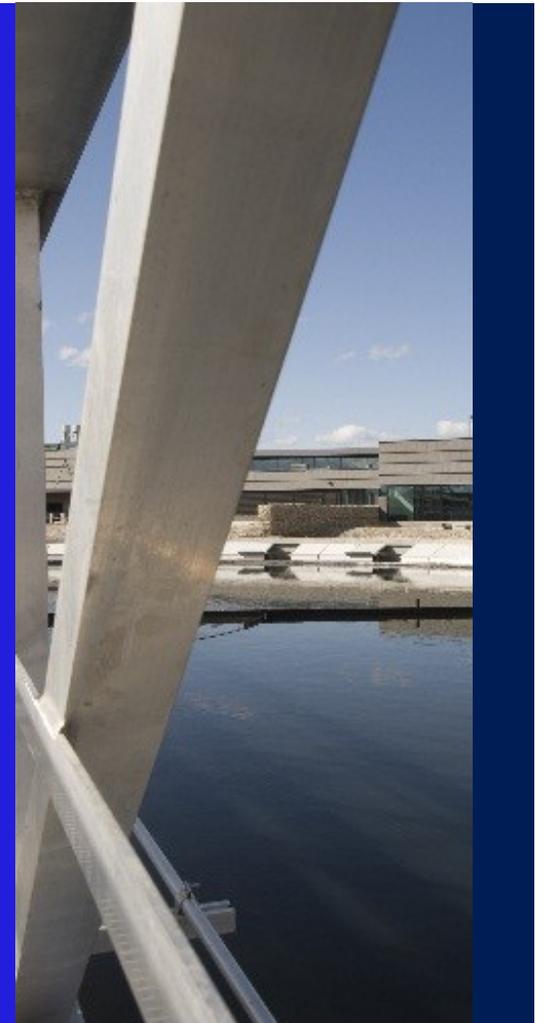


In the kNOW Webinar

Water Utility Resilience + COVID-19 Response

June 2, 2020



Welcome & Introductions

Why this issue is Important

- Adam Hosking, Jacobs, Vice President, Global Director for Water Resources

Incorporating Climate Resilience Planning into Asset Management

- Rob Taylor, Energy Manager, WSSC Water
- Laurens van der Tak, PE, D. WRE, Jacobs, Technology Fellow | Water Resources

Applying Resilience, Strategy and Tools to COVID-19 Response

- Richard Windsor, Asset Management Lead, TEAM2100 for UK Environment Agency
- Scott Haskins, Jacobs, Strategic Consulting | Water Market Lead

Questions & Answers

Defining Resilience...

Resilience is the ability to anticipate and resist the effects of a **disruptive event or trend**, **minimise adverse impacts**, respond effectively, maintain or recover functionality, and adapt in a way that allows for **learning and thriving**.



Water Utility Resilience

Disruptive events & trends

- Pandemic
- Climate change
- Cyber attack
- Aging infrastructure

Minimize impacts

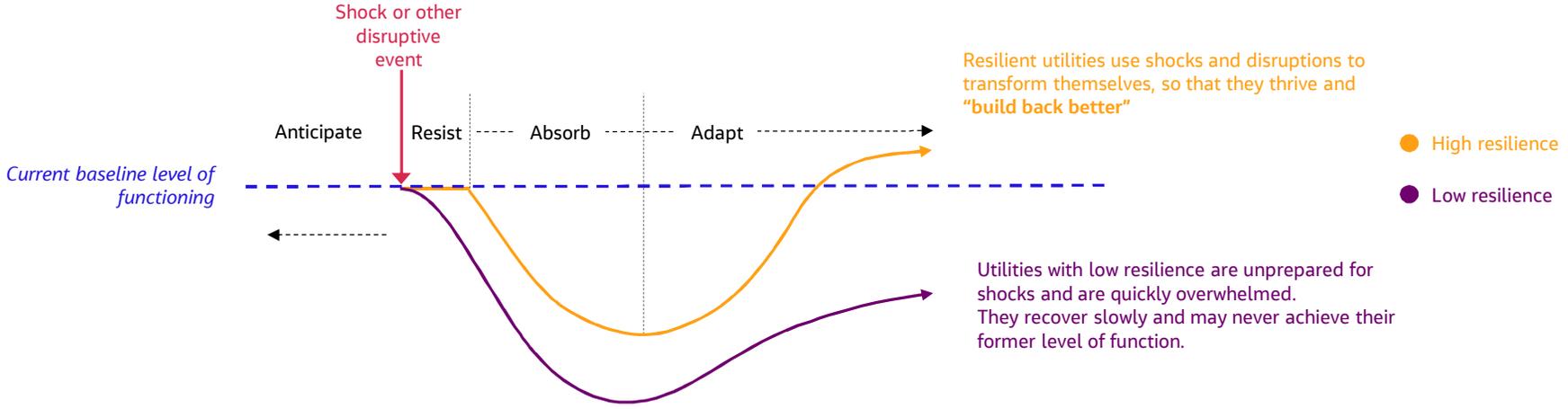
- Adaptive actions
- Continuity of operations plans
- Response and recovery
- Safety

Adapt, learn and thrive

- Recognise the opportunity
- 'Build back better'
- Share learning

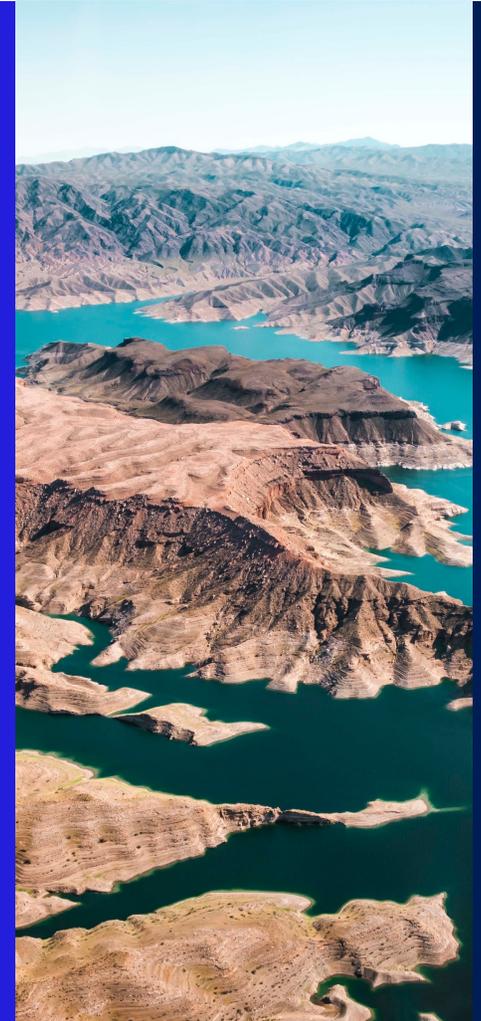


Where are We Now? What's Next?



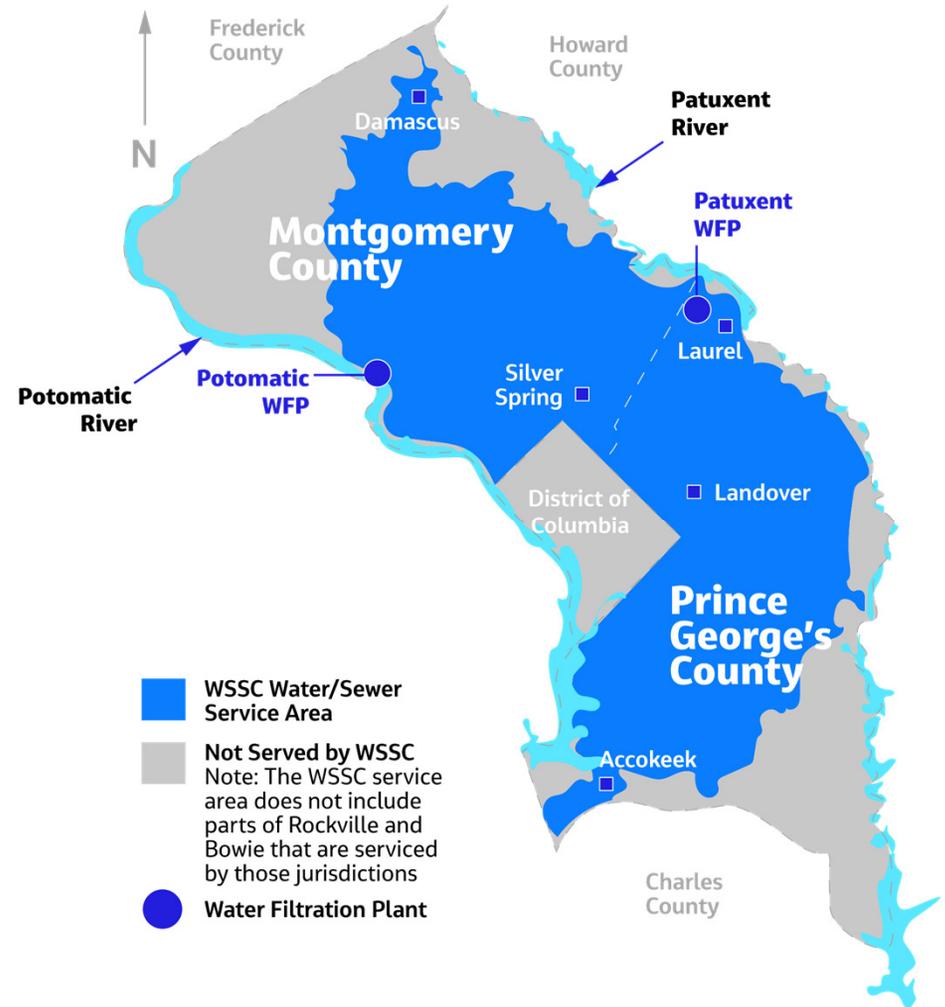
Incorporating Climate Resilience
Planning into Asset Management :
WSSC Water's Climate Change
Vulnerability Assessment,
Adaptation and Mitigation Plan

