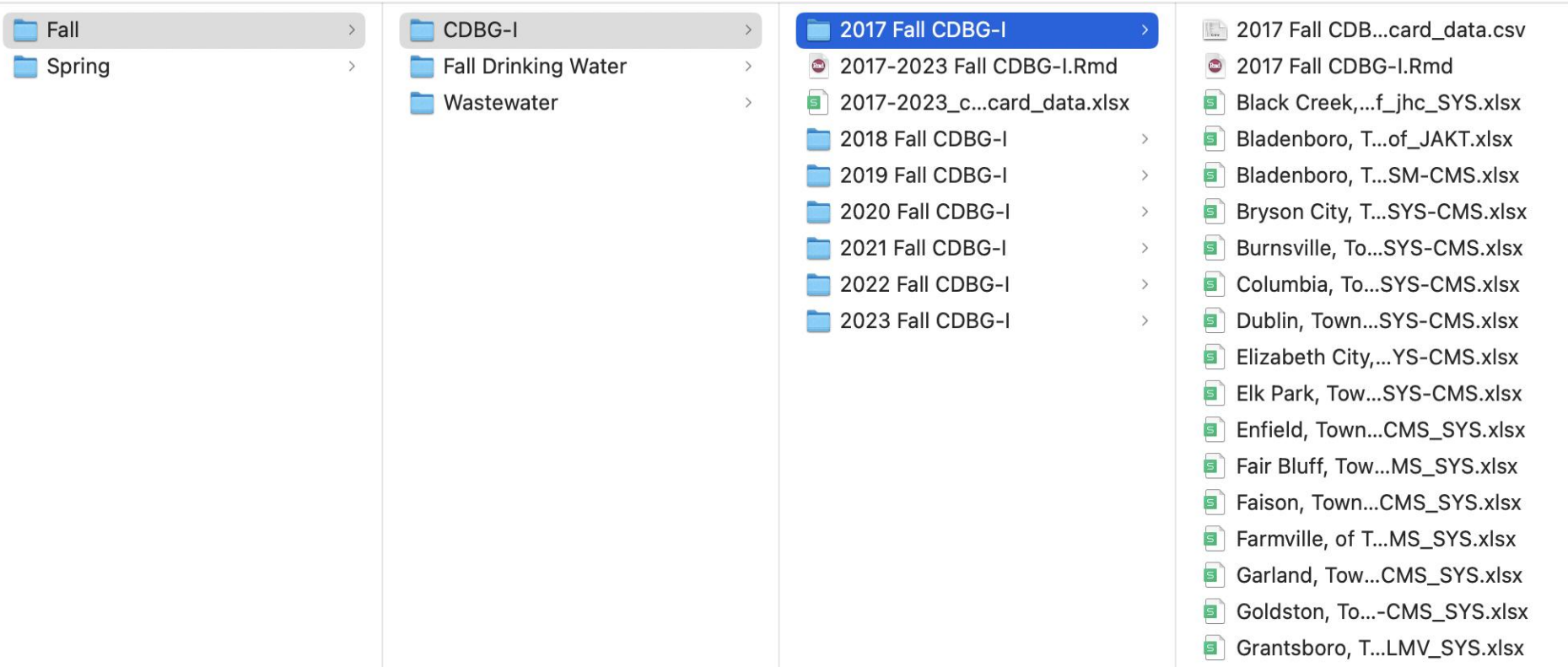
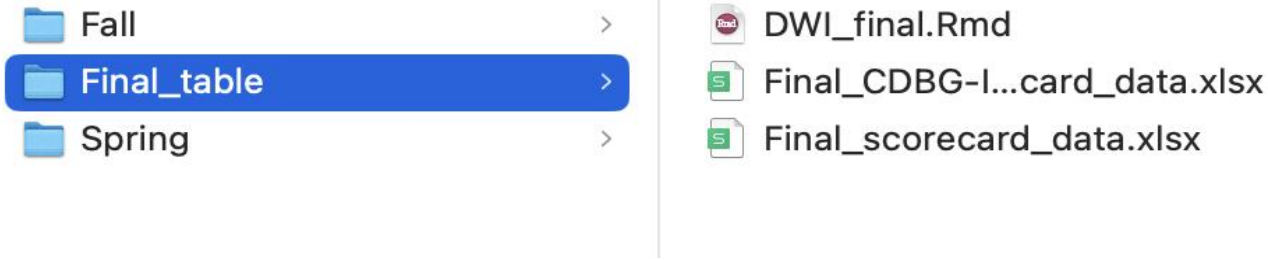
