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SURREY COASTAL FLOOD ADAPTATION STRATEGY (CFAS)

Advisory Group Meeting
May 16th, 2019

nhc
northwest hydraulic consultants

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epi

Advisory Group Meeting

Agenda and Introductions

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Agenda

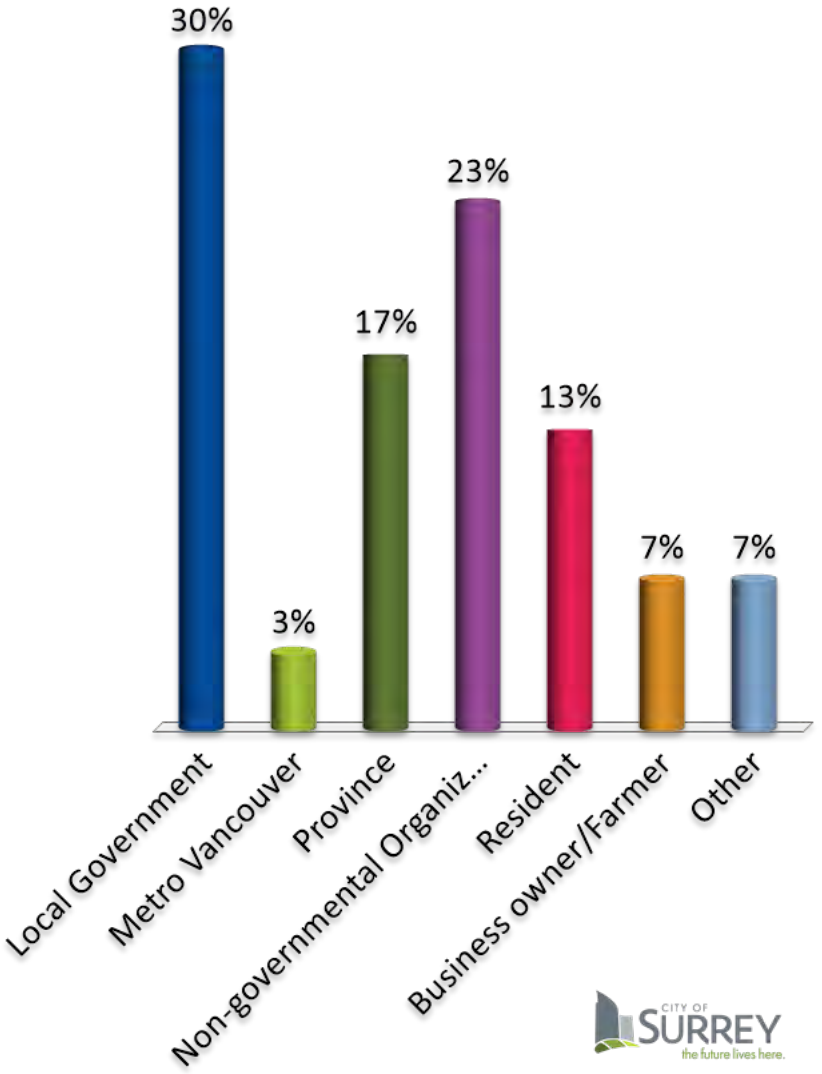
- Project overview and update
- Disaster Mitigation andAdaptation Fund (DMAF)
- CFAS overview
- Next steps

Purpose

- Refresh Advisory Group on project
  - It's been a while since we last met
- Introduce Disaster Mitigation and Adaptation Fund (DMAF)
  - Implications and opportunities for Advisory Group
- Walk though CFAS
  - Structure and Actions
- Seek input on CFAS strategic directions and key short-term (2020-2030) Actions

Who's in the room?

A. Local Government
B. Metro Vancouver
C. Province
D. Non-governmental Organization
E. Resident
F. Business owner/Farmer
G. Other



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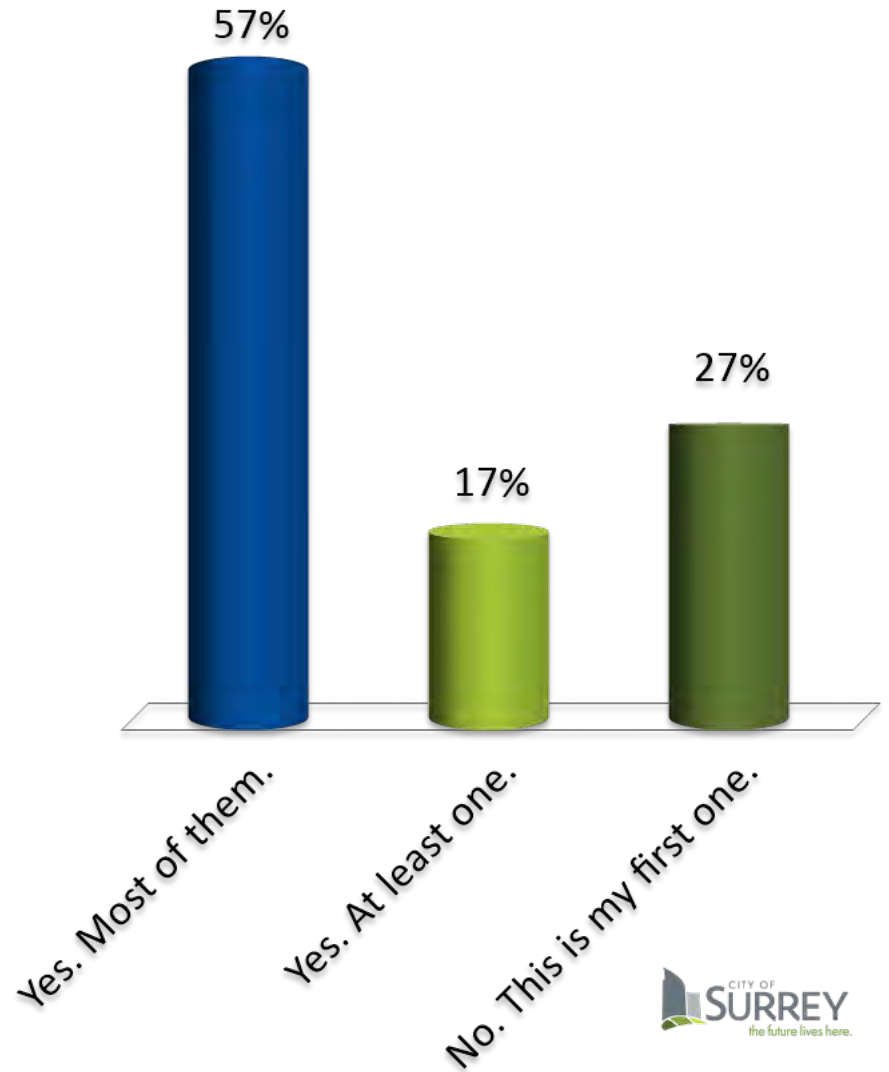
Have you participated in other CFAS Advisory Group meetings?

A. Yes. Most of them.
B. Yes. At least one.
C. No. This is my first one.



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Purpose of Advisory Group

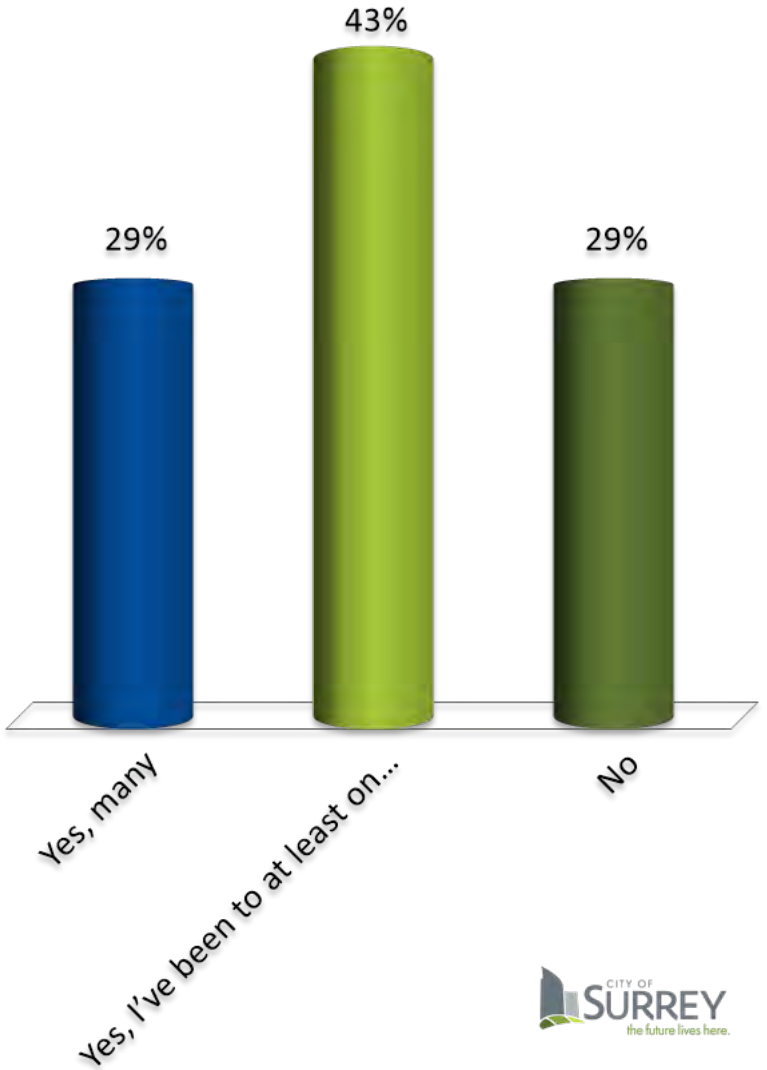
- Provide non-binding recommendations, strategic advice and input on CFAS
- Identify key issues, concerns and opportunities for the City and project consultant team
- Support collaboration and develop a deeper understanding of issues
- Support CFAS communications and outreach

Advisory Group Ground Rules

- Group discussion is important; and everyone should get a chance to speak
- Provide honest, open opinions
- Agree to disagree; consensus may not always be achieved

Have you participated in other CFAS events?

A. Yes, many
B. Yes, I've been to at least one event
C. No



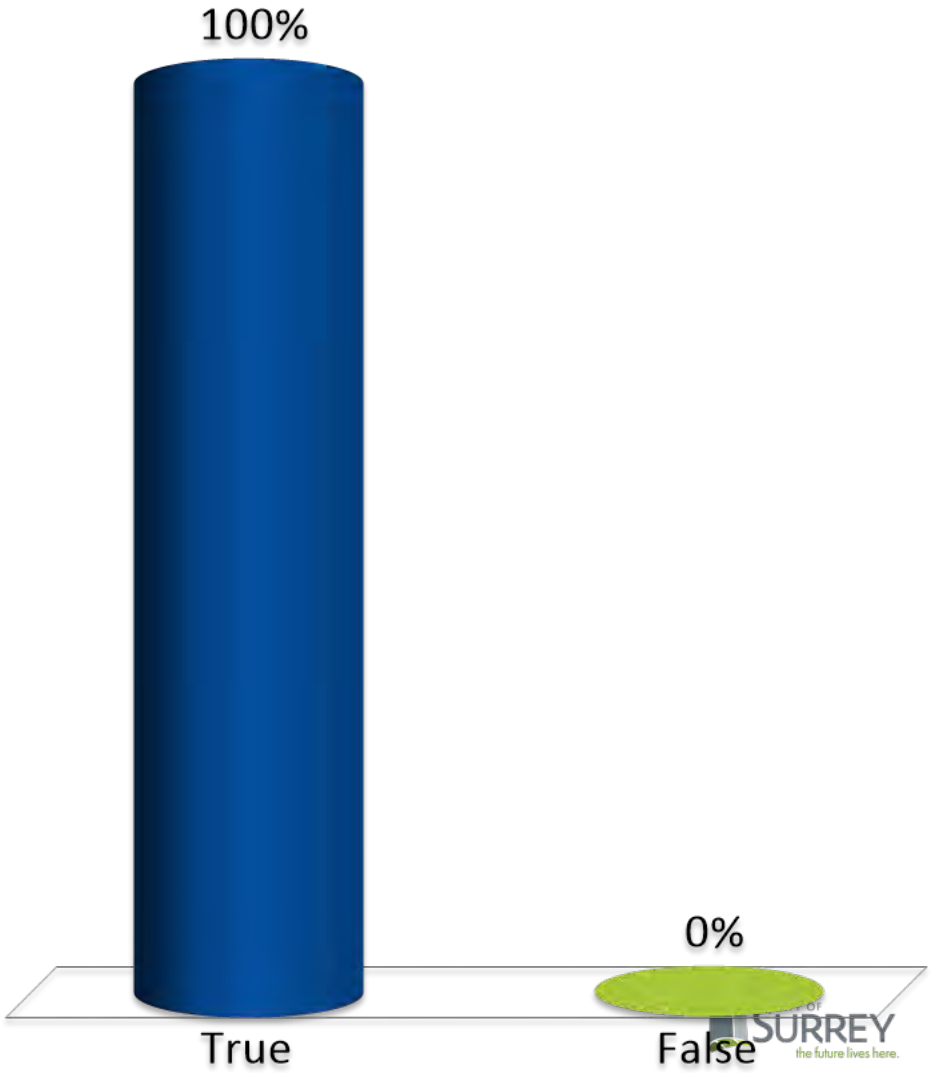
Activity

- In tables, please share the main reason for wanting to be part of today's workshop

Climate change is happening.

A. True

B. False



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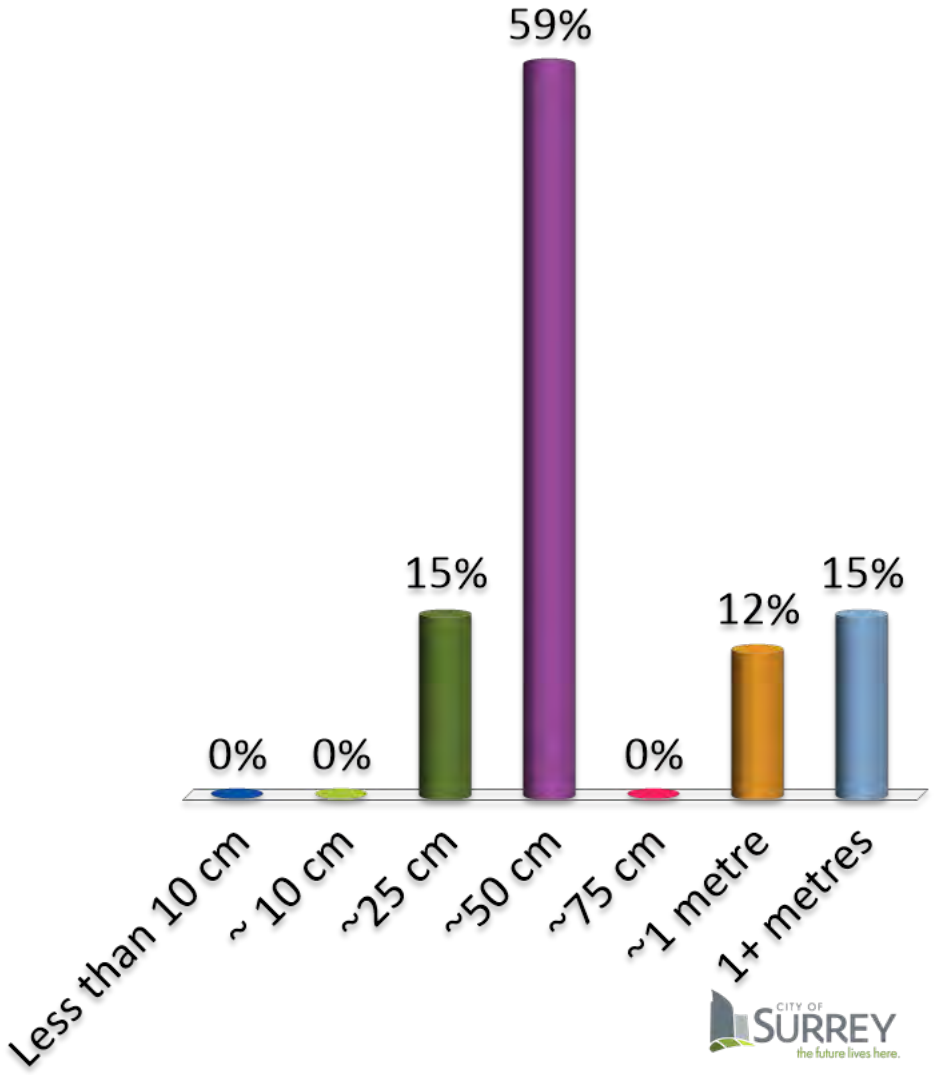
How much are sea levels in the Salish Sea expected to rise by 2050

A. Less than 10 cm
B. ~ 10 cm
C. ~25 cm
D. ~50 cm
E. ~75 cm
F. ~1 metre
G. 1+ metres



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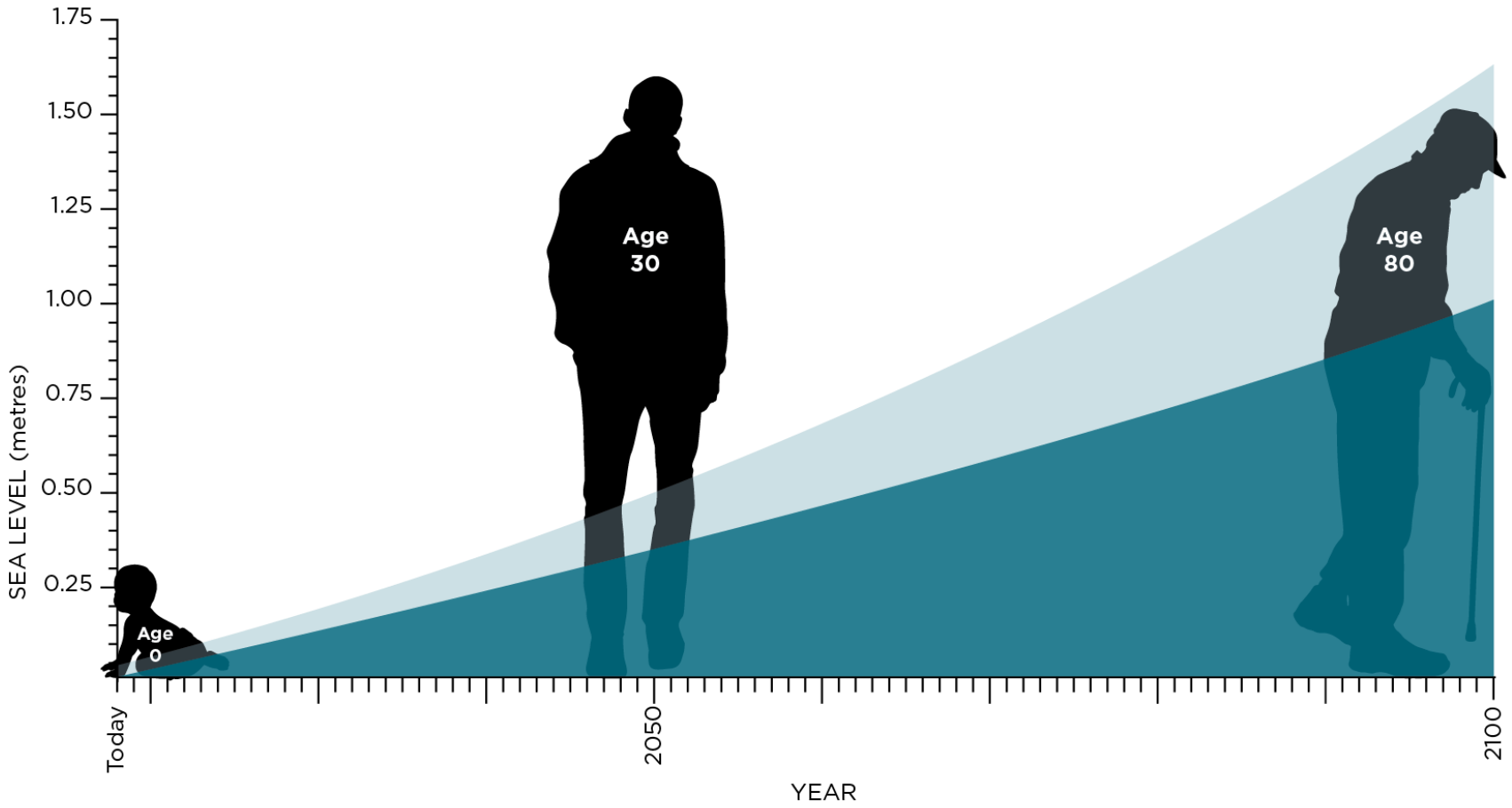
Sea level rise

- A lifetime of sea level rise



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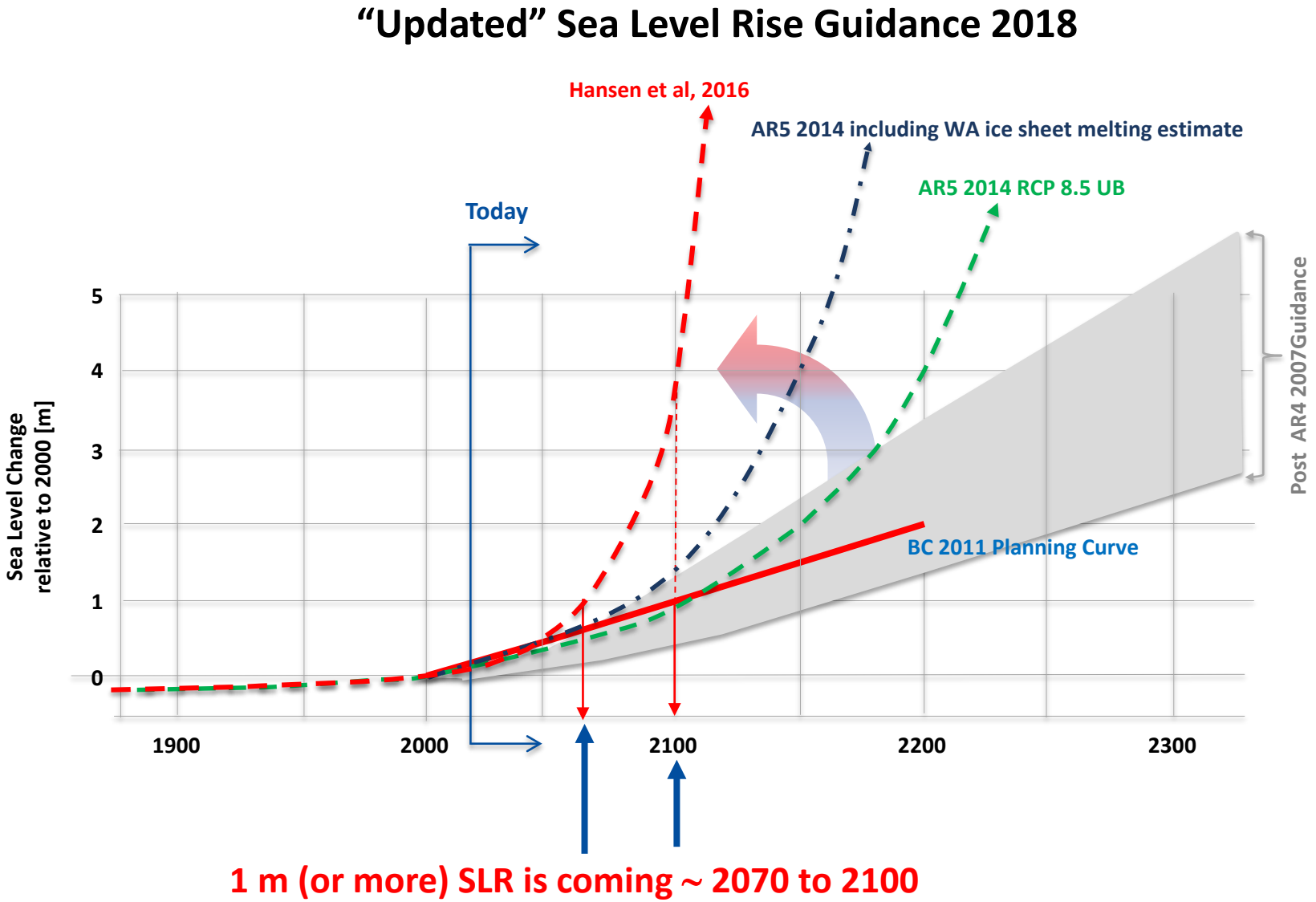
Sea level rise and uncertainty



