Allocation Program

Technical Documentation on Allocation Methods

This document describes how the model produces the Allocation Program results. This is a technical document intended for District staff who need to answer questions about how the model works, need to keep the model updated, and need to troubleshoot any issues in the model.

Although this document describes detailed technical processes it does not describe every step of the model. Instead, this document focuses on explaining the general steps of the model with a focus on ***why*** the model takes specific steps. Understanding why the model operates in a specific way is important for avoiding unintended consequences when updating model methods.

When describing the general model methods, this documentation will focus on the following:

- when and why the model produces errors;
- specific manipulations to the data like changing data types that are critical to correct processing;
- when and why the model may produce duplicate rows and how to handle these results; and
- expectations for the relationship between different values and data sets.

Last updated August 23, 2023

Underlying data

The data the model uses to calculate allocations. These data include the following:

- **APN-account** relationships
- **Account** information (e.g., account class, dwelling units, meter size)
- **Historical consumption**
- **Landcover** information (e.g., irrigated area, irrigable not irrigated area).

APN-account relationships

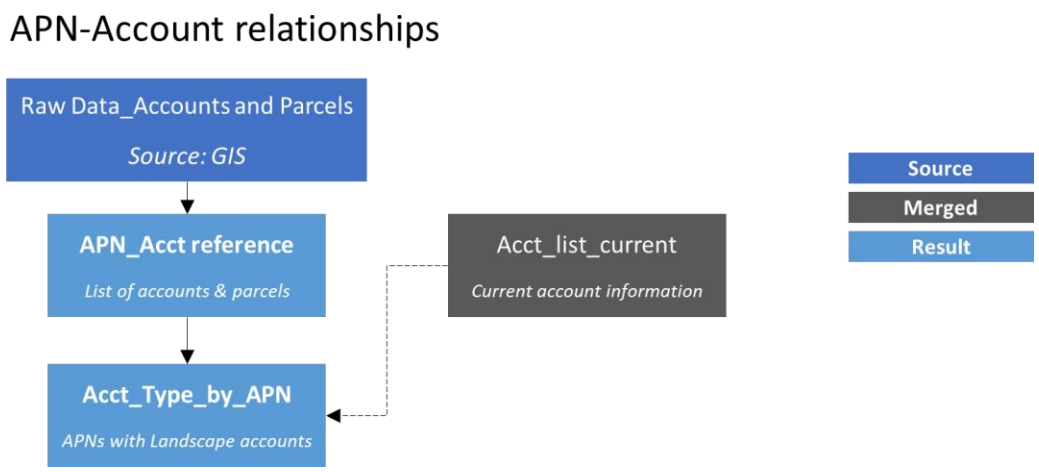
Allocations are based on characteristics of the customer's account, and characteristics of their parcel. Both account data and parcel data are necessary to calculate the customer's allocation. Therefore, the District must identify which accounts are associated with each parcel. The account to parcel relationship is not 1:1. Some accounts span multiple parcels. Some parcels have multiple accounts.

Results

This portion of the model will produce the following results.

- List of each APN-Account relationship in a separate row.
- The number of accounts associated with each unique APN.
- Identification of parcels with Landscape accounts.

Data Map



Raw data

Source: Excel download from internal ArcGIS database; layer is Accounts and Parcels

Raw data are saved as Accounts and parcels.xlsx

Rows are unique APNs. Relevant columns are APN, account roots, and document date. APNs associated with multiple account numbers have each relevant account number in separate columns of the same row.

List each APN – account relationship in a separate row of the APN_Acct_reference table

1. In the Raw Data_Accounts and parcels data table, change the account root columns to the whole number data type instead of text.

   This will drop any leading zeros. It is necessary for subsequent calculation steps.

2. Reference the Raw Data_Accounts and parcels data table to create the APN_Acct_reference data table.

   This preserves the raw data as a separate data table in the model. This is important for checking the results are accurate.

