CITY COUNCIL MEETING
MAY 15, 2014
BLACKSMITH FORK VILLAS
RETIREMENT COMMUNITY PUD
PRELIMINARY PLAT
~650 EAST MAIN STREET

ZONING- R-2 Allows PUD- Also title 17.28.005 indicates that this area would be considered for a senior housing PUD. The General Plan also calls for a higher density senior development in this block.

UTILITIES-The city staff recommends all utilities be built to city standards with the city taking over maintenance and operation of utilities. The sewer and water will be installed down the 16 foot strip of property going to the west to 600 East. They have agreed to restore this area after installation of utilities.

CURB, GUTTER, AND SIDEWALKS- Curb & gutter will be installed on all streets with sidewalks running in front of all Condos.

ROADS- All roads within are proposed at a width of 26 feet asphalt, 29 feet curb to curb. Highway access will need to be approved by UDOT. Final approval will be required with final plat. Roads in the development to be maintained by owner.

PARKING- Each dwelling unit will have a small two car garage and driveway. Nine extra parking stalls and an unloading area are being proposed with the assisted living area. It appears that more parking could be added to the north if needed.

STORM WATER- As shown.

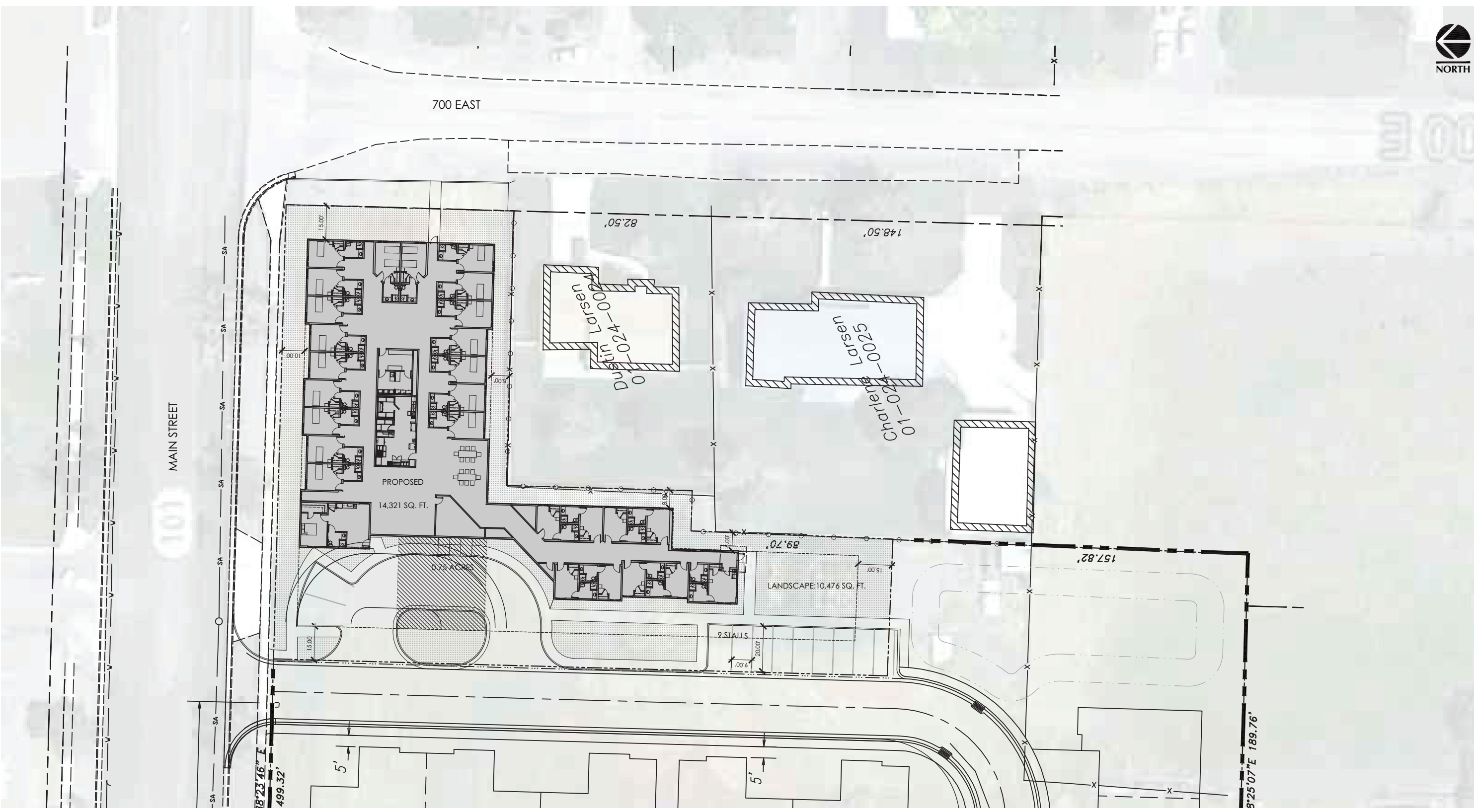
LANDSCAPING-

FENCING- Fencing will be installed around development.

BUILDINGS- Elevations and floor plans as proposed.

HOA- .

NOTES- The proposal is for seven condos with twenty five units. These buildings will be single level. It is intended that the units will be individually owned. The assisted living building will have twenty-seven units and will be single story. The assisted living building elevations are not ready to be proposed at this time. They will be required to bring elevations back to the planning commission before construction of the assisted living building begins. The planning commission unanimously recommends approval with the following conditions: Assisted living building elevations to be approved by the planning commission before building permit is issued, If snow removal becomes an issue then snow will be hauled off of site, final landscaping plan to be approved by the planning commission, UDOT permits submitted with final plat, CC&R's submitted with final plat, work with city on restoration of 16 foot utility easement, and require the owner to increase parking for the assisted living building if needed.

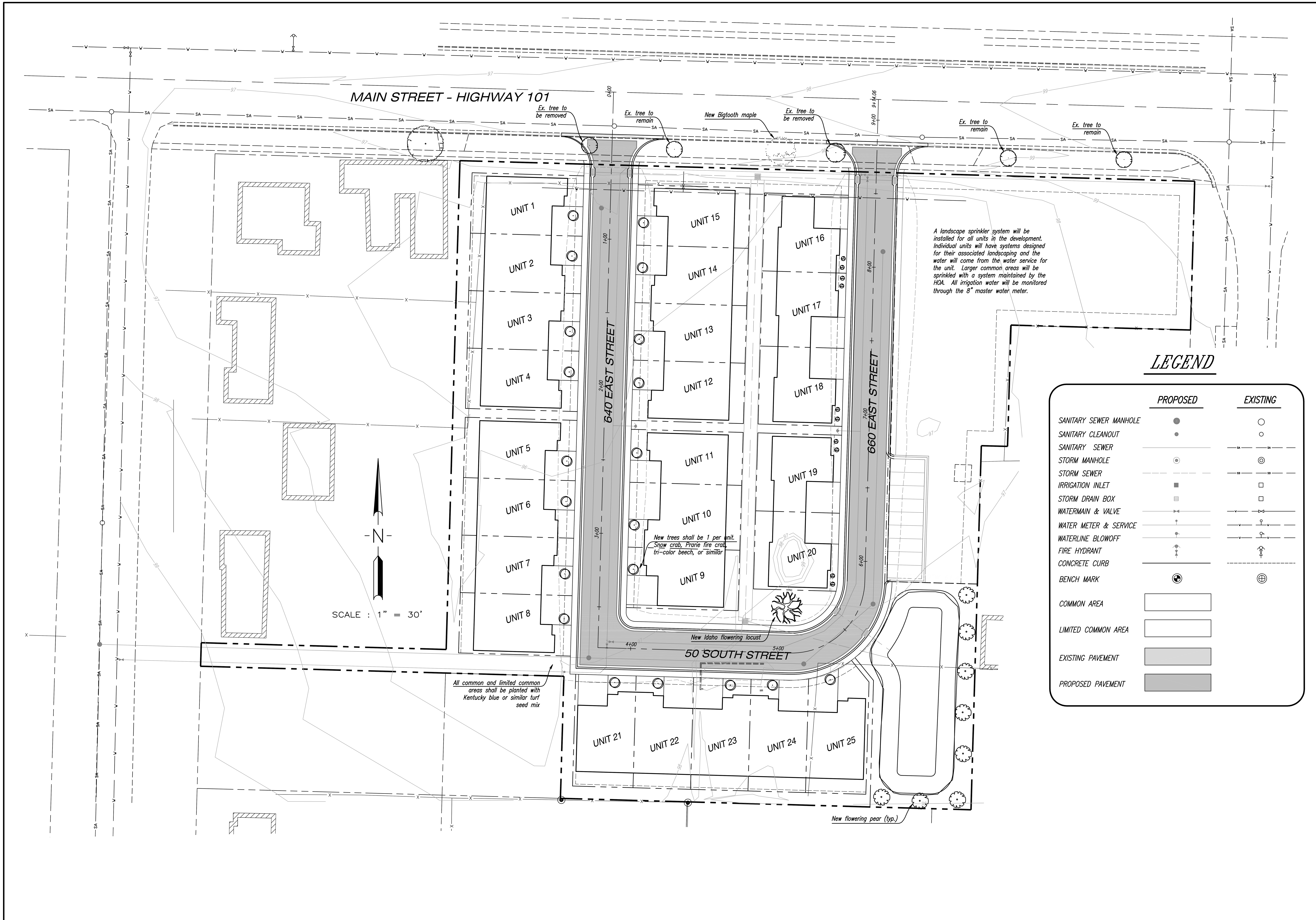


1 PRELIMINARY SITE PLAN
SCALE (24x36): 1:20
SCALE (11x17): 1:40

aeurbia architects and engineers

HYRUM ASSISTED LIVING

1:20



Turner Design Engineering, Inc.

