[redacted]

UIC CLASS VI GEOLOGIC STORAGE OF CO_2 PERMIT APPLICATION

Loving CCS Hub

[redacted]

Loving County, Texas

Section 3: Construction Details / Engineering Design

[40 CFR §146.82, §146.86, §146.87]

Prepared for:

EPA Region 6

Underground Injection Control Section

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3.0 CONSTRUCTION DETAILS / ENGINEERING DESIGN [40 CFR 146.82(a)(7), (a)(8), (10), (11), (12) 146.86, 146.87]

Milestone's permit **Section 3** describes the engineering design details and **Section 4** includes operational strategies employed during the planning of the proposed [redacted]

3.1 Engineering Design [40 CFR 146.82(a)(11), (12), 146.86]

The design of the injection wells is optimized to permanently sequester CO_2, prevent the movement of CO_2 and subsurface fluids into USDWs, and account for various operational factors, such as injection volume, rate, chemical composition, metallurgical evaluations, physical properties of the injectate fluid, and the corrosive nature of the injectate fluid and its impact on wellbore components. The operation of the wells will be managed to ensure efficient use of pore space in the reservoir and to contain the CO_2 within the authorized injection unit both during and post-injection.

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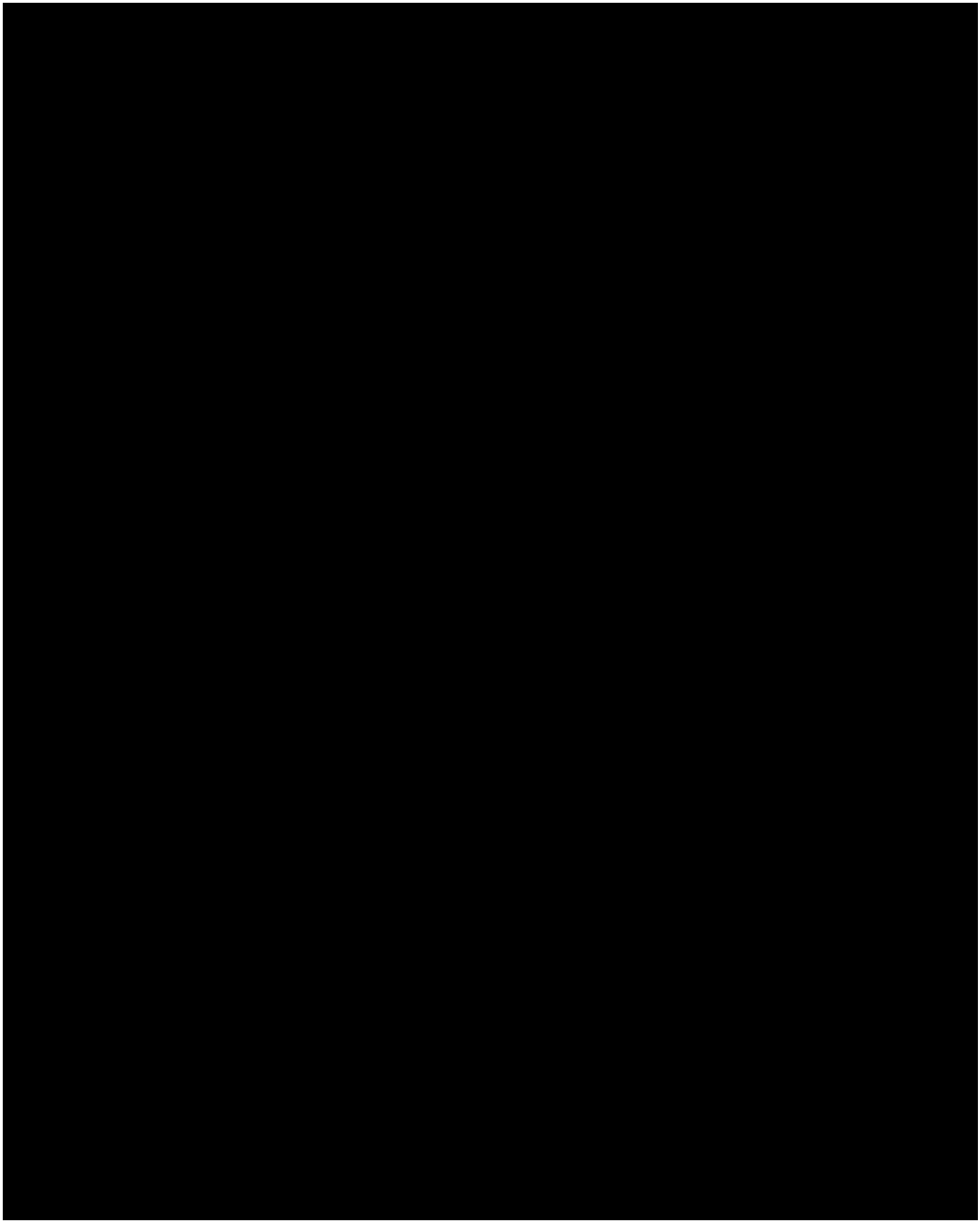
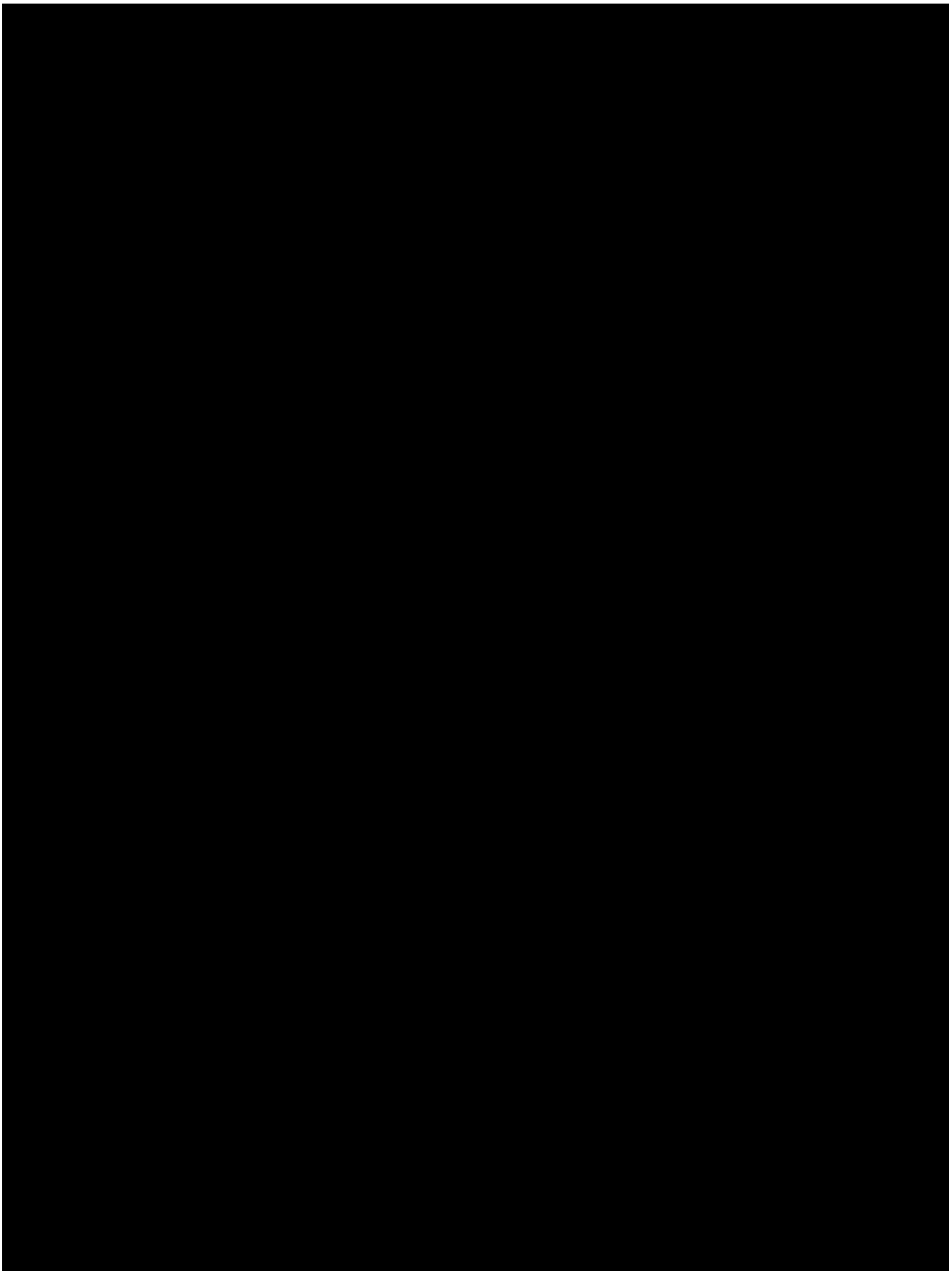
3.3.9 Wellhead Discussion

