

# Cost Minimization with Expansion

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# Task Overview

- **Goal:** How best to minimize costs during warehouse expansion
- **Current Costs:**
  - Annual Warehouse Spend: **\$150K**
  - Annual Shipping Costs: cost (\$) to ship packages throughout USA
  - Sales Growth Rate: **15% YoY**
    - Increased Sales → Increased Shipments → Increased Costs
- Our strategy for expansion ensures the company will reduce costs while improving existing sales.

# Current Rates

- The company pays the following shipping rates:
- We can assume all packages have a uniform price.
- Shipments have surcharges.

Distance	Price
< 500 mi	\$5.60 / package
< 1250 mi	\$8.70 / package
> 1250 mi (continental USA)	\$11.90 / package
Air Freight	\$18.00 / package

# Data Summary

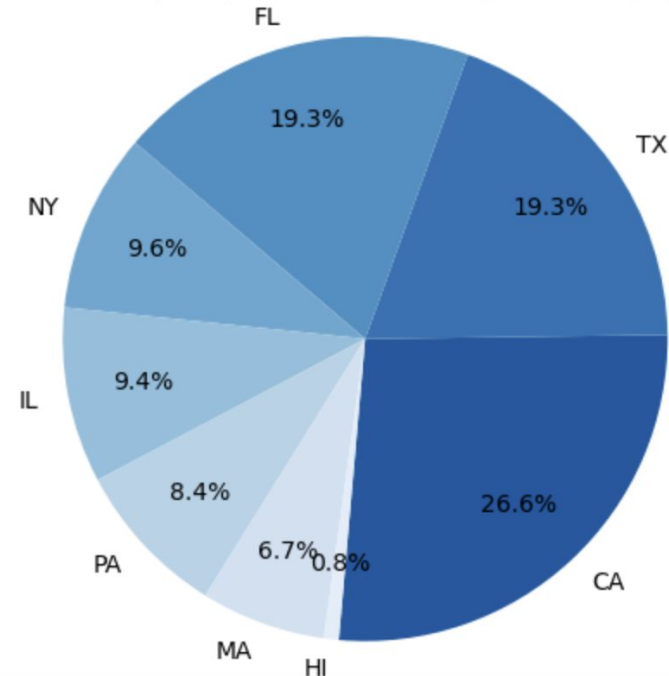
	Ship_Date	Delivery_Date	Shipper_State	Recipient_State	Surcharge
0	2019-10-07	2019-10-10	NY	TX	1.72
1	2019-10-11	2019-10-19	NY	CA	3.28
2	2019-10-04	2019-10-08	NY	TX	5.21
3	2019-10-10	2019-10-14	NY	TX	3.28
4	2019-10-04	2019-10-07	NY	NY	0.35

- We were given 1 month of data for **8,512** shipments from **October 1st, 2019 - November 1st, 2019**.
- We assume October's sales *represent our monthly costs*.

# Current Trends

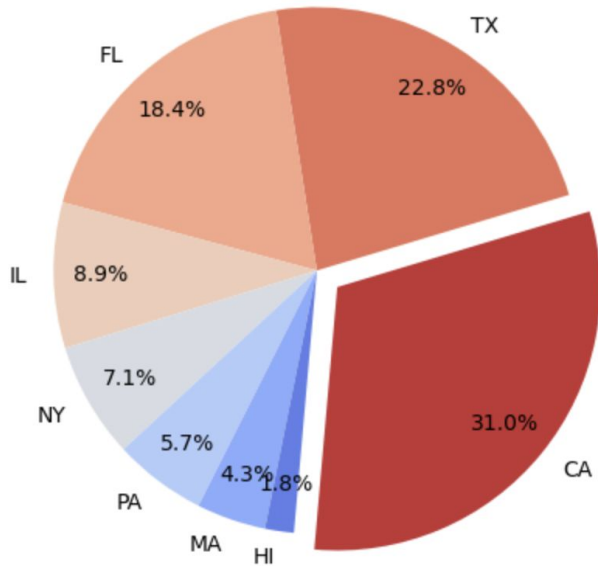
- **Top 3 Shipment Recipient States:**  
California, Texas, and Florida
- CA shipments make up **~27%** of our total monthly shipments.
- HI shipments make up **<1%** of our total monthly shipments.

