Project Chimera Briefing Document

Project Goal: To create an ambitious multi-genre cannabis cultivation simulation blending detailed infrastructure management, genetic mastery, creative construction, strategic optimization, data-driven decision-making, and player-driven progression. The ultimate aim is for players to become masters of cannabis genetics by perfecting growing conditions, developing superior strains, and refining breeding protocols. Authenticity and depth are key, requiring extensive research into real-world cannabis practices.

I. Core Gameplay Pillars (MVP Focus)

The initial launch will focus on a complete, satisfying core gameplay loop, built upon several pillars:

* Cultivation Simulation: Players will manage the detailed plant lifecycle from seed/clone to harvest. This involves manual and basic automated environmental control (temperature, humidity, light cycles), manual nutrient mixing and application, monitoring medium EC/pH, and addressing basic plant health issues (visual indicators, few common pests/diseases, manual treatment).
* Quote: "\* Detailed plant lifecycle: planting seeds/clones, transplanting, basic plant training (topping, manual LST).\*"
* Quote: "\* Nutrient Management: Manual mixing basic nutrient recipes, application, medium EC/pH monitoring (handheld meters).\*"
* Genetics & Basic Breeding: A simplified inheritance model for core traits (cannabinoid potential, yield, flowering time, morphology) will be present. Players will identify plant sex, perform manual pollination for F1 seeds, clone mother plants for genetic preservation, and select desired phenotypes based on visual characteristics and basic post-harvest metrics.
* Quote: "\* Simplified inheritance model for core key traits (primary cannabinoid potential [THC/CBD], basic yield factor, flowering time, rudimentary morphology).\*"
* Quote: "\* Basic Cloning: Cuttings from mother plants for genetic preservation. \* Phenotype Observation: Player selection via visual characteristics, basic post-harvest metrics.\*"
* Facility Construction & Management: Players start on a "Residential House" map and unlock a "Warehouse" map. Construction is grid-based for interior rooms (walls, doors). Players place essential cultivation equipment (lights, fans, pots, basic irrigation) and manage basic abstracted utility connections (power).
* Quote: "\* Facility Construction & Management (Initial Scale - 'Residential House' Map): Grid-based interior room construction (walls, doors). \*"
* Quote: "\* Essential cultivation equipment placement: basic tier grow lights, fans, pots/containers, basic irrigation... \*"
* Post-Harvest Processing: Basic processes are included: manual drying (hanging/racks, environment impacts quality), manual curing (jars, "burping"), and manual hand-trimming.
* Quote: "\* Drying: Manual hanging/rack in designated (player-built) dry space; environment impacts time/quality. \* Curing: Manual container curing (jars), manual 'burping'. \* Trimming: Manual hand-trimming.\*"
* Economy (NPC-Driven): The MVP economy is driven solely by NPCs. Players receive NPC-issued cultivation contracts (specific strain, quantity, quality, deadline) and can perform direct sales to limited NPC buyers. Basic operational costs (utilities, consumables, initial equipment) are managed.
* Quote: "\* MVP primary economic interaction: NPC entities via contracts & direct sales. \*"
* Quote: "\* NPC-issued cultivation contracts (specific strain/quantity/quality). \* Direct sales to limited NPC buyers. \*"
* Player Progression: Progression is driven by an initial Skill Tree (core cultivation, basic genetics, facility operation), unlocking new equipment and techniques through achievements/skill points. Narrative guidance (via ADA) leads to major milestones like unlocking the Warehouse map.
* Quote: "\* Player Progression (Core Loop): Initial Skill Tree branches: core cultivation, basic genetics, facility operation. \*"
* Quote: "\* Narrative guidance (AI Advisor ADA), initial objectives to Warehouse map unlock (major milestone).\*"
* Data, UI, & Feedback Systems: Essential systems for player decision-making include core environmental data dashboards (real-time sensor readouts), plant status UI panels, basic logs/notes, and an essential alert system for critical deviations. Data collection is manual with handheld meters for environment and plant health.
* Quote: "\* Data, UI, & Feedback Systems (Essential): Core environmental data dashboards (real-time sensor readouts). Plant status UI panels (essential health/growth info).\*"
* Quote: "\* Manual Environmental & Plant Sampling: Unlocks: Handheld meters (pH, EC/PPM, temp, humidity, basic soil moisture)...\*"

