Heavy Use Area Protection Project Design
CIG Project – HUAP surface using wood chips

Dewy Meadows Farm

Warren Township, Bradford County

Designed by:
Nathan Dewing,
Bradford County Conservation District
200 Lake Rd
Towanda, PA 18848
(570) 265-5539 ext. 3130

Design Approval and Certification by:
Robert Sweppenheiser, II
District Engineer
Bradford County Conservation District
200 Lake Rd
Towanda, PA 18848
(570) 265-5539 ext. 3127

8/30/18

Computation Sheet

NRCS-ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project Dewy Meadows Farm		
By [illegible]	Date 9/21/17	Checked by RWJ	Date 8/9/18	Job No.
Subject Design - HUAP CIG				Sheet 1 of 9

Resource Concern - Water Quality from ACA runoff

Proposed Solution - HUAP. Concrete Stabilized Feed/Scrape Lane with bulk of HUAP surfaced with wood chips with leachate collection drainage under neath. Manure Stacking Area Adjacent to scrape lane. Project has partial funding from CIG.

HUAP Sizing

50 head of cows + feeders. Curb side feeding space needed = 2' x 50 head = 100'

Feed/Scrape Lane = 12' x 100' = 1,200 ft²

Wood Chip Area = 200 ft²/AU

50 head @ 1,000 lb ea = 50 AUs x 200 ft² ea
= 10,000 ft² - Make area 100' x 100'

Note: Univ. UT Extension "Woodchip Pads for Livestock" (attached) recommends 110 ft²/animal (Table 2). NRCS CLA Guidance Exhibit 5 recommends 300-400 ft²/1,000 lb animal (unpaved) We chose 200 ft²/1,000 lb animal for wood chip area.

Total HUAP = 11,200 ft² = 224 ft²/AU (10% concrete; 90% wood chips)

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project Dewy Meadows Farm		
By [illegible]	Date	Checked by	Date	Job No.
Subject Design - HUAP - CIG				Sheet 2 of 9

Sizing Manure Stacking Area

Solid manure stacking area adjacent to scrape lane.
Manure will be from scrape lane only.
Size for 4 months. (Dec - Apr.)

90 lb/day × 50 AUs × 120 days × 75% of manure
= 203T + 20% bedding = 203T + 41 = 244T
@ 33 ft³/T = 8,052 ft³ ÷ 4' high
= 2,013 ft² footprint.

Use 40'w × 50'l = 2,000 ft²

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project Dewy Meadows		
By	Date 9/21/17	Checked by	Date	Job No.
Subject Design - HUAP - CIG				Sheet 3 of 9

Check VTA area needed for nutrients

Paved area = 3,200 ft² = 0.073 ac.

N delivered = 325 lb N/total ac × 0.073 ac = 24 lbs N

P delivered = 25% of N = 24 × 0.25 = 6 lbs P

Unpaved area = 10,000 ft² = 0.23 ac. (Design Guide PA-5 Fig 3.24 - 37" rainfall)

N delivered = 165 lb N/total ac × 0.23 ac = 38 lbs N

P delivered = 25% of P = 38 × 0.25 = 10 lbs P

Total N = 24 + 38 = 62 lbs

Total P = 6 + 10 = 16 lbs

Expected yield from VTA = 4T/ac. Uptake = 200 lb N / 60 lb P

Area required for N = $\frac{62 \text{ lbs N}}{200 \text{ lbs/ac}}$ = 0.31 ac.

Area required for P = $\frac{16 \text{ lbs P}}{60 \text{ lbs/ac}}$ = 0.27 ac.

N is limiting - requires 0.31 ac = 13,504 ft²

This requires a 66' radius

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project: Dewy Meadows Farm		
By: [illegible]	Date:	Checked by:	Date:	Job No.:

Subject: Design - HUAP - Routing Runoff

Sheet 4 of 9

From TR 55 $Q_{25} = 0.58$ cfs $Q_2 = 0.30$ cfs

If sprinkler allows 40 gpm = 0.09 cfs $< Q_2$ so OK

Calculate required storage for 25 yr - 24 hr. storm when the Q_{out} is limited by irrigation pump

$Q_{out} = 40$ gpm $= 0.09$ cfs $Q_{in} = Q_{25} = 0.59$ cfs

V_r = Volume of runoff V_s = Volume of Storage needed.

$\frac{q_o}{q_i} = \frac{0.09}{0.58} = 0.16 \rightarrow$ Using TR55 Fig 6.1 $\frac{V_s}{V_r} = 0.5$

Using EFH-2 CN 89 Runoff from 25 yr, 24 hr storm (4.3") = 3.11" runoff

$V_r = \frac{3.11"}{12"/ft} (13,200\ ft^2) = 3,421\ ft^3$ of runoff

$\frac{V_s}{V_r} = 0.5$ $V_s = V_r (0.5) = 3421\ ft^3 (0.5) = 1,711\ ft^3$

Stormwater Storage Volume Required = 1,711 ft^3

Effluent Collection Tank Volume = 1,250 gallons

Pumpable capacity = 1,050 gallons = 140 ft^3

$V_s = 1,711\ ft^3 - 140\ ft^3$ in tank $= 1,571\ ft^3$ remaining storage needed.

Store in drainage stone with 50% void space.

Need $1,571\ ft^3 / 50\% =$ **3,142 ft^3 storage sp**

GPO U.S. GOVERNMENT PRINTING OFFICE: 2009—353-490

Computation Sheet
NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project Dewy Meadows Farm		
By	Date	Checked by	Date	Job No.
Subject Design - HUAP - CIG				Sheet 5 of 9

Stormwater storage in drainage stone under HUAP

Need 3,142 ft³ volume to store 1,571 ft³ water

Backing water up to elev. 1245.8 provides 3,230 ft³

Build compacted earthen berm to elev. 1247 (=top of wood chips)

(Lowest elev. of compacted berm will be elev. = 1246.5)

Irrigation Calculations

@ elev. 1246.5 storage vol. = 5,100 ft³ ÷2 = 2,550 ft³

Effluent collected to be irrigated to VTA

VTA Soil is VoB - PA Irrigation Guide Soil Group 10

Max applic. rate = 0.3 inches/hr.

AWC = 0.15 inches water/inch soil (Soil Survey)

12" soil depth → 12" x 0.15 = 1.8" AWC

Area needed for nutrients = 13,504 ft² (66' radius)
(0.31 ac.)

Max weekly volume must be less than 2" (rain + treatment water)

- Highest month is June @ 1" reg. rainfall per week.
- Allowable waste load = 2" max - 1" reg. rainfall = 1"
- 50% AWC = 1.8" x 50% = 0.9"

AWC is limiting so max weekly application is 0.9"

GPO U.S. GOVERNMENT PRINTING OFFICE: 2009—353-490

Computation Sheet
NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project		
By	Date	Checked by	Date	Job No.
Subject: Design - HUAP - CIG				Sheet 6 of 9

Irrigation Cont...

Max allowable/week = $\frac{0.9"}{12"/ft} \times 13,504\ ft^2 = 1,013\ ft^3$

Runoff expected in highest month = $\frac{1"}{12"/ft} \times 13,200\ ft^2 \times 34\%$ (Runoff Factor)

↑ University of VT research

$= 374\ ft^3$

Expected Runoff < Max allowable so OK

Application rate not to exceed 0.3" per hour (PA Irrigation Guide)

Sprinkler @ 40 gpm x 60 min/hr = 2,400 gph = $321\ ft^3/hr.$

Irrigation sprinkler being used covers 78' radius = $19,113\ ft^2$

$\frac{321\ ft^3}{19,113\ ft^2} = 0.0168\ ft/hr \times 12"/ft = 0.20"/hr.$

Planned 0.2"/hr < Max 0.3"/hr. so OK

Applying 39 gpm on a VTA at least $19,113\ ft^2$ in size is acceptable

GPO U.S. GOVERNMENT PRINTING OFFICE: 2009—353-490

Computation Sheet
NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project Dewy Meadows Farm		
By [illegible]	Date	Checked by	Date	Job No.
Subject Design - HUAP - CIG			Sheet 7 of 9	

Selecting pump and irrigation sprinkler

Use Rainbird Model 80 EHD

½" nozzle @ 35 psi → 40 gpm over 79' radius.

Pump Transfer pipe length = 310'

Equiv. length of fittings - 2 - 90° elbows @ 10' = 20'

1 - quick disconnect @ 2' = 2'

22'

Total equiv. length = 310' + 22' = 332' ≈ 350'

Friction-loss in 3" pipe @ 40 gpm = 0.32 ft/100' pipe

Head loss = 350' × 0.32'/100' = 1.1' ≈ 1'

Elevation Head = 16' Pump @ elev. 1242
Sprinkler @ elev. 1258

Sprinkler operation = 35 psi × 2.3'/1 psi = 81'

TDH = 16' + 1' + 81' = 98'

Need pump to deliver 40 gpm @ 98' TDH

Pump curve shows 40 gpm @ 95' TDH so

see interpolation on next page.

GPO U.S. GOVERNMENT PRINTING OFFICE: 2009—353-490

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project Dewy Meadows Farm		
By	Date	Checked by	Date	Job No.
Subject Design - HUAP - CIG			Sheet 8 of 9	

Interpolation to predict more accurate flow rate

pump will supply 40 gpm @ 95' of head.

95' - 17' elevation + friction = 78' = 33.8 psi to sprinkler
≈ 34 psi

Using Rain Bird Chart - interpolate between 30 & 35 psi:

$$\frac{1}{5} = \frac{40.1 - x}{40.1 - 37.1} \qquad 40.1 - x = 0.6 \qquad x = 39.5 \text{ gpm}$$

$$\text{Radius covered} = \frac{1}{5} = \frac{79 - x}{79 - 73} \qquad 79 - x = 1.2 \qquad x = 77.8 \approx 78' \text{ radius}$$

$$= 19{,}113 \text{ ft}^2 \text{ covered}$$

TDH = 16' elev. + 1' friction + 78' sprinkler = 95'

Need pump to deliver 39 gpm @ 95' TDH

Use Goulds B3885 2HP pump - WE 2012H or approved equivalent.

Use Rain Bird 80 EHD sprinkler w/ 1/2" nozzle @ 34 psi → 39 gpm over 78' radius

GPO U.S. GOVERNMENT PRINTING OFFICE: 2009—353-490

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project: Dewy Meadows Farm		
By: [illegible]	Date	Checked by	Date	Job No.
Subject: Design - HUAP - CIG				Sheet 9 of 9

Check Pump Run - Time

Use 2,000 gallon Pre-cast tank

i.d. = 11'5" Long x 5'9" wide

volume = 11.42 x 5.75' x ½" = 5.47 ft³/inch = 40.1 gal/inch

Set tank so that top elevation = 1246.6

(max water elev. under pad = 1245.8)

Tank inside floor = 1241.1

Manifold Pipe Outlet into tank = 1243.4

Start Pump when water level reaches Manifold Outlet

Pump can sit on floor or be blocked up max. 2"

Min Dose height = 1243.4 - 1241.1 = 28" - 2" block up = 26"

Min Dose Volume = 26" x 41 gal/inch = 1,066 gal.

Min Pump Run Time = 1,066 gal / 39 gpm = 27 minutes

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State	Project		
PA	Andy Newing		
By: RWJ	Date: 8/18	Checked by:	Date:
Job No.			
Subject: Check Buoyancy on Pump Tank		Sheet 1 of 1	

Tank Dimensions - 12'L x 6.5'W x 5.67'D

Minimum 2' cover over Tank

3" walls + Floor - 6" Lid

Rating perimeter drain Half way up Tank but going to ignore for calculations

Buoyancy - 12' x 6.5' x 5.67' = 443 ft³

Worst case scenario is to top of lid

Buoyant Force = 443 ft³ x 62.4 lb/ft³ = 27,644 lbs

Weight of Soil & Tank

Soil on Top - 2' x 12'L x 6.5'W = 156 ft³

156 ft³ x 115 lb/ft³ = 17,940 lbs for soil

Concrete

Sides - 2 x (12' x 5.67' x 3/12) = 34 ft³

2 x (6.5' x 5.67' x 3/12) = 18 ft³

Floor - 12' x 6.5' x 3/12 = 19.5 ft³

Lid - 12' x 6.5' x 0.5' = 39 ft³

Total = 110.5 ft³

Concrete Weight = 110.5 ft³ x 150 lb/ft³ = 16,575 lbs Concrete

Total Weight = 17,940 lbs + 16,575 lbs = 34,515 lbs

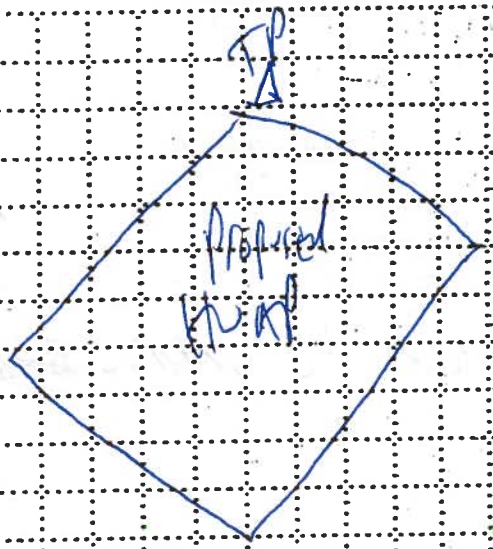
Weight of Soil & Concrete 34,515 > Buoyancy 27,644 lbs

SOIL INVESTIGATION TO DETERMINE SUITIBILITY OF PROPOSED AG WASTE STORAGE

FARMER'S NAME Andy Bewing COUNTY Bradford
DATE _____ FIELD OFFICE _____

TYPE OF MANURE	☒ SOLID ☐ LIQUID ☐ SLURRY ☐ LAGOON	Beef TYPE OF ANIMAL	DISTRICT CONSERVATIONIST

SKETCH OF PROPOSED POND SHOWING WHERE BORINGS WERE MADE



PIT NO. 1				PIT NO. 2				PIT NO. 3				PIT NO. 4			
Depth	soil text	%f	%cl	Depth	soil text	%f	%cl	Depth	soil text	%f	%cl	Depth	soil text	%f	%cl
0-12"	Topsoil														
12"-48"	CL														

Dewy Meadows Farm
CIG - Wood Chip Pad Design

Use 2,000 gal tank for max capacity & depth for trans. pipe cover & drain back to tank.

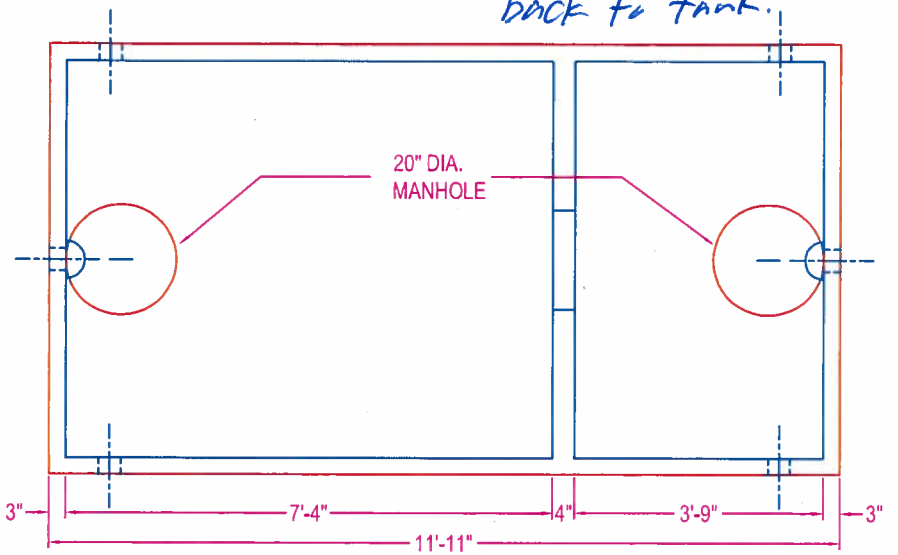
SEPTIC TANK
ST-2000

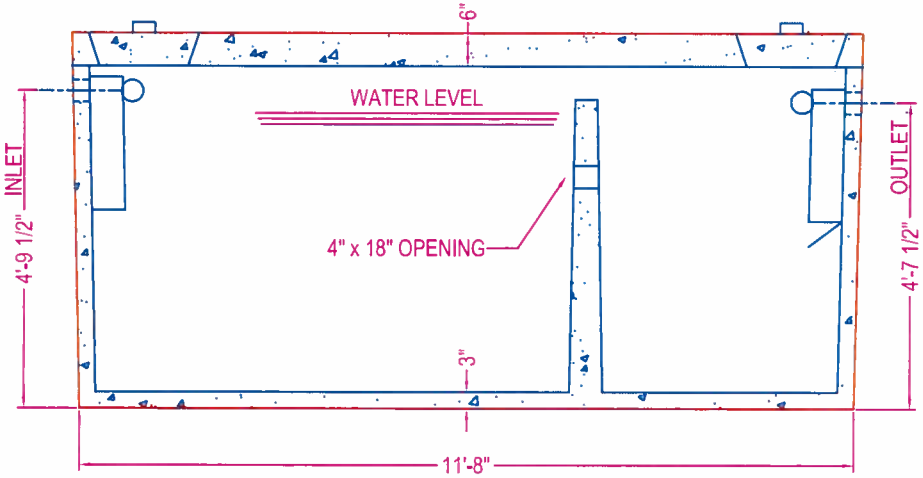
3-INLETS
3-OUTLETS

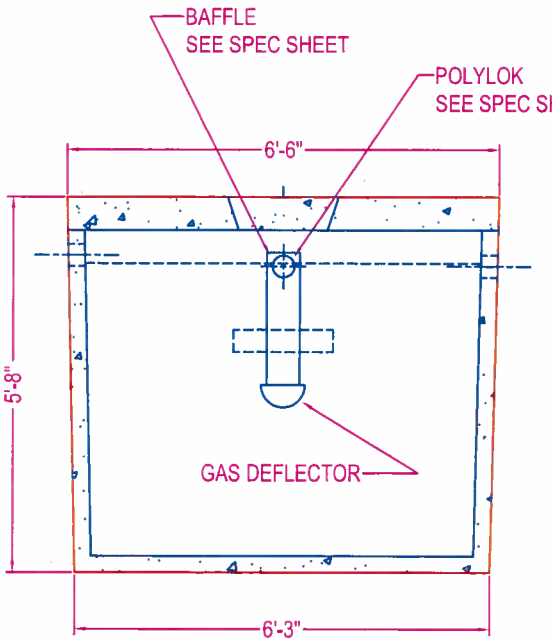
Min Dose = 24"
41 gal/inch
Min Dose = 41 x 24" = 984 gal
Pump Run time @ 40 gpm
= 984/40 = 25 min.