Monthly Shipments Received per State (%)

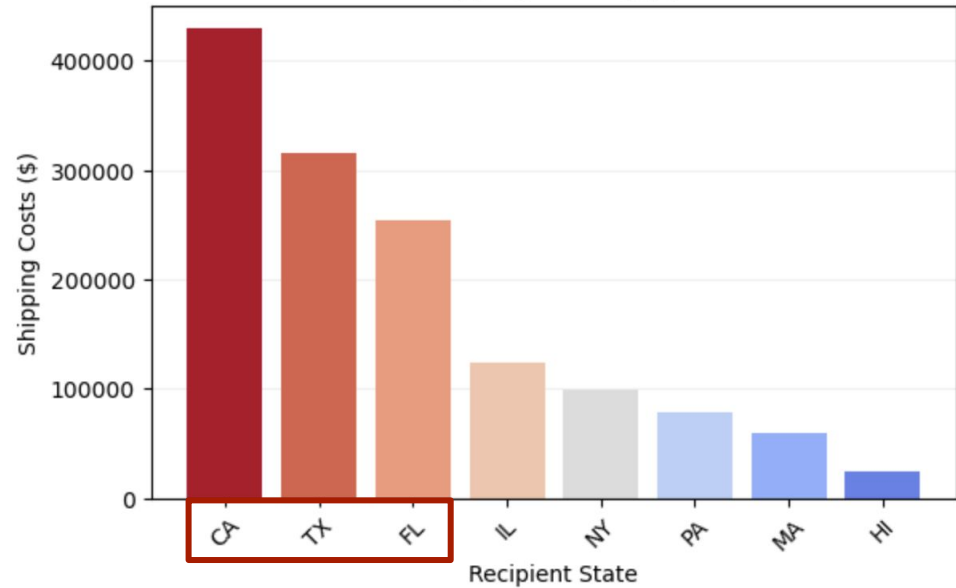


# Current Trends

Annual Shipping Costs per State (%)