CIVIL ENGINEERING ▲ LAND PLANNING
60 E. CENTER #210 LOGAN, UT. 84321
(435) 752-1669 (435) 770-2240

LICENSED PROFESSIONAL ENGINEER No. 318871 DAN B TURNER STATE OF UTAH

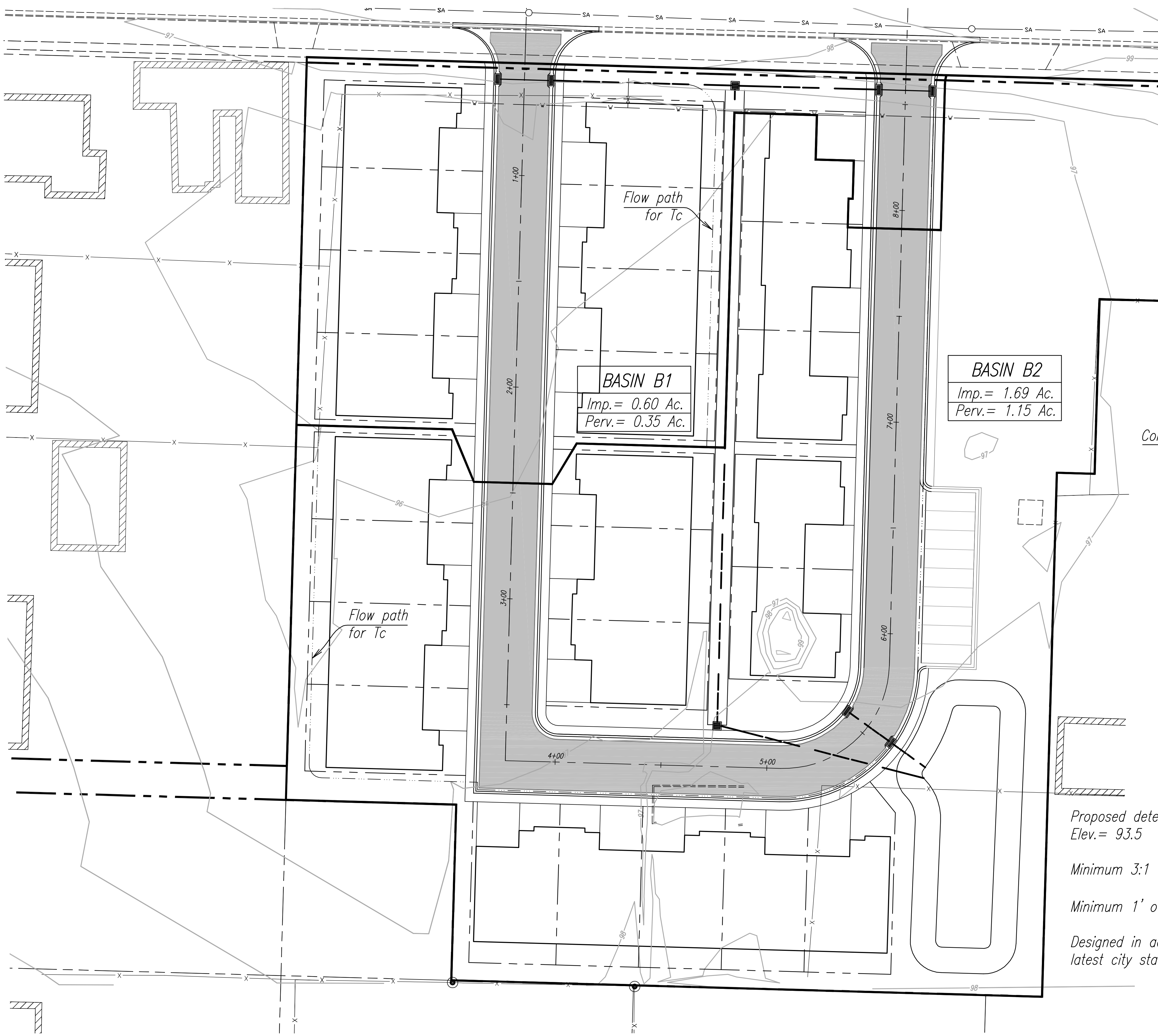
LANDSCAPE PLAN

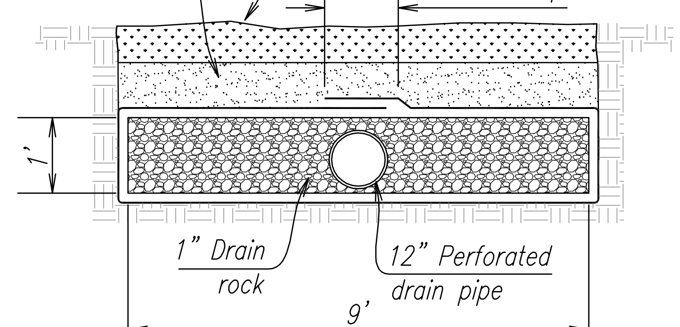
BLACKSMITH FORK VILLAS

A RETIREMENT AND ASSISTED LIVING COMMUNITY

HYRUM, UTAH

Revisions	
Date	Apr. 29, 2014
Scale	1" = 30'
Designed by	D.T.
Drawn By	D.T.
Job Number	14-003
Sheet	1 of 1





DRAINAGE TRENCH DETAIL

NO SCALE

Proposed detention pond.
Elev.= 93.5

Minimum 3:1 side slopes.

Minimum 1' of freeboard.

Designed in accordance with the latest city standards.

Job Number	14-003
Sheet	1 of 1
Date	Apr. 25, 2014
Scale	1" = 30'
Designed by	D.T.
Drawn By	D.T.
Revisions	

STORM SYSTEM MAP

HYRUM PUD

HYRUM, UTAH

LICENSED PROFESSIONAL ENGINEER No. 318871 DAN B TURNER STATE OF UTAH

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60 E. CENTER #210 LOGAN, UT. 84321
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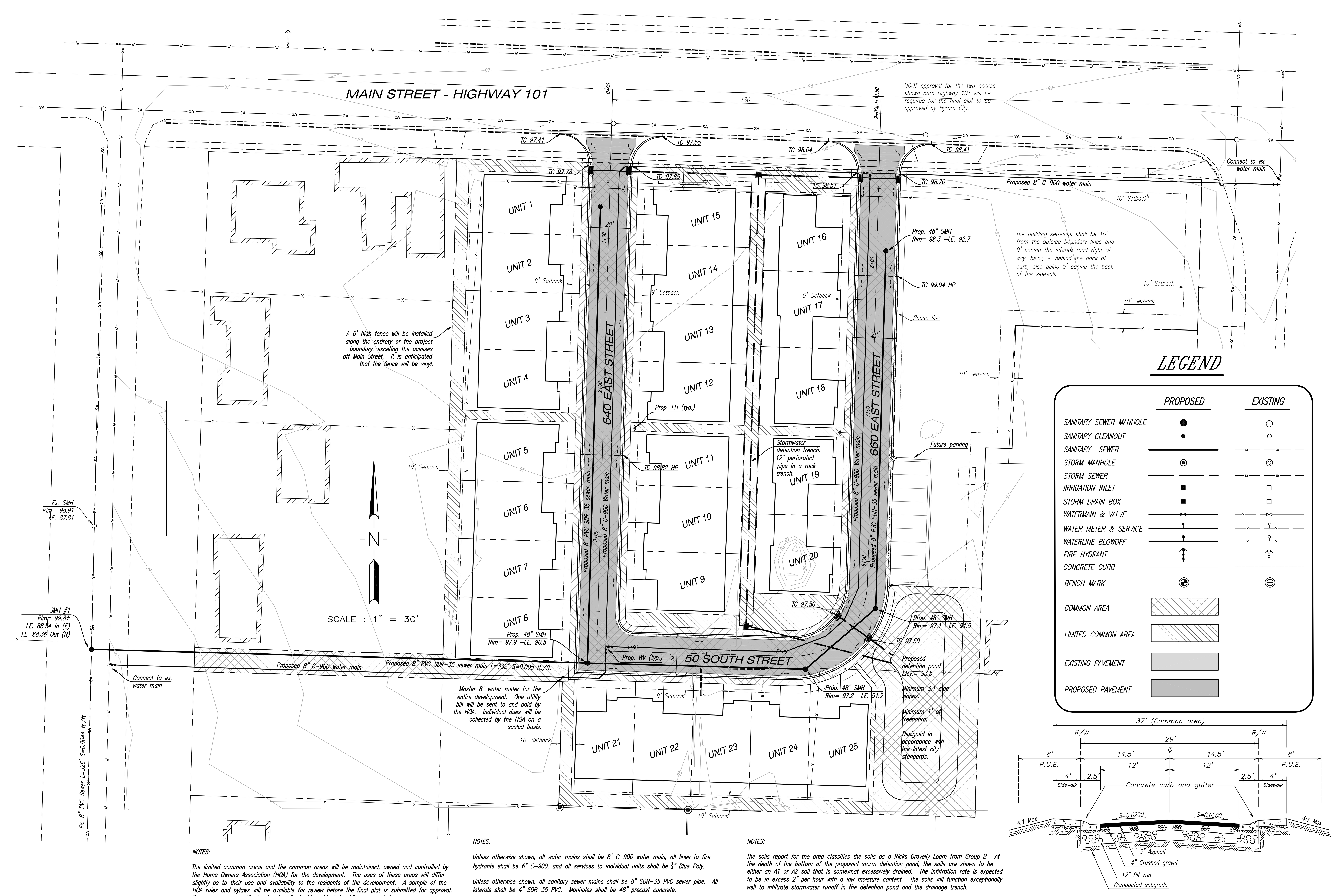

TYPICAL STREET SECTION

NO SCALE

NOTES:

The limited common areas and the common areas will be maintained, owned and controlled by the Home Owners Association (HOA) for the development. The uses of these areas will differ slightly as to their use and availability to the residents of the development. A sample of the HOA rules and bylaws will be available for review before the final plat is submitted for approval. The common area will also be described with a blanket utility easement for sewer, water, power, communications, gas, and any other utility desiring to be in the development.

NOTES:

Unless otherwise shown, all water mains shall be 8" C-900 water main, all lines to fire hydrants shall be 6" C-900, and all services to individual units shall be ¾" Blue Poly.

Unless otherwise shown, all sanitary sewer mains shall be 8" SDR-35 PVC sewer pipe. All laterals shall be 4" SDR-35 PVC. Manholes shall be 48" precast concrete.

The storm drainage trench shown shall be a perforated 12" ADS pipe bedded in a rock trench with a width of 9' and a depth of 1', lined with fabric on all sides with a minimum of 6" topsoil for landscaping. The trench will have a release orifice outlet to the pond.

NOTES:

The soils report for the area classifies the soils as a Ricks Gravelly Loam from Group B. At the depth of the bottom of the proposed storm detention pond, the soils are shown to be either an A1 or A2 soil that is somewhat excessively drained. The infiltration rate is expected to be in excess 2" per hour with a low moisture content. The soils will function exceptionally well to infiltrate stormwater runoff in the detention pond and the drainage trench.

An onsite infiltration test will be done when the location is preliminarily approved, prior to final design.

Turner Design Engineering, Inc.
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60 E. CENTER #210 LOGAN, UT. 84321
(435) 752-1669 (435) 770-2240

LICENSED PROFESSIONAL ENGINEER No. 318871 DAN B TURNER STATE OF UTAH

PRELIMINARY PLAT

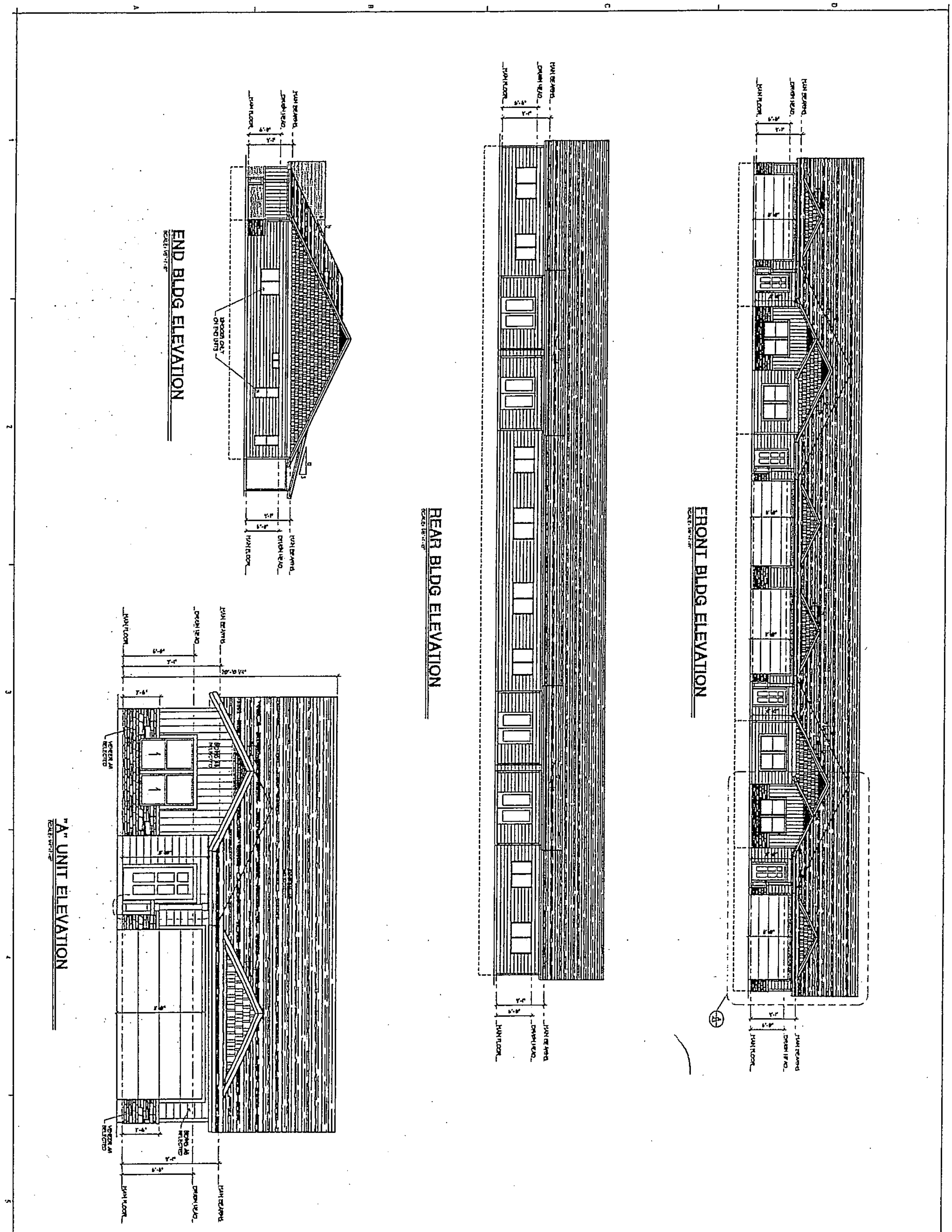
BLACKSMITH FORK VILLAS

A RETIREMENT AND ASSISTED LIVING COMMUNITY

HYRUM, UTAH

Revisions

Job Number	Date	Scale	Designed by	Drawn By	Sheet
14-003	Apr. 29, 2014	1" = 30'	D.T.	D.T.	2 of 2