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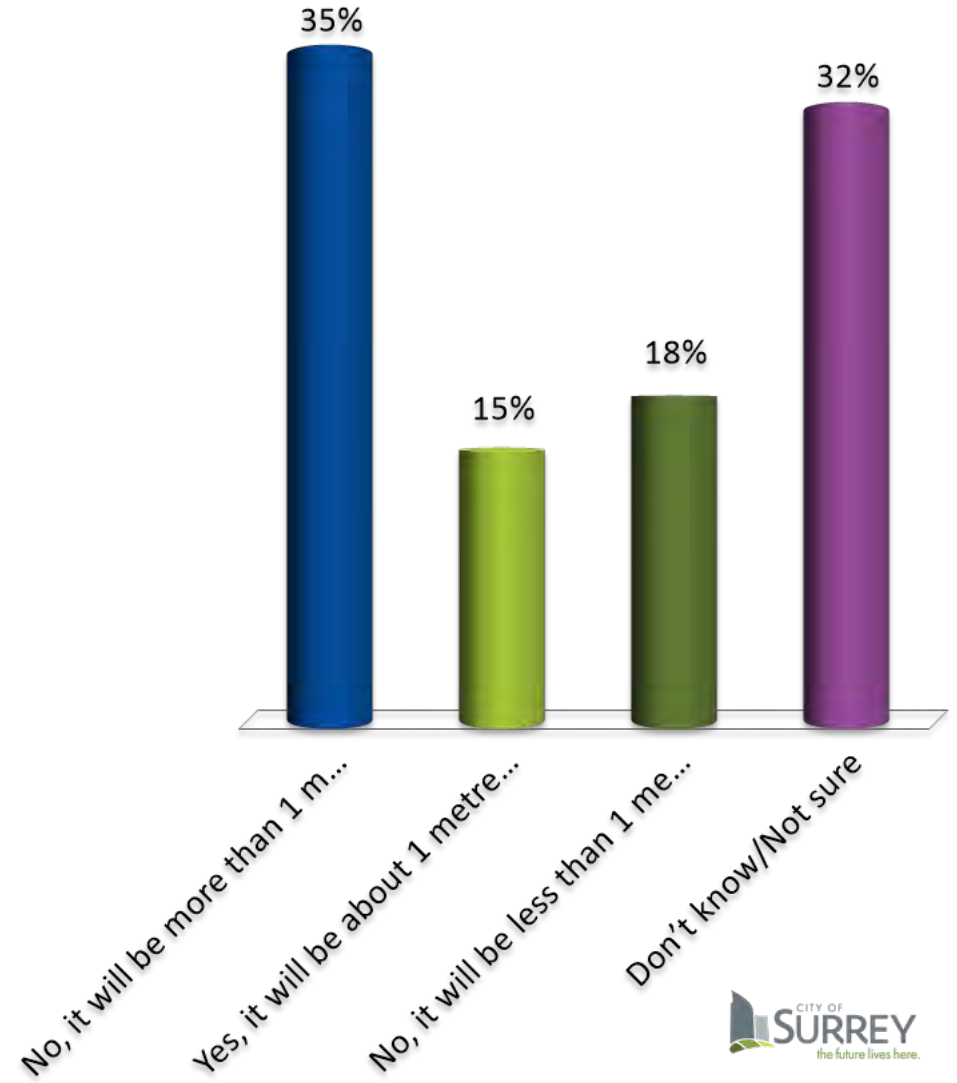
Do you agree with the sea level rise forecast for the region?

A. No, it will be more than 1 metre by 2100
B. Yes, it will be about 1 metre by 2100
C. No, it will be less than 1 metre by 2100
D. Don't know/Not sure



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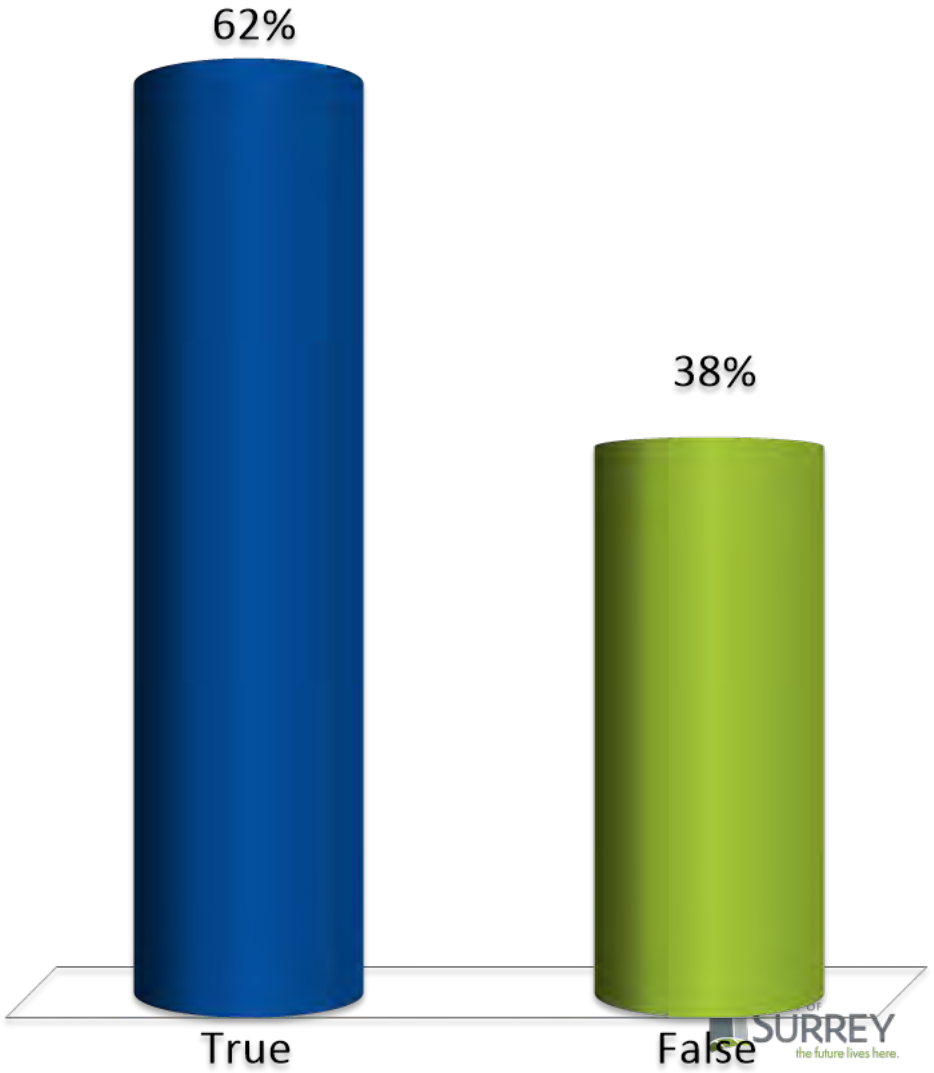
Sea levels are rising faster in Vancouver than in Seattle.

A. True

B. False



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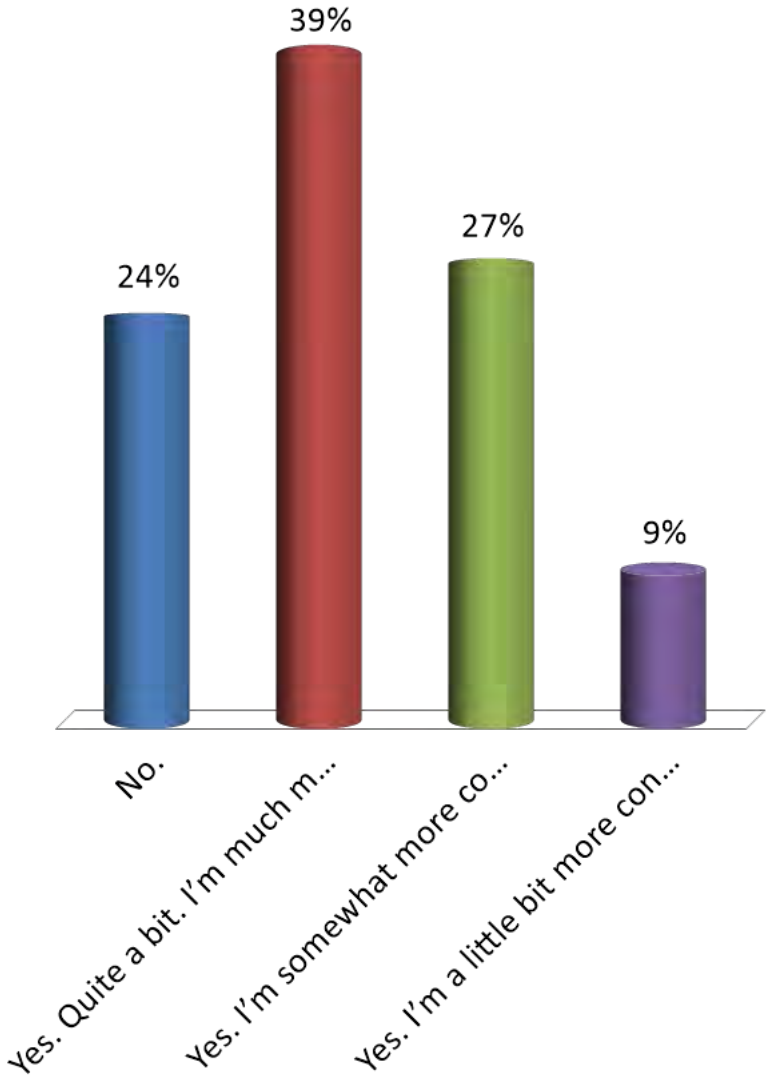
Approximate sea level rise since 1972

Has your concern around climate change and sea level rise changed since CFAS began in 2016?

A. No.
B. Yes. Quite a bit. I'm much more concerned.
C. Yes. I'm somewhat more concerned.
D. Yes. I'm a little bit more concerned



Advisory Group Meeting

Project Overview & Update

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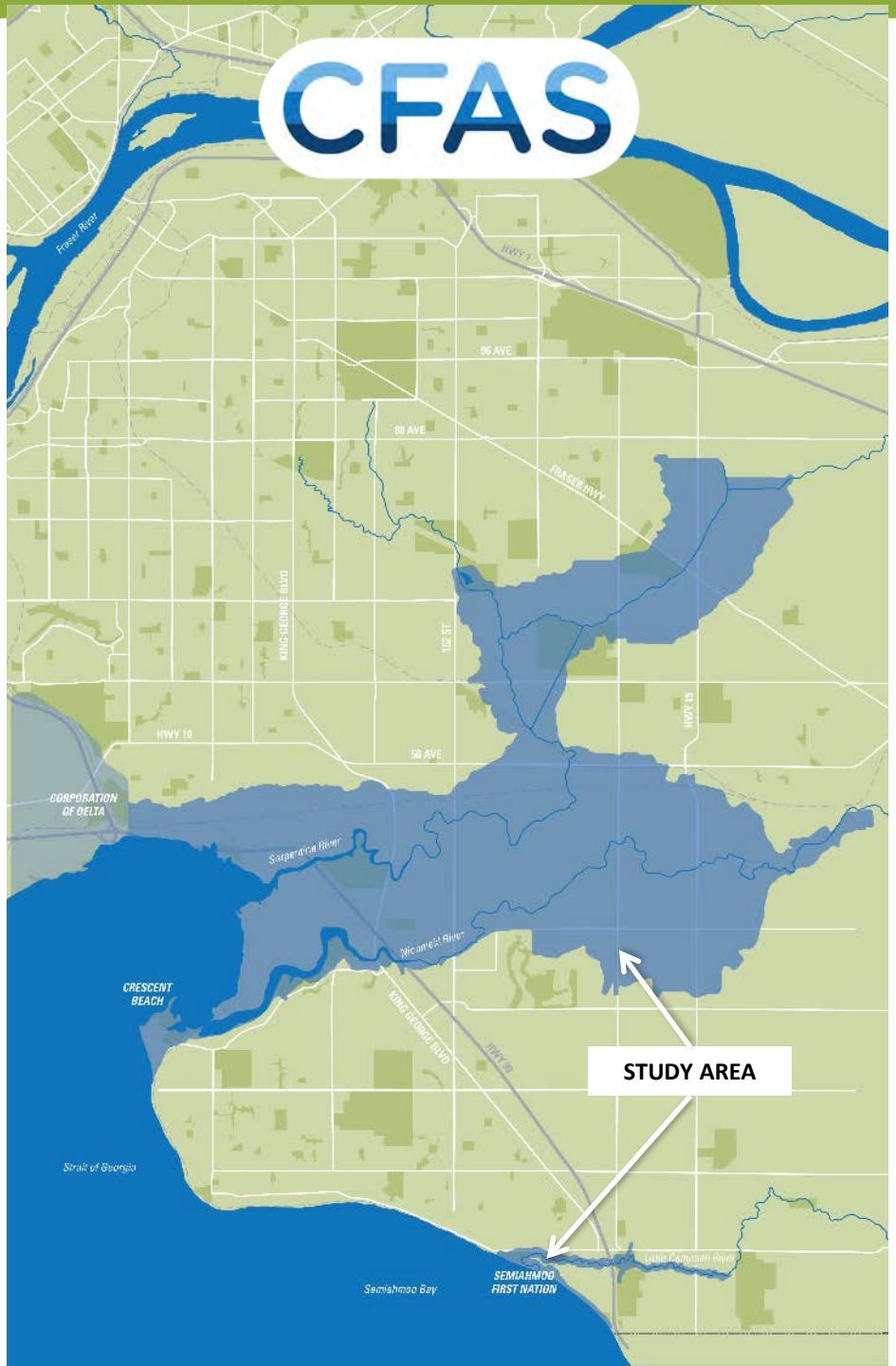
Climate Change & Coastal Floods

- **Coastal cities around the world are facing same challenges of sea level rise**
- **Province directed municipalities to plan for at least 1 m sea level rise by 2100**
- **In Surrey and Metro Vancouver most drainage systems not designed for projected changes**



SURREY COASTAL FLOOD ADAPTATION STRATEGY (CFAS)

- Climate Adaptation Strategy adopted November 2013
- Council adopted recommendation to develop a coastal flooding strategy in 2016
- Anticipated to be complete summer 2019

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- **A project without precedent**
  - No template or guide for project team or Advisory Group and other project partners
  - Asked hard questions around a difficult, value-laden subject
- **A project that's generated a lot of interest**
  - Three plus years of engagement and collaborative planning
  - Regional, provincial, national interest

Study area @ a glance

What is at Risk?

COMMUNITIES AND PEOPLE

Many residential areas and neighbourhoods
Semiahmoo First Nation
2,500+ residents
Approximately 20% of Surrey's land area

PARKS AND ENVIRONMENT

Destination regional and City parks
Beaches and recreation areas
Critical foreshore, coastal, and riparian areas

LOCAL AND REGIONAL ECONOMY

3,500+ jobs
Over $100M in annual farm gate revenue
Over $1B in assessed property value
Almost $25B annual truck and rail freight traffic

INFRASTRUCTURE

Over 10km of Provincial Highways
Over 200,000 vehicle trips a day
Over 30km of railway (freight, passenger)

FOOD SECURITY

~ 60 km^2 agricultural land
~10% of Metro Vancouver's farmland

COASTAL AND RIVER FLOODING

1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100 2100

Major Coastal and River Flood Events

1.2 Metres

Sea Level Rise with Ground Subsidence

100 cm
80 cm
60 cm
40 cm
20 cm
0 cm

Sea Level Rise

TODAY

A Changing Shoreline

In 1890, dyking of Mud Bay begins. Shortly afterwards, dyking and damming of the Serpentine and Nicomekl Rivers begins.
By 1953, a timber sea wall at Crescent Beach is constructed.

Since then, residents of Surrey's Coastal Floodplain have relied on a system of dykes and sea dams to protect themselves from ocean and river flooding.

An Evolving Future

As our climate continues to change and sea levels continue to rise over the coming years, it is anticipated that the frequency and intensity of major coastal and river floods will also increase.

The Province has directed municipalities to plan for at least 1m sea level rise by 2100. In Surrey, and elsewhere in the Lower Mainland, most drainage systems are not designed for projected changes.

Photos courtesy Surrey Archives and Museum

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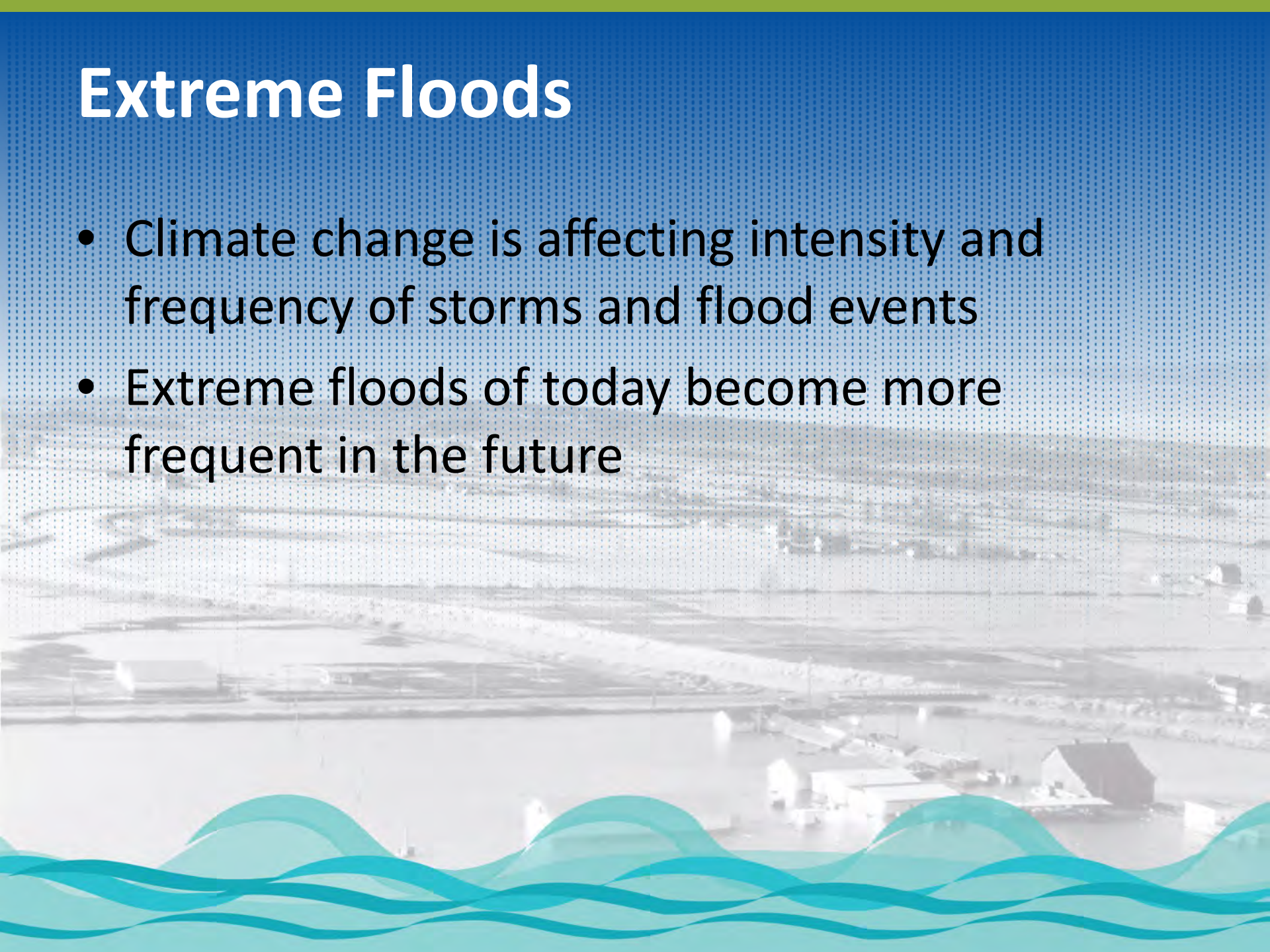
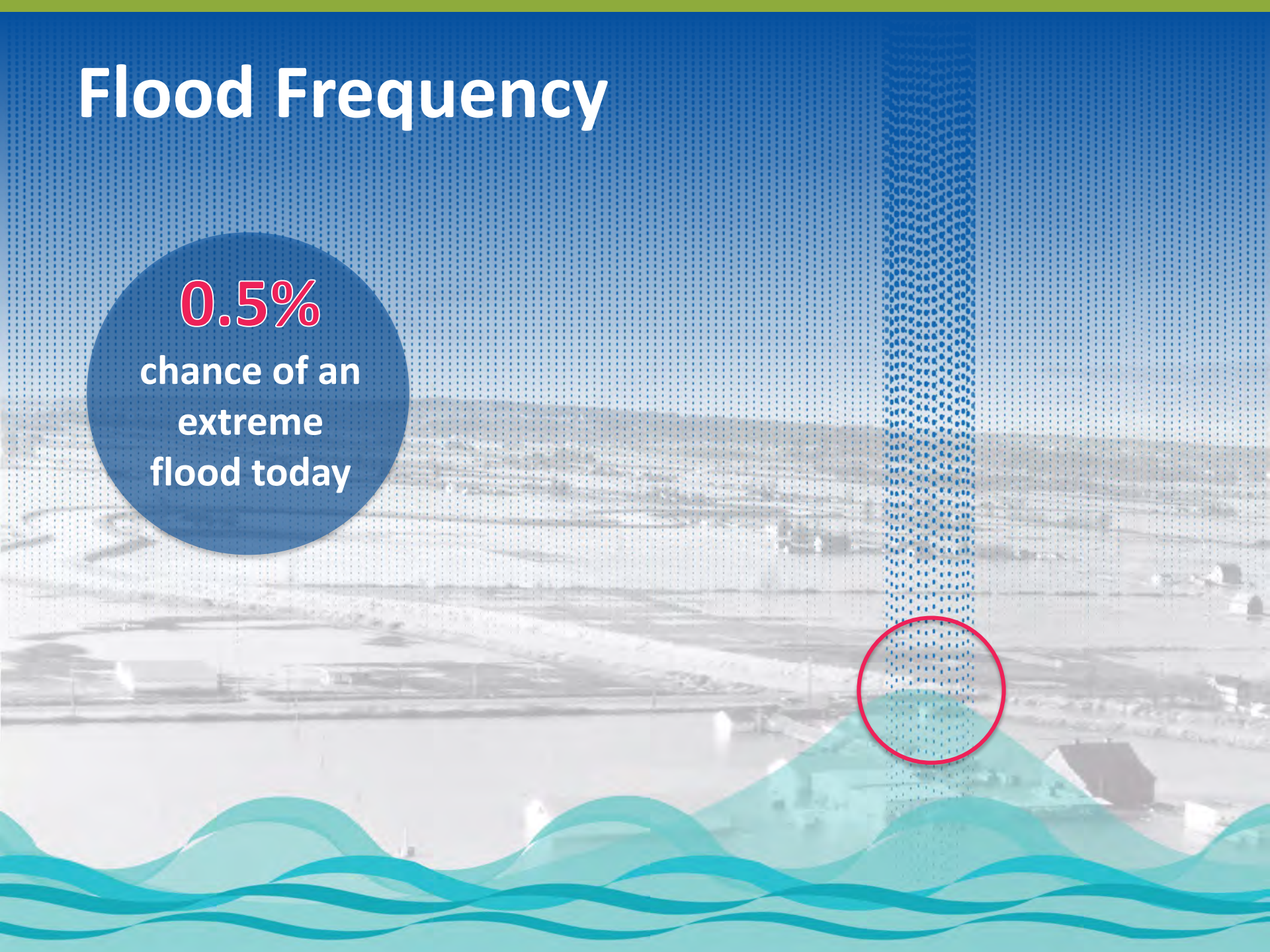
Extreme Floods

- Climate change is affecting intensity and frequency of storms and flood events
- Extreme floods of today become more frequent in the future