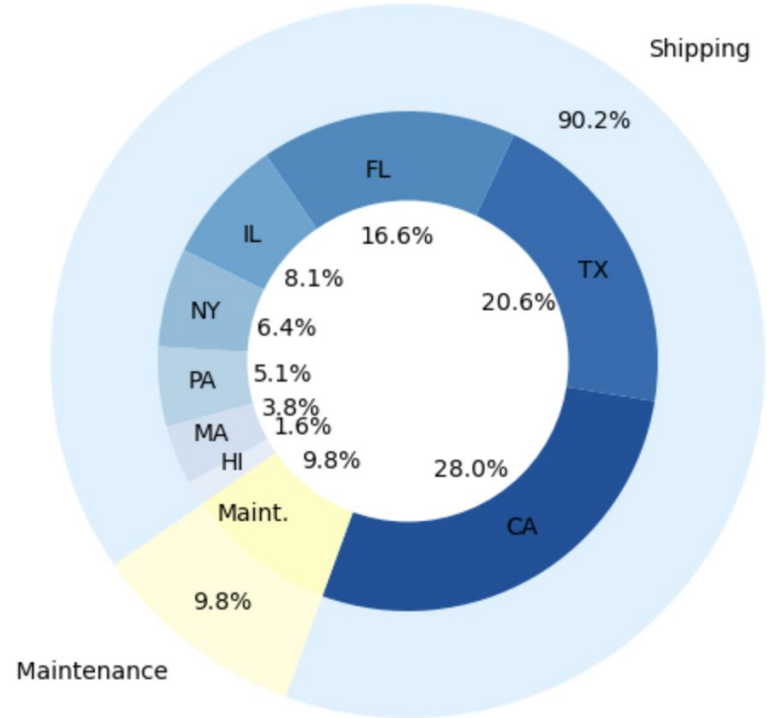
Annual Shipping Costs (\$) per State



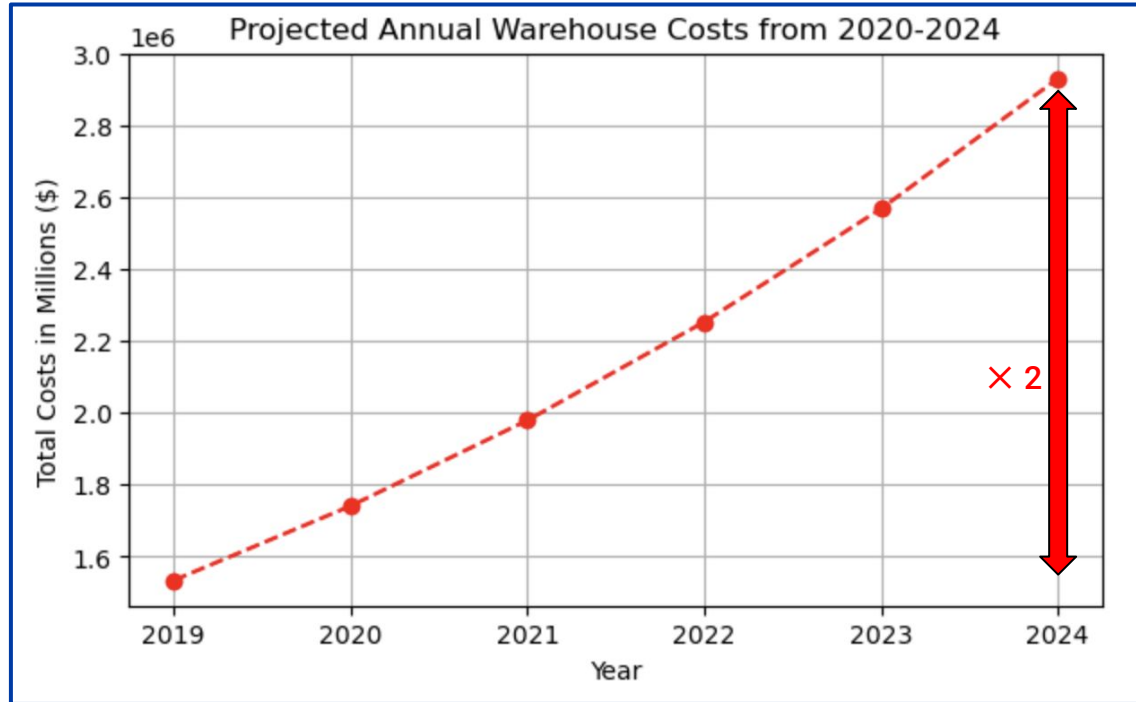
# Current Trends

- Current **Total** Annual Costs: **\$1.5M**
  - Shipping Costs: **\$1.4M**
  - Warehouse Maintenance: **\$150K**
- Shipping costs make up **~90%** of our total annual warehouse costs.
  - **31%** of these shipping costs are just our packages to CA.
  - We spend **\$429,255.84** on shipping packages to CA, annually.
    - This is **28%** of our total costs.