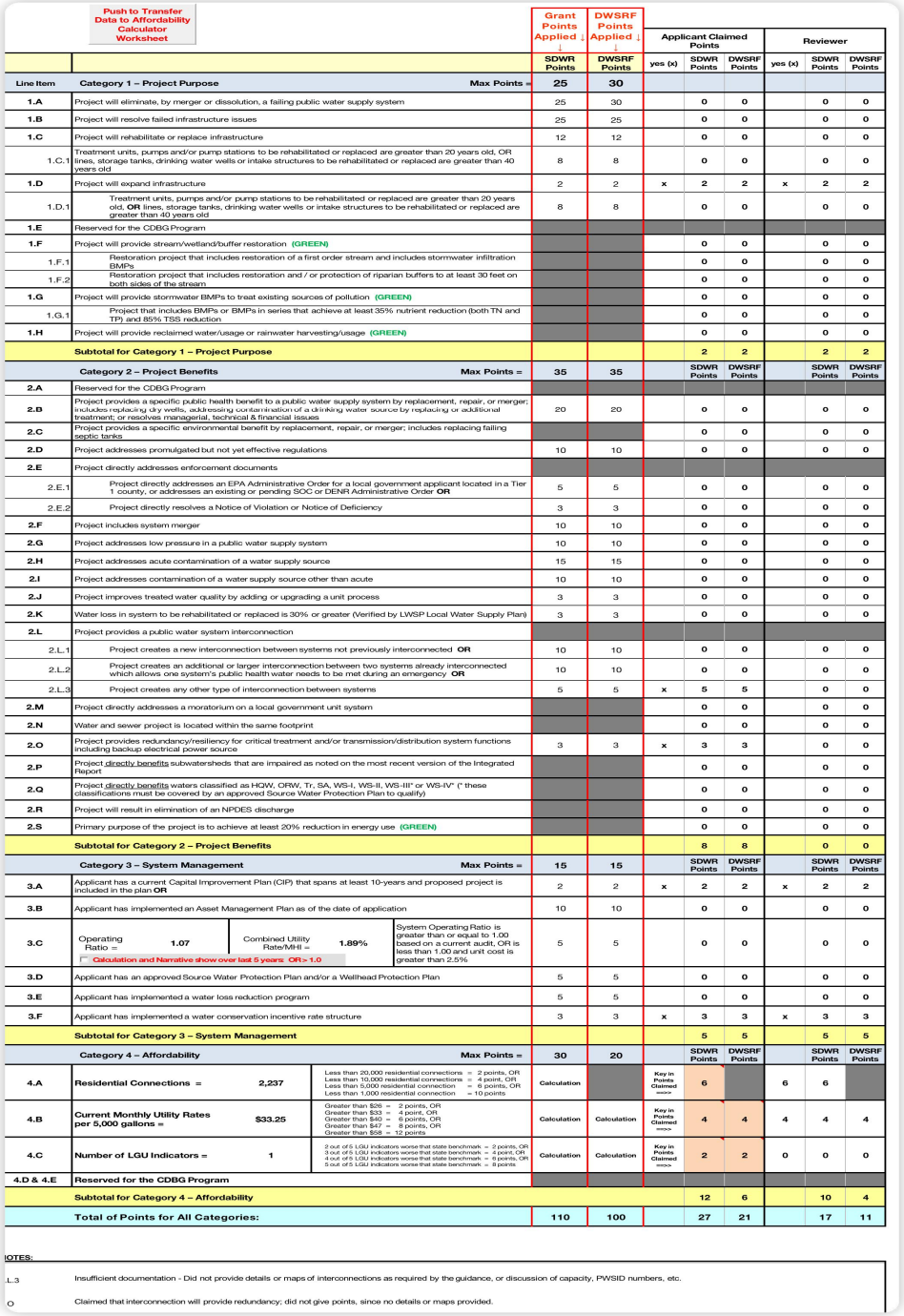