Robert Taylor/WSSC Water
Laurens van der Tak/Jacobs



WSSC Water Service Area (Maryland)

- One of the largest water/wastewater utilities in the nation
- Serves 1.8 million customers in Maryland's Montgomery and Prince George's Counties
- Founded in 1918 -102 years!
- Provides 170 MGD drinking water
- Collects 200 MGD wastewater
- Treats 70 MGD wastewater
- Supplies DC Water with 130 MGD wastewater
- (2) Water Filtration Plants
- (5) Water Resource Recovery Plants
- (13) Water Pumping Stations
- (50) Wastewater Pumping Stations
- (10) Field Offices/Lab/HQ



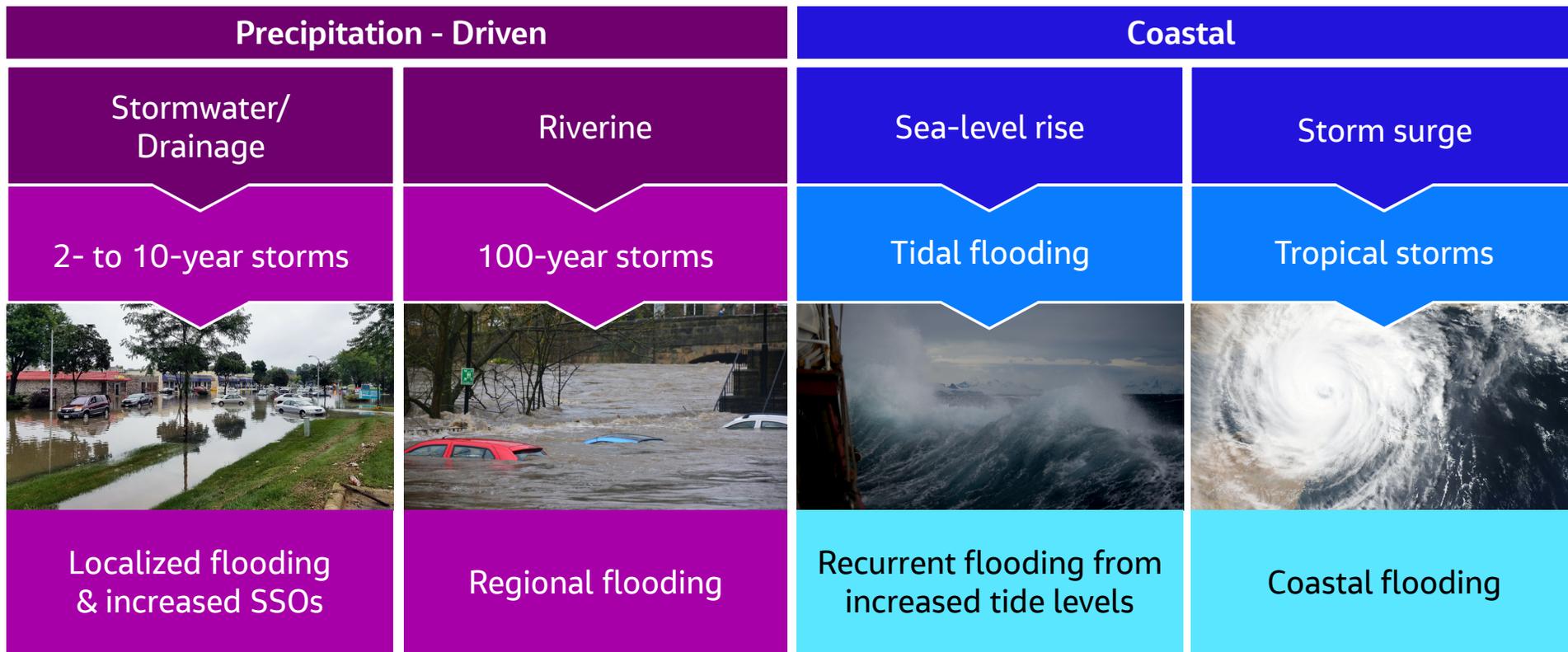
Climate Change Vulnerability Assessment, Adaptation, and Mitigation Planning (CCVAAMP) Project

- Climate Analysis & Projections
- Vulnerability Assessment
- Adaptation Analysis
- Mitigation Planning (GHG Inventory and Action Plan)