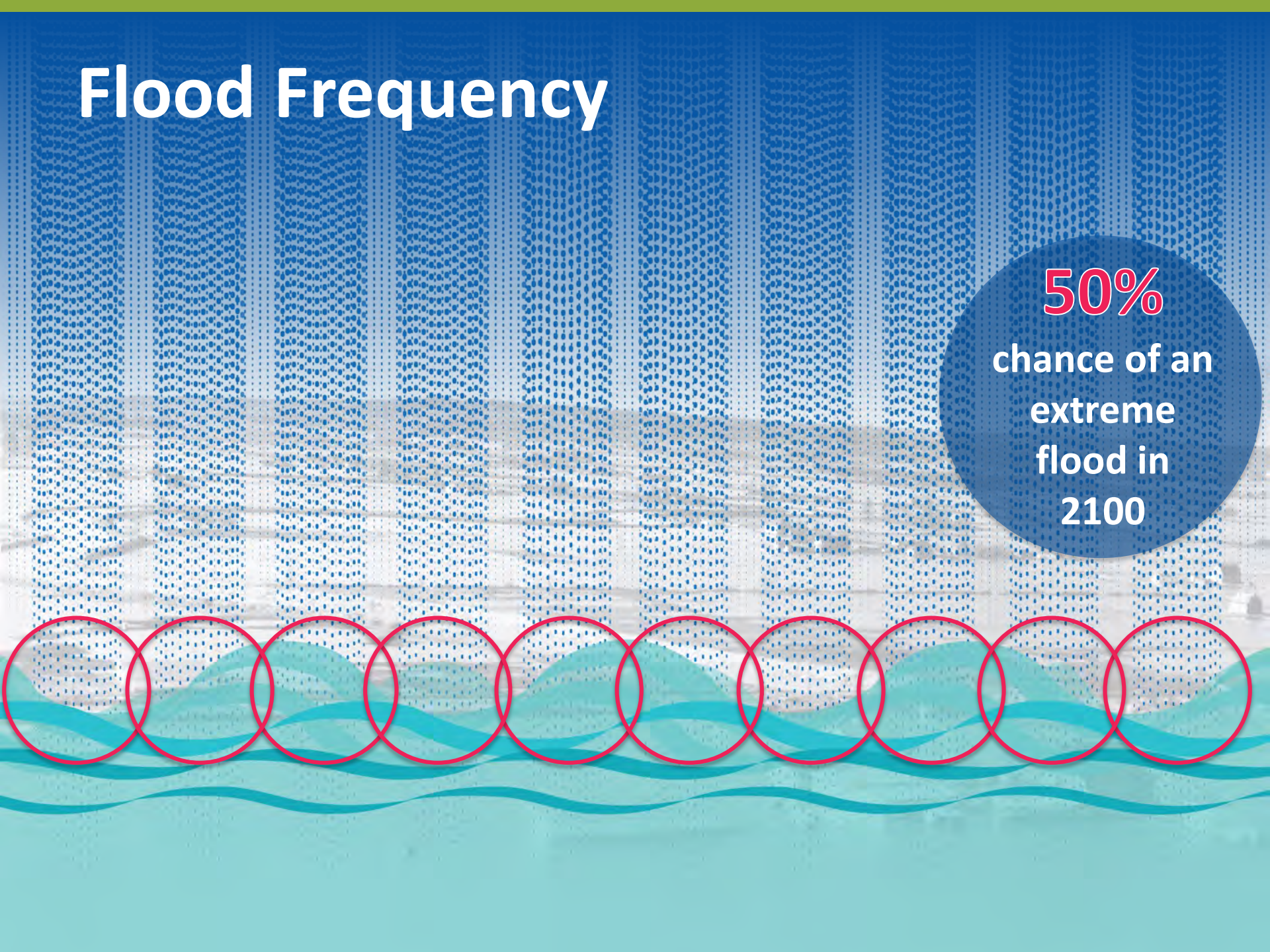


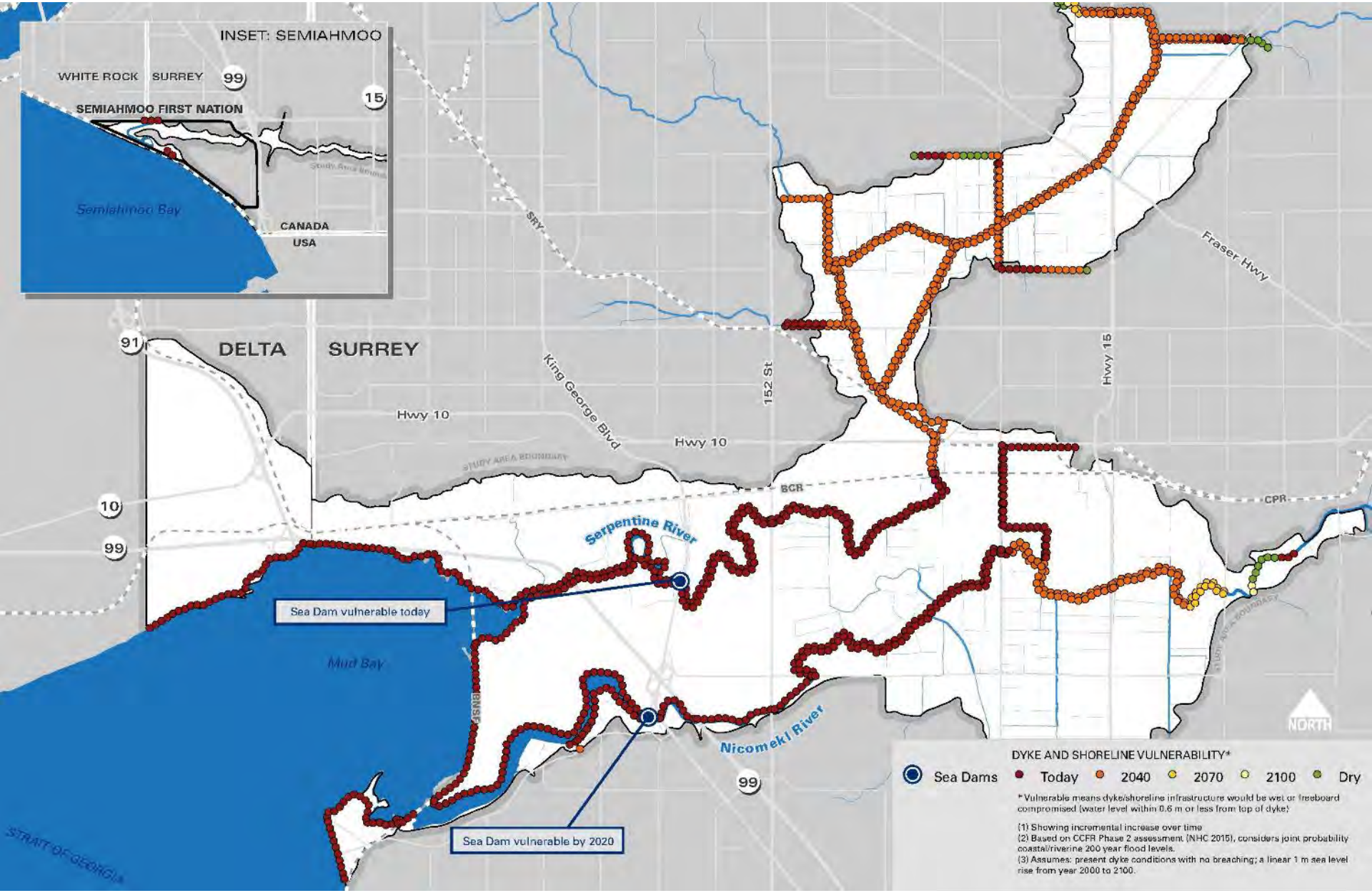
Flood Frequency

0.5%
chance of an extreme flood today



Flood Frequency





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Hwy 10
STUDY AREA BOUNDARY
10
99
*Flood model data for Delta only includes year 2010.
Mud Bay
BNSF
STRAIT OF GEORGIA

What are we seeing?

Photos from December 20, 2018 high wind event

https://www.facebook.com/cbcnews/videos/white-rock-pier-rescue/2311446602412569/

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CFAS Overview

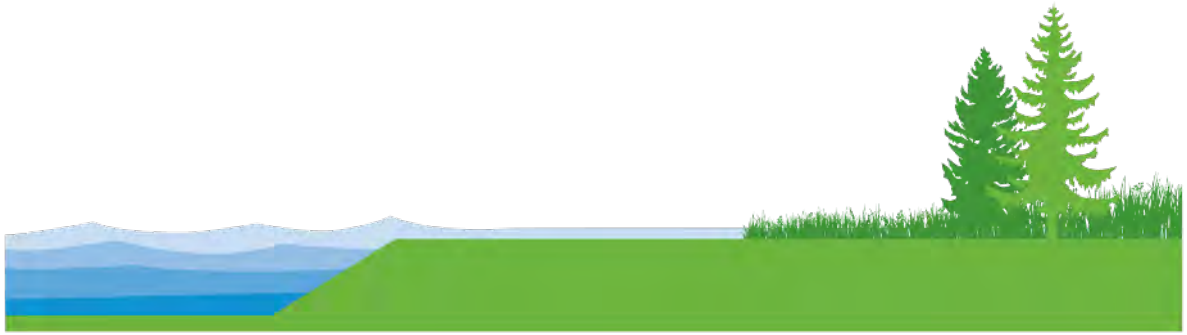
Building Shared Understanding → Shaping Choices → Making Decisions → Phasing

Flood Adaptation Approaches

PROTECT (RESIST)

ACCOMMODATE

RETREAT (PULLBACK)



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Flood Adaptation Approaches

COMBINATION

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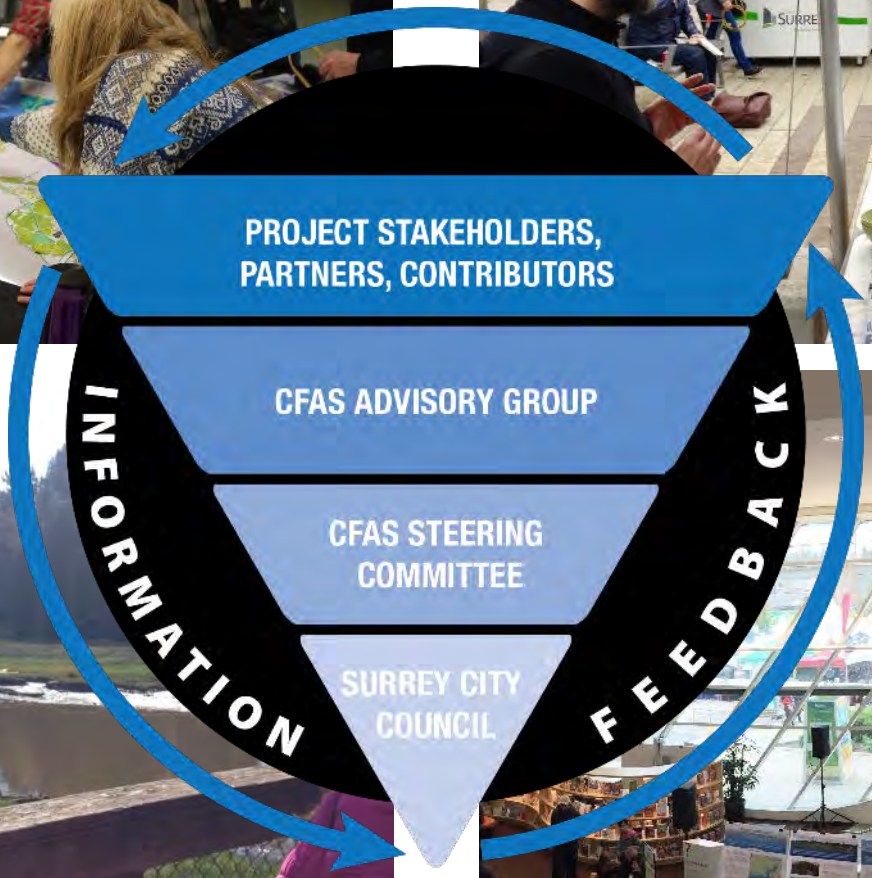
Approach & Process

- Participatory, values-based, iterative

Engagement


PROJECT STAKEHOLDERS, PARTNERS, CONTRIBUTORS
CFAS ADVISORY GROUP
CFAS STEERING COMMITTEE
SURREY CITY COUNCIL
INFORMATION
FEEDBACK


50 cm

Engagement Highlights

- 1,000+ directly engaged (workshop, focus group, etc.)
- 8 pop-up events
- 2 bus tours
- 200+ students (elementary & high school)
- 30+ organizations involved
- Advisory Group representing wide range of organizations, agencies, and governments
- 3 surveys, including technical options review
- Engaging and partnering with local expertise and capacity – UBC, SFU, UFV

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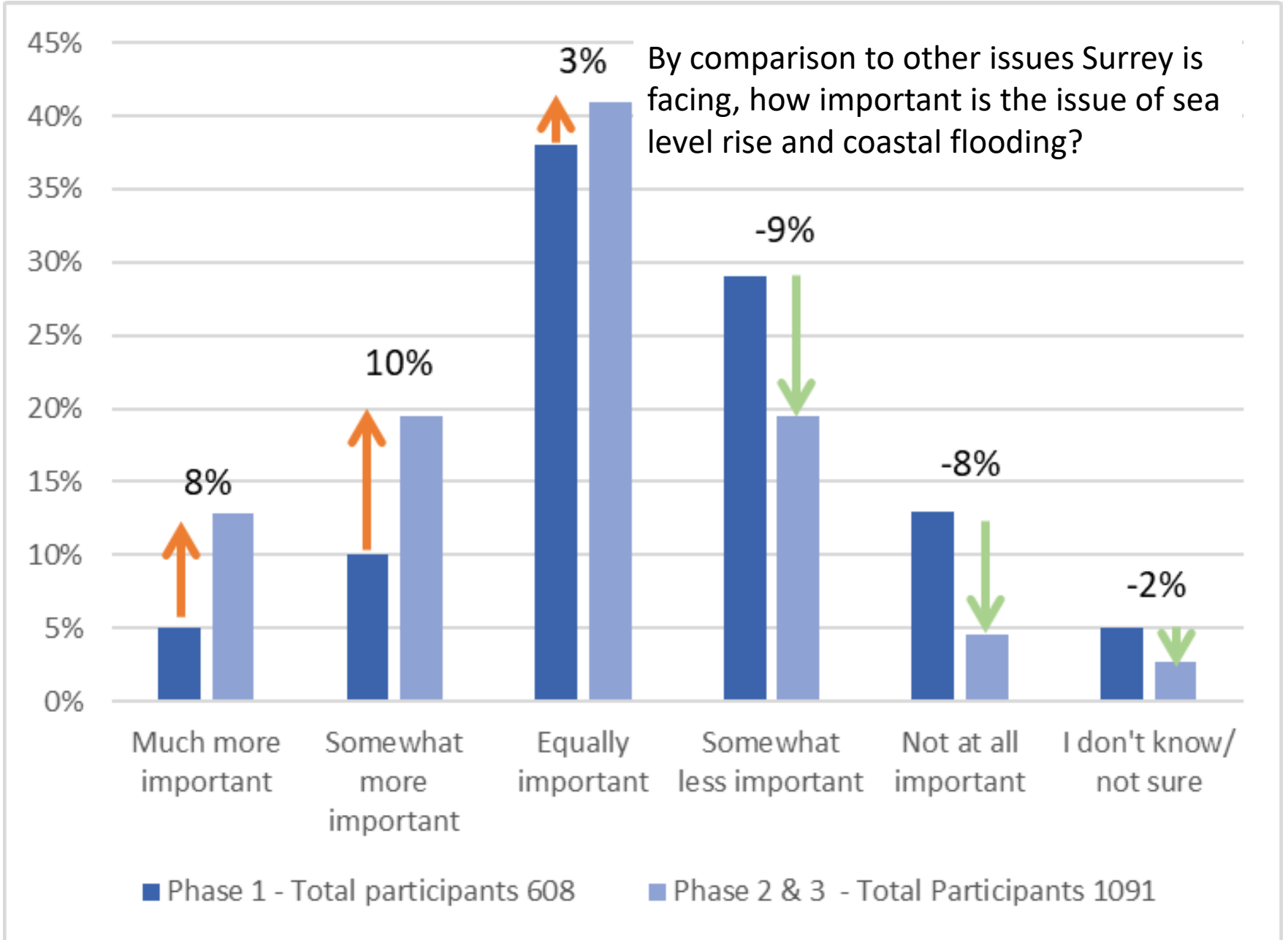
Communications Highlights

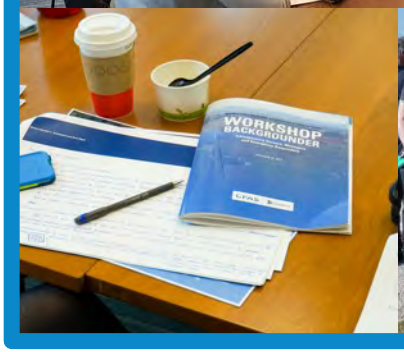
- Print, web, social media
- 2 "Primers" – project intro and options
- 3 Interactive "Story Maps"
- 250,000 social media impressions
- 9 major media hits (local, regional, national)
- 3 project videos (10,000+ views on YouTube)
- One very effective (and giant) "old school" banner

Engagement Results



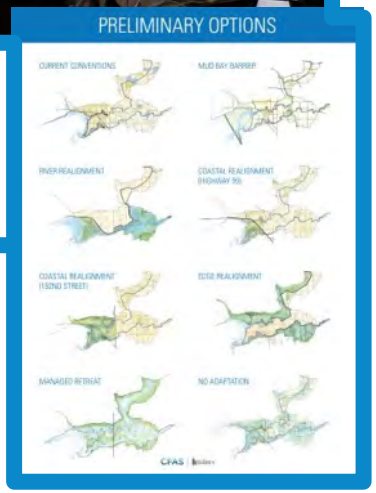
Options Development

Preliminary Options Development with Community and Professionals



HIGH-LEVEL FEASIBILITY ANALYSIS

Community Review of Preliminary Options



REFINEMENT & TECHNICAL ANALYSIS

Shortlisted Options

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Technical Criteria

FLOOD DAMAGE PREVENTION:
How well would the option reduce or prevent flood damage from sea level rise and storm surges?

OUTCOME OF A FAILURE:
If the option failed, what would the consequences be to people, infrastructure and the environment?

GEOTECHNICAL STABILITY:
How effective would the option be at withstanding hazard events given the soil's stability?

ADAPTABILITY OVER TIME:
How well can the option be adjusted or phased to changing sea level rise?

CAPITAL COST:
What are the capital costs for the City of implementing the option?

OPERATIONS & MAINTENANCE COST:
What are the operation and maintenance costs for the City of implementing the option?

Technical Ranking:

VERY POOR	POOR	LIMITED	GOOD	VERY GOOD

Capital Costs:

$ = <100M
$$ = 100M – 1B
$$$ = 1B+

FLOOD DAMAGE PREVENTION	
OUTCOME OF A FAILURE	
GEOTECHNICAL STABILITY	
ADAPTABILITY OVER TIME	
CAPITAL COST CoS	$$
O&M COST CoS	

Values Criteria

RESIDENTS:
Minimize people displaced

AGRICULTURE:
Reduce permanent loss of agricultural land

ENVIRONMENT:
Minimize impacts to wetland habitats and riparian areas

INFRASTRUCTURE:
Minimize vulnerabilities

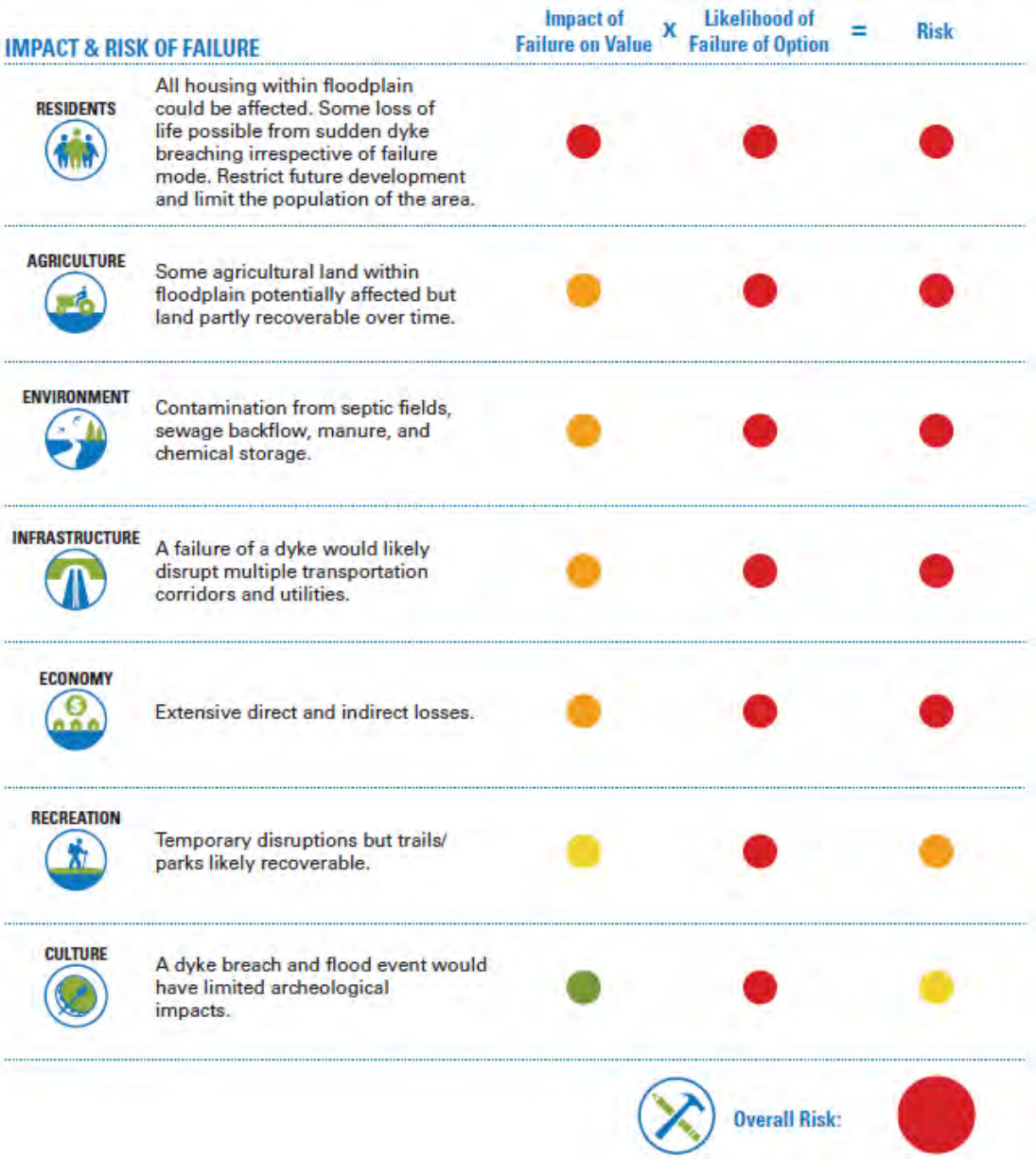
ECONOMY:
Minimize loss of local businesses

RECREATION:
Maximize recreational opportunities

CULTURE:
Maximize opportunities for traditional practices

Values Ranking:

Risk Evaluation



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SHORTLISTED OPTIONS – MUD BAY

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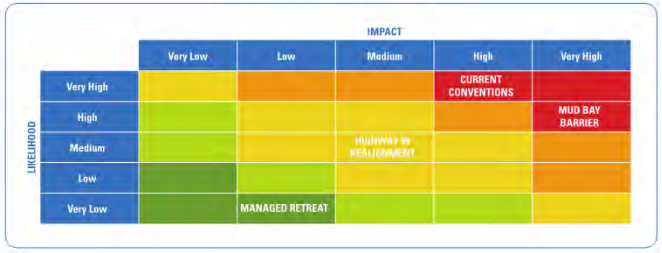
The summary table compares the short-listed options for the Mud Bay study area. The overview includes a "Baseline" or "No Adaptation" option for reference. Full descriptions of the short-listed options are available in the Primer (Primer Part II: Options) and at the video station.