3. Unpivot columns so there is one APN column and one account root column.

   APNs associated with multiple account roots will appear in multiple rows (duplicate APN values). Account roots associated with multiple APNs will appear in multiple rows (duplicate account root values).

   Accounts listed as "needs info" or "none" will show up as errors (because they are text values, and the column data type is numeric). The District has imperfect information about account-APN relationships. When the District does not know whether there is an account associated with an APN it records the account as "need info". Additionally, some APNs do not have an account with the District (i.e., the parcel is undeveloped). The District records these accounts as "none".

   a. Replace errors in the account root column with "null".

   b. Filter to remove null values from the account root column.

   It is necessary to remove the errors to complete subsequent calculation steps.

4. Categorize each APN as "Old" or "New" construction.

   Use the RecMapDate column from the County data. Dates on or after January 1st 2019 are considered New construction. The State sets different water use expectations for old vs new construction. To keep the District's water use in line with the State's expectations, it is necessary for the District's allocations to differentiate between old and new construction.

   a. Convert the Construction Type values to text.

      Some APN rows do not have a DocDate. These rows will return null values. Null values cannot be converted to text and will result in an Error.

   b. Replace all errors in the Construction Type column with "unknown".

Identify parcels with Landscape accounts

1. Reference the APN-Acct_reference data table to create the Acct_Type_by_APN data table.

   The APN-Acct_reference table is referenced by other data tables. Therefore, it is important that manipulation of the data to identify parcels with landscape accounts occurs in a separate data table.

   a. Remove other columns except the APN and Account Root.

2. Merge the Account_list_current based on the account root.

   Because the APN_Acct_reference table does not include customer class information, it is necessary to bring in customer class information from the Account_list_current table.

   a. Retain only the APN, Account_root, and Account Class Description columns.

3. Pivot the Account Class Description column.

   a. Remove the Fire Protection and CVWD columns.

4. Identify parcels that have a Landscape account.

   Parcels with a count of 1 or more in the Landscape column have one or more landscape accounts. This is important to know because in the calculation of outdoor allocations, if a landscape account is present on the parcel, then all irrigable area is attributed to landscape account.

Account Information

To assign each account within the District an allocation, it is necessary to identify all accounts by their account root, and to identify the account class of each account because the allocation methods vary by account class.

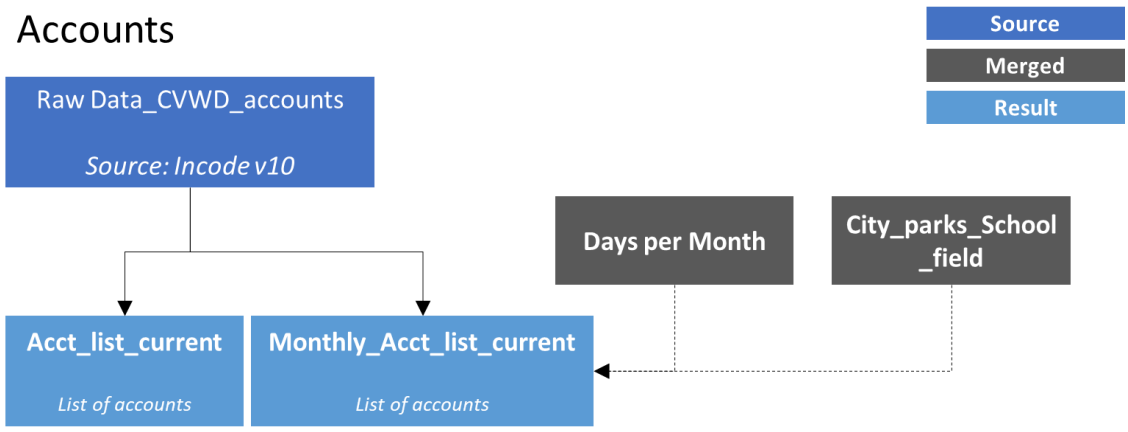
This process results in two accounts lists. One list has one row for each account. The other list has monthly data so there are 12 rows for each account.

Results

This portion of the model will produce the following results.