SHEET TITLE:	OVERALL BUILDING ELEVATIONS
CLIENT:	CHAMPLIN DEVELOPMENT
ADDRESS:	XXXX HYRUM, UTAH

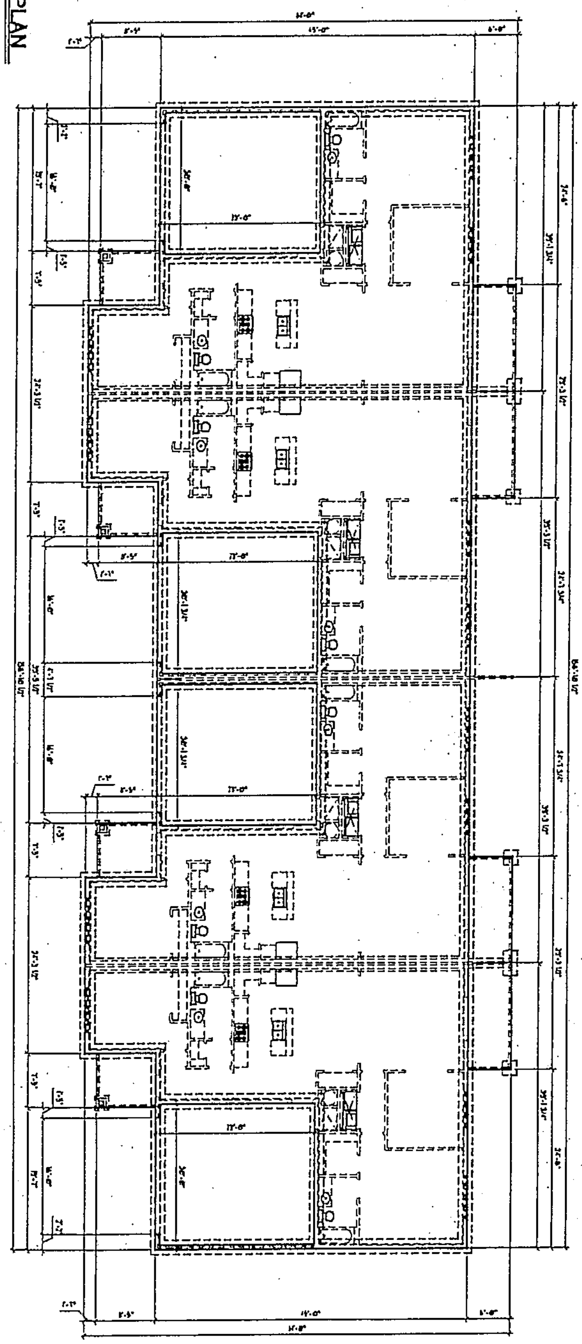
MARTINDALE HOME DESIGN
RESIDENTIAL DESIGN & DRAFTING

DATE 4/20/14
SCALE 1/8"=1'-0"

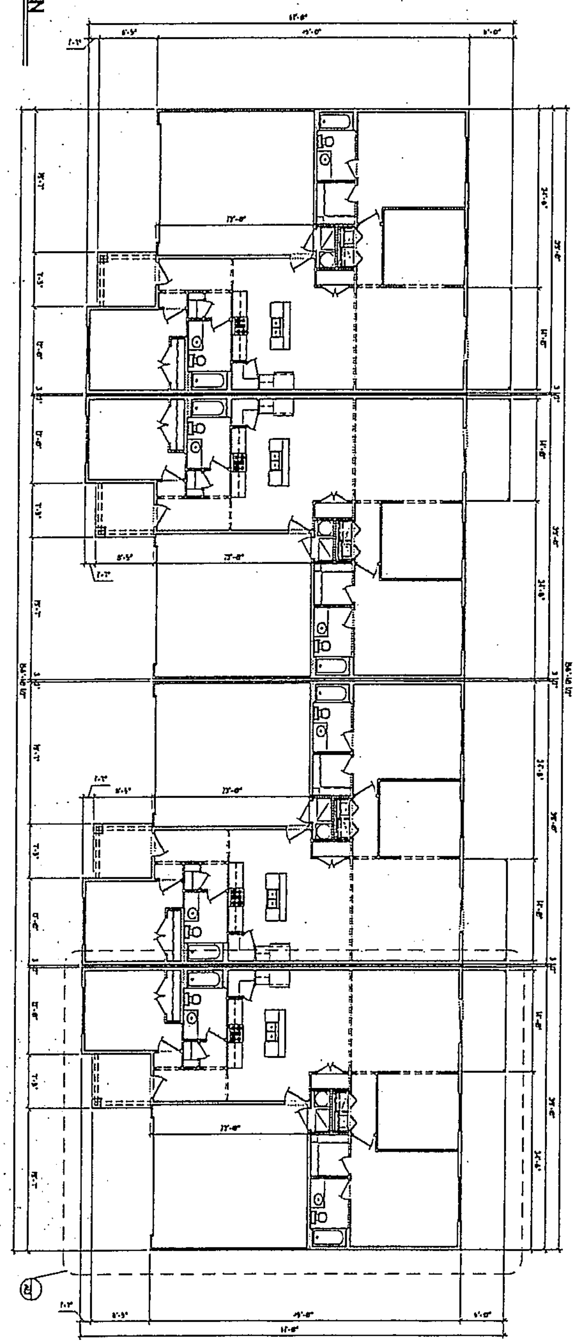
SHEET A3

REVISIONS

OVERALL FOOT. & FOUND. PLAN



OVERALL MAIN FLOOR PLAN



NOT FOR CONSTRUCTION

SHEET	A1
DATE	4/20/14
JOB	14-HYRUM3PD
SCALE	1/8"=1'-0"
DRAWN	CBU

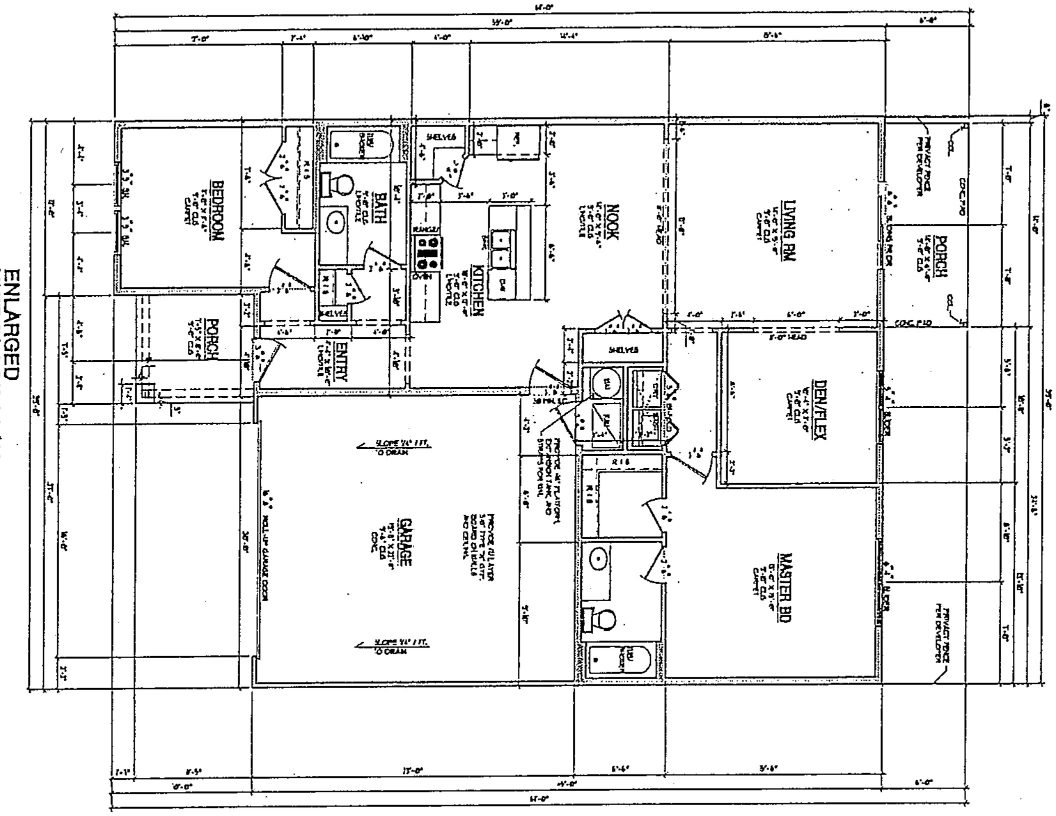
MARTINDALE
HOME DESIGN
RESIDENTIAL DESIGN & DRAFTING

50 PINEVIEW DRIVE
HYDE PARK, UT. 84318
Office: (435) 2320306
www.martindalehomedesign.com

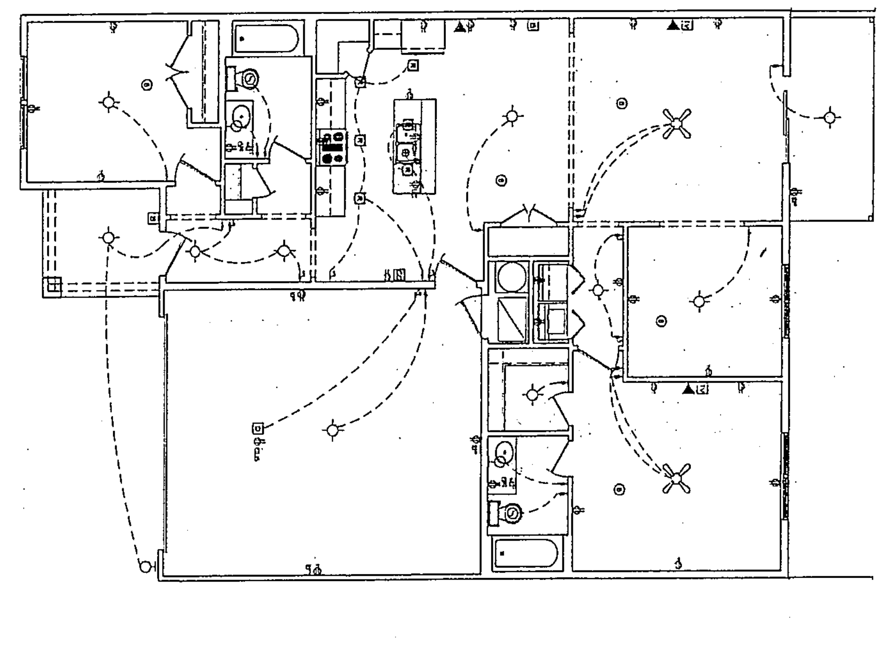
SHEET TITLE:	OVERALL MAIN FLOOR PLANS
CLIENT:	CHAMPLIN DEVELOPMENT
ADDRESS:	XXXX HYRUM, UTAH