① Raw Data Introduction

The raw data consists of **three main parts:** CDBG-I, Drinking Water projects, and Wastewater projects. The data is categorized by Fall and Spring, with CDBG-I and Drinking Water projects spanning from **2014 to 2023**. A total of around **400 Excel files were cleaned and consolidated into a single standardized table** for further analysis.



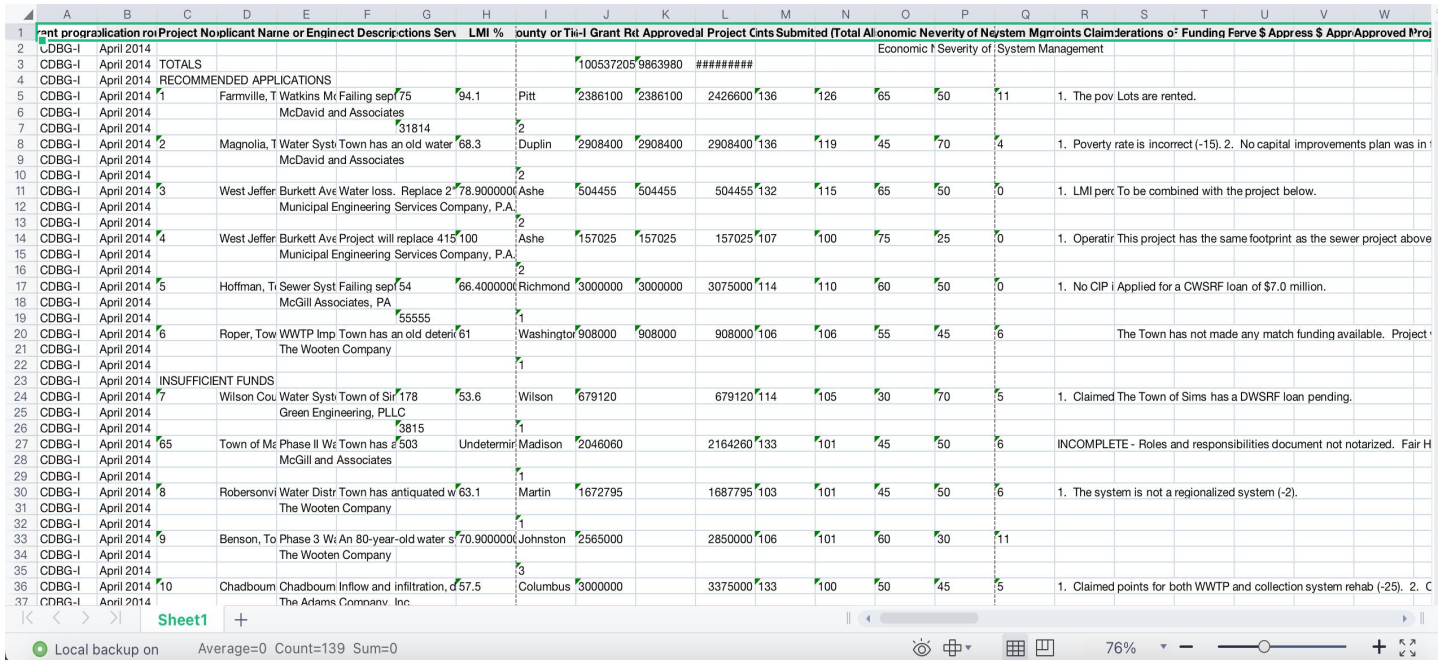
Push to Transfer Data to Affordability Calculator Worksheet

