STERLING RANCH

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June 30, 2011

Ms. Veva Deheza
Colorado Water Conservation Board
1313 Sherman Street, Suite 721
Denver, CO 80203

Mr. Kevin Rein
Division of Water Resources
1313 Sherman Street, Suite 818
Denver, CO 80203

RE: 2011 Sterling Ranch Precipitation Harvesting Pilot Study Annual Report

Dear Veva and Kevin,

The enclosed letter report is the first annual report submitted by Leonard Rice Engineers, Inc. on behalf of the Sterling Ranch Development of the Precipitation Harvesting Pilot Study.

The zoning process extended beyond the anticipated schedule due to the complexity of the issues and to the extent of the public's interest. By working closely with County to address their concerns, on May 31, 2011, Sterling Ranch received approval for their zoning application and the associated Sterling Ranch Water Appeal. In the appeal, Douglas County approved a new standard for water use and approved a process by which the standard may be reevaluated as the development's actual water use data is collected. This approval shows recognition for the rigorous water conservation plan integral to Sterling Ranch's Development and encourages Sterling Ranch's ongoing efforts to tie efficient use of water with sustainable water supplies.

Despite the delay in zoning approval, Sterling Ranch continued their efforts on the Precipitation Harvesting study to minimize delays. In particular, efforts for collecting information for natural conditions were continued with the installation of essential equipment and the initial collection of data.

The 2011 Sterling Ranch Precipitation Harvesting Pilot Study Annual Report documents the progress that was made in the 2010/2011 study year, including the data that has been collected,

the planned tasks for next year, and the variances to the application that was submitted on May 1, 2010.

Tasks accomplished this year for the Pilot Project include:

- Climate station was installed on March 29, 2010.
- Climate data was collected from April 2010 to May 2011 showing at least one significant rainfall event.
- Recorded rainwater was compared to two nearby weather stations showing the difference in locality of the data.
- A surface water station was installed in upper Sterling Gulch.
- A website was developed to enhance communication about the project at different levels of interest and involvement.
- A partnership was developed with the Denver Botanic Gardens (DBG) for the Residential Experimental Site. Planning and design efforts that were accomplished include, landscape plans, precipitation collection plans, and efficient irrigation system guidelines.

Though efforts on the Monitoring Plan and the Residential Experimental Site were delayed in 2010/2011 due to the zoning application process, they continue to grow and evolve with new partnership opportunities. For example, the residential experimental site, condensed to the Allis Ranch, has been expanded through a partnership with the DBG. This site is currently well on its way for 2011/2012 and will further demonstrate the type of water conservation landscaping for Sterling Ranch as well as northwest Douglas County.

In addition, trail cameras have been added for installation at the surface water stations to digitally record surface water events in the Sterling Gulch Basin.

The Sterling Ranch Precipitation Harvesting Pilot Study is well on its way. Thank you for your continued support in these ongoing efforts.

Best Regards,

Harold R. Smethills, Jr.
Managing Director
Sterling Ranch, LLC

cc: Jack N. Hoagland
Diane Smethills
Beorn Courtney
Greg Roush
Mary Kay Provaznik

Encl: 2011 Sterling Ranch Precipitation Harvesting Pilot Study Annual Report

July 1, 2011

Ms. Veva Deheza
Colorado Water Conservation Board
1313 Sherman Street, Suite 721
Denver, CO 80203

Mr. Kevin Rein
Division of Water Resources
1313 Sherman Street, Suite 818
Denver, CO 80203

RE: 2011 Sterling Ranch Precipitation Harvesting Pilot Study Annual Report

Dear Veva and Kevin,

This letter report is the first annual report submitted by Leonard Rice Engineers, Inc. on behalf of the Sterling Ranch Development of the Precipitation Harvesting Pilot Study.

Introduction

The proponents of the Sterling Ranch Development have been passionately working towards a vision for the land that is in harmony with the area, the community, and the State, and that meets a significant need for housing and infrastructure in Douglas County. Sterling Ranch's participation in the Colorado Water Conservation Board's (CWCB) Rainwater Harvesting Pilot Project Program (Program) is a reflection of their goals for establishing sustainable, defensible, non-potable water supplies for their development, as well as to be a positive example of conservation and efficient resource management.

Generally, the Sterling Ranch Precipitation Harvesting Pilot Study (Pilot Project) has proceeded on schedule despite an extended schedule for the zoning phase of development. However, some monitoring installation was delayed until zoning approval was secured. Variances to the Pilot Project, including the proposed schedule, are described herein.

Douglas County Approves Zoning and Water Appeal

Dominion Water and Sanitation District (Dominion), the wholesale water provider for Sterling Ranch, has a mission to provide a new conjunctive use water supply to the area in accordance with the goals set in Douglas County's 2030 Comprehensive Master Plan. On May 31, 2011, the Douglas County Board of Commissioners approved the zoning application for the Sterling Ranch Development and the associated Sterling Ranch Water Appeal. As the project was the first to

consider a conjunctive water supply, and as it introduced a new water wise demand approach to the water supply planning and zoning, the process required working closely with the County, particularly over the past several months of review and public hearings.

Working with Douglas County through the zoning application process, Sterling Ranch modified their water plan appeal to include an initial planning unit of 0.4 acre-feet per year (af/yr) per unit residential water demand at the water treatment plant or master meter, which was significantly lower than the Douglas County guidelines of 0.75 af/yr per residential unit. Recognizing Sterling Ranch's rigorous conservation plan, and in the interest of encouraging conservation through Sterling Ranch's development, Douglas County also approved the water appeal guidelines for adjusting this water supply requirement based on actual water use data as Sterling Ranch develops. Based on documentation of similar use in other communities, Dominion expects water use to average 0.286 af/yr at the water treatment plant or master meter for each residential unit.

Summary of Pilot Project Progress

The schedule included in the Application accounted for a gradual start to the overall Pilot Study due to the anticipated 2010-2011 zoning process. This gradual start, however, has included the installation of essential equipment and the beginning acquisition of essential data. The following tasks were accomplished in 2010-2011:

- Climate station installation and climate data collection
- Surface water station installation
- Residential Experimental Site (Demonstration Site) planning and design:
    - landscape plans
    - precipitation collection plans
    - efficient irrigation system guidelines

These tasks, associated costs, and variances to the overall Pilot Project are further discussed in this Annual Report.

CWCB Program and Reporting Requirements

On March 1, 2010 Sterling Ranch provided an application for the "Sterling Ranch Precipitation Harvesting Pilot Study Application" (Application) based on the criteria and guidelines outlined by the CWCB established under House Bill 09-1129. The aim of the Program is to use field verification to evaluate precipitation harvesting in Colorado as a water conservation enhancement when paired with advanced outdoor water demand management and as a legally obtainable water supply.

The Application described the conceptual Sterling Ranch planning policies and requirements, including their current water conservation plan, and the Pilot Project strategies to be implemented to assist in the overall precipitation harvesting design.