REVISIONS

ENLARGED UNIT FLOOR PLAN



ENLARGED UNIT ELEC. PLAN



NOT FOR CONSTRUCTION

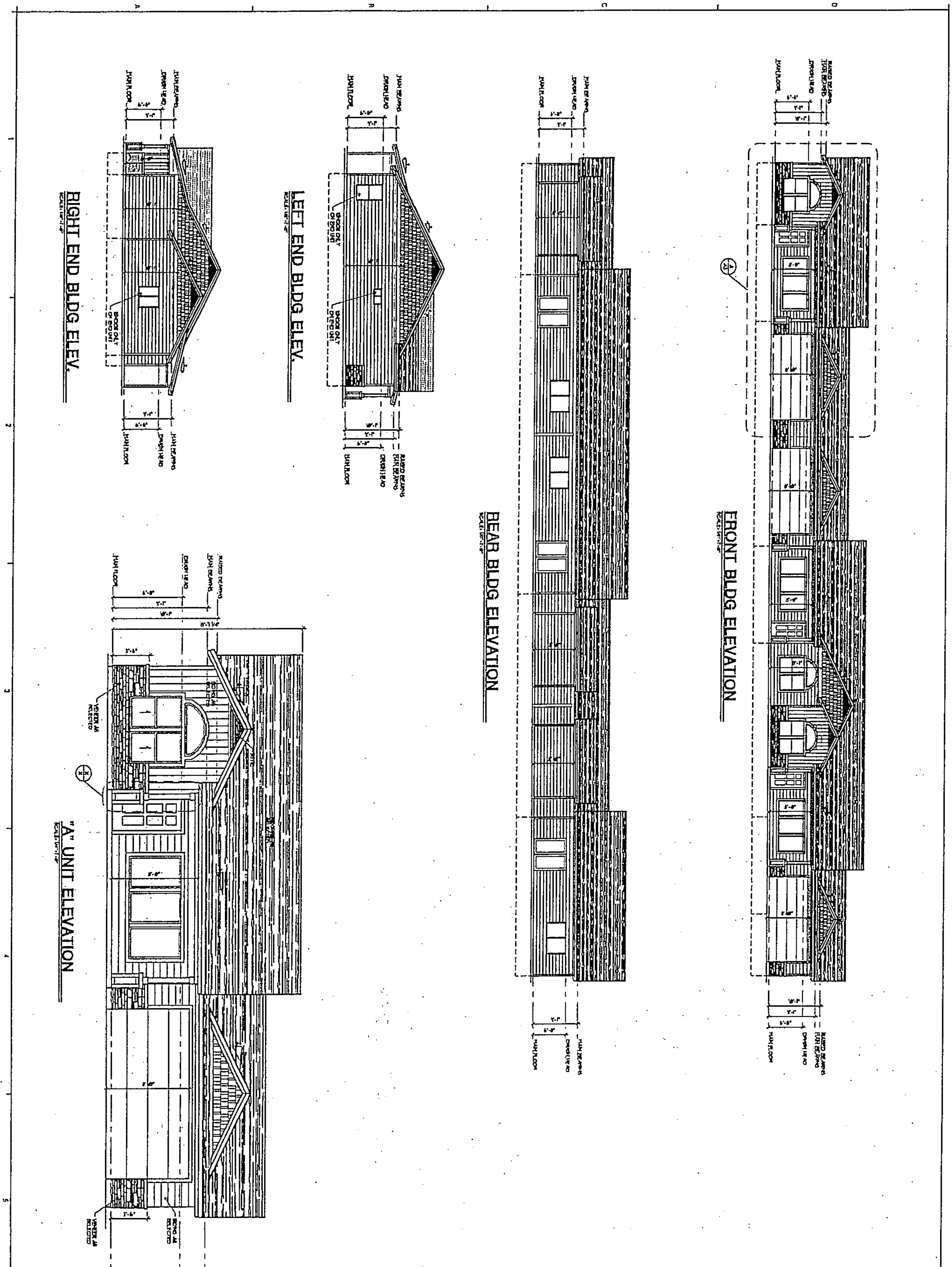
MARTINDALE
HOME DESIGN
RESIDENTIAL DESIGN & DRAFTING

40 PINEVIEW DRIVE
HYDE PARK, UT 84318
OFFICE (435) 232-0306
www.martindalehomedesign.com

SHEET TITLE:	ENLARGED UNIT FLOOR PLAN
CLIENT:	CHAMPLIN DEVELOPMENT
ADDRESS:	XXXX HYRUM, UTAH

SHEET A1.2

REVISIONS



NOT FOR CONSTRUCTION

SHEET A3

DATE 4/20/14
JOB 14-HYRUM280
SCALE 1/8" = 1'-0"
DRAWN CBU

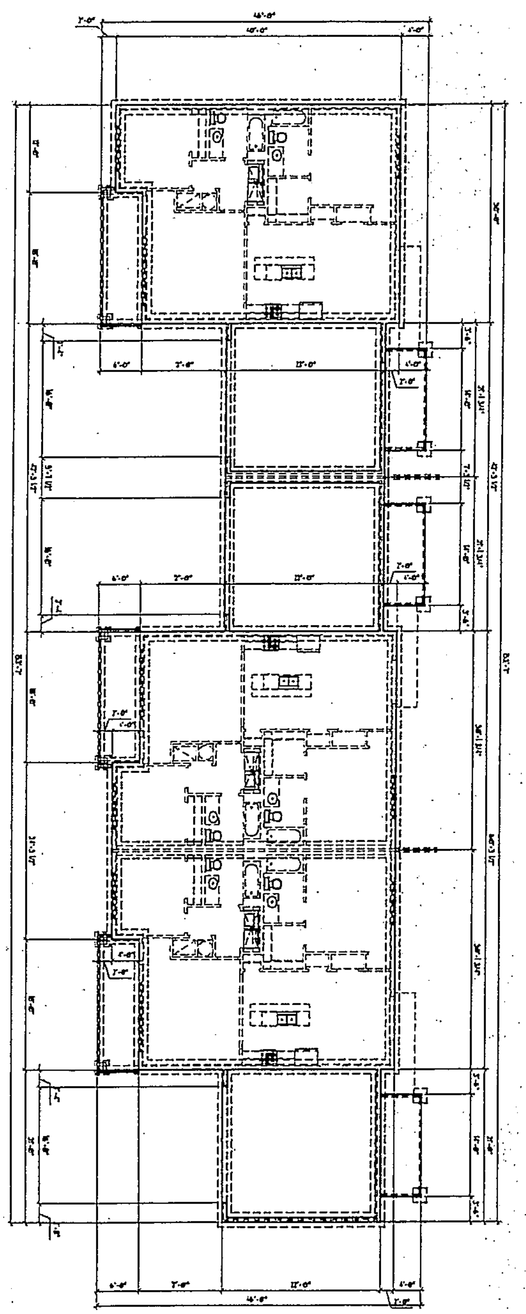
MARTINDALE
HOME DESIGN
RESIDENTIAL DESIGN & DRAFTING

50 PINEVIEW DRIVE
HYDE PARK, UT. 84318

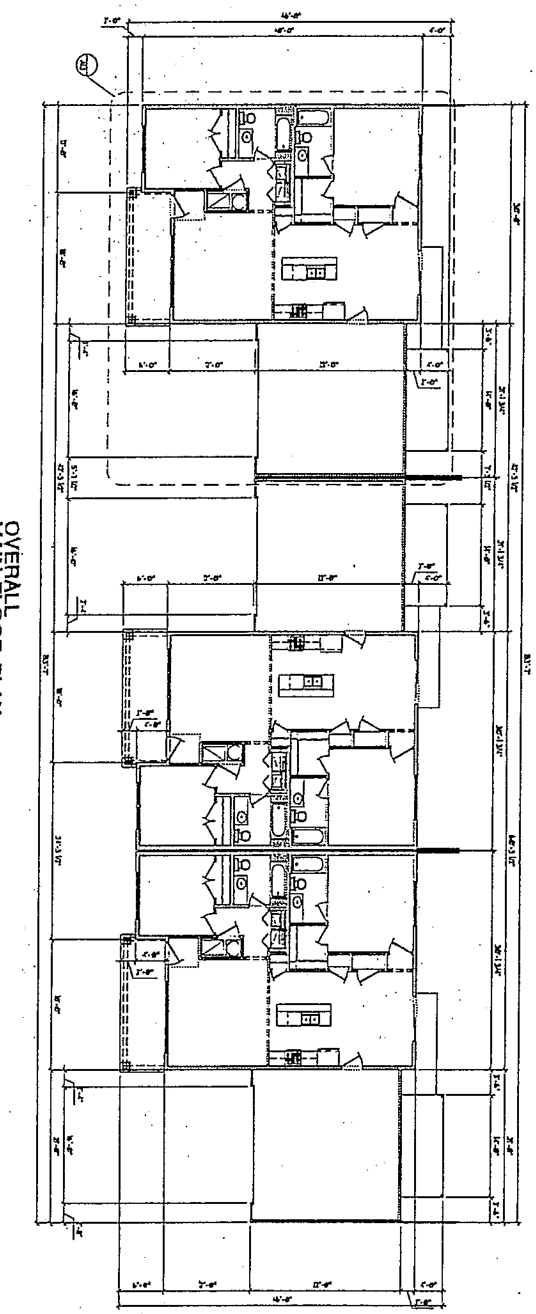
OFFICE: (435) 232-0306
www.martindalehomedesign.com

