

Loyola Marymount University Datathon
March 9, 2024

Analyzing EPA Contract Awards

For small, women-owned businesses, and
minority owned businesses

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Meet the Team



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Information Systems and
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Major, and Computer
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INTRODUCTION & AGENDA

01

Introduction +
Stakeholders

02

Methodology

03

Insights &
Visualization

04

Recommendations

- **Objective:** Analyzing EPA contract awards to identify patterns and opportunities for small, woman-owned, and minority-owned businesses.
- **Importance:** Ensuring equitable access to contract opportunities, fostering diversity, and supporting economic growth.



Stakeholders

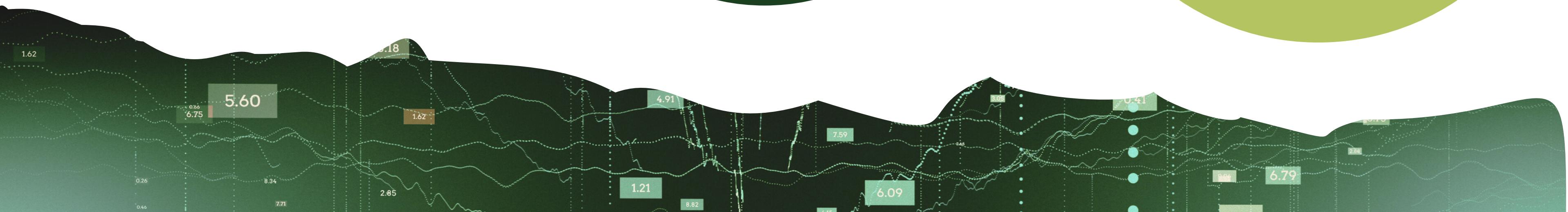
- Small Businesses
- Woman–Owned Businesses
- Minority–Owned Businesses
- EPA Representatives:
- Policy Makers
- Support Organizations:

Methodology

Started With:
Data Cleaning

Then did:
Data Analysis

To Get:
**Key Findings,
Conclusions, and
Suggestion**





01/ Data Cleaning

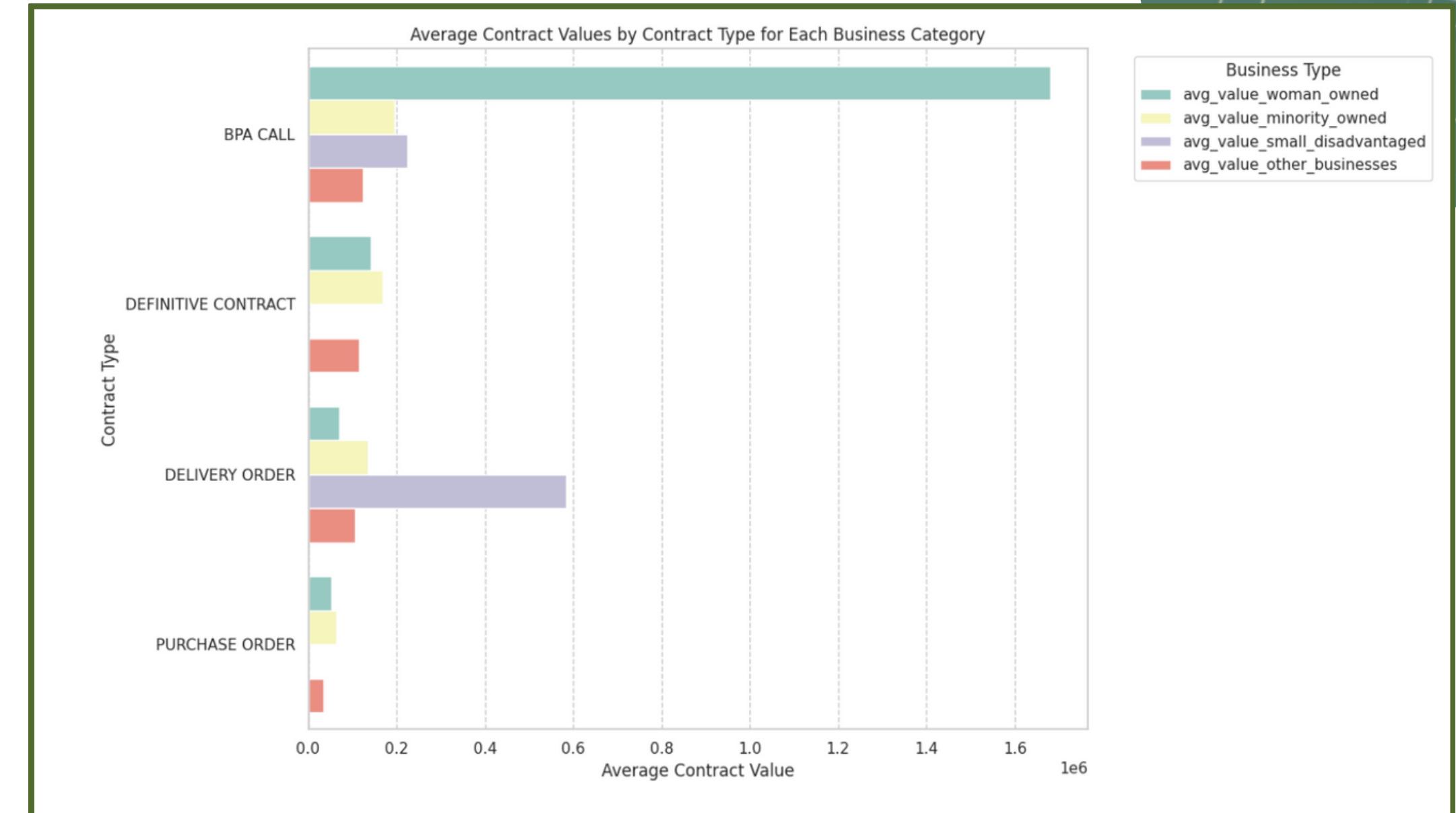
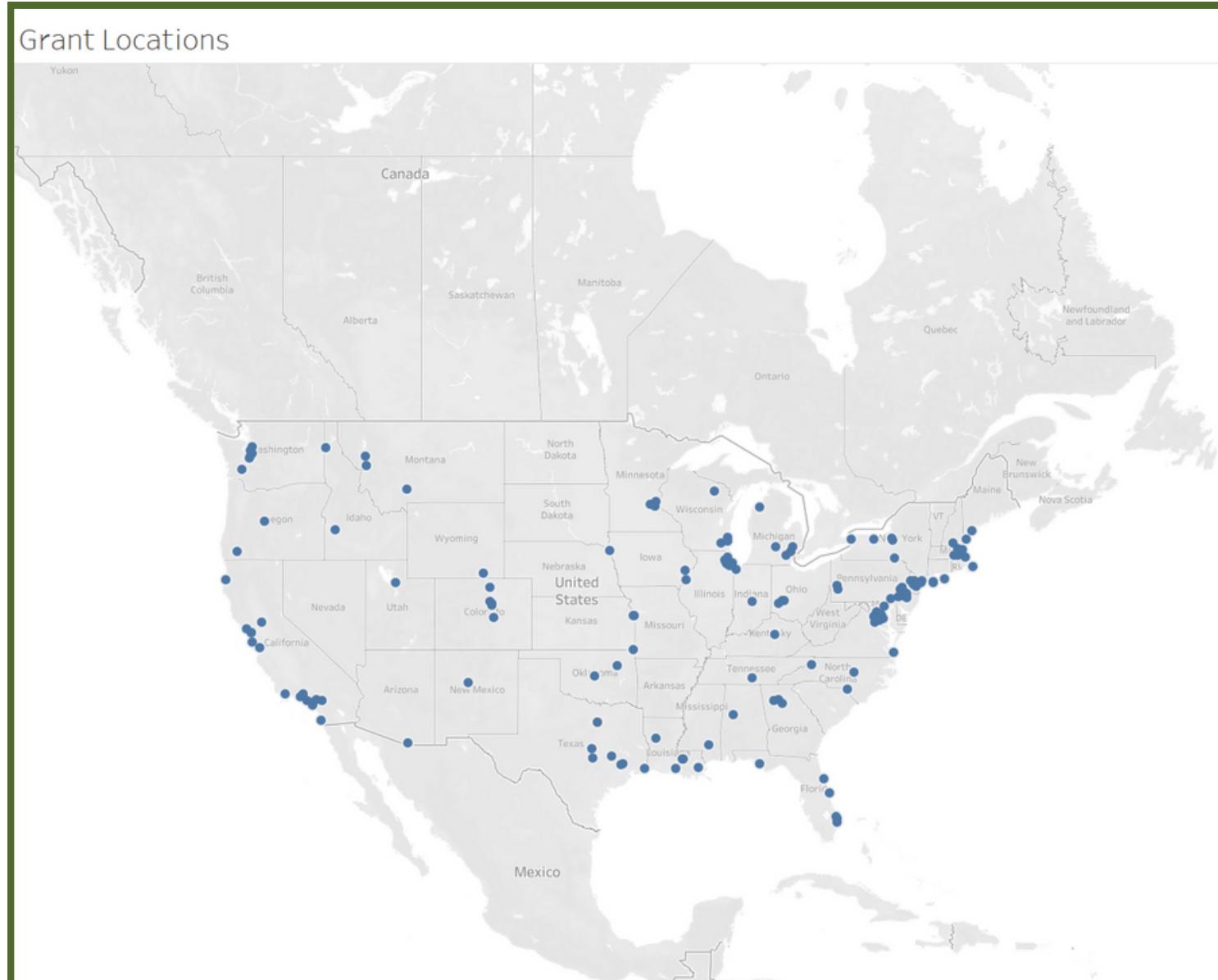
- Dataset used:
 - Obtained from USA Spending.gov's Award Data Archive.
- Ensured dataset met analysis requirements :
 - Hand crafted data on Excel from a subset of original dataset
(Multiple subsets were used to better manage the data)
 - Condensed over 200 columns to 154 more relevant categories
 - (On Excel)
 - Handled missing values, duplicates, and standard data formats.
 - (On Python)
- Created a filter on data to segment data into three relevant stakeholder groups: Small businesses, Minority Owned, and Women owned.