NOTES:

CONCRETE: 5000 psi @ 28 days
REF: Matrix HPS fiber mesh
rebar grade 60 ASTM A615
ENTRAINED AIR: +/- 5% to 8%
DESIGN LOAD: 300 psf / non-traffic
LIVE LOAD: N/A
EARTH FILL: 24" max fill depth
BUOYANCY FACTOR: N/A
PIPE CONNECTS: polylok (cast in)
BAFFLE: plastic baffle w/ gas deflector
on outlet opening
plastic baffle on inlet







Zeiser Wilbert VAULT, INC. CONCRETE PRODUCTS
750 Howard Street Elmira, NY 14904
Fax: (607) 737-0291
Phone: (607) 733-0568
1-800-472-4335

Title: ST-2000 Two Comp

Scale: Not To Scale

Drawn By: JPS

Drawing No.: 01020910

Date: 1-2-09

1,520 ft³ > 1,448 ft³ – elev. 1245.5

DEWY MEADOWS FARM
Project: HUAP
Basin Desc: STORMWATER STORAGE UNDER PAD

Storage Volume (Vs) available

Contour Elevation	Contour Area (sq. ft)	Depth (ft) Avg. End (cu. ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Conic (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume
1,244.00	0	N/A	N/A	0	N/A	0
1,244.10	17.7	0.1	0.89	0.89	0.59	0.59
1,244.20	8.06	0.1	1.29	2.17	1.26	1.85
1,244.20	41.27	0	0	2.17	0	1.85
1,244.30	8.63	0.1	2.49	4.67	2.29	4.14
1,244.30	32.24	0	0	4.67	0	4.14
1,244.30	70.76	0	0	4.67	0	4.14
1,244.40	10	0.1	4.04	8.71	3.58	7.72
1,244.40	34.06	0	0	8.71	0	7.72
1,244.40	70.8	0	0	8.71	0	7.72
1,244.40	106.25	0	0	8.71	0	7.72
1,244.50	81.57	0.1	9.39	18.1	9.36	17.08
1,244.50	0	0	0	18.1	0	17.08
1,244.60	8.84	0.1	0.44	18.54	0.29	17.38
1,244.60	585.62	0	0	18.54	0	17.38
1,244.70	9.66	0.1	29.76	48.3	22.35	39.73
1,244.70	34.92	0	0	48.3	0	39.73
1,244.70	822.68	0	0	48.3	0	39.73
1,244.80	10.21	0.1	41.64	89.95	30.82	70.54
1,244.80	38.05	0	0	89.95	0	70.54
1,244.80	76.28	0	0	89.95	0	70.54
1,244.80	1,089.27	0	0	89.95	0	70.54
1,244.90	10.25	0.1	54.98	144.92	40.17	110.72
1,244.90	40.82	0	0	144.92	0	110.72
1,244.90	82.74	0	0	144.92	0	110.72
1,244.90	1,375.35	0	0	144.92	0	110.72
1,245.00	41.02	0.1	70.82	215.74	55.13	165.85
1,245.00	89.46	0	0	215.74	0	165.85
1,245.00	1,984.56	0	0	215.74	0	165.85
1,245.10	10.65	0.1	99.76	315.5	71.35	237.2
1,245.10	91.65	0	0	315.5	0	237.2
1,245.10	2,565.19	0	0	315.5	0	237.2
1,245.20	42.39	0.1	130.38	445.88	97.91	335.11
1,245.20	3,224.08	0	0	445.88	0	335.11
1,245.30	95.13	0.1	165.96	611.84	129.1	464.21
1,245.30	3,810.89	0	0	611.84	0	464.21
1,245.40	4,551.79	0.1	418.13	1029.98	417.59	881.8
1,245.50	5,258.76	0.1	490.53	1520.5	490.1	1371.9

p. 1 of 2

To store entire 25yr 24hr Storm Vr = 3,022 ft

~~2,076 ft³ > 1,848 ft³ elev.~~

3,380 ft³ > 3,022 ft³ Required - elev. is ok?

DEWY MEADOWS FARM
Project: HUAP
Basin Desc: STORMWATER STORAGE UNDER PAD

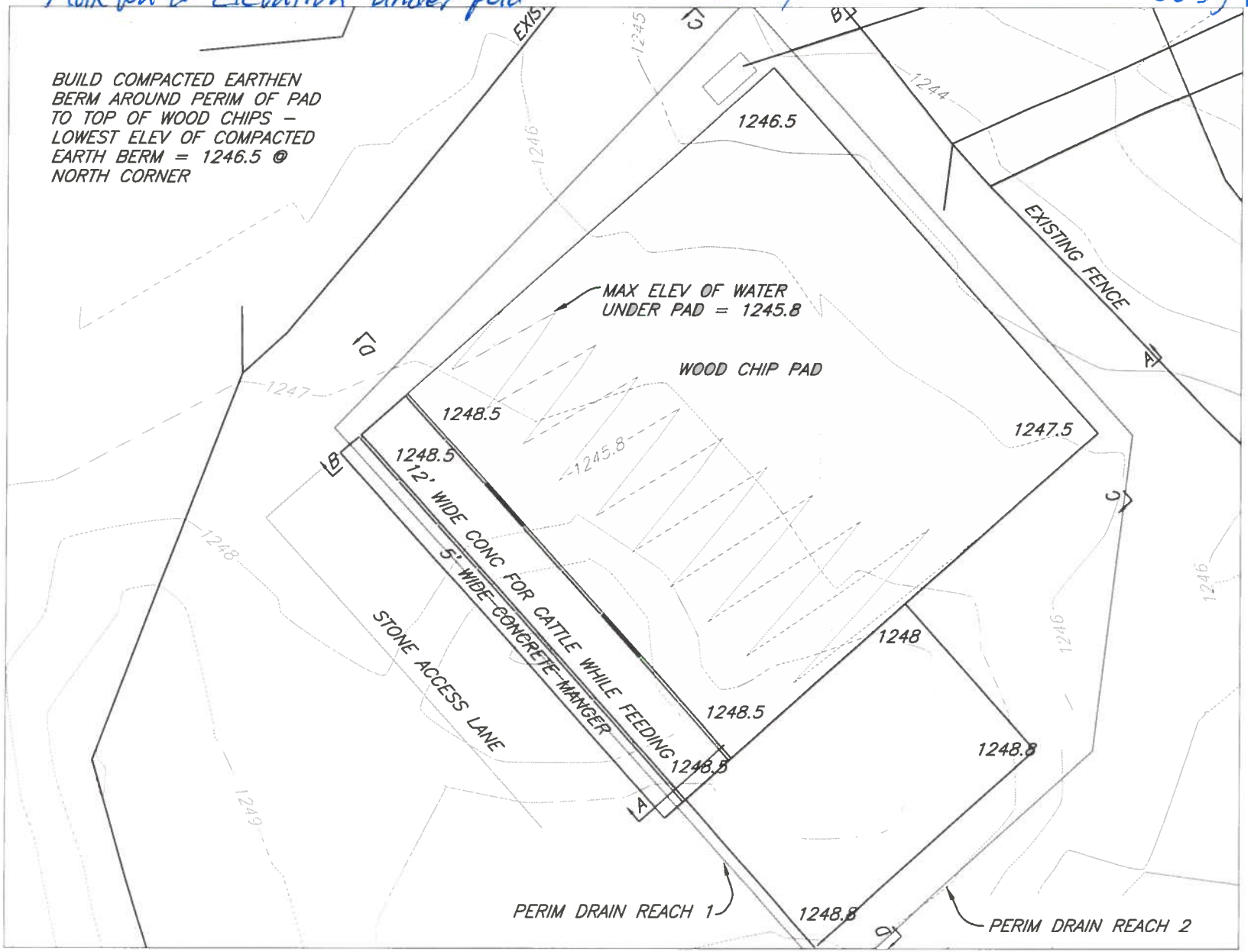
Contour Elevation	Contour Area (sq. ft)	Depth (ft) Avg. End (cu. ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Conic (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume	
1,245.60	5,859.90	0.1	555.93	~~2076.44~~	555.66	1927.56	
1,245.70	6,521.31	0.1	619.06	2695.5	618.77	2546.33	
1,245.70	6,521.31	0	0	2695.5	0	2546.33	
1,245.80	7,182.53	0.1	685.19	3380.69	684.93	3231.25	→ pumping @ 40 gpm
1,245.90	7,841.88	0.1	751.22	4131.91	750.98	3982.23	
1,245.90	7,841.88	0	0	4131.91	0	3982.23	
1,246.00	8,509.81	0.1	817.58	4949.49	817.36	4799.59	
1,246.10	111.71	0.1	431.08	5380.57	319.88	5119.48	
1,246.10	104.46	0	0	5380.57	0	5119.48	
1,246.10	98.09	0	0	5380.57	0	5119.48	
1,246.10	5,165.62	0	0	5380.57	0	5119.48	
1,246.10	149.33	0	0	5380.57	0	5119.48	
1,246.10	92.45	0	0	5380.57	0	5119.48	
1,246.10	129.51	0	0	5380.57	0	5119.48	
1,246.10	87.42	0	0	5380.57	0	5119.48	
1,246.10	217.38	0	0	5380.57	0	5119.48	
1,246.10	119.96	0	0	5380.57	0	5119.48	
1,246.20	84.14	0.1	10.2	5390.78	10.15	5129.63	
1,246.20	52	0	0	5390.78	0	5129.63	
1,246.20	5,175.24	0	0	5390.78	0	5129.63	
1,246.20	72.98	0	0	5390.78	0	5129.63	
1,246.20	49.17	0	0	5390.78	0	5129.63	
1,246.20	217.11	0	0	5390.78	0	5129.63	
1,246.20	67.54	0	0	5390.78	0	5129.63	
1,246.20	62.84	0	0	5390.78	0	5129.63	
1,246.20	58.76	0	0	5390.78	0	5129.63	
1,246.20	55.17	0	0	5390.78	0	5129.63	
1,246.30	27.93	0.1	4.15	5394.93	4.08	5133.71	
1,246.30	26.11	0	0	5394.93	0	5133.71	
1,246.30	5,178.51	0	0	5394.93	0	5133.71	
1,246.30	24.52	0	0	5394.93	0	5133.71	
1,246.30	37.52	0	0	5394.93	0	5133.71	
1,246.30	23.11	0	0	5394.93	0	5133.71	
1,246.30	32.44	0	0	5394.93	0	5133.71	
1,246.30	21.85	0	0	5394.93	0	5133.71	
1,246.30	30.02	0	0	5394.93	0	5133.71	
1,246.30	209.73	0	0	5394.93	0	5133.71	
1,246.40	9.38	0.1	10.96	5405.89	8.78	5142.49	
1,246.40	5.77	0	0	5405.89	0	5142.49	

p. 2 of 2

Low point of compacted berm = Elev. 1246.5 - provides 5,100 ft³ volume
Need 1,571 ft³ for water so OK. ÷2 = 2,550 ft³ for water.

Max water elevation under pad

Dewy Meadows Farm, CIG Design



Nate D

Dewy Meadows HUAP
Wood chip barnyard
Bradford NOAA_B County, Pennsylvania

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)
SUBAREAS				
HUAP	0.31	12.41	0.59	12.42
REACHES				
OUTLET	0.31		0.59	

UNIVERSITY OF VERMONT EXTENSION

CULTIVATING HEALTHY COMMUNITIES

Woodchip Pads for Livestock

Introduction

Suitable winter feeding systems are often a challenge for livestock farms in the Northeast and elsewhere. Ease of feeding during winter conditions is a prime concern, as well as protection of pastures, especially during wet, muddy conditions when pugging and damage can occur. To address these issues, some level of confinement is often implemented on farms. With conventional confinement, negative effects on livestock comfort and performance can be significant in some situations, while accompanying environmental impact and nutrient management considerations are receiving more attention as water quality concerns increase in many watersheds. Woodchip heavy-use areas, or 'woodchip pads', offer an alternative to common winter feeding approaches. This fact sheet addresses key questions related this innovative approach to livestock comfort and water quality.

Pastures often become damaged during winter and late-fall/early-spring feeding. (Photo: Tom Basden, West Virginia University Extension Service)

Shaping of woodchip pad subgrade to encourage drainage.

Woodchip Pad Basics

What are woodchip pads?

Woodchip pads are livestock heavy-use areas that have a drainage layer overlain by woodchips as a surface material. These systems have been used for years on beef and dairy farms in Ireland, the United Kingdom, and New Zealand, and have been documented to improve animal performance (Table 1). Systems require careful siting and design due to environmental and management considerations. Construction entails the excavation of soil to a 24" depth, followed by a shaping of the subgrade into a 'ridge and valley' configuration to encourage drainage. The subgrade is covered with geotextile, and then perforated pipe is placed in the valleys and connected to a solid pipe, which slopes to an outlet. A 12"-18" layer of drainage stone is placed over the pipe and subgrade, followed by a 10"-12" layer of selected woodchips. The perimeter of the pad is fenced and surface-bermed to prevent any off-site water from entering the pad's drainage system.

Woodchip pad in operation during late spring in northern Vermont.

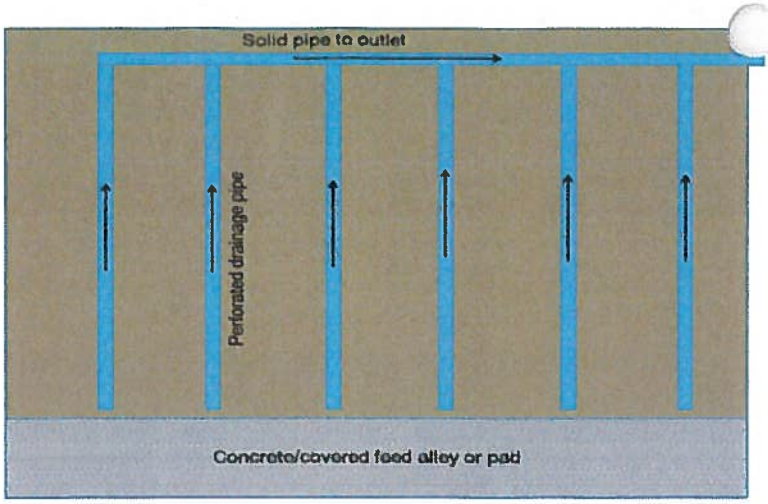
	Wood chip pad	Slat Barn
Feed intake (lb DM/day)	24.0	20.9
Live weight gain (lb/day)	3.1	2.2
Carcass gain (lb/day)	1.7	1.4

Table 1: Performance of beef cattle wintered on a woodchip pad vs. indoors in a slat barn (French and Hickey, 2003).

Large woodchips are important for woodchip pad longevity and drainage. (Photo: David DeVallance, West Virginia University, Wood Science and Technology)

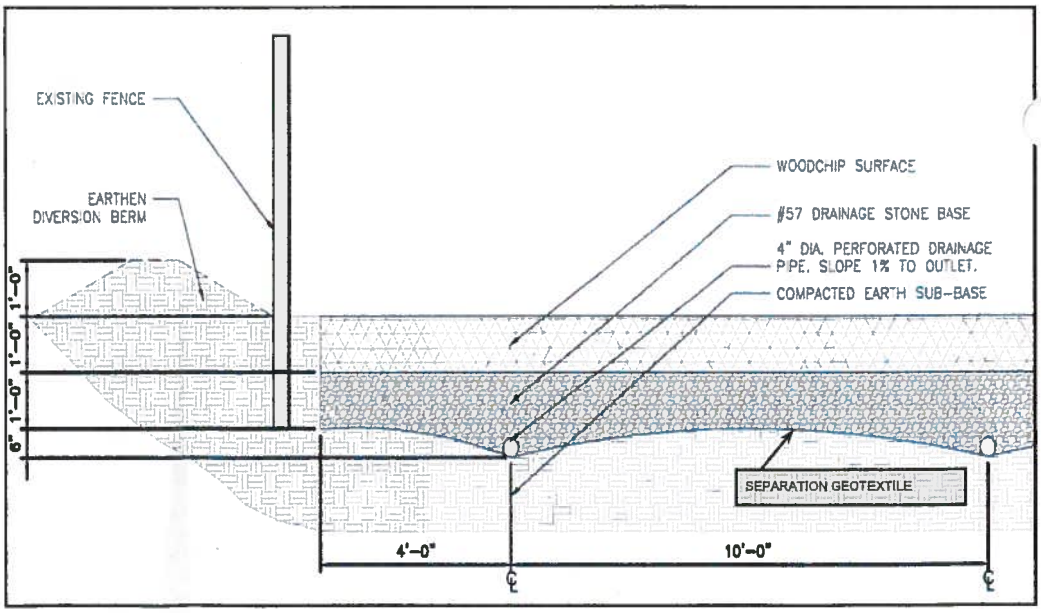
Does the type of woodchip matter?