SHEET TITLE:	OVERALL BUILDING ELEVATIONS
CLIENT:	CHAMPLIN DEVELOPMENT
ADDRESS:	XXXX HYRUM, UTAH

REVISIONS



OVERALL FOOT. & FOUND. PLAN



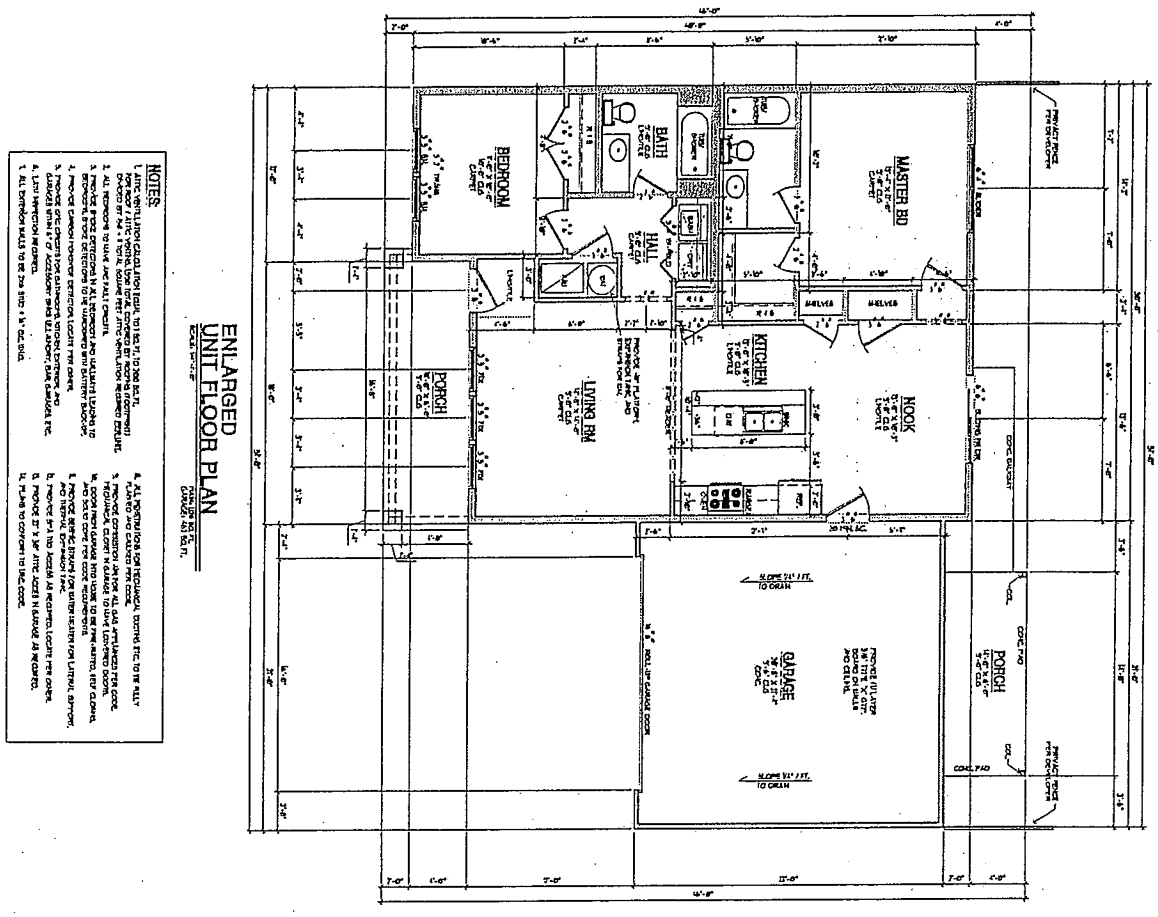
OVERALL MAIN FLOOR PLAN

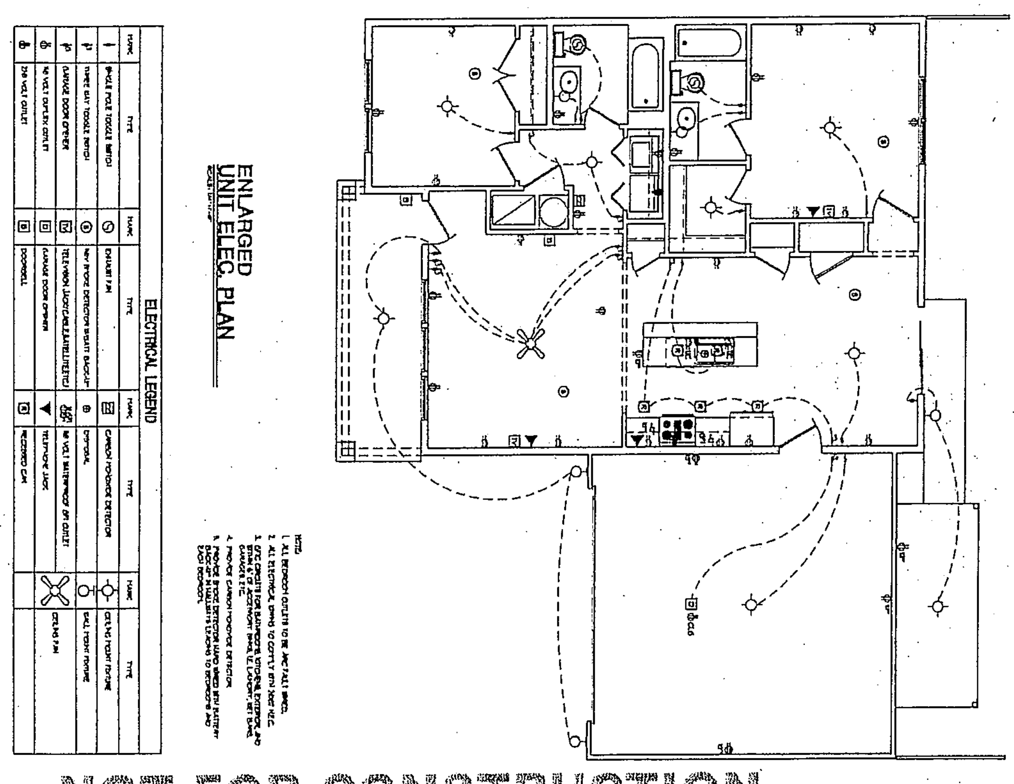
NOT FOR CONSTRUCTION

SHEET A1	DATE 4/20/14; JOB 14-HYRUM280; SCALE 1/8"=1'-0"; DRAWN CBN	MARTINDALE HOME DESIGN RESIDENTIAL DESIGN & DRAFTING 50 PINEVIEW DRIVE HYDE PARK, UT. 84318 OFFICE (435) 2320308 www.martindalehomedesign.com

SHEET TITLE:	OVERALL MAIN FLOOR PLANS
CLIENT:	CHAMPLIN DEVELOPMENT
ADDRESS:	XXXX HYRUM, UTAH

REVISIONS





NOT FOR CONSTRUCTION

SHEET TITLE:	ENLARGED UNIT FLOOR PLAN
CLIENT:	CHAMPLIN DEVELOPMENT
ADDRESS:	XXXX HYRUM, UTAH

MARTINDALE HOME DESIGN
RESIDENTIAL DESIGN & DRAFTING
50 PINEVIEW DRIVE HYDE PARK, UT. 84318
Office: (435) 232-0306 www.martindalehomedesign.com

SCALE: 1/4" = 1'-0"

SHEET A1.2

REVISIONS

HYRUM SENIOR DEVELOPMENT DESIGN REPORT

HYRUM, UTAH

PREPARED FOR:

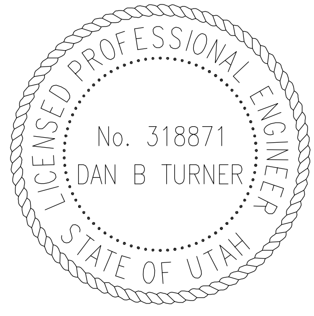
INTERSTATE COMMERCIAL PROPERTIES
255 SOUTH MAIN #200
LOGAN, UTAH
435-757-4445

PREPARED BY:

Turner Design Engineering, Inc.

307 HAMMOND LANE, PROVIDENCE UTAH

(801) 834-2805



DEVELOPMENT REPORT

Project Description

This project involves the development of 3.83 acres in Hyrum, Utah, located generally at 650 East Main Street. The land has historically been used for agricultural purposes. There are a few portions of concrete foundation that previously housed various barns and other out buildings. As part of the development, these will be removed and disposed of in an approved landfill.

The ground is relatively flat, with only a faint remnant of a partial irrigation ditch on the property. Main Street is currently developed with curb and gutter and sidewalk. These improvements will remain except in the areas of proposed access to the project. Approval from UDOT will need to be given before the development can be constructed. At this location, Highway 101 is a Class VII roadway. The access management plan of UDOT requires a minimum spacing of 150' between access points. The access locations shown have a 180' spacing, above the minimum. These plans will be concurrently submitted to UDOT for their approval.

The proposal for the project consists of construction of fully developed roadways and utilities to serve 25 condominium units and a future assisted living center.

Stormwater Plan

The stormwater plan consists of runoff traveling by overland and gutter flow to two separate detention facilities. On the north portion of the project, the runoff will be collected by curb inlets boxes in the roadway before reaching the approach to Main Street. The runoff will then be piped along the Main Street frontage to a distribution box located midway along the frontage of Main Street. This distribution box will outlet to a 12" perforated pipe bedded in a gravel trench to allow infiltration to the groundwater. At the south end of the trench there will be another distribution box. At this location there will be a 4" outlet pipe that will function as an orifice to release excess runoff to the main detention pond. The outlet end in the detention pond will be fitted with a one-way flow flap valve so if excess stormwater is in the pond, it will not flow back into the trench. The trench will have a width of 9' and a depth of 1'. Subtracting out the area of the pipe itself yields a storage volume of 8.2 cf per foot. A void ratio of 50% has been applied to the rock trench resulting in a storage volume of 4.1 cf per foot. Adding back in the pipe storage volume of 0.80 cf per foot results in a total sectional storage in the trench of 4.9 cf per foot. Multiplying the total trench length of 300' gives a storage volume of 1,467 cf. The southern and eastern portions of the parcel will also collect runoff by overland and gutter flow, captured in sag curb inlet boxes, and be directed to a detention pond located in the southwest corner of the development. The pond will have a top elevation of a minimum 97.50 and a bottom elevation of 93.50. The pond will have a maximum capacity of 19,499 cf. The side slopes of the pond will be a maximum of 3:1.

In the 100-yr, 24-hr event, the trench will be completed filled to the maximum capacity. This will activate the one-way flap valve and runoff that is not infiltrated will be conveyed to the detention pond. In addition, the inlets in the southwest corner of the loop road will convey runoff water to the pond. The maximum water surface during this design event will be 96.28, leaving 1.22’ of freeboard.

The infiltration rate of 2” per hour was found through the NRCS soils survey. Before the engineering plans are finalized, an onsite infiltration test will be done at the pond location and also along the trench alignment to assure correct infiltration rates.

Sanitary Sewer System

The sewer system will connect to the existing main in 600 East Street. The proposed sewer will then service the project through a 16’ wide strip of land that is part of the total parcel. All mains will be 8” SDR-35 PVC. The individual units will be serviced with a standard 4” PVC lateral. Because all of the units will be built as slab on grade, the depth of the lateral is not critical.

Water system

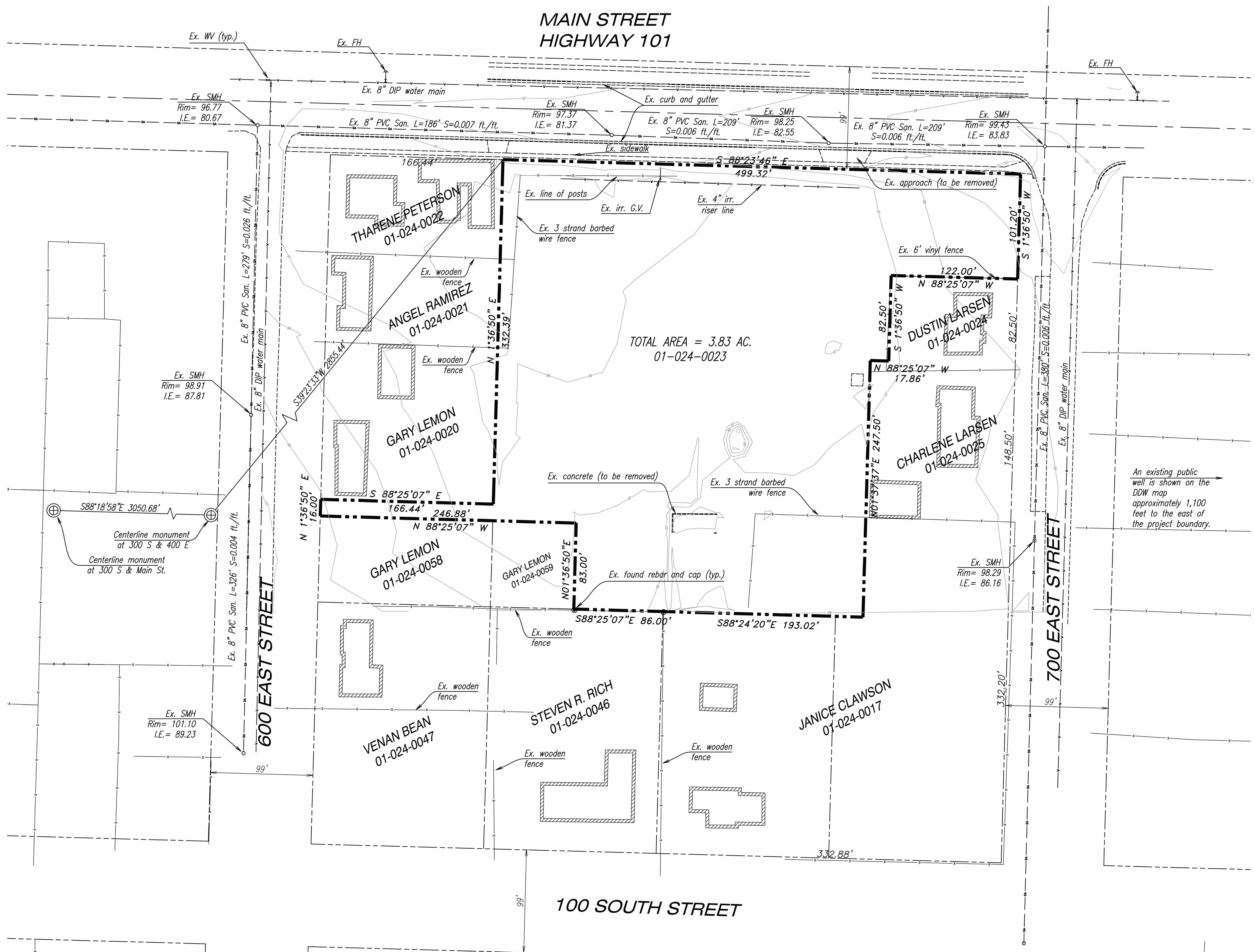
The water system will connect to the existing water mains in 600 and 700 East Streets. This will loop the water system through the development. There will be a single 8” master water meter used on the project. This will allow the City to send the HOA only one water bill. That bill will be divided internally by the HOA to the residents of the individual units. Each unit will be served by a ¾” poly line.

Hyrum City Code 16.12.030 Part D

1. The boundary lines shown on the existing conditions plan, sheet 1 of the submitted preliminary plat, were obtained and calculated by Jeff Nielson of Foresight Surveying. All of the required surveying information is shown.
2. Phasing will be the condominium development and the assisted living center development. It is anticipated that both projects will be constructed concurrently, however, that is dependant on when a final design is completed for the assisted living center building.
3. The CC & R’s for the development will be submitted separately.
4. The requirements of a PUD have been followed.
5. Drainage calculations are attached.
6. All runoff will e contained onsite.
7. The development will not impact any irrigation channels.
8. No easements across private lands not controlled by the owner will be required.
9. There are no wetlands on the site.
10. We are requesting a waiver from the landscape plan at this time. There will be trees and shrubs planted as parts of the development, but the exact species and locations have not yet been determined. Once the locations of the buildings have been approved, a landscaping and irrigation plan will be submitted for review.