- List of each account root with important account data like account class and # of dwelling units.
- List of each account class with one row for each month.
- Number of days per month
- Identification of accounts for irrigation of City parks and school fields.

Data Map



Raw data

Source: Incode QBE download "Allocation_All"

Raw data are saved as Account Service_NEW.csv

Relevant columns are account class, account status, dwelling units, account number, meter number. Rows are each unique account number for each month and year from January 2017 – December 2022.

This data set should have all account classes and account roots.

Format the current CVWD account data in the Acct_list_current table

1. Reference the Raw Data_CVWD_accounts data table to create the Acct_list_current table.

   It is important to save a copy of the raw data to reference when troubleshooting issues.

2. In the Acct_list_current table filter out the rows with no meter data. Filter for the most recent month and year.

   When downloaded from Incode, the dataset has duplicate account rows with no meter information due to the way data are joined in Incode.

   The account class of an account may change over time. To ensure the model is using the current account class, filter for the most recent data. Use the date (month and year) instead of the account status to identify the most recent data because it is possible that an account root was temporarily inactive when the data were downloaded.

3. Extract the account root from the account number.

   a. Change the data type from number to text to drop the leading zero.

4. Group rows to keep only a list of account roots with necessary identifying information.

   a. Group by account root. Include columns account class, meter size, and dwelling units.

   This grouping ensures there is one instance of each account root in the data set. It is necessary that each account root is represented to each account receives an allocation. However, it is also important there are not duplicate account roots because this would double an account's allocation.

Format the current CVWD account data in the Monthly_Acct_list_current table

1. Reference the Raw Data_CVWD_accounts data table to create the Current_Acct_data table.

2. In the Current_Acct_data table filter out the rows with no meter data. Filter for the most recent month and year.

   When downloaded from Incode, the dataset has duplicate account rows with no meter information due to the way data are joined in Incode.

   The account class of an account may change over time. To ensure the model is using the current account class, filter for the most recent data. Use the date (month and year) instead of the account status to identify the most recent data because it is possible that an account root was temporarily inactive when the data were downloaded.

3. Extract the account root from the account number.

   a. Change the data type from number to text to drop the leading zero.

4. Group rows to keep only a list of account roots with necessary identifying information.

   b. Group by account root. Include columns account class, meter size, and dwelling units.

This grouping ensures there is one instance of each account root in the data set. It is necessary that each account root is represented to each account receives an allocation. However, it is also important there are not duplicate account roots because this would double an account's allocation.

5. Add individual columns with each month name. The value in each row is the month number.

The resulting column of month names becomes the reference point for joining the days per month data table.

6. Merge the Days_per_month data table based on the month name.
7. Insert identifier columns.
8. Merge the City_parks_School_fields table based on the account root.

This data identifies which rows contain accounts for a city park or school field. This is important because these accounts are treated as landscaping accounts.

Historical Consumption

The District compares historical consumption data to calculated allocations to determine which customers are likely to exceed their allocation. This information helps the District refine the allocation methodology, identify potential problems with the methodology, identify customers who are likely to protest their allocation, and develop policy decisions about how much water is available and to what degree customers can exceed their budget, if any, without being considered inefficient.

Results

This portion of the model will produce the following results.

- Average annual consumption (HCF) by account
- Average consumption by month (HCF) and account

Data Map

Raw Data

Source: Incode download of the QBE "Allocation_All"

Raw data are saved as Account Service_NEW.csv

Columns are account class, account status, dwelling units, account number, meter number, meter size, consumption (HCF). Rows are each unique account number for each month and year from January 2017 – December 2022.

Format the consumption data in the All_cons_hist table

1. Reference the Raw Data_CVWD_accounts data table to create the Current_Acct_data table.
2. Extract the account root from the account number.
    c. Change the data type from text to number to drop the leading zero.

Calculate the average monthly consumption of each account in the Average_monthly_cons table

1. Reference the All_cons_hist table.

   This preserves the data in the All_cons_hist table. This is necessary because the average annual data analysis will also need to reference the All_cons_hist data.