The wellhead proposal should be designed to combat working pressures (**Fig. 3-9**). [redacted]





3.3.11 Cement Discussion

Milestone will use corrosion resistant cement over [redacted]

Milestone is currently evaluating CO_2 resistant cement from the industry's leading suppliers, Halliburton and SLB. ThermaLock is an option from Halliburton. EverCrete and Ecoshield are two (2) options from SLB. All the cement solutions have been thoroughly tested and are designed to maintain reliable corrosion resistant properties throughout the life of an injection or monitoring well exposed to CO_2. The products listed above are all rated for the temperature and pressure ranges of the [redacted] They will provide long lasting zonal isolation.

ThermaLock is a non-Portland based cement that is a specially formulated calcium aluminate phosphate system which gives it resistant properties to CO_2 corrosion.

Evercrete has long been the reliable workhorse for CO_2 injection wells. Its low permeability allows it to withstand corrosive effects of supercritical CO_2 and has self-healing properties if a fracture is formed. **Figure 3-12** shows the compressive strength of Evercrete compared to Portland Cement when exposed to CO_2 and brine or carbonic acid over time. Ecoshield is a geopolymer cement free system that provides an alternative to Portland cement while delivering comparable performance. EcoShield system matches the rheology, thickening time, and compressive strength properties of Portland cement-based systems. The technology fits within standard oilfield cementing workflows without major changes to the design process, onsite execution, or post job evaluation.

This is an evolving science and Milestone will continue evaluating the most suitable corrosion resistant cement product for the proposed well construction. Cement and cement additives will be compatible with the injectate stream and formation fluids and of sufficient quality and quantity to maintain integrity over the design life of the geologic sequestration project. The integrity and location of the cement shall be verified using technology capable of evaluating cement quality radially and identifying the location of channels to ensure that USDWs are not endangered.

