1) **Title:** Santa Ynez River Water Conservation District: Water Supply Management Strategy

2) **Proposed by:**
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3) **Bren Faculty Sponsor(s):** Patricia Holden and John Melack were consulted regarding the project proposal and feasibility.

4) **Proposed Project**

   **A. Problem Statement:** The State of California Office of Environmental Health Hazard Assessment has set a new public health goal for the maximum contaminant level (MCL) of chromium $^{6+}$ (Cr$^{6+}$) at 0.02 parts per billion (ppb) in drinking water (OEHHA 2011). This change has led to new legislation that is expected to pass imminently and will drastically affect, financially and strategically, all suppliers of drinking water with naturally occurring levels of Cr$^{6+}$ in their water supply. The Santa Ynez River Water Conservation District, Improvement District #1 (ID1) contains naturally occurring Cr$^{6+}$ in approximately a quarter of its water supply sources and must therefore revise ID1 water supply management plans in anticipation of this forthcoming chromium legislation.

   **B. Project Objectives:** Based on the anticipated ruling of a new Cr$^{6+}$ MCL by the state of California, this project seeks to:
   - Develop an updated, cost-effective water supply management strategy for ID1 that makes treatment and technology recommendations for long-term management plans to protect the future stability of ID1 groundwater supplies.
   - Evaluate practicality and economic viability of alternative water sourcing (e.g. surplus wells not in use due to high nitrate concentrations) in the case that the Cr$^{6+}$ testing or treatment options prove less economically feasible.
   - Develop cost-effective water management strategies adapted for applicability to additional water districts or state-wide water sources such as the State Water Project.

   **C. Project Significance:** Chromium is commonly used in manufacturing and industrial applications; it also naturally occurs through the erosion of soil and rock (Sutton 2009). Chromium is found in different forms, one of which is hexavalent chromium (Cr$^{6+}$), a potentially toxic form of chromium that has been documented to cause gastrointestinal, stomach and other cancers. The United States Environmental Protection Agency (EPA) set the current MCL for total chromium at 100 ppb. The California (CA) EPA lowered the drinking water MCL for total chromium to 50ppb. Even with stricter regulations, recent concern over Cr$^{6+}$ has risen on account of high levels of contamination found in CA drinking water. These abnormal Cr$^{6+}$ levels were linked to increased cancer rates in two CA cities and
eventually led to law suits against public utility companies. Those legal actions have engendered the state of California to set a public health goal of 0.02ppb for Cr$^{6+}$ (OEHHA 2011). This public health goal does not include a mandatory MCL for drinking water yet; however, legislation will be enacted soon and could significantly impact many of the water purveyors in the state of California.

The establishment of a new Cr$^{6+}$ MCL will impact any water purveyor with measurable amounts of Cr$^{6+}$ in their water supply. Particularly vulnerable are those water purveyors whose groundwater supplies include naturally occurring levels of Cr$^{6+}$ such as Los Banos, CA; Davis, CA; and ID1. Little has been done to examine the potential impacts on the water supply industry as it prepares to adjust to the changing Cr$^{6+}$ MCL legislation. Realistically quantifying costs of the new legislation in terms of testing and treatment options merits concerted economic and scientific analysis that will prove useful to water suppliers throughout California as they seek to meet future EPA standards.

D. Background Information: ID1 currently obtains approximately 50% of its supply from the State Water Project, 25% from District wells which pump from the Santa Ynez Uplands Groundwater Basin, and 25% from District wells which pump from the Santa Ynez River alluvium. Although the setting of an MCL for Cr$^{6+}$ by the California EPA is expected to significantly impact over 50% of water purveyors in California, this project’s efforts will focus on the Santa Ynez Uplands Groundwater Basin of ID1, because Cr$^{6+}$ is known to be naturally occurring in the local Upland Basin (Tambini 2011). Thus, under stricter legislation, the water district would expect to face increased costs including additional treatment of active wells contaminated by Cr$^{6+}$, modification of treatment for supplemental wells with distinct contaminant issues, and increased analytical projects to communicate overall progress. For example, new testing techniques have recently lowered the current method detection limit (MDL) for Cr$^{6+}$ to a sensitivity of 0.02ppb; however, reporting thresholds remain higher than the State-established Public Health Goal of 0.02ppb (EPA 2011). Difficulty in attaining accurate Cr$^{6+}$ data at lower thresholds could lead to higher testing and treatment costs.

E. Stakeholders: Located in the central portion of Santa Barbara County, ID1 serves the communities of Santa Ynez, Los Olivos, Ballard, the Santa Ynez Band of Chumash Indians, and the City of Solvang. The Water District currently provides water directly to 2,553 residential and commercial customers and approximately 118 agricultural customers, serving a total population of approximately 7,156. Each of these customers has a vested interest in the cost, quantity, and quality of their water supply.

F. Approaches and Available Data:
- Assess the geology and recharge area for the Upland Basin as it relates to Cr$^{6+}$.
- Review available data to determine the severity and source(s) of existing Cr$^{6+}$ levels.
- Arrange for an analysis by a certified water quality lab for Cr$^{6+}$ levels in the ID1 distribution system, including post-chlorination treatment for individual wells.
- Compare treatment options for wells that are currently not in use, due to high nitrate concentrations or other issues.
• Perform a cost analysis for various treatment scenarios associated with a range of possible MCLs.
• Suggest operational modifications for ID1 consistent with EPA guidelines.

Available Data: Data will be supplied by ID1 for historical Total Chromium and Cr⁶⁺ sampling in 28 District wells and 3 District reservoirs. These data include sample locations, dates, results, and analytical methods.

G. Deliverables:
• A water supply management strategy for ID1 based on a range of possible MCLs for Cr⁶⁺ set by the state of California that details water use and treatment policies and accommodates stricter Cr⁶⁺ legislation.
• A cost analysis of possible MCLs scenarios and available treatment options; recommendations made for cost-effective water management strategies (focused on the ID1 Upland Basin) will be studied and adapted for applicability to additional water districts or state-wide water sources such as the State Water Project.

H. Please see ‘References’ below

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6) Client Data Commitment: There are no client restrictions on the use of data; ID1 does ask for sensitivity to public relation issues in reporting of results. Please see attached letter of data commitment.

7) Financial Deliverables:
Anticipated financial needs: Summer Internship ($3,750), Water Quality Testing/Data Collection (STBD)
Financial sources of support: Bren ($1,500); Dudek ($3,750); ID1 ($ As-Needed Water Quality Testing, Data Collection, Internship or Supplemental Analysis); Please see attached letters of financial commitment.

8) Internship Opportunities: Dudek is prepared to offer project team members one summer internship with a stipend of $3,750. This funding is available for a 150-hour summer internship at a pay rate of $25/hr. The internship would entail half the time (75 hours) spent on supplemental data collection, analysis, and other tasks applicable to the Bren group project; the other 75 hours would be devoted to Dudek consultant work. Possible additional internship at ID1 spent part time on the project and part time on ID1 as-needed projects such as GIS/GPS work or policy analysis.
References


Tambini, E. 2011. “Staff Report: Hexavalent Chromium (Cr\textsuperscript{6+}).”