Power Washing Your Data: Using SAS Data Quality Steps in SAS Studio Flows

Exercise Description

Update your data cleaning process with point-and-click data quality steps in SAS Studio Flows! In this hands-on workshop, you'll learn how to build a flow that deduplicates, parses, and standardizes your data with SAS Data Quality steps and code snippets.

Log in to SAS Viya

Open a new window in the *Google Chrome* browser and select the **SAS Viya** bookmark.

- ID: **student**
- Password: **Metadata0**

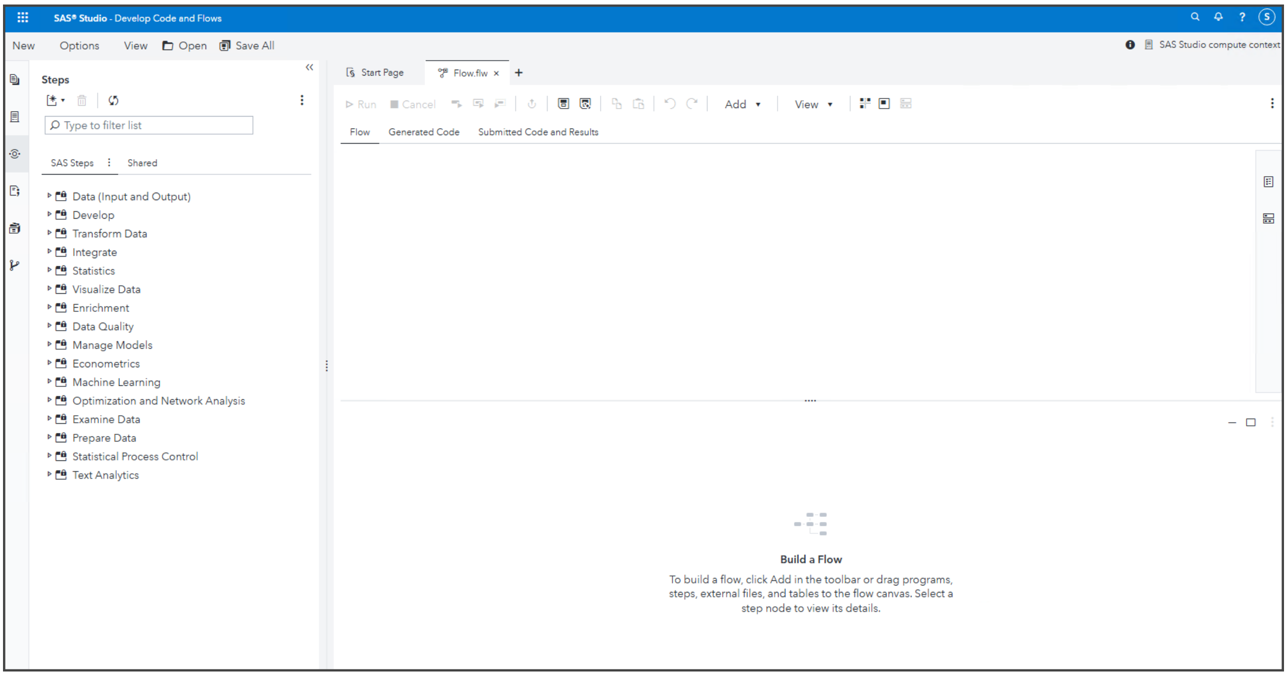
Select **No** when prompted about accepting *Admin* privileges.

Create a SAS Studio Flow

1. Select ⊞ ➔ **Develop Code and Flows** to open *SAS Studio*.

2. Select **New ➔ Flow**.

3. Select ⊙ to view the **Steps** pane.



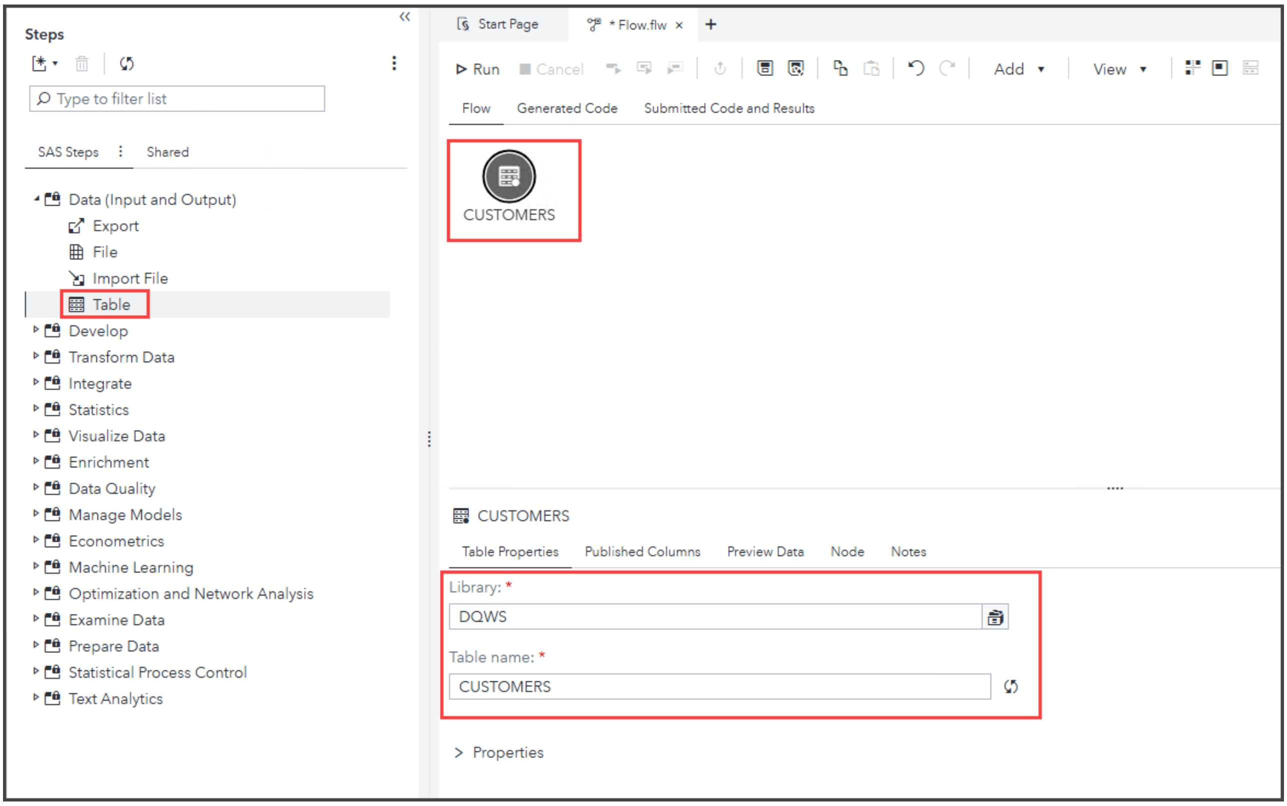
Build a Flow

To build a flow, click Add in the toolbar or drag programs, steps, external files, and tables to the flow canvas. Select a step node to view its details.

4. Expand the *Data (Input and Output)* section of the *Steps* pane. Double-click the **Table** step to add it to the flow canvas.

5. Select the **Table** node on the flow canvas. In the **Table Properties** section, select the following:

   - Library: **DQWS**
   - Table name: **CUSTOMERS**

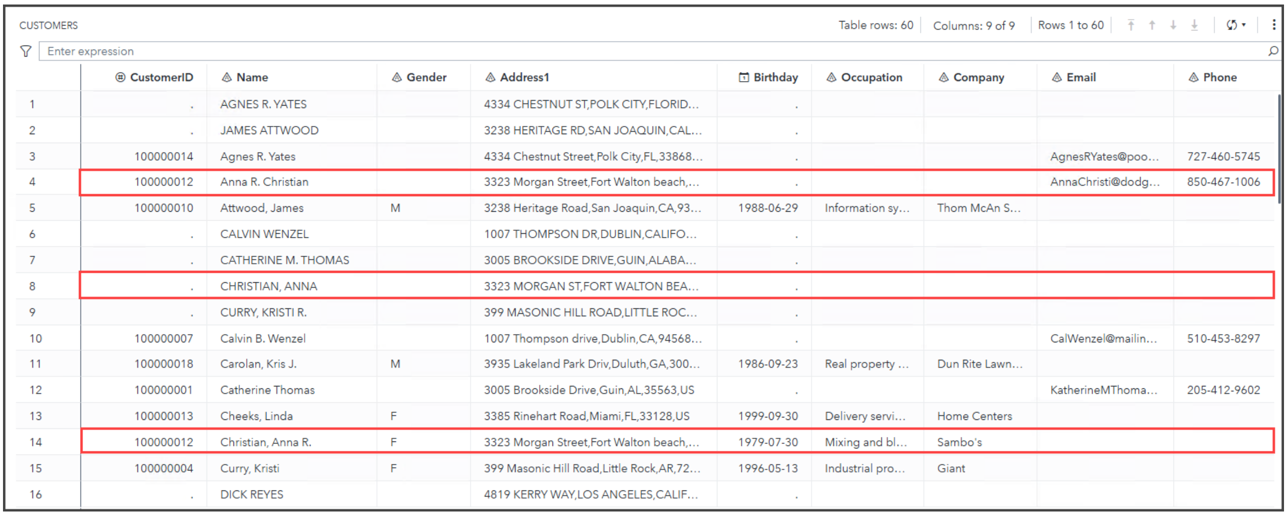


Library: * DQWS

Table name: * CUSTOMERS

6. Click **Preview Data** to view a subset of rows from the table.

> ✎ If needed, click « to hide the Steps pane, or click □ to maximize the preview.



CUSTOMERS

Table rows: 60 | Columns: 9 of 9 | Rows 1 to 60

Enter expression

	CustomerID	Name	Gender	Address1	Birthday	Occupation	Company	Email	Phone
1	.	AGNES R. YATES		4334 CHESTNUT ST,POLK CITY,FLORID...	.				
2	.	JAMES ATTWOOD		3238 HERITAGE RD,SAN JOAQUIN,CAL...	.				
3	100000014	Agnes R. Yates		4334 Chestnut Street,Polk City,FL,33868...	.			AgnesRYates@poo...	727-460-5745
4	100000012	Anna R. Christian		3323 Morgan Street,Fort Walton beach,...	.			AnnaChristi@dodg...	850-467-1006
5	100000010	Attwood, James	M	3238 Heritage Road,San Joaquin,CA,93...	1988-06-29	Information sy...	Thom McAn S...		
6	.	CALVIN WENZEL		1007 THOMPSON DR,DUBLIN,CALIFO...	.				
7	.	CATHERINE M. THOMAS		3005 BROOKSIDE DRIVE,GUIN,ALABA...	.				
8	.	CHRISTIAN, ANNA		3323 MORGAN ST,FORT WALTON BEA...	.				
9	.	CURRY, KRISTI R.		399 MASONIC HILL ROAD,LITTLE ROC...	.				
10	100000007	Calvin B. Wenzel		1007 Thompson drive,Dublin,CA,94568...	.			CalWenzel@mailin...	510-453-8297
11	100000018	Carolan, Kris J.	M	3935 Lakeland Park Driv,Duluth,GA,300...	1986-09-23	Real property ...	Dun Rite Lawn...		
12	100000001	Catherine Thomas		3005 Brookside Drive,Guin,AL,35563,US	.			KatherineMThoma...	205-412-9602
13	100000013	Cheeks, Linda	F	3385 Rinehart Road,Miami,FL,33128,US	1999-09-30	Delivery servi...	Home Centers		
14	100000012	Christian, Anna R.	F	3323 Morgan Street,Fort Walton beach,...	1979-07-30	Mixing and bl...	Sambo's		
15	100000004	Curry, Kristi	F	399 Masonic Hill Road,Little Rock,AR,72...	1996-05-13	Industrial pro...	Giant		
16	.	DICK REYES		4819 KERRY WAY,LOS ANGELES,CALIF...	.				

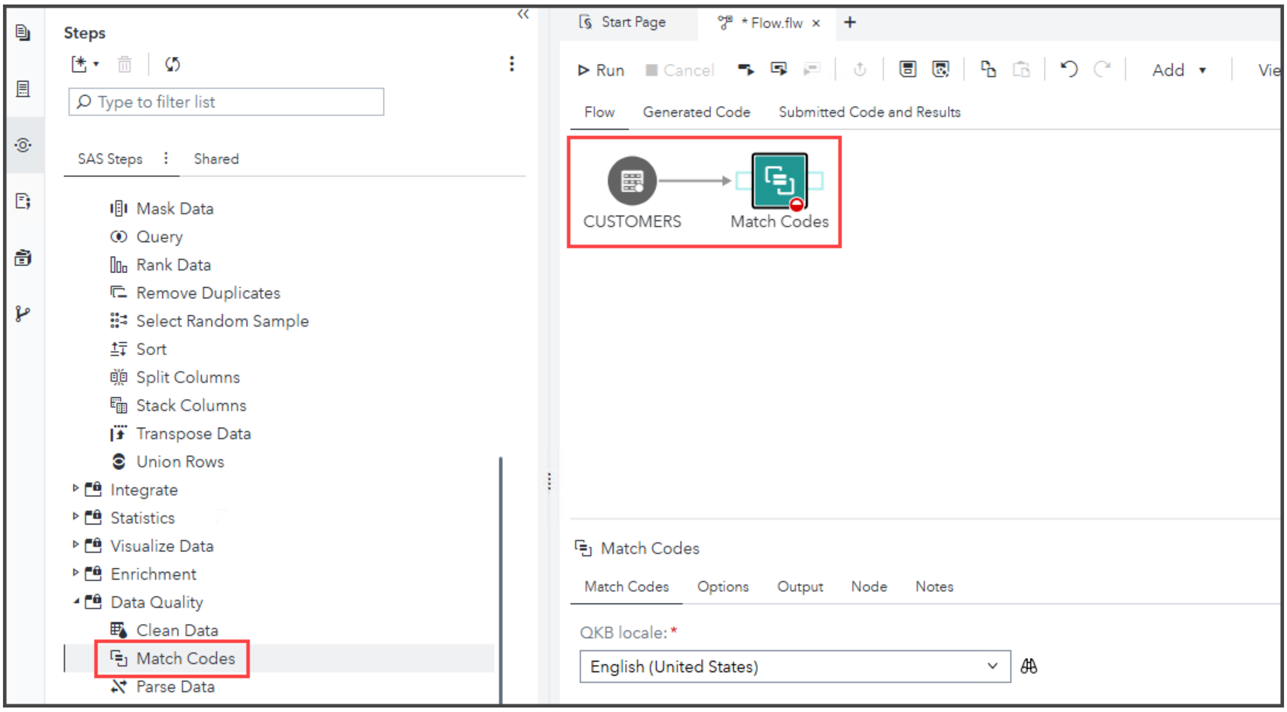
CUSTOMERS has **60** rows and **9** columns. Note that:

- Each customer appears three times.
- All rows have *Name* and *Address* values.
- Most rows have a non-missing *CustomerID* value.
- Customer *Name* values differ in each appearance (casing, name order, inclusion of middle initial or use of nickname).
- Rows with non-missing *Gender* values also have non-missing *CustomerID*, *Birthday*, *Occupation*, and *Company* values.
- Rows with non-missing *Email* values also have non-missing *CustomerID* and *Phone* values.

