

# **WATER AFFORDABILITY BUSINESS CASE TOOL: USER MANUAL**

**CALCULATING A UTILITY'S NET REVENUE ASSOCIATED WITH  
LOW-INCOME AFFORDABILITY OR ASSISTANCE PROGRAMS**



Developed by Roger Colton (Fisher, Sheehan & Colton, Public Finance & General Economics) under contract to the Natural Resources Defense Council.\* Additional technical support provided by Synapse Energy Economics Inc. The Tool was beta tested in 2022 with several water and wastewater utilities and refined based on feedback.

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**DOWNLOAD THE TOOL**



The Water Affordability Business Case Tool (Version 2.1), along with this Manual and a FAQ and Quick Start Guide, can be downloaded at the following link: <https://www.nrdc.org/resources/water-affordability-business-case-downloadable-tool>.

**TIP**



In the Tool, the first data input page will ask you to email [WaterTool@nrdc.org](mailto:WaterTool@nrdc.org) to be added to a list to receive notification of updates. Questions or feedback on the Tool can also be sent to the same email address.

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# TABLE OF CONTENTS

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**PART 1: PURPOSE AND DESIGN..... 4**

**Introduction ..... 4**

**Low-Income Program Types ..... 6**

**Glossary ..... 7**

**Overview of Tool Design .....10**

  

**PART 2: DETAILED INSTRUCTIONS AND TECHNICAL METHODOLOGY.....12**

**User Inputs .....12**

**Summary Tables ..... 30**

**Supporting Worksheets ..... 33**

# Part 1: Purpose and Design

## INTRODUCTION

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This Manual accompanies the Water Affordability Business Case Tool (“Tool”). Its purpose is to provide detailed instructions and guidelines for using the Tool, along with a thorough explanation of its methodology and underlying premises and assumptions. This Manual also provides background information that can help Users better interpret the results of the Tool.

The Tool itself is in the form of an Excel file. The Tool, along with this Manual and an “FAQ and Quick Start Guide,” can be downloaded at the following link: <https://www.nrdc.org/resources/water-affordability-business-case-downloadable-tool>.

The Tool allows Users to model the financial impacts on a particular water, wastewater, and/or stormwater utility of providing bill discounts to low-income customers.<sup>1</sup> Although discounted rates are typically viewed as a cost to the utility, in the form of forgone billing, the Tool accounts for offsetting increases in revenue and avoided costs that result from making bills more affordable to customers currently struggling to pay. This approach helps utilities assess the business case for offering a low-income discount program by considering such programs as a collection device designed to improve overall revenue and strengthen the utility’s financial position.

The business case approach may also help utilities provide a legal rationale for funding low-income discount programs with rate revenues, based on financial benefits that accrue to ratepayers as a whole.<sup>2</sup>

Water utility associations’ publications expressly acknowledge the business case for low-income discounts, although no other tools are currently available for individual utilities to quantitatively assess their own business case. For example, the industry-standard rate-setting manual explains that “[w]hen customers have trouble paying utility bills, the cost to the utility is manifested in increased arrearages, late payments, disconnection notices, and service terminations....Some of the specific advantages of adopting customer financial assistance programs include...reducing utility collection costs, arrearages, disconnects, and reconnects, which improves the utility’s bottom line....”<sup>3</sup> Similarly, a Water Research Foundation report on low-income affordability explained that “customer assistance programs have been shown to be capable of producing more total revenue for the dollars expended.”<sup>4</sup> And the American Water Works Association’s executive director for government affairs noted in the association’s journal that “frequent service shutoffs and resolving bad debt from customers who cannot afford their rates can be more expensive for a utility than instituting a [customer assistance program] and assisting customers in paying their bills . . . The benefit to the utility of having discounts or lower rates for low-income customers is the increased likelihood of collecting payment from these customers.”<sup>5</sup>

A bill collectability analysis, such as the analysis provided by this Tool, is built on the premise that bills imposing an unaffordable burden on low-income customers become less collectable as bill burdens increase. For purposes of this analysis, “bill burden” is defined as a customer’s annual water bill as a percentage of income. Water industry experience tells us that as bill burdens increase, the collectability of bills decreases, and vice versa. For example, customers with bill burdens of 10% would pay less of each bill, and in a less timely fashion (thereby necessitating more collection interventions), than do customers with bill burdens of 4%.

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1 The Tool was designed primarily for use by publicly owned utilities. It does not account for an investor-owned utility’s return on equity. However, an adaptation is suggested regarding the input for “carrying costs,” which should allow an investor-owned utility to use this Tool with certain caveats.

2 As explained in a Water Research Foundation report on low-income affordability: “If a special rate has a purpose broader than simply to improve the affordability of bills to low-income customers, it is more likely that the rate will be [considered permissible under state law]. State regulatory commissions have approved low-income discount rates not solely as social policy, but rather as sound business alternatives to a cycle involving the billing of unaffordable rates, followed by entering into unaffordable payment plans, followed by payment plan breaches, followed by yet additional unaffordable payment plans.” John Cromwell, et al., *Best Practices in Customer Payment Assistance Programs*, Water Research Foundation, January 2010, p. 93, [https://aquadoc.typepad.com/files/water\\_affordability\\_4004.pdf](https://aquadoc.typepad.com/files/water_affordability_4004.pdf). Similarly, in a report funded by the major national water and wastewater utility associations, the University of North Carolina’s Environmental Finance Center explained that the business case argument can provide legal support for ratepayer-funded programs: “Rather than framing [an assistance program] as a subsidized rate class, present it as an essential cost of running a utility that provides financial benefits to all customers.” University of North Carolina Environmental Finance Center, *Navigating Legal Pathways to Rate-Funded Customer Assistance Programs: A Guide for Water and Wastewater Utilities*, 2017, p. 9, <https://efc.sog.unc.edu/wp-content/uploads/sites/1172/2021/06/Nagivating-Pathways-to-Rate-Funded-CAPS.pdf>; see also *ibid.* at 17-18.

3 American Water Works Association (AWWA), *MI Principles of Water Rates, Fees and Charges, Seventh Edition*, 2017, pp. 217-18.

4 Cromwell, et al., *Best Practices in Customer Payment Assistance Programs*, p. 91; see also *ibid.* at 87-91.

5 G. Tracy Mehan and Ian D. Gansler, “Addressing Affordability as a Necessary Element of Full-Cost Pricing,” *Journal AWWA* 109, no. 10 (October 2017): 46-50 (internal citation omitted), [http://aquadoc.typepad.com/files/affordability\\_full-cost\\_pricing\\_jawwa20o2017.pdf](http://aquadoc.typepad.com/files/affordability_full-cost_pricing_jawwa20o2017.pdf).

This analysis examines collectability and total revenue from the utility’s perspective. The Tool models whether the provision of discounts to low-income customers results in reduced or increased revenue to the utility. But it does *not* calculate rate impacts on nonparticipating customers. The Tool provides Users the option to examine the financial impacts, for the utility, of recovering (or not recovering) the costs of a low-income discount from nonparticipating ratepayers. But if the cost recovery option is selected, the Tool does not model how the costs might be allocated among nonparticipating ratepayers. Different methods of allocation would result in different bill impacts for those ratepayers. Likewise, if the Tool shows that providing low-income discounts would increase total revenues, decisions regarding how to disburse those increased revenues involve policy choices by the utility, which are beyond the scope of the Tool. For example, the revenue could be returned to ratepayers in reduced rates, devoted to a rate stabilization fund, or used for other purposes.

The Tool considers overall collectability, with a focus on residential households (including both low-income and standard-rate residential households) paying a direct bill to the utility. In addition, it examines the impacts of improved collectability on a selected set of expense attributes, including the avoided cost of carrying unpaid balances associated with unaffordable bills and the cost of collection activities. The Tool is designed to capture reductions (or increases) in such expenses.

This Tool analyzes three types of low-income discount program:

- “Percentage of Income Program” (PIP), in which bills for participating households are capped at an affordable percentage of income.
- “Percentage of Bill” (POB) program, in which bills for participating households are set equal to a percentage discount from the total bill at standard rates. A POB may be designed to achieve affordable bill burdens, by providing a larger percentage discount for households at the lowest income levels. Alternatively, a POB may offer the same percentage discount for all participating households, without regard to the resulting bill burden.
- “Fixed Dollar Discount” (FDD) program, in which each participating household receives a set dollar-amount discount on their bill.

Within each program type, the User can select from various program design options. The User can also assess results using a range of participation rates by eligible customers, program administrative costs, and other factors.

For purposes of the Tool, for each of the three program types, all residential customers with household income at or below 150% of the Federal Poverty Guidelines (FPG) are considered income-eligible.

The program types are explained in greater detail below.

# LOW-INCOME PROGRAM TYPES

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In presenting this Tool, we acknowledge that different terms may have different meanings for different sectors. For our purposes, we define low-income discount program types as follows:

- **Percentage of Income Program (PIP):** A program under which each participating low-income customer's bill is calculated by application of a customer-specific discount designed to reduce the total bill to no more than a predetermined affordable percentage of gross household income (i.e., an affordable bill burden).<sup>6</sup> Such programs are sometimes known as "fixed payment" (or "fixed bill") programs, under which the bill does not vary according to consumption.
- **Percentage of Bill Program (POB):** A program under which a participating low-income household's bill is calculated by application of a designated percentage discount to the total bill. The Tool allows Users to select between two alternative designs for a Percentage of Bill program.

Under the first approach (which is set in the Tool as the default POB design), bills are capped for participating low-income households at an explicitly prescribed affordable bill burden. This is achieved through a tiered discount based on income (i.e., an "income-based POB"). The affordable bill burdens are set equal to those used in the PIP to ensure an apples-to-apples comparison. Although both PIPs and income-based POBs are designed to achieve an affordable bill burden for each participating household, POB discounts vary with consumption, whereas PIP discounts result in fixed bills.

The Tool also allows an alternative POB approach, which applies an across-the-board discount that does not vary by income tier and is applied irrespective of the resulting bill burden. (This is referred to in the Tool as an "across-the-board percentage discount.") This is generally not considered to be an especially effective or efficient approach to achieving affordable bills, given the range of incomes among qualifying customers. However, as it used by many utilities, the Tool allows the User to assess this approach in comparison with other program designs.

Note that where a utility uses a percentage discount off a certain *portion* of the bill, the discount would need to be analyzed as a "Fixed Dollar Discount," as described below.

- **Fixed Dollar Discount (FDD) program:** A program under which a participating low-income household receives a bill discount calculated as a set dollar amount. (This option also applies when a utility offers a percentage discount off either a fixed charge or a volumetric charge, rather than a percentage discount on the entire bill. In that case, a User of the Tool would need to convert that percentage discount into a dollar amount.)

Even though an FDD structure reduces bills to low-income customers, it is not designed to tailor the amount of the discount based on need, nor is it designed to expand or reduce the discount to account for need or lack thereof. Because of this inflexibility, the FDD approach is not designed to achieve a prescribed level of affordability.

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<sup>6</sup> If a standard bill (without a discount) is an affordable bill burden for a particular customer, no discount is provided.

# GLOSSARY

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**Affordable bill:** A bill that has a reasonable likelihood of being sustainably paid, as defined by a prescribed “bill burden” that does not unreasonably impinge on a customer’s income.

$$\text{Affordable Bill} = \text{Affordable Bill Burden} \times \text{Gross Annual Income}$$

**Affordable bill burden:** The amount set by the User as a maximum percentage of income that a low-income customer should pay for water, wastewater, and/or stormwater service. The affordable bill burden may vary by income level among low-income households.

**American Community Survey (ACS):** An annual survey, undertaken by the Census Bureau of the U.S. Department of Commerce, that collects information previously collected only in the long form of the decennial Census.

**Annual bill (or Average annual bill):** A dollar amount derived by dividing the total residential revenue of a utility by the average number of residential customers. Rather than calculating a bill by applying a rate structure to consumption, this term is used to designate average per-customer revenue by a utility.

$$\text{Average Residential Bill} = \text{Total \$ Residential Revenue} / \text{Total Residential Customers}$$

**Base affordable annual bill burden:** The burden corresponding to the highest income range eligible for a program. If the program uses a tiered structure, the base affordable burden is reduced by an incremental decrease for each next-lower level of income (based on Federal Poverty Guidelines [FPG]). For example, if the base affordable burden for 100–150% of FPG is 3.0%, and the incremental decrease is 0.5%, the affordable burden for 50–100% of FPG will be 2.5% (3.0–0.5%) while the affordable burden for 0–50% of FPG will be 2.0% (2.5–0.5%). If the program design does not use a tiered structure, the incremental decrease would be set at 0% and the affordable burdens would be the same for each FPG range.

**Bill burden:** Annual bill as a percentage of income.

$$\text{Bill Burden} = \text{Annual Bill for Service} / \text{Gross Annual Income}$$

**Billed revenue:** The dollar amount for current service appearing on a customer’s bill for service.

**Carrying costs:** Costs utilities incur as a result of rendering a bill and not yet receiving payment. Such costs include both the out-of-pocket costs of any resulting borrowing and the opportunity costs of forgone investments.

**Charge-off:** In the utility sector, the term “charge-off” is often used interchangeably with “write-off” or “uncollectables.” They are used interchangeably in the Tool. The terms refer generally to amounts billed to customers that the utility determines, after attempted collections, it is unable to recover from those customers. A User entering a utility’s data into the Tool should apply the specific definition of these terms that is used in the accounting system of that utility, as precise accounting methods may vary.

**Collectability rate:** The rate at which billed revenue (in dollars) is translated into collected receipts (in dollars). The collectability rate is expressed as a percentage, with the billed revenue as the denominator and the collected receipts as the numerator.

**Collection intervention:** Any response by a utility that is undertaken as a result of customer nonpayment and directed toward that customer as a result of their nonpayment, and that is designed to elicit more timely, more complete, or more regular payment.

**Customer:** As used in this Tool, “customer” refers to residential customers, meaning a person or household that is billed directly for water, wastewater, and/or utility service provided to that person or household’s residence. For purposes of inputting data to this Tool, a residential customer does not include (1) a household whose service is billed to their landlord, or (2) a person, household, or other entity that receives a single bill for service to a multiunit (i.e., “multi-family”) residential property.

**Embedded lost revenue:** The amount of billed revenue not collected. The percentage of billed revenue that is embedded lost revenue is the difference between 100% and the collectability rate. For example, if the collectability rate is 88%, the embedded lost revenue is 12%. Therefore:

$$\text{Embedded Lost Revenue} = \text{Billed Revenues} \times (1 - \text{Collectability Rate})$$

**Expense attributes:** A dollar amount that may include both out-of-pocket expenditures and forgone revenue.

**Expense offsets:** A reduction in expense attributes that can be applied against lost receipts or lost billings attributable to a low-income program.

$$\text{Expense Offsets} = \text{Expense Attributes w/o Program} - \text{Expense Attributes w/ Program}$$

**Federal Poverty Guidelines (FPG):** Household income thresholds established by the U.S. Department of Health and Human Services for use in determining eligibility for certain federal programs.

**Federal Poverty Level (FPL):** Household income thresholds determined by the U.S. Census Bureau to represent poverty-level income. (FPL is formally referred to by the U.S. Census Bureau as the “federal poverty threshold.”)

**Hard-to-quantify benefits:** The dollar value of impacts of a low-income program that are recognized to be greater than 0 (e.g., improved health, reduced lost wages) but for which no specific dollar quantification can practically be generated.

**Lost billings:** A dollar amount derived by subtracting total bills rendered through a low-income program from total bills rendered at standard residential rates.

$$\text{Lost Billings} = \text{Bills at Standard Residential Rate} - \text{Discounted Bills}$$

**Lost receipts:** A dollar amount derived by subtracting bills rendered through a low-income program from actual received revenue (i.e., receipts) derived from bills rendered at standard residential rates. (This metric is similar to “lost billings” but accounts for the fact that a percentage of bills are never paid.)

**Low-income customer:** A residential customer whose gross annual or annualized income falls at or below the maximum income prescribed to define a low-income household.

**Low-income household:** For purposes of this Tool, a low-income household is defined as a household with gross annual or annualized income at or below 150% of the FPG.

**Low-income program:** A system of rate modification under which the utility reduces low-income households’ residential bills for current service, relative to the bill for current service at standard residential rates. As the term is used in this Tool, low-income programs are distinct from grants that support income-eligible customers that need support retiring arrears. Also, *for purposes of this tool, low-income programs include programs that are sometimes called “affordability programs” as well as those that are sometimes called “assistance programs.”* (Although the latter two terms are sometimes used interchangeably, only programs that reduce bills sufficiently to ensure that each participating household receives an affordable bill are appropriately referred to as affordability programs. Programs that offer other types of low-income discounts are most appropriately called assistance programs. In this Tool, Percentage of Income Programs and income-based Percentage of Bill Programs constitute affordability programs, whereas across-the-board Percentage of Bill Programs and Fixed Dollar Discount programs constitute assistance programs.)

**Low-income program collectability rate:** The rate at which bills are paid by low-income program participants. This rate could be the same as that of residential customers as a whole under the assumption that bills that are made affordable will be paid at the same rate irrespective of income. This rate could be less than that of residential customers as a whole under the assumption that low-income customer bills that are made affordable may still go unpaid to a greater extent because the level of income is only one low-income attribute affecting payment. For example, the fragility of income (such as for an hourly employee who loses income due to personal or family illness combined with a lack of paid leave) is a factor that affects the ability to pay in addition to the absolute level of income.

**Maximum annual discount:** A dollar amount that the annual level of discount provided to a customer under a low-income program may not exceed, irrespective of the resulting bill burden.

**Minimum monthly bill:** A minimum dollar amount charged to a low-income program participant that represents the dollar value below which a bill for current service may not fall.



**Overpayment:** The dollar amount by which a bill discount exceeds the amount necessary to reduce a bill to an affordable bill burden.

**Participant:** A customer participating in a low-income program.

$$\# \text{ of Participants} = \text{Eligible Customers} \times \text{Expected Participation Rate}$$

**Participation rate:** The percentage of eligible low-income customers who participate in a low-income program.

**Ratepayer:** A person or entity that receives a bill from the utility for water, wastewater, and/or stormwater service provided.

**Receipts:** The dollars of revenue for current bills actually received as payments applied to customers' accounts.

$$\text{Receipts} = \text{Billed Revenues} - \text{Embedded Lost Revenue}$$

**Standard residential rate:** The non-discounted rate charged to residential customers, without modifications from a low-income program.

**Tiered discount:** A low-income program under which the level of discount to participating customers either (1) is designed to achieve a prescribed affordable bill burden, *and* the prescribed affordable bill burden varies as a function of the ratio of income to FPG or (2) is a percentage-of-bill discount that varies as a function of the ratio of income to FPG. As a general rule, the prescribed affordable bill burden in a tiered discount system decreases as income decreases; conversely, the prescribed percentage discount increases as income decreases.