Line Item			Grant Points Applied ↓ SDWR Points	DWSRF Points Applied ↓ DWSRF Points	Applicant Claimed Points yes (x)	SDWR Points	DWSRF Points	Reviewer yes (x)	SDWR Points	DWSRF Points
	Category 1 – Project Purpose	**Max Points =**	**25**	**30**						
1.A	Project will eliminate, by merger or dissolution, a failing public water supply system		25	30		0	0		0	0
1.B	Project will resolve failed infrastructure issues		25	25		0	0		0	0
1.C	Project will rehabilitate or replace infrastructure		12	12		0	0		0	0
1.C.1	Treatment units, pumps and/or pump stations to be rehabilitated or replaced are greater than 20 years old, OR lines, storage tanks, drinking water wells or intake structures to be rehabilitated or replaced are greater than 40 years old		8	8		0	0		0	0
1.D	Project will expand infrastructure		2	2	x	2	2	x	2	2
1.D.1	Treatment units, pumps and/or pump stations to be rehabilitated or replaced are greater than 20 years old, OR lines, storage tanks, drinking water wells or intake structures to be rehabilitated or replaced are greater than 40 years old		8	8		0	0		0	0
1.E	Reserved for the CDBG Program									
1.F	Project will provide stream/wetland/buffer restoration (GREEN)					0	0		0	0
1.F.1	Restoration project that includes restoration of a first order stream and includes stormwater infiltration BMPs					0	0		0	0
1.F.2	Restoration project that includes restoration and / or protection of riparian buffers to at least 30 feet on both sides of the stream					0	0		0	0
1.G	Project will provide stormwater BMPs to treat existing sources of pollution (GREEN)					0	0		0	0
1.G.1	Project that includes BMPs or BMPs in series that achieve at least 35% nutrient reduction (both TN and TP) and 85% TSS reduction					0	0		0	0
1.H	Project will provide reclaimed water/usage or rainwater harvesting/usage (GREEN)					0	0		0	0
	Subtotal for Category 1 – Project Purpose					2	2		2	2
	Category 2 – Project Benefits	**Max Points =**	**35**	**35**		SDWR Points	DWSRF Points		SDWR Points	DWSRF Points
2.A	Reserved for the CDBG Program									
2.B	Project provides a specific public health benefit to a public water supply system by replacement, repair, or merger; includes replacing dry wells, addressing contamination of a drinking water source by replacing or additional treatment; or resolves managerial, technical & financial issues		20	20		0	0		0	0
2.C	Project provides a specific environmental benefit by replacement, repair, or merger; includes replacing failing septic tanks					0	0		0	0
2.D	Project addresses promulgated but not yet effective regulations		10	10		0	0		0	0
2.E	Project directly addresses enforcement documents									
2.E.1	Project directly addresses an EPA Administrative Order for a local government applicant located in a Tier 1 county, or addresses an existing or pending SOC or DENR Administrative Order OR		5	5		0	0		0	0
2.E.2	Project directly resolves a Notice of Violation or Notice of Deficiency		3	3		0	0		0	0
2.F	Project includes system merger		10	10		0	0		0	0
2.G	Project addresses low pressure in a public water supply system		10	10		0	0		0	0
2.H	Project addresses acute contamination of a water supply source		15	15		0	0		0	0
2.I	Project addresses contamination of a water supply source other than acute		10	10		0	0		0	0
2.J	Project improves treated water quality by adding or upgrading a unit process		3	3		0	0		0	0
2.K	Water loss in system to be rehabilitated or replaced is 30% or greater (Verified by LWSP Local Water Supply Plan)		3	3		0	0		0	0
2.L	Project provides a public water system interconnection									