We would like to deduplicate this data by combining unique values into one row per customer. First, we'll generate match codes to determine which rows represent the same customers.

Generate Match Codes

1. Restore your screen view if needed.
2. Expand the *Data Quality* section of the *Steps* pane. Double-click the **Match Codes** step to add it to the flow canvas.
3. Drag the *Match Codes* step to the right of *CUSTOMERS*. Use your mouse to draw an arrow connecting *Customers* to the *Match Codes* step.
4. (Optional) Click ▦ on the flow toolbar to arrange the nodes.

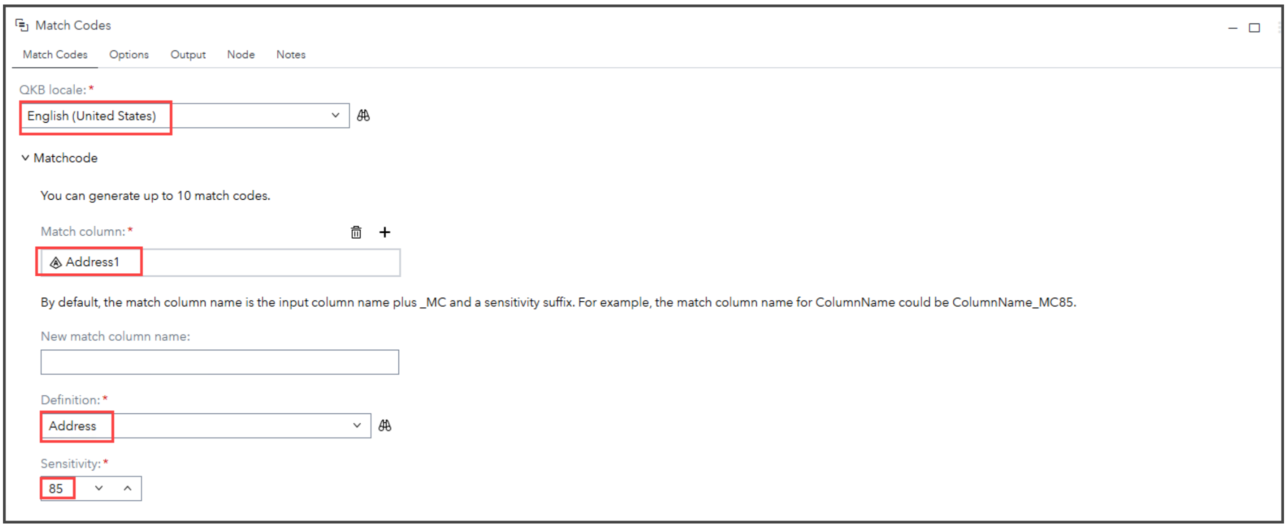


QKB locale: * English (United States)

5. In the *Match Codes* tab for the *Match Codes* step, ensure that the default QKB locale (**English (United States)**) is selected.

6. Configure the *Match Codes* step as follows:

   - Match column: **Address1**
   - New match column name: **[Leave blank]**
   - Definition: **Address**
   - Sensitivity: **85**



QKB locale: * English (United States)

Matchcode

You can generate up to 10 match codes.

Match column: * Address1

By default, the match column name is the input column name plus _MC and a sensitivity suffix. For example, the match column name for ColumnName could be ColumnName_MC85.

New match column name:

Definition: * Address

Sensitivity: * 85

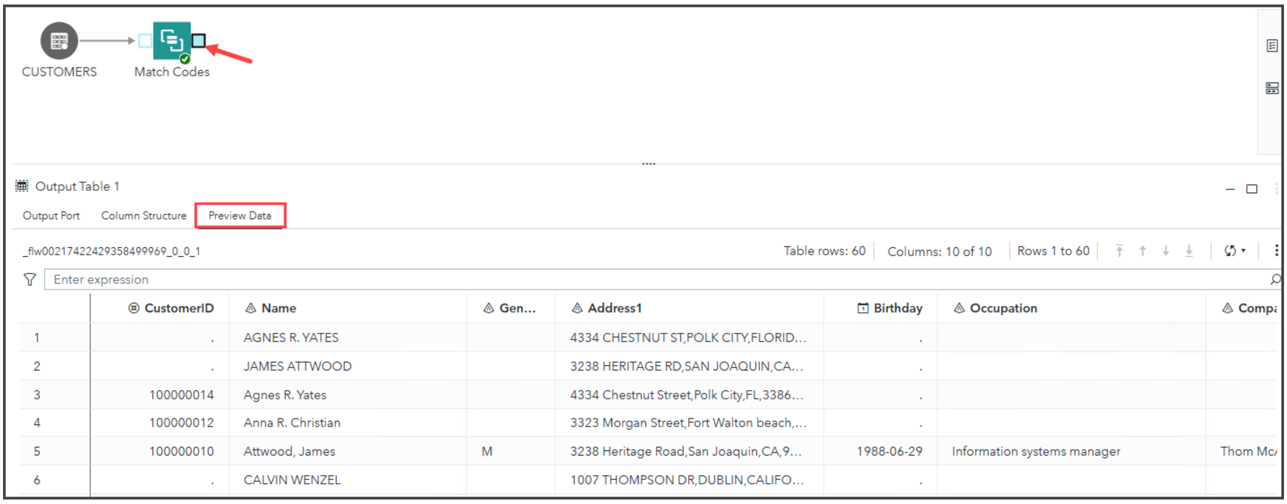
7. Select 💾 to save the flow.

8. Navigate to **SAS Content ➔ Public**. Save the file as **DQ_HOW.flw**.

9. Select ▷ Run on the flow toolbar to run the flow.

10. After the flow has run successfully, click the shaded **output port** on *Match Codes*.

11. Click **Preview Data** to review the output.



Output Table 1

Output Port | Column Structure | Preview Data

_flw0021742242935849969_0_0_1 Table rows: 60 | Columns: 10 of 10 | Rows 1 to 60

Enter expression

	CustomerID	Name	Gen...	Address1	Birthday	Occupation	Compa
1	.	AGNES R. YATES		4334 CHESTNUT ST,POLK CITY,FLORID...	.		
2	.	JAMES ATTWOOD		3238 HERITAGE RD,SAN JOAQUIN,CA...	.		
3	100000014	Agnes R. Yates		4334 Chestnut Street,Polk City,FL,3386...	.		
4	100000012	Anna R. Christian		3323 Morgan Street,Fort Walton beach,...	.		
5	100000010	Attwood, James	M	3238 Heritage Road,San Joaquin,CA,9...	1988-06-29	Information systems manager	Thom Mc
6	.	CALVIN WENZEL		1007 THOMPSON DR,DUBLIN,CALIFO...	.		

12. Click ⋮ in the *Preview Data* window and select **Column Selection**.

13. In the *Column Selection* window, deselect all columns, then individually select **Name**, **Address1**, and **Address1_MC85**, then click **OK**.

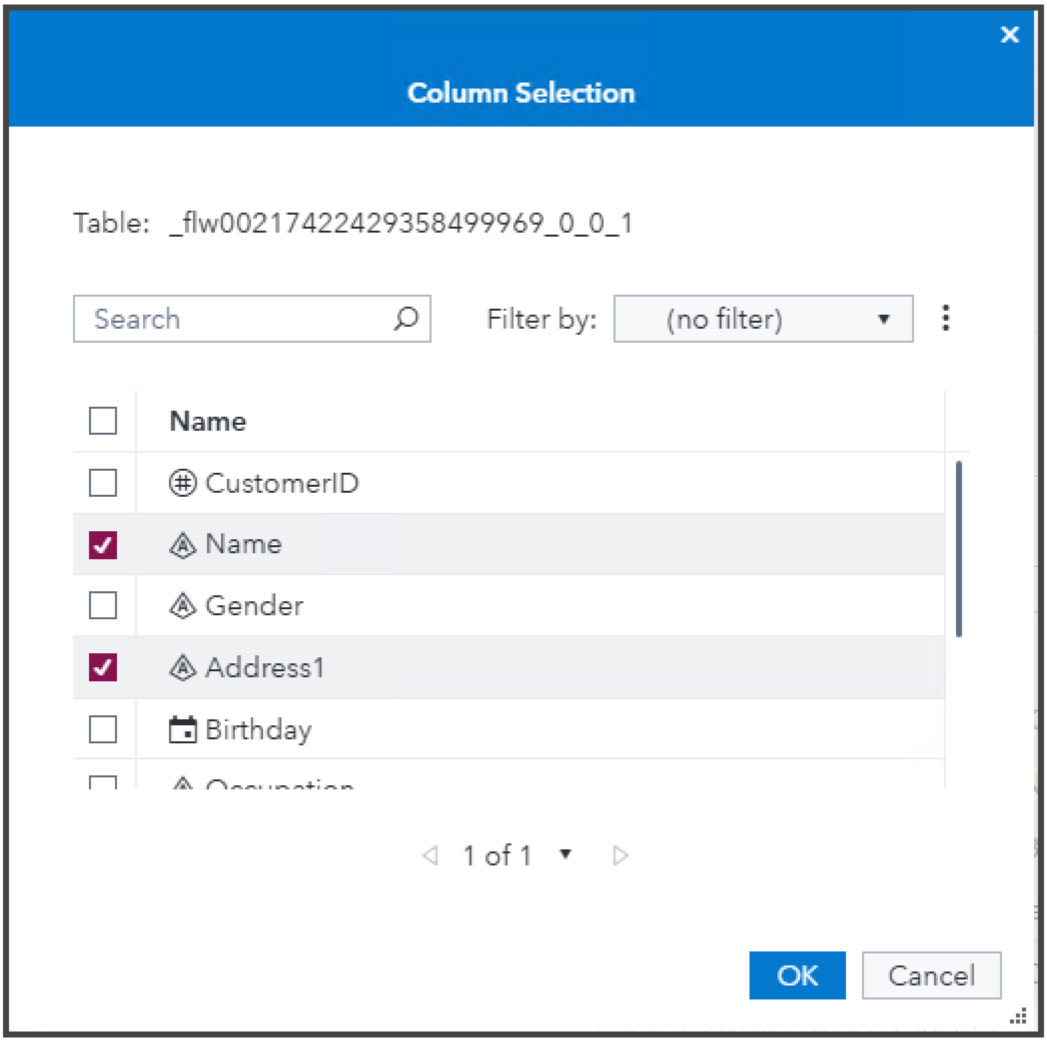
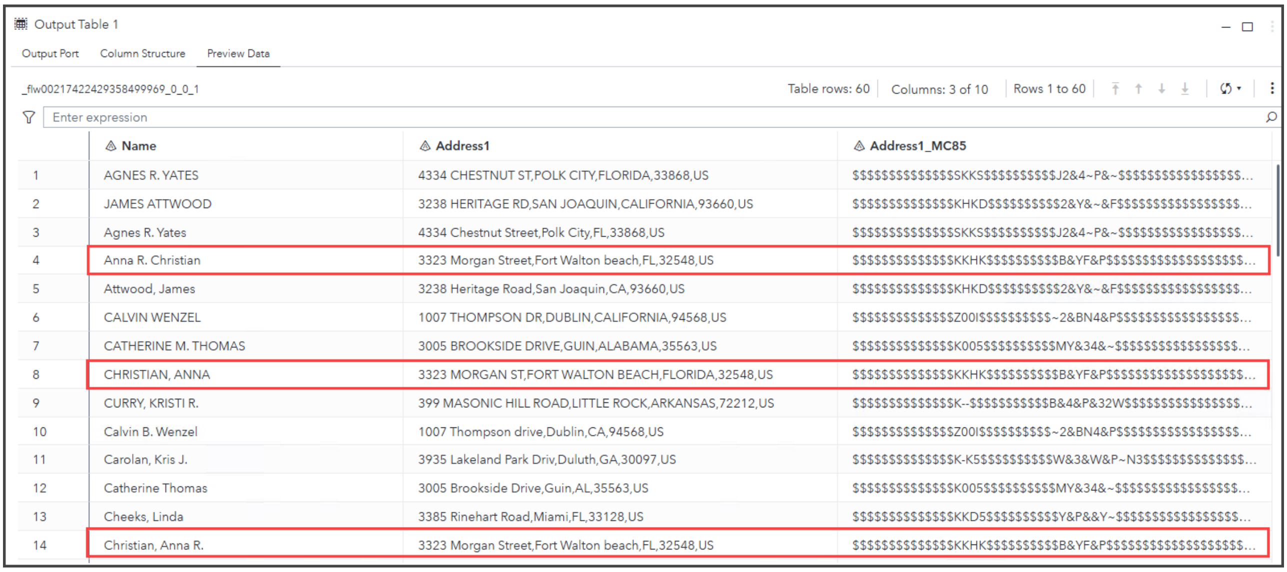