Larger, screened woodchips are critical for a well-drained surface that will not clog. Woodchips that are commonly used for commercial heating applications work well ('bole' chips). These woodchips are typically 2" x 2" x 0.25" and have been screened to remove fine particles. We have tested hardwood and softwood chips, and find both work well. Hardwoods are expected to absorb less water (meaning more runoff), while softwoods may degrade quicker.



Plan view of drainage system beneath woodchip pad. Perforated pipes are commonly spaced 10 feet apart, and sloped toward the solid outlet pipe.

Drainage stone is placed over the perforated pipe. Accessible clean-outs are recommended to protect against clogging.



Profile view of an example woodchip pad.

Animal Type	Minimum space requirement per animal (ft^2)
Dairy Cow	130
Cow-calf pair	110
Beef cattle (>2 yr)	110
Cattle (1-2 yr)	90
Cattle (<1 yr)	65

Table 2: Recommended stocking density by animal type (Source: United Kingdom Dept. of Agriculture Fisheries and Food)

What size of woodchip pad is appropriate for my herd?

It is highly recommended that livestock are fed off of the woodchip pad, on an adjacent concrete feed alley, for example. This will greatly extend the usable life of the woodchips and keep animals cleaner. Stocking densities are listed in Table 2. Woodchip pads are only recommended for lactating dairy cows when they have access to daytime pasture (BRP, 2011).

Handling Drainage Water

How should the drainage water from the woodchip pad be handled?

While many of the manure nutrients are retained within the woodchips, drainage water is still polluting and must be handled appropriately. Typical nutrient concentrations can be many times lower than barnyard runoff (Table 3). An agricultural engineer and agency personnel can assist with handling and treatment considerations during the design process. Options include storage in a holding pond for later land application, or distribution to a vegetative treatment area. The option selected depends greatly on the proximity to surface water, topography, and surrounding soils. The drainage water handling system cost can have a large influence on the total cost of the woodchip pad system.

How much drainage water should be expected from a woodchip pad?

One of the key advantages of woodchip pads vs. concrete is that woodchip pads produce up to 50% less dirty water. This reduces the infrastructure, labor, and space required to handle and/or treat this water. The woodchips absorb a significant amount of incoming rainfall, and then it evaporates during drier days. A study over two years found that only **24%** of incoming rainfall on a woodchip pad left the system as drainage water (Faulkner et al., 2015).

	Average (mg/l)	Maximum (mg/l)
Total Nitrogen	117.1	155.1
Total Phosphorus	6.2	12.9
Dissolved Phosphorus	4.4	8.2

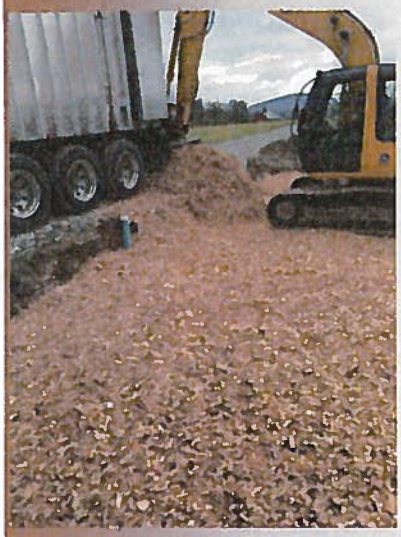
Table 3: Nutrient concentrations in drainage water from a woodchip pad for fifteen storms (Faulkner et al., 2015).

Woodchip pad in operation during late fall in West Virginia. Cattle are fed in adjacent roofed winter feeding structure, and have free access to the woodchip pad. Woodchips and spent manure are composted in the structure. Drainage water is sent to a vegetative treatment area (not visible).

Water samples taken from woodchip pads using a variety of different types of woodchips. (Photo: David DeVallance, West Virginia University, Wood Science and Technology)

Drainage water holding pond constructed for effluent from a woodchip pad.

Buried holding tank for woodchip pad drainage water. Water is dosed from tank to adjacent vegetative treatment area.



Woodchips being unloaded with a live-bed trailer, and spread with a excavator during construction.

Geotextile between subgrade and drainage stone increasing bearing strength of surface and provides additional support for equipment traffic.

Operation and Maintenance

How often do the woodchips need to be replaced?

Replacement of woodchips depends on how heavy the woodchip pad is used, the length of the winter, as well as the weather and other factors. It is recommended that the top 2" - 3" of woodchips be removed once every spring, after the stocking period. These woodchips should then be replaced in the fall with a topdressing before winter begins. Additional years of on-farm experience will provide more information on how long the deeper woodchips will last.

What happens to the spent woodchips?

Woodchips that are removed from the woodchip pad will be laden with manure, and should be composted before field application. The woodchips provide a carbon source for the compost process, and do not hinder composting (like sawdust) due to their size and relative surface area. Once composted, they can be field applied. Forage yield was equal from composted woodchips applied at 143 lb N/acre and synthetic fertilizer applied at 54 lb N/acre (BRP, 2011). Use of any compost as a fertility source also has the benefit of increasing soil organic matter.

Cost

How much does it cost to build and maintain a woodchip pad?

Construction costs are variable depending on location and how drainage water is handled. In the Northeast, costs have ranged from $163/cow for a system with a vegetated treatment area for drainage water, to $920/cow for a system with a lined drainage water holding pond. Woodchip costs vary widely, and range from $30/ton to $65/ton, delivered. Financial assistance may be available through various agencies.

For More Information

Contact: Joshua Faulkner
UVM Extension Center for Sustainable Agriculture
Phone: 802-656-3495
E-mail: Joshua.Faulkner@uvm.edu
23 Mansfield Ave. Burlington, VT 05401

References:

Better Returns Programme. 2011. Improved design and management of woodchip pads for sustainable out-wintering of livestock. Agriculture and Horticulture Development Board. www.eblex.org.uk.

Christianson, L., D. DeVallance, J. Faulkner, and T. Basden. 2017. Scientifically advanced woody media for improved water quality from livestock woodchip heavy-use areas. *Frontiers of Environmental Science and Engineering*. 11(3):1-9.

Faulkner, J.W. , J.L. Miller, T.J. Basden, D.B. DeVallance. 2015. Woodchip heavy-use area effluent quality, quantity, and hydrologic design considerations. *Applied Engineering in Agriculture*. 31(5):783-790.

French P and Hickey M. (2003). Out-wintering pads as an accommodation system for beef cattle, Unpublished Technical Note. Teagasc, Grange Research Centre.

Exhibit 5 -
Size Requirements[1] for Heavy Use Areas by Animal Type and Weight

Dairy Lot – Square Footage per Head			
Animal Weight (lbs.)	250-400 lb	600-800 lb	1000-1400 lb
Paved [2] Surface	30-40 SF	40-50 SF	60-75 SF
Unpaved [3] Surface	250-300 SF	350-500 SF	600-700 SF
Beef Lot - Square Footage per Head			
Animal Weight (lbs.)	Cow/calf pair (1200 lb)	600 lb	1000 lb
Paved Surface	60-75 SF	40-50 SF	50-60 SF
Unpaved Surface	400-500 SF	200-250 SF	300-400 SF
Unpaved Surface (no mounds)	550-650 SF	400-500 SF	500-600 SF
Unpaved Surface (with mounds)	20-45 SF	20-45 SF	20-45 SF
Sheep Lot - Square Footage per Head			
Animal Weight (lbs.)	50 -100 lb	100-150 lb	150-200 lb
Paved Surface	10-20 SF	20-30 SF	30-45 SF
Unpaved Surface	50-100 SF	100-125 SF	125-150 SF
Equine Lot - Square Footage per Head [4]			
Animal Weight (lbs.)	Mare/foal pair	400-600 lb	600-1200 lb
Stone Surface	600 SF	300 SF	400 SF
Improved Surface [5]	600 SF	300 SF	400 SF

Notes:

1 These size ranges do not supersede practice standard or specification criteria found in FOTG Section IV. The square footage recommendations are not the basis for financial assistance practice payment limitations. Refer to the current year program guidance for payment criteria or program limitations. When sizing Heavy Use Areas allow additional area around:

- Feed bunks & watering facilities – extend 6 feet from perimeter
- Traffic lanes for equipment – if necessary, allow a 10 to 12 foot wide travel path in addition to square footage calculated according to animal numbers/weight.

2 "Paved" means any hard surface that does not compress (leave a hoof print) when walked on when dry.

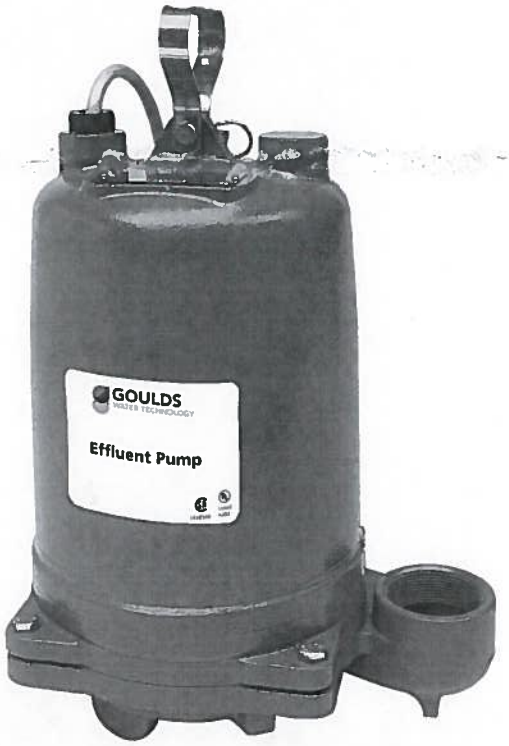
3 "Unpaved" is everything softer than paved.

4 A minimum of 1200 SF is required. This area can be increased according to the numbers above when there are more than 2 animals per turnout group. Increase square footage by area listed above for every animal over 2 in the turnout group. It is possible to have multiple turnout groups per area. Equine operations can limit the extent of improved exercise lots by sizing the area based on the largest group and not on the total animal numbers. Groups are rotated thru the area when it is not appropriate to have them on pasture.

Example – a turnout group of 5 mare/foal pairs
1200 + (3x600) = 3000 SF

5 Improved surfaces can include shredded bark, shredded tires, earthen with top soil removed, etc.

TECHNICAL BROCHURE
B3885 R2



FEATURES

Impeller: Cast iron, semi-open, non-clog with pump-out vanes for mechanical seal protection. Balanced for smooth operation. Silicon bronze impeller available as an option.

Casing: Cast iron volute type for maximum efficiency. 2" NPT discharge.

Mechanical Seal: Silicon Carbide vs. Silicon Carbide sealing faces. Stainless steel metal parts, BUNA-N elastomers.

Shaft: Corrosion-resistant, stainless steel. Threaded design. Locknut on all models to guard against component damage on accidental reverse rotation.

Fasteners: 300 series stainless steel.

Capable of running dry without damage to components.

Designed for continuous operation when fully submerged.

EXTENDED WARRANTY AVAILABLE FOR RESIDENTIAL APPLICATIONS.

WE Series

Model 3885

SUBMERSIBLE EFFLUENT PUMPS

BUILT IN THE USA
ENGINEERED, ASSEMBLED & TESTED

Dewy Meadows Farm
HUAP effluent.

Use WE2012H - single phase
2.0 HP

GOULDS WATER TECHNOLOGY
a xylem brand

APPLICATIONS

Specifically designed for the following uses:

- Homes, Farms, Trailer Courts, Motels, Schools, Hospitals, Industry, Effluent Systems

SPECIFICATIONS

Pump

- Solids handling capabilities: ¾" maximum
- Discharge size: 2" NPT
- Capacities: up to 140 GPM
- Total heads: up to 128 feet TDH
- Temperature: 104°F (40°C) continuous, 140°F (60°C) intermittent.
- See order numbers on reverse side for specific HP, voltage, phase and RPM's available.

MOTORS

- Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.
- Class B insulation on ⅓ - 1½ HP models.
- Class F insulation on 2 HP models.

Single phase (60 Hz):

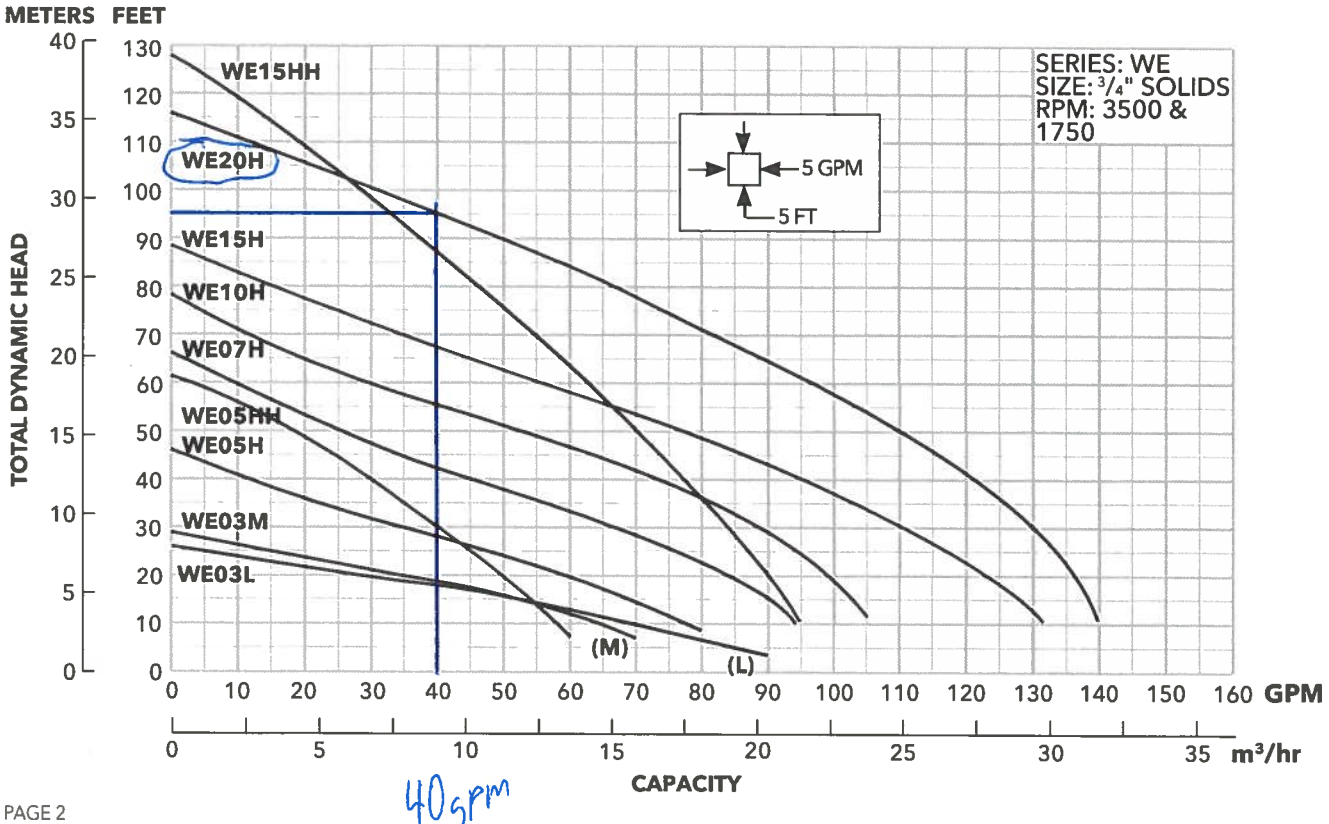
- Capacitor start motors for maximum starting torque.
- Built-in overload with automatic reset.
- SJTOW or STOW severe duty oil and water resistant power cords.
- ⅓ - 1 HP models have NEMA three prong grounding plugs.
- 1½ HP and larger units have bare lead cord ends.

Three phase (60 Hz):

- Class 10 overload protection must be provided in separately ordered starter unit.
- STOW power cords all have bare lead cord ends.
- Designed for Continuous Operation: Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage when fully submerged.
- Bearings: Upper and lower heavy duty ball bearing construction.
- Power Cable: Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. Standard cord is 20'. Optional lengths are available.
- O-ring: Assures positive sealing against contaminants and oil leakage.

