



Sterling Ranch, Colorado

The collage features 15 framed items:

- Top Left:** A small logo with the text "STERLING RANCH" and "A COMMUNITY OF IDEAS".
- Top Center:** A framed document titled "Education at Sterling Ranch" with text about the Sterling Ranch Life Plan and various educational programs.
- Top Right:** A framed photograph of a construction site with workers in safety vests, titled "Water Treatment Plant, January 2007".
- Middle Left:** A framed photograph of a large field of yellow flowers, titled "Sterling Ranch Life Plan and Program".
- Middle Center:** A framed document titled "Sterling Ranch, Colorado An Exercise in Teamwork" featuring logos of various partner organizations like IBM, Motorola, Siemens, and others.
- Middle Right:** A framed document titled "The Vision of Sterling Ranch" with a list of goals and a map of the area.
- Bottom Left:** A framed document titled "Vanderbilt Week at Sterling Ranch" with a list of speakers and topics.
- Bottom Center:** A framed photograph of a large group of people standing in front of a building, titled "Vanderbilt Week at Sterling Ranch - January 2006".
- Bottom Right:** A framed photograph of a landscape with a body of water, titled "Sterling Ranch - A Beautiful Place to Live".



Sterling Ranch - A Unique Vanderbilt Sustainability and Education Research Center

Trans-Institutional Programs

David S. Kosson, PI, School of Engineering

Claire Smrekar, Co-PI, Peabody College



STERLING RANCH
COLORADO



VANDERBILT
UNIVERSITY



3,400 acres, 12,050 homes, 45,000 residents, construction initiated in 2015

- Energy and Cyber-Physical Systems
- Education Ecosystem
- Sustainability & Environmental Quality
- Future - Health, Security, Mobility, Archeology
- Research
- Design Projects & Honors Projects
- Immersive Spring Break
- Internships

What is Vanderbilt's Role?

Bringing next generations of innovation - design, education, science and technology

Trans-institutional and Multi-disciplinary Vertical Integration of Education and Research

- Undergraduate research and honor's projects
- Senior design projects
- Graduate research and capstone projects
- Internships
- Vanderbilt Week at Sterling Ranch

Sterling Ranch serves as "test bed"

Partnerships

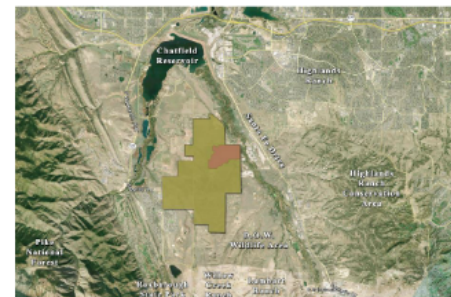
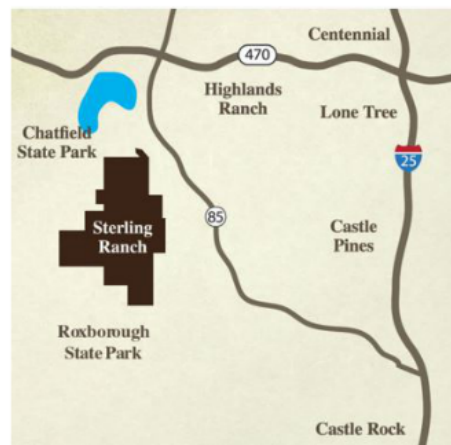
- Current Sterling Ranch Partners
- VU led partnerships



The Vision of Sterling Ranch

Creating a Sustainable Community

- Applied Innovations
- Water Conservation
- Intelligent Energy
- Promoting Fulfilling Lifestyles
- All-Encompassing Safety & Security
- Education Ecosystem



"I can say this without a single contradiction of all the 200+ metro areas I've visited as USDOT Secretary, 'there is no more collaborative metropolitan area in the nation, than Denver.'" - Ray LaHood