*Total Annual Cost Breakdown*



# Current Trends

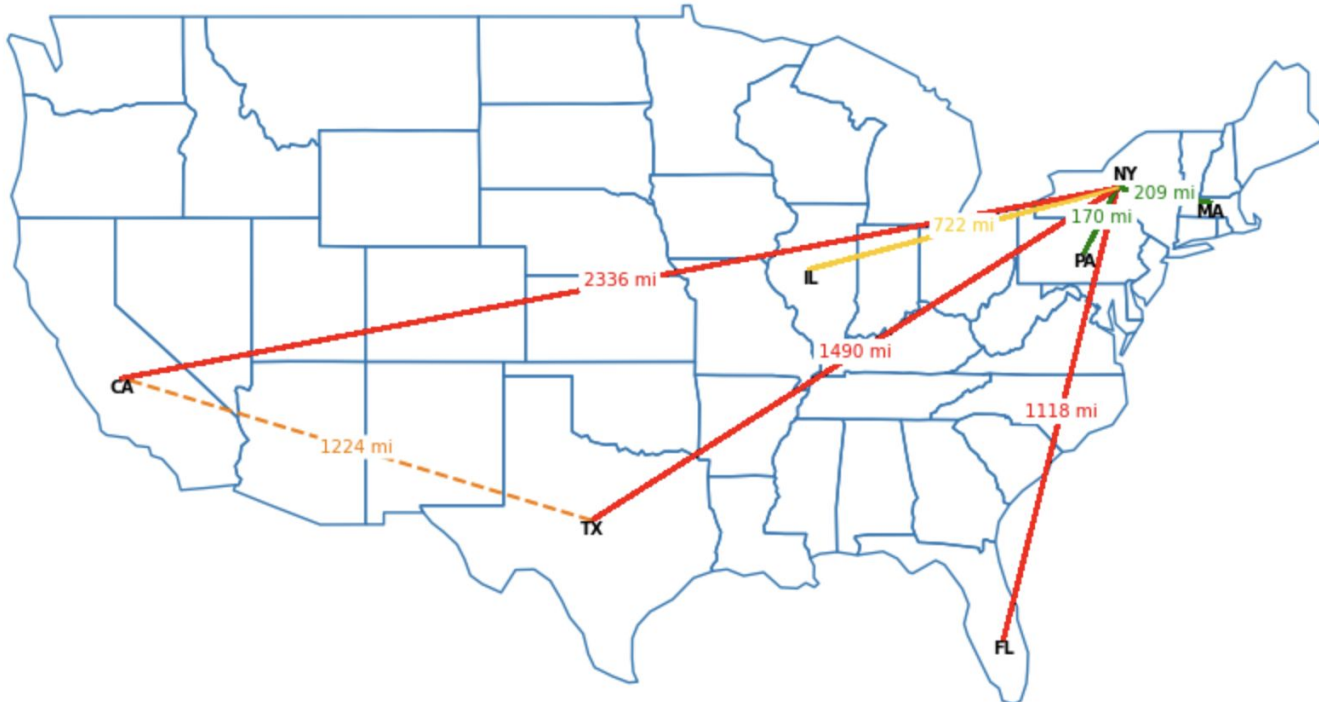


With our **15% YoY growth rate**, we can expect our total annual costs to almost double over the next 5 years.



