



WATER ON THE RISE: PROTECTING CANADIAN HOMES FROM THE GROWING THREAT OF FLOODING

EXECUTIVE SUMMARY

CHERYL EVANS AND DR. BLAIR FELTMATE | INTACT CENTRE ON CLIMATE ADAPTATION | APRIL 2019

GENEROUSLY SUPPORTED BY:





ABOUT THE INTACT CENTRE ON CLIMATE ADAPTATION

The Intact Centre on Climate Adaptation (Intact Centre) is an applied research centre at the University of Waterloo. The Intact Centre was founded in 2015 with a gift from Intact Financial Corporation, Canada's largest property and casualty insurer. The Intact Centre helps homeowners, communities and businesses to identify and reduce risks associated with climate change and extreme weather events.

ABOUT THE UNIVERSITY OF WATERLOO

University of Waterloo is Canada's top innovation university. With more than 36,000 students, the university is home to the world's largest co-operative education system of its kind. The university's unmatched entrepreneurial culture combined with an intensive focus on research powers one of the top innovation hubs in the world.

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Intact Financial Corporation (TSX: IFC) is the largest provider of property and casualty (P&C) insurance in Canada and a leading provider of specialty insurance in North America, with over \$10 billion in total annual premiums. Supported by approximately 14,000 employees, the Company serves more than five million personal, business and public sector clients through offices in Canada and the U.S.

ABOUT THE ONTARIO MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS

Ontario's Ministry of the Environment, Conservation and Parks is responsible for protecting clean air, land and water, species at risk and their habitat, building community resilience to help tackle climate change and managing Ontario's parks and conservation reserves for present and future generations of Ontarians. This project received funding support from the Government of Ontario. Such support does not indicate endorsement of the contents by the Province.

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Insurance Bureau of Canada (IBC) is the national industry association representing Canada's private home, auto and business insurers. Its member companies make up 90% of the property and casualty (P&C) insurance market in Canada. For more than 50 years, IBC has worked with governments across the country to help make affordable home, auto and business insurance available for all Canadians.

ABOUT THE CITY OF BURLINGTON

The City of Burlington is in the Regional Municipality of Halton, Ontario. With a population of 183,314 (2016 Census), the City of Burlington is located at the northwestern end of Lake Ontario.

ABOUT THE CITY OF TORONTO

The City of Toronto is the capital city of Ontario and also the largest city in Canada. With a population of 2,731,000 people, the City of Toronto is located along the northeastern shore of Lake Ontario.

ABOUT AET GROUP

AET Group is an employee-owned multi-disciplinary environmental consulting, auditing and scientific services company that has been serving Canadians since 1998. With over 1,000 projects completed in Ontario and across Canada, AET offers extensive experience, capabilities and a proven track record. AET Group was contracted by the University of Waterloo to provide delivery of the Home Flood Protection Program assessments.

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CITATION

Evans, C., Feltmate B. 2019. Water on the Rise: Protecting Canadian Homes from the Growing Threat of Flooding, Executive Summary. Intact Centre on Climate Adaptation, University of Waterloo.

EXECUTIVE SUMMARY

Residential basement flooding is on the rise across much of Canada. Intense rainfall events combined with aging infrastructure, increased urbanization, loss of natural infrastructure, and a lack of flood protection measures at the household level have resulted in losses in the billions of dollars for the country's insurance companies, governments, homeowners, landlords and tenants over the past decade. **With an average price tag of \$43,000 per flooded basement (Insurance Bureau of Canada, 2018), Canadian residents are increasingly seeking site-specific guidance to help them achieve practical, cost-effective means to reduce their household flood risk.**

From 2016 to 2018, the Intact Centre on Climate Adaptation (University of Waterloo) developed and tested the Home Flood Protection Program (HFPP), which is an initiative designed to provide homeowners with practical information necessary to identify and limit their risk of basement flooding.

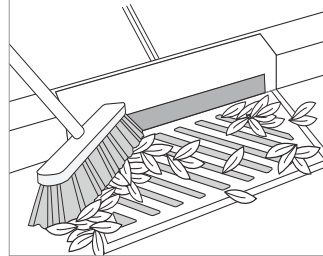
A key lesson learned from the program was that there are 10 top actions that can be completed to significantly reduce the risk of basement flooding for most homes. **Many of these actions can be completed by residents themselves in less than 1 day, for under \$250.** Unfortunately, many residents are not completing these actions. Program results indicate that direct conversations, between homeowners and those trained in flood risk mitigation, are the most effective means to motivate residents to take action to reduce flood risk at the household level.

For sample program testimonials please see page 9. For a concise summary of report findings please see the infographic on page 11.