Vanderbilt and Sterling Ranch by the Numbers

32 total undergraduate immersion events to date

- 9 senior design projects
- 8 summer internships
- 2 Vanderbilt Weeks at Sterling Ranch

73 total number of students/faculty to date

- 52 undergraduate
- 5 graduate
- 16 faculty (College of Arts & Sciences, Peabody College of Education & Human Development, School of Engineering)



Motivated redesign of Civil Engineering undergraduate curriculum

Senior Design Projects

2015-2016 Academic Year

Net Zero Home Design 1
Net Zero Home Design 2
Water Quality Monitoring
Energy Community
Solar Desalination

2016-2017 Academic Year

Smart Home Analytics Interface Applications
Design a Sterling Ranch Home for Race to Zero
Design a Low Energy Home
Innovative Transit Analysis Interface Applications

Senior Design Team Accomplishments

Solar Powered Desalination with Capacitive Deionization (CDI) - Awarded 2016 EPA P3 (People, Prosperity, and Plant) Student Design Competition - Phase 1 (\$15,000)

Race to Zero - Selected as finalist to attend the 2017 Race to Zero competition April 22-23, 2017 at the National Renewable Energy Laboratory in Golden, CO

Graduate Research Proposals Submitted

NSF Proposal: "SCC-IRG Track 1: Investigating Metropolitan Social-Cultural Applications of Physical and Environmental Systems (MetroSCAPES) to Enhance Resource Allocation and Quality of Life in Smart and Connected Communities" (\$5,000,000)

D. Kosson, PI, G. Biswas, C. Smrekar, P. Speer, A. Dubey, Co-PI's

NSF Proposal: "NRT (Research Training): Sustainability Transitions in Coupled Human-Natural Systems - a New Approach for Research and Education on Complex Environmental Systems" (\$3,000,000)

S. Goodbred, PI, H. Baroud, C. Brady, J. Gilligan, D. Hess, Co-PI's

Vanderbilt Week at Sterling Ranch - January 2016



2015-2016 Senior Design Teams



Vanderbilt Week at Sterling Ranch

January 2017



Vanderbilt Week at Sterling Ranch

January 3-6, 2017 Agenda

Tuesday, January 3

**Smart Home Analytics Interface
Applications - Siemens (Marty
Skolnick, Account Executive)**



**Design a Sterling Ranch Home for
Race to Zero / Design a Low Energy
Home - Lennar Homes (Jay
Steinberg, Purchasing Analyst)**



**Innovative Transit Analytics Interface Applications - Fox Tuttle
Hernandez (Carlos Hernandez, Molly Veldkamp)**

Vanderbilt Week at Sterling Ranch

January 3-6, 2017 Agenda

Wednesday, January 4

- **Municipal Financing & Issuing Bonds - Elizabeth Funk, Director of Municipal Securities Division, Citi Bank**
- **EPA Net Zero Lessons Learned / Smart Metering - Michael B. Nye, U.S. EPA**
- **"Building an Innovative Education System at Sterling Ranch: Research & Models" - Eve Rifkin & Kristin Baese, Peabody College, Vanderbilt University -**
- **Denver Regional Economic Development - Tom Clark, CEO, Metro Denver Economic Development Corporation**
- **Sterling Ranch Site Tour**
- **Home Technology Overview - Marty Skolnick, Account Executive, Siemens**



Water Treatment Plant, January 2017

Vanderbilt Week at Sterling Ranch

January 3-6, 2017 Agenda

Thursday, January 5

- Overview of National Center for Atmospheric Research - James Done, Project Scientist
- Water Supply & Demand - Mary Kay Provaznik, Dominion Water
- Colorado Department of Transportation - Shailen Bhatt, Executive Director