2. Group the rows by account root and consumption month. Average the consumption. Include other important account data like the meter size, dwelling units, and account class.

   This will average the consumption in each month across all years by account. The result will be twelve rows of data for each account root (one row for each month) with the average consumption in each row.

3. Round the consumption to whole numbers.

   Consumption data are reported in whole numbers on the customer's bill.

4. Insert a unique identifier column.

   This will enable merging of these data while preserving the monthly consumption.

Calculate the average annual consumption of each account in the Average_annual_cons table

1. Reference the Average_monthly_cons table.

   This preserves the data in the Average_monthly_cons *table.*

2. Group the rows by account root. Sum the consumption. Include other important account data like the meter size, dwelling units, and account class.

   This will sum all months of data for each each account root. The result will be total annual consumption by account. Instead of rows for each month, there will be one row with the annual allocation for each account.

Irrigated Area – Land Cover

The District needs to know the irrigated area associated with each account so it can determine that account's allocation (for outdoor water use). The result is irrigated area (SQFT) by account root.

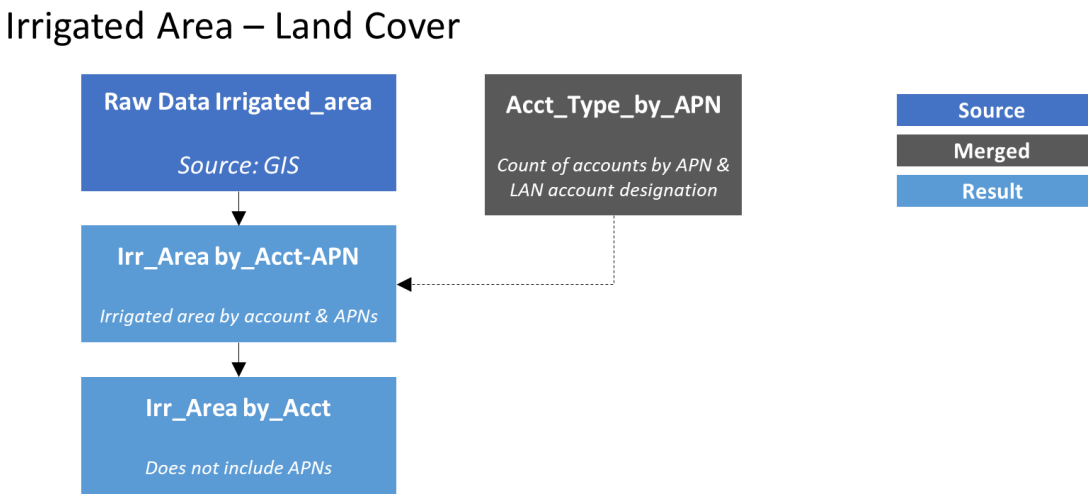
Land cover information is available for each parcel. The District must determine how to distribute parcel land cover information to each account. This determination is based on irrigated area data, APN to account relationships, and account classifications.

Results

This portion of the model will produce the following results.

- Irrigated area by APN
- Irrigated area by account

Data Map



Raw Data

Source: GIS download

Irr_Areas_with_pseudo_parcels.xlsx

Columns APN, irrigable-irrigated, irrigable-not irrigation, and not irrigable. Rows are unique APNs and landcover areas in square feet.

Calculate the total irrigated area (SQFT) by account

1. Reference the Raw Data_Irr_area_with_Pseudo_Parcels table.

   It is important to save a copy of the raw data to reference when troubleshooting issues.

2. Keep only the APN and II, INI, and total area columns.

3. Merge the Account_type_by_APN table based on APN.

   It is important to know how many accounts are associated with each parcel. It is also important to know whether there is a landscape account associated with the parcel.

4. Divide the areas by the account count.

   If there are multiple accounts associated with one APN, the irrigated area, for example, will be divided by the number of accounts. This is necessary for the allocation calculation.

