NorthWest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering • Materials Testing

September 23, 2020

Joe Robbins Architect
P.O. Box 771403
Steamboat Springs, CO 80477

Job Number: 20-11733

Subject: On-Site Wastewater Treatment System Design, Home Ranch, 27250 Home Ranch Road, Routt County, Colorado.

Joe,

This report presents the results of an On-site Wastewater Treatment System (OWTS) Design for the Home Ranch located at 27250 Home Ranch Road in Routt County, Colorado. The OWTS design was completed in accordance with Colorado Department of Public Health and Environment (CDPHE)-Water Quality Commission On-site Wastewater Treatment System Regulation #43 (Regulation), dated June 30, 2017, as adopted by Routt County (Regulation).

**Proposed Construction:** It is our understanding, based on our conversations with the client and review of preliminary plans provided by the architect, the Home Ranch, when completed, will consist of a new Owner's Residence, a renovated Lodge, six renovated cabins, a possible new cabin, a Trainer's Residence, new shop and new greenhouse that will require wastewater treatment facilities.

NWCC understands the new Owner's Residence will consist of a two bedroom residence and the new Trainer's Residence will be constructed with a total of three bedrooms. The existing lodge will be renovated and all of the existing guest rooms will be removed and one guest bedroom will remain. The lodge will be used to host events for up to 18 people that will be staying in the cabins. A commercial kitchen will be located in the renovated lodge. A new shop will be constructed near the location of the existing shop. A new Greenhouse will also be constructed northeast of the existing greenhouse. The shop and new greenhouse will each have a bathroom. The greenhouse will also have a wash sink for cleaning vegetables. Based on conversations with the architect and ranch manager, NWCC understands that 10 to 15 employees will be at the site during each day.

Five of the existing cabins will be partially renovated to include a total of 7 guest rooms. A future cabin may be constructed with an additional two guest rooms. These cabins will not have kitchen facilities, only bathrooms. The existing Columbine Cabin will be remodeled to have a total of three bedrooms when completed. A residential kitchen will also be included in the Columbine Cabin.

NWCC is proposing two separate OWTS be constructed at the site. One OWTS will be constructed for the new Owner's and Trainer's Residences, as well as the Lodge and the new shop and greenhouse structures. The Soil Treatment Area (STA) for the first system will be located west of the new Owner's Residence and Lodge, southwest of the new shop and south of the existing STA for the facility. The second OWTS will be constructed for the existing and renovated cabins in the eastern portion of the site. The STA for the second OWTS will be located northwest of the existing Columbine Cabin and northeast of the existing Lodge.

**Existing Site Conditions:** The existing Home Ranch Facility is situated east of County Road 129 and south of County Road 64 in Routt County, Colorado. The site is bordered on the west by the town of Clark, the east by National Forest and the north and south by residential properties. The Home Ranch is currently serviced by an existing well located in the southeast portion of the property. The water is pumped to a treatment facility located approximately 350 feet to the east of the existing cabins.

The Elk River is located approximately 600 feet north of the site. The vegetation at the site consists of grasses, weeds and landscaped trees and shrubs. The topography is variable highly variable and generally slopes down to the north-northwest on the order of 5 to 20 percent. The approximate location of the Home Ranch is shown on the attached Vicinity Map (Figure #1).

**Existing OWTS:** There is currently one existing OWTS for the existing Home Ranch Facility. The existing OWTS was designed by Paul Stettner in March of 1979. Based on our observations of the existing OWTS it appears that the existing STA was constructed to the size indicated in the 1979 design. No record of the construction of the system was available in the Routt County Department of Environmental Health Permit. Based on a review of a recent inspection report completed by Nordic Pumping, LLC (Nordic), dated July 28, 2019, it is noted that there are three septic tanks placed in series. The first tank consists of a 1,500-gallon fiberglass tank with one-compartment. The second tank consists of a 1,000-gallon fiberglass tank with two compartments. The third tank consists of a 1,000-gallon concrete tank with two compartments. The Nordic report also notes that there are two entrance ports in the third septic tank. It appears that the third tank may have been added at a later date than the original system construction.

It should be noted that the two existing fiberglass tanks have only 0 to 3 inches of cover material and the access manholes for these two tanks were covered with sheets of plywood and automobile tires. The top of the concrete tank and concrete lids were exposed at the existing ground surface.

A site plan showing the overall Home Ranch property and approximate locations of the existing P.U.D. and proposed P.U.D. Addition is shown in Figure #2. A detailed site plan of the existing and proposed facilities and OWTS is shown in Figure #3. The horizontal influence areas for each proposed OWTS are also shown in Figure #3.

**Subsurface Conditions:** Two test pits were excavated near each of the proposed STA on June 3, 2020. The subsurface conditions encountered in the test pits generally consisted of a layer of natural topsoil and

organic materials overlying natural clays to the maximum depth investigated, 7 feet below the existing ground surface (bgs). The layer of natural topsoil and organics was encountered at the ground surface in all of the test pits. The topsoil ranged from 24 to 36 inches in thickness. Natural clays were encountered below the topsoil and organic materials in all of the test pits and extended to a depth of 7 feet bgs in each of the test pits. The clays were slightly sandy to sandy, moderately plastic, medium stiff to stiff, slightly moist to moist and brown to light brown in color.

Percolation testing was not completed in the area of the proposed STA's at the time of this investigation. Previous percolation testing at the site indicates the topsoil and organic materials will exhibit percolation rates ranging from 10 to 25 minutes per inch (mpi). Based on the assumed percolation rate and visual soil classification, NWCC has classified the topsoil and organic materials as Soil Type 2 in accordance with Table 16-1 of CDPHE Regulation 43.

**OWTS Design:** Based on our understanding of the proposed construction and the soils encountered at the site, NWCC recommends the OWTS design consist of multiple two-compartment septic tanks (for pre-treatment of the raw effluent) for the residences, cabins, lodge, shop and greenhouse. A two-compartment grease interceptor tank for the commercial kitchen is also recommended to pretreat the kitchen waste and filter the fats, oils and grease out of the wastewater. The pretreated effluent will be delivered to a dosing tank near the STA. The effluent will be pumped to distribute the effluent over a minimum 2 feet mounded Sand Filter Treatment Area (SFTA). The sand filter treatment system is considered a higher level treatment system by the Regulations.

The OWTS design presented below is based on the anticipated usage of the facility, as well as the soil classification of the sand filter media and natural topsoil and organic materials. Considering the anticipated maximum occupancy, NWCC has determined an effluent design flow of 1,650 gallons per day (gpd) for the residence's, lodge, shop and greenhouse system. This was calculated using a design flow of 150 gpd/bedroom for the residences, 25gpd/person using the lodge during events and 20gpd/employee working in the lodge, shop or greenhouse. These are values outlined in Table 6-2 of CDPHE Regulation 43.

NWCC has determined an effluent design flow of 1,350 gpd for the cabins. This was calculated using 150 gpd/bedroom for the renovated Columbine Cabin with three bedrooms and a full kitchen and 50 gpd/person, with an occupancy of 2 people per guest room in the cabins with bathrooms only. There is a total of 7 existing guest rooms with a possible additional 2 bedrooms when the new cabin is completed for a total of 9 guest rooms, 18 people.

It should be noted that the wastewater flows used in the design of the OWTS from Table 6-2 of the Regulation may be conservative. If future expansion of the facility is under consideration, NWCC strongly recommends the water usage at the facility be metered in order to determine future needs in regard to potable water, as well as better define design flows for future wastewater treatment. A water meter should be installed to measure the intake of potable water into each of the structures. In addition, a flow meter is recommended between the dosing tank and distribution valve for the SFTA to determine actual wastewater

flows to the treatment area. The meters along with pump cycles at the control panel will be able to determine accurate wastewater flows to design future facilities.

Since the total combined flow of both systems is greater than 2,000 gpd the horizontal influence area was calculated at 218 feet for the first system and 182 feet for the cabins system, per the Colorado Water Quality Control Division Water Quality Site Application Policy WQSA-6. Each individual system is less than 2,000 gpd design flow and the horizontal influence area for each of the proposed SFTA do not overlap and do not encroach on any existing or proposed wells, NWCC believes the OWTS should not be subject to CDPHE Site Application process and should be permitted through the Routt County Department of Environmental Health.

Septic/Grease/Dosing Tanks: A minimum septic tank capacity, for pre-treatment of the effluent, of 3,300-gallons is required for the proposed residences, lodge, shop and greenhouse. NWCC recommends a 1,000-gallon, two compartment septic tank be used for each of the new Owner's Residence, Trainer's Residence, Shop and Greenhouse. NWCC recommends a 1,500-gallon, two compartment septic tank be used for the renovated Lodge. Due to the subsurface conditions encountered at the site, we recommend that concrete septic tanks be used. This will provide a total septic tank capacity of 4,500-gallons.