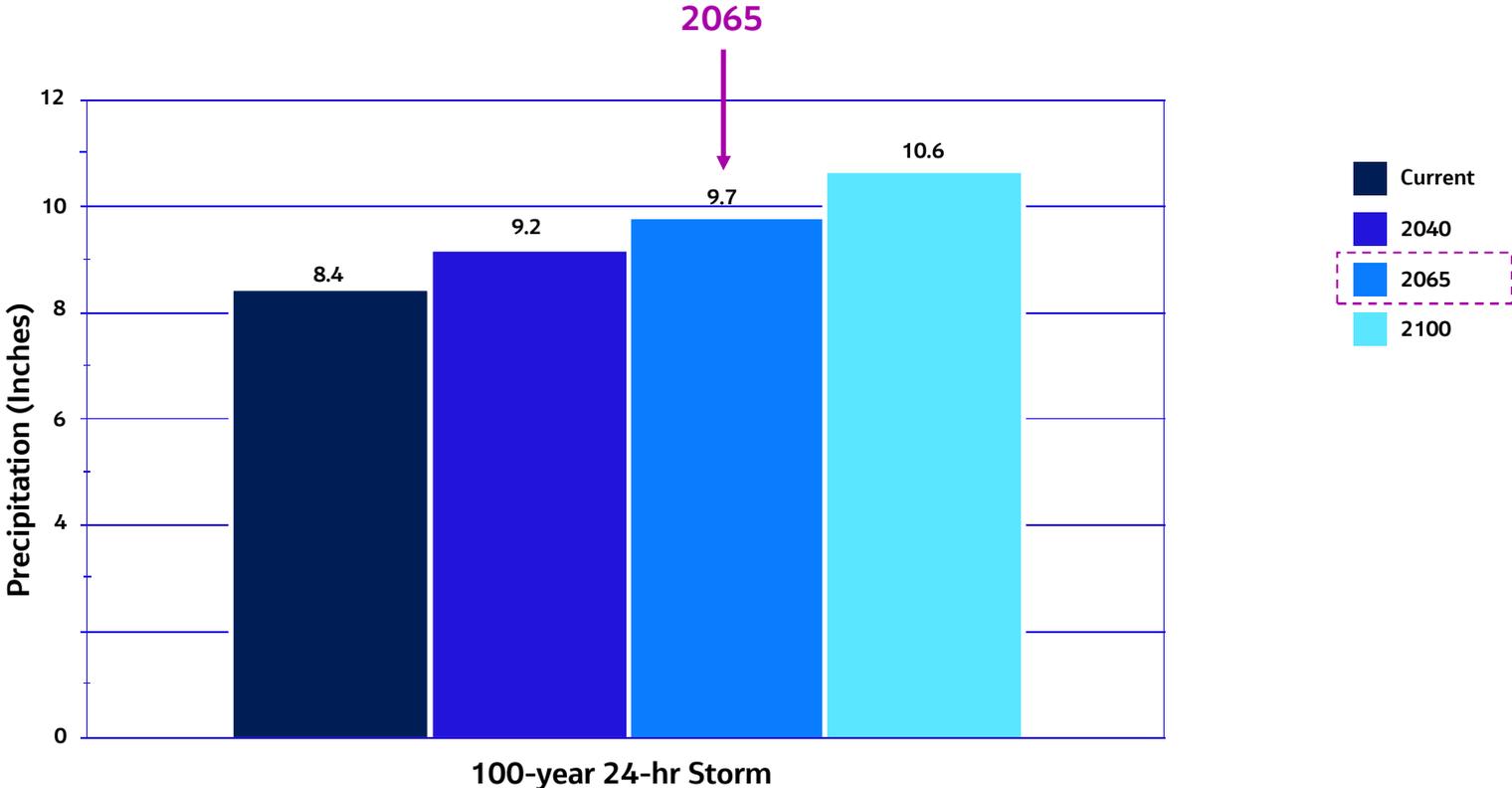
Climate Analysis and Projections

Climate Change Impacts Rainfall, Extreme Storms and Sea-Level Rise



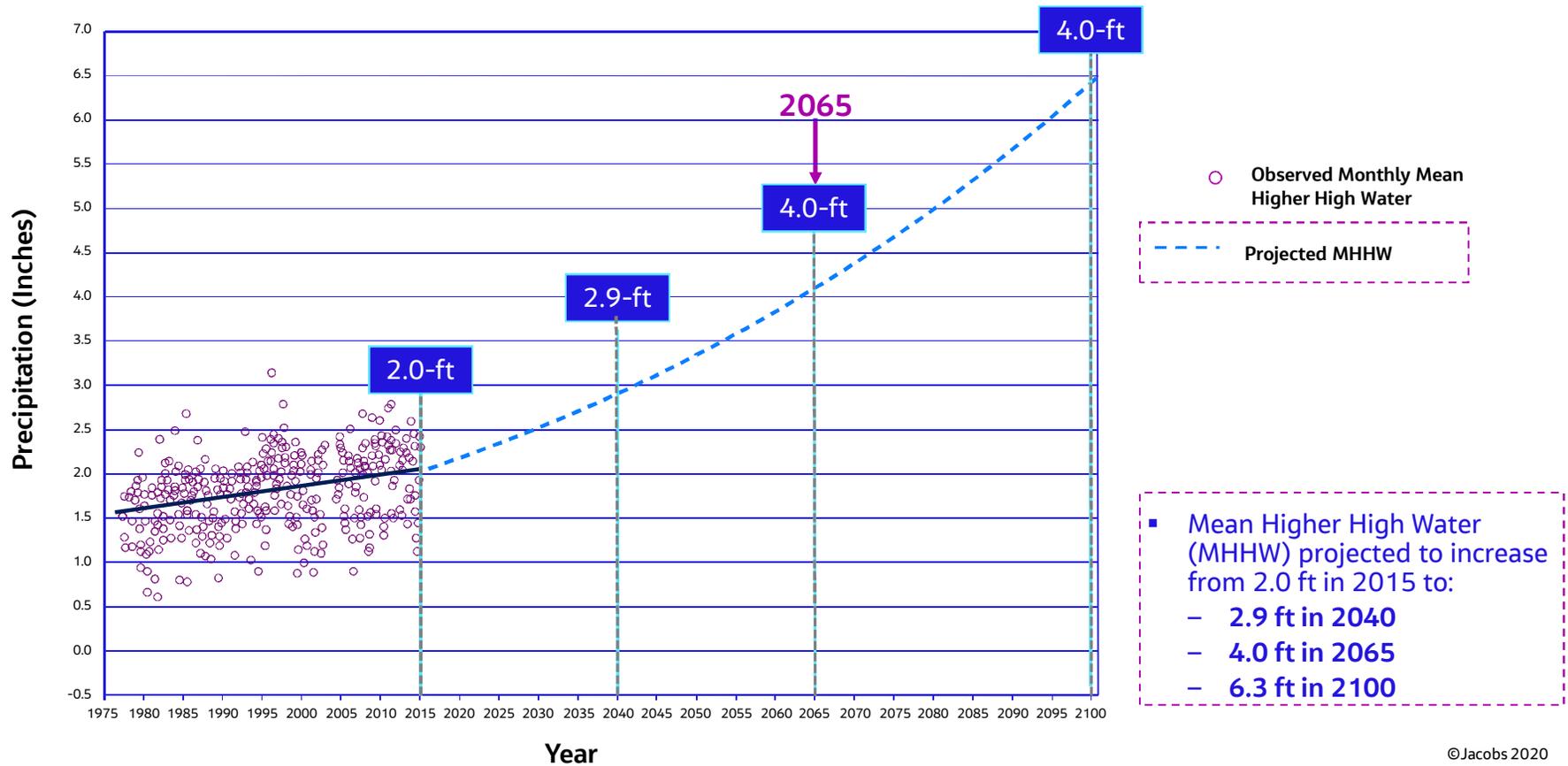
Climate Projections for WSSC Water Service Area (100 yr. storm)

24-hour rainfall depth projected to increase 15% by 2065



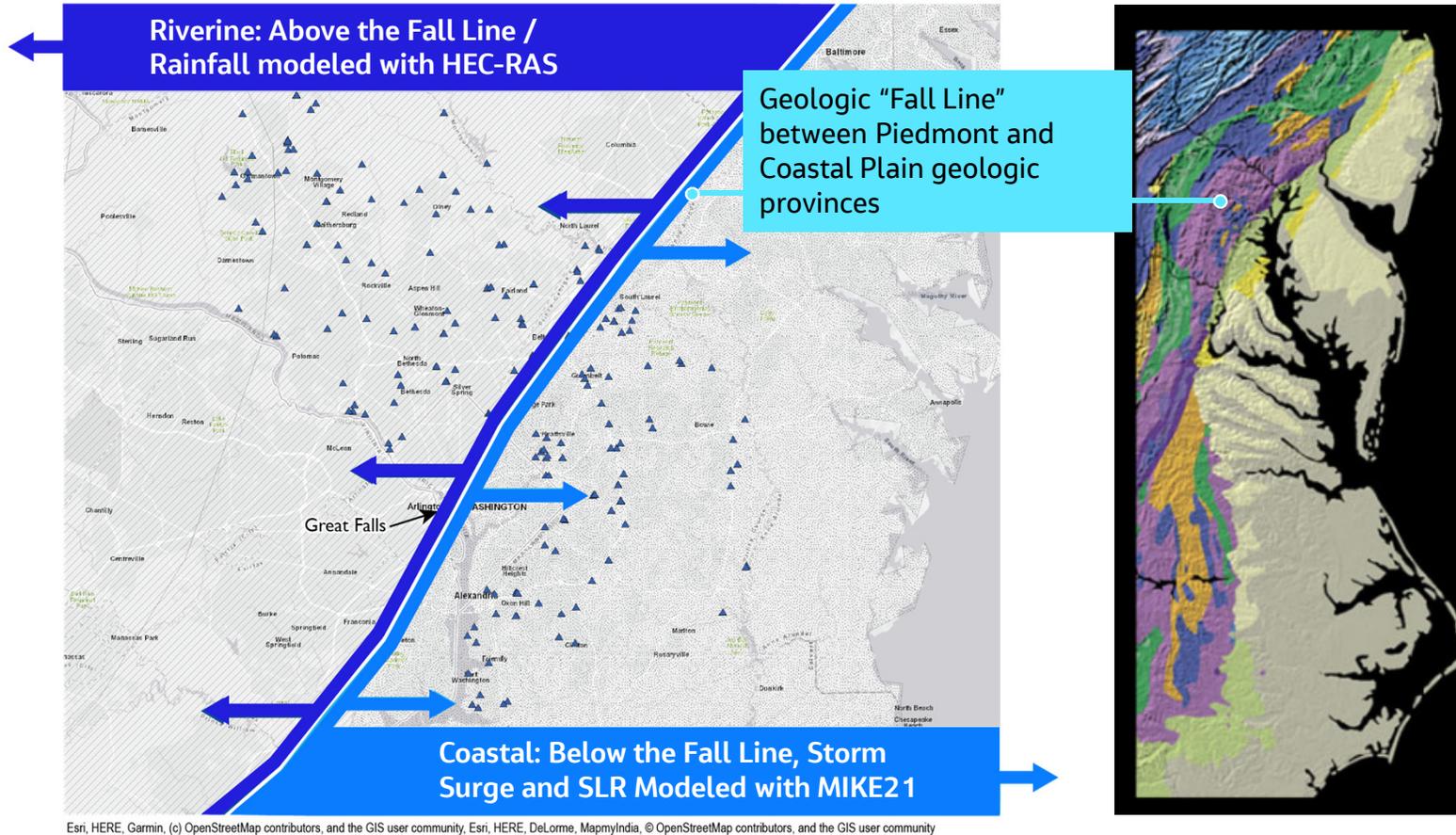
Sea-Level Rise Projections for WSSC Water Service Area:

High Tide (MHHW) projected to increase from 2.0 ft to 4.0 f in 2065



Facility Vulnerability Assessments and Adaptation Planning

Flood Modeling Completed for Riverine and Coastal Facilities



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Water and Wastewater Facilities Investigated to Date for WSSC Water

200 +	Facilities in GIS
49	Facilities located in or near floodplain
18	Facilities prioritized for future flood modeling
18	Vulnerability assessments completed to date

Coastal

- Anacostia WWPS #1
- Anacostia WWPS #2
- Broad Creek WWPS
- Western Branch WRRF
- Hyattsville WWPS
- Piscataway WRRF
- Anacostia Depot
- Colmar Manor WWPS
- Forest Heights WWPS
- Fort Foote WWPS

Riverine

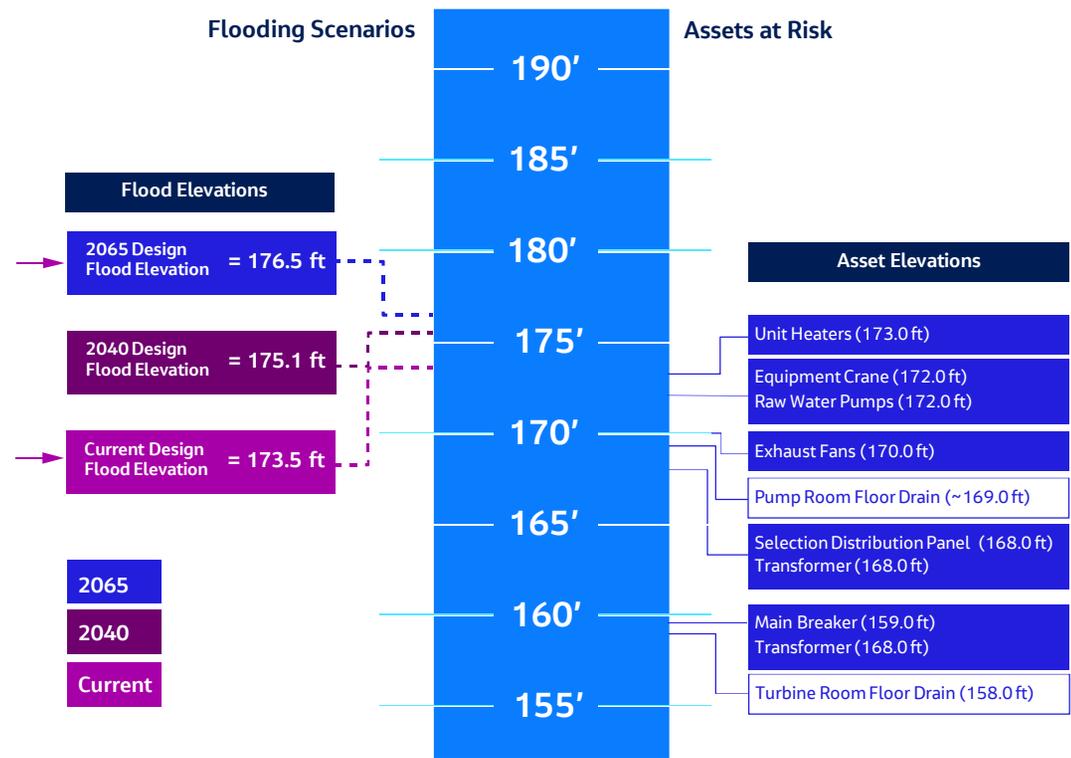
- Air Park WPS
- Decatur Street WWPS
- Hyattstown WRRF
- Marlboro Meadows WWPS
- Parkway WRRF
- Reddy Branch WWPS
- Rocky Gorge WPS



Risk Assessment / Alternatives Development

-Major assets located below new Design Flood Elevation

1. Identify all assets at risk below recommended design flood elevation (DFE).
2. Determine Level of Service (LOS) of all assets at risk.
3. For high LOS assets under the DFE, develop asset-level strategy.
4. For all buildings at risk, develop building-level strategies.
5. Calculate benefit of adaptation.
6. Compare benefits to cost of flood-proofing alternatives.