	BASELINE - NO ADAPTATION	CURRENT CONVENTIONS	MUD BAY BARRIER	HIGHWAY 99 REALIGNMENT	MANAGED RETREAT
VALUES CRITERIA					
RESIDENTS *People permanently displaced*	FAR WORSE	SLIGHTLY WORSE	NO CHANGE	SLIGHTLY WORSE	FAR WORSE
AGRICULTURE *Permanent loss of agriculture land*	FAR WORSE	SLIGHTLY WORSE	NO CHANGE	SLIGHTLY WORSE	FAR WORSE
ENVIRONMENT *Impacts to wetland habitats, freshwater fish habitat & riparian areas*	MODERATELY WORSE	FAR WORSE	FAR WORSE	SLIGHTLY BETTER	FAR BETTER
INFRASTRUCTURE *Percent of service/transportation infrastructure made vulnerable*	FAR WORSE	NO CHANGE	NO CHANGE	NO CHANGE	SLIGHTLY WORSE
ECONOMY *Revenue*	FAR WORSE	SLIGHTLY WORSE	NO CHANGE	SLIGHTLY WORSE	MODERATELY WORSE
RECREATION *Diversity of recreational opportunities*	FAR WORSE	NO CHANGE	SLIGHTLY WORSE	SLIGHTLY BETTER	MODERATELY BETTER
CULTURE *Opportunities for traditional practices*	SLIGHTLY WORSE	NO CHANGE	MODERATELY WORSE	NO CHANGE	NO CHANGE
IMPACT & RISK OF FAILURE					
OVERALL RISK	VERY HIGH	VERY HIGH	VERY HIGH	MEDIUM	VERY LOW
COST CRITERIA					
CAPITAL COST	—	$100M - $1B	MORE THAN $4B	$1B - $4B	$1B - $4B
OPERATION & MAINTENANCE COST	MORE THAN $10M	MORE THAN $10M	$1M - $10M	$1M - $10M	LESS THAN $1M
OTHER INFRASTRUCTURE COST	MORE THAN $100M	$10M - $100M	LESS THAN $10M	$10M - $100M	MORE THAN $100M
FUTURE ADAPTATION COST	$1B - $4B	$1B - $4B	$1B - $4B	$1B - $4B	LESS THAN $100M

RISK ASSESSMENT HEAT MAP



Emerging Directions (Summer 2018)

- 4 options shortlisted for two primary study areas – Mud Bay, Crescent Beach
- Survey, Advisory Group, Focus Group review and evaluation narrowed down to single "emerging direction" for each area

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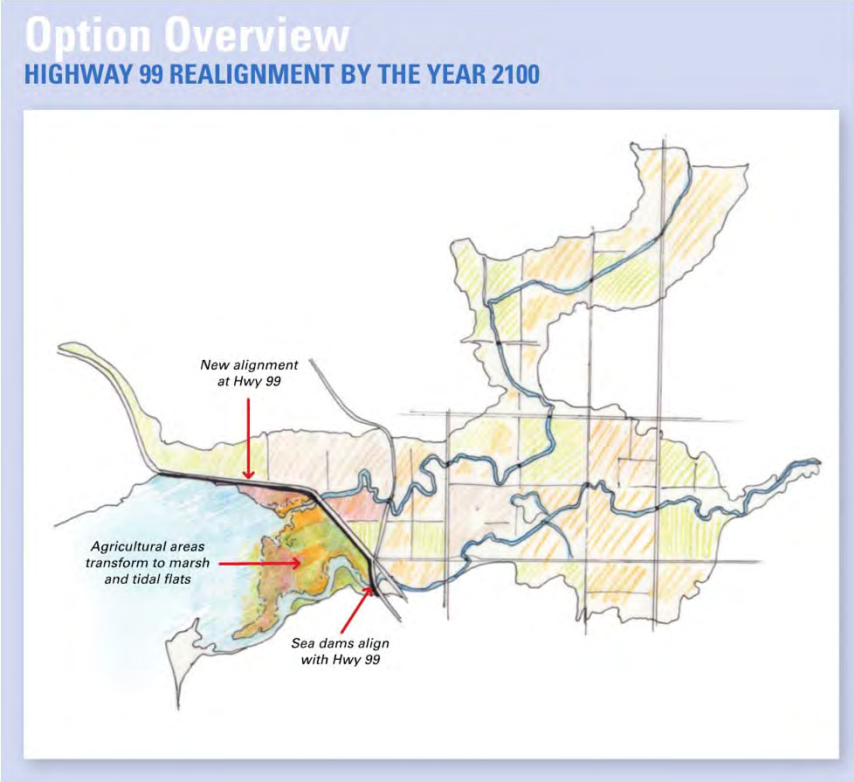
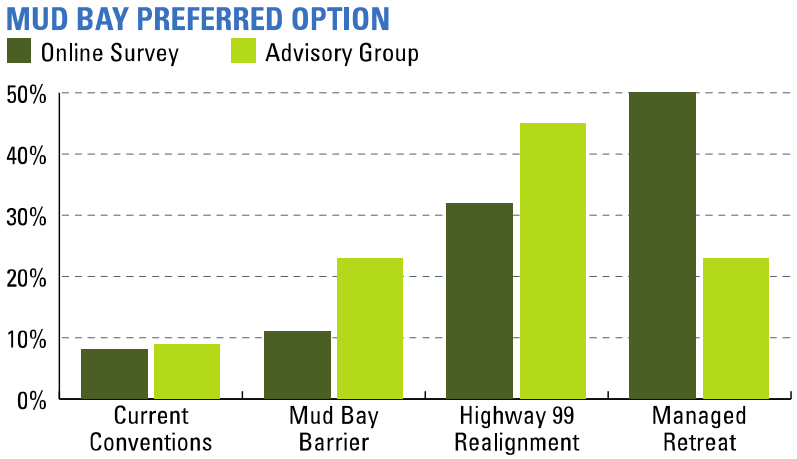


Mud Bay

- Coastal Works/Highway 99 by the year 2100
- 2nd most preferred option for Advisory Group and online survey



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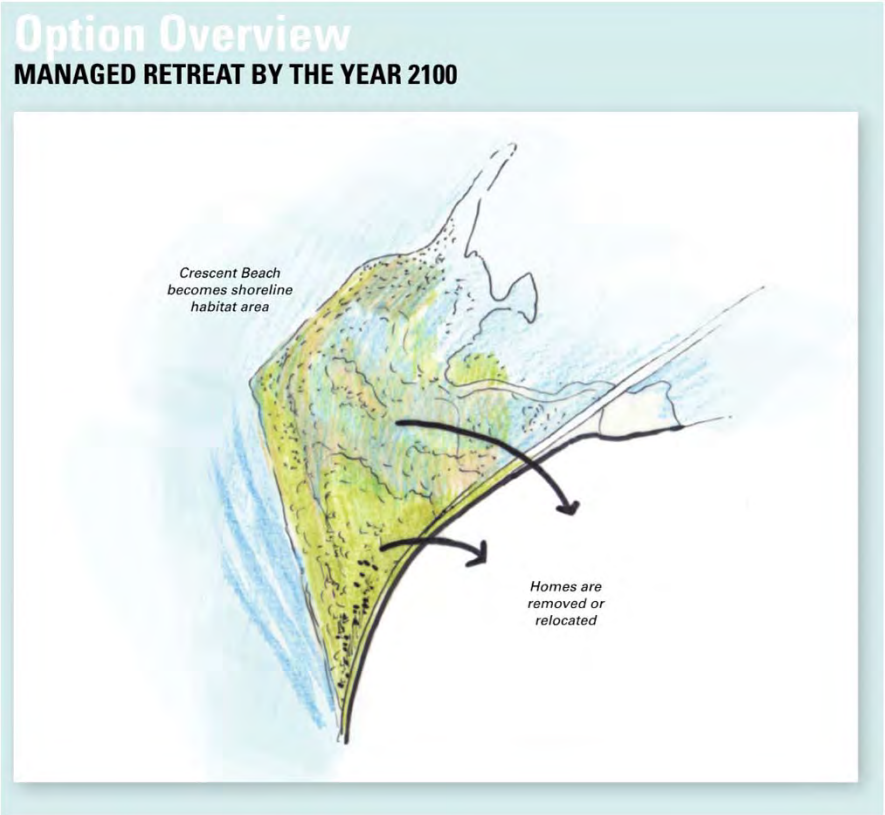
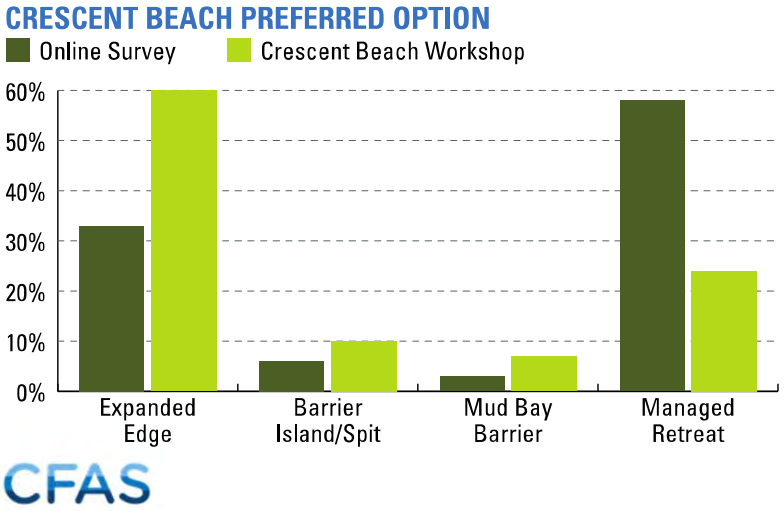
Crescent Beach





- Explored "managed retreat" or pullback by the year 2100
- 2nd most preferred option for residents
- Preferred option – online survey
- Taken off the table

Options to Actions

- Three events helped further inform and shape Actions
  - Additional discussions with directly impacted stakeholders
    - Crescent Beach Property Owners
    - Mud Bay Dyking District
    - Ministry of Transportation and Infrastructure
  - Local elections
  - DMAF (Disaster Mitigation and Adaptation Fund)

Options to Strategic Directions and CFAS Actions

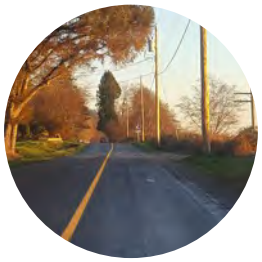
Shortlisted Options

ADDITIONAL REVIEW AND CITY-WIDE SURVEY

Strategic Directions

Mud Bay
Coastal Works / Highway 99

Crescent Beach
Expanded Edge



Semiahmoo Bay
Infrastructure Improvements and Land Raising

TECHNICAL ANALYSIS – PATHWAY DEVELOPMENT

Disaster Mitigation & Adaptation Fund (DMAF)

13

Canada

CFAS Actions

18 Area-wide

28 Area-specific

32 shorter-term (2020-2030), Area-specific tactical Actions

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Advisory Group Meeting

Disaster Mitigation and Adaptation Fund

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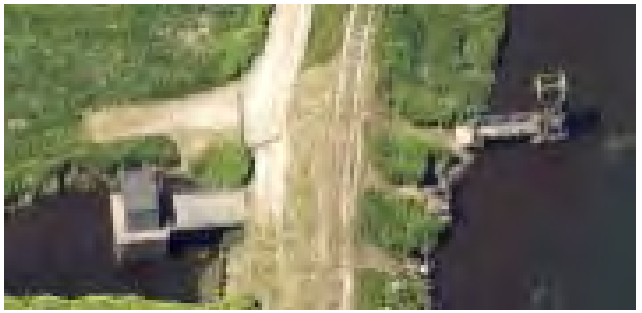
DMAF Overview

- Closely linked to and integrated with CFAS project
  - Surrey is Lead Applicant for bundled project with 13 components
  - $187M nine-year program ($76.6M federal contribution)
- Multi step assessment
  - ☑ Expression of Interest July 2018
  - ☑ Full Application January 2019
  - ☑ Additional Request March 2019
  - ❑ Treasury board approval
  - ❑ Approval in Principle
  - ❑ Contribution Agreement

= economy = infrastructure = environment = communities

Shovel Ready Projects

- Surrey
  - Colebrook Dyke Upgrades
  - Stewart Pump Station
  - Burrows Pump Station
  - Southern Railway of BC
- City of Delta
  - Boundary Bay Dyke Upgrades



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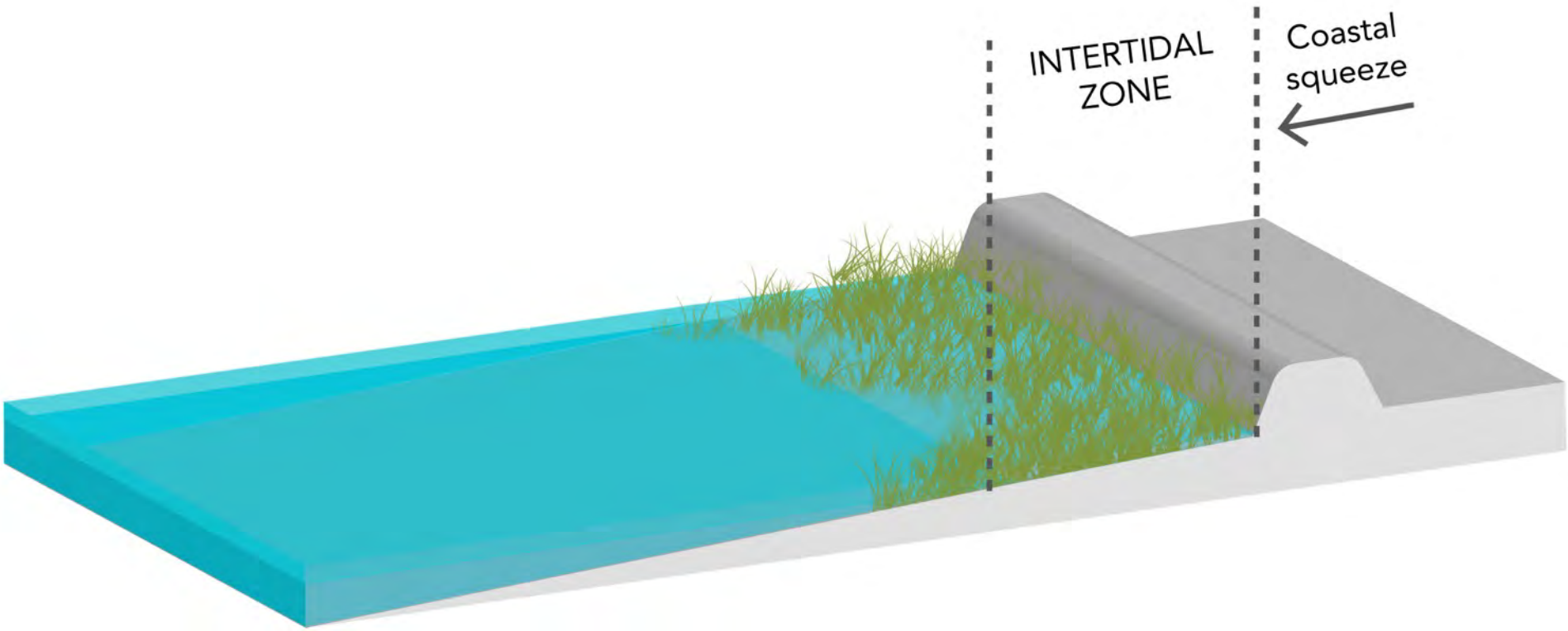
High Priority Projects

- Conceptual design
  - Nicomekl King George Blvd Bridge
  - Nicomekl Riverfront Park
  - 152 St Raising and Widening
- Detailed design
  - Colebrook Pump Station

Innovative Projects

- Foreshore protection
- Nature-based solutions



SURREY DISASTER MITIGATION AND ADAPTATION FUND PROJECT OVERVIEW

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#	Component	Asset Type	Hazard Mitigation	Community Co-benefits	Values Protected	Partnership Opportunities
1	**Colebrook Dyke Upgrades**	Coastal Dyke		Recreation, bird watching, food security		
2	**Colebrook Drainage Pump Station Replacement**	Drainage Pump Station		Increased agricultural productivity and food security		
3	**Sea Dam – Serpentine River**	Sea Dam (drainage and irrigation)		Agriculture irrigation, fish passage, worker safety		
4	**152 St Road Upgrades and Raising**	Transportation Network		Congestion relief, transportation safety, accommodate growth, cycling, pedestrian		TRANSLINK, FORTIS BC
5	**Nicomekl Riverfront Park - Phase 1**	Flood Storage		Recreation (blue way), nature trails, wetlands, culture, open space		
6	**King George Boulevard Bridge and Nicomekl River Sea Dam Replacement**	Arterial Bridge		Congestion relief, transportation safety, accommodate growth, cycling, pedestrian, integrated to Nicomekl Park, fish passage, agriculture irrigation		metrovancouver
7	**Crescent Beach Storm Sewer System Upgrades - Perforated Piping**	Flood Protection		Street beautification/ road improvements, transportation safety		
8	**Dyking - Lower reaches of Nicomekl and Serpentine**	Flood Protection		Food security and transportation flood safety		
9	**Serpentine SRY Rail Link Bridge Replacement and Dyking**	Flood Protection		Economy (freight and heritage railway), worker safety and goods movement		SRY Rail Link (Southern Railway of BC)
10	**Burrows Drainage Pump Station Upgrade**	Drainage Pump Station		Increased agricultural productivity and food security		
11	**Stewart Farm Sanitary Pump Station Coastal Flood Proofing**	Sanitary Sewer Network		Sanitation, worker safety and water quality		
12	**Campbell River Pedestrian and Emergency Access Bridge Replacement**	Transportation Network		Emergency access, Multi Use Path		
13	**Foreshore Enhancements**	Flood Control		Wetlands (birds, fish, clams) and food security		Delta

Hazard Mitigation
= flood = seismic = drought

Values Protected
= economy = infrastructure = environment = communities

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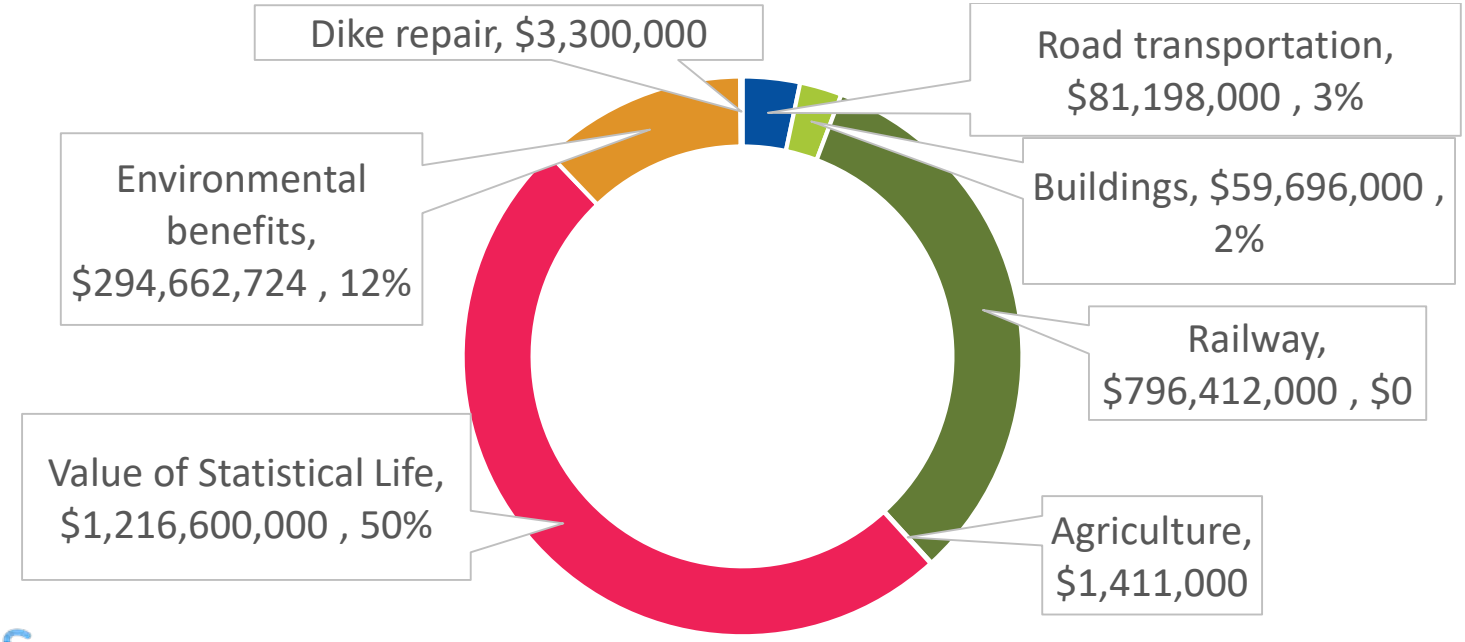
Return on Investment

- Suite of projects must be economically viable
- Nationally significant infrastructure is protected
- Avoided damages calculated over life of assets
- Benefit to Cost ratio 126:1



Total Avoided Flood Damages $24.5B

Key Projects

- DMAF actions with partner/stakeholders implications
  - Colebrook Dyke Upgrades
  - Sea Dam – Serpentine River
  - 152nd Street Upgrades and Raising
  - King George Boulevard Bridge and Nicomekl River Sea Dam Replacement
  - Foreshore Enhancements

Activity

- Review DMAF Actions with partnership opportunities with table group
- Complete the actions worksheet individually (5 min)
- Discuss sheets with table – any issues/ideas? (5 min)

- DMAF "Pre-mortem"
  - It's 2027 and one of the DMAF Actions has been deemed a "failure" by some
    - Which DMAF action is most likely to "go wrong"? Why?
    - What would a "failure" look like to you or your organization? (5 min)
- Report back and share key themes with large group