NWCC also recommends a two-compartment 2,000-gallon grease interceptor tank be installed to collect wastewater from the commercial kitchen in the lodge prior to discharge to the SFTA. A Polylok PL-625 effluent filter (1/32" filtration) must be placed in the outlet of the grease interceptor tank to reduce the amount of fats, oils and grease (FOG) flowing to the SFTA.

A minimum septic tank capacity, for pre-treatment of the effluent, of 2,700-gallons is required for the proposed cabins. NWCC recommends a 1,000-gallon, two compartment septic tank be used for Columbine Cabin (3 bedrooms total). NWCC recommends a 1,500-gallon, two compartment septic tank be used for the Kanga/Roo, Birdhouse/Whistler and Bunkhouse cabins (5 guest rooms total). NWCC recommends a 1,250-gallon, two compartment septic tank be used for the Sundown, Compromise and Future cabins (4 guest rooms total). Due to the subsurface conditions encountered at the site, we recommend that concrete septic tanks be used. This will provide a total septic tank capacity of 3,750-gallons.

The manhole lids for septic tanks and grease interceptor tank must be exposed at final grades. Manhole ring extensions should be used as needed to reach final grades. The tanks should be placed in a location to allow access for pumping. Generally, a septic tank can be pumped from 100 feet away with a maximum lift of 10 feet; however, a local sewage pumping contractor should be consulted in regard to the tank maintenance access. The tanks should be placed outside of any driveway areas, preferably in landscaped areas.

The effluent will be delivered from the buildings to the septic/grease tanks with a 4-inch diameter solid PVC transport line. A minimum slope of 2 percent is recommended for the solid PVC piping. Where gravity flow is possible, 4-inch diameter solid PVC transport line can be used to deliver the effluent from

the septic/grease tanks to the dosing tanks. A minimum slope of 2 percent is recommended for the solid PVC piping.

Where gravity flow is not possible, a pump system will be required to deliver the effluent from the septic tank to the dosing tank. NWCC anticipates a pump will be required for the greenhouse and Trainer's Residence septic tanks. A pump may also be required for the shop septic tank. The effluent from these tanks should be pumped with an Orenco PF5005 pump through a 2-inch solid PVC line (Schedule 40) and tie into a 4-inch diameter transport line to take the effluent to the dosing tank. The pumping system (pump, filter and float assembly) will be housed in an Orenco Biotube Pump Vault.

Areas where the transport lines cross under driveways or parking areas should have a minimum of 48 inches of soil cover and/or be insulated with rigid foam insulation to protect from freezing. A minimum of 2 inches of insulation and 2 feet of soil cover is recommended.

Where a transport line crosses or encroach within 10 feet of a water line, the transport line or waterline must be encased in Schedule 40 PVC pipe. The encasing pipe should be of sufficient diameter to slide over the pipe with rigid end caps, Schedule 40, glued watertight at ends of encasement pipe. A hole to accommodate transport line shall be drilled in the lowest section of the cap so that the transport line rests on the bottom of the encasement pipe. Where the transport line passes through the cap shall be sealed with an approved underground sealant.

A plan showing the proposed locations of the septic tanks and grease interceptor tank and transport lines is presented in Figure #4 for the Owner's Residence, Lodge and Shop, Figure #5 for the Greenhouse and future Trainer's Residence and Figure #7 for the Cabins.

The pump system for each of the pressurized dosing systems will be placed in a 1,000-gallon dosing tank placed near the SFTA. The pumping system will consist of a high head pump (Orenco PF500511) with a 2-inch diameter PVC (Schedule 40) discharge assembly and 1.5-nch PVC (Schedule 40) transport line to an Automatic Distribution Valve (ADV). The ADV will be an Orenco ADV6606. NWCC also recommends a flow meter be installed in the transport line between the pump in the dosing tank and the ADV. The flow meter will assist in determining actual wastewater flows and evaluating the OWTS for potential future expansion of the facility.

The pumping system (pump, filter and float assembly) will be housed in an Orenco Biotube Pump Vault. NWCC recommends the system have a high level alarm float, a low level/pump off float and a pump ON/OFF float. We recommend the floats in the dosing tank be set to provide a dose of approximately 75 to 80 gallons. An Orenco MVP-S1-DM control panel with high level alarm (light and audible) should be placed near the dosing tank in a location that allows line of sight between the control panel and the pump chamber. A secondary or backup pump stored on-site for quick change over is also recommended in the event of a pump failure.

Sand Filter Treatment Area-System 1: Based on the soil type and design effluent flow and using an application rate 0.8 gpd/ft$^2$ for secondary sand media, a minimum sand filter treatment area of 2,063 ft$^2$ is required for the Residence's, Lodge, Shop and Greenhouse system. A sand filter treatment area with six zones, each 344 ft$^2$ in area, will be constructed over a minimum depth of 2 feet of sand filter material, placed over the existing topsoil and organic materials. Each zone will be 4 feet by 86 feet in size for a total size of 24 feet by 86 feet of gravel distribution bed. The sand filter material must be approved by NWCC prior to use and consist of a clean, well graded sand, which meets ASTM C33 specifications for concrete sand with 3 percent or less passing the No. 200 sieve. Based on a Soil Type 2 for the natural topsoil and organic, a minimum area of 2,750 ft$^2$ is required for the base or the sand filter materials to discharge to the natural topsoil and organic materials. The bottom of the sand filter materials will be placed over the top of the natural topsoil and organics after thorough scarification.

A pressurized distribution system is required for the sand filter treatment system. The pumping system and ADV for the pressurized distribution system is outlined above. The pressurized distribution system will consist of 1.5-inch diameter PVC pipe (Schedule 40) laterals with 3/16-inch diameter orifice's spaced at 48 inches on center. Two laterals are required for each of the 4 feet by 86 feet zones. The laterals should be constructed to within 1 to 1½ feet of the limits of the SFTA. The orifices should be oriented to spray upward (12 o'clock). To allow the distribution lines to drain and prevent freezing, NWCC recommends two of the orifices, in each lateral, be oriented downward (6 o'clock). The perforated distribution lines should be placed in a minimum of 12 inches of washed gravel (3/4" to 2½" diameter) placed over the sand filter treatment materials. The effluent will be distributed to each lateral through solid 1.5-inch diameter solid PVC (Schedule 40) from the ADV to a solid 1.5-inch diameter solid PVC manifold pipe. A flow control valve must be placed in each of the lateral lines, after the manifold. The flow control valves should be adjusted to maintain a minimum 5 feet spray height at the last orifice.

The system design for the sand filter treatment system 1 is presented in Figures #4 through #6 and Figure # 9. Septic tank, dosing tank and pump system details are presented in Figure #10. Grease Interceptor Tank details are presented in Figure #11. The design calculations are shown in Appendix A and the specifications for the system are given in Appendix B. Any variance of equipment/materials specified in this design must be approved by NWCC prior to construction.

Sand Filter Treatment Area-System 2: Based on the soil type and design effluent flow and using an application rate 0.8 gpd/ft$^2$ for secondary sand media, a minimum sand filter treatment area of 1,688 ft$^2$ is required for the Cabins system. A sand filter treatment area with six zones, each 284 ft$^2$ in area, will be constructed over a minimum depth of 2 feet of sand filter material, placed over the existing topsoil and organic materials. Each zone will be 4 feet by 71 feet in size for a total size of 24 feet by 71 feet of gravel distribution bed. The sand filter material must be approved by NWCC prior to use and consist of a clean, well graded sand, which meets ASTM C33 specifications for concrete sand with 3 percent or less passing the No. 200 sieve. Based on a Soil Type 2 for the natural topsoil and organic, a minimum area of 2,250 ft$^2$ is required for the base or the sand filter materials to discharge to the natural topsoil and organic materials. The bottom of the sand filter materials will be placed over the top of the natural topsoil and organics after thorough scarification.

A pressurized distribution system is required for the sand filter treatment system. The pumping system and ADV for the pressurized distribution system is outlined above. The pressurized distribution system will consist of 1.5-inch diameter PVC pipe (Schedule 40) laterals with 3/16-inch diameter orifice's spaced at 48 inches on center. Two laterals are required for each of the 4 feet by 86 feet zones. The laterals should be constructed to within 1 to 1½ feet of the limits of the SFTA. The orifices should be oriented to spray upward (12 o'clock). To allow the distribution lines to drain and prevent freezing, NWCC recommends two of the orifices, in each lateral, be oriented downward (6 o'clock). The perforated distribution lines should be placed in a minimum of 12 inches of washed gravel (3/4" to 2½" diameter) placed over the sand filter treatment materials. The effluent will be distributed to each lateral through solid 1.5-inch diameter solid PVC (Schedule 40) from the ADV to a solid 1.5-inch diameter solid PVC manifold pipe. A flow control valve must be placed in each of the lateral lines, after the manifold. The flow control valves should be adjusted to maintain a minimum 5 feet spray height at the last orifice.