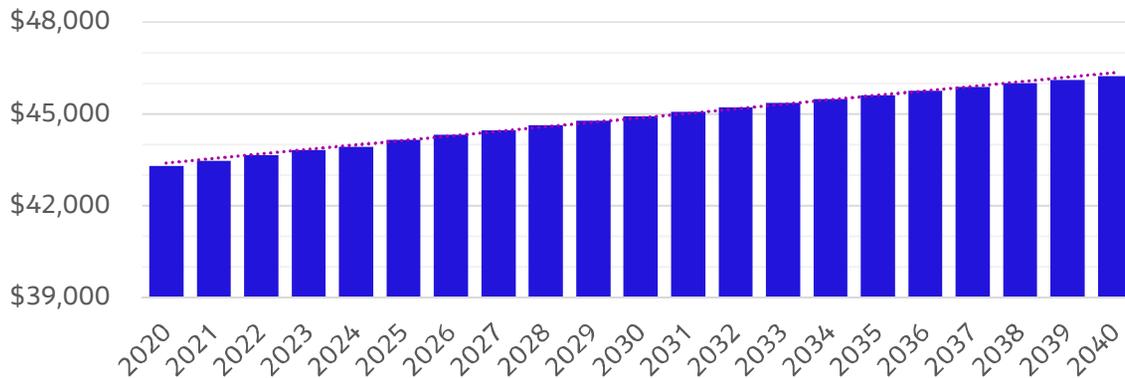


Rocky Gorge Water Pump Station

Cumulative Risk Avoided Accounts for Climate Change Over the Expected Life of Each Asset

$$\text{Cumulative Risk Avoided} = \sum_{i=2017}^{2040} \text{Annual Risk Avoided}$$

Annual Risk Avoided = (Probability of flood event in given year) * (Asset Replacement Cost) * (1 - Strategy Failure Potential)



Includes:

- Increasing probability of floods from now to 2040
- Potential of strategy failure
- Annual risk discounted to present dollars

Adaptation Strategies for Treatment Facilities and Pump Stations

Strategy	Resiliency Level
No Action	No Protection
Sandbagging	Low
Temporary Barriers	Moderate
Seal Building/ Control Room	Moderate/ Medium
Construct Static Barrier	High
Flood-proof Equipment	High
Elevate Equipment	Very High



Temporary Movable Barriers



Source: www.floodstopbarrier.com

Source: <http://usfloodcontrol.com/tiger-dam-products/>

Manual Flood Panels/Gates

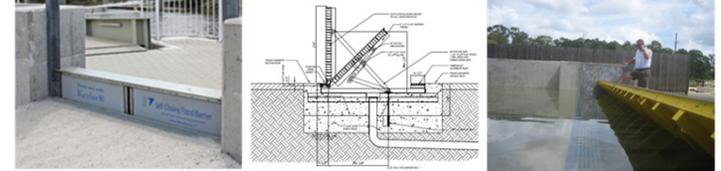


Source: www.floodbarriers.com

Source: www.floodpanel.com

Source: www.floodcontrolinternational.com

Automated Flood Gates



Source: www.floodcontrolinternational.com

Source: www.floodbreak.com



Compare Strategy Costs to Cumulative

Assets at Risk and Area Level Strategies

Building/Area	All Assets At Risk			
	Quantity	Cost of Replacement	Strategy Costs	Cumulative Risk Avoided
Electrical Yard	7	\$5,510,000	\$452,000*	\$1,070,000
Generator Building	5	\$20,520,000	\$300,000	\$390,000
Pump Station Building	23	\$22,300,000	\$300,000	\$2,160,000
Screening Building	5	\$1,340,000	\$160,000	\$130,000
Valve Vaults	8	\$260,000	\$90,000	\$50,000
Surge Tank Area	1	\$20,000	-	-

Costs < Risks

Broad Creek Wastewater Pump Station

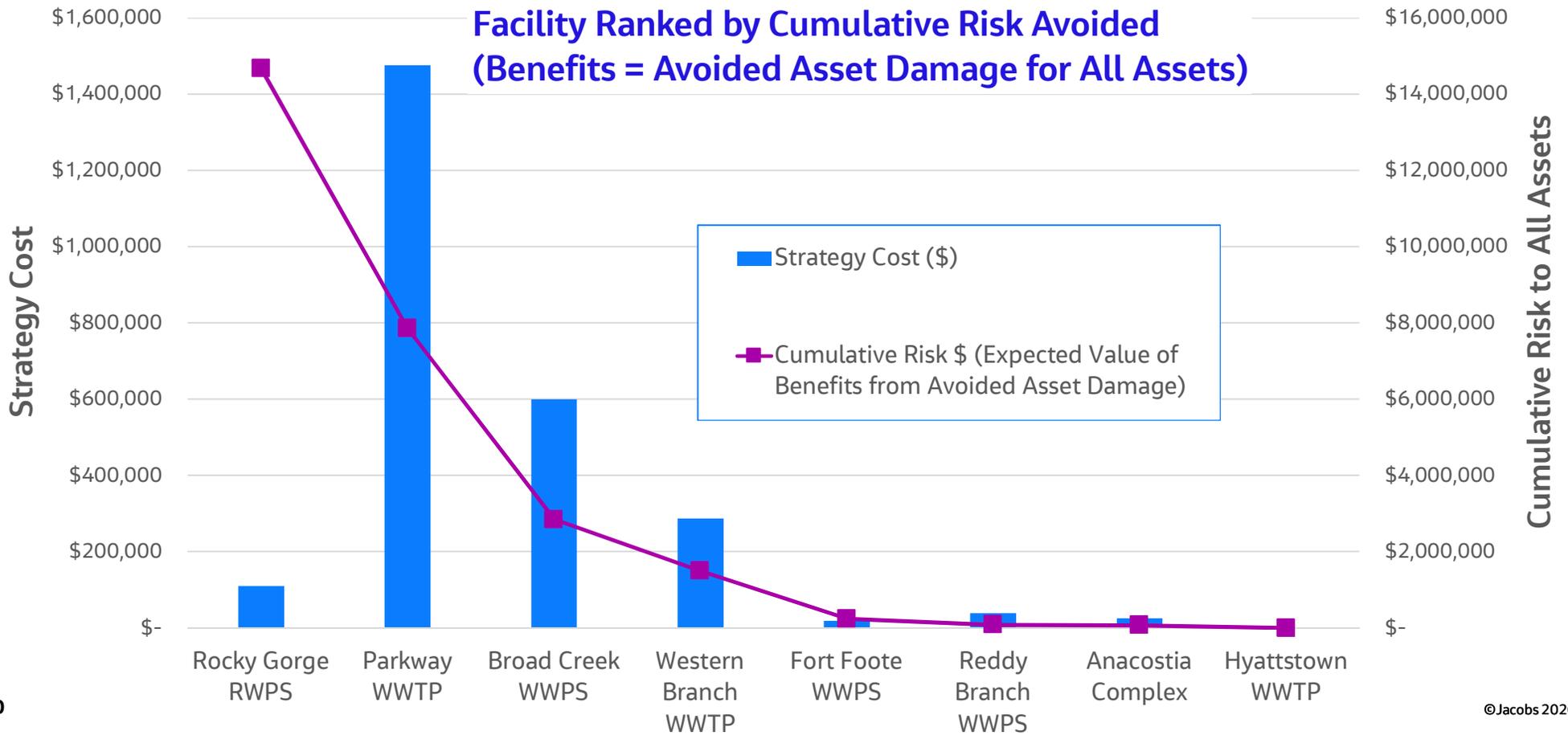
Recommended Strategies Based on Benefit-Cost Analysis

- Elevate Electrical Yard
- Install temporary door covers around Generator Building and Pump Station Building