Table: _flw0021742242935849969_0_0_1

	Name
□	CustomerID
☑	Name
□	Gender
☑	Address1
□	Birthday
□	Occupation

14. Review the output on the *Preview Data* tab.



_flw00217422429358499969_0_0_1   Table rows: 60 | Columns: 3 of 10 | Rows 1 to 60

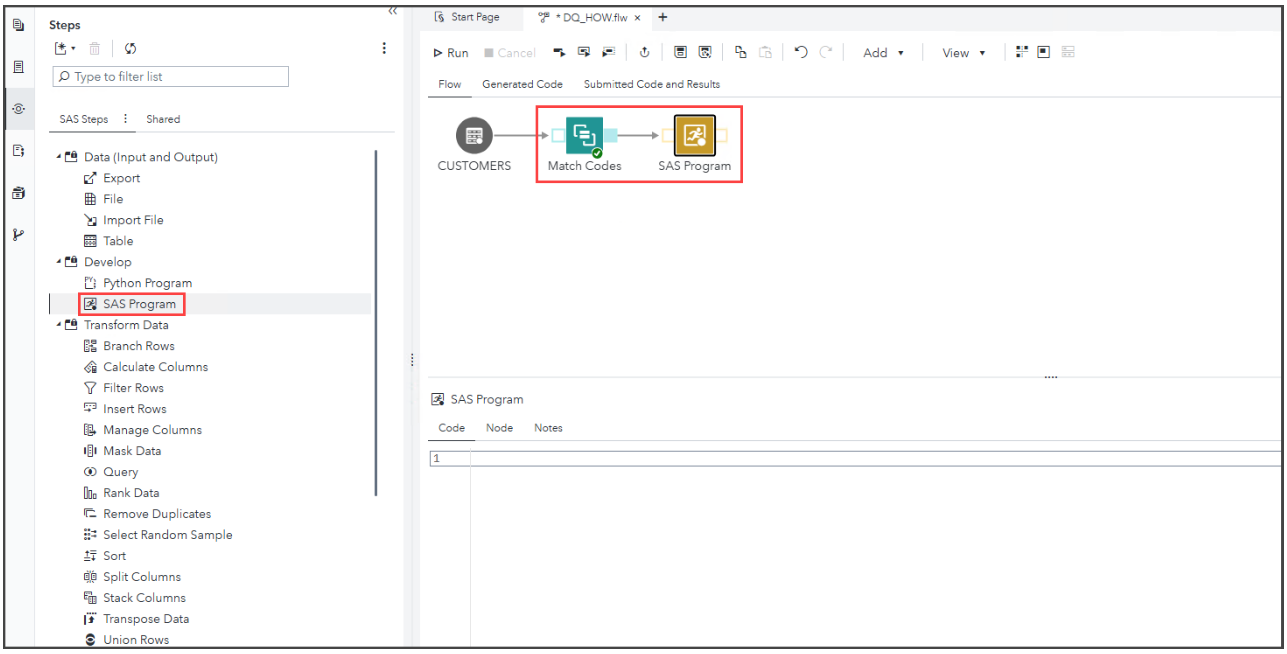
	Name	Address1	Address1_MC85
1	AGNES R. YATES	4334 CHESTNUT ST,POLK CITY,FLORIDA,33868,US	$$$$$$$$$$$$$$SKKS$$$$$$$$$$J2&4~P&~$$$$$$$$$$$$$$$$$...
2	JAMES ATTWOOD	3238 HERITAGE RD,SAN JOAQUIN,CALIFORNIA,93660,US	$$$$$$$$$$$$$$KHKD$$$$$$$$$$2&Y&~&F$$$$$$$$$$$$$$$$$...
3	Agnes R. Yates	4334 Chestnut Street,Polk City,FL,33868,US	$$$$$$$$$$$$$$SKKS$$$$$$$$$$J2&4~P&~$$$$$$$$$$$$$$$$$...
4	Anna R. Christian	3323 Morgan Street,Fort Walton beach,FL,32548,US	$$$$$$$$$$$$$$KKHK$$$$$$$$$$B&YF&P$$$$$$$$$$$$$$$$$$$...
5	Attwood, James	3238 Heritage Road,San Joaquin,CA,93660,US	$$$$$$$$$$$$$$KHKD$$$$$$$$$$2&Y&~&F$$$$$$$$$$$$$$$$$...
6	CALVIN WENZEL	1007 THOMPSON DR,DUBLIN,CALIFORNIA,94568,US	$$$$$$$$$$$$$$Z00I$$$$$$$$$$~2&BN4&P$$$$$$$$$$$$$$$$$...
7	CATHERINE M. THOMAS	3005 BROOKSIDE DRIVE,GUIN,ALABAMA,35563,US	$$$$$$$$$$$$$$K005$$$$$$$$$$MY&34&~$$$$$$$$$$$$$$$$$...
8	CHRISTIAN, ANNA	3323 MORGAN ST,FORT WALTON BEACH,FLORIDA,32548,US	$$$$$$$$$$$$$$KKHK$$$$$$$$$$B&YF&P$$$$$$$$$$$$$$$$$$$...
9	CURRY, KRISTI R.	399 MASONIC HILL ROAD,LITTLE ROCK,ARKANSAS,72212,US	$$$$$$$$$$$$$$K--$$$$$$$$$$B&4&P&32W$$$$$$$$$$$$$$$$...
10	Calvin B. Wenzel	1007 Thompson drive,Dublin,CA,94568,US	$$$$$$$$$$$$$$Z00I$$$$$$$$$$~2&BN4&P$$$$$$$$$$$$$$$$$...
11	Carolan, Kris J.	3935 Lakeland Park Driv,Duluth,GA,30097,US	$$$$$$$$$$$$$$K-K5$$$$$$$$$$W&3&W&P~N3$$$$$$$$$$$$$$$...
12	Catherine Thomas	3005 Brookside Drive,Guin,AL,35563,US	$$$$$$$$$$$$$$K005$$$$$$$$$$MY&34&~$$$$$$$$$$$$$$$$$...
13	Cheeks, Linda	3385 Rinehart Road,Miami,FL,33128,US	$$$$$$$$$$$$$$KKD5$$$$$$$$$$Y&P&&Y~$$$$$$$$$$$$$$$$$...
14	Christian, Anna R.	3323 Morgan Street,Fort Walton beach,FL,32548,US	$$$$$$$$$$$$$$KKHK$$$$$$$$$$B&YF&P$$$$$$$$$$$$$$$$$$$...

Notice that rows with equivalent *Address1* values generated the same match codes regardless of *Address1* format. We can use these match codes to combine customer data into one surviving record.

Remove Duplicates with Survivorship Snippet

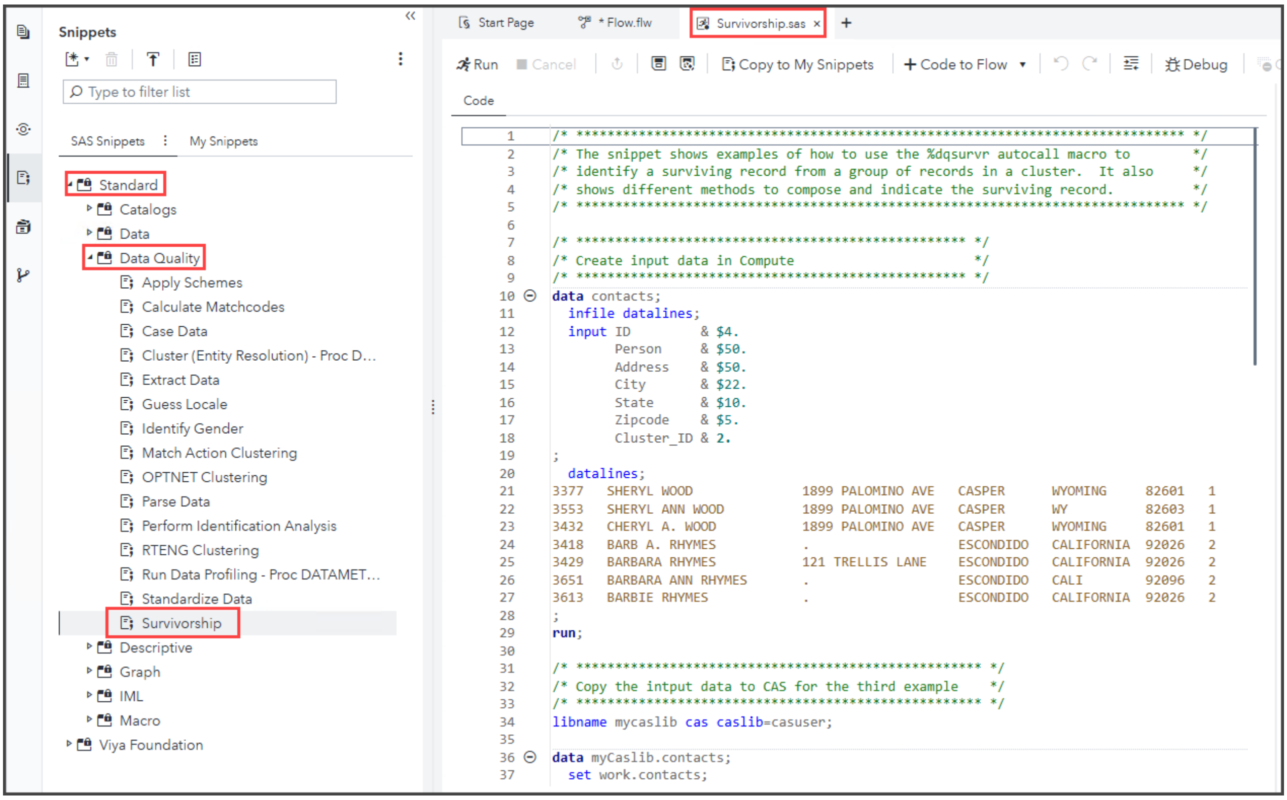
1. Add the **SAS Program** step from the *Develop* section of the *Steps* pane to the flow canvas and connect it to the *Match Nodes* step.

2. **Arrange** the nodes and **save** the flow.



3. Select to open the **Snippets** pane.

4. Expand **Standard ➔ Data Quality** and double-click **Survivorship** to open the *Survivorship* snippet in a new tab.



```
/* ***************************************************************************** */
/* The snippet shows examples of how to use the %dqsurvr autocall macro to        */
/* identify a surviving record from a group of records in a cluster.  It also     */
/* shows different methods to compose and indicate the surviving record.          */
/* ***************************************************************************** */

/* ************************************************** */
/* Create input data in Compute                       */
/* ************************************************** */
data contacts;
  infile datalines;
  input ID         & $4.
        Person     & $50.
        Address    & $50.
        City       & $22.
        State      & $10.
        Zipcode    & $5.
        Cluster_ID & 2.
;
  datalines;
3377   SHERYL WOOD              1899 PALOMINO AVE   CASPER      WYOMING     82601   1
3553   SHERYL ANN WOOD          1899 PALOMINO AVE   CASPER      WY          82603   1
3432   CHERYL A. WOOD           1899 PALOMINO AVE   CASPER      WYOMING     82601   1
3418   BARB A. RHYMES           .                   ESCONDIDO   CALIFORNIA  92026   2
3429   BARBARA RHYMES           121 TRELLIS LANE    ESCONDIDO   CALIFORNIA  92026   2
3651   BARBARA ANN RHYMES       .                   ESCONDIDO   CALI        92096   2
3613   BARBIE RHYMES            .                   ESCONDIDO   CALIFORNIA  92026   2
;
run;

/* **************************************************** */
/* Copy the intput data to CAS for the third example    */
/* **************************************************** */
libname mycaslib cas caslib=casuser;

data myCaslib.contacts;
  set work.contacts;
```

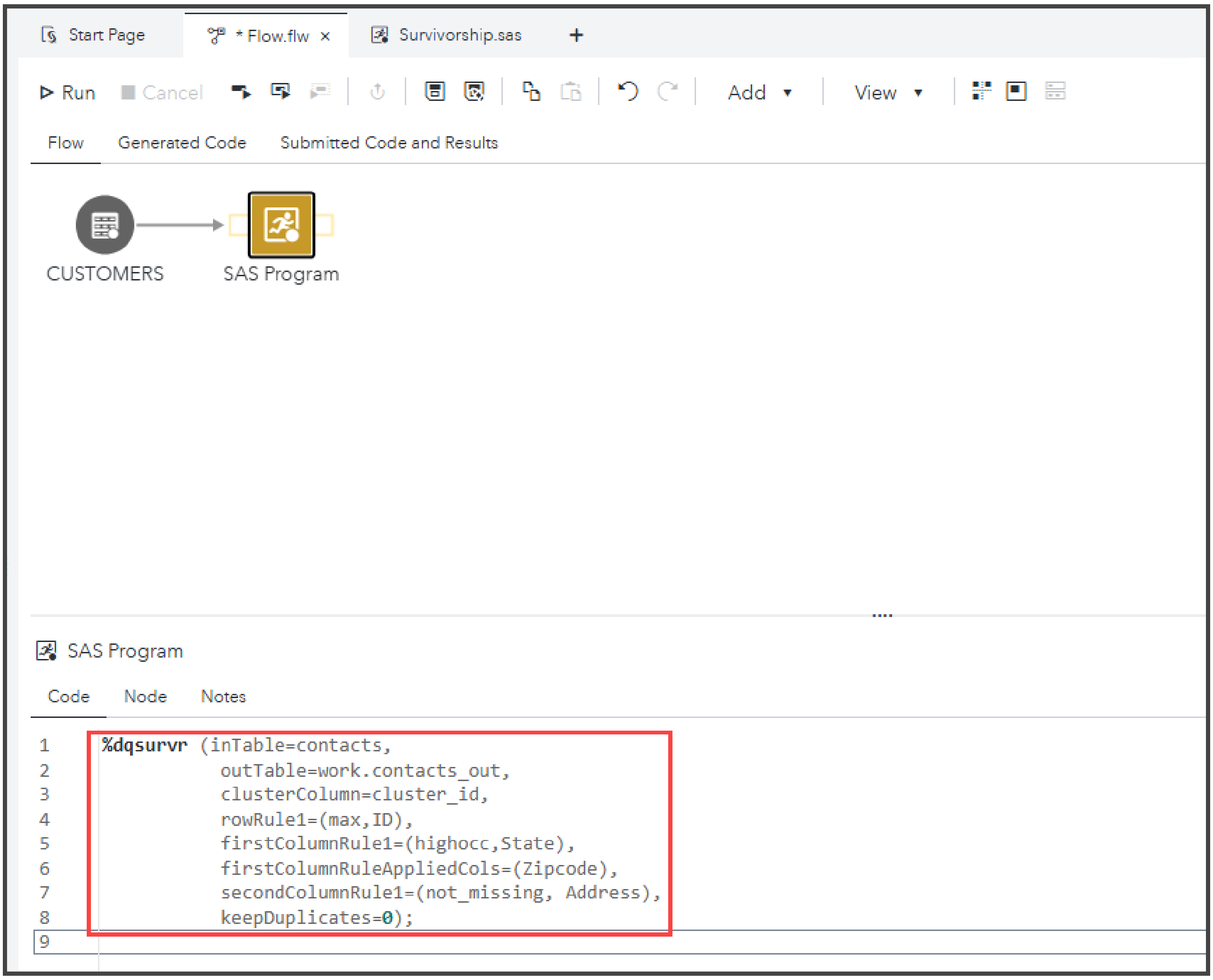
Per the snippet documentation: *The snippet shows examples of how to use the %dqsurvr autocall macro to identify a surviving record from a group of records in a cluster. It also shows different methods to compose and indicate the surviving record.*

5. Copy the first example that calls the %dqsurvr macro **(lines 52 - 59)** and paste it into the SAS Program node's *Code* tab.