11. Only minor changes have been made from the previously approved concept plan. The number of units as remained unchanged although they have been moved slightly to allow for better coverage and density.
12. There are no imminent hazards on the site or adjacent to the property.
13. Additional land was purchased from Clawson and Larsen to make the project more prone to development. These purchase contracts have been closed with both parties.
14. No animal rights are being requested.

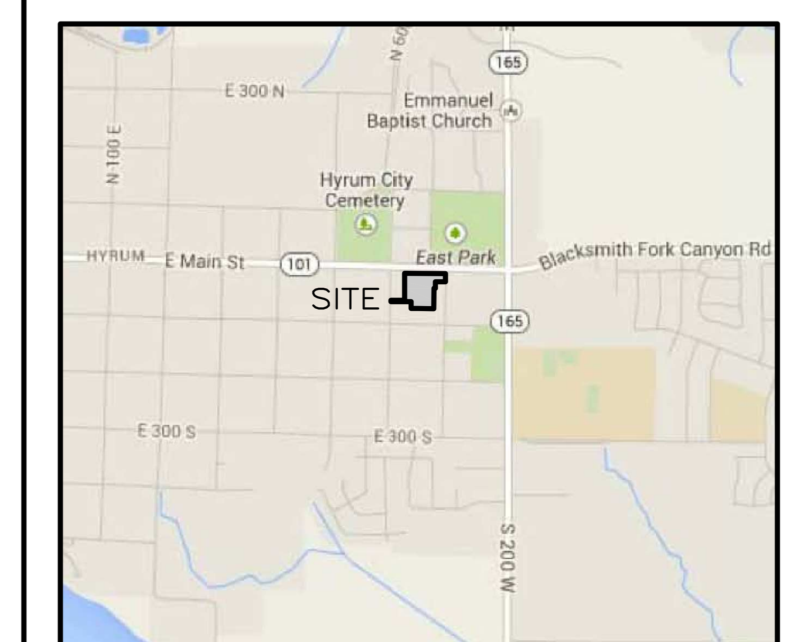
PRELIMINARY PLAT
FOR THE
BLACKSMITH FORK VILLAS
A RETIREMENT AND ASSISTED LIVING COMMUNITY
HYRUM CITY, CACHE COUNTY, UTAH
A PART OF THE SOUTHEAST QUARTER
OF SECTION 3, TOWNSHIP 10 N., RANGE 1 E.
SALT LAKE BASE AND MERIDIAN
APRIL 2014



-N-

SCALE : 1" = 60'

VICINITY MAP



LEGEND

	PROPOSED	EXISTING
SANITARY SEWER MANHOLE	●	○
SANITARY CLEANOUT	•	○
SANITARY SEWER	———	— SA —
STORM MANHOLE	⦿	◎
STORM SEWER	— —	— SD —
IRRIGATION INLET	■	□
STORM DRAIN BOX	▦	□
WATERMAIN & VALVE	—⋈—	—⋈—
WATER METER & SERVICE	———	———
WATERLINE BLOWOFF	———	———
FIRE HYDRANT		
CONCRETE CURB	———	- - -
LIGHT POLE	✱	☆
POWER POLE	•	◇
BENCH MARK		⊕
EXISTING PAVEMENT		
PROPOSED PAVEMENT		

OWNER / DEVELOPER

INTERSTATE COMMERCIAL PROPERTIES
CONTACT: RYAN REEVES
255 SOUTH MAIN # 100
LOGAN, UTAH 84321
435-757-4445

PRELIMINARY PLAT

BLACKSMITH FORK VILLAS

A RETIREMENT AND ASSISTED LIVING COMMUNITY

HYRUM, UTAH

PROPOSED DEVELOPMENT LAND USE

Total land to e developed = 3.83 acres

Assisted living center land = 0.75 acres

Residential land = 3.08 acres
Density = 8.1 units/acres (25 Units)
Common space = 1.00 acres
Limited common space = 0.33 acres

Turner Design Engineering, Inc.
CIVIL ENGINEERING ▲ LAND PLANNING
307 HAMMOND LANE PROVIDENCE, UTAH
(801) 834-2805

OWNER'S AFFIDAVIT

Know all men by these presents that we, the undersigned, are registered representatives of the owner of the property. Authorization of this action has been given expressly by Interstate Commercial Properties. Under this designation of representation, we submit the certificate of clear title on the land shown on this plat.

In witness we have hereunto set our signature this the_____day of __________, 2014.

WATER APPROVAL

I certify that I have had this plat examined and find that it is correct and in accordance with the standards and specifications set forth by both the water department.

Date ______________
Dept. Official ______________

SOLID WASTE APPROVAL

I certify that I have had this plat examined and find that it is correct and in accordance with the standards and specifications set forth by both the solid waste department.

Date ______________
Dept. Official ______________

PLANNING COMMISSION APPROVAL

Approved this the _____day of __________, 2014 by the ______________ Planning Commission.

Chairman ______________

CITY COUNCIL APPROVAL

Approved this the _____day of __________, 2014 by the ______________ City Council.

Chairman ______________

ENGINEER'S CERTIFICATE

I certify that I have had this plat examined and find that it is correct and in accordance with the information on file at the Hyrum City office.

Date ______________
Engineer ______________

PUBLIC UTILITY ACKNOWLEDGEMENT

We have reviewed this plat and approved it according to our utility. The utility agrees to place specific utilities underground, within the right of way, or easement, as shown on the plan. The utility is willing to provide needed service for the development. Any restrictions, fees, and timetables shall be provided before construcion begins.

Date	Questar Gas	Date	Utah Power
Date	Century Link	Date	Comcast

April 29, 2014	Date
1" = 60'	Scale
D.T.	Designed by
D.T.	Drawn By

Job Number
14-003

Sheet
1 of 2

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type II 24-hr Rainfall=3.02"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment B1: B1

Tc=63.6 min CN=88 Area=0.949 ac Runoff= 0.89 cfs 0.132 af

Subcatchment B2: B2

Tc=50.3 min CN=87 Area=2.844 ac Runoff= 3.03 cfs 0.380 af

Pond 1: B1 Peak Storage= 1,569 cf Inflow= 0.89 cfs 0.132 af
Discarded= 0.07 cfs 0.051 af Primary= 0.40 cfs 0.081 af Outflow= 0.47 cfs 0.132 af

Pond 2: B2 Peak Storage= 13,537 cf Inflow= 3.25 cfs 0.461 af
Discarded= 0.27 cfs 0.185 af Outflow= 0.27 cfs 0.185 af

Runoff Area = 3.793 ac Volume = 0.512 af Average Depth = 1.62"

Subcatchment B1: B1

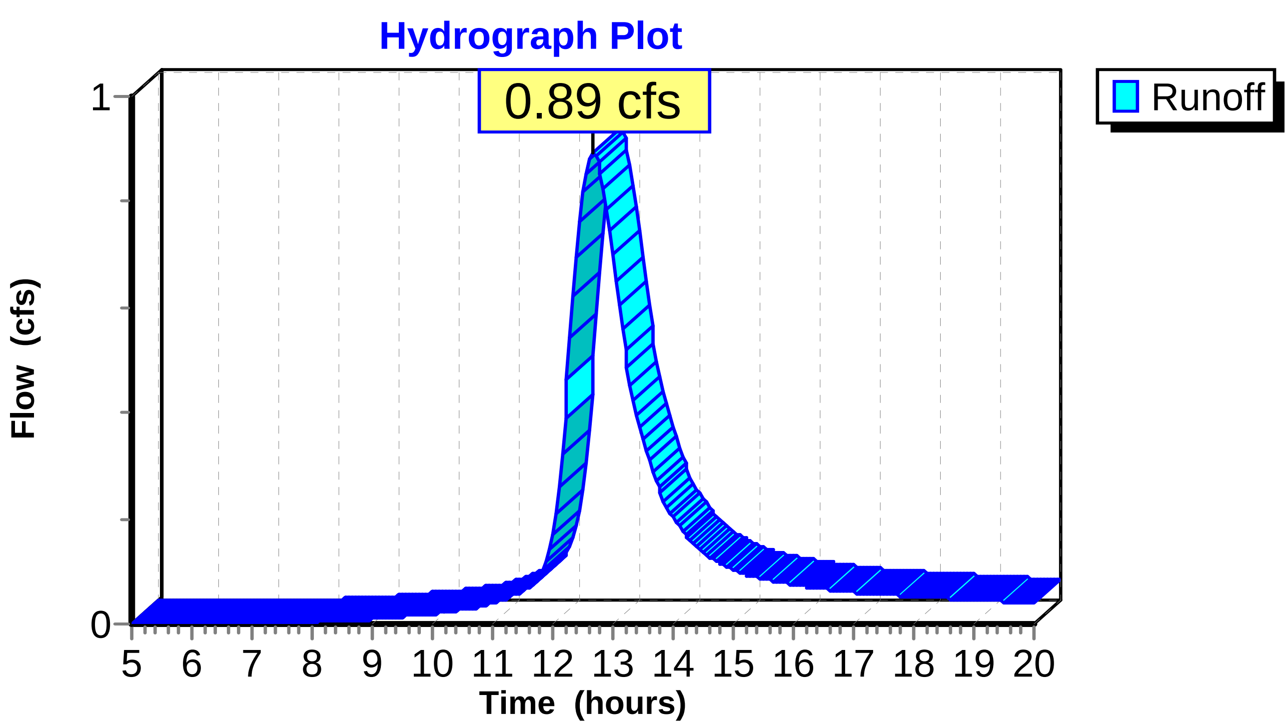
Runoff = 0.89 cfs @ 12.66 hrs, Volume= 0.132 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.02"

Area (ac)	CN	Description
0.355	98	Roof
0.077	98	Driveway
0.168	98	Road
0.349	70	Landscape
0.949	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
63.6					**Direct Entry,**

Subcatchment B1: B1



Subcatchment B2: B2

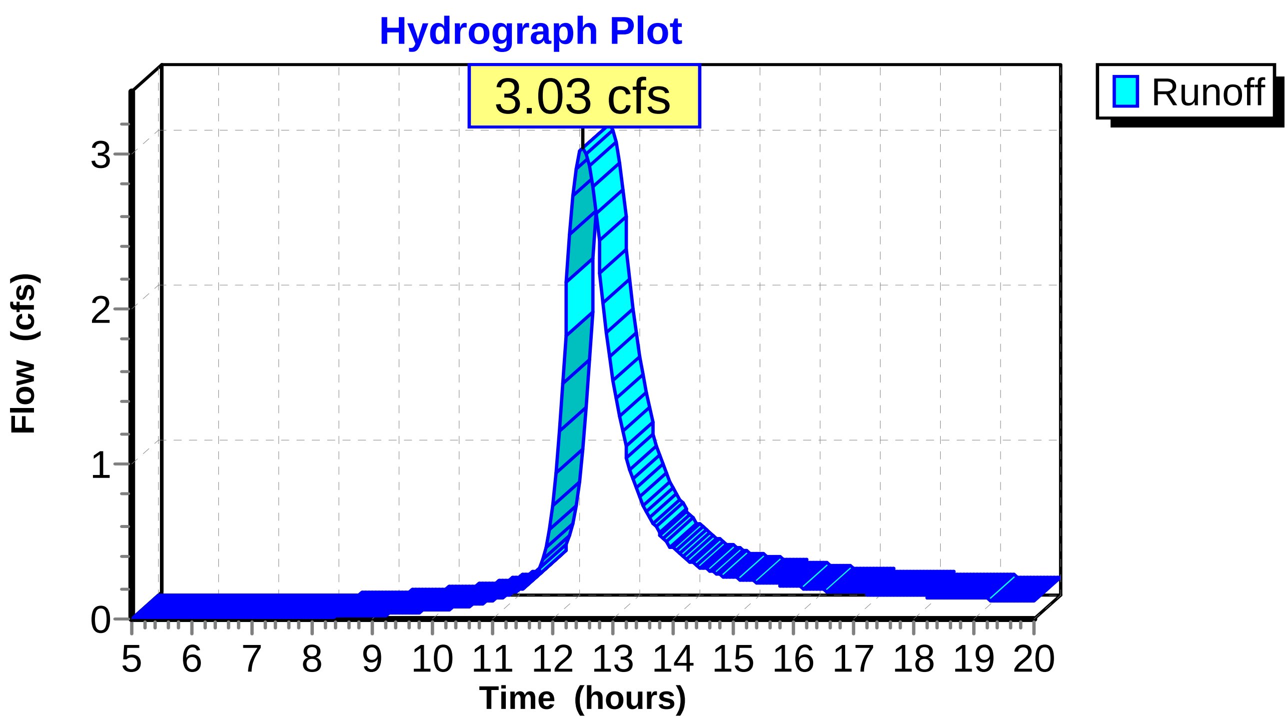
Runoff = 3.03 cfs @ 12.49 hrs, Volume= 0.380 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.02"