2.L.1	Project creates a new interconnection between systems not previously interconnected OR		10	10		0	0		0	0
2.L.2	Project creates an additional or larger interconnection between two systems already interconnected which allows one system's public health water needs to be met during an emergency OR		10	10		0	0		0	0
2.L.3	Project creates any other type of interconnection between systems		5	5	x	5	5		0	0
2.M	Project directly addresses a moratorium on a local government unit system					0	0		0	0
2.N	Water and sewer project is located within the same footprint					0	0		0	0
2.O	Project provides redundancy/resiliency for critical treatment and/or transmission/distribution system functions including backup electrical power source		3	3	x	3	3		0	0
2.P	Project directly benefits subwatersheds that are impaired as noted on the most recent version of the Integrated Report					0	0		0	0
2.Q	Project directly benefits waters classified as HQW, ORW, Tr, SA, WS-I, WS-II, WS-III* or WS-IV* (* these classifications must be covered by an approved Source Water Protection Plan to qualify)					0	0		0	0
2.R	Project will result in elimination of an NPDES discharge					0	0		0	0
2.S	Primary purpose of the project is to achieve at least 20% reduction in energy use (GREEN)					0	0		0	0
	Subtotal for Category 2 – Project Benefits					8	8		0	0
	Category 3 – System Management	**Max Points =**	**15**	**15**		SDWR Points	DWSRF Points		SDWR Points	DWSRF Points
3.A	Applicant has a current Capital Improvement Plan (CIP) that spans at least 10-years and proposed project is included in the plan OR		2	2	x	2	2	x	2	2
3.B	Applicant has implemented an Asset Management Plan as of the date of application		10	10		0	0		0	0
3.C	Operating Ratio = 1.07; Combined Utility Rate/MHI = 1.89%; Calculation and Narrative show over last 5 years OR > 1.0	System Operating Ratio is greater than or equal to 1.00 based on a current audit, OR is less than 1.00 and unit cost is greater than 2.5%	5	5		0	0		0	0
3.D	Applicant has an approved Source Water Protection Plan and/or a Wellhead Protection Plan		5	5		0	0		0	0
3.E	Applicant has implemented a water loss reduction program		5	5		0	0		0	0
3.F	Applicant has implemented a water conservation incentive rate structure		3	3	x	3	3	x	3	3
	Subtotal for Category 3 – System Management					5	5		5	5
	Category 4 – Affordability	**Max Points =**	**30**	**20**		SDWR Points	DWSRF Points		SDWR Points	DWSRF Points
4.A	**Residential Connections =** 2,237	Less than 20,000 residential connections = 2 points, OR; Less than 10,000 residential connections = 4 point, OR; Less than 5,000 residential connection = 6 points, OR; Less than 1,000 residential connection = 10 points	Calculation		Key in Points Claimed ==>>	6		6	6	
4.B	**Current Monthly Utility Rates per 5,000 gallons =** $33.25	Greater than $26 = 2 points, OR; Greater than $33 = 4 point, OR; Greater than $40 = 6 points, OR; Greater than $47 = 8 points, OR; Greater than $58 = 12 points	Calculation	Calculation	Key in Points Claimed ==>>	4	4	4	4	4
4.C	**Number of LGU Indicators =** 1	2 out of 5 LGU indicators worse that state benchmark = 2 points, OR; 3 out of 5 LGU indicators worse that state benchmark = 4 point, OR; 4 out of 5 LGU indicators worse that state benchmark = 6 points, OR; 5 out of 5 LGU indicators worse that state benchmark = 8 points	Calculation	Calculation	Key in Points Claimed ==>>	2	2	0	0	0
4.D & 4.E	**Reserved for the CDBG Program**									
	Subtotal for Category 4 – Affordability					12	6		10	4
	Total of Points for All Categories:		110	100		27	21		17	11

