Infrastructure for Credible Ecosystem Outcomes

A White Paper on High-Integrity Water Stewardship and the Orenna Registry Model

Published	December 2025
Version	1.0
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1. Executive Summary

The transition of corporate environmental commitments from qualitative narratives to quantified, auditable outcomes represents one of the most significant shifts in global capital markets in the 21st century. Historically, corporate water stewardship was relegated to the periphery of sustainability reporting, often characterized by philanthropic donations or small-scale local projects with limited scientific oversight.

However, as the global freshwater crisis intensifies—with over two billion people lacking access to safe drinking water and two-thirds of the global population projected to face water shortages by the end of 2025—water has moved from the periphery to the center of enterprise risk management.

> *Major global entities, particularly hyperscale technology providers and industrial leaders, have recognized that the permanent availability of safe water resources is essential not only for human well-being but for the continued viability of their operations.*

This realization has led to a surge in ambitious corporate targets, such as Google's commitment to replenish 120% of its freshwater consumption and Microsoft's goal to become water positive by 2030. Yet, the implementation of these goals has outpaced the development of the infrastructure required to measure, verify, and report these benefits with the level of integrity required by modern financial and regulatory standards.

2. The Convergence of Corporate Ambition and Methodological Maturity

The year 2025 serves as a hinge moment for water stewardship, defined by the release of rigorous new accounting frameworks that provide a scientific foundation for corporate claims. The publication of **Volumetric Water Benefit Accounting (VWBA) 2.0** and the first-of-its-kind **Water Quality Benefit Accounting (WQBA)** guidebook in September 2025 has provided practitioners with a standardized, six-step approach for identifying, quantifying, and communicating water stewardship outcomes.

These methodologies reflect years of empirical learning and extensive partner consultation, aimed at ensuring that every gallon of water "replenished" represents a genuine contribution to watershed health and community resilience.

> *"Corporate practitioners are no longer permitted to simply 'count drops.' The new standard demands a deep understanding of the local catchment context, recognizing that the ecological and social value of a water benefit is entirely dependent on where and when it occurs."*

This shift toward context-based targets is reflected in the strategies of market leaders. Meta, for example, has established a goal to restore 200% of the water it consumes in high-water-stress regions, acknowledging that the impact of its operations is most acute in these vulnerable landscapes. This level of specificity requires a level of data integrity that traditional sustainability reporting—often characterized by fragmented documentation and inconsistent artifacts—cannot provide.

3. The Core Problem: The Infrastructure Gap in Environmental Markets

Despite the clear demand for high-integrity water benefits, the market currently suffers from a profound **infrastructure gap**. Corporate sustainability claims are increasingly coming under the purview of law, requiring them to be auditable via strict due diligence accounting. Today, the evidence for these claims is often scattered across various implementers, consultants, and internal reporting teams, leading to fragmented documentation and high transaction costs.

Without a neutral, audit-ready infrastructure layer, each buyer and implementer is forced to build bespoke workflows, creating "trust bottlenecks" where buyers must rely on the counterparty's assurances rather than tamper-evident evidence.

Key Finding:

In the voluntary carbon market, project developers spend up to 60% of their time managing duplicative data requests, and buyers spend more than a year on due diligence for a single project.

To avoid these pitfalls, the water stewardship market requires an infrastructure layer that standardizes the entire lifecycle of an outcome—from intake and verification to issuance, retirement, and reporting. **Orenna Holdings, PBC** has been established specifically to build this "registry rails" layer, serving as a neutral system-of-record for high-integrity water benefit claims.

4. The Orenna Solution: Standardizing the Lifecycle of Water Benefits

Orenna's architecture is designed as a "rails-first" platform that does not compete with implementers or verifiers but instead provides the software layer that connects them through standardized evidence, workflows, and lifecycle state transitions. By focusing on the verification workflow, registry rails, tokenization, and reporting of benefits aligned with VWBA 2.0 and WQBA, the platform enables the creation of "claims packs" that are suitable for enterprise reporting and professional assurance.

4.1 Technological Architecture and Data Integrity

The core of the Orenna platform is built on the principles of **immutability** and **transparency**. By leveraging a "hash-on-chain, evidence-off-chain" model, the platform ensures that raw documents—which may contain sensitive proprietary information—remain encrypted and access-controlled, while the blockchain stores cryptographic commitments (hashes) to those documents.

This ensures that once an evidence pack is submitted and verified, it cannot be altered without detection, creating a permanent and tamper-evident lineage for every water benefit claim.

The platform utilizes a **schema-first architecture** that is natively aligned with the six steps of the VWBA 2.0 methodology. This alignment allows the platform to act as a shared language between implementers, verifiers, and buyers, reducing friction and increasing the repeatability of the verification cycle. Furthermore, the platform supports the integration of W3C Verifiable Credentials (VC) v2.0, which allows for the expression of machine-readable claims that are cryptographically signed by the issuer.