The system design for the sand filter treatment system 2 is presented in Figures #7 through #9. Septic tank, dosing tank and pump system details are presented in Figure #10. The design calculations are shown in Appendix A and the specifications for the system are given in Appendix B. Any variance of equipment/materials specified in this design must be approved by NWCC prior to construction.

**Operation and Maintenance:** Observing the operation and performing routine maintenance of the OWTS is essential to allow proper, long term functioning of the system. NWCC recommends a qualified, licensed maintenance contractor provide monitoring and maintenance of the system.

1) *Septic/Grease/Dosing Tanks*: The scum and sludge accumulation in the septic/dosing tanks should be monitored yearly. Once the scum or sludge thickness reaches 25% of the chamber depth, the tanks should be pumped. A pumping frequency of 1 to 3 years is likely at the design flows used for this system; however, depending on use, pumping may only be required every 3 to 7 years. The grease interceptor tank should be monitored frequently during period of heavy use. The grease interceptor tank must be cleaned when the FOG thickness reaches 25% of the chamber depth. Depending on the amount of FOG discharged to the system, the grease interceptor tank may require cleaning every 1 to 3 months. More frequent cleaning may be required depending on usage and FOG management practices.

2) *Effluent Filters and Dosing/Pump Systems*: The effluent filter at the pump vault should be cleaned when the septic/dosing tanks are inspected or as required. The effluent filter in the grease interceptor tank should be cleaned when the tank is inspected or as required. The effluent pumps and automatic distribution valve should be checked semi-annually to ensure the pumps and distributing valves are functioning properly. If the high water alarm sounds, the system should be inspected and serviced immediately. NWCC strongly recommends a backup pump be stored on-site for quick change over in the event of a pump failure.

3) *Sand Filter Treatment Area*: Sand Filter Treatment Area should be fenced off to livestock. The surface area around the treatment area should be observed monthly for signs of failure, such as lush vegetation growth or ponding. Liquid levels within the sand filter should be observed through the observation pipes.

4) *Treated Water*: NWCC does not recommend water softeners or water treatment systems be connected to the OWTS. The chemical and hydraulic loading from the backwash of these treatment systems may be detrimental to the OWTS. If a treatment system is used, a separate dry well should be constructed for the backwash waste. In addition, chemically treated water from a swimming pool or spa must not be discharged into the OWTS.

5) *General Notes*: The owner should be aware that the operation of the OWTS is different from a public sewer service. Plastic and other non-biodegradable materials should not be placed into the system. Water use should be monitored so fixtures are not allowed to run if a seal malfunctions. Allowing fixtures to flow continuously to prevent water lines from freezing or a malfunctioning faucet or toilet can consume in excess of 1,000 gallons per day. Excessive flows could continually flood and cause premature failure of the system. No plastic or landscaping that requires additional irrigation should be placed over the sand filter treatment area.

6) *FOG Management Practices*: Fats, oils and grease (FOG) from kitchen/concession facilities can have a negative impact on the OWTS. The following practices for FOG management are strongly recommended. 1) All cookware, utensils and dishware should be dry wiped into garbage receptacles so FOG is limited from being washed into OWTS. 2) Recycle waste cooking oil. Do not discharge waste cooking oil into wash sinks. 3) Minimize use of detergents for dishwashing. Water temperature should be 140 degrees or less. 4) Do not use a garbage grinder. Food waste should be composted or placed in garbage. 5) Dry clean floors. Do not wash down floors to a floor drain. 6) Train staff to the importance of FOG management.

**Limitations:** The procedures and design criteria used in this design were obtained from the EPA "Design Manual - On-site Wastewater Treatment and Disposal Systems", as well as the Colorado Department of Public Health and Environment-Water Quality Control Commission, On-site Wastewater Treatment System Regulation, Regulation #43, effective June 30, 2017. The OWTS design presented is based on currently accepted design procedures, the proposed structures and usage of the facilities. If the usage of the structure or addition of new facilities to those currently planned in the building changes, the OWTS design will also most likely change. It should also be noted that OWTS require periodic maintenance as noted above. The failure of the owner to provide periodic inspection and maintenance of the system can lead to premature system failure.

Please be advised that Colorado law requires that a permit must be obtained prior to construction, alteration or use of an OWTS. In addition, this office must be retained by the client to observe the construction/installation of the OWTS and to provide an as-built report to the Routt County Building Department when the construction is completed.

If you have any questions concerning this report, or if we may be of further service, please contact this office.

Sincerely,
**NWCC, INC.**

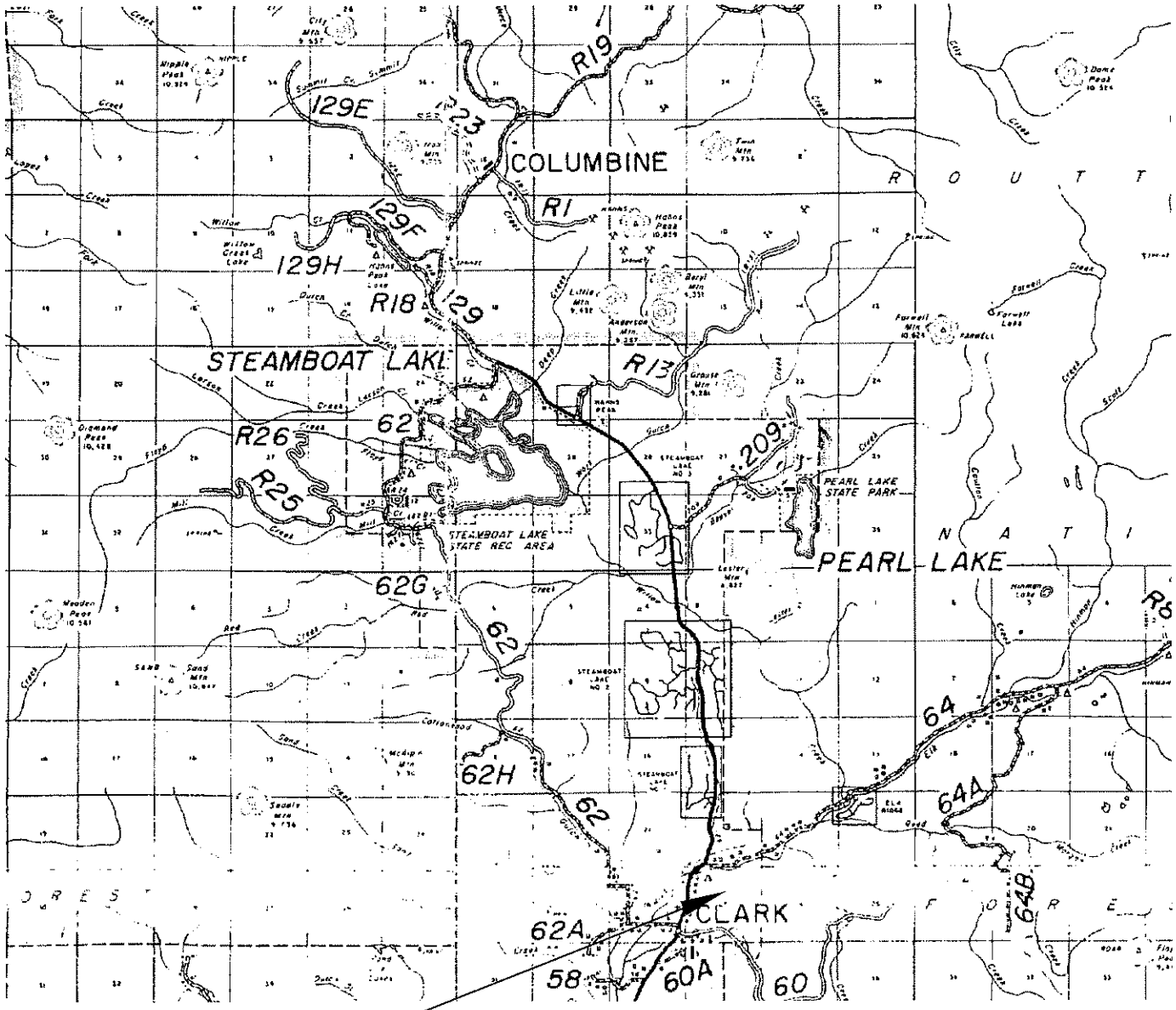
Timothy S. Travis, P.E.
Senior Project Engineer