The Pilot Project is split into three phases; 1) Natural Conditions, 2) Experimental Precipitation Harvest Designs, and 3) New Precipitation Harvest Designs.

Annual Reporting Requirements

One of the requirements of the Pilot Project Program is to submit an annual progress report (Report) by July 1st of every year that the Pilot Project is in operation. In accordance with Section 37-60-115(6)(a), C.R.S., the Report summarizes each component of the Pilot Project and indicates how the data and findings address Program goals. The CWCB Annual Report Requirements serve as an outline for this report and are included in **Attachment A**. The information required includes:

1. A **description of variances** from the Application including information on any data quality issues that may magnify if results are extrapolated to a larger scale project.

2. **Precipitation harvesting performance metrics**.

3. Pilot Project **implementation plan and estimated water conservation** achieved through pairing precipitation harvesting with advanced outdoor water management.

4. A **description of the climate and hydrologic data collected** to characterize the pre-existing, natural vegetation conditions.

Sterling Ranch Precipitation Harvesting Pilot Project - Progress and Variances

Four objectives were established in the Application that are designed to meet the guidelines and criteria provided by CWCB. They are:

1. Evaluate natural conditions (climate, hydrology, and ET) to quantify the amount of precipitation physically and legally available as a water supply.
2. Evaluate a variety of precipitation collection designs.
3. Evaluate precipitation harvesting paired with advanced outdoor water demand management as a water conservation practice.
4. Create a baseline set of data to support;
    a) An engineering report for a water court application for an augmentation plan to use harvested precipitation, and define a defensible water supply.
    b) Develop sound, transferable, and scalable methodologies for use at other locations in the State of Colorado.

In 2010-2011, the Pilot Project started the installation of the measuring devices for the natural conditions, collecting associated data, and implementing a demonstration site. These efforts are further discussed in the sections below.

Phase 1: Natural Conditions

Two study basins were proposed to evaluate natural conditions of Sterling Ranch as part of a comprehensive monitoring plan. The integrated monitoring plan includes measuring climate, precipitation, surface runoff, native ET, and deep percolation to ground water to provide the foundation for defining physical yield characteristics and return flow obligations.

Figure 1 shows the location of the two watersheds and the location of the implemented and proposed monitoring stations within the Sterling Ranch boundary. The study basins are being used to quantify the site-specific amount of precipitation that, under pre-existing natural vegetation conditions, occurs to the natural stream system via surface and ground water return flows. The sections below summarize the progress, variation, and data collected to-date for each of the monitoring programs that were designed to characterize the return flows.

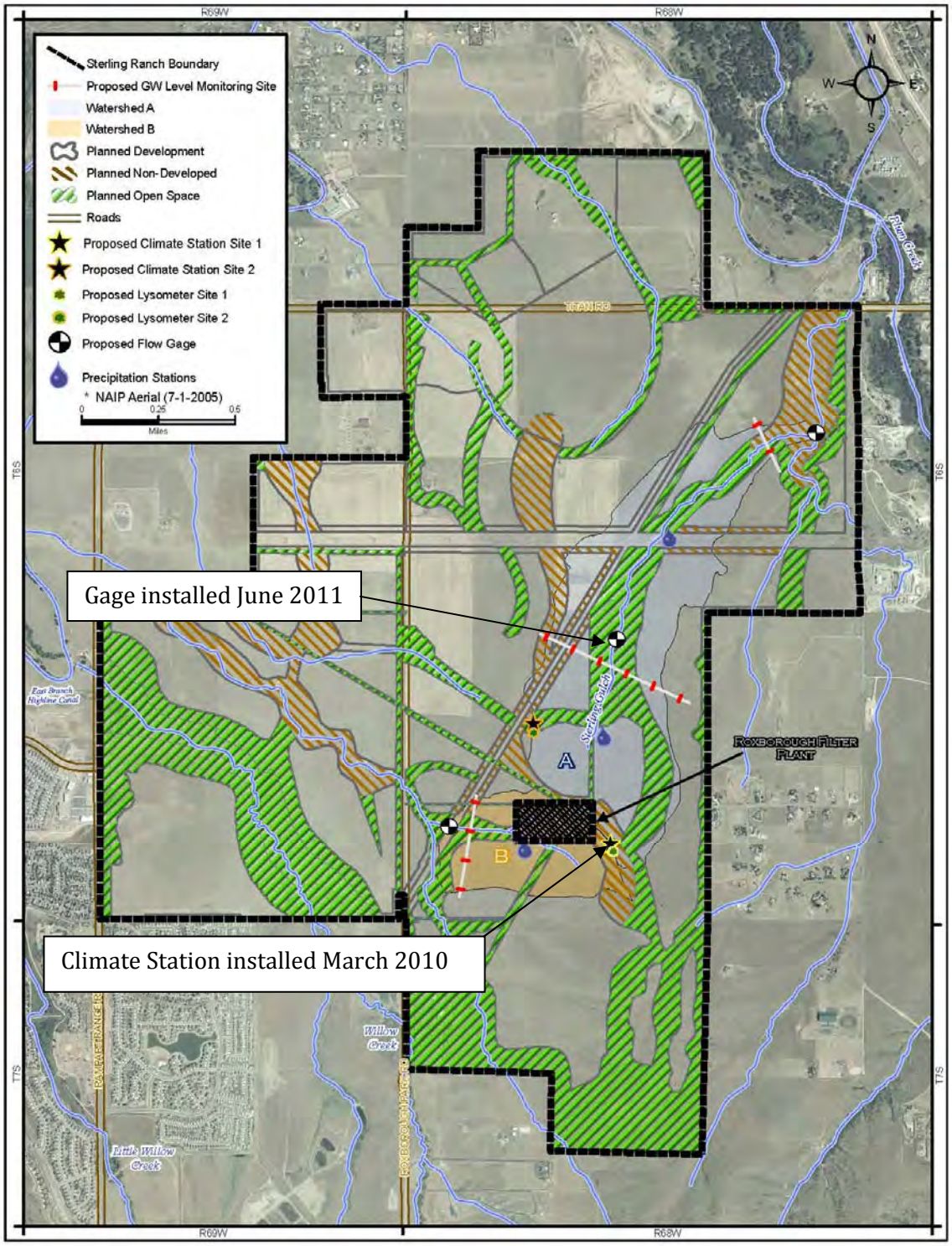


Figure 1- Proposed Study Basin Map

Climate Monitoring Program

Variance from Application: None

The Sterling Ranch Climate Station was installed on March 29, 2010. The station is being used to characterize local weather patterns, as well as provide data for the estimates of native ET. The data collected at the Sterling Ranch site includes net solar radiation, air temperature, wind velocity and direction, relative humidity, barometric pressure, and soil temperature at varying depths. Most data is being recorded in 15-minute intervals and being transmitted to the Sterling Ranch website real-time, and archived in a centralized database.