02/ Data Analysis

- Conducted Exploratory Data Analysis (EDA) to understand dataset structure, distributions, and variable relationships.
- Employed statistical analysis to identify patterns, trends, and anomalies.
- Utilized data visualization techniques (charts, graphs) for clearer interpretation.

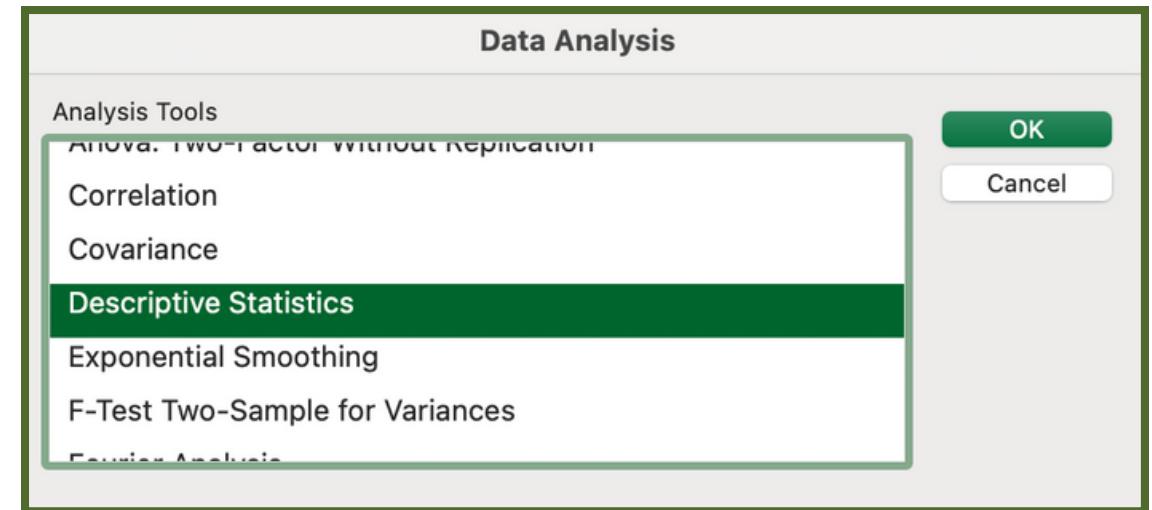
Analytics Techniques and Tools

- Statistical Analysis: Excel
- Exploratory Data Analysis (EDA); Google collab; using built in python libraries like Pandas, Seaborn, SQL
- Data Visualization: Tableau, Seaborn, Pandas



Excel: Descriptive Statistics

By Singular Award



potential_total (small businesses)	
Mean	\$ 10,387,866.42
Standard Error	1557160.917
Median	598035.96
Mode	100000
Standard Deviation	64786128.61
Sample Variance	4.19724E+15
Kurtosis	302.4500897
Skewness	15.51036197
Range	1570000000
Minimum	0
Maximum	\$ 1,570,000,000.00
Sum	17981396769
Count	1731
	1

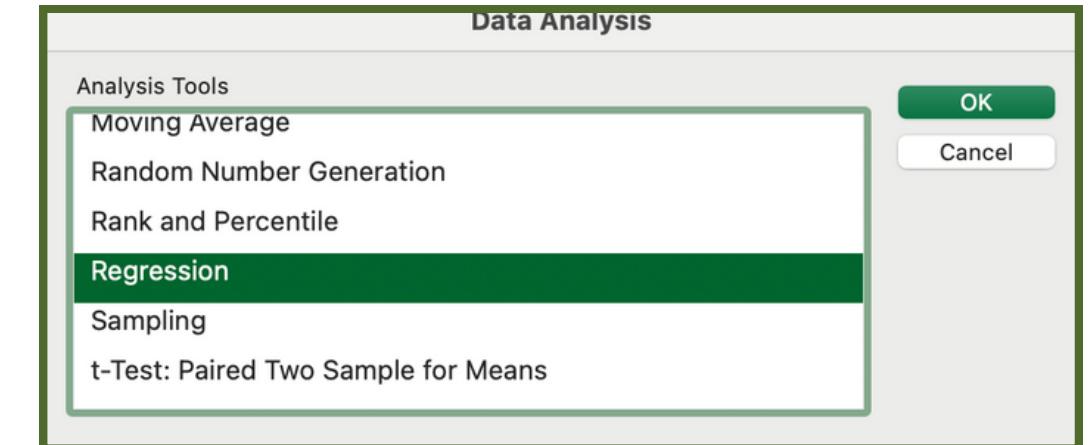
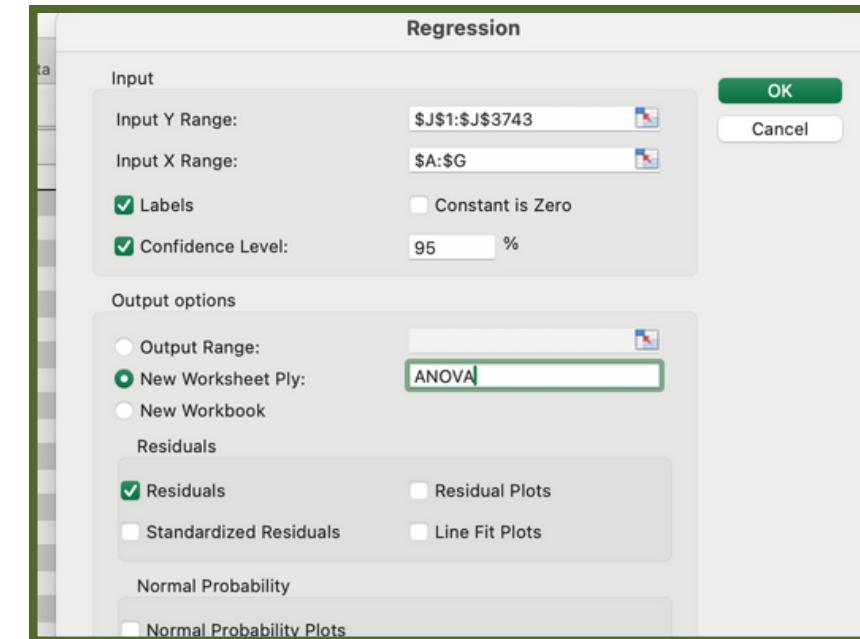
potential_total (minority owned)	
Mean	\$ 7,814,758.53
Standard Error	1718084.945
Median	1332331.995
Mode	370000
Standard Deviation	42084314.5
Sample Variance	1.77109E+15
Kurtosis	342.0964058
Skewness	16.92087579
Range	899997787
Minimum	\$ 2,213.00
Maximum	\$ 900,000,000.00
Sum	4688855117
Count	600
	1