Architectural Feature	Functionality	Impact on Market Integrity
Cryptographic Commitment	Storage of document hashes on-chain	Tamper-evident evidence lineage and audit readiness
Role-Based Workflow	Collaboration gates for implementers, verifiers, and buyers	Standardized QA gates and reduced per-project verifier burden
Unique Serialization	Serialization of units (e.g., MG/Year by vintage)	Prevents double counting and ensures clear chain-of-custody
Method-Native Schema	Logic built around VWBA 2.0 and WQBA 2025 guidebooks	Comparable reporting across basins and project types
Verifiable Credentials	Machine-readable attestations signed by verifiers	Integration with financial-grade digital infrastructure

5. The Business Model: Monetizing Software Rails

Orenna operates as an infrastructure company, prioritizing scalability by focusing on software workflows rather than labor-intensive project delivery. The business model is structured to monetize the "rails" through a combination of program licenses for implementers, subscription tiers for enterprise buyers, and discrete event-based fees.

The pricing architecture is designed to encourage full-portfolio adoption and to be the system-of-record for water, water quality, and Nature-based Solutions (NbS). Optional "Assurance Packs" are available to provide faster audit response SLAs and custom evidence exports for high-visibility reporting cycles.

6. Leading the Implementation: The Resource Environmental Solutions (RES) Pathway

The success of a registry infrastructure depends on the quality of the projects it tracks. Orenna's go-to-market strategy centers on a partnership with **Resource Environmental Solutions (RES)**, the nation's largest nature-based solutions provider. RES brings decades of experience in watershed science and ecological restoration, having conserved and protected over 88,000 acres of land and restored nearly 700 miles of streams.

6.1 Case Study: The Klamath River Restoration

One of the most profound examples of high-impact ecosystem restoration in history is the **Klamath River Renewal Project**. RES serves as the primary habitat restoration contractor for this undertaking, which involves the removal of four hydroelectric dams to restore a free-flowing river. The removal of the dams in 2024 opened access to over 400 miles of critical fish habitat, but the subsequent restoration of the formerly inundated lands is vital to the long-term success of the project.

The restoration effort involves an "adaptive design" process that adapts stream reconstruction to the terrain exposed after the reservoirs are drained. In late 2025, RES celebrated the completion of tributary restoration at key sites, marking the end of structural "surgery" and the beginning of ecological "healing". This project demonstrates the scale and complexity of the interventions that Orenna is designed to track, from the re-grading of streambank slopes to the placement of large wood and boulder habitat structures.

6.2 Multi-Benefit Restoration and Water Quality

While the Klamath project focuses heavily on habitat and fish passage, other RES initiatives highlight the growing importance of water quality. In projects like the Bacon's Castle Nutrient Bank, RES implements restoration activities to maximize ecological uplift and generate nutrient offsets. This aligns with the new WQBA methodology, which provides a framework for quantifying the reduction of pollutants like nitrogen and sediment.

By integrating these complex, multi-benefit projects into a standardized registry, Orenna allows buyers to capture the full value of their investments—including both the volumetric replenishment (MG/year) and the specific water quality indicators (e.g., pounds of nutrient removed).

7. The Role of Independent Verification and Assurance

Integrity is the primary product of the Orenna platform. To ensure that water stewardship claims are defensible, they must undergo rigorous third-party verification. **SCS Global Services** has emerged as a key partner in this area, launching "Water Positive Verification Services" in May 2025 that are specifically aligned with the VWBA 2.0 methodology. This verification process assesses whether a project has the correct strategy, documentation, and volumetric evidence to support a corporate claim.

Verification Body	Program/Certification	Key Focus
SCS Global Services	Water Positive™ Verification	Assessment of projects against VWBA 2.0 methodology
The Water Council	WAVE: Assess & WAVE: Action	Enterprise-wide water stewardship verification
Alliance for Water Stewardship (AWS)	AWS International Water Stewardship Standard	Site-based and catchment-based water management
BioCarbon Standard	Verified Water Credits (VWC)	NbS certification with focus on infiltration gains

The Alliance for Water Stewardship (AWS) provides another foundational layer of trust through its International Water Stewardship Standard. This framework encourages major water users to understand their risks and work collaboratively for sustainable water management within a catchment context. Certification to the AWS Standard—offered at Core, Gold, and Platinum levels—demonstrates that a site has met the global benchmark for responsible stewardship.

Platforms like Orenna reduce the "verification bottleneck" by providing verifiers with standardized evidence packs and automated workflows, allowing them to focus on technical review rather than data collection.

