BERKELEY CITY COUNCIL BUDGET & FINANCE COMMITTEE
REGULAR MEETING

Thursday, March 13, 2025
10:00 AM

Cypress Room – 2180 Milvia Street, 1st Floor, Berkeley, CA 94704

Committee Members:

Mayor Adena Ishii, Councilmembers Rashi Kesarwani and Brent Blackaby
Alternate: Councilmember Igor Tregub

This meeting will be conducted in a hybrid model with both in-person attendance and virtual participation. All Committee meetings are recorded.

To access the meeting remotely use this URL - https://cityofberkeley-info.zoomgov.com/j/1602864762 To request to speak, use the "raise hand" function in Zoom. To join by phone: Dial **1-669-254-5252 or 1-833-568-8864 (Toll Free)** and Enter **Meeting ID: 160 286 4762.** To provide public comment, press *9 and wait to be recognized by the Chair. To submit a written communication for the Committee's consideration and inclusion in the public record, email policycommittee@berkeleyca.gov.

This meeting will be conducted in accordance with the Brown Act, Government Code Section 54953. Any member of the public may attend this meeting, however, if you are feeling sick, please do not attend the meeting in person.

Pursuant to the City Council Rules of Procedure and State Law, the presiding officer may remove, or cause the removal of, an individual for disrupting the meeting. Prior to removing an individual, the presiding officer shall warn the individual that their behavior is disrupting the meeting and that their failure to cease their behavior may result in their removal. The presiding officer may then remove the individual if they do not promptly cease their disruptive behavior. "Disrupting" means engaging in behavior during a meeting of a legislative body that actually disrupts, disturbs, impedes, or renders infeasible the orderly conduct of the meeting and includes, but is not limited to, a failure to comply with reasonable and lawful regulations adopted by a legislative body, or engaging in behavior that constitutes use of force or a true threat of force.

California Government Code Section 84308 (Levine Act) Parties to a proceeding involving a license, permit, or other entitlement for use are required to disclose if they made contributions over $500 within the prior 12 months to any City employee or officer. Parties and participants with a financial interest are prohibited from making more than $500 in contributions to a decisionmaker for the 12 months after the final decision is rendered on the proceeding. The above contribution disclosures and restrictions do not apply when the proceeding is competitively bid, or involves a personnel or labor contract. For more information, see Government Code Section 84308.

AGENDA

Roll Call

Public Comment on Non-Agenda Matters

Minutes for Approval

Draft minutes for the Committee's consideration and approval.

1. Minutes - February 13 and February 27, 2025

Committee Action Items

The public may comment on each item listed on the agenda for action as the item is taken up. The Chair will determine the number of persons interested in speaking on each item. Up to ten (10) speakers may speak for two minutes. If there are more than ten persons interested in speaking, the Chair may limit the public comment for all speakers to one minute per speaker.

Following review and discussion of the items listed below, the Committee may continue an item to a future committee meeting, or refer the item to the City Council.

2. FY25 Mid-Year Budget Update
From: City Manager
Recommendation: Receive a report on the Fiscal Year 2025 Mid-Year Budget Update
Financial Implications: See report
Contact: Sharon Friedrichsen, City Manager's Office, (510) 981-7000,
Henry Oyekanmi, Finance, (510) 981-7300

3. "Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Berkeley" and provide recommendations related to the City's General Fund Reserve Policy
From: City Manager
Recommendation: Receive a presentation on the Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Berkeley" and provide recommendations related to the City's General Fund Reserve Policy
Financial Implications: See report
Contact: Sharon Friedrichsen, Budget Manager, (510) 981-7000

4. Audit Status Reports: Fleet Replacement Fund Short Millions & Rocky Road: Berkeley Streets at Risk and Significantly Underfunded *(Item contains supplemental material)*
From: City Manager
Recommendation: ****On May 23, 2023, the City Council referred to the Budget and Finance Policy Committee to prioritize funding to the vehicle replacement fund to make up the shortfall over time in order to stabilize the fund.****
Financial Implications: See report
Contact: Terrance Davis, Public Works, (510) 981-6300

Unscheduled Items

These items are not scheduled for discussion or action at this meeting. The Committee may schedule these items to the Action Calendar of a future Committee meeting.

Items for Future Agendas

- **Requests by Committee Members to add items to the next agenda**

Adjournment

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Written communications submitted by mail or e-mail to the Budget & Finance Committee by 5:00 p.m. the Friday before the Committee meeting will be distributed to the members of the Committee in advance of the meeting and retained as part of the official record.

This meeting will be conducted in accordance with the Brown Act, Government Code Section 54953 and applicable Executive Orders as issued by the Governor that are currently in effect. Members of the City Council who are not members of the standing committee may attend a standing committee meeting even if it results in a quorum being present, provided that the non-members only act as observers and do not participate in the meeting. If only one member of the Council who is not a member of the committee is present for the meeting, the member may participate in the meeting because less than a quorum of the full Council is present. Any member of the public may attend this meeting. Questions regarding public participation may be addressed to the City Clerk Department (510) 981-6900.

COMMUNICATION ACCESS INFORMATION:
This meeting is being held in a wheelchair accessible location. To request a disability-related accommodation(s) to participate in the meeting, including auxiliary aids or services, please contact the Disability Services specialist at ada@berkeleyca.gov, (510) 981-6418 (V), or (510) 981-6347 (TDD) at least three business days before the meeting date. Attendees at public meetings are reminded that other attendees may be sensitive to various scents, whether natural or manufactured, in products and materials. Please help the City respect these needs.

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I hereby certify that the agenda for this meeting of the Standing Committee of the Berkeley City Council was posted at the display case located near the walkway in front of the Maudelle Shirek Building, 2134 Martin Luther King Jr. Way, as well as on the City's website, on March 6, 2025.

Mark Numainville, City Clerk

Communications

Communications submitted to City Council Policy Committees are on file in the City Clerk Department at 2180 Milvia Street, 1st Floor, Berkeley, CA, and are available upon request by contacting the City Clerk Department at (510) 981-6908 or policycommittee@berkeleyca.gov.

BERKELEY CITY COUNCIL BUDGET & FINANCE COMMITTEE REGULAR MEETING MINUTES

Thursday, February 13, 2025
10:00 AM

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Mayor Adena Ishii, Councilmembers Rashi Kesarwani and Brent Blackaby
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MINUTES

Roll Call: 10:07 a.m.

Present: Kesarwani, Blackaby, Ishii

Absent: None

Election of Chairperson
Action: M/S/C (Blackaby/Ishii) to elect Councilmember Kesarwani as committee chair.
Vote: All Ayes.

Public Comment on Non-Agenda Matters – 1 speaker

Minutes for Approval

Draft minutes for the Committee's consideration and approval.

1. **Minutes - November 7 and November 14, 2024**
   Action: M/S/C (Ishii/Kesarwani) to approve the minutes of 11/7/24 and 11/14/24.
   Vote: All Ayes.

Committee Action Items

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Following review and discussion of the items listed below, the Committee may continue an item to a future committee meeting, or refer the item to the City Council.

2. **"Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Berkeley" and provide recommendations related to the City's General Fund Reserve Policy**
   From: City Manager
   Recommendation: Receive a presentation on the Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Berkeley" and provide recommendations related to the City's General Fund Reserve Policy.
   Financial Implications: See report
   Contact: Sharon Friedrichsen, Budget Manager, (510) 981-7000
   Action: 1 speaker. Discussion held. Item continued to the March 13, 2025 meeting.

Mayor Ishii exited the meeting for the consideration of Item 3 at 11:29 a.m. due to Brown Act participation rules.

Councilmember Tregub joined the meeting for the consideration of Item 3 at 11:31 a.m. due to Brown Act participation rules.

Committee Action Items

3. Establish Rules and Limits When Community-Based Organizations Receive City Funding Without Procurement to Promote Transparency, Fairness, and Stewardship of Public Funds
From: Councilmember Kesarwani (Author), Mayor Ishii (Co-Sponsor)
Referred Date: January 6, 2025
Due Date: June 9, 2025
Recommendation: Refer to the City Manager to establish an open and transparent process for community-based organizations seeking a grant of emergency funds outside of the City's existing request for proposal (RFP) or other procurement processes. The process to be established should include the following components: Annual Funding Limit. Establish a maximum amount of $25,000 annually to be granted to a Berkeley-based non-profit or public organization, and a grand total of $225,000 annually to up to nine community-based organizations operating in Berkeley; "Declaration of Need" Form Available on a City Webpage. A Declaration of Need application form should be made available on a dedicated City webpage to ensure all community-based organizations have an equal opportunity to learn about the availability of funds, including the deadline for submitting the completed form; Declaration of Need Form Should Require Documentation of Financial Need and Non-Profit Status (When Appropriate). The Declaration of Need form should be short to reduce the burden on community-based organizations but should include at a minimum a request to explain the purpose/need for the funds and document the organization's financial need. In addition, the City should verify that the organization is a registered non-profit organization (if applicable); Selection Process. The City Manager shall establish a process for selecting qualifying community-based organizations, including establishing a scoring criteria and submitting recommendations to Council as part of the annual budget development process; and Financial Reporting Requirement for Selected Community-Based Organizations. For organizations selected to receive emergency funding of up to $25,000, the City shall enter into a contract that requests documentation at six months and 12 months to ensure that funds were used for the purpose for which they were requested. This financial reporting requirement should apply as soon as practicable to FY2024-25 budget allocations, and continue for future budget years.
Financial Implications: See report
Contact: Rashi Kesarwani, Councilmember, District 1, (510) 981-7110
Action: 1 speaker. M/S/C (Kesarwani/Blackaby) to send the item to Council with a positive recommendation.
Vote: All Ayes.

Mayor Ishii joined the meeting after the consideration of Item 3 at 12:05 p.m. due to Brown Act participation rules.

Councilmember Blackaby exited the meeting at 12:06 p.m.

Councilmember Tregub served as the alternate member for the remainder of the meeting and consideration of Items 4, 5, and 6.

Committee Action Items

4. City Council Legislative Systems Redesign
From: City Manager
Referred: January 16, 2024
Due: February 28, 2025
Recommendation: ***On January 16, 2024, the Agenda and Rules Committee referred the questions in the supplemental materials to the Budget and Finance Policy Committee for review and response.***
Financial Implications: See report
Contact: Mark Numainville, City Clerk, (510) 981-6900
Action: 0 speakers. Discussion held. M/S/C (Kesarwani/Ishii) to take no further action on the item and defer to the Agenda and Rules Policy Committee for further consideration of the legislative process improvements.
Vote: All Ayes.

5. Audit Status Reports: Fleet Replacement Fund Short Millions & Rocky Road: Berkeley Streets at Risk and Significantly Underfunded
From: City Manager
Recommendation: ***On May 23, 2023, the City Council referred to the Budget and Finance Policy Committee to prioritize funding to the vehicle replacement fund to make up the shortfall over time in order to stabilize the fund.***
Financial Implications: See report
Contact: Terrance Davis, Public Works, (510) 981-6300
Action: Item continued to the next meeting.

6. Study: Sabbatical Leave for City of Berkeley Employees
From: Councilmember Hahn (Author)
Referred: September 30, 2024
Due: March 4, 2025
Recommendation: Refer to the City Manager study of a potential Sabbatical Leave policy for all City of Berkeley employees, modeled after the City's existing agreements with several bargaining units.
Consult with labor partners and City employees to explore a variety of terms and options, and the costs/benefits of unpaid, partially paid, and paid Sabbatical Leaves.
Report findings to Council, outlining possible options and their financial impacts as well as potential benefits to recruitment, morale, longevity of tenure, and wellbeing.
Financial Implications: See report
Contact: Sophie Hahn, Councilmember, District 5, (510) 981-7150
Action: Item continued to the next meeting.

Unscheduled Items

These items are not scheduled for discussion or action at this meeting. The Committee may schedule these items to the Action Calendar of a future Committee meeting.

Items for Future Agendas

- None

Adjournment

Action: M/S/C (Kesarwani/Tregub) to adjourn the meeting.
Vote: All Ayes.

Adjourned at 12:12 p.m.

I hereby certify that the foregoing is a true and correct record of the Budget & Finance Committee meeting held on February 13, 2025.

_____
Neetu Salwan, Assistant City Clerk

BERKELEY CITY COUNCIL BUDGET & FINANCE COMMITTEE REGULAR MEETING MINUTES

Thursday, February 27, 2025 10:00 AM

Cypress Room – 2180 Milvia Street, 1st Floor, Berkeley, CA 94704

Committee Members:

Mayor Adena Ishii, Councilmembers Rashi Kesarwani and Brent Blackaby
Alternate: Councilmember Igor Tregub

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MINUTES

Roll Call: 10:02 a.m.

Present: Kesarwani, Blackaby, Ishii

Absent: None

Public Comment on Non-Agenda Matters – 0 speakers

Minutes for Approval

Draft minutes for the Committee's consideration and approval.

1. Minutes - February 13, 2025
Action: Item continued to the next meeting.

Committee Action Items

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From: City Manager
Recommendation: ****On May 23, 2023, the City Council referred to the Budget and Finance Policy Committee to prioritize funding to the vehicle replacement fund to make up the shortfall over time in order to stabilize the fund.*****
Financial Implications: See report
Contact: Terrance Davis, Public Works, (510) 981-6300
Action: 0 speakers. Presentation made and discussion held. Item continued to the next meeting.

Committee Action Items

3. Study: Sabbatical Leave for City of Berkeley Employees
From: Councilmember Hahn (Author)
Referred: September 30, 2024
Due: March 4, 2025
Recommendation: Refer to the City Manager study of a potential Sabbatical Leave policy for all City of Berkeley employees, modeled after the City's existing agreements with several bargaining units.
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Financial Implications: See report.
Contact: Sophie Hahn, Councilmember, District 5, (510) 981-7150
Action: 0 speakers. M/S/C (Ishii/Kesarwani) to send the item to Council with a negative recommendation.
Vote: All Ayes.

Unscheduled Items

These items are not scheduled for discussion or action at this meeting. The Committee may schedule these items to the Action Calendar of a future Committee meeting.

4 "Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Berkeley" and provide recommendations related to the City's General Fund Reserve Policy
From: City Manager
Recommendation: Receive a presentation on the Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Berkeley" and provide recommendations related to the City's General Fund Reserve Policy
Financial Implications: See report
Contact: Sharon Friedrichsen, Budget Manager, (510) 981-7000

Items for Future Agendas

- None

Adjournment

Action: M/S/C (Ishii/Kesarwani) to adjourn the meeting.
Vote: All Ayes.

Adjourned at 10:46 a.m.

I hereby certify that the foregoing is a true and correct record of the Budget & Finance Committee meeting held on February 27, 2025.

_____
Neetu Salwan, Assistant City Clerk

There is no material for this item.

City Clerk Department
2180 Milvia Street
Berkeley, CA 94704
(510) 981-6900

The City of Berkeley Budget and Finance Policy Committee Webpage:

https://berkeleyca.gov/your-government/city-council/council-committees/policy-committee-budget-finance

03

A Risk-Based Analysis of General Fund Reserve for the City of Berkeley

Purpose of Analysis

- Compliant with City General Fund Reserve Policy
  - Current goal is a minimum of 30% of Adopted GF Revenue within 10 years (2027)
  - Council will consider increasing or lowering reserve level based on a risk assessment (according to best practices) to be updated at least every five years
- Analysis to inform recommendations on whether to make any changes to policy

Goals for Today

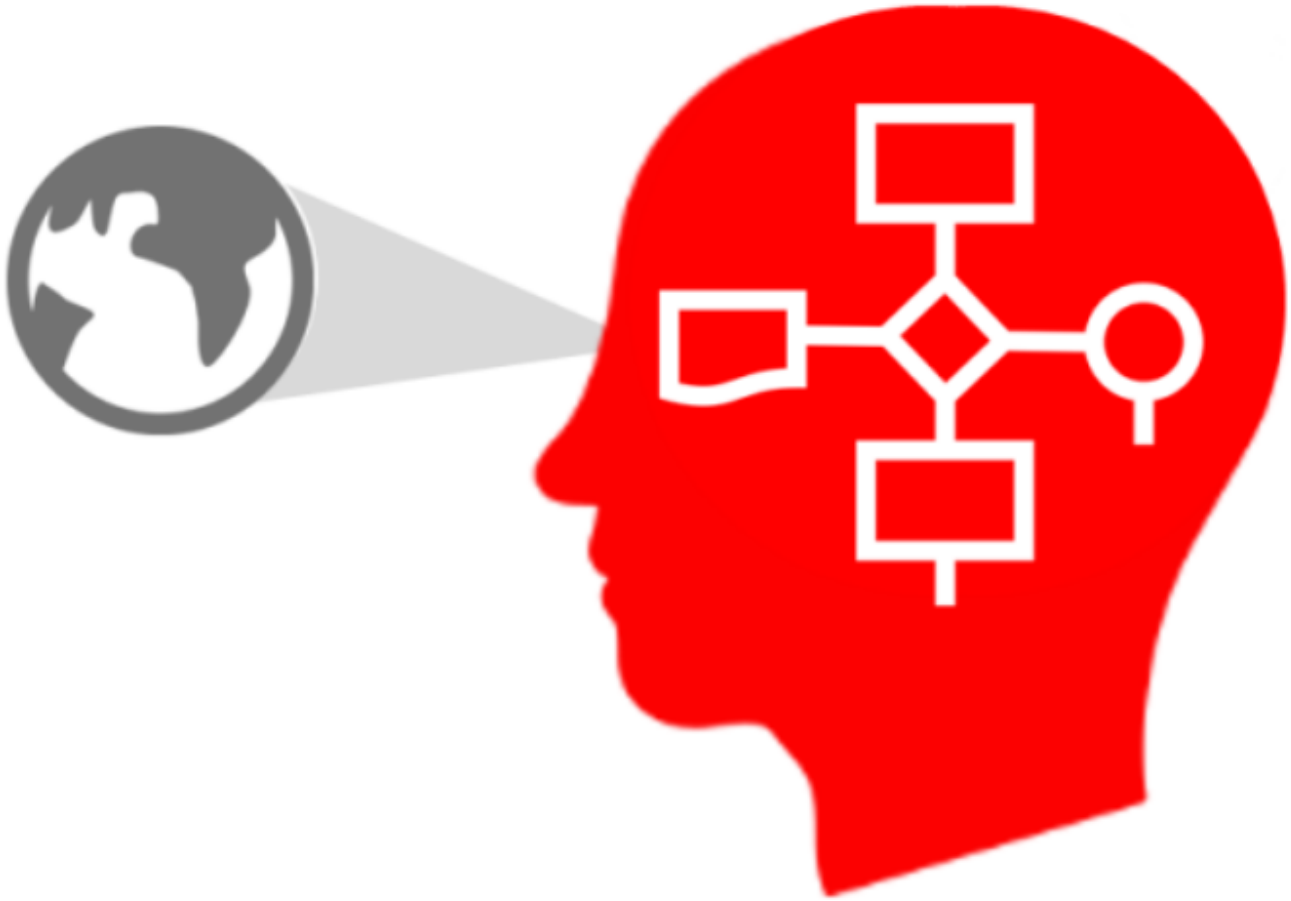
- Review five steps of the project
  - Define "reserves"
  - Define the risks the City of Berkeley is subject to
  - Determine exposure to risks
  - Putting together the findings of risk analysis
  - Next steps from here
- Gain awareness of how analysis was performed, results, and implications for the City of Berkeley
- Discuss existing General Fund Reserve policy and any modifications to the existing policy

Step 1 – Define “Reserves”

A mental model is a representation of how the real-world works.

The real world is complicated.

Mental models simplify.



What are Reserves?

"Reserves" is a budget and policy term that describes the resources available *outside of the budget* for use if the resources appropriated *inside of the budget* are insufficient. This offers protection against **unplanned, unavoidable** costs or losses.

What is the Traditional Mental Model for Reserves?

The Savings Account

- Easy to grasp
- Seemingly obvious parallel to our personal lives

The Savings Account Mental Model is Limited

- Savings is more commonly seen as deferred spending than a way to manage risk
- Implies that more is better

What is the Alternative?

The Insurance Policy

- A reserve manages volatility
- Risk is a product of volatility
- Hence, reserves help manage risk

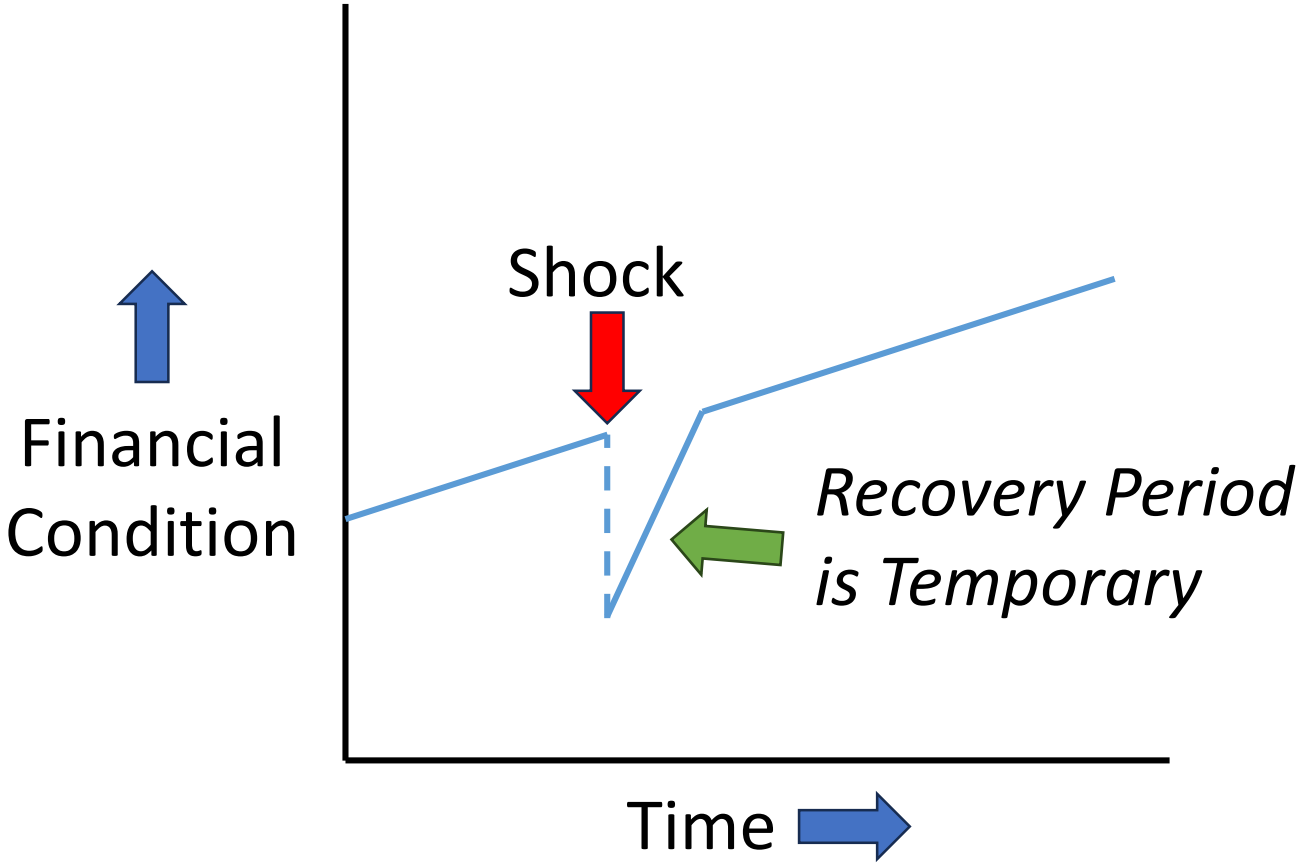
Advantages

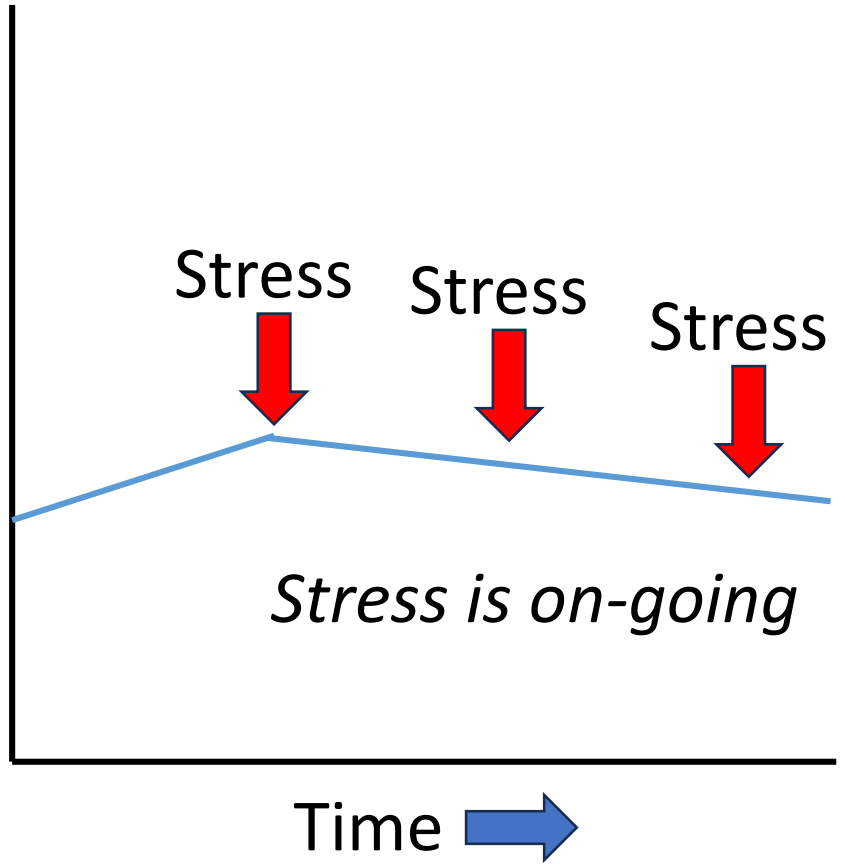
- Obvious parallel to personal lives
- Invites us to think how commercial insurance complements reserves
- Implies there is an optimal amount

Reserves as Insurance		Reserves as Savings Account		
Addresses reserve's role in guarding against risks like revenue instability, catastrophic events, and cashflow instability.	+	Addresses reserve's role in accumulating cash to pay for future costs that would not be affordable within a single year's revenue. A capital asset is an example of such a cost.	=	**Savvy Financial Strategy**
Provides a lens that encourages new and savvy ways to manage risk across the government.		Provides a lens that encourages multiyear financing strategies for large costs.		

Step 2 – Define Risks City of Berkeley is Protecting Against

Shock Versus ***Stress***





Reserves are an appropriate tool for shocks because temporary recovery period matches with non-renewable nature of reserves

Natural & Human-made Catastrophes

Wildfires

Earthquakes

Other Hazards

Tsunamis

Revenue Instability (Recessions and Pension)

Revenue	% of Total
Taxes	
Property Tax	38%
Sales Taxes	7%
Real Property Transfer Tax	12%
Business License Tax	10%
Utility Users Fee	7%
All Other Taxes	3%
All other revenue	22%
TOTAL	100%

Step 3 – Determine Amount of Exposure to the Risks

How Did We Analyze Exposure to These Risks?

- Monte Carlo computer simulation
  - Has been around since the 1950s
  - Standard practice in industries like insurance
  - Basically, we built a multiverse of the City of Berkeley

Where the Data Came From

- Berkeley's own historical experience
- Historical experience in the wider region.
- Berkeley's finance and emergency management staff
- Third party experts
  - Aon and FirstStreet.org
  - State experts
  - County / regional hazard reports

The Normal Distribution or "Bell Curve"

Average
5' 9"

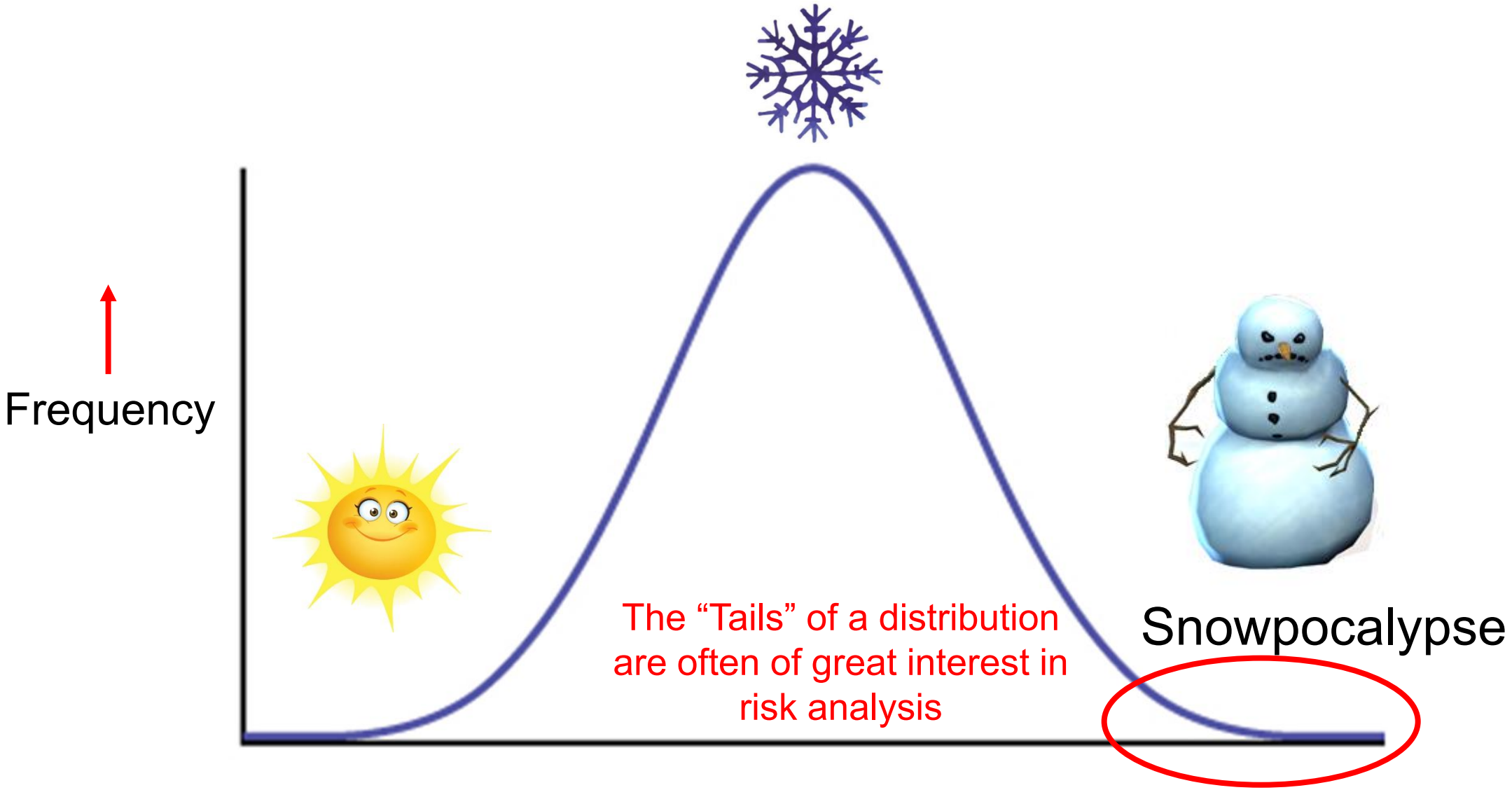
4' 5"

7' 1"