potential_total (woman owned)	
Mean	\$ 3,949,023.39
Standard Error	691469.2347
Median	508939.6
Mode	456970.1
Standard Deviation	11936609.71
Sample Variance	1.42483E+14
Kurtosis	57.1078311
Skewness	6.817450445
Range	117927574.5
Minimum	\$ 3,832.97
Maximum	\$ 117,931,407.48
Sum	1176808969
Count	298
	1

potential_total (others)	
Mean	\$ 11,267,720.27
Standard Error	1961365.145
Median	697344.94
Mode	0
Standard Deviation	87363351.65
Sample Variance	7.63236E+15
Kurtosis	261.6918596
Skewness	15.46288562
Range	1570000000
Minimum	0
Maximum	\$ 1,570,000,000.00
Sum	22355157020
Count	1984
	1

Diagnostic Statistics

- Use of ANOVA to find which variables are significant
- Found that federal_action_obligation, total_dollars_obligated, and base_and_all_options values are significant against the dependent variable potential_total_value_of_award
- Decided to go a different direction on analysis techniques

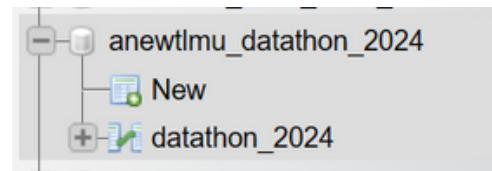


=IF([@[women_owned_small_business]]="f",0,1)

G	H	I	J	K	L
women_owned_small_busir	women_owned_dummy	minority_owned_business	minorit_owned_dummy	officers_determination_of	Small_business dummy
f	0	f	0	OTHER THAN SMALL BUSINESS	0
f	0	f	0	OTHER THAN SMALL BUSINESS	0
f	0	t	1	SMALL BUSINESS	1
f	0	f	0	OTHER THAN SMALL BUSINESS	0
f	0	f	0	OTHER THAN SMALL BUSINESS	0
f	0	f	0	OTHER THAN SMALL BUSINESS	0
f	0	f	0	SMALL BUSINESS	1

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.12899249							
R Square	0.01663906							
Adjusted R Square	0.01505937							
Standard Error	76794655.8							
Observations	3742							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	6	3.72708E+17	6.2118E+16	10.533077	1.26865E-11			
Residual	3735	2.20269E+19	5.8974E+15					
Total	3741	2.23996E+19						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	7812322.63	1778873.815	4.39172389	1.1557E-05	4324663.811	11299981.4	4324663.81	11299981.44
federal_action_obligation	-3.8022682	1.931020494	-1.969046	0.04902162	-7.588225699	-0.0163107	-7.5882257	-0.016310715
total_dollars_obligated	1.7660422	0.240321118	7.34867671	2.4461E-13	1.294868777	2.23721562	1.29486878	2.237215624
base_and_all_options_value	1.14210268	0.428264479	2.66681627	0.00769037	0.302447628	1.98175773	0.30244763	1.981757731
women_owned_dummy	-5970332.8	5080630.65	-1.1751165	0.24002303	-15931413.83	3990748.3	-15931414	3990748.302
minority_owned_dummy	-3882685.4	3865249.717	-1.0045109	0.3151975	-11460891.41	3695520.62	-11460891	3695520.623
Small_business dummy	2335091.76	2870088.307	0.81359579	0.41592841	-3292001.462	7962184.98	-3292001.5	7962184.979

Analytics Techniques: SQL



QUERIES:

```
SELECT recipient_name, SUM(potential_total_value_of_award) AS total_awarded
FROM datathon_2024
WHERE woman_owned_business = "t"
GROUP BY recipient_name
ORDER BY total_awarded DESC;
```

recipient_name	total_awarded
ENDYNA, INC.	236751559.10
PEGASUS TECHNICAL SERVICES, INC	76379557.80
VERACITY CONSULTING, INC.	75048714.98
VMD SYSTEMS INTEGRATORS, INC	68015283.21
MPF FEDERAL, LLC	52585568.42
FEDTEC LLC	46301778.40

```
SELECT recipient_name, SUM(potential_total_value_of_award) AS total_awarded
FROM datathon_2024
WHERE minority_owned_business = "t"
GROUP BY recipient_name
ORDER BY total_awarded DESC;
```

recipient_name	total_awarded
HYDROGEOLOGIC, INC.	1130079463.95
ENVIRONMENTAL QUALITY MANAGEMENT, INC	336619371.02
AGILE DECISION SCIENCES, LLC	315446163.32
ARROWHEAD CONTRACTING INC	270441528.44
RED ROCK REMEDIATION JV	237778787.08
DAYCOM LLC	223264366.14

```
SELECT recipient_name, SUM(potential_total_value_of_award) AS total_awarded
FROM datathon_2024
WHERE contracting_officers_determination_of_business_size = "SMALL BUSINESS"
GROUP BY recipient_name
ORDER BY total_awarded DESC;
```

