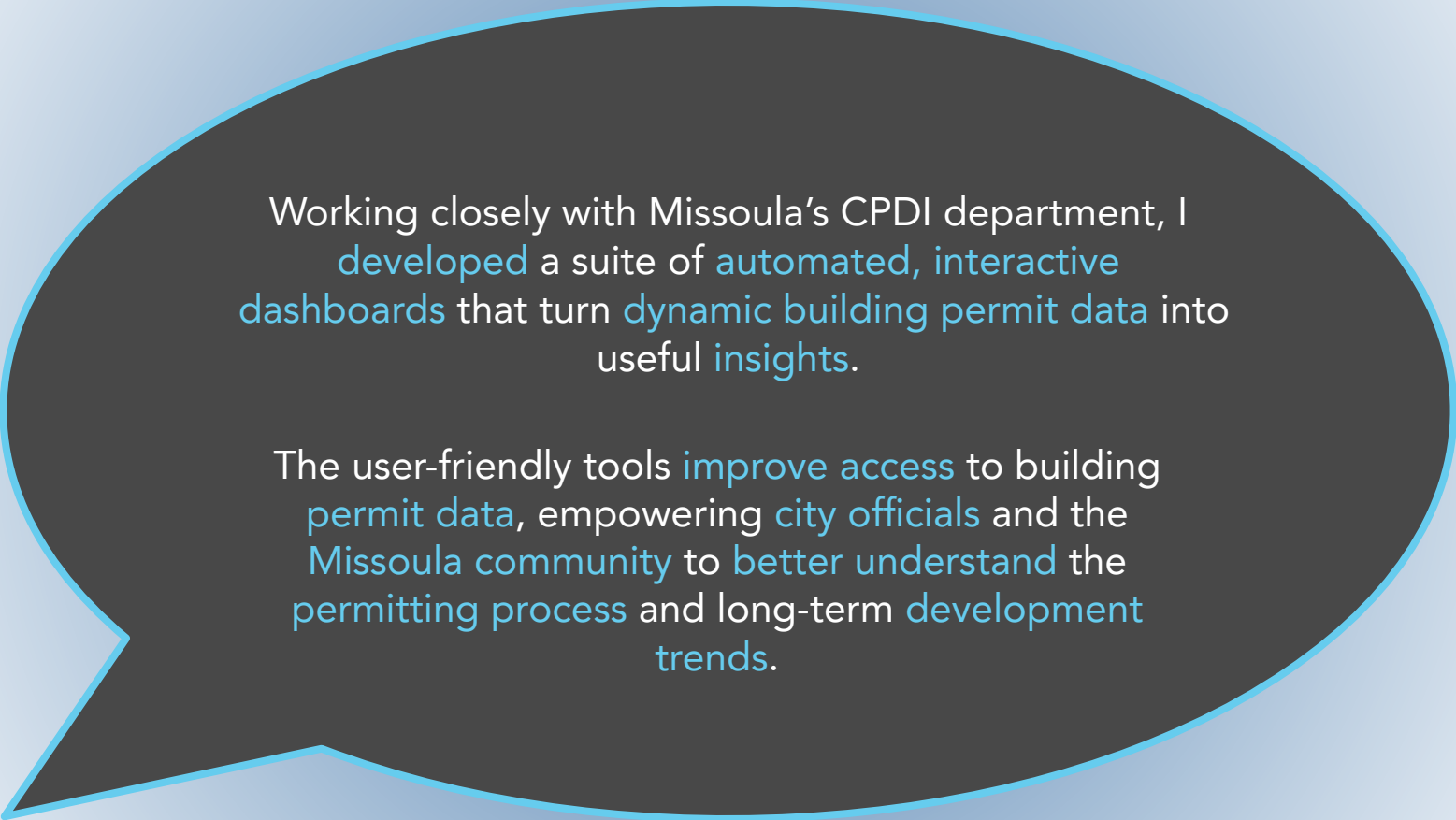


City of Missoula Building Permits

An Initiative for Enhanced
Accessibility & Insights from
Building Permit Data



A Data Engineering Project by [Luke Wyman](#)
of University of Montana In Collaboration with
City of Missoula Community Planning, Development & Innovation



Working closely with Missoula's CPDI department, I developed a suite of automated, interactive dashboards that turn dynamic building permit data into useful insights.