II. Deferred/Simplified Features (Post-MVP/Later Phases)

Many complex systems are intentionally simplified or deferred to future updates to ensure a manageable MVP scope. These include:

* Advanced Breeding Systems (complex traits, genetic analysis, tissue culture, genetic modification).
* Player-Driven Marketplace (MVP is NPC only).
* Advanced Automation & Robotics (complex late-game systems).
* Advanced Extraction & Product Formulation (oils, concentrates, edibles, topicals).
* Complex Physics Models (detailed fluid/airflow).
* Multi-Region Gameplay & Advanced Exterior World Simulation (MVP is internal facilities in a "white abyss").
* Deep Narrative & Complex NPCs (MVP has functional ADA and basic contract givers).
* AI Research Lab (advanced breeding prediction tool).

III. Narrative & World-Building

Narrative is a supportive, non-intrusive layer providing motivation and context, not the primary focus. World-building is subtle and diegetic (in-game discovery).

* AI Advisor (ADA): A key narrative element. ADA is a helpful, functional AI guiding the player via text-based UI (inbox, notifications). Synthesized voice-overs are used sparingly for critical alerts and major milestones. ADA delivers contracts, research directives, and subtle hints.
* Quote: "\* Key narrative element: AI Advisor (ADA), guiding entity; helpful, functional AI. \*"
* Quote: "\* ADA communication: primarily text-based UI (inbox, notifications, pop-ups). Synthesized voice-overs: sparingly for critical alerts, major milestones, initial intros; for impact, avoid annoyance; voice clear, neutral, professional. \*"
* Lore Delivery Methods: World details are fleshed out through in-game communications (industry news, science excerpts, NPC messages, internal memos), item descriptions (manufacturer, history, origin stories), research/skill tree unlocks (text blurbs on significance), and ambient environmental cues (news ticker, branding).
* Quote: "\* World fleshed out via non-intrusive, diegetic methods; organic lore discovery. \*"
* Quote: "\* Delivery Methods: In-Game Communications (Email/Messaging)... Item Descriptions... Research & Skill Tree Unlocks... Ambient Environmental Cues (Subtle)... \*"
* Lore Content Examples: The game world includes details on the state of the cannabis industry (post-legalization, corporations, regulations), the scientific/technological landscape (tech level, fictional institutions), cultural context (in-world views on cannabis), and historical milestones (events shaping the present).
* Quote: "\* Content of Lore (Examples): State of Cannabis Industry... Scientific & Technological Landscape... Cultural Context... Historical Milestones...\*"

IV. Progression Systems

Progression is a structural framework guiding the player journey and unlocking capabilities.