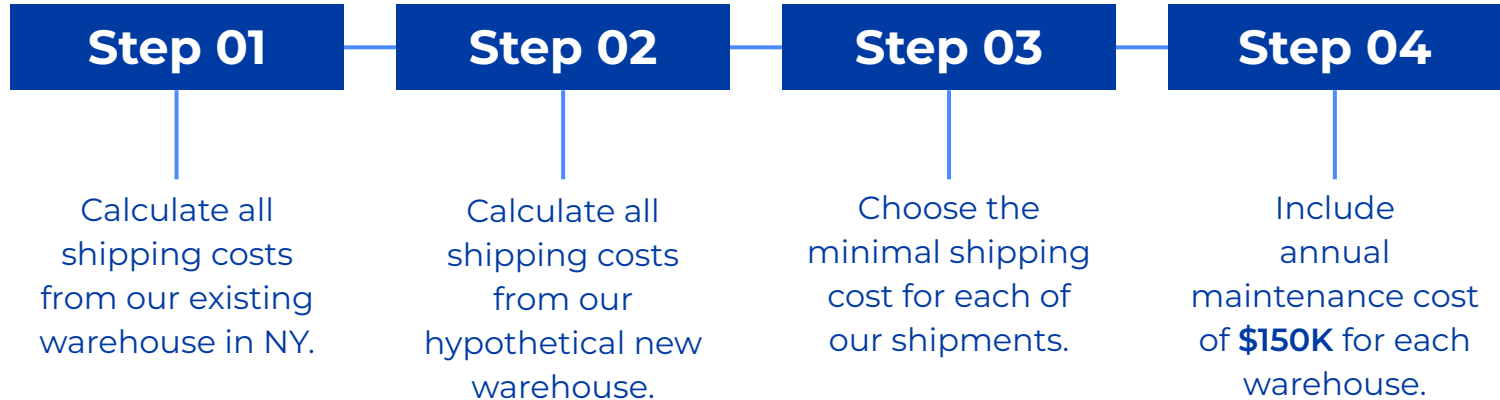
# Savings Opportunities

Distances from Shipper to Recipient States within Continental USA

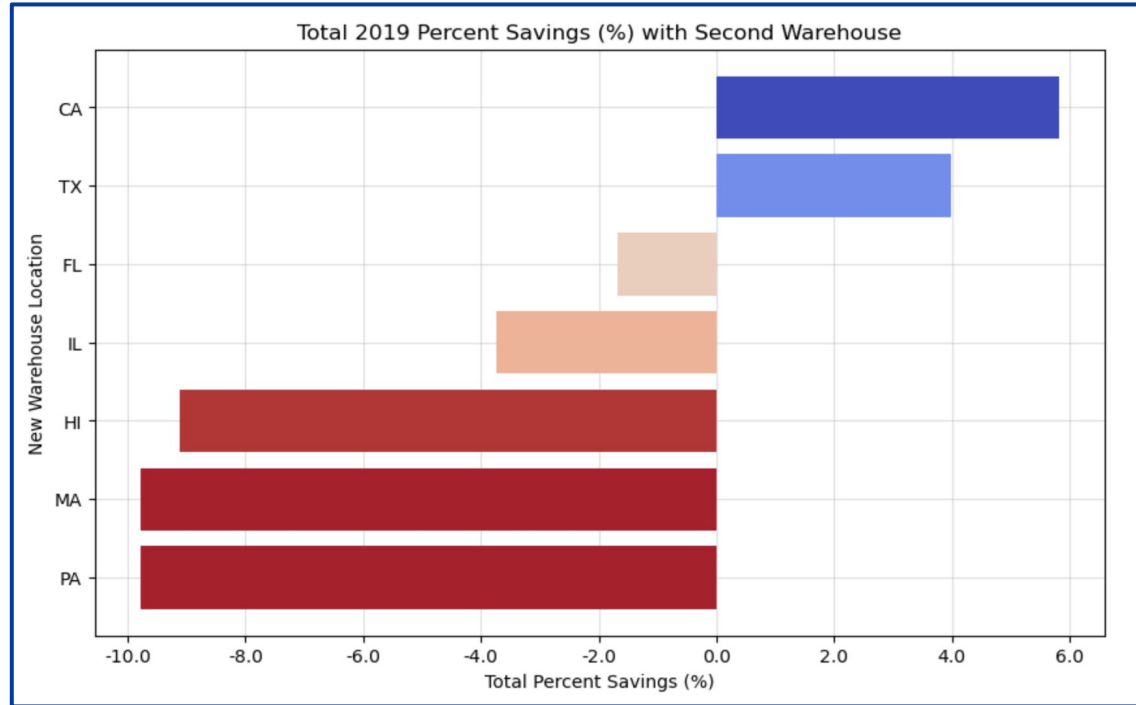


# Savings Opportunities

To calculate what our **new** total spending cost for 2019 would have been **with a second warehouse**, we would:

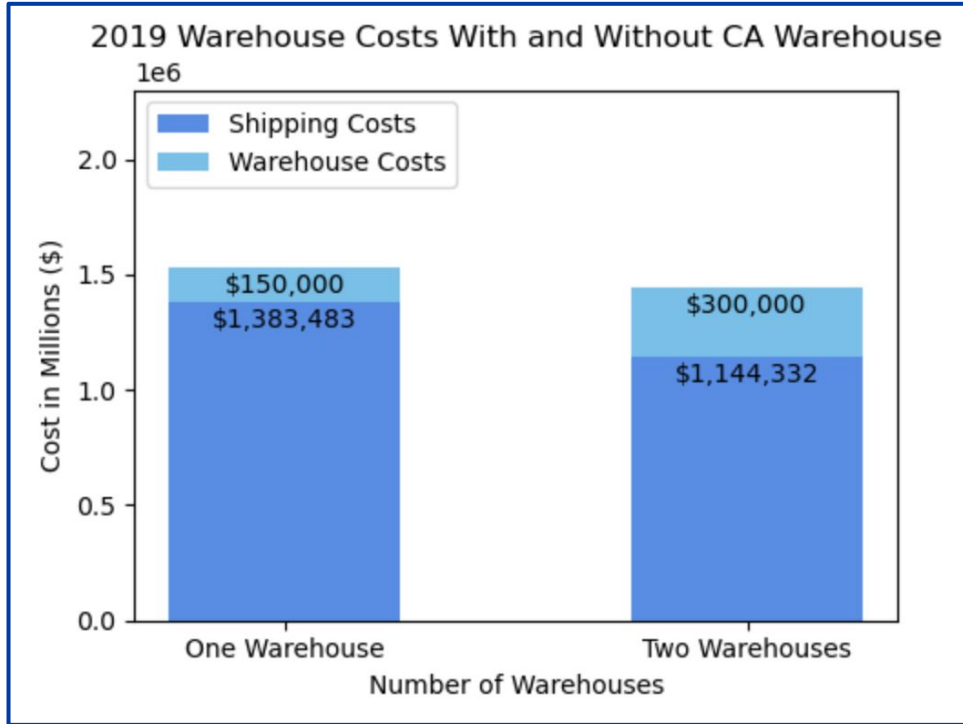


# Savings Opportunities



Another warehouse in CA would allow us to reduce costs the most, with **5.8% in total savings**.

# Savings Opportunities



- With a **second warehouse in CA** in 2019, we would have saved:
  - ~\$89K on total costs.
    - That's ~5.8% in savings.
  - ~\$239K on shipping costs.
    - That's ~17.3% in savings.
- Only **79% of our total annual spend** would have been due to shipping costs.

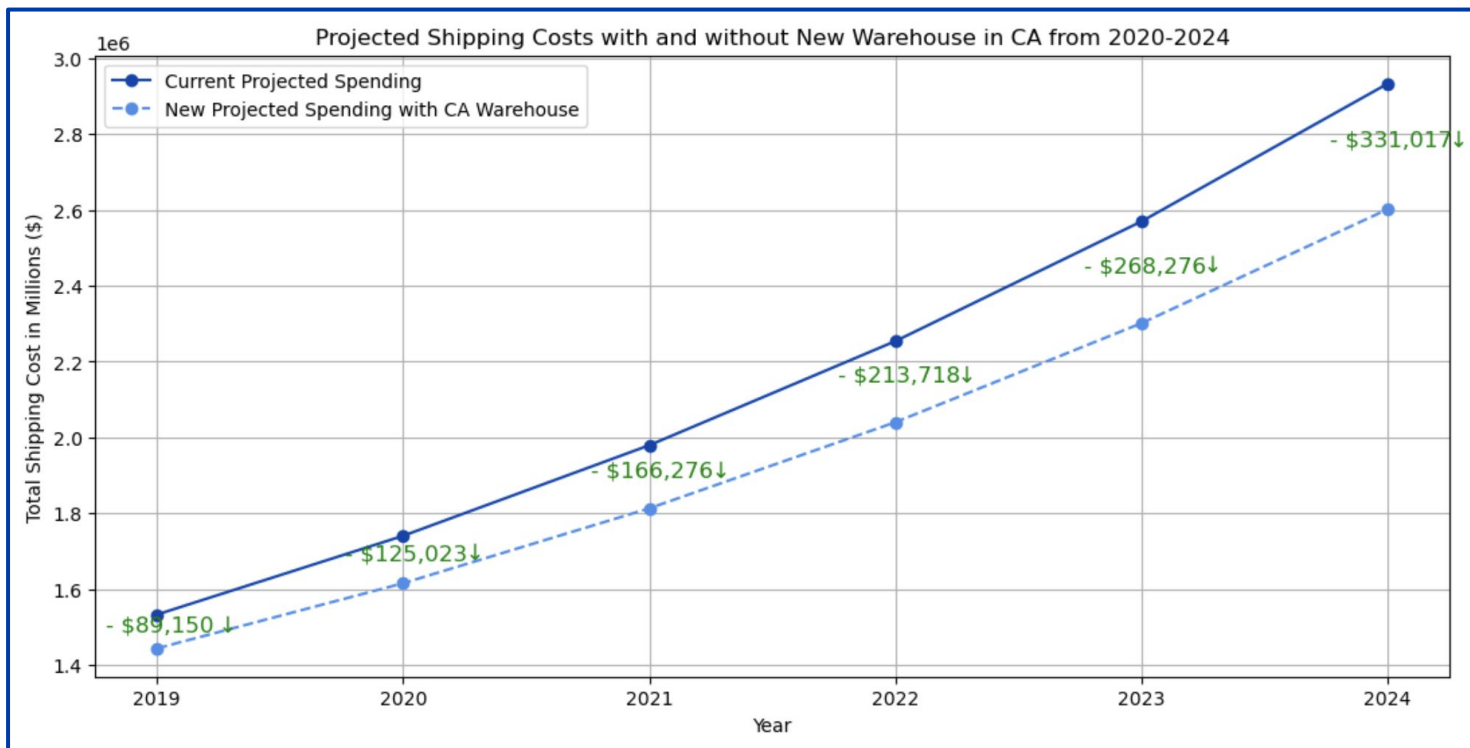
# Future Savings Opportunities

After running a simulation for **all possible pairs** of new warehouses, we found a **second warehouse in CA** and a **third warehouse in TX** would *not* maximize savings.