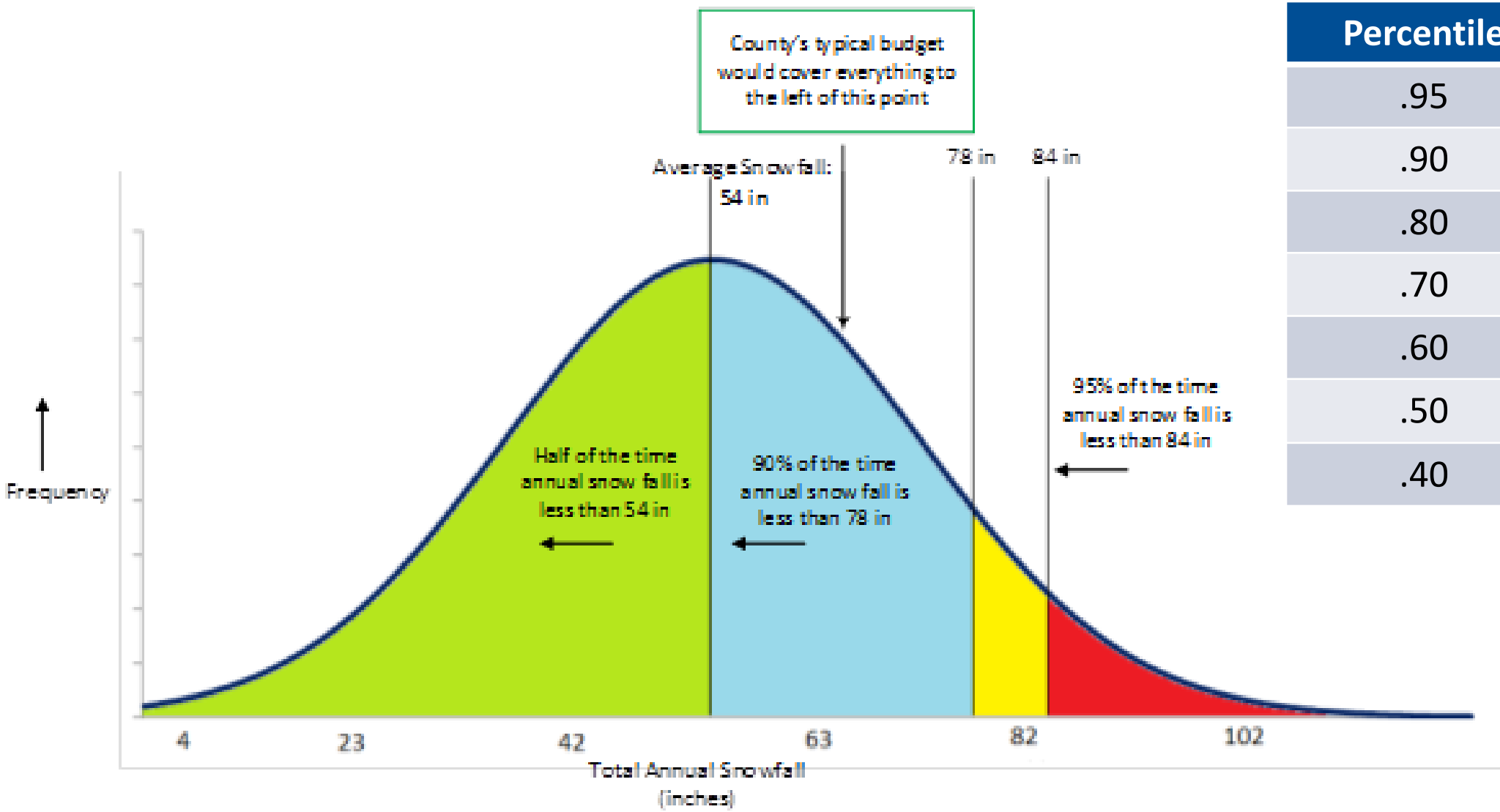
Frequency

Height

Normal (Symmetrical) Distribution in Local Govt



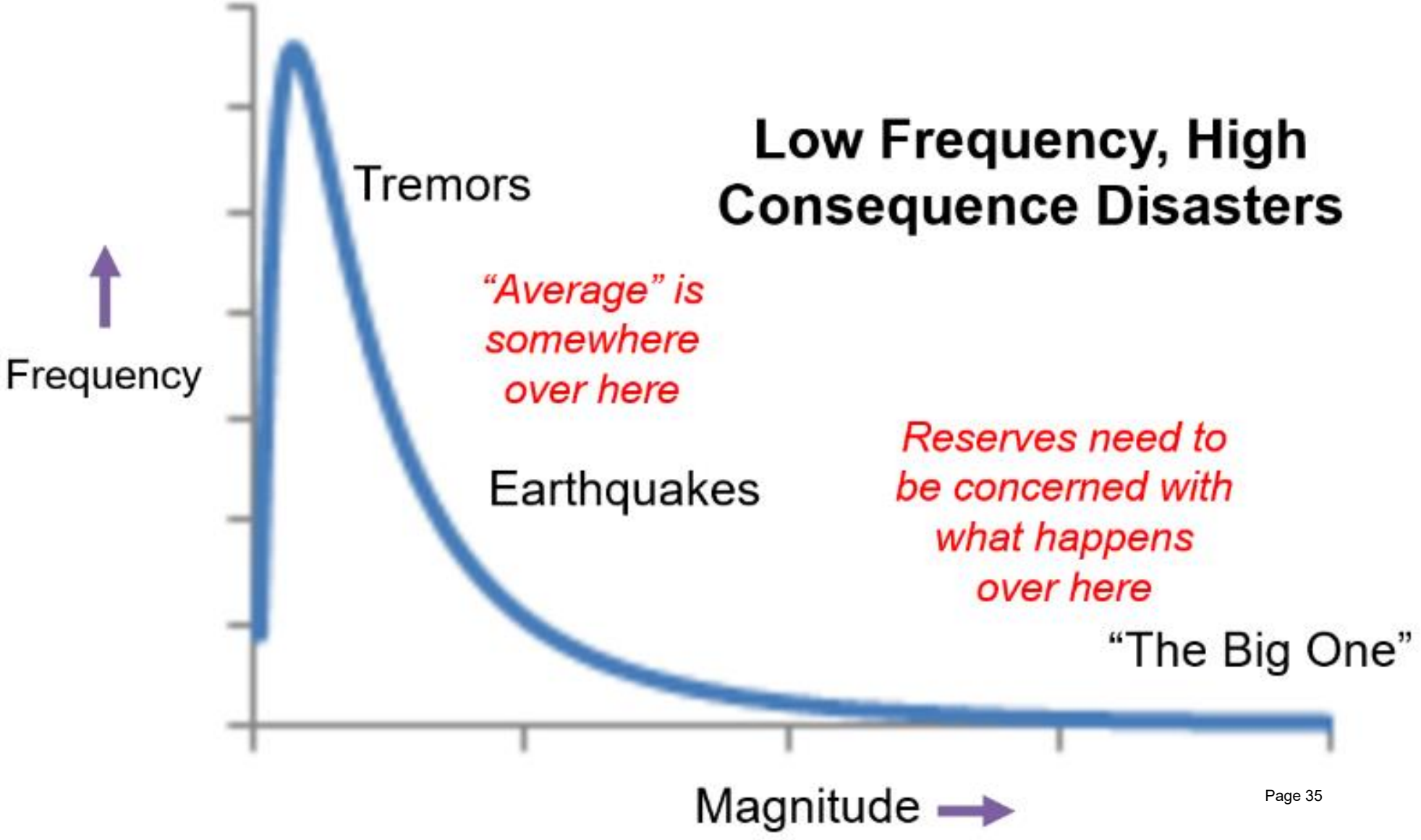
Normal Distribution Applied to a County



Percentile	Snowfall
.95	84
.90	78
.80	70
.70	64
.60	59
.50	54
.40	49

Important Feature of Many Catastrophes

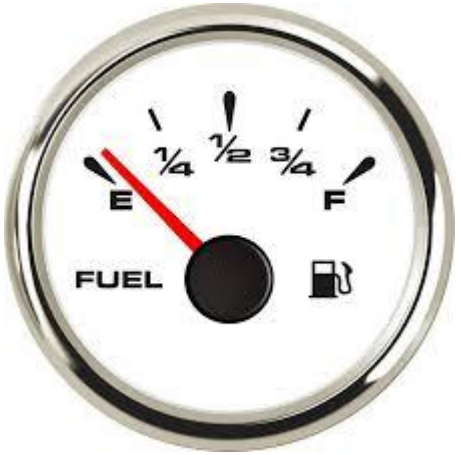
- Hockey stick shaped loss curve



Step 4 – Putting the Findings of Risk Analysis Together

Let's Add Up All the Risks GFOA Analyzed

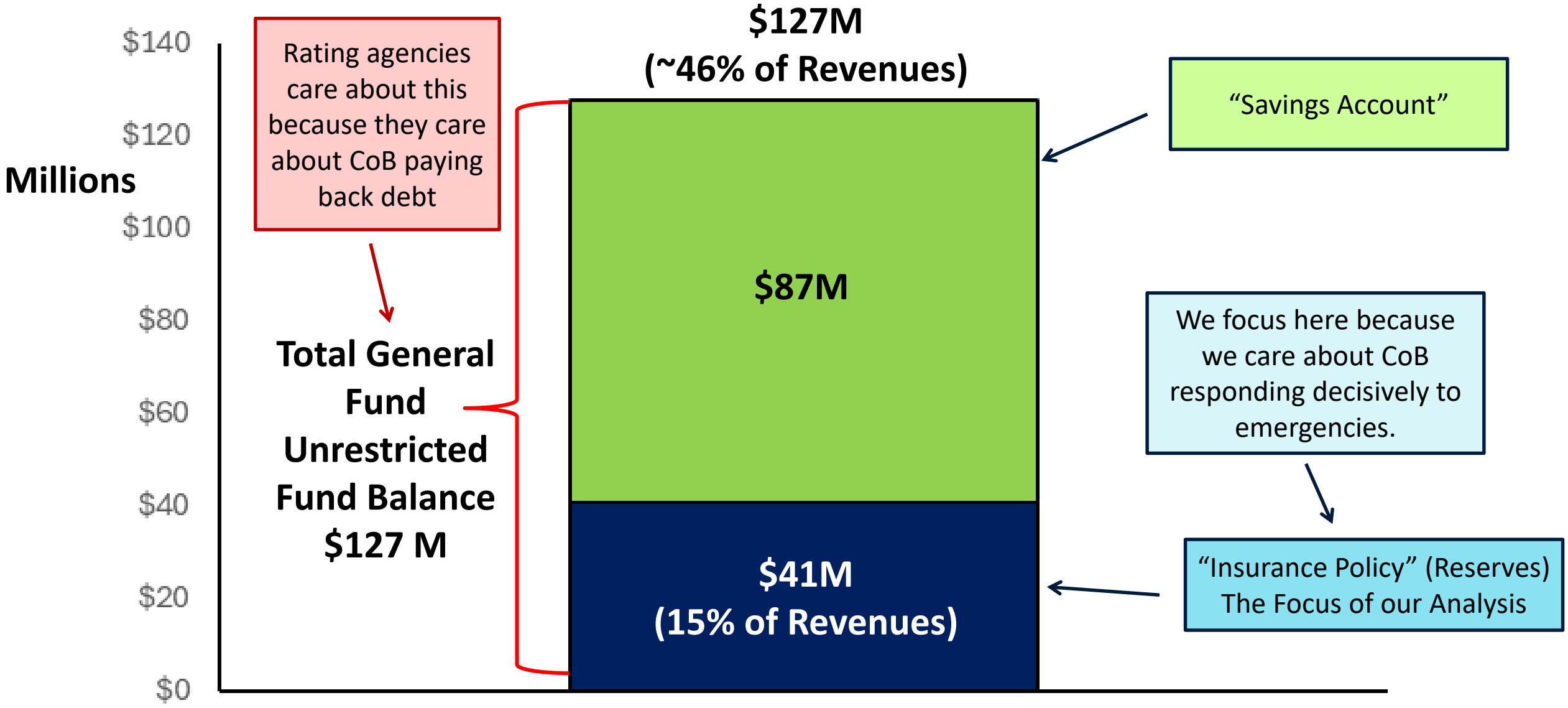
- But first some important points…



  - Risks don't add up like you might expect
    - Interdependencies!
  - Berkeley will not "do nothing" if a bad thing happens – it will look for savings opportunities. We assumed a willingness to cut the budget by about 4.5% This can be changed.
  - "Critical threshold" is set to Aaa bond rating for fund balance and zero for reserves. This is the "floor" or the least amount of gas you want in your tank.

Bond Rating Agency Expectations

- Berkeley has a goal of maintaining a Aaa bond rating
- Moody's pegs **fund balances** above 35% across the entire govt as equivalent to Aaa.
- Because Berkeley has robust **balances** in other funds, the burden on the general fund to meet this 35% goal is less than it might otherwise be.
- Our analysis addresses primarily "**reserves**" but also addresses **general fund balance**
  - Reserves is the "insurance policy" aspect of fund balance


$127M
(~46% of Revenues)
Rating agencies care about this because they care about CoB paying back debt
"Savings Account"
$140
$120
Millions
$100
$80
$60
$40
$20
$0
Total General Fund Unrestricted Fund Balance $127 M
$87M
We focus here because we care about CoB responding decisively to emergencies.
$41M
(15% of Revenues)
"Insurance Policy" (Reserves) The Focus of our Analysis

Some Implications

- Reducing the “savings account” or the “insurance policy” would make it harder to meet rating agency expectations
- Berkeley could, in theory, borrow from enterprise funds or internal service funds, in an emergency. Bond ratings focus on ability to repay debt. Berkeley has broader concerns.
- General fund does have role in backstopping some aspects of Berkeley operations so must be able to stand alone, to an extent.

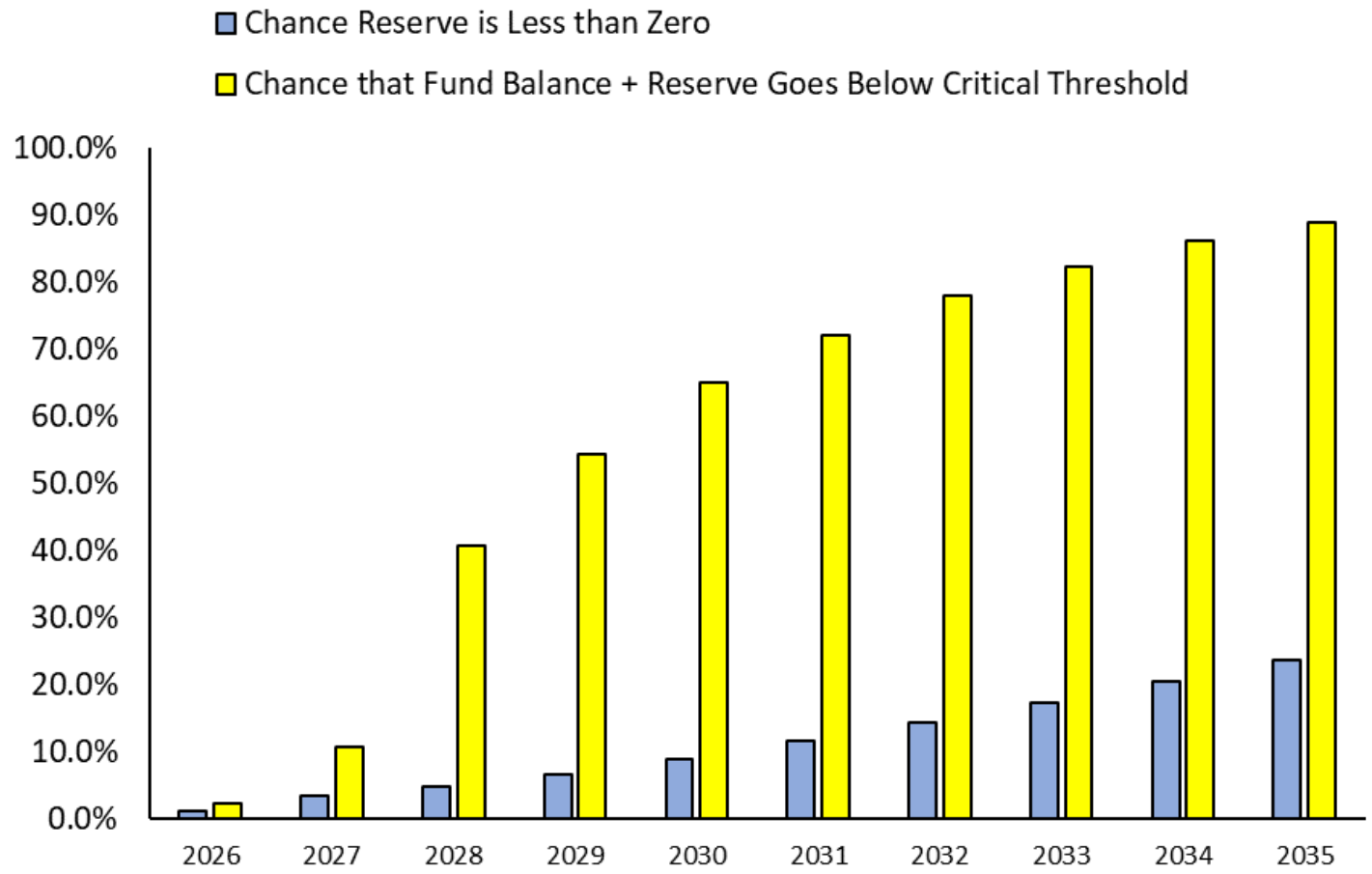
Other Factors Considered…

Issue	Implication for Risk Aversion	Notes
FEMA/CalOES, Other Reimbursement	←→	Does not reduce need to hold reserves, but helps replenish faster
Commercial Insurance	↓	Insurance might provide coverage that substitutes for reserves. FEMA data used accounts for this.
Taxbase Impairment	↑	Large earthquake (~7.0) could heavily damage many buildings
Unknown Unknowns	↑	Risk Model Includes “Other Hazards” simulation
Opportunity Costs	?	What are alternative uses of the funds and how do those benefits compare to insuring against the risks described in this report?
Analysis uses Historical Data	↑	Historical data does not account for climate risk
Spending cuts	↓	The City can reduce costs in response to a revenue loss or even in response to an expenditure spike. Cuts of 4.5% appear reasonable for planning purposes.
Annual Surpluses and Deficits	←→	Outside of recessions, it is uncertain if the City will create surpluses.

- City has a small but increasing chance of exhausting reserves over 10 years

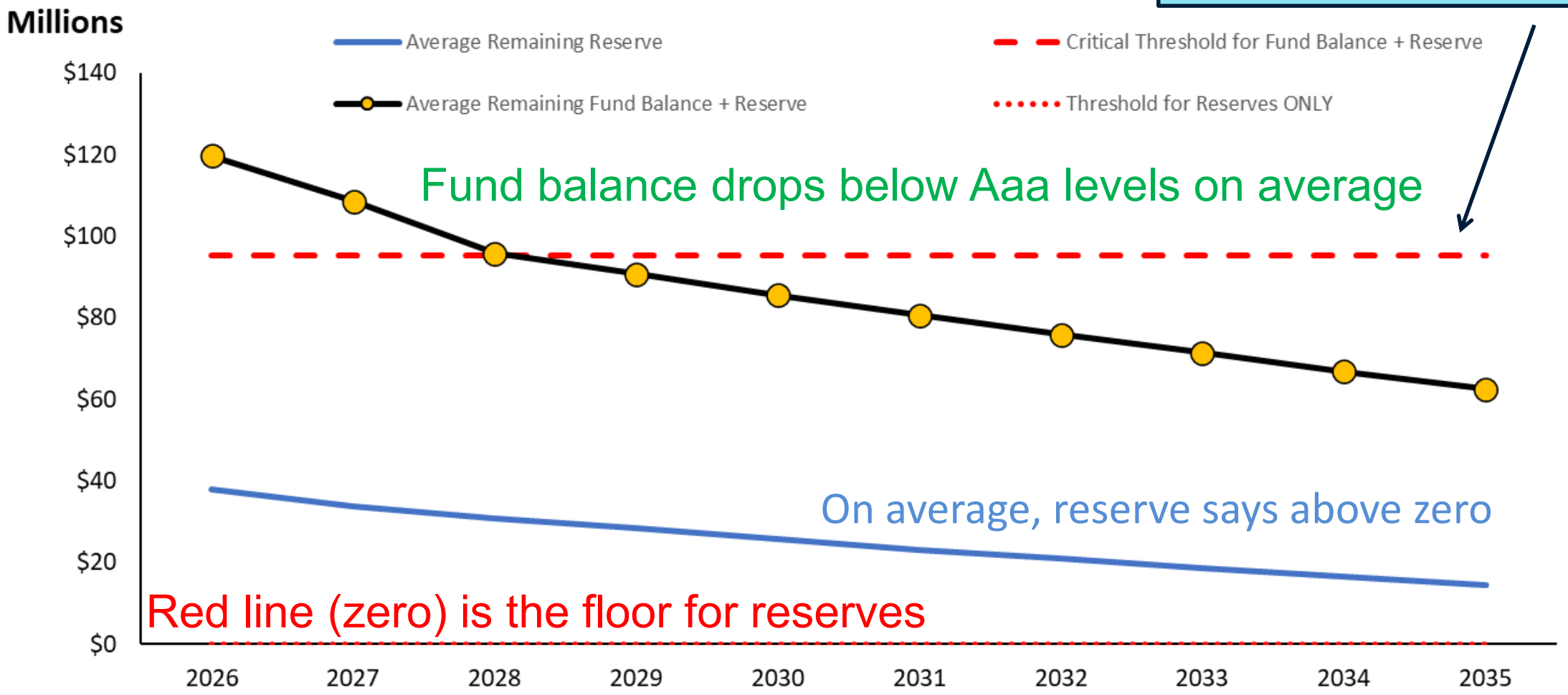
- General fund will have a dramatically increasing chance of falling below Aaa level of fund balance

Exhibit 1.1 – Chance Fund Balance + Reserves is Less than Bond Rating Aaa and Chance Reserve is Less than Zero.



Assumes: 1) annual surpluses are used to build back the reserve if used, as quickly as possible; 2) CoB will cut budget up 4.5% in response to recessions

Exhibit 1.2 – Simulated Remaining Fund Balance and Reserve each Year

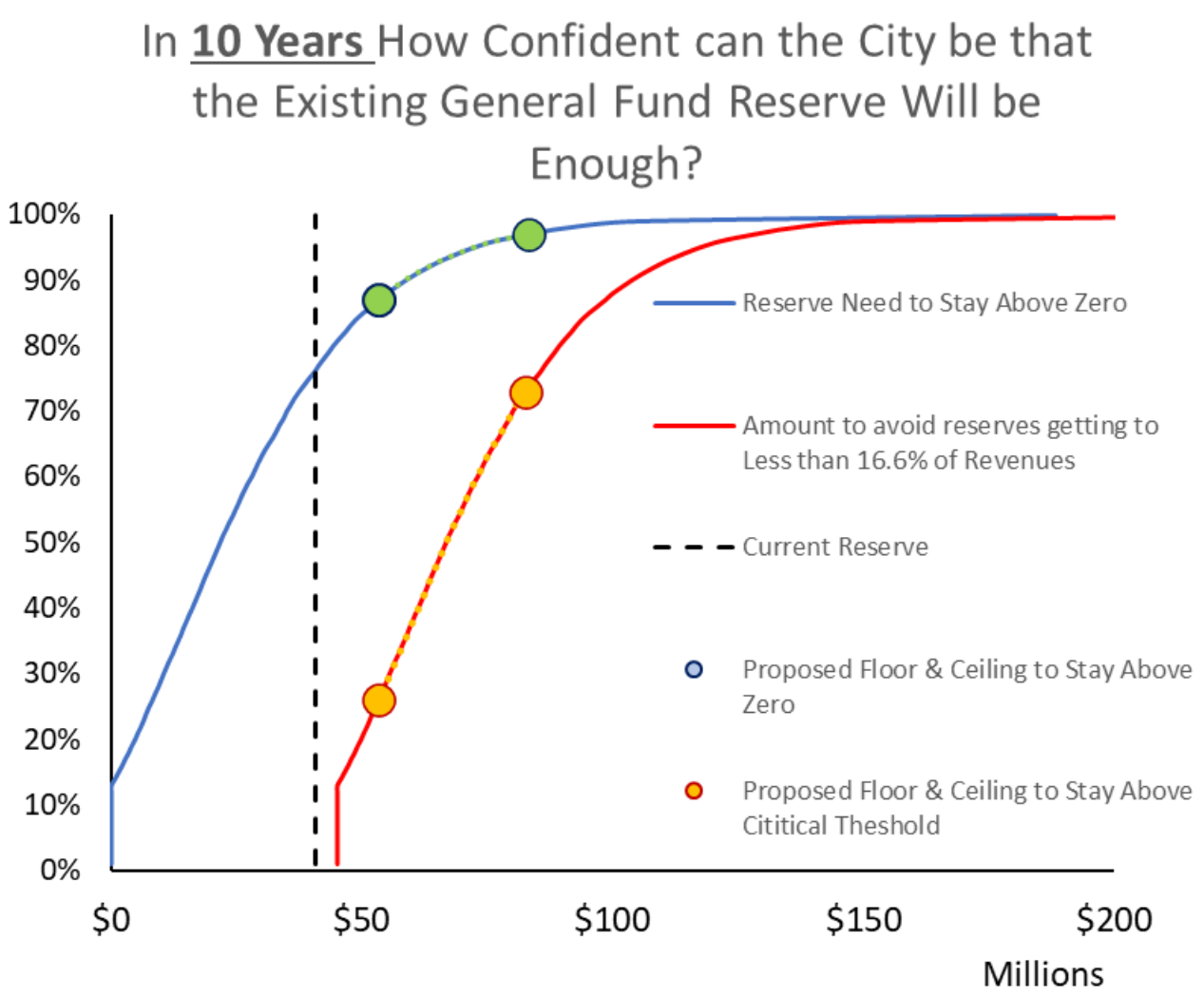


Step 5 – Where to From Here/Recommendations

Our Starting Points

- Purpose of this project is to review the City's reserve strategy and provide analysis to inform whether to keep the current policy in place or to make changes
- Current policy 16.7% of Adopted revenue by 2020 with goal of minimum 30% of revenue in 2027. Currently 17%.
- Options to keep or modify policy

Exhibit 1.4 – Cumulative Probability Chart with Proposed Range of Reserves



Curves flatten out where more reserves not as beneficial

Long tail represents extreme outcomes, like 7.0M quake

GENERAL FUND RESERVE SUGGESTIONS RELATIVE TO STAYING ABOVE ZERO

A Reserve Policy typically expresses reserve targets as a percent of expenditures or revenues. Below we have converted the dollar figures to a percent of revenues.

Dollars			Percent of General Fund Revenues
$53.5	Million	87% confident of staying above zero over ten years	20%
$83.0	Million	97% confident of staying above zero over ten years	30%

City is currently at about 15%

Options and Recommendations

- Keep policy of 30% minimum of adopted revenue in place

OR

- Modify policy to include a floor and ceiling for reserves instead of one target number (20-30% of revenue)
  - This gives the City between about 87% and 97% confidence of being able to handle the risks included in the analysis while keeping reserve above zero and
  - A 26% and 73% chance of handling the risks while keeping reserves above 17% of revenues (2 months of revenue)

Options and Recommendations

- Consider combining stabilization and catastrophic reserves into one reserve fund

- GFOA report includes several other suggestions for reporting on compliance with policy and other strategies to potentially increase the reserves

RESOLUTION NO. 67,821–N.S.

ESTABLISHING THE CITY COUNCIL'S POLICY FOR THE GENERAL FUND RESERVES

WHEREAS, the General Fund Reserves ensure the City's ability to maintain vital services to the community during times of economic uncertainty; and

WHEREAS, the City is committed to achieving long-term fiscal stability as well as mitigating the negative impacts of extraordinary risk such as earthquakes, fires, and floods; and

WHEREAS, the prior General Fund Reserve level of 8% is not consistent with GFOA's best practice recommended minimum General Fund Reserve level of 16.7%; and

WHEREAS, specific portions of the reserve should be designated for catastrophic and stabilization purposes and should be reported separately from the General Fund Balance; and

WHEREAS, the use and replenishment of the General Fund Reserves should be defined.

NOW THEREFORE, BE IT RESOLVED by the Council of the City of Berkeley that the attached exhibit titled General Fund Reserve Policy is hereby adopted.

The foregoing Resolution was adopted by the Berkeley City Council on January 24, 2017 by the following vote:

Ayes: Bartlett, Davila, Droste, Hahn, Maio, Wengraf, Worthington and Arreguin.

Noes: None.

Absent: None.

Jesse Arreguin, Mayor

Attest:
Mark Numainville, City Clerk

City of Berkeley
General Fund Reserve Policy

Policy

The General Fund is the City's primary operating fund. It is not connected to any one revenue source and may be used at the City's discretion. The General Fund is the operation fund that pays for general services provided by the City as well as public safety and capital improvements. The General Fund accounts for all general revenues and expenditures of the City related to the delivery of the City's general services not specifically collected or levied for other City funds.

The City of Berkeley is committed to achieving long-term fiscal stability as well as mitigating the negative impacts of extraordinary risk such as earthquakes, fires, floods, and economic volatility. A key attribute of a financially stable organization is appropriate reserves. Strong reserves position an organization to weather significant economic downturns more effectively, manage the consequences of outside agency actions that may result in revenue reductions, and address unexpected emergencies such as natural disasters and other catastrophic events. Establishing an adequate General Fund reserve policy allows the City to mitigate current and future financial risks resulting from economic instability or catastrophic loss.

Functions of Reserves: Stability and Catastrophic

The City of Berkeley will establish and maintain an adequate General Fund Reserve ("Reserve") to prepare for the impact of economic cycles and catastrophic events and assure fluctuations in revenue do not impede the City's ability to meet expenditure obligations. When revenues fail to meet the City's normal operating requirements, or the need for disbursements temporarily exceeds receipts, General Fund reserves, upon a two-thirds vote of the City Council, may be used in accordance with the standards set forth herein.

The Reserve shall be comprised of two elements: a Stability Reserve and a Catastrophic Reserve. The Reserve shall not be used for ongoing or new programs or services.

A Stability Reserve will be maintained to mitigate loss of service delivery and financial risks associated with unexpected revenue shortfalls during a single fiscal year or during a prolonged recessionary period. The purpose of the Stability Reserve is to provide fiscal stability in response to unexpected downturns or revenue shortfalls, and not to serve as a funding source for new programs or projects.

A Catastrophic Reserve will be maintained for the purpose of sustaining General Fund operations in the case of a public emergency such as a natural disaster or other

catastrophic event. The Catastrophic Reserve will be used to respond to extreme, onetime events, such as earthquakes, fires, floods, civil unrest, and terrorist attacks. The Catastrophic Reserve will not be accessed to meet operational shortfalls or to fund new programs or projects.

Funding and Functions that are NOT Part of the General Fund Reserves

Not included in the General Fund Reserves are funds that are set aside for a specific purpose. This would include restricted, committed, and assigned funds.

- The restricted fund balance category includes amounts that can be spent only for the specific purposes stipulated by constitution, external resource providers, or through enabling legislation.
- The committed fund balance classification includes amounts that can be used only for the specific purposes determined by a formal action by the City Council.
- Amounts in the assigned fund balance classification are intended to be used by the government for specific purposes but do not meet the criteria to be classified as restricted or committed.

Target Reserve Levels

The General Fund Reserve consists of the total of the Stability Reserve and the Catastrophic Reserve. 55% of the Reserve shall be allocated to the Stability Reserve and 45% to the Catastrophic Reserve.

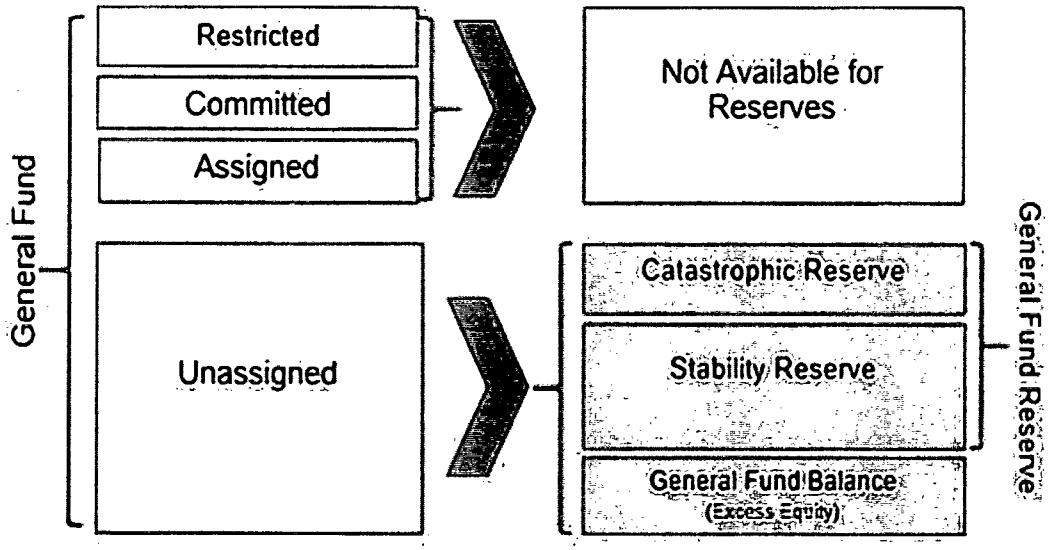
Effective immediately, the target level for the Reserve shall be a minimum of 13.8% of 2017 Adopted General Fund Revenues with an Intermediate Goal of a minimum of 16.7% by the end of Fiscal Year 2020, if financially feasible.
The Council hereby adopts a Long Term Goal of a Reserve of a minimum of 30% of General Fund Revenues, to be achieved within no more than 10 years. Based on a risk assessment (according to best practices), to be updated at least every five years, the Council may consider increasing or lowering the General Fund Reserve level.

Starting in Fiscal Year 2018, to achieve the City's Intermediate and Long Term Reserve Goals, 50% of Excess Equity above the first $1M shall be allocated to Reserves. Additional Excess Equity may be allocated to Reserves by a majority vote of the City Council.

Methodology to Meet Reserve Levels

The General Fund Reserve is separate from the General Fund Balance. The sum of the Stability Reserve and the Catastrophic Reserve and the amount determined to be

Excess Equity is deemed to be General Fund Unassigned Fund Balance. Unassigned fund balance is the residual classification for the City's general fund and includes all spendable amounts not contained in the other classifications. The following graphic shows the relation between these funds as well as other restricted, committed, and assigned general fund monies.



Excess Equity is most commonly a non-recurring source of revenue and shall only be used for one-time, nonrecurring expenditure needs of the City. Excess Equity should be reported separately from the General Fund Reserves .

Attaining the Long Term Goal of 30% Reserves is important to the long-term financial health and stability of the City

Replenishment of the General Fund Reserves

The City Manager shall recommend a replenishment schedule for all monies proposed for appropriation from the General Fund Reserves. The replenishment schedule shall be adopted simultaneous with the appropriation to withdraw Reserve funds or, if infeasible due to emergency circumstances, no more than 3 months from the date of the withdrawal appropriation. Repayment shall begin no more than 5 years from the date of withdrawal and be completed within 10 years from the date of withdrawal.

While staff envisions that, in most cases, repayment will start as soon as possible, the repayment guidelines are meant to reflect a commitment to maintain a sufficient Reserve, while also recognizing that a use of Reserve funds may occur during an economic downturn and it may be necessary to postpone repayment while the economy improves.

A Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Berkeley, California

2025

Produced by:

The Government Finance Officers Association

Table of Contents

Section 1 - Executive Summary

A local government's "reserves" are the portion of fund balance which serves as a hedge against risk. The City of Berkeley ("the City" or "Berkeley") has asked the questions: "what is the right amount of general fund reserves for us?" and "how resilient would any potential reserve target be to losses?" The Government Finance Officers Association (GFOA) has helped the City answer this question by examining the risks that it is subject to.

Though reserves are a subset of fund balance, fund balance also matters. Bond rating agencies use total fund balance as one factor when assigning bond ratings. The City desires to maintain a AAA rating and our analysis provides insights into the chances of maintaining a fund balance level associated with a AAA rating.

GFOA's methodology is intended to evaluate potential risks and their cost to the City's general fund. Our methodology is not intended to predict Berkeley's future. The GFOA Risk Model provides the option for Berkeley to adjust variables when future conditions change. Our model and this report also describe the assumptions behind our analysis and recommendations.

First, we identified the risks that posed the most clear and present danger to the City. The major risks are:

- Revenue loss from recessions
- Increased pensions costs that are unaffordable under the City's other available funding mechanisms (primarily the annual budget, but also including the pension trust fund)
- Wildfires, earthquakes, and tsunamis are the leading potential catastrophic natural disaster risks the City faces. In discussions with City staff, these disasters represent the greatest risk of catastrophic loss and received the most analytical attention.
- Other natural hazard exposures included in the Risk Model are high winds, severe storms and landslides.
- The Risk Model made provisions for "other risks", not named above. This represents the "unknown" risks we can't anticipate.

Next, for each risk, we calculated the probability that the City would experience the risk over a ten-year period and, if an event were to occur, what the magnitude of the loss would be for the City's general fund. To calculate the probability and magnitude of events, we did the following:

- **Analyzed Berkeley's own experience and the experiences of other municipalities.** For example, a recession would have similar impacts in other California municipalities because the economic and legal environment would be similar (e.g., state aid would be impacted similarly).
- **Reviewed research produced by other agencies.** For instance, the Federal Emergency Management Agency (FEMA) has data on costs that natural disasters have caused.
- **Drew from the expertise of City staff.** City staff work every day on preparing the City for the risks it faces. Staff provided their expertise to help us estimate risks. For example, City staff helped us understand the nuances of natural disaster risks and revenue instability risks in Berkeley. The City's hazard mitigation plan was also a valuable resource.

We modeled each risk individually and then combined each individual risk into a ten-year model of the City's fund balance and reserves. The model is intended to answer the primary question: what amount of reserves will give the City of Berkeley sufficient confidence that it will be able to cover the losses from the

risks GFOA has analyzed? Secondarily, it answers the question: was is the chance total fund balance stays above the amount associated with a AAA bond rating?

We combined all the information described above to create a ten-year probabilistic model. The City's goal for this analysis was to find an amount that can give the City sufficient comfort that its reserves will cover its risks. The following pages present a series of graphics based on this model.

We combined all the information described above to create a ten-year probabilistic model. The City's goal for this analysis was to find an amount that can give the City sufficient comfort that its fund balance and reserves will be sufficient. We next present a series of graphics based on this model.

Exhibit 1.1 compares fund balances and reserves to thresholds that the City is concerned about.

For fund balance, the threshold is the amount of fund balance associated with Aaa bond rating, according to the bond rating agency Moody's: an amount equal to at least 35% of general fund revenue. An important caveat must be noted, however. *Moody's evaluates fund balance across the entire local government, while our analysis is just for the general fund.* Thus, our analysis is really asking about the chance that the general fund can carry its "fair share" of the load of meeting rating agency expectations and not if the City, overall, will be able to meet rating agency expectations.

For reserves, the threshold is zero. Zero represents the "self-insurance" aspect of the City's reserves running out.

In Exhibit 1.1, we see there is a very high chance, approaching 90% (or 9 in 10) that the City's fund balance will go below the amount associated with a Aaa bond rating. Again, we should draw attention to our caveat that a bond rating is based on the entire City government, while our analysis covers only the general fund. As of this writing, the position of the City's other funds is *currently* strong enough to keep the entire City in Aaa territory, but our analysis says nothing about the chances of this continuing. Another important caveat is that fund balance is just one of several criteria that bond rating agencies consider, so a decline in fund balance below the Aaa threshold does not necessarily mean that the City will be downgraded – perhaps other aspects of the City' financial condition could balance out a declining fund balance.[1]

Exhibit 1.1 also addresses reserves, where there is just over a 20% chance that that the reserve will reach zero at the end of ten years. This is a greater chance than GFOA has observed most municipalities are comfortable with.

It is important to note that, generally, the bars in presentations like 1.1 will get higher the further in the future we look because more bad things can happen. That said, we should also note that a very important cause of the rising height of the bars is the assumption that the City will have a tough time generating budget surpluses in the next few years, as per City staff long-term forecasts. For example, if we were to change the most likely outcome of our surplus-or-deficit simulation to just "zero" or break-even, the chance of the City's fund balance being below Aaa in year ten improves by around 15 percentage points

[1] GFOA did a separate analysis on bond rating for the City which goes into the factors Moody's considers and the City's relative position on each.

(about a 75% chance). The impact in the near term is even greater: 5 years out the chances improve by 25 percentage points (from a 65% to 40% chance of going below the critical threshold). The pension risk described in Section 4 of this report also adds a persistent drag on the City's finances, including its fund balances and reserves.

Exhibit 1.1 – Chance Fund Balance + Reserves is Less than Bond Rating Aaa and Chance Reserve is Less than Zero.