AGENCY LISTINGS

Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association File #LR38549



95' TDH

40gpm

MODELS

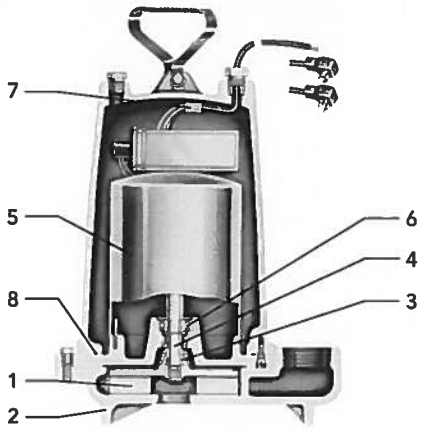
Order Number	HP	Phase	Volts	RPM	Impeller Diameter (in.)	Maximum Amps	Locked Rotor Amps	KVA Code	Full Load Efficiency %	Resistance		Power Cable Size	Weight (lbs.)
										Start	Line-Line		
WE0311L	0.33	1	115	1750	5.38	10.7	30.0	M	54	11.9	1.7	16/3	56
WE0318L			208			6.8	19.5	K	51	9.1	4.2		
WE0312L			230			4.9	14.1	L	53	14.5	8.0		
WE0311M			115			10.7	30.0	M	54	11.9	1.7		
WE0318M			208			6.8	19.5	K	51	9.1	4.2		
WE0312M			230			4.9	14.1	L	53	14.5	8.0		
WE0511H	0.5	1	115	3450	3.56	14.5	46.0	M	54	7.5	1.0	14/3	60
WE0518H			208			8.1	31.0	K	68	9.7	2.4	16/3	
WE0512H			230			7.3	34.5	M	53	9.6	4.0		
WE0538H		3	200			4.9	22.6	R	68	NA	3.8	14/4	
WE0532H			230			3.3	18.8	R	70	NA	5.8		
WE0534H			460			1.7	9.4	R	70	NA	23.2		
WE0537H			575			1.4	7.5	R	62	NA	35.3		
WE0511HH		1	115		3.88	14.5	46.0	M	54	7.5	1.0	14/3	
WE0518HH			208			8.1	31.0	K	68	9.7	2.4	16/3	
WE0512HH			230			7.3	34.5	M	53	9.6	4.0		
WE0538HH		3	200			4.9	22.6	R	68	NA	3.8	14/4	
WE0532HH			230			3.6	18.8	R	70	NA	5.8		
WE0534HH			460			1.8	9.4	R	70	NA	23.2		
WE0537HH			575			1.5	7.5	R	62	NA	35.3		
WE0718H	0.75	1	208		4.06	11.0	31.0	K	68	9.7	2.4	14/3	70
WE0712H			230			10.0	27.5	J	65	12.2	2.7		
WE0738H		3	200			6.2	20.6	L	64	NA	5.7	14/4	
WE0732H			230			5.4	15.7	K	68	NA	8.6		
WE0734H			460			2.7	7.9	K	68	NA	34.2		
WE0737H			575			2.2	9.9	L	78	NA	26.5		
WE1018H	1	1	208		4.44	14.0	59.0	K	68	9.3	1.1	14/3	
WE1012H			230			12.5	36.2	J	69	10.3	2.1		
WE1038H		3	200			8.1	37.6	M	77	NA	2.7	14/4	
WE1032H			230			7.0	24.1	L	79	NA	4.1		
WE1034H			460			3.5	12.1	L	79	NA	16.2		
WE1037H			575			2.8	9.9	L	78	NA	26.5		
WE1518H	1.5	1	208		4.56	17.5	59.0	K	68	9.3	1.1	14/3	80
WE1512H			230			15.7	50.0	H	68	11.3	1.6		
WE1538H		3	200			10.6	40.6	K	79	NA	1.9	14/4	
WE1532H			230			9.2	31.7	K	78	NA	2.9		
WE1534H			460			4.6	15.9	K	78	NA	11.4		
WE1537H			575			3.7	13.1	K	75	NA	16.9		
WE1518HH		1	208		5.50	17.5	59.0	K	68	9.3	1.1	14/3	
WE1512HH			230			15.7	50.0	H	68	11.3	1.6		
WE1538HH		3	200			10.6	40.6	K	79	NA	1.9	14/4	
WE1532HH			230			9.2	31.7	K	78	NA	2.9		
WE1534HH			460			4.6	15.9	K	78	NA	11.4		
WE1537HH			575			3.7	13.1	K	75	NA	16.9		
WE2012H	2	1	230		5.38	18.0	49.6	F	78	3.2	1.2	14/3	83
WE2038H		3	200			12.0	42.4	K	78	NA	1.7	14/4	
WE2032H			230			11.6	42.4	K	78	NA	1.7		
WE2034H			460			5.8	21.2	K	78	NA	6.6		
WE2037H			575			4.7	16.3	L	78	NA	10.5		

PERFORMANCE RATINGS (gallons per minute)

Order No.		WE-03L	WE-03M	WE-05H	WE-07H	WE-10H	WE-15H	WE-05HH	WE-15HH	WE-20H
Total Head Feet of Water	HP	⅓	⅓	½	¾	1	1½	½	1½	2
	RPM	1750	1750	3500	3500	3500	3500	3500	3500	3500
	5	86	-	-	-	-	-	-	-	-
	10	70	63	78	94	-	-	58	95	-
	15	52	52	70	90	103	128	53	93	138
	20	27	35	60	83	98	123	49	90	136
	25	5	15	48	76	94	117	45	87	133
	30	-	-	35	67	88	110	40	83	130
	35	-	-	22	57	82	103	35	80	126
	40	-	-	-	45	74	95	30	77	121
	45	-	-	-	35	64	86	25	74	116
	50	-	-	-	25	53	77	-	70	110
	55	-	-	-	-	40	67	-	66	103
	60	-	-	-	-	30	56	-	63	96
	65	-	-	-	-	20	45	-	58	89
	70	-	-	-	-	-	35	-	55	81
	75	-	-	-	-	-	25	-	51	74
	80	-	-	-	-	-	-	-	47	66
	90	-	-	-	-	-	-	-	37	49
	100	-	-	-	-	-	-	-	28	30

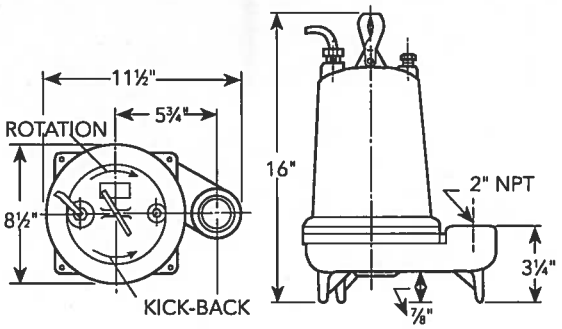
COMPONENTS

Item No.	Description
1	Impeller
2	Casing
3	Mechanical Seal
4	Motor Shaft
5	Motor
6	Ball Bearings
7	Power Cable
8	Casing O-Ring



DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)

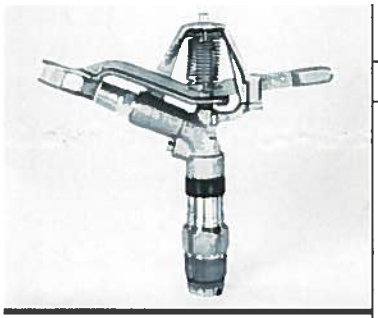


xylem
Let's Solve Water

Xylem Inc.
2881 East Bayard Street Ext., Suite A
Seneca Falls, NY 13148
Phone: (866) 325-4210
Fax: (888) 322-5877
www.gouldswatertechnology.com

Dewy Meadows Farm
Wood Chip HUAP design

RAIN BIRD



80EHD

1 1/4" 32 mm Full Circle, Brass Impact Sprinkler

Bearing: 1 1/4" Male NPT, Brass
Trajectory Angle: 27°
Operating Range: 25-100 psi 1.7-6.9 bars
Flow Rate: 17.1-127.7 GPM 2.88-2.9 m³/h
Radius: 61-116 ft. 18.6-35.4 meters

Features

- Heavy duty brass construction
- Internal plastic straightening vane
- Stainless steel springs and fulcrum pin
- Plastic bearing hood
- Chemically resistant washers
- Dual nozzle ports
- Two-year warranty

Benefits

- Internal straightening vane increases distance of throw
- Plastic bearing hood protects spring and bearing sleeve from damage
- Corrosion and grit resistant
- Built to last

U.S. STANDARD DATA

PERFORMANCE DATA — 80EHD

STRAIGHT BORE NOZZLE (SBN-5) WITH PLUG* (Stream Height: 14 ft.)

	NOZZLE SIZE US STANDARD																					
	11/32"		3/8"		13/32"		7/16"		15/32"		1/2"		17/32"		9/16"		5/8"		11/16"	
PSI @ Nozzle	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM
25	61	17.10	62	20.30	64	23.40	66	26.70	66	30.30	66	33.80	66	37.10	66	42.30	66	51.50	66	61.90
30	64	18.80	65	22.30	68	25.70	69	29.30	72	33.20	73	37.10	73	40.80	73	46.40	73	56.50	73	68.10
35	67	20.30	68	24.10	72	27.80	74	31.70	77	35.90	79	40.10	79	44.10	79	50.20	79	61.10	79	73.80
40	69	21.80	71	25.80	75	29.70	77	33.90	80	38.50	83	42.90	83	47.20	86	53.70	86	65.40	86	79.20
45	71	23.10	73	27.40	77	31.60	79	36.00	82	40.80	85	45.60	88	50.10	90	57.10	92	69.50	92	84.20
50	73	24.40	75	28.90	79	33.30	81	38.00	84	43.10	87	48.10	90	52.90	94	60.20	95	73.30	97	88.90
55	75	25.50	77	30.30	81	34.90	83	39.70	86	45.30	89	50.30	92	55.60	96	63.20	99	77.30	100	93.50
60	77	25.80	79	30.80	83	35.90	86	41.60	88	47.40	91	53.00	94	58.80	97	65.50	101	80.10	104	97.80
65	79	26.90	81	32.00	84	37.40	87	43.30	90	49.90	93	55.30	96	61.20	99	69.40	102	84.40	106	102.00
70	81	28.10	83	33.30	86	38.90	89	45.10	91	51.40	94	57.50	98	63.50	101	72.20	104	87.80	108	106.00
75	82	29.20	84	34.50	87	40.30	90	46.80	93	53.30	96	59.60	99	65.80	102	74.90	105	91.00	109	109.90
80	83	30.40	86	35.70	89	41.80	92	48.40	94	55.10	97	61.60	101	68.10	104	77.50	107	94.10	110	113.70
85	85	31.50	87	37.00	90	43.20	93	50.00	96	56.90	99	63.50	102	70.30	105	80.00	108	97.10	112	117.30
90	86	32.70	89	38.30	92	44.60	95	51.50	97	58.50	100	65.30	104	72.40	106	82.20	110	99.90	113	120.90
95	87	33.90	90	39.50	93	46.00	96	53.00	98	60.00	101	67.10	105	74.40	108	84.30	111	102.60	115	124.30
100	88	34.00	91	40.70	94	47.40	97	54.50	99	61.50	102	68.90	106	76.40	109	87.20	112	105.20	116	127.70

* Nozzle and plugs must be purchased separately.

Interpolation:
34 psi - 78' radius
@ 39.5 gpm
(see calc. sheet 8 of 9)

STRAIGHT BORE NOZZLE (SBN-5) AND SPREADER (LAN-1-20)* (Stream Height: 14 ft.)

	NOZZLE SIZE US STANDARD									
	11/32" x7/32-20°		3/8" x7/32-20°		13/32" x7/32-20°		7/16" x7/32-20°		15/32" x7/32-20°	
PSI @ Nozzle	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM
25	61	23.30	62	26.50	64	29.60	66	32.90	66	36.40
30	64	25.60	65	29.10	68	32.40	69	36.10	72	40.00
35	67	27.70	68	31.40	72	35.10	74	39.00	77	43.30
40	69	29.60	71	33.60	75	37.60	77	41.80	80	46.30
45	71	31.50	73	35.70	77	39.90	79	44.40	82	49.20
50	73	33.20	75	37.70	79	42.10	81	46.80	84	51.90
55	75	34.90	77	39.70	81	44.30	83	49.10	86	54.70
60	77	36.50	79	41.40	83	46.60	86	51.50	88	57.20
65	79	38.00	81	43.20	84	48.60	87	53.80	90	59.80
70	81	40.10	83	44.90	86	50.40	89	55.90	91	62.10
75	82	41.00	84	46.70	87	52.40	90	57.90	93	64.30
80	83	42.60	86	48.30	89	54.30	92	60.00	94	66.70
85	85	43.80	87	49.80	90	56.00	93	62.00	96	68.80
90	86	45.70	89	51.40	92	57.90	95	63.90	97	70.70
95	87	46.60	90	53.00	93	59.60	96	65.80	98	72.80
100	88	47.90	91	54.50	94	61.20	97	67.50	99	74.80

Part Numbers and Ordering Information

Sprinkler Only	
U.S. Standard	
Sprinkler without Nozzle	A23802

Nozzle Only			XX = Nozzle Size										
		U.S. Standard	7/32"	11/32"	3/8"	13/32"	7/16"	15/32"	1/2"	17/32"	9/16"	5/8"	11/16"
Brass Straight Bore Nozzle	SBN-5	103043-XX	–	22	24	26	28	30	32	34	36	40	44
Brass Low Pressure Nozzle	SPB-1	108149-XX	–	22	24	26	28	30	32	–	–	40	–
Brass 20° Low Angle Spreader Nozzle	LPN-1-20	100226-XX	14	–	–	–	–	–	–	–	–	–	–
Plug for 1/8" Spreader Port		100255	Bold nozzle size numbers denote the most common nozzle choices.										

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project: Dewy Meadows Farm		
By: [illegible]	Date: 3/27/19	Checked by	Date	Job No.
Subject: Comparative Cost Est.				Sheet 1 of 1

Cost Estimate to compare with concrete barnyard for same # animals.

Size HUAP for 50 AUs

50 AUs @ 75 ft² each = 3,750 ft²

50' x 75'

Flat Work = 50' x 75' @ 5" = 60 yd³

Curbs = 50' + 50' + 75' + 75' = 250' @ 0.15 yd³ = 38 yd³

Flat work = 60 yd³ @ $300/yd³ = $18,000

Curbs = 38 yd³ @ $350/yd³ = $13,300

Stone = 3,750 ft² @ 3" = 60 T @ $17 = $1,020

Excavation = $3,000

Subsurface Drain = 125' @ $7 = $875

Outlet = 150' @ $7 = $1,050

Total = $37,245

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State		Project: Dewy Meadows Farm		
By: [illegible]	Date: 1/29/2020	Checked by	Date	Job No.
Subject: VTA - Redesign after year 1				Sheet 1 of 1

Effluent Analysis = 5.06 lb N - 0.49 lb P - 7.65 lb K
(lbs)/1,000 gal)

Total Effluent applied Jan 1 - May 31, 2019 = 122,840 gal

Total Area Contributing Nutrients = 13,200 ft²
(10,000 ft² wood chip pad, 1,200 ft² feedlane, 2,000 ft² MSF)

Total Lot size = 13,200 ft² / 43,560 ft²/ac = 0.30 ac.

Total Nutrients:

N = 5.06 lb N/1,000 gal x 122,840 gal = 622 lb N

P = 0.49 lb/1,000 gal x 122,840 gal = 60 lb N

20% N availability = 622 lb x 20% = 124.4 lb N

VTA needed for these nutrients

Nutrients needed for 4T/Ac yield on VTA = 200 lb N/ac
60 lb P/ac

Area needed for N = 125 lb N / 200 lb N/ac = 0.63 ac

Area needed for P = 60 lb P / 60 lb P/ac = 1.0 ac.

One sprinkler @ 78' radius = 0.44 ac. Would have required three sprinklers.

Append

Dewy M... ows Farm - Wood Chip HUAP

VTA Design Evaluation

'29/2020

1/29/2020

[1] Total Effluent Applied (gal)=	122,840
VTA size (ac) =	0.44
Application Rate (gal/ac) =	279,182

Nutrient	Content (lb/1,000 gal)	Total Applied (lb)	Avail Factor	Total Available (lb)	[2] Crop Need (lb/ac)	VTA Area Required (ac)	[3] Sprinklers Required	Total Available (lb/ac)	[4] Balance (lb/ac)	[5] Balance if larger VTA (lb/ac)
N	5.06	622	20%	124	200	0.62	1.4	283	(83)	170
P	0.49	60	100%	60	60	1.00	2.3	137	(77)	34
K	7.65	940	100%	940	200			2136	(1936)	(448)

[1] Total effluent applied from January 1 - May 31, 2019 = 122,840 gal. Actual Precip >18" compared to 12.91" avg for period.

[2] Crop need based on 4T/ac yield of Mixed Grass

[3] P is limiting for VTA design; would require 3 sprinklers x 0.44 ac each = 1.32 ac total VTA.

[4] This is as-built condition. Nutrient balance on a per acre basis when using only 1 irrigation sprinkler. All nutrients are overapplied.

[5] This is nutrient balance if total avail nutrients are applied to 1.32 ac VTA. N and P are under-applied. K still over-applied by 450 lb/ac.

Operation and Maintenance Plan:

This Plan should be reviewed regularly to ensure the proper maintenance of the system.

General:

1) Maintain all conservation practices previously constructed on the farm.
2) Use the conservation plan as developed by the Natural Resources Conservation Service (NRCS).
3) This plan is not a substitute for local, state or federal permits that might be required.
   a) Use the nutrient management plan. Contact the nutrient management planner to update the nutrient management plan if any significant changes occur on the farm.

Heavy Use Area Protection:

1) The Wood Chip Pad is sized for 50 Animal Units (1,000 lb each) @ 200 sq ft per AU.