* Skill Tree ("The Tree"): The primary driver, visualized as a Cannabis plant. Leaves represent categories (Genetics, Cultivation, Environment, Construction, Harvest, Science, Business), unfurling to show Nodes (skills/concepts). Unlocking nodes introduces concepts and mechanics, while mastery is often tied to acquiring better equipment/tools.
* Quote: "\* Primary Driver: Skill Tree ('The Tree'): Character-centric, visualized as Cannabis plant. 'Leaves' (categories) vary size/prominence; unfurl to 'Nodes' (skills/concepts); plant grows/vibrancy increases with progression. \*"
* Quote: "\* Node Unlocking Philosophy: Node unlock: introduces core concept & associated game mechanics/simulations. Mastery/efficiency of concept via separate equipment/tool progression (purchased, researched, crafted). \*"
* Skill Point Acquisition: Main source is completing objectives/tasks. Successful harvests (quality/outcome based) are a secondary source.
* Quote: "\* Skill Point Acquisition Summary: Main source: Objective Completion... Successful Harvests: skill points via quality/outcome of final crop... \*"
* Research System: A dedicated system for discovery and specialized unlocks beyond the Skill Tree. Funded by Research Points (from contracts, data analysis, breeding breakthroughs). Unlocks include equipment blueprints, technique refinements, genetic insights, facility upgrades, and narrative elements.
* Quote: "\* Research System: Dedicated; discovery, specialized unlocks, resource mngmt beyond Skill Tree. Integrated: Research Points fund Skill Tree, or Projects available after node unlocks. \*"
* Narrative Milestones: Structural points in the progression guiding the player through development stages. Examples include securing funding, developing a strain for research, achieving certifications, or pioneering genetic lines. Milestones unlock Skill Tree sections, Research Projects, new maps, NPCs, and rewards.
* Quote: "\* Narrative Milestones: Structural framework for progression. Guide through dev stages, unlock capabilities. Examples: Early... Mid... Late... \*"
* Quote: "\* Milestones unlock: Skill Tree sections/tiers, Research Projects, new maps (Residential->Warehouse), NPCs/factions/markets, one-time rewards...\*"
* Equipment & Resource-Based Progression: Distinct from the Skill Tree, involving upgrading equipment and improving resource quality via currency and research.
* Meta-Progression: Persistent elements across saves, such as a Persistent Genetic Library (player-bred strains tied to account) and potential starting facility choices.

V. Construction & Facility Management

* Phased Maps: Progression moves from smaller, predefined spaces (Residential House) to large-scale, customizable sandbox facilities (Warehouse).
* Quote: "\* Core\_Concept\_Progression: Smaller, predefined spaces (Residential House) -> large-scale, customizable sandbox facilities (Warehouse, potential future maps: Greenhouse, Research Lab, Outdoor Field). \*"
* Utility Systems: Key systems include Electrical, Irrigation/Plumbing, and HVAC/Airflow. Players manually route utilities; no auto-routing in MVP. Utility highlighting (color-coding, glow for active components) is crucial for visualization in the "Utility Highlighting View" unlocked after Warehouse access.
* Quote: "\* Utility System Construction... Placement: Route pipes, ducts, wires in 3D (grid-snap or free). Considers collisions. \*"
* Quote: "\* Utility Highlighting: Color-Coding: Each utility type has a distinct, recognizable color... Selection/Active State: Currently selected or actively functioning components feature an emissive glow... \*"
* Microclimate Modeling: The simulation models localized environmental variations within controlled spaces. Equipment (fans, lights, HVAC) projects a radius or cone of influence for environmental impact, diminishing with distance/obstruction. Enclosed rooms form boundaries for calculations.
* Quote: "\* Abstracted\_Microclimate\_Modeling... Equipment (fans, ACs, heaters, heat-producing lights) project "radius of effect" or directional "cone of influence" for environmental impact...\*"
* Asset-Based Properties: Structural elements (walls) have their height and material properties defined by the selected asset type. Material selection is done when choosing the construction asset, not via a separate "paint" tool in MVP.
* Quote: "\* Dimensional Control & Asset-Based Properties... Height/thickness of structural elements (e.g., walls) primarily determined by selected asset type. \*"
* Quote: "\* Material Application Philosophy... Structural element material (drywall, concrete) inherent to chosen construction asset. Selecting an asset like "Concrete Wall Section" chooses form and material simultaneously.\*"

VI. Genetics & Breeding Systems

Genetics and breeding are a core pillar aimed at sophisticated discovery, experimentation, and innovation.