CCVAAMP Vulnerability Assessment Results

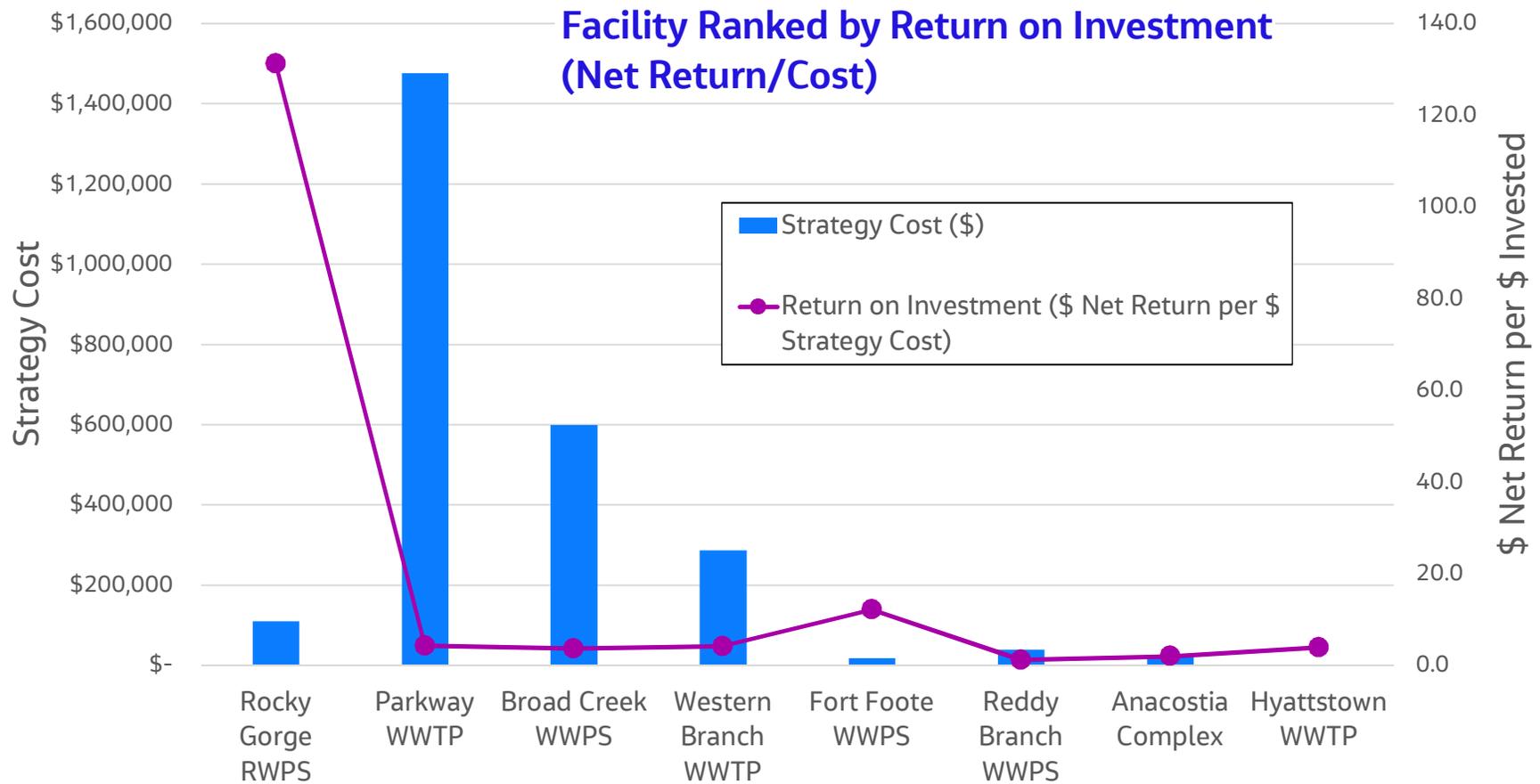
Priority Ranking Based On Risk Alone

Facility Ranked by Cumulative Risk Avoided
(Benefits = Avoided Asset Damage for All Assets)



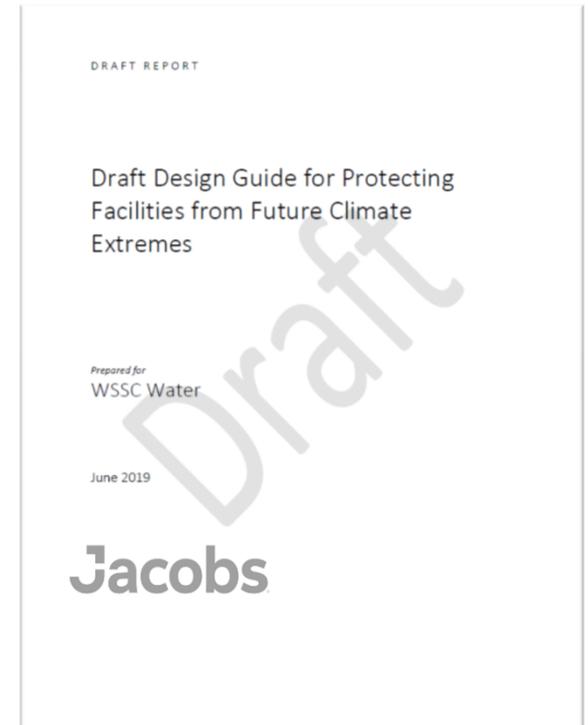
CCVAAMP Vulnerability Assessment Results

Priority Ranking Based Return on Investment: \$ Net Return per \$ Invested in Resilience



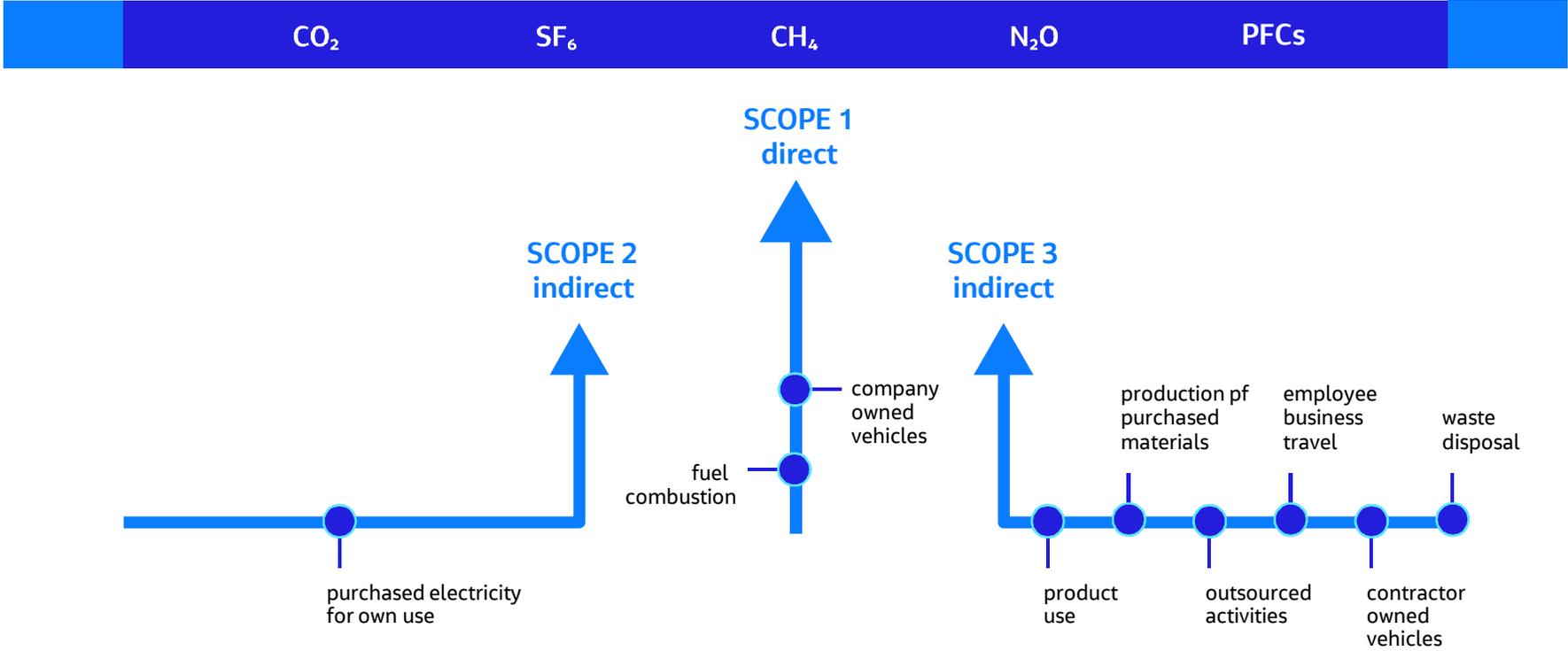
Design Guide for Protecting Facilities from Future Climate Extremes

- Guidance for flood protection criteria
 - Criteria for design of new facilities and protection of existing facilities
 - Outfall tailwater design elevations for treatment process
 - Site stormwater design guidance based on climate projections
- Guidance for resiliency of electrical and instrumentation & controls systems
- Greenhouse gas emissions reporting guidance for new projects

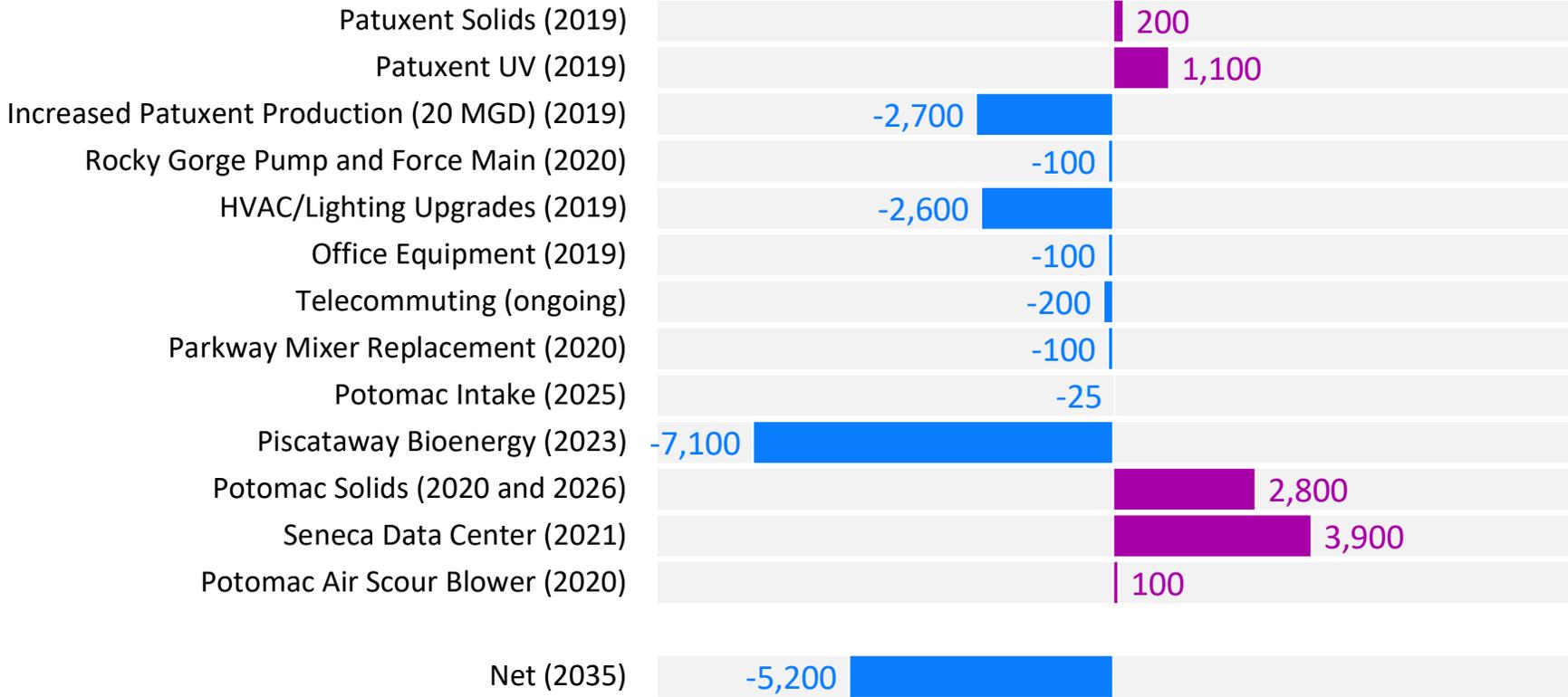


Greenhouse Gas Reduction (Mitigation) Progress

What a GHG inventory includes...