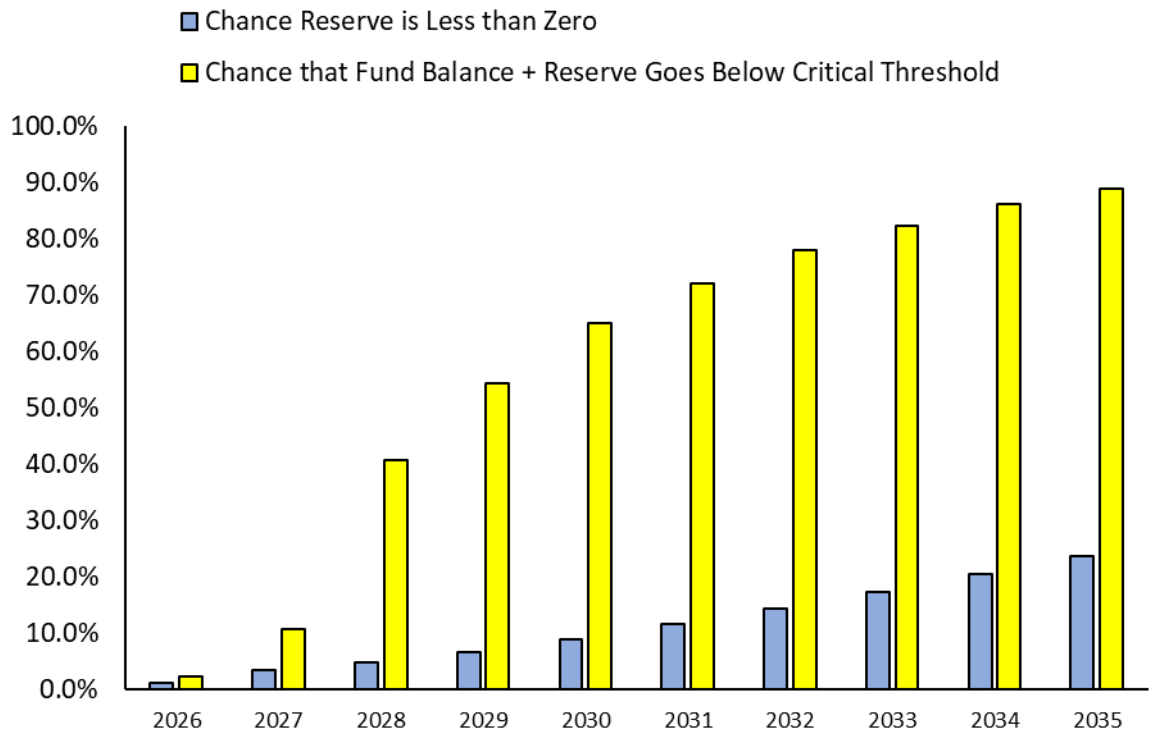


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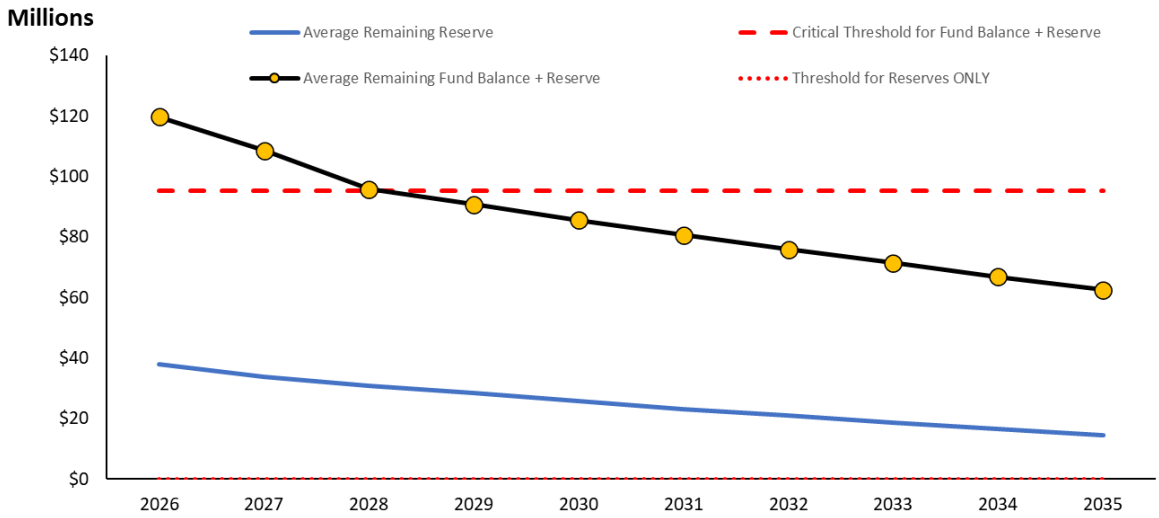
Exhibit 1.2 shows the average remaining fund balance and reserves each year. Perhaps unsurprising given the rising bars in Exhibit 1.1, Exhibit 1.2 shows the lines on a downward trajectory. It shows that the City's fund balance falls below the Aaa threshold, on average, in the fourth year of the analysis. On average, reserves stay above zero each year. Note that the threshold for reserves is set to zero, so the dotted red line that represents this threshold may be difficult to see because it overlaps the black line border that is also at the zero position.

Exhibit 1.2 – Simulated Remaining Fund Balance and Reserve each Year



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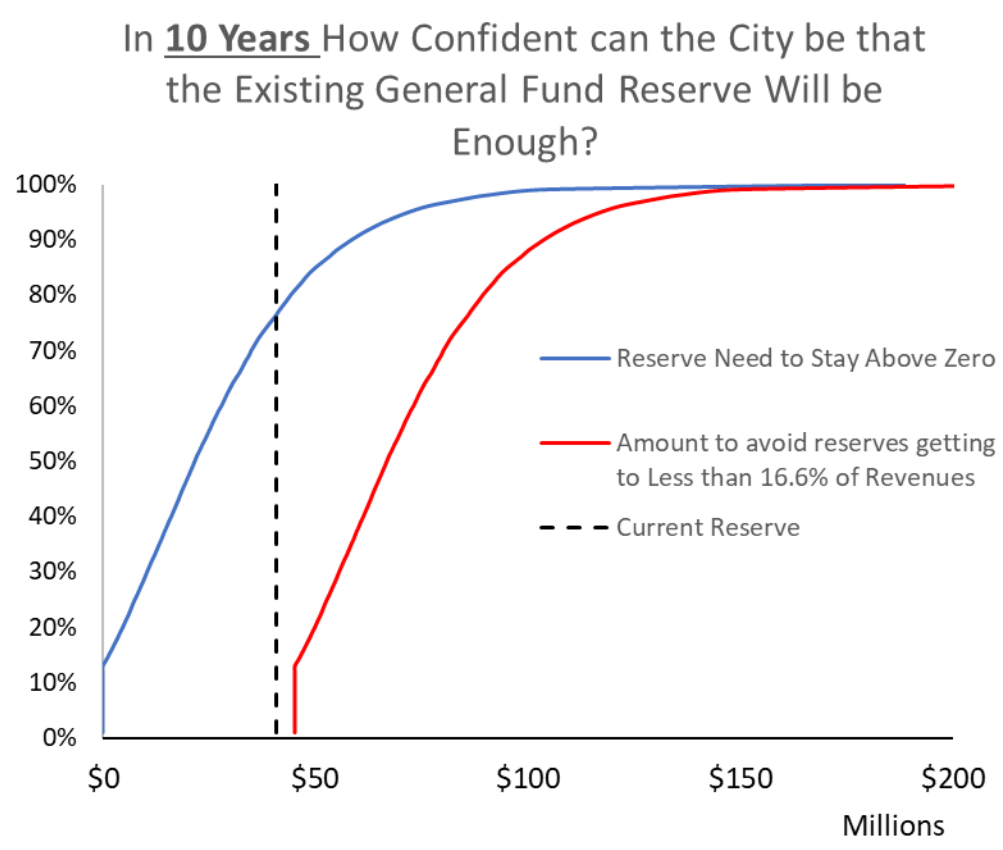
Finally, below is Exhibit 1.3. This is a cumulative probability chart. It shows the confidence available from varying levels of reserves. Berkeley's existing reserve intersects the blue line at about 80% confidence, which means there is an 80% chance that the City will have an amount of reserves greater than zero in the tenth year of the analysis. This is the other side of our earlier conclusion that there is about a 20% chance of the reserves being less than zero in year ten. This graphic adds an element for GFOA's rule-of-thumb on the minimum amount of fund balance a City should maintain, which is equal to at least 2 months (16.6%) of revenues.[2] Currently, the City is just short of that amount if we focus just on the City's reserves. Exhibit 1.3 shows the amount of money that would be needed in the reserve in year 1 to have a given level of confidence that reserves would remain above zero or 16.6% of revenues in year 10.

A key takeaway is that reserves have a diminishing return at a certain point because the flatter the line gets, the less confidence an additional dollar of reserve "buys" you. This is because the further to the right you go on the graph, the more extreme the events are that must be covered by reserves. This graphic shows that the City would still get a good "bang for the buck" from higher reserves than it has today. This City would not be as well served by accumulating reserves past the point where the line starts to flatten.

Exhibit 1.3 – Cumulative Probability Chart



[T]The GFOA rule of thumb concerns unrestricted fund balance of which reserves are typically a subset.

The City can use the results of this report to optimize the range of general fund reserves it would like to hold. GFOA recommends the City establish a floor and a ceiling amount of reserves. The ceiling is an amount of reserves the City will try not to exceed and a floor is an amount that the City will try not to go below and will try to replenish the reserves quickly if they do go below the floor.

City officials will also want to think about other factors to finalize the reserve target range. This is because Exhibit 1.3 cannot account for every possible factor that should go into deciding how much Berkeley should keep in its reserve. The numbers shown in the exhibit are what is needed to protect the City from just the risks described in this report and to keep the reserve above zero (and fund balance within Aaa territory). Usually, municipal governments have other concerns they expect their reserves to address. Here are examples of such concerns:

- There are risks that are sometimes called "unknown unknowns." These are risks that are totally unanticipated. Our risk model does include an "other hazards" simulation which should go a long way towards addressing unknown unknowns.
- Our Risk Model is based largely on historical data, which, by definition, does not capture the potential future impacts of climate change. It is impossible to say what the future impacts of climate change will be. This might suggest a more "risk averse" approach to reserves (i.e., maintaining more, rather than less).
- The City might wish to use fund balances for purposes other than mitigating risks – for example, building a capital project using cash financing. The Risk Model gives the City the ability to estimate the cost of potential projects to see the financial impact of redirecting reserves to other uses.[3] More broadly, City officials should consider opportunity costs of holding reserves: what are alternative uses of the funds and how do those benefits compare to self-insuring against the risks described in this report?

The considerations above could be addressed by choosing a robust floor and ceiling level for reserves. Different floors and ceilings can be "stress tested" by changing thresholds that the model measures against. GFOA's discussions with the City staff suggested a threshold of zero for reserves is useful for assessing the risk of exhausting the "self-insurance" capacity of its fund balance. The City could choose to vary this critical threshold, which would then change the total amount of reserves the City would need to maintain to achieve a given degree of confidence that reserves would stay above the threshold. For example, perhaps the City selects a threshold of 5% or 10% of revenues to provide a buffer against going all the way to zero.

Here are some other conclusions we can draw from the graphics presented on the previous pages:

- The City's ability to generate surpluses has a significant impact on the chances that fund balance and reserves go below thresholds. Later we recommend a "structurally balanced budget policy" to help the City more consistently generate balanced budgets, if not surpluses.
- If the City does generate surpluses, it must then choose to direct those surpluses towards building the reserves. A one-time or volatile revenue policy, discussed in the recommendations later, could help in this regard.

[3] Note that the City has historically done some level of cash financing of projects. The model already accounts for "normal" spending that takes place in the City's annual budget, so this feature of the Risk Model would be used for larger projects that exceed what might be considered "typical."

- The City should remain mindful of the potential for extreme consequence events. A large earthquake could impair the taxbase. In Exhibit 1.3 the reader will notice that the red line extends very far to the right, past $200 million. This tells us that there is a small chance of some very extreme outcomes, due to the City's vulnerability to earthquakes and tax base impairment. Later in this report, we discuss parametric insurance as an alternative to reserves to protect the City against these extreme cases.

GFOA discussed all the factors above with the City staff and the conclusion of this discussion was that the City of Berkely would be well served by a policy that calls for *general fund reserves* equal to between 20% and 30% of the City's revenues. This gives the City between about 87% and 97% confidence of being able to handle the risks included in our analysis while also keeping the reserve above zero.

We could also compare the policy range to the City chances of staying above 17% of revenues, which is the equivalent of two months of revenues.[4] This amount of reserves is a long-standing rule of thumb in public finance. Reserves equal to 20% to 30% of revenue provide between a 26% and 73% chance of handling the risks included in our analysis while also keeping reserves above 17% of revenues. The tables below summarize what we just described.

GENERAL FUND RESERVE SUGGESTIONS RELATIVE TO STAYING ABOVE THE CRITICAL THRESHOLD		
CRITICAL THRESHOLD = 16.7% of Revenues or $44M		
A Reserve Policy typically expresses reserve targets as a percent of expenditures or revenues. Below we have converted the dollar figures to a percent of revenues.		
Dollars		Percent of General Fund Revenues
$53.5 Million	26% confident of staying above critical threshold over ten years	20%
$83.0 Million	73% confident of staying above critical threshold over ten years	30%

GENERAL FUND RESERVE SUGGESTIONS RELATIVE TO STAYING ABOVE ZERO		
A Reserve Policy typically expresses reserve targets as a percent of expenditures or revenues. Below we have converted the dollar figures to a percent of revenues.		
Dollars		Percent of General Fund Revenues
$53.5 Million	87% confident of staying above zero over ten years	20%
$83.0 Million	97% confident of staying above zero over ten years	30%

On the next page, we will discuss the context and rationale for this recommendation.

[4] 2 months of 12 months is the same as is 1 in 6. 1 in 6 is 16.67%, which rounded up is 17%.

For context, let's first recall that the City's reason for undertaking this study is to update its reserve policy in order ensure that its reserve targets are appropriate given the risks that the City faces. These recommendations provide that update.

Next, we are suggesting that the City think of its reserves as a range (a ceiling and floor) that it wishes to remain within. This contrasts with identifying a single target for reserves. The dynamic environment the City is within makes it very difficult to hit and maintain a single target number. It is more practical to manage within a range or boundary. The suggested floor is reserves equivalent to 20% of revenues and the ceiling is 30%.

As for rationale, first, the suggested range gives the City a very good chance of staying above zero reserves – an 87% chance, on the low end. As for staying above the two-month rule of thumb (reserves equal 17% of revenues), the chance is substantially less, but we believe this is acceptable for two important reasons. First, the two-month rule of thumb is loosely based on bond rating agency expectations. As we discussed earlier, the risk model addresses bond rating agency expectations directly. Hence, we'd suggest that the City keep its eye on the chances of missing bond rating agency expectations directly, instead of monitoring them indirectly via this rule of thumb. Secondly, the rule of thumb assumes the user has no additional knowledge of the exposure to risk. As this report has shown, we have a great deal of knowledge about the City's exposure to risk. Therefore, the City probably does not need the entire margin against risk that staying above the rule of thumb would provide.

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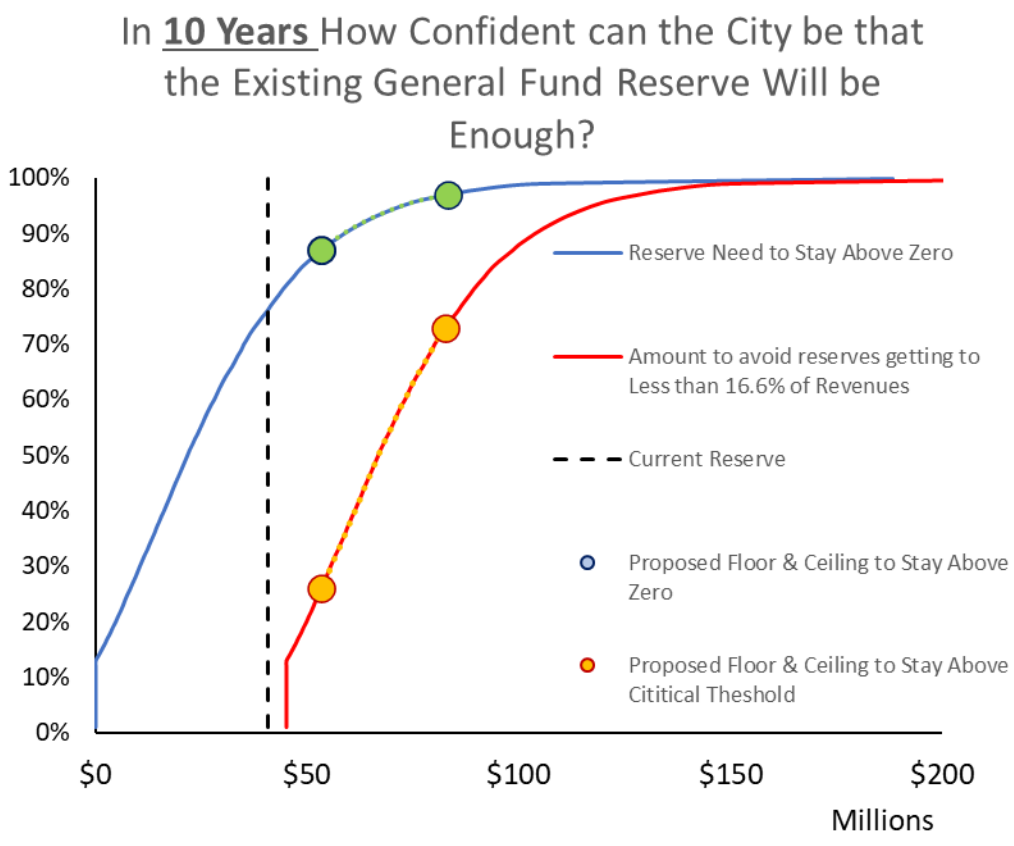
The other important rationale is the cost-effectiveness of this choice. The reader may recall Exhibit 1.3, which spoke to the cost-effectiveness of various levels of reserves. Exhibit 1.4 reproduces the same presentation but adds the recommended range of reserves to the curves. When the curve starts to flatten out, we have reached the point of diminishing returns on the benefit of building reserves. In Exhibit 1.4, the colored dot that is furthest to the right on each curve is the ceiling and the leftmost dot is the floor. The ceiling-dots and floor-dots represent the same dollar amount on both curves – the ceilings and floors are at same points on the horizontal axis.

We see that we are starting to reach the flat portion of the blue curve (the reserve needed to stay above zero) but still have plenty of room on the red curve (the reserve needed to stay above 17%). This is a cost-effective range for the City because the City is avoiding the flattest part of the blue curve, while also staying on the steepest points of the red curve. As implied earlier, the red curve likely represents a more conservative standard, so it would be cost ineffective to reach the flat part of the red curve. Conversely, the blue curve is a less conservative standard, so even though the proposed reserve is not on the steepest part of the curve, the marginal benefit of additional reserves is still positive.

Exhibit 1.4 – Cumulative Probability Chart with Proposed Range of Reserves



To complement the reserve analysis, we offer the following additional recommendations:

The City should update its robust reserves policy. GFOA has conducted extensive research into what it takes for a local government to be financially sustainable. We call this body of work "Financial Foundations for Thriving Communities" (Financial Foundations). This research has shown that local governments require clear decision-making boundaries. A policy on the target level of reserves that the City should maintain, and the acceptable use of those reserves provides clear decision-making boundaries for reserves. This City has a robust policy in place to govern reserves. The most important potential refinement to the policy is that, as was discussed earlier, the policy could identify both a floor and ceiling for reserves, rather than just a single target number, as in the case with the current policy. Having a range defines the acceptable tolerances the reserves should stay within.

Another possible refinement is to combine the Stability Reserve and Catastrophic Reserve into a single reserve. The Risk Model treats all risks as part of the same City risk profile, so produces an analysis result that speaks to this comprehensive risk profile. Combining reserves is a form of risk pooling. Risk pooling works when you combine uncorrelated risks. Recessions and natural catastrophes are not highly correlated,[5] so the City should be able to realize efficiencies by combining those risks into a single reserve.

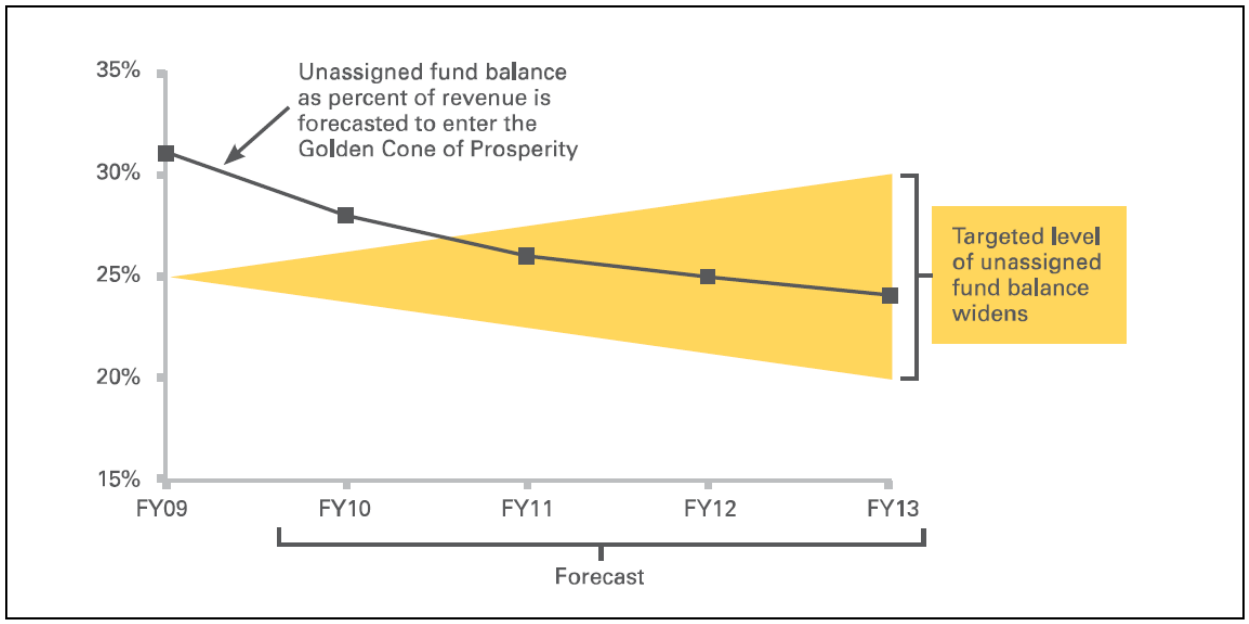
The City should adopt a mechanism to monitor its own compliance with the policy. GFOA's Financial Foundations research suggests that boundaries (e.g., financial policies) must be monitored to be fully effective.

The City of Tempe, Arizona provides a good example of how a reserve policy can be monitored. Tempe's policy is to maintain the general fund reserve equal to between 20% and 30% of general fund revenues. The general fund reserve policy is combined with Tempe's five-year financial forecast, where the goal is to keep reserves within the 20% to 30% boundary during the five-year forecast period. This approach originated in 2009 when Tempe had a policy to maintain reserves equal to 25% of general fund revenues. However, Tempe had been maintaining fund balances above 30%, which was causing some to question why Tempe was not in alignment with the policy and whether Tempe had a fund balance that was too large. The City Council and staff agreed to change the policy to set a goal for the reserves to be between 20% and 30% of revenues. This range would provide more discretion, but it would also create clear bounds for what Tempe would consider acceptable maximum and minimum reserves.

Tempe staff developed a presentation of Tempe's revenue forecast in the context of this new arrangement and informally called it the "Golden Cone of Prosperity." Exhibit 1.5 shows the presentation as it was in 2009, where the yellow cone representing the range of desired fund balance widens over the forecast horizon as the new policy is phased in and the black line representing actual fund balance gradually enters the cone.

[5] We stop short of saying uncorrelated because a big earthquake could impair the tax base, which might be like a hyperlocal "recession". The Risk Model accounts for this possibility.

Exhibit 1.5 —Tempe's Golden Cone of Prosperity in 2009



The meaning of the Golden Cone of Prosperity is straightforward, and its design and name give it a memorable character. As of 2020, Tempe staff still present the Golden Cone twice per year to help public officials to understand the big picture and to show whether Tempe is staying within agreed-upon boundaries. This is a testament to the communicative power of the Golden Cone. Berkeley could develop a similar presentation to help make sure the City stays within its agreed upon financial boundaries.

Adopt a policy of objective forecasting and conservative budgeting. The City is projected to run deficits for the next few years. This places a stress on reserves. So, the question becomes: how can services be expanded without putting the City's finances at excessive risk? There are several budget policies and practices the City could adopt to support good public services while safeguarding its financial position at the same time.

- **Understand the risk of increasing on-going expenditures.** The risk of adding more services to the City budget is that it makes it more likely the City will run a deficit and need to cut back . So, the balance the City needs to find is: how much can expenditures be increased without incurring unacceptable risk? The City can adopt forecasting methods that highlight the risk of the City budget getting out of balance. The City can also adopt a range of policies to protect against this risk, as outlined below.
- **One-time revenue policy.** Limit the use of one-time, non-recurring revenues to one-time, non-recurring expenditures or to pay down liabilities (e.g., catching up on deferred asset maintenance, like a park, road, etc., or making additional discretionary payments to CalPERS to reduce unfunded actuarial pension liability). An example of a one-time, non-recurring revenue would be proceeds from a lawsuit or the sale of an asset.
- **Volatile revenue policy.** Some revenues, like sales taxes, are recurring, but they can go up and down substantially from year to year. A volatile revenue policy would treat extraordinarily high annual revenues from a volatile source as a one-time revenue. The bulk of the revenue income would be treated like a recurring revenue – it is just the extraordinary amount that would have

more limited uses. This protects the City from using peak revenues to over-invest in programs that must be supported for many years. The City already has a policy like this for its transfers tax. We are suggesting that such a policy be extended to cover other volatile revenues as well. This would serve to help the City maintain a stable, dependable set of on-going services over the long-term because it would help the City avoid over-expanding services beyond what is truly affordable.

- **Adopt a structurally balanced budget.** Cities are required to adopt a balanced budget by law. However, this just means financial sources must equal uses. So, for instance, City Hall could be sold off (a non-recurring revenue) and the proceeds used to hire more firefighters (a recurring expenditure). This would, of course, be a bad idea. A structurally balanced budget policy commits the City to balancing its recurring revenues and recurring expenditures and balancing its non-recurring revenues and expenditures, separately.
- **Adopt a phased schedule of spending on non-recurring expenditures and condition spending on forecasts being met**. As part of its budget, the City could adopt a prioritized list of one-time expenditures, in addition to its regular on-going expenditures. The total of the one-time and on-going expenditures would be equal to or less than the City's projected revenue. The one-time expenditures would then be made throughout the year, in priority order, and conditioned on revenues coming in as projected. If revenues underperform the City's forecasts, then the lower priority expenditures would not be made.
- **Adopt flexible strategies for providing on-going services.** It is unlikely that all the City's service goals can be met through one-time expenditures. New on-going services may be needed. The City could look for opportunities to adopt flexible service models, where costs can be scaled up or down. Contracted services often can provide flexibility that in-house staff cannot. This is not to say that in-house staffing is undesirable. There may be situations where in-house staffing is better, but there may also be opportunities where contracts can provide financial flexibility.
- **Affirmative reauthorization of spending.** The conventional approach to budgeting is that once a new service is authorized it is "baked in" to the budget and is funded year after year. This can lead to financial distress when new services are layered on top of old services. An alternative is to require affirmative reauthorization for a new service. This could be especially useful where a new service is intended to achieve some clear public policy goal. At the end of some set period, the City Council could be required to explicitly reauthorize funding based on whether the program is achieving its stated goals.

The City should consider further investments in cybersecurity. Cybersecurity is an emerging and growing threat for local governments. As we described earlier, available data suggests several sobering points:

- Local governments are an attractive target for cybercriminals and ransomware attacks against local governments are common.
- The amount of damage from an attack appears to only be weakly correlated to the size of the government. Data suggests that the average attack costs around $100,000 but attacks can and have cost local governments many millions of dollars. Even though Berkeley is not as large as cities that have made headlines for multi-million-dollar losses incurred by an attack, Berkeley could still suffer a substantial loss – perhaps more than its policy limits.
- Cyber insurance policies can get expensive and hard to come by when insurance markets harden.

Given the points above, the City might consider the following recommendations that have implication for the City's reserves:

- Continue planning for enhanced security and make cost-effective investments in cybersecurity controls that both: A) reduce the likelihood of a successful attack; and B) reduce the potential damages, if an attack succeeds. Because reserves are ultimately a form of self-insurance there could be a strong case for using some of the City's reserves to strengthen its cybersecurity. This is because a dollar invested in prevention is usually going to be more effective than a dollar invested in remediation.
- Be prepared to retain more risk on a cyber insurance policy. If policies get substantially more expensive (or, worst case, unavailable), Berkely could lower the cost by retaining more risk. This could be accounted for in the reserve amount. As we stated above, there is a plausible risk of a cyberattack costing the city more than $1 million. Therefore, "retention" of risk is not just the insurance deductible, but also includes the risk of a catastrophic attack that costs more than the policy limit.

For natural hazards consider "parametric" insurance in addition to traditional indemnity insurance. Indemnity insurance is the type of insurance that most governments have traditionally purchased, where the insurance corresponds to the value of the assets being insured and reimbursement is paid out after a certain deductible has been met. The advantage of traditional indemnity insurance is that there is a known damage threshold past which the City is covered.

Parametric insurance is a newer type of insurance for providing coverage for extreme events, having increased in popularity in the last 15 years or so in the public sector but has been in use in the private sector for decades. Parametric coverage provides the policyholder (the City) with a payment amount that is defined ahead of time, should a defined event come to pass (an earthquake of a certain magnitude). Parametric insurance could be more useful for providing an injection of liquidity because the policyholder receives the defined payment immediately upon verification by a third-party that the given event occurred, which usually would be within a matter of days. As a simple illustration, a parametric policy might provide the City of Berkeley with $5 million upon the occurrence of an earthquake of some given magnitude, after magnitude is verified by a third-party, such as the USGS. This feature of parametric insurance also eliminates much of the administrative hassle that would be associated with a traditional indemnity policy (e.g., working with claims adjusters). A final advantage is that the proceeds from the policy payout are completely fungible – the City could use them to fund whatever service it deems necessary or to counteract revenue loss from tax base impairment, whereas indemnity policies might require the policyholder to use the funds to repair or replace the asset that was insured. Parametric policies are not without their drawbacks, though, and are not a substitute for traditional insurance. The City can learn more about parametric policies in the publicly available GFOA research report "Parametric Insurance: An Emerging Tool for Financial Risk Management."[6]

A robust insurance strategy could make use of both traditional indemnity and parametric insurance. For example, traditional indemnity insurance could be used to protect against loss of the City's assets, while parametric insurance could be used to compensate the City for the losses in tax revenue it would experience from an impaired tax base, for instance.

[6] Available at: https://www.gfoa.org/parametric-insurance/.

The City could consider a robust internal borrowing policy. There will always be some chance that Berkeley could find that it needs access to more financial resources than are available in its reserves. GFOA's research suggests that interfund borrowing could be a practical "last line of defense" in emergency circumstances. Some other funds might be able to make short-term loans to the general fund in case of an emergency. The City could develop policies to provide the flexibility to use these borrowing tools while also providing the necessary guidelines and limitations to ensure that borrowing occurs in a fiscally prudent manner.

Berkeley might consider if a policy could recognize internal borrowing's role as a supplementary risk management tool. A policy would "pre-position" the City to better respond to an extreme financial catastrophe. A policy could address the following points:

- The rationale for using internal borrowing (reserves may not be able to handle every possible contingency).
- When internal borrowing may be used (if reserves are ever exhausted by an extreme event).
- Differentiate between short-term (to be paid back within the same fiscal year) and long-term borrowing.
- How the interest on the borrowing will be calculated (can have multiple alternatives to be determined on a case-by-case basis); and
- General repayment terms (e.g., interest only, fully amortized, duration, etc.).

GFOA's analysis has its limits. It is impossible for any risk analysis to be completely comprehensive of all considerations facing the City. Appendix 1 to this report lists the important limitations of this analysis.

Section 2 - Introduction

"Reserves" are the portion of a local government's fund balance that are available to respond to the unexpected. Reserves are the cornerstone of financial flexibility, sustainability, and continuity of existing service levels. Reserves provide a government with options to respond to emergencies and provide a buffer against shocks and other forms of risk. Managing reserves, though, can be a challenge. Foremost is the question of how much money to maintain in a general fund reserve. How much is enough and when does a reserve become too much?

The City of Berkeley has been considering the implication that various types of extreme events, like natural disasters, could have on the City government's financial condition, particularly its reserve levels for the general fund. The City engaged the GFOA to produce a recommendation to help it decide the appropriate reserve level for the general fund, given the risks from extreme events. GFOA is a non-profit association of more than 21,000 state and local government finance professionals and elected officials from across North America. A key part of GFOA's mission is to promote best practices in public finance, including reserve policies. The analysis by GFOA also shed light on the potential broader economic losses to the community, not just City government.

GFOA's approach to reserves does not suppose "one-size-fits-all." Ideally, a local government's reserve strategy will be customized to the risk that the local government faces. For example, GFOA's "Best Practice" on general fund reserves recommends that general-purpose governments maintain reserves of no less than two months of regular operating revenues or regular operating expenditures (i.e., reserves equal to about 16.7 percent of revenues or expenditures), but that local governments should determine a reserve target that is most appropriate for their circumstances.[7] Therefore, GFOA worked with the City to conduct an analysis of the risks influencing the need for reserves as a hedge against uncertainty and loss.

A "risk" is defined as the probability and magnitude of a loss, disaster, or other undesirable event.[8] The GFOA's framework of risk assessment is based on the risk management cycle: identify risk; assess risk; identify risk mitigation approaches; assess expected risk reduction; and select and implement mitigation methods. Our analysis focuses primarily on risk retention, or using reserves, to manage risk. However, our analysis also encourages the City to think about how other risk management methods might alleviate the need to hold larger reserves. In other words, can the City manage its risks in some other way besides holding reserves? For example, could insurance or borrowing strategies complement the City's reserve strategy? A thorough examination of the risk factors should lead to a range of desired reserves and improve the City's understanding of its overall risk profile. A risk-aware analysis helps the City *stress test* its reserve strategy.

[7] GFOA Best Practice. "Appropriate Level of Unrestricted Fund Balance in the General Fund." GFOA. 2009.

[8] Definition of risk taken from: Douglas W. Hubbard. *The Failure of Risk Management: Why It's Broken and How to Fix It.* John Wiley and Sons, Inc. Hoboken, New Jersey. 2009.

As a first step to this project, GFOA conducted a review of the risk factors influencing the amount of reserves a municipal government should hold.[9] This review identified the risks on Exhibit 2.1 as the most salient risks to Berkeley's general fund reserve.

Exhibit 2.1 – Primary Risk Factors that Influence Reserve Levels for Berkeley
Revenue source stability, particularly as it relates to the potential for revenue decline from an economic downturn
Vulnerability to extreme events and public safety concerns, with emphasis on: • Wildfires • Recessions and revenue volatility • Earthquakes • High winds • Tsunamis • Pensions • Other hazards, such as infectious disease

The next section gives an overview of how we analyze these risks and what you can expect to see in the rest of this report.

[9] The risk factors and basic review method were developed and published in the GFOA publication: Shayne C. Kavanagh. *Financial Policies*. (Government Finance Officers Association: Chicago, IL) 2012.

Section 3 - The Approach to Uncertainty

The accomplished forecasting scientist, Spyros Makridakis, suggests a "Triple-A" approach for dealing with highly uncertain phenomena.[10]

1. **Accept.** First, we must accept that we are subject to uncertainty. For example, the severity and timing of an earthquake is unpredictable. Berkeley could go years without experiencing a serious earthquake or one could occur next month!
2. **Assess.** Next, we must assess the potential impact of the uncertainty, with history providing a useful reference point. The experiences of other local governments are also a good reference point. For example, we used the historical experiences of Berkeley and other relevant municipalities to estimate the potential impact of future extreme events. However, historical experiences are not perfectly predictive of the future. That leads us to the next point…
3. **Augment.** The range of uncertainty we face will almost always be greater than what we initially assess it to be. Therefore, we must augment our understanding of risk beyond what our historical experiences show us. For example, very few people saw the 2008 Great Recession coming or thought it could be as bad as it was. They were unprepared for this historically unprecedented recession. We can augment our understanding of risk using a technique called "Probability Management."[11] Probability Management is an application of modern information processing technology that allows us to simulate thousands of potential events (e.g., floods, recessions, etc.) so that we can observe the probability of events of various magnitudes coming to pass. The statistical technique that Probability Management is based on is called "Monte Carlo analysis." This technique was established in the late 1940s, but until very recently required special computers and software to use. Modern information technology has made Monte Carlo analysis accessible to anyone with a personal computer.

