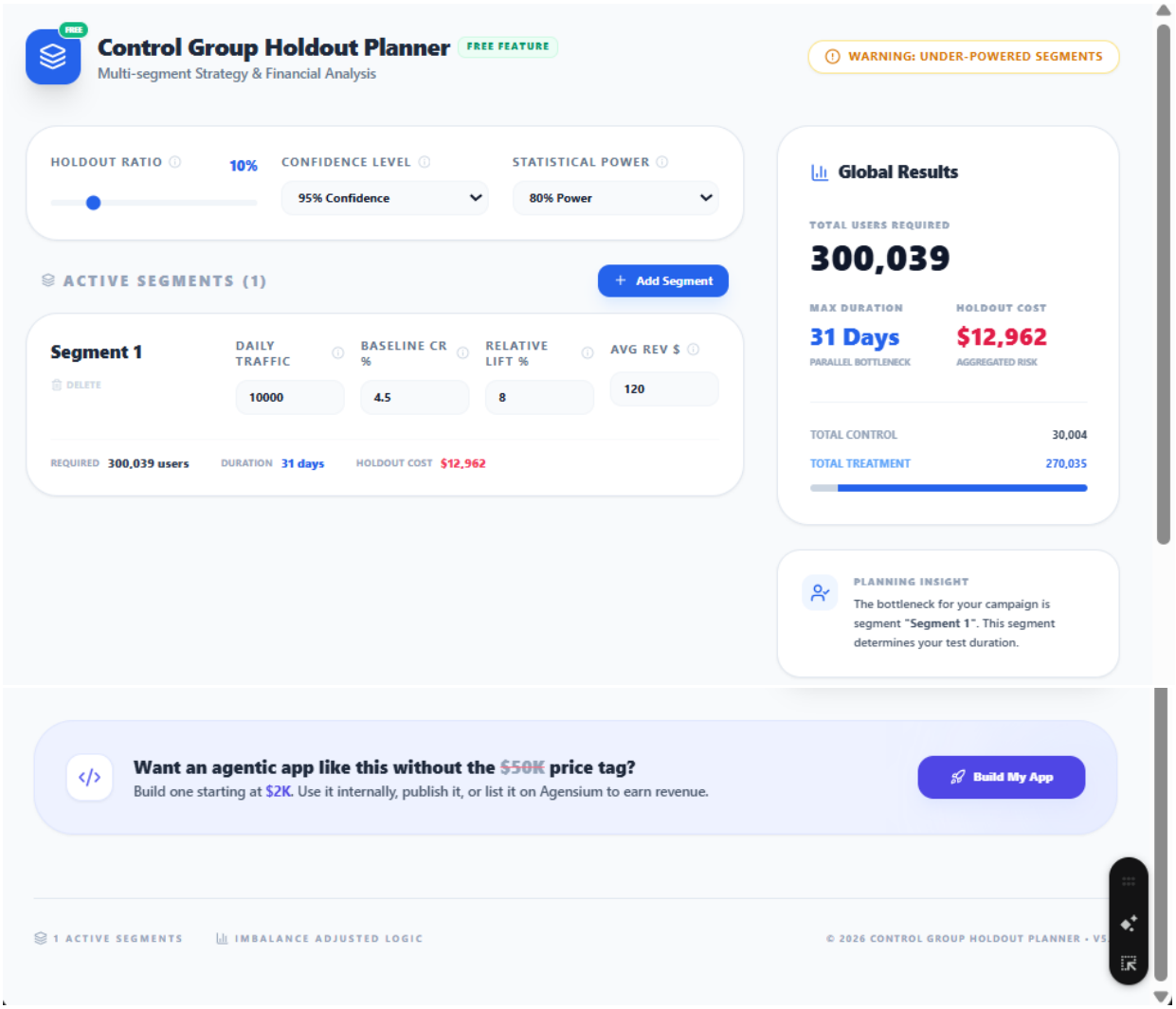

Technical Specification: Control Group Holdout Planner

This document serves as the implementation guide for developers building or extending the Multi-Segment Control Group Holdout Planner.

1. Input Definitions & Default Values

Global Parameters

These settings apply to all segments to ensure statistical consistency.

Parameter	Type	Default	Selected Options / Range
Holdout (Control) Ratio (R)	Slider	10%	1% to 50%
Confidence Level	Dropdown	95%	90%, 95%, 99%
Statistical Power	Dropdown	80%	80%, 90%

Segment-Specific Parameters (Per Segment)

The app should support up to 10 segments.

Parameter	Type	Default	Description
Segment Name	Text	"Segment 1"	User-defined label.
Daily Traffic (T)	Number	10,000	Unique visitors per day.
Baseline (p_1)	Number	4.5%	Current conversion rate.
Lift (L)	Number	8%	Expected relative improvement.
Value (V)	Number	$120	Revenue generated per conversion.

2. Calculation Logic (The Math)

For each segment, the logic follows these steps:

Step 1: Prep Constants

- **Z-scores for Alpha (Confidence):**
  - 90% → 1.645
  - 95% → 1.96
  - 99% → 2.57
- **Z-scores for Beta (Power):**
  - 80% → 0.841
  - 90% → 1.28

Step 2: Define Target Rates

- **Control Rate (p_1):** Baseline / 100
- **Treatment Rate (p_2):** p1 * (1 + (Lift / 100))

Step 3: Calculate Base Sample Size (n)

This calculates users needed *per group* as if the split was a standard 50/50: n = ((Z_alpha + Z_beta)^2 * (p1*(1-p1) + p2*(1-p2))) / (p1 - p2)^2

Step 4: Adjust for Imbalanced Holdout Split

Since business holdouts are rarely 50/50, we adjust the **Total Required Users (N)** for the segment:

- p = HoldoutRatio / 100
- q = 1 - p
- ImbalanceFactor = (1/p + 1/q) / 4
- **Segment Total (N):** (n * 2) * ImbalanceFactor

Step 5: Segment Outputs

- **Duration (Days):** N / Traffic
- **Holdout Users:** N * p
- **Holdout Cost ($):** HoldoutUsers * (p1 * (Lift/100)) * Value *(The revenue lost by keeping a portion of users in the lower-performing Control group).*

3. Aggregation (Dashboard Results)

Once individual segment results are calculated, generate the aggregate Global Results:

1. **Total Users Required:** Sum of all Segment Total (N) values.
2. **Max Duration:** The Duration (Days) of the **slowest** segment (the parallel bottleneck).
3. **Total Holdout Cost:** Sum of all segment Holdout Cost ($) values.

4. UI/UX & CTA

- **Warning Label:** If Holdout Users < n, flag the segment as "Under-powered" or display a "Small Control" warning.

- **Free Feature Badge:** Ensure the header includes a "Free Feature" badge to differentiate from paid agentic services.
- **CTA:** Include the following banner at the bottom:

"Want an agentic app like this without the $50K price tag? Build one starting at $2K. Use it internally, publish it on your site, or list it on Agensium to earn revenue." **Button:** [Build My App]