2) The concrete scrape lane is sized to feed 50 head along the curb.

3) When using the heavy use area for cattle feeding, confine animals to the pad, and do not allow roaming access to areas outside the pad.

4) Do not feed cattle on the wood chip surface. All feeding will be done along the curb of the concrete scrape lane. This will help minimize manure concentration on the wood chips.

5) Scrape manure from the concrete scrape lane approximately 2 times per week. It will be important to keep the scrape alley clean to minimize manure being tracked into the wood chips by the cattle. Manure can be scraped to the manure stacking area.

6) Seasonally or as needed, remove soiled wood chips and replace with new. Typically the top 2"-3" of wood chips will need to be removed. Minimize tracking manure onto surface of clean chips. Add new chips. Always use screened wood chips to minimize fines and maintain good drainage. Bole chips approximately 2" x 2" x 0.25" will work well. Hardwood recommended. Maintain 12" of wood chips over top of drainage stone.

7) **All concentrated animal activity outside the barn must take place on the improved area. No new manure concentrations may be developed outside of the improved area.**

8) **New expansions must maintain water quality standards achieved with this publicly funded project. This may require additional barnyard and filter space if herd size significantly increases in the future.**

9) Check perimeter tile drain and keep free of sediment and debris so they are free flowing.

10) Perform routine maintenance as needed on fence, signs and gates around the structure.

Waste Tranfer:

11) Monitor water level in tank monthly. Watch for high water level alarm as an indication that pump may not be turning on as designed. During excessively high precipitation events, the high water alarm may activate. This would be considered normal for up to one day. If high water alarm remains active for more than one day, investigate further.

12) Monitor solids build up in settling compartment of tank. Very few solids should be in the collection system. Vacuum solids from tank as necessary to minimize the amount of solids being pumped to sprinkler head.

13) Monitor effluent collection lines annually to be sure solids are not building up. Flushing these lines every couple years may help maintain good flow.

14) Inspect sprinkler head annually and as needed to be sure it is not restricted or clogging. Clear any debris to maintain full function.

Manure Stacking Area:

15) Begin loading manure stacking area in a systematic way in order to get full use of the storage area.

16) Empty storage and field apply manure according to the nutrient management plan.

17) Begin the winter season with an empty storage to allow room for winter time storage.

18) Stack manure in a way that runoff from the manure pile can make its way to the wood chip drainage area.

19) Add bedding to the manure if manure is not stacking well. The manure stacking area is designed for 4 months of capacity and this is based on stacking manure 4 ft high. If manure is not stacked this high, capacity will be reduced.

Access Road:

20) Maintain surface material and grading of access road so surface water does not concentrate on and erode the lane.

21) Replace surface material as needed to maintain a good road profile.

22) Do not allow animals to congregate or loaf on the lane. All manure concentrations must be on the improved barnyard area

Emergency Response

Bradford County Conservation District: (570) 485-3144
NRCS: (570) 485-3143
PA DEP: (570) 327-3636

If a manure spill should ever occur, the farm will make every effort to contain the spill and keep wastes from entering surface water, ponds, streams or ditches. The farm will also make the appropriate notifications to the Conservation District, NRCS, or DEP at the above numbers.

I understand the maintenance requirements of this proposed resource management system and agree to manage the facilities addressed in this plan as stated above:

_____ Date:_____

Landowner Signature

Dewy Meadows Farm
Heavy Use Area Protection

July 18, 2018

Approximate Quantities (CONTRACTORS ARE RESPONSIBLE FOR VERIFYING QUANTITIES FOR BIDS)

270 cu. yds.	Clay soil from borrow area.
420 feet	6" perforated, corrugated plastic tubing meeting AASHTO M-252 for perim drain
90 feet	6" Sch 40 PVC pipe for perim drain outlets
200 feet	4" perforated, corrugated plastic tubing meeting AASHTO M-252 for filter tile line
380 feet	4" Sch 40 PVC pipe for filter tile outlet and pad drain manifold pipe
380 feet	3" Sch 40 PVC pipe for pump transfer pipe
1,000 feet	4" ADS 3000 triple wall perforated pipe for pad effluent collection system
450 Ton	AASHTO #57 stone (35 T conc subgrade; 60 T perim drain; 40 T filter tile; 310 bottom 9" under chips)
780 Ton	AASHTO #1 stone (80 T perim drain; 475 T top 9" under chips; 220 T access rd)
15,000 Sq ft	Geotextile – ADS 701 non-woven geotextile or equivalent
370 cu yards	Wood chips, hardwood screened approx. 2" x 2" x 0.25" no fines. (approx. 110 T)
160 Ton	Driving Surface Aggregate (DSA) for top surface on access road
1 tank	2,000 gallon 2 compartment precast concrete tank
1 pump	Goulds 2 hp 3885 WE2012H pump or equivalent
1 sprinkler	Rain Bird 80EHD w ½ nozzle or equivalent
130 cu. yds.	4000 psi concrete for slab and walls, including all reinforcing steel

AS BUILT PLANS

Dewy Meadows Farm
Heavy Use Area Protection

July 18, 2018

INSTALLATION SEQUENCE

and CONTRACTOR NOTIFICATION REQUIREMENTS

The following is a list of key steps in the installation of this project. **THE CONTRACTOR MUST NOTIFY THE INSPECTOR AT LEAST 24 HOURS IN ADVANCE OF PROCEEDING WITH EACH STEP.** Failure to do so may result in the NRCS being unable to adequately check construction and certify that the installation meets PA Technical Guide Standards. The responsibility for notification will be reviewed and individual responsibilities may be assigned at the pre-construction conference.

---

1. Install E&S controls.

2. Strip and stockpile topsoil.

3. Install leachate collection tank, pump transfer and sprinkler. Pump transfer line is below perimeter drain so might help to install this first. Also will help dewater the site during construction if this is operational (farmer may want to run water line to pasture in same trench). **CONTRACTOR MUST NOTIFY INSPECTOR 24 HOURS IN ADVANCE OF BEGINNING EXCAVATION**

4. Install filter area tile line and underground outlet.

5. Install perimeter drain reaches 1 and 2 (farmer may want to run conduit for electric and water in same trench). **INSPECTOR MUST CHECK ELEVATIONS BEFORE ANY BACKFILL IS PLACED.**

6. Begin installation of access road to East corner of pad.

7. Prepare subgrade for wood chip pad, concrete, and construct compacted clay berm.

8. Install geotextile and effluent collection system piping. Place drainage stone and wood chips.

9. Install Concrete slab and walls. **CONTRACTOR MUST NOTIFY THE INSPECTOR 24 HOURS IN ADVANCE OF EVERY CONCRETE PLACEMENT. ALL STEEL PLACEMENT MUST BE APPROVED BY INSPECTOR BEFORE CONCRETE PLACEMENT.**

10. Backfill all concrete footers.

11. Install Access Road along feed manger.

12. Seed and mulch all disturbed areas.

AS BUILT PLANS

This page provides "Additional Conditions" for this specific design which are used to supplement the Construction Specification "561 Heavy Use Area Protection" dated April, 2016. The information contained on this page(s) along with the 561 Specification are required to construct this facility under this contract.

6. Additional conditions which apply to this project are:

A. Measurement and Payment. These items will be paid at the contract lump sum price. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work.

B. Wood Chip Pad and Clay Berm

1. The proposed Heavy Use Area Protection consists of a wood chip surface contained within a compacted clay subgrade and perimeter berm (the stone and pipe drainage collection system under the wood chips is described under the waste transfer specification). This item shall include all excavation work, materials and installation for the compacted clay subgrade and berms, and wood chip pad as described here and shown on the drawings. This item shall also include the silt fence/hay bale barriers installation for E & S control.

2. The existing subgrade material is suitable clay and will be used in place as is. Geotextile shall be placed atop graded subgrade before placement of pipe, stone or wood chips. Geotextile shall be ADS-701 (non-woven) or equivalent.

3. The compacted clay perimeter berm will require approximately 120 cu yards of material. This clay material will be from a borrow site on the farm. Borrow material must be approved by BCCD prior to placement. Compaction on all fill added to the berm shall be with 3 passes of a sheepsfoot roller compacted in 4 inch lifts. The sheepsfoot must be capable of exerting 450 psi. Moisture of borrow material will be important for proper compaction. If borrow material is too dry, water will need to be added. If material is too wet, construction must halt until material can be made dryer. The berm must be compacted to an elevation equal to the wood chip pad surface, however the minimum elevation for compacted clay shall be 1247.0. Dimensions of the compacted clay berm can be shaved back to a 3 ft top width, 2:1 inside slope and 3:1 outside slope. Final elevation of the berm shall be 6" higher than wood chip pad surface. Berm was left wide

4. Wood chips must be hardwood and must be screened to remove fines. "Bole" chips (screened wood chips commonly used for commercial heating applications) work well. Bole chips typically measure 2" x 2" x 0.25". Farmer has contacted Wagner Lumber regarding wood chip supply. Wood chips shall be placed 12" thick atop drainage stone. Care must be taken to maintain a uniform interface between wood chips and drainage stone. From Wagner Lumber - Owego, NY

5. The farmer is responsible for all fencing and gates needed around the perimeter of the pad. The farmer is also responsible for seeding and mulching all disturbed areas.

As-Built shown in Red - OK

AS BUILT PLANS

Plotted 12/28/18

14

This page provides "Additional Conditions" for this specific design which are used to supplement the Construction Specification "634 Manure Transfer System" dated March, 2013. The information contained on this page(s) along with the 634 Specification are required to construct this facility under this contract.

6. Additional conditions which apply to this project are:

A. Measurement and Payment. Items of work listed in the bid schedule for Manure Transfer will be paid at the contract lump sum price. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary are identified in this section of the specification.

B. Effluent Collection and Transfer

1. This item includes the furnishing, excavation, installation, and backfilling of the effluent collection pipe, drainage stone, manifold pipe, tank, pump, electric components, pipelines, and sprinkler head.

2. Effluent collection pipe shall be 4" perforated ADS 3000 Triple Wall HDPE pipe. Perforations shall be in 3 rows facing down. Slope on pipe shall range from 1.0% - 2.0% as indicated on the HUAP Pad Layout drawing. Drain pipe spacing shall be 10'6" center to center as shown on Layout and Detail drawings. Geotextile will be placed against subgrade and perforated pipe will be placed on top of geotextile. 2 row perf. @ 120°

3. Drainage stone over perforated pipe will be a total depth of 18" as shown in the detail drawing. The first 9" of pipe bedding shall be AASHTO #57 clean stone. The top 9" can be AASHTO #57 stone or AASHTO #1 stone. Entire 18" is AASHTO #57 stone

4. Each effluent collection pipe will Tee into a 4" schedule 40 PVC manifold pipe. The manifold pipe shall have minimum slope of 1.0% and will outlet into the collection tank. A clean-out shall be installed at the beginning of each collection pipe. Each clean out will come up through the concrete footer close to the curb, shall be flush with top of concrete and capped with a steel plate. A clean-out shall be installed at the beginning of the manifold pipe and at the first 90 degree elbow (locations shown on drawing). Each manifold cleanout shall be capped outside the HUAP perimeter fence. 2 cleanouts in manifold.

5. Collection tank shall be a 2,000 gallon, two compartment precast concrete tank. **Tank dimensions shall be confirmed with BCCD before ordering**. The smaller compartment will be placed toward the north to act as a settling area where the manifold pipe will outlet. The larger compartment on the south end will be the pump side. The tank baffle wall shall be perforated 12" above the floor to allow some of the settling side volume to be pumped down. The tank must have manhole access with secure lids at each end of the tank. Manhole extensions will be needed for 2 feet of cover over tank.

6. Pump shall be Goulds 2.0 hp 3885 WE2012H or equivalent capable of handling ¾ inch solids and delivering 40 gpm at 98 ft total dynamic head. The pump can sit on the tank floor or be blocked up maximum 2". The pump float switch will be set to turn pump on when water level reaches just below effluent drain outlet, providing approx. 24" of water for a minimum dose (950 gal, 24 minutes). A high level alarm is required in the pump tank. The alarm must be mounted in a visible location near the tank. A relief drain shall be installed in the pump transfer line to allow line to drain back into tank. Recommend using 1" Auto-Drain Valve from Flomatic Valves. Alternatives solutions shall be approved by BCCD prior to installation. The valve shall close when pump is on and will open when pump is off to allow water in the pipe to drain back to tank. pump is on tank floor. Drains back through pump. Suitable valve not found.

7. Pump transfer line shall be 3" schedule 40 PVC pipe with pressure fittings. Pump discharge may be 2". Step up to 3" may be done after union accessible from manhole but must be done

As-Builts in Red
√=OK dated 12/28/18

AS BUILT PLANS

2" union. Must enter tank to break union for pump removal. (See tank As-Built Drawing).

before leaving the tank. . Breakable union in the 2" or 3" line shall be accessible from tank manhole to allow pump removal. Pipe must turn down after union and exit tank near the floor as shown to allow drain back and maximum cover over transfer line. A drain-back valve must be installed inside tank where shown and as described above in item 6. Minimum depth of pipe shall be 3 feet. Grade of transfer pipe back toward tank must always be at least 0.5%.

8. Sprinkler head shall be RainBird 80EHD with ½ inch nozzle or equivalent, capable of applying 40 gpm at 35 psi over a 79' radius. Any substitute must be approved by BCCD prior to use. The sprinkler riser shall be attached to a minimum 4x4 pressure treated post. Support post must be at least 4' deep in the ground. Sprinkler head must be minimum 5' above ground. The sprinkler riser must be fenced to prevent cattle contact.
9. Vegetated treatment area is in existing pasture. The entire paddock will be managed for the vegetated treatment area as part of the intensive rotational grazing system. New fence will not be needed around perimeter of treatment area. Small watershed above treatment area will be graded so surface water does not enter treatment area.
10. One dangerous gas warning sign must be posted at tank location.
11. Farmer is responsible to seed and mulch all disturbed areas.

As-Builts in Red ✓-ok

AS BUILT PLANS

NRCS 12/28/18

This page provides "Additional Conditions" for this specific design which are used to supplement the Construction Specification "Subsurface Drain" dated July, 2012. The information contained on this page(s) along with the 606 Specification on the preceding pages are required to construct this facility.

9. Additional Conditions which apply to this project are:

A. Measurement and Payment. The installed conduit, including the outlet pipe, will be measured to the nearest foot. Payment will be made at the contract unit price. Such payment will constitute full compensation for furnishing, transporting, and installing the conduit, including excavation, shoring, backfilling, filter or envelope, all fittings, appurtenances, outlet and fittings, and other items necessary and incidental to the completion of the work.

B. Perimeter Drain

1. This item includes the materials, excavation, installation, and backfilling of Reach 1 and 2 of the 6" subsurface perimeter drain line around the proposed heavy use area.
2. The tile line shall be 6 inch perforated corrugated drain tubing meeting AASHTO M-252 and installed as shown on the plan view and detail drawings.
3. The tile line shall start as shown near the south corner of the manure stacking area, where its highest elevation is 1244.0. Minimum trench width shall be 24". Minimum cover over the pipe shall be 30" except at outlet. **Minimum slope shall be 0.5%. There is minimal room for the outlet to be lower so grade control must maintain very tight tolerance.**
4. The pipe shall be bedded and backfilled as per detail drawing with AASHTO#57 stone and then bank run or equivalent.
5. Both reaches transition to 6" schedule 40 PVC pipe near the outlet as shown on the profile drawings.
6. Farmer is responsible to seed and mulch all disturbed areas.

B. Filter Tile

1. This item includes the materials, excavation, installation, and backfilling of tile line above the vegetated treatment area.
2. The tile line shall be 4 inch perforated corrugated drain tubing meeting AASHTO M-252 and installed as shown on the plan view and detail drawings.
3. The tile drain shall be located at least 20' upslope from the edge of the filter area.
4. Minimum trench width shall be 24". Minimum cover over the pipe shall be 30" except at outlet. Minimum slope shall be 1.0%.
5. The pipe shall be bedded and backfilled as per detail drawing.
6. The tile line will transition to 4" schedule 40 PVC pipe for an outlet.
7. Farmer is responsible to seed and mulch all disturbed areas.

As-Builts in Red ✓=ok

AS BUILT PLANS

(Marked) 12/28/18

DRAWING INDEX

CIG

WOOD CHIP BARNYARD PROJECT

1. REGULATIONS: All Federal, State and Local Laws, Rules and Regulations governing the construction of this facility shall be strictly followed. The owner or operator is responsible for obtaining all construction permits.
2. BCCD DESIGN: Failure to construct this facility in accordance with design or authorized modifications will result in withdrawal of BCCD technicial and financial assistance.
3. ACT 287: The PA One Call utility check serial number for design is 20182012332 dated 7/20/2018. It is the duty of the contractor(s) to comply with the provisions of PA Act 287 (1974) as amended by PA. Act 199 (2004) before performing any excavation. PA One Call phone number is 1-800-242-1776.
4. PRE-CONSTRUCTION MEETING: A meeting between the landowner, contractor and NRCS Representative shall be required prior to any excavation or construction work. See PRE-CONSTRUCTION CHECKLIST.
5. CERTIFICATION OF CONFORMANCE: The Certification of conformance shall certify that all work was performed to BCCD design specifications. See CERTIFICATION OF CONFORMANCE SHEET.
6. CONTRACTOR VERIFICATION: The contractor is responsible for verifying actual field measurements shown on the plans.