Figure 2 - Sterling Ranch Climate Station

Table 1 is a monthly summary of the data collected to date from the Sterling Ranch Climate Station.

Table 1 –Sterling Ranch Climate Station Monthly Summary

Year	2010									2011				
Month	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**
Temperature (F)														
Average Temperature	47.5	54.71	67.24	72.21	72.42	67.56	54.89	39.9	36.68	32.86	30.85	44.02	47.44	52.13
Max Temperature	75	88	93	96	94	94	84	77	67	67	64	74	81	84
Min Temperature	26	30	41	50	53	44	28	6	0	0	-17	20	18	28
Temp Range	49	58	52	46	41	50	56	71	67	67	81	54	63	56
Soil Temp (5 cm) (F)														
Average Temperature	51.00	61.24	72.46	77.22	77.66	72.58	55.22	38.87	33.46	30.96	32.38	45.69	51.98	57.46
Max Temperature	76	89	98	102	98	93	83	63	50	46	47	66	78	88
Min Temperature	33	37	51	58	62	59	33	19	22	23	24	30	35	38
Temp Range	43	52	47	44	36	34	50	44	28	23	23	36	43	50
Soil Temp (15 cm) (F)														
Average Temperature	50.08	59.25	70.26	75.22	76.12	72.10	56.57	41.26	35.13	32.28	32.98	45.12	51.52	56.27
Max Temperature	64	76	82	86	89	80	72	51	42	39	40	55	61	71
Min Temperature	38	43	55	62	64	64	40	28	29	28	28	34	42	45
Temp Range	26	33	27	24	25	16	32	26	13	11	12	21	19	26
Wind (mph)														
Average Velocity	7.47	7.12	5.39	5.23	5.75	5.93	5.73	5.87	4.92	5.57	6.26	6.28	7.06	5.77
Max Velocity	40	48	39	29	27	25	37	41	40	31	35	36	39	37
Average Direction (Deg N	191.45	185.92	186.39	174.19	181.10	177.65	197.16	182.90	175.62	189.11	190.18	185.31	200.26	190.54
Solar Radiation (MJ/m2 h)														
Average Radiation	0.87	1.00	0.99	0.97	0.94	0.86	0.60	0.45	0.35	0.42	0.55	0.71	0.80	0.84
Max Radiation	4.23	4.24	4.63	4.72	4.29	3.66	3.36	2.78	2.49	2.59	3.06	3.65	4.04	4.44
Barometric Pressure (mbar)														
Average BP	816.40	817.43	822.15	823.99	823.83	823.20	823.54	819.03	818.53	819.33	817.85	818.19	815.72	817.61
Max BP	832.66	829.25	831.36	831.02	835.76	833.10	835.17	838.49	830.61	829.82	829.81	828.87	826.61	830.72
Min BP	801.14	804.04	813.18	813.88	811.88	811.47	798.66	798.78	794.16	807.42	804.52	806.26	804.74	803.64
Humidity (%)														
Average Humidity	51.26	50.40	52.22	49.32	43.36	30.08	41.07	45.59	49.08	49.65	50.05	40.13	46.87	56.26
Max Humidity	100.00	101.50	98.88	97.14	92.84	91.24	96.82	99.71	97.77	98.78	98.98	99.61	99.37	99.05
Min Humidity	9.96	9.64	9.58	10.01	8.29	4.55	8.44	7.96	9.25	11.89	9.32	6.38	7.05	5.36

Precipitation Monitoring Program

Variance from Application: None

The OTT Pluvio^2 weighing precipitation gage was installed on the site and began collecting data on March 29, 2010 (see **Figure 3**). The precipitation gage is located at the same site as the Sterling Ranch Climate Station and reports data in 15-minute intervals. The data collected at the site includes total accumulation and maximum intensity. This is the first of many proposed precipitation stations for the Pilot Project (see **Figure 1**). The physical measurement of precipitation is important in characterizing the native water supply, native water demand, and other hydrologic processes.

Figure 3 - Sterling Ranch OTT Pluvio^2 Precipitation Gage

Table 2 is a summary of the data collected from the Sterling Ranch Climate Station.

Table 2 - Sterling Ranch Climate Station Precipitation Summary*

Year	2010									2011				
Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation (in)														
Monthly Total	1.66	0.34	1.59	1.72	0.87	0.00	0.56	0.76	0.00	0.00	0.19	0.37	1.44	3.44
Max Intensity (in/hr)	3.03	0.53	2.64	6.23	2.63	0.00	1.28	28.21	0.00	0.00	2.62	0.24	0.42	1.17

**Maximum intensity using precipitation measured over 15-minute intervals*

Surface Water Monitoring Program

Variance from Application: None

- *Trail cameras to digitally photograph surface water events have been added to the plan at the two surface monitoring stations in the Sterling Gulch Basin.*

A surface water monitoring program has been initiated to quantify the site-specific stream flow that accrues to the natural stream system through surface water flows. Three surface water measurement stations were proposed in the Application for installation (see **Figure 1**).

One surface water station in upper Sterling Gulch is 95% complete. Remaining tasks for this station include installation of data logger components and a camera. When complete, this station will include a 9-inch Parshall Flume, shaft encoder level sensor, data logger, and a time-lapse camera for visual checks during rain events.

Following certain precipitation events, anecdotal information was collected during site visits in the spring of 2010 and spring of 2011. Pictures at various locations were taken to observe what happens after different precipitation events and help determine where to gather the best data. A more formal and consistent process will be developed this year to document further visits. How the data will be used is yet to be determined and will likely evolve as further analyses are developed. The following photos show the three different days of the site visits.

Figures 4 and 5 – April 2010 site visit to Sterling Ranch

Figures 6 and 7 – May 17, 2010 site visit to Sterling Ranch


Figures 8 and 9 – May 13, 2011 site visit to Sterling Ranch

A proposal has been prepared for the lower surface water station to be located at Sterling Gulch and Titan Road. Data collection from the data loggers and installing a trail camera at the flume are anticipated to begin this summer.

Native Vegetation (ET) Monitoring Program

Variance from Application: None

Lysimeters are proposed specifically to collect data regarding two important aspects of the pilot study; the actual native vegetation ET and the amount of precipitation that percolates through the soil root zone to the ground water table known as ground water recharge or deep percolation. The lysimeters may also provide some insight on site-specific soil moisture storage and surface runoff.

This monitoring program has not yet been implemented, so there is currently no data to report.

Ground Water Monitoring Program

Variance from Application: None

Understanding pre-existing ground water interactions on Sterling Ranch is another important component of the water budget. Quantifying the amount, timing, and location of ground water return flows that accrue to the local alluvial aquifer from precipitation events is important when defining augmentation requirements to local streams. The installation of monitoring wells and ground water level monitoring equipment is currently in the proposal phase.

This monitoring program has not yet been implemented, so there is currently no data to report.