▶ Details

Click to view or copy the required section of code.

```
%dqsurvr (inTable=contacts,
              outTable=work.contacts_out,
              clusterColumn=cluster_id,
              rowRule1=(max,ID),
              firstColumnRule1=(highocc,State),
              firstColumnRuleAppliedCols=(Zipcode),
              secondColumnRule1=(not_missing, Address),
              keepDuplicates=0);
```



```
%dqsurvr (inTable=contacts,
             outTable=work.contacts_out,
             clusterColumn=cluster_id,
             rowRule1=(max,ID),
             firstColumnRule1=(highocc,State),
             firstColumnRuleAppliedCols=(Zipcode),
             secondColumnRule1=(not_missing, Address),
             keepDuplicates=0);
```

6. Edit the macro parameters as follows:

   - inTable=**&_input1**
   - outTable=**&_output1**
   - clusterColumn=**Address1_MC85**
   - rowRule1=**(longest, Name)**

     > ✎ The surviving record will be chosen by the longest **Name** value, because this should be the fullest version of the customer's name.

   - firstColumnRule1=**(not_missing, Gender)**

     > ✎ The surviving record should store the first non-missing *Gender* value from the cluster records.

   - firstColumnRuleAppliedCols=**(Birthday, Occupation, Company)**

     > ✎ The surviving record should store the *Birthday*, *Occupation*, and *Company* values from the row satisfying *firstColumnRule1*.

   - secondColumnRule1=**(not_missing, Email)**

     > ✎ The surviving record should store the first non-missing *Email* value from the cluster records.

- **Add firstColumnRuleAppliedCols=(CustomerID, Phone)**

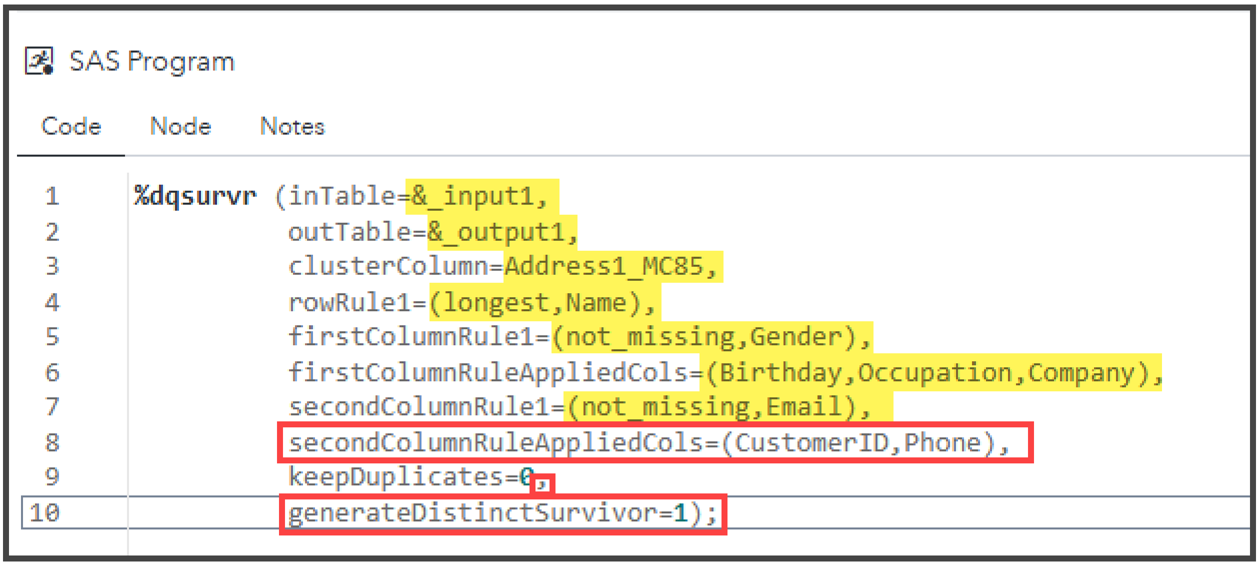
  > ✎ The surviving record should store the *CustomerID* and *Phone* values from the row satisfying *secondColumnRule1*.

- **Add a comma after** keepDuplicates=**0**
- **Add generateDistinctSurvivor=1** after keepDuplicates=**0**

▶ Details

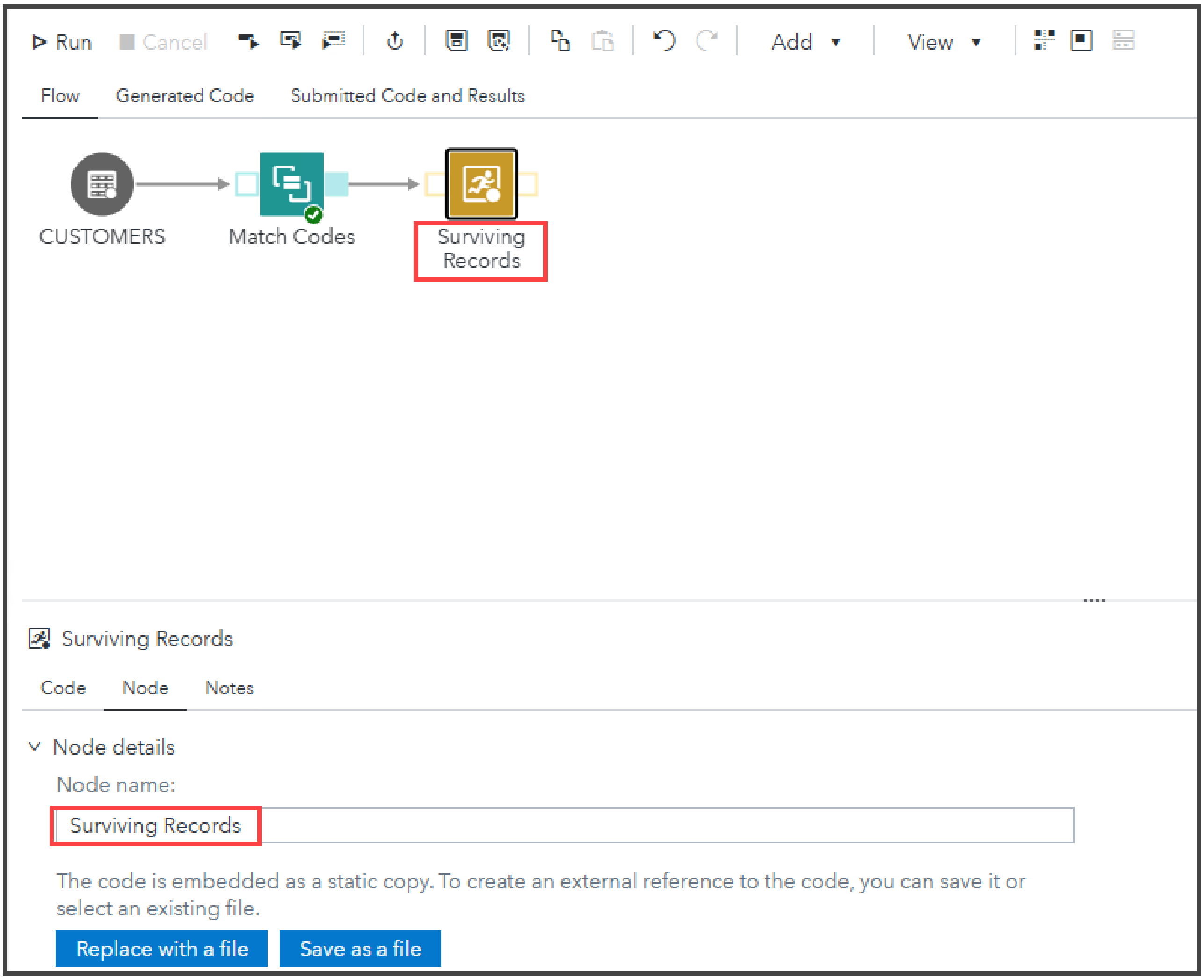
Click to view or copy the edited macro call.

```
%dqsurvr (inTable=&_input1,
       outTable=&_output1,
       clusterColumn=Address1_MC85,
       rowRule1=(longest,Name),
       firstColumnRule1=(not_missing,Gender),
       firstColumnRuleAppliedCols=(Birthday,Occupation,Company),
       secondColumnRule1=(not_missing,Email),
       secondColumnRuleAppliedCols=(CustomerID,Phone),
       keepDuplicates=0,
       generateDistinctSurvivor=1);
```



```
%dqsurvr (inTable=&_input1,
          outTable=&_output1,
          clusterColumn=Address1_MC85,
          rowRule1=(longest,Name),
          firstColumnRule1=(not_missing,Gender),
          firstColumnRuleAppliedCols=(Birthday,Occupation,Company),
          secondColumnRule1=(not_missing,Email),
          secondColumnRuleAppliedCols=(CustomerID,Phone),
          keepDuplicates=0,
          generateDistinctSurvivor=1);
```

7. On the **Node** tab, re-name the node to **Surviving Records**.

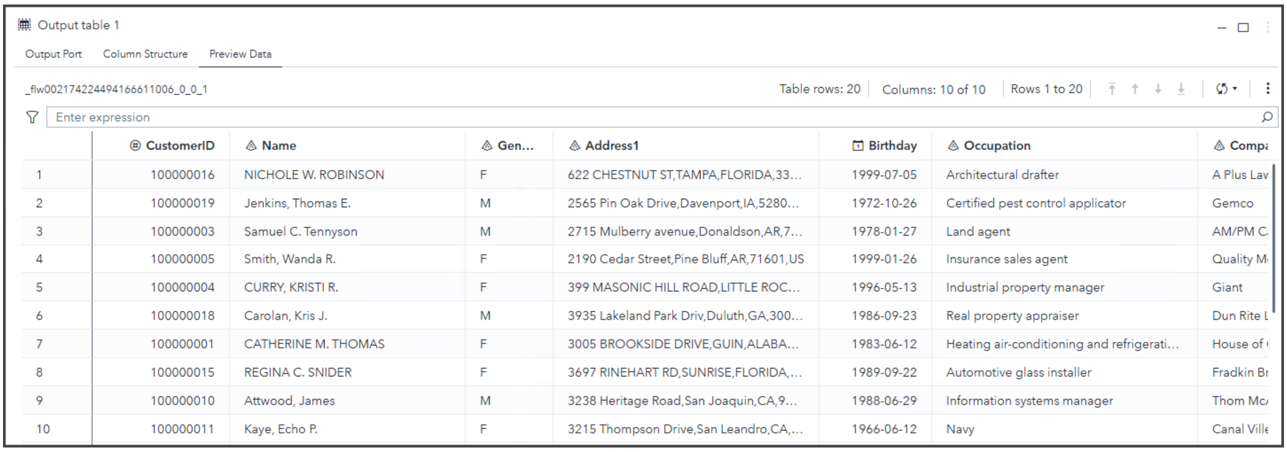


Node name: Surviving Records

The code is embedded as a static copy. To create an external reference to the code, you can save it or select an existing file.

8. **Save** the changes to the flow.

9. **Right-click** *Surviving Records* and select **Run node**. Select the **output port** of *Surviving Records* and **preview** the results.