Advisory Group Meeting

BREAK

Advisory Group Meeting

CFAS overview

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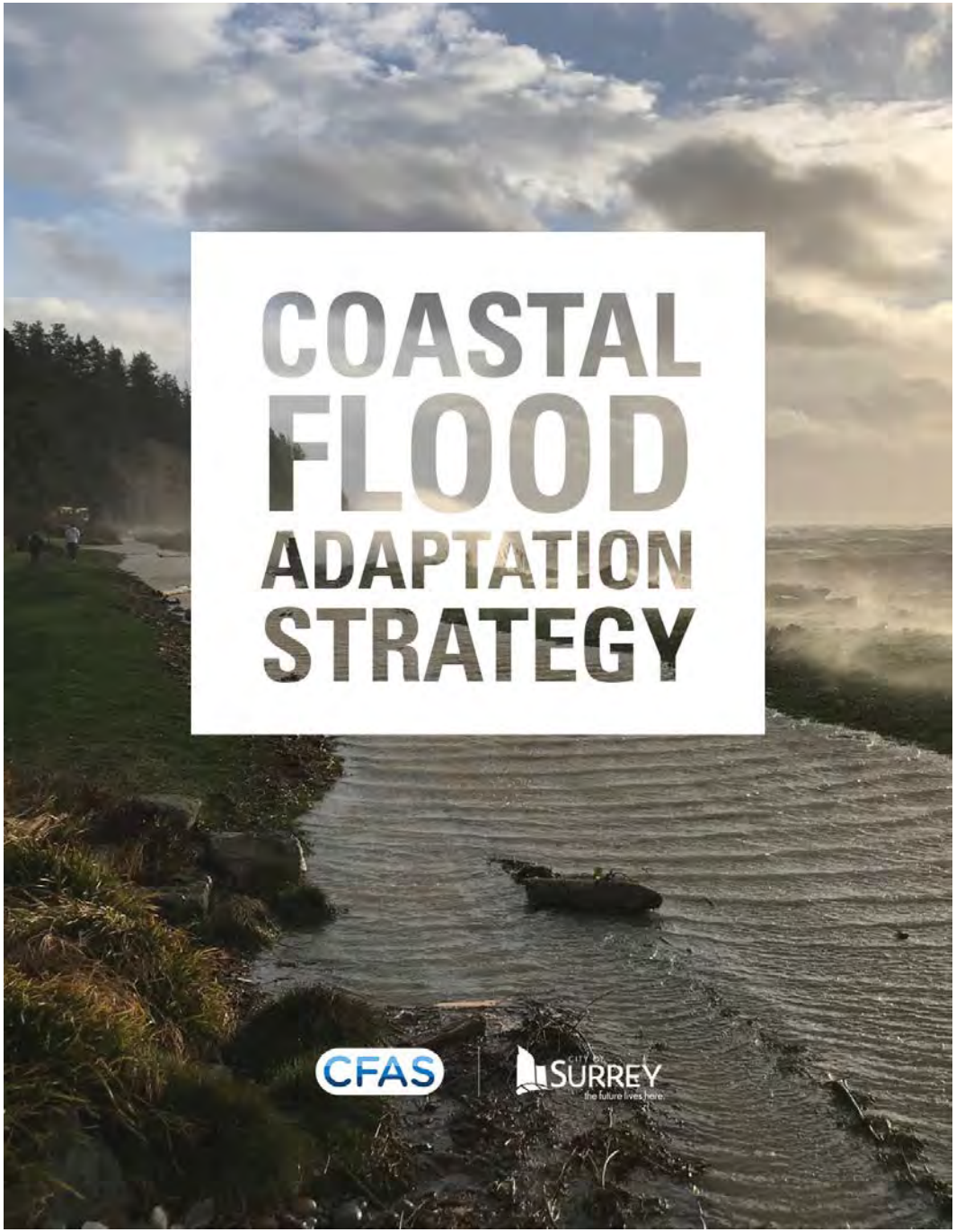
COASTAL
FLOOD
ADAPTATION
STRATEGY
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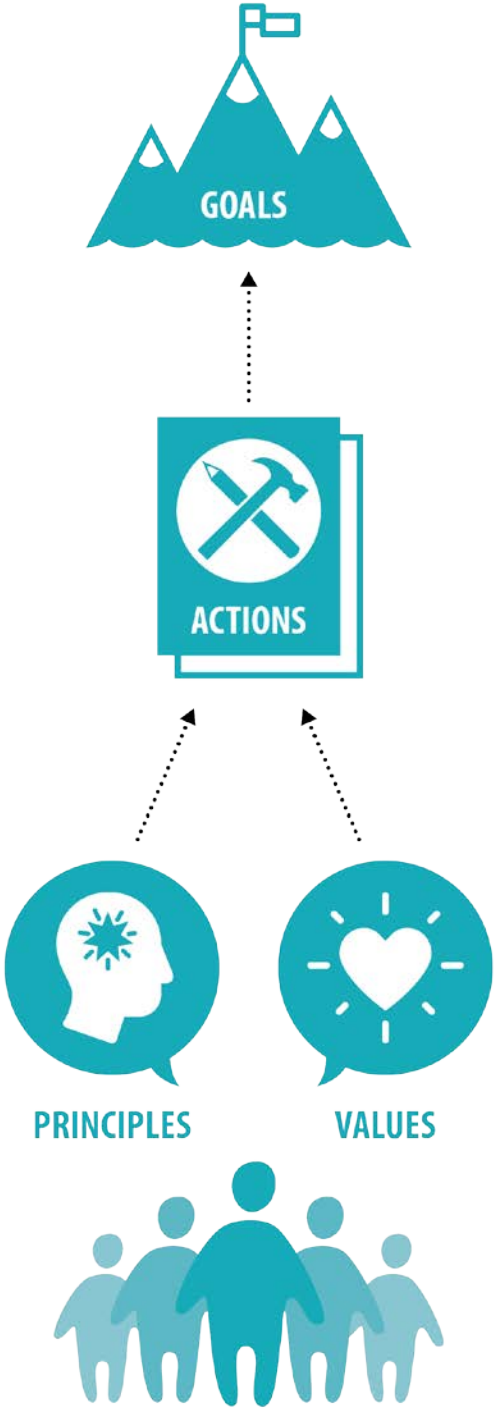

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Goals

- The CFAS Goals are:
  - Improve resilience of existing infrastructure
  - Ensure new infrastructure is resilient and adaptive
  - Update regulatory controls to improve resiliency
  - Ensure that flood management infrastructure and programs steward and enhance ecosystems and natural areas where practical and possible
  - Coordinate with, and contribute to, regional flood management strategies
  - Improve emergency response program for extreme flood events
  - Improve coastal flood hazard awareness, education, and communication
  - Improve and enhance monitoring and evaluation to keep CFAS up-to-date

Principles

Plan for multiple values
(co-benefits)

Plan for adaptability
(adaptive management)

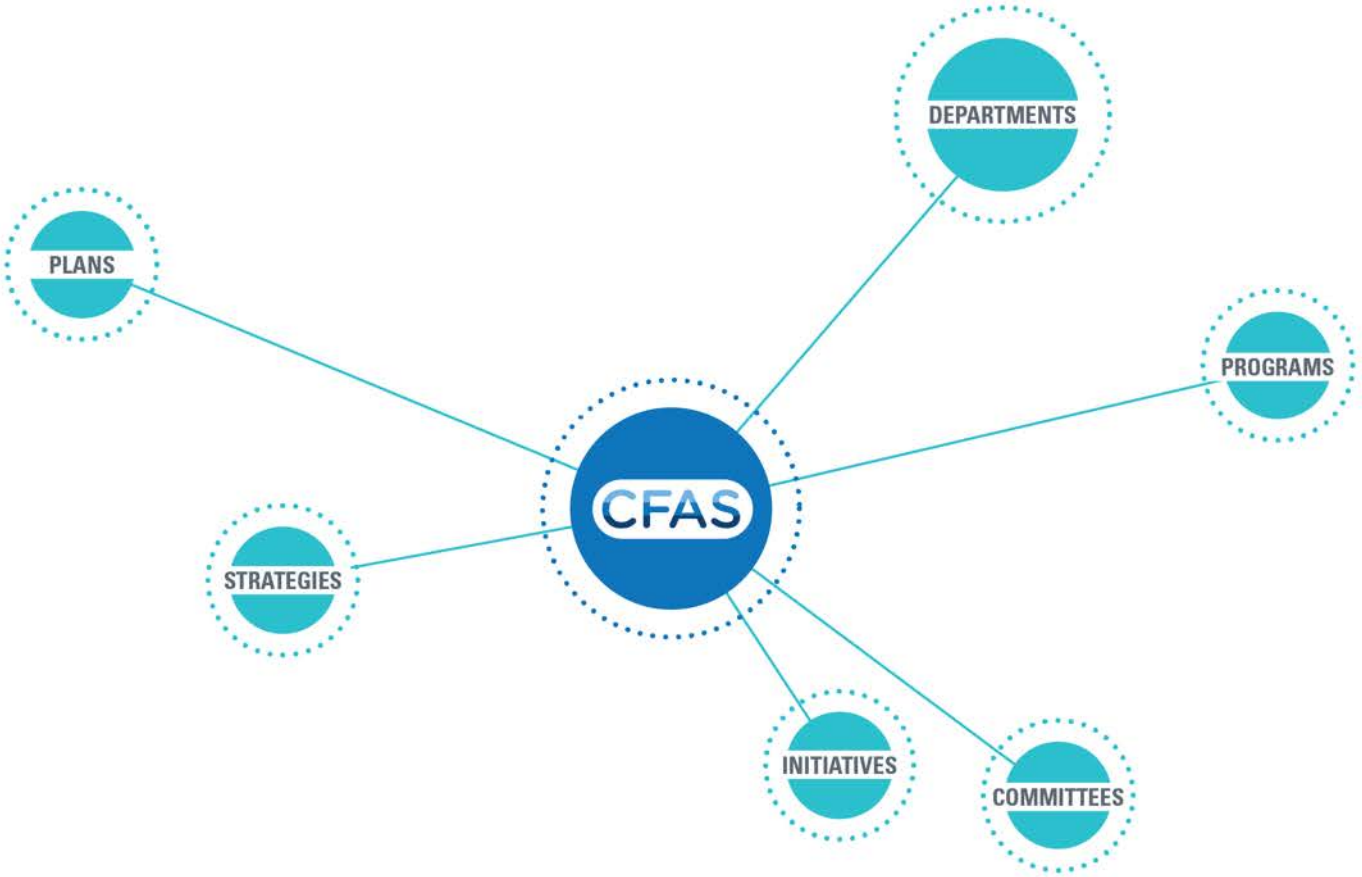
Design for/with nature
(mitigation *and* adaptation)

Design for resilience
(multiple lines of defence)

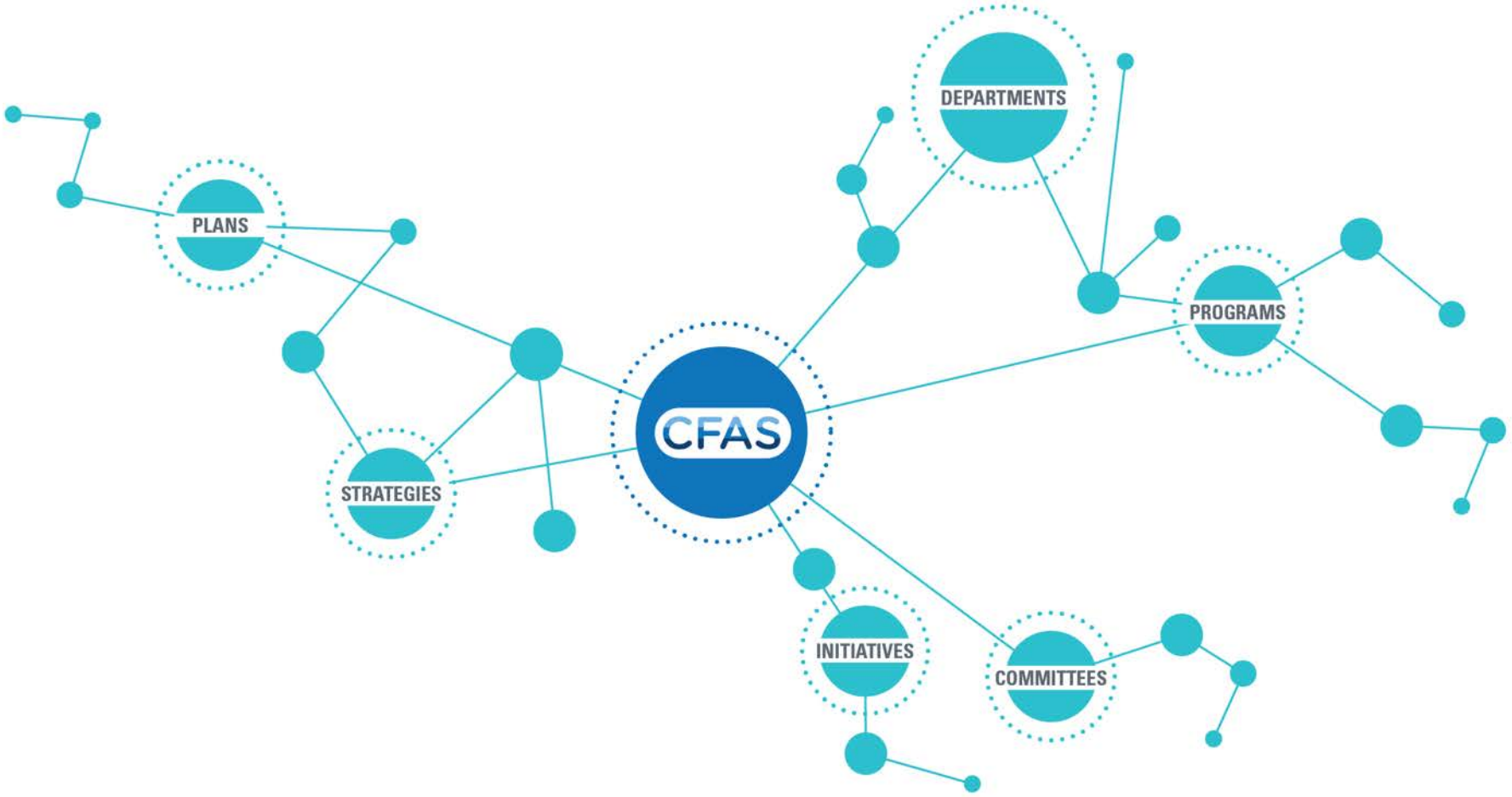
Plan for collaboration/partnerships
(collective, cumulative actions – *everyone* has a role to play)

Plan for food security
(adapting and stewarding agricultural heritage)

CFAS Connections



CFAS Connections



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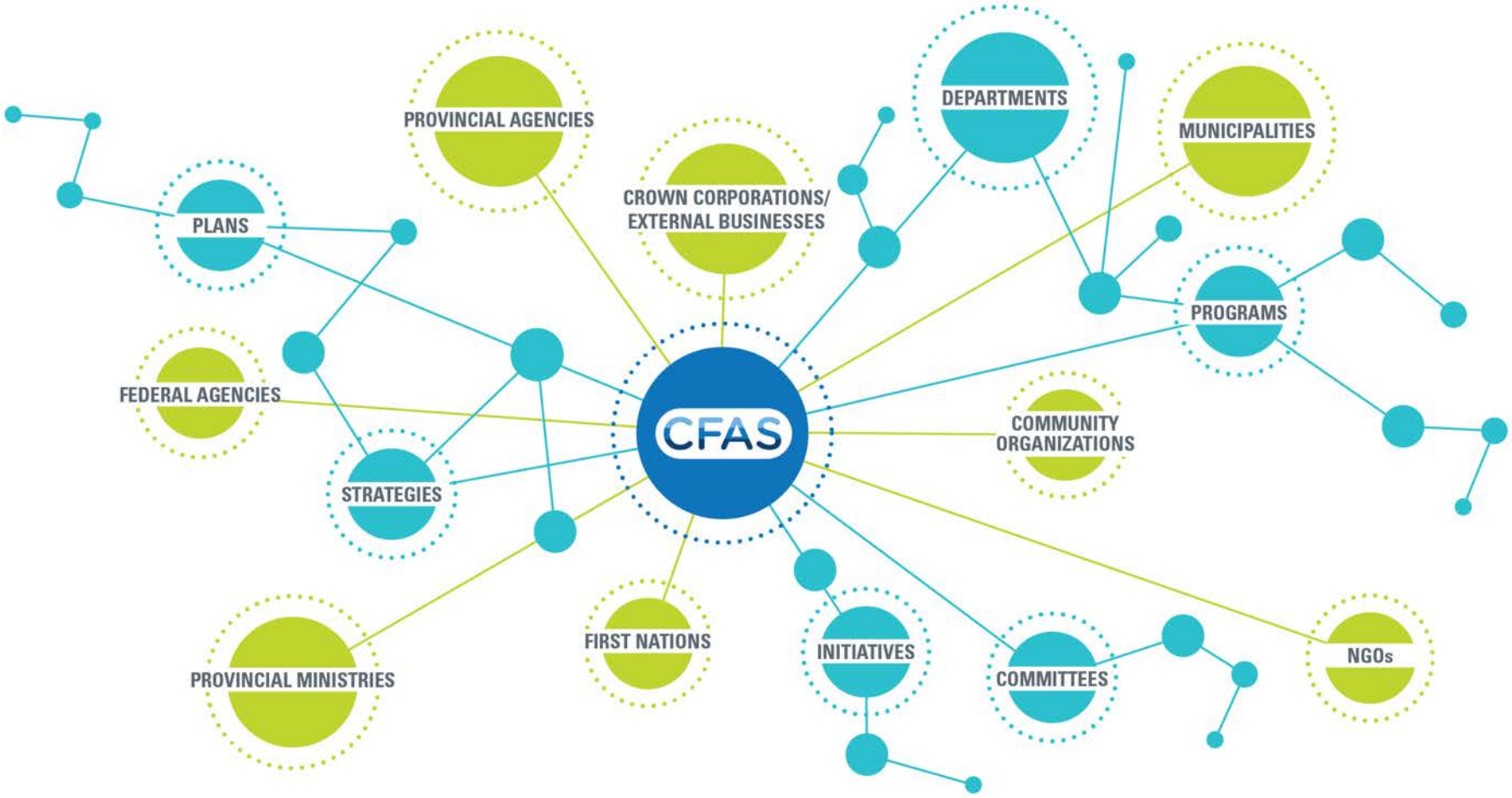

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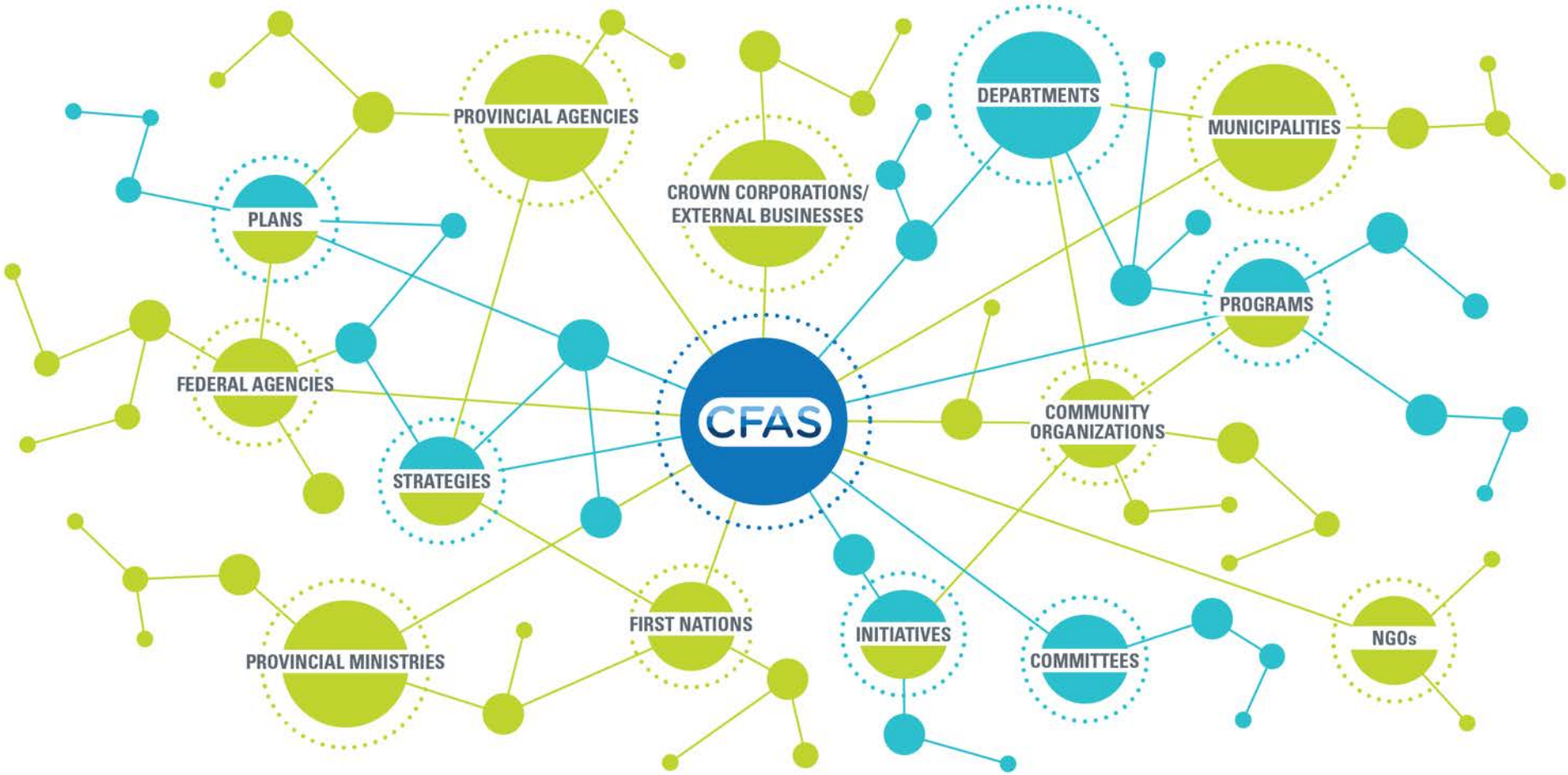
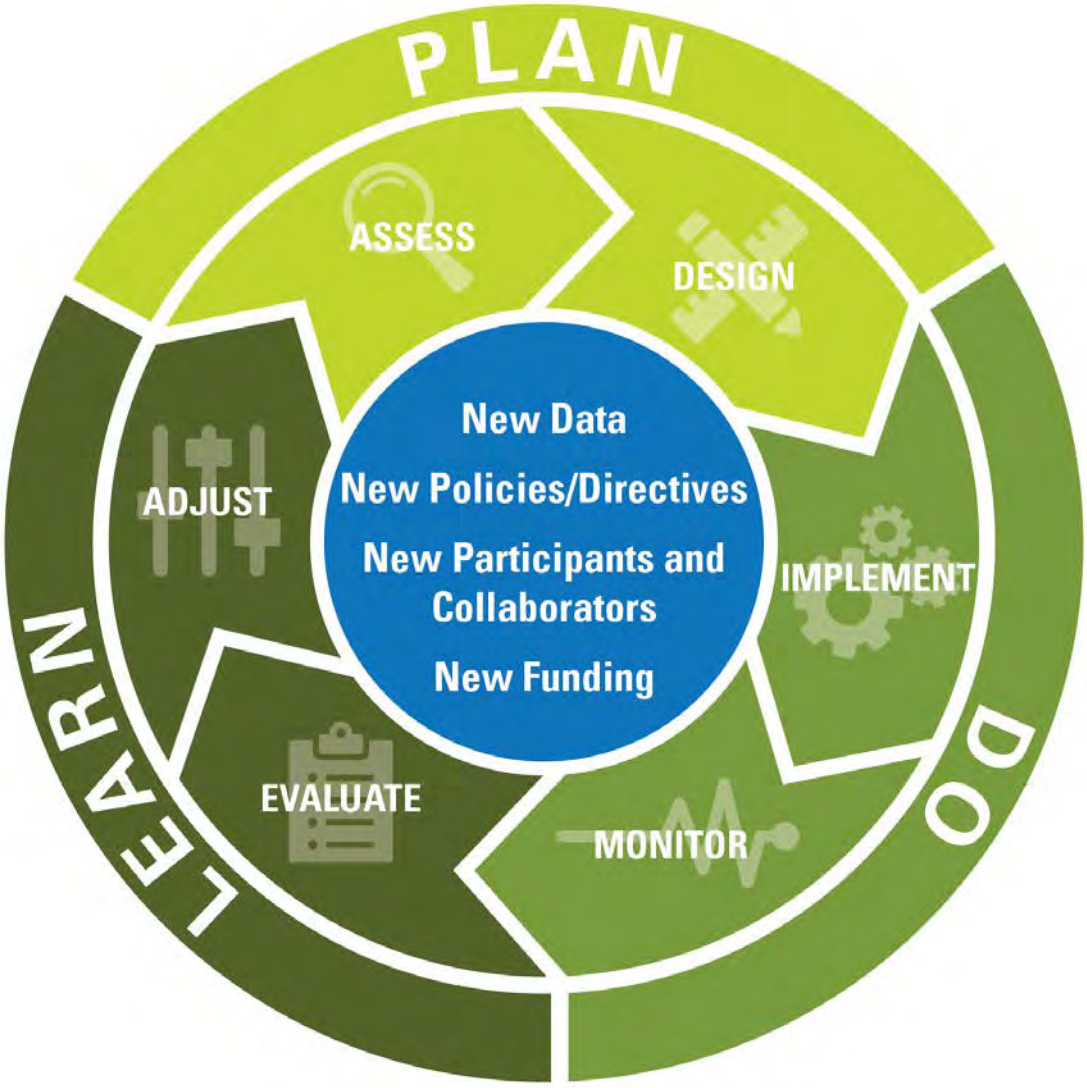