Monitoring Program Maintenance Plan

The design of the monitoring plan is modular, and the maintenance requirement of each monitoring program is different. Once installed, routine physical inspections of all instrumentation will be conducted. Real-time sensors can be remotely monitored to verify that they are operating

correctly. Data-logging sensors will be checked and maintained every time that the data is retrieved.

The installation of the climate station is the only monitoring site complete. OneRain has been maintaining the monitoring site and reporting any issues. OneRain made four maintenance visits to the climate station over the last year in October, November, December, and February. The goal of the maintenance visits is to detect failure before it occurs. When servicing a climate station, the inspections are broken down into the following areas: power, telemetry, data logger, and sensors.

Data Summary and Analyses

A comparison was made between external data sources and the Sterling Ranch Climate Station to help characterize the regional rainfall patterns at and near Sterling Ranch.

External Data Sources Recorded

The external sources used in the comparison are the NOAA Kassler (Kassler) weather station, approximately four miles north of the Sterling station, and the Denver Water Board Foothills Water Treatment Plant site, approximately four miles south. **Table 3** shows the monthly and total rainfall at the different stations since the Sterling Ranch Climate Station was installed in March of 2010.

Table 3 - Precipitation Comparison

Year	2010									2011					Total
Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Precipitation (in)															
Sterling Ranch Climate Station	1.66	0.34	1.59	1.72	0.87	0.00	0.56	0.76	0.00	0.00	0.19	0.37	1.44	3.44	12.94
Foothills Water Treatment Plant	2.86	1.04	2.65	2.16	1.14	0.01	0.78	0.36	0.07	0.22	0.42	0.25	1.10	3.21	16.27
Kassler - (NOAA)	3.60	1.30	2.80	2.00	1.60	0.00	0.90	0.50	0.40	0.70	1.20	0.30	1.10	2.70	19.10

For the limited period of record, the total precipitation at Sterling Ranch was lower than the other two sites. This shows the local variance of the rainfall events and will be useful information for the harvesting system design.

Weather Patterns

The data collected show a dry winter with some peak storms. **Figure 4** shows a graph of data from all of the stations, which illustrates how the Sterling Ranch Climate Station tracks relative to the other two stations. **Figure 5** shows the Sterling Ranch data compared to the historical average for the Kassler station.

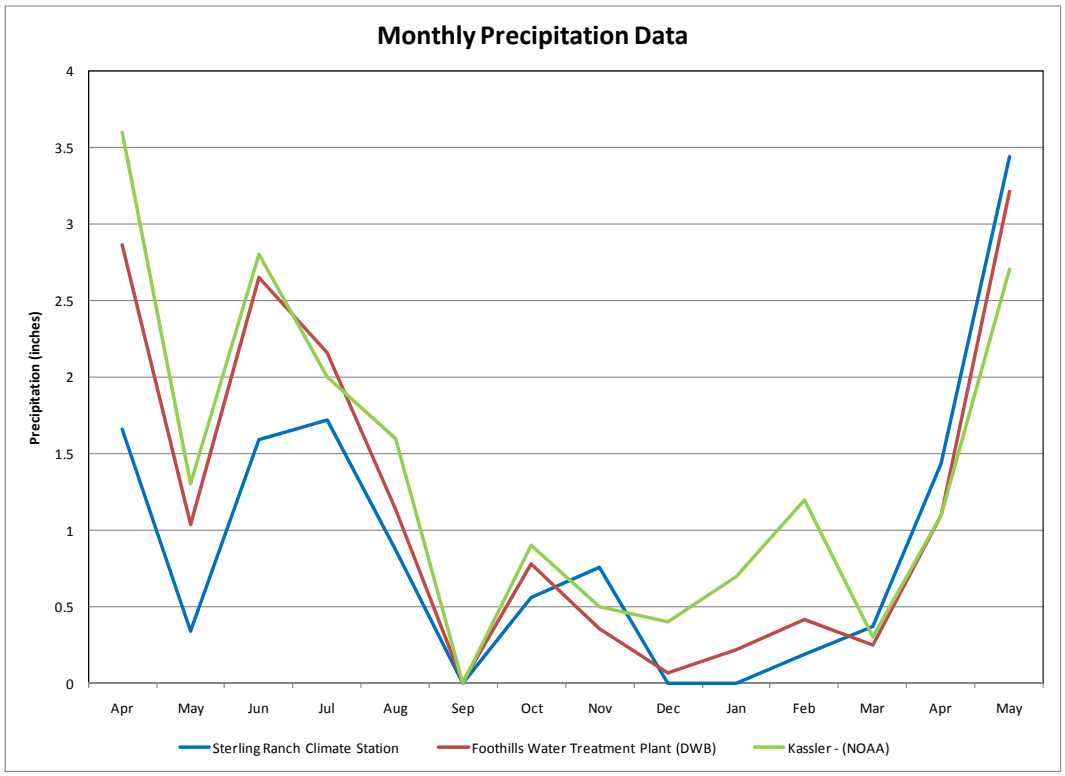


Figure 10 - Sterling Ranch Precipitation Comparison to Nearby Precipitation Station Data Sources

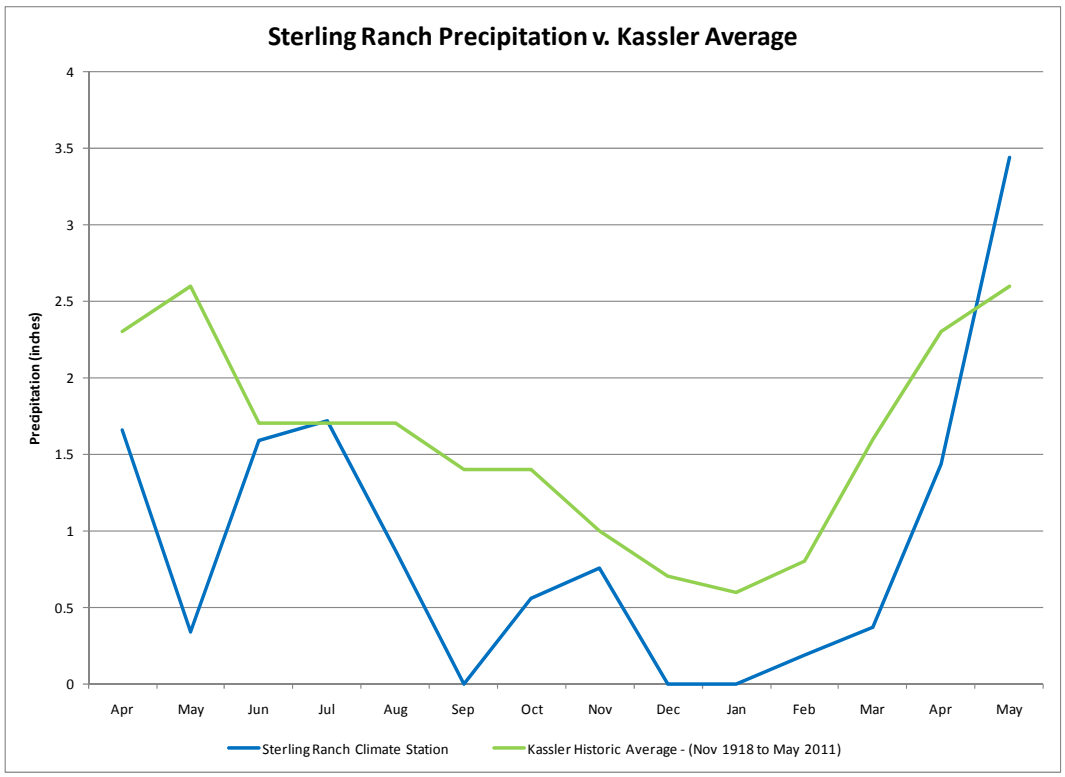


Figure 11 - Sterling Ranch Precipitation Data vs. Historical Kassler Precipitation Data