**Unaffordable burden:** A bill burden that exceeds the amount set by the User as an affordable burden for a specific household.

**Underpayment:** The dollar amount by which bill discounts are less than the amount necessary to reduce a bill to an affordable bill burden.

**User:** As utilized in this discussion, a "User" is the person using the spreadsheet.

**Utility:** An entity providing water, wastewater, or stormwater service, or some combination thereof to residential customers.

# OVERVIEW OF TOOL DESIGN

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The Water Affordability Business Case Tool is a User-friendly instrument designed to be fully customizable to meet most water, wastewater, and stormwater utilities' specifications. The Tool guides Users through its various input and output pages by navigational buttons that update automatically based on User preferences. The User always maintains the option to navigate through the Tool using pages that exist within the standard Excel interface. To alternate between views, the User can select the button labeled "Restore/Hide default Excel functionality," which appears on the Welcome page and the Input General Information page.

Following a brief overview of the structure of the Tool, the remainder of this Manual provides a line-by-line description of the inputs, outputs, and calculations used throughout the Tool.

## INPUTS AND DEFAULT VALUES

This Tool provides seven input pages that require User-specific data (the use of which depends on which elements of the Tool the User wishes to exercise). It also includes one page displaying default values for certain inputs, which can be modified by advanced Users.

The pages that require User-specific inputs are as follows:

- Input General Information
- Input Common Data
- Input Water Data
- Input Wastewater Data
- Input Stormwater Data
- Input Combined Service Data
- Input Poverty and Household Data

All input fields are designated by light blue highlighting. For select fields, pop-ups to the right of the input field provide explanations and guidance, which are also provided in this Manual (see Tables 1-5 below).

The Default Values page is accessible by clicking a button at the bottom of the Input Common Data page.

## INPUT GENERAL INFORMATION

All Users start customizing the tool at the Input General Information page. The User inputs the name of the water utility, the utility jurisdiction, and the services the User would like to examine (water, wastewater, and/or stormwater).

## INPUT COMMON DATA

Once the User has selected services, the navigation buttons guide the User to the Input Common Data page. This page contains information that is common to each service, eliminating the need for the User to reenter data multiple times. The Input Common Data page also contains a link at the bottom to the Default Values page, which provides defaults for certain data inputs that may not be readily available to the average User. These defaults are based on assumptions that are consistent with industry practices. All Users have the flexibility to modify the defaults.

## INPUT WATER/WASTEWATER/STORMWATER DATA

There is a separate input page for each of the three service types (water, wastewater, and stormwater) that Users are directed to if they selected that service and not the "combined service" option on the Input General Information page.

## INPUT COMBINED SERVICE DATA

If the User selects the combined service option on the Input General Information page, they are directed to this page *instead* of the service-specific input pages. This page contains all of the necessary inputs to run the tool for the services selected by the User.

## INPUT POVERTY AND HOUSEHOLD DATA

Finally, the User inputs data on the Input Poverty and Household Data page, which asks for two types of data on poverty and household size for the User's service territory. These data are available through the U.S. Census Bureau:

- [Ratio of Income to Poverty Level in the Past 12 Months](#)
- [Average Household Size of Occupied Housing Units by Tenure](#)

The User should note that two different references to “poverty” are used in the Tool. The distribution of households (and thus of customers) by income is done by reference to data from the U.S. Census, which uses the Federal Poverty Level (also known as the federal poverty threshold). However, the income thresholds that the Tool uses for program design are determined by reference to the Federal Poverty Guidelines published annually by the U.S. Department of Health and Human Services (see the Glossary for definitions of these two terms). While the two terms are not identical, in practice they are commonly used in conjunction with one another, in the manner in which they are used in the Tool.

## OUTPUTS (SUMMARY TABLES)

This Tool has only one output page, the Summary Tables page. The tables on this page display various results related to program-induced revenue gains and losses for each of the three program types: PIP, POB, and FDD. For the POB program type, one additional table displays the amount by which total discounts provided are greater or less than the amount necessary to achieve affordable bills for participating customers. Pop-ups on the right side of some lines provide explanatory information about the results, which is also provided in this Manual (see Table 6 below).

## SUPPORTING WORKSHEETS

This Tool has 10 supporting worksheets, which the User can opt to review by selecting “See Supporting Worksheets” on the Summary Tables page:

- Program Parameters
- Offset Parameters
- Water Collectability
- Water Offsets
- Wastewater Collectability
- Wastewater Offsets
- Stormwater Collectability
- Stormwater Offsets
- Combined Service Collectability
- Combined Service Offsets

*In various instances in the input data above, the Tool acknowledges the lack of industry research within the water industry. In such circumstances, the Tool relies on best available research, which is generally research from the energy rather than water industry. One positive impact arising from the use of this Tool, however, will be the anticipated increase in water industry research to populate different metrics (e.g., collectability, low-income-specific collectability, relationship between mobility and affordable/unaffordable bills). As research within the water industry progresses, it is expected that analysts will be able to rely increasingly on research specific to water utilities rather than energy utilities.*

*In addition, the continuing use of this Tool is expected to have the beneficial impact of prompting water utilities over time to develop processes and procedures to derive needed input data from their own customer information systems.*

# PART 2: Detailed Instructions and Technical Methodology

The remainder of this Manual provides line-by-line instructions on entering inputs (“User Inputs”), descriptions of each of the Tool’s outputs (“Summary Tables”), and a detailed explanation of the Tool’s technical methodology, including a description of all calculations the Tool performs to generate outputs (“Supporting Worksheets”).

## USER INPUTS

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The User Inputs within this Tool ask for a variety of data.

Much of the data required is expected to be either reasonably available from internal utility information, or derivable from this information. Data such as the number of customers, the amount of residential billings, and the number of disconnections should be available through internal utility records.

Some of the inputs are established by policy. The inputs labeled “policy” are not empirically derived or determined; the User chooses them. The level of a minimum bill or a maximum discount are examples of User inputs established by policy.

The Tool also contains inputs that may not be readily available to the User. Examples of data inputs that may not be readily available include information on how average bills, collections rates, or other metrics differ between “low-income” customers and residential customers generally. The Tool provides most of these inputs as default values.

Users should understand that, while some input figures are highly judgmental, there are reasonable ranges within which they may fall. When the User faces such input decisions, an appropriate way to employ the input data is to enter alternative figures at a “high,” “medium,” and “low” value to see the extent to which, if at all, the changes in values substantially alter the results presented in the Summary Tables. One example involves accounting for “hard-to-quantify benefits.” It is universally agreed that hard-to-quantify benefits have a value greater than 0. The default is set at 1.2 (i.e., 120%), but this figure is subject to change by the User (a value of 100% means that there are no hard-to-quantify benefits). Using a low, medium, and high figure to determine whether the change would result in differing policy conclusions by the User is reasonable in this case because it helps the User quickly determine whether it is worth debating the merits of any particular value. If the change would *not* greatly affect the results, the User can spend less time on the matter.

Finally, the User may want to consider whether to match the year of the internal data used as inputs with the year of the Census data provided on the Input Poverty and Household Data page. Particularly in these days when internal data from recent years may have been affected by utility responses to the COVID-19 pandemic, recent data on collections (e.g., disconnections) may not truly reflect typical operations. While it is not essential to have an exact match between the year of the Census data and the dates of the utility-generated data, the User should specifically consider how to proceed if such a matching of dates does *not* occur.

With this introduction, each Input page is now explained, line by line, below.

## INPUT GENERAL INFORMATION

On this page, the User inputs the name of the water utility, the utility jurisdiction, and most important, the services the User would like to examine. The User can examine services individually by selecting “Yes” next to the applicable service and “No” under the combined service option. In this permutation, each of the services is examined as a stand-alone program and the inputs on one page (e.g., water) do not impact the services input on another page (e.g., wastewater). Alternatively, the User can examine multiple services offered within the same service territory by selecting “Yes” under combined service. If the User chooses to examine multiple services as a combined service, the service accounts should align. (For example, a utility that provides water service to a city and sewer service to both the city and its suburbs should be examined as a separate water utility and sewer utility, rather than as a single utility providing combined service.)

At the bottom of this page, a button labeled “Restore default Excel functionality” provides Users with the option to navigate through the Tool using tabs that display in the standard Excel interface. If the User clicks this button, the button will be relabeled as “Hide default Excel functionality” and the User can click again to hide the tabs.

## INPUT COMMON DATA

Some data inputs are common to all service types. The input does not vary depending on whether it is applied to water service, wastewater service, or stormwater service. The Input Common Data page consolidates these data inputs so that they need not be repeatedly entered for each service. See the line-by-line descriptions of each input below.

Note especially that the dropdown on Line 16 makes a significant difference in the outputs generated by the Tool. As described in Table I, below, the yes/no choice on Line 16 determines whether or not the costs of providing discounts to low-income customers are recovered from nonparticipating ratepayers. (The implications for the Tool’s results are explored below in the discussion of the Tool’s “Summary Tables.”)

TABLE I. COMMON DATA INPUTS				
Line	Metric	Unit	Source	Information
<b>Federal poverty information</b>				
1	Federal Poverty Guidelines (FPG) data year	Year	Insert current year.	This line memorializes the FPG data year.
2	100% FPG—1-person household	Dollars (\$)	Data for current year available at: <a href="https://aspe.hhs.gov/poverty-guidelines">https://aspe.hhs.gov/poverty-guidelines</a> .	This line is the FPG income for a 1-person household. This Poverty income is obtained from an annual publication by the U.S. Department of Health and Human Services (HHS).
3	100% FPG—2-person household	Dollars (\$)	Data for current year available at: <a href="https://aspe.hhs.gov/poverty-guidelines">https://aspe.hhs.gov/poverty-guidelines</a> .	This line is the income for a 2-person household. These data are obtained from the same HHS publication used for the 1-person household. The Tool will calculate the FPG for larger household sizes based on the difference between a 1-person household and a 2-person household.
<b>Miscellaneous inputs</b>				
4	Household size multiplier	Multiplier	User estimate. Pre-populated with default of 1.0, but may be adjusted by User.	This line allows the User to adjust the average household size (default of 1.0) up or down to account for the belief that low-income households may be larger (use a multiplier of greater than 1.0) or smaller (use a multiplier of less than 1.0) than residential households in general. Note that average residential households include low-income households. In addition, this number is a multiplier rather than a value for the number of persons. The Tool uses household size to calculate income.
5	Percent total accounts in arrearages (monthly average)	Percent (%)	Retrieve from internal utility records.	This line presents the percentage of total residential accounts in arrearages. These data are input on the basis of utility data. Different utilities may define “arrearage” differently. The intent here is for the User to use the utility’s own internal definition of the term and interpret the results accordingly.

**TABLE I. COMMON DATA INPUTS**

Line	Metric	Unit	Source	Information
6	Minimum monthly bill—total for all services provided	Dollars (\$)	Established by policy.	<p>This line presents the total minimum bill for all services provided by the utility. (If a utility provides more than one service, the Tool does not request a separate minimum bill for each service provided. If a utility providing more than one service has a separate minimum bill amount for each service, the User must enter the sum of the minimum bills for all services.)</p> <p>This minimum bill is set by policy. Although it may be set at zero (0), a non-zero minimum bill would reflect the idea that all households should make a minimum payment toward essential water services, irrespective of income.</p> <p>For every program design included in the Tool, a program participant is charged the greater of the minimum bill or the low-income discounted bill (as determined by the selected program design).</p> <p>Minimum bills should not affect a substantial number of program participants. If they do, the value is too high. See the User Manual's description of Program Parameters, Line 36, for an explanation of how to determine whether the selected minimum bill may affect too many program participants.</p>
7	Multiplier to determine maximum discount	Multiplier	<p>User estimate. Pre-populated with default of 1.5, but may be adjusted by User.</p> <p>If no maximum is desired, this number should be set at 9999.</p>	<p>This line establishes a ceiling on the annual discounts provided through a low-income program. The maximum annual discount is established as a multiplier of the average annual low-income bill. The default multiplier is set at 1.5. If an average annual low-income bill is \$800, for example, the maximum annual discount would be \$1,200 (<math>\\$800 \times 1.5 = \\$1,200</math>). The same multiplier is used for all service types. The primary purpose of setting a maximum discount is to control overall program costs. It is possible, but not likely, that the maximum discount will have a meaningful impact on the calculations in this tool.</p>
<b>Disconnections and arrears inputs</b>				
8	Internal cost per disconnection	Dollars (\$)	Retrieve from internal utility records.	<p>This is the cost to the utility of executing an involuntary disconnection of service for nonpayment. As a general rule, this cost should not be offset by any fee associated with disconnection (particularly if that fee is also associated with the cost of reconnection). Moreover, it would be inappropriate to offset this cost with any fee imposed unless complete collection of that fee is assured.</p>
9	Internal cost per disconnection notice	Dollars (\$)	Retrieve from internal utility records.	<p>This is the average internal cost to the utility for each disconnection notice. If more than one type of notice is issued (e.g., both a mailed notice and a posted notice), this should be a weighted average cost.</p>
10	Gross charge-off (or write-off) percentage (annual)	Percent (%)	Retrieve from internal utility records.	<p>This input should be the percentage gross residential charge-offs on an annual basis. This line seeks charge-offs without accounting for any subsequent recoveries.</p>
11	Number of months arrearage carried after final bill before charge-off	Months	Retrieve from internal utility records.	<p>Most utilities will carry an account that has been disconnected, or otherwise final-billed, for a prescribed period of time before writing off the dollars of unpaid balance associated with that account. This line identifies that length of time (in months). This default is set to six months. However, the tool allows the User to overwrite this default value. This value cannot exceed 12 months because this analysis is presented on an annual basis.</p>
12	Rate at which residential* accounts reconnected (annual)	Percent (%)	Retrieve from internal utility records.	<p>Many, but not all, accounts that are involuntarily disconnected for nonpayment eventually have service reconnected. This line provides the percentage of disconnected accounts that are reconnected, on an annual basis. It is often calculated as the ratio of the number of reconnections to the number of disconnections.</p>

**TABLE I. COMMON DATA INPUTS**

Line	Metric	Unit	Source	Information
13	Average days of vacancy with no reconnection	Days	Retrieve from internal utility records (or use pre-populated default value if data are not available).	This line provides an estimate of the average number of days a home remains vacant if water service is disconnected and not reconnected to the same customer. This number <i>differs</i> from the average number of days an account remains disconnected before being reconnected. In this instance, it is assumed that the disconnected account is never reconnected to the same customer. On the basis of experience in the water industry, the default value is set at 21. However, it can be overwritten by the User.
14	Account for compounding monthly interest?	Dropdown	“No” indicates no compounding. “Yes” indicates monthly compounding.	This line presents the User a choice of whether to compound the interest associated with nonpayment. The interest, established elsewhere, can be either the cost of borrowing to replace the dollars not being collected or the opportunity cost of not having those funds to invest.
15	Annual interest (for carrying costs of arrears)	Percent (%)	Retrieve from internal utility records. (Pre-populated with default of 2%. Should be adjusted by User if current interest rate information is available.)	This line presents an annual carrying cost for unpaid balances. If unpaid balances had been paid, the utility would have been able either to avoid some level of borrowing or to place those funds in an investment that would have generated some amount of return. While a default rate of 2% is used to represent these carrying costs, this rate can be overwritten by the User.  NOTE: If a User applies this Tool to an investor-owned utility, it is recommended that the annual interest be set to zero. The User should determine separately how to account for carrying costs (and savings from reduced carrying costs), taking into account the utility’s return on equity and associated income tax implications.
<b>Additional program inputs</b>				
16	Allow cost recovery from nonparticipating ratepayers?	Dropdown	“Yes” indicates that the utility recovers costs on nonparticipant bills. “No” indicates that the utility does not recover costs associated on nonparticipant bills.	This dropdown impacts how the Summary Tables display net revenue. If the User allows for cost recovery from nonparticipating ratepayers (“Yes”), the net revenue (positive or negative) from the discounted low-income bills is summed with the increased revenue collected from nonparticipating ratepayers. If the User wishes to isolate the impacts of offering discounted rates without cost recovery from nonparticipants, the User should select “No.”  See Summary Tables, Line 4, for further explanation of how the cost recovery is calculated.
17	Multiplier for hard-to-quantify benefits, applied to offsets	Dropdown	User estimate. Since hard-to-quantify benefits are known to be non-zero, the value chosen must be greater than 100%. A selection is provided here, ranging in 5% increments from 110% (1.10 multiplier) to 125% (1.25 multiplier).	A number of expense offsets can be reasonably expected from the adoption of a low-income program. Due to the lack of quantification, however, these offsets are omitted from this analysis. An example of these offsets is an increase in productivity of staff addressing payment problems that can be resolved given an affordable bill (as opposed to such problems that cannot be addressed due to a bill’s unaffordability). A reduced turnover in staff, along with the reduced expenses associated with the replacement of staff, has long been postulated as a positive result of a low-income program. An increase in “reputational capital” has also been associated with low-income programs. This analysis does not seek to place a dollar value on these hard-to-quantify benefits but notes with absolute certainty that whatever value exists is greater than \$0. This line presents a multiplier through which the analysis can incorporate these hard-to-quantify benefits.
18	Administrative costs as percentage of discounts	Percent (%)	The default of 10% is based on industry experience with administration of low-income programs. The User can replace this with a different estimate of administrative costs.	The cost of providing an affordable rate is not limited exclusively to the cost of the discount itself. There will be additional administrative costs associated with offering the rate. These will include costs such as outreach, intake to verify income eligibility for the low-income program, periodic reverification of income, and so on. This line allows the User to establish those administrative costs as a percentage of the total discount provided. A typical administrative cost ranges from 5% to 10%.

**TABLE 1. COMMON DATA INPUTS**

Line	Metric	Unit	Source	Information
19	Income-based discount v. across-the-board discount**	Dropdown	Established by policy. Select “Income-based discount” if the User wants the model to calculate the discount. Select “Across-the-board discount” if the User wants to manually input the discount.	A Percentage of Bill program can be designed in two different ways. In one option, the POB discount is a calculated amount, with the calculation determining what discount level is needed to reduce average bills to an affordable percentage of income burden at differing income ranges (select “Income-based discount”). In the second option, the POB discount is set at a prescribed percentage across the board irrespective of the percentage-of-income burden resulting from that discount (select “Across-the-board discount”).
20	Expected program participation rate	Dropdown	A default of 40% can be modified by the User. The default was selected on the basis of participation rates in ratepayer-funded low-income programs in the energy utility sector. (See Pennsylvania PUC, Bureau of Consumer Services, <a href="#">Report on Collections Performance and Universal Service Programs</a> (annual).)	This line presents the estimated participation rate in the low-income program. It is unreasonable to expect that a 100% participation rate will ever be achieved. <sup>7</sup> Typical participation rates range from 30% to 50%. This line allows the User to test the impact of differing participation rates.  The same participation rate is assumed to apply to all services and to each of the three program types studied.