COLORADO LICENSED
BRIAN D. LEN
25750
PROFESSIONAL ENGINEER
9/24/2020

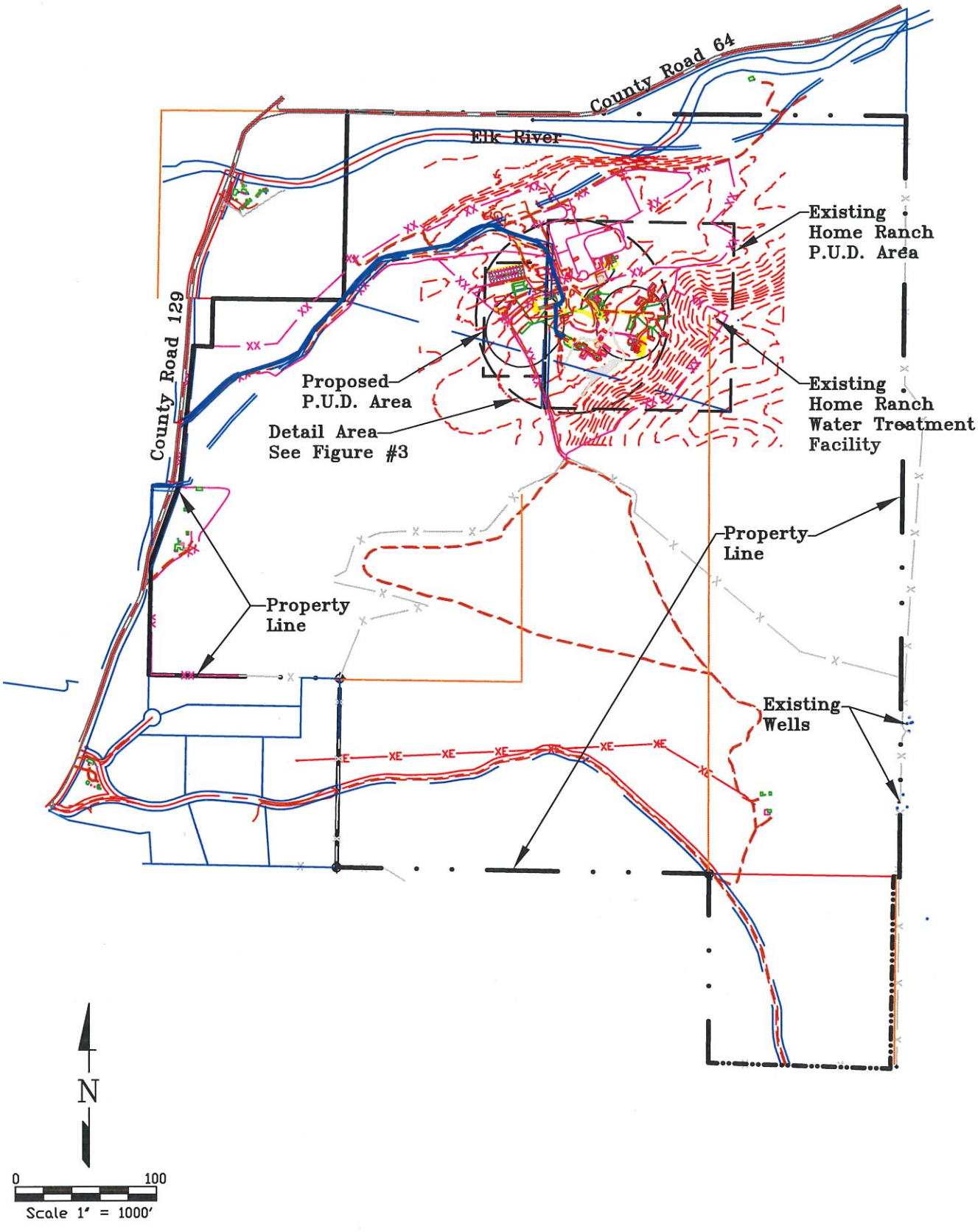
Reviewed by Brian D. Len, P.E.
Principal Engineer

N

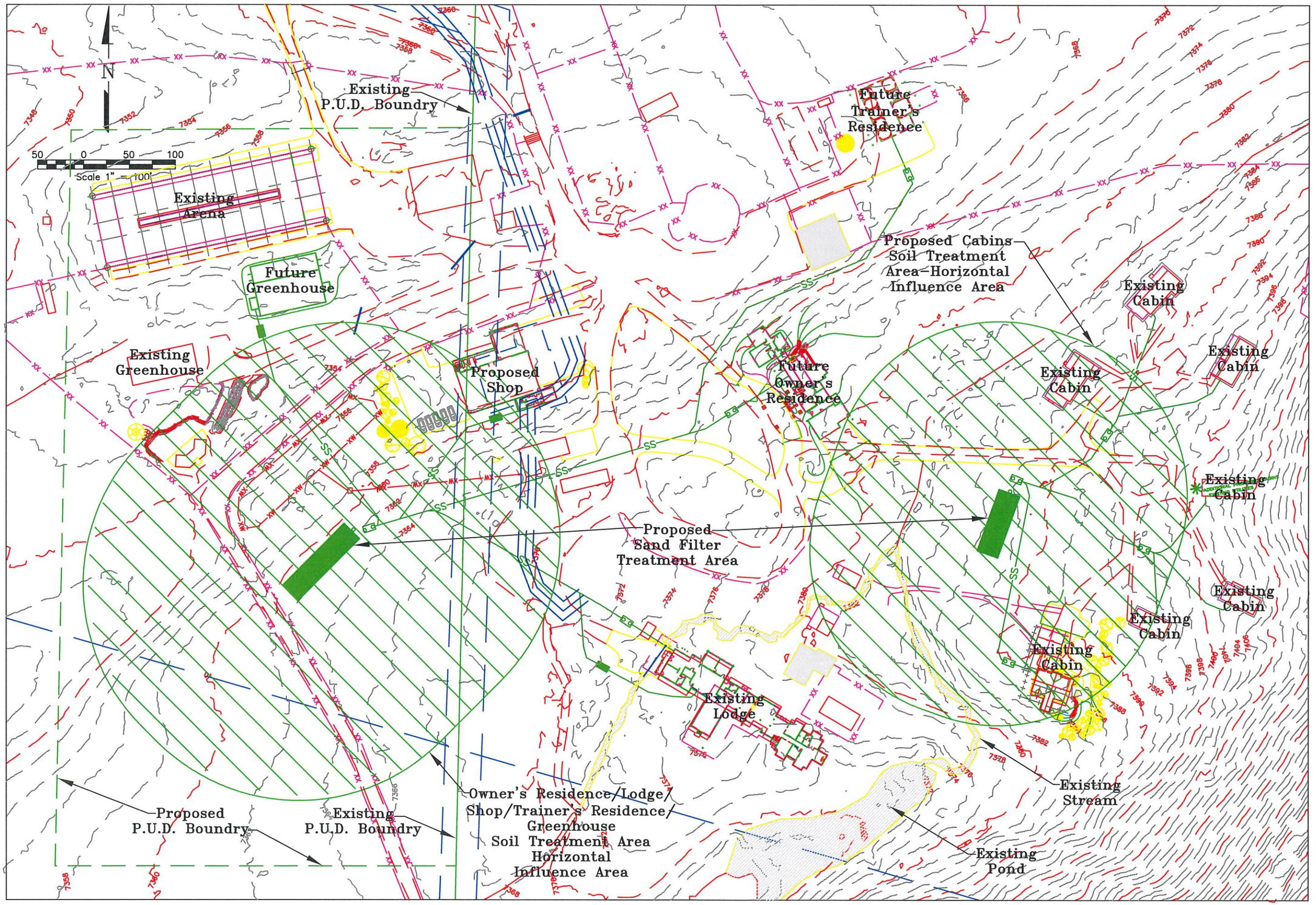
NOT TO SCALE




| | | | |
|---|---|---|---|
| **Title:** O.W.T.S.–VICINITY MAP | | **Date:** 9/22/2020 | NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing |
| **Job Name:** Home Ranch | | **Job No.** 20-11733 | (970)879-7888 - Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487 |
| **Location:** 27250 Home Ranch Road, Routt County, Colorado | | **Figure** #1 | |




| | | |
|---|---|---|
| **Title:** O.W.T.S.–OVERALL SITE PLAN | **Date:** 9/22/2020 | NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering · Materials Testing |
| **Job Name:** Home Ranch | **Job No.** 20–11733 | (970)879-7888 · Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487 |
| **Location:** 27250 Home Ranch Road, Routt County, Colorado | **Figure** #2 | |




NWCC
Northwest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering Materials Testing
(970)879-7888 Fax (970)879-7891
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487

O.W.T.S.-
Site Plan
Influence Areas

Home Ranch
27250 Home Ranch Road
Routt County
Colorado

| | | |
|---|---|---|
| | REVISED AND UPDATED BY | |
| | DRAWN BY | |
| | DATE | |
| | REVISIONS | |
| | REV. NO. | |

| | |
|---|---|
| Job. No. | 20-11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | 1" = 100' |

Figure

#3

New Greenhouse 1000–Gallon Two–Compartment Concrete Septic Tank with Orenco Biotube Vault and Orenco PF5005 Pump

Proposed Shop

2–inch Diameter PVC Schedule 40 From Trainer's Residence

Future Owner's Residence

1000–Gallon Two–Compartment Concrete Septic Tank with Orenco Biotube Vault and Orenco PF5005 Pump

2–inch Diameter PVC Schedule 40

New 1,000–Gallon Two–Compartment Concrete Septic Tank

Orenco Automatic Distribution Valve (ADV 6606)

4–inch Diameter PVC ASTM 3034; SDR 35 2% Min. Slope (typ.)

