Stage 11 Doctrine: Warp → Detect → Denoise

This document provides a high-level doctrine for Stage 11 of the NGeodesic project. The overarching objective is to engineer the latent manifold so its energy landscape becomes a single, clean, stable well — suppressing hallucinations by construction.

Doctrine: Three Steps

1. **Warp the Manifold:** Shape the latent energy into a well. Use orthogonalization, calibrated nulls, and proper weighting to create curvature with one dominant basin.
2. **Detect the Singularity:** Run matched detection with calibrated z-scores. Apply soft selection (temperature/anneal) to avoid clipping weak true signals.
3. **Denoise in ■■:** Suppress phantom wells and distractors with lateral inhibition and residual refinement. Preserve only the true well.

Signal Processing Framing

Viewed through signal processing: • *Warp* ≡ subspace projection & background removal. • *Detect* ≡ matched filtering & calibrated hypothesis testing. • *Denoise* ≡ non-maximum suppression & iterative subtraction. Phantom wells correspond to structured noise or side-lobes. The true well is the dominant signal lobe.

Knobs and Controls

- Orthogonalization (rank r): controls background removal strength.
- Null calibration (block length, permutations): controls z-score stability.
- Residual refinement (drop fraction): sets strictness for energy drainage.
- Lateral inhibition (σ, λ): suppresses overlapping distractors.
- Temperature descent (T0 → Tmin): anneals from exploration to stable convergence.
- Candidate floor: widens or narrows initial detection pool.
- Per-primitive gates: safety checks for chronic offenders (e.g., flip_v).

Pass/Fail Success Criteria

- Recall ≈ 1.0 (±2%).
- Hallucination rate ≤ 0.26 overall (flip_v ≤ 0.24).
- Precision ≥ 0.8.
- Margins ≥ 0 (true wells deeper than phantoms).
- Phantom Index trending downward.
- F1 and Jaccard improving steadily.

Execution Checklist

- Run baseline (S5-3) and log PI, margins, metrics.
- Apply orthogonalization + calibrated nulls (Step 2–3).
- Layer in residual refinement (Step 4).

- Add lateral inhibition (Step 5).
- Enable temperature descent (Step 6).
- Track metrics against success bar after each step.
- Visualize surfaces & manifold; confirm only one clean well remains.

Stage 11 is the breaking point: the transition from heuristic parsing to an explicit warped-manifold energy framework. By following the Warp $\rightarrow$ Detect $\rightarrow$ Denoise doctrine, phantoms are suppressed, recall is preserved, and hallucinations are eliminated by design.