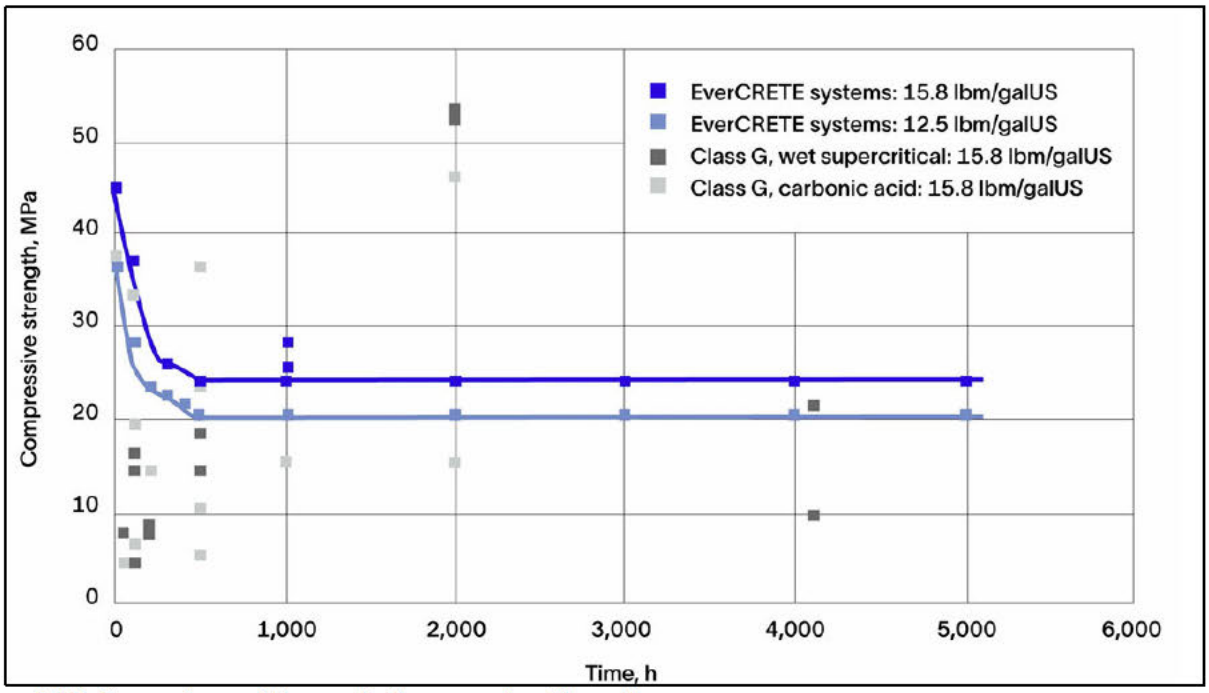
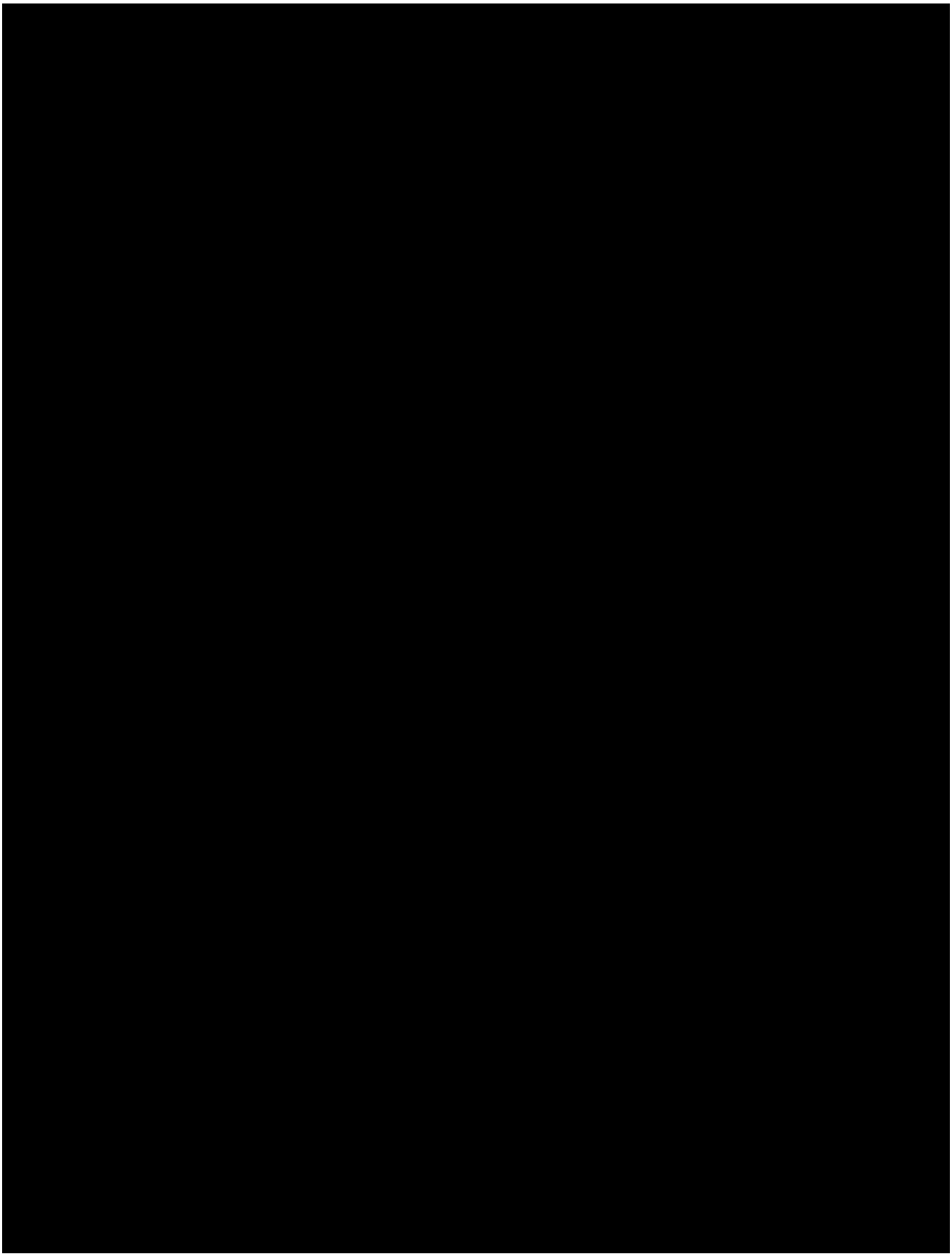
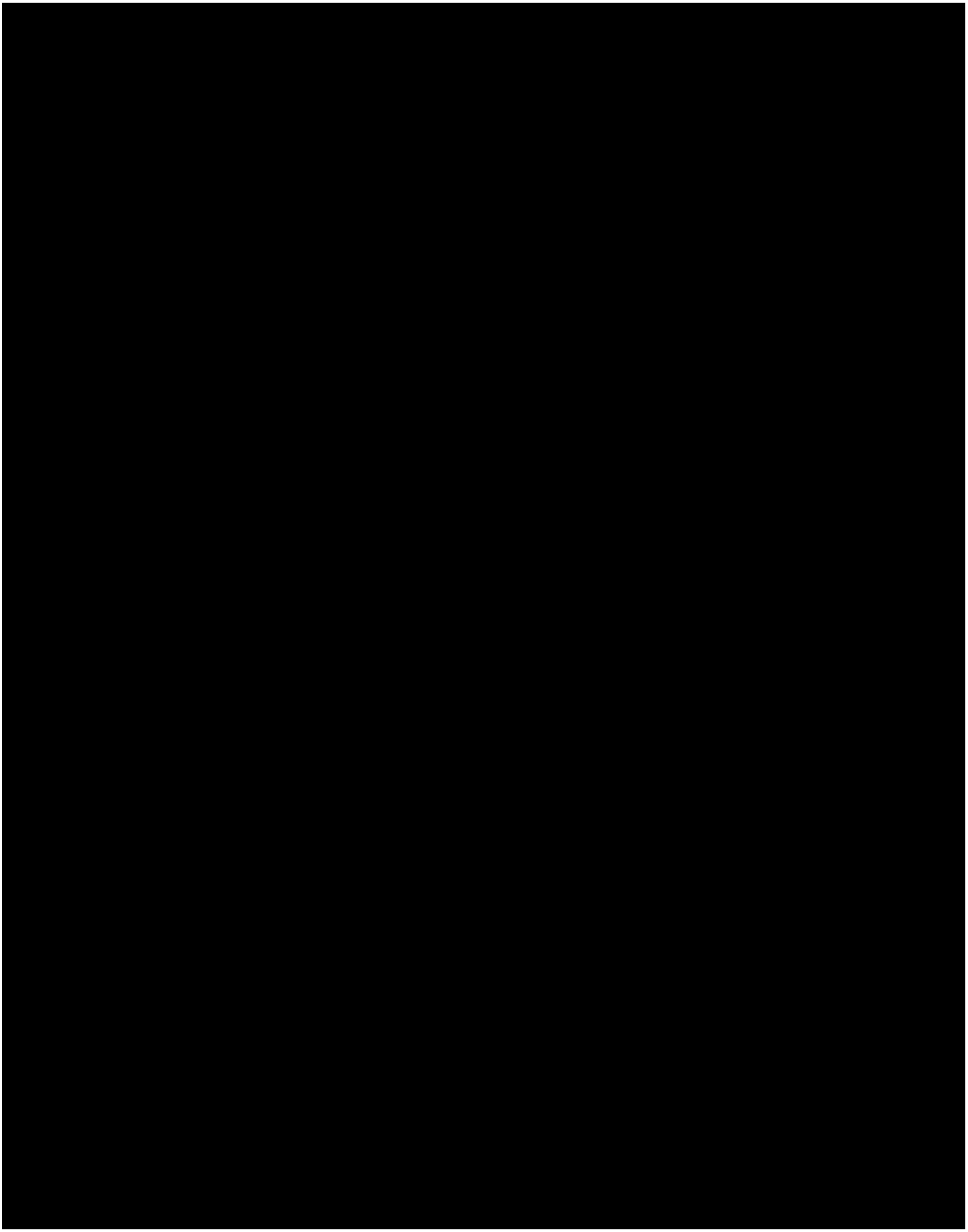


Figure 3-12: Comparison of Evercrete Compressive Strength
Evercrete(Blue) vs Portland Cement (Grey) over time when exposed to Supercritical CO2 and Brine or Carbonic Acid

[redacted]





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