_flw002174224494166611006_0_0_1

Table rows: 20 | Columns: 10 of 10 | Rows 1 to 20

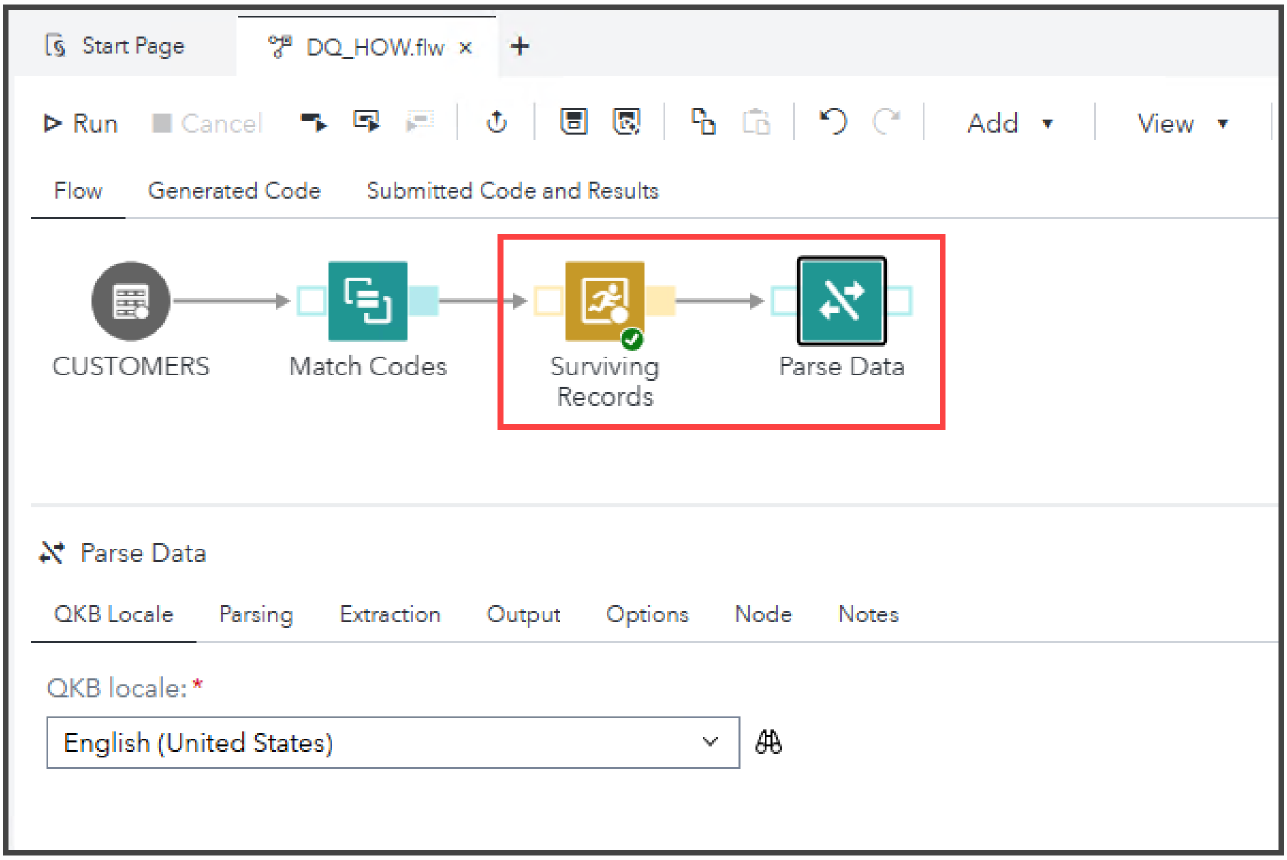
	CustomerID	Name	Gen...	Address1	Birthday	Occupation	Compa
1	100000016	NICHOLE W. ROBINSON	F	622 CHESTNUT ST,TAMPA,FLORIDA,33...	1999-07-05	Architectural drafter	A Plus Lav
2	100000019	Jenkins, Thomas E.	M	2565 Pin Oak Drive,Davenport,IA,5280...	1972-10-26	Certified pest control applicator	Gemco
3	100000003	Samuel C. Tennyson	M	2715 Mulberry avenue,Donaldson,AR,7...	1978-01-27	Land agent	AM/PM C
4	100000005	Smith, Wanda R.	F	2190 Cedar Street,Pine Bluff,AR,71601,US	1999-01-26	Insurance sales agent	Quality M
5	100000004	CURRY, KRISTI R.	F	399 MASONIC HILL ROAD,LITTLE ROC...	1996-05-13	Industrial property manager	Giant
6	100000018	Carolan, Kris J.	M	3935 Lakeland Park Driv,Duluth,GA,300...	1986-09-23	Real property appraiser	Dun Rite L
7	100000001	CATHERINE M. THOMAS	F	3005 BROOKSIDE DRIVE,GUIN,ALABA...	1983-06-12	Heating air-conditioning and refrigerati...	House of
8	100000015	REGINA C. SNIDER	F	3697 RINEHART RD,SUNRISE,FLORIDA,...	1989-09-22	Automotive glass installer	Fradkin Br
9	100000010	Attwood, James	M	3238 Heritage Road,San Joaquin,CA,9...	1988-06-29	Information systems manager	Thom Mc
10	100000011	Kaye, Echo P.	F	3215 Thompson Drive,San Leandro,CA,...	1966-06-12	Navy	Canal Ville

The output table has **20** rows and **5** columns. Duplicate records were accurately condensed to store all customer data in one record. Next, we'll parse *Address1* and store individual tokens like Street, City, and State in separate columns.

Parse Address Data

1. Add the **Parse Data** step from the *Data Quality* section of the *Steps* pane to the flow canvas and connect it to the *SAS Program (Surviving Records)* step.

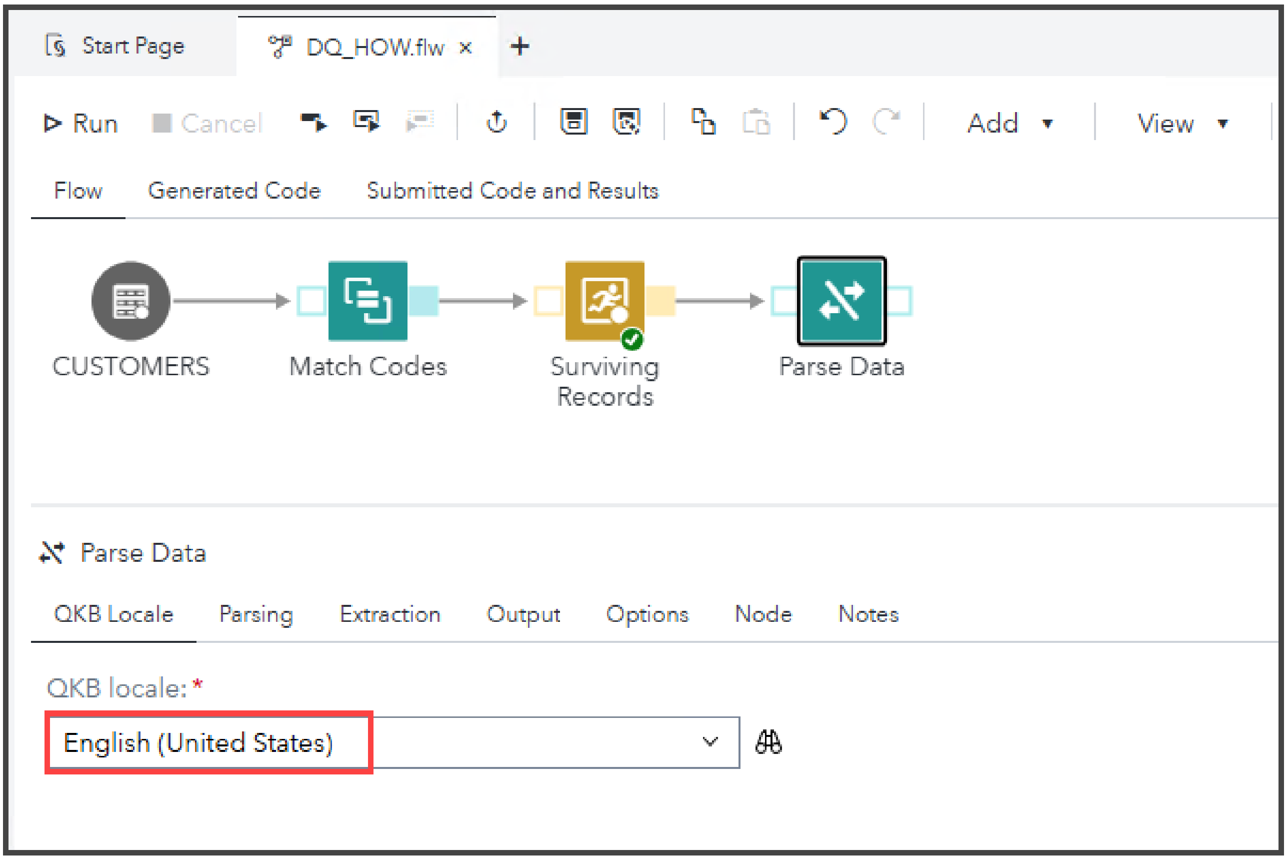
2. **Arrange** the nodes and **save** the flow.



QKB locale: *

English (United States)

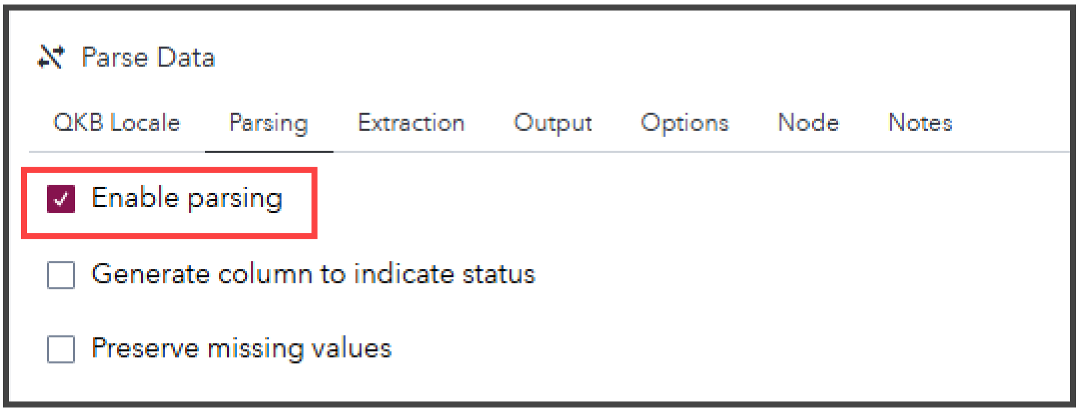
3. In the *QKB Locale* tab for the *Parse Data* step, ensure that the default QKB locale (**English (United States)**) is selected.



QKB locale: *

English (United States)

4. On the *Parsing* tab, check the box to **Enable parsing**.

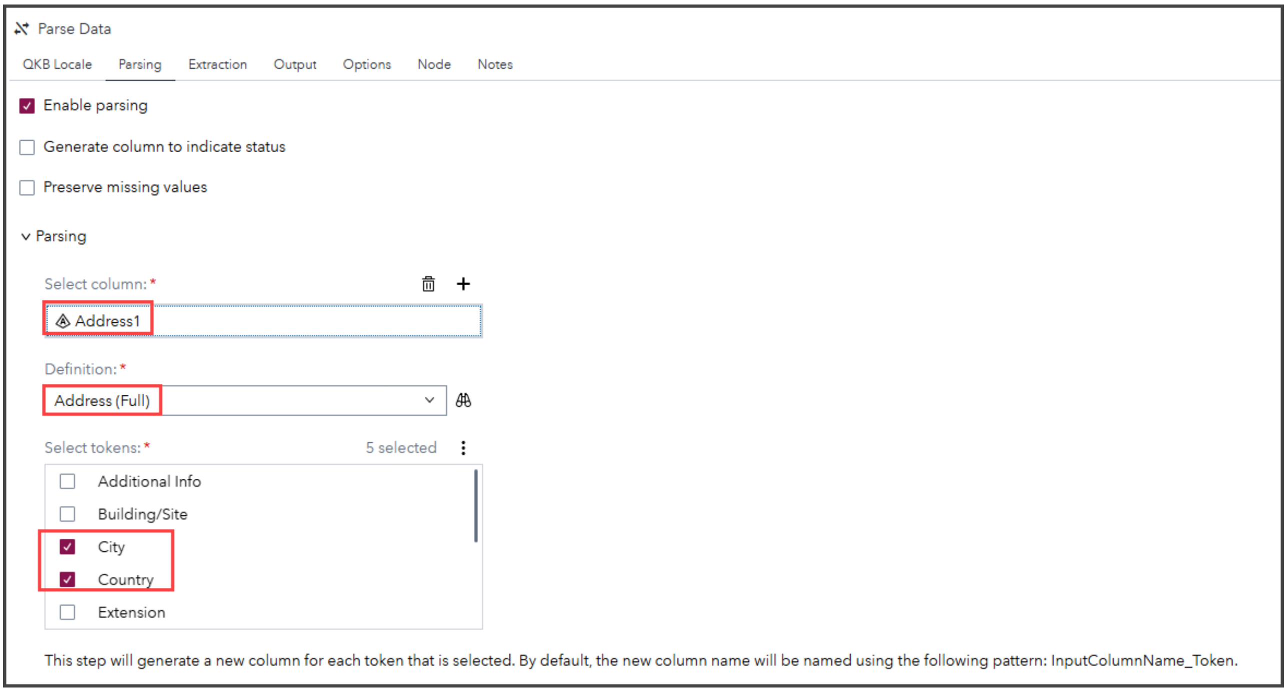


☑ Enable parsing

□ Generate column to indicate status

□ Preserve missing values

5. Configure the *Parse Data* step as follows:
   - Select column: **Address1**
   - Definition: **Address (Full)**
   - Select tokens: **City**, **Country**, **Postal Code**, **State/Province**, **Street**



☑ Enable parsing

□ Generate column to indicate status

□ Preserve missing values

Select column: * Address1

Definition: * Address (Full)

Select tokens: * 5 selected

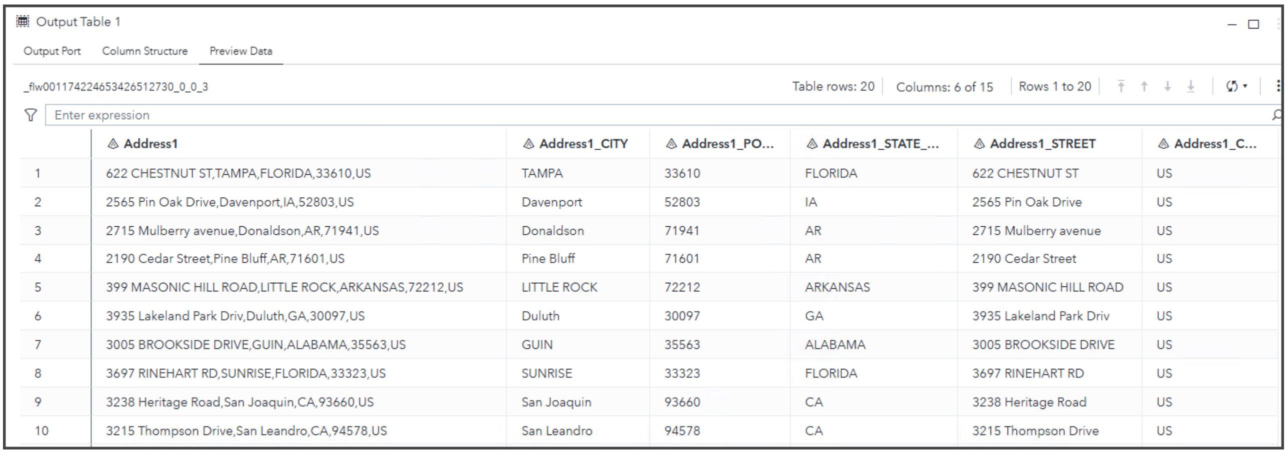
□ Additional Info
□ Building/Site
☑ City
☑ Country
□ Extension

This step will generate a new column for each token that is selected. By default, the new column name will be named using the following pattern: InputColumnName_Token.