As-Builts in Red
AS BUILT PLANS
Glenn D. 12/28/2018

- X Requirements For Notification by Contractor
- X OSHA Information Sheet
- X Agricultural Construction
- X Soil Cave - In
- __ Warning Sign Fact Sheet
- __ Preconstruction Check List
- X Certification of Conformance

AS-BUILT/ DESIGN INFORMATION

QUALITY ASSURANCE STATEMENT				ENGINEER STATEMENT	
To the best of my knowledge, I certify that the practices have been installed as per the attached drawings and specifications, based on the information provided to me and/or observations I have made.				In my professional opinion, I certify that the practices have been installed as per the attached drawings and specifications, based on the information provided to me and/or observations I have made.	
Practice	Description	As-Built Quantity (By Inspector)	Inspector (Initials)	Certification (Engineer/JAA Signature)	Date Certified
561	Heavy Use Area Protect. - Wood Chip	10,000 ft²	GWD		12/27/18
561	HUAP - Concrete	1,200 ft²	GWD		12/27/18
313	Manure Stacking Area (8,000 ft³)	2,000 ft²	GWD		12/27/18
634	Waste Transfer	1 system	GWD		12/27/18
606	Subsurf Drain	765 ft	GWD		12/27/18
620	Underground outlet	170 ft	GWD		12/27/18
560	Access Rd.	510 ft	GWD		9/30/19
382	Fence - HUAP perim.	424 ft.	GWD		12/27/18

(Roof gutter outlet not included in this certification)

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT W. SWEPPENHEISER II
ENGINEER
PE045582-E

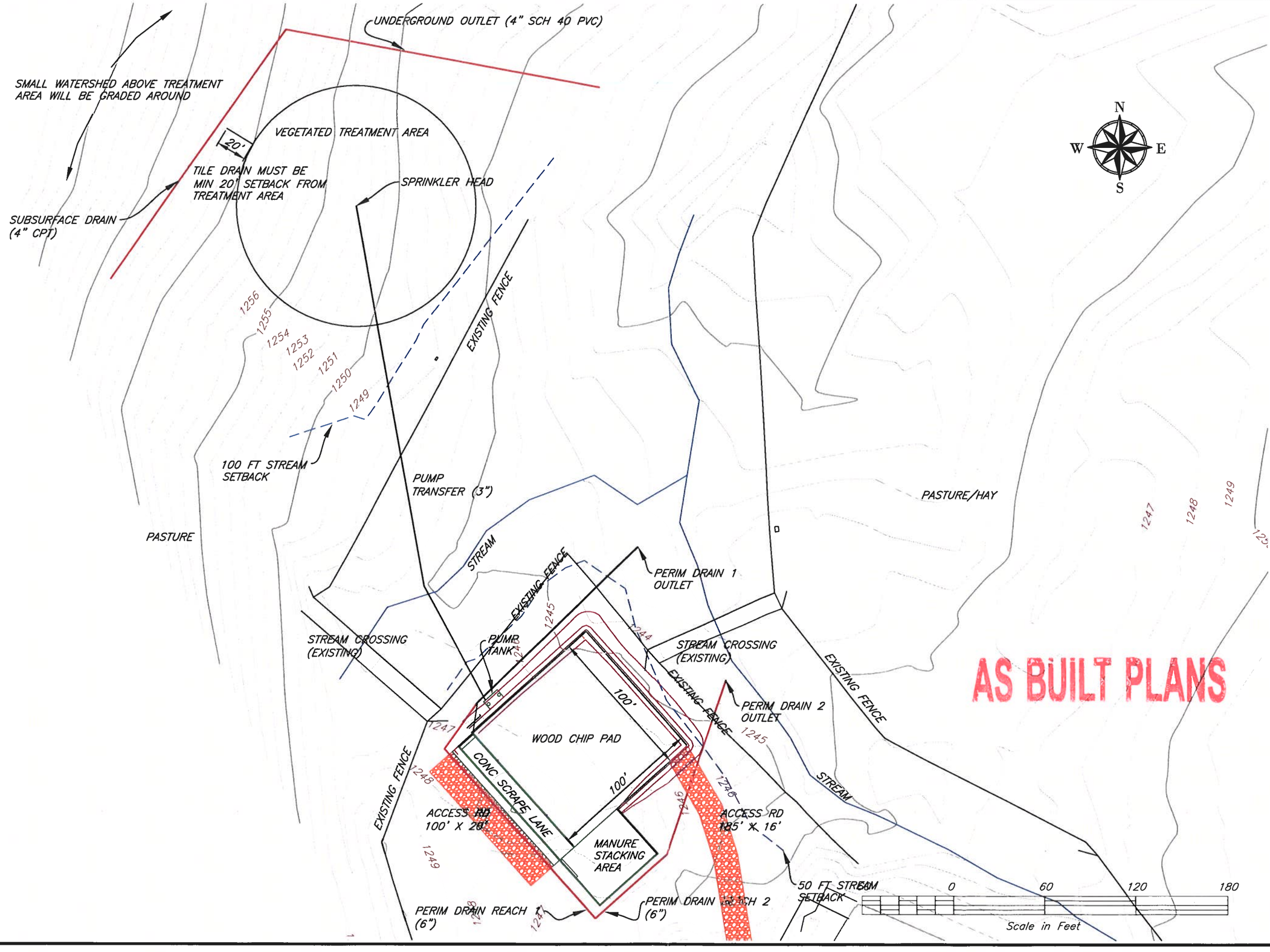
8/30/18

	Date	Approved by	Title	Date	Title
Designed N. DEWING	7-18				
Drawn N. DEWING	7-18				
Revised					
Checked					

BCCD
BRADFORD COUNTY CONSERVATION DISTRICT

DEWY MEADOWS FARM
HEAVY USE AREA PROTECTION
BRADFORD COUNTY, PENNSYLVANIA
CIG
COVER SHEET

Drawing No.
Sheet No. 1 of 23



Date 7/18
Designed N. DEWING
Drawn N. DEWING 7-18
Checked
Approved

TOPOGRAPHIC MAP

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

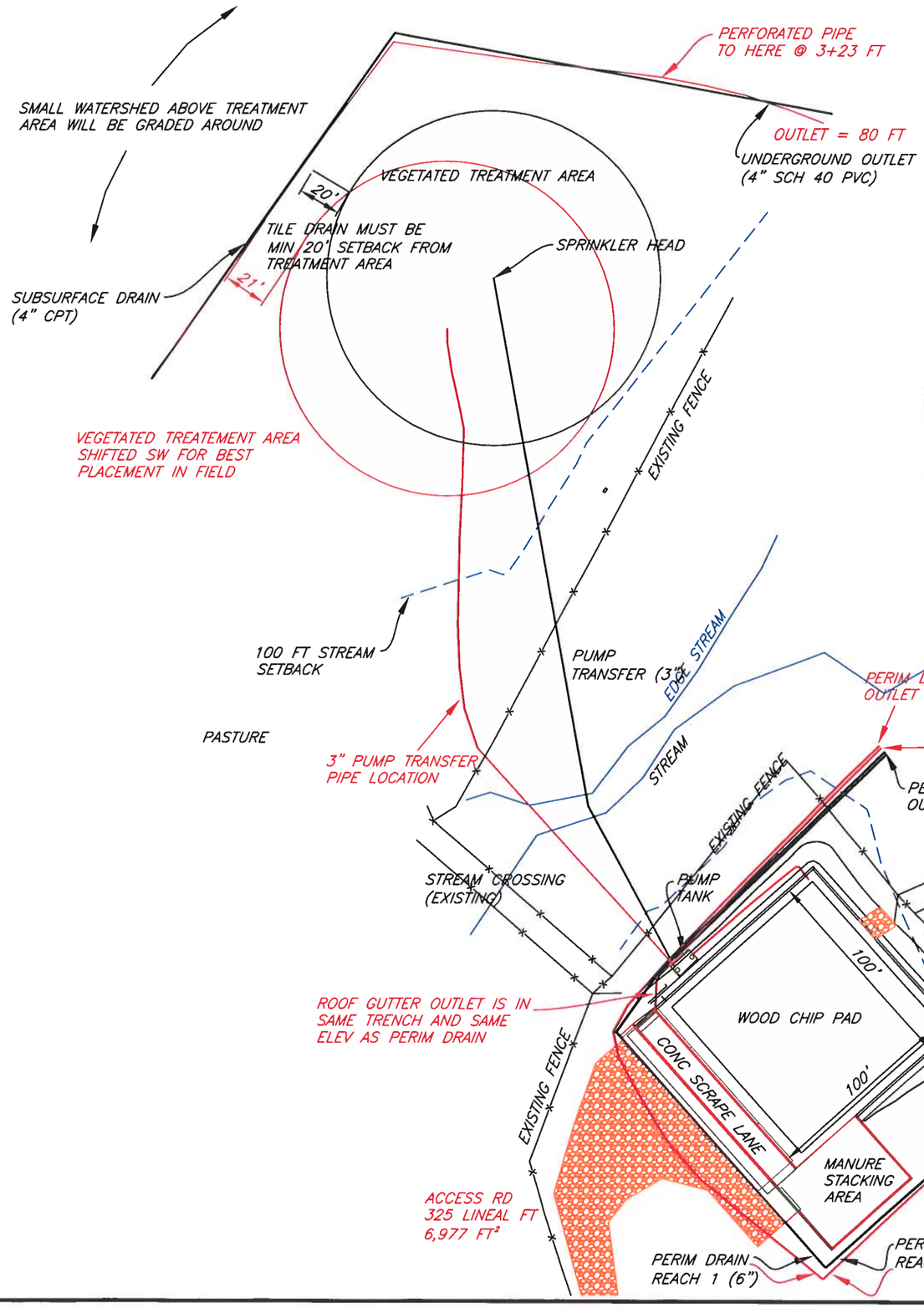
BCCD
BRADFORD COUNTY CONSERVATION DISTRICT

Bradford County Conservation District

File No.
PLAN VIEW DewyMeadows 2.dwg

Drawing No.

8/8/18 2:54 PM
Sheet 2 of 23



AS-BUILTS IN RED ✓=OK 12/28/2018

AS BUILT PLANS

N
W E
S

AS-BUILT QUANTITIES
- HUAP WOOD CHIPS = 10,000 FT²
- HUAP CONCRETE = 1,200 FT²
- MSF = 2,000 FT² (8,000 FT³)
- WASTE TRANSFER - 1 SYSTEM
- SUBSURFACE DRAIN = 765 FT
- UNDERGROUND OUTLET = 170 FT
- FENCE (HUAP PERIM) = 424 FT
- Access Rd - 510' - Updated 9/26/2019

Date 7/18
Designed N. DEWING
Drawn N. DEWING 7-18
Checked
Approved

PLAN VIEW
DEWY MEADOWS FARM
HEAVY USE AREA PROTECTION
BRADFORD COUNTY, PENNSYLVANIA

CIG

BCCD Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg
Drawing No.
3/1/19 1:36 PM
Sheet 3 of 23

One pipe jogged over to avoid waterer location (a NW waterer)

PUMP TRANSFER PIPE 3" SCH 40 PVC

NO TOE OF BERM ALONG NW SIDE ELEVATION TAPERS OVER LONG DIST

OUTSIDE TOE BERM

LEACHATE COLLECTION – 2,000 GAL PRECAST CONC TANK

2,000 gal

PAD DRAIN PIPE 10 @ 2% SLOPE

2%

DRAIN PIPES UNDER THE PAD ARE PLACED ALMOST EXACTLY AS DESIGNED. NOT SHOWN IN RED FOR CLARITY. FOR EXACT LOCATION SUGGEST VIEWING AS-BUILT POINTS IN CAD PIPES ARE AT POINTS CALLED "AB SG LOW" (LOW SPOTS BETWEEN RAISED BERMS IN SUBGRADE)

WOOD CHIP PAD

MANIFOLD PIPE CLEANOUT ACCESSIBLE OUTSIDE FENCE

MINIMUM ELEVATION OF COMPACTED CLAY IN BERM IS 1247.0

TOP OF COMPACTED BERM ELEVATIONS SHOWN IN BOLD (THEN OVERBUILD WITH ADDITIONAL 6" TOP SOIL)

INSTALL REINFORCED GRAVEL ACCORDING TO DETAIL WHERE CATTLE WILL EXIT WOOD CHIP AREA. INSTALL FROM OUTSIDE TOE OF BERM TO EDGE OF WOOD CHIPS.

PAD DRAIN MANIFOLD 1% SLOPE

TOP OF BERM 3' WIDE

OUTSIDE TOE BERM

PERIM DRAIN OUTLET

MANIFOLD PIPE CLEANOUT ACCESSIBLE OUTSIDE FENCE

EXTEND REINFORCED GRAVEL DETAIL OVER COMPACTED BERM TO WOOD CHIP AREA WHERE ACCESS ROAD ENTERS

PERFORATED CURB TO ALLOW WATER FROM CONCRETE INTO PAD DRAINAGE. 2" WIDE SLOT IN CURB EVERY 12 FT

INSTALL A CLEAN OUT WITH STEEL CAP AT TOP END OF EACH PAD DRAIN PIPE (FLUSH WITH TOP OF FOOTER)

CONCRETE SCRAPE LANE

8' 5" WIDE CONCRETE MANGER

8" CURB 9" CURB 12" CURB 12" CURB

SLOPE ACCESS LANE

PAD DRAIN PIPE 1 @ 1% SLOPE

1%

OUTSIDE TOE BERM

NO TOE OF BERM ALONG SE SIDE ELEVATION TAPERS FOR LONG DIST

MANURE STACKING AREA

40'

4 FT WALL

RAMP CURB

15'

13'-7"

PERIM DRAIN REACH 1

PERIM DRAIN REACH 2

ACCESS ROAD
185' X 16'
185'
2,960 FT²

HIGHEST PERIM DRAIN ELEV = 1244.0

1244.0

√ = U/L

AS-BUILTS IN RED

AS BUILT PLANS

12/20/2018

20 0 20 40 60

Scale in Feet

HUAP PAD LAYOUT

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

		Date
Designed	N. DEWING	7/18
Drawn	N. DEWING	7-18
Checked		
Approved		

Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg

Drawing No.

3/1/19 11:00 AM

Sheet 4 of 23

PERIMETER FENCE TO CONFINE CATTLE.
- FENCE WILL BE 5 STRAND HIGH TENSILE ELECTRIC
- POSTS TO BE LOCATED ON INSIDE SLOPE OF BERM AT EDGE OF WOOD CHIPS SO CATTLE CANNOT BE ON BERM
- MAX POST SPACING = 16 FEET
- FENCE ALONG FEED CURB TO BE SLANT BARS
  - FENCE IS 5' HIGH TENSILE WOVEN WIRE
  - POSTS LOCATED ON INSIDE SLOPE AT EDGE OF WOOD CHIPS
  - POST SPACING VARIES, <16'
  - FEED CURB FENCE IS SLANT BARS

USE REINFORCED GRAVEL DETAIL WHERE CATTLE AND EQUIPMENT TRAFFIC WILL OCCATIONALLY CROSS BERM

12' 12' GATE

12' 12' GATE

22' 16' GATE

12' 12' GATE

WOOD CHIP AREA

CONCRETE SCRAPE LANE

CONCRETE SLAB FOR FEED MANGER

MANURE STACKING AREA

20 0 20 40 60

Scale in Feet

AS-BUILTS IN RED

AS BUILT PLANS

12/28/18

HUAP FINAL LAYOUT

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

		Date
Designed	N. DEWING	7/18
Drawn	N. DEWING	7-18
Checked		
Approved		

Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg

Drawing No.

3/1/19 10:28 AM

Sheet 5 of 23

2000 GAL TWO-COMPARTMENT FROM ZEISER

2000 GALLON TWO COMPARTMENT TANK
500 GALLONS SETTLING AND PUMP SET UP
TO TURN ON AT 27" OF DEPTH

MANHOLES AND LIDS SHALL BE PRECAST CONCRETE OR SECURED PLASTIC LIDS

Secured plastic

EFFLUENT DRAIN ENTERS

SETTLING TANK ACCESS

PUMP TANK ACCESS

CONDUIT

ELECTRIC LINES

EXISTING GROUND

SEED ALL DISTURBED AREAS

24" MAX.

QUICK RELEASE ADAPTER RELEASABLE FROM MANHOLE

MAX WATER ELEV = ~~1245.8~~ 1245.8

SETTLING COMPARTMENT (Approx 1/3)

2.0HP GOULDS 3885 WE2012H OR EQUIV.