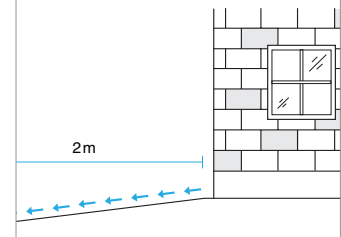
TOP TEN ACTIONS TO REDUCE BASEMENT FLOOD RISK

Intact Centre, 2018

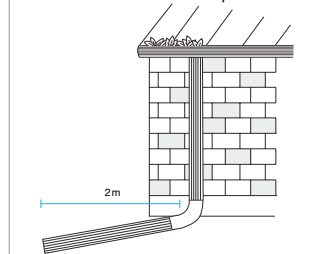
Remove Debris from Nearest Storm Drain



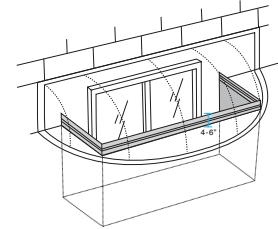
Correct Grading around Foundation



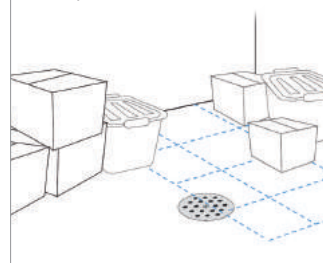
Clean Eaves Troughs & Extend Downspouts



Install Window Wells & Covers



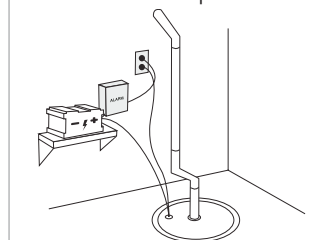
Keep Floor Drains Clear



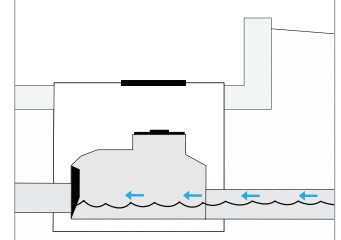
Store Valuables in Watertight Containers



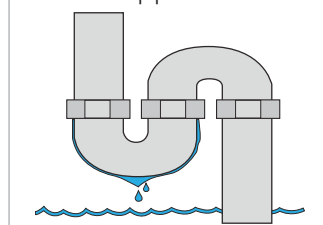
Test Sump Pump & Install Backup Power



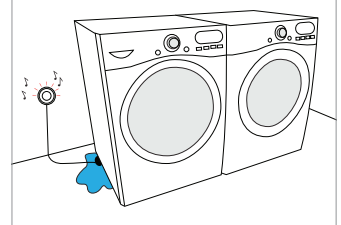
Install & Maintain Backwater Valve



Repair or Replace Deteriorating Pipes & Appliances



Install & Maintain Flood Alarms



Program Delivery

The Home Flood Protection Program was piloted in Toronto and Burlington, Ontario, as well as in Saskatoon, Saskatchewan (2016-2018). The HFPP delivery in each community included the following key elements:

- 1. Free Online Resources:** Home flood protection fact sheets and video links were provided through the program's webpage www.homefloodprotect.ca. Additional local resources were included for participating communities, featuring local flood protection subsidy program information and tips for selecting local flood risk mitigation contractors.
- 2. Home Flood Protection Assessment:** A confidential, onsite, 60-90 minute flood risk assessment service was made available to owners of detached homes, semi-detached homes and townhomes. The service featured an easy-to-read summary report and an optional 15-minute follow-up conversation with the assessor. Depending on the resources available within each pilot community, the assessment was available to residents for a fee ranging from \$0 to \$125.
- 3. Customized Outreach Strategy:** A unique outreach strategy was developed for each community based on its flood

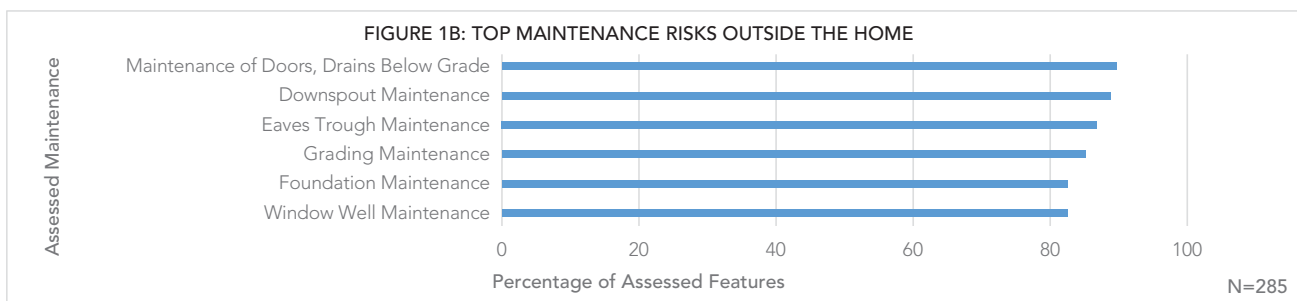
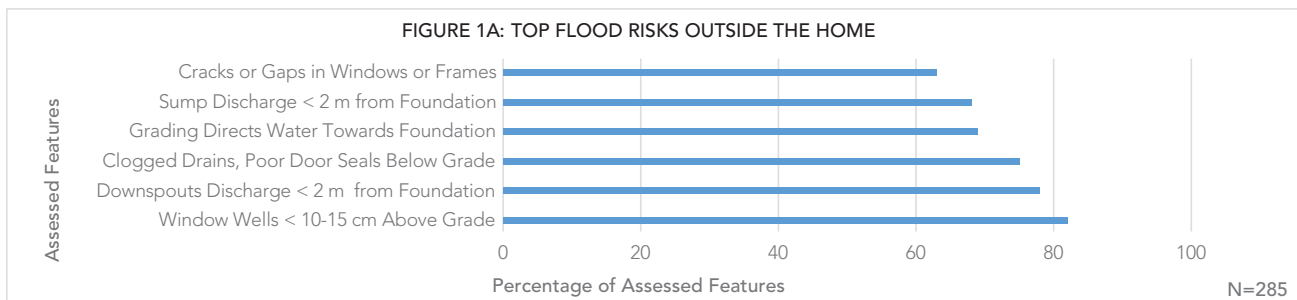
risk reduction goals, project timelines and the resources available. Program planning and promotions were developed in collaboration with local municipalities, conservation authorities, community groups and insurance providers to complement and enhance ongoing flood risk reduction efforts.