Actions Going Forward



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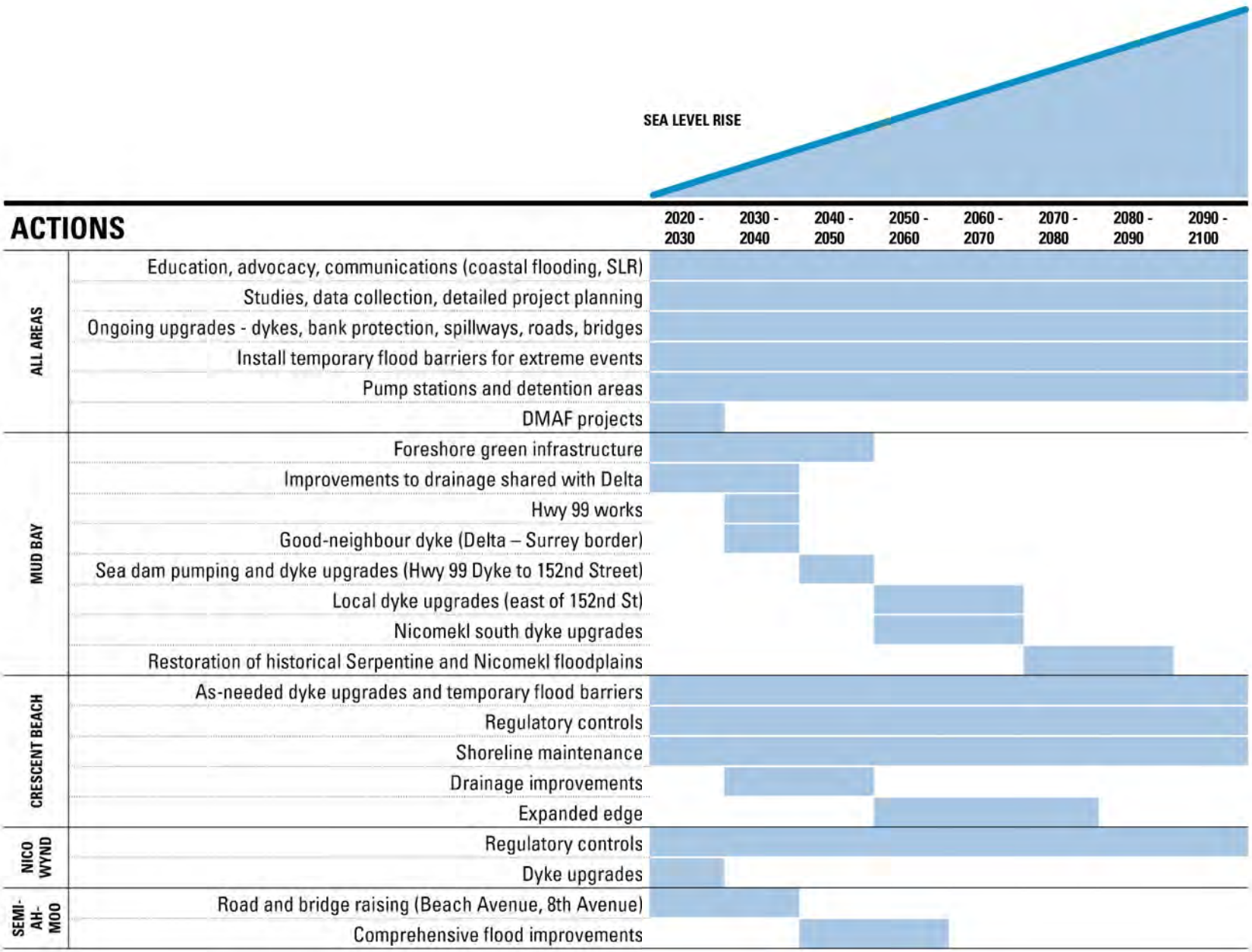
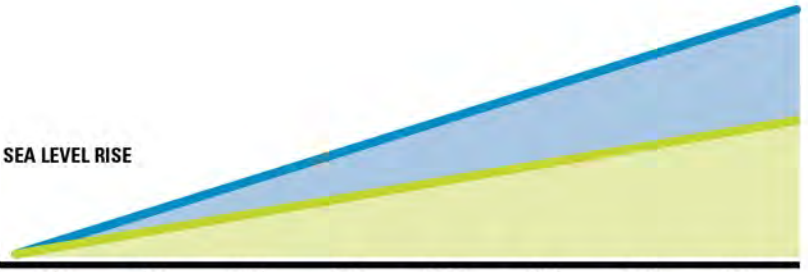

SEA LEVEL RISE
ACTIONS
2020 - 2030
2030 - 2040
2040 - 2050
2050 - 2060
2060 - 2070
2070 - 2080
2080 - 2090
2090 - 2100
ALL AREAS
Education, advocacy, communications (coastal flooding, SLR)
Studies, data collection, detailed project planning
Ongoing upgrades - dykes, bank protection, spillways, roads, bridges
Install temporary flood barriers for extreme events
Pump stations and detention areas
DMAF projects
MUD BAY
Foreshore green infrastructure
Improvements to drainage shared with Delta
Hwy 99 works
Good-neighbour dyke (Delta – Surrey border)
Sea dam pumping and dyke upgrades (Hwy 99 Dyke to 152nd Street)
Local dyke upgrades (east of 152nd St)
Nicomekl south dyke upgrades
Restoration of historical Serpentine and Nicomekl floodplains
CRESCENT BEACH
As-needed dyke upgrades and temporary flood barriers
Regulatory controls
Shoreline maintenance
Drainage improvements
Expanded edge
NICO WYND
Regulatory controls
Dyke upgrades
SEMI-AH-MOO
Road and bridge raising (Beach Avenue, 8th Avenue)
Comprehensive flood improvements



ACTIONS		2020 - 2030	2030 - 2040	2040 - 2050	2050 - 2060	2060 - 2070	2070 - 2080	2080 - 2090	2090 - 2100
ALL AREAS	Education, advocacy, communications (coastal flooding, SLR)								
	Studies, data collection, detailed project planning								
	Ongoing upgrades - dykes, bank protection, spillways, roads, bridges								
	Install temporary flood barriers for extreme events								
	Pump stations and detention areas								
	DMAF projects								
MUD BAY	Foreshore green infrastructure								
	Improvements to drainage shared with Delta								
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	Nicomekl south dyke upgrades								
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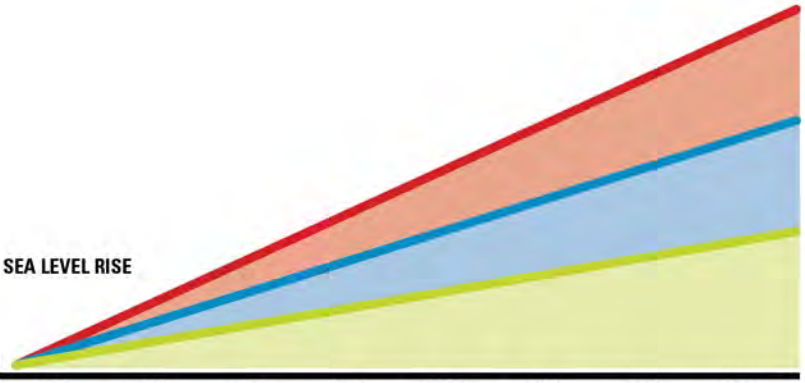
CRESCENT BEACH	As-needed dyke upgrades and temporary flood barriers								
	Regulatory controls								
	Shoreline maintenance								
	Drainage improvements								
	Expanded edge								
NICO WYND	Regulatory controls								
	Dyke upgrades								
SEMI-AH-MOO	Road and bridge raising (Beach Avenue, 8th Avenue)								
	Comprehensive flood improvements								



ACTIONS	2020 - 2030	2030 - 2040	2040 - 2050	2050 - 2060	2060 - 2070	2070 - 2080	2080 - 2090	2090 - 2100
ALL AREAS								
Education, advocacy, communications (coastal flooding, SLR)	■	■	■	■	■	■	■	■
Studies, data collection, detailed project planning	■	■	■	■	■	■	■	■
Ongoing upgrades - dykes, bank protection, spillways, roads, bridges	■	■	■	■	■	■	■	■
Install temporary flood barriers for extreme events	■	■	■	■	■	■	■	■
Pump stations and detention areas	■	■	■	■	■	■	■	■
DMAF projects	■							
MUD BAY								
Foreshore green infrastructure	■	■	■					
Improvements to drainage shared with Delta	■	■	■					
Hwy 99 works	■	■	■					
Good-neighbour dyke (Delta – Surrey border)	■	■	■					
Sea dam pumping and dyke upgrades (Hwy 99 Dyke to 152nd Street)		■	■	■				
Local dyke upgrades (east of 152nd St)			■	■	■	■	■	
Nicomekl south dyke upgrades			■	■	■	■	■	
Restoration of historical Serpentine and Nicomekl floodplains					■	■	■	■
CRESCENT BEACH								
As-needed dyke upgrades and temporary flood barriers	■	■	■	■	■	■	■	■
Regulatory controls	■	■	■	■	■	■	■	■
Shoreline maintenance	■	■	■	■	■	■	■	■
Drainage improvements	■	■	■	■				
Expanded edge			■	■	■	■	■	■
NICO WYND								
Regulatory controls	■	■	■	■	■	■	■	■
Dyke upgrades	■							
SEMI-AH-MOO								
Road and bridge raising (Beach Avenue, 8th Avenue)	■	■	■					
Comprehensive flood improvements		■	■	■	■			

Advisory Group Meeting

CFAS Actions

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Options to Strategic Directions and CFAS Actions

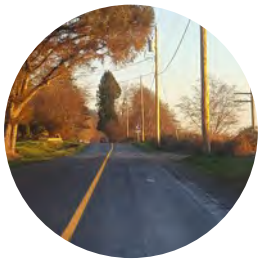
Shortlisted Options

ADDITIONAL REVIEW AND CITY-WIDE SURVEY

Strategic Directions

Mud Bay
Coastal Works / Highway 99

Crescent Beach
Expanded Edge



Semiahmoo Bay
Infrastructure Improvements and Land Raising

TECHNICAL ANALYSIS – PATHWAY DEVELOPMENT

Disaster Mitigation & Adaptation Fund (DMAF)

13

Canada

CFAS Actions

18 Area-wide

28 Area-specific

32 shorter-term (2020-2030), Area-specific tactical Actions

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Area-wide Actions

CFAS AREA-WIDE ACTIONS		2020 - 2030	2030 - 2040	2040 - 2050	2050 - 2060	2060 - 2070	2070 - 2080	2080 - 2090	2090 - 2100
Ongoing Education, Communications, and Advocacy Initiatives									
1	CFAS Steering Committee								
2	Internal Updates								
3	CFAS Advisory Group								
4	CFAS Website								
5	Advocacy Partners Workshop								
6	Communications and Media								
Detailing Planning, Studies, and Data Collection									
7	Update hazard bibliography								
8	Update coastal flood hazard assessment								
9	Detailed studies - Strategic Actions								
Regulatory Controls, Design Standards, and Guidelines									
10	Review Development Variance practices								
11	Support flood resilient design and construction								
12	Explore Sea Level Rise Planning Area								
13	Design Standards Guidebook								
Extreme Flood Management									
14	Hazard review								
15	Training and readiness								
16	Improve flood warning systems and communications								
17	Temporary protection measures assessment								
18	Build Back Better program								
Disaster Mitigation and Adaptation Fund (DMAF) Projects									
DMAF projects									

Area-wide Actions

- Advocacy Partners Workshop
- Review Development Variance practices
- Support flood resilient design and construction
- Explore Sea Level Rise Planning Area
- Build Back Better program

Area-wide Actions

- **Advocacy Partners Workshop**
  - Encourage the Province to organize a workshop with Municipal Insurance Association of BC, Real Estate Foundation of BC, financial institutions/associations, Local Government Association of BC, West Coast Environmental Law, and others with a focus on the real estate considerations of CFAS strategic directions.

Area-wide Actions

- **Review Development Variance practices**
  - Review and update Development Permit Variance Permit (DVP) practices around DVPs for Flood Construction Level (FCL) reductions, replacing them with DVPs that allow for the construction of more adaptable buildings to improve resilience and mitigate current and future risks to residents.

Area-wide Actions

- **Support flood resilient design and construction**
  - Explore regulatory changes to the Surrey Zoning Bylaw and Official Community Plan through new Development Permit Guidelines that support and encourage flood-tolerant design and construction standards in flood hazard areas.

Area-wide Actions

- **Explore Sea Level Rise Planning Area**
  - Review Provincial Flood Hazard Area Land Use Management Guidelines amendment for sea level rise and consider establishing a special Sea Level Rise Planning Area
  - Such an area may be designated as a floodplain under Section 524 of the *Local Government Act* and specify special flood construction levels levels and setbacks to address sea level rise.

Area-wide Actions

- **Build Back Better program**
  - Advocate for Province to adopt Include ‘Built Back Better’ principles
  - Include ‘Built Back Better’ principles in recovery planning

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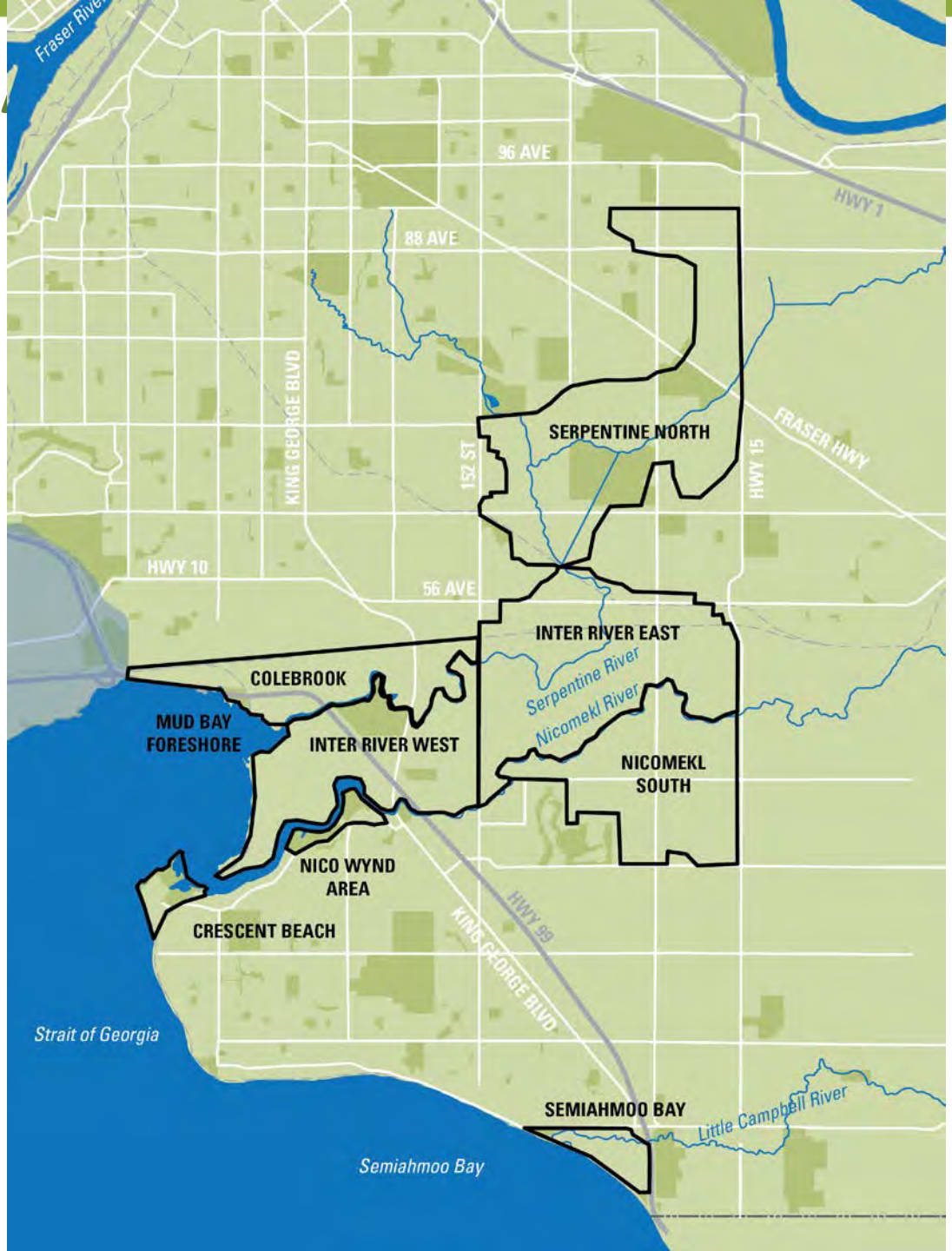

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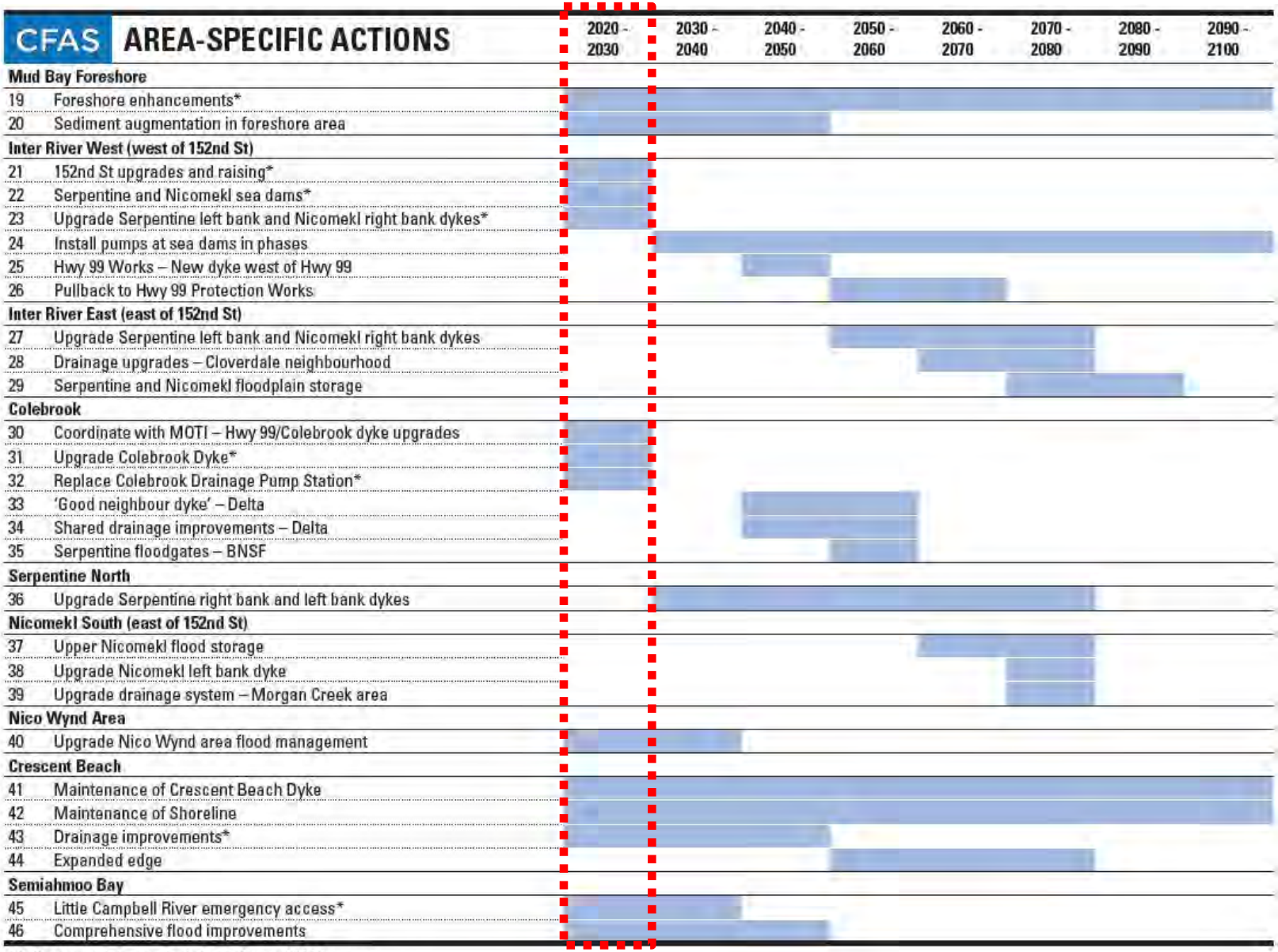
Area-specific Actions



** Indicates partial scope included in Surrey DMAF program*

Area-specific Actions under $5M capital cost are omitted for clarity

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Area-specific Actions

- Action 19: Foreshore enhancements*
- Action 20: Sediment augmentation
- Action 21: 152nd Street upgrades and raising*
- Action 22: Serpentine and Nicomekl sea dams*
- Action 23: Upgrade Serpentine left bank and Nicomekl right bank dykes*
- Action 30: Coordinate with MOTI – Hwy 99/Colebrook dyke upgrades
- Action 31: Upgrade Colebrook Dyke*
- Action 32: Replace Colebrook Drainage Pump Station*
- Action 37: Upper Nicomekl flood storage
- Action 40: Upgrade Nico Wynd area flood management
- Action 41: Maintenance of Crescent Beach Dyke
- Action 42: Maintenance of Shoreline
- Action 43: Drainage improvements*
- Action 45: Little Campbell River emergency access*
- Action 46: Comprehensive flood protection improvements

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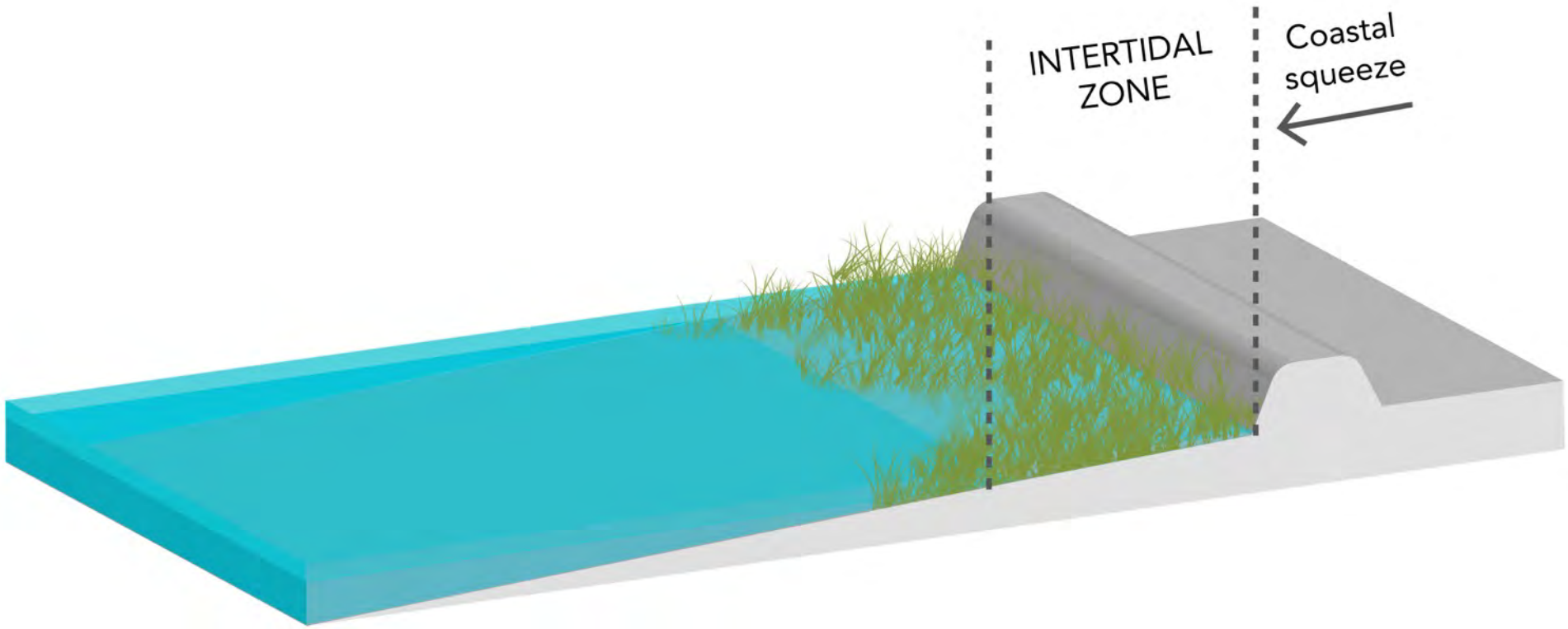
Mud Bay Foreshore