PLUMBING DOES NOT COME HIGH IN TANK. SIMPLY 2" UP OUT OF PUMP, THEN 90° OVER TO 2" UNION, THEN TO 3" AND EXITS TANK APPROX 6" ABOVE FLOOR. MUST ENTER TANK TO BREAK UNION WHEN REMOVING PUMP

PERFORATE BAFFLE APPROX 12" ABOVE FLOOR TO ALLOW PUMP TO REMOVE MAXIMUM VOLUME

12" ABOVE FLOOR

PUMP ON WHEN WATER = 1243.3

AUTOMATIC VALVE OPENS WHEN PUMP TURNS OFF TO ALLOW DRAIN BACK

WATER DRAINS BACK THROUGH PUMP – NO FANCY VALVE

4" SCH 40 PVC – MIN GRADE = 1.0%

1.0%

4"sch.40

1243.4
1243.4

90 DEGREE ELBOW OR TEE DOWN APPROX. 6"
NO ELBOW

1241.1 1241.1

PUMP

3.0" SCH 40 PVC PIPE
MIN SLOPE BACK TOWARD TANK = 0.5%

1241.7 1241.6

1240.8
1240.8

4" OF #57 GRAVEL

PUMP MAY SIT ON TANK FLOOR. IF BLOCKING UP, MAX ELEV ABOVE FLOOR SHALL BE 2"
PUMPS SITS DIRECTLY ON TANK FLOOR

3" pump transfer exits tank 6" above floor and goes under perim drain reach #1 and roof gutter outlet

NOTES:
1. THE SMALLER TANK COMPARTMENT SHALL BE USED FOR SOLIDS SETTLING WHERE THE EFFLUENT DRAIN ENTERS. THE LARGER COMPARTMENT SHALL HOUSE THE PUMP.
2. THE "PUMP" SHALL BE SET TO TURN ON WHEN WATER LEVEL REACHES JUST BELOW EFFLUENT DRAIN ENTERING TANK (VOLUME OF MINIMUM DOSE APPROX 950 GALLONS; TIME FOR MINIMUM DOSE APPROX 24 MINUTES)
3. SUBMERSIBLE EFFLUENT PUMP RATED AT 40 GPM (MIN.) WITH 98 FT. HEAD AND CAPABLE OF HANDLING 3/4" SOLIDS. USE GOULDS 3885 WE2012H OR EQUIV
2.0 HP GOULDS 3885 WE2012H

AS BUILT PLANS

√=OK

12/28/18

AS-BUILTS IN RED

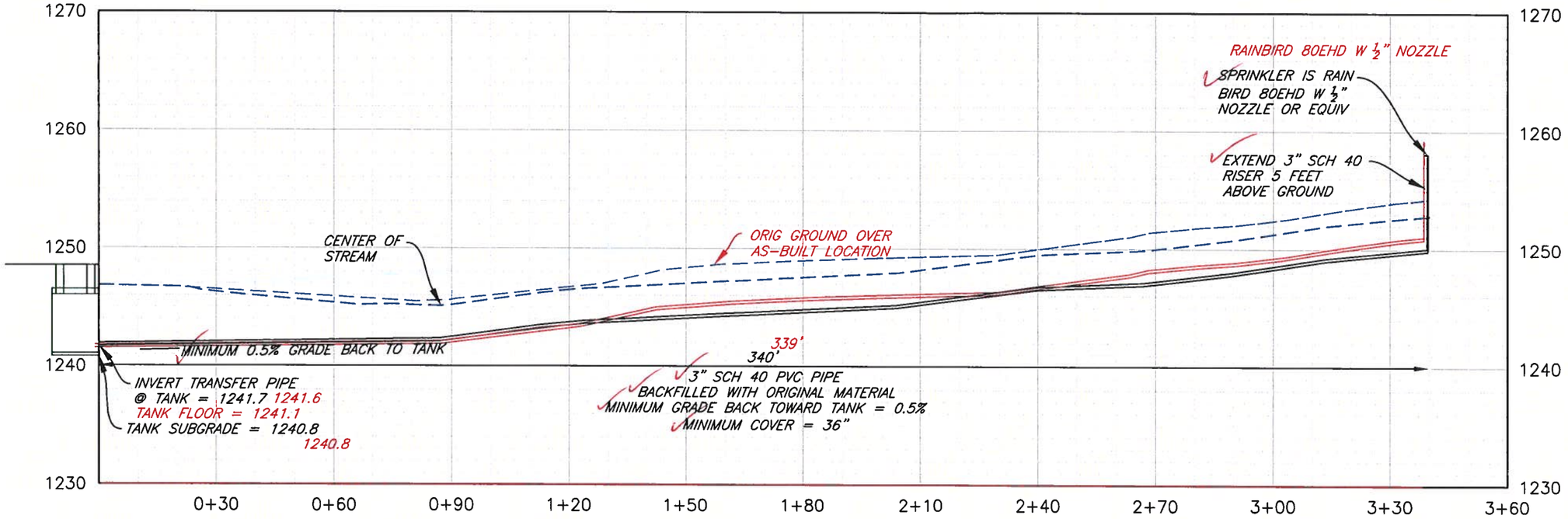
Date
Approved by
Title
Title

Date 7-18
Designed N. DEWING
Drawn
Revised
Checked

BCD
BRADFORD COUNTY CONSERVATION DISTRICT

DEWY MEADOWS FARM
HEAVY USE AREA PROTECTION
BRADFORD COUNTY, PENNSYLVANIA
PUMP TANK DETAIL

Drawing No.
Sheet No. 6 of 23



PUMP TRANSFER PROFILE

AS-BUILTS IN RED ✓=OK 12/28/18

AS BUILT PLANS

30 0 30 60 90

Scale in Feet

Designed	N. DEWING
Drawn	N. DEWING
Checked	
Approved	
Date	7-18 / 7-18

PUMP TRANSFER PROFILE

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

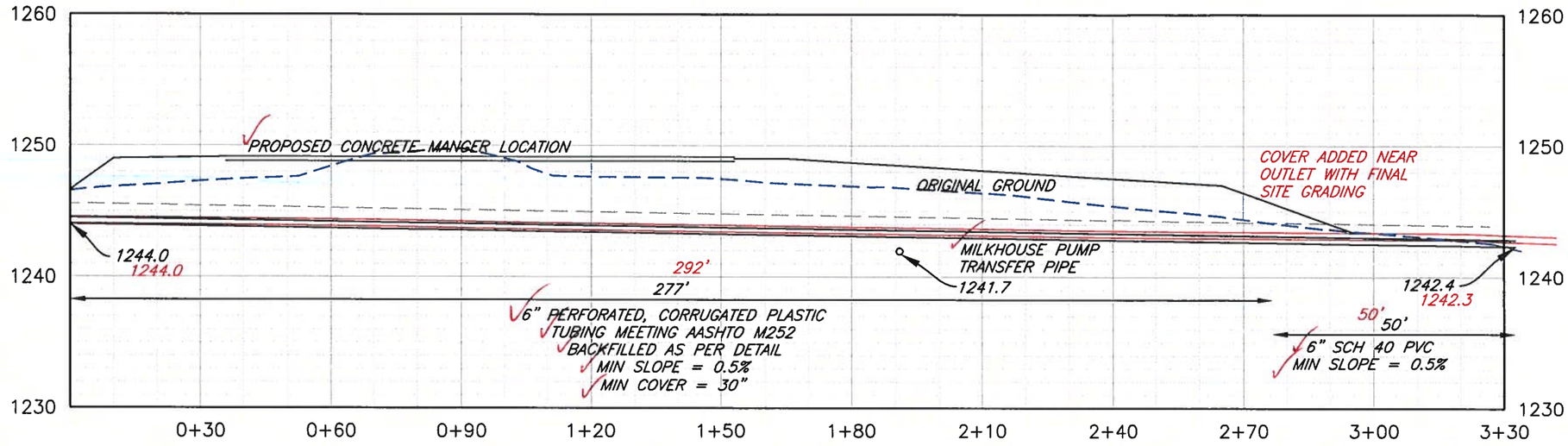
Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg

Drawing No.

3/1/19 10:37 AM

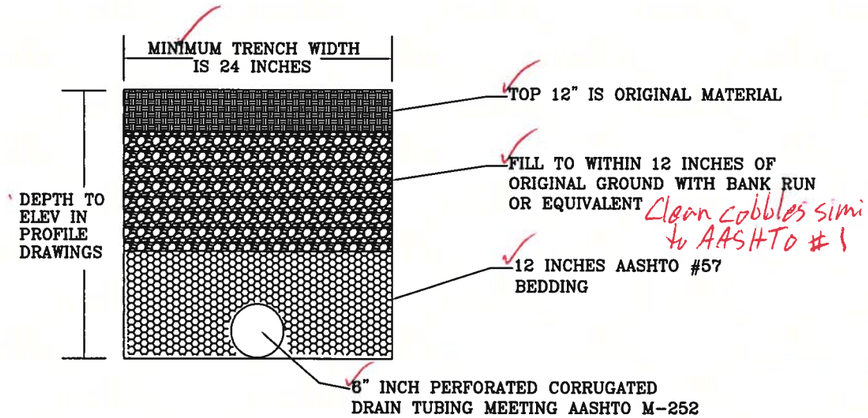
Sheet 7 of 23



PERIM DRAIN REACH 1 PROFILE

AS-BUILTS IN RED ✓= O/C Waited 12/28/18

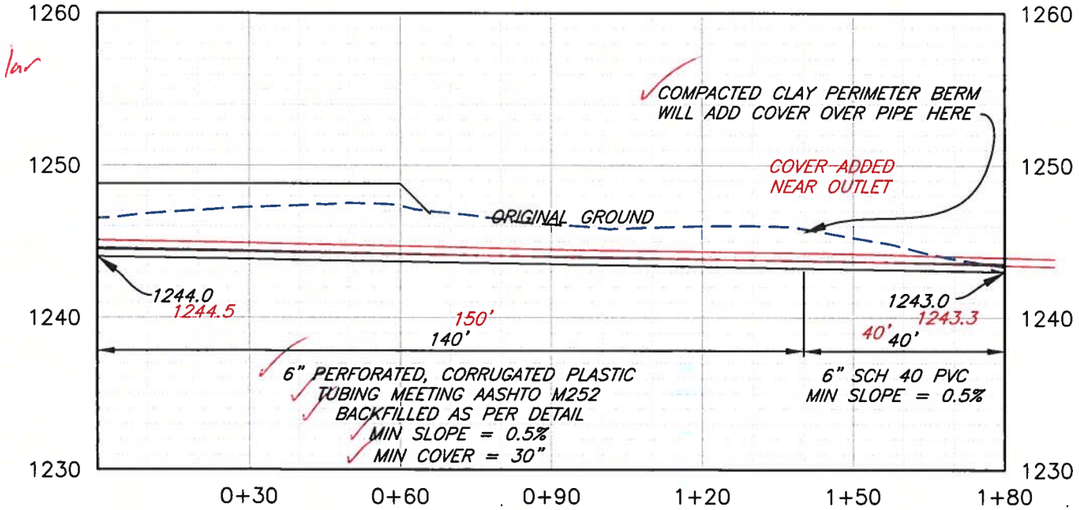
AS BUILT PLANS



QUANTITY FOR BOTH REACHES OF PERIM DRAIN:

ITEM	UNIT	QUANTITY	
6 INCH PERFORATED CORRUGATED DRAIN TUBING	FEET	420	442'
6 INCH SCH 40 PVC PIPE	FEET	90	90'
AASHTO #57 GRAVEL	TON	60	
BANK RUN (OR EQUIVALENT)	TON	110	
ANIMAL GUARD AND STONE HEADWALL		2	

AS-BUILT QUANTITIES
SUBSURFACE DRAIN = 442'
UNDERGOUND OUTLET = 90'



PERIM DRAIN REACH 2 PROFILE

30 0 30 60 90

Scale in Feet

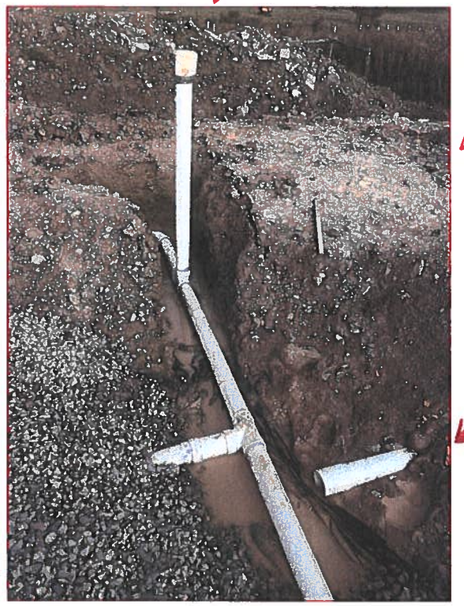
Date 7/18
Designed N. DEWING
Drawn N. DEWING 7-18
Checked
Approved

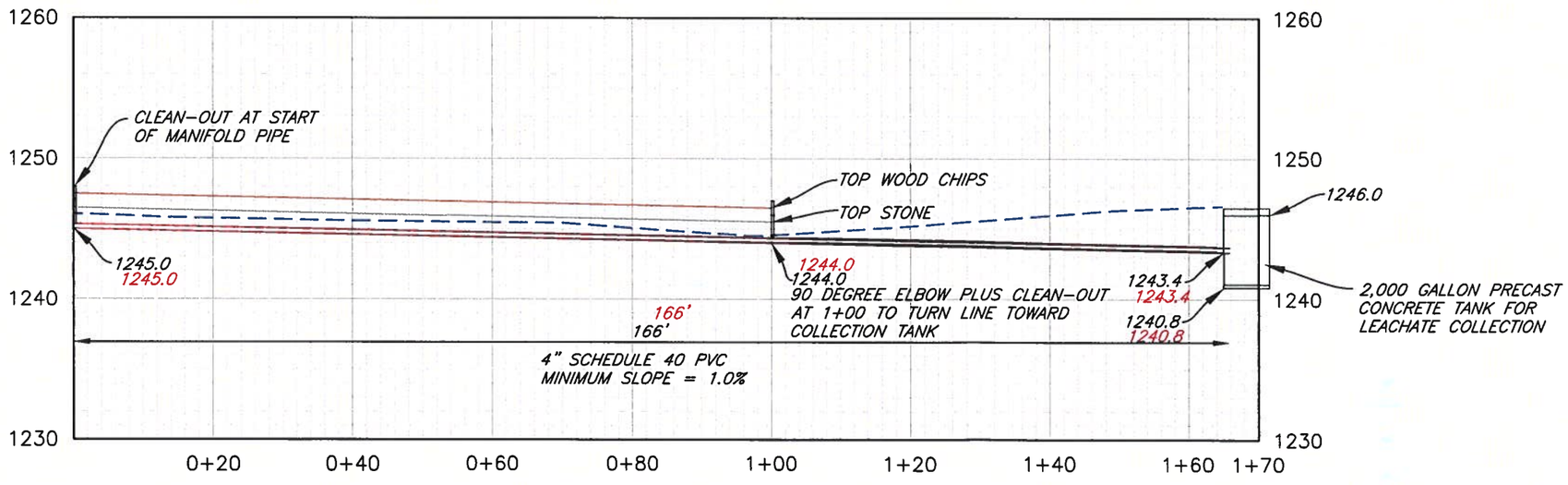
PERIMETER DRAIN PROFILE
DEWY MEADOWS FARM
HEAVY USE AREA PROTECTION
BRADFORD COUNTY, PENNSYLVANIA

CIG

BCCD Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg
Drawing No.
3/1/19 11:58 AM
Sheet 9 of 23





PAD DRAIN MANIFOLD PROFILE

AS-BUILTS IN RED ✓ = O/L 12/28/18

AS BUILT PLANS

20 0 20 40 60

Scale in Feet

PAD DRAIN MANIFOLD PROFILE

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

		Date
Designed	N. DEWING	7-18
Drawn	N. DEWING	7-18
Checked		
Approved		

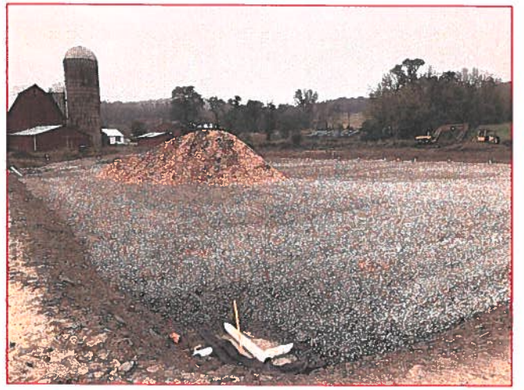
Bradford County Conservation District

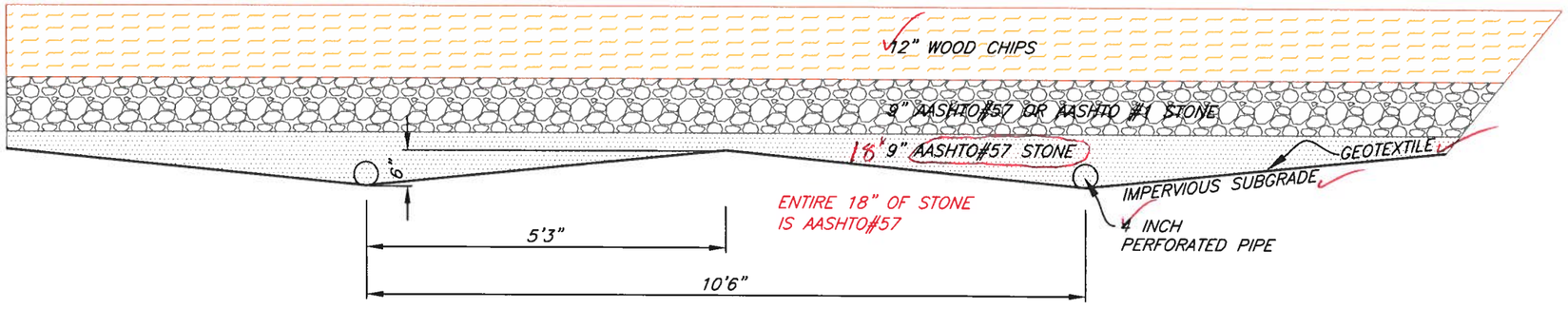
File No. AS BUILT DewyMeadows.dwg

Drawing No.