1000–Gallon One–Compartment Concrete Dosing Tank with Orenco Biotube Vault and Orenco PF5005 Pump

New 1,500–Gallon Two–Compartment Concrete Septic Tank

Existing Stream

Sand Filter Treatment Area 24' x 86' (6 Sections– 4' x 84') See Detail Figuure #6

New 2000–Gallon Two–Compartment Concrete Grease Interceptor Tank with Polylok PL–625 Effluent Filter

Existing Lodge

Cleanout (typ.)

7356 7358 7360 7362 7370 7372 7374 7376 7378 7380 7382

N

25 0 20 50

Scale 1" = 50'

NWG
Northwest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering, Materials Testing
(970)879-7869 Fax (970)879-7891
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487

O.W.T.S.– Lodge/Residence's/ Shop/Greenhouse Site Plan

Home Ranch
27250 Home Ranch Road
Routt County
Colorado

| REV. NO. | REVISIONS | DATE | DRAWN BY | REVIEWED AND SIGNED BY |
|---|---|---|---|---|
| | | | | |

| | |
|---|---|
| Job. No. | 20–11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | 1" = 50' |

Figure

#4

Existing Arena

Future Greenhouse

4-inch Diameter PVC ASTM 3034; SDR 35 2% Min. Slope (typ.)

1000-Gallon Two-Compartment Concrete Septic Tank with Orenco Biotube Vault and Orenco PF5005 Pump

Proposed Shop

Existing Soil Treatment Area

2-inch Diameter PVC Schedule 40

Sand Filter Treatment Area

4-inch Diameter PVC ASTM 3034; SDR 35 2% Min. Slope (typ.)

New 1,000-Gallon Two-Compartment Concrete Septic Tank

Future Owner's Residence

4-inch Diameter PVC ASTM 3034; SDR 35 2% Min. Slope (typ.)

Cleanout (typ.)

Future Trainer's Residence

1000-Gallon Two-Compartment Concrete Septic Tank with Orenco Biotube Vault and Orenco PF5005 Pump

2-inch Diameter PVC Schedule 40

7358 7354 7356 7360 7362 7364

N

25 0 20 50

Scale 1" = 50'


NWG Northwest Geotechnical Consultants, Inc.
Geotechnical / Environmental Engineering / Materials Testing
(970)875-7888 Fax (970)875-7891
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487


O.W.T.S.- Trainer Residence/ Greenhouse Site Plan

Home Ranch
27250 Home Ranch Road
Routt County
Colorado

| REV. NO. | REVISIONS | DATE | DRAWN BY | PROJECT MGR. AND SUPERV. BY |
|---|---|---|---|---|
| | | | | |

| | |
|---|---|
| Job. No. | 20-11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | 1" = 50' |

Figure

#5

(NOT TO SCALE)

2' 86' 2'

84'– 1.5" Dia. Sch. 40 PVC with 3/16" Dia. oriface @ 48" c.c. to spray upward.
(Two oriface's in each lateral should spray downward to allow pipe to drain and prevent freezing)

1' 1'

5' Min.

Limits of Gravel Distributiion Bed

Limits of Mound Basal Area

24'

2'

Zone 1 — 1' + 2'
Zone 2 — 2' + 2'
Zone 3 — 2' + 2'
Zone 4 — 2' + 2'
Zone 5 — 2' + 2'
Zone 6 — 2' + 1'

Inspection Pipe (typ.)

Inspection Pipe (typ.)

Inspection Pipe (typ.)

1.5" Diameter Solid PVC (Schedule 40) Pipe Manifolds Set Level

Orenco ADV6606 Automatic Distribution Valve with PVC Enclosure and Insulated Access Lid (See Detail Above)

2" to 1.5" Reducer

Pressure Relief Valve

Dosing Tank with Pump

1.5" Diameter Solid PVC (Schedule 40) Distribution Line–1% Slope to Manifolds

2" Diameter Solid PVC Pipe Schedule 40 Transport Line

1.5" Diameter Solid PVC (Schedule 40) Pipe Manifolds Set Level

Cleanout/ Monitor Port (typ.) (See Detail–Fig. #9)

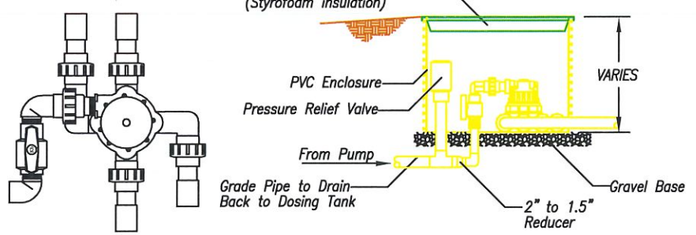
Limits of Gravel Distributiion Bed

Limits of Mound Basal Area

Lateral 1.5" Diameter Perforated PVC Pipe

Flow Control (Ball) Valve (typ.)

**Automatic Distribution Valve**




Top View – V6404A

ADV Enclosure


North West Colorado Consultants, Inc
Geotechnical / Environmental Engineering Materials Testing
(970)879-7883 Fax (970)879-7881
2560 Copper Ridge Drive
Steamboat Springs, Colorado 80487


OWTS – Lodge/Residence's/ Shop/Greenhouse Mounded Sand Filter/ Gravel Bed Plan

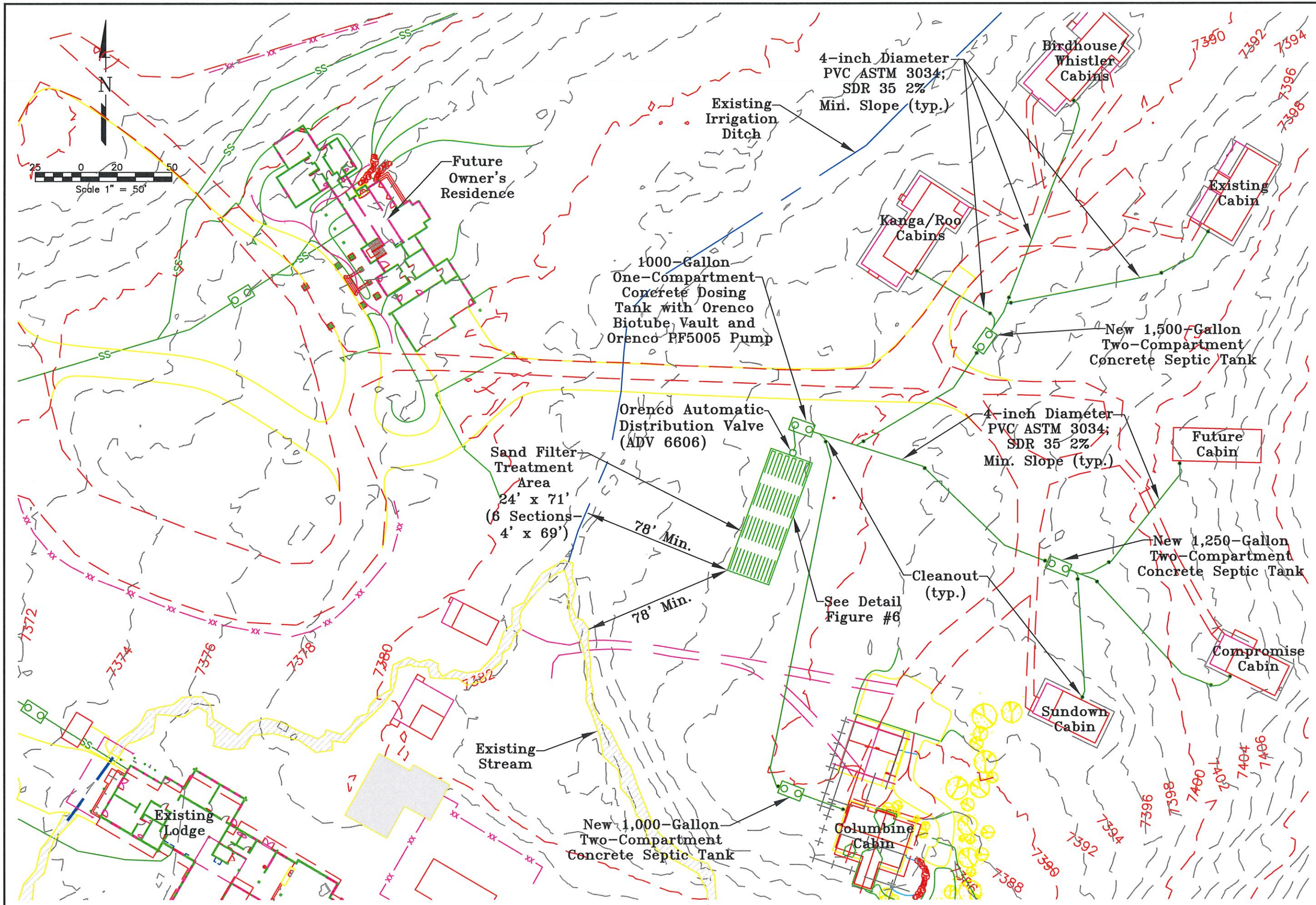
Home Ranch
27250 Home Ranch Road
Routt County
Colorado

| REVISED AND ISSUED BY | DRAWN BY | DATE | REVISIONS | REV. NO. |
|---|---|---|---|---|
| | | | | |

| | |
|---|---|
| Job. No. | 20–11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | NTS |

Figure

#6




NWG
Northwest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering / Materials Testing
(970)879-7884 Fax (970)879-7891
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487

O.W.T.S.- Cabins Site Plan

Home Ranch
27250 Home Ranch Road
Routt County
Colorado

| REV. NO. | REVISIONS | DATE | DRAWN BY | REVIEWED AND SIGNED BY |
|---|---|---|---|---|
| | | | | |

| | |
|---|---|
| Job. No. | 20-11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | 1" = 50' |

Figure

#7

N

(NOT TO SCALE)

2' 71' 2'

69'– 1.5" Dia. Sch. 40 PVC with 3/16" Dia. oriface @ 48" c.c. to spray upward.
(Two oriface's in each lateral should spray downward to allow pipe to drain and prevent freezing)

1' 1'

4' Min.