Program Results

A total of 510 HFPP assessments were completed. Ten flood risk assessors were trained in Ontario, delivering 397 flood risk assessments in 2017 and 2018. Fueled by the success of the Ontario program, an additional two assessors were trained in Saskatoon, Saskatchewan, delivering 113 assessments in 2018.

In Ontario, 72% of program participants participated in a Home Flood Protection follow-up study. Its purpose was to determine the degree to which homeowners took action to limit flood risk based on information they received during their Home Flood Protection Assessment. Ninety-one participants completed a three-month follow-up survey and 24 participants completed a six-month follow-up survey. The flood risk data featured in this report summarizes the results of these assessment reports and follow-up surveys.

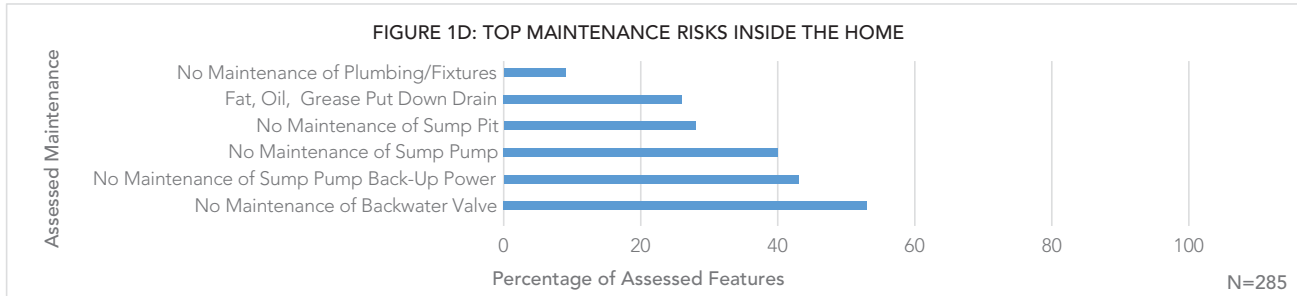
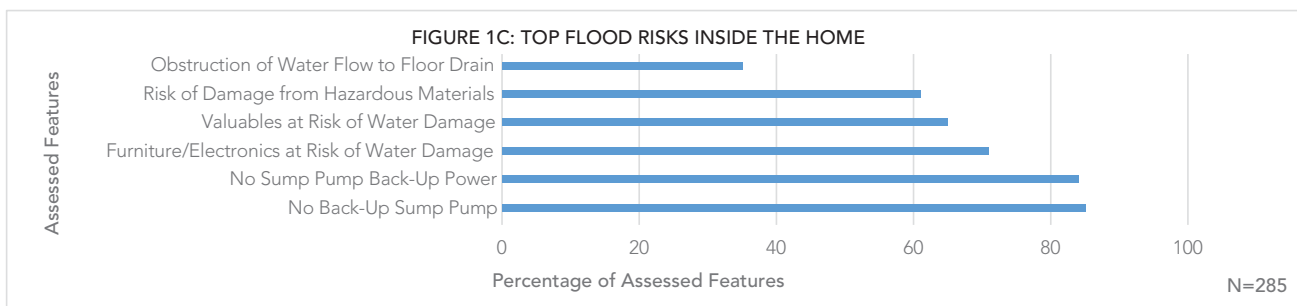
FLOOD RISKS OUTSIDE THE HOME



Flood Risks Outside the Home

Visual assessment of the lot grading, landscaping and exterior characteristics of participating Ontario homes revealed several key flood protection features that consistently did not meet best practice standards for reducing risk. These deficiencies increased the risk of overland and seepage flooding into the basement. **Eighty-two percent of homes with window wells had wells that were not 10-15cm above the surface of the ground and sealed at the foundation. Seventy-eight percent of homes with downspouts and 68% of homes with sump pump discharge pipes discharged water less than 2m from the home's foundation.** Seventy-five percent of homes with doors below grade had drains and door seals in poor condition. Sixty-nine percent of homes had grading that did not direct water away from the foundation and 63% of homes with basement windows had cracks and gaps in the windows or frames (Figure 1A). When asked to report on maintenance efforts to limit flood risk outside of the home, residents stated that they were acting with commendable effort – however, such reporting stood in contrast to on-the-ground observations (Figure 1B).