5. Merge parcel characteristics from the APN__Acct_reference table.

   The designation of "old" versus "new" construction is used in the allocation calculation.

6. Group data by account root.

   Some accounts span multiple parcels. Therefore, it is necessary to sum up the parcel data (i.e., sum up the irrigated area for each parcel) by each account. This step needs to be done before bringing in the historical consumption (which occurs in the monthly allocation step).

Allocations

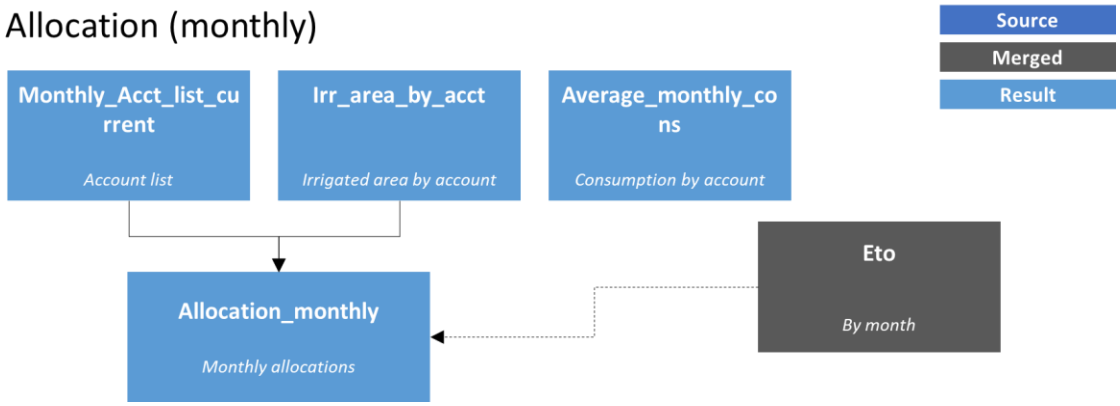
To determine allocations, the District needs to identify each account that should receive an allocation, and the irrigated area associated with that account. To understand whether the allocations are reasonable, the District compares the allocations against historical consumption.

Results

This portion of the model will produce the following results.

- **Outdoor** allocations (monthly) for all residential accounts, landscape accounts, City Parks and School Fields.
- **Indoor** allocations (monthly) for all **residential** accounts.
- **Monthly** allocations (indoor + outdoor) for all account types except fire, temporary, and CVWD accounts.
- **Comparison** of allocation and actual consumption for each account.

Calculate monthly allocations



Data Wrangling Process

1. Reference the Monthly_Acct_list_current table.
2. Filter out the fire, CVWD and temporary account classes.

   There is no allocation for CVWD, fire, or temporary accounts. Therefore, they should not be included in the allocation calculation.

3. Merge the monthly ETo data based on month name.

   Evapotranspiration data is from a specific reference year (2009) from the CIMIS database.

4. Merge the irrigated area by account data based on account root.
5. Replace null values in the irrigated area data with zero.

The null values will prevent subsequent calculation steps. A common reason for null values is that the parcel is entirely covered by native vegetation, the beach, or the salt marsh. These native habitats do not receive allocations because they do not require irrigation. Alternatively, some accounts may not have any irrigated area because they are completely hardscape, or the District doesn't know what parcel the account is on, or parcel lines changed so the parcel reference for that account is out of date. It is not uncommon for small, multi-family dwelling units to have negligible irrigated area on a small patio.

6. Merge the Average_monthly_cons data.

   The allocation for the CII and agricultural account classes is based on historical use.

7. Calculate the indoor allocation for residential accounts.

   The District uses the State's indoor residential allocation formula. This ensures the District is not over allocating compared to the State's expectations of the District's water use.

8. Calculate the outdoor allocation for each residential, landscape, city park, and school field account.

   The District uses the State's outdoor residential allocation formula. This ensures the District is not over allocating compared to the State's expectations of the District's water use. The State's formula assumes that new construction has lower outdoor water use than old construction.