To use Probability Management, we express any given type of extreme event as a range of possibilities that the City might experience. This range is called a "distribution." A distribution is a shape that signifies how frequently the City might expect to experience a certain type of event and/or how severe the event might be.

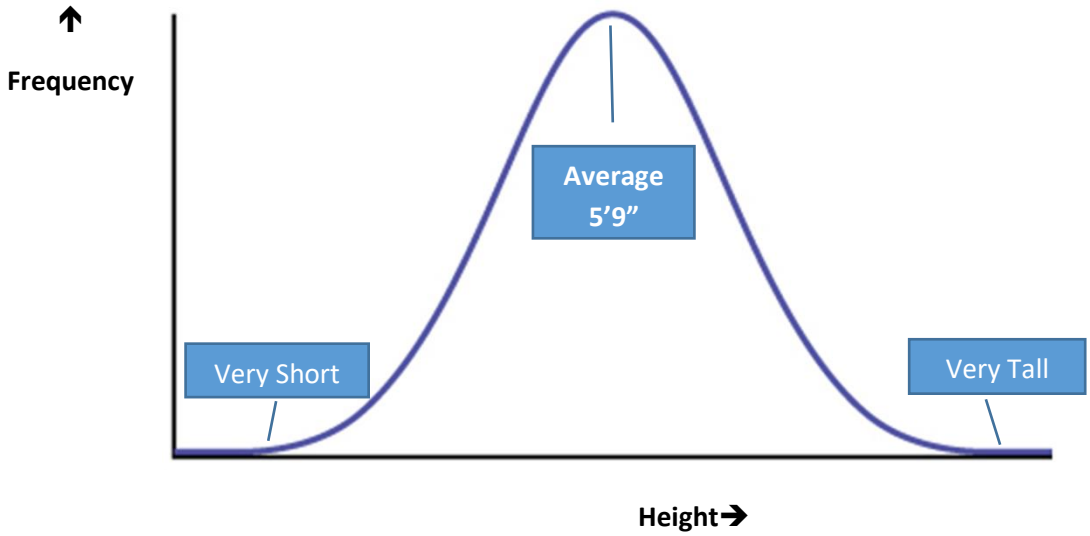
The most common type of distribution is called the "normal distribution," more popularly known as the "bell curve." Many phenomena fit a bell curve. To help us understand how to read a distribution, we can start with an example that is related to everyday life: the height of American men.

[10] See: Spyros Makridakis, Robin Hogarth, and Anil Gaba. *Dance with Chance: Making Luck Work for You*. (Oneworld Publications: Oxford, England). 2009.

[11] The discipline of "Probability Management" was developed by Dr. Sam Savage, author of *The Flaw of Averages*. You can learn more about Probability Management at probabilitymanagement.org.

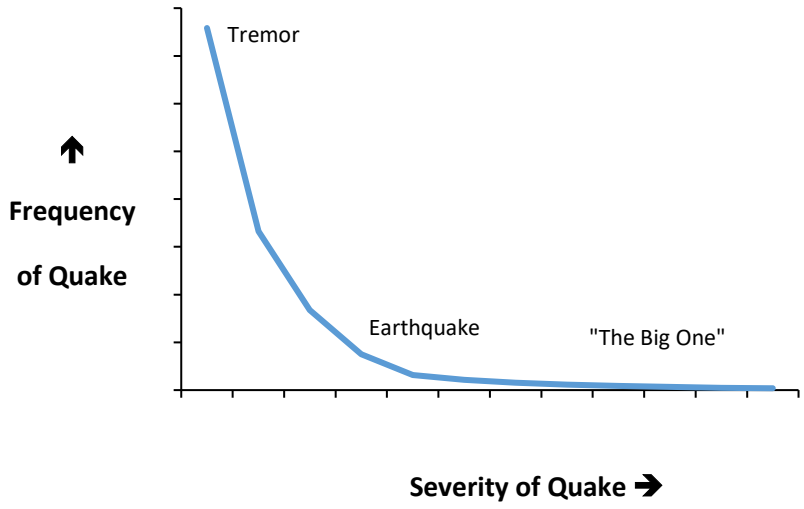
Exhibit 3.1 shows a bell curve for the height of American men. The horizontal axis of Exhibit 3.1 represents height. The vertical axis represents frequency. The most common height is 5'9", so it is shown at the top of the curve. Much taller men, like NBA centers, would be found on the right-hand side of the curve. Very short men would be found on the left.

Exhibit 3.1 – The Normal Distribution for American Men



The normal distribution can help analyze risk. To illustrate, the severity of an economic downturn is roughly normally distributed. A few downturns are slight, a few are severe, but most are closer to average.

Exhibit 3.2 – Sample Asymmetrical Distribution



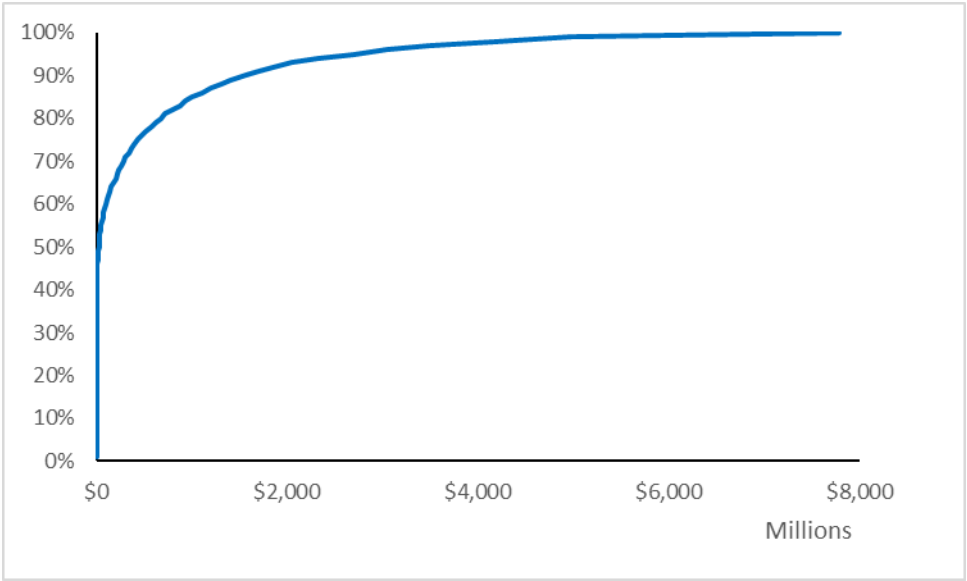
Another type of distribution we use in our analysis is an asymmetrical distribution, shown in Exhibit 3.2. Earthquakes fit an asymmetrical distribution. Exhibit 3.2 shows that tremors are the most common. Full-fledged earthquakes are relatively rare. The distribution is "asymmetrical" because the frequency with which we will experience these events are not evenly distributed around the middle of the distribution. Put another way, there are far more tremors that are smaller than the "average" earthquake. Yet, there are far fewer earthquakes ("the big one") that are larger than the average earthquake.

Expressing Berkeley's vulnerability as distributions allows us to calculate the probability that an event of a given magnitude will come to pass. When we associate a dollar amount with that event, we can estimate the probability or chance that Berkeley will need to have a given amount of money on-hand to respond.

Exhibit 3.3 is not a distribution but is a type of graphic we will use in this report. It is called a "cumulative probability chart." It shows the economic losses to the entire Berkeley community from earthquakes over the course of 10 years. Earthquakes are rare events, so over a ten-year period there is a chance that there will be no earthquakes at all. Hence, the blue line intersects the vertical axis at about 50% (there is about a 50% chance of no earthquake). We then see the blue line go up and to the right from the vertical axis. This means that the chance of larger and larger losses becomes increasingly remote. To illustrate, the blue line intersects 70% at about $300 million. This means there is a 70% chance that total economic losses are $300 million or less (or a 30% chance that losses will be more). The blue line insects 80% at $670 million, which means there is an 80% chance that losses will be less than that (or a 20% chance that losses will be more).

Exhibit 3.3 – Cumulative Chance of Economic Losses to Berkeley Community from Earthquakes over 10 Years

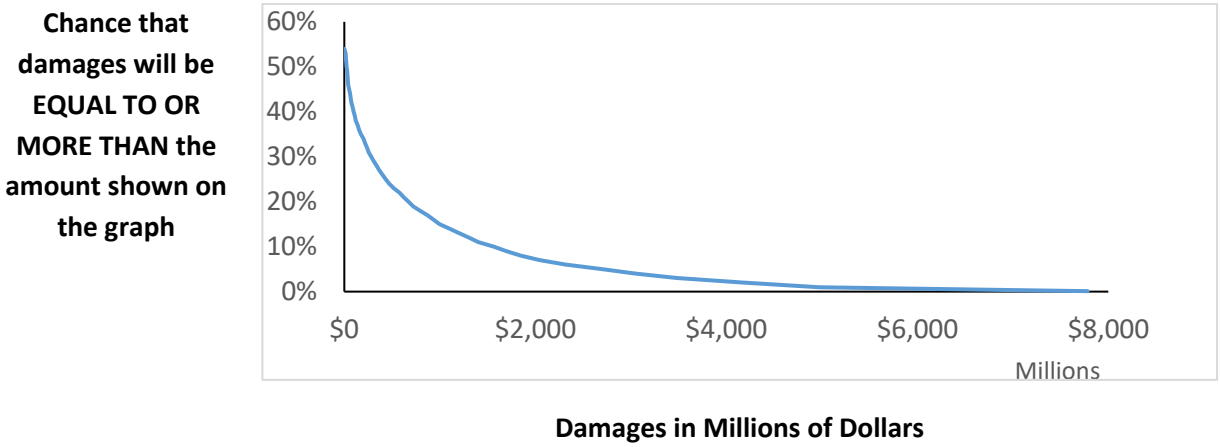
Chance that damages will be EQUAL TO OR LOWER THAN the amount shown on the graph



Damages in Millions of Dollars

Another type of chart we will show is a loss exceedance curve. It is another way of looking at the same concept as we saw in Exhibit 3.3. Exhibit 3.4 shows the loss exceedance curve for the same earthquake data. It just presents it in an inverse way. So, the 20% point in the vertical axis is $670 million because there is a 20% chance that damages will be more than. Exhibit 3.4 showed there was an 80% of damages being less.

Exhibit 3.4 Loss Exceedance Curve for of Economic Losses to Berkeley Community from Earthquakes over 10 Years



Both cumulative probability charts and loss exceedance curves are commonly used when quantifying risk.

It is important for the reader of this report to understand that **there is never one single, objectively best amount of reserves to hold**. The amount of reserves the City will want to hold will partially be a function of the City's willingness to take on risk. If City officials are willing to take on risk, they might opt for lower reserves and spending more money on current services. If officials are more risk averse, they might opt for higher reserves. GFOA's recommendations are informed by where reserves appear to provide the best value or "bang for the buck." The spot on a cumulative probability chart, like Exhibit 3.3, before where the line begins to flatten out is usually where the best bang for the buck lies.

In Section 4, we cover revenue instability owing to economic downturns. In Section 5 of this report, we will review the City's primary risks posed by extreme events, including wildfires, earthquakes, tsunamis, and more. Section 6 reviews secondary risk factors that have less weighty implications for the City's reserve strategy. We include Section 6 to highlight the full range of risks that were considered, even if some of them did not seem to present as clear and present a threat to the City's general fund reserve.

After we analyze the individual risks, in Section 7, we will consider the risks holistically. This section will:

- Consider the risks over a ten-year period. This provides a more complete perspective on potential vulnerability and how to use reserves. For example, the numbers shown in Exhibit 3.3 pertain just to one year. The potential losses are much greater over a ten-year period.
- Consider the potential occurrence of any of the risks we analyzed to occur at the same time. Obviously, if they did occur at the same time, the stress on the City's reserves would be compounded.

Section 4 - General Fund Revenue Volatility and Pension Risk

An important risk for any local government is revenue volatility owing to downturns in the economy. Reserves can be used to help a local government make a "soft landing" in the event of a revenue downturn. In this section of the report, we will analyze the City's vulnerability to revenue downturns.

For the purposes of our analysis, we divided the City's revenues into the categories shown in Exhibit 4.1. Property taxes are the most important single source, as you can see in Exhibit 4.1. Immediately following Exhibit 4.1, we will analyze the risk the City faces in each category.

Exhibit 4.1 – Relative Importance of City Revenues, based on 2023 Estimated Actuals

Revenue	% of Total
Taxes	
Property Tax	38%
Sales Taxes	7%
Real Property Transfer Tax	12%
Business License Tax	10%
Utility Users Fee	7%
All Other Taxes	3%
All other revenue	22%
TOTAL	***100%***

Before we examine each individual revenue source, let's make a note of Berkeley's historical population growth. The City grew from 103,000 people in 2000 to 119,000 people as of the 2020 US Census, which is about a 15% increase over the period. The increase appears to steady over this period, as the 2010 population was 113,000. Our analysis starts in 1999 to capture the impact of two recessions: the 2001 "dot.bomb recession" and 2008 "Great Recession." The City appears to have experienced a small bump in population growth right around the time of the Great Recession. It could be that the bump in growth offset at least some of the revenues losses the City would have otherwise experienced from the 2008 Great Recession. Therefore, we converted all historical revenues to per-capita figures for our analysis and all figures presented are per capita unless otherwise noted. Note that we do not consider the COVID-19 recession to be as useful an analogue as the two recessions mentioned above. This is because that recession was not a result of conventional economic causes and behaved much differently than past recessions. For example, the COVID recession featured a record decline followed by record recovery). This does not mean we ignored COVID. Risk from unconventional sources, like a pandemic, is addressed in a later section of this report.

Below we will briefly review key, relevant features about the volatility of each revenue shown in Exhibit 4.1. The purpose of this section is to be clear about the assumptions that go into our simulation of the City's revenue volatility in the face of recessions. Before we dive into the details, we should note that the year-over-year percent changes we describe below are not necessarily the chance from one fiscal year to the next. Rather, we examined monthly data to find the worst 12 month decline in each revenue. The reason is that the City's fiscal year is an arbitrary period that is not related to the performance of the

economy. This might obscure the full impact of a recession on revenue. For example, imagine there is recession lasting 12 months. It starts 6 months into a fiscal year and ends six months into the next fiscal year. Each fiscal year would only reflect half of the recession, thereby obscuring the total magnitude of the revenue loss.

Property Taxes

Property taxes are a stable revenue for Berkeley. They have exhibited consistent year-over-year growth since 1999. Of course, the 2008 recession featured a popping property price bubble that was felt across much of the world. Even so, during the entire length of the Great Recession Berkeley's property tax growth merely slowed down for three years – around 3% annual growth, compared an average of 7% annual growth for all other years, 1999 to 2018. That said, we should not discount the possibility that future recessions could result in declining property values and property tax revenues. In fact, GFOA's examination of recessions before 1999 shows that housing prices have declined during some of these recessions.

So, to model risk we looked at the decline during the Great Recession and found that the single worst continuous 12-month performance was a 5% decline in property tax revenue. We took this as emblematic of the possibility of future severe recessions. During the 2001 recession, property taxes grew for Berkeley. This represents the possibility that during a relatively mild recession, like 2001's, property tax revenue could go up. The 2008 recession is the worst recession, in terms of GDP[12] decline since World War II whereas the 2001 recession was one of the mildest. Hence, we can use these two recessions rough "boundaries" on the possibilities for future recessions.[13] In our simulation we did account for the fact that the 2008 recession was unusually weighted towards losses in real estate. This was done to avoid overestimating the vulnerability of property taxes to recessions. We looked at how much property values declined, nationally, during a past, more "average" recession and compared that to what happened in 2001 and 2008. This "average" price decline was not exactly in between 2001 and 2008 but was skewed closer to 2001. We included this skew in our simulation.

Finally, it is worth noting that Berkeley does not have a material risk from concentration of the tax base in one or few taxpayers. An example of this risk would be if a small municipality has a large industrial property, where that property makes up a large portion of the tax base – if the factory were to close, then it would have a big impact on the tax base. Fortunately, Berkeley does not appear to have such a risk. The taxpayer with the highest assessed value is 742 Grayson Owver LLC, whose property comprises less than 1% of the City's assessed value.

Sales Taxes

Sales taxes have a reputation for being more responsive to economic downturns than property tax and this is true in Berkeley. Sales taxes declined by 7% during the 2001 recession and the worst year-over-year decline during the 2008 recession was 12%. When it comes to COVID-19, the federal government provided

[12] Gross domestic product, a standard measure of national economic activity.

[13] Our simulation method does not treat these as firm boundaries. Rather there were about ten recessions since World War II, the Great Recession was the worst, the 2001 recession the mildest which puts them at the 10th and 90th percentile. This leaves room for even worse or even milder recessions than these two in our simulations.

financial aid to individual citizens during the pandemic, beyond what is normal for an economic downturn. Hence, we should not take 2019 and the subsequent COVID-19 experience as representative of future possible downturns. We used the 2001 and 2008 recessions as our boundaries for the analysis.

Real Property Transfer Tax

The real property transfer tax has proven a volatile revenue for Berkeley. It declined around 7%, year-over-year, during the 2001 recession, which was not that much different from other revenues. However, during the Great Recession, the revenue dropped an astounding 44% year-over-year. That said, the 2008 recession was uniquely driven by difficulties in the property market. Hence, the 44% decline might represent a particularly bad outcome. For this reason, we adjusted the model for potential skew, like we did for the property tax.

Business License Tax

The business license tax's vulnerability to recessions is not as clear cut as the other revenues we have examined. Revenue from the tax is largely based on gross receipts of local businesses, which suggests that there should be some vulnerability to recessions. However, when we examine the 2001 recession there was only a 2% decline in the early part of the recession. The 2008 Great Recession is more complicated because, according to the City's 2008 financial report, a correction to a miscoding in City revenues resulted in about $800,000 in increased annual revenues. Presumably, this would have offset at least some of the decreases we might have otherwise observed during the recession. However, even backing out this additional revenue, it does not appear that there was a large decline in this revenue during the Great Recession.

To provide an additional perspective, we also looked at what happened to this revenue during COVID-19. Though COVID was not a conventional recession in the way that we are defining it in this analysis (non-conventional risks, like COVID, are addressed later in this report), it does demonstrate what an economic dislocation could do to this revenue. In 2021, the revenue declined about 15% year over year from 2020. Because COVID was the sharpest economic decline since World War 2 and the fastest recovery, it does not seem wise to use a 15% decline as an analogue for future recessions. Nevertheless, this experience does suggest that declines are possible. To make better use of the COVID experience we might consider that the largest annual quarter to quarter decline **in national GDP** during COVID was 9.5%. This compares to the worst quarterly decline **in GDP** during the Great Recession of 8.4%. The worst total annual loss in GDP during COVID and during the Great Recession was somewhat similar. These two data points suggest that because GDP loss was somewhat less severe during the Great Recession that assuming a tax loss somewhat less than the COVID experience could be a reasonable assumption. We used a 10% decline to avoid the risk of projecting too much of the COVID experience onto a conventional recession. The worst decline we could find for the City during the Great Recession was 6.5%.

Utility Users Fees

Perhaps unsurprisingly, utility users fees are a stable revenue source because demand for utility services does not change much during a recession. The total decline was close to 6% in each recession.

All Other Taxes

When we look at all remaining City taxes (i.e., hotel tax plus a host of much smaller taxes), we see year-over-year declines of about 15% during both the 2001 and Great Recessions.

All Other (Non-Tax) Revenues

When we look at all other non-tax revenues, we saw relatively little decline during the Great Recession (3% year over year decline), but a larger decline during the 2001 recession (12%). This may be due to the mixed bag of sources that make up other revenues and their potential for idiosyncratic behavior. Let's take, for example, intergovernmental revenue. It declined quite a bit during the 2001 recession but almost not all during the 2008 recession. The explanation may be that intergovernmental revenues, unlike the tax revenues we have described above, are primarily dependent on the whims of state policy makers. Local taxes are primarily dependent on economic activity (property transfers, retail sales, etc.). To simulate this, our model uses the declines from the recessions as the parameter for other revenues but makes the impact independent from what happens to taxes. For example, if the model simulates a "bad" recession that results in a sharp decline for taxes, we do not assume that necessarily means a sharp decline in other revenues.

Analyzing Revenue Volatility Risk

To analyze the risk that the City is subject to we used the information presented above to inform our Risk Model. In addition to this information, we also used the following information:

- We used data on how often recessions have occurred and how long those recessions have lasted from 1950 onwards to simulate the frequency and duration of future recessions.
- We examined the timing of each revenue's decline relative to the others. Meaning, not all revenues declined at the same time. For example, both property transfer tax and non-tax revenues appeared to decline well before most other revenues during both the recessions we examined. Thus, the Risk Model shows these two revenues decline immediately upon a recession while there is a one-year lag for all other revenues.
- The model does not include any assumptions about what the City might do in response to a recession like cutting expenditures or adding new revenues. However, the model does not ignore these possibilities either. The user of the model has the option to define the City's assumed response to recessions and see how that impacts the City's financial position. This is discussed in more detail in Section 7 of this report.

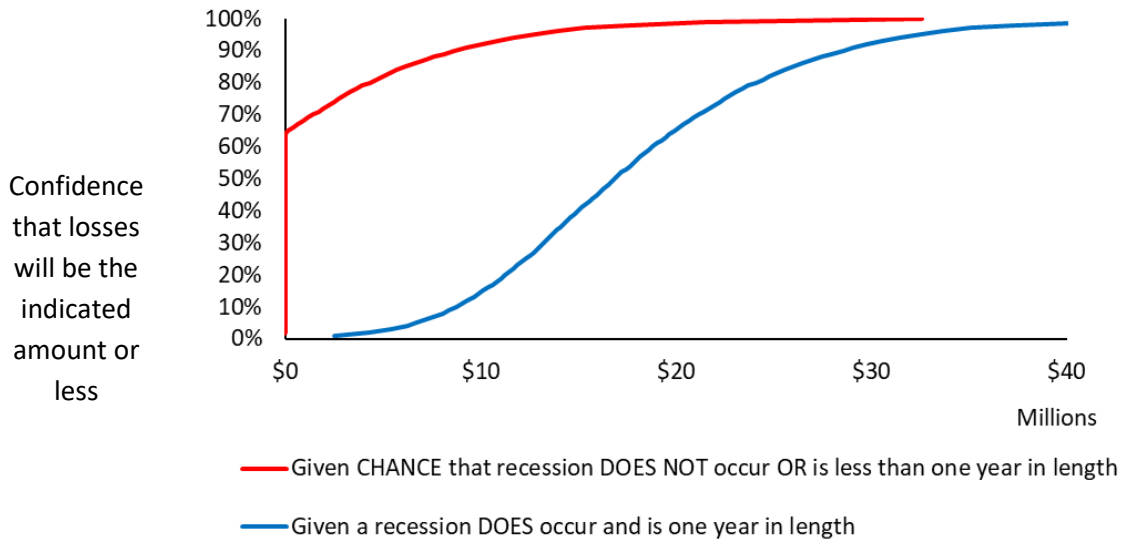
Exhibit 4.2 below shows the cumulative probability curve for a single year loss, accounting for all the information described in this section. The blue line shows the losses if recession DOES occur, and it lasts the entire year. The red line shows the losses given the chance a recession does OR does not occur. This accounts for the fact that a recession could not occur at all or last less than the entire year. Note that although the lines in Exhibit 4.2 are limited to what could happen in a single year, our simulation also allows for the possibility that a recession could span multiple years. We will discuss the multi-year perspective on all the of the City's risks that we analyzed in Section 7.

In Exhibit 4.2, we can see the red line remains at zero about 70% of the time, which means that 70% of the time the City is simulated to *not* be in a period of revenue downturns. The blue line approaches zero as well because the very mildest of recessions could have negligible financial impact.

Both lines slope up and to the right, which means that as we move to the right the potential losses get higher, but we also get higher and higher confidence that the losses would be less than the indicated amount. We see that on an annual basis, losses around $4 million to $9 million might be considered a plausible, not just possible, risk. For example, on the red line, we can be 85% confident that losses will be less than $6.2 million in any given year, and 15% confident that losses will be more. We can be 90% confident that losses would be less than $9.2 million.

Both lines flatten out at the right end. This shows that extreme annual losses, over $20 million, are possible, but are also highly unlikely. This is because the corresponding values on the vertical axis are above 95%, which means we can be 95%, or more, confident that the losses during a given year will be less than these extreme amounts.

Exhibit 4.2 – Cumulative Probability Chart for Annual Recession Losses (total, not per capita)



Checkpoints

- ✓ Property tax is an important source of revenue for the City and is also very stable.
- ✓ Sales tax and property transfer taxes are important revenue sources but are responsive to economic conditions.
- ✓ Historical data does not show much of a decline in business license taxes during past recessions, but there is reason to believe that the revenue could exhibit a larger decline in future recessions.

These reasons include an anomalous event in 2008 that resulted in an increase in revenues and the fact that this revenue did decline markedly during the COVID downturn.

- ✓ There is also potential for instability in other City revenues, though these revenues constitute a relatively small portion of total revenue, compared to those above.
- ✓ In a given year, there is about a 70% chance that there would be no impact at all from a recession. There is a 90% chance that losses in a given year would be less than $10 million.
- ✓ The analysis presented in this section does not take account of any willingness on the part of the City to cut its budget in response to a recession. That is addressed in Section 7.

Pension Risk

Like many cities throughout the country, Berkeley has a substantial liability for employee pensions. This is potentially a risk for the general fund because if the pension plan investments consistently perform below expectations, then the City will need to make up the difference. This potential unplanned, unavoidable expenditure places additional pressure on the City finances.

The GFOA Risk Model examines the vulnerability of the City's pension situation under different scenarios. We worked with Foster and Foster to develop a range of different possible outcomes that are consistent with different long-term return assumptions from CalPERS. Of particular relevance to the questions being posed by this report is the possibility of underperformance of CalPERS investments. Foster and Foster provided the range of possible outcomes, informed by assumptions from CalPERS about the expected range of possible performance of its investment strategies.[14] We then correlated these ranges with the GFOA recession model, so that, generally, in scenarios reflecting poor economic performance, generally, there would be poor CalPERS performance as well.

The model does not assume that any and all underperformance by the pension will translate directly into an impact on the reserve. There are several filters pension costs must pass before impacting reserves in the risk model.

First, CalPERS itself takes steps to shield participating local governments from the effects of year-to-year changes in investment performance. The scope of our contract did not accommodate duplicating CalPERS' pension cost smoothing algorithms, but we did develop a model that balances out under-performing years with over-performing years such that the City would see greater additional burden when under-performing years outweigh the over performing years across all ten years of the simulation.

Second, the City has proven willing to accommodate pension cost increases in its budget. Hence, the model includes a user-defined variable for how much pension costs would need to increase before the City becomes unwilling to absorb the full cost in its budget. We assume the City is willing to absorb up to a 15% annual increase in pensions, based on past experiences of the City. You can think of this variable as the amount the City would find a way to accommodate in its normal budget planning for pensions.

[14] To be more precise, the range took the form of a distribution with a median value and favorable and unfavorable results distributed around the median.

Third, the City has a pension trust fund. The model includes the pension trust fund as an alternative to reserves for covering excess pension costs that the budget cannot absorb. In essence, the simulation splits any excess pension costs evenly between the reserves and the pension trust. The model also accounts for interest earned on the pension trust balance.

With these assumptions applied the model shows:

- There is about a 50**%** chance that the general fund reserve and pension trust fund, together, will need to absorb, at most, an additional **$10 million** in costs over a ten-year period.
- About a **75%** chance that the general fund reserve and pension trust fund, together, will need to absorb, at most, an additional **$15 million** in costs over a ten-year period.
- About a **90%** chance that the general fund reserve and pension trust fund, together, will need to absorb, at most, an additional **$19 million** in costs over a ten-year period.

To see just the burden on the reserve, simply divide the dollars in the points above in half.

Checkpoints

- ✓ Pensions are an important risk for the City not only because of the size of the liability but because poor performance of the pension investment will likely be correlated with poor performance of the City's revenues. That means the general fund reserves will be under pressure from both revenue losses and pension losses at the same time, if the economy performs poorly.
- ✓ There is about a 25% chance that the general fund reserve will need to absorb $7.5 million or more over a ten-year period due to pension under-performance and a 10% chance of need to absorb more than $9.5 million.

Section 5 - Extreme Events

Although Berkeley can receive reimbursement from insurance and public agencies for natural disasters and some human-caused extreme events, having adequate reserves in place is important to respond to extreme events quickly and decisively. For example, FEMA reimbursement will not cover all the costs the City incurs, and it could take months, if not years, to receive reimbursement. Wildfires, earthquakes, and tsunamis are the leading potential catastrophic natural disaster risks the City faces. In discussions with City staff, these disasters represent the greatest risk of catastrophic loss and will be the focus of this section of the analysis. Other exposures included in the Risk Model and discussed in

FEMA, CalOES, and Reserves

The U.S. Federal Emergency Management Agency (FEMA) reimburses local governments for monies spent in response to a federally-declared disaster. FEMA reimbursement is only partial (typically 75 percent) and is often not immediate. Therefore, local governments must have the financial capacity to respond quickly and decisively, independent of FEMA assistance. In California, CalOES (California Office of Emergency Services) provides additional assistance to supplement FEMA. Our simulation includes FEMA and CalOES assistance but also simulates the time lag to get the assistance. Note when we refer to "FEMA assistance" we are also referring to CalOES since our model treats assistance from both agencies in essentially the same way.

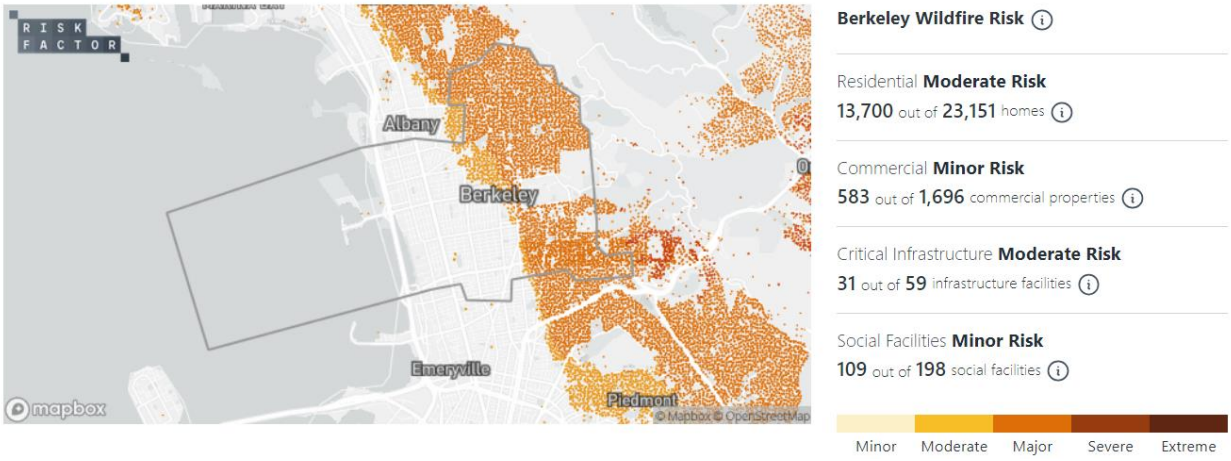
this section are high winds, severe storms and landslides. This section will also discuss the provisions made in the model for other risks, not named above.

The following sub-sections will explore the potential economic and budgetary implications that these hazards have for the Berkely community and City government. These sections will explain any notable features of the data sets we used and discuss the range of potential damage the City could experience, as suggested by the data we gathered.

A. Wildfires

According to the First Street Foundation,[15] "there are 15,085 properties in Berkeley that have some risk of being affected by wildfire over the next 30 years. This represents 57% of all properties in Berkeley." Exhibit 5.A.1 shows a wildfire risk map from First Street. That said, we should also note that the overall risk to Berkeley is considered "moderate" by FirstStreet, which is the second lowest risk level on their scale (the scale can be seen in the bottom right corner of Exhibit 5.A.1).

Exhibit 5.A.1 – Wildfire Risk in Berkeley (according to the First Street Foundation)



Though the First Street data does help illuminate the potential for wildfires in the City of Berkeley, it does not address consequences of nearby fires, like smoke heavy enough severely impede daily life in Berkeley. Therefore, we should recognize that the total risk to Berkeley from fires is more than might be implied in the map above. However, for the purposes of this analysis we are focused on the more narrowly defined risk of losses to the City government due to unplanned, unavoidable expenditures from a large fire.

To analyze wildfire risk, we divided the risk into two parts.

First are very large wildfires – including those large enough to be historically unprecedented in the region. We obtained simulated fires from a company called Pyrologix, which specializes in simulating fires. Pyrologix's customers include the US Forest Service. Pyrologix's data set focused only on very large fires and showed which geographic areas of the City burned.

[15] The mission of First Street Foundation is to make climate risk accessible, easy to understand and actionable for individuals, governments, and industry.

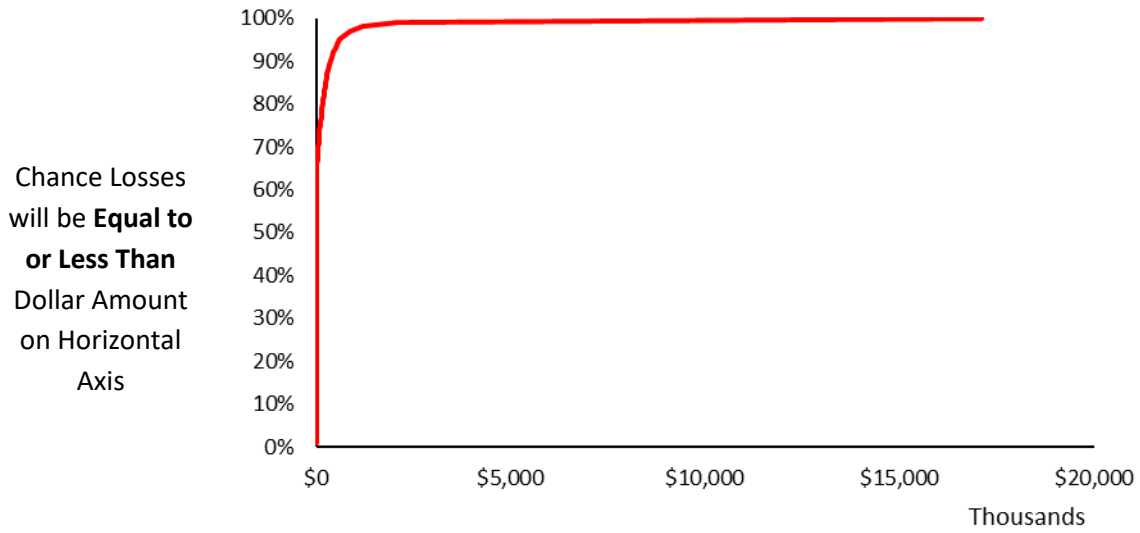
Second are wildfires that are less intense, which we will call "medium" fires – even though the fires simulated here are still often large enough to be eligible for FEMA assistance. These medium fires are simulated to occur 4 times more frequently than the large fires. For medium fires, we used historical data from across California to see how often wildfires directly impact urbanized areas to the point where city governments incur material costs, and we used those historical costs to simulate the impact on Berkeley.

We simulated both kinds of fires and then combined the results into a single model. The result was the cumulative probability chart shown in Exhibit 5.A.2.

We can see that, like Exhibit 5.B.1, there is a small chance of any losses at all – the red line is equal to zero up until about the 60% mark, which means that 6 out of 10 times when we look at a ten-year period the losses will be zero. The line also goes vertical (up) very sharply after it diverges from the zero axis. This means that most wildfires the City might experience are simulated to not cause a drastic amount of losses. This would be consistent with the actual experiences of cities at "moderate" wildfire risk in our FEMA database (where "moderate" is as defined by FirstStreet). The line does extend out quite some distance to the right, which represents the fact that there is a very small chance of some very large losses over a ten-year period. The long-tail is the result of the very larger wildfire simulation we discussed earlier.

Note that the losses shown in Exhibit 5.A.2 ***do not*** reflect reimbursement from FEMA to the City government. The impact FEMA reimbursement and other mitigating factors will be included in Section 7 of this report, "Putting it All Together".