Vanderbilt Week at Sterling Ranch

January 3-6, 2017 Agenda

Friday, January 6

- Lockheed Martin Spacecraft Center Tour

Xcel Energy

- Grid Management & Integration of Renewable Energy - John Welch, Director of Power Operations
- National Energy Trading Floor (Tour) - Kirk Scheitler, Manager, Policy & Outreach
- Colorado's Utility & State Legislative Climate - Wes Parham, Manager, State Government Affairs
- David Eves, President & CEO of Public Service Company of Colorado
- Xcel Energy Regulatory Environment - Robin Kittel, Director, Regulatory & Strategy



Sterling Ranch, Colorado

An Exercise in Teamwork



STERLING RANCH
COLORADO



SIEMENS



Arlo Braun, Architect, LLC



DENVER BOTANIC
GARDENS



Brownstein Hyatt
Farber Schreck



McGEADY SISNEROS



LENNAR



Specific Science and Technology Projects

- **Water**

- Design monitoring system for water cycle and quality; establish baseline
- Reduce discharge of nutrients and pollutants
- New nano-structured membrane water purification
- Provide residents real time feedback & projections on water usage (how & how much)

- **Energy**

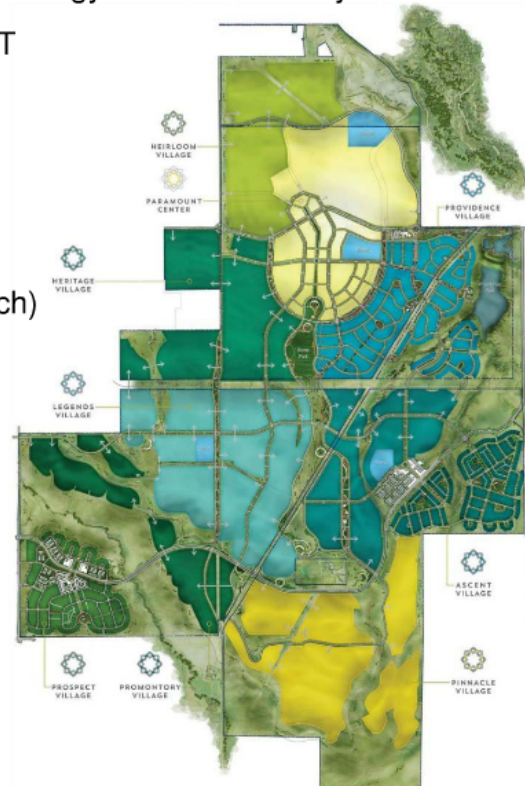
- Energy efficiency and net zero energy at the community level
- Next generation sustainable IoT home design
- Micro-grid simulation, design and controls
- Provide residents real time feedback & projections on energy usage (how & how much)