The user-friendly tools improve access to building permit data, empowering city officials and the Missoula community to better understand the permitting process and long-term development trends.

Agenda



Introduction



Opportunities & Data Sources



Solution Architecture & Design



Dashboards



Quick Demo



Challenges & Limitations



Impacts & Next Steps



Questions

Introduction

City of Missoula CPDI & Community

- CPDI department oversees building permits for residential and commercial projects
- Community submits permits for new construction and additions/remodels
- CPDI teams review, approve, and issue building permits

Enhance Accessibility & Insights

- Brings greater visibility into permit review timelines and open applications
- Supports data-informed planning and operational decision-making

Build Interactive Permit Dashboards

- Designed for internal staff and public use
- Centralizes access to historical building permit data
- Enables exploration of current trends and historical permit and development activity

Centralized, Visual Tools

- Provides a foundation for performance metrics and KPI development
- Draws inspiration from other municipalities

Opportunities & Data Sources

Analytics Opportunities

- Permit metrics & trends
- Permit process workflows
- Long-term economic development activity

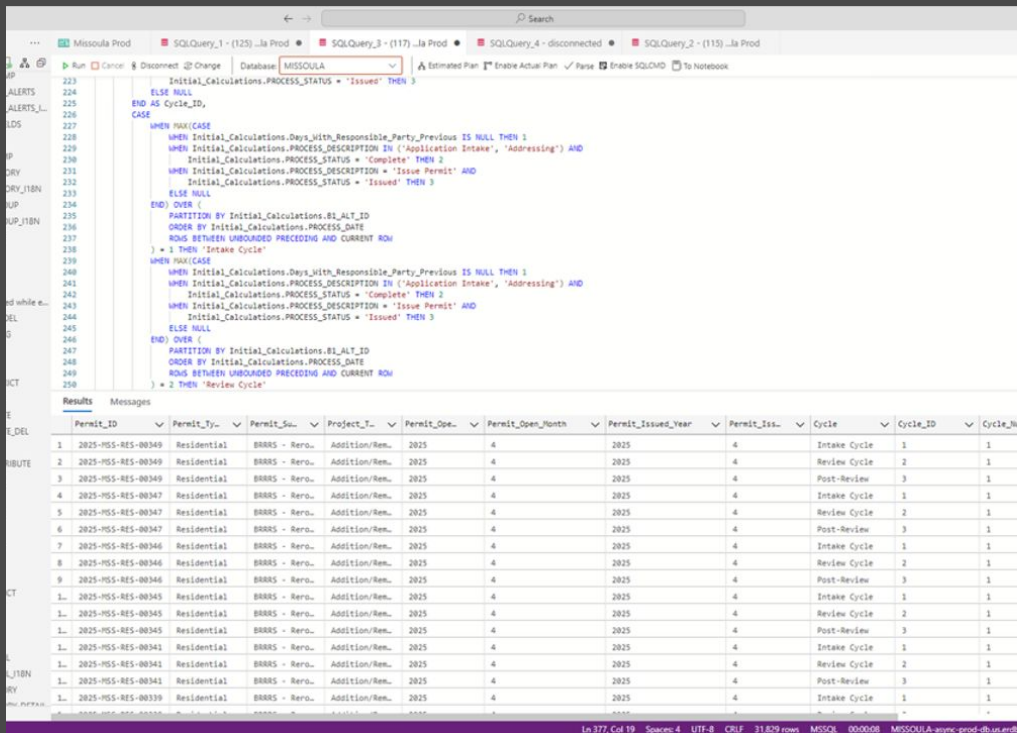
Data Sources

Accela Database tables (SQL)