\* “Residential” includes standard-rate and low-income customers.

\*\* If the User selects “Across-the-board discount,” they will be prompted to input a specific percentage discount on the service-specific pages.

## INPUT SERVICE-SPECIFIC DATA

All service-specific input pages require the same data. The input type does not vary depending on whether it is applied to water service, wastewater service, or stormwater service. These data inputs are separately listed on each service-specific input page, and the User will be asked to enter data only if the service has been selected. (In the Tool, these input pages are titled Input Water Data, Input Wastewater Data, and Input Stormwater Data.)

The actual numbers input into the Input Stormwater Data page may be substantially different from those input into the Water or Wastewater pages. For example, stormwater service would likely not involve any “nonpayment disconnections.” As a result, data such as the number of disconnections, the number of disconnection notices, or the internal cost per disconnection may well be “0” rather than some positive number. Data on stormwater service disconnections seem to be generally unavailable or inapplicable. The model allows the use of data on stormwater disconnections, but it also allows for no data to be input in those instances.

In addition, it would not be surprising for the “base affordable annual bill burden” that a utility sets for stormwater service to be substantially lower than the burden that is deemed affordable for water and wastewater service. This would reflect that stormwater is a much smaller portion of a low-income customer’s bill.

See the line-by-line descriptions of each input in Table 2, below.

**TABLE 2. SERVICE-SPECIFIC DATA INPUTS**

Line	Metric	Unit	Source	Information
<b>Basic Information to establish bill levels</b>				
1	Annual residential [service] revenue	Dollars (\$)	Retrieve from internal utility records.	This line, obtained from internal records, presents the total revenue billed to residential customers. The term “residential bill,” which is displayed in multiple instances throughout the Tool, is calculated as the average revenue per residential customer.
2	Number of residential* [service] accounts	Number of accounts	Retrieve from internal utility records.	Enter here the average monthly number of residential customers.

<sup>7</sup> Research shows any number of reasons why income-eligible customers do not participate, either by choice or otherwise, in programs that provide financial assistance. See generally Roger D. Colton, *Energy Affordability for Low-Income Natural Gas and Electricity Customers in Pennsylvania*, submitted on behalf of the Office of Consumer Advocate, Pennsylvania Public Utilities Commission, Docket No. M-2017-2587711 (May 2019).



**TABLE 2. SERVICE-SPECIFIC DATA INPUTS**

Line	Metric	Unit	Source	Information
3	Low-income [service] annual bill as a percentage of average residential bill	Percent (%)	Default set to 100%, but the User can adjust based on local data or professional judgment.	<p>This line allows the User to account for differences in average bill levels between low-income customers and residential customers as whole.</p> <p>The default on this line is set at 100% (i.e., low-income bills do not differ from residential bills as a whole), but the User can modify this assumption.<sup>8</sup> A number lower than 100% would mean that average low-income bills are lower than average residential bills. Conversely, a number higher than 100% would mean that average low-income bills are higher than average residential bills.</p> <p>For example, low-income water usage, and thus low-income water bills, are generally found to be lower than average residential usage (in large part because of lower outdoor usage).<sup>9</sup> Alternatively, especially in densely developed areas with little outdoor water use, it may be hypothesized that low-income customers' bills are higher than residential bills on average (e.g., because low-income customers may live in housing with older, inefficient plumbing fixtures and leakier pipes).</p> <p>When entering this input on the Input Wastewater Data page and Input Stormwater Data page, the same rationale would apply if wastewater and/or stormwater charges are correlated to water usage. If wastewater and/or stormwater charges are not correlated to water usage, then the User should use best professional judgment to identify any other reasons why low-income customers may tend to have higher or lower wastewater or stormwater charges than residential customers as a whole. If there are no likely differences, then keep the default input of 100%.</p>
<b>Percentage of income data inputs</b>				
4	Base affordable [service] annual bill burden	Percent (%)	Established by policy. This is the affordable bill burden for households with income between 100% and 150% of FPG.	<p>"Affordability" in this Tool is defined in terms of annual bills as a percentage of income, also known as the customer's "bill burden." For example, if a customer has an annual water bill of \$1,200 and an annual income of \$48,000, the customer has a water bill burden of 2.5%.</p> <p>The User must define a ceiling on bills as a percentage of income that will be deemed to be affordable. It is important to remember that this figure is a service-specific figure. If the User provides more than one service, the total affordable burden will be the sum of the burdens for each stand-alone service.</p> <p>Importantly, the values entered here will also help determine the threshold between a mid-range bill burden and a high-range bill burden. Users are strongly encouraged to consider whether to adjust the defaults in the Default Values page, Lines 16-18, in light of the User's entry on this line. For explanation of how bill burden thresholds determine the extent to which bill discounts improve customers' payment rates, see Lines 10-20 of the Default Values page.</p>

<sup>8</sup> The difference between "bills" and "usage" is not considered. As discussed elsewhere, the term "average bill" is, in fact, used to reference average per-customer revenue. Accordingly, the question of rate structures and how they affect an "average bill" due to differing mixes of fixed and volumetric charges becomes less important.

<sup>9</sup> See, e.g., Wa'el Hussien, Fayyaz A. Memon, and Dragan A. Savic, "Assessing and Modelling the Influence of Household Characteristics on Per Capita Water Consumption, Water Resources Management," *Water Resources Management* 30, no. 9 (2016); R. Quentin Grafton et al., "Determinants of Residential Water Consumption: Evidence and Analysis From a 10-Country Household Survey," *Water Resources Management* 47, no. 8 (2011); Thomas D. Rockaway et al., "Residential Water Use Trends in North America," *Journal of the American Water Works Association* 103, no. 2 (2011); and D. Kenney, "Residential Water Demand Management: Lessons From Aurora Colorado," *Journal of the American Water Resources Association* 44, no. 1 (2008): 192-207.

**TABLE 2. SERVICE-SPECIFIC DATA INPUTS**

Line	Metric	Unit	Source	Information
5	Incremental decrease in affordable [service] bill burden as incomes decrease	Percent (%)	Established by policy. This is used to calculate the affordable bill burden for households with income below 100% of FPG.	<p>As income declines, the bill burden that can be deemed affordable declines as well. Therefore, some percentage of income-based programs use a “tiered bill burden” to define affordability, resulting in a tiered discount based on household income level. The Tool is designed to allow three tiers of income, as a percentage of FPG (0–50%, 50–100%, and 100–150%).</p> <p>This line sets the incremental decrease in affordable bill burden (as compared to the “base” bill burden in Line 4) at each succeeding lower FPG range below 100% of FPG. For example, if the “affordable water annual bill burden” is set at 1.5% and the incremental decrease is set at 0.25%, the three tiers would have affordable burdens of: 100–150% of FPG: 1.5%; 50–100% of FPG: 1.25%; 0–50% of FPG: 1.00%.</p> <p>Establishing a tiered discount based on a tiered bill burden is the recommended approach. However, if a User chooses to define the affordable bill burden as the same percentage of income for all low-income customers, this line should be set as zero (0).</p>
<b>Percentage of bill data inputs</b>				
6-II	Distribution of customers with annual bill that is X% of the average annual [service] bill	Percent (%)	Retrieve from internal utility records. Used only to calculate over- or underpayment, not to calculate discounts. Only applicable if Line I9 on the Input Common Data page is set to “Income-based discount.”	<p>These lines are used in calculating the Percentage of Bill program costs. The basic structure of the POB program aims for affordability given an “average” bill level. Not all customers, however, have an average bill. These lines allow the User to distribute residential customers around the average. For example, if an average annual bill is \$1,000 and 10% of customers have an annual bill of less than \$500, Line 7 would be 10%. The sum of the data in Lines 7 through II should always equal 100%. If the User has selected “Across-the-board discount” on Line I9 of the Input Common Data page, the input will be grayed out.</p>
12	Across-the-board discount	Percent (%)	Established by policy. Only applicable if Line I9 on the Input Common Data page is set to “Across-the-board discount.”	<p>There are two ways to establish a bill discount in a percentage -of-bill program model. The default method used in this model is income-based, applying the bill discount that is needed to result in a bill that is affordable at a prescribed percentage of income. The User, however, may wish to provide an across-the-board discount of a certain percentage. This line allows the User to input the value of such an across-the-board discount. If the User has selected “Income-based discount” on Line I9 of the Input Common Data page, the input will be grayed out.</p> <p>After completing all inputs to the Tool, the User can determine the extent to which the selected percentage discount is reducing customers’ bill burdens by referring to the Water/Wastewater/ Stormwater Collectability worksheets. On those Worksheets, Lines 7 and IO show the bill burden for customers at varying levels of income before the discount and after the discount, respectively. Line I shows the thresholds for low-range (i.e., affordable), mid-range, and high-range bill burdens, which are set based on User inputs. The worksheets can be viewed by selecting “See Supporting Worksheets” at the top of the Summary Tables page, or by clicking “Restore default Excel functionality” on the Welcome page or the Input General Information page.</p>

**TABLE 2. SERVICE-SPECIFIC DATA INPUTS**

Line	Metric	Unit	Source	Information
<b>Fixed dollar discount data inputs</b>				
13	[Service] annual fixed dollar discount: all FPG ranges	Dollars (\$)	Based on program design.	<p>This line allows the User to define an annual dollar amount for a Fixed Dollar Discount.</p> <p>A FDD could simply constitute a discount of a set amount of dollars. The FDD option can also be used to evaluate the impacts of waiving certain charges or providing percentage discounts on a portion of the bill rather than on the entire bill. For example, if the User wishes to waive a fixed monthly charge or provide a 50% discount on a fixed charge or volumetric charge, they can input here the annual value of that waiver or discount (as applied to the average annual customer bill).</p> <p>After completing all inputs to the Tool, the User can determine the extent to which the selected fixed dollar discount is reducing customers' bill burdens by referring to the Water/Wastewater/Stormwater Collectability worksheets. On those Worksheets, Lines 7 and 10 show the bill burden for customers at varying levels of income before the discount and after the discount, respectively. Line 1 shows the thresholds for low-range (i.e., affordable), mid-range, and high-range bill burdens, which are set based on User inputs. The worksheets can be viewed by selecting "See Supporting Worksheets" at the top of the Summary Tables page, or by clicking "Restore default Excel functionality" on the Welcome page or the Input General Information page.</p>
<b>Expense/revenue offset data inputs</b>				
14	Average monthly arrears per residential* [service] account in arrears	Dollars (\$)	Retrieve from internal utility records.	This line is the dollar value of average monthly residential arrears (of accounts having arrears). It affects the calculation of expense offsets throughout the model.
15	Number of disconnections for nonpayment (annual)	Number of disconnections	Retrieve from internal utility records.	This line, derived from internal records, is the annual number of residential nonpayment disconnections.
16	Disconnection notices for nonpayment (annual)	Number of notices	Retrieve from internal utility records.	This line, derived from internal records, is the annual number of notices of residential nonpayment disconnections. If more than one type of notice is provided (e.g., a mailed notice followed by a door hanger), both types of notice should be included.

**TABLE 2. SERVICE-SPECIFIC DATA INPUTS**

Line	Metric	Unit	Source	Information
17 (for water and wastewater service input pages)	Expected percent reduction in disconnection notices and disconnections from low-income program	Percent (%)	User estimate. Could be based on internal utility records or external research. Default set to 10%.	<p>This line allows the User to project the degree to which offering a bill discount would reduce the number of disconnection notices and disconnections. The User also has the option of entering "0%" to indicate that providing a discounted bill would have no impact on the number of disconnection notices and disconnections.</p> <p>Note that the Tool applies the percentage reduction entered here to all program designs, even though programs that do not achieve affordable bill burdens will not, in fact, result in as large a reduction as programs that do achieve affordable bill burdens. Therefore, if the User enters a number here reflecting the reductions associated with a PIP or an income-based POB, the Tool will produce results that tend to overestimate the number of disconnections and disconnection notices avoided by an across-the-board POB or FDD.</p> <p>The User may choose to insert a variety of values (perhaps a low, medium, and high value) to determine to what extent, if at all, changing this figure results in differences in the results (shown in the Summary Tables).</p> <p>TIP: The User could also use this line to account for reduced disconnections attributable to changes in utility policies, above and beyond the impacts of a bill discount itself. For example, a utility considering a ban on disconnections for participants in a low-income program could estimate, separate from the Tool, the percentage reduction in disconnections that might result from such a ban. That percentage reduction could be entered here.</p>
17 (for stormwater service input pages)	Expected percent reduction in disconnection notices and disconnections from low-income program	Percent (%)	User estimate. For stormwater the default is set to 0%.	<p>This line allows the User to project the degree to which offering a bill discount will reduce the number of disconnection notices and disconnections. The default value (0%) is based on the unlikelihood that stormwater service would be disconnected.</p>
18	Total [service] revenue (includes nonresidential sectors) (annual)	Dollars (\$)	Retrieve from internal utility records.	<p>This line calls for the input of annual total [service] revenue from all ratepayers. Total revenue is used as an input into one calculation presented in the Summary Tables. It allows the User to examine the cost of a low-income discount (prior to offsets) as a percentage of total [service] revenue.</p>

\* "Residential" includes standard-rate and low-income customers.

## INPUT COMBINED SERVICE DATA

Some data inputs are common to all service types. The input does not vary depending on whether it is applied to water service, wastewater service, or stormwater service. The Input Combined Service Data page consolidates these data inputs so that they need not be repeatedly entered for each service.

See the line-by-line descriptions of each input in Table 3, below.

TABLE 3. COMBINED SERVICE DATA INPUTS				
Line	Metric	Unit	Source	Information
<b>Basic Information to establish bill levels</b>				
1-3	Annual residential revenue	Dollars (\$)	Retrieve from internal utility records.	These lines, obtained from internal records, ask for the residential revenue for each service subset of the combined services. The term "residential bill," which is displayed in multiple instances throughout the Tool, is calculated as the average revenue per residential customer.
4	Annual residential* combined service accounts	Number of accounts	Retrieve from internal utility records.	This line asks for the number of accounts with combined service. An account with services in water and wastewater services, for example, should be counted only once on this line.
5	Low-income annual bill as a percentage of average residential bill	Percent (%)	Default set to 100%, but the User can adjust based on local data or professional judgment.	<p>This line allows the User to account for differences in average bill levels between low-income customers and residential customers as whole.</p> <p>The default on this line is set at 100% (i.e., low-income bills do not differ from residential bills as a whole), but the User can modify this assumption.<sup>10</sup> A number lower than 100% would mean that average low-income bills are lower than average residential bills. Conversely, a number higher than 100% would mean that average low-income bills are higher than average residential bills.</p> <p>For example, low-income water usage, and thus low-income water bills, are generally found to be lower than average residential usage (in large part because of lower outdoor usage).<sup>11</sup> Alternatively, especially in densely developed areas with little outdoor water use, it may be hypothesized that low-income customers' bills are higher than residential bills on average (e.g., because low-income customers may live in housing with older, inefficient plumbing fixtures and leakier pipes).</p> <p>For combined service utilities, if wastewater and stormwater charges are correlated to water usage, then lower (or higher) average water usage for low-income customers would result in lower (or higher) average combined service bills. If wastewater and/or stormwater charges are not correlated to water usage, then the User should use best professional judgment to identify any other reasons why low-income customers may tend to have higher or lower wastewater or stormwater charges than residential customers as a whole and apply best professional judgment to estimate the relationship between low-income combined service bills and average residential bills.</p>

<sup>10</sup> The difference between "bills" and "usage" is not considered. As discussed elsewhere, the term "average bill" is, in fact, used to reference average per-customer revenue. Accordingly, the question of rate structures and how they affect an "average bill" due to differing mixes of fixed and volumetric charges becomes less important.

<sup>11</sup> See, e.g., Wa'el Hussien, Fayyaz A. Memon, and Dragan A. Savic, "Assessing and Modelling the Influence of Household Characteristics on Per Capita Water Consumption, Water Resources Management," *Water Resources Management* 30, no. 9 (2016); R. Quentin Grafton et al., "Determinants of Residential Water Consumption: Evidence and Analysis From a 10-Country Household Survey," *Water Resources Management* 47, no. 8 (2011); Thomas D. Rockaway et al., "Residential Water Use Trends in North America," *Journal of the American Water Works Association* 103, no 2 (2011); and D. Kenney, "Residential Water Demand Management: Lessons From Aurora Colorado," *Journal of the American Water Resources Association* 44, no. 1 (2008): 192-207.