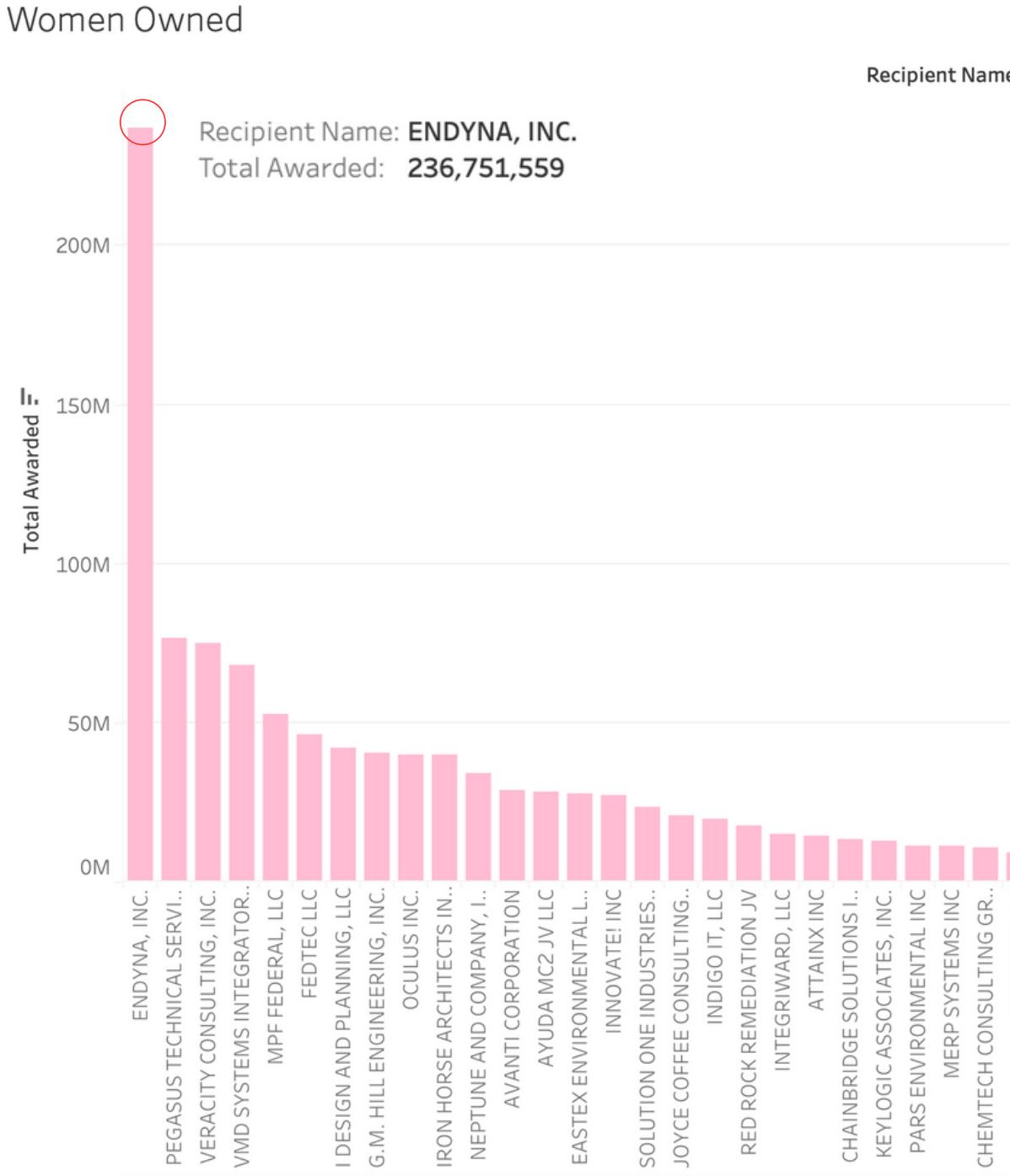
recipient_name	total_awarded
ENVIRONMENTAL RESTORATION LLC	4432300482.76
EA ENGINEERING, SCIENCE, AND TECHNOLOG...	2145807357.15
BAY WEST LLC	1230000000.00
HYDROGEOLOGIC, INC.	1130079463.95
KEMRON/ARROWHEAD JV, LLC	696696604.51
HGL-PORTAGE JV LLC	670000000.00

CONVERT
TO .CSV
FILES

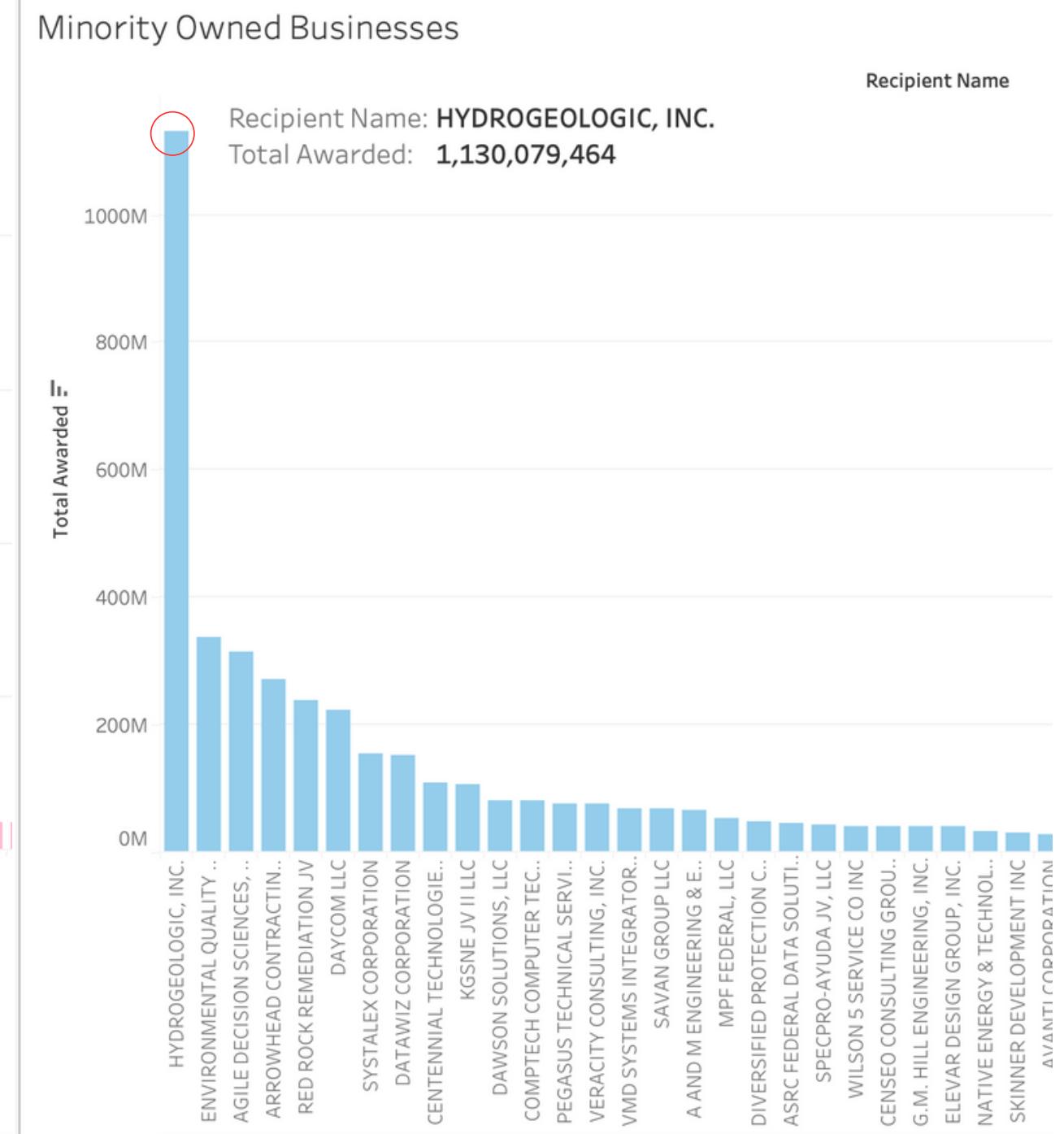
Visualization: Tableau

Potential total value of awards granted to highest to lowest (cumulative awards)