FLOOD RISKS INSIDE THE HOME

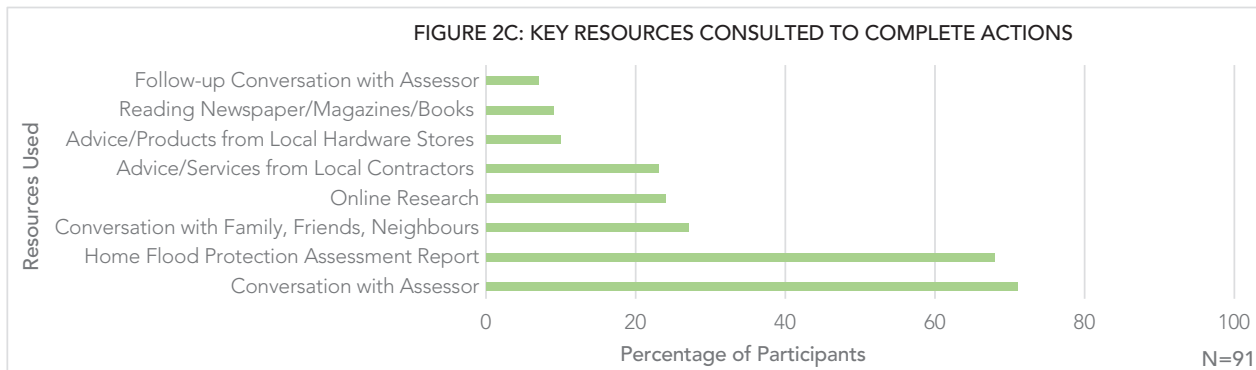
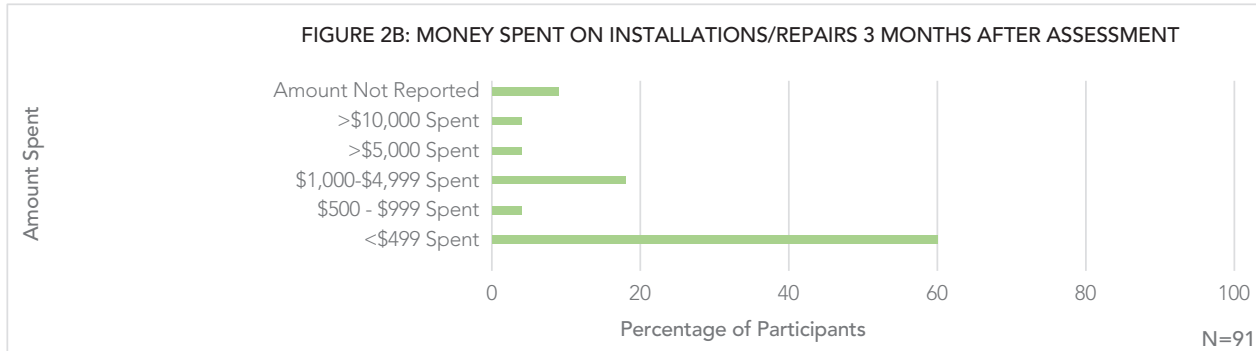
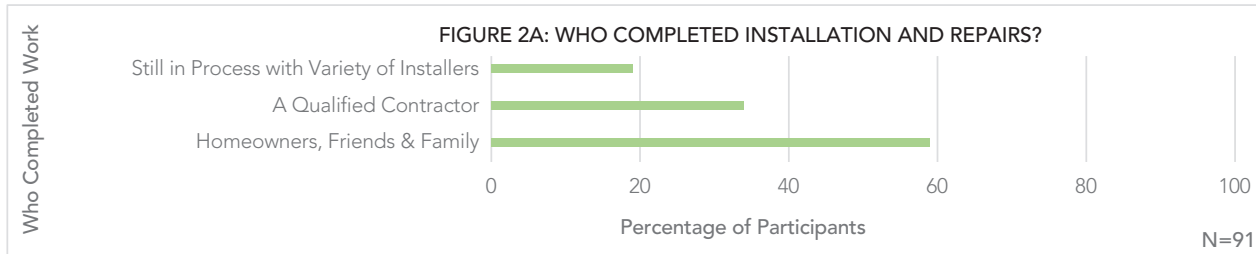


Flood Risks Inside the Home

Visual assessment of basements revealed several key flood protection features that did not meet best practice standards for reducing risk. These deficiencies put homes at increased risk of sump pit overflow, sewer backup and damage to the basement's structure and contents. **Eighty-five percent of homes with sump pumps did not have a back-up sump pump and 84% did not have backup power in case of a power outage. Seventy-one percent of homes had furniture and electronics and 65% had stored valuables at risk of water damage during a flood.** Sixty-one percent had improperly stored hazardous materials (e.g. paints, pesticides) that may increase damage during a flood (Figure 1C).