NOTES:

L.3 Insufficient documentation - Did not provide details or maps of interconnections as required by the guidance, or discussion of capacity, PWSID numbers, etc.

O Claimed that interconnection will provide redundancy; did not give points, since no details or maps provided.



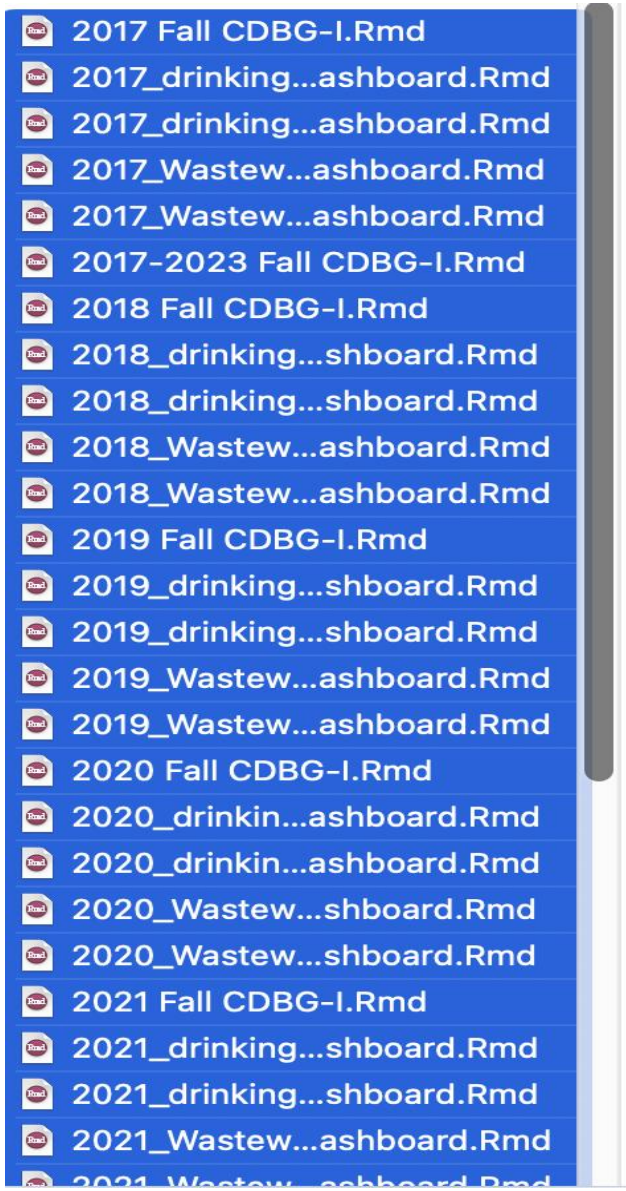
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	rant progra	plication rou	Project No	plicant Name	or Engineer	Descriptions	Serv	LMI %	ounty or Tri	I Grant Re	Approved	Project Cnts	Submited	(Total All	onomic Ne	Severity of Ne	ystem Mgm	oints Claim	derations o	Funding Fer	ve $ Appres	s $ Appr	Approved Proj
2	CDBG-I	April 2014													Economic N	Severity of	System Management						
3	CDBG-I	April 2014	TOTALS							100537205	9863980	#########											
4	CDBG-I	April 2014	RECOMMENDED APPLICATIONS																				
5	CDBG-I	April 2014	1	Farmville, T	Watkins Mi	Failing sep	75	94.1	Pitt	2386100	2386100	2426600	136	126	65	50	11	1. The pov	Lots are rented.				
6	CDBG-I	April 2014			McDavid and Associates																		
7	CDBG-I	April 2014				31814			2														
8	CDBG-I	April 2014	2	Magnolia, T	Water Syst	Town has an old water	68.3		Duplin	2908400	2908400	2908400	136	119	45	70	4	1. Poverty rate is incorrect (-15). 2. No capital improvements plan was in					
9	CDBG-I	April 2014			McDavid and Associates																		
10	CDBG-I	April 2014							2														
11	CDBG-I	April 2014	3	West Jeffer	Burkett Ave	Water loss. Replace 2	78.900000		Ashe	504455	504455	504455	132	115	65	50	0	1. LMI perc	To be combined with the project below.				
12	CDBG-I	April 2014			Municipal Engineering Services Company, P.A.																		
13	CDBG-I	April 2014							2														
14	CDBG-I	April 2014	4	West Jeffer	Burkett Ave	Project will replace 415	100		Ashe	157025	157025	157025	107	100	75	25	0	1. Operatir	This project has the same footprint as the sewer project above				
15	CDBG-I	April 2014			Municipal Engineering Services Company, P.A.																		
16	CDBG-I	April 2014							2														
17	CDBG-I	April 2014	5	Hoffman, T	Sewer Syst	Failing sep	54	66.400000	Richmond	3000000	3000000	3075000	114	110	60	50	0	1. No CIP i	Applied for a CWSRF loan of $7.0 million.				
18	CDBG-I	April 2014			McGill Associates, PA																		
19	CDBG-I	April 2014				55555			1														
20	CDBG-I	April 2014	6	Roper, Tow	WWTP Imp	Town has an old deteri	61		Washingtor	908000	908000	908000	106	106	55	45	6		The Town has not made any match funding available. Project				