6. **Save** the changes to the flow.

7. **Right-click** *Parse Data* and select **Run node**. Select the **output port** of *Parse Data* and **preview** the results.

> ✎ Use the *Column Selection* option or scroll all the way to the right in the *Preview Data* window to see new columns.



_flw0011742246534265127300_0_3 Table rows: 20 Columns: 6 of 15 Rows 1 to 20

	Address1	Address1_CITY	Address1_PO...	Address1_STATE_...	Address1_STREET	Address1_C...
1	622 CHESTNUT ST,TAMPA,FLORIDA,33610,US	TAMPA	33610	FLORIDA	622 CHESTNUT ST	US
2	2565 Pin Oak Drive,Davenport,IA,52803,US	Davenport	52803	IA	2565 Pin Oak Drive	US
3	2715 Mulberry avenue,Donaldson,AR,71941,US	Donaldson	71941	AR	2715 Mulberry avenue	US
4	2190 Cedar Street,Pine Bluff,AR,71601,US	Pine Bluff	71601	AR	2190 Cedar Street	US
5	399 MASONIC HILL ROAD,LITTLE ROCK,ARKANSAS,72212,US	LITTLE ROCK	72212	ARKANSAS	399 MASONIC HILL ROAD	US
6	3935 Lakeland Park Driv,Duluth,GA,30097,US	Duluth	30097	GA	3935 Lakeland Park Driv	US
7	3005 BROOKSIDE DRIVE,GUIN,ALABAMA,35563,US	GUIN	35563	ALABAMA	3005 BROOKSIDE DRIVE	US
8	3697 RINEHART RD,SUNRISE,FLORIDA,33323,US	SUNRISE	33323	FLORIDA	3697 RINEHART RD	US
9	3238 Heritage Road,San Joaquin,CA,93660,US	San Joaquin	93660	CA	3238 Heritage Road	US
10	3215 Thompson Drive,San Leandro,CA,94578,US	San Leandro	94578	CA	3215 Thompson Drive	US

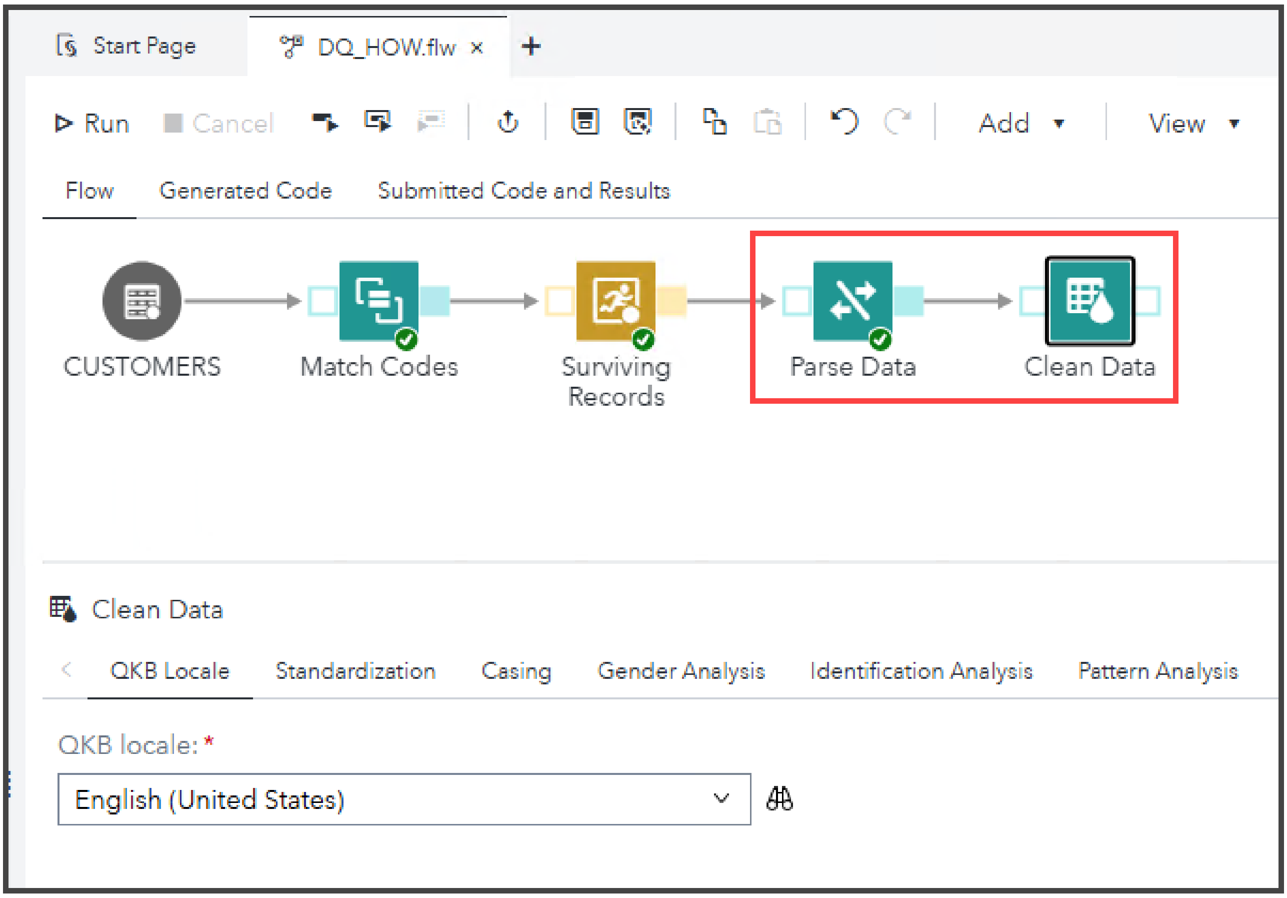
The output table has **5** new columns storing the **City**, **Country**, **Postal Code**, **State/Province**, and **Street** from each *Address1* value. Note that:

- **Address1_CITY** varies in casing. Some city names are written in uppercase, while others are in proper case.
- **Address1_STATE_PROVINCE** varies in format. Some state names are written in full, while others are written in abbreviations.
- **Address1_STREET** varies in casing and format. Specifically, some street addresses use full road names, while others use abbreviations.
- **Address1_COUNTRY** uses a consistent country abbreviation standard, but we'd like to see the full country name instead. We'll correct these issues and others with the Clean Data step.

Standardize Data

1. Add the **Clean Data** step from the *Data Quality* section of the *Steps* pane to the flow canvas and connect it to the *Parse Data* step.

2. **Arrange** the nodes and **save** the flow.



QKB locale: *

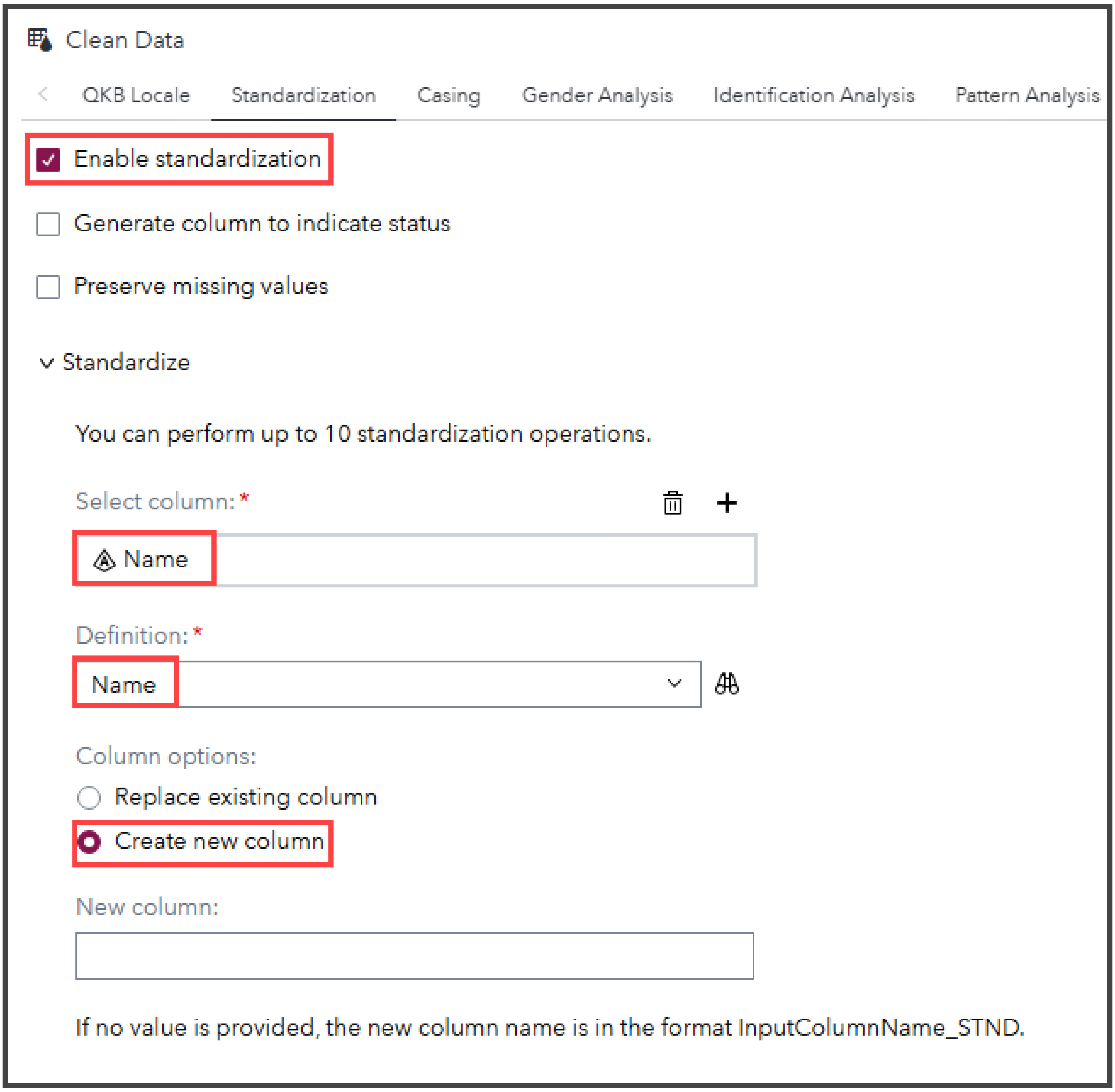
English (United States)

3. In the *QKB Locale* tab for the *Clean Data* step, ensure that the default QKB locale (**English (United States)**) is selected.

4. On the *Standardization* tab, check the box to **Enable standardization**.

5. Configure the *Clean Data* step as follows:

    - Select column: **Name**
    - Definition: **Name**
    - Column options: **Create new column**
    - New column: **[Leave blank]**



Clean Data

☑ Enable standardization

□ Generate column to indicate status

□ Preserve missing values

Standardize

You can perform up to 10 standardization operations.

Select column: * Name

Definition: * Name

Column options:

○ Replace existing column

● Create new column

New column:

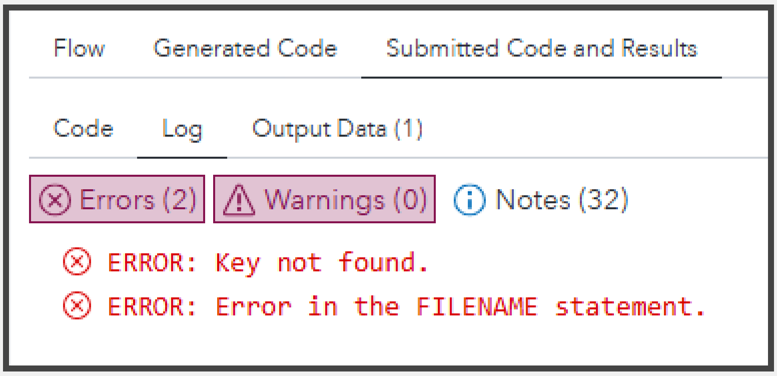
If no value is provided, the new column name is in the format InputColumnName_STND.

