGINEERING INC.

PROJECT: CALEDON EAST FLOOD MITIGATION STUDY		DATE: NOVEMBER 2013	
TITLE: SCHEDULE A		SCALE: N.T.S.	FIG. NO.: 1


ALLISON CREEK
REG. FLOOD PLAIN
AIRPORT ROAD
CREEK
CENTREVILLE
1
2
3
4
5
6
7
8

SCHEDULE B

Schedule C
to PW 2014-38
Dated 24 June 2014

Caledon East Flood Study – Structure and Property Protection Information

The following is a brief summary of the properties along Airport Road that are affected by the Regional flood lines and the steps that need to be taken to protect buildings and the information required by the Town of Caledon for any re-development applications in the Caledon east Flood Plain.

Property #	Location	Property Information
1	Vacant property west of Airport Road adjacent to Centreville Creek	Maximum Regional flood line is 288.78m. Ground elevation ranges from 287.25m to 288.11m. Development may not be possible as significant amounts of fill would be required which would affect water levels off site.
2	Vacant properties south of Emma Street	Maximum Regional flood line is 288.78m. Ground elevations range from 288.4m to 288.9m. Re-development application would require the submission of a grading/servicing plan showing buildings and access outside the Regional flood line. General parking and site uses need to meet MNR Regulations. Building openings, such as doors and windows, restricted to an elevation of 0.3m above the Regional flood line. Sanitary service connections should be fitted with back flow preventers.
3	East side, at 15935 Airport Road, buildings identified as 6, 7, & 8 in the Sanchez Report	Regional flood line is 288.78m. Centre line of Airport Road is 288.38m. Ground elevation at building is at 288.54m. Access is from Airport Road, depth of flooding is approximately 0.4m, which may exceed MNR emergency access requirements. For re-development to occur a more detailed site grading/servicing plan would be required including elevations on Airport Road in front of the property. General parking and site uses need to meet MNR Regulations. Building openings such as doors and windows restricted to an elevation 0.3m above the Regional Flood Line. Sanitary service connections should be fitted with back flow preventers.

4	East side, at 15955 Airport Road, building identified as # 3 in the Sanchez Report	Regional flood line is approximately 289.0m. Centre line of Airport Road is 288.50m. Ground elevation at building is 288.55m to 288.4m. Access is from Airport Road and depth of flooding is approximately 0.5m which would exceed MNR emergency access requirements. For re-development to occur a more detailed site grading/servicing plan would be required including elevations on Airport Road at the front of the property. General parking and site uses need to meet MNR Regulations. Building openings such as doors and windows restricted to an elevation 0.3m above the Regional Flood Line. Sanitary service connections should be fitted with back flow preventers.
5	Property 5 - West side at 15954 Airport Road, building identified as # 5 in the Sanchez Report, and is at the corner of Emma and Airport Road	Regional flood line is approximately 289.0m, centre line Airport Road around 288.5m. Access to parking is from Emma Street which is outside flood plain. For re-development to occur a more detailed site grading/servicing plan would be required, including elevations on Airport Road and Emma Street adjacent to the property. General parking and site uses need to meet MNR Regulations. Building openings such as doors and windows restricted to an elevation 0.3m above the Regional flood line. Sanitary service connections should be fitted with back flow preventers.
6	West side at 15958 Airport Road, identified as building #4 in the Sanchez Report has access from Airport Road	Regional flood line is 289.06m. Centre line of Airport Road is around 288.5m. Access to building is from Airport Road and depth of flooding is approximately 0.5m, which would exceed MNR emergency access requirements. For re-development to occur a more detailed site grading/servicing plan would be required including elevations on Airport Road in front of the property. Building openings such as doors and windows restricted to an elevation 0.3m above the Regional flood line. Sanitary service connections should be fitted with back flow preventers.

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7	West side at 15964 Airport Road has access from Airport Road	The existing building is outside the Regional flood line, which is at an elevation of 289.0m. Elevation of Airport Road is around 288.5m, which results in a flood depth of 0.5m, which exceeds MNR emergency access requirements. For re-development to occur a more detailed site grading/servicing plan would be required, including elevations on Airport Road in front of the property. Building openings, such as doors and windows restricted to an elevation 0.3m above the Regional flood line. Sanitary service connections should be fitted with back flow preventers.
8	West side at 15968 Airport Road	Access is from Parsons Avenue, which is outside the Regional flood line, which is 289.0m. Building is also outside Regional flood line. The existing parking area straddles flood line with a depth less than 0.8m. Any re-development application will require access from Parsons Avenue with openings in the building above 289.3m. Sanitary service connections should be fitted with back flow preventers.
9	East side at 15977 Airport Road	The existing building is outside the Regional flood line which is at elevation 289.36m. It is recommended any openings be protected to an elevation of 289.66m. Access is from Airport Road, elevation of Airport Road is around 288.95m and the flood line is around 289.36m. Emergency access depth of 0.41m exceeds MNR requirements. Any re-development application needs to be accompanied by a grading/servicing plan showing entire property and include Airport Road. Sanitary service connections should be fitted with back flow preventers.
10	West side at 15976 Airport Road, N.W. corner of Parsons	Building is outside Regional flood line; however access is from the rear via Ivan and crossing of creek. Re-development would probably not be supported. Flood proofing of building to 289.66m is recommended. Sanitary service connections should be fitted with back flow preventers.

11	West side at 15980 Airport Road, identified as building #2 in the Sanchez Report	A small portion of building is within the Regional flood line, which is at an elevation of 289.36m. It is recommended flood proofing of the building be to an elevation of 289.66m. Access is from Airport Road and Ivan Avenue. Flood line around 289.36m, centre line of Airport around 288.95m. Depth of water is around 0.41m, which exceeds MNR requirements. Access from Ivan Avenue to the rear, which is 290.45m, is outside the flood line. Any redevelopment application should show openings protected to an elevation of 289.66m and access should be from Ivan Avenue. Sanitary service connections should be fitted with back flow preventers.
12	East side at 15995 Airport Road	Access is from Old Church Road. Both building and parking are outside flood plain. The flood line is around 289.9m so any openings should be above 290.2m, with access from Old Church Road. There are no restrictions to re-development
13	16000 Airport Road, identified as building #1 in the Sanchez Report	Regional flood line is around 289.9m, building needs to be flood proofed with openings above an elevation of 290.2m. Access to the property is from both Ivan and Airport Road. Centre line elevation of Airport Road is at 289.64m, with the flood line at 289.9m. The flood depth of 0.26m meets MNR emergency access requirements. As the parking lot between Ivan and Airport Road is an overland flow route, a flood study will be required as part of any re-development application.
14	Proposed building is outside flood plain.	Access is from Ivan, crossing creek. Applicant is doing their own study.
15	Other properties	For those properties on the east side of Airport Road, north of Old Church Road, the buildings and access are outside the Regional flood line. It is recommended that any openings be above an elevation of 290.34m. Sanitary service connections should be fitted with back flow preventers.