Exhibit 5.A.2 – Cumulative Probability Chart of Losses to the City Government from Wildfires Over a Ten-Year Period (millions of dollars)



Our data does not factor in the impact of climate change, so the 10-year losses may be understated.[16] However, there are other assumptions in our model that cause the model to simulate greater losses. This might offset the absence of a climate change assumption. These assumptions are:

- The model does not assume that a fire in one year reduces the chance of a fire in the next year. In reality, if a fire occurs it often burns the fuel that could otherwise feed a fire in the future. In our model, the chance of a fire in a given year is not reduced if a fire had occurred the prior year. Put another way, the chance of fire is the same every year.
- When gathering losses from other cities to use as analogues from Berkely we looked across the entire state of California for cities that are roughly comparable size to Berkeley.[17] Perhaps unsurprisingly, only a handful of cities that have actually experienced material losses from a fire are at "moderate" risk (by the FirstStreet scale). Most are at "major" risk or worse. Also, the average per capita losses experienced by the "major" risk cities was materially higher than those experienced by the "moderate" risk cities. Nevertheless, we included most of the "major" risk cities as analogues for Berkeley when simulating potential damages.[18] This means our model may be biased towards overstating the damage from a fire.

Checkpoints

- ✓ According to the First Street Foundation's analysis, Berkeley's risk from wildfire is "moderate".
- ✓ We used data from the fire simulation firm Pyrologix to simulate very large wildfires.
- ✓ We used historical data from FEMA to help simulate more moderate wildfires, coupled with information from First Street on relative risk of cities in California. This helped us pick analogues for Berkeley.
- ✓ The results show that over a ten-year period there is about a 6 in 10 chance that damage from wildfire is zero.
- ✓ There is a chance of larger damage over a ten-year period. For example, there is a 1 in 10 chance damages could exceed $350,000. There is small chance of extreme multi-million-dollar losses (about 1 in 50 chance).

B. Tsunamis

Berkeley is at some risk from Tsunamis. The worst tsunami that researchers have mostly contemplated is the 1-in-900-year tsunami. This represents a tsunami so large that we would expect to see one that large only once in 900 years. Exhibit 5.B.1 shows a map of the area of the City we could expect to be impacted by such a tsunami. A tsunami of this size is expected to impact about 1,400 residents, a daytime population of 6,800, and 448 buildings. The damage of less intensive tsunamis is substantially less. A tsunami of

[16] Wildfire is, perhaps, the most difficult type of natural catastrophe to model because there is a smaller base of experience to draw upon, compared to more well-studied risks like hurricanes, and because the physics of wildfires are more complicated, compared risks like flooding. Though many researchers are working on improving wildfire models, we could not obtain data that included climate change effects.

[17] Our research has shown that very small cities tend to have higher per capita losses from fires, so we don't use small cities as analogues for cities that are not small.

[18] We dropped cities much larger than Berkeley and outliers that experienced extreme damages far beyond anything experienced by the moderate risk cities in the data set.

sufficient intensity to occur only once every 475 years is only estimated to impact 125 residents, 1,100 daytime population, and 14 businesses.

Exhibit 5.B.1 – Area Impacted by a 1-in-900 Year Tsunami

Unfortunately, researchers have not produced nearly as much information on projected economic losses from a tsunami as has been produced for other types of disasters. To arrive at an estimate, we used a joint report from the United States Geological Survey and California Geological Survey that modeled a large, plausible tsunami.[19] We will refer to this as the "SAFR report" (Science Application for Risk Reduction report). The tsunami contemplated by the SAFR report appears to be the rough equivalent of the 475-year tsunami described above.[20] The SAFR report does not estimate losses for Berkeley but does for all Alameda County: $184 million. We derived a share of this for Berkeley by looking at Berkeley's share of the Alameda coastline, which equates to about 7% or about $13 million. Our estimate of 7% is somewhat conservative (overestimates Berkeley's share) because we excluded a portion of the coast that the SAFR report appears to project will not be significantly impacted by a tsunami and because we used straight

[19] The main report is: "The SAFRR (Science Application for Risk Reduction) Tsunami Scenario", Stephanie Ross and Lucile Jones, Editors. The specific sub-report we used was: "The SAFRR Tsunami Scenario—Physical Damage in California" By Keith Porter, William Byers, David Dykstra, Amy Lim, Patrick Lynett, Jamie Ratliff, Charles Scawthorn, Anne Wein, and Rick Wilson Open-File Report 2013–1170–E California Geological Survey Special Report 229
U.S. Department of the Interior, U.S. Geological Survey

[20] The report does not give a recurrence interval for the tsunami the report describes, but it does give wave amplitudes which we compared to projected wave amplitudes for different tsunami scenarios in Berkeley. The 475-year scenario appears to be the closest match.

line estimates,[21] which discounts inlets, coves, islands, etc. We then were able to scale the estimated damages from a 475-year tsunami ($13 million in economic losses to the community) to tsunamis of other recurrence intervals but using estimates of the number of people impacted by different sizes of tsunamis in Berkely.[22]

The next step is to estimate the potential loss to the City government. Again, because there is not much research available on the projected financial impacts of tsunamis, we had to make some assumptions. We started with the estimate of total economic losses, as per above. We then examined data we had available for earthquakes and wildfires and found damages to public entities (e.g., local governments) typically range between 11% and 32% of the economic losses.[23] This resulted in the cumulative probability chart shown in Exhibit 5.B.1.

We can see that, like in Exhibit 5.B.1, there is a relatively small chance of any losses at all – the red line is equal to zero up until about the 90% mark, which means that 9 out of 10 times when we look at a ten-year period the losses will be zero. The line does extend out quite some distance to the right, which represents the fact that there is a very small chance of some very large losses over a ten-year period. It should also be noted that estimates from the tsunami unit of the California Geological Survey show that a very small number of people (less than 25) and households (less than 10) would be impacted by a 200-year tsunami. This means that many of the tsunamis that the risk model simulates will have very little financial impact.

Note that the losses shown in Exhibit 5.B.1 ***do not*** reflect reimbursement from FEMA to the City government. The impact FEMA reimbursement and other mitigating factors will be included in Section 7 of this report, “Putting it All Together”.

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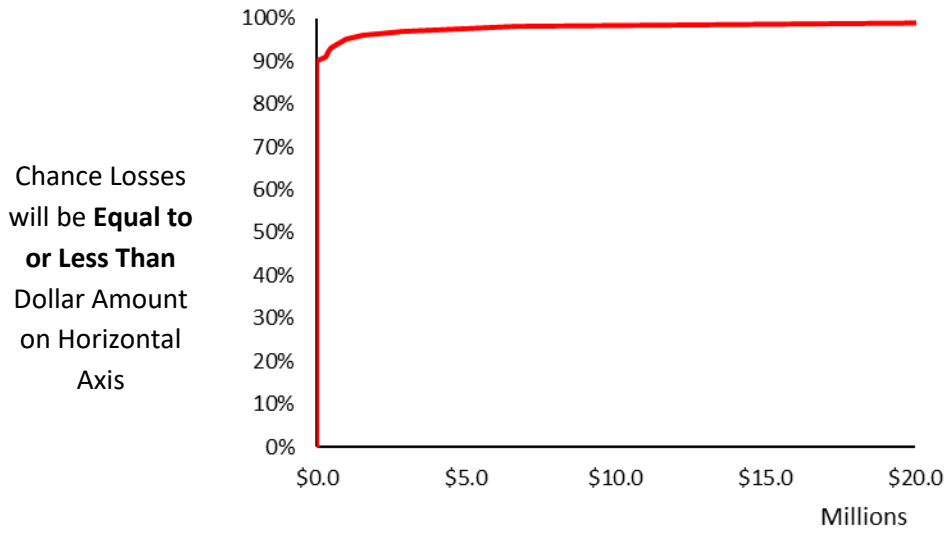
[21] By this, we mean we drew straight lines on a map of the county coast and measured the distances of those lines.
[22] Estimates produced using ESRI software, by the tsunami unit of the California Geological Survey.
[23] Based on estimates from Aon. Aon’s data shows projected public assistance provided by FEMA. Knowing that FEMA reimburses 75% of local cost allowed us to simulate total costs to city government.

Exhibit 5.B.1 – Cumulative Probability Chart of Losses to the City Government from Tsunamis Over a Ten-Year Period (million of dollars)



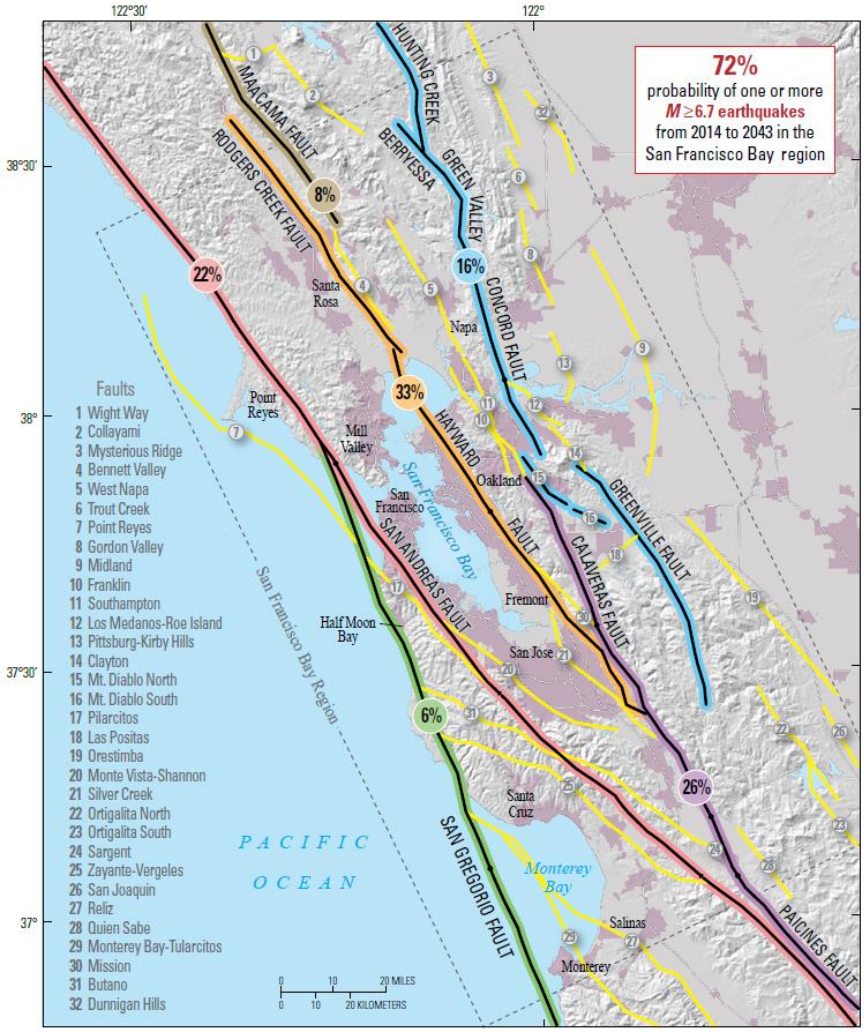
Checkpoints

- ✓ Tsunami experts believe that a tsunami large enough to do a great deal of damage to Berkeley is a very rare event – we might expect such a tsunami once every 900 years.
- ✓ Though less severe tsunamis are quite possible, the damage a less severe tsunami would do is estimated to be far less though certainly not inconsequential.
- ✓ The simulation shows that over a ten-year period there is a 90% chance the City of Berkely would have zero financial losses from tsunamis. There is a very small chance, though, of experiencing very large losses.

C. Earthquakes

Berkeley is susceptible to earthquake risk. Exhibit 5.C.1 provides a map of major fault lines in the region.

Exhibit 5.C.1 – Map of Known Active Geologic Faults[24]

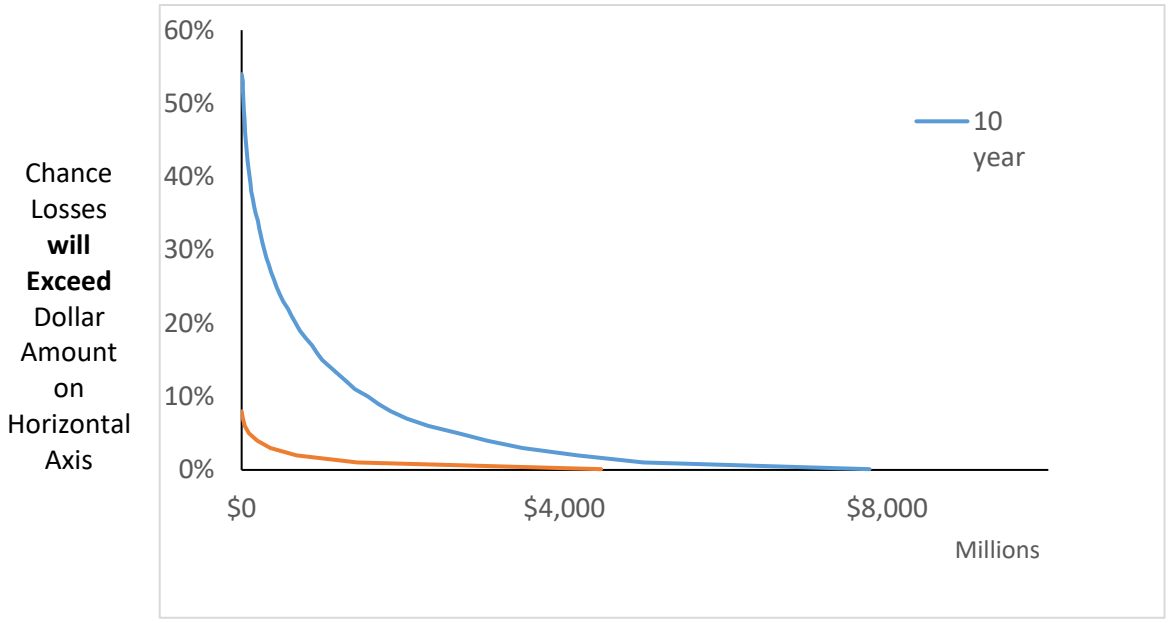


To address earthquakes, we obtained a data set of simulated earthquakes from Aon for the Contra Costa and Alameda County area.[25] The simulation includes projected economic losses for earthquakes. We then scaled these losses to Berkeley by comparing Berkeley's share of total property value to the rest of the two-county area. Berkeley comprises about 4% of the total property value, so we assumed Berkeley would experience about 4% of the economic losses from a given quake. We also set a limit in our model to only address quakes above 6.0 in magnitude. In the USGS report that Exhibit 5.C.1 came from describes the potential damage of a 6.0 quake as "light" so earthquakes below the limit might not cause a material amount of economic loss. That said, our model does provide the ability to manually adjust the threshold downward to include other quakes.

[24] From: "The HayWired Earthquake Scenario—Earthquake Hazards" published by the US Geological Survey.
[25] Aon is global insurance and data analytics firm.

5.C.2 provides a loss exceedance curve for ten years and 1 year, showing total economic losses Berkeley.

Exhibit 5.C.2 – Loss Exceedance Curve for Economic Losses from Earthquakes, Over 10 Years and 1 Year



We next converted the earthquake simulation into losses for the City of Berkeley general fund. First, we converted economic losses to total public assistance provided by FEMA to governmental agencies in the two-county area. Next, we estimated the share of losses to the governments that serve Berkely (city, county, school, etc), using measures of the total capital assets owned by each government.[26] We then identified the City of Berkeley's general fund share by looking at the percent of Berkeley's capital assets attributable to governmental funds versus those not owned by governmental funds. Finally, we compared the results of the simulation to actual losses of California municipal governments from three historical earthquakes. The results of the simulation were consistent with these historical experiences. The results are shown in Exhibit 5.C.3.

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[26] This includes adjusting for the community of Berkeley's "share" of each government's assets. For example, community's share of the school district's assets is 100%, but the share of the transit district's assets is much less. We also included an allocation for state government and quasi-governmental agencies, based on these entities share of earthquake losses in historical quakes.

Exhibit 5.C.3 - Cumulative Probability Chart of Losses to the City Government General Fund from Earthquakes Over a Ten-Year Period (millions of dollars)

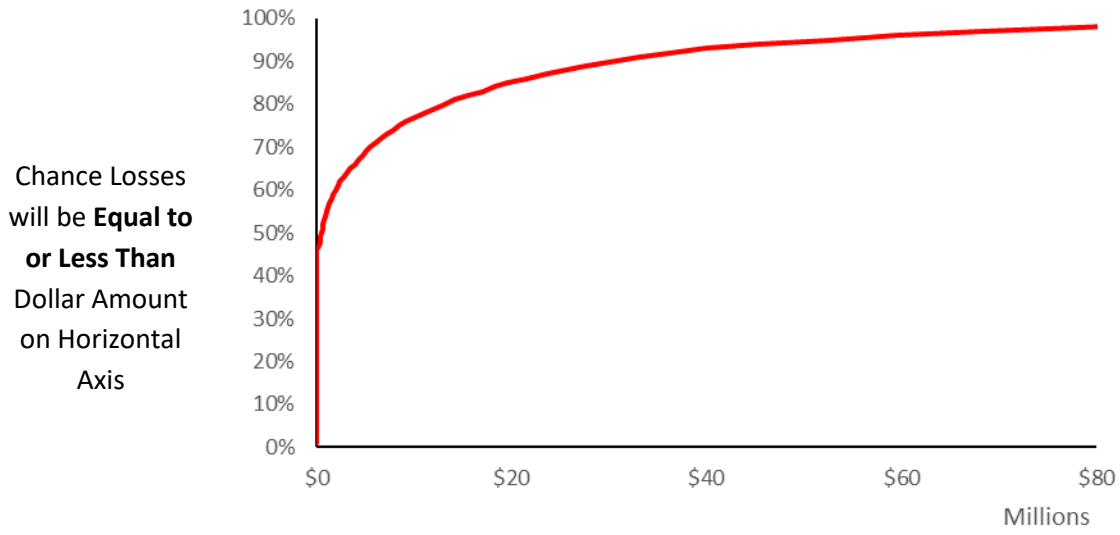


Exhibit 5.C.2 shows that there is about 50% chance of no losses at all. But there is also a chance of large losses. There is an 80% chance that losses are less than $13 million over a 10-year period, which means there is 20% chance losses could be more. Note that Exhibit 5.C.2 does not include the FEMA assistance that the City would receive. This chart also does not address the possibility that a very severe quake could impair the City's tax base. Both of these issues will be addressed in Section 7.

Finally, we should address the fact that a powerful earthquake (e.g., 7.0 or greater) could impair the City's taxbase. Uninhabitable retail buildings could not make sales. Uninhabitable residential buildings would not make purchases. Both would result in lower sales taxes, for example. An impaired tax base would result in lower revenues for the City over a multi-year period, which would not be recoverable through FEMA or by property insurance.

The risk model accounted for tax base impairment. If the model simulates a 7.0 or greater magnitude quake, then a tax base impairment simulation is activated. The assumptions for this simulation were largely taken from a body of work by the United States Geological Survey called the "HayWired Earthquake Scenario" which investigates the potential societal impacts of a 7.0 earthquake in the region.[27] The information in the report was supplemented with estimates from relevant subject matter experts, such as City staff. We also used estimates for earthquake recovery timelines developed as part of another project with Salt Lake City, Utah. Examples of variables that the tax base impairment model addresses include:

[27] Within this body of work, we relied on the report: "The HayWired Earthquake Scenario—Engineering Implications" Scientific Investigations Report 2017-5013-I-Q, Version 1.1, April 2022. Edited by Shane T. Detweiler and Anne M. Wein, U.S. Department of the Interior, U.S. Geological Survey

- Berkeley's share of buildings stock within Alameda County. The HayWired scenario only provides county-level estimates.
- The degree of damage to buildings that might be expected from a 7.0 quake.
- The range of economic losses that could be expected to buildings that are damaged to one degree or another.
- The estimated time to rebuild damaged buildings.
- Short and long-term impacts of tax base impairment and the fact that lost tax revenue is not covered by FEMA assistance. Later in this report (Section 7) we discuss parametric insurance as one way to provide coverage for lost tax revenues, in addition to reserves.
- Offsetting increases in sales tax revenue from construction activity to rebuild, including cost of buildings that are materials, percent of materials that are purchased inside Berkeley, and the additional cost necessary to rebuild a home vs building new.

The analysis shows the losses to the general fund could be material, approaching 5% of general fund revenues in the first year, before much rebuilding has taken place. The model assumes it would take around 8 years to completely replace all the lost buildings.[28]

Checkpoints

- ✓ Earthquakes are an important risk for the City of Berkeley. There are multiple active fault lines in the region.
- ✓ There is about a 50% chance of no losses at all over a ten-year period.
- ✓ Earthquakes can produce substantial losses. For example, there is a 20% chance that losses to the City government could be more than $13 million.
- ✓ A large earthquake (e.g., magnitude 7.0) could impair the City's tax base by a material amount – approaching 5% of general fund revenue in the first year.

D. Rainfall Triggered Major Landslides

Heavy rainfalls can trigger landslides in Berkeley. A search of historical records indicates that there have been 3 major, damaging landslides,[29] triggered by rain, in Berkeley since 1982. We used this as the basis for the potential frequency of landslides in the future: 3 landslides in 41 years implies a 7% annual chance of a landslide.

For potential damages landslides might cause we looked at two sources:

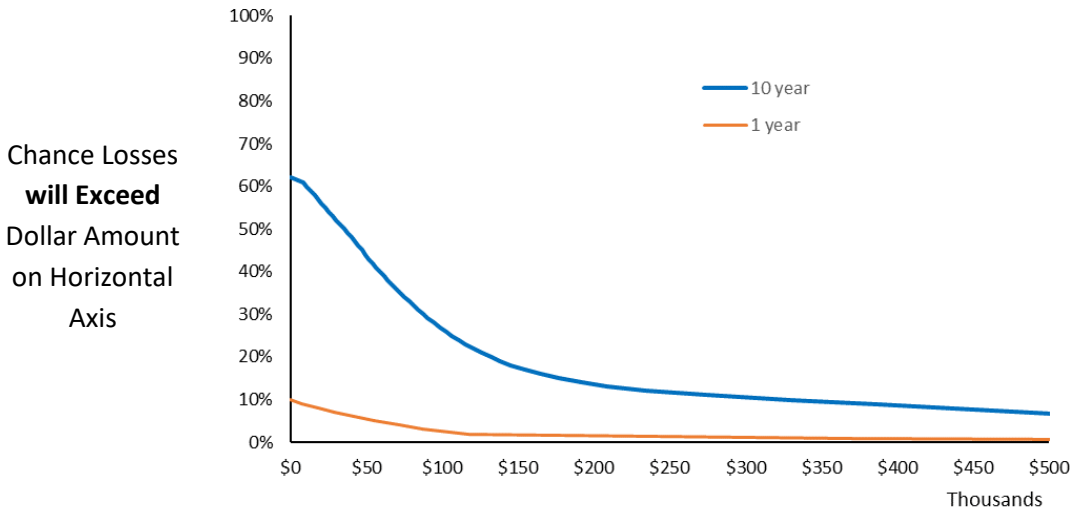
[28] This is based on discussions with building officials in Salt Lake City. We worked with Salt Lake City to build this model and then transferred it to Berkeley. We changed all the assumptions that were specific to Salt Lake City. The time required to rebuild buildings is the only variable that wasn't changed, however, it can be changed quite easily, if needed.

[29] By "major and damaging" we simply mean that the damage was large enough to require intervention by City government and cause City government a significant cost.

- FEMA estimates of total exposure to landslides in each census tract in Berkeley and estimated loss ratios. This provided a starting point for what losses might be from a landslide.
- Historical records of losses from landslides in the region. This provided a sense of the variation that can take place.

We put all these pieces of data together to develop a range of possible landslide outcomes. This resulted in the potential community economic losses shown in Exhibit 5.D.1.

Exhibit 5.D.1 – Loss Exceedance Curve for Landslides, 10 Year and 1 Year Risks (millions of dollars)



The next step is to estimate the potential loss to the City government. There is not much research available on the projected financial impacts of landslides or much historical data to draw upon, so we had to make some assumptions. We started with the estimate of total economic losses, as per above. We then examined data we had available for earthquakes and wildfires and found damages to public entities (e.g., local governments) typically range between 11% and 32% of the economic losses.[30] This resulted in the cumulative probability chart shown in Exhibit 5.D.2.

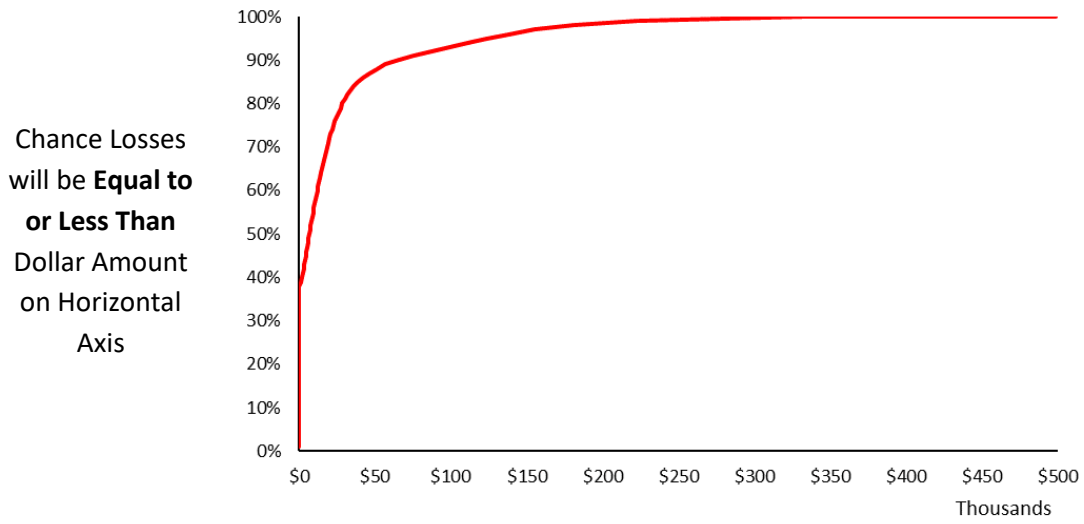
We can see that there is about a 50% chance of no losses at all – the red line is equal to zero up until about the 50% mark, which means that 5 out of 10 times when we look at a ten-year period the losses will be zero. The line does extend out to about $500 thousand, which represents the high-end of losses produced by the simulation.

We should note that there is no instance, in the FEMA records we had access to, of FEMA reimbursing a California municipality for landslides. Therefore, nowhere in our model do we assume FEMA reimbursement for landslides costs. Also, the simulation resulted in many landslides of marginal cost to

[30] Based on estimates from Aon. Aon's data shows projected public assistance provided by FEMA. Knowing that FEMA reimburses 75% of local cost allowed us to simulate total costs to city government.

City government. We might reasonably assume that these minor landslides will be absorbed by the regular City budget, rather than the general fund reserve. This will be reflected in Section 7 of this report, "Putting it All Together".

Exhibit 5.D.2 – Cumulative Probability Chart of Losses to the City Government from Landslides Over a Ten-Year Period (thousands of dollars)



Checkpoints

- ✓ Berkeley has experienced three damaging landslides since 1982.
- ✓ We used FEMA data on potential losses from landslides plus historical data from other landslides in the region to simulate potential costs to the City government.
- ✓ The simulation shows that over a ten-year period there is a 50% chance the City of Berkely would have zero financial losses from landslides. The simulation showed that losses could reach about $500 thousand, if the City is unlucky.

E. High Winds

High winds can cause damage in the community and occur relatively frequently. For example, data from the National Weather Service indicates that there have been 118 wind events in the entire San Francisco Bay Shoreline zone since 2011, with an average speed of 43 miles per hour. Of course, not every wind event in this zone will impact Berkeley. An examination of wind data from a local weather station for the last 24 months showed that the average windspeed of the 10 sustained wind events was about 30 mph. For comparison, FEMA regards 67 mph as a very strong wind event that would be likely to cause significant damage. During the same 24-month period, the San Francisco Bay Shoreline Zone experienced three

events over 40 mph. The biggest was on April 11, 2002. On that day in Berkeley, the maximum sustained wind period was around 40 mph. It should be noted that sustained winds (customarily measured over ten minutes[31]) are not as strong as unsustained wind gusts that can happen during the same wind event. For example, during a recent two-year period[32] the top speed of a wind gust was an average of 4.7 mph greater than the speed measured for the associated sustained wind event.

If we compare the 24 months of local weather station data to the same period from the National Weather Service data, we find that the wind events for the San Fransico Bay Shoreline zone were fully felt in Berkeley in four out of eleven cases (36%). Hence, we applied that some portion to entire 12-year period of history to arrive at an assumption that there will be an average of 3.5 wind events per year, on average.

We assumed that there was a 3% chance of a wind event with sustained winds of 67 mph or greater, which is equivalent to assumptions from FEMA's estimates of losses for Berkeley. 50% of wind events were assumed to be 45 mph or less, which is consistent with historical data. To estimate damage, we started with estimates from FEMA for damages from a very strong wind event (67 mph), based on total exposed value and expected rates of loss, which was $43,200 per event. We then scaled that loss down to expected damage from a 45-mph event. According to the Beaufort Wind Scale[33] winds at 45 mph result in damages such as twigs and small branches broken from trees. Hence, we assumed that damage was minimal at winds of this speed. This resulted in the loss exceedance curve shown in Exhibit 5.F.1.

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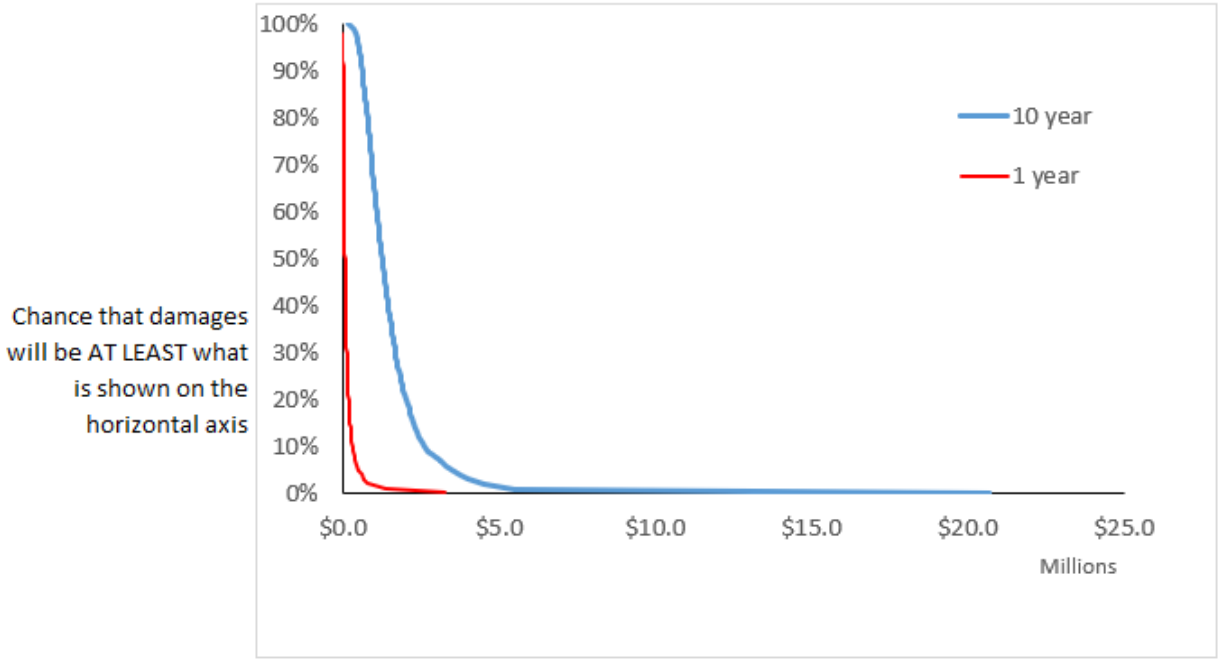
[31] https://www.rmets.org/metmatters/beaufort-wind-scale

[32] September 2023 to September 2021

[33] You can see the full scale at: https://www.weather.gov/mfl/beaufort. The scale is typically used to measure mean speeds, usually averaged over 10 minutes by convention, and do not capture the speed of wind gusts.

Exhibit 5.F.1 – Loss Exceedance Curve for Strong Winds, 10 Year and 1 Year Risks (Millions of Dollars)



10 Year Average	$	1,528,838	1 Year Average	$	137,226
10 Year Median	$	1,259,749	1 Year Median	$	64,149

The next step is to estimate the potential loss to the City government. There is not much research available on the projected financial impacts of high winds or much historical data to draw upon, so we had to make some assumptions. We started with the estimate of total economic losses, as per above. We then examined data we had available for earthquakes and wildfires and found damages to public entities (e.g., local governments) typically range between 11% and 32% of the economic losses.[34] This resulted in the cumulative probability chart shown in Exhibit 5.F.2.

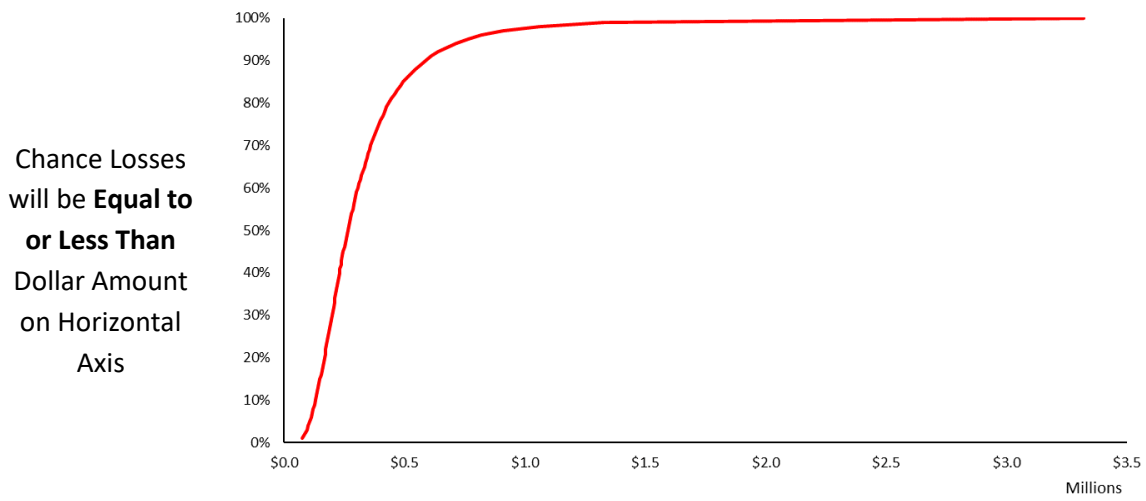
We can see that there is about an 85% chance of total losses over 10 years less than $500,000 – the red line is equal to $500,000 up until about the 85% mark. The line does extend out to about $3.3 million which means our simulation did show that large costs are possible, even if the chances a very remote. For example, there is only a 3% chance that total losses over ten years would be more than $1 million.

Note that we are considering this risk to be different from a severe storm, which might include lightning and heavy rain. The high winds risk only relates to winds that may or not be accompanied by storm conditions. Because this risk is limited to more "routine" winds, which fall short of a "natural catastrophe", we do not assume FEMA would get involved. However, we also assume that many wind events will only result in marginal damage, which could be absorbed in the City budget, rather than the general fund

[34] Based on estimates from Aon. Aon's data shows projected public assistance provided by FEMA. Knowing that FEMA reimburses 75% of local cost allowed us to simulate total costs to city government.

reserve. This will be reflected in Section 7 of this report, "Putting it All Together". We also have another section of this report on severe storms.

Exhibit 5.F.2 – Cumulative Probability Chart of Losses to the City Government from High Winds Over a Ten-Year Period (thousands of dollars)



Checkpoints

- ✓ High winds occur regularly in the bay areas and sometimes reach high enough speed that they could cause a material amount of damage to the community.
- ✓ There could also be costs to the City government. Most of these costs could probably be absorbed by the City budget, but it is possible that extraordinary costs would require the use of the reserve.
- ✓ Our simulation shows that there is about an 85% chance of total losses over 10 years less than $500,000. There is only a 3% chance that total losses over ten years would be more than $1 million.