Area (ac)	CN	Description
1.015	98	Roof
0.163	98	Driveway
0.511	98	Road
1.155	70	Landscape
2.844	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.3					**Direct Entry,**

Subcatchment B2: B2



Pond 1: B1

Inflow	=	0.89 cfs @	12.66 hrs,	Volume=	0.132 af
Outflow	=	0.47 cfs @	13.27 hrs,	Volume=	0.132 af, Atten= 48%, Lag= 36.7 min
Discarded	=	0.07 cfs @	11.65 hrs,	Volume=	0.051 af
Primary	=	0.40 cfs @	13.27 hrs,	Volume=	0.081 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 93.07' Storage= 1,569 cf
Plug-Flow detention time= 37.6 min calculated for 0.132 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

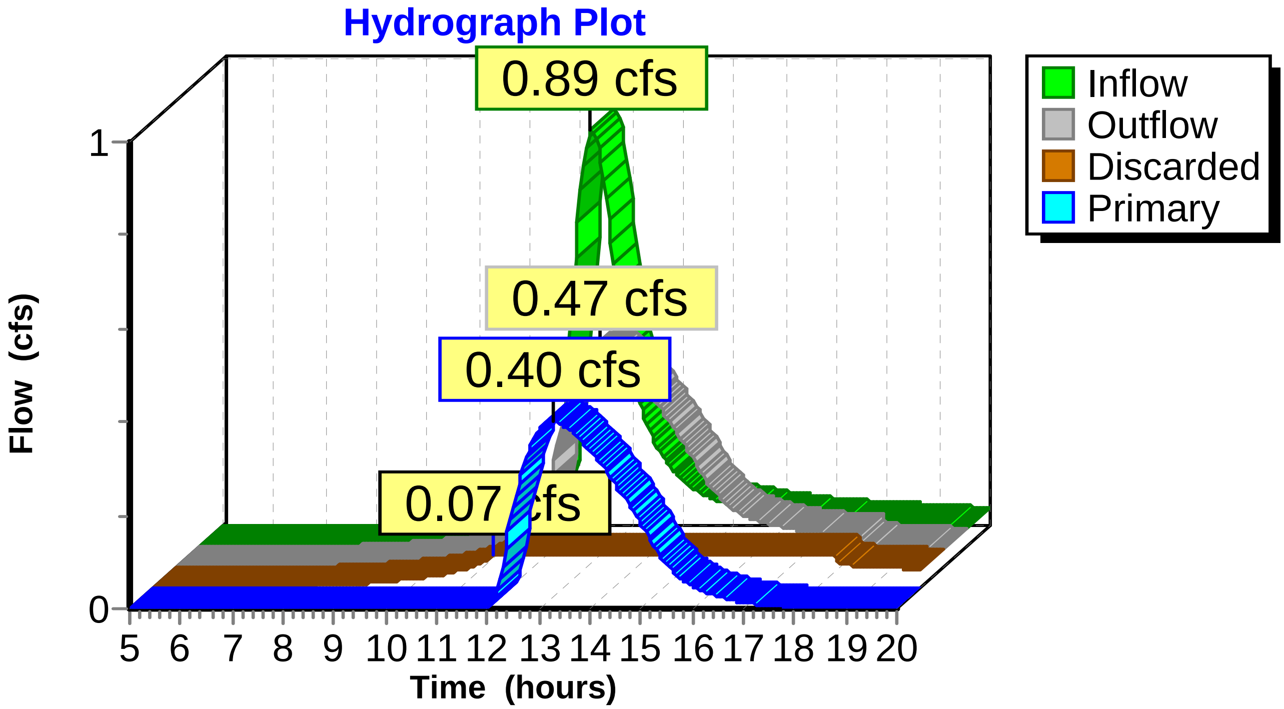
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.00	1,467	0	0
93.00	1,467	1,467	1,467

Discarded OutFlow (Free Discharge)
└─2=Exfiltration

Primary OutFlow (Free Discharge)
└─1=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	92.00'	**4.0" Vert. Orifice/Grate** C= 0.600
2	Discarded	0.00'	**0.002800 fpm Exfiltration over entire Surface area**

Pond 1: B1



Pond 2: B2

Inflow = 3.25 cfs @ 12.52 hrs, Volume= 0.461 af
Outflow = 0.27 cfs @ 15.90 hrs, Volume= 0.185 af, Atten= 92%, Lag= 203.0 min
Discarded = 0.27 cfs @ 15.90 hrs, Volume= 0.185 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

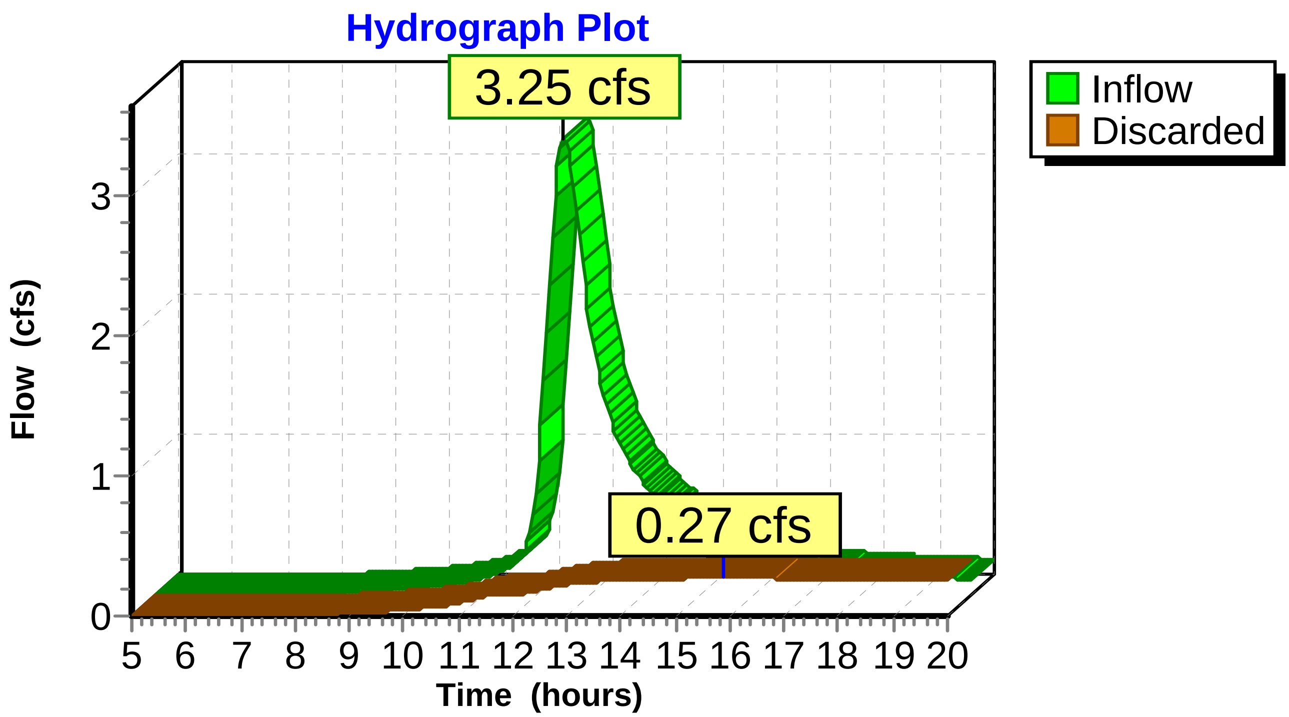
Peak Elev= 96.28' Storage= 13,537 cf
Plug-Flow detention time= 204.7 min calculated for 0.184 af (40% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
93.50	3,104	278.0	0	0	3,104
97.50	6,894	354.0	19,499	19,499	7,130

Discarded OutFlow (Free Discharge)
└─1=Exfiltration

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.002800 fpm Exfiltration over entire Surface area**

Pond 2: B2



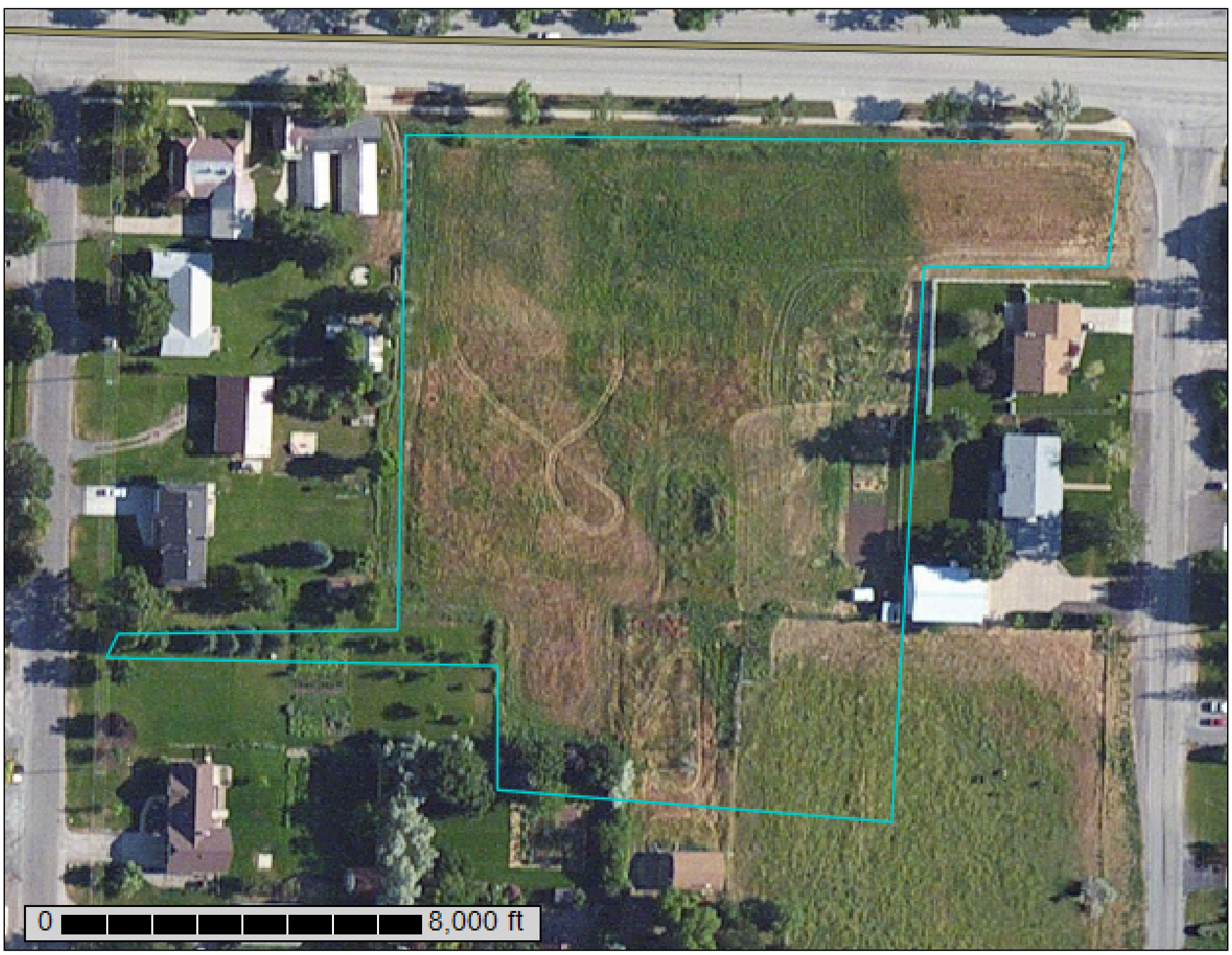
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Cache Valley Area, Parts of Cache and Box Elder Counties, Utah