Event Characterizations

Table 2 in the Precipitation Monitoring section of this report showed a rainfall event in July of 2010 with an intensity of 6.23 inches per hour over a 15-minute interval. This can be seen in the peak of the graph in **Figure 4**; however, May of 2011 is the highest month of precipitation to date. Three months over the year had no precipitation.

Natural Consumptive Use, Return Flows to the River, Water Budgets, and Models

There is nothing to report on these sections for the 2010/2011 project year.

Phase 2: Experimental Precipitation Harvest Designs

The purpose of Phase 2 is to collect information about different types of precipitation harvesting designs, equipment, and materials from existing sites and structures so that Sterling Ranch can immediately begin collecting data that can be used to refine harvesting designs that will be implemented on new structures.

Residential Experimental Sites

Variance from Application:

- *The Residential experimental sites have been reduced to one site – the Allis Ranch Demonstration Garden. This site is referred to herein as the Demonstration Site.*
- *The Colorado Rush Site is not included.*
- *Through a partnership with the DBG, the Demonstration Site has been expanded to further demonstrate water conservation landscaping that could be implemented throughout Sterling Ranch.*

Per Phase 2 of the Application, an existing residential site, Allis Ranch, is being developed with rainwater capture systems and water conserving landscapes and irrigation systems. This site will provide an opportunity to analyze collection efficiencies, review different collection equipment, and document and demonstrate various water-saving landscapes and irrigation systems.

With the help of a partnership with the DBG, plans are being finalized for the Demonstration Site. Both landscape plans and rainwater capture designs have been drafted, and are included in **Attachment B** to show the current plans for the Demonstration Site's implementation. The plan for the Demonstration Site is to demonstrate the use of various water conserving irrigation products from several manufacturers, water saving landscapes that may be typical at Sterling Ranch, and the use of various rainwater harvesting equipment.

Sterling Ranch is currently selecting and securing contractors, suppliers and equipment for Demonstration Site, and is expecting to begin landscape and rainwater capture installation this summer.

Commercial Experimental Monitoring Site and the Regional Observation Site

The Commercial Experimental Monitoring Site and the Regional Observation Site were delayed due to the extended zoning hearings. These are currently being designed and are expected to be implemented this summer. There is no data to report on these sections for the 2010/2011 project year.

Phase 3: New Precipitation Harvest Designs

The new precipitation harvesting designs were not expected to begin in 2010-2011.

Overall Pilot Project Schedule

Variance from Application:

- *Residential Experimental Site (Demonstration Site) is currently in the planning, design, and installation stage. Delay = approx. 6 months*
- *Commercial monitoring site just beginning. Delay = approx. 6 months*
- *Regional monitoring site just beginning. Delay = approx. 6 months*
- *Administration includes preliminary administration reporting developed for the Demonstration Site as a test for the development of the new sites. The delay on the Demonstration Site has delayed this preliminary administration reporting. Delay = approx. 6 months*
- *The first surface water monitoring site will be installed and providing data very shortly. Ahead of schedule = 6 months*
- *Lysimeters for measuring ET and deep percolation of return flows are planned for implementation this year. Delay = approx.6 months*

Figure 8 shows the timeline proposed with the adjustments made due to the extended schedule on the zoning hearings. As shown, the climate and precipitation monitoring programs were implemented and began monitoring in April of 2010. Sterling Ranch is currently in the planning, design, and installation stages for the residential experimental site, commercial monitoring site, and regional site.