* Deep Genetics Simulation: A robust simulation of inheritance and expression is central. Key quantitative traits are polygenic. An optional in-game "AI Research Lab" (late-game) can provide simplified probabilistic outputs for breeding outcomes based on simulated biological data. Initial launch includes 5-10 foundational landrace-inspired strains.
* Quote: "\* Deep Genetics Simulation: Robust simulation of inheritance/expression is heart. Key quantitative traits (yield, potency) polygenic... \*"
* Quote: "\* Optional unlockable in-game "AI Research Lab": simplified algorithms for potential breeding outcomes... \*"
* Trait Library: A dynamic, player-populated database of all known in-game traits (cannabinoid profiles, terpenes, yield, flowering time, morphology, tolerances, resistances). Populated via acquisition (landraces, cultivars), breeding (novel expressions via pheno-hunting), and research (unlocking understanding).
* Quote: "\* 'Trait Library' System: Dynamic, player-populated database of all known in-game genetic traits (discovered/acquired). \*"
* Quote: "\* Content: Catalogs traits: Cannabinoid Profiles... Terpene Profiles... Yield Potential...\*"
* Breeding Mechanics: Core loop involves selecting parents, crossing, harvesting F1 seeds, and pheno-hunting (evaluating offspring and selecting the best). Elite individuals can be cloned, used as parents, or stabilized. Advanced techniques like backcrossing and inbreeding are planned. Stability vs. variability tension is modeled.
* Quote: "\* Breeding Mechanics: Core: Select parents, cross-pollinate, harvest seeds, grow F1. Pheno-Hunting: Grow offspring, evaluate phenotypes (visual, data), select best for traits...\*"
* Rare Genetic Acquisition: (Post-AR Removal) Robust in-game mechanics replace removed AR search/find. Methods include NPC-sponsored expeditions/grants, high-tier NPC contacts/faction reputation, lore-driven discovery quests, and specialist NPC vendors/collectors. Acquired landraces come with narrative context ("Acquisition Report"/"Origin Dossier").
* Quote: "\* Rare Genetic Acquisition (Post-AR Removal): AR search/find deferred... Robust in-game mechanics instead: NPC-Sponsored Expeditions/Grants... High-Tier NPC Contacts... Lore-Driven Discovery... Specialist NPC Vendors/Collectors. \*"
* Tissue Culture & Micropropagation: An advanced technique for rapid multiplication and preservation, requiring a dedicated sterile lab (high-tier Construction asset). Benefits include rapid cloning and long-term preservation. It is linked to the Science skill tree.
* Quote: "\* Tissue Culture & Micropropagation: Advanced rapid multiplication/preservation. Mechanics: dedicated sterile lab (high-tier Construction asset)...\*"

VII. Economy & Resource Management

The economic layer evolves from a basic NPC-driven system to a potential future player-driven marketplace.

* Initial NPC Economy (MVP): Primary income from selling to NPC buyers via contracts (specifying strain, quantity, quality). Basic operational cost management is present.
* Quote: "\* Initial NPC Buyer/Contract Economy (MVP Focus): NPC economy only for MVP. Income: selling to NPC buyers via contracts (specify strain, quantity, quality). \*"
* Future Player-Driven Marketplace (Post-MVP): A core future expansion allowing extensive in-game trading, primarily of genetics (seeds, cuttings) and equipment. Based on Supply & Demand principles. Includes order management and potential future market data analysis. Reputation (user/company) is crucial, affected by product quality and contract fulfillment.
* Quote: "\* Future Player-Driven Marketplace (Post-MVP): Core future expansion; extensive, active in-game trading. Tradable: All game attributes; largest segments: genetics (seeds, cuttings), equip. \*"
* Quote: "\* Reputation (user/company): affects NPC interactions (prices, contracts), P2P trade (trust, value); tied to crop quality...\*"
* Robust Resource/Currency Sinks: Mechanisms to prevent inflation include Marketplace Tax & Listing Fees (in the future player market), NPC Vendors selling essentials, rare items, and services (like advanced lab analysis) at high prices, and ongoing operational costs (utilities, consumables, equipment).
* Quote: "\* Robust Resource/Currency Sinks: Prevent inflation, maintain value. Marketplace Tax & Listing Fees... NPC Vendors: sell essentials, rare genetics, blueprints, services (adv. lab analysis high fee) at fixed, high prices; removes currency. Operational Costs: utilities, consumables, equip purchase/repair, upgrades, research funding; ongoing sinks. \*"
* Resource Management: Players track consumable quantities (nutrients, medium, water, fuel, CO2, building materials, seeds/clones). Depletion rates are real-time, tied to the time scale.
* Quote: "\* Resource Management: Track consumable quantities (nutrients, medium, water, fuel). Depletion rates real-time, tied to time scale; reserves critical at faster speeds. \*"