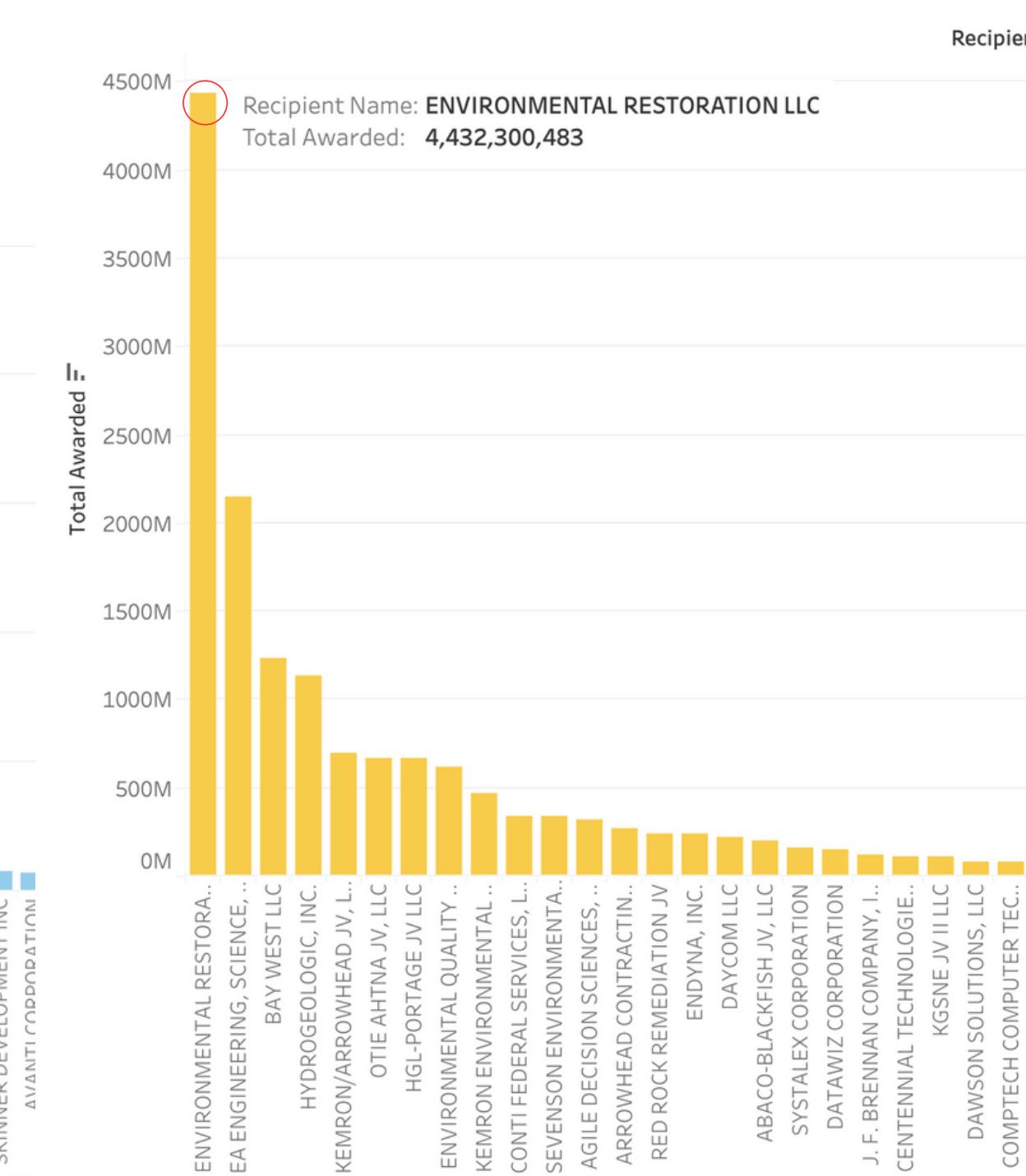
Women Owned



Minority Owned Businesses

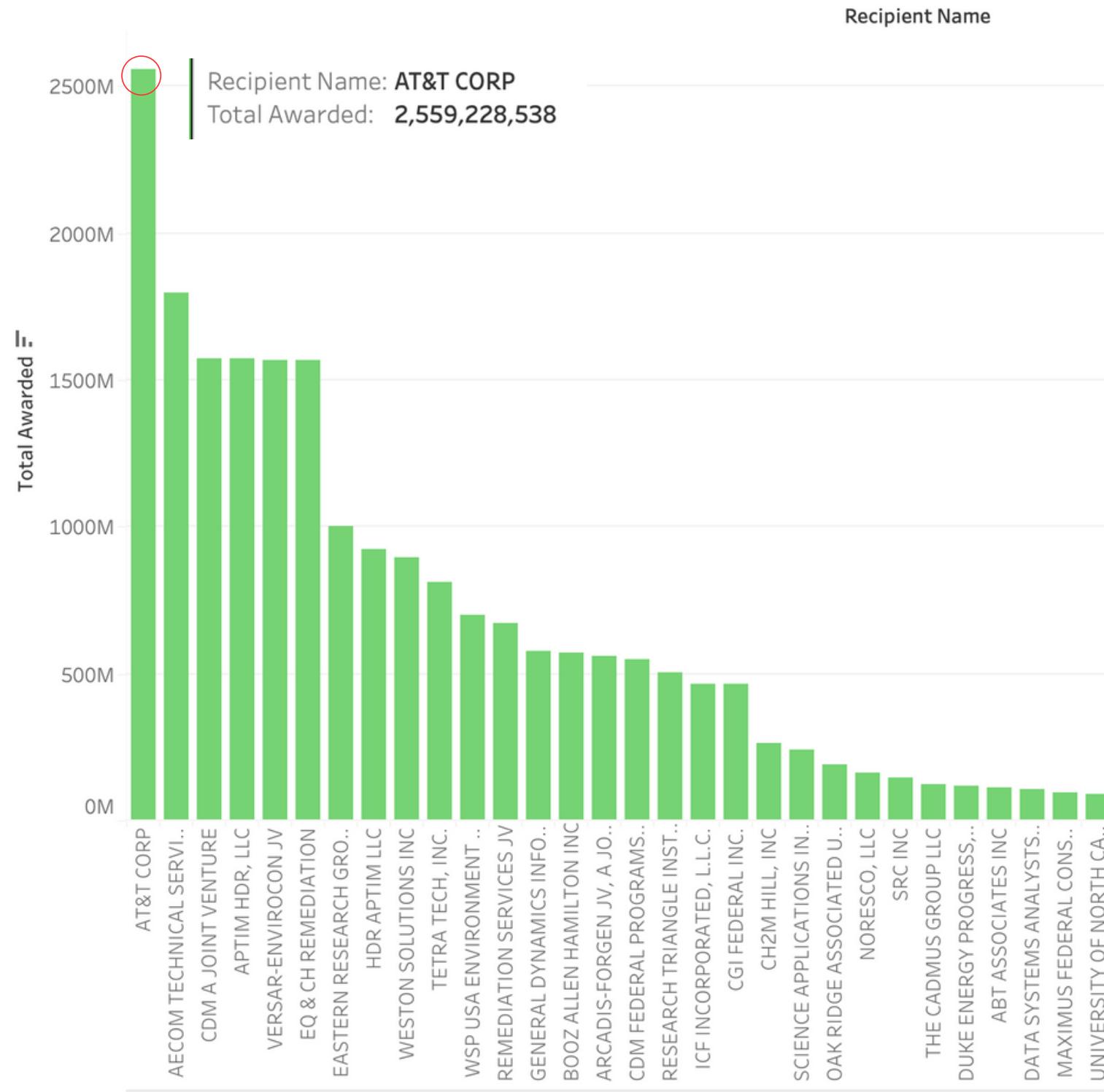


Small Businesses



Visualization Cont.