**TABLE 3. COMBINED SERVICE DATA INPUTS**

Line	Metric	Unit	Source	Information
<b>Percentage of income data inputs</b>				
6-8	Base affordable [service] annual bill burden	Percent (%)	Established by policy. This is the affordable bill burden for households with income between 100% and 150% of FPG.	<p>“Affordability” in this Tool is defined in terms of annual bills as a percentage of income, also known as the customer’s “bill burden.” For example, if a customer has an annual water bill of \$1,200 and an annual income of \$48,000, the customer has a water bill burden of 2.5%.</p> <p>The User must define a ceiling on bills as a percentage of income that will be deemed to be affordable. It is important to remember that this figure is a service-specific figure. If the User selects more than one service, the total affordable burden will be the sum of the burdens for each stand-alone service.</p> <p>Importantly, the values entered here will also help determine the threshold between a mid-range bill burden and a high-range bill burden. Users are strongly encouraged to consider whether to adjust the defaults in the Default Values page, Lines 16-18, in light of the User’s entries here. For explanation of how bill burden thresholds determine the extent to which bill discounts improve customers’ payment rates, see Lines 10-20 of the Default Values page.</p>
9	Incremental decrease in affordable bill burden as incomes decrease (per service)	Percent (%)	Established by policy. This is used to calculate the affordable bill burden for households with income below 100% of FPG. This incremental decrease will be applied to each service individually (water, wastewater, and stormwater).	<p>As income declines, the bill burden that can be deemed affordable declines as well. Therefore, some percentage of income-based programs use a “tiered bill burden” to define affordability, resulting in a tiered discount based on household income level. The Tool is designed to allow three tiers of income, as a percentage of FPG (0-50%, 50-100%, and 100-150%).</p> <p>For each service provided (water, wastewater, stormwater), this line sets the incremental decrease in affordable bill burden (as compared to the “base” bill burden in Lines 6-8) at each succeeding lower FPG range below 100% of FPG. This incremental decrease will be applied to each service individually. For example, if a utility provides combined water and wastewater service, the “affordable water annual bill burden” and “affordable wastewater annual bill burden” are each set at 1.5%, and the incremental decrease is set at 0.25%, then the three tiers for each service would have the following affordable burdens: 100-150% of FPG: 1.5%; 50-100% of FPG: 1.25%; 0-50% of FPG: 1.00%. The affordable annual bill burden for the <i>combined</i> service, for each income tier, would be: 100-150% of FPG: 3.0%; 50-100% of FPG: 2.5%; and 0-50% of FPG: 2.0%.</p> <p>Establishing a tiered discount based on a tiered bill burden is the recommended approach. However, if a User chooses to define the affordable bill burden as the same percentage of income for all low-income customers, this line should be set as zero (0).</p>
<b>Percentage of bill data inputs</b>				
10-15	Distribution of customers with annual bill that is X% of average annual combined service bill	Percent (%)	Retrieve from internal utility records. Used only to calculate over- or underpayment, not to calculate discounts. Only applicable if Line 19 on the Input Common Data page is set to “Income-based discount.”	<p>These lines are used in calculating the Percentage of Bill program costs. The basic structure of the POB program aims for affordability given an “average” bill level. Not all customers, however, have an average bill. These lines allow the User to distribute residential customers around the average. For example, if an average annual bill is \$1,000 and 10% of customers have a monthly bill of less than \$500, Line 11 would be 10%. The sum of the data in Lines 11 through 15 should always equal 100%. If the User has selected “Across-the-board discount” on Line 19 of the Input Common Data page, the input will be grayed out.</p>

**TABLE 3. COMBINED SERVICE DATA INPUTS**

Line	Metric	Unit	Source	Information
16	Across-the-board discount	Percent (%)	Established by policy. Applicable only if Line 19 on the Input Common Data page is set to "Across-the-board" discount.	<p>There are two ways to establish a bill discount in a Percentage of-Bill program model. The default method used in this model is income-based, applying the bill discount that is needed to result in a bill that is affordable at a prescribed percentage of income. The User, however, may wish to provide an across-the-board discount of a certain percentage. This line allows the User to input the value of such an across-the-board discount. If the User has selected "Income-based discount" on Line 19 of the Input Common Data page, the input will be grayed out.</p> <p>After completing all inputs to the Tool, the User can determine the extent to which the selected percentage discount is reducing customers' bill burdens by referring to the Combined Service Collectability worksheet. On that Worksheet, Lines 7 and 10 show the bill burden for customers at varying levels of income before the discount and after the discount, respectively. Line 1 shows the thresholds for low-range (i.e., affordable), mid-range, and high-range bill burdens, which are set based on User inputs. The worksheets can be viewed by selecting "See Supporting Worksheets" at the top of the Summary Tables page, or by clicking "Restore default Excel functionality" on the Welcome page or the Input General Information page.</p>
<b>Fixed dollar discount data inputs</b>				
17-19	Combined service annual fixed dollar discount: all FPG ranges	Dollars (\$)	Based on program design.	<p>This line allows the User to define an annual dollar amount for a Fixed Dollar Discount for each service. The discounts will be summed together for the combined service discount.</p> <p>A FDD could simply constitute a discount of a set amount of dollars. The FDD option can also be used to evaluate the impacts of waiving certain charges or providing percentage discounts on a portion of the bill for a service rather than on the entire bill for that service. For example, if the User wishes to waive a fixed monthly charge for water service or provide a 50% discount on a fixed charge or volumetric charge for water, they can input here the annual value of that waiver or discount (as applied to the average annual customer bill).</p> <p>After completing all inputs to the Tool, the User can determine the extent to which the selected fixed dollar discount is reducing customers' bill burdens by referring to the Combined Service Collectability worksheet. On that Worksheet, Lines 7 and 10 show the bill burden for customers at varying levels of income before the discount and after the discount, respectively. Line 1 shows the thresholds for low-range (i.e., affordable), mid-range, and high-range bill burdens, which are set based on User inputs. The worksheets can be viewed by selecting "See Supporting Worksheets" at the top of the Summary Tables page, or by clicking "Restore default Excel functionality" on the Welcome page or the Input General Information page.</p>
<b>Expense/revenue offset data inputs</b>				
20	Average monthly arrears per residential* combined service account in arrears	Dollars (\$)	Retrieve from internal utility records.	<p>This line is the dollar value of average monthly residential arrears (of accounts having arrears). It affects the calculation of expense offsets throughout the model.</p>

**TABLE 3. COMBINED SERVICE DATA INPUTS**

Line	Metric	Unit	Source	Information
21	Total disconnections for nonpayment—combined service accounts (annual)	Number of disconnections	Retrieve from internal utility records.	This is the total annual number of disconnections. Since generally there are no separate wastewater or stormwater disconnections, the number of water disconnections will generally cover all disconnection types.
22	Disconnection notices for nonpayment—combined service accounts (annual)	Number of notices	Retrieve from internal utility records.	This is the total annual number of disconnection notices. Since generally there are no separate wastewater or stormwater disconnections, the number of water disconnection notices would generally cover the number of disconnection notices for all types. If more than one type of notice is provided (e.g., a mailed notice followed by a door hanger), both types of notice should be included.
23	Expected percent reduction in disconnection notices and disconnections from low-income program	Percent (%)	User estimate. Could be based on internal utility records or external research. Default set to 10%. Assumed to correspond with water- or wastewater-related disconnections.	<p>This line allows the User to project the degree to which offering a bill discount would reduce the number of disconnection notices and disconnections. The User also has the option of entering “0%” to indicate that providing a discounted bill would have no impact on the number of disconnection notices and disconnections.</p> <p>Note that the Tool applies the percentage reduction entered here to all program designs, even though programs that do not achieve affordable bill burdens will not, in fact, result in as large a reduction as programs that do achieve affordable bill burdens. Therefore, if the User enters a number here reflecting the reductions associated with a PIP or an income-based POB, the Tool will produce results that tend to overestimate the number of disconnections and disconnection notices avoided by an across-the-board POB or FDD.</p> <p>The User may choose to insert a variety of values (perhaps a low, medium, and high value) to determine to what extent, if at all, changing this figure results in differences in the results (shown in the Summary Tables).</p> <p>TIP: The User could also use this line to account for reduced disconnections attributable to changes in utility policies, above and beyond the impacts of a bill discount itself. For example, a utility considering a ban on disconnections for participants in a low-income program could estimate, separate from the Tool, the percentage reduction in disconnections that might result from such a ban. That percentage reduction could be entered here.</p>
24	Total combined service revenue (includes nonresidential sectors) (annual)	Dollars (\$)	Retrieve from internal utility records.	This line calls for the input of annual total combined service revenue from all ratepayers. Total revenue is used as an input into one calculation presented in the Summary Tables. It allows the User to examine the cost of a low-income discount (prior to offsets) as a percentage of total revenue.

\* “Residential” includes standard-rate and low-income customers.

## INPUT POVERTY AND HOUSEHOLD SIZE DATA

The Input Poverty and Household Size Data page allows the User to tailor this Tool to fit the demographics of a utility’s service area. Two types of Census data are sought on this page, including information on the distribution of population among FPL ranges and on the average household size.\*

See the line-by-line descriptions of each input in Table 4, below. Note that the Tool displays this page in a very wide format. The User must scroll to the right to see all of the data inputs.



**TABLE 4. POVERTY AND HOUSEHOLD SIZE DATA INPUTS**

Line	Metric	Unit	Source	Information
0	Year of Census data used	Year		
1-100 (left side of page)	Ratio of income to poverty level in the past 12 months		Census Bureau’s American Community Survey, <a href="#">Table C17002</a>	<p>Enter data from American Community Survey (ACS), Table C17002: “Ratio of Income to Poverty Level in the Last 12 Months.” These data show the distribution of population by poverty range.</p> <p>Insert data for each geographic area within the utility’s service area on a separate line. The granularity of the geographic area(s) of choice depends on the User’s definition of the utility’s service territory. To find data on the ACS table for a specific geographic area, click the button labeled “Geos” and search by name.</p> <p>It is suggested that the five-year data from the most recent year available be used. To find the five-year data on the ACS table, click on the dropdown labeled “1-Year Estimates Detailed Tables” and select the option titled “5-Year Estimates Detailed Tables.”</p>
1-100 (right side of page)	Average household size of occupied housing units by tenure		Census Bureau’s American Community Survey, <a href="#">Table B25010</a>	<p>Enter data from American Community Survey (ACS), Table B25010: “Average Household Size of Occupied Housing Units by Tenure.”</p> <p>Insert data for each geographic area within the utility’s service area on a separate line. The granularity of the geographic area(s) of choice depends on the User’s definition of the utility’s service territory. To find data on the ACS table for a specific geographic area, click the button labeled “Geos” and search by name.</p> <p>It is suggested that the five-year data from the most recent year available be used. To find the five-year data on the ACS table, click on the dropdown labeled “1-Year Estimates Detailed Tables” and select the option titled “5-Year Estimates Detailed Tables.”</p> <p>While the Tool uses the average household size for all households as the default, the User can use average household size for owner-occupied units, for renter-occupied units, or for all units (irrespective of the tenure of the occupant). Average household size is typically larger for owner-occupied units than for renter-occupied units; if the User believes that larger household size is more typical of the utility’s customer base, the User may wish to use the average household size for owner-occupied units, or vice versa. To select which household size data will be used, make a selection from the “Select Housing Type” drop-down menu, which is located to the right of the data entry fields. (Regardless of the option selected, however, the User must enter the ACS data for all three options.)</p>

\* The Tool assesses the financial impacts of providing discounts only to low-income households that directly receive a bill from the utility (see the definition of “Customer” in the Glossary). Tenants often pay for water, wastewater, and/or stormwater service through their rent rather than receiving a bill directly, and therefore often are not actually customers of the utility. But the Census data on income distribution do not distinguish between owners and renters, even though tenants generally tend to have lower income than homeowners. Given the limitations of the Census data, the Tool imputes to a utility’s *customers* the income distribution of the *entire population* the utility serves (including all homeowners and all tenants). This approach likely overestimates the percentage of a utility’s customers that would be eligible for discounts, as it relies on an income distribution reflecting a greater percentage of renters, and therefore a greater percentage of low-income households, than is likely the case among the utility’s customers. Accordingly, by overestimating the number of customers eligible for discounts, the Tool likely overestimates the total dollar amount of discounts that would be provided. Similarly, the Tool likely overestimates the “offsets” (i.e., the increased revenue and avoided costs) that would result from providing discounts to low-income customers. These two overestimates tend to counteract each other; therefore, the lack of data on income distribution specific to homeowners may not substantively affect the results calculated by the Tool, although this cannot be known with any certainty.

## DEFAULT VALUES

The Default Values page is an extension of the Input Common Data page, but for more obscure factors. In many cases, the User will want to defer to the default values. However, Users are encouraged to overwrite any of the default values with utility-specific data where available. Defaults may also be changed on the basis of the User’s own assumptions or understanding of evolving industry practices.

The Default Values page is accessible by clicking a button at the bottom of the “Input Common Data” page. See the line-by-line descriptions of each input in Table 5, below.

TABLE 5. DEFAULT VALUES				
Line	Metric	Unit	Source	Information
<b>Arrearage inputs</b>				
1	Multiplier of low-income accounts in arrears	Dropdown	The percentage of low-income accounts in arrears is universally higher than the percentage of residential accounts in general that are in arrears—typically two (or more) times higher. The default is thus set at “2” but is subject to change by the User. A reasonable approach is to use a range of inputs. Allowed inputs range from a low of “1” (or no difference) to a high of “5.”	This line presents the multiplier of low-income accounts in arrears relative to total residential accounts in arrears. The default multiplier of 2 indicates that the percentage of low-income accounts in arrears is two times the percentage of residential accounts in arrears. In many instances, this multiplier understates the low-income arrears. The rate at which low-income revenue is in arrears (as contrasted to the rate at which low-income accounts are in arrears) is also frequently greater than the rate at which total residential revenue is in arrears.
2	Multiplier of low-income dollars in arrears to residential* dollars in arrears	Dropdown	Not only is the percentage of low-income accounts in arrears higher than the percentage of residential accounts in arrears, but the dollars of low-income arrears are higher as well. Allowed inputs range from a low of “1” (or no difference) to a high of “5.”	It is nearly universally known that the rate at which low-income billings (dollars) are in arrears is substantially greater than the rate at which total residential billings (dollars) are in arrears. This line allows the User to establish the difference between the two rates. The default multiplier of 2 indicates that if 10% of residential dollars are in arrears, 20% of low-income dollars will be in arrears.
<b>Disconnections inputs</b>				
3	Low-income charge-off multiplier	Integer	Default set to 4. Based on Pennsylvania PUC, Bureau of Consumer Services, <a href="#">Report on Collections Performance and Universal Service Programs</a> (annual).	The rate of charge-off of low-income billings has historically been substantially higher than the rate of charge-off of residential billings generally. This line presents the multiplier that will represent the extent of the increase. A multiplier of “1” means no difference in low-income and residential charges.
4	Low-income multiplier of rate of reconnection	Percent (%)	Default set to 85%. Based on Pennsylvania PUC, Bureau of Consumer Services, <a href="#">Report on Collections Performance and Universal Service Programs</a> (annual).	This line presents the relationship between the rate at which residential customers who have had service disconnected for nonpayment are reconnected and the rate at which low-income customers who have had service disconnected for nonpayment are reconnected. If the two populations are reconnected at the same rate, this multiplier will be 100%. The default is set at 85%.
5	Average days after disconnection prior to reconnection—residential*	Days	Default set to 1 day.	This line provides the average number of days that a residential account remains disconnected for nonpayment before it is reconnected. If the period is measured in hours, but fewer than 24 hours, the number should be set to “1.” Numbers should be presented in whole digits.
6	Average days after disconnection prior to reconnection—low-income	Days	Default set to 3 days.	This line provides the average number of days that a low-income account remains disconnected for nonpayment before it is reconnected.

**TABLE 5. DEFAULT VALUES**

Line	Metric	Unit	Source	Information
<b>Mobility inputs</b>				
7	Mobility rate for customers with non-affordable bills	Percent (%)	Default set to 40%. See Roger D. Colton, " <a href="#">The Economic Development Impacts of Home Energy Assistance: The Entergy States</a> ," Entergy, 2003, page 14.	Research shows that low-income customers are considerably more mobile than non-low-income customers. Mobility is defined as a household changing residence within a 12-month period. Research also shows that reducing utility bills to an affordable level helps to stabilize low-income household residency. This line provides an estimate of the rate of low-income mobility without the household having an affordable bill.
8	Reduction in mobility rates for customers with discounted bills	Percent (%)	Default set to 50%. See Roger D. Colton, " <a href="#">A Road Off Taken: Unaffordable Home Energy Bills, Forced Mobility, and Childhood Education in Missouri</a> ," <i>Journal of Children and Poverty</i> 2, no. 2, 1996.	<p>If no reduction is expected, this number should be set at "0%." If low-income mobility is expected to be eliminated, the number should be set at 100%. Research with other programs has found that reductions in mobility (if the discount is sufficient to achieve an affordable bill) are generally in the range of 50%.</p> <p>Note that the Tool applies the percentage reduction entered here to <i>all</i> program designs, even though programs that do not achieve affordable bill burdens will not, in fact, result in as large a reduction as programs that do achieve affordable bill burdens. Therefore, if the User enters a number here reflecting the reductions associated with a PIP or an income-based POB, the Tool will produce results that tend to overestimate the reduction in mobility rates resulting from an across-the-board POB or FDD.</p> <p>The User may choose to insert a variety of values (perhaps a low, medium, and high value) to determine to what extent, if at all, changing this figure results in differences in the results (shown in the Summary Tables).</p>
9	Vacancy days due to household mobility	Days	Default set to 7 days. See Roger D. Colton, " <a href="#">A Road Off Taken: Unaffordable Home Energy Bills, Forced Mobility, and Childhood Education in Missouri</a> ," <i>Journal of Children and Poverty</i> 2, no. 2, 1996.	<p>This line presents the number of days a housing unit remains vacant during the time between when one resident moves out and a new resident moves in. Service need not be "off" for the housing unit to be vacant. The placeholder is set at a time of vacancy of one week (7 days). The line is measured in number of days.</p> <p>This value differs from the number in the Input Common Data page, Line 13, in that this figure captures frequent mobility not caused by a disconnection of service.</p>
<b>Collectability inputs</b>				
10	Annual collectability of residential* bills	Percent (%)	Default set at 90%. User can modify this value from a low of 85% to a high of 100%.	The collectability of bills reflects the fact that not all dollars billed to customers are collected by the water utility. Some billed revenue ultimately gets written off as uncollectable. Other dollars of billed revenue are carried as unpaid balances in buckets of "aged" arrears. The collectability for these calculations is based on the percentage of billed revenue translated into receipts within the first 12-month period after they are billed. The base collectability is set at 90% of billed revenue. However, this line allows the User to override the default value.