F. Severe Storms

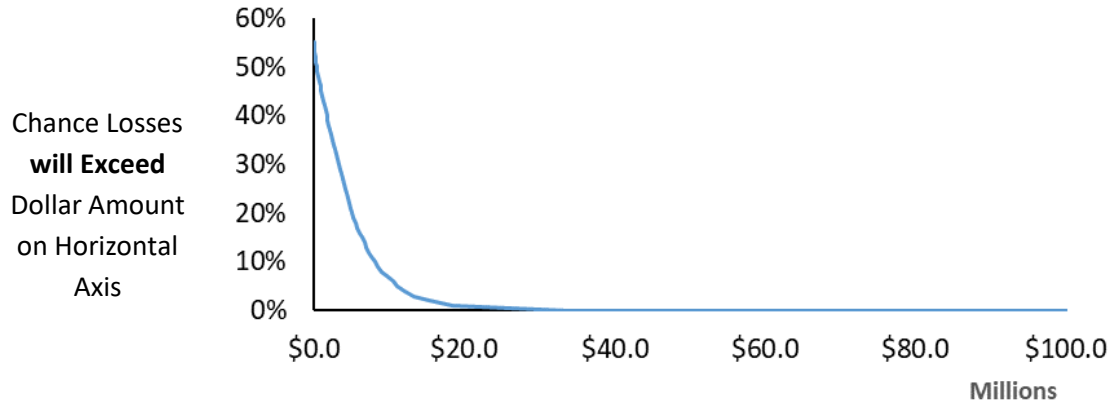
A prior section of this report addressed high winds, which focused on winds in the range of around 35 to 67 mph, where many simulated wind events cause marginal or no damage. That section did not address severe storms which could include not only high winds, but also violent precipitation. In 2006, Berkeley, along with 16 other cities in Alameda and Contra Costa counties experienced a storm that was severe enough to receive assistance from FEMA. We used this storm as a starting point to simulate future storms. There was also a severe storm in 2023, but not enough data from that storm is available to be able to fully include in the risk model (but it still partially informs the model).

Let's start simulating the frequency of storms. There have been three severe storms in Alameda and Contra Costa counties that were bad enough to receive FEMA support since 1998.[3] Berkeley was only impacted by two of the storms. Hence, we simulated an 12% annual chance of storms,[4] with a 66% chance that Berkeley would be impacted by any given storm.[5]

To simulate damages, we looked a per capita damage from each of the cities impacted by the 2006 storms.[35] That provided a range of potential losses. We used this range to simulate Berkeley's potential losses from future storms: both economic losses to the community at large and financial losses to the City government.

Exhibit 5.G.1 shows the loss exceedance curve for the economic losses to the entire community from severe storms. We see that some very large losses seem possible, even if highly unlikely.

Exhibit 5.G.1 - Loss Exceedance Curve for Tsunamis for Berkeley Community, 10 Year Risk (millions of dollars)



Section 6 -

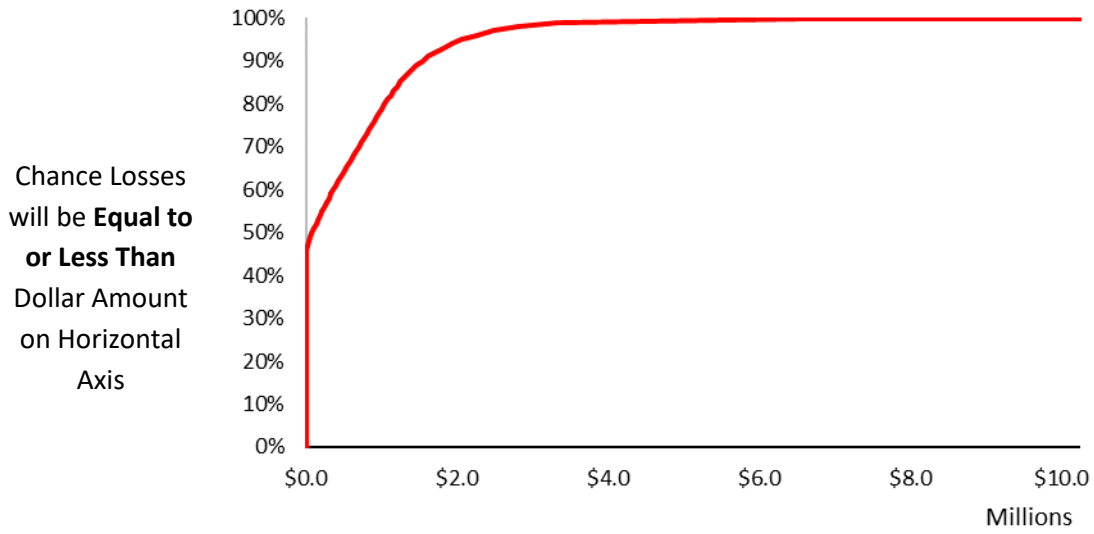
	Chance that Economic Losses Will Exceed Dollar Amounts (Millions) Indicated Below			
Time Horizon	5%	10%	50%	90%
1-Year	$1.1M	$0	$0	$0
10-Year	$10.5M	$8M	$0.4M	$0

Exhibit 5.G.2 shows the cumulative probability chart for direct losses to the City government from severe storms. Similar to 5.G.1, we see that very large losses are possible, though highly unlikely. The cumulative

[3] This is as far back as we can obtain records from FEMA
[4] 3 storms in 25 years is 3/25 or 0.12
[5] Berkeley was impacted by 2 of 3 storms, or .66.
[35] 2023 data is not available as of this writing

probability chart does not include FEMA reimbursement. That will be addressed in Section 7 of this report, "Putting it All Together".

Exhibit 5.G.2 – Cumulative Probability Chart of Losses to the City Government from Severe Storms Over a Ten-Year Period (millions of dollars)



Checkpoints

- ✓ Severe storms present a greater amount of possible damage than just high winds.
- ✓ Severe storms powerful enough to cause material amounts of damage are rare, but the amount of potential damage could be quite large.
- ✓ That said the chance of very large damage is remote. There is a 7-in-10 chance of zero losses to City government over 10 years and a 9-in-10 ten chance of losses less than $1 million.

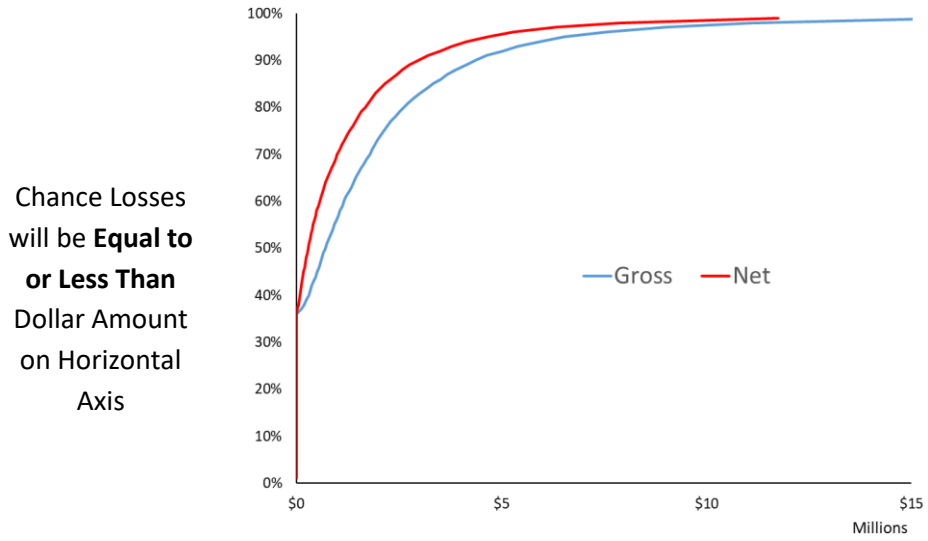
H. Pandemics / Infectious Disease and Other Risks

COVID-19 has made people more aware of the risks posed by pandemics. We included pandemics in the Risk Model by developing a "miscellaneous risks" simulation to account for pandemics as well as other unusual events that don't fit into the categories above, but that have the potential to require the City to use reserves. Another example of such an event occurred in 2013. A wildfire in the Tahoe region caused extensive damage to property owned by the City of Berkeley, requiring a large outlay from the general fund (on top of reimbursements from insurance) to mediate. Other events might not cause much damage. For example, civil unrest in 2019 created overtime costs for public safety personnel, but the total cost was relatively modest. Note that by limiting the scope of this simulation to events that might impact reserves we are excluding insurable losses.

The simulation provides for a small annual chance that an unusual event might occur. The annual chance is aligned with how frequently such events have happened to Berkeley in the past. If an event is simulated to occur, the potential damages are also aligned with the damages for events Berkeley has experienced in the past. Something on the scale of the damage from COVID would be very rare. Finally, the model simulates reimbursement by outside entities. The chances of reimbursement are also aligned with Berkeley's experience. Also, GFOA's experience with building similar models for other local governments allowed us to draw on the experience of other local governments to provide more data points to base the model on.

Exhibit 5.H.1 shows a cumulative probability chart of simulated losses over a ten-year period. Because reimbursements were customized for the miscellaneous simulation, we included lines for gross losses and losses net of reimbursement.

Exhibit 5.H.1 – Cumulative Probability Chart of Losses to the City Government from Miscellaneous Risks Over a Ten-Year Period (millions of dollars)



We see Berkeley has a 33% chance of zero losses. Even if losses do occur, they are relatively mild most of the time (compared to some other hazards we have discussed in this report). For example, there is 70% chance net losses will be less than $1 million in a ten-year period. Nevertheless, larger losses are possible. There is a 5% chance net losses could exceed $5 million in a ten-year period.

Section 7 of this report shows how miscellaneous risks impact the City's reserves, along with the other risks we analyzed.

Checkpoints

- ✓ The City could be impacted by other, unexpected hazards; besides those we've described in other sections of this report. Pandemics are the most recent example of a hazard that was not top of mind for many local governments until recently.
- ✓ We used the experience with COVID-19 as well as other unusual events the City has experienced to simulate the exposure of the City's reserve to other hazards. We also drew upon GFOA's experience building similar models for other cities to broaden the data available.
- ✓ The simulation suggests that very large losses, net of reimbursement from other entities, from miscellaneous risks is unlikely. There is a 70% chance net losses will be less than $1 million in a ten-year period. Larger losses are possible. There is a 5% chance net losses could exceed $5 million in a ten-year period.

Section 6 - Secondary Risks and Comparable Analysis

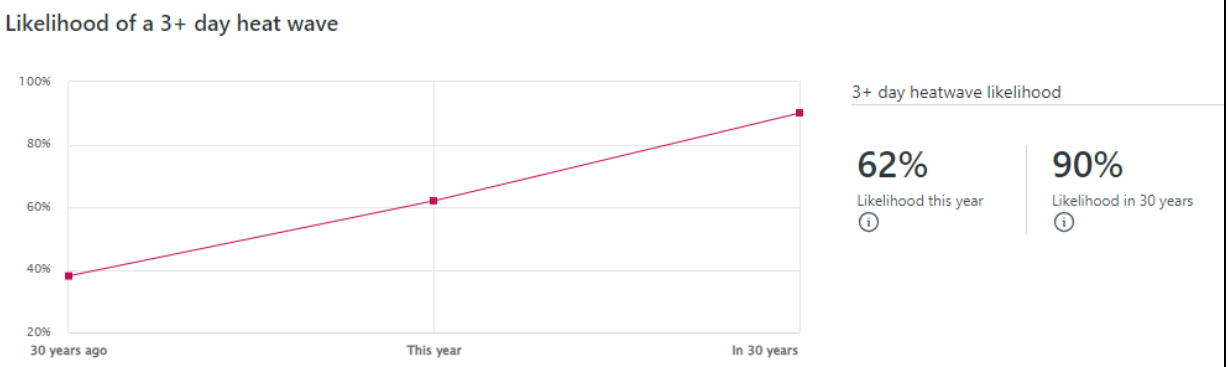
Prior sections of this report reviewed the risks of the greatest financial consequence to Berkeley. In this section we briefly review other risks that we considered, but that did not appear to be as important to Berkeley's general fund reserve as the other risks we examined. This is not to say that Berkeley should not prepare for these risks or that they are not important. It is only to say that these events were not included in the scope of our analysis because of the low potential impact on the general fund reserve. Finally, we should note that the primary risk section of this report includes an "other hazards" model which is intended to capture the possibility of losses from unexpected sources. For example, we will see later in this section although the City has solid cyber insurance, like every other city, there are exceptions in the policy for acts of war. One could imagine a scenario in which a cyber-attack by state-sponsored actors is not covered by the policy, requiring the city self-fund the recovery. These kinds of "unconventional" scenario are the purpose of the "other hazards" model.

Also, in this section we examine how Berkely compares to other cities in terms of indebtedness and the amount of fund balance maintained.

A. High Heat

According to the First Street Foundation's Risk Factor tool, Berkeley has a "moderate" risk for heat. This is, first, because "feels like" temperatures have been rising. Exhibit 5.G.1 shows First Street's rising expectations for heat waves in the future. We see that it is going up, where a hot day is defined as temperatures above 83 degrees Fahrenheit.

Exhibit 6.A.1 – First Street's Estimation of the Chance of a 3+ Day Heat Wave



First Street also posits that homes in Berkley have moderate vulnerabilities to heat based on factors like shade and proximity to bodies of water.

We used data from First Street to simulate the number of heat days along the following thresholds, where the indicated temperature is the "feels like" temperature, so includes humidity (which increases the

perceived temperature).[36] First Street provided an estimate of the average number of days between 80 and 90 degrees and above 90 degrees for the next 30 years. We focused on the next ten years. Historically, we looked at the difference between what First Street's algorithm would have predicted for past years and compared it to what actually happened to estimate the potential variation between what First Street's algorithm predicts for the future and what actually happens.

Unfortunately, not much useful research exists on economic impacts of high heat at the local level – research seems to focus on aggregated losses at the national or international level. Further, by speaking with a CFO of a large city in the Phoenix area (which has a much larger risk of high heat days than Berkeley) we learned that high heat days don't seem to have much potential impact on general fund reserves. Therefore, we did not quantify this risk. Instead, Exhibit 5.G.2 provides summaries of the simulation results for 10 years in the future.

Exhibit 6.A.2 – Summary of Simulation Results for Number of High Heat Days

"Feel Like" Temperature	Annual Average Now	Annual Average in 10 Years	Annual 90th Percentile Now	Annual 90th Percentile in 10 Years
80-85 Degree Days	17	18	25	26
85-90 Degree Days	8	10	13	16
90-100 Degree Days	6	7	11	12
100+ Degree Days	0	1	2	2

B. Cyber Risk

Local governments are at high risk for cyberattack, particularly ransomware attacks. In fact, studies have shown that local governments are one of the most popular ransomware targets for cybercriminals.[37]

The City currently has coverage under "Alliant Insurance Services, Inc. Alliant Property Insurance Program (APIP) Cyber Insurance Evidence Attachment." GFOA is not an insurance analyst, and a comprehensive review of all policy details was outside the scope of our project, but we can offer the following observations from our review of the policy as it relates to the City's reserve strategy.

The insurance has a $2 million limit aggregate limit of liability. There are also several sublimits for different kinds of coverages. For example, there is a $500,000 limit for "Breach Response Costs". It is conceivable that a particularly bad attack could exceed one or more of these sublimits. Research suggests that the potential damages from and attack and size of the government are only weakly correlated. This means that even small governments can be on the receiving end of large attacks – and Berkeley is not a small government. Losses over these sublimits might be covered using the City's reserves. It is also worth noting that there is a $40 million aggregate limit for all members of the policy. Presumably, this refers to the governments that participate in the Bay Cities Joint Powers Insurance Authority. In most cases, this joint

[36] The "Feels Like" temperature relies on environmental data including the ambient air temperature, relative humidity, and wind speed to determine how weather conditions feel to bare skin.
[37] The GFOA report "Cyber Risk Savvy" describes multiple such sources. It is available at gfoa.org.

limit would not be much of a concern but could be an issue in the case of widespread attack that impacts many jurisdictions at the same time.

There is also a retention (deductible).[38] The policy describes a sliding scale of retentions, depending on the insured's size. The scale ranges from $50,000 to $250,000. Presumably, the City would be on the upper half of this scale, however it is also ***very important*** to understand how retentions work in cyber policies. There are two basic approaches single retention and multiple retention. A cyber-attack could trigger multiple types of coverage within the policy. The City's policy has around twenty different types of coverage. An important question is: if a claim occurs would the City pay a separate retention for each type of coverage that is triggered ("multiple retention") or one retention amount for the entire cyber-attack event ("single retention")? This is not a trivial issue because the deductible amount the City would face could be multiple times larger under a multiple retention policy compared to a single retention policy. GFOA could not discern whether the policy is single or multiple retention from the documents provided. The City may wish to inquire with its insurance provider on this point.

The policy provides coverage on a "claims made and reported basis." According to the International Risk Management Institute (IRMI), a claims-made and reported policy is a type of policy in which a claim must be both made against the insured and reported to the insurer during the policy period for coverage to apply. Further, IRMI states: ***claims-made and reported policies are unfavorable from the insured's standpoint because it is sometimes difficult to report a claim to an insurer during a policy period if the claim is made late in that policy period***. This is particularly important when it comes to cyber risk. For example, imagine malicious software infiltrated the City's network months ago but the City finds out about it after the policy period is over. How would the policy cover that situation?

Cyberattacks can cause many types of losses. As mentioned above, the City's policy includes several coverages to address different losses. Nevertheless, cyber policies are rarely, if ever, comprehensive of every cost that could arise from every cyberattack scenario. Here are examples of uncovered losses from the City's policy:

- The policy excludes acts-of-war, but this is a common exclusion in insurance policies. Many ransomware attacks are thought to be perpetrated by state or quasi-state actors. If interpreted as an "act of war" the City may not have coverage. The policy goes even further by excluding "Governmental Actions," which may be intended to exclude the actions of state-sponsored cybercriminal when those actions do not rise to the level of "an act of war."
- The policy excludes property damage. For example, if a computer virus sabotages physical equipment besides computer hardware, the City may not be covered. Many types of equipment, from vehicles to smart infrastructure, rely on computer systems. Sabotage of the computer system could result in physical damage to the asset.
- Betterment Coverage. This is coverage for expenses incurred to update, restore, or improve computer systems to a level beyond what existed before the attack. This might be important, for example, if the old system posed particular security vulnerabilities that could only be eliminated via a substantial

[38] Retentions and deductibles not synonyms, but they are close. Retentions can include any source of loss not commercially insured – it is the risk retained by the holder of the policy. In the part of the policy this paragraph refers to, "retentions" are being used in a way that most people understand insurance deductibles.

upgrade in the system. Note that the policy does not use the term "betterment coverage," but rather spells out the concept as an exclusion.

That said, GFOA is ***not*** suggesting the City should have insurance coverage for ***all*** risks that could arise from a cyberattack. Such a policy might be cost prohibitive or even completely unobtainable. The City, though, should be cognizant of what risks the City is not commercially insuring because those risks are then being, de facto, self-insured.

Finally, some municipal governments have found cyber policies to be increasingly expensive or hard to get at all in recent years. Insurance companies are becoming more rigorous in their underwriting practices and are increasingly requiring that policyholders have risk-mitigating practices in place, like multi-factor identification and more. This has two implications for the City:

- The City should continue to stay up to date with nationally recognized cybersecurity standards.
- The City may need to be prepared to take on higher retentions for cyber policies in the future.

Given the points above, the City might consider the following recommendations that have implication for the City's reserves:

- The City should remain open to investing in additional cost-effective cyber controls to help mitigate future risks. This is because a dollar invested in prevention is usually going to be more effective than a dollar invested in remediation.
- Be prepared to retain more risk on a cyber insurance policy. If policies were to become substantially more expensive (or, worst case, unavailable), the City could lower the cost by retaining more risk. This could be accounted for in the City's reserve amount. As we stated above, it is conceivable that a cyberattack could cost the City's more than the sublimits outlined in the policy. Therefore, "retention" of risk is not just the insurance deductible, but also includes the risk of a catastrophic attack that costs more than the policy limit or that causes damages that are not covered under the policy.

Because the costs of cyber risk are variable it is hard to estimate an amount to hold for a reserve with the available data. Hence, cyber-attacks ***are not*** part of the probabilistic risk model GFOA has developed. The City's current policy does cover many kinds of cyber risks. The City's "retained" risks appear to be:

- The deductible costs, especially if the City is responsible for covering multiple deductibles that could arise from a single attack.
- Damages in excess of the sublimits under any of the individual coverages.
- Uncovered risks, which should be remote relative to the risks that are covered.

GFOA has observed that $1 million is a common limit on cyber policies (the City already has an aggregate limit of $2 million). Given that most risks are covered, a conservative approach might be to add $1 million (or a lesser amount, such as $250,000 which is the high end of the deductibles listed in the policy) to the City's "critical threshold" for reserves. That has the impact of raising the desired "floor" on reserves. A higher floor provides more flexibility to address risks that are not factored into

the model. A less conservative approach would be to rely exclusively on the City's commercial insurance and a strong preventative posture and not hold additional reserves for cyber risk.

C. Manmade Risks like Hazmat and Terrorism

GFOA's experience with cities that have a substantial presence of hazardous materials in the community is that risk to the general fund reserve is remote. According to City of Berkeley's Local Hazard Mitigation Plan "over the last 25 years, Berkeley has seen a more than 90 percent reduction in the number of facilities with extremely hazardous materials". This means that hazmat risk is even more remote for the City of Berkeley.

With respect to terrorism, the Hazard Mitigation Plan says, "it is not possible to estimate the probability of a terrorist attack".

For these reasons, we did not quantify hazmat or terrorism risk, specifically. However, the risk model does include the other hazards model, which provides accommodation for losses from unexpected sources, which could include hazmat releases or terrorism.

D. Comparable Analysis

This section compares Berkeley to an outside standard for ***fund balance***. This information provides context for the City in selecting its own ***reserve*** levels. Reserves are a subset of fund balance. Unfortunately, publicly available financial records often do not distinguish between a government's fund balance and what they are holding in a reserve for the purposes of self-insurance. Therefore, we will look at the entirety of fund balance and compare it to the standards used by Moody's bond rating agency for assigning credit scores. The scores range from Aaa (the best) to Ca (the worst). The measure Moody's uses are "Available Fund Balance Ratio", which compares fund balance to revenues. It is important to note that Moody's considers fund balance across the entire government, not just general fund. The rationale is that, if it came down to it, a government would use fund balance from anywhere across its holdings to make a debt payment, rather than default. Moody's assesses creditworthiness based on the likelihood of repayment of debt. Moody's basic formula for Available Fund Balance Ratio is:[39]

Available Fund Balance Ratio: (Available Fund Balance + Net Current Assets) / Revenue

The table below shows a summary of the calculations of this Ratio for Berkeley, as the end of fiscal year 2023. The details behind the summary were reviewed with City staff. We can see at the bottom of the table that the ratio across all of City government is 75%. Moody's standard for a Aaa rating is anything over 35%. So, by that measure, Berkeley is doing quite well. We see in the table that if we limited our scope to just the governmental funds, then Berkeley would be above the standard for Aaa, though not nearly as much. Our table doesn't show general fund balances in isolation, but the general fund balance is not much different from governmental funds as a group (52% of revenue).

[39] Moody's documentation describes nuances to calculate this formula, which we have included in our calculations.

We should emphasize that the Moody's rating system considers the whole government, so the governmental funds' lower ratio should not impact the City's rating, under Moody's standards. Also, fund balances are one of several criteria that Moody's and other rating agencies consider. This means a local government is not guaranteed a AAA bond rating by virtue of high fund balances alone. GFOA provided a separate report to Berkeley that provides an analysis of the other criteria that go into a bond rating.

We should also emphasize that the table below is a snapshot in time (end of fiscal year 2023). The risk model what we built for Berkely simulates the general fund over a future ten-year period. But the table below does show us that the City's fund balances are, as of now, in a good position compared to the standard used by Moody's bond rating agency.

Calculation of Fund Balance Ratio as per Moody's Metholodogy	
Step 1 - Get Total UNRESTRICTED Governmental Fund Balance	
Total from ACFR	222,914,865
Total Unrestricted Governmental Fund Balance	**222,914,865**
Step 2 - Get Total Net Current Assets from Proprietary Funds	
Total Net Current Assets from ACFR	207,329,840
Total Net Current Assets	**207,329,840**
Step 3 - Get Total Revenues	
Total Governmental Fund Revenues	451,986,361
Total Proprietary Fund Operating & Non-Operarting Revenues (excludes Internal Service Operating)	125,081,787
Total Revenues	**577,068,148**
Step 4 - Get Fund Balance Ratios	
Governmental Funds	49%
Proprietary Funds	166%
Total	**75%**

To close this section, let's summarize:

- ✓ Moody's ratio is not a perfect proxy for what we are measuring in the GFOA analysis: we are measuring self-insurance capacity of the general fund, while Moody's is measuring ability to repay bonds.
- ✓ Nevertheless, the Moody's ratio and its associated benchmarks for bond ratings provide a clue: both reserves and Moody's ratio are a product of the City' fund balance.
- ✓ We can see that Berkeley's level of fund balance is healthy when considering all of City government, when compared to rating agency expectations. Even if we limit our scope to governmental funds (of which the general fund is part), Berkeley still does well.
- ✓ This analysis is a snapshot in time (the end of fiscal year 2023). Our risk model simulates the 54performance of the general fund over a ten-year period. The next section puts together all the previous parts of this report to present the conclusions from the simulation.

Section 7- Putting it All Together

In Sections 4 and 5 we examined individual risks such as recessions, fires, earthquakes, and more. We examined each of these risks individually in order to best understand the nature of each risk and the financial implications. However, to arrive at a final reserve strategy for the City, we need to consider these risks as a group. Considering the risks as a group has important advantages.

The first advantage is that considering risks as a group recognizes the diversity in the risks that the City faces. This diversity actually is an advantage for City finances! Diversity in risks means we should not simply add together a reserve for each individual risk. This may overstate the amount of reserves that the City really needs. This is because it is unlikely, for example, that the City will experience a deep recession, a severe earthquake, and severe fire all within a short time period.

The second advantage of considering all of the risks together is that not all of the risks have an equal chance of occurring over a given time period. Recessions are more common than a 7.0 magnitude earthquake. The reserve analysis should reflect this fact. We can use relative chance of each of the major risks occurring over a ten-year period to build a model of risks over a long-term time horizon.

The final advantage of considering all the risks together is that we can consider "risk interdependencies." This simply means that the occurrence of one risk could impact the probability and/or magnitude of a related risk. In Berkeley's case, a good example an interdependency is revenue performance and pension burden. The worse the economic performance is over a ten-year period, the worse the implications are both for Berkeley's revenue income and pension burden. There are also interdependencies between revenues during a recession. Some revenues decline right away while others take longer to decline. Other than that, there does not appear to be any critical interdependencies. It is not unusual for local governments GFOA has worked with to not have many interdependencies.

To realize the advantages described above, we built a model that considers the City's risks over a ten-year time horizon. The GFOA Risk Model runs ten thousand simulations of possible futures for Berkeley. Below are the key assumptions behind the model. Some of these assumptions are user-definable so that the City can explore alternative scenarios to those described in the report. Below, we have italicized user definable variables and described the default values included in the model.

- **Probability of an undesirable event.** The probability of any undesirable event occurring is consistent with the assumptions described in Sections 4 and 5 of this report.
- **Magnitude of an undesirable event.** Should a simulation show that an undesirable event occurs each year, the magnitude is generated randomly in a manner identical to how we described for the risks earlier in this report.
- **FEMA / CalOES reimbursement.** The City could recoup some of its losses from extreme events, such as floods, fires, and earthquakes from reimbursements from FEMA and CalOES. The model assumes the reimbursements are received *two years after the event occurs*.[40] The model assumes all large natural catastrophes would be assisted by FEMA. Small ones may not. CalOES would supplement FEMA in all the cases above. We also assume the City will be reimbursed at the

[40] Our research shows that FEMA reimbursements are completed 18 months after the disaster occurs, on average. So, this is a conservative assumption.

customary *rate of 75% of incurred costs* by FEMA. We *assume 18.75% reimbursement* from CalOES. We also assume there is some amount of losses that do not fit into FEMA reimbursement (beyond the 25% local share) that the City will need to bear. The amount varies by type of disaster but ranges from 35% to 10%.[41]

- **The City does cut some spending to help offset the impact of a recession or an extreme event.** At least some of the losses from a recession or extreme event could be absorbed by cutting back on the City's regular spending. The Risk Model provides the user with the ability to set the amount of spending the City is willing to cut and pick between various cost cutting strategies. For the purposes of the discussion in this report, we worked with City staff to select a set of strategies that amounted to about a 4.5% reduction in the annual budget. We strove to be consistent with past experiences the City has had in balancing its budget. The user of the model can easily select a different set of strategies.
- **The City will have a tough time generating budget surpluses in years when there is not a recession.** In the past, the City has usually generated surpluses in years when there is not a recession. However, forecasts by the City staff project deficits for the next few years and continued, though less acute, challenges in balancing the budget for a few years after that. Hence, the risk model simulates continued deficits as the most likely future outcome for the next few years (but not a certain outcome – the model still provides a small chance of surpluses) and then a break-even budget for the next few years, and finally a small surplus for the last few years. There is possible variation built into the simulation so that any year is capable of generating a surplus or deficit (just like in real life), but the most likely outcome is as described above.
- **Critical threshold.** *This is the amount that the City does not want **fund balance or reserves** to go below*. For the purposes of this report, we set the critical threshold for **general fund balance** at the amount Moody's bond rating agency looks for in a Aaa credit: 35% of revenues. For reserves, we set the threshold at zero. This would be the point at which the City's "self-insurance" capacity provided within fund balance is exhausted. The model simulates the interaction between fund balance and reserves as well. So, if reserves are exhausted, then fund balance picks up the slack.
- **Pension trust fund**. The City has a pension trust fund. The pension trust fund is in the model and helps absorb excess pension costs. The pension risk model and the role of the pension trust fund was described in detail in Section 4 of this report.
- **City's starting fund balance and reserve**. The starting reserves are $130.7 million. Reserves are a subset of fund balance and are equal to $40.7 million to start. As per conversations with City staff, this is the amount the City has been considering the "reserve" amount within fund balance.

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[41] A recent high wind event in the City produced costs that were not reimbursable by FEMA in an amount equal to about 50% of the costs that were. Hence, 50% is not an unrealistic upper limit.

We combined all the information described above to create a ten-year probabilistic model. The City's goal for this analysis was to find an amount that can give the City sufficient comfort that its fund balance and reserves will be sufficient. We next present a series of graphics based on this model.

Exhibit 7.1 compares fund balances and reserves to thresholds that the City is concerned about.

For fund balance, the threshold is the amount of fund balance associated with Aaa bond rating, according to the bond rating agency Moody's: an amount equal to at least 35% of general fund revenue. An important caveat must be noted, however. *Moody's evaluates fund balance across the entire local government, while our analysis is just for the general fund.* Thus, our analysis is really asking about the chance that the general fund can carry its "fair share" of the load of meeting rating agency expectations and not if the City, overall, will be able to meet rating agency expectations.

For reserves, the threshold is zero. Zero represents the "self-insurance" aspect of the City's reserves running out.

In Exhibit 7.1, we see there is a very high chance, approaching 90% (or 9 in 10) that the City's fund balance will go below the amount associated with a Aaa bond rating. Again, we should draw attention to our caveat that a bond rating is based on the entire City government, while our analysis covers only the general fund. As of this writing, the position of the City's other funds is *currently* strong enough to keep the entire City is Aaa territory, but our analysis says nothing about the chances of this continuing. Another important caveat is that fund balance is just one of several criteria that bond rating agencies consider, so a decline in fund balance below the Aaa threshold does not necessarily mean that the City will be downgraded – perhaps other aspects of the City' financial condition could balance out a declining fund balance.[42]

Exhibit 7.1 also addresses reserves, where there is just over a 20% chance that that the reserve will reach zero at the end of ten years. This is a greater chance than GFOA has observed most municipalities are comfortable with.

It is important to note that, generally, the bars in presentations like 7.1 will get higher the further in the future we look because more bad things can happen. That said, we should also note that a very important cause of the rising height of the bars is the assumption we described earlier about the City having a "tough time generating budget surpluses" in the next few years. For example, if we were to change the most likely outcome of our surplus-or-deficit simulation to just "zero" or break-even, the chance of the City's fund balance being below Aaa in year ten improves by around 15 percentage points (about a 75% chance). The impact in the near term is even greater: 5 years out the chances improve by 25 percentage points (from a 65% to 40% chance of going below the critical threshold). The pension risk described in Section 4 of this report also adds a persistent drag on the City's finances, including its fund balances and reserves.

[42] GFOA did a separate analysis on bond rating for the City which goes into the factors Moody's considers and the City' relative position on each.

Exhibit 7.1 – Chance Fund Balance + Reserves is Less than Bond Rating Aaa and Chance Reserve is Less than Zero.

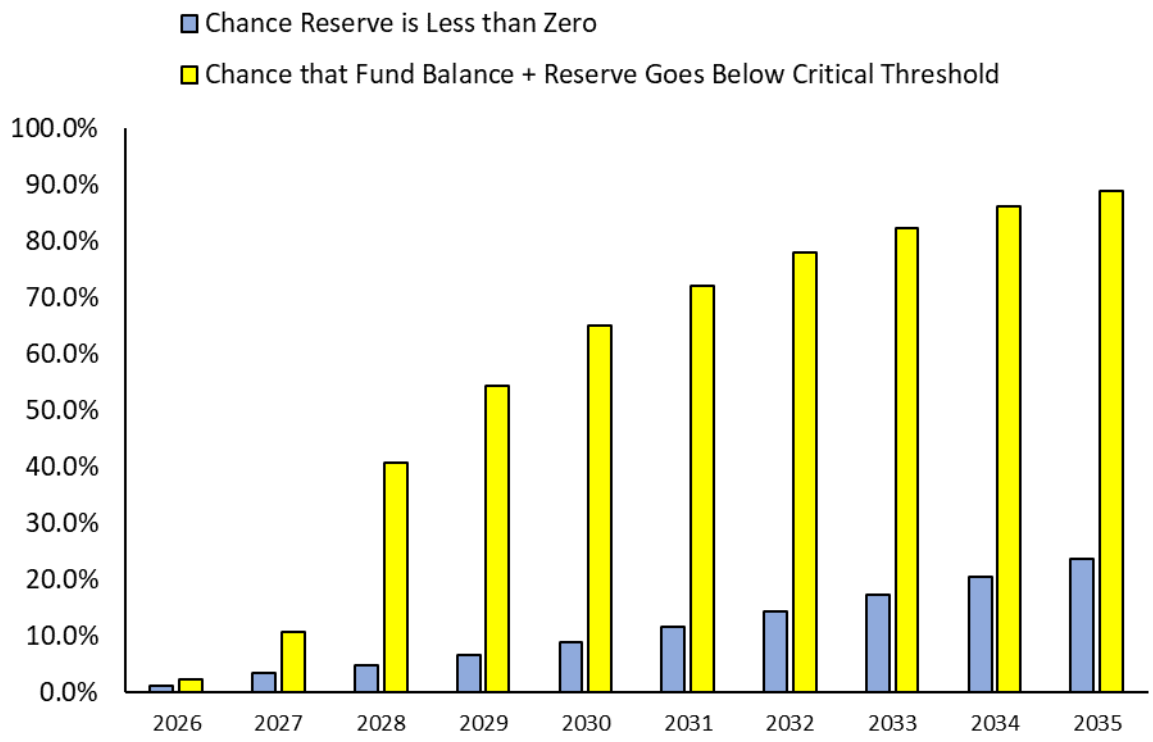

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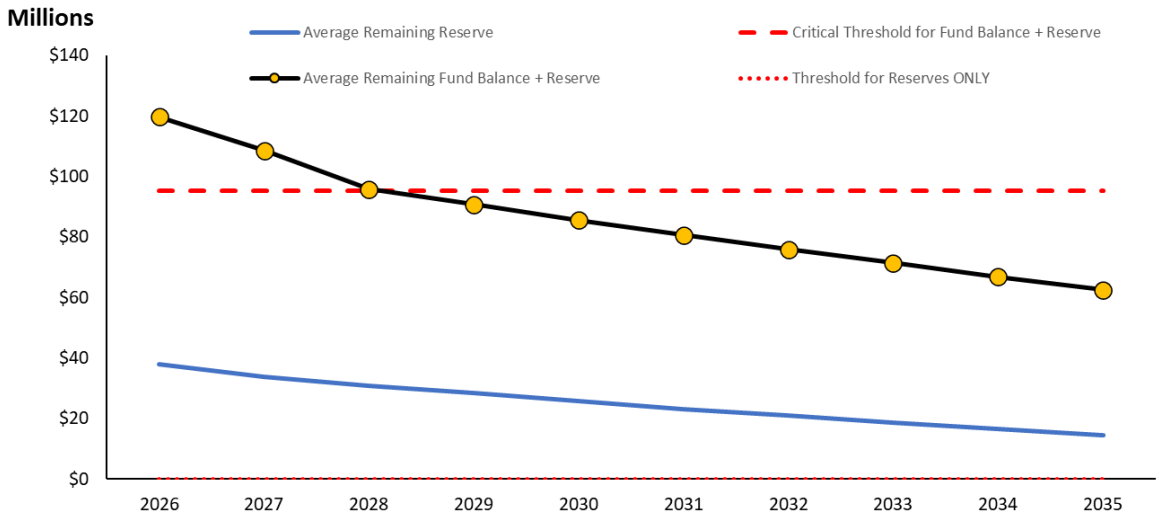
Exhibit 7.2 shows the average remaining fund balance and reserves each year. Perhaps unsurprising given the rising bars in Exhibit 7.1, Exhibit 7.2 shows the lines on a downward trajectory. It shows that the City's fund balance falls below the Aaa threshold, on average, in the fourth year of the analysis. On average, reserves stay above zero each year. Note that the threshold for reserves is set to zero, so the dotted red line that represents this threshold may be difficult to see because it overlaps the black line border that is also at the zero position.