Several key maintenance activities that were not completed twice a year put homes at increased risk of sump pit overflow and sewer backup. **Fifty-three percent of homes with backwater valves never maintained them, 43% of homes with backup power for their sump pump never maintained the system, 40% with sump pumps never maintained them, and 26% of homes put fat, oil or grease down their drains** (Figure 1D).

INSTALLATION AND REPAIRS COMPLETED TO REDUCE FLOOD RISK



Actions Taken to Reduce Flood Risk

Each home flood risk assessment report featured a summary of the top actions that could be taken “outside” and “inside” the home to reduce risk. These summaries identified physical features and maintenance practices that ranked as “poor/needs further investigation.” Study participants were asked to report at 3 months and 6 months to identify which actions they had taken to address any of these top ranked deficiencies. **At 3 months, 79% of participants noted completing at least one new action to address flood risk, and at 6 months, 71% of participants noted completing at least one additional action.** As part of the 3-month follow-up survey, 59% of participants noted that they had completed the actions themselves or with the help of family and friends, 34% noted that the actions had been completed by a contractor, and 19% stated that actions were still in the process of being completed (Figure 2A).

Sixty percent of participants completed actions that cost under \$500 and could be completed by a “handy-person” homeowner generally within a day. Examples of these actions include: storing valuables in waterproof containers or removing them from the basement, cleaning out eaves troughs, installing window well covers, and extending downspouts and sump pump discharge pipes to a minimum of 2m away from the foundation. Forty percent of participants completed actions that were more complex, costly and often required the support of qualified contractors. The cost of completing these actions ranged widely from \$500 to over \$10,000 (Figure 2B). Some of these actions included installing a backwater valve, backup sump pump or backup battery, relining or replacing a sewer lateral, installing a sewer lateral cleanout, replacing basement windows, replacing eaves troughs, replacing a driveway and installing window wells.

Key Information Resources Cited

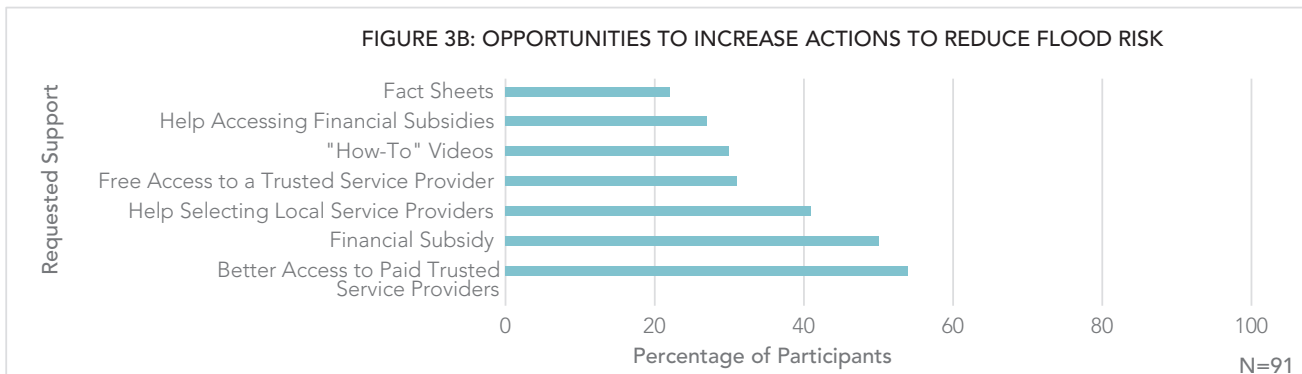
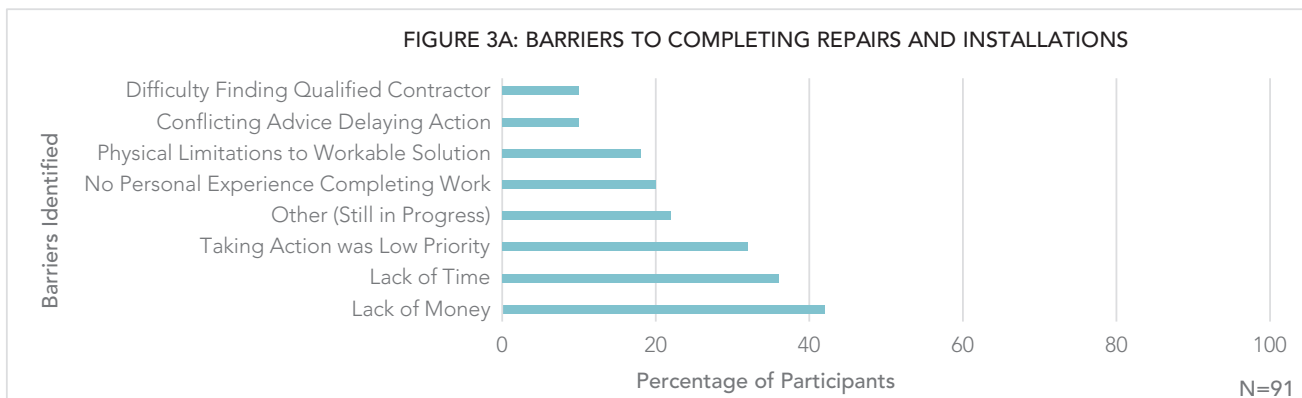
Participants used various resources to support their decision-making and to help them complete flood risk reduction actions. The powerful influence of one-on-one conversations with trusted flood risk mitigation experts stands out as significant. Seventy-one percent of participants cited conversations with their Home Flood Protection Assessors and 68% cited their assessment report (which is a written record of the conversation with the assessor) as key resources used. Twenty-seven percent cited the importance of conversations with family, friends and neighbours, 23% cited conversations with local contractors and 10% cited advice from staff at local hardware stores as key decision-making sources of information. Participants also noted referring to educational materials they found online (24%), and in newspapers, books and magazines (9%) (Figure 2C).