3/1/19 12:01 PM

Sheet 10 of 23





NOTES

ADS 3000 TRIPLE WALL – 2 ROWS PERF @ 120 DEG FACING DOWN

- 4 INCH PERFORATED DRAIN PIPE IS ADS 3000 TRIPLE WALL WITH THREE ROWS PERFORATIONS @ 60 DEGREES – HOLES PLACED DOWN
- ✓ DRAIN PIPE IS SPACED 10'–6" ON CENTER. 1.0% MINIMUM GRADE ON ALL DRAINAGE PIPE
- ✓ IMPERVIOUS SUBGRADE SLOPES AT 6" DROP TOWARD DRAIN PIPE IN EACH DIRECTION
- ✓ DRAIN PIPE BEDDED WITH AASHTO#57 STONE (MINIMUM 9") 18"
- ✓ TOTAL DRAINAGE STONE DEPTH = 18" ✓ TOP 9" OF STONE CAN BE AASHTO #57 OR AASHTO #1 ENTIRE 18" OF STONE IS AASHTO#57
- ✓ GEOTEXTILE PLACED ON TOP OF IMPERVIOUS SUBGRADE, BELOW DRAINAGE
- ✓ GEOTEXTILE SHALL BE ADS 701 (NON–WOVEN) OR EQUIVALENT
- ✓ WOOD CHIPS ARE HARDWOOD AND SCREENED TO REMOVE FINES; APPROX SIZE OF CHIP 2" X 2" X 0.25"; PLACED 12 INCHES THICK

AS–BUILTS IN RED ✓=OK Mitchell 12/28/18

Wood Chips from Wayne Lumber, Owego, NY
Chips mainly Soft Maple and Ash

AS BUILT PLANS

2 0 2 4 6

Scale in Feet

WOOD CHIP AREA DETAIL

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

Designed N. DEWING Date 7-18

Drawn N. DEWING 7-18

Checked

Approved

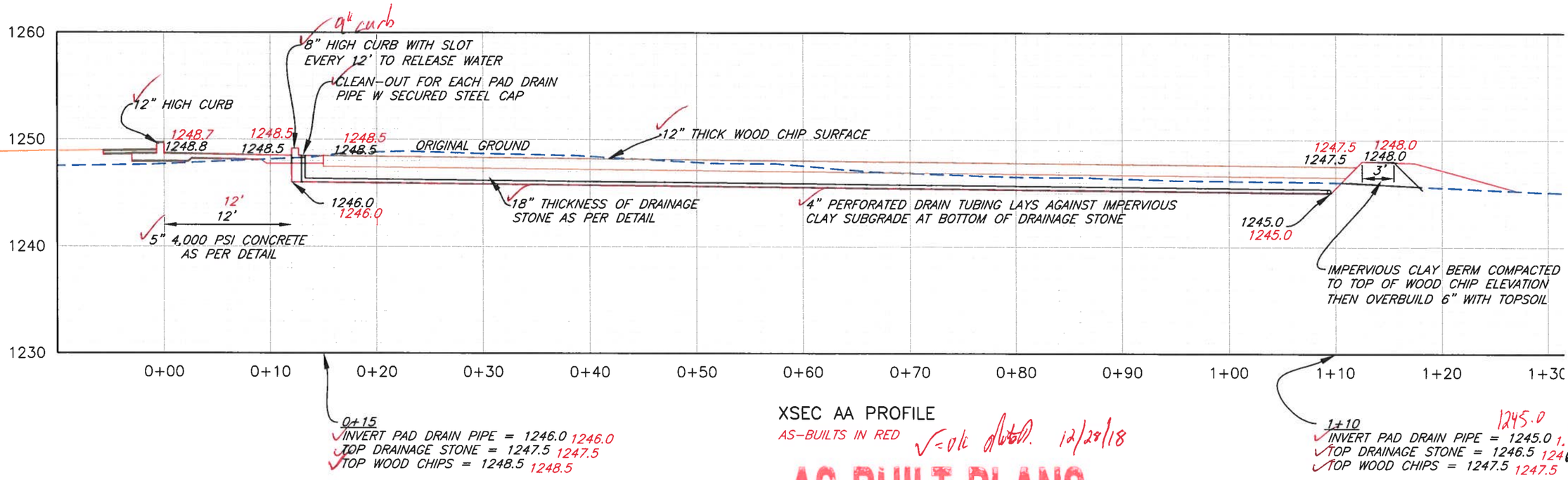
BCCD Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg

Drawing No.

3/1/19 12:08 PM

Sheet 11 of 23



0+15
INVERT PAD DRAIN PIPE = 1246.0 1246.0
TOP DRAINAGE STONE = 1247.5 1247.5
TOP WOOD CHIPS = 1248.5 1248.5

XSEC AA PROFILE
AS-BUILTS IN RED

√-ok dlwb. 12/28/18

1+10
1245.0
INVERT PAD DRAIN PIPE = 1245.0 1.
TOP DRAINAGE STONE = 1246.5 1246.5
TOP WOOD CHIPS = 1247.5 1247.5

AS BUILT PLANS

10 0 10 20 30
Scale in Feet

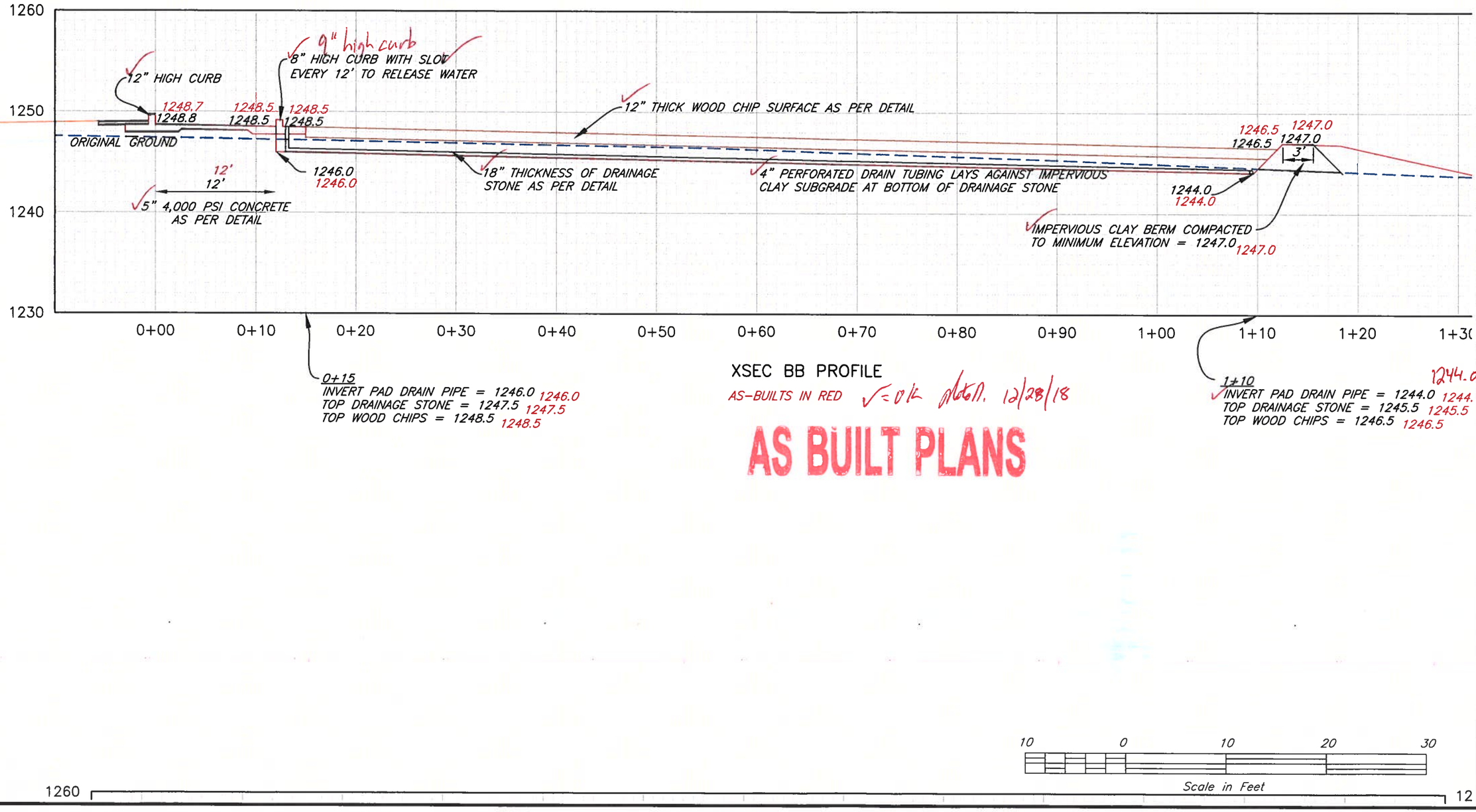
Date 7-18
Designed N. DEWING
Drawn N. DEWING 7-18
Checked
Approved

CIG

CROSS SECTION AA
DEWY MEADOWS FARM
HEAVY USE AREA PROTECTION
BRADFORD COUNTY, PENNSYLVANIA

BCCD Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg
Drawing No.
3/1/19 12:08 PM
Sheet of



0+15
INVERT PAD DRAIN PIPE = 1246.0 1246.0
TOP DRAINAGE STONE = 1247.5 1247.5
TOP WOOD CHIPS = 1248.5 1248.5

XSEC BB PROFILE

AS-BUILTS IN RED ✓=OK MCM. 12/28/18

1+10
1244.0
INVERT PAD DRAIN PIPE = 1244.0 1244.
TOP DRAINAGE STONE = 1245.5 1245.5
TOP WOOD CHIPS = 1246.5 1246.5

AS BUILT PLANS

10 0 10 20 30
Scale in Feet

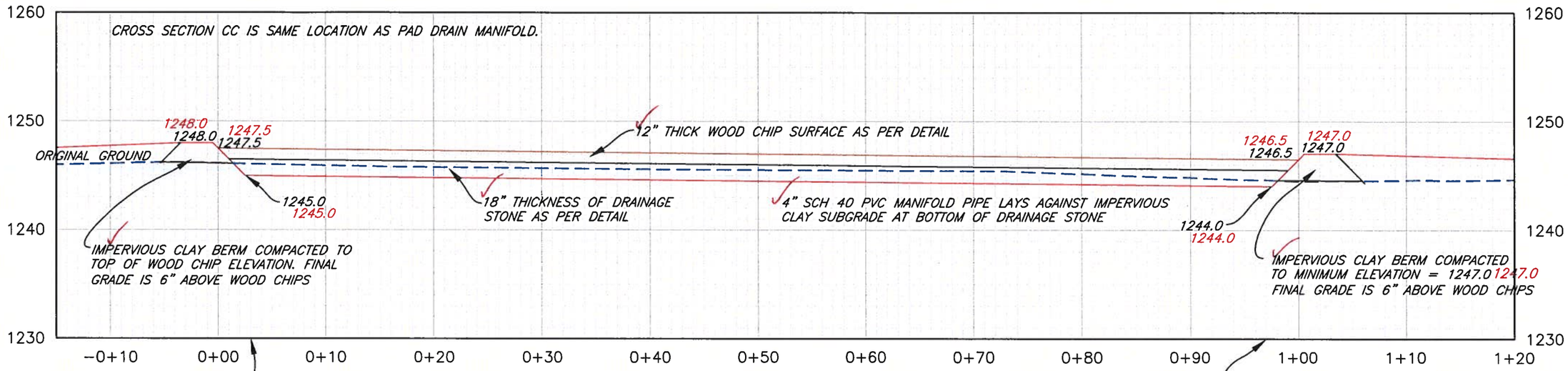
Date 7-18
Designed N. DEWING
Drawn N. DEWING 7-18
Checked
Approved

CIG

CROSS SECTION BB
DEWY MEADOWS FARM
HEAVY USE AREA PROTECTION
BRADFORD COUNTY, PENNSYLVANIA

BCCD Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg
Drawing No.
3/1/19 11:00 AM
Sheet 13 of 23



0+03
INVERT PAD DRAIN PIPE = 1245.0 1245.0
TOP DRAINAGE STONE = 1246.5 1246.5
TOP WOOD CHIPS = 1247.5 1247.5

0+97
INVERT PAD DRAIN PIPE = 1244.0 1244.0
TOP DRAINAGE STONE = 1245.5 1245.5
TOP WOOD CHIPS = 1246.5 1246.5

XSEC CC PROFILE

AS-BUILTS IN RED √=O/L 12/28/18

AS BUILT PLANS

10 0 10 20 30

Scale in Feet

Designed N. DEWING 7-18
Drawn N. DEWING 7-18
Checked
Approved

CROSS SECTION CC

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

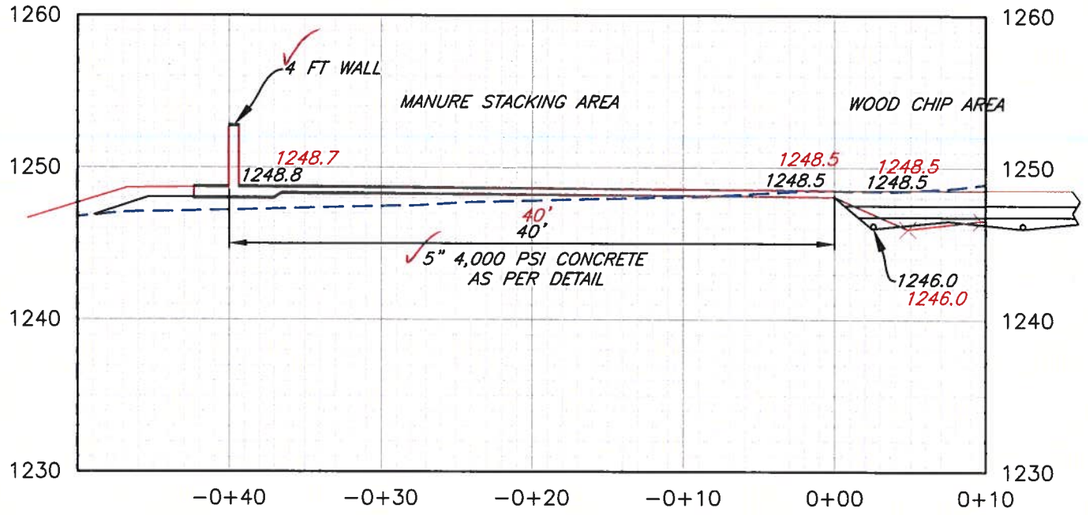
Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg

Drawing No.

3/1/19 11:00 AM

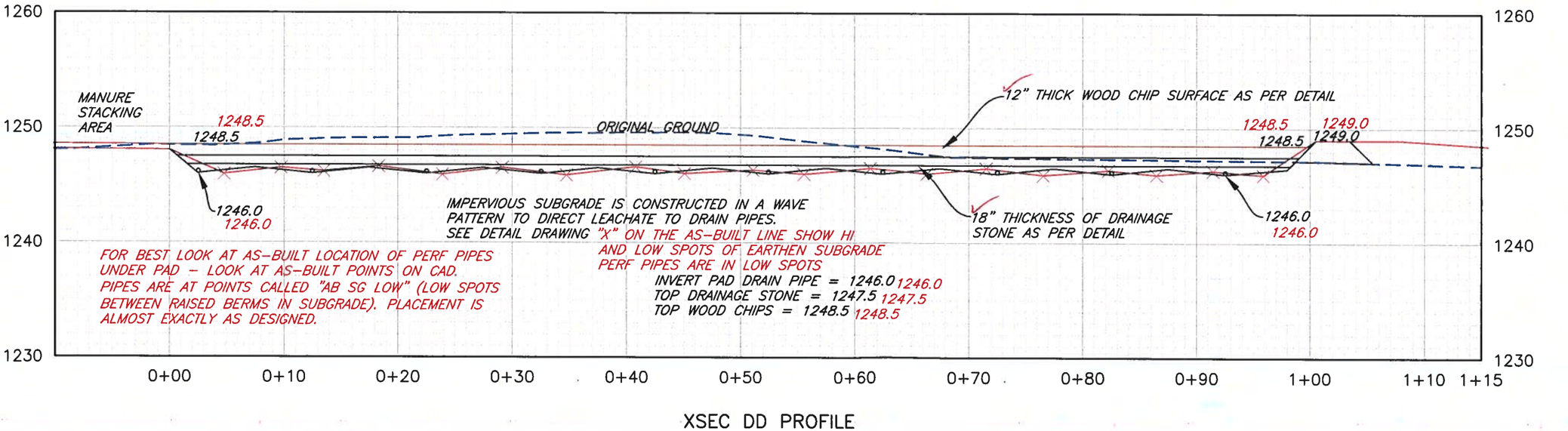
Sheet 14 of 23



XSEC DD PROFILE

AS-BUILTS IN RED
✓= OK
Dewitt D. 12/28/18

AS BUILT PLANS



XSEC DD PROFILE

10 0 10 20 30

Scale in Feet

Designed N. DEWING Date 7-18
Drawn N. DEWING 7-18
Checked
Approved

CROSS SECTION DD

DEWY MEADOWS FARM

HEAVY USE AREA PROTECTION

BRADFORD COUNTY, PENNSYLVANIA

CIG

BCCD Bradford County Conservation District

File No. AS BUILT DewyMeadows.dwg

Drawing No.

3/1/19 12:08 PM

Sheet of