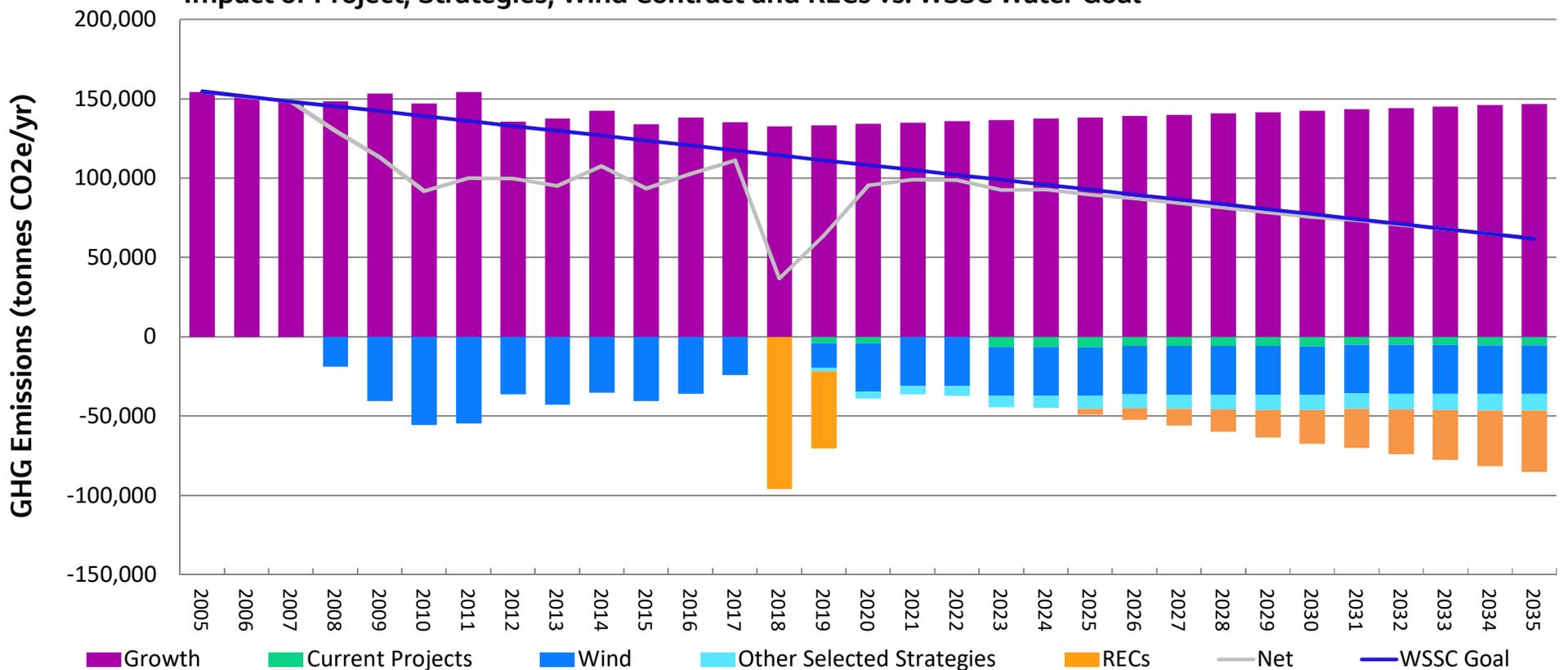
GHG Emissions Impacts of Current Projects (tonnes CO2e/Yr)



GHG Emissions Reductions (Goal: 60% reduction by 2035)

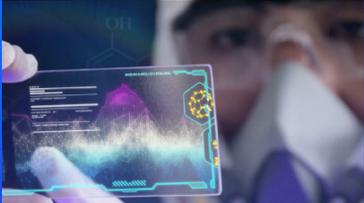
WSSC Emissions Projections (2005 - 2035)

Impact of Project, Strategies, Wind Contract and RECs vs. WSSC Water Goal



Your turn...

Poll Question #1



Applying Resilience Strategy and Tools to COVID-19 Response

Richard Windsor, Richard Windsor, Asset Management
Lead, TEAM2100, UK

Scott Haskins, Jacobs, Water Market Lead, Strategic
Consulting

Jacobs

TEAM2100



TEAM2100 Overview Description and Purpose

Our Vision

To increase the resilience of communities, wildlife and business within London and the Thames Estuary through the sustainable management of flood defenses

Our Values

What we are
Integrated, Collaborative and Innovative

What we do
Deliver on commitments and finish the job

How we work
Safely, efficiently and flexibly

Our Pathfinder Mission Principles

Be a world-class asset management enterprise

Be a catalyst for change delivering efficiencies for the Environment Agency

Be a place where people want to work that has a culture of caring and safety

TEAM2100 Overview Description and Purpose

- 2100 Plan
- Delivering the Thames Estuary
- UK's largest single flood risk programme of works, Environment Agency; one of worth over £300m
- Pathfinder Project for the Environment Agency
- UK government top 40 major infrastructure project

TEAM2100



Thames Estuary Flood Risk Management System



The need	Our assets	The value from our assets		What we do
River flows	Major barriers	People and property	Water, land biodiversity	Asset Management System
Storm surge	Fixed defenses	Heritage	Commerce	Incident Management
Legislation	Bio-dynamic	Culture	Industry	Maintenance & Monitoring
		Business	Recreation	Asset Creation, Renewal, Disposal
		Infrastructure		

TEAM2100 Overview Description and Purpose

What Does the System Protect?

People & Property

- 1.3 million residents
- Over 500,000 homes
- £275 bn property value

Heritage

- Over 3100 hectares of sensitive heritage sites
- 4 world heritage sites

Industry

- 40,000 commercial and industrial properties

Habitat

- 55 sq. km designated habitat sites

Culture

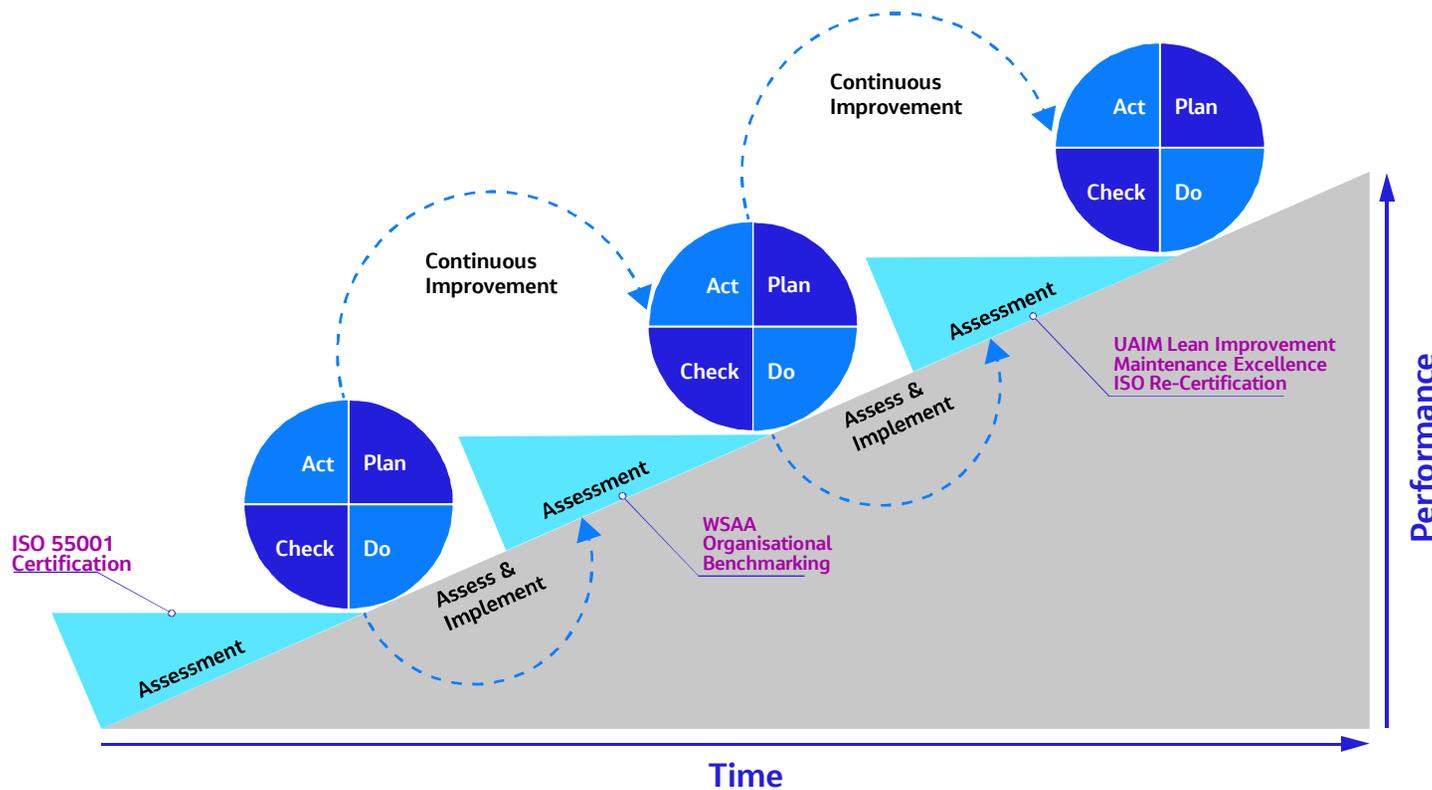
- Art galleries and historic buildings

Infrastructure

- 400 schools
- 16 hospitals
- 8 power stations
- More than 1000 electricity substations
- 167 km of railway
- 35 tube stations
- 51 rail stations
- Over 300 km of roads



