**Memorandum**

**To:** State Water Resources Control Board Needs Assessment Team

**From:** UCLA Luskin Center for Innovation

**Date:** October 1, 2020

**Re:** Thresholds for Financial Indicators for Risk Screening

## Overview

The State Water Resources Control Board and the UCLA Luskin Center for Innovation have identified a variety of indicators to develop a Risk Scoring Tool as part of a Risk Assessment for small water systems across the state. Multiple financial indicators have been identified, although coverage is low for all of them. The purpose of this memo is to describe potential ‘thresholds’ for these financial indicators, above which, systems would likely be ‘at risk’ should data coverage be greater in the future.

For these financial indicators, the UCLA Luskin Center for Innovation gathered financial data for water systems with fewer than 3,300 connections in California. Given challenges with data availability, UCLA was only able to gather data for approximately 25% of these systems. Financial indicators help to measure a water system’s financial capacity, which is a prerequisite to system investments that ensure high-quality, reliable water delivery. Initial indicator selection was based on data availability and existing industry and academic literature. Proposed indicators include several financial ratios, thus allowing for an assessment of financial capacity beyond operational revenues and expenses.

This memo identifies potential thresholds for four financial indicators and summarizes the distribution of water systems above and below each threshold. We then conduct a statistical analysis coding each financial indicator into a binary variable (above and below the threshold) to assess its relationship to ‘at risk’ water systems. We use fiscal year 2017-2018 financial data to predict water systems ‘at risk’ in 2019-2020. We then conclude with a summary of recommendations.

## Potential Thresholds for Financial Indicators

In this section we examine thresholds for four financial indicators:

1. Asset depreciation
2. Days of cash on hand
3. Operating ratio (including depreciation)
4. Revenue collection per capita

We first describe each indicator. Then, we identify several potential thresholds for each indicator. We include a table that summarizes the number of water systems above and below each identified threshold. We then calculate the percent of water systems above and below each threshold that fall into each Risk Screening level: in violation, at risk, potentially at risk, and healthy.

**1. Asset Depreciation**

Asset Depreciation is equal to ‘accumulated infrastructure depreciation expenses’ divided by ‘total depreciable assets.’ This ratio indicates the infrastructure condition of the water system by comparing the amount of assets depreciated to the total amount of assets that can be depreciated. In other words, the asset depreciation ratio indicates the remaining life expectancy of the utility plant. The higher this number is, the older the utility plant and the more need there is for capital investment. These higher ratios indicate water system infrastructure that are more likely to need updates. For this indicator, we were able to gather data on 159 small water systems. The average ratio was 0.52. The smallest ratio was 0 and the largest was 1.62.

We identify two potential thresholds for *Asset Depreciation*:

* Lowest 10th percentile
* Highest 10th percentile

**Table 1. Asset Depreciation Threshold Summary**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Threshold** | **Number of Water Systems** | **Percent In Violation** | **Percent At Risk** | **Percent Potentially at Risk** | **Percent Healthy** |
| Lowest 10th Percentile | 16 | 0% | 50% | 44% | 6% |
| Other observations | 143 | 8% | 31% | 26% | 35% |
| Highest 10th Percentile | 16 | 6% | 38% | 31% | 25% |
| Other observations | 143 | 8% | 32% | 27% | 33% |

**2. Days of Cash on Hand**

Days of Cash on Hand is equal to ‘unrestricted cash and investments’ divided by ‘operating expenses excluding depreciation divided by 365.’ This indicator represents the number of days a system can operate without receiving any more revenues from customers. In the case of emergencies (such as the current COVID-19 crisis), this indicator helps identify the system’s reserves with respect to the expenses required to deliver water to customers while keeping a system solvent. For this indicator, we were able to gather data on 352 small water systems. The average days of cash on hand was 480. The fewest was -17.7 and the most was 7,093.6.