- ↳ Building Permit Metrics data
- ↳ Building Permit Operational Insights data

Excel Workbook sheets

- ↳ Building Permit Data All data
- ↳ Permit Data All data



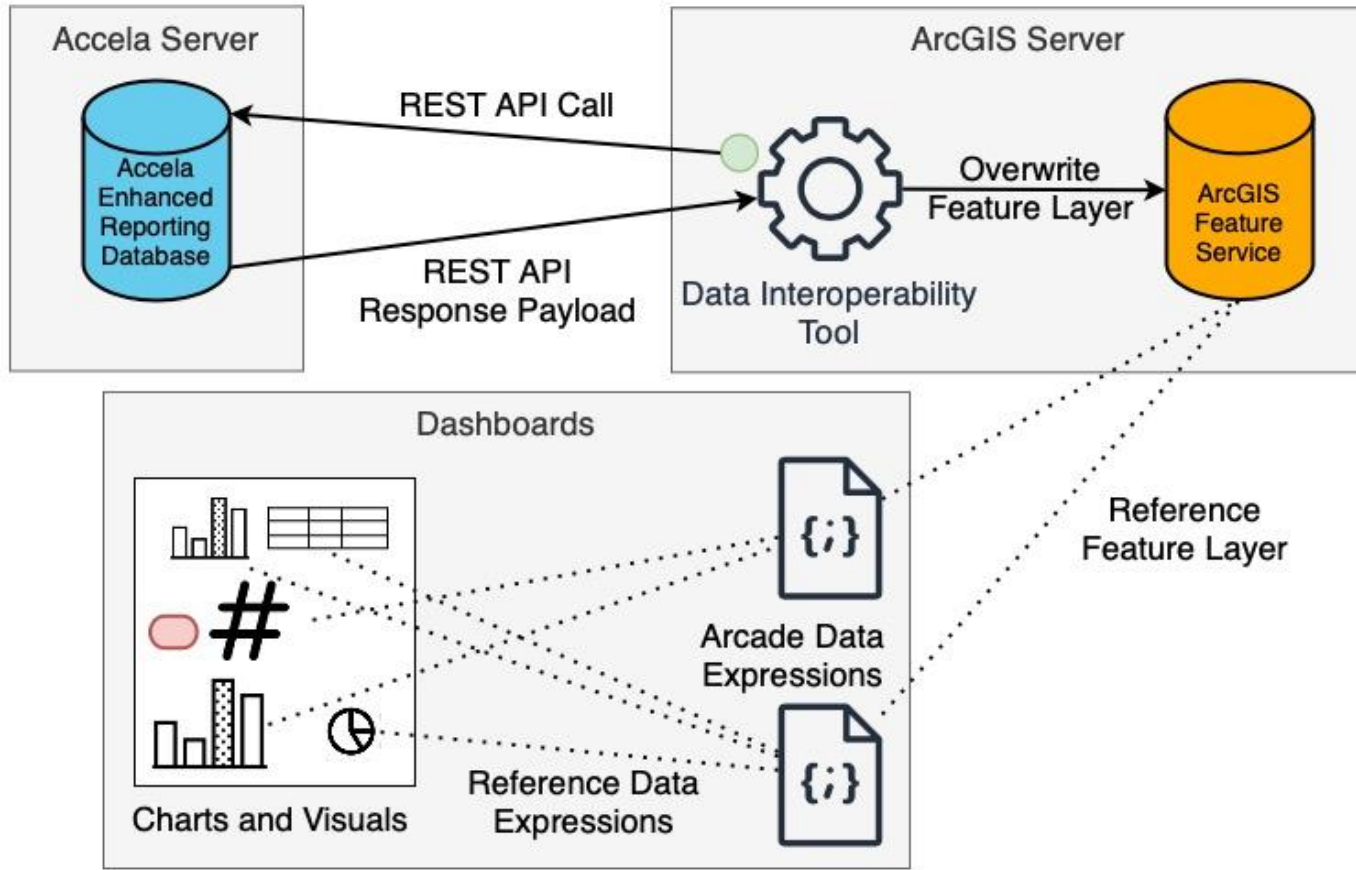
The screenshot shows a SQL query editor with a query window on the left and a results window on the right. The query is a complex SQL statement involving multiple CTEs and a final SELECT statement. The results window displays a table with columns: Permit_ID, Permit_Type, Permit_Status, Project_Type, Permit_Open, Permit_Open_Month, Permit_Issued_Year, Permit_Issued_Month, Cycle, Cycle_ID, and Cycle_Name. The table contains 10 rows of data, showing various permit types and their associated cycles.