Exhibit 7.2 – Simulated Remaining Fund Balance and Reserve each Year



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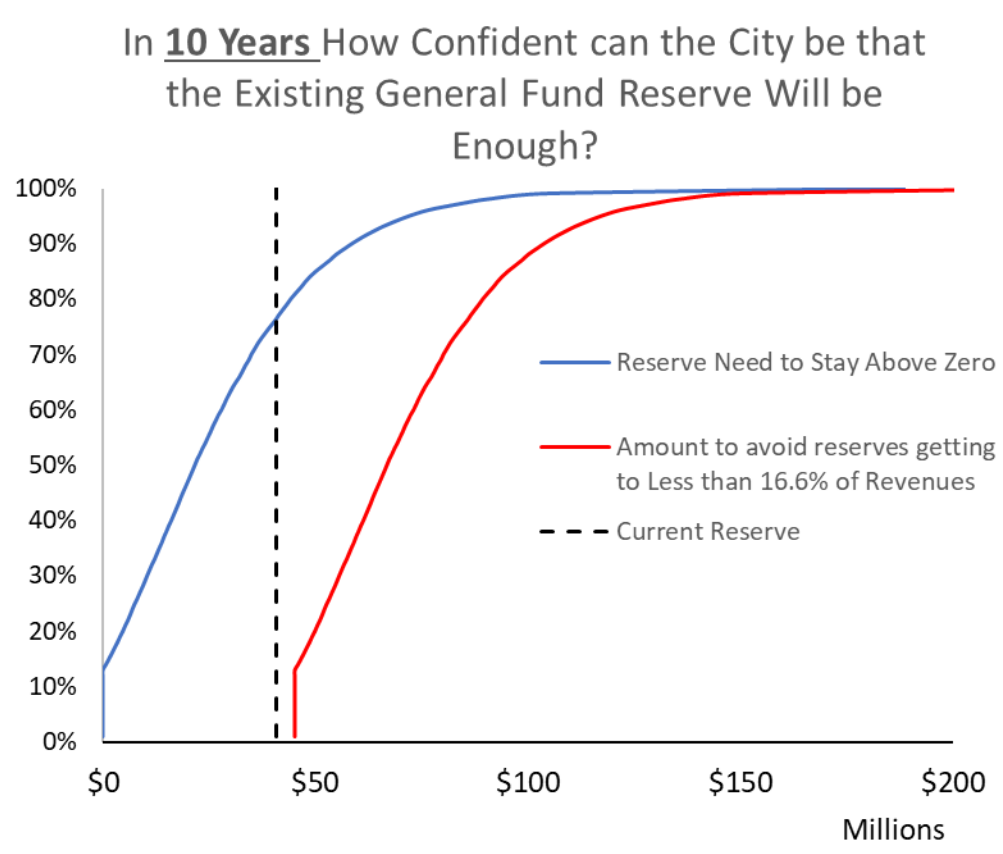
Finally, below is Exhibit 7.3. This is a cumulative probability chart. It shows the confidence available from varying levels of reserves. Berkeley's existing reserve intersects the blue line at about 80% confidence, which means there is an 80% chance that the City will have an amount of reserves greater than zero in the tenth year of the analysis. This is the other side of our earlier conclusion that there is about a 20% chance of the reserves being less than zero in year ten. This graphic adds an element for GFOA's rule-of-thumb on the minimum amount of fund balance a City should maintain, which is equal to at least 2 months (16.6%) of revenues.[43] Currently, the City is just short of that amount if we focus just on the City's reserves. Exhibit 7.3 shows the amount of money that would be needed in the reserve in year 1 to have a given level of confidence that reserves would remain above zero or 16.6% of revenues in year 10.

A key takeaway is that reserves have a diminishing return at a certain point because the flatter the line gets, the less confidence an additional dollar of reserve "buys" you. This is because the further to the right you go on the graph, the more extreme the events are that must be covered by reserves. This graphic shows that the City would still get a good "bang for the buck" from higher reserves than it has today. This City would not be as well served by accumulating reserves past the point where the line starts to flatten.

Exhibit 7.3 – Cumulative Probability Chart



[T]The GFOA rule of thumb concerns unrestricted fund balance of which reserves are typically a subset.

The implication of the line going flat is that not all points on the line are equally cost effective. Let's examine Exhibit 7.3 to illustrate. According to the graph, to be 90% confident of staying above the zero threshold requires a reserve of $58.7 million. To be 95% confident requires a reserve of $72.2 million, a difference of about $13.5 million from 90% confidence. To be 99% confident requires $104.9 million, which is about $32.7 million more than the amount required to be 95% confident. Thus, it is almost three times as much to "buy" a similar increase in confidence. This is the point where the line in Exhibit 7.3 goes flat, and it is not efficient to build reserves.

The City can use the results of this report to optimize the range of general fund reserves it would like to hold. GFOA recommends the City establish a floor and a ceiling amount of reserves. The ceiling is an amount of reserves the City will try not to exceed and a floor is an amount that the City will try not to go below and will try to replenish the reserves quickly if they do go below the floor. GFOA cannot recommend a precise amount of reserves the City should maintain, but our analysis does provide a clear general direction, and our risk model provides the ability to "stress test" different reserve strategies. The reason we cannot make a precise recommendation is that a big part of determining a desirable reserve amount is the "risk appetite" of City officials. Officials who are risk averse may prefer more reserves. Those who are less averse and perhaps more sensitive to the opportunity costs of holding reserves may prefer less.

City officials will also want to think about other factors to finalize the reserve target range. This is because Exhibit 7.3 cannot account for every possible factor that should go into deciding how much Berkeley should keep in its reserve. The numbers shown in the exhibit are what is needed to protect the City from just the risks described in this report and to keep the reserve above zero (and fund balance within Aaa territory). Usually, municipal governments have other concerns they expect their reserves to address. Here are examples of such concerns:

- There are risks that are sometimes called "unknown unknowns." These are risks that are totally unanticipated. Our risk model does include an "other hazards" simulation which should go a long way towards addressing unknown unknowns.
- Our Risk Model is based largely on historical data, which, by definition, does not capture the potential future impacts of climate change. It is impossible to say what the future impacts of climate change will be. This might suggest a more "risk averse" approach to reserves (i.e., maintaining more, rather than less).
- The City might wish to use fund balances for purposes other than mitigating risks – for example, building a capital project using cash financing. The Risk Model gives the City the ability to estimate the cost of potential projects to see the financial impact of redirecting reserves to other uses.[44] More broadly, City officials should consider opportunity costs of holding reserves: what are alternative uses of the funds and how do those benefits compare to self-insuring against the risks described in this report?

[44] Note that the City has historically done some level of cash financing of projects. The model already accounts for "normal" spending that takes place in the City's annual budget, so this feature of the Risk Model would be used for larger projects that exceed what might be considered "typical."

The considerations above could be addressed by choosing a robust floor and ceiling level for reserves. Different floors and ceilings can be "stress tested" by changing thresholds that the model measures against. GFOA's discussions with the City staff suggested a threshold of zero for reserves is useful for assessing the risk of exhausting the "self-insurance" capacity of its fund balance. We have used the zero threshold the Exhibits show in Section 7 of the report. The City could choose to vary this critical threshold, which would then change the total amount of reserves the City would need to maintain to achieve a given degree of confidence that reserves would stay above the threshold. For example, perhaps the City selects a threshold of 5% or 10% of revenues to provide a buffer against going all the way to zero.

Here are some other conclusions we can draw from the graphics presented on the previous pages:

- The City's ability to generate surpluses has a significant impact on the chances that fund balance and reserves go below thresholds. Later in the report we recommend a "structurally balanced budget policy" to help the City more consistently generate balanced budgets, if not surpluses.
- If the City does generate surpluses, it must then choose to direct those surpluses towards building the reserves. A one-time or volatile revenue policy, discussed in the recommendations later, could help in this regard.
- The City should remain mindful of the potential for extreme consequence events. A large earthquake could impair the taxbase. GFOA found that this caused the City's risk model to produce some extreme results. In Exhibit 7.3 the reader will notice that the red line extends very far to the right, past $200 million. This tells us that there is a small chance of some very extreme outcomes, due to the City's vulnerability to earthquakes and tax base impairment. Later in this document, we will discuss parametric insurance as an alternative to reserves to protect the City against these extreme cases.

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GFOA discussed all the factors above with the City staff and the conclusion of this discussion was that <u>the City of Berkely would be well served by a policy that calls for *general fund reserves* equal to between 20% and 30% of the City's revenues.</u> This gives the City between about 87% and 97% confidence of being able to handle the risks included in our analysis while also keeping the reserve above zero.

We could also compare the policy range to the City chances of staying above 17% of revenues, which is the equivalent of two months of revenues.[45] This amount of reserves is a long-standing rule of thumb in public finance. Reserves equal to 20% to 30% of revenue provide between a 26% and 73% chance of handling the risks included in our analysis while also keeping reserves above 17% of revenues. The tables below summarize what we just described.

GENERAL FUND RESERVE SUGGESTIONS RELATIVE TO STAYING ABOVE THE CRITICAL THRESHOLD		
CRITICAL THRESHOLD = 16.7% of Revenues or $44M		
A Reserve Policy typically expresses reserve targets as a percent of expenditures or revenues. Below we have converted the dollar figures to a percent of revenues.		
Dollars		Percent of General Fund Revenues
$53.5 Million	26% confident of staying above critical threshold over ten years	20%
$83.0 Million	73% confident of staying above critical threshold over ten years	30%

GENERAL FUND RESERVE SUGGESTIONS RELATIVE TO STAYING ABOVE ZERO		
A Reserve Policy typically expresses reserve targets as a percent of expenditures or revenues. Below we have converted the dollar figures to a percent of revenues.		
Dollars		Percent of General Fund Revenues
$53.5 Million	87% confident of staying above zero over ten years	20%
$83.0 Million	97% confident of staying above zero over ten years	30%

On the next page, we will discuss the context and rationale for this recommendation.

[45] 2 months of 12 months is the same as is 1 in 6. 1 in 6 is 16.67%, which rounded up is 17%.

For context, let's first recall that the City's reason for undertaking this study is to update its reserve policy in order ensure that its reserve targets are appropriate given the risks that the City faces. These recommendations provide that update.

Next, we are suggesting that the City think of its reserves as a range (a ceiling and floor) that it wishes to remain within. This contrasts with identifying a single target for reserves. The dynamic environment the City is within makes it very difficult to hit and maintain a single target number. It is more practical to manage within a range or boundary. The suggested floor is reserves equivalent to 20% of revenues and the ceiling is 30%.

As for rationale, first, the suggested range gives the City a very good chance of staying above zero reserves – an 87% chance, on the low end. As for staying above the two-month rule of thumb (reserves equal 17% of revenues), the chance is substantially less, but we believe this is acceptable for two important reasons. First, the two-month rule of thumb is loosely based on bond rating agency expectations. As we discussed earlier, the risk model addresses bond rating agency expectations directly. Hence, we'd suggest that the City keep its eye on the chances of missing bond rating agency expectations directly, instead of monitoring them indirectly via this rule of thumb. Secondly, the rule of thumb assumes the user has no additional knowledge of the exposure to risk. As this report has shown, we have a great deal of knowledge about the City's exposure to risk. Therefore, the City probably does not need the entire margin against risk that staying above the rule of thumb would provide.

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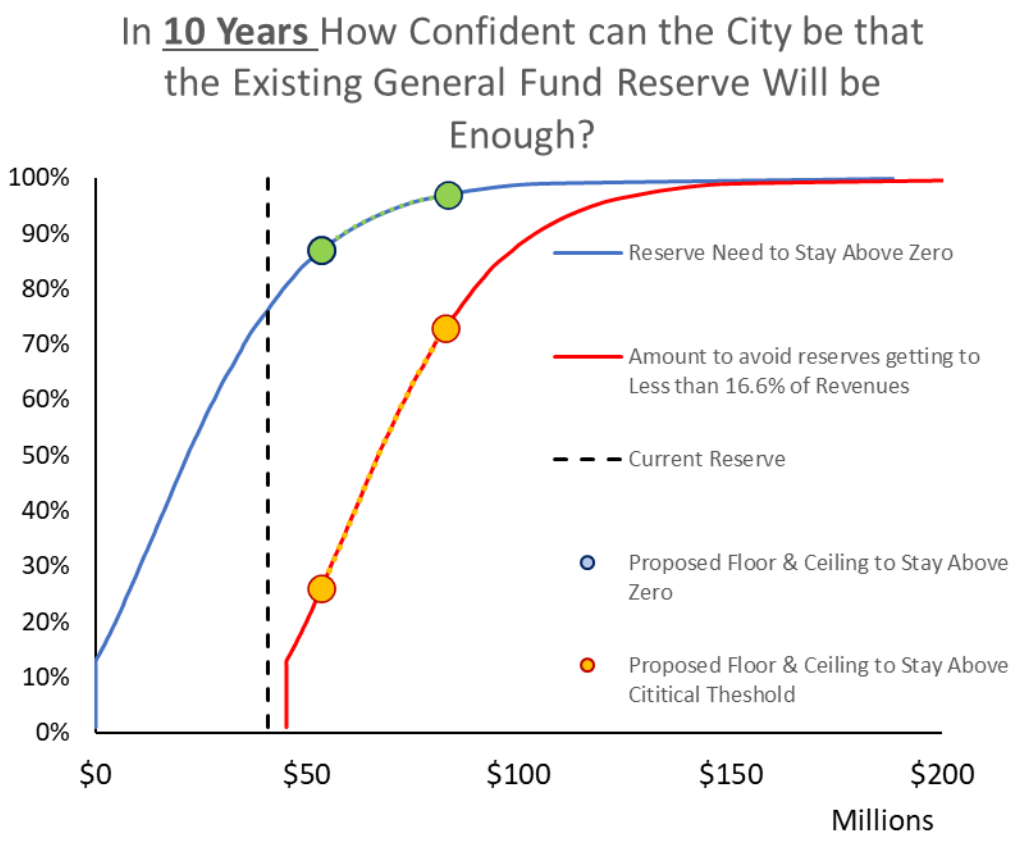
The other important rationale is the cost-effectiveness of this choice. The reader may recall Exhibit 7.3, which spoke to the cost-effectiveness of various levels of reserves. Exhibit 7.4 reproduces the same presentation but adds the recommended range of reserves to the curves. The reader may recall that when the curve starts to flatten out, we have reached the point of diminishing returns on the benefit of building reserves. In Exhibit 7.4, the colored dot that is furthest to the right on each curve is the ceiling and the leftmost dot is the floor. The ceiling dots and floor dots represent the same dollar amount on both curves – the ceilings and floors are at same points on the horizontal axis.

We see that we are starting to reach the flat portion of the blue curve (the reserve needed to stay above zero) but still have plenty of room on the red curve (the reserve needed to stay above 17%). This is a cost-effective range for the City because the City is avoiding the flattest part of the blue curve, while also staying on the steepest points of the red curve. As implied earlier, the red curve likely represents a more conservative standard, so it would be cost ineffective to reach the flat part of the red curve. Conversely, the blue curve is a less conservative standard, so even though the proposed reserve is not on the steepest part of the curve, the marginal benefit of additional reserves is still positive.

Exhibit 7.4 – Cumulative Probability Chart with Proposed Range of Reserves



To complement the reserve analysis, we offer the following additional recommendations:

The City should update its robust reserves policy. GFOA has conducted extensive research into what it takes for a local government to be financially sustainable. We call this body of work "Financial Foundations for Thriving Communities" (Financial Foundations). This research has shown that local governments require clear decision-making boundaries. A policy on the target level of reserves that the City should maintain, and the acceptable use of those reserves provides clear decision-making boundaries for reserves. This City has a robust policy in place to govern reserves. The most important potential refinement to the policy is that, as was discussed earlier, the policy could identify both a floor and ceiling for reserves, rather than just a single target number, as in the case with the current policy. Having a range defines the acceptable tolerances the reserves should stay within.

Another possible refinement is to combine the Stability Reserve and Catastrophic Reserve into a single reserve. The Risk Model treats all risks as part of the same City risk profile, so produces an analysis result that speaks to this comprehensive risk profile. Combining reserves is a form of risk pooling. Risk pooling works when you combine uncorrelated risks. Recessions and natural catastrophes are not highly correlated,[46] so the City should be able to realize efficiencies by combining those risks into a single reserve.

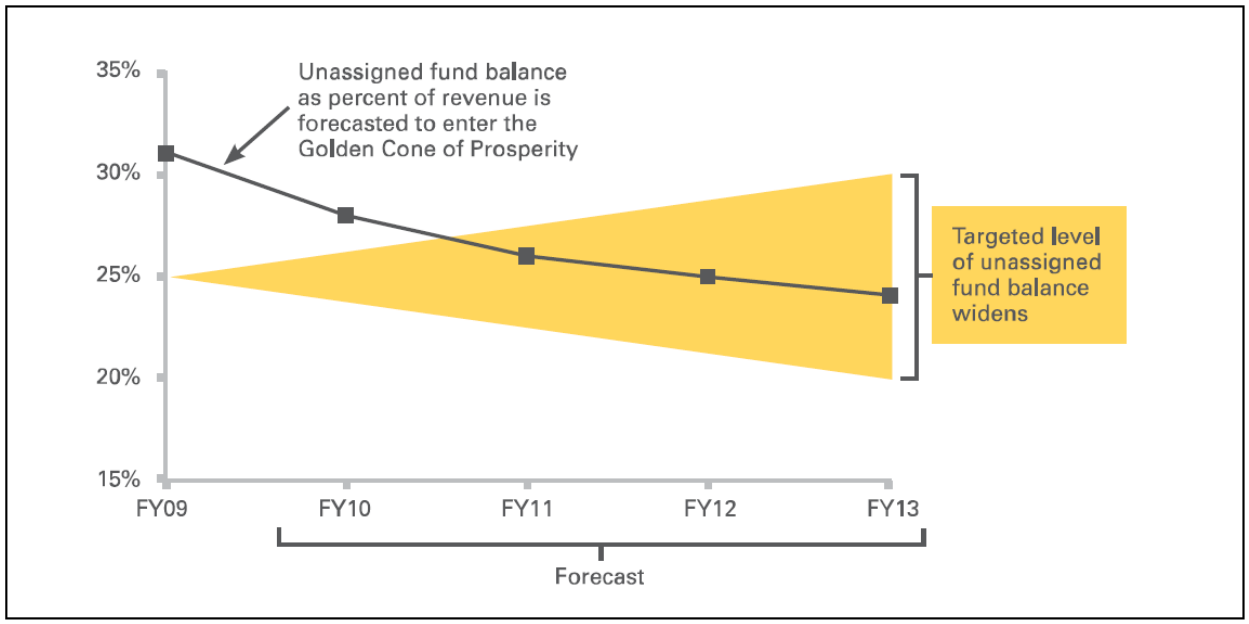
The City should adopt a mechanism to monitor its own compliance with the policy. GFOA's Financial Foundations research suggests that boundaries (e.g., financial policies) must be monitored to be fully effective.

The City of Tempe, Arizona provides a good example of how a reserve policy can be monitored. Tempe's policy is to maintain the general fund reserve equal to between 20% and 30% of general fund revenues. The general fund reserve policy is combined with Tempe's five-year financial forecast, where the goal is to keep reserves within the 20% to 30% boundary during the five-year forecast period. This approach originated in 2009 when Tempe had a policy to maintain reserves equal to 25% of general fund revenues. However, Tempe had been maintaining fund balances above 30%, which was causing some to question why Tempe was not in alignment with the policy and whether Tempe had a fund balance that was too large. The City Council and staff agreed to change the policy to set a goal for the reserves to be between 20% and 30% of revenues. This range would provide more discretion, but it would also create clear bounds for what Tempe would consider acceptable maximum and minimum reserves.

Tempe staff developed a presentation of Tempe's revenue forecast in the context of this new arrangement and informally called it the "Golden Cone of Prosperity." Exhibit 7.5 shows the presentation as it was in 2009, where the yellow cone representing the range of desired fund balance widens over the forecast horizon as the new policy is phased in and the black line representing actual fund balance gradually enters the cone.

[46] We stop short of saying uncorrelated because a big earthquake could impair the tax base, which might be like a hyperlocal "recession". The Risk Model accounts for this possibility.

Exhibit 7.5 —Tempe's Golden Cone of Prosperity in 2009



The meaning of the Golden Cone of Prosperity is straightforward, and its design and name give it a memorable character. As of 2020, Tempe staff still present the Golden Cone twice per year to help public officials understand the big picture and to show whether Tempe is staying within agreed-upon boundaries. This is a testament to the communicative power of the Golden Cone. Berkeley could develop a similar presentation to help make sure the City stays within its agreed upon financial boundaries.

Adopt a policy of objective forecasting and conservative budgeting. The City is projected to run deficits for the next few years. This places a stress on reserves. So, the question becomes: how can services be expanded without putting the City's finances at excessive risk? There are several budget policies and practices the City could adopt to support good public services while safeguarding its financial position at the same time.

- **Understand the risk of increasing on-going expenditures.** The risk of adding more services to the City budget is that it makes it more likely the City will run a deficit and need to cut back . So, the balance the City needs to find is: how much can expenditures be increased without incurring unacceptable risk? The City can adopt forecasting methods that highlight the risk of the City budget getting out of balance. The City can also adopt a range of policies to protect against this risk, as outlined below.
- **One-time revenue policy.** Limit the use of one-time, non-recurring revenues to one-time, non-recurring expenditures or to pay down liabilities (e.g., catching up on deferred asset maintenance, like a park, road, etc., or making additional discretionary payments to CalPERS to reduce unfunded actuarial pension liability). An example of a one-time, non-recurring revenue would be proceeds from a lawsuit or the sale of an asset.
- **Volatile revenue policy.** Some revenues, like sales taxes, are recurring, but they can go up and down substantially from year to year. A volatile revenue policy would treat extraordinarily high annual revenues from a volatile source as a one-time revenue. The bulk of the revenue income would be treated like a recurring revenue – it is just the extraordinary amount that would have

more limited uses. This protects the City from using peak revenues to over-invest in programs that must be supported for many years. The City already has a policy like this for its transfers tax. We are suggesting that such a policy be extended to cover other volatile revenues as well. This would serve to help the City maintain a stable, dependable set of on-going services over the long-term because it would help the City avoid over-expanding services beyond what is truly affordable.

- **Adopt a structurally balanced budget.** Cities are required to adopt a balanced budget by law. However, this just means financial sources must equal uses. So, for instance, City Hall could be sold off (a non-recurring revenue) and the proceeds used to hire more firefighters (a recurring expenditure). This would, of course, be a bad idea. A structurally balanced budget policy commits the City to balancing its recurring revenues and recurring expenditures and balancing its non-recurring revenues and expenditures, separately.
- **Adopt a phased schedule of spending on non-recurring expenditures and condition spending on forecasts being met**. As part of its budget, the City could adopt a prioritized list of one-time expenditures, in addition to its regular on-going expenditures. The total of the one-time and on-going expenditures would be equal to or less than the City's projected revenue. The one-time expenditures would then be made throughout the year, in priority order, and conditioned on revenues coming in as projected. If revenues underperform the City's forecasts, then the lower priority expenditures would not be made.
- **Adopt flexible strategies for providing on-going services.** It is unlikely that all the City's service goals can be met through one-time expenditures. New on-going services may be needed. The City could look for opportunities to adopt flexible service models, where costs can be scaled up or down. Contracted services often can provide flexibility that in-house staff cannot. This is not to say that in-house staffing is undesirable. There may be situations where in-house staffing is better, but there may also be opportunities where contracts can provide financial flexibility.
- **Affirmative reauthorization of spending.** The conventional approach to budgeting is that once a new service is authorized it is "baked in" to the budget and is funded year after year. This can lead to financial distress when new services are layered on top of old services. An alternative is to require affirmative reauthorization for a new service. This could be especially useful where a new service is intended to achieve some clear public policy goal. At the end of some set period, the City Council could be required to explicitly reauthorize funding based on whether the program is achieving its stated goals.

The City should consider further investments in cybersecurity. Cybersecurity is an emerging and growing threat for local governments. As we described earlier, available data suggests several sobering points:

- Local governments are an attractive target for cybercriminals and ransomware attacks against local governments are common.
- The amount of damage from an attack appears to only be weakly correlated to the size of the government. Data suggests that the average attack costs around $100,000 but attacks can and have cost local governments many millions of dollars. Even though Berkeley is not as large as cities that have made headlines for multi-million-dollar losses incurred by an attack, Berkeley could still suffer a substantial loss – perhaps more than its policy limits.
- Cyber insurance policies can get expensive and hard to come by when insurance markets harden.

Given the points above, the City might consider the following recommendations that have implication for the City's reserves:

- Continue planning for enhanced security and make cost-effective investments in cybersecurity controls that both: A) reduce the likelihood of a successful attack; and B) reduce the potential damages, if an attack succeeds. Because reserves are ultimately a form of self-insurance there could be a strong case for using some of the City's reserves to strengthen its cybersecurity. This is because a dollar invested in prevention is usually going to be more effective than a dollar invested in remediation.
- Be prepared to retain more risk on a cyber insurance policy. If policies get substantially more expensive (or, worst case, unavailable), Berkely could lower the cost by retaining more risk. This could be accounted for in the reserve amount. As we stated above, there is a plausible risk of a cyberattack costing the city more than $1 million. Therefore, "retention" of risk is not just the insurance deductible, but also includes the risk of a catastrophic attack that costs more than the policy limit.

For natural hazards consider "parametric" insurance in addition to traditional indemnity insurance. Indemnity insurance is the type of insurance that most governments have traditionally purchased, where the insurance corresponds to the value of the assets being insured and reimbursement is paid out after a certain deductible has been met. The advantage of traditional indemnity insurance is that there is a known damage threshold past which the City is covered.

Parametric insurance is a newer type of insurance for providing coverage for extreme events, having increased in popularity in the last 15 years or so in the public sector but has been in use in the private sector for decades. Parametric coverage provides the policyholder (the City) with a payment amount that is defined ahead of time, should a defined event come to pass (an earthquake of a certain magnitude). Parametric insurance could be more useful for providing an injection of liquidity because the policyholder receives the defined payment immediately upon verification by a third-party that the given event occurred, which usually would be within a matter of days. As a simple illustration, a parametric policy might provide the City of Berkeley with $5 million upon the occurrence of an earthquake of some given magnitude, after magnitude is verified by a third-party, such as the USGS. This feature of parametric insurance also eliminates much of the administrative hassle that would be associated with a traditional indemnity policy (e.g., working with claims adjusters). A final advantage is that the proceeds from the policy payout are completely fungible – the City could use them to fund whatever service it deems necessary or to counteract revenue loss from tax base impairment, whereas indemnity policies might require the policyholder to use the funds to repair or replace the asset that was insured. Parametric policies are not without their drawbacks, though, and are not a substitute for traditional insurance. The City can learn more about parametric policies in the publicly available GFOA research report "Parametric Insurance: An Emerging Tool for Financial Risk Management."[47]

A robust insurance strategy could make use of both traditional indemnity and parametric insurance. For example, traditional indemnity insurance could be used to protect against loss of the City's assets, while parametric insurance could be used to compensate the City for the losses in tax revenue it would experience from an impaired tax base, for instance.

[47] Available at: https://www.gfoa.org/parametric-insurance/.

The City could consider a robust internal borrowing policy. There will always be some chance that Berkeley could find that it needs access to more financial resources than are available in its reserves. GFOA's research suggests that interfund borrowing could be a practical "last line of defense" in emergency circumstances. Some other funds might be able to make short-term loans to the general fund in case of an emergency. The City could develop policies to provide the flexibility to use these borrowing tools while also providing the necessary guidelines and limitations to ensure that borrowing occurs in a fiscally prudent manner.

Berkeley might consider if a policy could recognize internal borrowing's role as a supplementary risk management tool. A policy would "pre-position" the City to better respond to an extreme financial catastrophe. A policy could address the following points:

- The rationale for using internal borrowing (reserves may not be able to handle every possible contingency).
- When internal borrowing may be used (if reserves are ever exhausted by an extreme event).
- Differentiate between short-term (to be paid back within the same fiscal year) and long-term borrowing.
- How the interest on the borrowing will be calculated (can have multiple alternatives to be determined on a case-by-case basis); and
- General repayment terms (e.g., interest only, fully amortized, duration, etc.).

GFOA's analysis has its limits. It is impossible for any risk analysis to be completely comprehensive of all considerations facing the City. Appendix 1 to this report lists the important limitations of this analysis.

Appendix 1 – Limitations of GFOA's Analysis

This section highlights the most important limitations of our analysis.

Our analysis is not predictive. GFOA does not forecast future recessions, natural disasters, or other extreme events. Rather, our model generates hundreds or even thousands of different scenarios to show how the future could unfold. This helps the City think more broadly about risk so that it can be more prepared for whatever future event does eventually come to pass. Finally, it is important to note that low probability events are still possible events. Hence, even if our model says an event has a low probability, then that does not mean it won't occur.

GFOA is not a risk management consultant. We worked with the City to find out which risks the City believes are most salient and then modeled those risks quantitatively to judge the potential financial impact. We are not risk managers and it is not our role to tell the City which risks it should be more concerned about or less concerned about or what the best way is to manage those risks.

Our analysis is based on historical records. Historical data is often a good way to model potential future outcomes. However, historical data may not be perfect. For example, global climate change could increase the City's vulnerability to naturally occurring extreme events.[48] This means that historical data could underestimate the likelihood and/or severity of extreme events in the future. Unfortunately, no one can say precisely what the impact of climate change will be. Hence, GFOA can't speculate if an upward adjustment to the reserves is necessary and, if so, by how much. However, this does mean that there could be a case for reserving a higher amount than the efficient range described in our report (or pursuing other risk management strategies). Also, GFOA's Microsoft Excel Risk Model provides the City with the ability to adjust the likelihood and/or magnitude of many types of natural catastrophes. This feature could be used to test different scenarios, including ones where climate change is assumed to increase the likelihood and/or magnitude of extreme events.

Our analysis is not inclusive of every risk the City could possibly face. We examined the City's history and worked with City staff to identify the risks that posed the most clear and present danger to the City. However, it is possible that the City could experience a shock that no one was expecting. Hence, there is a case for reserving more than our analysis suggest is efficient. This could provide additional protection against risks that no one can foresee. Being prepared for these "unknowable" events is part of the value of the "red line" or critical threshold that our reserve analysis considered. Our model also includes an "other hazards" simulation to account for completely unanticipated risks. However, this does not mean that the City doesn't need to prepare for risks that aren't specifically included in our model.

[48] According to the Fourth National Climate Assessment created by the U.S. Global Change Research Program (USGCRP) and released in November 2018: "more frequent and extreme weather and climate-related events, as well as changes in average climate conditions, are expected to continue to damage infrastructure, ecosystems, and social systems." The report cites climate-related risks to communities "from adverse weather and climate related events such as extreme storms or wildfires." https://nca2018.globalchange.gov/chapter/1/.

Our model is focused on general fund reserves as a risk mitigation tool. Other mitigation tools, such as insurance, can provide additional resources to respond to an extreme event. We did not judge the adequacy of the City's insurance program.

Good decisions do not always lead to good outcomes. Excel simulation tools can enhances one's perception and understanding of uncertainty and risk.[49] However, when dealing with uncertainty, even the best decision may not lead to a good outcome, if luck goes against you.[50] To illustrate, imagine an insurance company was willing to sell Berkeley an insurance policy against being hit by a meteor for $50 million. A meteor strike is an extremely remote risk, so spending $50 million on an insurance policy would not be a wise decision. Imagine Berkeley does then get hit by a meteor that causes $100 million in damage. Should you criticize the decision not to buy insurance? No, because the decision was reasonable given the information available at the time and there was no way to predict a meteor hitting the City. Similarly, our model may show that a given amount of reserves is reasonable under most conditions, but Berkeley could encounter a confluence of undesirable events that the reserves are insufficient to address.

[49] To survive in an increasingly unpredictable world, we need to train our brains to embrace uncertainty, Emre Soyer, Quartz Magazine, January 9, 2017 https://qz.com/879162/to-survive-in-an-increasingly-unpredictable-world-we-need-to-train-our-brains-to-embrace-uncertainty/.

[50] This is one of the primary lessons in: Annie Duke. *Thinking in Bets: Making Smarter Decisions When You Don't Have All the Facts*. Portfolio. 2019.

Audit Status: Fleet Replacement Fund Short Millions

- Equipment Replacement Fund Health
- Equipment Replacement Plan including Electric Vehicles
- Challenges
- Next Steps

Audit Status: Equipment Replacement Fund Health

- 671 Fund Balance:
- FY2019 - $7,429,630, now FY2025 - $19,741,742
- Annual budgeted amount for replacement through Internal Service Fund (ISF) $4,754,926.00
- Actual contributions by Departments through ISF for replacement

2022	2023	2024	2025
$ 7,662,840.55	$ 8,810,380.86	$ 9,283,202.75	$ 5,578,025.53

- Amount spent or currently encumbered from Fund 671 on Equipment Replacement since FY2019 - $50,305,869

Audit Status: Equipment Replacement Fund Health (cont.)