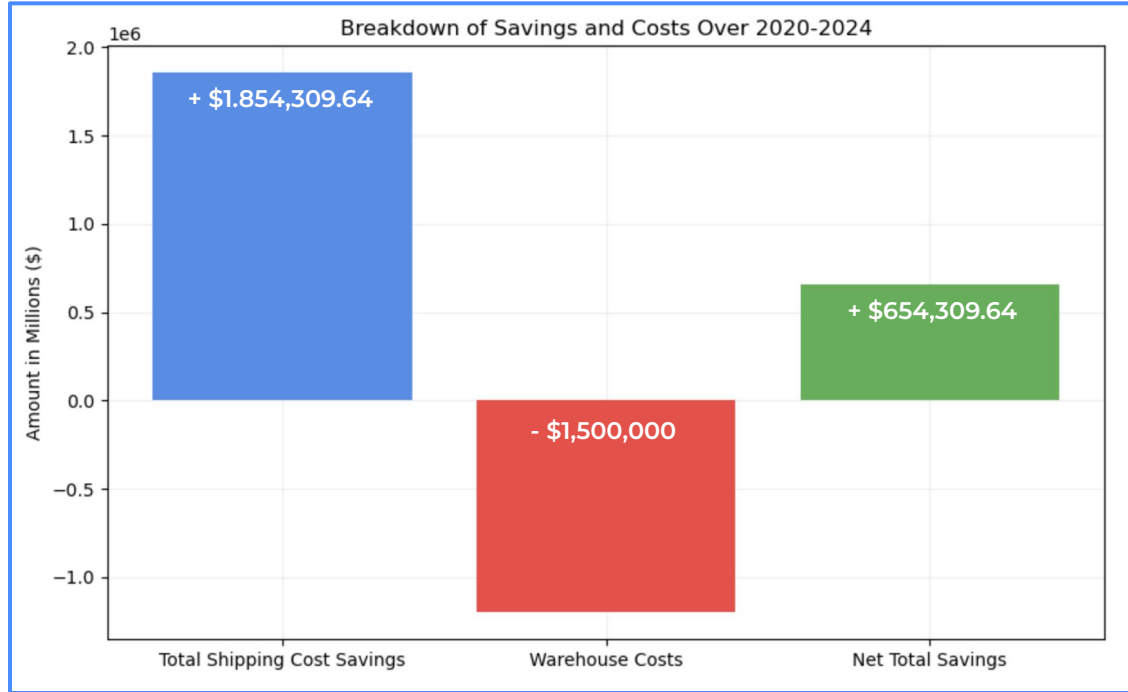
**No other pairs of warehouses were found** to maximize savings.

New Warehouse Location 1	New Warehouse Location 2	Total Savings (\$)	Percent Total Savings (%)
CA	TX	195.6	0.01
CA	FL	158.4	0.01
TX	FL	-27994.8	-1.83
CA	IL	-31126.8	-2.03
CA	HI	-55708.8	-3.63

# Future Savings Opportunities



# Future Savings Opportunities



Our **net savings** over the next 5 years would be **\$654,309.64**

# Recommendations

- A **single** additional warehouse would **save costs** and **hold long-term benefits**.
- The optimal location for a second warehouse is in **California**.
- By opening a second warehouse in CA, **over the next 5 years**:
  - We'd **save a grand total of \$1.1M**.
    - That's **9.62% in total savings**.
  - We'd save **\$1.85M** on **shipping costs** *alone*.
  - Warehouse costs would be: **\$300K a year** → **\$1.5M over 5 years**.
    - This makes our **net savings: \$654,309.64**.