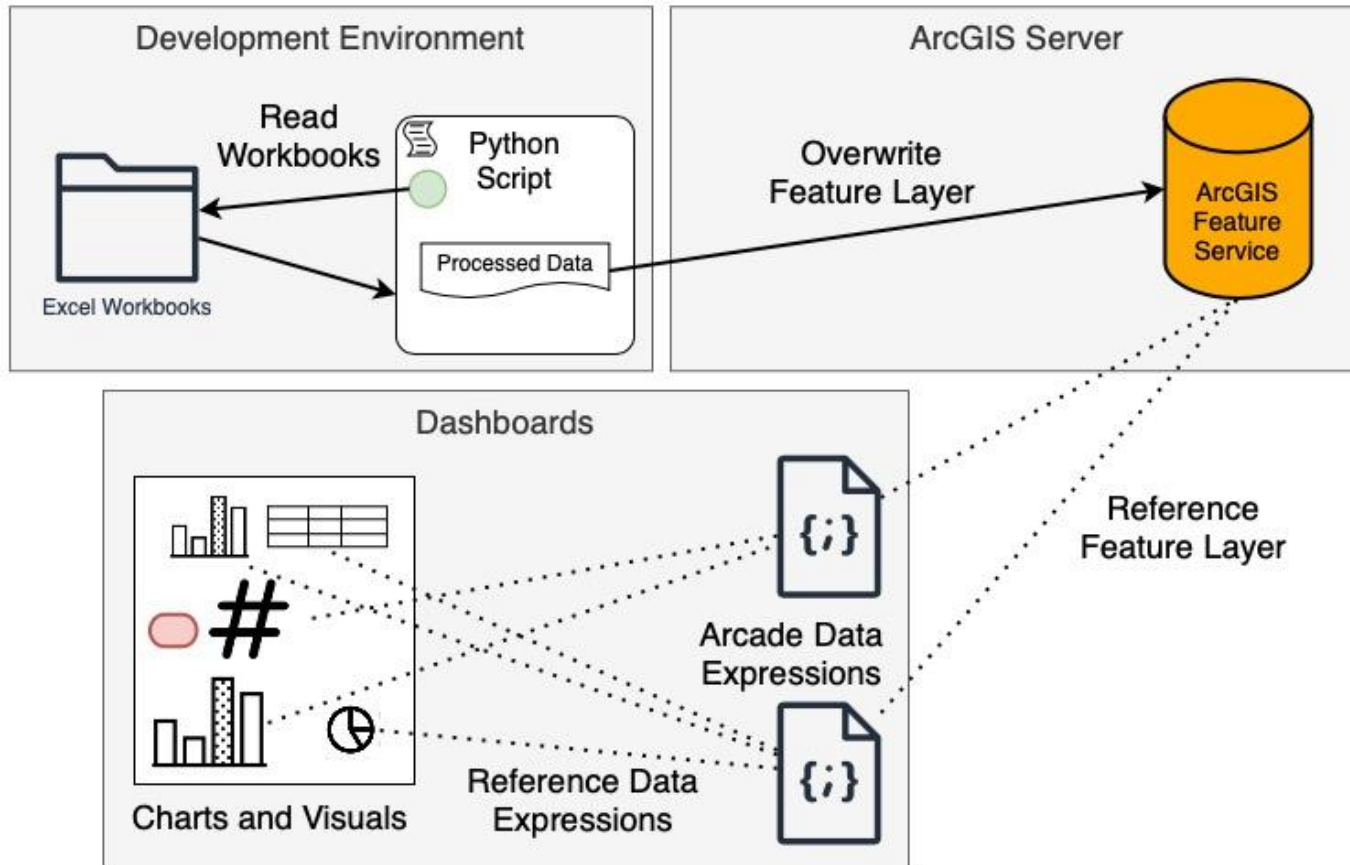
```
SQLQuery_1 - (125) - la Prod
SQLQuery_2 - (117) - la Prod
SQLQuery_3 - disconnected
SQLQuery_4 - disconnected
SQLQuery_5 - (115) - la Prod

Run Cancel Disconnect @ Change Database MISSOULA Estimated Plan Enable Actual Plan Parse Enable SQLCMD To Notebook

223 Initial_Calculations.PROCESS_STATUS = 'Issued' THEN 3
224 ELSE NULL
225 END AS Cycle_ID,
226 CASE
227 WHEN MAX(CASE
228 WHEN Initial_Calculations.Days_With_Responsive_Party_Previous IS NULL THEN 1
229 WHEN Initial_Calculations.PROCESS_DESCRIPTION IN ('Application Intake', 'Addressing') AND
230 Initial_Calculations.PROCESS_STATUS = 'Complete' THEN 2
231 WHEN Initial_Calculations.PROCESS_DESCRIPTION = 'Issue Permit' AND
232 Initial_Calculations.PROCESS_STATUS = 'Issued' THEN 3
233 ELSE NULL
234 END) OVER (
235 PARTITION BY Initial_Calculations.BI_ALT_ID
236 ORDER BY Initial_Calculations.PROCESS_DATE
237 ROWS BETWEEN UNBOUNDED PRECEDING AND CURRENT ROW
238 ) = 1 THEN 'Intake Cycle'
239 WHEN MAX(CASE
240 WHEN Initial_Calculations.Days_With_Responsive_Party_Previous IS NULL THEN 1
241 WHEN Initial_Calculations.PROCESS_DESCRIPTION IN ('Application Intake', 'Addressing') AND
242 Initial_Calculations.PROCESS_STATUS = 'Complete' THEN 2
243 WHEN Initial_Calculations.PROCESS_DESCRIPTION = 'Issue Permit' AND
244 Initial_Calculations.PROCESS_STATUS = 'Issued' THEN 3
245 ELSE NULL
246 END) OVER (
247 PARTITION BY Initial_Calculations.BI_ALT_ID
248 ORDER BY Initial_Calculations.PROCESS_DATE
249 ROWS BETWEEN UNBOUNDED PRECEDING AND CURRENT ROW
250 ) = 2 THEN 'Review Cycle'
251 ) = 2 THEN 'Review Cycle'

Results Messages
Permit_ID Permit_Type Permit_Status Project_Type Permit_Open Permit_Open_Month Permit_Issued_Year Permit_Issued_Month Cycle Cycle_ID Cycle_Name
1 2025-MSS-RES-00349 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Intake Cycle 1 1
2 2025-MSS-RES-00349 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Review Cycle 2 1
3 2025-MSS-RES-00349 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Post-Review 3 1
4 2025-MSS-RES-00347 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Intake Cycle 1 1
5 2025-MSS-RES-00347 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Review Cycle 2 1
6 2025-MSS-RES-00347 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Post-Review 3 1
7 2025-MSS-RES-00346 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Intake Cycle 1 1
8 2025-MSS-RES-00346 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Review Cycle 2 1
9 2025-MSS-RES-00346 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Post-Review 3 1
10 2025-MSS-RES-00345 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Intake Cycle 1 1
11 2025-MSS-RES-00345 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Review Cycle 2 1
12 2025-MSS-RES-00345 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Post-Review 3 1
13 2025-MSS-RES-00341 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Intake Cycle 1 1
14 2025-MSS-RES-00341 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Review Cycle 2 1
15 2025-MSS-RES-00341 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Post-Review 3 1
16 2025-MSS-RES-00339 Residential BARRRS - Rero Addition/Rem. 2025 4 2025 4 Intake Cycle 1 1
```