6. Under the *Additional Standardize* heading, repeat this process to standardize columns as specified below. **For all *Additional Standardize* columns, select *Create new column* and leave the new column name *blank*.**

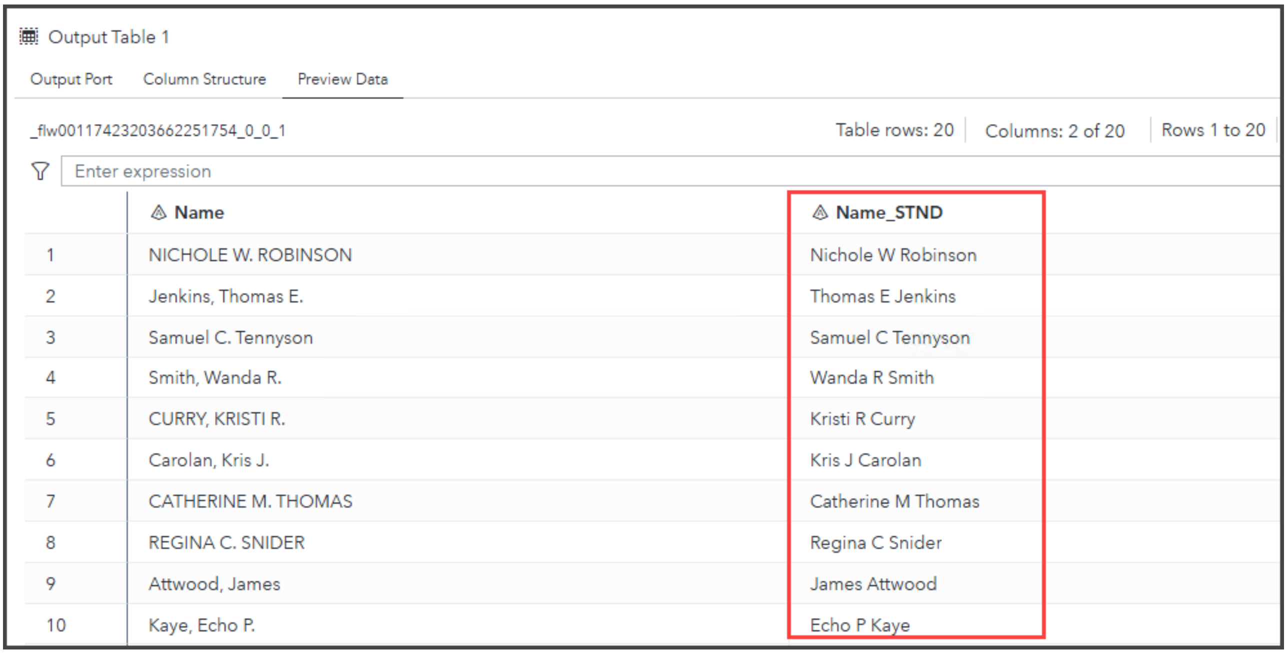
Select Column	Definition
Address1_CITY	City
Address1_STATE_PROVINCE	State/Province (Full Name)
Address1_STREET	Address
Address1_COUNTRY	Country

7. **Save** the changes to the flow.

8. **Right-click** *Clean Data* and select **Run node**. Select the **output port** of *Clean Data* and **preview** the results.

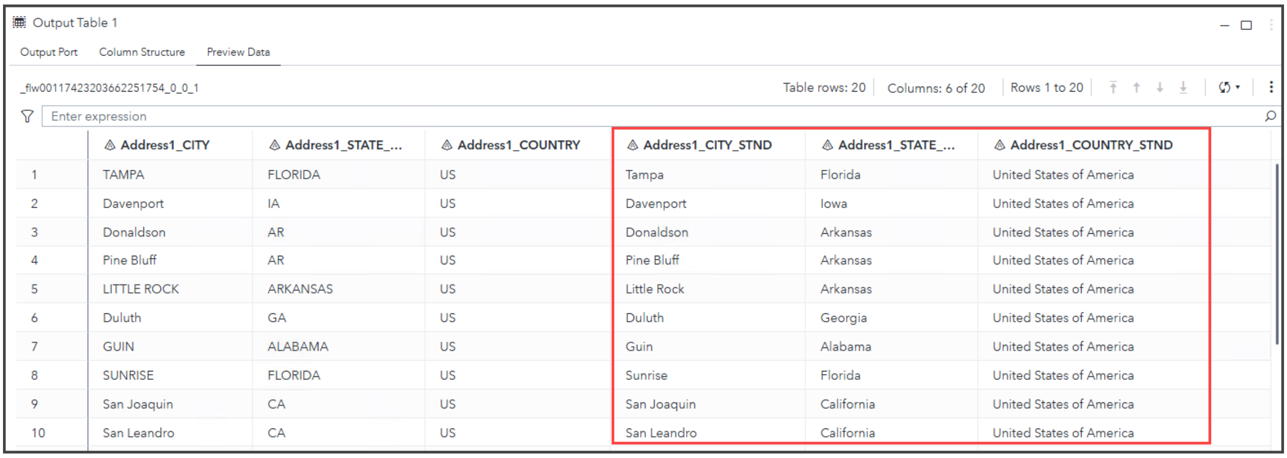
> ✎ If the *Clean Data* step fails with *ERROR: Key not found* and *ERROR: Error in the FILENAME statement*, simply run the step again. This is a known bug which is resolved by executing again.
>
> 
>
>
> ```
> ERROR: Key not found.
> ERROR: Error in the FILENAME statement.
> ```

9. (Optional) use the *Column selection* option to limit the column view in the *Preview Data* window.



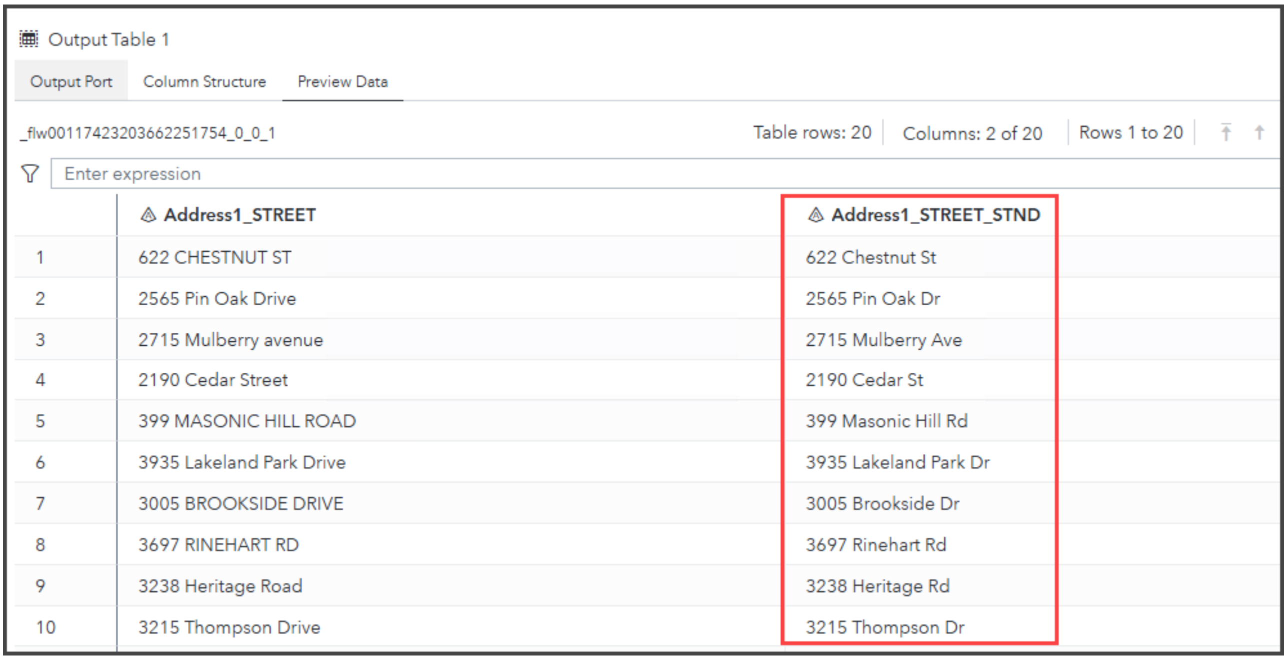
	Name	Name_STND
1	NICHOLE W. ROBINSON	Nichole W Robinson
2	Jenkins, Thomas E.	Thomas E Jenkins
3	Samuel C. Tennyson	Samuel C Tennyson
4	Smith, Wanda R.	Wanda R Smith
5	CURRY, KRISTI R.	Kristi R Curry
6	Carolan, Kris J.	Kris J Carolan
7	CATHERINE M. THOMAS	Catherine M Thomas
8	REGINA C. SNIDER	Regina C Snider
9	Attwood, James	James Attwood
10	Kaye, Echo P.	Echo P Kaye

Standardized names are proper cased and written in **First MI Last** format.



	Address1_CITY	Address1_STATE_...	Address1_COUNTRY	Address1_CITY_STND	Address1_STATE_...	Address1_COUNTRY_STND
1	TAMPA	FLORIDA	US	Tampa	Florida	United States of America
2	Davenport	IA	US	Davenport	Iowa	United States of America
3	Donaldson	AR	US	Donaldson	Arkansas	United States of America
4	Pine Bluff	AR	US	Pine Bluff	Arkansas	United States of America
5	LITTLE ROCK	ARKANSAS	US	Little Rock	Arkansas	United States of America
6	Duluth	GA	US	Duluth	Georgia	United States of America
7	GUIN	ALABAMA	US	Guin	Alabama	United States of America
8	SUNRISE	FLORIDA	US	Sunrise	Florida	United States of America
9	San Joaquin	CA	US	San Joaquin	California	United States of America
10	San Leandro	CA	US	San Leandro	California	United States of America

Standardized city, state, and country names are proper cased and written in full instead of abbreviated.



	Address1_STREET	Address1_STREET_STND
1	622 CHESTNUT ST	622 Chestnut St
2	2565 Pin Oak Drive	2565 Pin Oak Dr
3	2715 Mulberry avenue	2715 Mulberry Ave
4	2190 Cedar Street	2190 Cedar St
5	399 MASONIC HILL ROAD	399 Masonic Hill Rd
6	3935 Lakeland Park Drive	3935 Lakeland Park Dr
7	3005 BROOKSIDE DRIVE	3005 Brookside Dr
8	3697 RINEHART RD	3697 Rinehart Rd
9	3238 Heritage Road	3238 Heritage Rd
10	3215 Thompson Drive	3215 Thompson Dr

Standardized street names are proper cased and road type names (Street, Drive, Avenue, etc) are shortened.

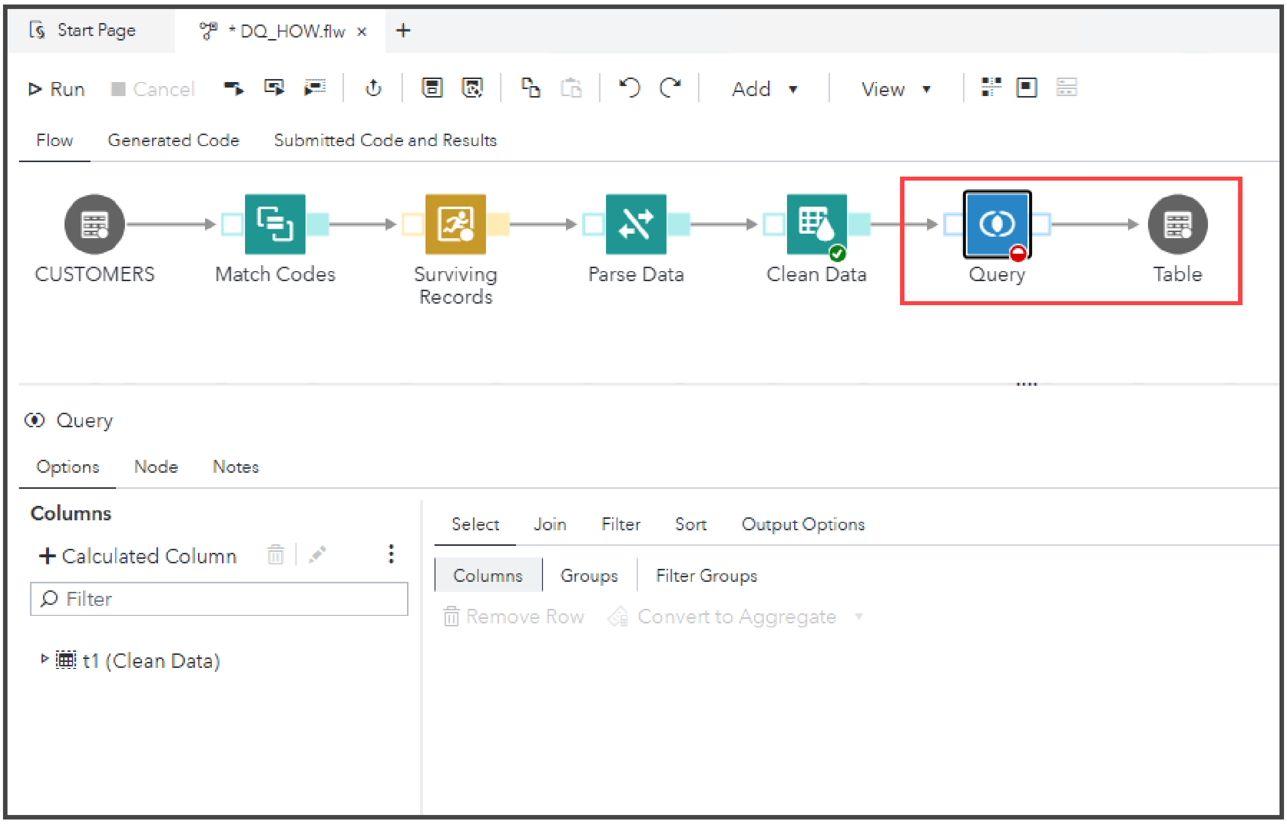
We'll finish by creating an output table to store the final results.

Create Output Table

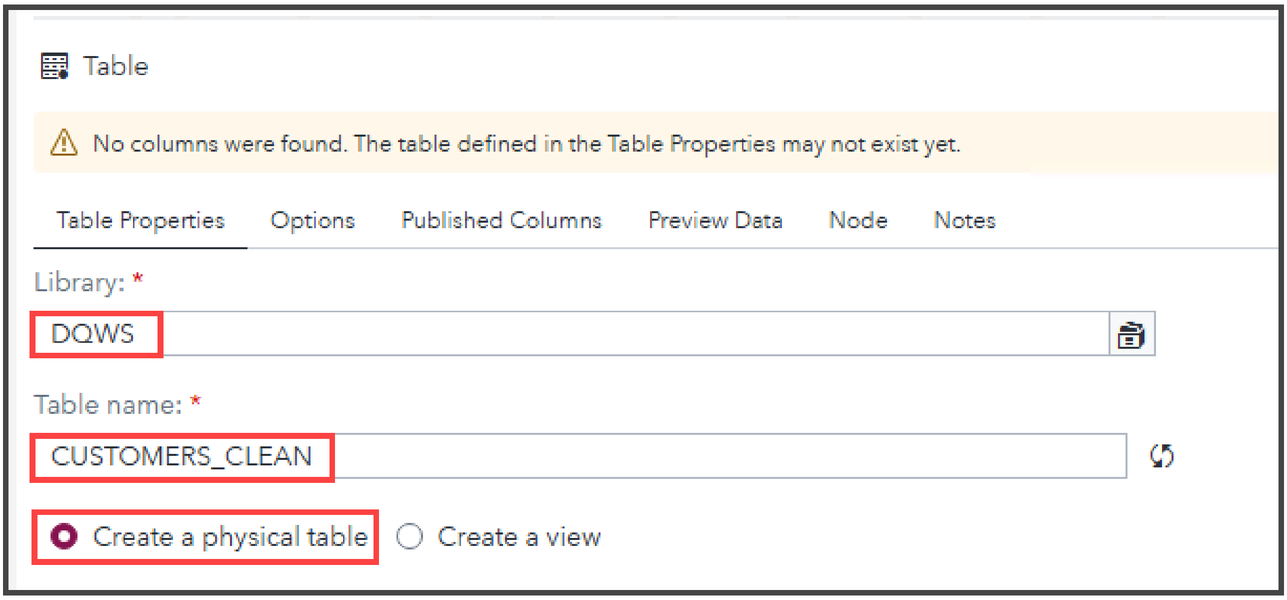
1. Add the **Query** step (from the *Transform Data* section of the *Steps* pane) to the flow canvas and connect it to the *Clean Data* step.