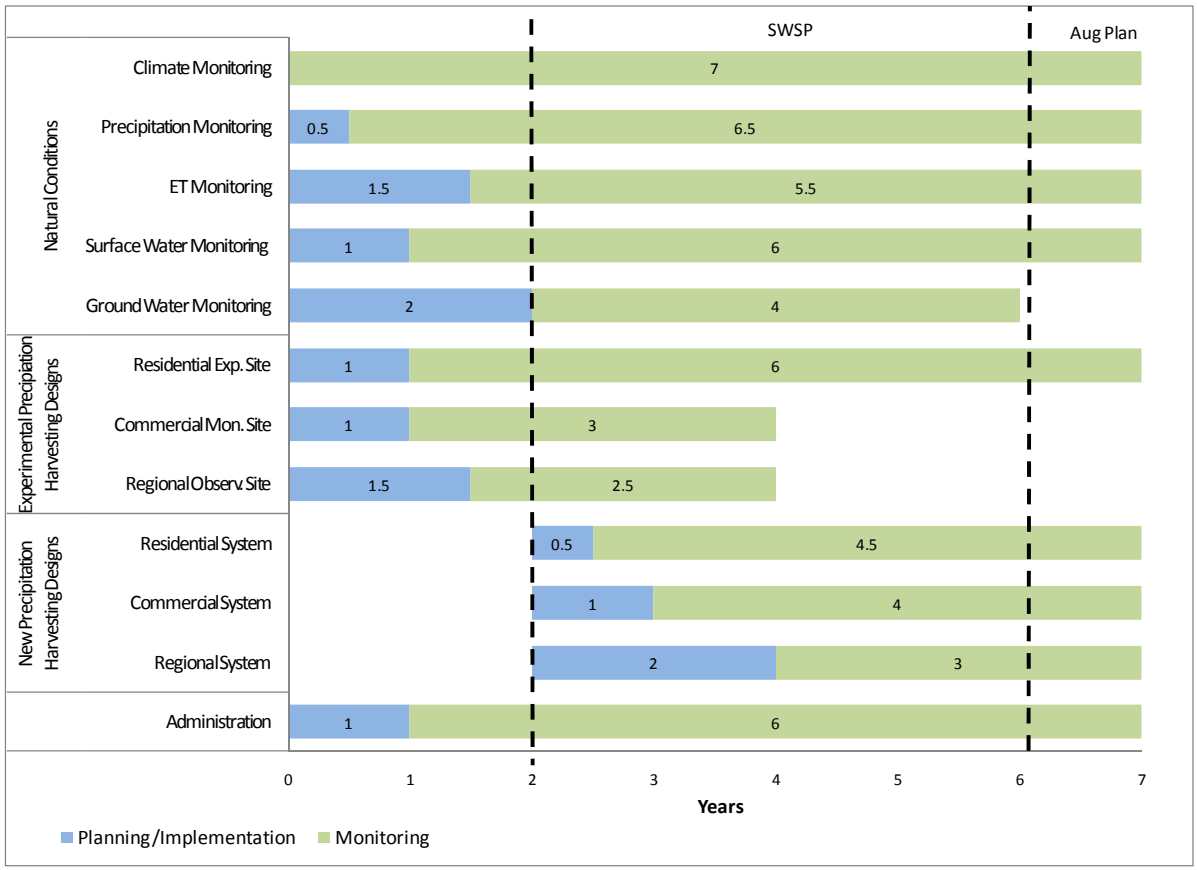


Figure 12 - Pilot Project Schedule

Augmentation Requirements

The Augmentation Requirements that will be met under an approved Substitute Water Supply Plan are expected to begin with Phase 3, and therefore were not expected to begin in 2010-2011. An example SWSP will be developed for the Demonstration Site to provide guidance for the new sites that will be implemented in Phase 3 of the Pilot Project.

Implementation

Collection and irrigation system design have not currently been finalized or implemented, therefore, no data is yet available for describing operation and maintenance or for estimating collection efficiencies.

Supplemental Water Supply

A permit for Demonstration Site was obtained from the Colorado Division of Water Resource to collect precipitation under S.B. 09-80 as a supplemental water supply to the existing well on site.

No other supplemental water supply will be needed until rainwater harvesting systems are implemented on new construction in Phase 3.

Estimated Water Savings, Landscape Plans, Metered Water Use, Consumptive Use and Estimated Water Conservation, Estimated Unit Cost for Rainwater

Currently there is no new information to provide on the estimated water savings, landscape plans, metered water use, consumptive use, estimated water conservation, and estimate unit cost for rainwater capture and use. Preliminary data will begin to be available in the upcoming year, and the Demonstration Site will be used to better develop landscape plans for Phase 3.

Costs to date

Costs for the Pilot Project have occurred primarily in the efforts for the monitoring of natural conditions and for the Demonstration Site. These are summarizes below:

Natural Conditions

The climate station and the flume were the equipment and monitoring installed in 2010-2011. These costs were:

Climate Station Total for 2010 - $42, 483

- Labor Hours/Analysis - $13,774.07
- Installation/Cell Phone/Calibration/Pluvio - $7,920.00
- Equipment - $16,463.32
- Contrail Software - $4,326.00

Surface Water Flume

- Flume/Equipment/Installation - $8,830.00

Demonstration Site

Preliminary costs for construction of the two systems planned for Demonstration Site came in higher than expected, and modifications to the system described in the Application may be necessary to keep the project within budget. It may be necessary to install a single cistern and pump to reduce construction costs. A schematic design for the collection system and a draft layout for the landscape are provided in **Attachment B**.

The partnership with the DBG and the interest of rainwater capture suppliers provides for unique and ever-changing opportunities for the Demonstration Site. As such, the Demonstration Site continues to flex with expected variances to occur in the overall budget. Costs will be provided as the project progresses.

Partnerships and the Sharing of Information

Educational efforts are being made in this phase of the Pilot Project to help people understand the concept of what Sterling Ranch is doing in terms of water conservation and rainwater harvesting. A lot of the educational budget over the last year went into promoting the idea of Sterling Ranch and gain approval of the citizens and Board of Commissioners in Douglas County.

While a formal education program will be developed as Sterling Ranch is developed, the current form of education is in a website, media articles, and interviews. The Sterling Ranch website, located at http://sterlingranchcolorado.com/, goes into a significant amount of detail about the project overview that includes a description of the lifestyle, housing, and conservation that will be built into the development.

One page of the website includes articles that have been published about Sterling Ranch that is kept current by Sterling Ranch staff. Other pages include conservation, community, and frequently asked questions.

Partnering opportunities are constantly being sought to help with the cost of the intensive nature of the Pilot Project. A mutually beneficial partnership has been formed over the last year with the DBG for help with the landscape designs that will be offered at Sterling Ranch, including an edible garden. Additionally, a list is being kept of manufacturers that are interested in having their products used at Sterling Ranch. These opportunities and others will continue to be pursued throughout the next year.

Closing

This letter report describes the first year of the Sterling Ranch Precipitation Harvesting Pilot Study. If you have any questions, please feel free to call 303-455-9589.

Sincerely,

LEONARD RICE ENGINEERS, INC.

Mary Kay Provaznik, P.E.
Project Manager

MKP/vaf/mkj
1207DOM02

Encl: Attachments A & B

cc: Harold Smethills

Sterling Ranch, Attachment A - CWCB Requirements for Annual Report

1. A description of variances from the Pilot Project application including information on any data quality issues that may magnify if results are extrapolated to a larger scale project.