Others



Methodology:

```

SELECT recipient_name, SUM(potential_total_value_of_award) AS total_awarded
FROM datathon_2024
WHERE contracting_officers_determination_of_business_size != 'SMALL BUSINESS'
    AND woman_owned_business = 'f'
    AND minority_owned_business = 'f'
GROUP BY recipient_name
ORDER BY total_awarded DESC;

```

	recipient_name	total_awarded
▶	AT&T CORP	2559228537.60
	AECOM TECHNICAL SERVICES, INC.	1794783550.82
	CDM A JOINT VENTURE	1574907970.28
	APTIM HDR, LLC	1570782611.00
	EQ & CH REMEDIATION	1570000000.00
	VERSAR-ENVIROCON JV	1570000000.00

Additional SQL Insight:

Number of Small Businesses vs. Others:

```
SELECT contracting_officers_determination_of_business_size AS business_type,  
COUNT(contracting_officers_determination_of_business_size) AS total_contracts  
FROM datathon_2024  
GROUP BY contracting_officers_determination_of_business_size;
```

business_type	total_contracts
OTHER THAN SMALL BUSINESS	2011
SMALL BUSINESS	1731

Cumulative Current Contracts by Recipient

```
SELECT DISTINCT (recipient_name), COUNT(recipient_name) AS num_of_awards  
FROM datathon_2024  
WHERE parent_award_single_or_multiple = "MULTIPLE AWARD"  
GROUP BY recipient_name  
ORDER BY num_of_awards DESC;
```

recipient_name	num_of_awards
EASTERN RESEARCH GROUP INC	69
EA ENGINEERING, SCIENCE, AND TECHNOLOG...	68
TETRA TECH, INC.	64
ICF INCORPORATED, L.L.C.	55
AGILE DECISION SCIENCES, LLC	52
ENVIRONMENTAL RESTORATION LLC	51

Outliers & Points of Reference (Money Wise)

Top outliers:

- ENDYNA (Women owned)
 - \$236 million
 - Supporting U.S. Government's cybersecurity, defense, occupational safety, clean environment, and public health missions through science and technology.
- Environmental Restoration LLC (Small Businesses)
 - \$4.4 Trillion
 - ER is a nationally recognized leader in Environmental Emergency Response, Remediation, and Construction since 1997.

Possible reasons they were outliers:

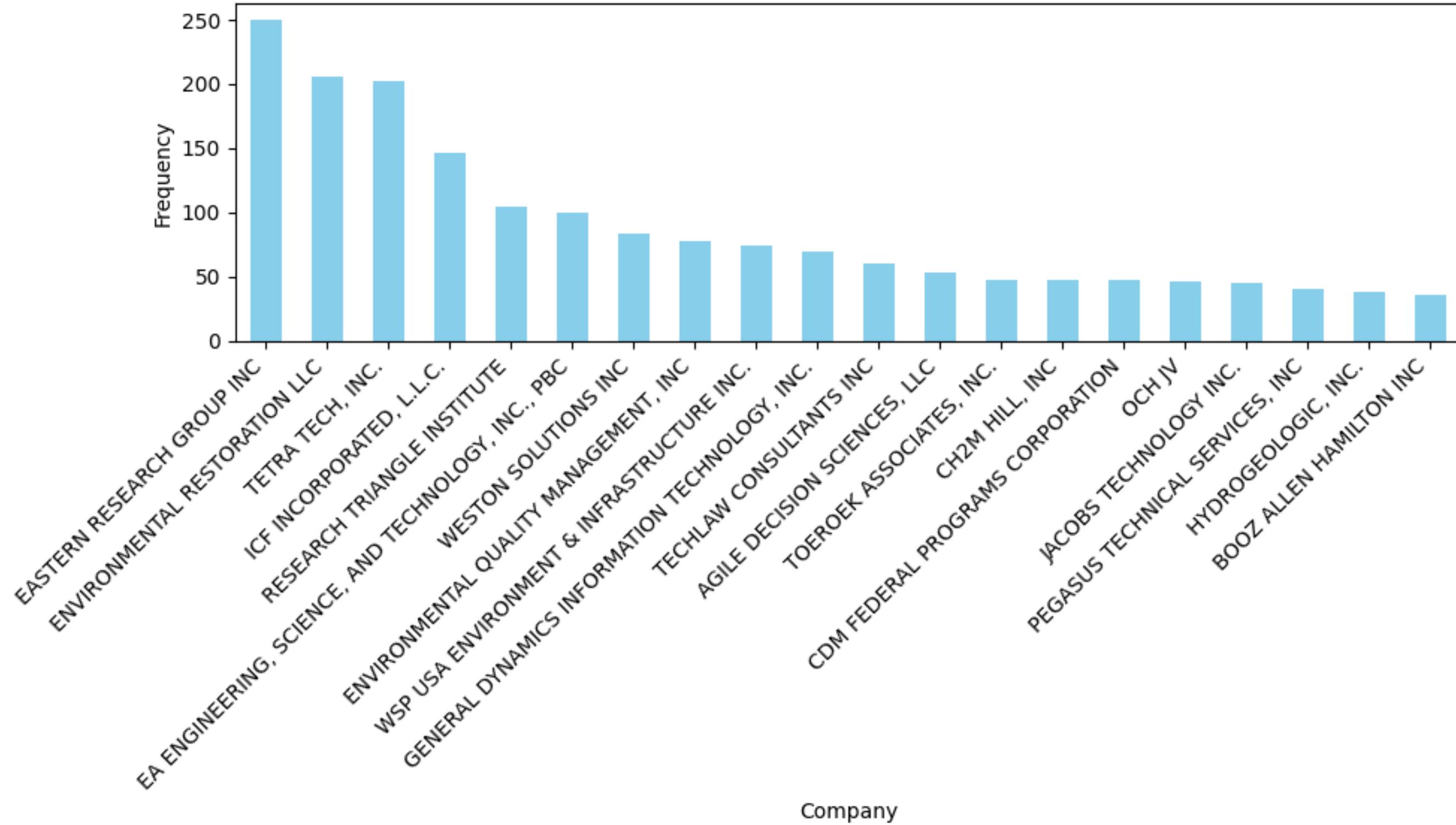
- ENDYNA:
 - Located in Virginia (a major city)
- Environmental Restoration LLC
 - Running since 1997

Our conclusions:

- Concentrating efforts on major cities and nurturing longer business tenures can significantly enhance chances of securing more contracts.

Contract Amount

Top 20 Companies



Outliers & Points of Reference (Contract Amount Wise)

- Found Eastern Research Group Inc as an outlier
 - What makes them stand out?

ERG is a consulting firm that provides a wide range of environmental, health, and safety consulting services to government agencies, private-sector clients, and non-profit organizations.

ERG is a longstanding Partner in the U.S. EPA's Green Power Partnership, a voluntary leadership program of organizations committed to using green power.