**TABLE 5. DEFAULT VALUES**

Line	Metric	Unit	Source	Information
11	Ratio of low-income program participants' collectability to residential* collectability	Percent (%)	Default set at 95%.	<p>Low-income programs can be expected to increase the collectability of participating customers' bills, if the discount is sufficient to achieve an affordable bill or to reduce the customer's bill burden from high-range to mid-range.</p> <p>Even if the discounted bill results in an affordable bill, the resulting collectability may or may not match that of residential accounts generally. In cases where the discount is sufficient to achieve an affordable bill, this line establishes the collectability of low-income program participants' bills as a percentage of residential collectability generally. For example, if estimated total residential collectability is 90% (the default for Line 10) and the ratio is set to 95% (the default setting for Line 11), that would reflect a bill collectability rate of 85.5% (<math>0.9 \times 0.95 = 0.855</math>) for participants whose discounted bill is an affordable bill.</p> <p>(For participants whose discounted bill still results in a high- or mid-range burden, the collectability of program participants' bills is determined according to the multipliers in lines 12 and 20 below.)</p>
12	Embedded lost revenue multiplier (mid-range bill burden) (water and wastewater)	Multiplier	<p>On the basis of extensive research in the energy industry—the water industry has not engaged in similar research—it is possible to estimate the extent to which the rate of embedded lost revenue increases as bill burdens increase. The default multiplier for mid-range bill burdens is set to 3. See Pennsylvania Public Utility Commission, Bureau of Consumer Services, <a href="#">Report on Universal Service Programs and Collections Performance</a> (annual).</p>	<p>Embedded lost revenue is the amount of billed revenue not collected. The percentage of billed revenue that is embedded lost revenue is the difference between 100% and the collectability rate. For example, if the collectability rate is 85% (see Line 11), the embedded lost revenue percentage is 15% (<math>1 - 0.85</math>).</p> <p>Not all billed revenue is translated into receipts at an equal rate. As bill burdens increase and bills become more unaffordable, the rate at which billed revenue is translated into collected receipts decreases. Accordingly, the rate of embedded lost revenue increases.</p> <p>The Tool applies the multiplier on this line to determine the embedded lost revenue percentage for customers in the mid-range of bill burdens. If the embedded lost revenue percentage for total residential customers is 10%, a multiplier of 3 would indicate that the embedded lost revenue percentage for customers in the mid-range of bill burdens is 30%.</p>

**TABLE 5. DEFAULT VALUES**

Line	Metric	Unit	Source	Information
13	Bottom of water collectability mid-range bill burden	Percent (%)	Set as identical to the User’s input for “Base affordable water annual bill burden” on the Input Water Data page (Line 4) or the Input Combined Service Data page (Line 6). Cannot be changed directly on this page.	As bill burdens increase, the collectability of billed revenue decreases. Lines 13-18 establish the boundaries of bill burden ranges where collectability changes.  The Tool divides bill burdens into three “ranges” (low, mid-range, and high burdens). Ranges are established separately for water, wastewater, and stormwater service.
14	Bottom of wastewater collectability mid-range bill burden	Percent (%)	Set as identical to the User’s input for “Base affordable wastewater annual bill burden” on the Input Wastewater Data page (Line 4) or the Input Combined Service Data page (Line 7). Cannot be changed directly on this page.	<ul style="list-style-type: none"> <li>Lines 13–15: These lines show the “bottom” of the mid-range of bill burdens for each service. By definition, bill burdens lower than this level are considered to be in the low range. Because the low range of bill burdens is intended to represent affordable bills, Lines 13–15 are set as equal to the “Base affordable annual bill burden” from the input pages for water, wastewater, stormwater, or combined service data. If the User wishes to change this default value, the User must return to those other pages and change the “Base affordable annual bill burden.”</li> </ul>
15	Bottom of stormwater collectability mid-range bill burden	Percent (%)	Set as identical to the User’s input for “Base affordable stormwater annual bill burden” on the Input Stormwater Data page (Line 4) or the Input Combined Service Data page (Line 8). Cannot be changed directly on this page.	<ul style="list-style-type: none"> <li>Lines 16–18: These lines set the “top” of the mid-range of bill burdens for each service. By definition, bill burdens higher than this level are considered to be in the high range. For each service, these lines must be set higher than the “bottom” of the mid-range of bill burdens for the same service (as shown on Lines 13, 14, and 15).</li> </ul>
16	Top of water collectability mid-range bill burden	Percent (%)	Default set to 1.5% higher than Line 13 above. User many chance to any other value that is higher than Line 13.	The low, mid-range, and high-range thresholds that result from these inputs can be viewed directly in the Water/Wastewater/Stormwater/Combined Service Collectability Worksheets, Line I. The worksheets can be accessed by selecting “See Supporting Worksheets” at the top of the Summary Tables page, or by clicking “Restore default Excel functionality” on the Welcome page or the Input General Information page.
17	Top of wastewater collectability mid-range bill burden	Percent (%)	Default set to 1.5% higher than Line 14 above. User many chance to any other value that is higher than Line 14.	
18	Top of stormwater collectability mid-range bill burden	Percent (%)	Default set to 1.0% higher than Line 15 above. User many change to any other value that is higher than Line 15.	
19	Increase in the maximum annual discount as incomes decrease	Multiplier	Default set to 1.25.	This factor adjusts the maximum annual discount, which is based on 100–150% FPG, to lower FPG tiers.
20	Embedded lost revenue multiplier (high-range bill burden) (water and wastewater)	Multiplier	Default set to 5. The default is based on the difference between low-income collectability and residential collectability for the six Pennsylvania energy utilities with the greatest difference in charge-off rates (excluding PECO-Gas, which reports a multiplier of more than 16 to 1). See Pennsylvania Public Utility Commission, Bureau of Consumer Services, <a href="#">Report on Universal Service Programs and Collections Performance</a> (annual).	<p>This line serves the same purpose as Line 12, except that this multiplier applies to customers in the high range of bill burdens. For example, if lost revenue for total residential customers is 10%, a multiplier of 5 would indicate that lost revenue for the high range of bill burdens is 50%.</p> <p>This multiplier should be set higher than the multiplier in Line 12 because higher bill burdens—i.e., more severely unaffordable bills—result in lower collectability and thus higher embedded lost revenue.</p>

\* “Residential” includes standard-rate and low-income customers.

# SUMMARY TABLES

The Summary Tables page provides the final results from the calculations of the collectability of billed revenue and the expense/revenue offsets for each of the three programs (PIP, POB, FDD) and for each of the four possible types of service (water, wastewater, stormwater, combined service). The calculations are the same for each type of program and each service type.

By selecting “See Supporting Worksheets” at the top of the page, a User can access the calculations that run in the background of the Tool to generate the results in the Summary Tables. (For an explanation of the Supporting Worksheets, see the next section of this Manual.)

As noted earlier in this Manual, by making a selection on the Input Common Data page, Line 16, the User can choose between two ways of determining the extent of a net impact from a low-income discount:

- **Option 1:** A utility can offer a discount and not seek to recover the lost receipts from nonparticipating ratepayers. (To model this scenario in the Tool, select “No” for “Allow cost recovery from non-participating ratepayers?” on Line 16 of the Input Common Data page.) Under this option, the utility does not seek to fill the revenue gap from ratepayers (resulting in a “0” on lines 4, 24, and 44 of the Summary Tables) and the Tool can be used simply to determine how big that gap will be (as reflected on lines 5, 25, and 45 of the Summary Tables). This information can help the utility identify potential funding options.
- **Option 2:** A utility can offer a discount and seek to recover the lost receipts from nonparticipating ratepayers. (To model this scenario in the Tool, select “Yes” for “Allow cost recovery from nonparticipating ratepayers?” on Line 16 of the Input Common Data page.) Under this option, the utility will collect those lost billings through rates charged to nonparticipating ratepayers (as reflected by a non-zero number on lines 4, 24, and 44 of the Summary Tables). The Tool then calculates the net impact on utility receipts (as reflected on lines 5, 25, and 45 of the Summary Tables) of transferring that portion of low-income customers’ bills to other ratepayers with higher collectability rates.

The Summary Tables restate which option the User has selected, above lines 4–5, 24–25, and 44–45. A User may wish to return to the Input Common Data page and change the selection on Line 16 there to see how that change modifies the results in the Summary Table.

As stated in various places throughout this Manual, however, the Tool does not assess the *rate impacts* on nonparticipant customers. It only determines the impact on total receipts from the perspective of the utility. If the total net gain is positive, for example, the utility will be receiving more money by offering a low-income discount than it would have received without the low-income discount. What the utility *does* with that money is not addressed by the Tool. The utility could return that net gain to everyone in reduced rates, or it could use that net gain for other internal purposes (e.g., pay down debt, invest in capital projects) that would not have been met in the absence of the net gain.

See the line-by-line descriptions for each output in Table 6, below.

TABLE 6. SUMMARY TABLES			
Line	Metric	Source	Information
<b>Gross revenue results</b>			
Program discounts			
1, 21, 41	Total bill discount applied for program participants (\$)	[Service] Collectability worksheet	This line represents the total program discount from <i>bills</i> . It is the difference between (1) amounts billed to program participants if they were charged at the standard residential rate and (2) amounts billed to program participants at the discounted rate.
2, 22, 42	Total discount from receipts for program participants (\$)	[Service] Collectability worksheet	This line represents the total program discount from <i>receipts</i> , taking into account that non-discounted bills are not paid in full. It is the difference between (1) expected receipts from program participants if they were charged at the standard residential rate and (2) amounts billed to program participants at the discounted rate.

**TABLE 6. SUMMARY TABLES**

Line	Metric	Source	Information
<b>Change in receipts</b>			
<b>3, 23, 43</b>	Change in total receipts from participants before and after discount program (\$)	[Service] Collectability worksheet	<p>This line presents the net change in receipts that are actually collected from program participants, taking into account improved collectability when the bill discount is sufficient to achieve an affordable bill or to reduce the customer's bill burden from high-range to mid-range. A negative number indicates that net receipts from participating customers will decline. A positive number indicates that receipts will increase, notwithstanding the dollars of discount that are provided.</p> <p>See the Default Values page, Lines 11, 12, and 20, for information on how to adjust the default values to test the sensitivity of the Tool's results to various collectability rates.</p>
<b>4, 24, 44</b>	Increase in receipts from nonparticipants (standard-rate customers) (\$)	[Service] Collectability worksheet	<p>On the Input Common Data page, Line 16, the User chooses whether to recover from nonparticipating ratepayers the value of discounts provided to low-income program participants. If the User selects "Yes" for that option, this line calculates the receipts derived from billing the discounted dollars to program nonparticipants. The discounts are translated into receipts at the collectability rate of residential customers as a whole. Note that, if a utility were to recover the costs of a low-income program from all ratepayers, including nonresidential ratepayers, the results on this line could be considered conservative, as nonresidential ratepayers typically have a higher collectability rate than residential ratepayers.</p> <p>If the User selects "No" on the Input Common Data page, Line 16, none of the discounts provided to low-income program participants are recovered from other ratepayers. In that case, this line will show as zero (0).</p>
<b>5, 25, 45</b>	Change in total receipts from all customers before and after discount program (\$)	Line 3 + Line 4	<p>This presents the net change in receipts resulting from offering a low-income discount, accounting for the change in receipts from program participants and, if applicable, from nonparticipating ratepayers. If the User has set the dropdown on the Common Inputs page, Line 16, to "Yes," this line will sum the change in receipts from participants and nonparticipants. If the User has set the dropdown to "No," this line will be identical to the change in total participant receipts above.</p>
<b>Offset results</b>			
<b>Reduced carrying costs</b>			
<b>6, 26, 46</b>	Reduced carrying costs: non-charged-off low-income arrearages (\$)	[Service] Offsets worksheet	<p>These lines bring forward the expense and revenue changes that offset the costs of a low-income discount. To trace these calculations, navigate to the Offsets worksheets by selecting "See Supporting Worksheets" at the top of the Summary Tables page.</p> <p>Note that the Tool applies the same reduced or avoided costs to all program designs, even though the impacts of programs that do not achieve affordable bill burdens will not, in fact, be as large as the impacts of programs that do achieve affordable bill burdens. Therefore, users should interpret these results with caution, especially for program types that are not designed to achieve affordable bills (i.e., across-the-board POBs and FDDs). Specifically, for Lines 6/26/46, 7/27/47, and 8/28/48, the Tool assumes that all program designs will reduce arrearages (i.e., the percentage of customers in arrears, and the average amount of arrears per account for those customers) among participating customers to the same level as residential customers as a whole. Similarly, for Lines 9/29/49, 10/30/50, 11/31/51, and 12/32/52, the Tool applies to all program designs the same rate of reductions in disconnection notices, disconnections, and customer mobility (see further explanation on the Input Service-Specific Data pages, Line 17; Input Combined Service Data page, Line 23; and Default Values page, Line 8).</p>
<b>7, 27, 47</b>	Reduced carrying costs: charged-off low-income arrearages (\$)		
<b>8, 28, 48</b>	Reduced carrying costs: redirected collections (\$)		
<b>Reduced collection efforts</b>			
<b>9, 29, 49</b>	Reduced collection efforts: disconnections for nonpayment (\$)		
<b>10, 30, 50</b>	Reduced collection efforts: nonpayment disconnection notices (\$)		
<b>Lost revenues</b>			
<b>11, 31, 51</b>	Reduction in revenue lost due to disconnections (\$)		
<b>12, 32, 52</b>	Reduction in revenue lost due to customer mobility (\$)		

**TABLE 6. SUMMARY TABLES**

Line	Metric	Source	Information
<b>Other</b>			
<b>13, 33, 53</b>	Hard-to-quantify offsets (multiplier)	Input Common Data page (Line 17)	This line brings forward the choice the User has made on the Input Common Data page regarding “hard-to-quantify” offsets. There are impacts that are generally recognized as arising from offering a low-income program but whose value is difficult, if not impossible, to quantify. One such impact, for example, involves the expectation that if a utility needs to devote less time and fewer resources to the collection of low-income customers’ bills, the utility will redirect that time and those resources to the collection of other bills. Assuming the collection effort generates a benefit to the utility, that benefit of those redirected efforts will be greater than \$0. How much greater, however, is not known. This multiplier accounts for these hard-to-quantify offsets.
<b>14, 34, 54</b>	Administrative costs (\$)	Offset Parameters worksheet x Line 1	This presents the dollar value of the administrative costs of the program. The administrative costs can be viewed in either of two ways that are functionally identical: as a value that reduces the program offsets, or as a value that increases the cost of the discounts. Either way, the administrative costs will increase the total net cost of the program (and will either reduce the net gain or increase the net loss). The administrative costs are driven by the percentage of program costs that the User has set for administrative costs.
<b>Totals</b>			
<b>15, 35, 55</b>	Sum of offsets (not accounting for administrative costs) (\$)	(Sum of Line 6 through Line 12) x Line 13	This adds the value of the offsets and multiplies it by the hard-to-quantify multiplier.
<b>16, 36, 56</b>	Sum of offsets (accounting for administrative costs) (\$)	Line 15 – Line 14	This line subtracts the administrative costs from the program offsets.
<b>17, 37, 57</b>	Offsets (accounting for administrative costs) as percentage of total discount (%)	Line 16 / Line 1	This line presents the relationship between the sum of program offsets (minus administrative costs) and the total program discounts from bills at standard residential rates. The sum of offsets on the preceding line does <i>not</i> address receipts. It assumes that 100% of the discounted revenue would have been collected in the absence of a low-income discount. If this line is 100%, the program offsets (minus administrative costs) will be exactly equal to the dollar amount of the discounts provided. If this line is more than 100%, the program offsets (excluding administrative costs) more than offset the dollar amount of the discount. If this line is less than 100%, the line informs the User of the extent to which the offsets reduce the dollar amount of the discount that needs to be collected from nonparticipating ratepayers or from some other, external source.
<b>Net impacts</b>			
<b>18, 38, 58</b>	Total program impact (\$)	Line 5 + Line 16	This line presents the net gain (or loss) resulting from the offer of a low-income discount. It combines the net change in customer receipts and the costs avoided through the program, while subtracting the administrative costs of the program.
<b>19, 39, 59</b>	Total program impact as percentage of residential revenue (%)	Line 5 / Input [Service] Data page Line 1	This line presents the net gain (or loss) in receipts resulting from the offer of a low-income discount as a percentage of residential revenues. This percentage does not take into consideration any offsets. It is a ratio with the net gain (or loss) in receipts in the numerator and the total residential revenue in the denominator. Note that this percentage will change according to the cost recovery User selection on the Input Common Date page (Line 16).
<b>20, 40, 60</b>	Total program impact as percentage of total system revenue (%)	Line 5 / Input [Service] Data page Line 18	This line presents the net gain (or loss) in receipts as a percentage of total system revenues (as compared with total residential revenues presented above). This percentage does not take into consideration any offsets. It is a ratio with the net gain (or loss) in receipts in the numerator and the total system revenue in the denominator. Note that this percentage will change based on the cost recovery User selection on the Input Common Data page (Line 16).
<b>61–67</b>	Over-/underpayments by FPG range	[Service] Collectability worksheet	These lines apply only to the Percentage of Bill program type, and only if the user selects the income-based POB discount (as opposed to the across-the-board POB discount). These lines calculate whether an income group has received more discount than necessary to achieve an affordable bill (overpayment), or less discount than necessary to achieve an affordable bill (underpayment).



# SUPPORTING WORKSHEETS

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The Tool has 10 supporting worksheets. By selecting “See Supporting Worksheets” on the Summary Tables page, the User can view each worksheet as a page within the Tool. (The User can also display the worksheets by selecting “Restore default Excel functionality” on the Welcome page or the Input General Information page.)

The supporting worksheets convert input data into various output variables. The User does not need to input any additional data on these worksheet pages, but rather can explore them to take a deeper dive into the inner workings of this Tool.

The supporting worksheets consist of five major sections, each with two subsections: (1)(a) program parameters and (b) program offsets; (2)(a) water collectability and (b) water offsets; (3)(a) wastewater collectability and (b) wastewater offsets; (4)(a) stormwater collectability and (b) stormwater offsets; and (5)(a) combined service collectability and (b) combined service offsets. In each major section, the first subsection focuses on the impact of providing bill discounts on receipts actually collected by the utility. The second subsection focuses on the impact of a low-income program on expenses.

For each supporting worksheet, the Tool performs calculations for each program type (PIP, POB, and FDD).

This section of the manual provides line-by-line information on:

- Program parameters
- Program offsets
- Collectability calculations (per service)
- Offset calculations (per service)

## PROGRAM PARAMETERS

The Program Parameters worksheet contains three distinct sections: variables that pertain to all three program types (PIP, POB, and FDD), variables that pertain to POB only, and variables that pertain to FDD only. The worksheet is designed this way due to the overlap in variables that exists between the program types.

A POB program differs from a PIP program because, while both program designs tie low-income bills to a percentage of income, in a POB program the dollar discount varies based on the total bill, whereas a PIP program results in a fixed bill. For the POB program, the Tool calculates the level of the discount to reflect an affordable bill burden at an average household size and average bill. Assume, for example, that an affordable annual water bill burden is set equal to 3% of income. Given the average annual income (as calculated in the Program Parameters worksheet), it would be possible to determine what level of annual bill would be required in order to achieve that affordable burden (income x affordable burden = affordable annual bill). Given the actual average annual water bill (as calculated in the Program Parameters worksheet), it would then *also* be possible to determine what percentage reduction in bills, if any, would be required in order to achieve the affordable burden on average. For example, if an affordable average annual bill is \$300 and the actual average annual bill is \$400, the affordable bill is 75% of the average annual water bill. The necessary discount, on average, to make the average annual bill affordable would thus be 25% (1 - 0.75).

Like the PIP, the recommended POB structure utilizes a tiered approach. Discounts vary based on the level of income (measured as a percentage of FPG) at which customers live. A customer with income at or below 50% of FPG, in other words, would receive a larger discount than would a customer with income at between 100% and 150% of FPG.

Even though the basic structure of a POB is income-based, Users can override this default program design on the Input Common Data page, Line 19. Similarly, if a User does not wish to have a POB structure based on an underlying tiered affordable bill burden, they can enter “0” for the “incremental decrease” on the Input Water/Wastewater/Stormwater Data pages, Line 5, or the Input Combined Service Data page, Line 10.

It should be noted that eliminating the tiered nature of the underlying affordability calculation does not eliminate the tiered nature of the POB discount. Assume, for instance, that an across-the-board affordable burden is set at 1.5% of income (though this observation applies irrespective of the affordable burden). The discount needed to reduce a bill to that affordable burden would need to be deeper for a household with income at or below 50% of FPG than it would be for a household with a somewhat higher income (e.g., between 100 and 150% of FPG).