Building Permit Metrics

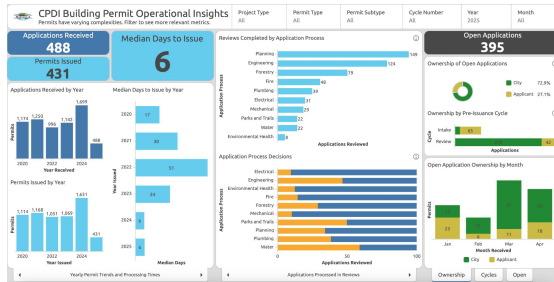


Provides enhanced transparency and insights into permit processing times, volumes, and types

01

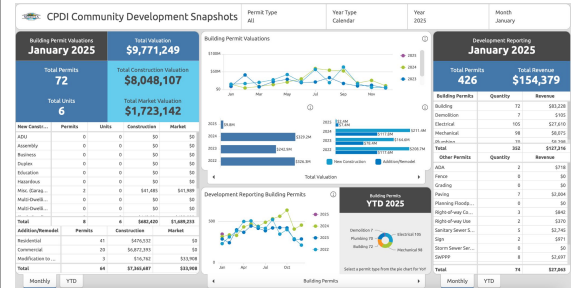
02

Building Permit Operational Insights



Help city officials improve the permit review process by identifying bottlenecks that could be leading to extended review times.