Action 20: Sediment augmentation

- Loss of habitat
- Loss of flood attenuation



Mud Bay Foreshore

Action 20: Sediment augmentation

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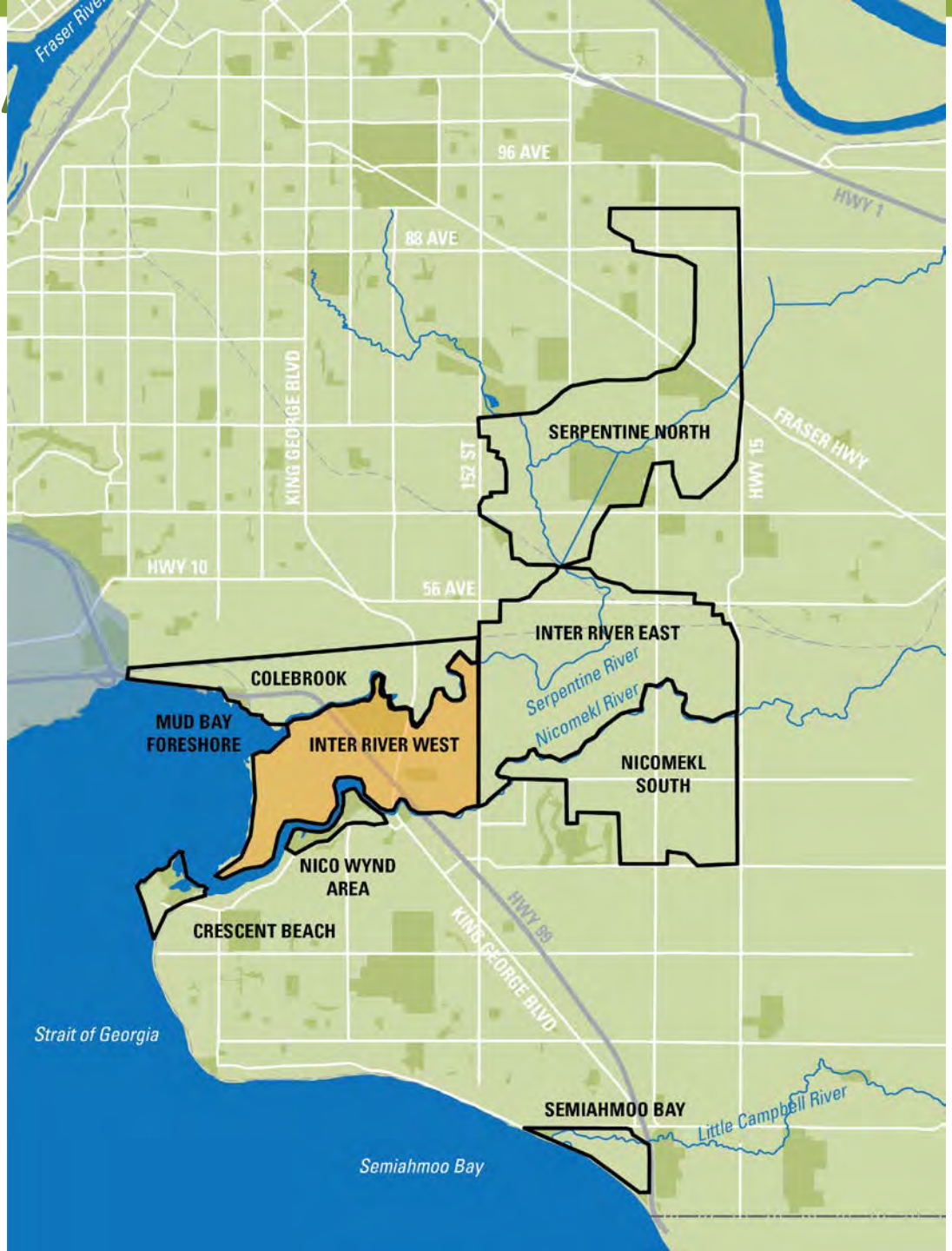

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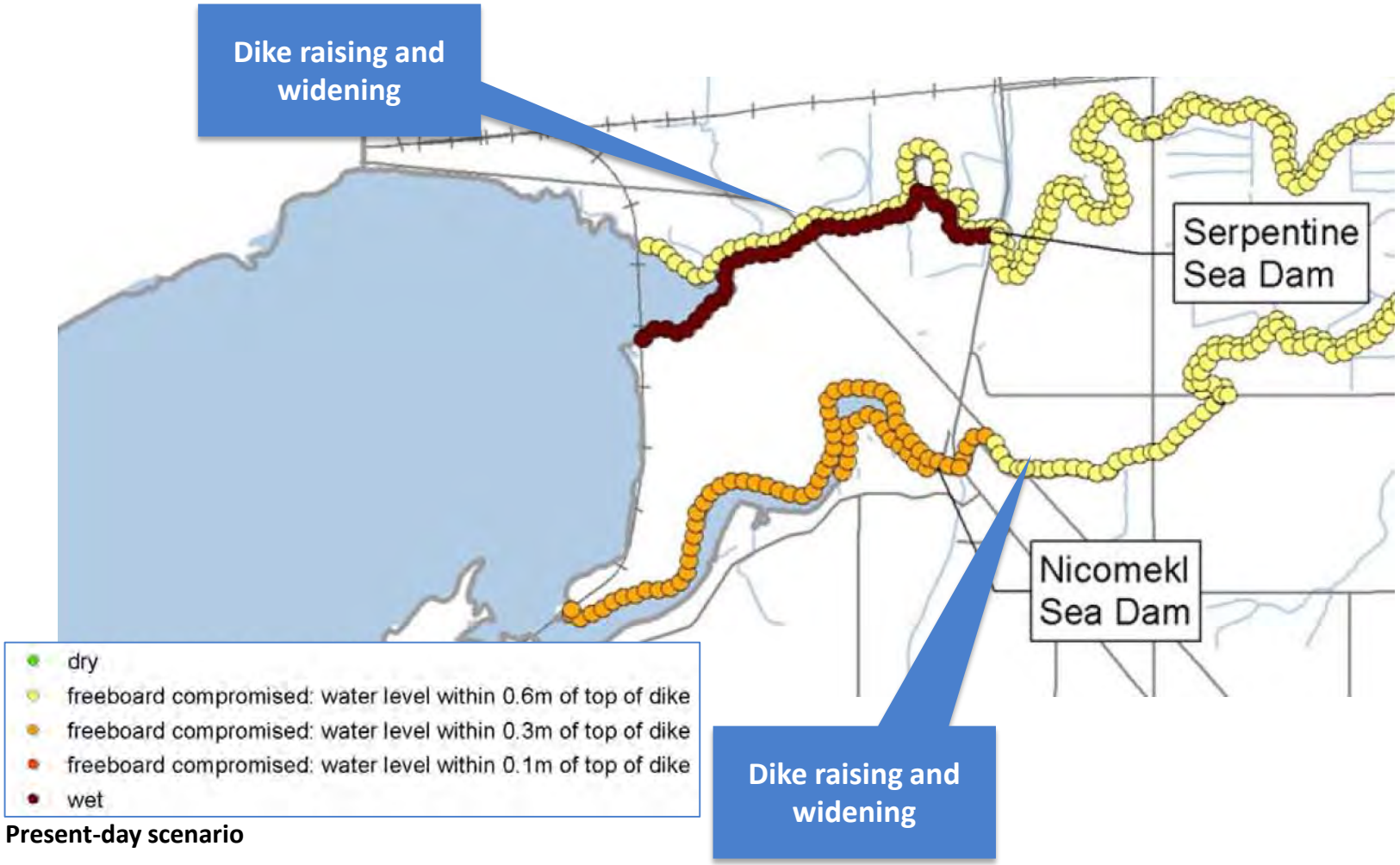
Inter River West

Action 23: Upgrade dykes



Present-day scenario

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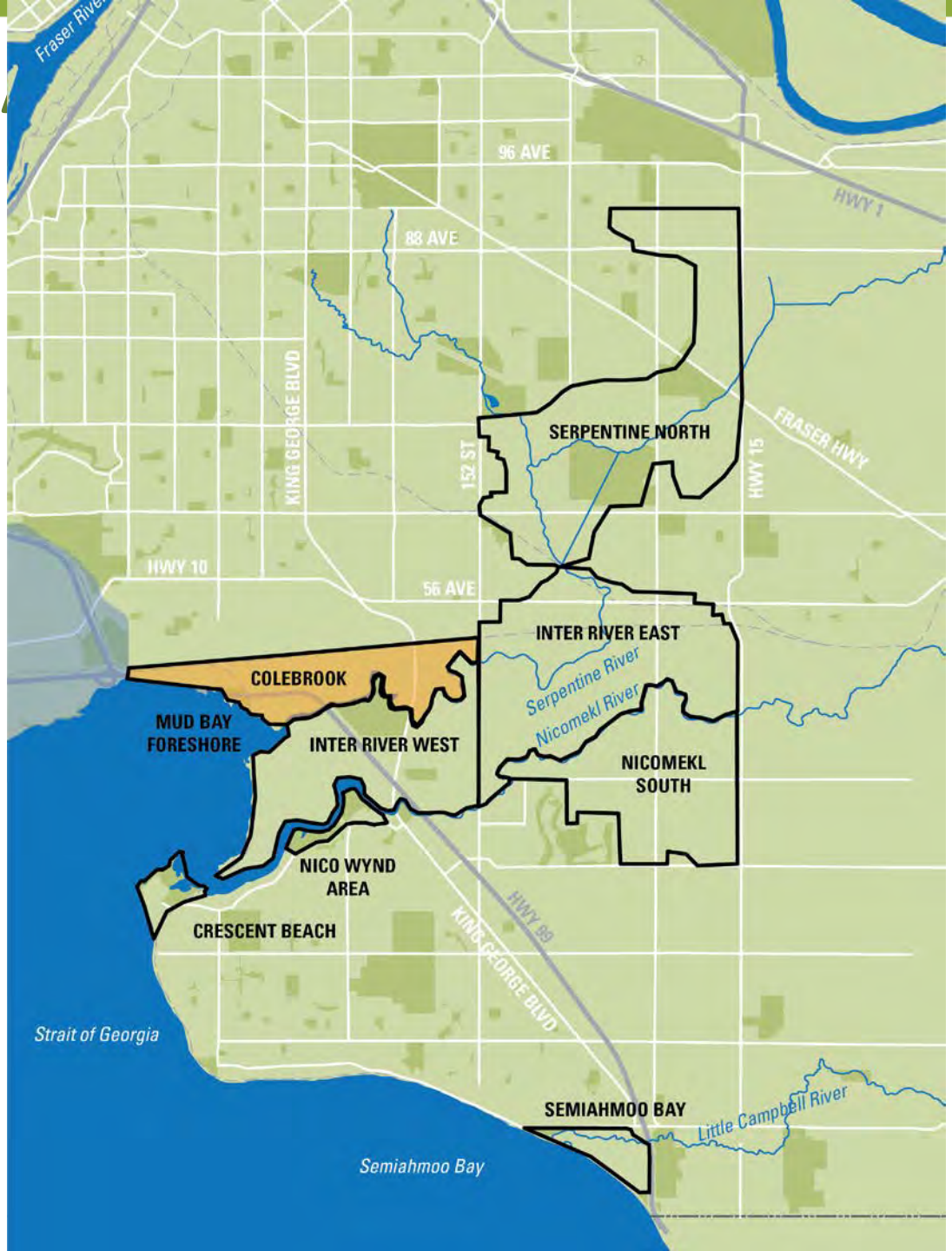

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Colebrook

Action 30: Coordinate with MOTI – Hwy 99/Colebrook dyke upgrades

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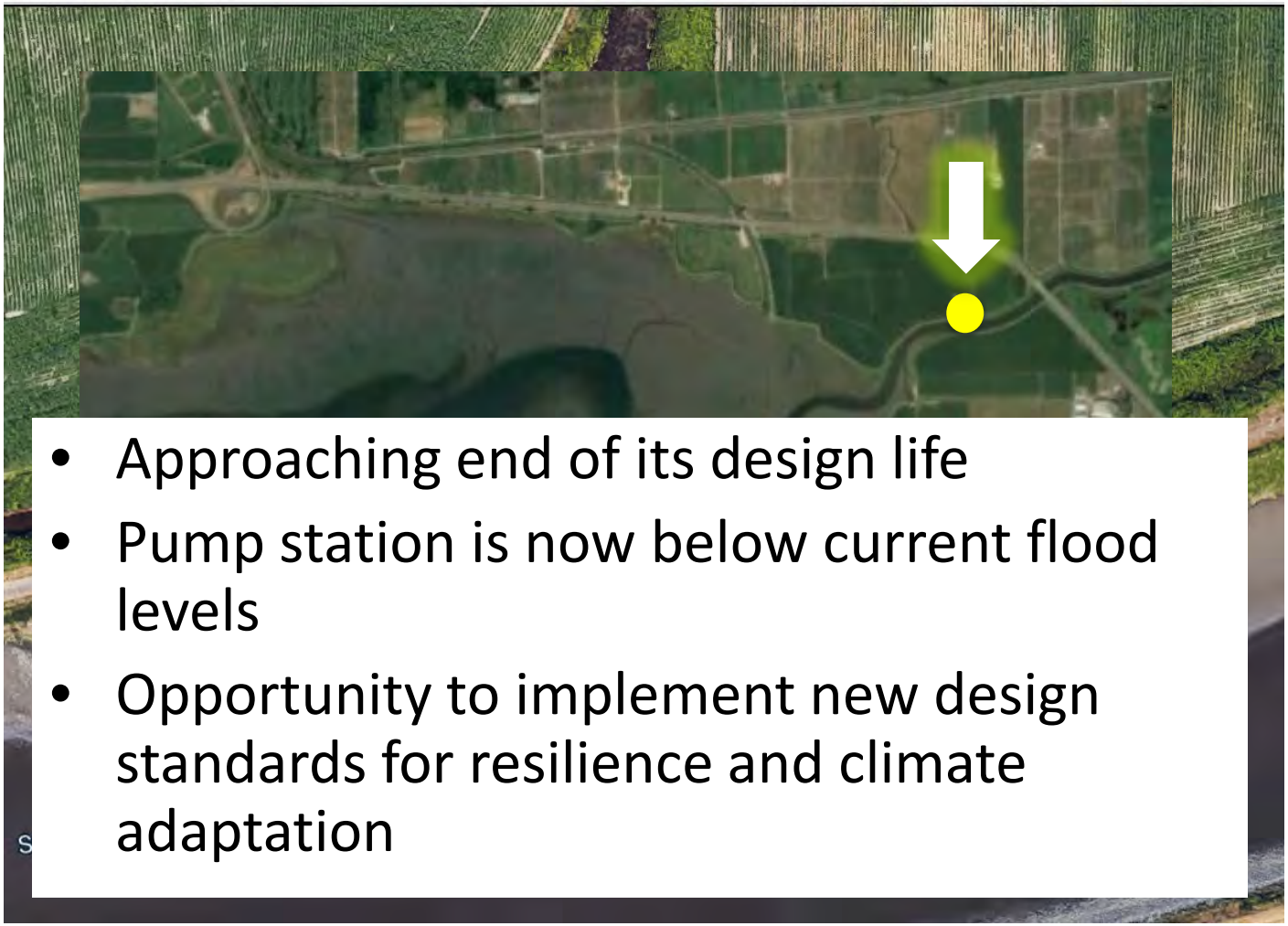
Colebrook

Action 32: Replace Colebrook Drainage Pump Station



- Approaching end of its design life
- Pump station is now below current flood levels
- Opportunity to implement new design standards for resilience and climate adaptation

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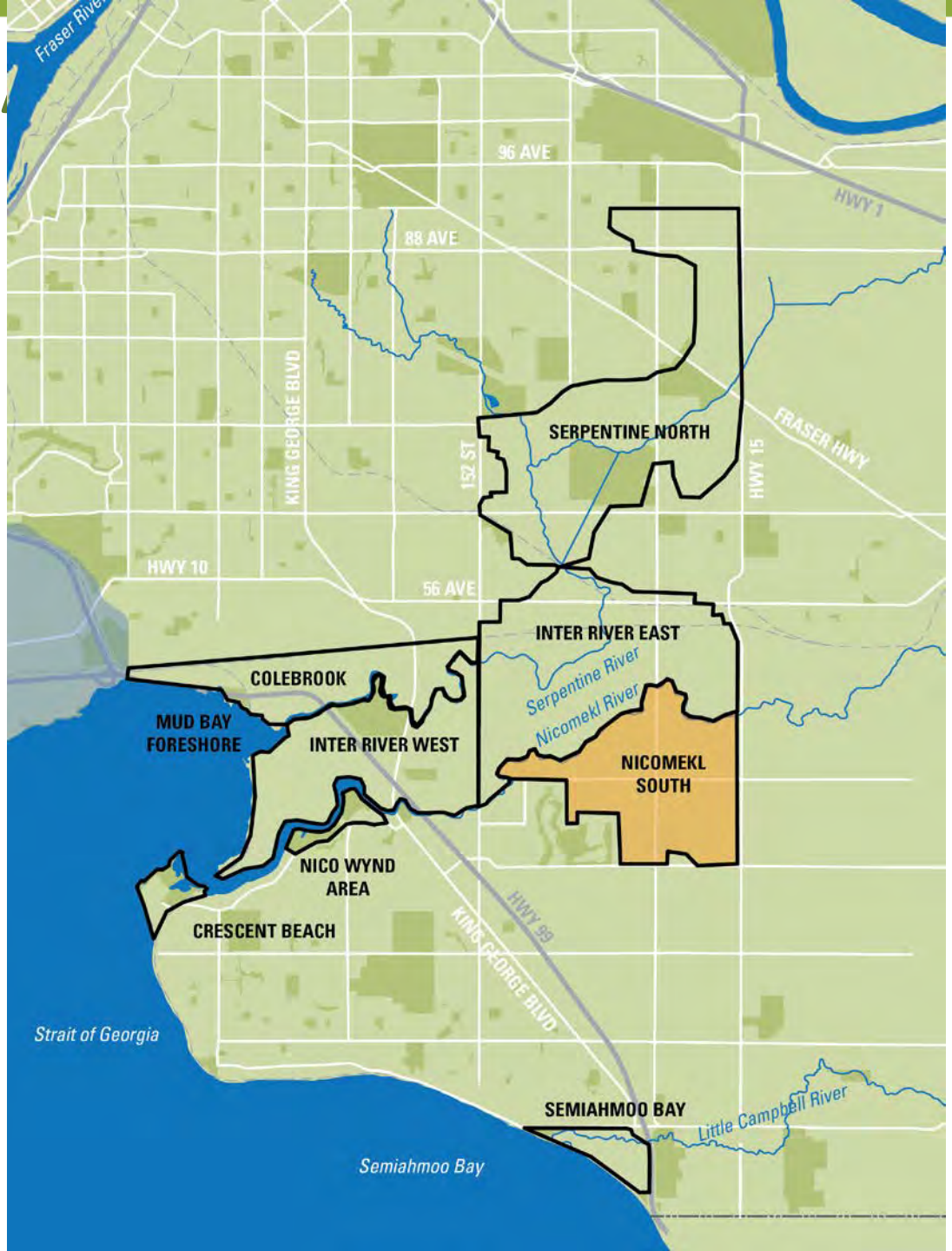

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Nicomekl South

Action 37: Upper Nicomekl Flood Storage

- Drainage improvements in 184th/196th St area may result in high peaks in Nicomekl
- Upper Nicomekl flood control strategy (2008) – several options identified
- Early coordination with Langley needed

UMA/AECOM (2008)

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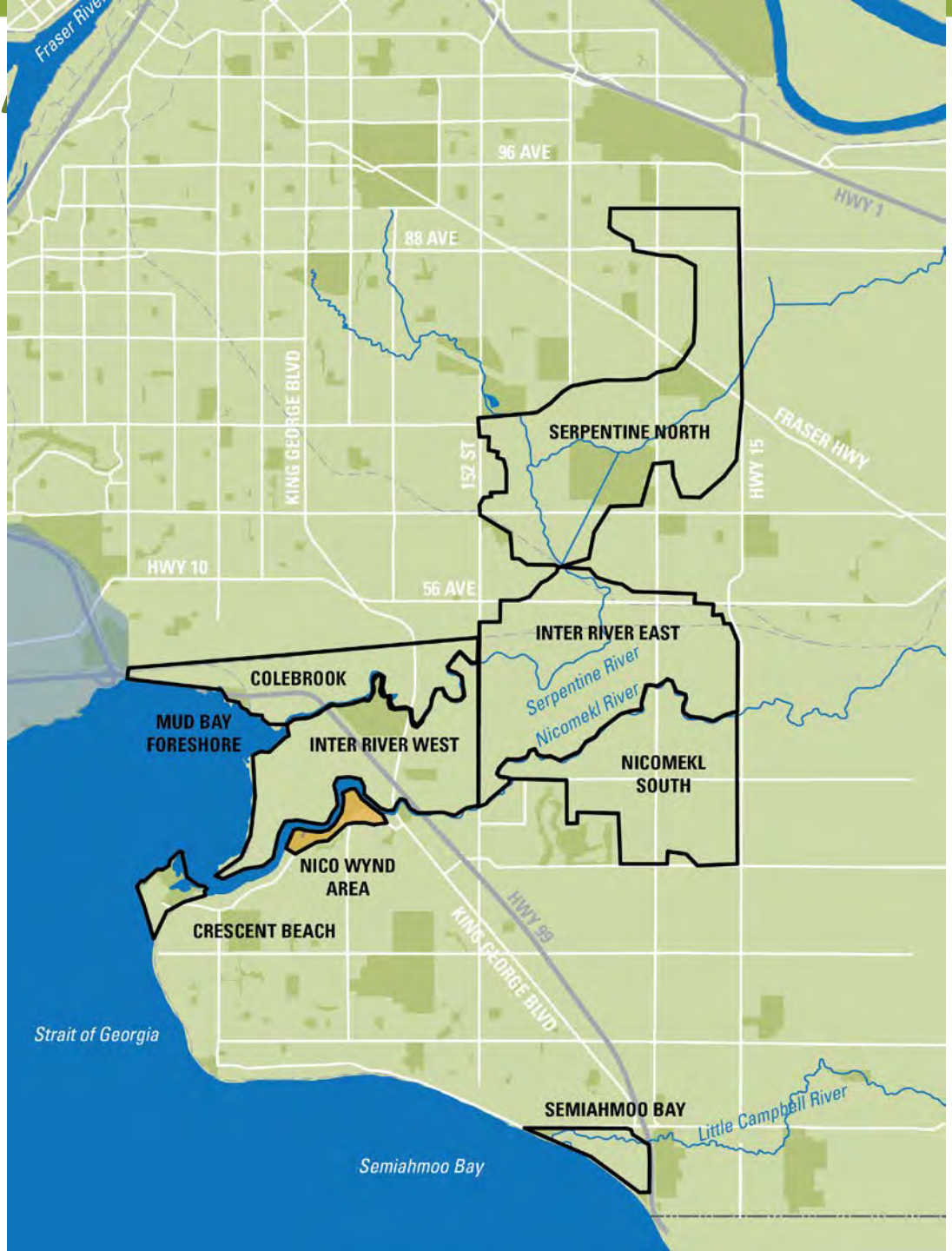

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Nico Wynd Area

Action 40: Upgrade Nico Wynd area flood management

- Nico Wynd dyke requires improvements
- Several options identified after detailed 2015 study
- Initiate planning process in short-term

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Crescent Beach

Action 41: Maintenance of Crescent Beach dyke

- Dyke recently improved but localized problems may occur in future scenarios
- On-going maintenance to keep up with sea level rise
- May include temporary protection options