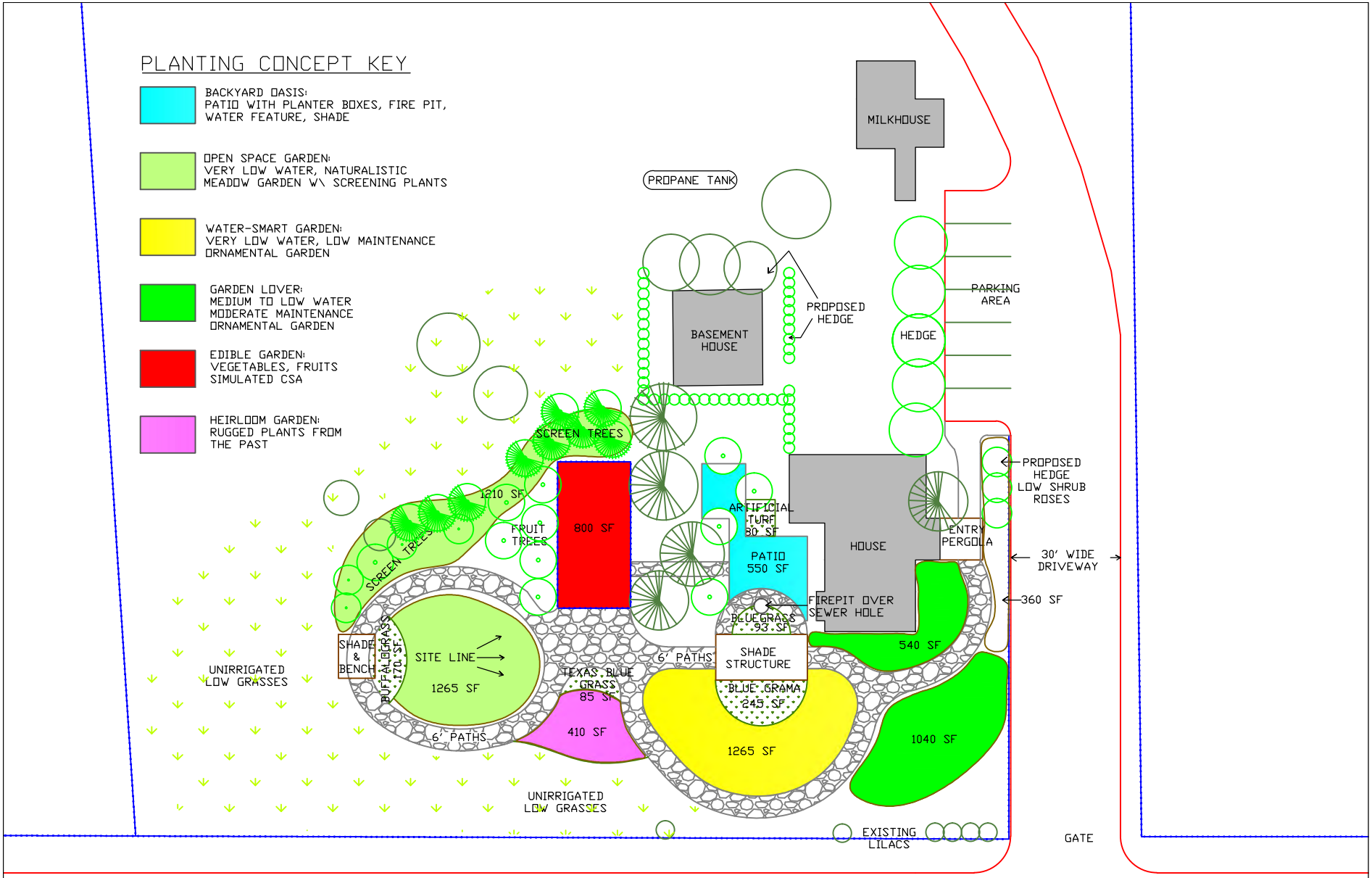
2. Precipitation harvesting performance metrics, including:
    a) Description of final collection system design with plans and specifications of all system components.
    b) Operation and maintenance plans and any issues encountered.
    c) Meter data of water flowing into the precipitation collection device and estimated capture efficiency.

3. Pilot project implementation plan and estimated water conservation achieved through pairing precipitation harvesting with advanced outdoor water management, including:
    a) A description of the applied method used to capture precipitation and any potable water supply with plans and specifications for all system components including any technology utilized (system programmers, ET controllers, etc.).
    b) Landscaping plans including measured irrigated acres, plan descriptions, theoretical irrigation water requirement methods, results, and water budgets reflecting application efficiencies.
    c) Metered water use from precipitation collection system. Water use will be categorized by use if application varies.
    d) Metered water use from other potable water supplies if the precipitation collection is supplemented. Water use will be categorized by use if application varies.
    e) Comparison of actual consumptive use by category of use to estimated water budgets. Estimate amount of water conserved as a result of the precipitation harvesting.
    f) A landscape maintenance assessment of quality of the landscapes, maintenance issues encountered, and any necessary replacement of plantings. The results of the irrigation system audit and corresponding actions.
    g) Cost to date including design, infrastructure, operations, and maintenance costs. Estimated costs to implement precipitation harvesting system per acre-foot of water saved; and comparison of original projected and actual costs from implementing the precipitation harvesting systems. The cost comparison will include institutional, legal, technical/design, infrastructure, and augmentation water supplies.

4. A description of the climate and hydrologic data collected to characterize the preexisting, natural vegetation conditions including:
    a) A description of the methodology and analysis results toward providing information about the technical ability to reasonably quantify the site-specific amount of precipitation that, under preexisting natural conditions, accrues to the natural stream system via surface and ground water return flows.
    b) A description of the baseline set of data and sound, transferrable methodologies used for measuring local weather and precipitation patterns that account for variations in hydrology and precipitation event intensity, frequency, and duration.
    c) Descriptions of the methodology and analysis results quantifying preexisting natural vegetation consumption; measuring precipitation return flow amounts; identifying surface versus ground water return flow splits; and identifying delayed ground water return flow timing to receiving streams.

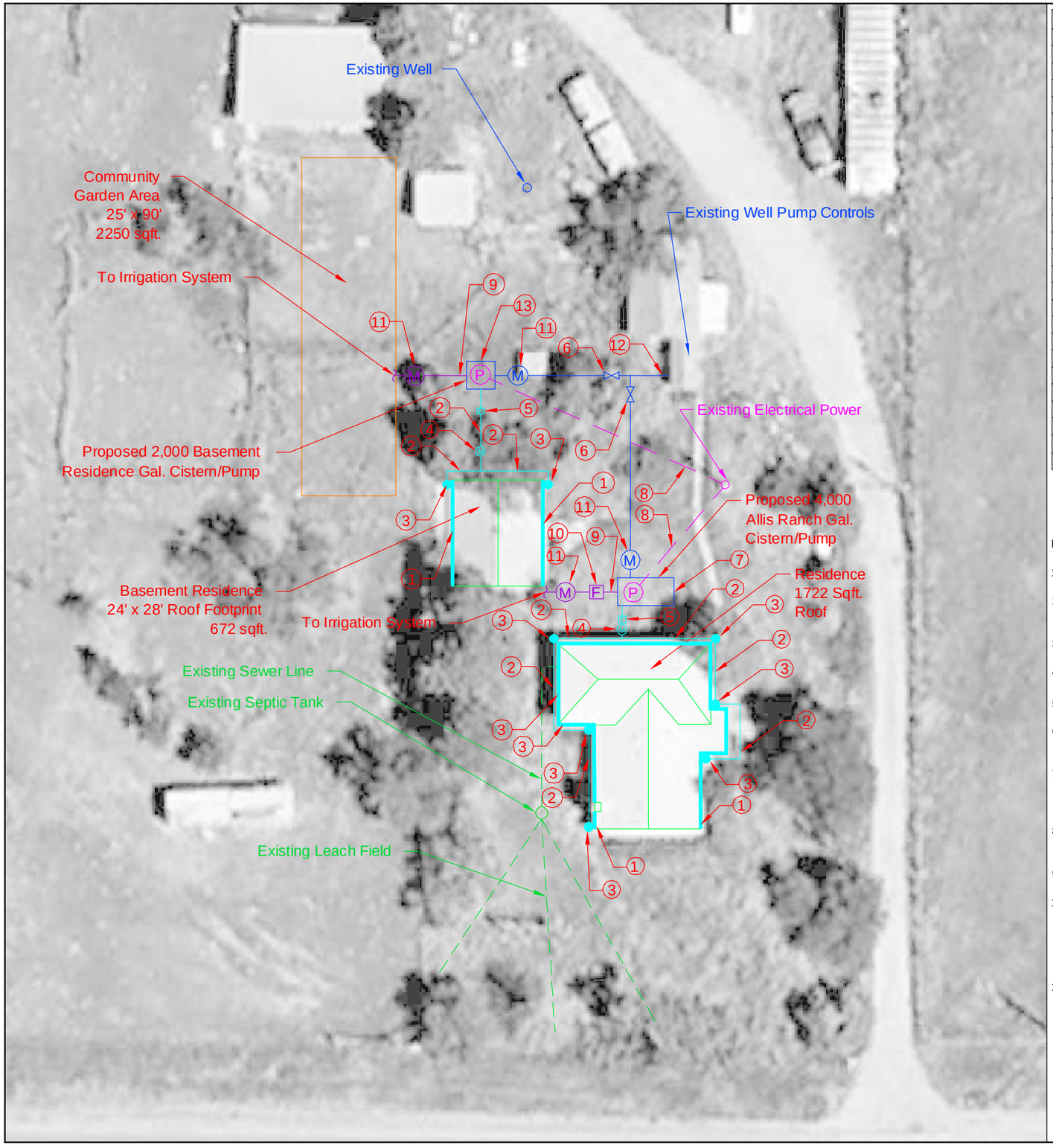
d) Quantification of the amount of precipitation that must be augmented to prevent injury to decreed water rights.
e) Description of the location and methods used to collect climate data measurements, with a summary of data including, at a minimum, temperature and precipitation.