Community Development Snapshots



Track and analyze Missoula's development trends, growth patterns, and economic indicators in building permit data.

03

Quick Demo

of the Building Permit
Metrics Dashboard

Challenges & Limitations

Challenges

- Understanding the data
- Optimizing SQL queries
- Processing data from Excel workbooks using a Python script
- Understanding niche requirements, like permit statuses, attributions.

Limitations

- Manual processing for development snapshots:
 - running Python script
 - uploading data
- Many requested features, hard to tell what's important
- Dashboard is a memory-intensive tool

City

- Improved operational efficiency
- Data-backed understanding of trends.
- Commitment to improvement

Public

- Greater transparency
- Predictability and planning
- General engagement

Impacts

- Review and prioritize operational insights metrics
- Compare to other municipalities, develop KPIs and goals
- Improve data sourcing and cleaning methods for the Community Development Snapshots dashboard

Next Steps

Questions?



CPDI Building Permit Metrics

Permits have varying complexities. Filter to see more relevant metr...

Project Ty...
All

Permit Ty...
All

Permit Subty...
All

Pre-Issuance Cy...
Review Cycle

Year
2025

Month
All

Applications Received

488

Permits Issued

431

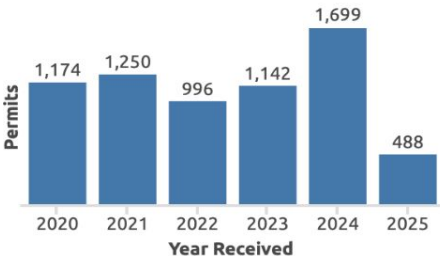
Median Days to Issue

6

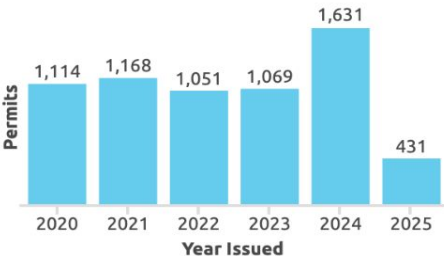
Open Applications

395

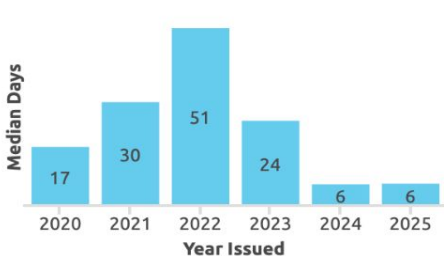
Applications Received by Year



Permits Issued by Year



Median Days to Issue by Year



Yearly Permit Trends and Processing Times

Monthly Permit Trends and Processing Times

Ownership of Open Applications



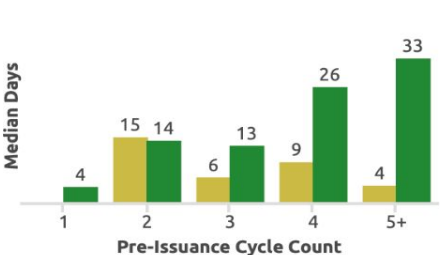
City 72.9%
Applicant 27.1%

Ownership by Pre-Issuance Cycle



Review Cycle

Median Ownership Days by Cycle Count



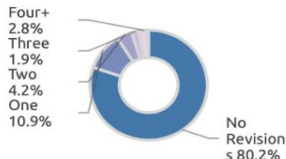
Median Days

Average Days

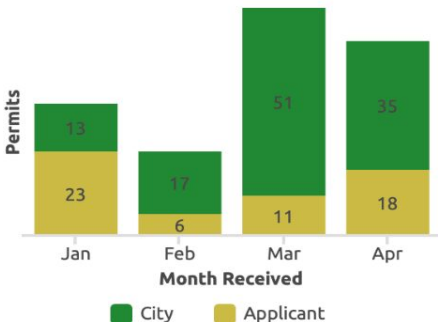
Application Cycle Count Reviews and Duration Statistics