If the User overrides the income-based approaches to examine an across-the-board POB discount, the User will be prompted to manually input a percentage discount that does not vary based on affordability calculations.

Meanwhile, the FDD program prescribes a constant dollar discount that does not vary by customer income or customer bill. (The FDD option can also be used to evaluate the impacts of other discount structures that can be converted by the User into a fixed-dollar equivalent. For example, a utility may offer a percentage discount on either a fixed charge or a volumetric charge, rather than a percentage discount on the entire bill. The Tool can be used to evaluate the operation of such program designs by translating the discount into a fixed dollar amount and inputting that amount on Line 13 of the Input Water/Wastewater/Stormwater Data pages, or Lines 17–19 of the Input Combined Service Data page, as applicable.)

The fundamental program parameters for an FDD program structure are, with some limited exceptions, otherwise identical to the parameters of a PIP and POB structure. Accordingly, as with the POB program parameters, the program parameters for the FDD are the same as those brought forward into PIP and POB. Namely, the following underlying parameters will not vary by program design: non-discounted low-income bills, participation rate, and customer incomes. These program parameters are brought forward from previous program designs.

See the line-by-line descriptions for each calculation in Table 7, below. Refer to the other tables in this Manual for values transferred from other pages within the Tool.

TABLE 7. PROGRAM PARAMETERS WORKSHEET			
Line	Metric	Calculation	Information
<b>All Program Types</b>			
The following inputs apply to the PIP, POB, and FDD programs.			
<b>Calculating Bills</b>			
<i>This analysis assumes that if there is no low-income program, rates for low-income customers are equal to standard residential rates. The User will assess the collectability of revenue at discounted rates against this bill at standard residential rates. The determination of an average annual residential water bill requires an examination of all three components of the “water” bill: water, wastewater, and stormwater.</i>			
<b>Calculating a Water Annual Bill</b>			
1	Total residential water revenue	User input	These three lines calculate average annual residential water bills. In this sense, an “average annual bill” is the average annual residential revenue per customer. The total annual residential water revenue for the utility is a direct input from the User, as is the average number of residential water accounts for the utility. The Tool calculates the average annual residential water revenue based on these inputs.
2	Total residential water accounts	User input	
3	Average residential water annual bill	Line 1 / Line 2	
4	Water customers below 150% of FPG	Line 2 x Line 69 (C)	This line presents the calculation of the number of low-income water customers, which multiplies the total residential customers by the percentage of the jurisdiction’s population with income at or below 150% of the FPG. This Tool defines “low-income” to include customers at or below 150% of FPG. For purposes of this Tool, the definition of “low-income” may not be changed.
5	Low-income water annual bill as percentage of total residential annual bill	User input	The low-income water bill is a calculated number. It represents, in dollar terms, the average residential bill times the percentage (as input by the User) that low-income customers’ bills are of residential bills in general.
6	Low-income water annual bill	Line 3 x Line 5	
7	Base affordable water annual bill burden	User input	
8	Incremental decrease in affordable water bill burden as incomes decrease	User input	
<b>Calculating a Wastewater Annual Bill</b>			
9	Total residential wastewater revenue	User input	See Lines 1–3. The same calculation is applied here, using the wastewater-specific User inputs.
10	Total residential wastewater accounts	User input	
11	Average residential wastewater annual bill	Line 9 / Line 10	

**TABLE 7. PROGRAM PARAMETERS WORKSHEET**

Line	Metric	Calculation	Information
12	Wastewater customers below 150% of FPG	Line 9 x Line 69 (C)	See Line 4. The same calculation is applied here, using the wastewater-specific User inputs.
13	Low-income wastewater annual bill as percentage of total residential annual bill	User input	See Lines 5–6. The same calculation is applied here, using the wastewater-specific User inputs.
14	Low-income wastewater annual bill	Line 11 x Line 13	
15	Base affordable wastewater annual bill burden	User input	
16	Incremental decrease in affordable wastewater bill burden as incomes decrease	User input	
<b>Calculating a Stormwater Annual Bill</b>			
17	Total residential stormwater revenue	User input	See Lines 1–3. The same calculation is applied here, using the stormwater-specific User inputs.
18	Total residential stormwater accounts	User input	
19	Average residential stormwater annual bill	Line 17 / Line 18	
20	Stormwater customers below 150% of FPG	Line 17 x Line 69 (C)	See Line 4. The same calculation is applied here, using the stormwater-specific User inputs.
21	Low-income stormwater annual bill as percentage of total residential annual bill	User input	See Lines 5–6. The same calculation is applied here, using the stormwater-specific User inputs.
22	Low-income stormwater annual bill	Line 19 x Line 21	
23	Base affordable stormwater annual bill burden	User input	
24	Incremental decrease in affordable stormwater bill burden as incomes decrease	User input	
<b>Calculating a Combined Services Annual Bill</b>			
25	Low-income total water/ wastewater/ stormwater annual bill	Line 3 + Line 11 + Line 19	This line sums the average bills for all services selected by the User. Any services not selected by the User are automatically excluded.
26	Total residential combined service accounts	User input	
27	Combined service customers below 150% of FPG	Line 17 Line 69 (C)	See Line 4. The same calculation is applied here, using the combined service User inputs.

**TABLE 7. PROGRAM PARAMETERS WORKSHEET**

Line	Metric	Calculation	Information
<b>General Parameters</b>			
28	Cumulative affordable water/wastewater/stormwater percentage (0–50% FPG)		An affordable burden is not separately calculated for a combined water/wastewater/stormwater service. Instead, the affordability for each poverty range is the sum of the affordable bill burdens established for the three components of the combined service. These three lines sum the affordable percentages for households with income at 0% to 50% of FPG, 50% to 100% of FPG, and 100% to 150% of FPG, respectively. Any services not selected by the User are automatically excluded.
29	Cumulative affordable water/wastewater/stormwater percentage (50–100% FPG)		
30	Cumulative affordable water/wastewater/stormwater percentage (100–150% FPG)		
31	Expected program participation rate	User input	
32	Minimum monthly bill—total for all services	User input	
33	Minimum monthly water bill	Line 32 x (Line 6 / Line 25)	The minimum bill is allocated to each service the utility provides based on the proportion of a low-income customer’s total bill the service represents. For example, if the total minimum monthly bill is set at \$15, and if water costs represent 33% of the total low-income bill for all services provided, the minimum monthly bill for water service would be \$5 (\$15 x 0.33 = \$5.00).
34	Minimum monthly wastewater bill	Line 32 x (Line 14 / Line 25)	
35	Minimum monthly stormwater bill	Line 32 x (Line 22 / Line 25)	
36	Assumed income at minimum payment and 0–50% FPG	Line 32 x (12 months) / Line 28	<p>This line provides a basis for establishing a minimum bill level by calculating the income at which the minimum bill would be affordable to the lowest-income tier of program participants. For example, if the lowest income tier (0–50% of FPG) had a total affordable bill burden defined to be 1.25% (0.5% for water + 0.5% for wastewater + 0.25% for stormwater), a customer charged a minimum bill of \$15 per month for all three services would need to have an annual income of \$14,400 (\$180 / 0.0125 = \$14,400). It is appropriate to use the total affordable bill burden for all services since the minimum bill is set for the three services together (and allocated among services as described above). It is appropriate to use the affordable bill burden for 0–50% of income since nearly all customers charged the minimum bill will be customers in this FPG range. The minimum bill is charged only when the percentage of income burdens yield a bill that is less than the minimum bill.</p> <p>This line is not an input into any formulas or outputs. Instead, it serves as a “reality check” on whether the income required to pay the minimum monthly bill is reasonable given expected incomes at 50% of FPG. The income calculated for this line allows the User to assess whether the minimum bill is going to apply to an unreasonably large population of low-income customers. To illustrate a likely overreach, a minimum bill of \$25 per month (\$300 per year) with an affordable burden of 1.25% yields an assumed income of \$24,000. Given that few, if any, households with income at or below 50% of FPG would have an income of \$24,000,<sup>12</sup> the implication would be that under such a minimum bill, a substantial portion of the low-income population would be charged significantly more than an affordable percentage of income burden.</p>
37	Multiplier to determine maximum discount	User input	

<sup>12</sup> A household with nine persons would have annual income of \$48,600 at 100% of the Federal Poverty Guidelines in 2020. Accordingly, households with nine or more persons would have an income of more than \$24,000 at 50% of the FPG. The income would be less than \$24,000 for the “or below” 50% households. As household sizes increase above nine persons, by arithmetic, the possibility that people at or below 50% of the FPG would have an income of more than \$24,000 increases.

**TABLE 7. PROGRAM PARAMETERS WORKSHEET**

Line	Metric	Calculation	Information
38	Maximum annual water discount (100–150% FPG)	Line 6 x Line 37	<p>These lines apply to PIP and income-based POB program designs only.</p> <p>These lines are the dollar amount of the maximum discount for customers with income in each major income bracket (100–150% of FPG, 50–100% of FPG, and 0–50% of FPG), repeated for all three services.</p> <p>The maximum discount for households at 100–150% FPG is the average low-income bill times the multiplier shown on Line 37.</p> <p>As incomes decrease and the defined affordable percentage of income burdens decreases, by definition the amount of dollars being provided to low-income customers as a benefit will increase. This occurs for two reasons. First, even if bills are the same, the affordable bill (defined by income times an affordable percentage of income) will be lower. As a result, the dollar amount of annual benefits (the average bill minus the affordable bill) will be higher for those lowest-income customers. In order to ensure that benefit ceilings do not disproportionately adversely affect customers as their incomes decline, the maximum discount is increased as incomes decrease.</p> <p>Accordingly, the maximum discount multiplier for customers at 50–100% of FPG is calculated by applying a multiplier to the maximum discount at 100–150% of FPG. The maximum discount for households at 0–50% of FPG is calculated by applying the same multiplier to the maximum discount for households at 50–100% of FPG. The default multiplier is set at 1.25 (see Default Values page, Line 19).</p>
39	Maximum annual water discount (50–100% FPG)	Line 38 x Default value	
40	Maximum annual water discount (0–50% FPG)	Line 39 x Default Value page	
41	Maximum annual wastewater discount (100–150% FPG)	Line 14 x Line 37	
42	Maximum annual wastewater discount (50–100% FPG)	Line 41 x Default Value page	
43	Maximum annual wastewater discount (0–50% FPG)	Line 42 x Default Value page	
44	Maximum annual stormwater discount (100–150% FPG)	Line 22 x Line 37	
45	Maximum annual stormwater discount (50–100% FPG)	Line 44 x Default Value page	
46	Maximum annual stormwater discount (0–50% FPG)	Line 45 x Default Value page	

**Calculating Collectability**

*The second section of the Program Parameters worksheet addresses the collectability rate of bills at standard residential rates and bills at affordable rates. One aspect of examining collectability is to consider the percentage of billings that is translated into revenue. A second aspect is to look at the flip side of collectability: the “lost revenue”—i.e., those dollars that are not collected under standard residential rates and under affordable rates.*

47	Annual collectability of residential bills	Default Values page	See Default Values page, Line 10.
48	Annual embedded lost revenue percentage (all residential)	1 – Line 47	<p>Embedded lost revenue is the amount of billed revenue not collected within the first 12 months after it is billed. The percentage of billed revenue that is embedded lost revenue is the difference between 100% and the collectability rate. For example, if the collectability rate is 90% (i.e., the default used for Line 47), the embedded lost revenue percentage is 10% (1–0.90).</p> <p>The rate of embedded lost revenue is applied to the residential customer base as a whole.</p>
49	Embedded lost revenue multiplier (mid-range bill burden) (water and wastewater)	Default Values page (User can modify)	See Default Values page, Line 12.

**TABLE 7. PROGRAM PARAMETERS WORKSHEET**

Line	Metric	Calculation	Information
50	Bottom of water collectability mid-range bill burden	Default Values page (User can modify)	See Default Values page, Lines 13–18.
51	Bottom of wastewater collectability mid-range bill burden	Default Values page (User can modify)	
52	Bottom of stormwater collectability mid-range bill burden	Default Values page (User can modify)	
53	Top of water collectability mid-range bill burden	Default Values page (User can modify)	
54	Top of wastewater collectability mid-range bill burden	Default Values page (User can modify)	
55	Top of stormwater collectability mid-range bill burden	Default Values page (User can modify)	
56	Embedded lost revenue percentage (mid-range bill burden) (water and wastewater)	Line 48 x Line 49	This line applies the embedded lost revenue multiplier (for customers with a mid-range bill burden) to the embedded lost revenue percentage for the residential customer base as a whole.
57	Embedded lost revenue multiplier (high-range bill burden) (water and wastewater)	Default Values page (User can modify)	See Default Values page, Line 20.
58	Bottom of water collectability high-range bill burden	Default Values page (User can modify)	See Default Values page, Lines 16–18.
59	Bottom of wastewater collectability high-range bill burden	Default Values page (User can modify)	
60	Bottom of stormwater collectability high-range bill burden	Default Values page (User can modify)	
61	Embedded lost revenue percentage (high-range bill burden) (water and wastewater)	Line 48 x Line 57	This line applies the embedded lost revenue multiplier (for customers with a high-range bill burden) to the embedded lost revenue percentage for the residential customer base as a whole.

**TABLE 7. PROGRAM PARAMETERS WORKSHEET**

Line	Metric	Calculation	Information
62	Low-income program embedded lost revenue multiplier	Calculated from User inputs	<p>Low-income programs can be expected to increase the collectability of participating customers' bills, if the discount is sufficient to achieve an affordable bill or to reduce the customer's bill burden from high-range to mid-range.</p> <p>If the discounted bill results in an affordable bill (as defined by the User), the resulting collectability of participating customers' bills will approach, but may not fully match, payment rates for residential customers as a whole. In cases where the discount achieves an affordable bill, this line determines the embedded lost revenue percentage for low-income program participants.</p> <p>The calculation here is driven by the total residential collectability rate and the ratio of low-income program participants' collectability to total residential collectability. For example, if estimated total residential collectability is 90% (Default Values page, Line 10), then total residential lost embedded revenue is 10% (i.e., 100% - 90%). If the ratio on the Default Values page, Line 11, is simultaneously set to 95%, then for low-income program participants achieving an affordable bill the collectability rate is 85.5% (i.e., 90% x 95%) and the embedded lost revenue is 14.5% (i.e., 100% - 85.5%). In that case, the multiplier calculated here for Line 62 would be 145%, because the embedded lost revenue percentage for low-income program participants is 1.45 times the total embedded lost revenue for residential customers (i.e., 14.5% / 10%).</p>
63	Low-income program embedded lost revenue percentage (water, wastewater, stormwater)	Line 48 x Line 62	This line represents the embedded lost revenue percentage for program participants where the discount results in an affordable bill.
<b>Poverty Distribution</b>			
64	Range: Income to FPL	A. User Input	<p>A. This column has the totals of the various geographic regions that make up the provider's service territory.</p> <p>B and C. These are calculations based on the data presented in Column A. Column B is the percentage of each line of the total and Column C is the increasing cumulative percentage.</p>
65		B. Each Line / Total	
66		C. Cumulative of Column B	
67			
68			
69			
70			
71			
72			
<b>Household Income</b>			
73	Average size of household	User input	
74	Household size multiplier	User input	
75	Adjusted average size of household	Line 73 x Line 74	This presents the adjusted household size to account for differences in low-income household sizes (if any).
76	FPG at average household size		This represents 100% of the FPG for the adjusted household size reported in Line 75. The incremental additional income as household size increases is constant over all household sizes in the FPG.
77	FPG for a 1-person and 2-person household	User input	
78			
79	Per household member over 1	Line 78 - Line 77	The Tool calculates the incremental increase for each additional person based on the differences in the FPG between the two household sizes above.
<b>POB only</b>			
80	Income	[Service] Collectability worksheet	

**TABLE 7. PROGRAM PARAMETERS WORKSHEET**

Line	Metric	Calculation	Information
81	Affordable water bill burden	[Service] Collectability worksheet	
82	Affordable water bill	Line 80 x Line 81	This line calculates an affordable water bill based on a customer's income and a calculated affordable bill burden.
83	Low-income water bill	Line 6	
84	Affordable bill as percentage of actual low-income bill	Line 82 / Line 83	This line compares an affordable bill to an actual bill.
85	Discount on water bill needed for affordability	Calculated from User inputs	This line calculates the discount needed to convert an unaffordable bill to an affordable bill.
86-91, 92-97, 98-103	See explanation for Lines 80-85. The same methodology repeats for wastewater, stormwater, and combined service.		
<b>FDD only</b>			
104	Water annual discount	User input	A separate FDD discount is not calculated for combined service bills. Instead, the FDD discount for combined service bills is set equal to the sum of the FDD discounts of the component parts of the bill (water, wastewater, and stormwater).
105	Wastewater annual discount	User input	
106	Stormwater annual discount	User input	

## OFFSET PARAMETERS

Each program design structure will generate different degrees of expense offsets. The Tool performs this assessment of expense offsets for each service (water, wastewater, and stormwater) and for each low-income program design. In each case, the offsets are presented in a second spreadsheet that corresponds to a collectability analysis.

Both the existence and the quantification of these expense reductions are based on prior research involving low-income programs in both the energy and water utility sectors. While the purpose of this Tool is not to develop the rationale for each expense reduction, this Manual will, to the extent reasonable, provide supporting discussion.

The expense offsets worksheets automatically calculate the reduction in collection expenses on the basis of the input data entered by the User, and these calculations are identical for each service and for each program design structure. The *results* will change by program design and service type given the different inputs of bill level and discount level. The structure of the analysis, however, remains the same.

The offsets calculations are limited to a discrete number of easily quantified results. Other offsets can reasonably be expected from the adoption of low-income programs but are omitted here due to their lack of quantification. Such offsets can include an increase in staff productivity when affordable bills result in fewer payment problems than do standard bills, as well as reduced staff turnover and its associated expenses (reduced staff turnover has long been postulated as a positive result of low-income programs). Another example of unquantified offsets is the increase in “reputational capital” associated with low-income programs. This analysis does not seek to place a dollar value on these hard-to-quantify benefits; rather it assumes with absolute certainty that whatever value exists is greater than \$0. The User-provided multiplier estimates these hard-to-quantify benefits.

See the line-by-line descriptions for each calculation in Table 8, below. Refer to the other tables in this Manual for values that are transferred from other pages or worksheets within the Tool.