Limits of Gravel Distributiion Bed

Limits of Mound Basal Area

1'
2'
2'
2'
2'
2'
2'
2'
2'
2'
2'
1'

Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6

24'

2'

Inspection Pipe (typ.)

Inspection Pipe (typ.)

Inspection Pipe (typ.)

1.5" Diameter Solid PVC (Schedule 40) Pipe Manifolds Set Level

Orenco ADV6606 Automatic Distribution Valve with PVC Enclosure and Insulated Access Lid (See Detail Above)

2" to 1.5" Reducer

Pressure Relief Valve

Dosing Tank with Pump

1.5" Diameter Solid PVC (Schedule 40) Distribution Line–1% Slope to Manifolds

2" Diameter Solid PVC Pipe Schedule 40 Transport Line

1.5" Diameter Solid PVC (Schedule 40) Pipe Manifolds Set Level

Cleanout/ Monitor Port (typ.) (See Detail–Fig. #9)

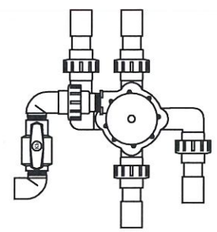
Limits of Gravel Distributiion Bed

Limits of Mound Basal Area

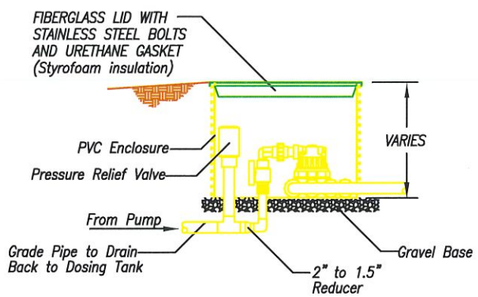
Lateral 1.5" Diameter Perforated PVC Pipe

Flow Control (Ball) Valve (typ.)

## Automatic Distribution Valve



Top View – V6404A




ADV Enclosure


NWCC Geotechnical / Environmental Engineering • Materials Testing
Northwest Colorado Consultants, Inc.
(970)879-7883 Fax (970)879-7881
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487


OWTS – Cabins
Mounded Sand Filter/ Gravel Bed Plan

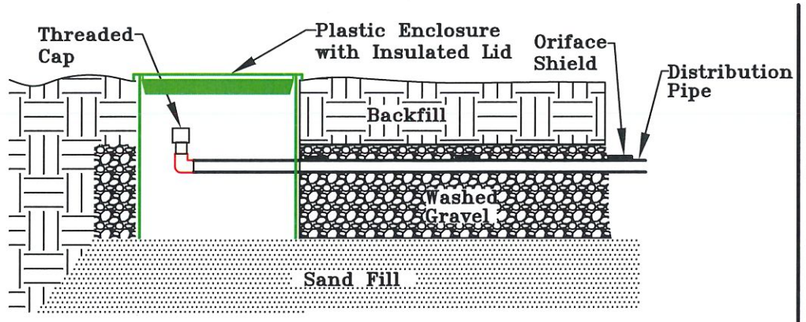
Home Ranch
27250 Home Ranch Road
Routt County
Colorado

| REV. No. | REVISIONS | DATE | DRAWN BY | REVIEWED AND SIGNED BY |
|---|---|---|---|---|
| | | | | |

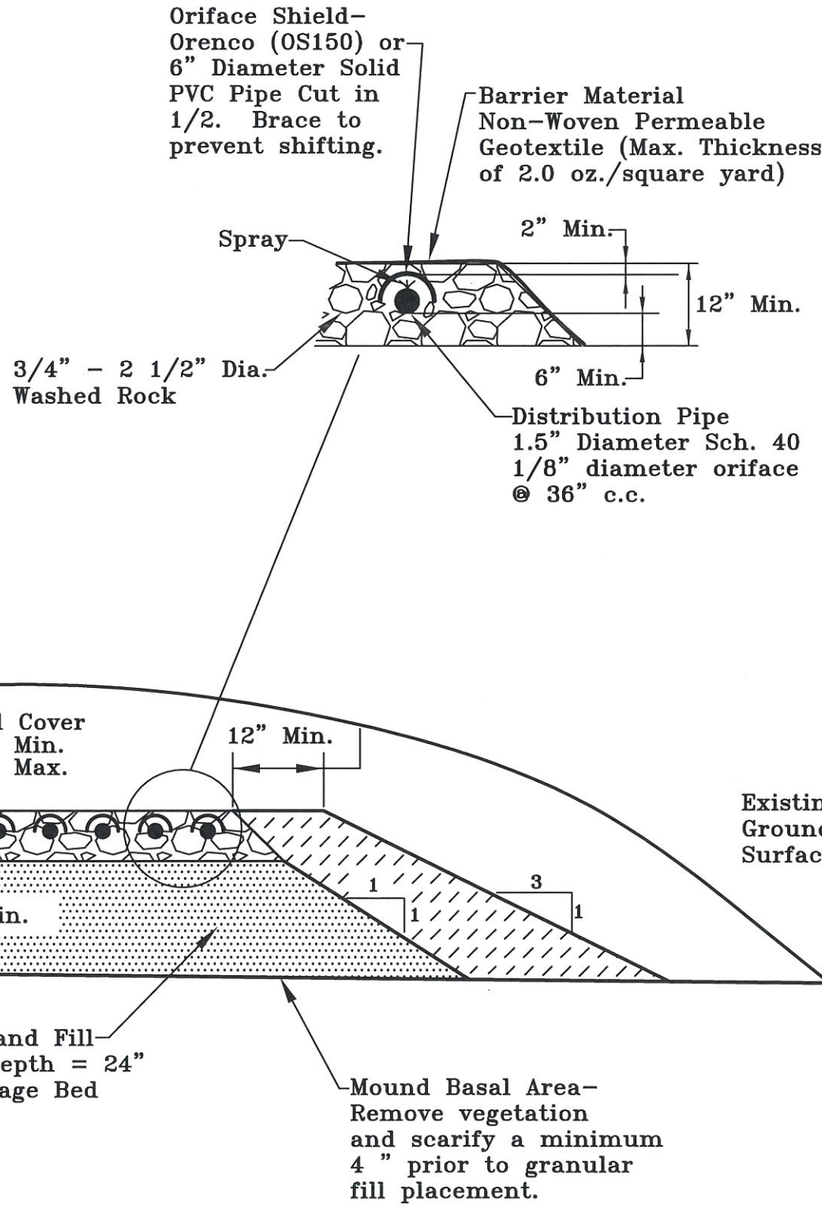
| | |
|---|---|
| Job. No. | 20–11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | NTS |

Figure

#8




Cleanout and Monitoring Port





NWCC
Northwest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering • Materials Testing
(970)879-7883 Fax: (970)879-7881
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487


OWTS – Mounded Sand Filter/Gravel Bed Cross Section

Home Ranch
27250 Home Ranch Road
Routt County
Colorado

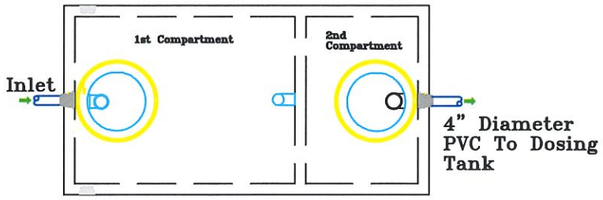
| REV. NO. | REVISIONS | DATE | DRAWN BY | REVIEWED AND SIGNED BY |
|---|---|---|---|---|
| | | | | |

| | |
|---|---|
| Job. No. | 20–11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | NTS |