Cycle Count	Reviews	Median D...	Average D...
1	430	3.8	28.2
2	85	37.2	65.2
3	38	20.8	48.2
4	20	42.8	69.6
5+	12	33.9	107.3
All Cycles	585	15.8	37.9

Revisions by Applicant



Open Application Ownership by Month



Microsoft Outlook

Ownership



CPDI Building Permit Operational Insights

Permits have varying complexities. Filter to see more relevant metrics.

Project Type

All

Permit Type

All

Permit Subtype

All

Cycle Number

All

Year

2025

Month

All

Applications Received

488

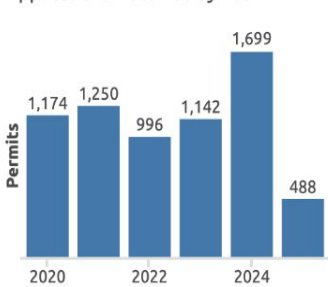
Permits Issued

431

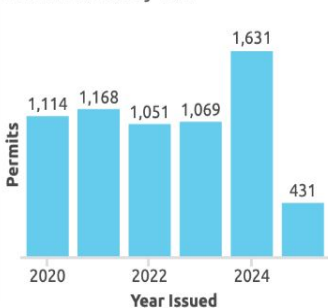
Median Days to Issue

6

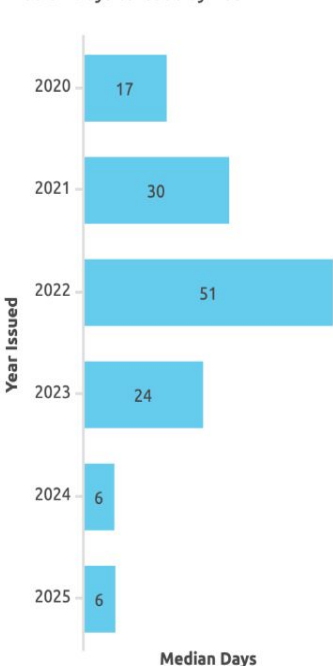
Applications Received by Year



Permits Issued by Year

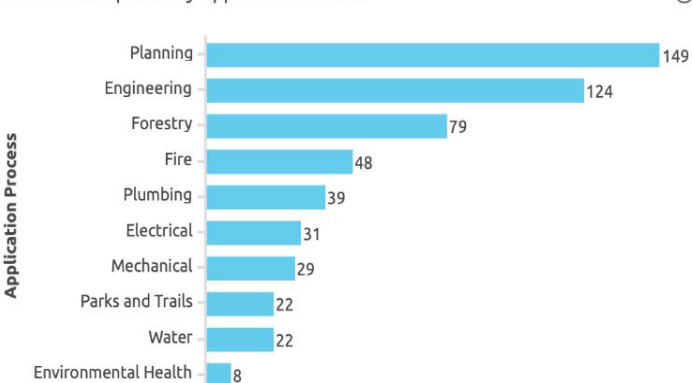


Median Days to Issue by Year

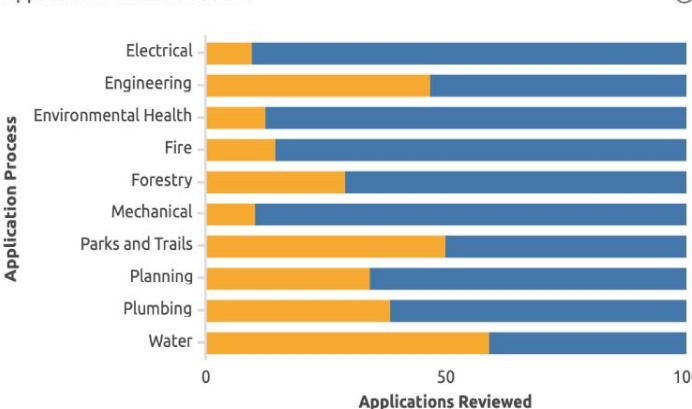


Yearly Permit Trends and Processing Times

Reviews Completed by Application Process



Application Process Decisions



Applications Processed in Reviews

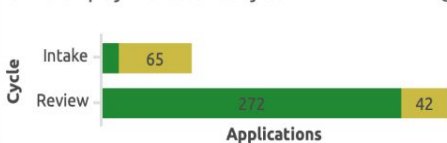
Open Applications

395

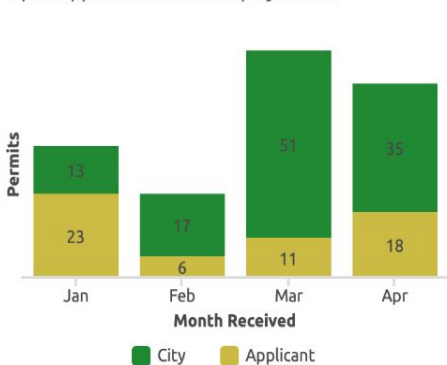
Ownership of Open Applications



Ownership by Pre-Issuance Cycle



Open Application Ownership by Month



Ownership

Cycles

Open



CPDI Community Development Snapshots

Permit Type
All

Year Type
Calendar

Year
2025

Month
January

Building Permit Valuations January 2025

Total Permits
72

Total Units
6