Barriers to Taking Action to Reduce Flood Risk

The main barriers that homeowners identified to taking action can be divided

into two main categories: barriers for those who wished to engage a contractor to do the work and barriers for those who wished to complete the work themselves. For those wishing to engage a contractor, 42% of surveyed participants noted that a lack of money was a barrier to action, 36% noted that there was a lack of time (many noted they were still waiting for a contractor to complete the work) and 10% noted difficulty finding a qualified contractor. For those wishing to complete the work themselves, a lack of personal expertise (20%), and physical limitations on their properties to finding a workable solution (such as wanting to extend the downspout but realizing it would present a tripping hazard (18%)) were noted barriers. Additional top ranked barriers related to the perceived lack of urgency for completing the work. For example, 32% noted that taking action was a low priority. A total of 12% of participants noted that they received conflicting advice from various sources about how to tackle a problem, and therefore their project stalled (Figure 3A).

BARRIERS AND OPPORTUNITIES TO INCREASE ACTIONS TO PROTECT BASEMENTS FROM FLOODING





Flood Risk Assessor Blake Roger engages homeowner Jonathan Scott in a flood risk reduction problem-solving conversation. Oakville, 2017

Opportunities to Increase Uptake of Flood Protection Actions by Residents

Participants identified that they would like increased access to financial support, improved access to qualified contractors and increased access to trustworthy, third-party information resources to help improve their ability to protect their homes from flooding.

• Increased Access to Financial Support

Fifty percent of participants stated they would like a financial subsidy to help them complete flood risk reduction projects, 31% noted that they would like financial support to get access to qualified contractors for free, and 27% noted that they would like help accessing available subsidies (Figure 3B).

Participants support the provision of municipal flood protection subsidies, including subsidies to complete flood risk assessments. **They also recommend a streamlined process for accessing subsidies such as instant rebates at retail stores for items such as downspout extensions and sump pump backup systems to simplify the process of accessing subsidies and to increase uptake.** Participants are also in favour of receiving insurance discounts for taking action to reduce flood risk.

• Increased Access to Qualified Contractors

Fifty-four percent of participants noted that they would like increased access to trusted service providers and 41% noted that they would like help selecting qualified contractors (Figure 3B).

Presently residents are experiencing challenges finding qualified contractors who can do flood protection work for them in a timely manner. Many participants noted long delays waiting for contractors and difficulties getting contractors to respond to requests for smaller jobs that they needed done.

A business opportunity exists in Ontario for trained home flood risk assessors to help residents identify their key opportunities to reduce risk. Additional opportunities exist for contractors to provide flood protection installation, maintenance and subsidy application services to residents. Increasing the number of contractors engaged in residential flood protection services will help address the demonstrated public demand for services and will drive local economic growth for contractors and suppliers.

- **Trustworthy, Third-Party Information Resources**

Residents want greater access to third-party information resources, particularly those residents who wish to complete actions on their own. Participants noted that they want trustworthy information from a source that is not trying to sell any one particular product or service, including those resources produced by government, academic, and non-governmental organizations.

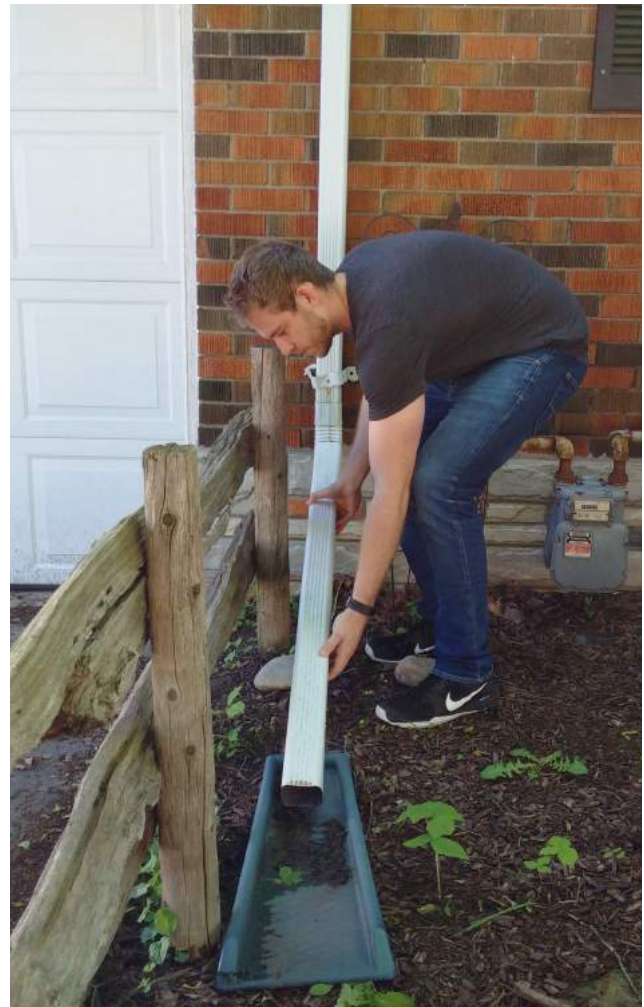
Thirty percent of participants noted that they wanted greater access to third-party how-to videos and 22% noted that they wanted greater access to third-party fact sheets (Figure 3B).