Sterling Ranch, Attachment B – Preliminary Allis Ranch Garden Design and Rainwater Harvesting System



STERLING RANCH CONCEPTUAL DRAWING
DESIGN BY DAN JOHNSON/DENVER BOTANIC GARDENS
DATE LAST EDITED: May 20, 2011
EDITED BY C. NEWLANDER
SCALE: 1" = 20'-0"

NORTH



	DESCRIPTION
1	5" WIDE BY 4" DEEP (MIN) K STYLE PVC ROOF GUTTERS
2	4" COLLECTION LINE SLOPED AT 1-2% WITH 1-2 FT OF COVER
3	DOWN SPOUT WITH ADAPTOR TO 4" COLLECTION LINE
4	OPEN CHANNEL FLOW METER
5	INFLUENT BASKET FILTER
6	1" GATE VALVE
7	ALLIS RANCH HOUSE CISTERN / PUMP
	A) CISTERN ½ HP ECOS PUMP (6-15 GPM) 50 PSI
	B) 4000 GALLON CUSTOM CISTERN TANK
	C) FLOAT VALVE FOR WELL WATER BACKUP SUPPLY
	D) ULTRA SONIC TRANSDUCER CAPABLE OF MEASURING TANK
	WATER LEVEL. COMPATIBLE WITH ONE RAIN DATA LOGGER
8	ELECTRICAL CONDUIT TO CISTERN PUMP
9	1" CISTERN DISCHARGE LINE WITH A MIN COVER OF 5 FT
10	1", 200 MESH, FILTER WITH FLUSH VALVE
11	¾" WATER METER WITH FLOW TOTALIZER AND COMPATIBLE
	WITH ONE RAIN DATA LOGGER
12	1" WELL WATER SUPPLY LINE WITH A MIN COVER OF 5 FT
13	PREFABRICATED 2000 GALLON CISTERN / PUMP / CONTROLS
	A) 2000 GALLON POLYTHENE TANK WITH ACCESS WAY
	B) INFLUENT DEBRIS FILTER
	C) WATER LEVEL AND BACKUP SUPPLY AUTO FILL SWITCH
	D) 10 - 20 GPM (50 PSI) PUMP
	E) 200 MESH FILTER ON PUMP DISCHARGE
	D) ULTRA SONIC TRANSDUCER CAPABLE OF MEASURING TANK
	WATER LEVEL. COMPATIBLE WITH ONE RAIN DATA LOGGER

MATERIAL NOTES:

1. ALL METERS AND VALVES SHALL BE PLACE IN STANDARD IRRIGATION VALVE BOXES.
2. 4" COLLECTION PIPE LINE SHALL BE PVC SDR 35 SEWER AND DRAIN PIPE OR POLYETHYLENE DRAIN PIPE, ADS MEGA GREEN OR APPROVED EQUAL.
3. ALL 1" WATER SUPPLY LINES SHALL BE CONSTRUCTED WITH SCHEDULE 40 PVC OR APPROVED EQUAL.
4. INFLUENT BASKET FILTER TO BE RAIN KEEPER BASKET STRAINER AVAILABLE FROM THE RAINWATER STORE OR APPROVED EQUAL.
5. ALLIS RANCH HOUSE CISTERNS ½ HP PUMP AVAILABLE FROM THE RAINWATER STORE OR APPROVED EQUAL.
6. CONSTRUCT 4000 GALLON CUSTOM CISTERN FROM 4' TO 6' DIAMETER CONTECH STEEL REINFORCED HDPE PIPE. INCLUDE A MAINTENANCE WAY AND PUMP ACCESS.
7. PREFABRICATED 2000 GALLON CISTERN SHALL BE JOHN DEERE GREEN TECH GT-RWH-2 OR APPROVED EQUAL. THE PREFABRICATED CISTERN WILL REQUIRE A 230 VOLT, SINGLE PHASE, ELECTRIC POWER SUPPLY.
8. PROVIDE OVERFLOW PIPE FROM BASKET FILTER TO DAYLIGHT. OVERFLOW TO BE DIRECTED TO AREA THAT WILL NOT BE ADVERSELY AFFECTED BY THE ADDITIONAL DRAINAGE.
9. LOW WATER SHUT DOWN SWITCH FOR PUMP OR APPROVED EQUAL SHALL BE PROVIDED ON ALL PUMPS.
10. OPEN CHANNEL FLOW METER SHALL BE 4" PALMER - BOWLUS FLUME WITH FLANGED CONNECTORS, STILLING WELL FOR PRESSURE TRANSDUCER, PLASTI - FAB OR APPROVED EQUAL. INSTALL IN JUMBO VALVE BOX. PRESSURE TRANSDUCER CAPABLE OF RECORDING FLOW AND VOLUME AND COMPATIBLE WITH ONE RAIN DATA LOGGER.
11. DATA COLLECTED FROM METERS, FLUMES, AND WATER TANK LEVEL SENSORS SHALL BE COMPATIBLE WITH ONE RAIN DATA LOGGER PROVIDED ON SITE. COORDINATE WITH ONE RAIN.

STERLING RANCH
ALLIS RANCH - EXISTING SITE
FIGURE 1

LEGEND

- RAIN WATER COLLECTION PIPE
- WELL SUPPLY PIPE
- IRRIGATION SUPPLY PIPE
- GUTTER
- SANITARY SEWER LINE
- DOWN SPOUT
- GATE VALVE
- M METER
- F FILTER
- P PUMP

N

Scale: 1" = 30'

0 30 60

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PROJECT: 1207DOM12
05/14/2010

VICINITY MAP