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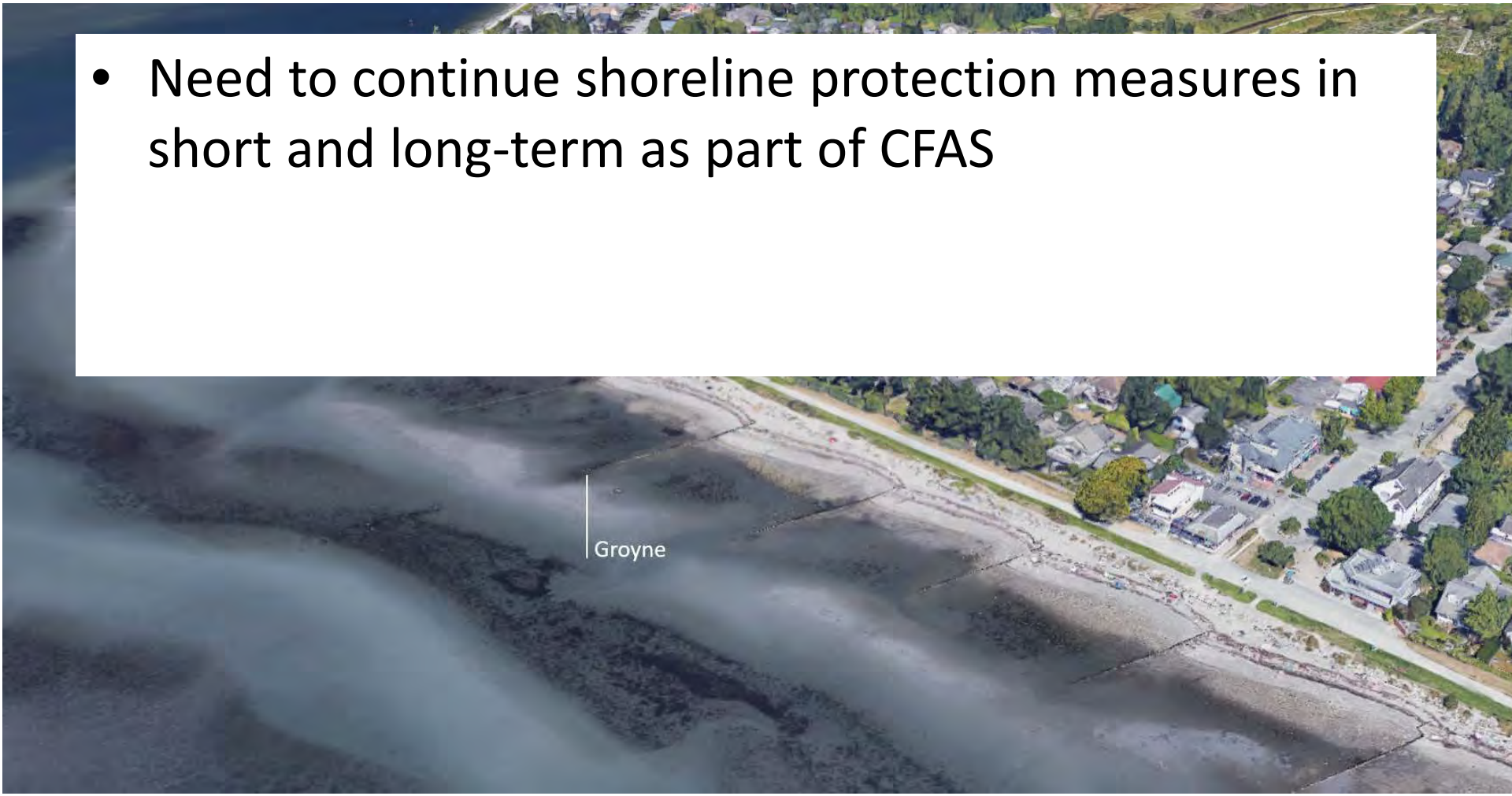
Crescent Beach

Action 42: Maintenance of shoreline

- Need to continue shoreline protection measures in short and long-term as part of CFAS

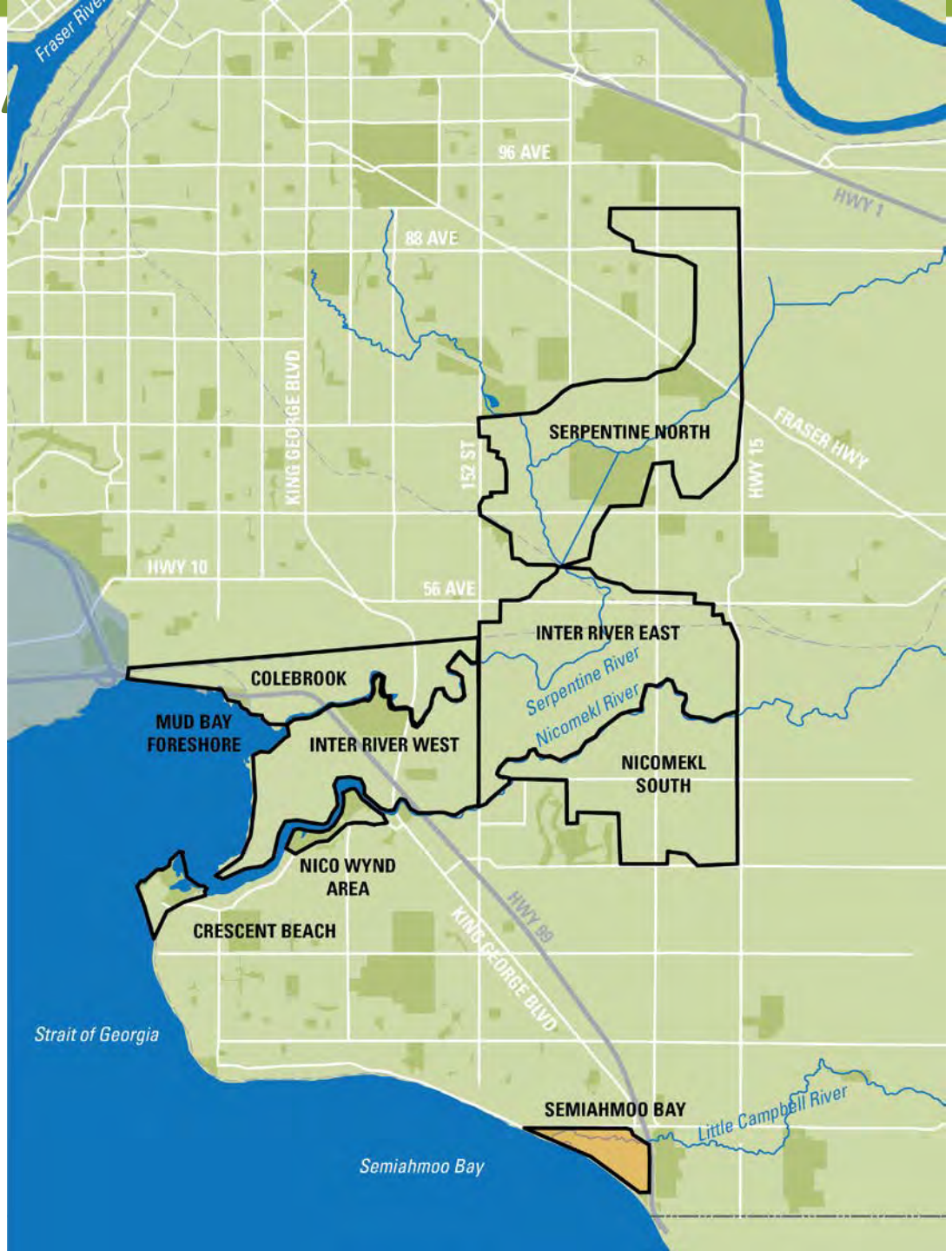


Crescent Beach

Action 43: Drainage improvements

- Known deficiencies, with no formal drainage system in some areas
- Drainage improvements already underway
- Continue in short-term, with climate change considerations

CFAS



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Semiahmoo Bay

Action 45: Little Campbell River emergency access

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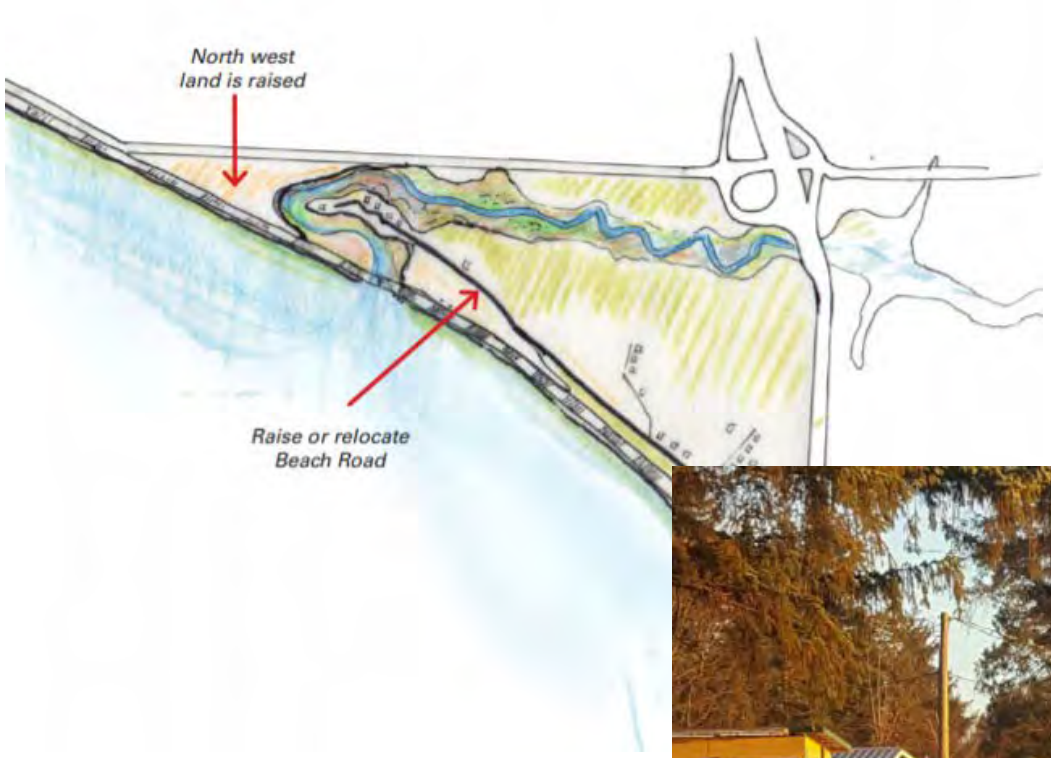
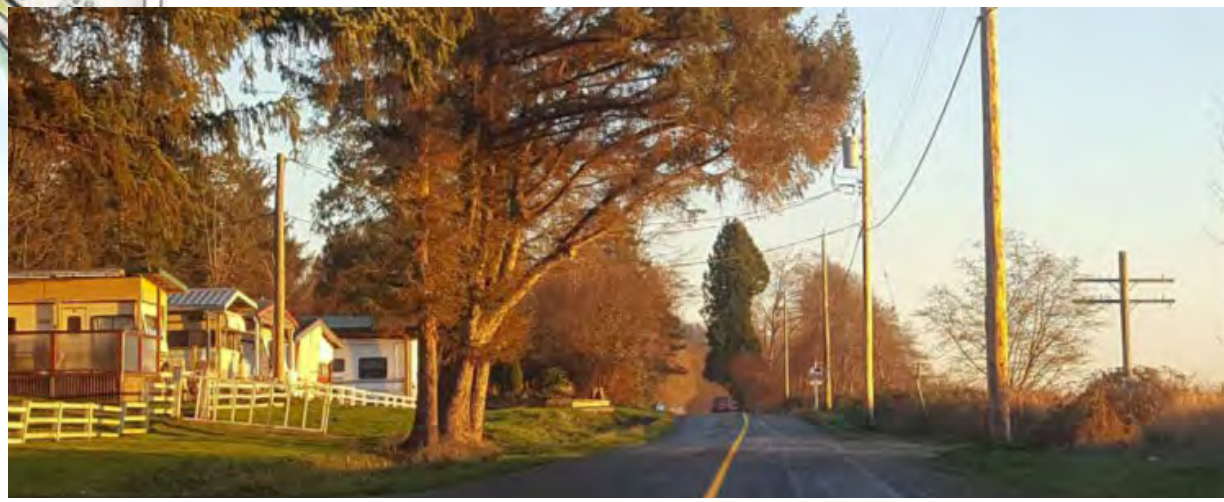
Semiahmoo Bay

Action 46: Comprehensive flood improvements





- Not a Surrey-led action

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Activity

- Review Area-specific Actions worksheet as a small group (5 min)
  - Shorter-term (2020-2030) tactical actions
- Complete worksheets individually (5 min)
- Discuss with table group – any issues (5 min)
  - Common themes or priorities?
- Report back to large group (5min)

Activity

- Large group discussion
  - Would any of the DMAF pre-mortem considerations/ideas apply to CFAS Actions? (5min)

Advisory Group Meeting

Next Steps

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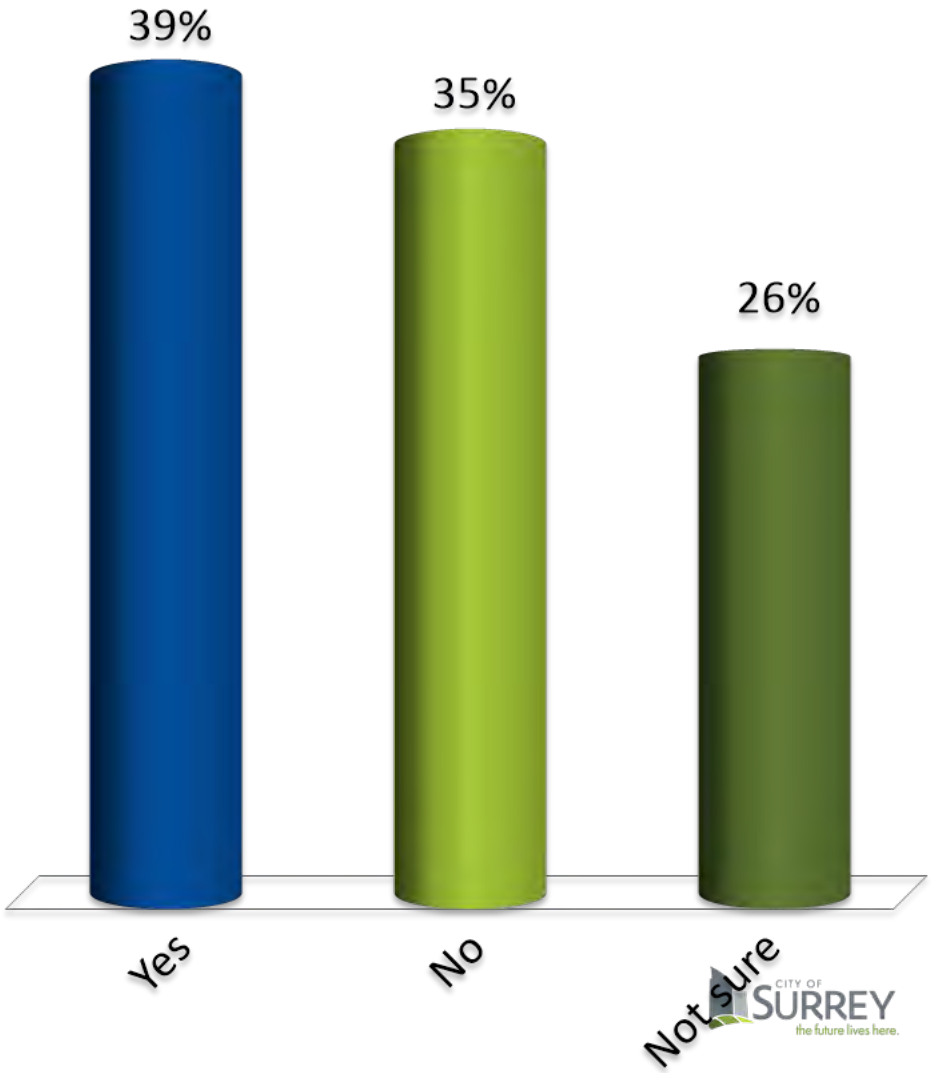
Would an extreme flood event change your opinion around the priorities you selected?

A. Yes
B. No
C. Not sure



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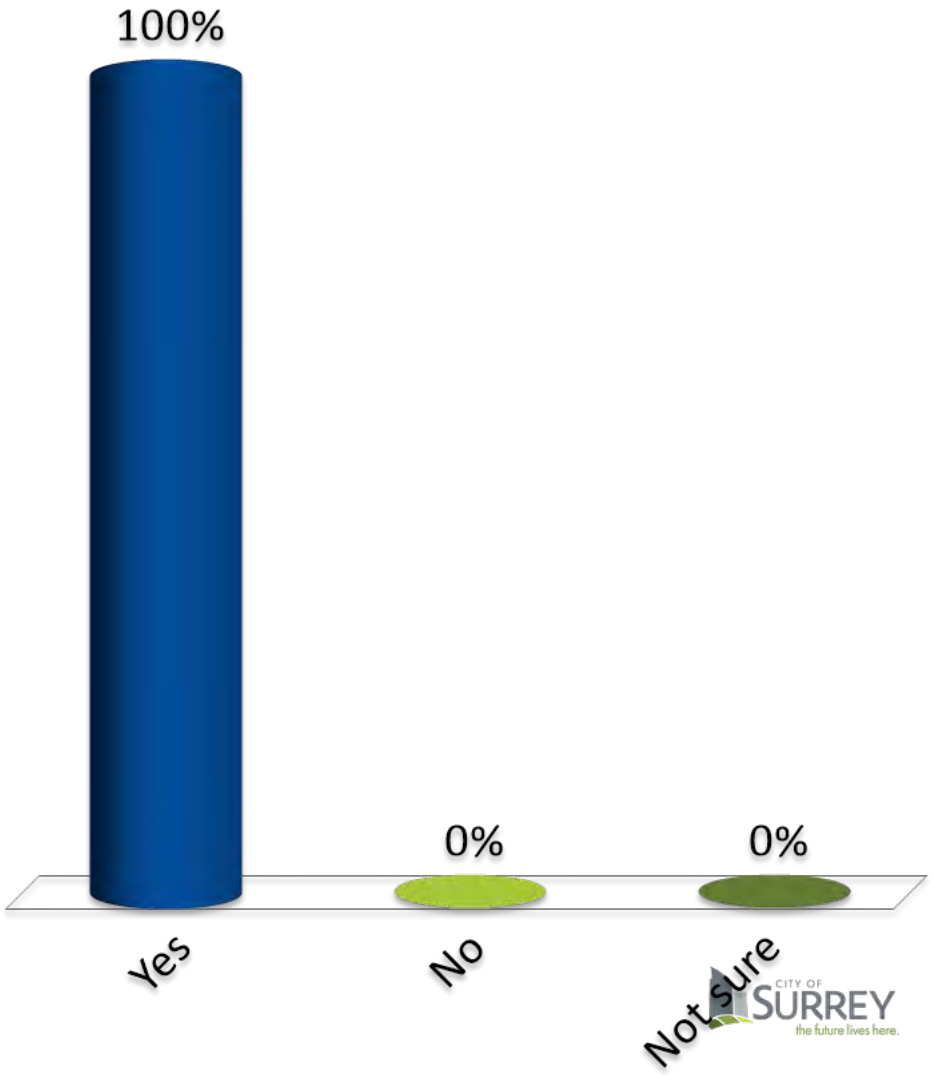
Would you or your organization like to remain involved on the CFAS Advisory Group?

A. Yes
B. No
C. Not sure



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Next Steps

- Await DMAF funding confirmation – soon….
- Draft CFAS Strategy – mid June
- Strategy referrals with key stakeholders
  - ALC, Delta, Semiahmoo First Nation, Langleys, FLNRORD, FBC
- Wrap-up event/open house
- Final strategy – fall 2019
- Final project video and CFAS Primer
- Ongoing linkage with Lower Mainland Flood Management Strategy (facilitated by FBC)

Next Steps - DMAF

- DMAF Implementation (pending funding approval)
  - Consultation process for Provincial Environmental Assessment (Sea Dams, Foreshore Enhancements)
  - Initiate design of major components and public consultation through Open Houses for preliminary designs 2020/2021
    - -Nicomekl Riverfront Park
    - -152 St Road Raising and Widening
    - -Crescent Beach Storm Sewer remaining works
    - -Campbell River Pedestrian\Emergency Access Bridge

Advisory Group

Lessons Learned

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Lessons Learned and Challenges

- 4 big take-aways
  - No adaptation is not an option
  - There's no silver bullet
  - All coastal flood management involves trade-offs
  - Adaptation demands a change in approach
    - Incorporating values into technical analyses
    - Deep multi-disciplinary collaboration
    - Asking the hard questions

Lessons Learned and Challenges

"Smaller" take-aways

- Behaviour/biases are a challenge
- Engagement & partnerships are key

Thank You!

- Thank you for your time, contributions, ideas, and commitment to CFAS
- Without the active participation of the Advisory Group CFAS wouldn’t have been the project it became


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CLASSROOMS
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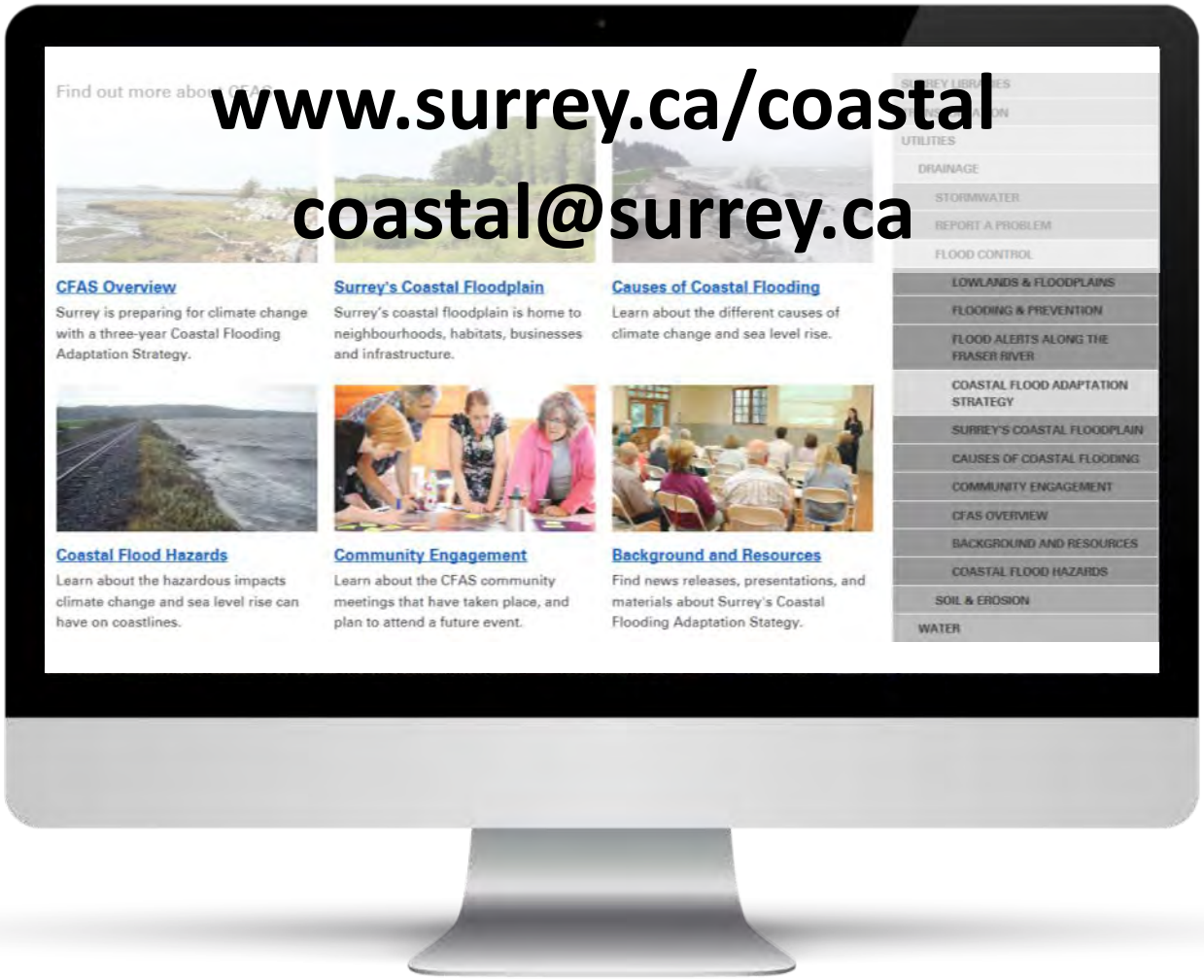
More information?



CFAS

SURREY COASTAL FLOOD ADAPTATION STRATEGY (CFAS)

Thank you!

nhc
northwest hydraulic consultants

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epi