Industry groups recommend systems maintain operating reserves of one to three months. More specifically, in 2015, Fitch Ratings reported that the median days of cash on hand for A-rated water and sewer systems was 366 days, and 481 days for AAA-rated systems. Standard & Poors targets are lower than Fitch: “S&P suggest that 30 to 60 days of cash is adequate, 60 to 120 days is good, and greater than 120 is strong.” Work by other research organizations such as the UNC EFC suggest that 6 or even 12 months of cash on hand is preferable, and is the norm in states such as North Carolina.

We identify five potential thresholds for *Days of Cash on Hand*:

* Highest 10th percentile
* 30 days
* 90 days
* 180 days
* 365 days

**Table 2. Days of Cash on Hand Threshold Summary**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Threshold** | **Number of Water Systems** | **Percent In Violation** | **Percent At Risk** | **Percent Potentially at Risk** | **Percent Healthy** |
| Lowest 10th Percentile | 36 | 8% | 42% | 22% | 28% |
| Other observations | 316 | 9% | 31% | 29% | 30% |
| Less than or equal to 30 | 53 | 11% | 38% | 21% | 30% |
| Greater than 30 | 299 | 8% | 31% | 30% | 30% |
| Less than or equal to 90 | 103 | 12% | 33% | 25% | 30% |
| Less than 90 | 249 | 8% | 32% | 30% | 30% |
| Less than or equal to 180 | 149 | 10% | 30% | 27% | 33% |
| Greater than 180 | 203 | 8% | 34% | 30% | 28% |
| Less than or Equal to 365 | 231 | 9% | 33% | 29% | 29% |
| Greater than 365 | 121 | 8% | 31% | 29% | 31% |

**3. Operating ratio (including depreciation)**

The operating ratio is equal to ‘operating revenues’ divided by ‘operating expenses including deprecation.’ The operating ratio including depreciation indicates whether operating revenues are sufficient to cover both operations and the necessary reserves that will be used for future capital investments (in the form of depreciation). For this indicator, we gathered data on 717 small water systems. The average ratio was 1.08. The smallest ratio was 0.01 and the largest was 4.84.

We expect a system with a ratio higher than 1 to collect enough operating revenues to cover both its costs as well as future investments necessary to maintain normal operations. However, some experts prefer an operating ratio including depreciation above 1.2, and others recommend a ratio as high as 1.3 depending on necessary reserves. We focus on the ratio including depreciation rather than the simple operating ratio in order to account for asset depreciation, which is essential to sustainably maintaining reliable infrastructure.

We identify five potential thresholds for *Operating Ratio*:

* Lowest 10th percentile
* Ratio of 0.75
* Ratio of 1
* Ratio of 1.1
* Ratio of 1.2

**Table 3. Operating Ratio Threshold Summary**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Threshold** | **Number of Water Systems** | **Percent In Violation** | **Percent At Risk** | **Percent Potentially at Risk** | **Percent Healthy** |
| Lowest 10th Percentile | 72 | 17% | 29% | 42% | 12% |
| Other observations | 645 | 9% | 34% | 28% | 29% |
| Less than 0.75 | 100 | 16% | 35% | 37% | 12% |
| Greater than or equal to 0.75 | 617 | 9% | 33% | 29% | 29% |
| Less than 1 | 314 | 12% | 36% | 29% | 23% |
| Greater than or equal to 1 | 403 | 9% | 31% | 31% | 30% |
| Less than 1.1 | 441 | 11% | 35% | 30% | 24% |
| Greater than or equal to 1.1 | 276 | 9% | 31% | 29% | 31% |
| Less than 1.2 | 519 | 10% | 34% | 29% | 27% |
| Greater than or equal to 1.2 | 198 | 11% | 31% | 31% | 27% |

**4. Revenue Collection per Capita**

Revenue collection per capita is equal to operating revenues divided by the total population. This ratio of average revenue per individual is a rough indication of a system’s fiscal capacity. For this indicator, we gathered data on 717 small water systems. For this indicator, we gathered data on 717 small water systems. The average revenue collection per capita was $561. The lowest was $0.84 and the highest was $26,726.19.