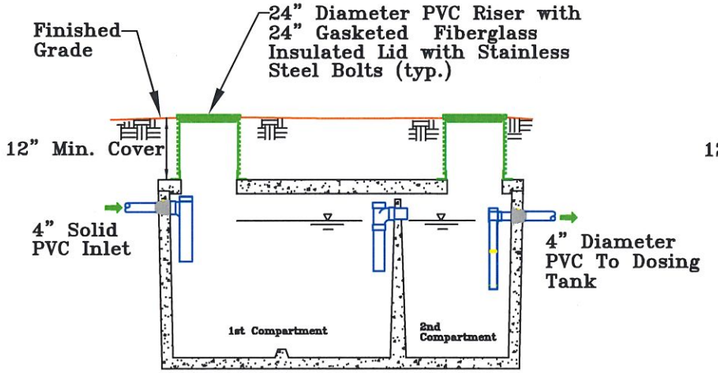
Figure

#9

## Two Compartment Septic Tank



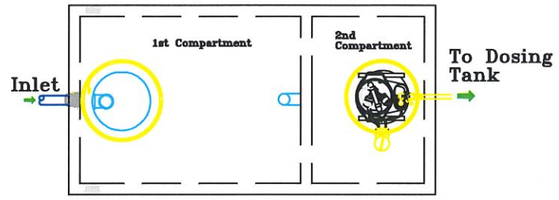

Top View



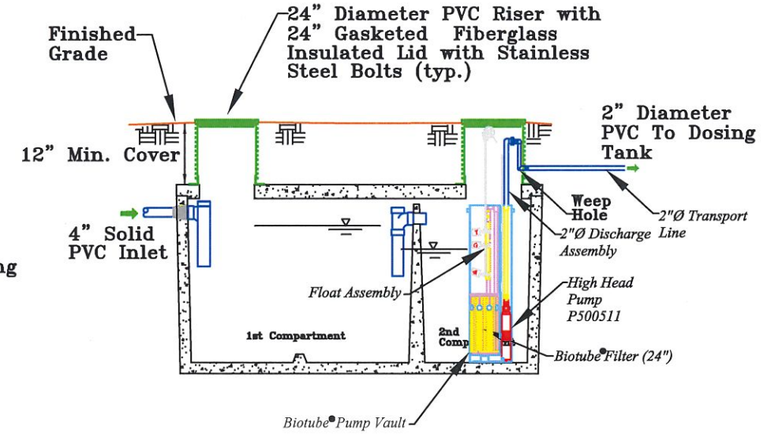

Section View

* Note: Septic tank shown is a typical 2-compartment septic tank configuration. Installer must submit detail from septic tank manufacturer, for approval by NWCC prior to construction.

## Two Compartment Septic Tank with Pump




Top View

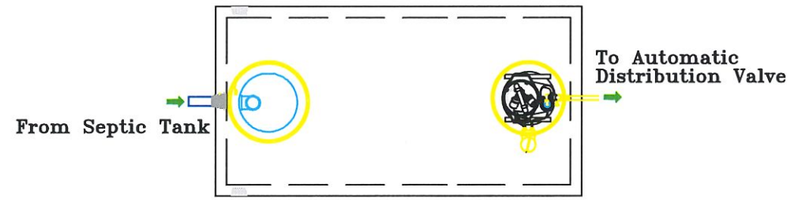



Section View

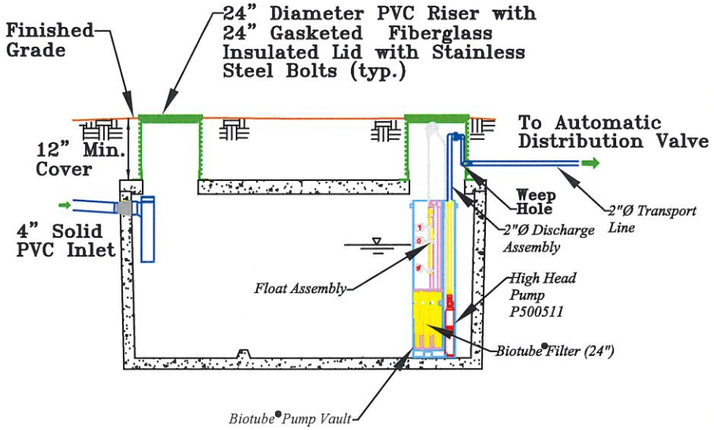
| Float Functions | |
|---|---|
| Y | High Level Alarm |
| G | Override Timer ON/OFF |
| W | LLA/RO |

* Note: Septic tank shown is a typical 2-compartment septic tank with pump configuration. Installer must submit detail from septic tank manufacturer, for approval by NWCC prior to construction.

## Dosing Tank




Top View




Section View

| Float Functions | |
|---|---|
| Y | High Level Alarm |
| G | Override Timer ON/OFF |
| W | LLA/RO |

* Note: Dosing tank shown is a typical configuration. Installer must submit detail from septic tank manufacturer, for approval by NWCC prior to construction.


NWCC Northwest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering / Materials Testing
(970)879-7883 Fax (970)879-7881
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487


OWTS - Septic/ Dosing Tank Details

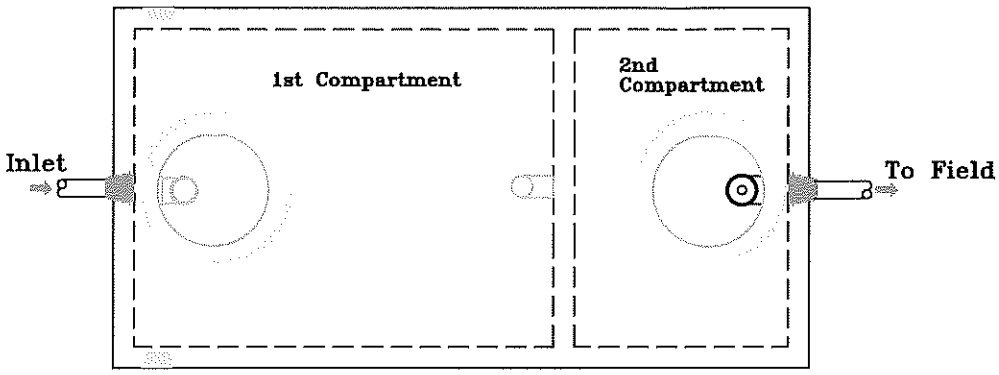
Home Ranch
27250 Home Ranch Road
Routt County
Colorado

| REV. No. | REVISIONS | DATE | DRAWN BY | REVIEWED AND SIGNED BY |
|---|---|---|---|---|
| | | | | |

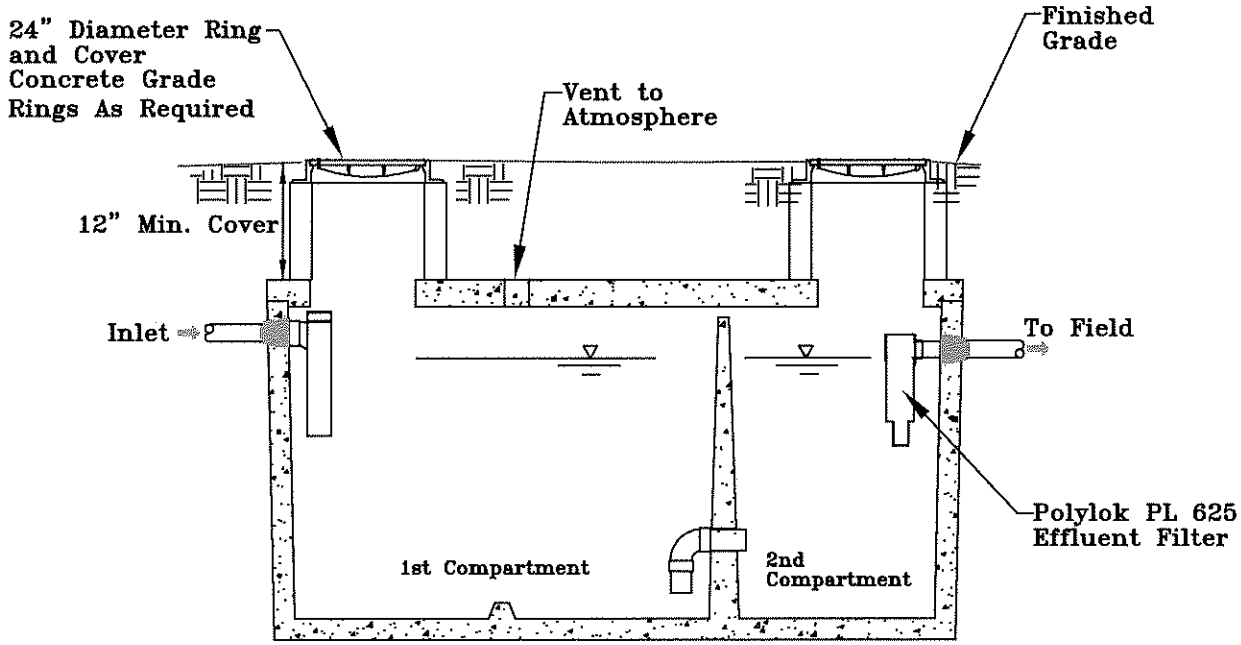
| | |
|---|---|
| Job. No. | 20-11733 |
| Date: | 9/22/2020 |
| Drawn | TT |
| Chkd | BDL |
| Scale | NTS |