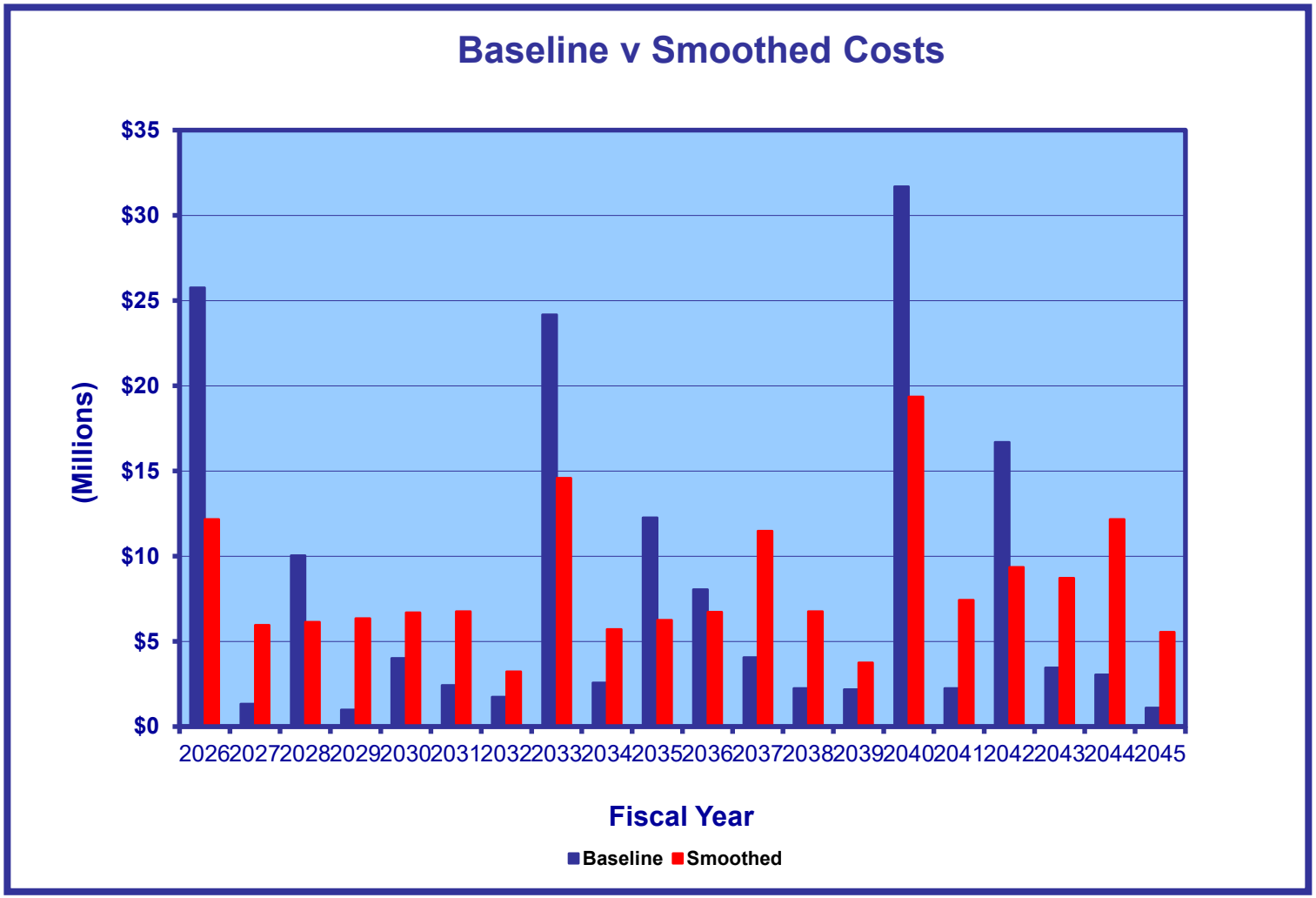
Other expenses to Fund 671 – not collected

- Transfer to Fund 672 for Operating Expenses
  - FY2024 $500,000 in FY2024, FY2025 - $2,000,000
- AssetWorks Software
- New to Fleet vehicles purchased but did not reimburse Fund 671 due to asset already being capitalized
- Upfitting of vehicles not able to be captured fully in FUND$ and assigned to the vehicle
- Staffing

Audit Status: Equipment Replacement Plan

Fleet Replacement Statistics	
Current Number of vehicles & equipment	631
Current replacement cost of the entire fleet	$44.8 M
Current Average Age	10.6
Years of replacement backlog based on average annual replacement cost	5.1
Years of replacement backlog based on average annual value of replacement purchases	7.0
Average number of units to be replaced each year	68
Average percent of fleet to be replaced each year	10.7%
Historical average number of units replaced each year (FY2020-24)	46
Historical average percent of fleet replaced each year (FY2020-24)	7.4%

Audit Status: Equipment Replacement Plan



Audit Status: Equipment Replacement Plan (cont.)

- EV Infrastructure 5 Year Plan – estimated to be $4,056,030

  - 201 University Phase 1 (Marina)
  - 1 Bolivar Phase 1 (ACS)
  - 1201 Second Phase 1 (TS)
  - 125 University Phase 1 (Parking Enforcement)
  - 1326 Allston Phase 1 (Corp Yard)
  - 2029 Berkeley Phase 1 (FS 2)
  - 2100 MLK Phase 1 (PSB)
  - 2640 MLK Phase 1 (HHCS Mental Health)
  - 2939 Ellis Phase 1 (SBSC)
  - 997 Cedar Phase 1 (Fire Training)

Audit Status: Challenges

- Availability of Vehicles to purchase
- Timelines for replacement
- 5-Year CIP Plan for Replacement – too rigid, pivot to 2-year budget cycle with reconciliation of planned purchases versus actual
- Insufficient staffing for vehicle and equipment procurement
- Lack of transparency with FUND$
- Delays in AssetWorks Implementation

Audit Status: Next Steps

- Launching the Fleet Vehicle Allocation Methodology (VAM) (Optimization Survey) for vehicle end users and managers by 3/7/2025
- Develop an updated fully inclusive chargeback rate model for Equipment Replacement and Equipment Maintenance
- Add Key Positions to mid-cycle budget update to support Equipment Replacement and AssetWorks Implementation
- Finish AssetWorks implementation - errors with month end billing process. Waiting on AssetWorks for an update
- Finalize Fleet Policies and Procedures including replacement and new to fleet requirements which includes a new Administrative Regulation

Office of the City Manager

INFORMATION CALENDAR
December 10, 2024

To: Honorable Mayor and Members of the City Council

From: Paul Buddenhagen, City Manager

Submitted by: Terrance Davis, Director, Public Works

Subject: Audit Status Reports: Fleet Replacement Fund Short Millions and Rocky Road: Berkeley Streets at Risk and Significantly Underfunded

INTRODUCTION

On November 19, 2020, the City Auditor published the Rocky Road: Berkeley Streets at Risk and Significantly Underfunded Audit Report,[1] reviewing the funding resources to sufficiently maintain City streets, and asking if Public Works has clear policies and processes to guide paving decisions.

On June 2, 2021, the City Auditor published the Fleet Replacement Fund Short Millions Audit Report,[2] reviewing the sufficiency of the fund to replace vehicles and asking if Public Works has key information necessary for managing the fleet program.

This is the third status report to City Council on the efforts made to implement the Audit Report's recommendations for both streets paving and fleet. Previous reports were issued on November 3, 2022[3] and March 19, 2024.[4]

CURRENT SITUATION AND ITS EFFECTS

The street paving audit report included two findings and five recommendations for the Public Works Department and its Engineering Division and Administrative & Fiscal Services Division to review, implement and report to Council. As of this report, three recommendations have been implemented and two recommendations have been partly implemented. All recommendations currently tracking as partly implemented require

[1] https://berkeleyca.gov/sites/default/files/2022-01/Rocky-Road-Berkeley-Streets-at-Risk-and-Significantly-Underfunded.pdf
[2] https://berkeleyca.gov/sites/default/files/2022-01/Fleet-Replacement-Fund-Short-Millions.pdf
[3] https://berkeleyca.gov/sites/default/files/documents/2022-11-03%20Item%2044%20Audit%20Status%20Reports%20Fleet%20Replacement.pdf
[4] https://berkeleyca.gov/sites/default/files/documents/2024-03-19%20Item%2013%20Audit%20Status%20Reports%20%20Fleet%20Replacement%20Fund%20Short%20Millions.pdf

funding source availability for appropriation to streets.

The fleet audit report noted two findings and twelve recommendations for the Public Works Department and its Equipment Management Division and Administrative & Fiscal Services Division to review, implement and report to Council. As of this report, there are updates to the status of ten of the twelve recommendations. The first set of seven recommendations were related to the underfunding of the Equipment Replacement Fund. One has been started and six have been partly implemented. The second set of five recommendations focused on Public Works having critical information available to inform management and decision making, and all five recommendations under this finding have been partly implemented.

These Audit Status Reports support the Strategic Plan Priority of advancing our goal to provide state-of-the-art, well-maintained infrastructure, amenities, and facilities. The attachment provides a detailed table of audit report recommendations, steps towards corrective action, and implementation progress updates. The next status report for the fleet and street paving audit are expected to be presented in Fall 2025.

BACKGROUND

Public Works' Engineering Division is responsible for capital projects to maintain over 216 centerline miles of streets in the City, while the Streets & Utilities Division handles day-to-day maintenance of those streets.

Public Works' Equipment Management Division manages the maintenance, purchase, and replacement of the City's 585 assets such as fleet vehicles, heavy duty trucks and large equipment, including public safety, fire, and alternative fuel vehicles and equipment.

The Administrative and Fiscal Services Division is responsible for the Department's budget and fiscal oversight and analytical support for routine and special projects in all Public Works operating divisions.

ENVIRONMENTAL SUSTAINABILITY AND CLIMATE IMPACTS

Public Works Equipment Maintenance always endeavors to procure electric vehicles or the most fuel-efficient vehicles and equipment that are suitable for the required tasks. Equipment Maintenance also researches the feasibility and availability of fully electric vehicles and hybrid-electric powertrains to support the City's transition away from fossil fuels towards an all-electric fleet.

Enhanced streets provide significant benefits for all users and are a key focus of Public Works' Engineering Division. By improving infrastructure, we encourage more sustainable modes of transportation, such as bicycling and walking, which in turn help reduce greenhouse gas emissions and contribute to healthier, more vibrant communities. Additionally, these projects often incorporate green infrastructure elements, such as permeable pavement and bioswales, designed to filter pollutants and manage stormwater. This ensures that runoff is cleaner and better managed before it enters the Bay, helping to protect our waterways and support long-term environmental sustainability. Through these improvements, we prioritize the safety, accessibility, and

ecological health of our urban spaces.

POSSIBLE FUTURE ACTION
Public Works will continue to address the remaining two partly implemented recommendations in the street paving audit and the twelve started and partly implemented recommendations in the fleet audit.

FISCAL IMPACTS OF POSSIBLE FUTURE ACTION
In the mid-Biennial Budget update a new rate model for Equipment Maintenance will be proposed to include the cost of fleet electrification. It is estimated that the additional costs to convert the planned replacement vehicles to all electric in the next five years $9,000,000. For the corresponding infrastructure required to support this conversion, the installation of chargers will cost the an estimated $6,500,000.

In the biannual budget adoption for FY 2023 and FY 2024, Council approved a funding guideline to approve an $8,000,000 annual increase to street paving funding in future fiscal years (plus annual CPI adjustments). This funding is intended to raise paving funding to levels sufficient to maintain current pavement condition. Significant additional funding would be needed to be allocated over several years to raise the pavement condition index (PCI) to 70-75 or “Good” status.

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Attachments:
1. Fleet Audit Findings and Recommendations Response Report
2. Street Audit Findings and Recommendations Response Report

Audit Title: Fleet Replacement Fund Short Millions					
Issue Date: June 2, 2021					
Finding	**Recommendation**		**Department**	**Previous status update**	**Current status update**
The Replacement Fund is underfunded by millions of dollars.	1.1	Calculate the dollar value of the City's replacement needs. Use results from the recent rate study to adjust departments' replacement fees to cover their share of the costs associated with vehicle replacement, including customization and personnel.	Public Works	Partly Implemented	Partly Implemented: Public Works is updating the replacement costs in AssetWorks, the new fleet management software, to accurately reflect current amortization values. The ongoing amortization charges, which will include upfitting expenses, are passed on to the end user departments. Additional charges are still being calculated which include personnel and electric vehicle charging infrastructure. Billing for and collecting for these additional charges will be presented to the Budget Office and City Departments as part of the next mid-biennial budget update in 2025.
The Replacement Fund is underfunded by millions of dollars.	1.2	Conduct an analysis of the City's current fleet and determine the optimal fleet size to provide services efficiently and effectively. This analysis should include fleet units identified as reserve, backup, and "pool" vehicles. The outcome of the analysis should be a plan to achieve and provide funding for the optimal fleet size.	Public Works	Started	Started: City Council approved a contract for Mercury Associates to conduct the fleet assessment study on November 21, 2023. The contract was executed in February 2024. Mercury delivered a draft fleet assessment in September 2024 and anticipates it to be finalized in November 2024. The assessment recommends the City conduct a right-sizing and right-typing study of the fleet. Public Works has begun this process by drafting a questionnaire for staff best suited to assess each vehicle's use.

The Replacement Fund is underfunded by millions of dollars.	1.3	Work with the City Manager's Office to adjust the funding model of the Equipment Replacement Fund or adopt a new one to ensure appropriate funding for timely fleet replacement, such as annually transferring money from the General Fund based on an assessment of the City's overall fleet needs and priorities. Expand the current vehicle and equipment replacement policy to ensure transparency of key provisions of the new or updated model.	Public Works	Started	Partly Implemented: Public Works updated its fund rate models based on FY 23 actuals and will update again for presentation of the new rates for adoption during the next mid-biennial budget adjustment in 2025. Public Works leadership and representatives from other separtments will work with Mercury Associates to finalize an Equipment Replacement Policy which will address new to fleet purchases, and clearly identify a process for keeping vehicles for a limited time after replacement or for motor pool usage. Anticipated draft completion is December 2024 with a recommendation to have the policy become an Administrative Regulation with adoption in the spring of 2025.
The Replacement Fund is underfunded by millions of dollars.	1.4	Revise the vehicle and equipment replacement policy to include that Public Works should regularly assess the personnel expenditures related to vehicle and equipment replacement and ensure that they are appropriate and proportional to their duties.	Public Works	Started	Partly Implemented: Public Works leadership and department representatives will work with Mercury Associates to finalize an Equipment Replacement Policy which will address new-to-fleet purchases, and clearly identify a process for keeping vehicles for a limited time after replacement or for motor pool usage. Anticipated draft completion is December 2024 with a recommendation to have the policy become an Administrative Regulation with adoption in the Spring of 2025. Personnel expenditures that are currently being allocated to the Equipment Replacement Fund will be evaluated annually as part of the budget update process.

The Replacement Fund is underfunded by millions of dollars.	1.5	Revise the vehicle and equipment replacement policy to prevent replacing unfunded vehicles by ensuring that contributed funds are available for the purchase.	Public Works	Started	Partly Implemented: Public Works leadership and department representatives will work with Mercury Associates to finalize an Equipment Replacement Policy which will include provisions to prevent replacing unfunded vehicles by ensuring that contributed funds are available for the purchase. Anticipated draft completion is December 2024 with a recommendation to have the policy become an Administrative Regulation with adoption in the spring of 2025.
The Replacement Fund is underfunded by millions of dollars.	1.6	Develop an AR that clarifies PW's responsibilities to manage the fleet and maintain fleet replacement funding. Include the following provisions: Provide an analysis of the impact on fleet replacement and overall costs when the City considers reallocating replacement funds or stopping payments into the Fund. Provide documented justification when deciding to use the ERF for non-replacement needs. The decision must be supported with a documented cost analysis from Public Works showing potential impact of insufficient funds on fleet replacement. See Audit report for full recommendation.	Public Works	Started	Partly Implemented: Public Works leadership and department representatives will work with Mercury Associates to finalize an Equipment Replacement Policy which will address the recommended provisions. Anticipated draft completion is December 2024 with a recommendation to have the policy become an Administrative Regulation with adoption in the spring of 2025. Additional meetings will be scheduled with Budget office to ensure passage of an updated rate model as part of the budget process.

The Replacement Fund is underfunded by millions of dollars.	1.7	To help secure the funding needed for transitioning to electric vehicles by 2030, work with the City Manager's Office to develop a budgetary plan to purchase electric vehicles. The plan should align with the City's fleet electrification goals and take into consideration the current economic downturn, funding availability, available infrastructure, and electric vehicle availability.	Public Works	Started	Partly Implemented: The Electrical Mobility Coordinator oversaw the grant submission to support fleet electrification. Berkeley was not awarded the grant as it primarily went to counties. The Electric Mobility Coordinator together with AVA Energy and Frontier Energy completed an assessment which provides a plan for charging infrastructure, vehicle transition, and costs. The Division and a variety of fleet users continue to meet with EV manufacturers to discuss purchase options. EV charging infrastructure is currently proposed to be funded by the Equipment Replacement Fund with reimbursement to the fund from an updated rate model. PW anticipates using state rebates through CORE and HVIP programs. Current estimated infrastructure expenses to upgrade charging infrastructure at City Facilities is $6.5 million with $9 million for EV purchases.

Public Works lacks information on vehicle and equipment replacement for decision making.	2.1	Conduct a needs assessment of vehicles overdue for replacement and create a plan that documents a timeline and cost for replacement. Report the findings to City Council.	Public Works	Started	Partly Implemented: Funding for replacement of backlog vehicle purchases was included in the FY 25 and FY 26 budgets along with scheduled replacements for those years. Additionally, as part of the annual appropriation ordinance process, funding was requested to ensure continued funding for vehicle replacement. As part of the work Mercury Associates is doing on behalf of the Equipment Maintenance Division, the Equipment Replacement Policy will outline replacement timelines and requirements. The Fleet Electrification Assessment from AVA Energy and Frontier Energy provides a Transition Calculator that outlines the expenses and timelines. The Fleet Electrification Assessment and the transition calculator were finalized in October 2024.
Public Works lacks information on vehicle and equipment replacement for decision making.	2.2	Update the vehicle and equipment replacement policy to include criteria for prioritizing fleet replacement. The policy should include a requirement to communicate a delay in replacement of their fleet to affected departments. In Administrative Regulation described in recommendation 1.6, specify that the vehicle and equipment replacement policy should include such criteria.	Public Works	Started	Partly Implemented: Public Works leadership and department representatives will work with Mercury Associates to finalize an Equipment Replacement Policy which will include language supportive of the recommendation. The final Policy will be reviewed by the City Manager's Office. Anticipated draft completion is December 2024 with a recommendation to have the policy become an Administrative Regulation with adoption in the spring of 2025.

Public Works lacks information on vehicle and equipment replacement for decision making.	2.3	Work with the vendor of the new fleet management system to configure it to address the data issues identified in this report, including: - Tracking Replacement Funds collected and leftover funds by department; - Zeroing out the balance after a vehicle is replaced; - Adjusting the replacement date and reporting the rationale if a replacement is deferred; and - Displaying any information needed to prioritize replacements based on specified criteria.	Public Works	Started	Partly Implemented: Public Works AssetWorks fleet management software launched in spring 2024. Reporting on vehicle replacement will be more thorough as the vehicle usage and maintenance costs will be more readily available. All vehicles that have been replaced have zeroed out the amortization balance. Mercury Associates will provide additional recommendations on the rationale for replacement that will be included in the replacement policy.
Public Works lacks information on vehicle and equipment replacement for decision making.	2.4	Clean and update the vehicle and equipment database before migrating it to the new fleet management system to ensure accuracy and data integrity.	Public Works	Started	Partly Implemented: Public Works AssetWorks fleet management software launched in spring 2024. Fleet team is still running the two systems, AssetWorks and FUND$ side by side until the new system is fully operational. Multiple physical inventories have been taken during 2024 to ensure accuracy of the vehicle and equipment data in AssetWorks, which is anticipated to be finalized by the end of 2024.
Public Works lacks information on vehicle and equipment replacement for decision making.	2.5	Update the vehicle and equipment replacement policy or develop a separate policy to require staff manage the City's data appropriately to ensure accurate complete information to support management decisions.	Public Works	Started	Partly Implemented: Public Works leadership and department representatives will work with Mercury Associates to finalize an Equipment Replacement Policy which will include language supportive of the recommendation. Anticipated draft completion is December 2024 with a recommendation to have the policy become an Administrative Regulation with adoption in the spring of 2025.

Audit Title: Rocky Road: Berkeley Streets at Risk and Significantly Underfunded					
Issue Date: November 19, 2020					
Finding	**Recommendation**		**Department**	**Previous status update**	**Current status update**
Without significant additional funding, Berkeley streets will continue to deteriorate and deferred maintenance costs will increase.	1.1	Annually, conduct a budget analysis, based on the deferred maintenance needs at that point in time, to determine what level of funding is necessary to achieve the desired goals of the Street Rehabilitation Program. Report findings to City Council. This information will be helpful during updates to the Five-Year Street Rehabilitation Plan and during the budgeting process.	Public Works	Partly Implemented	Partly Implemented: The City conducts budget analysis of deferred maintenance needs through the citywide paving condition survey funded by a grant from the Metropolitan Transportation Commission (MTC), which occurs every two years. The City reports these findings biannually to the City Council through the Five-Year Paving Plan adoption and the CIP Budget Development process. The City has not yet met the requirement for an annual analysis and reporting. Public Works plans to engage a consultant to inventory deferred maintenance needs and estimate associated costs for the years between the PCI survey.

Without significant additional funding, Berkeley streets will continue to deteriorate and deferred maintenance costs will increase.	1.2	Identify funding sources to achieve and maintain the goals of the Street Rehabilitation Program.	Public Works	Partly Implemented	Partly Implemented: The City has a baseline annual paving budget of $7 million, with an additional $8 million commitment (adjusted for inflation) secured in 2022. The remaining years in the 5-year plan are expected to receive $8 million annually, adjusted for inflation. Revenue from Zero Waste rates (estimated at $1–2 million annually) will help address pavement wear caused by refuse vehicles, and stormwater funds will cover half of green infrastructure costs. Additionally, a one-time $3.95 million from Measure T1 Phase 2 is allocated for FY 2025–2026. Measure FF, as approved by voters in November 2024, may provide approximately $15 million annually for 14 years in funding for: (from the ballot language) "street, sidewalk, and pedestrian path repair, repaving and reconstruction, safety improvements, and environmental infrastructure." Achieving an average Pavement Condition Index (PCI) of 70 requires an estimated $42 million annually over the next 12 years.
The Streets Rehabilitation and Repair Policy is out-of-date and Public Works is not following it.	2.1	Update the Street Rehabilitation and Repair Policy annually and define who is responsible for ensuring the Policy is updated, as stated in the Policy.	Public Works	Implemented	Implemented: Public Works Commission approved a Street Rehabilitation and Repair Policy March, 2021, which was received and revised after consideration at the FITES Commission in May 2021, and ultimately adopted by City Council on January 25, 2022. The Policy and Five Year Paving Plan were considered and adopted on the same Council agenda. The Street and Maintenance Policy shall be adopted by City Council at a minimum interval of 5 years, after review by the Transportation and Infrastructure Commission.

The Streets Rehabilitation and Repair Policy is out-of-date and Public Works is not following it.	2.2	When updating the Street Rehabilitation and Repair Policy, incorporate equity to align with Vision 2050 and clearly define how it will be applied to the street maintenance and rehabilitation planning process.	Public Works	Implemented	Implemented: The updated Street Rehabilitation and Repair Policy was adopted with clear language placing Equity as an objective. The updated Policy can be viewed here: https://berkeleyca.gov/sites/default/files/2022-04/Street%20Maintenance%20and%20Rehabilitation%20Policy_01_25_2022.pdf.
The Streets Rehabilitation and Repair Policy is out-of-date and Public Works is not following it.	2.3	Define goals and performance measures to guide the Street Rehabilitation and Repair Policy and Street Rehabilitation Program that align with other plans and policies relevant to street paving (e.g., Complete Streets Policy, Vision 2050, etc.). Regularly report to Council on performance measures.	Public Works	Implemented	Implemented: Performance Metrics are included as a major part of the adopted Specific Policy. Key areas: 1) The goal is to get to standard PCI of 70 for roadways: Arterials, Collectors, Bus Routes, Bikeway Network, and Equity Zone. 2) Funding should be prioritized with Equity in mind 3)Performance metrics reporting will be included with the biannual Paving Plan review. The updated policy can be viewed here: https://berkeleyca.gov/sites/default/files/2022-04/Street%20Maintenance%20and%20Rehabilitation%20Policy_01_25_2022.pdf.

Office of the City Manager

On May 23, 2023, the City Council adopted the recommendation outlined in this staff report, referring to the Budget and Finance Policy Committee to prioritize funding to the vehicle replacement fund to make up the shortfall over time in order to stabilize the fund.

CONSENT CALENDAR
May 23, 2023

To: Honorable Mayor and Members of the City Council

From: Dee Williams-Ridley, City Manager

Submitted by: Liam Garland, Director, Department of Public Works

Subject: Audit Status Reports: Fleet Replacement Fund Short Millions & Rocky Road: Berkeley Streets At Risk and Significantly Underfunded

POLICY COMMITTEE RECOMMENDATION

On April 13, 2023, the Facilities, Infrastructure, Transportation, Environment & Sustainability Committee adopted the following action: M/S/C (Hahn/Robinson) to send the item to City Council with a positive recommendation that Council:
1. Refer to the City Manager to establish a policy that the Public Works Department will be responsible for reviewing, submitting, and approving all departmental requests to Council for adding new vehicles to the fleet to facilitate maximum cost recovery through the vehicle replacement fund, consistency with fleet rightsizing studies, oversight, and timely electrification of the fleet.
2. Refer to the Budget and Finance Committee to prioritize funding to the vehicle replacement fund to make up the shortfall over time in order to stabilize the fund.
Vote: All Ayes.

INTRODUCTION

On November 19, 2020, the City Auditor published the Rocky Road: Berkeley Streets at Risk and Significantly Underfunded Audit Report[1], reviewing the funding resources to sufficiently maintain City streets, and asking if Public Works has clear policies and processes to guide paving decisions. This is the first status report regarding this audit. On June 2, 2021, the City Auditor published the Fleet Replacement Fund Short Millions Audit Report[2], reviewing the solvency of the fund to sufficiently replace vehicles and asking if Public Works has the key information necessary to manage the Fleet program. This is the first status report to City Council on the efforts made to implement the Audit Report's recommendations for Fleet.

CURRENT SITUATION AND ITS EFFECTS

The Street Paving Audit Report noted two findings and five recommendations for the Public Works Department to review, implement and report to Council. As of this report,

[1] Rocky Road: Berkeley Streets at Risk and Significantly Underfunded https://berkeleyca.gov/sites/default/files/2022-01/Rocky-Road-Berkeley-Streets-at-Risk-and-Significantly-Underfunded.pdf
[2] Audit: Fleet Replacement Fund Short Millions: https://berkeleyca.gov/sites/default/files/2022-01/Fleet-Replacement-Fund-Short-Millions.pdf

three recommendations have been implemented and two recommendations have been partially implemented.

The Fleet Audit Report noted two findings and twelve recommendations for the Public Works Department to review, implement and report to Council. As of this report, there are updates to the status of all twelve recommendations. The first set of seven recommendations was related to the underfunding of the replacement fund. One recommendation has been partly implemented, the remaining six recommendations have been started. The second set of five recommendations focused on Public Works having critical information available to inform management and decision making. All five recommendations under this finding have been started.

The attachment provides a detailed table of audit report recommendations, steps towards corrective action, and implementation updates. The next status report will be in May.

BACKGROUND

Public Works' Engineering Division is responsible for capital projects to maintain over 216 centerline miles of streets in Berkeley, while the Streets & Utilities Division handles day-to-day maintenance of those streets. Public Works' Equipment Maintenance Division manages the maintenance, purchase, and replacement of the City's 730 fleet vehicles, heavy duty trucks and large equipment, including public safety, fire, and alternative fuel vehicles and equipment. Public Works' Administrative and Fiscal Services Division is responsible for the Department's budget and fiscal oversight, regulatory compliance and reporting, and analytical support for routine and special projects in all Public Works operating divisions.

ENVIRONMENTAL SUSTAINABILITY AND CLIMATE IMPACTS

Public Works replaces vehicles with alternative fuel, hybrid and electric vehicles whenever possible given availability of fleet technology, available budget and charging infrastructure. Streets that are improved to benefit all users help encourage more bicycling and walking, which lowers greenhouse gas emissions. Streets that are improved to include green infrastructure help reduce pollution and clean stormwater before it reaches the Bay.

POSSIBLE FUTURE ACTION

Public Works will continue to address the remaining three partially implemented recommendations in the Streets Audit and the twelve started and partially implemented recommendations in Fleet Audit.

FISCAL IMPACTS OF POSSIBLE FUTURE ACTION

In the biennial budget adoption for FY 2023 and FY 2024, the City Council allocated an increase of $5,000,000 (FY2023) and $9,100,000 (FY2024) to street paving in the Capital Improvement Fund. The Council also passed a funding guideline to approve an $8,000,000 increase in future fiscal years. This funding is intended to raise paving

funding to levels sufficient to maintain current pavement conditions. The Measure L Bond Measure, if approved by Berkeley voters on November 8, 2022, would raise $300,000,000 towards street and traffic safety improvements, including improvements that advance bicycle and pedestrian use and safety. Project funding would be allocated over several years to raise the pavement condition index (PCI) to 70 or above, which is a “Good” status.

CONTACT PERSON

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Joe Enke, Manager of Engineering (510) 981-6411
Greg Ellington, Equipment Management Superintendent (510) 981-9469

Attachment:

1. Audit Findings and Recommendations Response Report – Streets
2. Audit Findings and Recommendations Response Report - Fleet

Audit Title: Rocky Road: Berkeley Streets at Risk and Significantly Underfunded					
Finding	**Recommendation**		**Lead Department**	**Expected or Actual Implementation Date**	**Status of Audit Recommendations, Corrective Action Plan, and Progress Summary**
Without significant additional funding, Berkeley streets will continue to deteriorate and deferred maintenance costs will increase.	1.1	Annually, conduct a budget analysis, based on the deferred maintenance needs at that point in time, to determine what level of funding is necessary to achieve the desired goals of the Street Rehabilitation Program. Report findings to City Council. This information will be helpful during updates to the Five-Year Street Rehabilitation Plan and during the budgeting process.	Public Works	Ongoing	Partly Implemented: The City received a PTAP grant to fund a consultant (PEI) to survey the entire City's paving condition. The consultant's report is pending. The newly adopted Street Rehab policy says that the City will conduct funding sufficiency analysis based on existing deferred maintenance. This analysis will be included as part of the biannual Paving Plan adoption. Public Works will propose a budget as part of the biannual CIP adoption to address the paving needs, based on available resources, and will present any funding shortfalls to the Council.
Without significant additional funding, Berkeley streets will continue to deteriorate and deferred maintenance costs will increase.	1.2	Identify funding sources to achieve and maintain the goals of the Street Rehabilitation Program.	Public Works	Ongoing	Partly Implemented: Funding sources for street improvement are identified in the Capital Improvement Program budget. The City Council also approved a ballot measure for the November 2022 ballot which if passed, will provide up to $300,000,000 to improve Berkeley's streets, sidewalks and bike and ped infrastructure. Approximately $230 million would be allocated to Street Rehabilitation and Repair.

The Streets Rehabilitation and Repair Policy is out-of-date and Public Works is not following it.	2.1	Update the Street Rehabilitation and Repair Policy annually and define who is responsible for ensuring the Policy is updated, as stated in the Policy.	Public Works	January 2022	Implemented: Public Works Commission approved a Street Rehabilitation and Repair Policy March, 2021, which was received and revised after consideration at the FITES Commission in May 2021, and ultimately adopted by City Council on January 25, 2022. The Policy and Five Year Paving Plan were considered and adopted on the same Council agenda. The Street and Maintenance Policy shall be adopted by City Council at a minimum interval of 5 years, after review by the Transportation and Infrastructure Commission.
The Streets Rehabilitation and Repair Policy is out-of-date and Public Works is not following it.	2.2	When updating the Street Rehabilitation and Repair Policy, incorporate equity to align with Vision 2050 and clearly define how it will be applied to the street maintenance and rehabilitation planning process.	Public Works	January 2022	Implemented: The updated Street Rehabilitation and Repair Policy was adopted with clear language placing Equity as an objective: "The benefits of good infrastructure shall be distributed equally throughout the entire community regardless of income, political influence, or demographic characteristics of the residents in the area. Equity means that disadvantaged residents with more pressing needs experience benefits sooner than others, as defined by the City within the adopted Five Year Plan." The policy also calls for the designation of an Equity Zone, serving neighborhoods with historic underinvestment, which is to be prioritized to achieve the PCI goals of 70 sooner than the remainder of the City.

The Streets Rehabilitation and Repair Policy is out-of-date and Public Works is not following it.	2.3	Define goals and performance measures to guide the Street Rehabilitation and Repair Policy and Street Rehabilitation Program that align with other plans and policies relevant to street paving (e.g., Complete Streets Policy, Vision 2050, etc.). Regularly report to Council on performance measures.	Public Works	January 2022	Implemented: Performance Metrics are included as a major part of the adopted Specific Policy. Key areas: 1) The goal is to get to standard PCI of 70 for roadways: Arterials, Collectors, Bus Routes, Bikeway Network, and Equity Zone. 2) Funding should be prioritized with Equity in mind 3) Performance metrics reporting will be included with the biannual Paving Plan review.

Audit Title: Fleet Replacement Fund Short Millions					
Finding	**Recommendation**		**Lead Department**	**Expected or Actual Implementation Date**	**Status of Audit Recommendations, Corrective Action Plan, and Progress Summary**
The Replacement Fund is underfunded by millions of dollars.	1.1	Calculate the dollar value of the City's replacement needs. Use results from the recent rate study to adjust departments' replacement fees to cover their share of the costs associated with vehicle replacement, including customization and personnel.	Public Works	Ongoing	Partly Implemented: The current fleet replacements costs have been updated in FUND$ Fleet Management System to include all costs, and have been reflected in the FY 23 & FY 24 Operating budget and the five year replacement schedule communicated in the FY 23-27 CIP.
The Replacement Fund is underfunded by millions of dollars.	1.2	Conduct an analysis of the City's current fleet and determine the optimal fleet size to provide services efficiently and effectively. This analysis should include fleet units identified as reserve, backup, and "pool" vehicles. The outcome of the analysis should be a plan to achieve and provide funding for the optimal fleet size.	Public Works	February - May 2023	Started: Staff issued an RFP to analyze its fleet and received two solicitations. Public Works has selected Mercury Associates to be the consultant to lead the study.

The Replacement Fund is underfunded by millions of dollars.	1.3	Work with the City Manager's Office to adjust the funding model of the Equipment Replacement Fund or adopt a new one to ensure appropriate funding for timely fleet replacement, such as annually transferring money from the General Fund based on an assessment of the City's overall fleet needs and priorities. Expand the current vehicle and equipment replacement policy to ensure transparency of key provisions of the new or updated model.	Public Works	Ongoing	Started: Public Works presented an Equipment Replacement Fund deficit reduction proposal in its departmental budget presentation to the Budget & Finance Policy Committee and in submittals for General Fund consideration to the City Manager. While not funded in FY 23/24, the department will keep monitoring the fund health and make funding proposals in future budget development cycles.
The Replacement Fund is underfunded by millions of dollars.	1.4	Revise the vehicle and equipment replacement policy to include that Public Works should regularly assess the personnel expenditures related to vehicle and equipment replacement and ensure that they are appropriate and proportional to their duties.	Public Works	Ongoing	Started: Draft policy has been updated and is going through final departmental review.
The Replacement Fund is underfunded by millions of dollars.	1.5	Revise the vehicle and equipment replacement policy to prevent replacing unfunded vehicles by ensuring that contributed funds are available for the purchase.	Public Works	Ongoing	Started: Draft policy has been updated and is going through final departmental review.

The Replacement Fund is underfunded by millions of dollars.	1.6	Develop an Administrative Regulation that clarifies Public Works' responsibilities to manage the fleet and maintain sufficient fleet replacement funding.	Public Works	Ongoing	Started: The department has drafted a policy docu use instead of an AR.
The Replacement Fund is underfunded by millions of dollars.	1.7	To help secure the funding needed for transitioning to electric vehicles by 2030, work with the City Manager's Office to develop a budgetary plan to purchase electric vehicles. The plan should align with the City's fleet electrification goals and take into consideration the current economic downturn, funding availability, available infrastructure, and electric vehicle availability.	Public Works	Ongoing	Started: EV purchases for FY 23-24 have been outlined in the budget. A budgetary plan for transitioning to EVs by 2030 is not yet available.
Public Works lacks information on vehicle and equipment replacement for decision making.	2.1	Conduct a needs assessment of vehicles overdue for replacement and create a plan that documents a timeline and cost for replacement. Report the findings to City Council.	Public Works	Ongoing	Started: Backlog vehicles to be purchased have been included in the FY 23-24 budget, though a formal needs assessment has not been completed.

Public Works lacks information on vehicle and equipment replacement for decision making.	2.2	Update the vehicle and equipment replacement policy to include criteria for prioritizing fleet replacement. The policy should include a requirement to communicate a delay in replacement of their fleet to affected departments. In Administrative Regulation described in recommendation 1.6, specify that the vehicle and equipment replacement policy should include such criteria.	Public Works	Ongoing	<u>Started:</u> Policy update is in draft form and awaits final approval.

Public Works lacks information on vehicle and equipment replacement for decision making.	2.3	Work with the vendor of the new fleet management system to configure it to address the data issues identified in this report, including: • Tracking Replacement Funds collected and leftover funds by department; • Zeroing out the balance after a vehicle is replaced; • Adjusting the replacement date and reporting the rationale if a replacement is deferred; and • Displaying any information needed to prioritize replacements based on specified criteria.	Public Works	December 2022	<u>Started:</u> Data issues have been presented to the vendor/project management team, though the new data system has not yet been implemented.
Public Works lacks information on vehicle and equipment replacement for decision making.	2.4	Clean and update the vehicle and equipment database before migrating it to the new fleet management system to ensure accuracy and data integrity.	Public Works	December 2022	<u>Started:</u> Data cleanup is underway however the Assetworks implementation is behind schedule and the go-live date is planned for the future.

Public Works lacks information on vehicle and equipment replacement for decision making.	2.5	Update the vehicle and equipment replacement policy or develop a separate policy to require staff manage the City's data appropriately to ensure accurate complete information to support management decisions.	Public Works	Ongoing	<u>Started:</u> Policy update is in draft form and awaits final approval.