- **Education**

- Education Ecosystem
- Bringing sustainability concepts into education

- **Quality of Life**

- Information tools
- Transportation
- Security



Sterling Ranch Water Plan

1st Holistic Integration of Demand Management with Land Plan

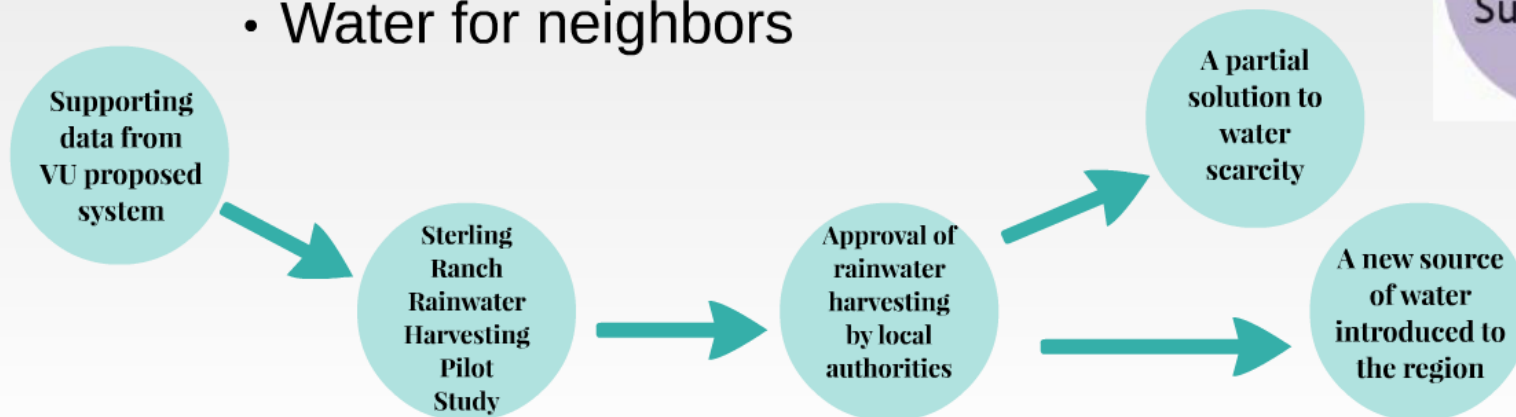
- Homes will use approximately 1/3 of county requirement
- Reduction integrated into land plan with look-back adjustments
- Required appealing the standards
- Water usage analytics for individuals & cohorts

State's 1st Rainwater Harvesting Pilot

- Required changing Colorado law

Regional water supply solutions

- Conjunctive use with renewable supplies
- Water for neighbors

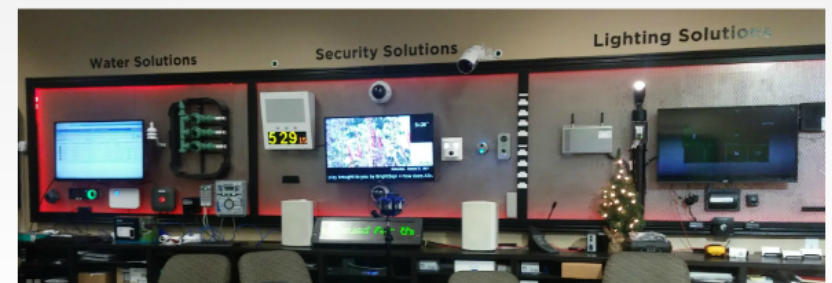
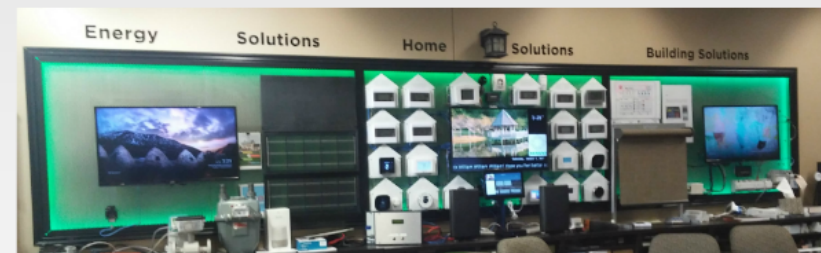




Sterling Ranch Net Zero Homes



Sterling Ranch Steward Technology



Education at Sterling Ranch

Sterling Ranch TIPS Plan and Purpose

- **Design** an educational "ecosystem" for new community
- **Anchor** innovative education master plan to community assets (private, public, non-profit)
- **Integrate** with DCSD mission, record of excellence (universal choice, rigor)
- **Engage** students in relevant research, in real time



Who?

Peabody Scholars (5-6): course work, field work, white papers

EdD Doctoral Students (3): Capstone project (implementation)

What?

School district analysis (teacher/admin interviews, observations, document review)

Constituent needs assessment (stakeholder/parent interviews)

Asset mapping (GIS software)

Design studio production (innovation in context)



All who engage with Sterling Ranch become stewards of the values inherent in an elevated, authentic and responsible style of living. Sterling Ranch, Colorado - a mixed-use, master-planned community vitalized by mindful, sustainable resources and forward-thinking technologies, brought together is a shared experience.