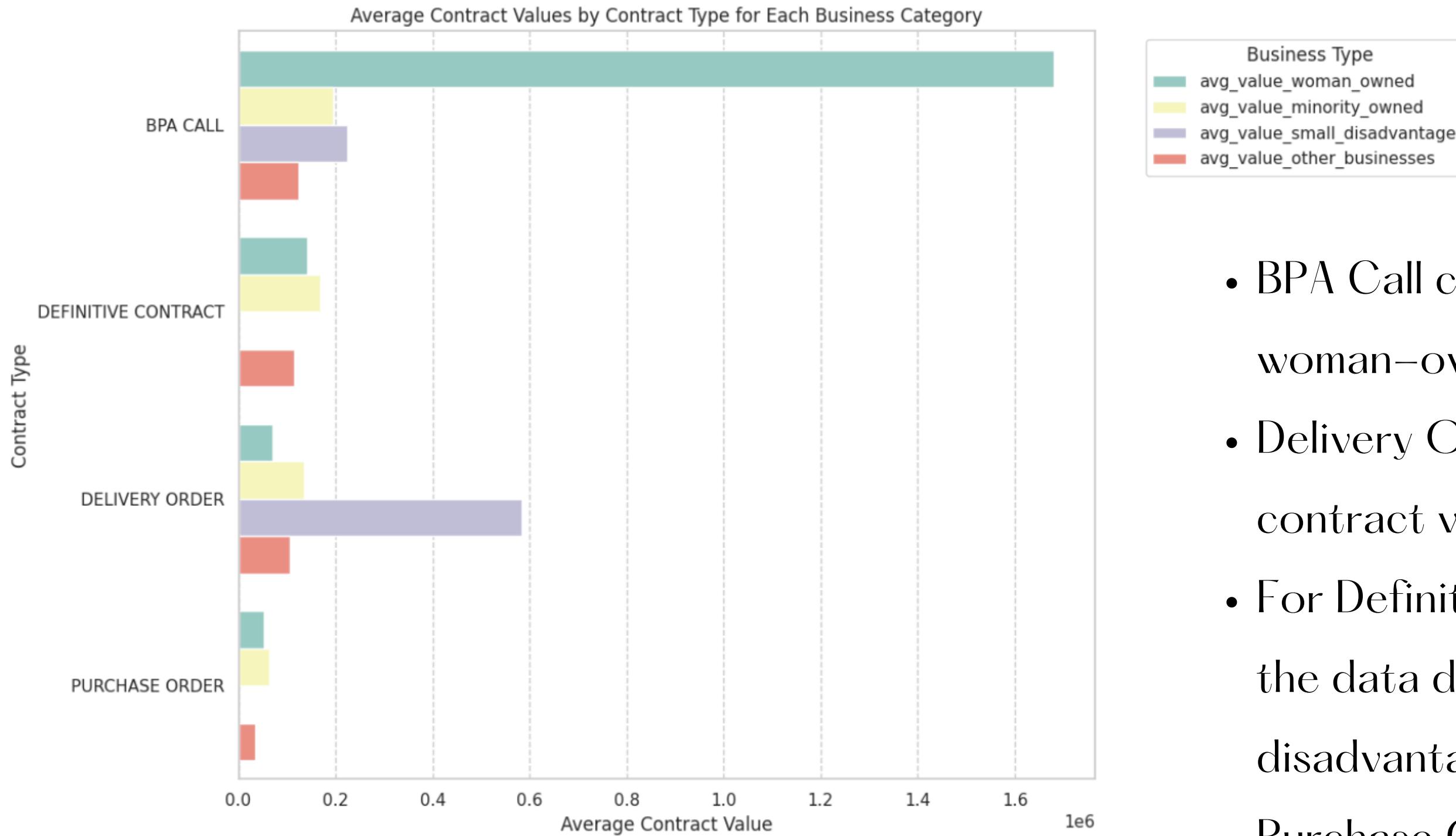
ERG is a member of The Climate Registry and has achieved Climate Registered™ Gold level for its increasing ambition in the areas of GHG reporting and reductions.

- ERG holds a 5-year Master Services Agreement with the University of Virginia to provide a broad range of strategic support services

What we Noticed:

- ERG has a diverse, clientele that it has fostered since 1984, including government agencies, private-sector clients, and non-profit organizations.
- The company has a team of professionals with backgrounds in environmental science, engineering, and other related fields.
- The ERG has a Small Business and Supplier Diversity Program:
 - ERG's dedicated Small Business Liaison Officer advocates for small businesses by conducting outreach, promoting company program initiatives, networking with small businesses, and fulfilling compliance requirements

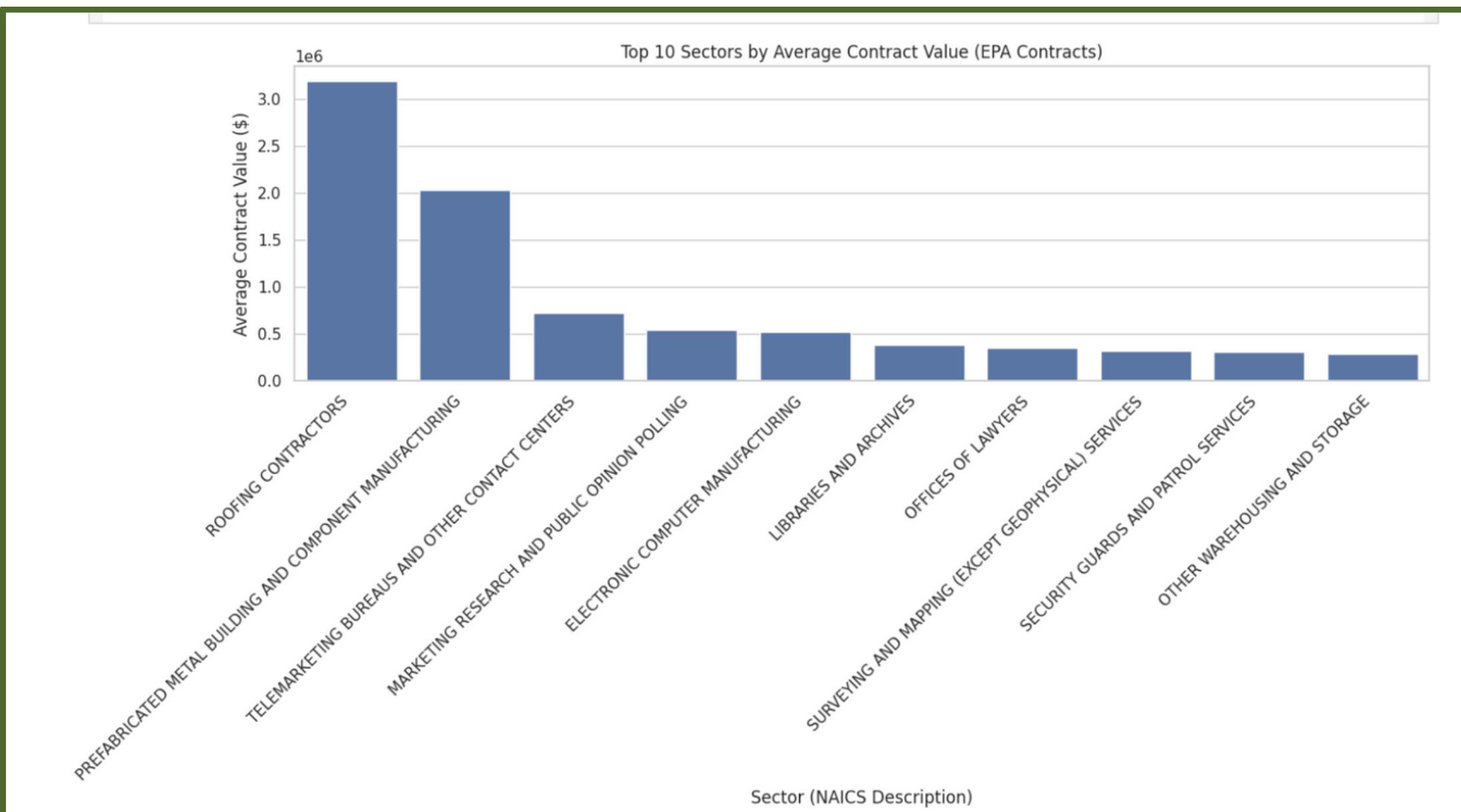
EDA Key Findings: Average Contract Values by Contract Type



- BPA Call contracts are notably valuable for woman-owned businesses
- Delivery Orders show the highest average contract value for small disadvantaged businesses
- For Definitive Contracts and Purchase Orders, the data does not show values for small disadvantaged businesses
- Purchase Orders generally have lower average values across all business types

Note: Our dataset doesn't delineate the overlap between categories, so it's important to acknowledge that women-owned businesses may also be classified as small disadvantaged businesses.