Total Valuation
\$9,771,249

Total Construction Valuation
\$8,048,107

Total Market Valuation
\$1,723,142

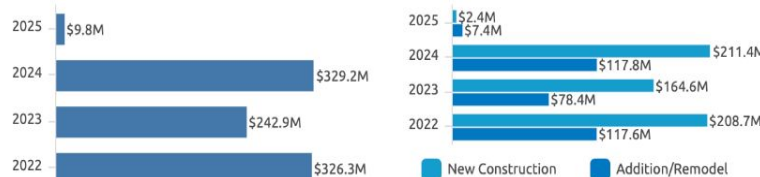
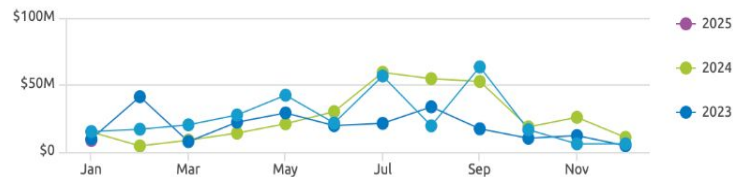
New Constr...	Permits	Units	Construction	Market
ADU	0	0	\$0	\$0
Assembly	0	0	\$0	\$0
Business	0	0	\$0	\$0
Duplex	0	0	\$0	\$0
Education	0	0	\$0	\$0
Hazardous	0	0	\$0	\$0
Misc. (Garag...	2	0	\$41,485	\$41,989
Multi-Dwelli...	0	0	\$0	\$0
Multi-Dwelli...	0	0	\$0	\$0
Subtotal	2	0	\$41,485	\$41,989
Total	8	6	\$682,420	\$1,689,233

Addition/Remodel	Permits	Construction	Market
Residential	41	\$476,532	\$0
Commercial	20	\$6,872,393	\$0
Modification to ...	3	\$16,762	\$33,908
Total	64	\$7,365,687	\$33,908

Monthly

YTD

Building Permit Valuations



Total Valuation

Development Reporting Building Permits



Building Permits YTD 2025



Select a permit type from the pie chart for YoY

Building Permits

Development Reporting January 2025

Total Permits
426

Total Revenue
\$154,379

Building Permits	Quantity	Revenue
Building	72	\$83,228
Demolition	7	\$105
Electrical	105	\$27,610
Mechanical	98	\$8,075
Plumbing	70	\$8,299
Total	352	\$127,316
Other Permits	Quantity	Revenue
ADA	2	\$718
Fence	0	\$0
Grading	0	\$0
Paving	7	\$2,004
Planning Floodp...	0	\$0
Right-of-way Co...	3	\$842
Right-of-way Use	2	\$370
Sanitary Sewer S...	5	\$2,745
Sign	2	\$971
Storm Sewer Ser...	0	\$0
SWPPP	8	\$2,697
Total	74	\$27,063

Monthly

YTD