21	CDBG-I	April 2014			The Wooten Company																		
22	CDBG-I	April 2014							1														
23	CDBG-I	April 2014	INSUFFICIENT FUNDS																				
24	CDBG-I	April 2014	7	Wilson Cou	Water Syst	Town of Sir	178	53.6	Wilson	679120		679120	114	105	30	70	5	1. Claimed	The Town of Sims has a DWSRF loan pending.				
25	CDBG-I	April 2014			Green Engineering, PLLC																		
26	CDBG-I	April 2014				3815			1														
27	CDBG-I	April 2014	65	Town of Ma	Phase II Wa	Town has a	503	Undetermir	Madison	2046060		2164260	133	101	45	50	6		INCOMPLETE - Roles and responsibilities document not notarized. Fair H				
28	CDBG-I	April 2014			McGill and Associates																		
29	CDBG-I	April 2014							1														
30	CDBG-I	April 2014	8	Robersonvi	Water Distr	Town has antiquated w	63.1		Martin	1672795		1687795	103	101	45	50	6	1. The system is not a regionalized system (-2).					
31	CDBG-I	April 2014			The Wooten Company																		
32	CDBG-I	April 2014							1														
33	CDBG-I	April 2014	9	Benson, To	Phase 3 W	An 80-year-old water s	70.900000		Johnston	2565000		2850000	106	101	60	30	11						
34	CDBG-I	April 2014			The Wooten Company																		
35	CDBG-I	April 2014							3														
36	CDBG-I	April 2014	10	Chadbourn	Chadbourn	Inflow and infiltration, d	57.5		Columbus	3000000		3375000	133	100	50	45	5	1. Claimed points for both WWTP and collection system rehab (-25). 2. C					
37	CDBG-I	April 2014			The Adams Company, Inc.																		

Sheet1 +

Local backup on Average=0 Count=139 Sum=0 76%

② Data Cleaning and Consolidation

The raw data included individual **scorecards** from various water agencies **across North Carolina**, categorized by project evaluations and scoring criteria. **Using R code**, these files were cleaned and consolidated into a single standardized table, **resulting in a final dataset with 139 columns and 4,463 rows**, streamlining the data for efficient analysis and comparison.



③ R code

Throughout the project, I used RMarkdown and key **packages like tidyverse, readxl, and stringr** for data cleaning and restructuring. I wrote **custom functions** to automate tasks like formatting, handling missing values, and merging data. The process consolidated data from **over 400 files into a single standardized table**. While the full process involved **40 RMarkdown files**, only 3 are shared on github here due to company privacy.