VIII. Data, UI, and Feedback Systems

UI/UX are critical gameplay assets, presenting complex simulation data intuitively and effectively for data-driven decision-making.

* Aesthetics & Goal: Modern, clean, sophisticated, visually stunning, intuitive, functional UI. Goal is to present complex data accessibly for actionable insights, using a "dark mode" palette. Icons are abstract line art; data visualization is prioritized for clarity and aesthetics (clean lines, subtle gradients, logical colors).
* Quote: "\* Aims: modern, clean, sophisticated, visually stunning, intuitive, functional. Goal: present complex data effectively without overwhelming; 'dark mode' palette. \*"
* Quote: "\* Data Visualization: CRITICAL FEATURE; displays (graphs, charts, readouts) exceptionally clear, easy to interpret, aesthetic, useful; clean lines, subtle gradients, logical Accent/Functional colors; visuals prioritized over text. \*"
* Data Points & Collection: Data collected includes environmental (sensors), growing medium (manual samples, potential probes), plant data (visual, simulated chlorophyll), simulated lab analysis (abstracted initially), operational, utility, and genetic data.
* Quote: "\* Data Points & Collection: Environmental (real-time sensor: Temp, RH, VPD, CO2, PAR/PPFD from player-placed sensors); Growing Medium (manual sample: EC/PPM, pH, Temp, VWC%); Plant Data (visual inspect: health, stage, structure, color; manual sample: sim Chlorophyll meters); Simulated Lab Analysis (potential advanced: tissue nutrient levels, post-harvest cannabinoid/terpene profiles; initially abstracted off-site); Operational (resource consumption, costs, task time, yield); Utility dashboard (breakdown, costs); Genetic (phenotypes, sim lab results, potential genetic marker results). \*"
* Data Presentation & UI: Includes Environmental Data Dashboards (real-time/summarized, customizable), Graphs & Charts (historical trends, multi-variable plots), Simulated Lab Analysis Results (values, charts), Breeding Interface, Facility Management Overlays (Utility View - "X-Ray", Zoning, Resource Inventory), Operational/Financial Data, Alerts & Notifications (visual/audio, tiered: Blue/Info, Yellow/Warning, Red/Critical), and Historical Logs & Notes.
* Quote: "\* Data Presentation & UI: Env. Data Dashboards/Overlays... Graphs & Charts... Sim Lab Results... Breeding Interface... Facility Mngmt Overlays... Operational & Financial Data... Alerts & Notifications... Historical Logs & Notes...\*"
* Quote: "\* Alerts & Notifications: Visual/audio cues (Env out-of-range, Pest, Root Rot). MVP. Critical player feedback. Tiered alerts MVP design. Blue/Info, Yellow/Warning, Red/Critical.\*"
* Quote: "\* Utility View ('X-Ray') crucial for MVP construction/troubleshooting. \*"
* Manual Data Acquisition & Plant Work Loop: Players identify a need, select a tool (cursor change, visible tool), click the target asset (plant, substrate, room), enter "Action Mode" (tool-specific zoomed view), observe the readout/animation, and data is auto-logged. This loop applies to environmental samples, plant work (pruning), etc.
* Quote: "\* Manual Data Acquisition Loop (Tool-Based): Identify need -> Select inventory tool... -> Click target asset... -> Enter 'Action Mode'... Observe animated tool readout -> Data auto-logged...\*"
* Quote: "\* Example (pH): Select meter -> select plant -> close-up pot/substrate view, meter animates reading, data auto-logged -> back out. \*"
* Rendering Style & Quality: Visually sophisticated and high-quality, slightly stylized but grounded. Focus on detail and clean visuals rather than photorealism. High geo detail/texture resolution for core assets, aggressive LODs (especially for plants), and PBR materials. Performance optimization is a priority, with initial scope limited for quality, expanding post-launch.
* Quote: "\* Rendering Style & Quality: Visually sophisticated, high-quality; slightly stylized but grounded. Detail/clean visuals emphasized, not photorealistic. \*"
* Quote: "\* Initial\_Launch\_Priority: High visual quality/detail within constrained scope...\*"