EDA Key Findings: Top 10 Sectors by Average Contract Value (without differentiation by business owner)



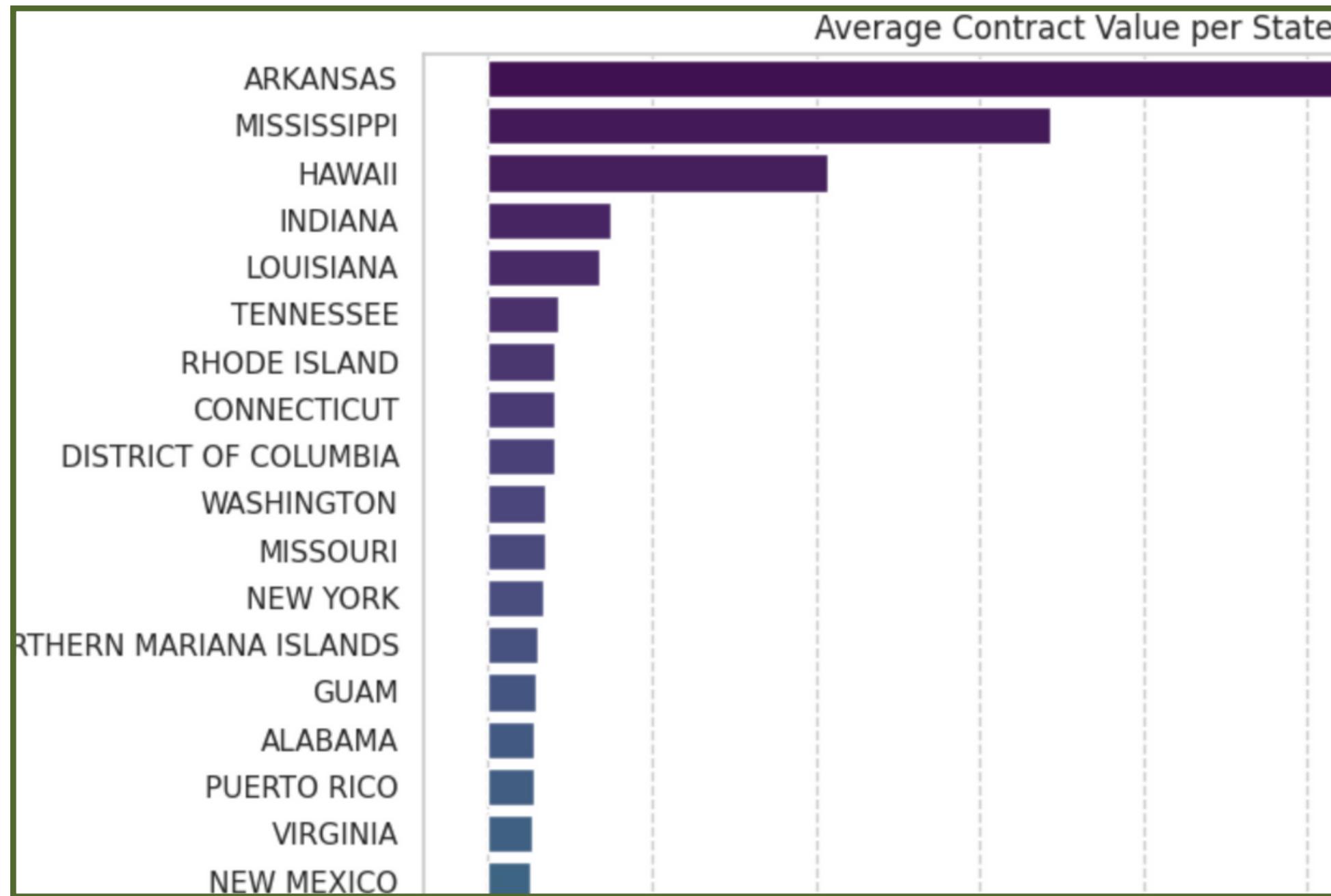
We Found:

- Expertise in these high-value sectors => better chances to secure lucrative contracts.

Suggestions:

- Woman-owned, minority-owned, and small disadvantaged businesses should consider these sectors for strategic planning
- Partnerships and Networking: Engaging in partnerships or networking within these sectors

EDA Key Findings: Average Contract Value per State



Note: (Not All states are shown due to large image size)

- The total number of contracts and average contract values vary significantly across states,
- Some states show a higher concentration of contracts and higher average values for certain types of businesses, pointing to geographical areas with active participation or significant opportunities.

Suggestions:

- Can strategize their focus, potentially targeting states with higher average values if they are equipped to handle larger projects.

Summary of Insights

1. Disparities in contract values.

- Higher values for woman-owned, minority-owned, and small disadvantaged businesses.
- Could be because EPA has departments focusing on underrepresented businesses (Suggests that this does work)

2. The businesses do well on certain contract types

- Women-owned businesses => BPA calls

3. Certain Contracts value Certain Business Sectors

- Top 3 business sectors were:
 - Roofing Contracts
 - Fabricated Metal Building and Component Manufacturing
 - Marketing Research and Public Opinion Polling

4. Regional Disparities:

- Varied contract values across states.



Conclusions & Recommendations

1. Sector Focus:

- Encourage focus on high-value sectors.
- Highlight successful sectors for businesses.
- Engaging in partnerships or networking within these sectors

2. Strategize their focus:

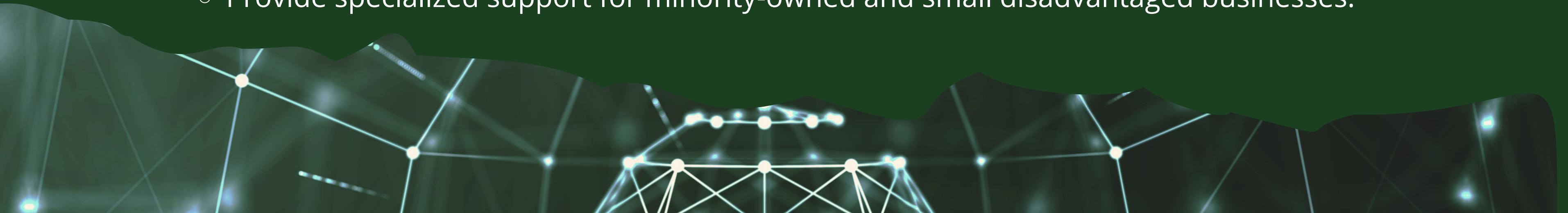
- Potentially targeting states with higher average values if they are equipped to handle larger projects.

3. Contract Type Focus:

- Potentially target contract types that specific business would do good on.

4. Addressing Barriers:

- Develop interventions for sector-specific barriers.
- Provide specialized support for minority-owned and small disadvantaged businesses.



Loyola Marymount University

Thank You!