**TABLE 8. OFFSET PARAMETERS WORKSHEET**

Line	Metric	Source	Information
<b>Calculating Arrears</b>			
1	Total water accounts	User input	
2	Total low-income water accounts	Program Parameters worksheet	
3	Percentage of total water accounts in arrears	User input	
4	Multiplier of low-income accounts in arrears	Default Values page	
5	Percentage of total low-income water accounts in arrears	Line 3 x Line 4	This is the percentage of low-income water accounts in arrears. For example, if 20% of all residential accounts are in arrears and the rate of low-income accounts in arrears is two times that of all residential accounts, 40% of the low-income accounts are in arrears.
6	Total number of low-income water accounts in arrears	Line 5 x Line 2	This is the total number of low-income water accounts in arrears.
7	Total wastewater accounts	Program Parameters worksheet	
8	Total low-income wastewater accounts	Program Parameters worksheet	
9	Percentage of total wastewater accounts in arrears	Line 3	
10	Multiplier of low-income accounts in arrears	Line 4	The multiplier used for water accounts in arrears is the same for all service types
11	Percentage of total low-income wastewater accounts in arrears	Line 9 x Line 10	This is the percentage of low-income wastewater accounts in arrears. For example, if 20% of all residential accounts are in arrears and the rate of low-income accounts in arrears is two times that of all residential accounts, 40% of the low-income accounts are in arrears.
12	Total number of low-income wastewater accounts in arrears	Line 8 x Line 11	This is the total number of low-income wastewater accounts in arrears.
13	Total stormwater accounts	Program Parameters worksheet	
14	Total low-income stormwater accounts	Program Parameters worksheet	
15	Percent total stormwater accounts in arrears	Line 3	
16	Multiplier of low-income accounts in arrears	Line 4	The multiplier used for water accounts in arrears is the same for all service types.
17	Percentage of total low-income stormwater accounts in arrears	Line 15 x Line 16	This is the percentage of low-income stormwater accounts in arrears. For example, if 20% of all residential accounts are in arrears and the rate of low-income accounts in arrears is two times that of all residential accounts, 40% of the low-income accounts are in arrears.
18	Total number of low-income stormwater accounts in arrears	Line 14 x Line 17	This is the total number of low-income stormwater accounts in arrears.
19	Total combined service accounts	User input	

**TABLE 8. OFFSET PARAMETERS WORKSHEET**

Line	Metric	Source	Information
20	Total low-income combined service accounts	Program Parameters worksheet	
21	Percentage of total combined service accounts in arrears	Line 3	
22	Multiplier of low-income accounts in arrears	Line 4	The multiplier used for water accounts in arrears is the same for all service types
23	Percentage of total low-income combined service accounts in arrears	Line 21 x Line 22	This is the percentage of low-income combined service accounts in arrears. For example, if 20% of all residential accounts are in arrears and the rate of low-income accounts in arrears is two times that of all residential accounts, 40% of the low-income accounts are in arrears.
24	Number of total low-income combined service accounts in arrears	Line 20 x Line 23	This is the total number of low-income combined service accounts in arrears.
25	Average arrears (dollars) per account in arrears— all residential water	User input	
26	Multiplier of low-income dollars in arrears to residential dollars in arrears—water	Default Values page	
27	Average arrears (dollars) per low-income account in arrears—water	Line 25 x Line 26	This is the average arrearage of low-income water accounts in arrears
28	Average arrears (dollars) per account in arrears— all residential wastewater	User input	
29	Multiplier of low-income dollars in arrears to residential dollars in arrears—wastewater	Line 26	This is the multiplier of average arrears for low-income residential wastewater accounts in arrears to residential wastewater accounts in arrears. Unlike in the energy industry, within the wastewater industry there is a dearth of information about the impact of unaffordable bill burdens on the collectability of bills. The wastewater multiplier is set equal to the water multiplier.
30	Average arrears (dollars) per low-income account in arrears—wastewater	Line 28 x Line 29	This is the average arrearage of low-income wastewater accounts in arrears.
31	Average arrears (dollars) per account in arrears— all residential stormwater	User input	
32	Multiplier of low-income dollars in arrears to residential dollars in arrears—stormwater	Line 26	This is the multiplier of average arrears for low-income residential stormwater accounts in arrears to residential stormwater accounts in arrears. Unlike in the energy industry, within the stormwater industry there is a dearth of information about the impact of unaffordable bill burdens on the collectability of bills. The stormwater multiplier is set equal to the water and wastewater multiplier.
33	Average arrears (dollars) per low-income account in arrears—stormwater	Line 31 x Line 32	This is the average arrearage of low-income stormwater accounts in arrears.
34	Average arrears (dollars) per account in arrears— all residential combined service	Line 25 + Line 28 + Line 31	This is the sum of the dollar amounts of arrears for water, wastewater, and stormwater accounts. The model will automatically ignore any services not selected by the User.
35	Multiplier of low-income dollars in arrears to residential dollars in arrears—combined service	Line 26	

**TABLE 8. OFFSET PARAMETERS WORKSHEET**

Line	Metric	Source	Information
36	Average arrears (dollars) per low-income account in arrears—combined service	Line 34 x Line 35	This is the average arrearage of low-income combined service accounts in arrears.
37	Annual interest (for carrying costs of arrears)	User input	This is the annual carrying cost for unpaid balances. If unpaid balances had been paid, the utility would either have been able to avoid some level of borrowing or would have been able to place those funds in an investment that would generate some amount of return.  NOTE: As described in the instructions for the Input Common Data page, if a User applies this Tool to an investor-owned utility, it is recommended that the User disregard carrying costs for purposes of the Tool by setting the annual interest to zero. The current version of the Tool treats carrying costs in the manner that they would be treated by a publicly owned utility; it is unable to account for certain differences in how carrying costs are treated by investor-owned utilities.
38	Monthly interest rate (for carrying costs)	Line 37 / 12 months	This converts the annual carrying cost to a monthly carrying cost. Whether or not this calculation provides a monthly compounding of the carrying cost is set by a previous dropdown input.
39	Multiplier to account for compounding of interest	User input	If the User selects “Yes” on Line 14 of the Input Common Data page (“Account for compounding monthly interest?”), this line will be set to “12” to account for the compounding. If the User selects “No” on Line 14 of the Input Common Data page, this line will be set to “1”.
<b>Calculating Disconnections</b>			
40	Number of disconnections for nonpayment—water	User input	
41	Number of disconnections for nonpayment—wastewater	User input	While it is assumed that wastewater service is not subject to “disconnection” for nonpayment independent of water service, the disconnection of wastewater service will have an impact on offsets other than the cost of the collection process. The impact on collection costs is accounted for in the “cost offset” subsection by making those elements regarding collection costs “inapplicable.”
42	Number of disconnections for nonpayment—stormwater	User input	While it is assumed that stormwater service is not subject to “disconnection” for nonpayment independent of water service, the disconnection of stormwater service will have an impact on offsets other than the cost of the collection process. The impact on collection costs is accounted for in the “cost offset” subsection by making those elements regarding collection costs “inapplicable.”
43	Total disconnections for nonpayment—combined service accounts	Line 40 + Line 41 + Line 42	This is the annual number of combined service account disconnections for nonpayment.
44	Total water revenue—residential	User input	
45	Total wastewater revenue—residential	User input	
46	Total stormwater revenue—residential	User input	
47	Total combined service revenue—residential	User input	
48	Disconnections per \$1,000 of billing—water	Line 40 / (Line 44 / 1,000)	This is the number of residential water disconnections for nonpayment per \$1,000 in residential water bills.
49	Disconnections per \$1,000 of billing—wastewater	Line 41 / (Line 45 / 1,000)	This is the number of residential wastewater disconnections for nonpayment per \$1,000 in residential wastewater bills.
50	Disconnections per \$1,000 of billing—stormwater	Line 42 / (Line 46 / 1,000)	This is the number of residential stormwater disconnections for nonpayment per \$1,000 in residential stormwater bills.
51	Disconnections per \$1,000 of billing—combined service	Line 43 / (Line 47 / 1,000)	This is the number of residential combined service disconnections for nonpayment per \$1,000 in residential combined service bills.

**TABLE 8. OFFSET PARAMETERS WORKSHEET**

Line	Metric	Source	Information
52	Expected percentage reduction in disconnections from low-income program—water	User input	
53	Expected percentage reduction in disconnections from low-income program—wastewater	User input	
54	Expected percentage reduction in disconnections from low-income program—stormwater	User input	
55	Expected percentage reduction in disconnections from low-income program—combined service	Average of Lines 52–54, or User input (combined service)	
56	Reduced rate of disconnections per \$1,000 in billing—water	Line 48 x Line 52	This is the expected reduction in disconnections of water customers due to the low-income program.
57	Reduced rate of disconnections per \$1,000 in billing—wastewater	Line 49 x Line 53	This is the expected reduction in disconnections of wastewater customers due to the low-income program.
58	Reduced rate of disconnections per \$1,000 in billing—stormwater	Line 50 x Line 54	This is the expected reduction in disconnections of stormwater customers due to the low-income program.
59	Reduced rate of disconnections per \$1,000 in billing—combined service	Line 51 x Line 55	This is the expected reduction in disconnections of combined service customers due to the low-income program.
60	Internal cost per disconnection	User input	
61	Disconnection notices for nonpayment—water	User input	
62	Disconnection notices for nonpayment—wastewater	User input	
63	Disconnection notices for nonpayment—stormwater	User input	
64	Disconnection notices for nonpayment—combined service accounts	Line 61 + Line 62 + Line 63, or User input (combined service)	
65	Disconnection notices per \$1,000 in billing—water	Line 61 / Line 44	This is the number of water disconnection notices issued per \$1,000 in billed water revenue.
66	Disconnection notices per \$1,000 in billing—wastewater	Line 62 / Line 45	This is the number of wastewater disconnection notices issued per \$1,000 in billed water revenue. The lack of wastewater shutoff notices independent of water service is accounted for in the Program Offsets subsections.

**TABLE 8. OFFSET PARAMETERS WORKSHEET**

Line	Metric	Source	Information
67	Disconnection notices per \$1,000 in billing—stormwater	Line 63 / Line 46	This is the number of stormwater disconnection notices issued per \$1,000 in billed water revenue. The lack of stormwater shutoff notices independent of water service is accounted for in the Program Offsets subsections.
68	Disconnection notices per \$1,000 in billing—combined service	Line 64 / Line 47	This is the number of combined service disconnection notices issued per \$1,000 in billed water revenue. The lack of combined service shutoff notices independent of water service is accounted for in the Program Offsets subsections.
69	Expected percentage reduction in disconnection notices from low-income program—water	User input	
70	Expected percentage reduction in disconnection notices from low-income program—wastewater	User input	
71	Expected percentage reduction in disconnection notices from low-income program—stormwater	User input	
72	Expected percentage reduction in disconnection notices from low-income program—combined service	User input	
73	Reduced rate of disconnection notices per \$1,000 in billing—water	Line 65 x Line 69	This is the reduction in notices of disconnection to water customers due to the low-income program.
74	Reduced rate of disconnection notices per \$1,000 in billing—wastewater	Line 66 x Line 70	This is the reduction in notices of disconnection to wastewater customers due to the low-income program.
75	Reduced rate of disconnection notices per \$1,000 in billing—stormwater	Line 67 x Line 71	This is the reduction in notices of disconnection to stormwater customers due to the low-income program.
76	Reduced rate of disconnection notices per \$1,000 in billing—combined service	Line 68 x Line 72	This is the reduction in notices of disconnection to combined service customers due to the low-income program.
77	Internal cost per disconnection notice (water)	User input	
<b>Other Offset Factors</b>			
78	Gross charge-off percentage (total residential)	User input	
79	Low-income charge-off multiplier	Default Values page (User can modify)	
80	Gross charge-off percentage (low-income)	Line 78 x Line 79	This is the expected charge-off rate for low-income residential customers.

**TABLE 8. OFFSET PARAMETERS WORKSHEET**

Line	Metric	Source	Information
81	Number of months arrearage carried after final bill before charge-off	User input	
82	Rate at which residential accounts are reconnected	User input	
83	Low-income multiplier of rate of reconnection	Default Values page (User can modify)	
84	Rate at which low-income accounts are reconnected	Line 82 x Line 83	This is the percentage of low-income disconnected accounts that are reconnected.
85	Average number of days after disconnection prior to reconnection—low-income	Default Values page (User can modify)	The average number of days a low-income account is disconnected.
86	Average number of days after disconnection prior to reconnection—residential	Default Values page (User can modify)	
87	Average number of days of vacancy with no reconnection	User input	
88	Mobility rate for customers with non-affordable bills	Default Values page (User can modify)	
89	Reduction in mobility rates for customers with discounted bills	Default Values page (User can modify)	
90	Vacancy days due to household mobility	Default Values page (User can modify)	
91	Administrative costs as percentage of benefits	User input	

## SERVICE-SPECIFIC COLLECTABILITY

With the basic program design parameters established above, we can move on to assessing the collectability of revenue given an affordable low-income bill under different program designs. The Tool performs this assessment of collectability for each service (water, wastewater, stormwater, and combined service) and for each low-income program design. Based on the program parameters described above, the model processes the User inputs to determine the impact of local variables on the net collectability of revenue associated with low-income programs.

The collectability analysis is done from the perspective of the utility rather than that of the ratepayer. If a net increase in collections occurs, that means that the utility would generate more receipts with the low-income program than without such a program. That does not necessarily mean that *rates* to individual non-participating ratepayers will decrease. The extent to which rates will increase or decrease depends entirely on how the utility chooses to use its increased revenue or how, if at all, the water provider’s regulator decides to modify rates given the increased revenue. Rate increases or decreases to individual ratepayers, in other words, are a function of policy decisions not measured or captured in this analysis. The only question asked and answered by this analysis is whether, for the same amount of billed revenue, a utility will generate greater or lesser actual receipts.

See the line-by-line descriptions for each calculation below. Refer to the other tables in this Manual for values transferred from other pages or worksheets within the Tool.

**TABLE 9. SERVICE-SPECIFIC COLLECTABILITY WORKSHEETS**

Line	Metric	Source	Information
1	Affordable [service] annual bill burden	Default Values page and Program Parameters worksheet	This line shows the thresholds for low-range (i.e., affordable), mid-range, and high-range bill burdens, based on User inputs. A bill burden equal to or less than the Low/Mid Burden Threshold is deemed an affordable bill. A bill burden exceeding that level is considered a mid-range burden if it does not exceed the Mid/High Burden Threshold, or a high-range burden if it exceeds the Mid/High Burden Threshold.  To adjust these thresholds, the User should adjust the relevant inputs on the Input [Water/Wastewater/Stormwater] Data pages (Lines 4-5) or Input Combined Services Data page (Lines 6-9), as applicable, and the Default Values page (Lines 16-18).
2	100% of FPG at average household size in utility service territory	Program Parameters worksheet	
3	Customers	Program Parameters worksheet	This is the distribution of customers for the [service] provider's jurisdiction by ratio of annual income to the FPG. The distribution begins with the number of residential accounts entered by the User. Those customers are distributed across FPG ranges based on the distribution of population by FPL appearing in Line 64 through Line 71 of the Program Parameters worksheet.
4	Expected participants	Line 3 x Program Parameters worksheet	It would be unreasonable to expect participation in a low-income program to reach 100%. No known system of providing means-tested assistance to low-income households has a participation rate even approaching 100%. This row multiplies the number of customers in each FPG range by the expected participation rate set forth in Line 31 of the Program Parameters worksheet.
5	Income	Program Parameters worksheet x income range	This sets forth the annual household income used in the bill affordability analysis, presenting the estimated income for each range of the FPG given the average household size the User enters.
6	Low-income bill	Program Parameters worksheet	
7	Bill burden	Line 6 / Line 5	This is the bill burden customers experience without a low-income discount.
8	Bill discount	Program Parameters worksheet	This discount is displayed as a percentage for POB and as a gross dollar amount for FDD.
9	Affordable bill burden	Line 1	
10	Discounted bill as percentage of income	Line 13 / Line 5	This line calculates the final bill after the discount as a percentage of income.
11	Affordable payment	Line 5 x Line 9	This applies the affordable burden to the average income reported. The average income, when multiplied by the affordable burden, yields the affordable payment. For example, if the average income is \$10,000 and the affordable burden is 3%, the affordable payment is \$300 ( $\$10,000 \times 0.03 = \$300$ ).
12	Minimum annual bill	Program Parameters worksheet x 12 Months	This presents the alternative minimum [service] bill in annual terms. The minimum monthly bill is multiplied by 12 months to obtain the minimum annual bill.
13	Program participant's discounted bill	Whichever is greater, Line 11 or Line 12	A program participant is charged either the discounted bill or the alternative minimum bill, whichever is greater. This row first determines which of the two alternatives will be charged to a low-income program participant. However, a program participant's bill will also never exceed the low-income bill at standard rates. Once the selection is made between the discounted bill and the minimum bill, an additional selection is made so that the program participant's bill is the lower of either the discounted bill or the low-income bill at standard rates. Stated another way, the program participant's discounted bill will be one of several alternatives depending on these choices: (1) the discounted bill or the minimum bill, whichever is greater; and (2) the discounted/minimum bill or the low-income bill at standard residential rates, whichever is less.
14	Embedded lost revenue without low-income program	Program Parameters worksheet	For customers in each FPG range, this line selects the embedded lost revenue percentage based on whether a standard bill is affordable, a mid-range burden, or a high-range burden.