TEAM2100 Continual Improvement and Resilience



Business Strategies

- Emergency preparedness
- Innovation
- Maturity assessment
- Certification
- Risk management

Continual Improvement and Resilience

The 'new normal' challenges in the COVID-19 Pandemic

- A new focus on **emergency operations and teleworking**
- **Depressed economy** and business function
- Pressure from customers to be more sensitive to **costs and affordability**
- Need to **optimize** and fund capital projects amid changing **priorities**
- **Staffing challenges**, including illnesses among staff and making decisions about short-term and long-term personnel needs
- **Reduction in customer demand** for services and forced shutdowns of offices and facilities
- New operational **efficiency, performance, and service delivery imperatives**
- **Supply chain disruptions**



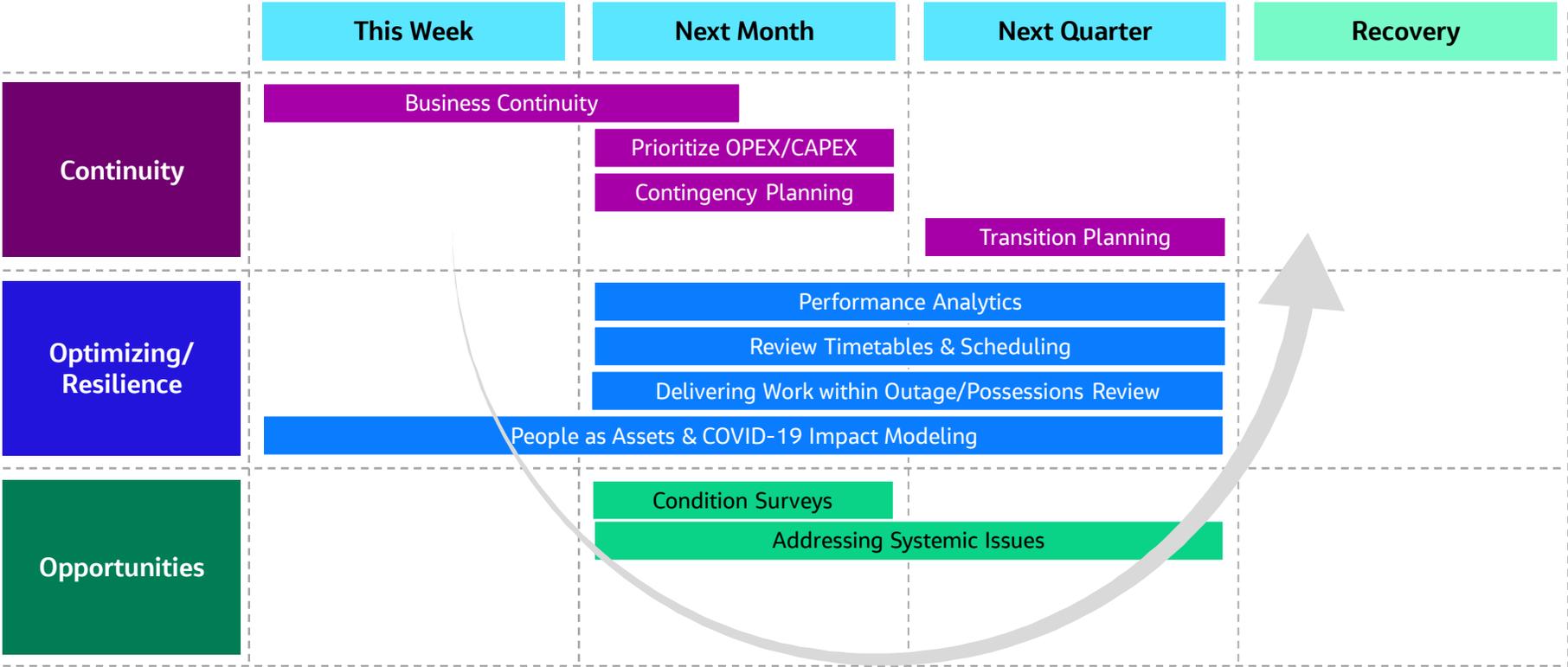
Friday night 5 pm rush hour in downtown Washington, D.C. illustrates the new normal

Continual Improvement and Resilience

Identifying Adaptive and Resilient Solutions

- Deploying proven approaches: strategic planning, decision analysis, financial forecasting, asset management/maintenance, and risk management increases the likelihood of your organization's ability to adapt.
- TEAM2100 adaptive and resilient solutions to address the COVID-19 pandemic includes:
 - Capital improvement refocus to address new near-term priorities
 - Staffing and resource level changes or deployment changes
 - Refocus of technology and innovation, e.g. supporting working from home
 - Initiatives to improve operational efficiency
 - Elevating efforts in safety and risk reduction

Recovery Will Occur Over a Range of Timeliness and Support Continuity of Operations



Continual Improvement and Resilience

Scenario Planning Helps Define COVID-19 Response Strategies

External drivers	Flattening the Curve	Midrange	Laissez Faire
Access to Capital and Finance	Market uncertainties result in unclear interest rates and restricted access for many.	Less complete early results and restricted access for some.	More support for companies to generate earlier recovery, so greater access to capital.
Operations and Efficiency	Focus on essential operations; ability to perform operations affected by remote teleworking, furloughs, access to work sites and supply chain.	Impacts on efficiency from regulatory constraints, significant disease in the population and revenue challenges but less pronounced.	Ability to perform operations affected by worker safety issues with widespread, sustained disease in the population.
Customer Relations And Service Levels	Significant near-term reduction in demand for service as a result of mandated lockdowns and voluntary company closures.	Mid-range impact on demand for service.	Some reduction in near-term demand for service but more moderate than in scenarios with widespread mandated lockdowns.
Affordability	Customer issues related to illness and unemployment and need for emergency bill relief for growing unemployed base.	Combination of illness and financially based needs for emergency bill assistance.	Many customers needing emergency assistance with bills due to rapid growth in significantly ill customers.
Workforce and Change Management	Immediate impacts on staffing, production and needed organizational changes from physical distancing; impacts extended over 6 to 8 months.	Mid-range impacts due to necessary workforce changes and new work practices.	Significant staff impacts due to extended illness period casualties and disruption; innovation restructuring for needed change.

Applying Tools and Strategies

Proven Approaches & Tools Help Manage the New Risks

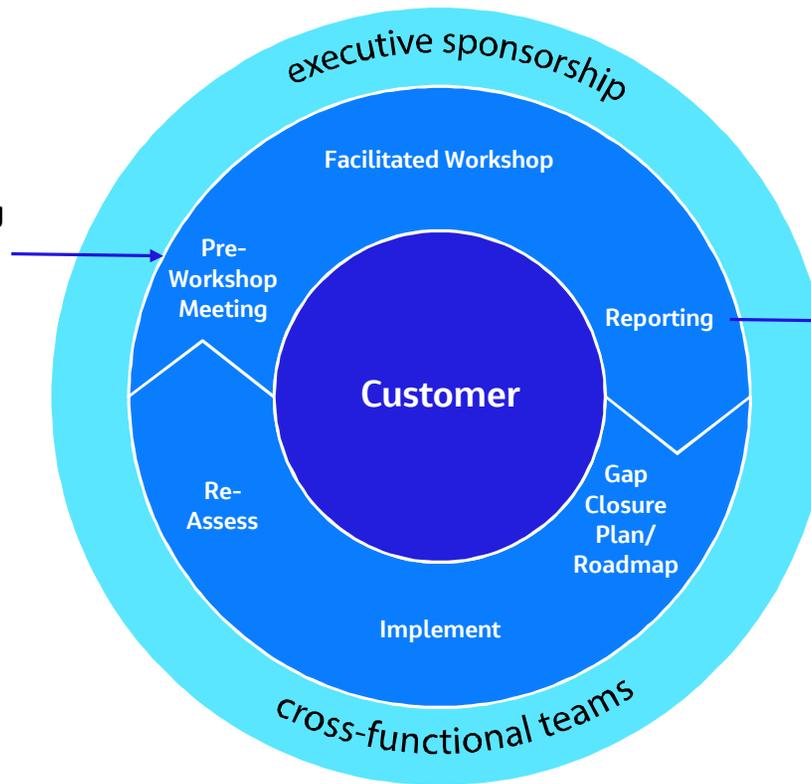
Approaches that can help make informed decisions amid current uncertainty include:

- | | | | |
|---|---|---|---|
|  | Short-term and long-term demand and financial forecasting |  | Strategic planning |
|  | Scenario planning |  | Systems for financial planning and delivery analysis |
|  | Programmatic and work planning |  | Risk and performance management |
|  | Prioritization and decision analysis |  | Change management, training, and business process improvement |

Industry Collaboration - Organizational and Asset Management Benchmarking

Focus Areas:

- Strategy & Planning
- Finance & Decision-Making
- Life Cycle Delivery
- Information & Systems
- Organization & People
- Risk & Resilience



- Organizational Report
- Industry Report
- Leading Practice Conference
- Peer Exchanges

**Assessment
Networking
Improvement**



Industry Collaboration – Organizational and Asset Management Benchmarking

Organizational Process Benchmarking

Enabling Business and Customer Value through better Asset Management

World's largest process benchmarking project, delivering:

- An asset/organizational management maturity assessment.
- Understanding of leading-edge practice across the lifecycle.
- Peer networks with other organizations internationally.

