Executive Overview: Strategic Roadmap for Human-Relevant Non-Animal Methodologies (NAMs) - Neurological & Psychiatric Research

1. Vision & Mandate

This roadmap outlines the institutional transition from traditional *in vivo* animal models to high-fidelity, human-relevant Non-Animal Methodologies (NAMs). Driven by the Section 2A statutory duty of the *Animals (Scientific Procedures) Act 1986*, this strategy prioritises the adoption of human-centric platforms to enhance the scientific validity, reproducibility, and ethical alignment of our research output.

2. Strategic Pillars

Our approach moves beyond isolated experiments, implementing a unified, cross-disciplinary framework across four core neurological and psychiatric focus areas:

- **Core Neurological & CNS Models (3.1):** Utilising human neurovascular unit (NVU) and BBB-on-chip platforms to replace legacy animal permeability assays.
- **Psychiatric & Mental Health Models (3.2):** Implementing assembled brain tissue (assembloids) and neurocomputational digital twins to supersede subjective, high-severity rodent behavioural assays.
- **Neurodegenerative Disease Models (3.3):** Adopting patient-derived iPSC brain organoids and protein-aggregation microfluidics to bypass the 100% failure rate inherent in transgenic rodent disease models.
- **Neurodevelopmental Disorders & Neuroinflammation (3.4 & 3.5):** Deploying advanced human cortical organoids and glial-inclusive microphysiological systems (MPS) to accurately model human-specific developmental kinetics and neuroimmune responses.

3. Institutional Impact & Roadmap Integration

By centralising these specialised technologies, the institution establishes a "fit-for-purpose" research infrastructure. This integration provides:

- **Regulatory Compliance:** Robust "Weight-of-Evidence" (WoE) packages that streamline Home Office and ASRU project licence approvals.
- **Scientific Superiority:** Data that mirrors human clinical outcomes, bypassing the inherent failures of rodent-to-human cross-species extrapolation.
- **Future-Proofing:** A sustainable research paradigm that positions the institution at the forefront of the global transition toward cruelty-free, precision medical science.

4. Commitment to Excellence

The successful execution of this roadmap is dependent on the prioritised investment in human expertise, including advanced training in iPSC-derived assembloid generation, neuro-circuit computational modelling, and human-specific neuroimmune system management. This commitment ensures that we remain compliant with *ASPA 1986* while simultaneously driving innovation in human-centric medical research.