We identify two potential thresholds for *Revenue Collection per Capita*:

* Lowest 10th percentile
* Highest 10th percentile

**Table 4. Revenue Collection per Capita Threshold Summary**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Threshold** | **Number of Water Systems** | **Percent In Violation** | **Percent At Risk** | **Percent Potentially at Risk** | **Percent Healthy** |
| Lowest 10th Percentile | 72 | 22% | 42% | 19% | 17% |
| Other observations | 645 | 8% | 29% | 28% | 25% |
| Highest 10th Percentile | 72 | 6% | 44% | 25% | 25% |
| Other observations | 645 | 10% | 29% | 27% | 24% |

Statistical Analysis and Recommendations

We then conduct a statistical analysis with our financial indicators. We regressed each indicator on water system risk. We used two dependent variables:

* Risk Score as a scale from 1-4
  + A score of 1 means the system is ‘healthy’
  + A score of 2 means the system is ‘potentially at risk’
  + A score of 3 means the system is ‘at risk’
  + A score of 4 means the system is ‘in violation’
* Binary Risk Score
  + A score of 1 means the system is ‘in violation’ (equivalent to a score of 4 for the Scale Risk Score variable)
  + A score of 0 means the system is ‘not in violation’ (all systems that scored 1 - 3 in the Scale Risk Score variable)

Continuous financial metrics were not statistically significant in any of the analyses at the 0.05 level. We then recode each financial indicator into a binary variable: water systems with financial indicators above the threshold are assigned a value of 1 and water systems below the threshold are assigned a value of 0. Using these thresholds, several indicators have a statistically significant relationship to the dependent variable. *Asset depreciation* and *days cash on hand* was not a statistically significant variable at any threshold. Using 0.75 as a threshold, the *operating ratio* is statistically significant for both dependent variables. With a threshold of 1 and lowest 10th percentile, it is a significant variable in predicting the scale risk score. Using the lowest 10th percentile as the threshold, *revenue per capita* is also statistically significant. Table 5 summarizes the results of these analyses. Columns marked with an ‘x’ indicate that threshold was statistically significant for that variable at the 0.05 level.

**Table 5. Financial Metrics with Thresholds Results**

|  |  |  |  |
| --- | --- | --- | --- |
| **Indicator** | **Threshold** | **Binary** | **Scale** |
| Asset depreciation | Lowest 10th Percentile |  |  |
| Highest 10th Percentile |  |  |
| Days Cash on Hand | Lowest 10th Percentile |  |  |
| Greater than or equal to 30 days |  |  |
| Greater than or equal to 90 days |  |  |
| Greater than or equal to 180 days |  |  |
| Greater than or equal to 365 days |  |  |
| Operating Ratio | Greater than or equal to 0.75 | x | x |
| Greater than or equal to 1 |  | x |
| Greater than or equal to 1.1 |  |  |
| Greater than or equal to 1.2 |  |  |
| Lowest 10th Percentile |  | x |
| Revenue per capita | Lowest 10th Percentile | x | x |
| Highest 10th Percentile |  |  |

Given the results from the statistical analysis, we recommend the following thresholds be used for each indicator:

**Table 6. Financial Metrics with Thresholds Results**

|  |  |
| --- | --- |
| **Indicator** | **Threshold** |
| Operating Ratio | Ratio of 0.75/1 or Lowest 10th Percentile |
| Revenue per Capita | Lowest 10th Percentile |
| Days of Cash on Hand | 90 or 180 days[[1]](#footnote-1) |
| Asset Depreciation | Highest 10th Percentile[[2]](#footnote-2) |

In the future, should financial data for small water systems become more easily accessible, we recommend repeating this threshold analysis to ensure that these trends hold true for a larger sample of water systems.

1. Given that no thresholds were statistically significant for *days cash on hand*, we recommend a threshold of 180 days S&P advises that more than 120 days cash on hand is considered ‘strong’. [↑](#footnote-ref-1)
2. Given that no thresholds were statistically significant for *asset depreciation*, we recommend using the highest 10th percentile as the threshold, as this will capture the systems with the oldest infrastructure. [↑](#footnote-ref-2)