2. Right-click the *Query* step output port and select **Add a table**.

3. **Arrange** the nodes and **save** the flow.



4. Select the **Table** node on the flow canvas. In the **Table Properties** section, type the following table attributes:
   - Library: **DQWS**
   - Table name: **CUSTOMERS_CLEAN**
   - Select **Create a physical table** (default selection)



Table

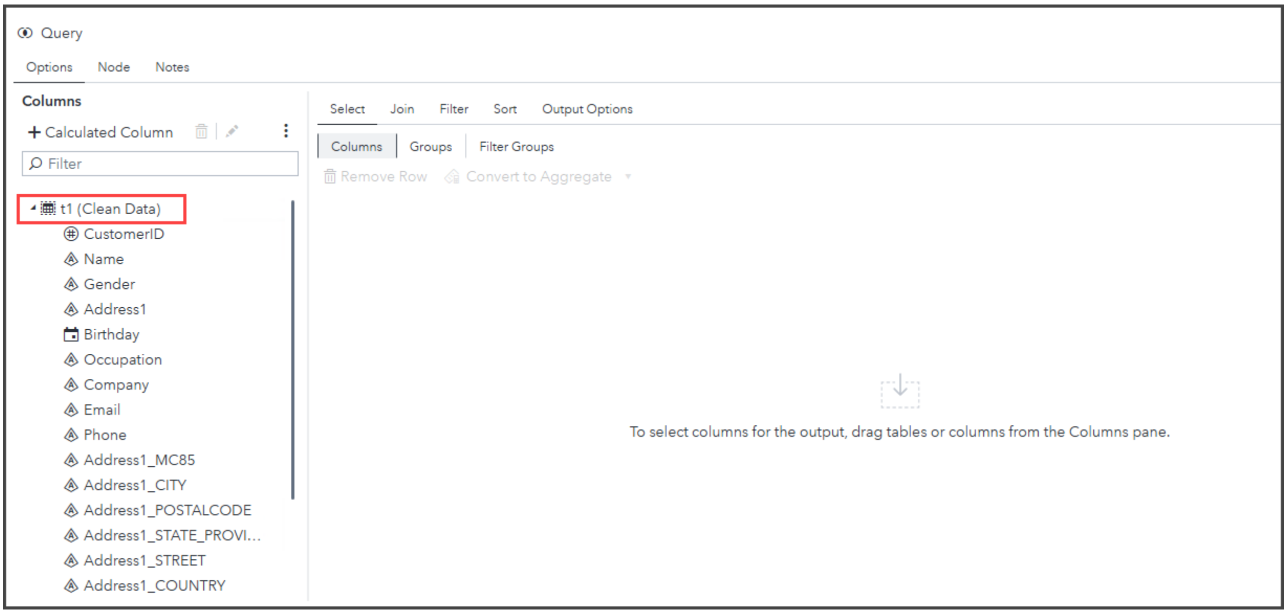
⚠ No columns were found. The table defined in the Table Properties may not exist yet.

Library: *
DQWS

Table name: *
CUSTOMERS_CLEAN

● Create a physical table ○ Create a view

5. Select the **Query** node on the flow canvas. In the *Options* tab, expand **t1 (Clean Data)** to view all source columns.



t1 (Clean Data)
- CustomerID
- Name
- Gender
- Address1
- Birthday
- Occupation
- Company
- Email
- Phone
- Address1_MC85
- Address1_CITY
- Address1_POSTALCODE
- Address1_STATE_PROVI...
- Address1_STREET
- Address1_COUNTRY

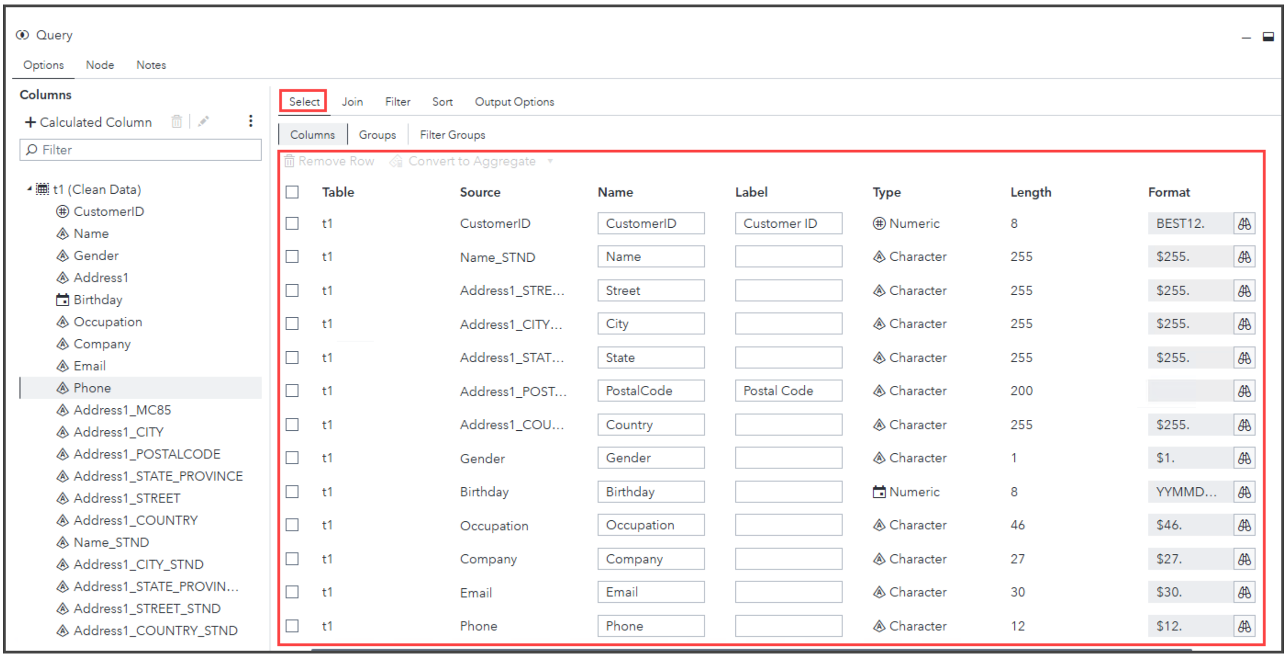
To select columns for the output, drag tables or columns from the Columns pane.

6. Select the following columns and update their attributes on the *Select* tab:

Source	Name	Label
CustomerID	CustomerID	**Customer ID**
Name_STND	**Name**	
Address1_STREET_STND	**Street**	

Source	Name	Label
Address1_CITY_STND	**City**	
Address1_STATE_PROVINCE_STND	**State**	
Address1_POSTALCODE	**PostalCode**	**Postal Code**
Address1_COUNTRY_STND	**Country**	
Gender	Gender	
Birthday	Birthday	
Occupation	Occupation	
Company	Company	
Email	Email	
Phone	Phone	

> ✏️ Updates to column attributes are **bolded**.



□	Table	Source	Name	Label	Type	Length	Format
□	t1	CustomerID	CustomerID	Customer ID	Numeric	8	BEST12.
□	t1	Name_STND	Name		Character	255	$255.
□	t1	Address1_STRE...	Street		Character	255	$255.
□	t1	Address1_CITY...	City		Character	255	$255.
□	t1	Address1_STAT...	State		Character	255	$255.
□	t1	Address1_POST...	PostalCode	Postal Code	Character	200	
□	t1	Address1_COU...	Country		Character	255	$255.
□	t1	Gender	Gender		Character	1	$1.
□	t1	Birthday	Birthday		Numeric	8	YYMMD...
□	t1	Occupation	Occupation		Character	46	$46.
□	t1	Company	Company		Character	27	$27.
□	t1	Email	Email		Character	30	$30.
□	t1	Phone	Phone		Character	12	$12.

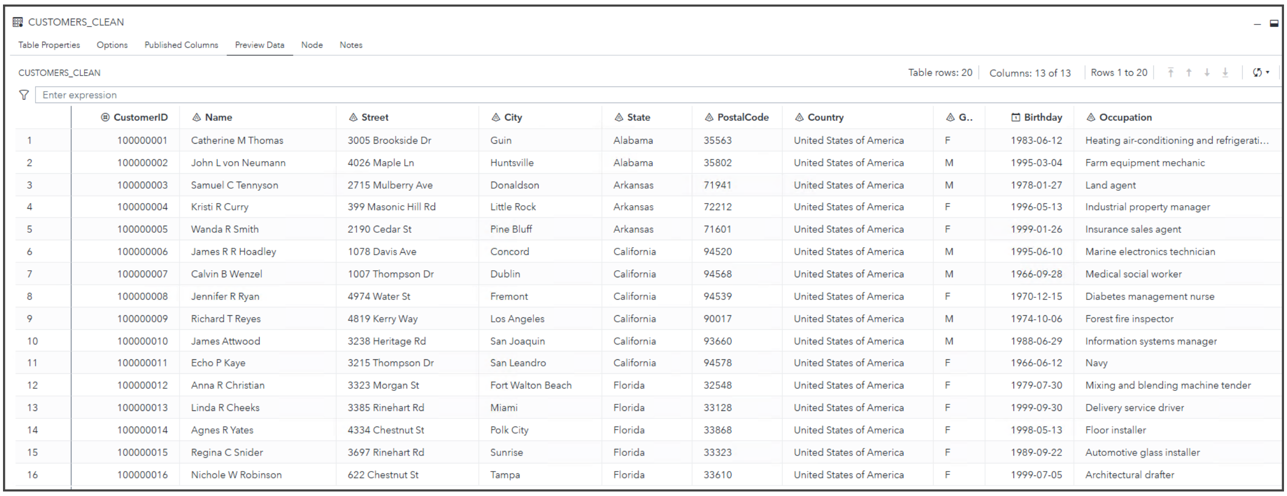
7. Click the *Sort* tab.

8. Double-click *CustomerID* to add it to the *Sort* tab. Keep the default sort order selection (**Ascending**).

9. **Save** the changes to the flow.

10. **Right-click** *Query* and select **Run node**. Select the output table **CUSTOMERS_CLEAN** and **preview** the results.

> ✏️ If needed, click « to hide the Steps pane, or click □ to maximize the preview.



CUSTOMERS_CLEAN

Table rows: 20 | Columns: 13 of 13 | Rows 1 to 20

Enter expression

	CustomerID	Name	Street	City	State	PostalCode	Country	G..	Birthday	Occupation
1	100000001	Catherine M Thomas	3005 Brookside Dr	Guin	Alabama	35563	United States of America	F	1983-06-12	Heating air-conditioning and refrigerati...
2	100000002	John L von Neumann	4026 Maple Ln	Huntsville	Alabama	35802	United States of America	M	1995-03-04	Farm equipment mechanic
3	100000003	Samuel C Tennyson	2715 Mulberry Ave	Donaldson	Arkansas	71941	United States of America	M	1978-01-27	Land agent
4	100000004	Kristi R Curry	399 Masonic Hill Rd	Little Rock	Arkansas	72212	United States of America	F	1996-05-13	Industrial property manager
5	100000005	Wanda R Smith	2190 Cedar St	Pine Bluff	Arkansas	71601	United States of America	F	1999-01-26	Insurance sales agent
6	100000006	James R R Hoadley	1078 Davis Ave	Concord	California	94520	United States of America	M	1995-06-10	Marine electronics technician
7	100000007	Calvin B Wenzel	1007 Thompson Dr	Dublin	California	94568	United States of America	M	1966-09-28	Medical social worker
8	100000008	Jennifer R Ryan	4974 Water St	Fremont	California	94539	United States of America	F	1970-12-15	Diabetes management nurse
9	100000009	Richard T Reyes	4819 Kerry Way	Los Angeles	California	90017	United States of America	M	1974-10-06	Forest fire inspector
10	100000010	James Attwood	3238 Heritage Rd	San Joaquin	California	93660	United States of America	M	1988-06-29	Information systems manager
11	100000011	Echo P Kaye	3215 Thompson Dr	San Leandro	California	94578	United States of America	F	1966-06-12	Navy
12	100000012	Anna R Christian	3323 Morgan St	Fort Walton Beach	Florida	32548	United States of America	F	1979-07-30	Mixing and blending machine tender
13	100000013	Linda R Cheeks	3385 Rinehart Rd	Miami	Florida	33128	United States of America	F	1999-09-30	Delivery service driver
14	100000014	Agnes R Yates	4334 Chestnut St	Polk City	Florida	33868	United States of America	F	1998-05-13	Floor installer
15	100000015	Regina C Snider	3697 Rinehart Rd	Sunrise	Florida	33323	United States of America	F	1989-09-22	Automotive glass installer
16	100000016	Nichole W Robinson	622 Chestnut St	Tampa	Florida	33610	United States of America	F	1999-07-05	Architectural drafter

11. **Close** the *DQ_HOW.flw* file tab after reviewing the results.

Exercise Completed

You have completed the exercise on building a flow with SAS Data Quality!

THANK YOU FOR ATTENDING THIS WORKSHOP!