   If there is a landscape account on a residential parcel, the District assumes that landscape account is responsible for all outdoor irrigation. Therefore, in the outdoor allocation calculation, the formula looks for accounts where there is a landscape account on the residential parcel and assigns those residential accounts an outdoor allocation of zero.

9. Calculate the allocation for CII accounts.

   The allocation for the CII account classes is based on average monthly historical use.

10. Calculate the allocation for Agricultural accounts.

    The allocation for the agricultural account classes is based on average monthly historical use.

11. Group rows by account and month.

    If an account spans multiple parcels, it will show up in the dataset in multiple rows. For example, a master meter account may include many parcels. The information the District needs is the total allocation by account. Therefore, it is necessary to sum up the allocations for accounts that span multiple parcels. This will return the total allocation, across all parcels, for that account.

12. Calculate total allocations.

    Sum the indoor allocation, outdoor allocation, and CII allocation.

Calculate total annual allocations by account

Data Wrangling Process

1. Reference the Allocation_monthly table.

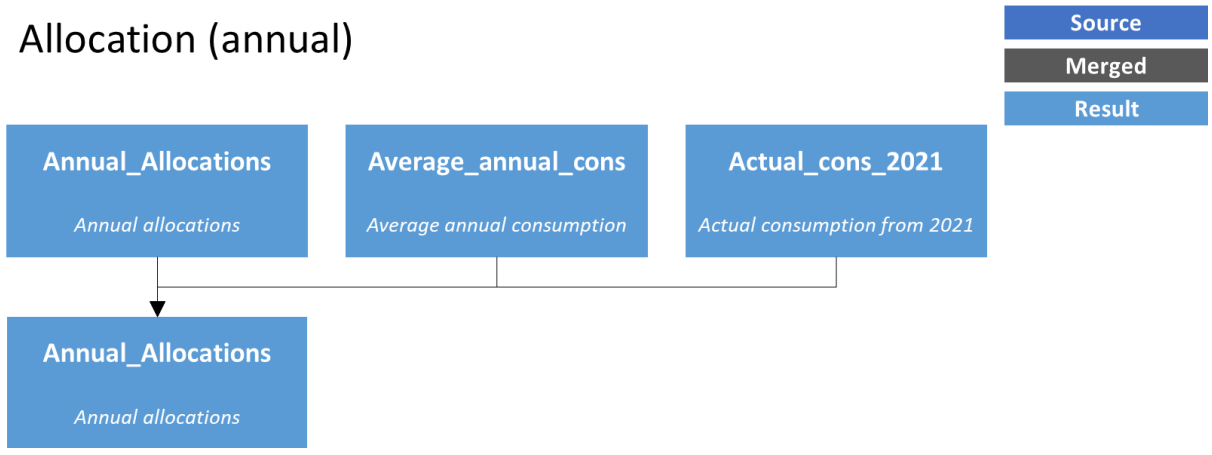
   Reference the monthly allocation table so the model has both monthly and annual results.

2. Group rows by account root. Sum the allocation columns. Include other columns with account and parcel details.

   Sum each of the allocation columns to determine the total annual allocation for each account.

   Do not sum the area columns. Return the max value. In the monthly data, the irrigated area, irrigable not irrigated, and total area are repeated in each row. When converting the monthly data to annual data, it would be inappropriate to sum these area values. The area values are representative of the landcover for the account's parcel area. Because the area values will be the same in each month-row (for one account), it is appropriate to return the max value.

Compare allocations and historical consumption



Data Wrangling Process

1. Reference the Annual_Allocations table.

2. Merge the Average_annual_cons table.
3. Merge the Actual_cons_2021 table.

   Consumption from 2021 provides a point of reference for recent consumption. This is important because recent consumption may differ from the historical average consumption.

4. Compare allocations and historical consumption.

   CII allocations and agricultural allocations will match average historical consumption. For the other account classes, comparison of the average annual use and allocations indicates whether the customer is likely to exceed their allocation, or use substantially less water than their allocation.