Figure

#10




Top View




Section View

* Note: Grease interceptor tank shown is a typical 2-compartment tank configuration. Installer must submit detail from septic tank manufacturer, for approval by NWCC prior to construction.

| | | |
|---|---|---|
| Title: OWTS–GREASE INTERCEPTOR TANK DETAILS | | Date: 9/22/2020 |
| Job Name: Home Ranch | | Job No. 20-11733 |
| Location: 27250 Home Ranch Road, Routt County, Colorado | | Figure #11 |

NWCC
North West Colorado Consultants, Inc.
Geotechnical / Environmental Engineering - Materials Testing
(970)879-7888 - Fax (970)879-7891
2596 Copper Ridge Drive
Steamboat Springs, Colorado 80487

# APPENDIX A

## SUMMARY OF DESIGN CALCULATIONS

A. Wastewater Volume Calculations-System 1

1) Owner's Residence: 2 Bedroom @ 150 gpd/bedroom: ..... 300 gpd
2) Trainer's Residence: 3 Bedroom @ 150 gpd/bedroom: ..... 450 gpd
3) Lodge: 1 Bedroom @ 150 gpd/bedroom: ..... 150 gpd
4) Lodge-Events: 18 people @ 25 gpd/person: ..... 450 gpd
5) Shop-Greenhouse: 15 employees @ 20 gpd/employee: ..... 300 gpd
6) Design Flow ..... Q = 1,650 gpd

B. System Sizing

1) Infiltrative Surface-Natural Topsoil and Organics-Soil Type 2 (Table 10-1)-LTAR = 0.6 gpd/ $ft^2$
1a) Secondary Sand Filter Media 42.11.3.b.2-LTAR = 0.8 gpd/ $ft^2$

2) Minimum mounded sand filter bed area = Q/LTAR = 1,650gpd/0.8gpd/ $ft^2$ = 2,063 $ft^2$
2a) Minimum mounded sand filter base area = Q/LTAR = 1,650gpd/0.6gpd/ $ft^2$ = 2,750 $ft^2$

3) Designed sand filter bed area = 6 Zones @ 344 $ft^2$ (4 ft x 86 ft)/zone = 6 x 344 $ft^2$ = 2,064 $ft^2$.
3a) Designed sand filter base area = 31 ft x 90 ft = 2,790 $ft^2$.

4) Septic Tank - 2 days x 1,650 gpd = 3,300-gallon septic tank minimum for system.
Total Design Tank Capacity = 4,500 Gallons

5) Grease Interceptor Tank - 2,000 -gallon grease interceptor tank recommended.

**System 1-Minimum Horizontal Setbacks in Feet**

| | Spring, Well, Potable Water Supply Cistern | Potable Water Supply Line | Dwelling, Occupied Building | Property Line, Piped or Lined Irrigation Ditch | Waterbody (Lake, Water Course, Irrigation Ditch, Wetland) | Dry Gulch/Swale, Subsurface Drain, Intermittent Irrigation Lateral |
|---|---|---|---|---|---|---|
| Septic Tank/ DosingTank | 50 | 10 | 5 | 10 | 50 | 10 |
| Building Sewer or Effluent Line | 50 | 10 | | 10 | 50 | 10 |
| Soil Treatment Area | 218 | 25 | 20 | 10 | 102 | 25 |

# APPENDIX A

## SUMMARY OF DESIGN CALCULATIONS

A. Wastewater Volume Calculations-System 2

1) Columbine Cabin: 3 Bedroom @ 150 gpd/bedroom:.....450 gpd
2) Existing Cabins: 7 Guest Rooms x 2 people/room @ 50 gpd/person: .....700 gpd
3) Future Cabin: 2 Guest Rooms x 2 people/room @ 50 gpd/person:.....200 gpd
4) Design Flow .....Q = 1,350 gpd

B. System Sizing

1) Infiltrative Surface-Natural Topsoil and Organics-Soil Type 2 (Table 10-1)-LTAR = 0.6 gpd/ $ft^2$
1a) Secondary Sand Filter Media 42.11.3.b.2-LTAR = 0.8 gpd/ $ft^2$

2) Minimum mounded sand filter bed area = Q/LTAR = 1,350gpd/0.8gpd/ $ft^2$ = 1,688 $ft^2$
2a) Minimum mounded sand filter base area = Q/LTAR = 1,350gpd/0.6gpd/ $ft^2$ = 2,250 $ft^2$

3) Designed sand filter bed area = 6 Zones @ 284 $ft^2$ (4 ft x 71 ft)/zone = 6 x 284 $ft^2$ = 1,704 $ft^2$.
3a) Designed sand filter base area = 30 ft x 75 ft = 2,250 $ft^2$.

4) Septic Tank - 2 days x 1,350 gpd = 2,700-gallon septic tank minimum for system.
Total Design Tank Capacity = 3,750 Gallons

**System 2-Minimum Horizontal Setbacks in Feet**

| | Spring, Well, Potable Water Supply Cistern | Potable Water Supply Line | Dwelling, Occupied Building | Property Line, Piped or Lined Irrigation Ditch | Waterbody (Lake, Water Course, Irrigation Ditch, Wetland) | Dry Gulch/Swale, Subsurface Drain, Intermittent Irrigation Lateral |
|---|---|---|---|---|---|---|
| Septic Tank/ DosingTank | 50 | 10 | 5 | 10 | 50 | 10 |
| Building Sewer or Effluent Line | 50 | 10 | | 10 | 50 | 10 |
| Soil Treatment Area | 182 | 25 | 20 | 10 | 78 | 25 |

# APPENDIX B

1) The Rules and Regulations of the CDPHE and Routt County Department of Environmental Health must be complied with during the installation/construction of the system.

2) Periodic inspections must be made by NWCC at the following points during construction:

   a. After subgrade excavation, septic/grease/dosing tanks and solid PVC pipe/casing installation.
   b. After placement of sand fill, washed gravel, perforated PVC pipe, flow meter and ADV, prior to backfilling. NWCC must observe dosing system pump test, flow control valve adjustment for proper spray height and automatic distribution valve operation.
   c. Upon final completion of the project.

3) The 4-inch PVC pipe shall conform to ASTM 3034/SDR 35 or better quality. Pressurized lines and PVC casing shall consist of solid Schedule 40 PVC or other approved piping material suitable for pressurized wastewater transmission. Pressurized lines should be constructed to drain to field or pump chambers or have adequate cover and/or insulation to prevent freezing. The piping should also be tested prior to approval. NWCC recommends a minimum 20 psi testing pressure. The perforated pipe in the sand filter treatment area should be constructed level.

4) Soils beneath the pipes entering and leaving a septic, grease or dosing tanks, which has been excavated, shall be backfilled in 6 inch lifts and mechanically compacted to a minimum of 95% of the maximum standard Proctor density. PVC pipe meeting ASTM 3034-SDR 35 or schedule 40 shall be used for 5 feet, or width of excavation, on the inlet and outlet sides of the tank.

5) Provide a minimum of 12 inches of soil cover over the septic, grease and dosing tanks, 18 inches of soil over the sand filter and 24 inches of soils cover over all pipes. Any piping placed under a driveway or other plowed areas should have a minimum of 48 inches of soil cover or be protected from freezing using insulation or other approved means. Manhole lids must be exposed at final grades. Provide manhole ring extensions as needed to reach final grades.

6) Special care should be taken when backfilling the system to prevent disturbance/crushing of the distribution lines. In addition, the distribution lines should be carefully bedded to minimize the settlement in these lines.

7) Surface drainage shall be ditched and diverted away from the soil treatment area and all tanks.

8) Disturbed surfaces, mounds and berms shall be covered with topsoil and heavily seeded. Heavy farm equipment and livestock should be fenced or kept off of the soil treatment area.

9) The washed rock shall be covered with synthetic filter fabric (Mirafi 140N) barrier material before overlying soils layers are placed. The washed rock will consist of gravel from 0.75 to 2.5 inches in size.

10) Inspection pipes to be constructed of PVC pipe with the portion of the pipe penetrating the gravel and sand being perforated. Inspection pipes must be extended to infiltrative surface at bottom of sand fill. Cleanouts must be placed in the solid distribution line upstream of the septic tank at maximum intervals of 100' or above any pipe bends 45 degrees or greater.

11) It is the responsibility of the owner and the installer to comply with all of the minimum setback requirements in the Regulations.

12) The sand filter materials must be approved prior to use by NWCC and consist of a clean, well graded sand meeting ASTM C33 for concrete sand with 3 percent or less passing the No. 200 sieve for secondary sand media.