Value proposition for Clients

- Demonstrate to customers and regulators that utilities are effective and efficient.
- Continuous improvement via practices, metrics and safety performance.
- target-setting, improvement initiatives and linkages to organizational strategic plans.
- Peer collaboration and learning, particularly leading practices, consortium benchmarking, and networking with leading practitioners nationally and internationally.
- Integration with IAM and ISO55000 standards.
- Achieving efficiency, improved practices and service level improvements.

Jacobs



Industry Collaboration- Business Process Improvements Utility Analysis and Improvement Methodology

Business Processes Describes

- Who is involved in the business process (swim lanes)
- Work flow (sequence paths of activities)
What decisions need to be made (and by whom)
- What resources (e.g. time, staff, equipment) are needed
- The metrics impacted by the process
- What data is required to execute work and make decisions
- Where (in what systems) the required data resides

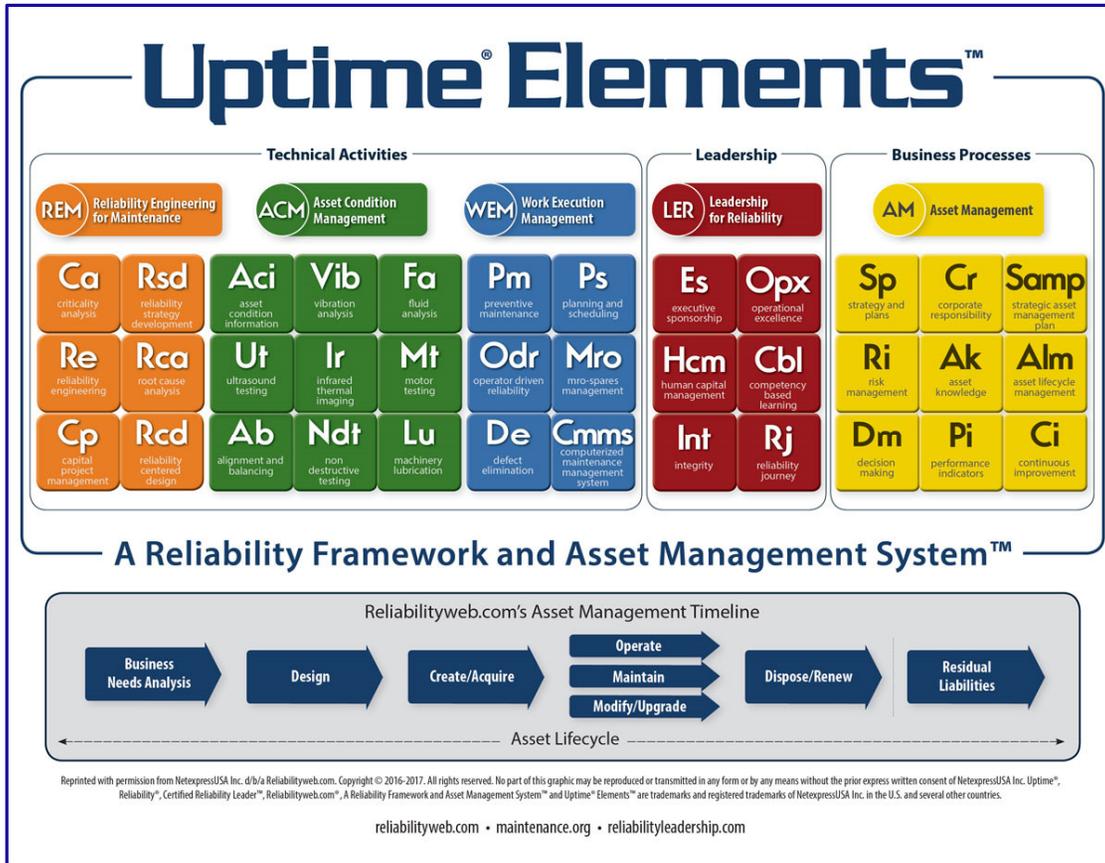
Major Features

LEAN Six Sigma
19 participating utilities
Research and Develop “To Be” processes for:

- CIP Delivery (TEAM2100 Lead)
- BCE/CIP Prioritization (DC Water Lead)
- Asset Management Plans (MCES Lead)
- Enterprise Risk (Portland Water Lead)
- Change Management
- Organization Culture
- Workforce Development



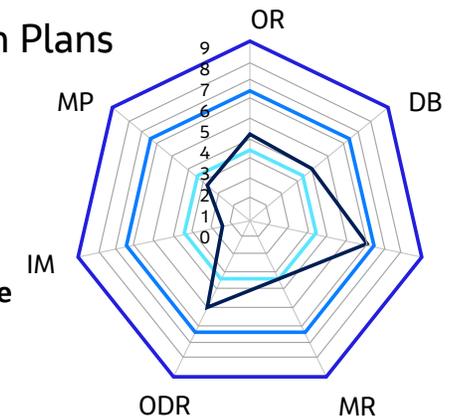
Industry Collaboration - Maintenance Excellence



The UPTIME ELEMENTS Framework by ReliabilityWeb is an Industry Framework

TEAM2100

- Training & Networking
- Peer Conferences
- Maintenance Excellence Maturity Assessment
- Chartering
- Implementation Plans



TEAM2100 Average Maturity Scores

TEAM2100 Maturity Assessments – Value Proposition

"I've seen it first hand. You gather up a diverse group of employees, put them in a room and allow them to discuss and ultimately score the assessment questions. Through this practice, the team gains a greater understanding of the business processes being assessed, and a greater respect for the differing viewpoints from each team member. It's real...paradigms shift and momentum for real change begins."

Andrew Pearce, Deputy Director –
Asset Management, Environment Agency

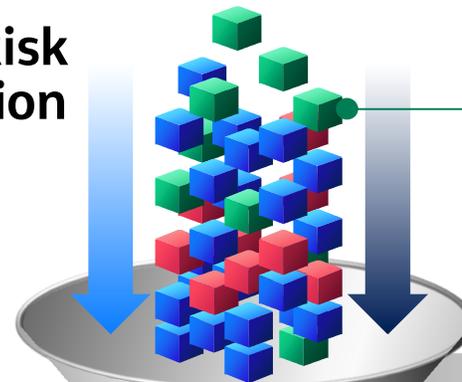


Tools and Strategies Applied - Risk Management

TEAM2 100 major risks include:

- Securing partnership funding in medium-term
- Significant weather event
- Third party owned asset interventions

Risk Identification



Program Risks
Project Risks
Operational Risks
Asset Risks

Risk Assessment

Risks identified during workshops are evaluated in relation to other risks; filters highest risks through use of consequence and likelihood matrices.

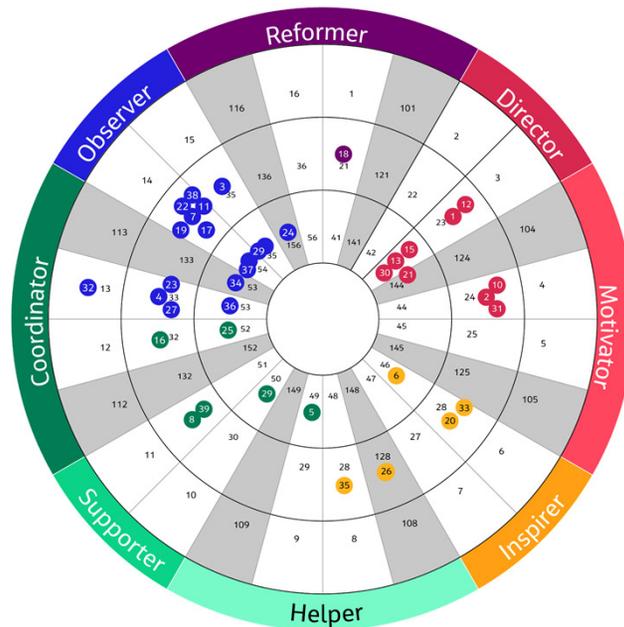
Program Risk Register

Prioritize program risks and finalize risk register; identify mitigations and risk owners; develop action plans and metrics; monitor and report status; updates for new risks and actions to be managed.

TEAM2100 Tools and Strategies Applied – Collaboration, Diversity, Innovation

Align organization, culture, tools and processes to future strategic direction

- Insights workshops – fostering diversity
- Positive challenge – ‘zones of uncomfortable discussion’
- Leadership example, team empowerment
- Staff rotations across our organizations
- Interchangeability - best person for the role



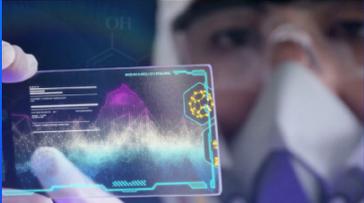
TEAM2100 Results of Resilience, Tools and Strategies Applied

- Improved decision-making (MODA, Prioritization, updated Strategic Plan, Process Improvements)
- Implementing AM Improvement recommendations; leading practices
- ISO55001 AM certified – focus on world class
- Over £30m of efficiencies recorded to date
- 300+ innovation ideas submitted, over 50 implemented
- Zero lost-time incidents since day one – 1.3m hours to date
- Team Innovation Award from Institute for Asset Management



Your turn...

Poll Question #2



Questions & Answers

Or send to: lori.irvine@Jacobs.com

A PDH certificate will be provided to those who participated in the live webinar.

Thank You!