Cost-effective opportunities exist for agencies to share clear and consistent third-party information with their networks. Opportunities also exist for training industry professionals (home inspectors, realtors, insurance brokers, retailers, and mortgage brokers), government and non-governmental organization staff about helping residents to reduce flood risk.

Part of the training should include the provision of reputable, third-party resources that they can share with their networks, including how-to-videos, flood protection subsidy information and seasonal maintenance reminders.



Homeowner Lindsay Bunce checks moisture levels on her property with Flood Risk Assessor Larry Freiburger. Toronto, 2017



Waterloo resident Riley Davidson-Evans extends his downspouts to 2 m after his assessment. Waterloo, 2017

Supporting Residential Flood Risk Reduction Across Canada

Reducing residential basement flood risk at a national scale is a complex challenge that will involve building on the successful work already underway by governments, not-for-profits, academia, retailers, and insurance companies to educate residents and provide financial incentives where possible, to help homeowners take sustained action to reduce flood risk. It will also include bringing additional parties to the table, such as landlord and tenant organizations, to ensure that they are aware of their risks and can take action to reduce those risks. Basement apartments represent some of the most cost-effective housing units in Canada, and it is critical that concerted efforts be made to ensure safe and reliable access to this form of housing.



Homeowner Margaret Banks demonstrates her methods for cleaning out her backwater valve once per season to minimize risk of sewer backup. Burlington, 2017

The Intact Centre's Support of Nation-Wide Basement Flood Risk Reduction Education Programs

The Home Flood Protection Program's flood risk reduction educational innovations are now driving action to reduce residential flood risk nation-wide.

Two key training programs are in place, one creating a skilled workforce to assess residential flood risk, and the other training industry professionals as well as government and not-for-profit staff to help residents understand their flood risk, and how to take action to reduce that risk. The programs are described below:

Home Flood Risk Assessor Training

In 2018, the Intact Centre partnered with Seneca and Fleming Colleges to develop a 42-hour Home Flood Risk Assessment Training (HFRAT) course for home flood risk assessors. In September 2018, the first course was offered at Seneca College in Toronto. The course is available nationally in 2019 through the Ontario Colleges' online training portal, OnLearn. Course graduates are granted access to the Home Flood

Protection Program's nationally applicable electronic residential flood risk assessment tool, thus enabling them to complete flood risk assessments for residential clients.

Registration is available at: <https://fleming-college.ca/continuing-education/courses/home-flood-risk-assessment-training>

Home Flood Risk Educator Training and Materials

In October 2018, a one-hour in-class flood risk education training program was developed and accredited for registered insurance brokers in Ontario. This training program is now being adapted for in-person and online deployment to insurance brokers nationally and to facilitate training of additional groups nation-wide that provide front line flood risk reduction and educational support to homeowners. These groups include realtors, mortgage brokers, emergency service workers, retailers, municipal and conservation authority staff, not-for profits, landlords and tenant associations. The course provides learners with easily shareable and adaptable third-party resources that they can use to drive residential action to reduce basement flood risk.

Third-Party Resources

A variety of free, third-party how-to resources are available to residents and organizations who would like to educate their residential networks. For example, please see Three Steps to Cost-Effective Home Flood Protection infographic on page 10. Additional resources are available through the Home Flood Protection Program website:

www.homefloodprotect.ca



Flood Risk Assessor Blake Roger engages homeowner Zafar Ismaili in a flood risk reduction problem-solving conversation. Waterloo, 2017

Participant Testimonials



▲
 “After going through two devastating sewer back- up floods in 2014, my family and I wanted to learn what we could do to protect our new home from flooding. I would recommend having an assessment to anyone who wants to understand what they need to do to protect their home and their personal belongings. The assessment is \$125, a small price to pay to have peace of mind.”

– Carol Solis (Burlington, Ontario)



▲
 “A few years ago we experienced a flooded basement from sump pit overflow. We also have chronic dampness in parts of our basement. From our assessment we learned we can upgrade our sump pump, install a backup battery and flood alarm and make some inexpensive changes to our downspouts to help us keep water out of our basement even during the biggest storms. The \$125 assessment fee is an investment that could save any family thousands of dollars in the future.”