8. Digital MRV (dMRV): The Future of Real-Time Accountability

A significant trend for 2025 is the integration of **Digital Monitoring, Reporting, and Verification (dMRV)** technologies. Traditional MRV processes are often costly and time-consuming, relying on manual measurements that might occur only once every few years. The shift toward dMRV—leveraging IoT sensors, satellite remote sensing, and AI-driven analytics—allows for near-real-time tracking of environmental variables such as moisture, temperature, and water flow.

The BioCarbon Standard and Planet 2050 established a dMRV Working Group in October 2025 to co-design best practices for integrating these technologies into carbon, biodiversity, and water certification programs. By utilizing IoT sensors and blockchain, organizations can verify project impacts in real-time, ensuring that benefits are only issued when they are physically delivered. This technological advancement is crucial for maintaining the integrity of voluntary markets and combating "greenwashing" skepticism.

9. Scaling Through Collective Action and the 100 Priority Basins

The global scale of the water crisis means that no single company can achieve water resilience in isolation. The **CEO Water Mandate** and the **Water Resilience Coalition (WRC)** have identified 100 "Priority Basins" where water stress, business risk, and social need are most acute. These basins, which include critical transboundary systems like the Rio Bravo/Rio Grande, are the primary targets for collective action.

The WRC's 2030 ambition is to achieve "Positive Water Impact" (PWI) in these 100 basins, supporting over 3 billion people. PWI is a quantifiable framework that measures progress against three dimensions: water availability, quality, and access (WASH). Collective action projects, such as the Rio Bravo Collaborative, unite corporations, governments, and civil society to engage in research, innovation, and direct infrastructure improvements.

Attribution Mechanics:

For collective action to be successful, it requires a transparent and auditable "attribution plan." If multiple companies invest in a single nature-based project, the registry must ensure that the resulting benefits are distributed proportionally and that no unit is claimed more than once. Orenna's registry rails are built with these attribution mechanics as a core feature.

10. Institutional Drivers: Regulation and Investor Pressure

The demand for high-integrity water infrastructure is also being driven by a changing regulatory and investor landscape. The Ceres 2025 "Valuing Water Finance Initiative" benchmark highlights that while companies have made progress in setting water use targets, corporate action on water quality remains insufficient. Investors are increasingly treating water as a financial risk, demanding that boards and senior management oversee water management with the same rigor as financial performance.

Regulation is also turning toward "Climate Transition Plans" (CTP) and the European Union's **Corporate Sustainability Reporting Directive (CSRD)** as mediums for disclosing progress against targets. These frameworks emphasize "double materiality"—the concept that a company's impact on the environment is as material to investors as the environment's impact on the company. In this environment, having a "System of Record" for water benefits is no longer a luxury; it is a compliance requirement.

11. The Orenna Team and Governance Model

Building the infrastructure layer for credible water outcomes requires a team with both scientific depth and operational experience. Orenna is led by **Ben Snyder (CEO)**, a Regional Engineering Director with over 20 years of experience in watershed science and ecosystem restoration design. Ben's expertise spans hydraulic modeling and sediment transport, and he has played a lead role in large and complex ecosystem restoration projects across the western United States.

The team also includes **Jerry Hess (CFO)**, who brings several decades of business finance and accounting experience across multiple economic centers, and **Fabienne Snyder (CCO)**, an expert in production design and creative direction.

Orenna is supported by advisors like Tim Degraff, Regional VP at RES, and Dr. Brian Cluer of NOAA Fisheries, who provide strategic guidance on implementer workflows and regulatory perspectives.

11.1 Governance Structure

As a **Public Benefit Corporation (PBC)**, Orenna is legally committed to the mission of scaling credible restoration. The organization aims to maintain dual governance: corporate governance for legal accountability and scoped DAO governance for stakeholder legitimacy and transparency. This hybrid model ensures that the platform remains a neutral, interoperable set of rails that can evolve with the needs of the entire water stewardship ecosystem.

12. Strategic Outlook: Toward a Global Ecological Registry

The long-term vision for Orenna is to become the underlying infrastructure for all nature-based restoration outcomes. While the initial focus is on volumetric water benefits (VWBA) and water quality (WQBA), the platform's architecture is natively extensible to biodiversity and habitat credits.

As the market for "nature capital" matures, investors and corporations will require a single, high-integrity rail to manage a portfolio of multi-benefit projects—where a single intervention might produce water replenishment, nutrient reduction, carbon sequestration, and species protection outcomes.

> *"The convergence of scientifically rigorous accounting, digital monitoring technology, and tamper-evident registry infrastructure is creating a new paradigm of environmental accountability."*

For enterprise buyers, the Orenna platform provides the "claims packs" and audit trails needed to satisfy regulators and investors. For implementers, it provides the standardized workflows needed to package and monetize high-impact restoration. By making ecosystem restoration measurable, verifiable, and reportable, Orenna is providing the essential rails for a water-resilient and nature-positive global economy.