**TABLE 9. SERVICE-SPECIFIC COLLECTABILITY WORKSHEETS**

Line	Metric	Source	Information
15	Embedded lost revenue with low-income program	Program Parameters worksheet	For customers in each FPG range, this line selects the embedded lost revenue percentage based on whether the low-income program discount results in an affordable bill, a mid-range burden, or a high-range burden.
16	Per-customer embedded lost revenue without program	Line 6 x Line 14	This sets out the calculation, on a per-program-participant basis, for the embedded lost revenue in dollar terms in the absence of a low-income program. If bills at standard residential rates represent an affordable percentage of income, the embedded lost revenue percentage defaults to the embedded lost revenue percentage for residential customers as a whole.
17	Per-customer receipts (bill at standard rates minus embedded lost revenue) without program	Line 6 – Line 16	This is the total receipts expected per low-income customer to be collected by FPG range on a per-participant basis, without discounted bills.
18	Maximum annual discount from standard rates (PIP only)	Program Parameters worksheet	This is the maximum set by the User on the amount of discount provided per customer.
19	Per-customer dollar discount from standard bill	Line 6 – Line 13, unless this value exceeds Line 18	This is a determination of the per-participant discount provided under the program design. This per-participant discount results from application of the bill discount, assuming that 100% of the bill at standard residential rates would have been collected.  Note that if the discounted bill equals or exceeds the program participant's non-discounted bill, the amount of the "lost revenue" for that participant is equal to \$0 (i.e., the lost revenue should never be negative).
20	Per-customer dollar discount from receipts collected under standard bill	Line 17 – Line 13	This is a determination of the dollar amount of "lost revenue" per participant resulting from application of the discounted bill relative to the receipts actually expected to be collected without the discount. In other words, this row compares the discounted rate to actual receipts from standard residential rates, rather than to billings at standard rates.  Note that if the discounted bill equals or exceeds receipts collected under the standard bill, the amount of the "lost revenue" for that participant is equal to \$0 (i.e., the lost revenue should never be negative).
21	Aggregate dollars of discount from bills at standard residential rates	Line 4 x Line 19	This calculates the aggregate dollars of discount from bills at standard residential rates.
22	Aggregate dollars of discount from receipts at standard residential rates	Line 4 x Line 20	This calculates the total dollars of discount from actual receipts given bills at standard residential rates.
23	Total bill at standard residential rates	Line 4 x Line 6	This is the total aggregated bills for program participants if bills were calculated at standard residential rates.
24	Actual receipts at standard residential rates	Line 4 x Line 17	This is the total aggregated receipts for program participants if bills were calculated at standard residential prices and collected at the collectability rates derived from the embedded lost revenue.
25	Participant receipts with discounted bill	Line 13 x (1 – Line 15) x Line 4	This presents the total aggregated receipts for program participants if bills are discounted (for each program design) and collected with an embedded lost revenue ratio equal to the residential customer class as a whole.
26	Net participant collections with program	Line 25 – Line 24	This presents the net collections from low-income program participants. If the resulting figure is positive, that means customers participating in the program are generating greater receipts than they would if they were billed at standard residential rates. If the resulting figure is negative, that means these customers would generate greater receipts at standard residential rates.
27	Nonparticipant collection of program discounts	Line 21 x Program Parameters worksheet	On the Input Common Data page (Line 16), the User can choose whether to recover from nonparticipants the value of discounts provided to low-income program participants. If the User selects "Yes" for that option, this Line 27 calculates the receipts derived from billing the discounted dollars to program nonparticipants. Specifically, the discounts are translated into receipts at the collectability rate of residential customers as a whole. Note that, if a utility were to recover the costs of a low-income program from <i>all</i> ratepayers, including nonresidential ratepayers, the results on this Line could be considered conservative, as nonresidential ratepayers typically have a higher collectability rate than residential ratepayers.



**TABLE 9. SERVICE-SPECIFIC COLLECTABILITY WORKSHEETS**

Line	Metric	Source	Information
28	Net increased collections at discounted rate	Line 26 + Line 27	Line 28 presents the net collections impacts to the water utility arising from the low-income program. Depending on the setting selected on the Input Common Data page, Line 16, the User can choose whether to allow cost recovery from nonparticipating ratepayers. The total net revenue (positive or negative) is the sum of the change in revenue from the increased collectability of discounted low-income bills and (if selected on the Input Common Data page, Line 16) the change in revenue from the increased collectability of transferring cost responsibility of the discount to nonparticipating ratepayers. If the "total" is a positive dollar figure, the water utility has gained money by providing the discount. If the "total" is a negative dollar figure, the water utility has lost money by providing the discount. Nothing in the Tool guides, let alone requires, how the utility should reflect the total net gain in its rates.  Irrespective of the User selection, this value does not set forth the total net gain or loss from a low-income discount. The net change in revenue must be combined with administrative costs and expenses offsets to make that determination.
29	Receipts without program	Line 24	
30	Total receipts with program	Line 25 + Line 27	This number is the total receipts actually collected by the water utility with the low-income program.
31	Collectability without program	Line 29 / Line 23	This is the total collection, in percentage terms, of bills without the low-income program for participants.
32	Collectability with program	Line 30 / Line 23	This is the total collection, in percentage terms, of bills with the low-income program.
<b>POB Over-/Underpayment</b>			
33	Expected participants	[Service] Collectability worksheet	
34	Income	[Service] Collectability worksheet	
35-40	Distribution by percentage of average bill	Line 33 x Distribution based on local data	This calculates the number of customers by income bracket and relative bill cost.
41-45	Non-discounted bill at percentage of average bill (midpoint of bill range)	Program Parameters worksheet x [Ranges]	This calculates the average bill for each of the participants bucketed in the lines above.
46-50	Discounted bill at percentage of average bill (midpoint of bill range)	Lines 41-45 (by bucket) x (1 - [Service] Collectability worksheet)	This calculates the discounted bill for each of the participants bucketed above.
51-55	Amount of POB discount at percent of average bill	Lines 41-45 (by bucket) - Lines 46-50 (by bucket)	This is the difference between the non-discounted bill and the discounted bill.
56-60	Affordable bill, by income level	[Service] Collectability worksheet	This is the affordable bill at each income level, based on User inputs that determine affordable bill burdens as a percentage of income.

**TABLE 9. SERVICE-SPECIFIC COLLECTABILITY WORKSHEETS**

Line	Metric	Source	Information
61-65	Discount needed to achieve affordable bill burden	Lines 41-45 (by bucket) – Lines 56-60 (by bucket)	This is the discount required to reach the affordable bill at each income level.
66-70	Per-household over- or underpayment of discount needed for affordability under POB	Lines 51-55 (by bucket) – Lines 61-65 (by bucket)	This is the difference between the calculated POB discount and the required POB discount to achieve affordability.
71-75	Aggregate over- or underpayment of discount needed for affordability under POB	Lines 35-40 (by bucket) x Lines 66-70 (by bucket)	This calculates over- or underpayments by the number of customers in each bucket.
76	Underpayments	Sums the negative values within Lines 71-75	This line calculates the total underpayments.
77	Overpayments	Sums the positive values within Lines 71-75	This line calculates the total overpayments.

## SERVICE-SPECIFIC OFFSETS

Each program design structure will generate different degrees of expense offsets based on the impact of their move toward affordability. The Tool performs this assessment of expense offsets for each service (water, wastewater, stormwater) and for each low-income program design. In each case, they are presented in a second worksheet that corresponds to a collectability analysis.

In the offsets analysis, the User inputs determine the impact of local variables on the extent to which a low-income program can reduce or mitigate ordinary operating expenses. The Tool identifies seven categories of expense reductions accruing from a low-income program (shown in Table 10, below).<sup>13</sup> Both the existence and the quantification of these expense reductions are based on prior research involving low-income programs in the water and energy utility sectors. While the purpose of this Tool is not to develop the rationale for each expense reduction, it provides supporting discussion to the extent reasonable.

The offsets calculations do not change from one type of service to another (water, wastewater, stormwater, combined service) or from one type of low-income program design to another, except as noted below in regard to disconnections and disconnection notices. See the line-by-line descriptions for each calculation below. Refer to the other tables within this manual for values that are transferred from other pages or worksheets within the Tool.

**TABLE 10. SERVICE-SPECIFIC OFFSETS WORKSHEETS**

Line	Metric	Source [ "A" refers to "Without Program" value; "B" refers to "With Program" value]	Information
<b>Reduced Carrying Costs: Non-Charged-Off Low-Income Arreages</b>			
1	Low-income customers in arrears	A. Offset Parameters worksheet B. Product of Offset Parameters	This presents the number of low-income customer accounts in arrears.
2	Average arrears of accounts in arrears	A. Offset Parameters worksheet B. Product of Offset Parameters	This presents the average dollar value of arrears for a low-income account in arrears.
3	Average total monthly arrears	Line 2 x Line 3	This presents the total arrears of low-income customers.

<sup>13</sup> "Expense reductions" can include revenue enhancements. Revenue enhancements can, for example, occur because of avoided lost sales due to shutoffs or customer mobility. They might also occur through increased collections through collection activity that is redirected from customers who cannot pay (i.e., those with unaffordable bills) to those who can pay but don't.

**TABLE 10. SERVICE-SPECIFIC OFFSETS WORKSHEETS**

Line	Metric	Source [ "A" refers to "Without Program" value; "B" refers to "With Program" value]	Information
4	Carrying cost of arrears per month	Line 3 x Offset Parameters worksheet	This presents the average monthly carrying costs for the total arrears of low-income customers.
5	Annualized carrying costs	Offset Parameters worksheet x number of months	This presents the annual carrying costs for the total arrears of low-income customers.
6	Annual reduced carrying costs attributable to program	5B – 5A	This derives the estimated offsets value by subtracting the value of the carrying costs with the low-income program from the value of the carrying costs without the program. The monthly carrying cost is a User input.
<b>Reduced Carrying Costs: Charged-Off Low-Income Arrearages</b>			
7	Annual billed revenue	A. [Service] Collectability worksheet B. Difference of [Service] Collectability	This line begins the consideration of reduced carrying costs associated with charged-off dollars by setting forth the total amount of billed revenue to low-income customers who will participate in the low-income program. Without the low-income program, the amount of billed revenue is the aggregated bill at standard residential rates to program participants. With the low-income program, the amount of billed revenue is the aggregated bill at standard residential rates minus the aggregated bill discount provided. From those billed revenues, not all unpaid bills are considered an "arrearage" by public utilities. Not included are unpaid balances associated with inactive accounts that have been written off as uncollectable. This section addresses those unpaid balances prior to the time of charge-off.
8	Charge-off percentage	Offset Parameters worksheet	This presents the charge-off percentage identified by the User.
9	Total charge-off (dollars)	Line 7 x Line 8	This presents the charge-off dollars.
10	Monthly carrying cost rate for arrears prior to charge-off	Line 10 x Offset Parameters worksheet	This presents the monthly carrying costs associated with these charged-off dollars for the months prior to their being charged-off.
11	Months before charge-off	Offset Parameters worksheet	This states the number of months that an unpaid balance is carried prior to being charged-off. Given that costs and offsets are being presented on an annual basis, this number should not exceed 12 months.
12	Annualized carrying costs	Line 10 x Line 11 (or, if the User selects "Yes" on the Input Common Data page, Line 14, this number is adjusted to account for monthly compounding of interest)	This presents the total carrying costs for unpaid balances carried prior to charge-off.
13	Annual reduced carrying costs attributable to program	12B – 12A	This derives the estimated offsets value by subtracting the value of the carrying costs with the low-income program from the value of the carrying costs without the program.
<b>Reduced Carrying Costs: Redirected Collections</b>			
14	Residential customers in arrears	A. Offset Parameters worksheet B. Difference of Offset Parameters	To the extent, if at all, that a utility reduces the number of collection activities directed toward low-income customers who are now paying their bills because they are more affordable, the provider in almost all probability will not simply reduce the overall number of collection activities. Instead, the provider will redeploy those collection activities to other customers in arrears that would not have been addressed in the absence of the low-income program. Taking the number of reduced collection activities and redeploying them in this fashion, Line 14 presents the number of nonparticipating residential customers in arrears subject to such collection activities with and without the low-income program.
15	Average arrears of accounts in arrears	Offset Parameters worksheet	This presents the average dollar value of arrears for residential accounts in arrears.
16	Total arrears associated with redirected collections per month	Line 14 x Line 15	This presents the total dollar value of arrears for residential accounts that will be subject to redeployed collection activities.

**TABLE 10. SERVICE-SPECIFIC OFFSETS WORKSHEETS**

Line	Metric	Source [ "A" refers to "Without Program" value; "B" refers to "With Program" value]	Information
17	Carrying costs per month	Line 16 x Offset Parameters worksheet	This presents the monthly carrying costs for the arrearages. It is derived by multiplying the total dollar value of arrears (average monthly) by the monthly carrying costs identified in the Offset Parameters worksheet.
18	Annualized carrying costs	Line 17 x 12 (or, if the User selects "Yes" on the Input Common Data page, Line 14, this number is adjusted to account for monthly compounding of interest)	This determines the annualized carrying costs by multiplying the monthly carrying costs by 12 months.
19	Annual reduced carrying costs attributable to program	18B – 18A	This derives the estimated offsets value by subtracting the value of the carrying costs with low-income program from the value of the carrying costs without such a program.
<b>Reduced Collection Efforts: Disconnections For Nonpayment</b>			
20	Disconnections per \$1,000 in billed revenue	Offset Parameters worksheet	This begins the analysis of the expense reduction associated with a reduced number of service disconnections for nonpayment (if any). This line presents the number of disconnections for nonpayment per \$1,000 in billed revenue with and without a low-income program. As discussed above (Table 8, Lines 41-42), there are no expected disconnections of wastewater and/or stormwater service independent of water service. Therefore, Lines 20-25 are marked as "not applicable" for those wastewater and stormwater services.
21	Annual billed revenue	Line 7	This presents the total billed revenue for program participants. The <i>Without Program</i> scenario is the billings at standard residential rates, pulled forward from the Collectability worksheet. The <i>With Program</i> scenario is the billings at standard residential rates minus the program discount, pulled forward from the Collectability worksheet.
22	Number of expected disconnections given total billed revenue	Line 20 x Line 21 / 1,000	This presents the expected number of disconnections for nonpayment calculated as the product of the number of disconnections per \$1,000 times the total billed revenue.
23	Internal cost per disconnection	Offset Parameters worksheet	This presents the internal cost per disconnection as input by the User.
24	Total cost of disconnections	Line 22 x Line 23	This presents the aggregate cost of disconnections for nonpayment, derived as the product of the number of disconnections for nonpayment (Line 22) times the cost per disconnection
25	Annual reduced cost of disconnections	24B – 24A	This derives the estimated offsets value by subtracting the value of the aggregated cost of disconnections with the low-income program from the value of the costs of disconnections without the program.
<b>Reduced Collection Efforts: Nonpayment Disconnect Notices</b>			
26	Nonpayment disconnection notices per \$1,000 in billed revenue	Offset Parameters worksheet	This begins the analysis of the expense reduction associated with a reduced number of the notices of service disconnections for nonpayment (if any). This presents the number of disconnections for nonpayment per \$1,000 in billed revenue, both without the low-income program and with the program. As discussed above (Table 8, Lines 41-42), there are no expected disconnections of wastewater and/or stormwater service independent of water service. Therefore, Lines 26-31 are marked as "not applicable" for wastewater and stormwater service.
27	Annual billed revenue	Line 21	This presents the total billed revenue, as pulled forward from the Program Parameters worksheet.
28	Number of expected nonpayment disconnection notices given total billed revenue	Line 26 x Line 27 / 1,000	This presents the expected number of nonpayment disconnections notices calculated as the product of the number of disconnections per \$1,000 times the total billed revenue.

**TABLE 10. SERVICE-SPECIFIC OFFSETS WORKSHEETS**

Line	Metric	Source [ "A" refers to "Without Program" value; "B" refers to "With Program" value]	Information
29	Internal cost per nonpayment disconnection notice	Offset Parameters worksheet	This presents the internal cost per notice of disconnection as reported by the User.
30	Total cost of nonpayment disconnection notices	Line 28 x Line 29	This presents the aggregate cost of notices of disconnections for nonpayment, derived as the product of the number of disconnections for nonpayment times the cost per disconnection notice.
31	Annual reduced cost of nonpayment disconnection notices	Line 22	This derives the estimated offset value by subtracting the value of the aggregated cost of disconnection notices with the low-income program from the value of the cost of notices of disconnections without the program.
<b>Lost Revenue Due To Disconnections</b>			
32	Number of expected disconnections given total billed revenue	Line 22	The disconnection of service is generally viewed as a collection device. One impact of a disconnection of service, however, is that the utility loses the revenue that would have been billed for the days on which the account was off the system. This calculation of "lost revenue" (or "lost sales") has two components. The first component concerns those accounts that are disconnected and then reconnected. The second component concerns those accounts that are disconnected and never reconnected. This offset takes both such components into consideration. Line 32 presents the expected number of disconnections for low-income customers given total expected billed revenue (Line 22).
33	Rate at which disconnected accounts reconnected	Offset Parameters worksheet	This line presents the percentage of disconnected customers that are expected to be reconnected both without the low-income program and with the program.
34	Number of expected reconnections	Line 32 x Line 33	This presents the number of disconnected customers who are expected to be reconnected.
35	Number of disconnections not expected to be reconnected	Line 32 – Line 34	This presents the number of disconnected customers who are not expected to be reconnected.
36	Average daily revenue per participant	Water Collectability worksheet / number of days	This presents the expected average daily revenue per participant. This occurs in two steps. First, the Tool determines the average annual revenue per participant by subtracting the total revenue that program participants would have generated without the low-income program from the total revenue program participants are projected to generate with the low-income program and dividing by the number of program participants. Second, the Tool converts this into average daily revenue by dividing the result by 365 days in the year.
37	Lost revenue due to disconnections reconnected	Line 34 x Offset Parameters worksheet x Line 36	This line presents the expected lost revenue from the low-income accounts that are disconnected and subsequently reconnected. This data point is the product of the number of customers disconnected and subsequently reconnected, times the average number of days off the system for low-income customers without bill discounts, times the average daily revenue per program participant.
38	Lost revenue due to disconnections not reconnected	Line 35 x Offset Parameters worksheet x Line 36	This line presents the expected lost revenue from the low-income accounts that are disconnected and <i>not</i> subsequently reconnected. This data point is the product of the number of customers disconnected and not subsequently reconnected, times the average days of vacancy, times the average daily revenue. The calculation is the same as Line 37 except the number of customers of disconnected and not reconnected is used. That number is determined by the number of customers disconnected minus the number of customers reconnected.
39	Lost revenue due to disconnections	Line 37 + Line 38	This line presents the total lost revenue from disconnections.
40	Annual reduction in revenue lost due to disconnections	39B – 39A	This is the estimated offset value derived by subtracting the value of the aggregated cost of lost revenue due to disconnections with the low-income program from the value of the aggregated cost of lost revenue due to disconnections without the program.

**TABLE 10. SERVICE-SPECIFIC OFFSETS WORKSHEETS**

Line	Metric	Source [ "A" refers to "Without Program" value; "B" refers to "With Program" value]	Information
<b>Lost Revenue Due To Customer Mobility</b>			
41	Low-income residential customers	Offset Parameters worksheet	Lost revenue does not occur simply as a result of the disconnection of service for nonpayment. Research has found that the unaffordability of utility bills is a substantial contributor to low-income households moving in an effort to find more affordable bills. This offset takes into account the reduction in lost revenue due to this frequent mobility. Line 41 is the number of low-income customers.
42	Rate at which low-income customers move	Offset Parameters worksheet	This presents the mobility rate for low-income customers. This number is set for the <i>Without Program</i> scenario and the <i>With Program</i> scenario.
43	Number of expected low-income moves due to unaffordability	Line 41 x Line 42	This presents the expected number of moves for low-income customers.
44	Number of days of lost revenue due to mobility	Offset Parameters worksheet	This presents the days of lost revenue while a home is vacant after a household moves.
45	Average daily revenue	Line 36	
46	Lost revenue due to customer mobility	Line 43 x Line 44 x Line 45	This is the total lost revenue due to low-income mobility.
47	Annual reduction in revenue lost due to customer mobility	46B - 46A	This is the estimated offset value derived by subtracting the value of the aggregated cost of lost revenue due to low-income mobility with the low-income program from the value of the aggregated cost of lost revenue due to low-income mobility without the program.