– Zainab & Patrick Moghal (Waterloo, Ontario)



◀
 “Overall, the program is so informative and revealed many issues that did not come up during our standard home inspection. It has provided us with a road map to follow as we prioritize upgrades and repairs for our home. We now have peace of mind knowing that we are doing everything we can to protect our home from flooding.”

– Lindsay Bunce (Toronto, Ontario)



THREE STEPS TO COST-EFFECTIVE BASEMENT FLOOD PROTECTION

Complete these 3 steps to reduce your risk of basement flooding and lower the cost of cleanup if flooding occurs. For items listed under step 3 check with your municipality about any permit requirements and the availability of flood protection subsidies.

Step 1: Maintain What You've Got at Least Twice per Year

**Do-It-Yourself
for \$0**



Remove Debris from Nearest Storm Drain



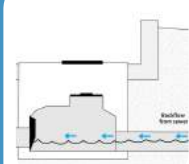
Clean Out Eaves Troughs



Maintain Plumbing, Fixtures and Appliances



Test Your Sump Pump



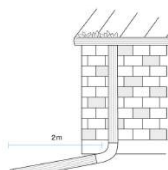
Clean Out Your Backwater Valve

Step 2: Complete Simple Upgrades

**Do-It-Yourself
for Under \$250**



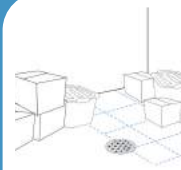
Install Window Well Covers



Extend Downspouts and Sump Discharge Pipes at Least 2m from Foundation



Store Valuables and Hazardous Materials in Watertight Containers or Remove from Basement



Remove Obstructions to Basement Floor Drain



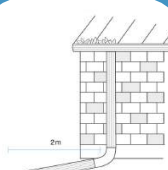
Install and Maintain Flood Alarms

Step 3: Complete More Complex Upgrades

Work with a Contractor for Over \$250



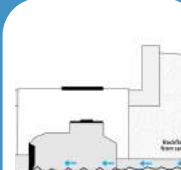
Install Window Wells that Sit 10-15 cm Above Ground and Upgrade to Water Resistant Windows



Disconnect Downspouts, Cap Foundation Drains and Extend Downspouts to Direct Water at Least 2m from Foundation



Correct Grading to Direct Water at Least 2m Away from Foundation



Install Backwater Valve



Install Backup Sump Pump and Battery

Note: Not all actions will be applicable to each home. Completing these steps does not guarantee the prevention of basement flooding.



WATER ON THE RISE: PROTECTING CANADIAN HOMES FROM THE GROWING THREAT OF FLOODING

Why is basement flooding on the rise?

A combination of:

- Extreme rainfall events
- Aging municipal infrastructure
- Lack of flood protection measures at the household level
- More hard surfaces and less green space as urban areas develop



What is the average cost of a basement flood?

\$43,000

(Insurance Bureau of Canada, 2018)



What is the Home Flood Protection Program?

- Residential flood risk reduction education program
- Launched by the Intact Centre on Climate Adaptation at the University of Waterloo in 2016
- Completed over 500 Home Flood Protection Assessments in Ontario and Saskatoon from 2017- 2018

How is the program helping Canadians?

- Providing free online flood protection resources for residents and flood protection educators
- Providing training programs for flood protection educators
- Providing nationally applicable flood risk assessment tool to successful course graduates

What were the top flood risks identified at homes?



Inside the Home

- 85% Had no backup sump pump or power source
- 71% Had furniture and electronics at risk of water damage
- 53% Never maintained their backwater valve
- 40% Never maintained their sump pump



Outside the Home

- 82% Had window wells <10-15cm above the ground
- 78% Had downspouts that deposited water <2m from the foundation
- 69% Had grading around their home that did not direct water away from the foundation
- 63% Had cracks or gaps in basement windows and frames

*Data based on 285 Ontario Home Flood Protection Assessments

What percentage of participants took action to reduce their risk after having a Home Flood Protection Assessment?

3 Months After Participation

✓ **79%** of residents took at least **one new action**

6 Months After Participation

✓ **71%** of residents took at least **one additional action**

How complex and expensive was it to complete actions to reduce flood risk?

60% of actions <\$500, simple, mostly completed by residents

- ✓ Tested sump pump, extended downspouts, installed window well covers

40% of actions >\$500, more complex, mostly contractor completed

- ✓ Installed sump pump, backwater valve, replaced eaves troughs and basement windows

*Data based on 91 Ontario follow-up surveys

How can flood protection educators help residents reduce basement flood risk?



Clear Communication

Share clear and consistent flood protection messaging with residents through many trusted agencies (E.g. municipalities, insurers, emergency services, not-for-profits)



Broad-based Marketing

Promote flood risk reduction and subsidy information to the entire community using social and traditional media, and community newsletters



Subsidies

Provide flood protection subsidies or incentives for residents, and a clear and simple application process



Targeted Promotions

Promote flood risk reduction and subsidy information to areas at higher risk of flooding by engaging residents in direct problem-solving conversations using door-to-door campaigns, and community events

Developed by:



Supported by:



Delivered by:





**FOR FURTHER INFORMATION ABOUT THE REPORT,
PLEASE CONTACT:**

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