13. Managing Risk in a Fragmented Market

The transition to this new paradigm is not without risks. **Methodology adoption risk** remains a concern as different standards compete for market dominance. Orenna mitigates this by maintaining a "method-neutral" rail that can support multiple schemas and versions over time, ensuring that buyers can report against whatever standard their specific jurisdiction or industry requires.

Additionally, the platform addresses the "verification bottleneck" by providing tools that increase verifier throughput without sacrificing rigor.

Market structure risk—the possibility that voluntary water markets will remain illiquid—is mitigated by Orenna's focus on the "infrastructure value" of the platform. Even in the absence of a liquid credit market, enterprise buyers need the platform to manage their own portfolios, fulfill their public commitments, and meet their regulatory disclosure obligations.

14. Conclusion: The Path Toward Credible Outcomes

The evolution of water stewardship from corporate philanthropy to a high-integrity asset class requires a fundamental transformation in how environmental data is captured and verified. The release of the 2025 VWBA and WQBA guidebooks has provided the scientific compass, while digital technologies like blockchain and dMRV provide the technical engine. However, these components must be integrated into a neutral, auditable infrastructure layer to be effective.

Orenna Holdings, PBC is filling this critical gap by providing the registry rails for the future of ecosystem restoration. By standardizing the evidence, verification, and issuance of water benefits, Orenna enables enterprise buyers to make claims with confidence and implementers to scale their impact.

> *As global corporations move toward their 2030 targets, the Orenna model provides the essential infrastructure for a future where nature's services are properly valued and restored for the benefit of all stakeholders.*

Works Cited

1. Water sustainability resources and technology - Microsoft. https://www.microsoft.com/en-us/sustainability/learning-center/water-sustainability

2. Water: Essential for Life, Critical for Business — Why Companies Must Act Now. UN Global Compact. https://unglobalcompact.org/compactjournal/

3. Collective Action for a Water Resilient World. CEO Water Mandate, 2025.

4. 2025 Google Water Stewardship Project Portfolio. https://sustainability.google/reports/

5. Accelerating Sustainability. Microsoft CSR, 2025.

6. Orenna Business Plan v1.3. Internal document.

7. Volumetric Water Benefit Accounting 2.0: Guidance for implementing. World Resources Institute, 2025. https://www.wri.org/research/volumetric-water-benefit-accounting-2-0

8. New Guidebooks on Corporate Water Benefit Accounting. World Resources Institute, 2025.

9. Water Quality Benefit Accounting: Guidance for implementing, evaluating, and claiming water quality benefits. World Resources Institute, 2025.

10. Volumetric Water Benefit Accounting 2.0 (VWBA 2.0). LimnoTech, 2025.

11. 2025 Sustainability Report. Meta, 2025. https://sustainability.atmeta.com/

12. Volumetric Water Benefits. Meta Sustainability, 2025.

13. The Carbon Crediting Data Framework. RMI, 2025. https://rmi.org/carbon-crediting-data-framework/

14. How Blockchain Could Help Build Trust in Nature Data. Nature Tech Collective, 2025.

15. Verifiable Credentials Data Model v2.0. W3C, 2025. https://www.w3.org/TR/vc-data-model-2.0/

16-18. Resource Environmental Solutions. https://res.us/

19-22. Klamath River Renewal Corporation and RES project documentation.

23. Browse Projects - Resource Environmental Solutions. https://res.us/home/browse-projects/

24. 2025 Google Water Stewardship Project Portfolio. Smart Energy Decisions.

25-26. Water Positive™ Verification for Water Stewardship Actions. SCS Global Services, 2025.

27-28. WAVE: Water Stewardship Verified. The Water Council, 2025.

29-30. AWS Standard. Alliance for Water Stewardship, 2025. https://a4ws.org/

31-32. Public Consultation and dMRV. BioCarbon Standard, 2025.

33. How technology is revolutionising carbon markets for climate action. South Pole, 2025.

34-35. MRV research and analysis. Nature Tech Collective/Memos, 2025.

36. The Guide to White Paper Creation for Demand Generation in 2025. Intent Amplify.

37-39. Collective Action & The 100 Priority Basins. Water Resilience Coalition, 2025.

40. Ceres 2025 Valuing Water Finance Initiative benchmark.

41-44. Climate governance and corporate sustainability frameworks. World Economic Forum, BSR, OECD, ECGI.

45. Why Every Company Needs a Biodiversity Strategy in 2025. Palladium Group.

46. Launching the Water Quality Benefit Accounting Guide. The Nature Conservancy, 2025.

47. 2025 State of Integrity in the Global Carbon-Credit Market. MSCI, 2025.

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