IX. Time Mechanic

Time acceleration is a key mechanic, but implemented with safeguards to prevent exploits.

* Time Scale Control: Players can control the passage of time.
* Transition Inertia: Prevents quick changes in time scale. Initiating a change requires confirmation and locks the player out of further changes while the speed ramps up/down over a "transition duration". The duration is proportional to the magnitude of the speed change.
* Quote: "\* 'Transition Inertia' System for Time Scale Changes: Concept: Prevents exploitation, encourages deliberate use; player cannot initiate another speed change during transition. \*"
* Quote: "\* Duration Calculation: Percentage (e.g., 5-10%) of real-world time for one in-game day at the slower of the two speeds. Larger jumps = more gradual, longer lock. \*"
* Time Scale-Dependent Variables: Minor risk/reward variables are tied to time scale. Slower speeds may offer slightly higher maximum genetic expression potential, while faster speeds might slightly increase the probability/severity of minor stressors if not perfectly managed.
* Quote: "\* Subtle Time Scale-Dependent Variables (Risk/Reward): Genetic Expression Potential: Slower speeds may offer slightly higher maximum potential quality... Stress Event Probability/Severity (Brainstorming): Faster speeds might slightly increase base probability/severity of minor stressors...\*"
* Offline Time Progression: Players can choose the time scale (including pause) for offline periods.

X. Realism Data & Knowledge Base

Ensuring authenticity ("Realism Bias" alignment) is crucial.

* Data Sourcing & Validation: Data is sourced from reputable public sources (peer-reviewed papers, university publications, guides). Expert consultation is considered budget/availability permitting. Info is cross-referenced for consensus.
* Quote: "\* Securing Realism Data & Knowledge Base: Accurate, verifiable info crucial for authenticity, "Realism Bias" alignment. Process for Sourcing/Validating Data: Public-Domain Knowledge Foundation... Expert Consultation (Considered, Budget/Availability Dependant)... Cross-Referencing/Consensus...\*"
* Focus on Established Principles: Simulation models prioritize well-understood biological/chemical processes.
* Quote: "\* Focus on Established Scientific Principles: Simulation prioritizes modeling on well-understood biological/chemical processes. \*"
* GxE Modeling: Simplified, believable mathematical/logical models simulate how environmental factors impact cannabis morphology, growth, health, and metabolites.
* Quote: "\* GxE (Genotype x Environment) Interaction Modeling: Identify key environmental factors... Develop simplified, believable mathematical/logical models for GxE responses...\*"
* Genetic Trait Data: Core heritable traits are defined with plausible ranges and simplified inheritance models derived from cannabis genetics literature.
* Quote: "\* Genetic Trait Data: Define core heritable traits... Plausible ranges, simplified inheritance... from cannabis genetics literature. \*"
* In-Game Documentation: Key validated information is conveyed to players via in-game guides and ADA explanations.
* Quote: "\* Iterative Refinement & In-Game Documentation: "Realism data" subject to ongoing review/refinement... Key validated info to players via in-game guides ("Plant Problems Guide"), ADA explanations. \*"

This briefing document provides a comprehensive overview of the key aspects of Project Chimera as detailed in the provided source excerpts, highlighting the core MVP features, planned future expansions, narrative approach, progression systems, and technical/design philosophies.