April 25, 2014

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

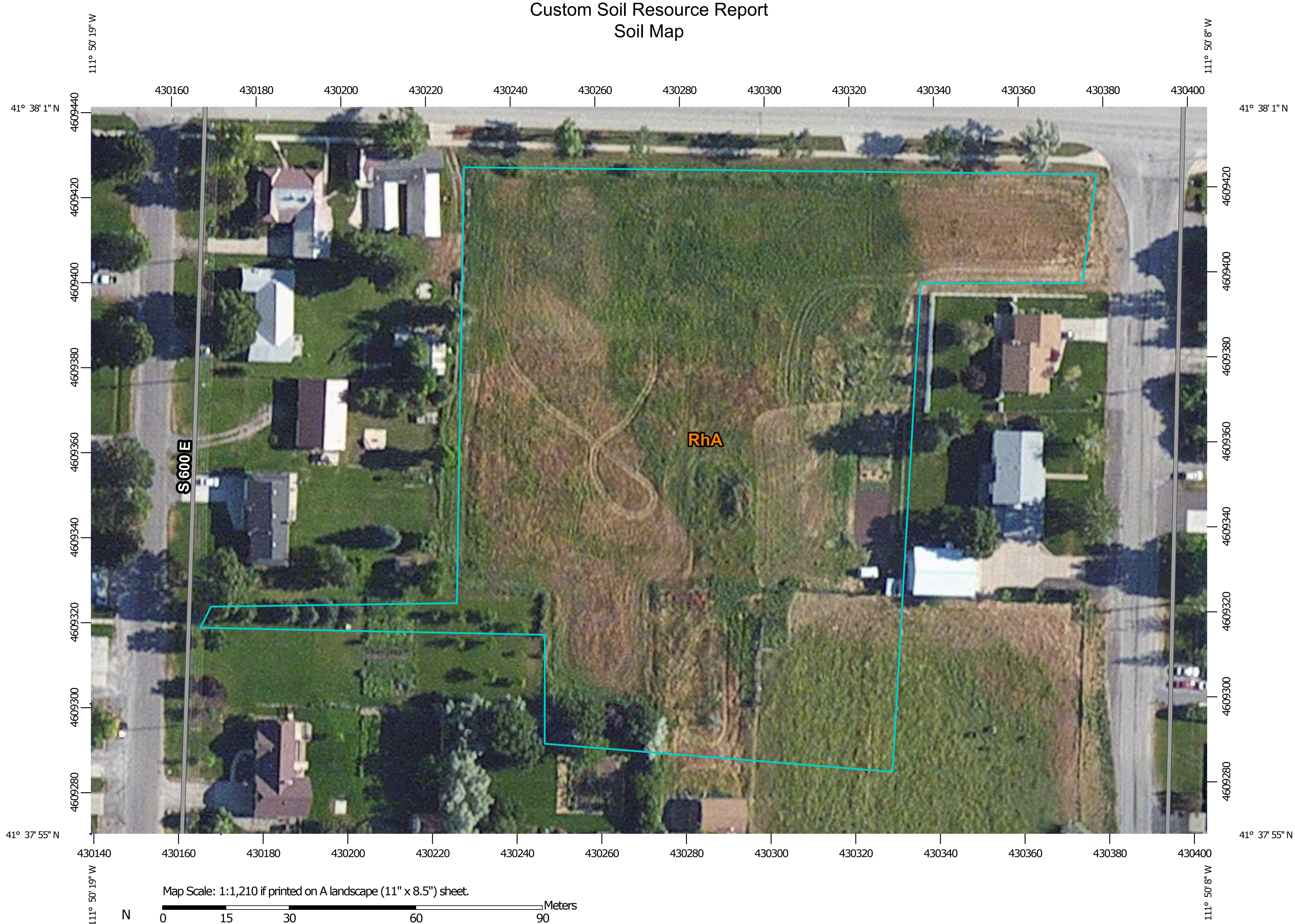
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

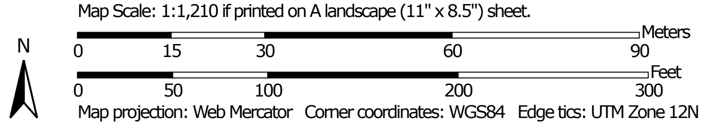
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,210 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cache Valley Area, Parts of Cache and Box Elder Counties, Utah
Survey Area Data: Version 7, Dec 16, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Sep 28, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Cache Valley Area, Parts of Cache and Box Elder Counties, Utah (UT603)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
RhA	RICKS GRAVELLY LOAM, 0 TO 3 PERCENT SLOPES	3.8	100.0%
Totals for Area of Interest		**3.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Cache Valley Area, Parts of Cache and Box Elder Counties, Utah

RhA—RICKS GRAVELLY LOAM, 0 TO 3 PERCENT SLOPES

Map Unit Setting

Elevation: 4,500 to 5,700 feet
Mean annual precipitation: 15 to 17 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Ricks and similar soils: 95 percent
Minor components: 5 percent

Description of Ricks

Setting

Landform: Lake terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and deltaic sediments derived from limestone, sandstone and quartzite

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.4 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 4s
Land capability (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: Upland Loam (Mountain Big Sagebrush) (R028AY310UT)
Other vegetative classification: Upland Loam (Mountain Big Sagebrush) (028AY310UT)

Typical profile

0 to 4 inches: Gravelly loam
4 to 9 inches: Gravelly loam
9 to 14 inches: Gravelly loam
14 to 18 inches: Gravelly sandy loam
18 to 24 inches: Very gravelly sand
24 to 60 inches: Very gravelly sand

Minor Components

Timpanogos

Percent of map unit: 5 percent

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number.

Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba).

Engineering Properties–Cache Valley Area, Parts of Cache and Box Elder Counties, Utah														
Map unit symbol and soil name	**Pct. of map unit**	**Hydrologic group**	**Depth**	**USDA texture**	**Classification**		**Fragments**		**Percentage passing sieve number—**				**Liquid limit**	**Plasticity index**
					Unified	**AASHTO**	**>10 inches**	**3-10 inches**	**4**	**10**	**40**	**200**		
			In				*Pct*	*Pct*					*Pct*	
RhA—RICKS GRAVELLY LOAM, 0 TO 3 PERCENT SLOPES														
Ricks	95	B	0-4	Gravelly loam	GC-GM, SC-SM	A-4	0	0	64-76	44-76	37-68	26-49	20-30	5-10
			4-9	Gravelly loam	GC-GM, SC-SM	A-4	0	0	64-76	44-76	37-68	26-49	20-30	5-10
			9-14	Gravelly loam, gravelly sandy loam	GC, GC-GM, SC-SM	A-2, A-4	0	0	64-76	44-76	37-68	26-49	20-30	5-10
			14-18	Gravelly sandy loam	GC, SC, SC-SM	A-2-4	0	0	64-76	44-76	32-60	16-31	20-30	5-10
			18-24	Very gravelly sand, very gravelly loamy sand, very cobbly sand	GP-GC	A-1, A-2	0	0-7	35-55	30-50	20-35	0-10	20-30	5-10
			24-60	Very gravelly sand, very gravelly loamy sand, very cobbly sand	GP-GC	A-1, A-2	0	0-7	35-55	30-50	20-35	0-10	20-30	5-10

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion.

There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Physical Soil Properties–Cache Valley Area, Parts of Cache and Box Elder Counties, Utah														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
RhA—RICKS GRAVELLY LOAM, 0 TO 3 PERCENT SLOPES														
Ricks	0-4	-46-	-42-	10-13- 15	1.35-1.40	4.00-14.00	0.11-0.13	0.0-2.9	2.0-3.0	.15	.37	2	6	48
	4-9	-46-	-42-	10-13- 15	1.35-1.40	4.00-14.00	0.11-0.13	0.0-2.9	2.0-3.0	.15	.37			
	9-14	-46-	-42-	10-13- 15	1.35-1.40	4.00-14.00	0.11-0.13	0.0-2.9	0.0-1.0	.15	.32			
	14-18	-68-	-20-	10-13- 15	1.35-1.40	4.00-14.00	0.11-0.13	0.0-2.9	0.0-1.0	.15	.32			
	18-24	-96-	- 2-	0- 3- 5	1.50-1.55	141.00-705.00	0.02-0.04	0.0-2.9	0.0-1.0	.05	.15			
	24-60	-96-	- 2-	0- 3- 5	1.50-1.55	141.00-705.00	0.02-0.04	0.0-2.9	0.0-1.0	.05	.15			

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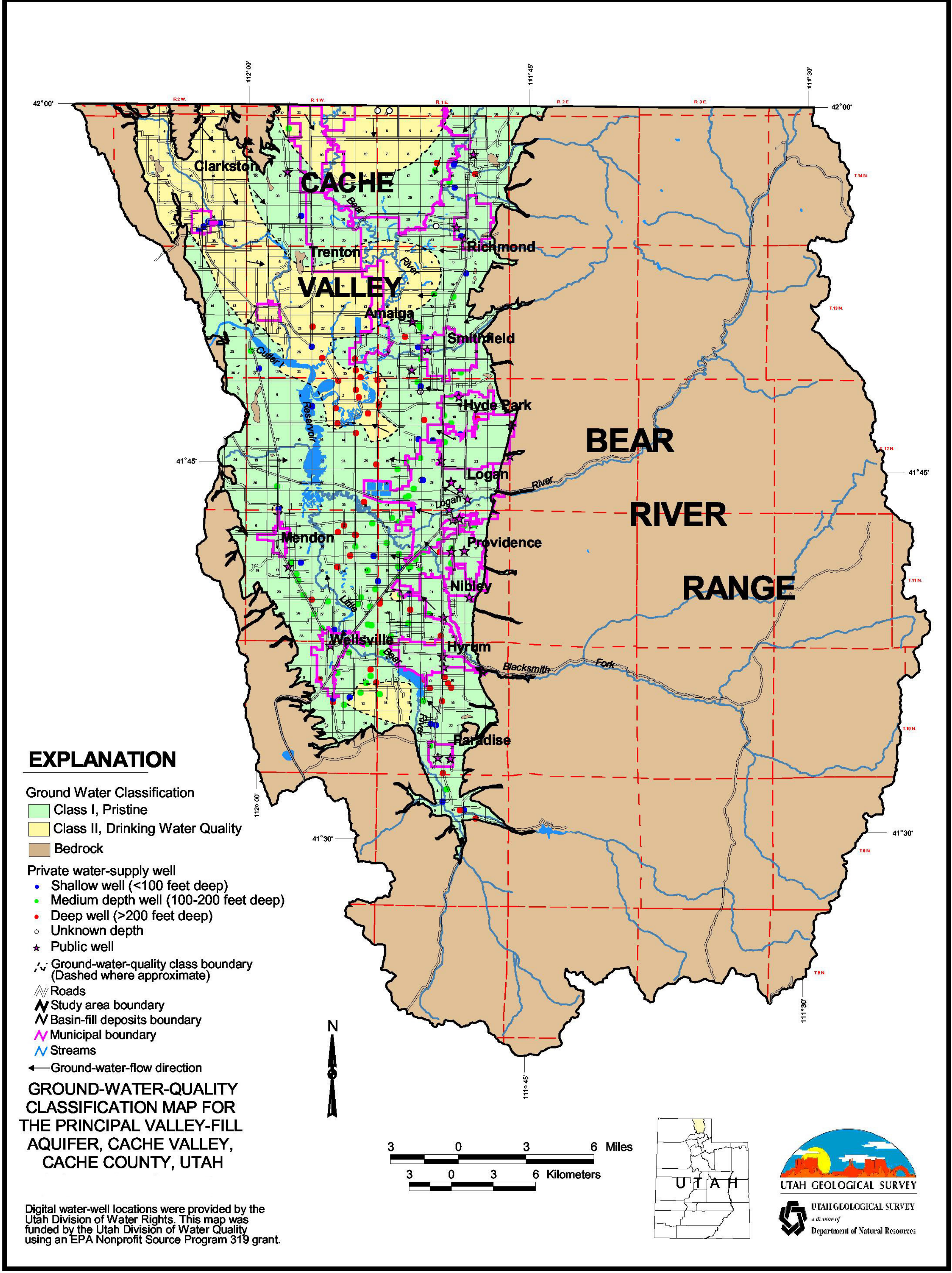

GROUND-WATER-QUALITY CLASSIFICATION MAP FOR THE PRINCIPAL VALLEY-FILL AQUIFER, CACHE VALLEY, CACHE COUNTY, UTAH

Digital water-well locations were provided by the Utah Division of Water Rights. This map was funded by the Utah Division of Water Quality using an EPA Nonprofit Source Program 319 grant.